Professional English in Use: Math, Physics and Computer Science

Кам’янець-Подільський

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I – 59

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Посібник "Professional English in Use: Math, Physics and Computer Science" рекомендований студентам, магістрантам, аспірантам та викладачам.

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FOREWORD

The book “Professional English in Use: Math, Physics and Computer Science” is recommended for students of physics and mathematics departments. This course content encourages the development of spoken and written English language abilities in students by providing a solid foundation for classroom, self-study, and individual work.

It features an excellent system of exercises designed to ensure the construction of receptive and productive types of speech activity, is created with consideration for contemporary foreign language learning technologies, and encourages the development of scientific research skills.

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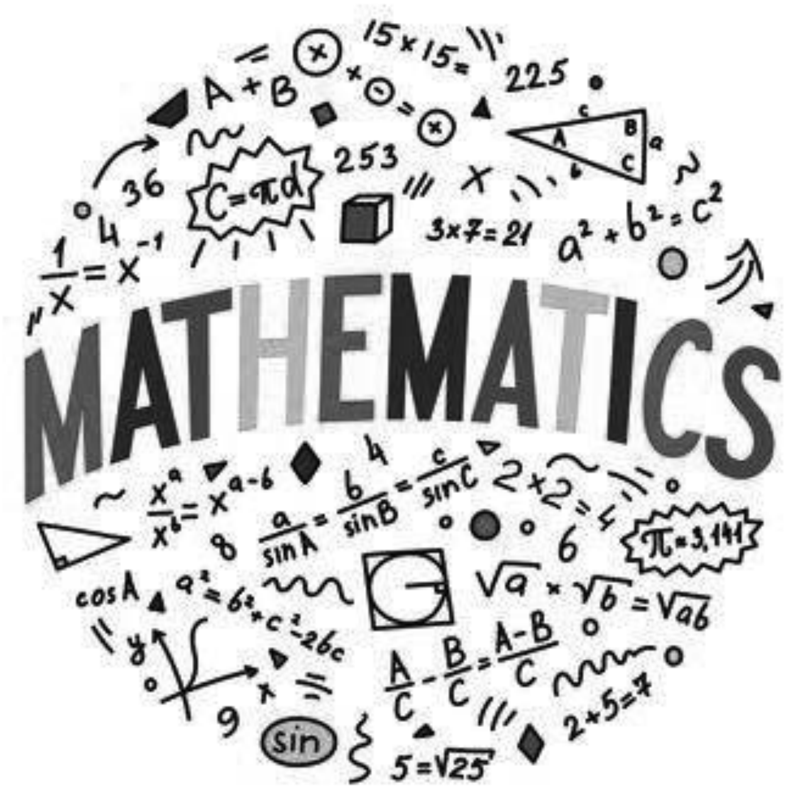
English for Students Majoring in Math



Mathematics: Main Aspects

I. Pre-reading task

1. Think about the answers to the following questions:

- Do you face the problem of necessity of counting in your everyday life?
- What is mathematics according to your point of view?
- What does mathematics consist of?

2. Read the following statements. Agree or disagree with them. Give the reasons of your choice.

1. It is impossible to give a concise and readily acceptable definition of maths as it is a multifield subject.
2. Maths in the broad sense of the world is a peculiar form of the general process of human knowledge of the real world.
3. Numbers are abstracted ideas or mental notions only, for numbers do not exist in nature.
4. A formal math system bears some analogy to a natural language, for it has its own vocabulary and rules.
5. Nowadays mathematicians frequently liken maths to art or game rather than to science.
6. Maths is the science dealing primarily with what can be obtained by reasoning alone.
7. Math writing is remarkable because it encompasses much information in few words.
8. Contemporary maths is mixture of much that is very old and still important (e.g., counting, the Pythagorean theorem) with new concepts such as sets, axiomatics, structure.
9. We need for careful and rigorous reasoning in proofs is not at once intuitively apparent to a non mathematician.
10. Modern methods of carrying out arithmetic operations and their applications become sophisticated through modern computers.

II. Reading

Read and translate the text.

One of the foremost reasons given for the study of mathematics is to use a common phrase, that – mathematics is the language of science. This is not meant to imply that mathematics is useful only to those who specialized in science. No, it implies that even a layman must know something about the foundations, the scope and the basic role played by mathematics in our scientific age.

The language of mathematics consists mostly of signs and symbols, and, in a sense, is an unspoken language. There can be no more universal or more simple language, it is the same throughout the civilized world, though the people of each country translate it into their own particular spoken language. For instance, the symbol 5 means the same to a person in England, Spain, Italy or any other country; but in each country it may be called by a different spoken word. Some of the best known symbols of mathematics are the numerals 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 and the signs of addition (+), subtraction (-), multiplication (x), division (:), equality (=) and the letters of the alphabets: Greek, Latin, Gothic and Hebrew (rather rarely).

Symbolic language is one of the basic characteristics of modern mathematics for it determines its true aspect. With the aid of symbolism mathematicians can make transition in reasoning almost mechanically by the eye and leave their mind free to grasp the fundamental ideas of the subject matter. Just as music uses symbolism for the representation and communication of sounds, so mathematics expresses quantitatively relations and spatial forms symbolically. Unlike the common language, which is the product of custom, as well as social and political movements, the language of mathematics is carefully, purposefully and often ingeniously designed. By virtue of its compactness, it permits a mathematician to work with ideas which when expressed in terms of common language are unmanageable. This compactness makes for efficiency of thought.

Mathematic language is precise and concise, so that it is often confusing to people unaccustomed to its forms. The symbolism used in math language is essential to distinguish meanings often confused in common speech. Math style aims at brevity and formal perfection. Let us suppose we wish to express in general terms the Pythagorean Theorem, well-familiar to every student through his high-school studies. We may say: "We have a right triangle. If we construct two squares each having an arm of the triangle as a side and if we construct a square having the hypotenuse of the triangle for its side, then the area of the third square is equal to the sum of the areas of the first two". But no mathematician expresses himself that way. He prefers: "The sum of the squares on the sides of a right triangle equals the square on the hypotenuse." In symbols this may be stated as follows: c2=a2+b2. This economy of words makes for conciseness of presentation, and math writing is remarkable because it encompasses much in few words. In the study of mathematics much time must be devoted 1) to the expressing of verbally stated facts in math language, that is, in the signs and symbols of mathematics; 2) to the translating of math expressions into common language. We use signs and symbols for convenience. In some cases the symbols are abbreviations of words, but often they have no such relations to the thing they stand for. We cannot say why they stand for what they do; they mean what they do by common agreement or by definition.

The student must always remember that the understanding of any subject in mathematics presupposes clear and definite knowledge of what precedes. This is the reason why "there is no royal road" to mathematics and why the study of mathematics is discouraging to weak minds, those who are not able to master the subject.

3. Which of these statements are true? Correct the false ones.

1. Symbolic language is one of the main characteristics of modern mathematics for it determines its true aspect.

2. The language of mathematics consists of signs and symbols.

3. In the process of studying the mathematics much attention should be devoted: 1- to

the expressing of verbally stated facts in math language; 2 - to the translating of math expressions into common language.

4. Like the common language, the language of mathematics is carefully, purposefully and often ingeniously designed.

5. Mathematic language is precise and concise, so that it is often confusing to people unaccustomed to its forms.

4. Make the false statements negative. Paraphrase, if possible, the negative sentences in more than one way.

Model 1: Mathematicians define this basic term.

Mathematicians do not define this basic term.

No mathematician defines this basic term. (Жоден…не…).

Don’t mathematicians define this basic term? (Хіба … не?).

1. There can be more universal or more simple language.

2. Symbolic language is the only basic characteristics of modern mathematics.

3. The language of mathematics is randomly designed.

4. The sum of the squares on the sides of a right triangle equals

the cube on the hypotenuse.

5. In the study of mathematics much time must be devoted to the learning of multiplication tables.

5. Find English equivalents of the following phrases:

- зрозуміти основні ідеї;
- неиає сенсу заперечувати;
- цивілізований світ;
- виражати кількісні відношення;
- гіпотенуза трикутника;
- головна причина;
- квадрат гіпотенузи;
- соціальні та політичні перетворення;
- просторова форма.

6. Reorder the words to make a sentence:

1. Of, symbols, the, consists, and, signs, language, of, mathematics, mostly.
2. Characteristics, modern, is, symbolic, its, the, language, aspect, one, determines, of, basic, mathematics, for, of, it, true.
3. The, common, to, often, symbolism, is, used, in, speech, math, language, distinguish, essential, in, meanings, confused.
4. The, what, of, presupposes, understanding, definite, clear, of, subject, mathematics clear, and, any, knowledge, proceeds, in.
5. Language, there, or, can, no, more, more, universal, simple, be, language.

7. Do the test:

1. In what profession knowledge of mathematics is required?

a) teacher; b) layman; c) mathematician; d) in all professions.

2. The language of mathematics consists mostly of …?

a) terms and tables; b) signs and letters;

c) signs and symbols; d) symbols and letters.

3. The symbol 5 means … to a person in England, Spain, Italy or any other country.

a) different things; b) “hello”; c) an arm; d) the same.

4. What is the sign of addition?

a) (-); b) (}); c) (+); d) (x).

5. What is the sign of subtraction?

a) (-); b) (=); c) (+); d) (x).

6. What is the sign of multiplication?

a) (#); b) (=); c) (>); d) (x).

7. What is the sign of division?

a) (-); b) (=); c) (“); d) (:).

8. What is the sign of equality?

a) (+); b) (=); c) (&); d) (:).

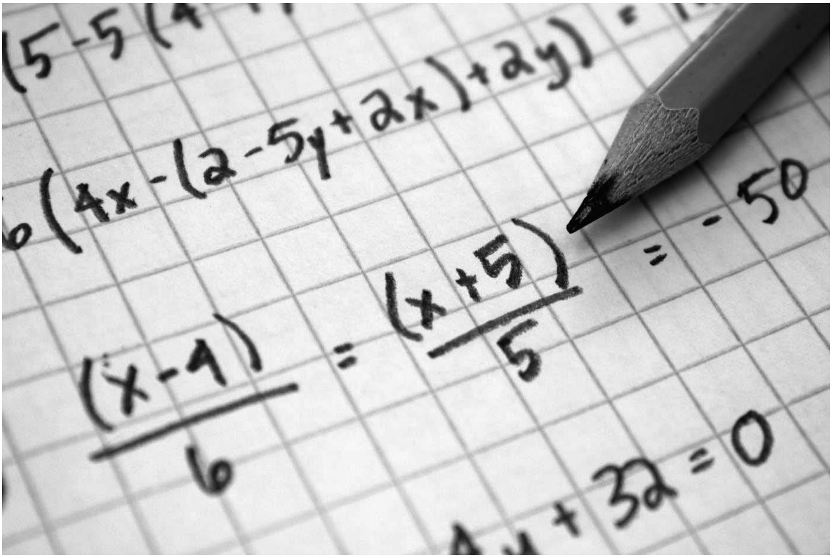
9. The letters of which alphabets are frequently used in mathematics?

a) Greek, Italian, Russian, and Hebrew; b) Latin, Gothic, and Times New Roman;

c) Latin, Gothic, French, and Hebrew; d) Greek, Latin, Gothic, and Hebrew.

10. The study of mathematics is discouraging to … minds, those who are not able to master the subject.

a) weak; b) dark; c) absent; d) blonde



Algebra

I. Pre-reading task

1. Read and translate the sentences.

1. The origin of the title “Algebra” is rather exotic. We owe the word “algebra” to the Arab mathematician al-Khowarismi.

2. Although originally algebra referred only to equations and their solution, the word today has acquired a new connotation.

3. Algebra in its development passed successively through three stages: the rhetorical, the symbolic.

4. Rhetorical algebra is characterized by the complete absence of any symbols and the words were used in their symbolic sense.

5. In syncopated algebra certain words of common and frequent use were gradually abbreviated. Eventually these abbreviations have become symbols. Modern algebra is symbolic.

6. One of the most interesting problems of algebra is that of the algebraic solution of equations.

7. Elementary algebra (from 1700 B.C. until 1700 A.D.) dealt exclusively with the general properties of numbers and the solution of algebraic equations.

8. Nearly all mathematicians of distinguished rank have treated this subject. They arrived at the general expression of the roots of equations of the first four degrees. However, ingenious devices rather than advances in insight and theory achieved these solutions.

9. Early in the 19th century a new view of maths began to emerge. Maths came not to restrict itself to numbers and shapes.

10. Algebra nowadays deals effectively with anything. The mainstream in the development of algebra followed a parallel and concurrent stream in the development of the complex number system.

2. Match the words to the definitions.

fraction	geometry	complex number	mathematical expressions	
algebra	positive number	conditional equation	mantissa equation	
variables	identical equation	characteristic	square root	cube root

1. An equation is a statement that two …….. are equal.
2. A conditional equation is true only for certain values of the …….
3. A whole part of a logarithm is called ……
4. …….. is a number that when multiplied by itself gives a given number.
5. ……..is a statement that two mathematical expressions are equal.
6. A statement that two mathematical expressions are equal for all values of their variables is called…….
7. The branch of mathematics that deals with the general properties of numbers we call ……
8. …….. is a number of type a+ib.

II. Reading

Read and translate the text.

The first records of man’s interest in cubic equations date from the time of the old Babylonian civilization, about 1800-1600B. C. Among the mathematical materials that survive, arc tables of cubes and cube roots, as well as tables of values of n2+ n3. Such tables could have been used to solve cubics of special types. For example, to solve the equation $2x^3 + 3x^2 = 540$, the Babylonians might have first multiplied by 4 and made the substitution $y = 2x$, giving $y^3 + 3y^2 = 2{,}160$. Letting $y = 3z$, this becomes $z^3 + z^2 = 80$. From the tables, one solution is $z = 4$, and hence 6 is a root of the original equation.

In the Greek period concern with volumes of geometrical solids led easily to problems that in modern form involve cubic equations. The well-known problem of duplicating the cube is essentially one of solving the equation $x^3 = 2$. This problem, impossible of solution by ruler and compasses alone, was solved in an ingenious manner by Archytas of Tarentum (c. 400 B.C), using the intersections of a cone, a cylinder, and a degenerate torus (obtained by revolving a circle about its tangent).

The well-known Persian poet and mathematician Omar Khayyam (A. D. 1100) advanced the study of the cubic by essentially Greek methods. He found solutions through the use of conics. It is typical of the state of algebra in his day that he distinguished thirteen special types of cubics that have positive roots. For example, he solved equations of the type $x^3 + b^2x = b^2c$ (where b and c are positive numbers) by finding intersections of the parabola $x^2 = by$ and the circle $y^2 = x(c—x)$, where the circle is tangent to the axis of the parabola at its vertex. The positive root of Omar Khayyam's equation is represented by the distance from the axis of the parabola to a point of intersection of the curves.

The next major advance was the algebraic solution of the cubic. This discovery, a product of the Italian Renaissance, is surrounded by an atmosphere of mystery; the story is still not entirely clear. The method appeared in print in 1545 in the "Ars magna" of Girolamo Cardano of Milan, a physician, astrologer, mathematician, prolific writer, and suspected heretic, altogether one of the most colourful figures of his time. The method gained currency as "Cardan's formula"; (Cardan is the English form of his name). According to Cardano himself, however, the credit is due to Scipione del Ferro, a professor of mathematics at the University of Bologna, who in 1515 discovered how to solve cubics of the type $x^3+bx = c$. As was customary among mathematicians of that time, he kept his methods secret in order to use them for personal advantage in mathematical duels and tournaments. When he died in 1526, the only persons familiar with his work were a son-in-law and one of his students, Antonio Maria Fior of Venice.

In 1535 Fior challenged the prominent mathematician Niccolo Tartaglia of Brescia (then teaching in Venice) to a contest because Fior did not believe Tartaglia's claim of having found a solution for cubics of the type x3+bx2= c. A few days before the contest Tartaglia managed to discover also how to solve cubics of the type x3+ax= c, a discovery (so he relates) that came to him in a flash during the night of February 12/13, 1535. Needless to say, since Tartaglia could solve two types of cubics whereas Fior could solve only one type, Tartaglia won the contest. Cardano, hearing of Tartaglia's victory, was eager to learn his method. Tartaglia kept putting him off, however, and it was not until four years later that a meeting was arranged between them. At this meeting Tartaglia divulged his methods, swearing Cardano to secrecy and particularly forbidding him to publish it. This oath must have been galling to Cardano. On a visit to Bologna several years later he met Ferro's son-inlaw and learned of Ferro's prior solution. Feeling, perhaps, that this knowledge released him from his oath to Tartaglia, Cardanopublished a version of the method in Ars Magna. This action evoked bitter attack from Tartaglia, who claimed that he had been betrayed.

The general quartic equation yielded to methods of similar character; and its solution, also, appeared in Ars Magna. Cardano's pupil Ludovico Ferrari was responsible for this result. Ferrari, while still in his teens (1540), solved a challenging problem that his teacher could not solve. His solution can be described as follows: First reduce the general quartic to one in which the x3 term is missing, then rearrange the terms and add a suitable quantity (with undetermined coefficient) to both sides so that the left-hand member is a perfect square. The undetermined coefficients are then determined so that the right-hand member is also a square, by requiring that its determinant be zero. This condition leads to a cubic, which can now be solved — the quartic can then be easily handled.

Later efforts to solve the quantic and other equations were foredoomed to failure, but not until the nineteenth century was this finally recognized. Carl Fridrich Gauss proved in 1799 that every algebraic equation of degree n over the real field has a root (and hence n roots) in the complex field. The problem was to express these roots in terms of the coefficients by radicals. Paolo Ruffini, an Italian teacher of mathematics and medicine at Modena, gave (in 1813) an essentially satisfactory proof of the impossibility of doing this for equations of degree higher than four, but this proof was not well-known at the time and produced practically no effect.

3. Read and decide which of the statements are true and which are false. Change the sentences so they are true.

1. For a positive number n, the logarithm of n is the power to which some number b must be raised to give n
2. Common logarithms are logarithms to the base e (2.718…).
3. Common logarithms for computation are used in the form of an integer plus a

positive decimal fraction.

4. Logarithms don't obey any laws.
5. An equation has as many roots as its degree.
6. The tree roots of the cubic equation yield to the same treatment as the two roots of the quadratic.
7. No general algebraic solution is possible for the polynomial equation of degree

greater than four.

8. Arabic algebra used the rules of false position and of double false position.

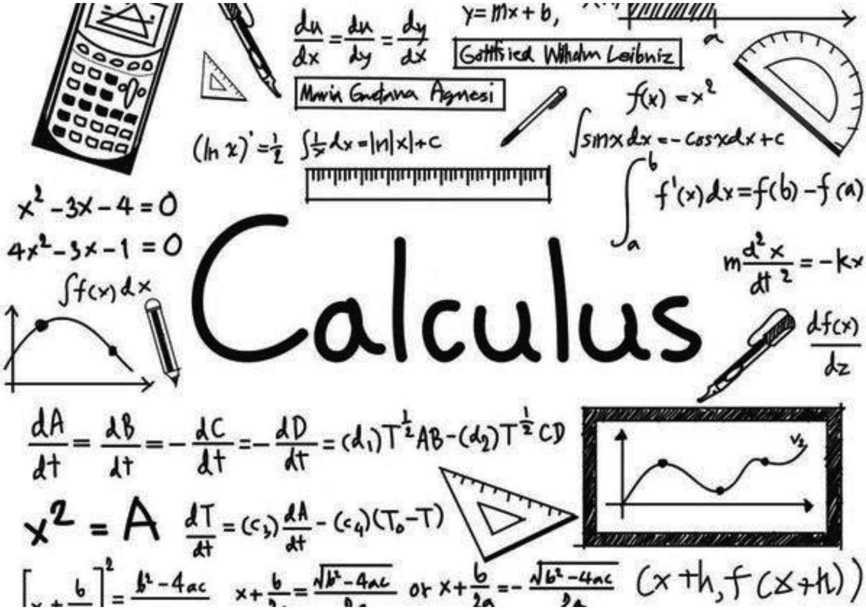
4. Give the English equivalents of the following Ukrainian words and word combinations:

тотожність, перестановка, корінь, рішення, невідома величина, основа, умовне рівняння, ступінь, показник ступеня, висловлювання (формулювання), еквівалентна операція, тотожне рівняння, рівняння з одним невідомим, рівняння першого ступеня, підстановка, підкореневий вираз, лінійне рівняння.

5. Choose the appropriate answer.

1. A variable whose limit is zero:
(A) infinitesimal (D) unknown quantity
(B) derivative (E) constant
(C) absolute value (F) limit
2. A positive and negative change in a variable:
(A) increment (D) derivative
(B) argument (E) infinity
(C) function (F) series
3. The interval which doesn't contain the end points:
(A) segment (D) partly open interval
(B) closed interval (E) straight line
(C) open interval (F) curve
4. An equation which is true for aall values of the variable:
(A) conditional equation (D)simple linear equation
(B) identical equation (E) differential equation
(C) integral equation (F) quadratic equation
5. The indicated sum of the terms of a sequence:
(A) finite sequence (D) general term
(B) series (E) summation
(C) infinite sequence (F) I don't know

6. Work in two teams. You are members of a conference committee. You are going to organize a conference on the topic "Number theory". As a group make a list of research problems to be discussed within different workshops or an information bulletin containing a brief summary of all the workshop discussion points to attract prospective participants.



Calculus

I. Pre-reading task

1. Think about the answers to the following questions:

1. Do you know who invented Calculus?
2. Can you give a brief history of the Calculus controversy?
3. Do you know whose notation is used in Calculus nowadays?
4. Try to explain the difference between integral calculus and differential calculus?

2. Match these terms with their definitions.

1. **tangent**	**a)** calculus that concerns accumulation of quantities and the areas under and between curves
2. **velocity**	**b)** calculus that deals with the study of the rates at which quantities change
3. **integral calculus**	**c)** a geometric line, curve, plane, or curved surface that touches another curve or

	surface at one point but does not intersect it
4. **differential calculus**	**d)** a measure of the rate of motion of a body expressed as the rate of change of its position in a particular direction with time
5. **curve**	**e)** the change of a function, f(x), with respect to an infinitesimally small change in the independent variable
6. **derivative**	**f)** the graph of a function with one independent variable
7. **volume**	**g)** the extent of a two-dimensional surface enclosed within a specified boundary or geometric figure
8. **area**	**h)** the rate of change of velocity
9. **acceleration**	**i)** the magnitude of the three-dimensional space enclosed within or occupied by an object, geometric solid, etc
10. **function**	**j)** a relation between a set of inputs and a set of permissible outputs with the property that each input is related to exactly one output

II. Reading

Read the text and fill in the gaps with the following words.

plagiarist, terrestrial, heavenly, instantaneous , subsidiary, associated, obtains,
assigning, curve, applications, opposite , Geometric , priority, budding, tangent,
calculus, reverse, velocity, pure, length, plane, variable, apparently, space, creator,
to manifest themselves, insight, acceleration, particles, inversely, proportional,
square, to emerge, differential, Algebraic

The most significant single advance in the history of mathematics was calculus, invented independently by Isaac Newton and Gottfried Leibniz. Leibniz published first, but Newton claimed 1) ______ and portrayed Leibniz as a 2) ____.

Even though Leibniz probably deserves priority, Newton turned 3) _____into a central technique of the 4)________ subject of mathematical physics, humanity's most effective known route to the understanding of the natural world. Newton called the theory "The System of the World". This may not have been terribly modest, but it was pretty fair description. Before Newton, human understanding of patterns in nature consisted mainly of the ideas of Galileo about moving bodies.

After Newton, mathematical patterns governed almost everything in the physical world: the movement of 5) _______and 6) ________bodies, the flow of air and water, the transmission of heat, light, and the force of gravity.

Newton's unpublished documents known as the Portsmouth Papers show that when he was working on the Principia, Newton already had the main ideas of calculus.

What is calculus? The methods of Newton and Leibniz are more easily understood if we preview the main ideas. Calculus is the mathematics of 7) _________rates of change – how rapidly is some particular quantity changing at this very instant? For a physical example: a train is moving along a track: how fast is it going right now? Calculus has two main branches. Differential calculus provides methods for calculating rates of change, and it has many geometric 8) ________, in particular finding tangents to curves. Integral calculus does the 9) ______: given the rate of change of some quantity, it specifies the quantity itself.

10) ____________applications of integral calculus include the computation of areas and volumes. Perhaps the most significant discovery is this unexpected connection between two 11)______unrelated classical geometric questions: finding tangents to a 12)______and finding areas.

Calculus is about functions: procedures that take some general number and calculate an associated number. The procedure is usually specified by formula, 13) _______ to a given number x (possibly in some specific range) an 14) ______ number f(x).

The first key idea of calculus is differentiation, which 15) _____ the derivative of a function. The derivative is the rate at which f(x) is changing, compared to how x is changing – the rate of change of f(x) with respect to x. The other key idea in calculus is that of integration. This is most easily viewed as the 16)_______ process to differentiation.

Inspirations for the invention of calculus came from two directions. Within 17)______ mathematics, differential calculus evolved from methods for finding tangents to curves, and integral calculus evolved from methods for calculating the areas of plane shapes and the volumes of solids. But the main stimulus towards calculus came from physics – the growing realization that nature has patterns. For reasons we still do not really understand, many of the fundamental patterns in nature involve rates of change. So they make sense, and can be discovered, only through calculus.

The invention of calculus was the outcome of a series of earlier investigations of what seem to be unrelated problems, but which possesses a hidden unity. These included calculating the instantaneous 18) ______ of a moving object from the distance it has travelled at any given time, finding the 19) ______ to a curve, finding the 20) ______ of a curve, finding the maximum and minimum values of a 21)________ quantity, finding the area of some shape in the 22) ________ and the volume of some solid in 23)________ Some important ideas and examples were developed by Fermat, Descartes and the more obscure Englishman, Isaac Barrow, but the methods remained special to particular problems. A general method was needed.

The first real breakthrough was made by Leibniz. The other 24) ______ of calculus was Isaac Newton. Newton's main law of motion (there are some 25)______ ones) states that the 26) _____ of a moving body, multiplied by its mass, is equal to the force that acts on the body. Now velocity is the derivative of position, and acceleration is the derivative of velocity. The law of gravity states that all 27) ______ of matter attract each other with a force that is 28)_______ to their masses, and 29) ______ proportional to the 30) _______ of the distance between them.

The most important single idea 31) ______ from the flurry of work on calculus was the existence, and the utility of a novel kind of equation – the 32) _______ equation. 33) _____ equations relate various powers of an unknown number.

Differential equations are grander: they relate various derivatives of an unknown function.

Newton's great discovery was that nature's patterns seem 34) ________ not as regularities in certain quantities, but as relations among their derivatives. The laws of nature are written in the language of calculus: what matters are not the values of physical variables, but the rates at which they change. It was a profound 35) _______, and it created a revolution, leading more or less directly to modern science, and changing our planet forever.

(An extract from the book The story of mathematics by Ian Stewart)

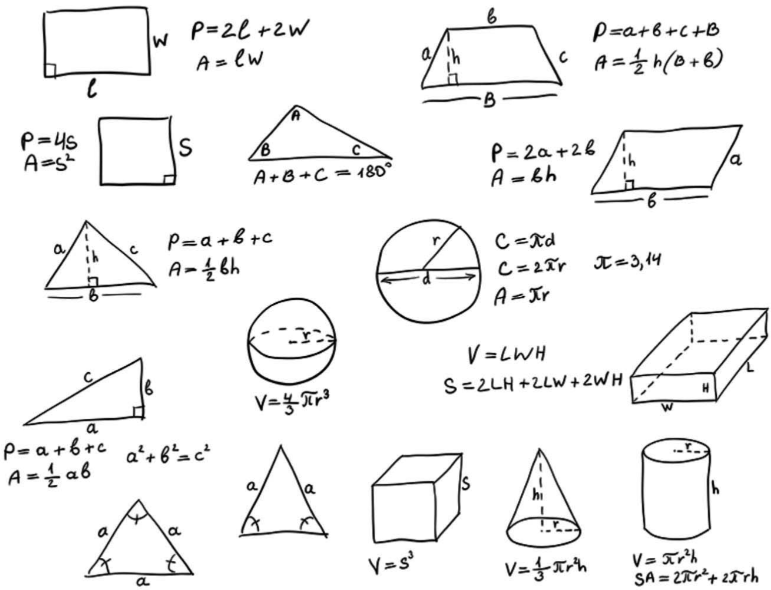
3. Form the plural: mind, mathematician, this, school, doctrine, member, his, man, person, mass.

4. Information search

1. Give a brief history of the Calculus controversy.
2. Explain the difference between integral calculus and differential calculus.
3. Outline the role of Calculus in science.

5. Discussion point

Work in two teams. You are members of a conference committee. You are going to organize a conference on the topic "The system of the World." As a group make a list of research problems to be discussed within different workshops or an information bulletin containing a brief summary of all the workshop discussion points to attract prospective participants.



Geometry

I. Pre-reading task

1. Read and remember the basic terminology:

LINE – лінія
ANGLE – кут
POINT OF INTERSECTION – точка перетину
ANGULAR POINT – кутова точка, вершина
STRAIGHT LINE – пряма (лінія)
RAY – промінь
CURVED LINE – крива лінія
RIGHT ANGLE – прямий кут
REFLEX ANGLE – кут в межах 180° та 360°
ACUTE ANGLE – гострий кут
OBTUSE ANGLE – тупий кут
CORRESPONDING ANGL – відповідний кут
SUPPLEMENTARY ANGLE – додатковий кут [до 180°]
COMPLEMENTARY ANGLE – додатковий кут [до 90°]

INTERIOR ANGLE – внутрішній кут
EXTERIOR ANGLE – зовнішній кут
PLANE TRIANGLE – плоский трикутник
EQUILATERAL TRIANGLE – рівносторонній трикутник
ISOSCELES TRIANGLE – рівнобедрений трикутник
ACUTE-ANGLED TRIANGLE – гострокутовий трикутник
RIGHT-ANGLED TRIANGLE – прямокутний трикутник
QUADRILATERAL – чотирикутнтк
SQUARE – квадрат
RECTANGLE – прямокутник
RHOMBUS – ромб
RHOMBOID – ромбоїд
TRAPEZIUM – трапеція
DELTOID – дельтоїд
IRREGULAR QUADRILATERALS – неправильний чотирикутник
POLYGON – багатокутник
REGULAR POLYGON – правильний багатокутник
CIRCLE – окружність, коло
CENTER – центр
CIRCUMFERENCE (PERIPHERY) – окружність, периферія
DIAMETER – діаметр
RADIUS – радіус
CHORD – хорда
SEGMENT – сегмент
ARC – дуга
SECTOR – сектор
RING (ANNULUS) – кільце
AXIS OF COORDINATES – координатна вісь
AXIS OF ABSCISSAE – вісь абсциси
AXIS OF ORDINATE – вісь ординати
VALUES OF ABSCISSAE AND ORDINATES – значення абсциси ординат
PARABOLA – парабола
ELLIPSE – еліпс
TRANSVERSE AXIS (MAJOR AXIS) – перетинаюча вісь (головна вісь)

HYPERBOLA – гіпербола
ASYMPTOTE – асимптота
SOLIDS – тверді тіла
CUBE – куб
PLANE SURFACE (A PLANE) – плоска поверхня (плоскість)
PARALLELEPIPED – паралелепіпед

II. Reading

Read the text and give your own definitions to geometric terms "ellipse", "hyperbola", "parabola".

The evolution of our present-day meanings of the terms "ellipse" "hyperbola", and "parabola" may be understood by studying the discoveries of history's great mathematicians. As with many other words now in use, the original application was very different from the modern.

Pythagoras (c. 540 B. C), or members of his society, first used these terms in connection with a method called the "application of areas". In the course of the solution (often a geometric solution of whatequivalent to a quadraticequation) one of three things happens: the base of the constructed figure either falls short of, exceeds, or fits the length of a given segment. (Actually, additional restrictions were imposed on certain of the geometric figures involved.) These three conditions were designated as ellipsis ("defect"), hyperbola ("excess") and parabola ("a placing beside"). It should be noted that the Pythagoreans were not using these terms in reference to the conic sections.

In the history of the conic sections Menaechmus (350 B.C.), a pupil of Eudoxus, is credited with the first treatment of the conic sections. Menaechmus was led to the discovery of the curves of the conic sections by a consideration of sections of geometrical solids. Proclus in his "Summary" reported that the three curves were discovered by Menaechmus; consequently they were called the "Menaechmian triads". It is thought that Menaechmus discovered the curves now known as the ellipse, parabola and hyperbola by cutting cones with planes perpendicular to an element and with the vertex angle of the cone being acute, right, obtuse, respectively.

The fame of Apollonius (c. 225 B. C.) rests mainly on his extraordinary “Conic Sections”. This work was written in eight books, seven of which are preserved. The work of Apollonius on the conic sections differed from that of his predecessors in that he obtained all of the conic sections from one right double cone by varying the angle at which the intersecting plane cuts the element.

All of Apollonius’ work was presented in regular geometric form, without the aid of the algebraic notation of the present-day Analytic Geometry. However, his work can be described more easily by using modern terminology and symbolism. If the conic is referred to a rectangular coordinate system in the usual manner with point A as the origin and with (x, y) as coordinates of any point P on the conic, the standard equation of the parabola $y2=px$ (where p is the length of the latus rectum, i.e., the length of the chord that passes through a focus of the conic perpendicular to the principal axis) is immediately verified. Similarly, if the ellipse or hyperbola is referred to a coordinate system with vertex at the origin, it can be shown that $y2< px$ or $y2> px$, respectively. The three adjectives “hyperbolic”, “parabolic”, and “elliptic” are encountered in many places in mathematics, including projective geometry and non-Euclidean geometries. Often they are associated with the existence of exactly two, one, or none of something of particular relevance. The relationship arises from the fact that the number of points in common with the so- called line at infinity in the plane for the hyperbola, parabola and ellipse is two, one and zero, respectively.

2. Read and decide which of the statements are true and which are false. Change the sentences so they are true.

1. A curve can be considered as the path of a moving point.
2. There're two types of curves: algebraic curves and transcendental curves.
3. Open curves have no end points and closed curves have a lot of end points.
4. A curve that does not lie in a plane is a skew or twisted curve.
5. A curvature is the rate of change of direction of a curve at a particular point on that curve.

6. The angle δψ through which the tangent to a curve moves as the point of contact moves along an arc PQ is the total curvature of this arc.

7. We define the mean curvature of any arc taking into account both the total curvature and the arc length.

8. At any point on a surface the curvature doesn't vary with direction.

3. Match the terms from the left column and definitions from the right column:

an angle	formed by, or with reference to, a straight line or plane perpendicular to a base
null	of less than 90 degrees
right	designating an angle greater than a straight angle (180 degrees
obtuse	height above a surface, as of the earth
flat	the shape made by two straight lines meeting at a common point, the vertex, or by two planes, meeting along an edge
acute	a decrease in force, activity, amount, etc.
reflex	greater than 90 degrees and less than 180 degrees greater than 90 degrees and less than 180 degrees
elevation	designating of, or being zero, as: a) having all zero elements (null matrix), b) having a limit of zero (null sequence), c) having no members whatsoever (null set)
depression	absolute, positive

4. Give the Ukrainian equivalents of the following words and word combinations:

1. side (arm)
2. acute angle
3. angle of depression
4. direction angle
5. sense of rotation
6. clockwise sense

7. vertex
8. obtuse angle
9. rotation
10. reflex angle
11. rotation angle
12. angle of elevation
13. right angle
14. flat (straight) angle
15. round angle (perigon)
16. null (zero) angle

5. Give the English equivalents of the following words and word combinations:

тупий кут, розгорнутий кут, нульовий кут, кут піднесення, кут пониження, прямий кут, повний кут, сторона, напрямок обертання, вершина, кут в межах від 180° 360, обертання (поворот), гострий кут, годинник, проти годинникової стрілки, кут обертання, кут, що направляє.

6. Read the sentences and think of a word, which best fits, each space.

1. An angle is a ... of two lines (the sides or …) meeting at a point called the vertex.
2. Flat (or ...) angle means half a ... turn.
3. An obtuse angle is greater than an ... angle.
4. The measure of a ... angle is between 180°and 360°.
5. Angles are classified according to their....
6. Clockwise means the ... in which the hands of a clock rotate.
7. The largest angle is the ... angle being 360 degrees.

7. Choose the correct variant of the answer.

1. An angle equal to one-half of a complete turn:
(A) flat angle (D) obtuse angle
(B) right angle (E) reflex angle
(C) round angle (F) acute angle
2. A type of conic that has an eccentricity greater than 1:
(A) parabola (D) focus

(B) hyperbola (E) transverse axis
(C) ellipse (F) circle
3. A plane figure formed by four intersecting lines:
(A) angle (D) quadrilateral
(B) cube (E) star polygon
(C) triangle (F) square
4. A surface composed of plane polygonal surface:
(A) polyhedron (D) quadrilateral
(B) polygon (E) circle
(C) isosceles (F) dodecahedron
5. A line either straight or continuously bending without angles:
(A) curvature (D) curve
(B) straight line (E) height
(C) ray (F) circle

8. Information search

Write a short report on the origin of geometry and its applications.

Making History of Mathematics. Inventions Then and Now.

I. Pre-reading task

1. Discuss these questions.

1. What is the difference between visual and symbolic reasoning in mathematics?
2. What is Euclid's contribution to mathematics?
3. What is the most influential aspect of Pythagorean cult's philosophy?
4. What is the main empirical support for the Pythagorean concept of a numerical universe?
5. What is Ptolemy's contribution to trigonometry?
6. Are you agree with the point of view that women cannot be genuine mathematicians?

II. Reading

Read and translate the text.

Great minds of Greece such as Thales, Pythagoras, Euclid, Archimede, Apollonius, Eudoxus, etc. produced an amazing amount of first class mathematics. The fame of these mathematicians spread to all corners of the Mediterranean world and attracted numerous pupils. Masters and pupils gathered in schools which though they had few, buildings and no campus were truly centers of learning. The teaching of these schools dominated the entire life of the Greeks.

Despite the unquestioned influence of Egypt and Babylonia on Greek mathematicians, the mathematics produced by the Greeks differed fundamentally from that which preceded it. It was the Greeks who founded mathematics as a scientific discipline. The Pythagorean School was the most influential in determining both the nature and content Greek mathematics. Its leader Pythagoras founded a community which embraced both mystical and rational doctrines.

The original Pythagorean brotherhood (c. 550—300 B. C.) was a secret aristocratic society whose members preferred to operate from behind the scenes and, from there, to rule social and intellectual affairs with an iron hand. Their noble born initiates were taught entirely by word of mouth. Written documentation was not permitted, since anything written might give away the secrets largely responsible for their power. Among these early Pythagoreans were men who knew more about mathematics then available than most other people of their time. They recognized that vastly superior in design and manageability Babylonian base-ten positional numeration system might make computational skills available to people in all walks of life and rapidly democratize mathematics and diminish their power over the masses. They used their own non positional numeration system (standard Greek alphabet supplemented by special symbols). Although there was no difficulty in determining when the symbols represented a number instead of a word, for computation the people of the lower classes had to consult an exclusive group of experts or to use complicated tables and both of these sources of help were controlled by the brotherhood.

For Pythagoras and his followers the fundamental studies were geometry, arithmetic, music, and astronomy. The basic element of all these studies was number not in its practical computational aspect, but as the very essence of their being; they meant that the nature of numbers should be conceived with the mind only. In spite of the mystical nature of much of the Pythagorean study the members of community contributed during the two hundred or so years following the founding of their organization, a good deal of sound mathematics.

Thus, in geometry they developed the properties of parallel lines and used them to prove that "the sum of the angles of any triangle is equal to two right angles". They contributed in a noteworthy manner to Greek geometrical algebra, and they developed a fairly complete theory of proportional though it was limited to commensurable magnitudes, and used it to deduce properties of similar figures. They were aware of the existence of at least three of the regular polyhedral solids, and they discovered the incommensurability of a side and a diagonal of a square.

Details concerning the discovery of the existence of incommensurable quantities are lacking, but it is apparent that the Pythagoreans found it as difficult to accept incommensurable quantities as to discover them. Two segments are commensurable if there is a segment that "measures" each of them – that is, it contains exactly a whole number of times in each of the segments.

2. Which of these statements are true? Correct the false ones.

1. It was the Egyptians who founded mathematics as a scientific discipline.

2. The Pythagorean School was the most influential in determining both the nature and content Greek mathematics.

3. There was some difficulty in determining when the symbols represented a number instead of a word.

4. For Pythagoras the fundamental studies were geometry, arithmetic, music, and astronomy.

5. Two segments are commensurable if there is a segment that "measures" each of them.

3. Find English equivalents of the following phrases:

- обчислювальні навички;
- зменшити чиюсь владу;
- система обчислення;
- існування незрівнянних кількостей;
- бути впевненим у існуванні;
- подібні фігури;
- будь-який трикутник;
- своя власна;

- керувалася братерством;
- властивості паралельних ліній.

4. Make word pairs to form expressions.

a) abstract	1 members
b) prime	2 source
c) unit	3 blow
d) cult	4 fraction
e) exact	5 concepts
f) body	6 square

5. Match the verbs (1-4) with the noun phrase (a-d) to form expressions

1. provide	this fact
2. form	the mistake
3. make	a triangle
4. announce	a key to

6. Do the test:

1. Who produced an amazing amount of first class mathematics?

a) Thales, Pythagoras; b) Newton, Euclid;

c) Archimede, Apollo; d) Apollonius, Eugene Onegin

2. What civilizations had a great influence on Greek mathematics?

a) Rome and Russia; b) Egypt and Rome;

c) Egypt and Babylonia; d) Babylonia and Rome.

3. The … was the most influential in determining both the nature and content Greek
mathematics.

a) Pythagoras School; b) Pythagorean School;

c) Pythagorian School; d) Pythagorative School.

4. The original Pythagorean brotherhood (550—300 B. C.) was a secret … society.

a) poor; b) aristocratic; c) mathematical; d) physical.

5. What symbols did the Pythagoreans use in their own system of calculation?

a) points; b) numerals; c) Latin alphabet; d) standard Greek alphabet.

6. Pythagorean brotherhood contributed in a noteworthy manner to Greek … .

a) geometry; b) algebraic geometry; c) algebra; d) geometrical algebra.

7. What did the Pythagoreans discover about a square?

a) the incommensurability of a side and a diagonal;

b) the incommensurability of area and volume;

c) the incommensurability of a side and a roof;

d) the incommensurability of a diagonal and volume.

8. The Pythagoreans found it as difficult to accept … quantities as to discover them.

a) uncountable; b) commensurable; c) countable; d) incommensurable.

9. What must exist two segments to be comparable?

a) a segment that "describes" each of them;

b) a segment that "covers" each of them;

c) a segment that "denies" each of them;

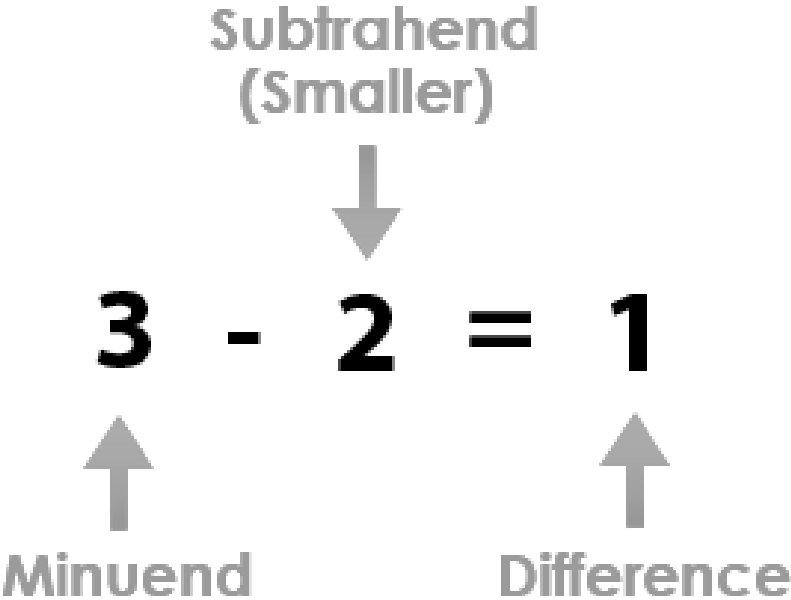
d) a segment that "measures" each of them.

10. Among the early Pythagoreans were men who knew more about … .

a) mathematics; b) life; c) physics; d) geometry.

7. Discussion point

What is the role of Ptolemy's theorem in trigonometry? Discuss this question in small groups of three or four. Choose a person from your group for a brief summary of your discussion.



Using Subtraction. Math Problems
Part I

I. Pre-reading task

1. Complete the following definitions:

a) Pattern: The operation, which is the inverse of addition is subtraction.

1. The operation, which is the inverse of subtraction … .
2. The quantity, which is subtracted … .
3. The result of adding two or more numbers … .
4. The result of subtracting two or more numbers … .
5. To find the sum … .
6. To find the difference … .
7. The quantity number or from which another number (quantity) is subtracted … .
8. The terms of the sum … .

b) Pattern: A number that is divided is a dividend.

1. The process of cumulative addition … .

2. The inverse operation of multiplication … .
3. A number that must be multiplied … .
4. A number by which we multiply … .
5. A number by which we divide … .
6. A part of the dividend left oover after division … .
7. The number which is the result of the operation of multiplication … .

2. Choose the correct term corresponding to the following definitions:

a) The inverse operation of multiplication.
addition fraction subtraction
quotient division integer
b) A whole number that is not divisible by 2.
integer prime number odd number
complex number even number negative number
c) A number that divides another number.
dividend division divisor
division sign quotient remainder
d) The number that is multiplied by another.
multiplication remainder multiplicand
multiplier product dividend

II. Reading

Read and translate the text.

History teaches the continuity of the development of science. We know that every age has its own problems, which the following age either solves or casts aside as profitless and replaces by new ones. If we would obtain an idea of the probable development of mathematical knowledge in the immediate future, we must let the unsettled questions pass before our minds and look over the problems which the science of today sets and whose solution we expect from the future. To such a review of problems the present day, lying at the meeting of the centuries seems to be well adapted. For the close of a great epoch not only invites us to look back into the past but also directs our thoughts to the unknown future.

The deep significance of certain problems for the advance of mathematical science in general and the important role which they play in the work of the individual investigator are not to be denied. As long as a branch of science offers an abundance of problems, so long is it alive; a lack of problems foreshadows extinction or the cessation of independent development. Just as every human undertaking pursues certain objects, so also mathematical research requires its problems. It is by the solution of problems that the investigator tests the temper of his steel; he finds new methods and new outlooks, and gains a wider and freer horizon.

It is difficult and often impossible to judge the value of a problem correctly in advance; for the final award depends upon the gain which science obtains from the problem. Are whether there general criteria which mark a good mathematical problem? An old French mathematician said: "A mathematical theory is not to be considered complete until you have made it so clear that you can explain it to the first man whom you meet on the street." This clearness and ease of comprehension, here insisted on for a mathematical theory, I should still more demand for a mathematical problem if it is to be perfect; for what is clear and easily comprehended attracts, the complicated repels us.

Moreover a mathematical problem should be difficult in order to entice us, yet not completely inaccessible, lest it mock at our efforts. It should be to us a guide post on the mazy paths to hidden truths, and ultimately a reminder of our pleasure in the successful solution.

The mathematicians of past centuries were accustomed to devote themselves to the solution of difficult particular problems with passionate zeal. They knew the value of difficult problems. For example, the "problem of the line of quickest descent," proposed by John Bernoulli. Experience teaches, explains Bernoulli, that lofty minds are led to strive for the advance of science by nothing more than by laying before them difficult and at the same time useful problems, and he therefore hopes to earn the thanks of the mathematical world by following the example of men like Mersenne, Pascal, Fermat, Viviani and others and laying before the distinguished analysts of his time a problem by which, as a touchstone, they may test the value of their methods and measure their strength. The calculus of variations owes its origin to this problem of Bernoulli and to similar problems.

3. Put the statements in the right order.

1. Mathematics helps to find solutions to various problems.

2. The solution of the problem depends on the perspective of privilege that will get
the science.

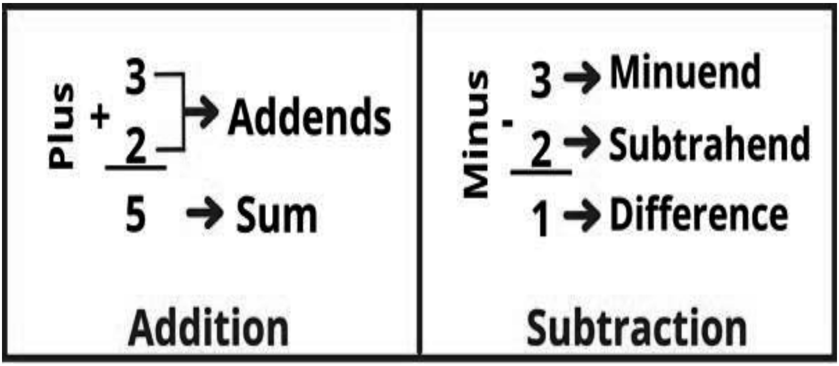
3. There are different problems in each time of our life.

4. Mathematical problem should be difficult in order to entice us.

5. Lack of problems foreshadows extinction or the cessation of independent development.

4. Match the words opposite in meaning.

1. difficult	a. mess
2. clearness	b. starting
3. problem	c. independent
4. lack	d. well-known
5. dependent	e. easy
6. final	f. prevent
7. order	g.secondary
8. help	h. plenty
9. general	i. misunderstanding
10. unknown	j.solution



Using Subtraction. Math Problems
Part II

I. Pre-reading task

1. Give the English equivalents of the following Ukrainian words and word combinations:

віднімання, величина, що зменшується, алгебраїчне додавання, еквівалентний вираз, віднімати, різниця, додавання, складати, доданок, сума, числівник, числа зі знаками, відносні числа, розподіл, множення, ділити, залишок, приватний, добуток, вираз, зворотня операція, дільник, ділене, множник, те, що множиться, суміжники, сума, знак множення, знак розподілу.

II. Reading

Read and translate the text.

To solve a mathematical problem meant to find its complete numerical solution. Gradually it became clear that such explicit solutions are possible only in exceptional cases, that in general one must be satisfied with a scheme by which the solution may be determined approximately, though with any desired accuracy. Something quite different is very frequently offered as the solution of a mathematical problem, namely, a representation of the solution in terms of the data of the problem; although it is in principle possible to devise a scheme for numerical calculation from such a representation, the question remains: What actually is the solution?

Mathematicians, in their search for representations of solutions, often modified the meaning of “solution” even further: to solve a problem is simply to prove the unique existence of solution.

A mathematical problem which possesses a unique solution is referred to as correctly posed or formulated. The way in which a large class of mathematical problems posed is never questioned. These problems are mostly of a standard, rather regular, type. Doubts arise, however, when the actual physical problem is replaced by an idealized problem. Such idealized problems may be considered as limiting cases of actual problems, arising when, for example, the domain is extended to infinity, forces are concentrated on surfaces, lines or points, or terms in the equations are simply omitted as insignificantly small. To the understanding of such idealized problems, purely mathematical existence and uniqueness considerations may still make valuable contributions.

As it is often emphasized, not only existence and uniqueness, but also a third abstract property of the solution should be required of the problem if it is to be called correctly posed: the property of continuous dependence on the data. Since physical data are not given with absolute precision, the mathematical problem is certainly not the appropriate expression of an actual physical situation if an arbitrarily small variation of the data may have a finite effect on the solution, or may destroy its existence or uniqueness. If the solution does not depend continuously on the data, it may be called unstable. There are important problems, which possess solutions only for exceptional values of the data; thus the solutions do not depend continuously on the data even when they exist.

2. Which of these statements are true? Correct the false ones.

1. The mathematicians of past centuries were not accustomed to devote themselves to the solution of difficult particular problems.

2. The deep significance of certain problems for the advance of mathematical science in general and the important role which they play in the work of the individual investigator are denied.

3. It is difficult and often impossible to judge the value of a problem correctly in advance.

4. A mathematical problem should be simple in order to entice

us.

5. To solve a mathematical problem meant to find its complete numerical solution.

6. Existence and uniqueness of the problem should be required if it is to be called correctly posed.

7. The mathematical problem is the appropriate expression of an actual physical situation.

8. If the solution depends continuously on the data, it may be called unstable.

3. Find English equivalent of the following phrases:

- розвиток науки;
- отримати уявлення;
- велика кількість проблем;
- віщувати вимирання;
- припинення самостійного розвитку;
- судити про величину;
- легкість розуміння;
- лінія якнайшвидшого спуску;
- прагнути вперед;
- властивість безперервної залежності.

4. Match the following terms with definitions and translate them into Ukrainian.

a. algebra	1. a physical quantity having magnitude and direction, represented by a directed arrow indicating its orientation in space
b. triangle	2. a step by step procedure by which an operation can be carried out
c. arithmetic	3. a proposition that is not actually proved or demonstrated, but is considered to be self-evident and

	universally accepted as a starting point for deducing and inferring other truths and theorems, without any need of proof
d. coordinate	4. the ordered pair that gives the location or position of a point on a coordinate plane, determined by the point's distance from the x and y axes
e. axiom	5. the part of mathematics that studies quantity, especially as the result of combining numbers (as opposed to variables) using the traditional operations of addition, subtraction, multiplication and division
f. algorithm	6. a polygon with three edges and three vertices, e.g. a triangle with vertices A, B, and C is denoted $\Delta\,ABC$
g. vector	7. a branch of mathematics that uses symbols or letters to represent variables, values or numbers, which can then be used to express operations and

	relationships and to solve equations

5. Do the test:

1. It is by the solution of problems that the investigator … the temper of his steel.

a) tests; b) analyzes; c) evaluates; d) reviews .

2. It is difficult and often impossible to judge … correctly in advance.

a) the relevance of the problem; b) the significance of the problem;

c) the value of problem; d) the importance of problem.

3. The deep … of certain problems for the advance of mathematical science in

general and the … role which they play in the work of the individual investigator are

not to be denied.

a) importance, essential; b) meaning, quite important;

c) value, significant; d) significance, important.

4. Who said the following "A mathematical theory is not to be considered complete until you have made it so clear that you can explain it to the first man whom you meet on the street."

a) ancient mathematician; b) modern mathematician;

c) old French mathematician; d) John Bernoulli .

5. Mathematical problem should be a … post on the mazy paths to hidden … .

a) conductor, validity; b) guide, truths; c) leader, accuracy;

d) direct, true.

6. To solve a mathematical problem meant to find its … … solution.

a) full numerical; b) entire numeral; c) total numerical;

d) complete numerical.

7. What actually is the solution? To solve the problem is … .

a) to deny the existence of solution; b) to prove the unique existence of solution;

c) to prove the existence of equation ; d) to confirm the existence of solution .

8. Idealized problems may be considered as … cases of actual problems.

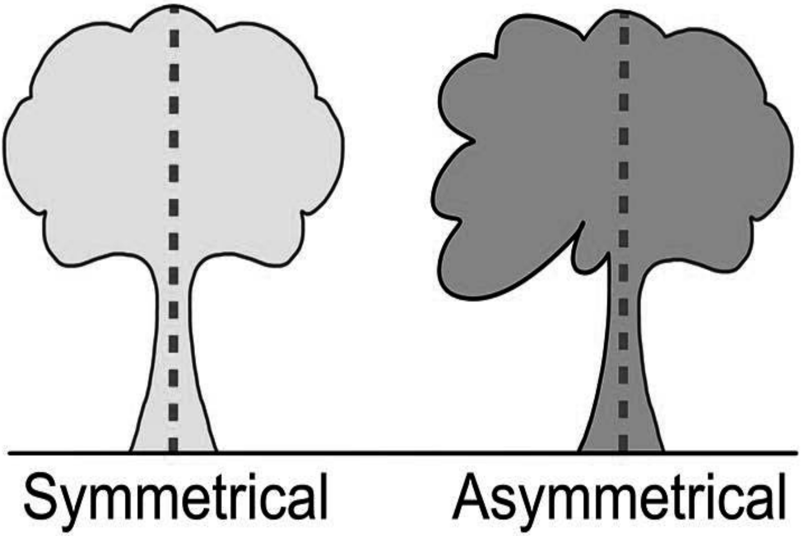
a) limit; b) restrictive; c) limiting; d) finite .

9. The solution do not depend continuously on the … even when they exist.

a) information; b) data; c) evidence; d) facts.

10. If the solution does not depend continuously on the data, it may be called … .

a) unstable; b) unbalanced; c) irregular; d) unsteady**.**



Symmetry

I. Pre-reading task

1. Discuss these questions.

1. Do you know what branch of algebra emerged from unsuccessful attempts to
solve algebraic equations?
2. What is the role of Galois in mathematics?

2. Match these terms with their definitions.

1. permutation	a) an exact correspondence in position or form about a given point, line, or plane
2. group	b) an ordered arrangement of the numbers, terms etc., of a set into specified groups
3. symmetry	c) an equation containing one or more terms in which the variable is

	raised to the power of two, but
4. a quadratic	d) a set that has an associated operation that combines any two members of the set to give another member and that also contains an identity element and an inverse for each element
5. resolvent	e) to modify or simplify the form of (an expression equation), esp. by substitution of one term by another
6. to reduce	f) something that resolves; solvent
7. a quintic	g) of, relating to, or containing roots of numbers or quantities
8. a radical	h) of or relating to the fifth degree
9. translation	j) a transformation in which the direction of one axis is reversed or which changes the sign of one of the variables
10. reflection	k) a transformation in which the origin of a coordinate system is moved to another position so that each axis retains the same direction or, equivalently, a figure or curve is moved so that it retains the same orientation to the axes
11. commutative law	l) (of an operator) giving the same result irrespective of the order
12. a group of prime order	m) a cyclic group whose order is a prime number

II. Reading

Read the text and fill in the gaps with the following words:

applying, predecessors, subsequent, insistence, indispensable tool, plausible, upshot, turning – point, intermittently, concept, worth, contribution, commutative law, profound, dissuade

Around 1850 mathematics underwent one of the most significant changes in its entire history, although this was not apparent at the time. Before 1800, the main objects of mathematical study were relatively concrete: numbers, triangles, spheres. Algebra used formulas to represent manipulations with numbers, but the formulas themselves were viewed as symbolic representations of processes, not as things in their own right. But by 1900 formulas and transformations were viewed as things, not processes, and the objects of algebra were much more abstract and far more general. In fact, pretty much anything went as far as algebra was concerned. Even the basic laws, such as the 1)_________ of multiplication, had been dispensed with some important areas.

These changes came about largely because mathematicians discovered group theory, a branch of algebra that emerged from unsuccessful attempts to solve algebraic equations, especially quintic, or fifth degree. But within 50 years of its discovery, group theory had been reorganized as the correct framework for studying the 2) ________ of symmetry. Today, group theory has become an 3)______________ in every area of mathematics and science, and its connections with symmetry are emphasized in most introductory texts. The 4)______________in the evolution of group theory was the work of a young Frenchman, Evariste Galois. There was a long and complicated prehistory. As the centuries went by, with no sign of any success, mathematicians decided to take a closer look at the whole area. The most successful and most systematic work was carried out by Lagrange. He found that partly symmetric functions of the solutions allowed him to reduce a cubic equation to a quadratic. The quadratic introduced a square root, and the reduction process could be sorted out using a cube root. Similarly, any quartic equation could be reduced to a cube, which he called the resolvent cubic. 5)_________the same techniques, you expect to get a resolvent quartic – job done. But, presumably, to his disappointment, he didn't get a resolvent quartic. He got a resolvent sextic – an equation of the sixth degree.

Instead of making things simpler, his method made the quintic more complicated. As Lagrange's ideas started to sink in, there was growing feeling that perhaps the problem could not be solved.

Perhaps the general quintic equation cannot be solved by radicals. Gauss seems to have thought so, privately, but expressed the view that this was not a problem that he thought was 6)_______tackling. Gauss had already initiated some of the necessary algebra to prove the insolubility of the quintic. The first person to attempt a proof of the impossibility was Paolo Ruffini. In his General Theory of Equations he claimed a proof that "The algebraic solution of general equations of degree greater than four is always impossible". But Ruffini's most important 7) ________was the realization that permutations can be combined with each other. Until then, a permutation was a rearrangement of some collection of symbols.

Mathematicians began to doubt that a solution could exist. Unfortunately the main effect of this belief was to 8)________ anyone from working on the problem.

An exception was Abel, a young Norwegian with a precocious talent for mathematics, who thought that he had solved the quintic while still at school. He eventually discovered a mistake, but remained intrigued by the problem, and kept working on it 9) _______. Abel showed that whenever an equation can be solved by radicals, there must exist a radical tower leading to that solution, involving only the coefficients of the original equation. But the hypothetical tower cannot contain a solution. The quintic is unsolvable because any solution (by radicals) must have self-contradictory properties, and therefore cannot exist.

Galois set himself the task of determining which equations could be solved by radicals, and which could not. Like several of his 10) _________, he realized that the key to the algebraic solution of equations was how the solutions behaved when permuted. The problem was about symmetry. Galois noticed that the permutations that fix some expression in the roots do not form any old collection. They have a simple, characteristic feature. If you take any two permutations that fix the expression, and multiply them together, the result also fixes the permutation. He called such a system of permutations a group. The 11) ________of Galois's ideas are that the quintic cannot be solved by radicals because it has the wrong kind of symmetries. The group of a general quintic equation consists of all permutations of the five solutions. The algebraic structure of this group is inconsistent with a solution by radicals.

The concept of a group first emerged in a clear form in the work of Galois. The main architect of this theory was Camille Jordan. He developed his own version of Galois theory. He proved that an equation is soluble if and only if its group is soluble, which means that the simple components all have prime order. He applied Galois's theory to geometric problems.The 4000-year-old quest to solve quintic algebraic equations was brought to an abrupt halt when Ruffini, Abel and Galois proved that no solution by radicals is possible. Although this was a negative result, it had a huge influence on the 12)_________development of both mathematics and science. This happenedbecause the method introduced to prove the impossibility tuned out to be central to the mathematical understanding of symmetry, and symmetry turned out to be vital in both mathematics and science. The effects were 13) _______. Group theory led to a more abstract view of algebra, and with it a more abstract view of mathematics. Although many practical scientists initially opposed the move towards abstraction, it eventually became clear that abstract methods are often more powerful than concrete ones, and most opposition has disappeared. Group theory also made it clear that negative results may still be important, and that an 14) _______on proof can sometimes lead to major discoveries. Suppose that mathematicians had simply assumed without proof that quintics cannot be solved, on the 15)________ grounds that no one could find a solution. Then no one would have invented group theory to explain why they cannot be solved. If mathematicians had taken the easy route, and assumed the solution to be impossible, mathematics and science would have been a pale shadow of what they are today. That is why mathematicians insist on proofs.

(An extract from the book The story of mathematics by Ian Stewart)

3. Mark these statements T(true) or F(false) according to the information in the text.

Find the part of the text that gives the correct information.

1. Quintic equations cannot be solved.
2. Jordan viewed Group theory geometrically.
3. Group theory emerged from unsuccessful attempts to solve

algebraic equations.

4. The concept of a group first emerged in a clear form in the work of Galois.

5. Abel discovered a blunder in his work.

4. Answer these questions.

1. Can quadratic and cubic equations be solved by radicals?
2. Can quintic equations be solved by radicals?
3. What branch of algebra emerged from unsuccessful attempts to solve algebraic equations?
4. What is the role of Galois in mathematics?
5. In whose work did the concept of a group first emerge in a clear form?

5. Find English equivalent of the following phrases:

- належити до групи
-кінцева група
- перевірити закон
- ряд (деяка кількість) об'єктів
- сучасна математика
- поняття групи
- дивовижна поінформованість
- це не має значення
- неявно усвідомлювати
- необмежена кількість елементів
- однозначний елемент
- одиничний елемент

6. Translate into English the following sentences.

1. Зараз теорія групи розробляється абстрактно, так що її можна застосовувати у багатьох різних ситуаціях.
2. Щоб зуміти дослідити структуру групи більш детально, необхідно ввести додавання як ще одну операцію між елементами групи.
3. Фелікс Кляйн (Felix Klein) продемонстрував, що поняття групи може виявитися корисним при класифікації багатьох сфер математики.

4. Розвиток цих двох гілок алгебри призвів до якісно нових проблем науки, пов'язаних з виникненням теорії Галуа і теорії груп.

5. Група – це математична система, елементи якої задовольняють чотирьом основним правилам.

6. Таким чином, предмет «Алгебра» визначився в XVIII ст., перетворившись у науку про алгебраїчні рівняння.

7. Термін «група» означає особливий вид математичної системи, і він не має нічого спільного з розмовним значенням, який приписується до слова «група».

7. Choose the correct form of the Infinitive or the Gerund.

1. I’ll never forget ... four more or less happy years in Cambridge.

a) to have spent; b) having spent

c) spending d) to spend

2. Only to enumerate all the fields of mathematics he enriched would take more space in the book than can ... to one man.

a) have been devoted b) to be devoted

c) to devote d) be devoted

3. This time next week I’ll ... to the lecture on the applications of the calculus to curved surfaces (twisted curves).

a) be listening b) being listened

c) listen d) have listened

4. Some of the mathematicians in the 19th century, notably Leibniz and DeMorgan, went on ... of adding logic itself to the domain of algebra.

a) to be dreaming b) to dream

c) being dreamt d) dreaming

5. I’m sorry ... the problem of determining the equation of a locus.

a)have not studied b) not studying

c) not to have studied d) being not studied

6. Teachers do not allow ... and ... in the exams

a) to speak / cheat b) to be spoken to / be cheated

c) speaking / cheating d) speaking / to cheat

7. The accuracy of the root needs ... Why not ... the number to

the power?

a) being checked /raising b) be checked /be raised

c) to be checked /raise d) checking /to raise

8. The theory of analytic functions of a complex variable ... one of the greatest

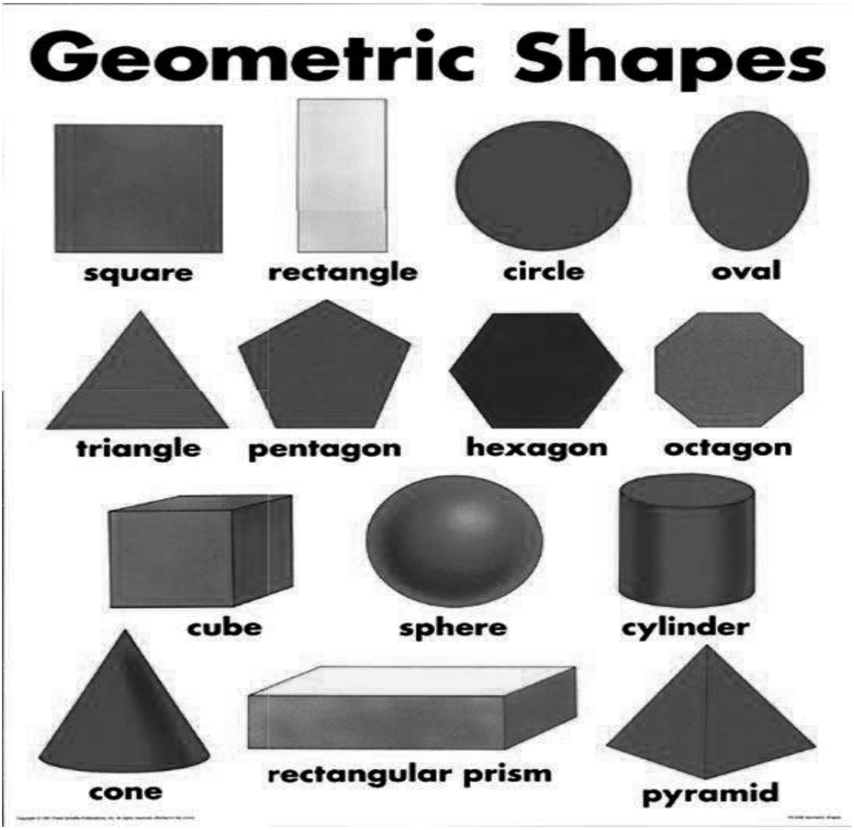
fields of mathematical triumphs in the nineteenth century.

a) should have been b) were to have been

c) must have been d) might have been

8. Web research task.

Find out as much as you can about Galois and his contribution to Group theory. Web search key words: Galois, group theory, quintics, etc



Geometric Shapes: Definition and Types of Geometric Shapes

Read and translate the text. Write out unknown items of vocabulary from it. Do the tasks after the text.

Geometric shapes are the figures which demonstrate the shape of the objects we see in our everyday life. In geometry, shapes are the forms of objects which have boundary lines, angles and surfaces. There are different types of 2d shapes and 3d shapes. Shapes are also classified with respect to their regularity or uniformity. A **regular shape** is usually symmetrical such as a square, circle, etc. **Irregular shapes** are asymmetrical. They are also called freeform shapes or **organic shapes**. For example, the shape of a tree is irregular or organic.

In plane geometry, the two-dimensional shapes are **flat shapes** and **closed figures** such as circles, squares, rectangles, rhombus, etc. In solid geometry, the three-dimensional shapes are cube, cuboid, cone, sphere and cylinder. We can observe all these shapes in our daily existence also. For example books glasses, traffic cones and so on.

Shapes are nothing but simple geometric figures which have a specific boundary, and interior and exterior surface area. In geometry, we can learn various shapes and their properties. Geometrical shapes are the figures which represent the forms of different objects. Some figures are two-dimensional, whereas some are three-dimensional shapes. The two-dimensional figures lie on only the x-axis and y-axis, but 3d shapes lie on the x, y and z axes. The z-axis shows the height of the object.

To draw or design any of these figures start with a line or a line segment or a curve. Depending upon the number and arrangement of these lines, we get different types of shapes and figures like a triangle, a figure where three line segments are connected, a pentagon (five-line segments) and so on. But every figure is not a complete figure.

Types and Properties of Geometric Shapes

Triangle is a polygon, which is made of three sides and consists of three edges and three vertices. Also, the sum of its internal angles equals to 180o. However, in case all the angles of a triangle are less than 90 degrees, then it will be called as an **acute-angled triangle**. If any, one of the angles in the triangle measures more than 90 degrees, then it will be known as an **obtuse angled triangle**. Finally, there is an **equiangular triangle**, in which all the angles of the triangle are 60 degrees. On the other hand, the triangle can also be identified or labeled on the type of sides they have.

Circle. On the other hand, a circle which is another shape of geometry has no straight lines. It is rather a combination of curves that are all connected. In a circle, there are no angles to be found.

Square is a quadrilateral where all the four sides and angles are equal and the angles at all the vertices are equal to 90° each.

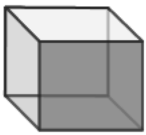
Rectangle. Similar to a square, a rectangle is also created by connecting four line segments. However, the only difference between a square and a rectangle is that in a rectangle, there are two line segments which are longer than the other two line segments.

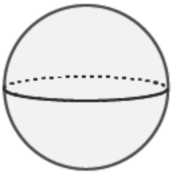
A parallelogram is another in the geometric shapes in which the opposite side of the shape are parallel. To be able to examine, if the sides are parallel or not, you'll have to closely examine the shape. The key property of a parallelogram is that parallel lines never cross or intersect each other, no matter how long you extend them. So, if you go on extending the lines through eternity and they never intersect each other, then they can be called a parallelogram.

Polygons are made up of line segments and no curves. They are enclosed structures based on different lengths of sides and different angles.

Three-Dimensional Shapes

Most of the three-dimensional shapes can be defined as a set of vertices, lines that connect the vertices and faces enclosed by these lines including obtained interior points. For many three dimensional shapes, faces are two-dimensional. Also, some shapes in three dimensions have curves surfaces. In three dimensions, the primary shapes are:

:Names of 3D geometric shapes	**Figure**	**Definition**
Cube		A cube is a three-dimensional shape which has 6 faces, 8 vertices and 12 edges. The faces of the cube are square. Example: A Rubik's cube

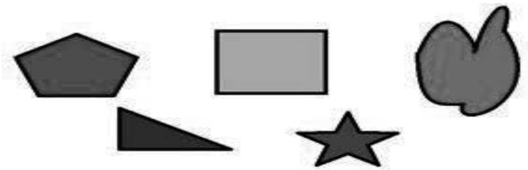
Cuboid		A cuboid is also three dimensional solid having 6 faces, 8 vertices and 12 edges but the faces of the cuboid are in a rectangular shape. Example: Matchbox
Cone		A cone is a solid which has a circular base and narrows smoothly from the surface to the top at a point called apex or vertex. Example: An icecream cone
Cylinder		A cylinder is a 3d solid shape that has two parallel circular bases connected by a curved surface. It has no vertex. Example: Gas cylinder
Sphere		A sphere is a round shape in a 3d plane, whose radius is extended to three dimensions (x-axis, y-axis and z-axis). Example: Ball

Open and Closed Figures

A point is a small dot which is the starting point of a line segment. By definition, a line segment is a part of a line in which a narrow lane is connecting two points within a line. Different numbers of line segments give us different figures and such figures may be either open figures or closed shapes or figures.

Closed Shapes

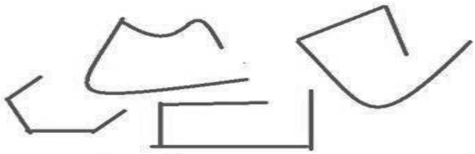
Geometric shapes such as a square, rectangles, and triangles are a few basic 2D shapes. These figures are collectively called polygons. A polygon is any flat shape or plane on a surface of a paper. They have a finite closed boundary made up of a fixed number of line segments and are called sides of the polygon. Each side meets at a common point called corners (vertex). Such bounded geometric shapes like polygons are called closed figures. A boundary of a closed figure is not only made of line segments but also of curves. Hence, a closed figure can be defined as any geometric shape which starts and ends at the same point to form a boundary by line segments or by curves.



Closed Figures

Open Shapes

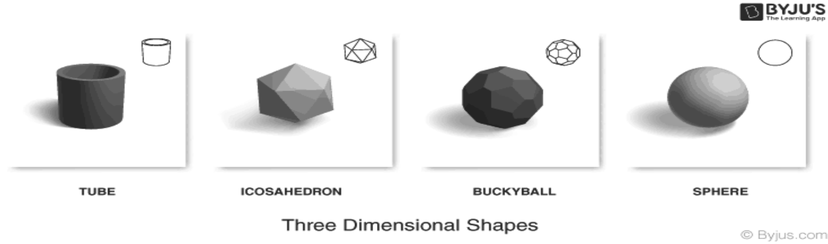
Open figures are incomplete shapes. To sketch a closed figure one has to meet both the starting point and ending point. Open figures are also depicted by using line segments or by curves but at least the lines will be discontinuous. An open figure's starting and endpoints are different.



Open Figures

Different Shapes

In our daily existence, we may observe different shapes which look exactly the same as some three-dimensional geometric shapes.



Answer the questions based on the text above.

1. What are geometrical figures? What types of them do you know?

2. Dwell upon 2-dimensional and 2-dimensional figures.
3. What is the triangle? What types of triangles do you know?
4. Name the differences and similarities between squares and rectangles.
5. Give the definition of a parallelogram and mark its key feature.
6. Define all the 3D geometric shapes.
7. What is the point? What is a line? What can they form?
8. What are closed shapes? Give examples of them.
9. Which open shades can you mention?
10. Do you know some other geometrical figures?

Find the proper English equivalents in the text above.

Геометричні фігури, форми предметів, межі, кути, поверхня, правильна форма, органічні форми, плоскі фігури, вісь, висота фігури, лінія, відрізок, крива, багатокутник, сумма внутрішніх кутів, гострокутний трикутник, тупокутний трикутник, рівнокутний трикутник, паралельні прямі, перетинатися, довжина сторони, грані куба, тверде тіло, вершина, точка.

Join the term with its explanation.

Term	Definition
1. acute angle	a) a continuous portion of a circle
2. angle	b) the property created by the space between two objects
3. arc	c) the length of the closed curve of a circle
4. circumference	d) the mean of n numbers expressed as the n-th root of their product
5. complementary angles	e) a line enclosing a plane area
6. coordinate	f) a straight line from the center to the perimeter of a circle
7. cosine	g) an angle less than 90 degrees but more than 0 degrees
8. diameter	h) relating to or situated in or extending toward the middle
9. distance	i) a straight line that intersects a curve at two or more points
10. geometric mean	j) the length of a straight line through the center of a circle
11. median	k) a line that touches a curve at only one point
12. perimeter	l) either of two equal and opposite angles formed by the intersection of two straight lines
13. radius	m) two angles whose sum is a right angle
14. right angle	n) ratio of the length of the side opposite the given angle to the length of the hypotenuse of a right-angled triangle
15. secant	o) of equal importance, rank, or degree
16. sine	p) the 90 degree angle between two perpendicular lines
17. tangent	q) the space between two lines or planes that intersect
18. vertical angle	r) ratio of the adjacent side to the hypotenuse of a right-angled triangle

Read and translate the text. Write out unknown items of vocabulary. Do the exercises after the text.

Area and Volume of Geometric Figures and Objects

Quite often it is necessary to multiply one denominate number by another. To do so, we multiply the number parts together and the unit parts together. For example,

8 in.·8 in. ==8·8·in.·in.64 in.28 in.·8 in.=8·8·in.·in.=64 in.2

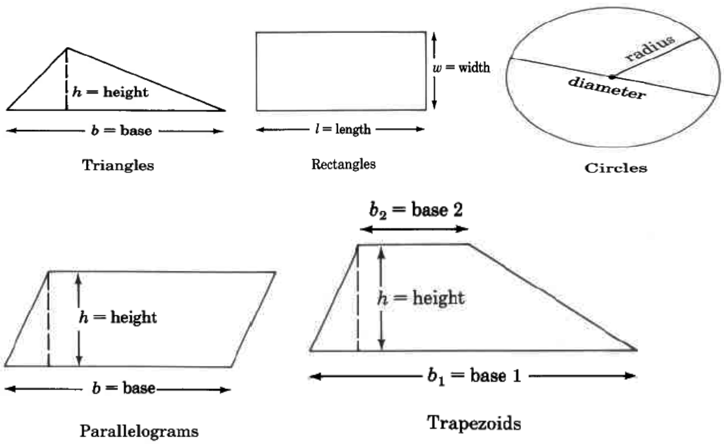
4 mm·4 mm·4 mm==4·4·4·mm·mm·mm64 mm34 mm·4 mm·4 mm=4·4·4·mm·mm·mm=64 mm3

The Meaning and Notation for Area

The product (length unit)·(length unit)=(length unit)2(length unit)·(length unit)=(length unit)2, or, square length unit (sq length unit), can be interpreted physically as the *area* of a surface.

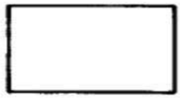
Area

The **area** of a surface is the amount of square length units contained in the surface. For example, 3 sq in. means that 3 squares, 1 inch on each side, can be placed precisely on some surface. (The squares may have to be cut and rearranged so they match the shape of the surface.) We will examine the area of the following geometric figures.



Area Formulas

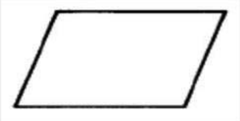
We can determine the areas of these geometric figures using the following formulas.



Rectangle

$A_R = l \cdot w$

Area of a rectangle is the length times the width.



Parallelogram

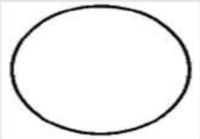
$A_P = b \cdot h$

Area of a parallelogram is base times the height.

Trapezoid

$A_{Trap} = \frac{1}{2} \cdot (b_1 + b_2) \cdot h$

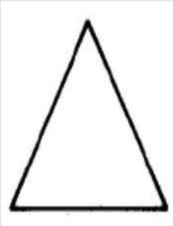
Area of a trapezoid is one half the sum of the two bases times the height.



Circle

$A_c = \pi r^2$

Area of a circle is π times the square of the radius.



Triangle

$$A_T = \frac{1}{2} \cdot b \cdot h$$

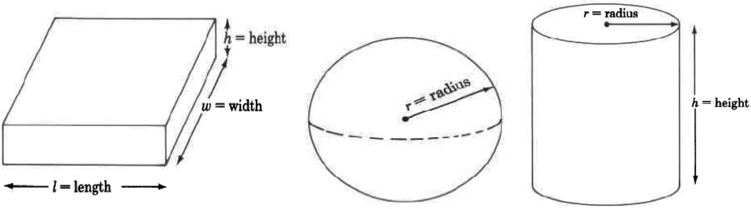
Area of a triangle is one half the base times the height.

The Meaning and Notation for Volume

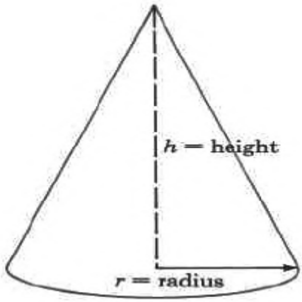
The product (length unit)(length unit)(length unit)=(length unit)3(length unit)(length unit)(length unit)=(length unit)3, or cubic length unit (cu length unit), can be interpreted physically as the *volume* of a three-dimensional object.

Volume

The **volume** of an object is the amount of cubic length units contained in the object. For example, 4 cu mm means that 4 cubes, 1 mm on each side, would precisely fill some three-dimensional object. (The cubes may have to be cut and rearranged so they match the shape of the object.)

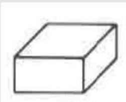


Rectangular solid Sphere Cylinder



Cone

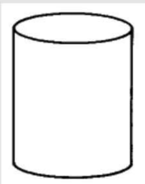
Volume Formulas



Rectangular solid

$$\begin{aligned} V_R &= l \cdot w \cdot h \\ &= (\text{area of base}) \cdot (\text{height}) \end{aligned}$$

The volume of a rectangular solid is the length times the width times the height.



Cylinder

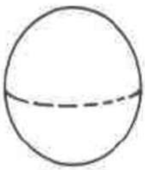
$$\begin{aligned} V_{Cyl} &= \pi \cdot r^2 \cdot h \\ &= (\text{area of base}) \cdot (\text{height}) \end{aligned}$$

The volume of a cylinder is π times the square of the radius times the height.

Cone

$$V_c = \frac{1}{3} \cdot \pi \cdot r^2 \cdot h$$
$$= (\text{area of base}) \cdot (\text{height})$$

The volume of a cone is $\frac{1}{3}$ times π times the square of the radius times the height.



Sphere

$$V_s = \frac{4}{3} \cdot \pi \cdot r^3$$

The volume of a sphere is $\frac{4}{3}$ times π times the cube of the radius.

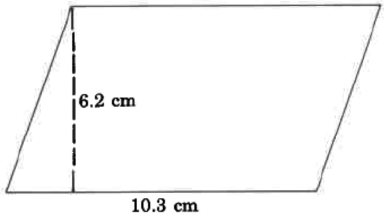
Join the term with its translation.

Term	Translation
1. to multiply	**a) поверхня**
2. square length unit	**b) висота**
3. surface	**c) основа**
4. width	**d) множити**
5. denominate number	**e) об'єм**
6. height	**f) тіло**
7. base	**g) одиниця**

8. volume	h) Номінал числа
9. unit	i) квадратна одиниця довжини
10. solid	j) ширина

Find Areas of Some Common Geometric Figures

Sample. Find the area of the parallelogram.



Solution

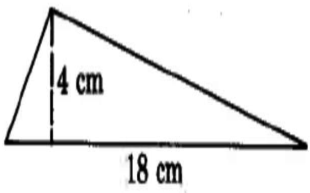
AP=b·h

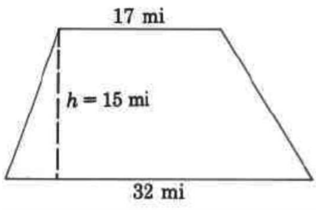
=10.3 cm 6.2 cm

= 63.86 sq cm

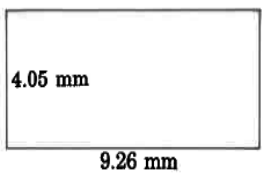
The area of this parallelogram is 63.86 sq cm.

A





B



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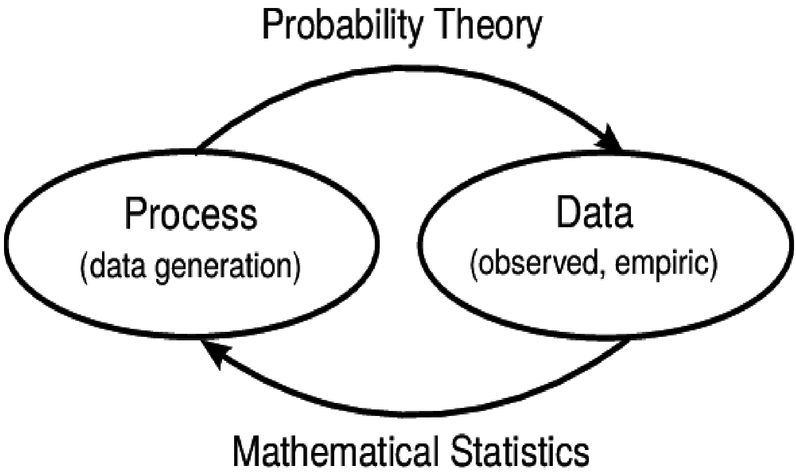


Probability Theory and Mathematical Statistics

Read and translate the text. Write out unknown items of vocabulary from it. Do the tasks following the text.

Probability theory and mathematical statistics are two interrelated branches of mathematics that play a vital role in our understanding and interpretation of the world around us. Probability theory deals with the study of uncertainty and randomness, while mathematical statistics is concerned with the collection, analysis, interpretation, presentation, and organization of data.

Probability theory provides a mathematical framework for quantifying uncertainty and making predictions about the likelihood of events. In probability theory, randomness is formalized through the concept of a probability distribution, which assigns probabilities to different possible outcomes of an event. The most common types of probability distributions include the uniform, normal, binomial, and Poisson distributions.

One of the main applications of probability theory is in the field of decision-making, where probabilities are used to calculate the expected value of an event and make decisions based on that information. For example, in finance, probabilities can be used to calculate the expected return on an investment and make decisions about investments based on that information. In addition, probability theory is also used in the field of cryptography, where it is used to secure communications by generating random numbers and encrypting messages.

Mathematical statistics, on the other hand, is concerned with the collection, analysis, interpretation, presentation, and organization of data. It uses the tools and techniques of probability theory to make inferences about a population based on a sample of data from that population. This is done through estimation, which involves making inferences about a population parameter based on a sample of data, and hypothesis testing, which involves testing claims about a population based on sample data.

Mathematical statistics plays a key role in many fields, including finance, engineering, medicine, and the social sciences. In finance, for example, statistical techniques are used to analyze stock market data and make predictions about future trends. In medicine, statistical methods are used to analyze clinical trial data and make decisions about the efficacy of new treatments. In the social sciences, statistical methods are used to analyze survey data and make inferences about population characteristics.

One of the key concepts in mathematical statistics is statistical inference, which involves making predictions about a population based on sample data. There are two main types of statistical inference: point estimation and interval estimation. Point estimation involves calculating a single value for a population parameter, while interval estimation involves calculating a range of values for a population parameter that is likely to contain the true value of the parameter.

Another important concept in mathematical statistics is hypothesis testing, which involves testing claims about a population based on sample data. In hypothesis testing, a null hypothesis and an alternative hypothesis are formulated and tested using statistical methods. The null hypothesis represents the default position that there is no difference between the population and the sample, while the alternative hypothesis represents the claim being tested.

In conclusion, probability theory and mathematical statistics are two crucial branches of mathematics that play a vital role in our understanding and interpretation of the world around us. They are used in a wide range of fields to make decisions based on data, predict outcomes, and gain insights into complex systems. Whether it's in finance, medicine, or the social sciences, the tools and techniques of probability theory and mathematical statistics are essential for making informed decisions and improving our understanding of complex systems.

Answer the questions to the text.

1. What are probability theory and mathematical statistics and how are they related?
2. What is the main focus of probability theory and what are some common types of probability distributions?
3. How is probability theory used in decision-making and cryptography?
4. What is the main focus of mathematical statistics and in what fields is it widely used?
5. What is statistical inference and what are the two main types of statistical inference?
6. What is hypothesis testing and what is the difference between the null hypothesis and the alternative hypothesis?
7. How do probability theory and mathematical statistics play a role in our understanding and interpretation of the world around us?
8. In what ways are the tools and techniques of probability theory and mathematical statistics essential for making informed decisions and improving our understanding of complex systems?

Match the following terms with their definitions.

1. Probability distribution	2.Point estimation
3. Hypothesis testing	4.Statistical inference
5. Alternative hypothesis	6.Null hypothesis

A. _______A statistical technique used to test claims about a population based on sample data

B._______A range of values for a population parameter that is likely to contain the true value of the parameter

C.________The default position that there is no difference between the population and the sample

D.________ Assigning probabilities to different possible outcomes of an event

E.________ Making predictions about a population based on sample data

F.________ Calculating a single value for a population parameter

Find English equivalents in the text and write your own sentences with them.

Теорія ймовірностей, математична статистика, вивчення невизначеності та випадковості, збір & аналіз& інтерпретація та організація даних, генерування випадкових чисел, шифрування повідомлень, вибірки даних, сукупність, перевірка гіпотез, точкова оцінка та інтервальна оцінка, нульова гіпотеза та альтернативна гіпотези.

Read and translate the text. Do the tasks following it.

The Main Laws of Probability

Probability theory is a branch of mathematics that deals with the study of random events and their outcomes. The laws of probability theory provide a framework for understanding the likelihood of different events and for making predictions about future events. The following are the main laws of probability theory:

1. The Law of Total Probability: This law states that the total probability of all possible outcomes of a random event is equal to 1. In other words, if there are multiple ways an event can occur, the sum of the probabilities of each occurrence must equal 1.
2. The Law of Large Numbers: This law states that as the number of trials of a random event increases, the average of the outcomes will approach the expected value. In other words, the more times a random event is performed, the more accurate the prediction of its outcome will be.
3. The Law of Conditional Probability: This law states that the probability of an event occurring given that another event has

already occurred can be calculated. For example, the probability of rolling a 6 on a dice given that the dice has already shown a 4 on its previous roll can be calculated using conditional probability.

4. Bayes' Theorem: This theorem provides a formula for calculating the probability of an event occurring given prior knowledge about related events. It is widely used in fields such as statistics, machine learning, and artificial intelligence.

5. The Multiplication Rule: This rule states that the probability of two independent events occurring simultaneously is equal to the product of their individual probabilities. For example, the probability of rolling a 6 on a dice and drawing an Ace from a deck of cards is equal to the product of the probability of each event occurring individually.

These laws form the foundation of probability theory and provide a way to understand and make predictions about random events. They are widely used in a variety of fields and have numerous applications in science, engineering, and commerce.

Do the test based on the laws of probability theory:

1. What is the main subject of probability theory? a) The study of random events and their outcomes. b) The study of laws of physics. c) The study of human behavior.

2. What is the law of total probability? a) The law that states that the total probability of all possible outcomes of a random event is equal to 1. b) The law that states that the average of the outcomes will approach the expected value. c) The law that states that the probability of an event occurring given that another event has already occurred.

3. What is the law of large numbers? a) The law that states that the total probability of all possible outcomes of a random event is equal to 1. b) The law that states that the average of the outcomes will approach the expected value. c) The law that states that the probability of an event occurring given that another event has already occurred.

4. What is the law of conditional probability? a) The law that states that the total probability of all possible outcomes of a random event is equal to 1. b) The law that states that the average of the outcomes will approach the expected value. c) The law that states that the probability of an event occurring given that another event has already occurred.

5. What is Bayes' Theorem used for? a) To calculate the probability of an event occurring given prior knowledge about related events. b) To make predictions about future events. c) To understand the likelihood of different events.

6. What is the multiplication rule? a) The rule that states that the probability of two independent events occurring simultaneously is equal to the product of their individual probabilities. b) The rule that states that the total probability of all possible outcomes of a random event is equal to 1. c) The rule that states that the average of the outcomes will approach the expected value.

Match the words with their explanation.

1. Based on the text

1. probability theory
2. multiplication rule
3. likelihood
4. law of total probability
5. law of large numbers
6. law of conditional probability
7. Bayes' Theorem

______The law that states that the total probability of all possible outcomes of a random event is equal to 1.

______The rule that states that the probability of two independent events occurring simultaneously is equal to the product of their individual probabilities.

______The law that states that the average of the outcomes will approach the expected value.

______The study of random events and their outcomes.

______The law that states that the probability of an event occurring given that another event has already occurred.

______Used to calculate the probability of an event occurring given prior knowledge about related events.

______The likelihood of different events.

2. Basic probability terms

1. Sample space
2. Sample point
3. Experiment or trial
4. Event
5. Outcome
6. Complimentary event
7. Impossible event

____ is an event that will not and cannot happen. For example, you can't toss a coin and get both tails and heads at the same time. When rolling one die, you can't get a number larger than six.

____ is a possible result you can get from doing a trial or experiment. For example, you could get heads when tossing a coin.

____ is one single outcome as the result of a trail or experiment. For example, getting a three when rolling a die, or getting an eight of clubs when choosing a card out of a deck.

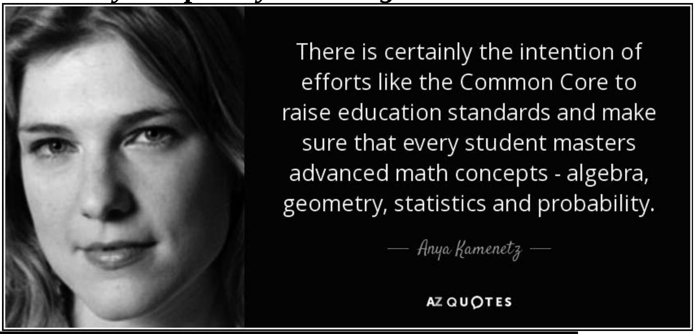
____ is the set of possible outcomes that can occur in a trial. For example, when tossing a coin, the set of possible outcomes is {heads, tails}. Or when rolling a single die, the set of possible outcomes is {1, 2, 3, 4, 5, 6}.

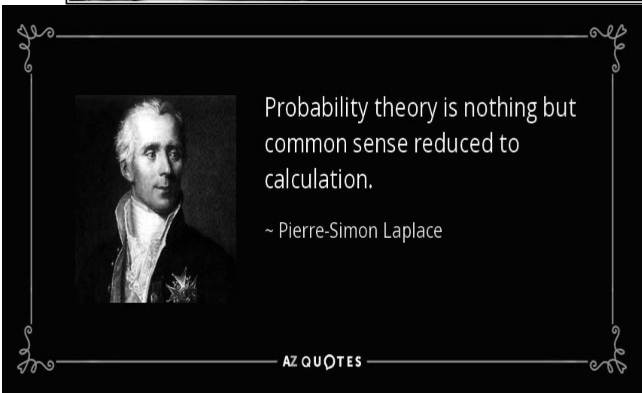
____ is when the outcomes are always uncertain in a series of actions. For example, selecting a card from a deck, tossing a coin or rolling a die.

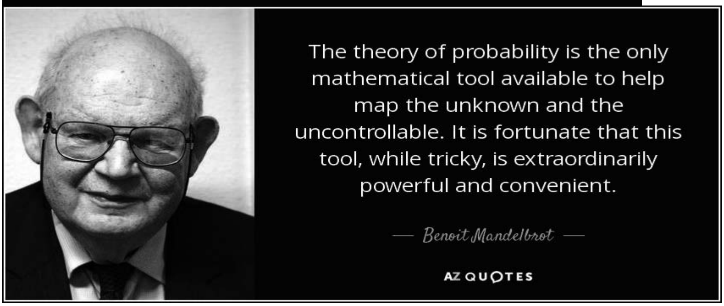
____ is a non-happening event. You write this as, "The compliment of an event X is the event not X." You write not X as X'. For example, with a regular deck of cards, if the event X is drawing a diamond, then the event X' is not drawing a diamond.

____ is one of the possible outcomes in a sample space. For example, when using a deck of cards, a sample point would be the ace of spades or the queen of hearts.

Discussion Topics: Do you agree with the quotes of famous inventors and scientists based on probability and statistics? YES/NO? Why? Explain your thoughts.

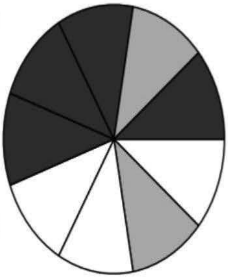






Try to solve probability tasks. Describe the procedure of solving and results in English.

Use each diagram to solve the problems.



1) If you spun the spinner 1 time, what is the probability it would land on a black piece?

2) If you spun the spinner 1 time, what is the probability of landing on either a black piece or a white piece?

3) If you spun the spinner 1 time, what is the probability it would land on a gray piece?

4) If you spun the spinner 1 time, what is the probability it would land on a white piece?

5) How many pieces are there total in the spinner?

6) If you were to roll the dice one time what is the probability it will NOT land on a 1?

7) If you were to roll the dice one time what is the probability it will land on a 4?

8) If you were to roll the dice one time, what is the probability of it landing on an odd number?

9) Which shape has a 0.40% chance (8 out of 20) of being selected?

10) If you were to select 1 shape at random from the array, what shape do you have the greatest probability of selecting?

11) If you were to select 1 shape at random from the array, what is the probability it will be a diamond?

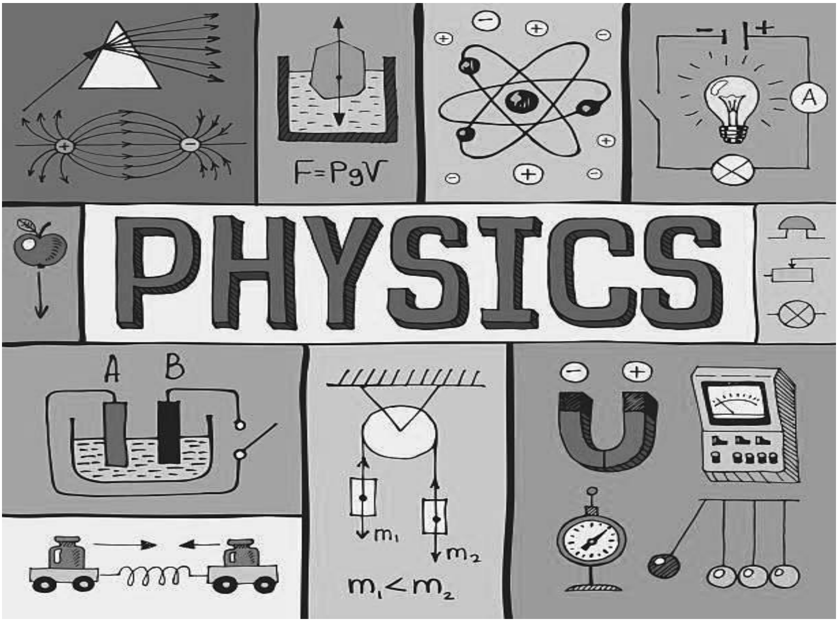
12) How many shapes are there total in the array?

Answers

1. ____________
2. ____________
3. ____________
4. ____________
5. ____________
6. ____________
7. ____________
8. ____________
9. ____________
10. ____________
11. ____________
12. ____________

Part II

English for Students Majoring in Physics



Physics: Main Aspects

Science consists of the theories and laws that are the general truths of nature as well as the body of knowledge they encompass. Scientists are continually trying to expand this body of knowledge and to perfect the expression of the laws that describe it. Physics is concerned with describing the interactions of energy, matter, space, and time, and it is especially interested in what fundamental mechanisms underlie every phenomenon. The concern for describing the basic phenomena in nature essentially defines the realm of physics.

> ***Useful Tip***
>
> *Read the texts carefully, slowly. It will be better to understand. Do not miss any interesting facts. Read almost every text fragment to the very end. Read with interest, thoughtfully.*

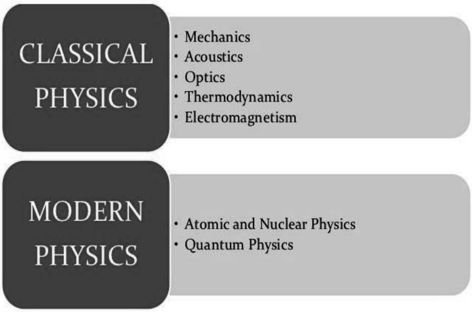
Physics aims to describe the function of everything around us, from the movement of tiny charged particles to the motion of people, cars, and spaceships. In fact, almost everything around you can be described quite accurately by the laws of physics.

You need not be a scientist to use physics. On the contrary, knowledge of physics is useful in everyday situations as well as in nonscientific professions. It can help you understand how microwave ovens work, why metals should not be put into them, and why they might affect pacemakers. Physics allows you to understand the hazards of radiation and rationally evaluate these hazards more easily.

Key Words	Grammar
___________	__________
Text Structure	Text Features
___________	__________

Physics also explains the reason why a black car radiator helps remove heat in a car engine, and it explains why a white roof helps keep the inside of a house cool. Similarly, the operation of a car's ignition system as well as the transmission of electrical signals through our body's nervous system are much easier to understand when you think about them in terms of basic physics.

Physics is the foundation of many important disciplines and contributes directly to others. Chemistry, for example – since it deals with the interactions of atoms and molecules – is rooted in atomic and molecular physics. Most branches of engineering are applied physics. In architecture, physics is at the heart of structural stability, and is involved in the acoustics, heating, lighting, and cooling of buildings. Parts of geology rely heavily on physics, such as radioactive dating of rocks, earthquake analysis, and heat transfer in the Earth. Some disciplines, such as biophysics and geophysics, are hybrids of physics and other disciplines.



Physics has many applications in the biological sciences. On the microscopic level, it helps describe the properties of cell walls and cell membranes. On the macroscopic level, it can explain the heat, work, and power associated with the human body. Physics is involved in medical diagnostics, such as x-rays, magnetic resonance imaging (MRI), and ultrasonic blood flow measurements.

Medical therapy sometimes directly involves physics; for example, cancer radiotherapy uses ionizing radiation. Physics can also explain sensory phenomena, such as how musical instruments make sound, how the eye detects color, and how lasers can transmit information.

It is not necessary to formally study all applications of physics. What is most useful is knowledge of the basic laws of physics and a skill in the analytical methods for applying them. The study of physics also can improve your problem-solving skills. Furthermore, physics has retained the most basic aspects of science, so it is used by all of the sciences, and the study of physics makes other sciences easier to understand.

(Retrieved from: "The Nature of Science and Physics. Physics: An Introduction")

Glossary

Physics – the branch of science concerned with the nature and properties of matter and energy. The subject matter of physics, distinguished from that of chemistry and biology, includes mechanics, heat, light and other radiation, sound, electricity, magnetism, and the structure of atoms.

Science – the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment.

Theory – a supposition or a system of ideas intended to explain something, especially one based on general principles independent of the thing to be explained.

Law – the system of rules which a particular country or community recognizes as regulating the actions of its members and which it may enforce by the imposition of penalties.

Nature – the phenomena of the physical world collectively, including plants, animals, the landscape, and other features and products of the earth, as opposed to humans or human creations.

Scientist – a person who is studying or has expert knowledge of one or more of the natural or physical sciences.

Expand – become or make larger or more extensive.

Expression – the process of making known one's thoughts or feelings.

Interaction – reciprocal action or influence.

Energy – the strength and vitality required for sustained physical or mental activity.

Matter – physical substance in general, as distinct from mind and spirit; (in physics) that which occupies space and possesses rest mass, especially as distinct from energy.

Space – a continuous area or expanse which is free, available, or unoccupied.

Time – the indefinite continued progress of existence and events in the past, present, and future regarded as a whole.

Mechanism – a system of parts working together in a machine; a piece of machinery.

Phenomenon – a fact or situation that is observed to exist or happen, especially one whose cause or explanation is in question.

Realm – a kingdom.

Movement – an act of changing physical location or position or of having this changed.

Motion – the action or process of moving or being moved.

Check your understanding.

1. What is physics as a science?
2. What is physics concerned with?
3. What does physics aim to describe?
4. What applications of physics do you know?

Pace yourself, don't rush. Read the entire question and pay attention to the details.

Fill in the gaps.

natural phenomena substances field
matter time continuous

Look!

Share your impressions from reading with groupmates.

Physics is a science that studies the simplest and, at the same time, the most general patterns of 1) … , the properties and structure of matter, the laws of its motion. Currently, two types of inanimate matter are known: 2) … and 3) … . The first type of matter – 4) … – includes atoms, molecules and all bodies composed of them. The second type of matter is formed by gravitational, electromagnetic and other fields.

Matter is in 5) … motion, which means any change in general. Motion is an inherent property of matter, which is uncreated and indestructible, like matter itself. Matter exists and moves in space and 6) … .

Render the text-fragment into English.

Галілео Галілей – вважається засновником не лише експериментальної, але значною мірою і теоретичної фізики. Він є основоположником експериментально-математичного методу вивчення природи. Саме від нього бере початок фізика як наука. Найважливішим вкладом Галілео Галілея в науку була свідома й послідовна заміна пасивного спостереження активним експериментом. Результатами цих експериментів стали зроблені ученим наукові відкриття.

(Retrieved from: https://dovidka.biz.ua/vidatni-vcheni-fiziki-ta-yih-vidkrittya/)

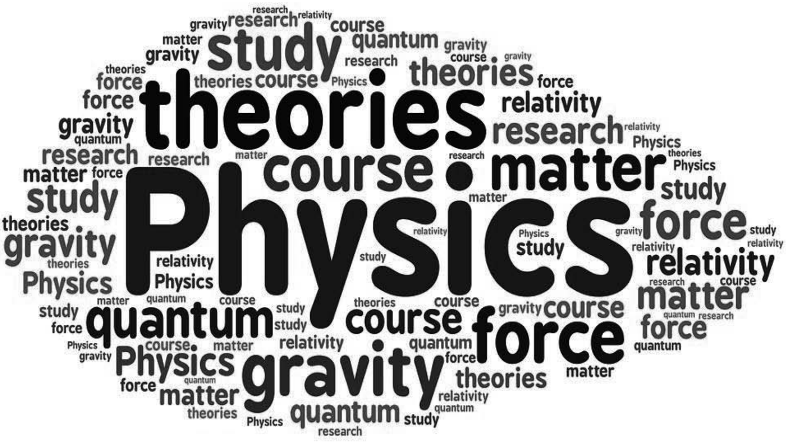
Work in pairs. Practice mini-dialogues using the key words.

Heat, light, force, magnetism, inertia, atoms, electricity, sound, gravity, friction.

Find the sentences with the following expressions in the text and translate them into Ukrainian.

Theories and laws, describing the interactions of energy, fundamental mechanisms underlie every phenomenon, tiny charged particles, microwave ovens, car's ignition system, biophysics and geophysics, cell walls and cell membranes, ultrasonic blood flow measurements, transmit information.

Make up and write down sentences of your own using the following words and expressions.



What is the main idea of the text? What are the supporting details? Fill in the organizer.

Main Idea:

____

____

____

____

Supporting Detail	Supporting Detail	Supporting Detail
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________

Speak on:

Make an Illustrated Acrostic Poem

Name ___________________

Draw a related picture to physics as a science, then write an acrostic poem about it. Start each line of your poem with the letter on that line.

P
H
Y
S
I
C
S

Make up an essay using these topics.

1. Outstanding physicists and their investigations.
2. Explain the difference between a principle and a law.
3. Explain the difference between a model and a theory.

Look!

Pay attention to the main information.

Put the words in the right order.

1. disciplines, Physics, the, is, foundation, many, of, important.
2. physics, study, of, can, improve, The, your, skills, problem-solving, also.
3. how, can, you, Physics, ovens, understand, help, microwave, work.
4. is, with, Physics, concerned, the, of, interactions, energy, describing.

Make a definition of physics.

____

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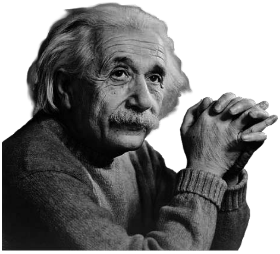
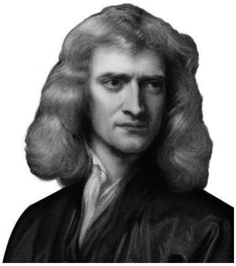
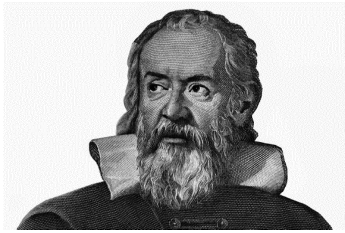
Describe the pictures. Name these famous physicists.

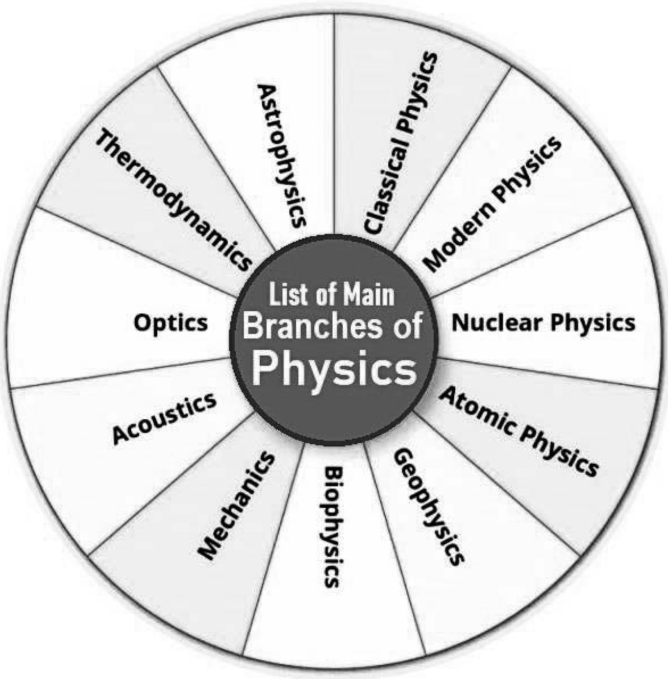

Make up a short story about one of these physics scientists.

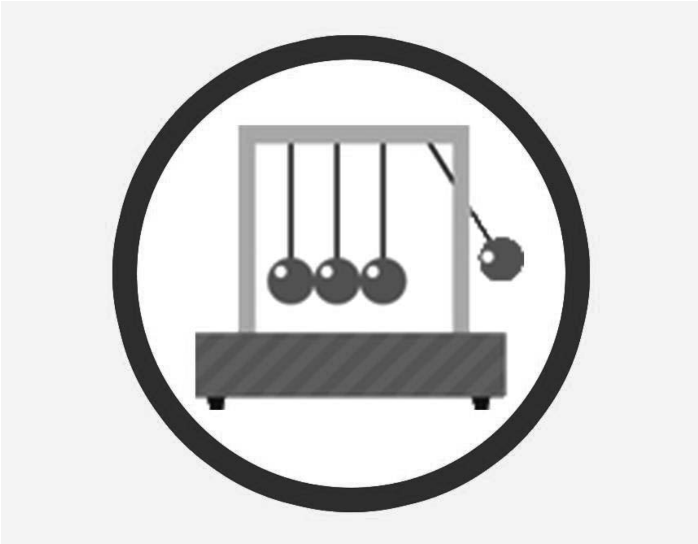
____

Which Ukrainian physicists do you know? Do you know such scientists as Ivan Puliui, Kostiantyn Tsiolkovskyi, Serhii Koroliov, Yurii Kotermak, Yevhen Paton? Can you name any other famous Ukrainian physicists? Who are they? What their investigations do you know?

Project Work.

Make your project on one of these topics.





Forces and Movement
Part I

It’s hard to believe, but everything in the world is in motion, all the time. Even things that look perfectly still are packed with atoms that are vibrating with energy. Understanding how motion works was one of the great milestones of science and it’s credited to the brilliant English physicist Sir Isaac Newton. His laws of motion, written over 300 years ago, were so well stated that scientists still use them in most situations today. The basic idea Newton taught us is that motion is caused by forces – which is easy enough to understand: kick a ball (the force) and it flies into the air (the motion). But forces don’t always make things move: a bridge has lots of forces acting on it, but it doesn’t go anywhere. Also, the “motion” forces produce is sometimes a shift in the direction in which something is moving or a change in its shape. So what exactly are forces and how they do they produce these different kinds of motion?

> ***Look!***
>
> *Reading can bring you huge benefits. While reading, you can use your imagination. Reading the texts, you fantasize, complementing the picture described. So you develop your imagination.*

Forces. Forces are the hidden power behind everything that happens in our world – and beyond. Forces make your heart race and your lungs pump; they swing the planets round the Sun and bind atoms tight. Think of anything, absolutely anything, that's going on in the universe right now, and you can guarantee that somewhere, somehow forces are responsible.

Forces and movement. When a force acts on an object, it often makes it move faster or in a different direction. Once something is moving, you don't need a force to keep it moving: it will carry on moving all by itself unless another force stops it. When a rocket blasts into space, you need a force to make it lift off to begin with and to overcome the force of Earth's gravity. But once the rocket is in space, it will carry on moving all by itself until and unless another force stops it.

Any time you want to make something speed up (accelerate) or slow down (decelerate), you need to use a force. In fact, you always need to use a force if you want to alter how something is moving. English scientist Isaac Newton was the first person to figure out properly how forces change the way things move.

Motion. We've already seen that forces can make things move, but how exactly are forces and motion linked together? How can we measure different amounts of motion or figure out where a flying bullet or a soaring space rocket is going to end up? Isaac Newton's work helps us tie forces and motion together in an easy-to-understand way. It also lets us calculate how things will move when we apply forces to them.

One important thing to remember about the laws of motion is that they apply only to things that are moving – things in motion! So, for example, if you stare down at your feet and wonder why you're standing firmly on the ground without sinking in, the explanation has nothing to do with Newton's third law of motion (action and reaction). You're standing still because repulsive, electrostatic forces between atoms in your shoes and atoms in the ground (pushing upward) exactly counterbalance the force of gravity (pulling down). There is no motion, so Newton's second and third laws don't apply. The first law does apply: your body is still because there is no overall force acting on it. If the ground suddenly collapsed, the upward force would no longer be enough to balance your weight. There would be a net downward force, making you accelerate into the ground.

(Retrieved from: "Forces and motion" by Chris Woodford)

Glossary

Physics – the branch of science concerned with the nature and properties of matter and energy.

Motion – the action or process of moving or being moved.

Milestone – a stone set up beside a road to mark the distance in miles to a particular place.

Physicist – an expert in or student of physics.

Force – strength or energy as an attribute of physical action or movement.

Change – replace (something) with something else, especially something of the same kind that is newer or better; substitute one thing for (another).

Exactly – without discrepancy (used to emphasize the accuracy of a figure or description).

Power – the ability to do something or act in a particular way, especially as a faculty or quality.

Direction – a course along which someone or something moves.

Gravity – the force that attracts a body toward the center of the earth, or toward any other physical body having mass.

Blast – a destructive wave of highly compressed air spreading outward from an explosion.

Measure – ascertain the size, amount, or degree of (something) by using an instrument or device marked in standard units or by comparing it with an object of known size.

Amount – a quantity of something, especially the total of a thing or things in number, size, value, or extent.

Calculate – determine (the amount or number of something) mathematically.

Apply – make a formal application or request.

Law – the system of rules which a particular country or community recognizes as regulating the actions of its members and which it may enforce by the imposition of penalties.

Upward – toward a higher place, point, or level.

Downward – moving or leading toward a lower place or level.
Accelerate – begin to move more quickly.

What is the main idea of the text? What are the supporting details? Fill in the organizer.

Main Idea:

____
____
____

Supporting Detail	Supporting Detail	Supporting Detail
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________

Check your understanding.

Pace yourself, don't rush. Read the entire question and pay attention to the details.

1. Is everything in the world in motion or not?
2. What did the brilliant English physicist Sir Isaac Newton investigate?
3. What is the basic idea Newton taught us?
4. Do forces always make things move?
5. What are forces?
6. How do they produce different kinds of motion?

Fill in the gaps.

legs   a push
muscles   a pull   direction

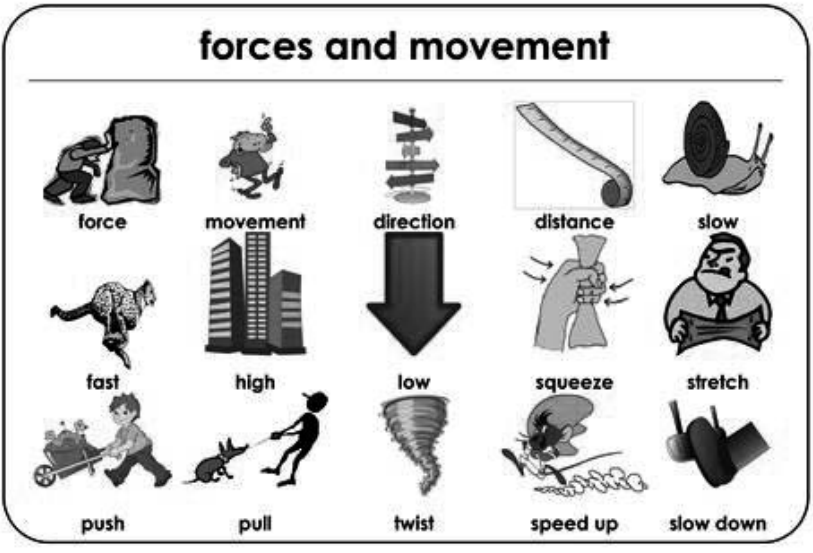
A force is basically 1) … , 2) … or a twist. A force is needed to start a mass moving, to change its speed, to make it change 3) … , or to bring it to rest.

We use our 4) … to produce force. We move ourselves and objects by exerting force with our arms and 5) … . We also produce force with engines to drive our machines. However, force is not needed to keep objects moving unless there is some resistance.

Render the text-fragment into English.

Коли ви кидаєте м’яч у повітря, ви застосовуєте м’язи руки для того, щоб підкинути м’яч у повітря. Куля сповільнюється опором повітря та опускається вниз завдяки гравітаційному тяжінню землі. Якщо б не було ні атмосфери, ані сили тяжіння, куля завжди рухалася б з однаковою швидкістю і в тому самому напрямку.

Make up and write down sentences of your own using the following words and expressions.



(Retrieved from: “Games and Activities Supporting Scientific Vocabulary”)

Work in pairs. Practice mini-dialogues using the key words.

Forces, motion, friction, acceleration, gravity, inertia, energy, effort, Earth, speed.

Find the sentences with the following expressions in the text and translate them into Ukrainian.

Vibrating with energy, milestones of science, laws of motion, kick a ball, flies into the air, make things move, a shift in the direction, hidden power behind everything that happens, lungs pump, somehow forces are responsible, force acts on an object, rocket blasts into space, to make something speed up (accelerate), slow down (decelerate).

Make up an essay using these topics.

1. Describe forces causing movement activities.
2. What is the relationship between force and motion?

Look!

Pay attention to the main information.

Read the text fragment to obtain and discuss the information. Give your own title to the text. Compress the text into 3 sentences.

Every object in the universe is surrounded by a gravitational field. The strength of the field is directly proportional to the mass of the object, and inversely proportional to the square of the distance from its center (for any point outside the object itself). Thus, the gravitational field of the sun is stronger overall than that of the earth, and the gravitational field of the earth is stronger in the vicinity of a person standing on the surface than it is at the altitude of a satellite in orbit. Nevertheless, the gravitational field surrounding any object extends indefinitely in all directions. Every particle in the entire universe is gravitationally attracted to every other particle. This is an important consideration in the development of theories concerning how the universe formed, how it is evolving, and what fate ultimately awaits it.

(Retrieved from: WhatIs.com)

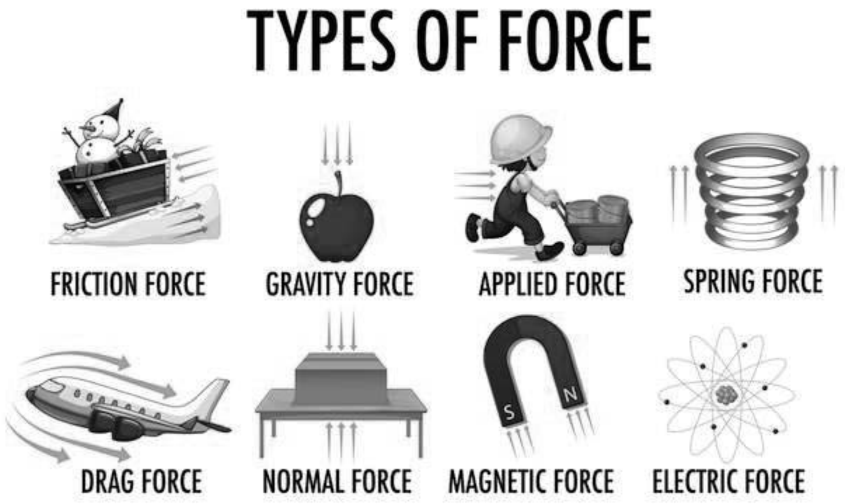
Put the words in the right order.

1. everything, that, Earth, is, some, moves, on, form, of, Almost, friction, resisted, by.
2. the, Earth, Moon, moves, The, always, around.
3. around, the, The, moves, Sun, Earth.
4. is, a, Gravity, that, objects, makes, force, each, attract, other.

Make the definitions of force and movement.

____
____
____
____
____
____

Describe the pictures. Translate these types of force into Ukrainian.



Make up a short story on one of these forces.

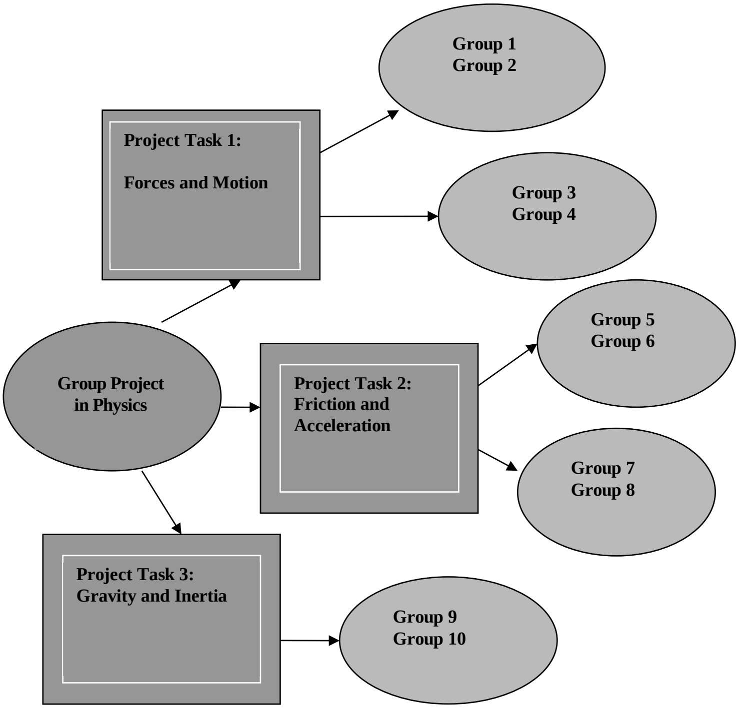
____
____

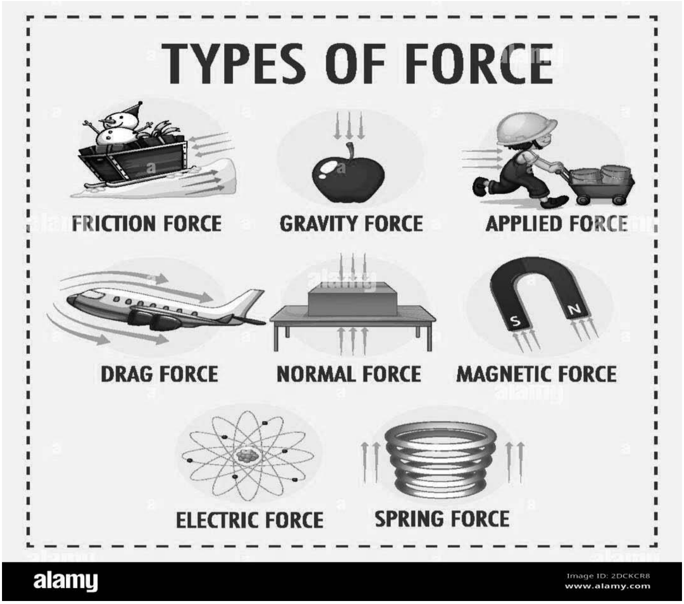
____
____
____
____

What Ukrainian physicists did investigate forces and movement? Do you know them? Can you name any other famous physicists who envisaged these issues? What country are they from?

Project Work.

Make your project on one of these topics.





Forces and Movement
Part II

Read ad translate the text. Write out unknown items of vocabulary. Do the exercises following it.

Forces are a fundamental concept in physics that describe interactions between objects and are responsible for causing changes in motion. Forces can be categorized as contact forces, which occur when two objects are in physical contact with each other, or non-contact forces, which occur at a distance without physical contact.

One of the most fundamental forces in physics is the force of gravity, which is a non-contact force that acts between all objects with mass. This force is responsible for keeping planets in orbit around stars and for keeping objects on the surface of the Earth. The strength of the gravitational force depends on the masses of the two objects and the distance between them.

Another important force in physics is the electromagnetic force, which is responsible for interactions between electrically charged particles. This force can be attractive or repulsive, depending on the charges of the particles involved. The electromagnetic force is responsible for binding atoms together to form molecules and for holding together the structure of materials.

The strong nuclear force is another fundamental force that is responsible for holding the nucleus of an atom together. This force is much stronger than the electromagnetic force and acts over very short distances, but its range is limited to the interior of atomic nuclei.

The weak nuclear force is responsible for certain types of radioactive decay and is involved in the process of nuclear fusion, which is the source of energy in the Sun and other stars.

In addition to these fundamental forces, there are a number of other forces that play important roles in physics, such as friction, air resistance, and tension. Friction is the force that opposes motion between two objects in contact and is important for determining the motion of objects on surfaces and for heat generation. Air resistance is the force that opposes motion of objects through air and is important for determining the motion of objects such as airplanes and projectiles. Tension is the force that is transmitted through a rope or cable when it is pulled tight and is important for understanding the behavior of structures such as bridges and suspension cables.

Forces can be described mathematically by using Newton's laws of motion. The first law states that an object will remain at rest or in uniform motion in a straight line unless acted upon by an unbalanced force. The second law states that the acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass. The third law states that for every action, there is an equal and opposite reaction.

When forces are combined, they can produce complex motion and behavior. For example, the motion of a pendulum can be understood in terms of the forces of gravity and tension acting on it. The motion of a bouncing ball can be understood in terms of the forces of gravity, air resistance, and elasticity.

In conclusion, forces play a crucial role in understanding the behavior of objects and systems in the physical world. They can be described mathematically and can be combined to produce complex behavior. Understanding the fundamental forces of gravity, electromagnetism, the strong and weak nuclear forces, and other forces such as friction, air resistance, and tension is essential for a deep understanding of physics and the physical world.

Answer the questions to the text.

1. What is a force in physics?

2. How does the force of gravity act on objects with mass?

3. Can you give an example of a contact force?

4. What is the difference between a contact force and a non-contact force?

5. Can you name some non-contact forces in physics?

6. How does friction affect the motion of objects?

7. What is tension and how does it affect the motion of objects?

8. How do air resistance and friction impact the motion of falling objects?

9. Can you give an example of how forces determine the behavior and stability of a system?

10. How do forces determine the efficiency of a mechanical system?

11. What is the relationship between forces and the motion of objects?

12. Can you explain how forces such as gravity, friction, and air resistance interact to determine the motion of an object?

Match the terms with their definitions.

Term	**Definition**
1. Force	A. Opposes motion between two objects in contact
2.	B.
3. Contact force	C. Holds the nucleus of an atom together
4. Non-contact force	D. Force that acts between all objects with mass

5. Gravity	E. Force that opposes motion of objects through air
6. Electromagnetic force	F. Force transmitted through a rope or cable when it is pulled tight
7. Strong nuclear force	G. Interactions between electrically charged particles
8. Weak nuclear force	H. Responsible for certain types of radioactive decay
9. Friction	I. The concept that describes interactions between objects
10. Air resistance	J. Force that occurs when two objects are in physical contact with each other
11. Tension	K. Force that occurs at a distance without physical contact

Complete the following sentences using vocabulary from the text:

a. The ___________ is responsible for holding the nucleus of an atom together.

b. The ___________ opposes motion between two objects in contact.

c. The ___________ is a non-contact force that acts between all objects with mass.

d. The ___________ is responsible for certain types of radioactive decay.

e. The ___________ is the force transmitted through a rope or cable when it is pulled tight.

f. The ___________ is the force that opposes motion of objects through air.

g. The ___________ is the concept that describes interactions between objects.

h. The ___________ is the force that occurs when two objects are in physical contact with each other.

i. The ___________ is the force that occurs at a distance without physical contact.

j. The ___________ describes interactions between electrically charged particles.

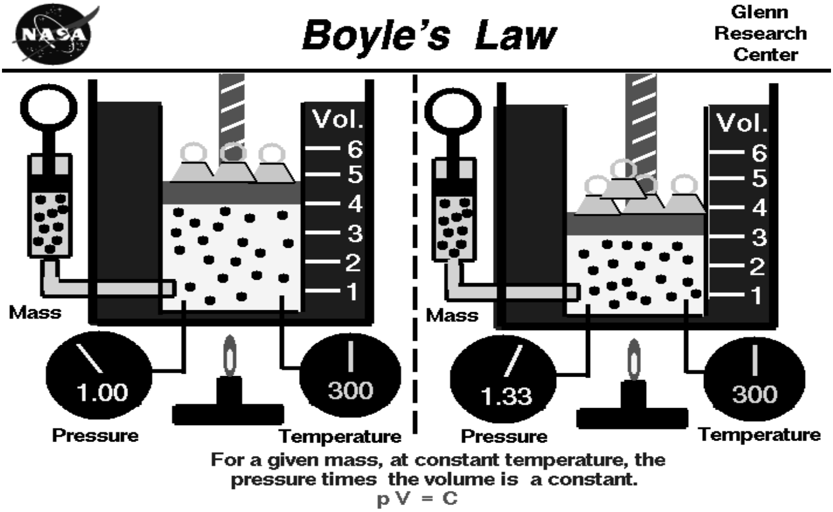
Read and translate the text and do the exercises after it.

How Were the Forces Found?

The concept of forces has been around for thousands of years, but it was not until the 16th century that a systematic study of forces in physics began. During this time, the scientific revolution was taking place, and scientists were eager to understand the world around them in new ways.

One of the earliest and most important contributions to the study of forces in physics was made by Sir Isaac Newton. Newton was an English mathematician and physicist who lived in the 17th century. In his famous work, "Philosophiæ Naturalis Principia Mathematica," also known as the "Principia," he set out the laws of motion and universal gravitation. These laws describe how objects move and interact with one another based on the forces acting upon them. Newton's laws of motion state that an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force. He also showed that the force of gravity acts on all objects with mass and decreases in strength as the distance between the objects increases.

Another important contributor to the study of forces in physics was Robert Boyle, an Irish chemist and physicist. Boyle is best known for his work on the relationship between pressure and volume in gases, known as Boyle's law. It states that the pressure exerted by a gas (of a given mass, kept at a constant temperature) is inversely proportional to the volume occupied by it. In other words, the pressure and volume of a gas are inversely proportional to each other as long as the temperature and the quantity of gas are kept constant. He also conducted experiments on friction and air resistance, demonstrating how these forces affect the motion of objects.



Over time, the study of forces in physics has expanded to include many different types of forces, including electromagnetic forces, strong and weak nuclear forces, and many others. Today, forces play a critical role in our understanding of the world and how it works. They are essential to many areas of physics, including mechanics, thermodynamics, and even our understanding of the fundamental structure of matter.

The invention of the concept of forces in physics has been a long and ongoing process, with many contributions from brilliant scientists throughout history. The study of forces continues to play a central role in our understanding of the physical world and has led to many important technological advances and innovations.

Define if the following statements are TRUE/FALSE.

1. The study of forces in physics began in the 16th century - True or False?

2. Sir Isaac Newton was a French mathematician and physicist - True or False?

3. Newton's laws of motion describe how objects move and interact with one another based on the forces acting upon them - True or False?

4. Robert Boyle is best known for his work on the relationship between pressure and volume in gases - True or False?

5. The study of forces in physics has only expanded to include a few types of forces - True or False?

6. Forces play a critical role in our understanding of the world and how it works - True or False?

7. Forces are not essential to many areas of physics - True or False?

8. The invention of the concept of forces in physics has been a short process with few contributions - True or False?

9. The study of forces continues to play a central role in our understanding of the physical world - True or False?

10. The study of forces has not led to many important technological advances and innovations - True or False?

Match the vocabulary word with its definition:

A. Laws of motion B. Universal gravitation C. Boyle's law D. Friction E. Air resistance F. Force G. Pressure

1. The relationship between the pressure of a gas and its volume ___________

2. The force that opposes motion between two surfaces that are in contact ___________

3. A force exerted by a fluid, such as air, that opposes motion ___________

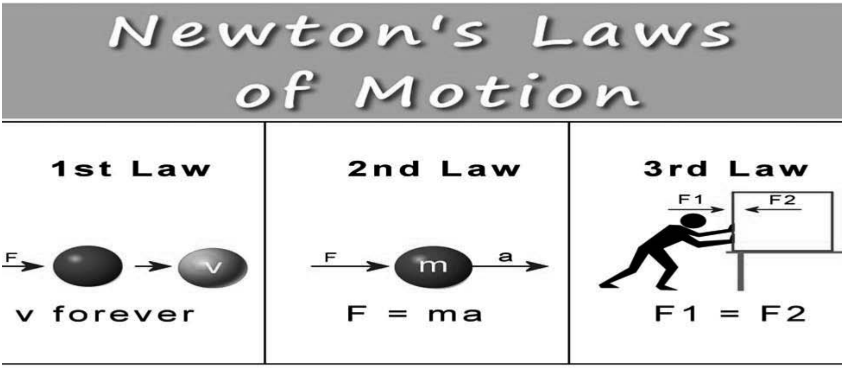
4. A measure of the force acting on an object, causing it to change its motion ___________

5. The laws that describe how objects move and interact with one another based on the forces acting upon them ___________

6. The force of attraction between all objects with mass ___________

7. The change in an object's velocity caused by a force acting upon it ___________

Read and translate the text. Do the fill in activity.



Space/ relationship/ reaction/ physics/ physics/ inversely/ inertia/ inertia/ classical/ classical

The laws of Newton are a set of three fundamental laws that describe the ___________ between forces and the motion of objects. These laws were first formulated by Sir Isaac Newton in the late 17th century and have since become an integral part of ___________ mechanics.

The first law, also known as the law of ___________, states that an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force. This law establishes the concept of ___________, which is the tendency of an object to maintain its state of motion unless acted upon by a force.

The second law states that the acceleration of an object is proportional to the force acting upon it and ___________ proportional to its mass. This law is commonly expressed as the equation F = ma, where F is the force acting on the object, m is its mass, and a is its acceleration.

The third law states that for every action, there is an equal and opposite __________. This law is known as the law of action and reaction and is commonly referred to as Newton's third law of motion. It states that if an object A exerts a force on object B, then object B will exert an equal and opposite force back on object A.

These three laws form the basis of __________ mechanics and have been widely used to describe and predict the motion of objects. They have also been instrumental in the development of many important technologies, including __________ travel, the design of automobiles and airplanes, and the understanding of motion in the natural world.

In conclusion, the laws of Newton are a cornerstone of __________ and have played a crucial role in our understanding of the world and how it works. They continue to be widely studied and used by scientists and engineers today, providing a foundation for much of the work in the field of __________.

Test on the Laws of Newton:

1.What is the first law of Newton? **a**. The law of action and reaction **b.** The law of inertia **c.** The law of acceleration.

2. What is the equation that describes the second law of Newton? **a.** F = ma **b.** a = m/F **c.** F = m/a.

3. What does the third law of Newton state? **a.** For every action, there is an equal and opposite reaction. **b.** An object will remain at rest or in uniform motion in a straight line unless acted upon by an external force. **c.** The acceleration of an object is proportional to the force acting upon it and inversely proportional to its mass.

4. What is the concept of inertia established by the first law of Newton? **a.** The tendency of an object to maintain its state of rest. **b.** The tendency of an object to maintain its state of motion unless acted upon by a force. **c.** The tendency of an object to change its state of motion

5. How have the laws of Newton been used in the development of technologies? **a.** They have been widely used to describe and predict the motion of objects. **b**. They have not been used in the development of technologies. **c.** They have been used only in a few areas of technology.

6. What role have the laws of Newton played in our understanding of the world and how it works? **a.** They have played a crucial role. **b.** They have played a minor role. **c.** They have not played a role.

7. Who first formulated the laws of Newton? **a.** Robert Boyle **b.** Sir Isaac Newton **c.** Albert Einstein.

8. What is the field of study that the laws of Newton form the basis of? **a**. Classical mechanics. **b**. Quantum mechanics. **c.** Relativity.

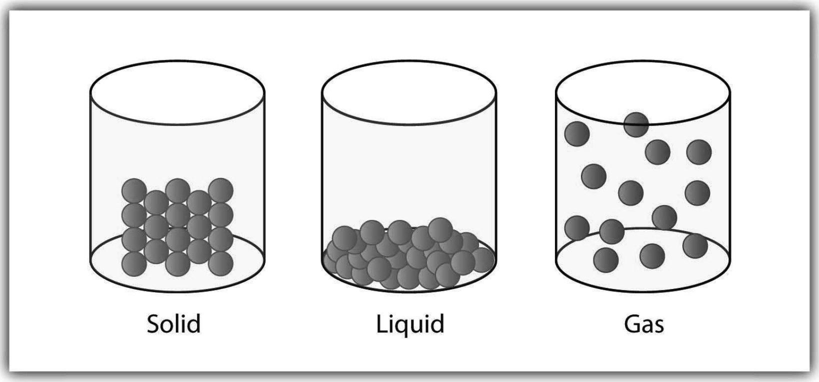
9. Are the laws of Newton still widely studied and used today? **a**. Yes **b.** No **c.** Only in a few areas of physics.

10. What does the third law of Newton refer to as? **a.** The law of action and reaction **b.** The law of inertia **c.** The law of acceleration.

Write a short essay on one of the topics.

- Describe the basic properties of the four fundamental forces in physics: gravity, electromagnetism, the strong nuclear force, and the weak nuclear force.
- Explain how forces can be described mathematically using Newton's laws of motion.
- Choose two of the following forces (friction, air resistance, tension) and describe their role in physics and provide real-life examples to illustrate their importance.
- Research a specific event in history where the understanding of forces in physics played a crucial role in its outcome (e.g. the Apollo moon landing, the development of the first airplane, etc.). Write a short report summarizing your findings.
- Conduct an experiment to measure the force of friction between two surfaces. Provide a detailed description of the experiment, including all materials used, procedures, and results.
- Investigate the motion of a pendulum and describe how the forces of gravity and tension act on it. Use mathematical equations to support your explanations.

- Conduct a laboratory experiment to measure the force of air resistance on a falling object. Explain how air resistance affects the motion of the object and provide a conclusion based on your results.
- Choose a real-life system (e.g. a bridge, a suspension cable, a lever, etc.) and describe how forces acting on the system determine its behavior and stability.
- Design a simple mechanical system (e.g. a pulley system, a lever, a gear train, etc.) and describe how forces acting on the system determine its behavior and efficiency. Provide a diagram of your system and explain how it works.



What Is the World Made of?

Matter is everything around us. Matter can be a confusing word because it has several meanings. We often hear phrases like "What is the matter?" or "It doesn't matter". Scientists have a different meaning for matter – matter is anything that occupies space and has mass.

Matter is made up of tiny particles. These can be atoms or groups of atoms called molecules. Atoms are like individual LEGO blocks. They are the smallest unit that anything can be broken down into without doing something extreme (like hitting a LEGO block with a hammer or smashing atoms in the Large Hadron Collider.) If atoms are like LEGO blocks, molecules are the structures you build with them. The physical characteristics of atoms and molecules decide the form or state the matter is in.

Solid. Right now, you are probably sitting on a chair, using a mouse or a keyboard that is resting on a desk – all these things are solids. Something is usually described as a solid if it can hold its own shape and is hard to compress (squash). The particles in most solids are closely packed together. Even though the particles are locked into place and cannot move or slide past each other, they still vibrate a tiny bit.

Ice is water in its solid form or state. Ice keeps its shape when frozen, even if it is removed from its container. However, ice is different from most solids: its molecules are less densely packed than in liquid water. This is why ice floats.

Liquid. The simplest way to determine if something is a liquid is to ask this question: If I try and move it from one container to another (i.e. by pouring), will it conform to (take on the shape of) the new container?

If you have a glass of water and pour it into another glass, it clearly conforms – it takes on the shape of the glass. If you spill the water, it will go everywhere. Because it isn't in a container, it conforms to the shape of the floor, making a big puddle!

In most liquids, the particles are less densely packed, giving them the ability to move around and slide past each other. While a liquid is easier to compress than a solid, it is still quite difficult – imagine trying to compress water in a confined container!

Water is an example of a liquid, and so are milk, juice and lemonade.

Gas. The atoms and molecules in gases are much more spread out than in solids or liquids. They vibrate and move freely at high speeds. A gas will fill any container, but if the container is not sealed, the gas will escape. Gas can be compressed much more easily than a liquid or solid. (Think about a diving tank – 600 L of gas is compressed into a 3 L cylinder.) Right now, you are breathing in air – a mixture of gases containing many elements such as oxygen and nitrogen.

Water vapour is the gaseous form or state of water. Unlike ice or water, water vapour is invisible. We exhale water vapour whenever we breathe out. We cannot see the water vapour as we exhale, but if we hold our eyeglasses or smartphone to our mouths, we can see the water vapour condensing (becoming liquid) on these objects.

Other states of matter. We've known about solids, liquids and gases for hundreds of years, but scientists have discovered other states. One state is plasma, which naturally occurs in lightning, and we create it in fluorescent light bulbs and plasma TVs. Another state of matter is Bose-Einstein condensate, but this state only occurs with super-low temperatures.

(Retrieved from: https://www.sciencelearn.org.nz/resources/607-solids-liquids-and-gases)

Glossary

Matter – physical substance in general, as distinct from mind and spirit; (in physics) that which occupies space and possesses rest mass, especially as distinct from energy.

Particle – a minute portion of matter.

Atom – the basic unit of a chemical element.

Molecule – a group of atoms bonded together, representing the smallest fundamental unit of a chemical compound that can take part in a chemical reaction.

State – the particular condition that someone or something is in at a specific time.

Solid – firm and stable in shape; not liquid or fluid.

Shape – the external form, contours, or outline of someone or something.

Compress (squash) – flatten by pressure; squeeze or press.

Slide – move along a smooth surface while maintaining continuous contact with it.

Vibrate – move or cause to move continuously and rapidly to and fro.

Liquid – a substance that flows freely but is of constant volume, having a consistency like that of water or oil.

Puddle – a small pool of liquid, especially of rainwater on the ground.

Container – an object that can be used to hold or transport something.

Gas – a substance or matter in a state in which it will expand freely to fill the whole of a container, having no fixed shape (unlike a solid) and no fixed volume (unlike a liquid).

Oxygen – a colorless, odorless reactive gas, the chemical element of atomic number 8 and the life-supporting component of the air.

Nitrogen – the chemical element of atomic number 7, a colorless, odorless unreactive gas that forms about 78 percent of the earth's atmosphere. Liquid nitrogen (made by distilling liquid air) boils at 77.4 kelvins (−195.8°C) and is used as a coolant.

Vapour – a substance diffused or suspended in the air, especially one normally liquid or solid.

Plasma – the colorless fluid part of blood, lymph, or milk, in which corpuscles or fat globules are suspended.

Check your understanding.

1. What is matter? What is it made of?
2. What are atoms and molecules?
3. Do you know what is solid?
4. Can you name the things around you that are solids?
5. What is liquid? What liquids can you name?
6. What is gas?
7. What other states of matter do you know?

Fill in the gaps.

gases liquids
temperature states solids

1. … , 2) … and 3) … are the three common states of matter. Most substances are in one of these three 4) … . If it is made cold enough, every substance will become solid. Many substances, such as rocks, are solid at the normal temperature at which we live. Substances that are liquid at normal 5) … have to be cooled to make them freeze.

Render the text-fragment into English.

Вода — це рідке тіло. Вона не має своєї форми, а набирає форми тієї посудини, у яку її наливають. На морозі вода перетворюється на тверде тіло, тобто — лід. Лід має сталу форму. Тонкий шар льоду прозорий, він крихкий. У теплому приміщенні лід тане й перетворюється на воду. Перехід води з твердого стану в рідкий можна спостерігати і в природі навесні. А коли влітку сильно пригріває сонце, вода починає випаровуватись і перетворюється на пару. Водяна пара — газоподібне тіло. Вона, як і вода, не має своєї форми. Запам’ятайте: вода у стані невидимої пари завжди є в повітрі. У природі постійно відбувається перехід води з одного стану в інший. Улітку, коли після спекотного дня настає прохолодний вечір, у низовинах — над луками, болотами, річками — з'являється туман.

(Retrieved from: https://uahistory.co/pidruchniki/textbook-special-needs-educational-f70-natural-science)

Work in pairs. Practice mini-dialogues using these questions.

1. What is fog? How is it formed?
2. What is dew? How is it formed?
3. What is frost? How is it formed?

Translate these sentences into Ukrainian and discuss.

Fog is small water droplets that form when water vapor cools and hang in the air.

On summer nights, small drops of water in the air, on the cooled leaves of plants, on the roofs of houses, and on the ground form large drops – dew.

Sometimes in winter the branches of trees and bushes are covered with frost. Water, evaporating, freezes and settles on trees, bushes, grass, wires in the form of fluffy snow – frost. So, frost, like fog, is formed from vapor in the air.

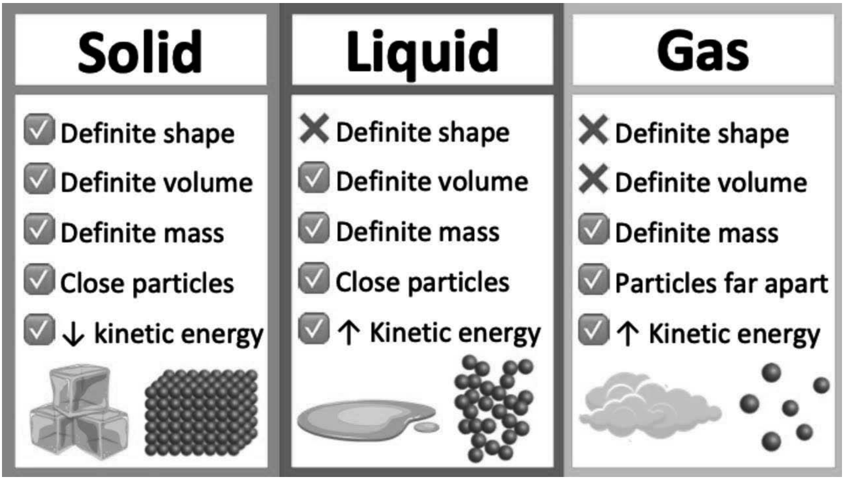
What is the main idea of the text? What are the supporting details? Fill in the organizer.

Main Idea:

____
____
____

Supporting Detail	Supporting Detail	Supporting Detail
________________	________________	________________
________________	________________	________________
________________	________________	________________

Make up and write down sentences of your own using the following chart.



Write the correct words to complete the sentences.

1. A pencil sharpener is a ***gas / solid***.
2. You can see ***steam / ice*** on very cold water.
3. You can see ***steam / ice*** on very hot water.
4. On a very cold day water can ***freeze / melt***.
5. On a very hot day water can ***freeze / melt***.
6. Water is a ***liquid / solid / gas***.
7. Ice is a ***liquid / solid / gas.***
8. Steam is a ***liquid / solid / gas***
9. On a hot day, ice cream can ***melt / freeze***.
10. On a cold day, water can ***melt / freeze***.
11. Students like to put ***ice / gas*** in drinks to make them cold.
12. We can’t hold a ***solid / gas*** in our hands.
13. We ***freeze / heat*** cold water to make it hot.

Make up an essay using these topics.

1. What is the difference between solids and liquids?

2. What is the difference between liquids and gases?

Look!

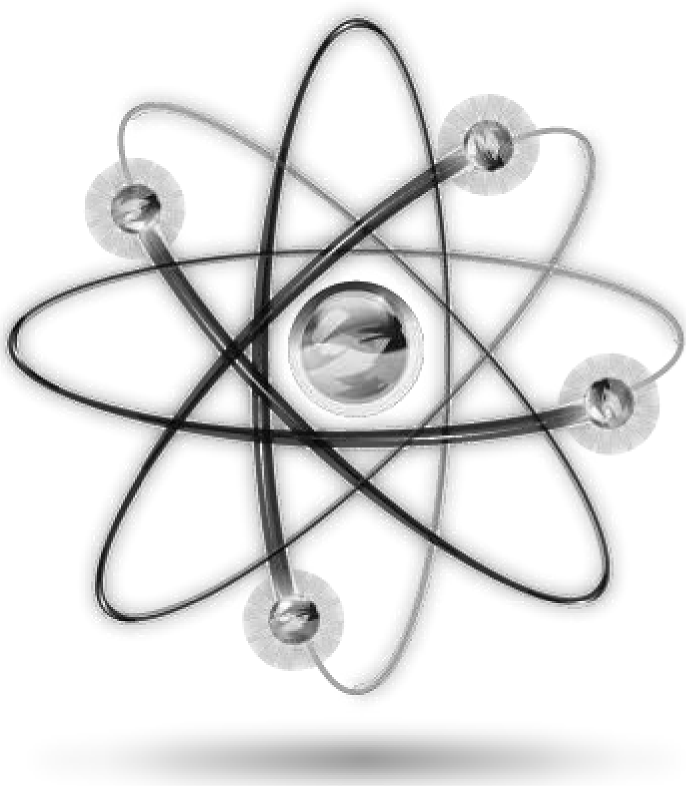
Pay attention to the main information.

Make the definitions of solid, liquid and gas.

____
____
____
____

Project Work.

Make your project on the topic "Forces and Movement".



Physics – the new science fiction

A speech by Professor Martin Brimble, who is retiring from his post as Professor of Physics at the University of Solihull after more than 30 years has revealed not what we know about the universe, but what we still don't know.
Science reporter Bob Hatton reports.

You would expect that after 30 years as Professor of Physics at one of the country's leading research centres, Professor Brimble would know quite a lot about the way the universe works. So what was most surprising was his detailed survey of the great unsolved problems facing physicists today.

For simplicity, he divided his talk into three parts. First, he talked about those things which happen in the world - and they happen every day - but for which there is no scientific explanation. He wasn't talking about ghosts or magic, naturally, but there are events which physicists have observed and which their theories and experiments have not yet been able to explain. Then, there are theories and ideas which scientists haven't been able to prove right or wrong because no one has been able to perform an experiment to test the theory. And as if that weren't enough, there are ideas which they know work and the science is right, but they are still waiting for the technology to be invented.

Well, what happens that can't be explained? One phenomenon is ball lightning. This is said to be just like ordinary lightning, but instead of being a spark jumping from point A to B, it forms a ball of light, about the size of a basketball. Scientists have been trying to explain it since 1904, but without success. Their efforts have been unsuccessful partly because of the fact that some physicists don’t even believe the phenomenon exists. Another such phenomenon is the accelerating universe. Physicists know that everything in the universe is moving away from everything else faster and faster. They've even measured the acceleration. But what they don’t know is why it’s happening. One idea is that it’s something to do with dark matter, but that's another problem. Because it is dark matter, we can't see it and many physicists will say they don’t even know where to look for it - if it exists at all. The truth is there just isn’t enough matter in the universe to keep it in one piece. Research is going ahead, but answers may take a long time to come.

Some things cannot be tested because they're just too big to test. These are ideas that sound like science fiction, but are actually theories that may be true because other theories could be wrong. For example, time travel: some say it's possible, but to do it, would need more energy than there is in the universe.

And we'll have to wait for a three-dimensional microchip to be made before we can build the fastest possible computer. So according to Professor Brimble we've got a lot to look forward to in the future!

(Retrieved from: onestopclil)

Glossary

Physicist – an expert in or student of physics.

Universe – all existing matter and space considered as a whole; the cosmos.

Simplicity – the quality or condition of being easy to understand or do.

Scientific – based on or characterized by the methods and principles of science.

Explanation – a statement or account that makes something clear.

Observe – notice or perceive (something) and register it as being significant.

Measure – ascertain the size, amount, or degree of (something) by using an instrument or device marked in standard units or by comparing it with an object of known size.

Research – the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions.

Energy – the strength and vitality required for sustained physical or mental activity.

Check your understanding.

1. Can you name the things which happen in the world every day?
2. What are the things for which there is no scientific explanation?
3. What do you think about time travel? Is it possible?

Fill in the gaps.

Global Positioning System   clocks   experiments
measurements and comparisons   physicists

Science and engineering are based on … . Thus, we need rules about how things are measured and compared, and we need … to establish the units for those measurements and comparisons. One purpose of physics (and engineering) is to design and conduct those experiments.

For example, … strive to develop clocks of extreme accuracy so that any time or time interval can be precisely determined and compared. You may wonder whether such accuracy is actually needed or worth the effort. Here is one example of the worth: Without … of extreme accuracy, the … (GPS) that is now vital to worldwide navigation would be useless.

Render the text-fragment into English.

Протягом усієї історії людства основним рушієм його розвитку було пізнання світу і себе в цьому світі. З давніх-давен людина прагнула дослідити навколишній світ, намагаючись пояснити ті явища, які бачила. Так з'являлися боги та ідоли.

З плином часу людство почало не лише споглядати за природою, а й намагалось застосовувати її закони, знаходячи закономірності певних явищ, розкриваючи їх причину. Так з'являлись перші винаходи: різноманітні механізми, пристрої тощо. За допомогою цих засобів людина змогла полегшити свою працю, вдосконалити свою майстерність.

(Retrieved from: https://disted.edu.vn.ua/courses/learn/11832)

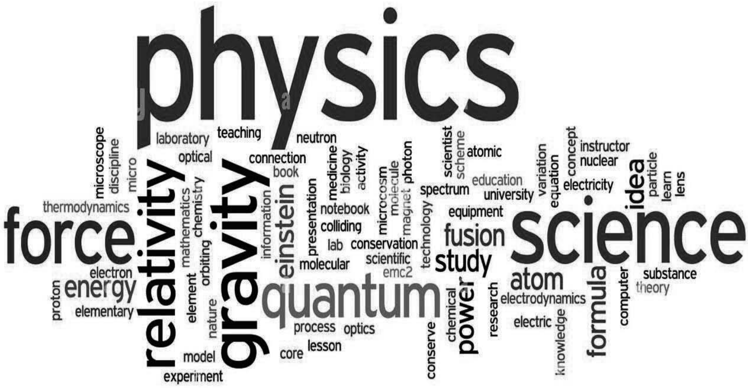
Work in pairs. Practice mini-dialogues using the key words.

Research, energy, universe, scientific, physicist, explanation, observe, measure.

Find the sentences with the following expressions in the text and translate them into Ukrainian.

Professor of Physics, unsolved problems facing physicists, scientific explanation, theories and experiments, ordinary lightning, phenomenon is the accelerating universe, ideas that sound like science fiction.

Make up and write down sentences of your own using the information from this picture.



What is the main idea of the text? What are the supporting details? Fill in the organizer.

Main Idea:

____

Supporting Detail Supporting Detail Supporting Detail

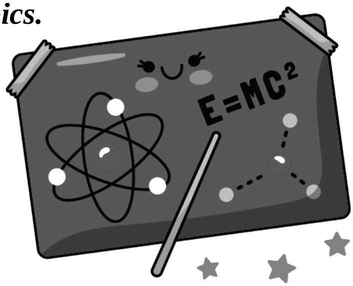
_____________ _____________ _____________

_____________ _____________ _____________

Make up an essay using these topics.

1. Physics as a mysterious subject for students.

2. Why did you choose to study physics in your Higher Education? Name the reasons.



Find the words.

Physics Word Search

E	E	T	E	L	N	Q	N	N	M	I	L	S	S	V	N	F
V	I	N	M	N	D	N	A	O	U	E	I	M	T	D	O	Y
P	I	M	E	L	E	C	T	R	I	C	I	T	Y	R	I	E
I	H	S	T	R	F	A	I	I	R	E	L	H	C	E	T	H
R	E	Y	D	O	G	R	I	M	S	I	T	E	N	G	A	M
E	I	O	S	K	L	Y	I	O	N	W	M	R	A	R	I	U
E	I	E	L	I	G	H	T	C	W	I	I	M	M	R	D	T
U	E	A	L	N	C	S	C	I	T	S	U	O	C	C	A	N
K	M	N	D	E	E	S	N	E	V	I	N	D	O	O	R	E
Q	U	A	N	T	U	M	C	Y	M	I	O	Y	A	T	F	M
E	N	S	C	I	T	A	T	S	C	F	T	N	M	S	I	O
A	O	H	T	C	P	I	N	S	C	I	N	A	H	C	E	M
W	A	V	E	S	V	T	T	E	U	S	S	M	L	N	L	A
N	R	O	C	A	T	R	I	I	E	S	C	I	O	E	D	T
M	A	V	R	C	T	E	R	A	E	I	R	C	T	M	R	T
I	F	G	G	I	O	N	A	S	N	O	I	S	U	F	I	E
I	R	P	O	P	T	I	C	S	S	N	C	T	S	E	T	R

Accoustics
Atom
Electricity
Energy
Field
Fission
Force
Friction
Fusion
Gravity
Harmonics
Heat
Inertia
Kinetics
Light
Magnetism
Mass
Matter
Mechanics
Momentum
Nuclear
Optics
Physics
Quantum
Radiation
Relativity
Spacetime
Statics
Thermodynamics
Waves

(*Retrieved from: https://sciencenotes.org/physics-word-search/)*

Play the game.

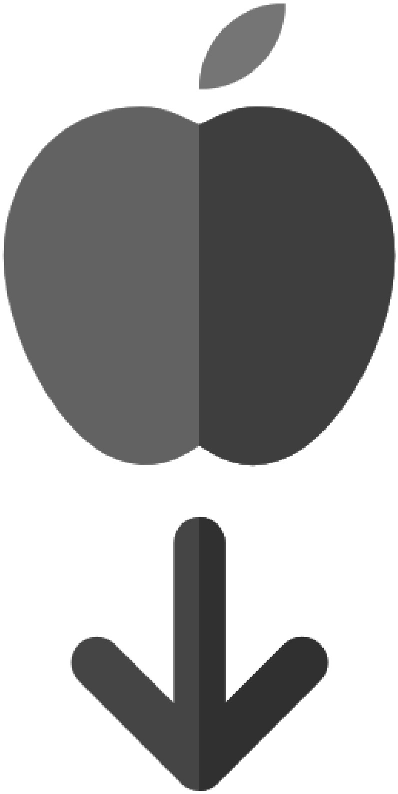
B	I	N	G	O
Gravitation-al Potential Energy	Potential Difference	Coulomb's Law	Ohm's Law	Interference
Periodic Motion	Dampening	Rarefaction	Simple Harmonic Motion	Electric Current
Interference	Frequency	FREE!	Compress-ion	Newton's Law of Universal Graviation
Displace-ment	Amplitude	Diffraction	Electric Potential Energy	Work
Displace-ment	Electric Field Strength	Volt	Natural Frequency	Period

Give the Ukrainian definitions of these words and word-combinations.

Project Work.

Make your project on one of these topics.

1. Linear motion.
2. Energy.
3. Momentum.
4. Circular and Rotational Motion.
5. Interactions and Force.
6. Work.
7. Motion in Two-Dimensions.
8. Gravity.



The Law of Universal Gravitation

Before 1687, a large amount of data had been collected on the motions of the Moon and the planets, but a clear understanding of the forces related to these motions was not available.

In that year, Isaac Newton provided the key that unlocked the secrets of the heavens. He knew, from his first law, that a net force had to be acting on the Moon because without such a force the Moon would move in a straight-line path rather than in its almost circular orbit. Newton reasoned that this force was the gravitational attraction exerted by the Earth on the Moon. He realized that the forces involved in the Earth–Moon attraction and in the Sun–planet attraction were not something special to those systems, but rather were particular cases of a general and universal attraction between objects. In other words, Newton saw that the same force of attraction that causes the Moon to follow its path around the Earth also causes an apple to fall from a tree. It was the first time that "earthly" and "heavenly" motions were unified.

You may have heard the legend that, while napping under a tree, Newton was struck on the head by a falling apple. This alleged accident supposedly prompted him to imagine that perhaps all objects in the Universe were attracted to each other in the same way the apple was attracted to the Earth. Newton analyzed astronomical data on the motion of the Moon around the Earth. From that analysis, he made the bold assertion that the force law governing the motion of planets was the same as the force law that attracted a falling apple to the Earth.

When Newton published his theory of universal gravitation, it was considered a success because it satisfactorily explained the motion of the planets. It represented strong evidence that the same laws that describe phenomena on the Earth can be used on large objects like planets and throughout the Universe. Since 1687, Newton's theory has been used to account for the motions of comets, the deflection of a Cavendish balance, the orbits of binary stars, and the rotation of galaxies.

(Retrieved from: "Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and John W. Jewett, Jr.)

Glossary

Amount – a quantity of something, especially the total of a thing or things in number, size, value, or extent.

Data – facts and statistics collected together for reference or analysis.

Motion – the action or process of moving or being moved.

Moon – the natural satellite of the earth, visible (chiefly at night) by reflected light from the sun.

Planet – a celestial body moving in an elliptical orbit around a star.

Circular – having the form of a circle.

Orbit – the curved path of a celestial object or spacecraft around a star, planet, or moon, especially a periodic elliptical revolution.

Gravitational – relating to movement toward a center of gravity.
Imagine – form a mental image or concept of.
Assertion – a confident and forceful statement of fact or belief.
Evidence – the available body of facts or information indicating whether a belief or proposition is true or valid.
Galaxy – a system of millions or billions of stars, together with gas and dust, held together by gravitational attraction.

What is the main idea of the text? What are the supporting details? Fill in the organizer.

Main Idea: ____

Supporting Detail	Supporting Detail	Supporting Detail
__________	__________	__________
__________	__________	__________
__________	__________	__________
__________	__________	__________
__________	__________	__________
__________	__________	__________

Check your understanding.

1. Did you study the law of universal gravitation?
2. What is it?
3. What is Newton’s Law of Universal Gravitation?
4. What did the Newton’s published theory of universal gravitation explain?

Read the text fragment. What title can you think of for this text?

The geocentric and original heliocentric models of the solar system both suggested circular orbits for heavenly bodies. Kepler’s first law indicates that the circular orbit is a very special case and elliptical orbits are the general situation. This notion was difficult for scientists of the time to accept because they believed that perfect circular orbits of the planets reflected the perfection of heaven.

(From "Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and John W. Jewett, Jr.)

Fill in the gaps.

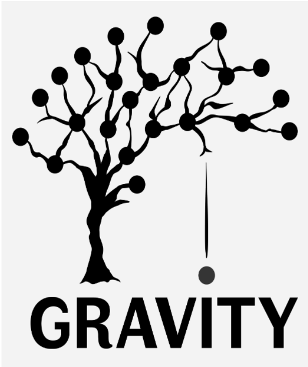
surface force determine center

Gravitational … is the force with which any planet attracts bodies that are near its … . The force of gravity is directed towards the … the planet vertically down and applied to the center of gravity of the body. This the force property is used to … a vertical line.

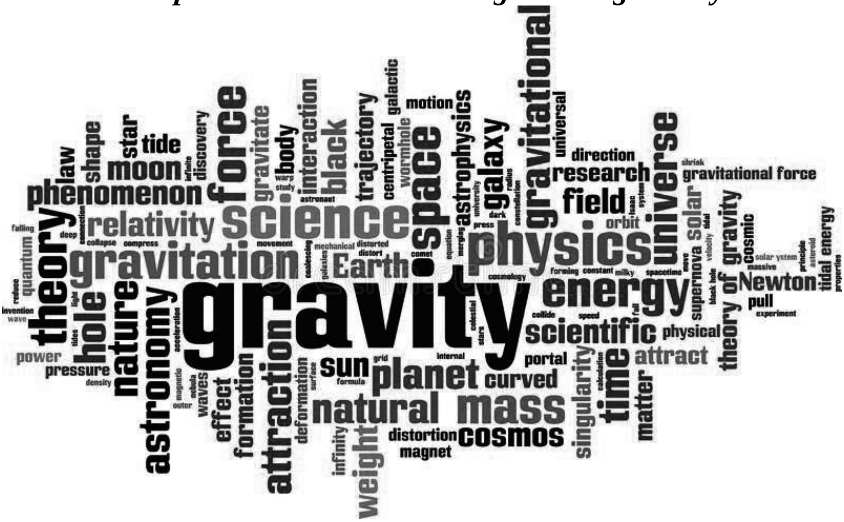
Render the text-fragment into English.

Гравітація — це сила, яка існує між усіма матеріальними об'єктами у Всесвіті. Для будь-яких двох об'єктів або частинок, які мають ненульову масу, сила тяжіння прагне притягнути їх один до одного. Гравітація діє на об'єкти будь-якого розміру, від субатомних частинок до скупчень галактик. Він також працює на всіх відстанях, незалежно від того, наскільки вони малі чи великі.

Гравітація є одним із найбільш вивчених явищ у фізиці. Ісаак Ньютон визначив його поведінку своїм знаменитим Законом всесвітнього тяжіння. Ньютон припустив, що сила тяжіння між будь-якими двома сферичними об'єктами однорідної щільності прямо пропорційна добутку їхніх мас і обернено пропорційна квадрату відстані між їхніми центрами.



Work in pairs. Practice mini-dialogues using the key words.



Make up an essay using these topics.

1. Newton’s law of universal gravitation.
2. Free-fall acceleration and the gravitational force.
3. Gravitational potential energy.
4. Energy considerations in planetary and satellite motion.

Make up a story using this material.

$$F = G\frac{m_1 m_2}{d^2}$$

F = gravitational force

G = gravitational constant

m_1 = mass of first object

m_2 = mass of second object

d = distance between masses

Make the definitions of gravitation.

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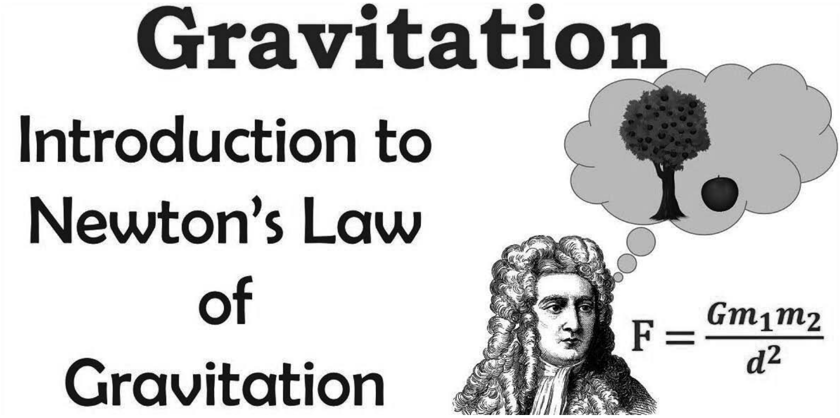
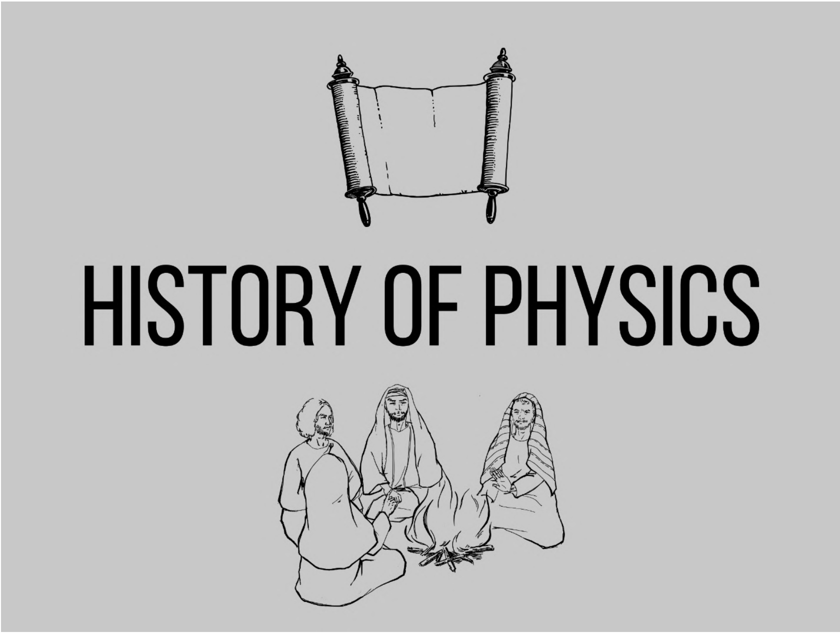
Project Work.

Make your project on this topic.





Making History of Physics

The history of physics, whilst incorporating elements of the fine mathematics and astronomy practiced by the Babylonians, Indians, Egyptians and Zoroastrians, largely remained embedded in the supernatural realm of the gods.

It was not until the methodological and theoretical approach of the Ancient Greeks that physics in its modern form appeared, based upon mathematics and first principles rather than superstition.

Picking out the history of ancient physics can be difficult, mainly because it is extremely difficult to separate it from other fields such as astronomy, mathematics and alchemy. Science had yet to split into recognisable disciplines or even separate fully from theology and philosophy, so there was some overlap in the history of physics at this formative stage.

Greek civilization, by historical standards, was exceptionally stable, despite the squabbles between the city-states of Athens, Sparta and Thebes, amongst others. This stability and wealth allowed the arts and philosophy to prosper, with Homeric poets and talented playwrights sharing the intellectual sphere with some of the greatest philosophers that the world has ever known.

From theoretical mathematics, accurate astronomy and sophisticated philosophy sprang ancient physics, an attempt to explain the world and uncover the laws that governed the universe. The ancient Greeks believed that the universe was harmonious, perfect, and governed by elegant laws and equations, as laid down by mathematicians such as Pythagoras and Euclid.

Thales was the first physicist and his theories actually gave the discipline its name. He believed that the world, although fashioned from many materials, was really built of only one element, water, called Physis in Ancient Greek. The interaction of water between the phases of solid, liquid and gas gave materials different properties. This was the first explanation to take natural phenomena out of the realm of divine providence and into the realm of natural laws and explanations.

Anaximander, more famous for his proto-evolutionary theory, disputed the ideas of Thales and proposed that rather than water, a substance called apeiron was the building block of all matter. With the aid of modern hindsight, we can say that this was another shrewd guess from Anaximander and very similar to the idea that hydrogen is the building block of all matter in our universe.

Heraclitus (around 500BC) proposed that the only basic law governing the universe was the principal of change and that nothing remains in the same state indefinitely. This observation made him one of the first scholars in ancient physics to address the role of time in the universe, one of the most important concepts even in the modern history of physics.

One of the first renowned ancient physicists was Leucippus (5th Century BC), who adamantly opposed the idea of direct divine intervention in the universe. This philosopher instead proposed that natural phenomena had a natural cause. Leucippus and his student, Democritus, developed the first atomic theory, arguing that matter could not be divided indefinitely and that you would eventually arrive at individual pieces that could not be cut.

These are called atoms, from a-tom (not cut). However this particular landmark in the history of physics would lie forgotten until nearly two millennia later. This theory also led to the atomists proposing that these atoms were governed by strict laws, rather than divine providence. This removal of free will and even the soul from ancient physics was a view that made these philosophers detested by Plato.

Interestingly, whilst Aristotle is regarded as the father of science, and certainly contributed to the history of science with his methodology and empiricism, he actually hindered the progress of physics for many millennia. He made the fatal error of assuming that mathematical theory and the natural world did not overlap, a sign of his overreliance upon empiricism. Aristotle attempted to explain ideas such as motion and gravity with his theory of elements, an addition to ancient physics that also spread into alchemy and medicine.

Aristotle firmly believed that all matter was made up of some combination of five elements, earth, air, fire, water and invisible aether. He took this further by suggesting that the realm of earth was surrounded by air, followed by the realms of fire and aether. Every element naturally attempted to return to its own realm, so a stone fell to the earth because it was trying to return to its own element. Flames rose because they wanted to return to the realm of all-enveloping fire whilst smoke, a combination of air and fire, also rose towards the heavens. Water flowed downwards because the realm of water lay below the realm of earth.

This idea, of the realms existing in neatly defined concentric circles, with aether surrounding all, held sway for centuries, shaping European science until the coming of such minds as Galileo and Newton. Until then, Aristotle's contribution to ancient physics continued to misdirect later scholars.

Archimedes is best known for his eureka moment, discovering the principles of density and buoyancy whilst enjoying a bath, but his contributions to the history of physics were much more profound. His ancient physics was closely tied to his gift of invention as he used mathematical and theoretical principles to create devices that are still common today.

Archimedes calculated the underlying mathematics of the lever and also developed elaborate systems of pulleys to move large objects with a minimum of effort. Whilst he did not invent these ancient devices, he improved upon them and laid down principles that allowed the construction of sophisticated machines. He also developed the principles of equilibrium states and centres of gravity, ideas that would influence the Islamic scholars, Galileo, and Newton.

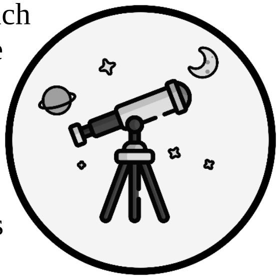
Finally, his Archimedes screw for moving liquids underpins modern hydroengineering, and his machines of war helped to hold back the armies of Rome in the first Punic War. Archimedes even tore apart the arguments of Aristotle and his metaphysics, pointing out that it was impossible to separate mathematics and nature and proved it by converting mathematical theories into practical inventions.

(Retrieved from: https://explorable.com/ancient-physics)

Glossary

History – the study of past events, particularly in human affairs.

Astronomy – the branch of science which deals with celestial objects, space, and the physical universe as a whole.



Mathematics – the abstract science of number, quantity, and space. Mathematics may be studied in its own right (pure mathematics), or as it is applied to other disciplines such as physics and engineering (applied mathematics).

Alchemy – the medieval forerunner of chemistry, based on the supposed transformation of matter. It was concerned particularly with attempts to convert base metals into gold or to find a universal elixir.

Philosophy – the study of the fundamental nature of knowledge, reality, and existence, especially when considered as an academic discipline.

Accurate – correct in all details; exact.

Propose – put forward (an idea or plan) for consideration or discussion by others.

Calculate – determine (the amount or number of something) mathematically.

What is the main idea of the text? What are the supporting details? Fill in the organizer.

Main Idea: ____
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Supporting Detail	Supporting Detail	Supporting Detail
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________

Check your understanding.

1. What do you know about the history of physics?
2. What did Babylonians, Indians, Egyptians and Zoroastrians investigate?
3. What changes did Ancient Greeks make?
4. What is the history of ancient physics?

Read the text fragment. What title can you think of for this text?

Hipparchus (190 - 120 BC) straddled the divide between astronomy and ancient physics, using sophisticated geometrical techniques to map the motion of the stars and planets, even predicting the times that solar eclipses would happen. To this, he added calculations of the distance of the sun and moon from the Earth, based upon his improvements to the observational instruments used at that time.

The sophistication of Hipparchus was probably built upon the detailed mathematics and observations of the Babylonians and he wrote many books elucidating his ideas. Sadly, all but a few scattered fragments are lost to the ravages of time.

(Retrieved from: https://explorable.com/ancient-physics)

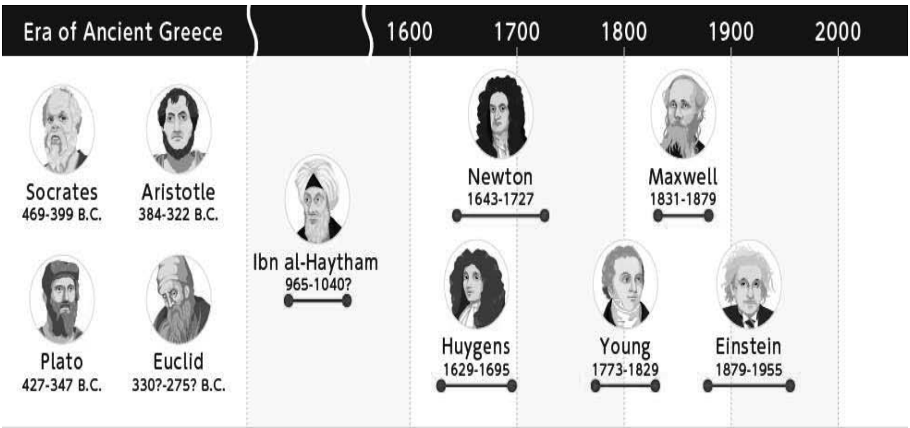
Render the text-fragment into English.

Становлення фізики відбувалося важко і зайняло більше двох тисяч років. Наукова математика, створена Евклидом, виникла в III в. до н.е. Народження ж наукової фізики пов'язують, в першу чергу, з працями І. Ньютона. Зрозуміло, вже в античності формулювалися гіпотези, які явно сприяли виникненню фізики як науки. Але вони, як правило, були погано забезпечені відповідними експериментальними дослідженнями. Показова в цьому зв'язку гіпотеза Левкіппа і Демокріта про існування атомів, яка в середні століття займала також уми багатьох арабських мислителів. Ні перші, ні другі не були в змозі довести існування атомів і створити їх теорію.

Часом встановлювалися актуальні співвідношення. Можна згадати в зв'язку з цим, наприклад, відкриття Архімедом законів важеля і вираз для сили, що діє на тіло, занурене в рідину або ж плаває на його поверхні. Архімед, який жив в один час з Евклидом, був генієм, рівного якому не знайти серед ентузіастів фізики аж до Галілея. Але навіть йому не судилося створити послідовну у всіх відносинах теорію, наприклад, механіки. Таблиця 8.1 дає уявлення про розвиток фізики як науки.

(Retrieved from: https://stud.com.ua/60199/filosofiya/istoriya_fiziki_tipi_fizichnih_teoriy)

Panel discussion. What do you know about these scientists?



Make up an essay on the history of physics and types of physical theories.

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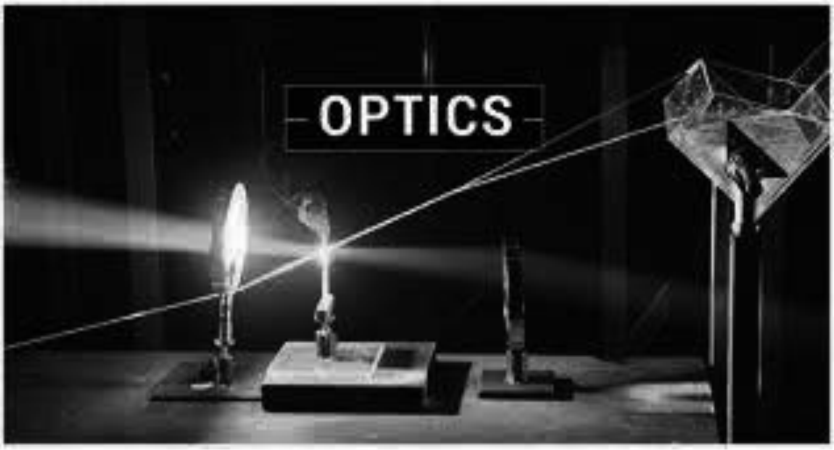
Project Work.

Make your project on the topic "A brief history of physics".



Fundamentals of Optics

Read and translate the text. Write out unknown items of vocabulary. Do the exercises following the text.

Optics is a branch of physics that deals with the behavior of light and its interactions with matter. The study of optics has been essential in understanding the nature of light, its behavior, and the ways in which it can be used for various applications. From the simplest form of observing an object to the most complex applications, optics plays a crucial role in the way we interact with light.

The study of light as a wave is referred to as geometric optics, while the study of light as a particle is referred to as quantum optics. The laws of reflection and refraction play a crucial role in the field of geometric optics. Light travels in straight lines until it encounters an object or medium that causes it to change direction. When light strikes a surface, some of it will be reflected, and some will be refracted. Reflection and refraction are the two main ways that light interacts with matter.

Geometric optics involves the use of mirrors and lenses to form and manipulate images. Mirrors and lenses can be used to produce images of objects by bending and refracting light in different directions. By understanding the laws of reflection and refraction, optical engineers can design and build lenses that can magnify and produce clear images. One of the most well-known applications of geometric optics is the use of telescopes, which use mirrors to collect and focus light from distant stars to produce clear images of the sky.

Quantum optics is the study of the behavior of light at the quantum level. This branch of optics is essential for understanding the behavior of light in various quantum systems such as lasers, superconducting devices, and quantum communication systems. The interaction between light and matter is a fundamental aspect of quantum optics, and understanding this interaction is crucial for the development of new technologies.

One of the most important applications of optics is in the field of photonics. Photonics involves the manipulation of light to create and transmit information. This field has revolutionized the way we communicate and transfer data, with applications ranging from optical fibers in telecommunications to laser-based medical treatments.

Optics is also essential in the field of imaging. From the earliest days of photography to the latest advances in medical imaging, optics has played a crucial role in producing images of objects and the human body. The use of optical instruments such as microscopes and telescopes has greatly expanded our knowledge of the world around us and allowed us to study objects and phenomena in greater detail.

In the field of medicine, optics has revolutionized the way we diagnose and treat diseases. Medical imaging techniques such as x-rays, CT scans, and MRI use optics to produce images of the human body. Optical fibers and lasers are also used in minimally invasive surgical procedures, reducing the need for open surgery and improving patient outcomes.

The field of optics has also impacted the way we see and experience the world around us. From the use of eyeglasses to correct vision to the development of virtual reality and augmented reality technologies, optics has changed the way we perceive the world. Advances in optics have also enabled us to produce more vivid and realistic displays, from high-definition televisions to large-scale projectors for cinema.

In conclusion, optics is an important branch of physics that provides a foundation for understanding the behavior of light and its interactions with matter. The study of optics has had a wide-ranging impact on many fields and has greatly impacted our everyday lives. From the simplest forms of observation to the most complex applications, optics plays a crucial role in the way we interact with light and the world around us. The field of optics is constantly evolving, and new technologies are being developed all the time, ensuring that optics will continue to play an important role in shaping our future

Answer the questions to the text.

1. What is optics in physics?
2. What is the difference between geometric optics and quantum optics?
3. What are the laws of reflection and refraction and how do they play a role in optics?
4. How are mirrors and lenses used in geometric optics to produce images?
5. What is the importance of quantum optics in various quantum systems?
6. What is photonics and what applications does it have?
7. How has optics impacted the field of imaging?
8. How has optics revolutionized medicine?
9. How has optics changed the way we see and experience the world around us?
10. What is the current state of the field of optics and what advancements can we expect in the future?

Find the appropriate English equivalents in the text.

Світло, закони відбивання і заломлення світла, часточки, середовище, дзеркала та лінзи, збільшувати та створювати чіткі зображення, квантові системи, лазери, надпровідні пристрої, системи квантового зв’язку, маніпулювання світлом для створення та передачі інформації, рентген, КТ і МРТ, оптичні волокна, технологій віртуальної реальності та доповненої реальності.

Fill in the gaps.

Properties, imaging, reflection, photonics, medicine, lenses, physical, quantization, refraction, mirrors.

1. Optics is the branch of physics that studies the ________ and behavior of light.

2. Geometric optics deals with the principles of light and its interactions with objects in the ________ world.

3. Quantum optics deals with the ________ of light and its interactions with matter.

4. The process of bouncing back of light when it hits a surface is called ________.

5. The bending of light as it passes through a material with a different refractive index is called ________.

6. Flat or curved surfaces that reflect light to produce an image are called ________.

7. Optical devices that use refraction to focus light to form an image are called ________.

8. The study of the generation, manipulation, and detection of light is called ________.

9. The creation of a representation of an object or scene using light or other forms of radiant energy is called ________.

10. The science and practice of diagnosing, treating, and preventing diseases and other physical and mental impairments in humans is called ________.

Join the terms with their definitions.

Term	Definition
1. Optics	A. The bending of light as it passes from one transparent medium to another of different density, causing the light to change direction.

2.	**Photonics**	B. The science and practice of diagnosing, treating, and preventing diseases and other medical conditions in humans and animals.
3.	**Refraction**	C. The branch of physics that deals with the nature and behavior of light, especially the interaction of light with matter.
4.	**Mirrors**	D. The bouncing back of light or sound waves from a surface when they encounter it.
5.	**Reflection**	E. Relating to the study of the behavior of matter and energy at a very small scale, where classical physics no longer holds.
6.	**Geometric**	F. An apparatus or machine designed to perform a specific task, such as a lens or mirror in optics.
7.	**Quantum**	G. The production of visual representation of an object or scene, such as through the use of a camera or other optical device.
8.	**Devices**	H. The field of science and technology concerned with the study of light and its applications in devices and systems, including optical communication, displays, lasers, and imaging systems.
9.	**Imaging**	I. Relating to the geometry of light, including the study of how light behaves when it passes through lenses, mirrors, and other optical elements.
10.	**Medicine**	J. A flat or curved surface made of a highly reflective material, such as glass, that reflects light in such a way as to form an image of what is in front of it.

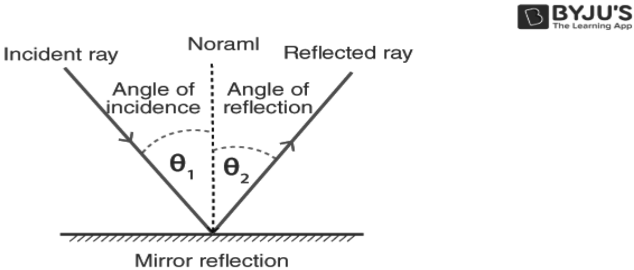
Read and translate the text. Create your own vocabulary. Do the tasks after the text.

The Three Main Laws of Optics

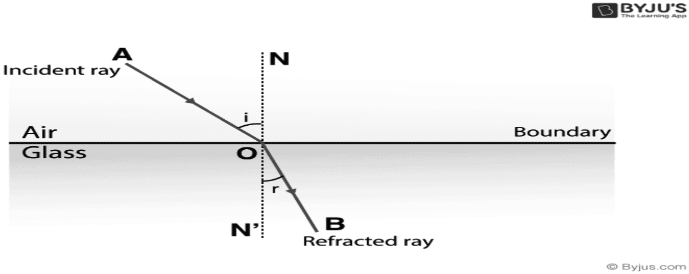
Optics is a branch of physics that deals with the study of light and its behavior. It encompasses the study of how light travels through different materials, how it interacts with mirrors and lenses, and how it forms images. In order to understand the behavior of light, various laws of optics have been established and are used as a basis for further research and applications in fields such as photography, medicine, and engineering.

The three main laws of optics are:

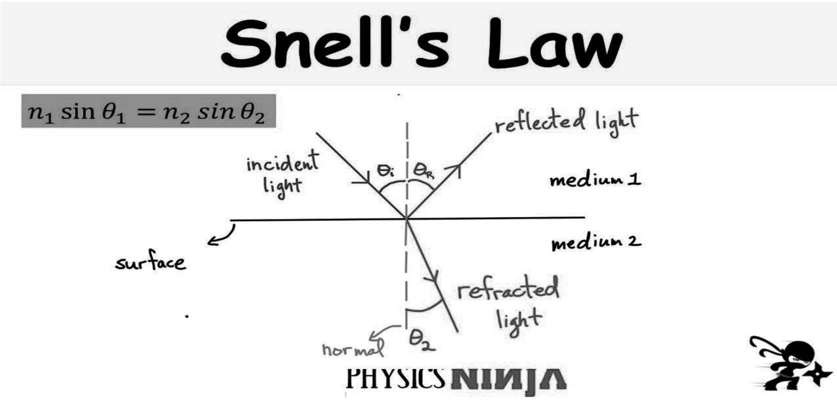
1. The Law of Reflection: This law states that when light hits a reflective surface, such as a mirror, it bounces back off the surface at an angle that is equal to the angle at which it hit the surface. The angle of incidence and the angle of reflection are always equal.



2. The Law of Refraction: This law states that when light passes from one medium to another of different density, such as from air to water, it changes direction and slows down. The amount of bending of light depends on the refractive index of the two materials. The law of refraction is used in the design of lenses and the correction of vision defects.



3. Snell's Law: This law describes the relationship between the angles of incidence and refraction in a medium. It states that the ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for a given pair of media. This law is used in the design of optical systems and to understand the behavior of light in different materials.



In addition to these three main laws, there are other laws of optics that describe the behavior of light in specific situations. For example, Fermat's Principle states that light travels along the path that takes the shortest time, while Huygens' Principle states that every point on a wavefront can be considered a new source of wavelets that spread out and create the next wavefront.

These laws of optics play a crucial role in the design and development of optical devices and systems. By understanding the behavior of light and how it interacts with different materials, scientists and engineers can create new technologies and applications that use light in innovative ways. For example, the principles of optics are used in the design of telescopes, microscopes, cameras, and laser systems. In medicine, the principles of optics are used in the design of instruments for surgery and diagnostic imaging.

The laws of optics provide a foundation for the study of light and its behavior. These laws are essential for understanding the behavior of light in different situations and for designing and developing optical devices and systems that have a wide range of applications in many fields.

Answer the questions based on the text.

1. What is the field of study that deals with the behavior of light?
2. What are the three main laws of optics?
3. How does the Law of Reflection describe the behavior of light?
4. What is the relationship between the angles of incidence and refraction described by Snell's Law?
5. How is the Law of Refraction used in the correction of vision defects?
6. What is Fermat's Principle and how does it relate to the behavior of light?
7. What is Huygens' Principle and how does it describe the behavior of light?
8. How are the principles of optics used in the design of optical devices and systems?
9. What are some examples of technologies and applications that use the principles of optics?
10. Why are the laws of optics considered essential for the study of light and its behavior?

Do the test based on information from the text.

1. True or False: Optics is the field of study that deals with the behavior of sound. a. True b. False.
2. What are the three main laws of optics? a. The Law of Reflection, the Law of Refraction, and Fermat's Principle b. The Law of Reflection, Snell's Law, and Huygens' Principle c. Snell's Law,

Fermat's Principle, and the Law of Refraction.

3. How does the Law of Reflection describe the behavior of light? a. It describes the relationship between the angles of incidence and reflection b. It describes how light travels through different mediums c. It describes how light can be refracted to correct vision defects.

4. What is the relationship between the angles of incidence and refraction described by Snell's Law? a. The angle of refraction is equal to the angle of incidence b. The angle of refraction is proportional to the angle of incidence c. The angle of refraction is inversely proportional to the angle of incidence.

5. How is the Law of Refraction used in the correction of vision defects? a. By changing the shape of the cornea to bend light correctly b. By adjusting the power of the lens to bend light correctly c. Both a and b.

6. What is Fermat's Principle? a. It describes how light travels through different mediums b. It describes the behavior of light in curved surfaces c. It describes the path of light that takes the least amount of time.

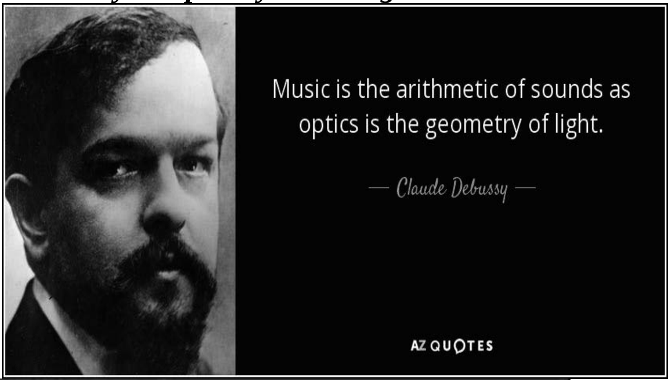
7. What is Huygens' Principle? a. It describes how light travels through different mediums b. It describes the behavior of light in curved surfaces c. It describes how light is refracted to correct vision defects.

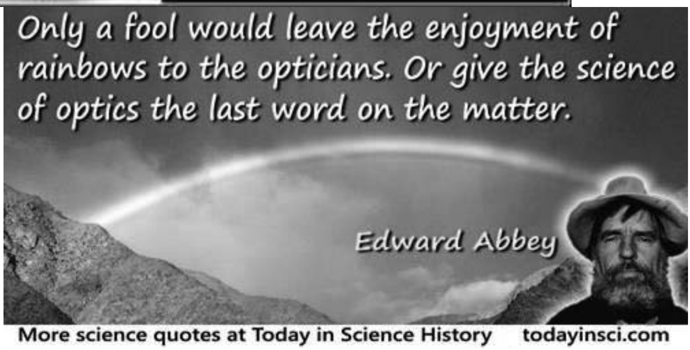
8. How are the principles of optics used in the design of optical devices and systems? a. To understand and control the behavior of light b. To enhance and improve the performance of optical devices c. Both a and b.

9. What are some examples of technologies and applications that use the principles of optics? a. Cameras, telescopes, and microscopes b. Head-up displays, virtual reality systems, and optical fibers c. Both a and b.

10. Why are the laws of optics considered essential for the study of light and its behavior? a. Because they help us understand the behavior of light in various situations b. Because they provide a framework for designing optical devices and systems c. Both a and b.

Discussion Topics: Do you agree with the quotes of famous inventors and scientists based on programming languages? YES/NO? Why? Explain your thoughts.





Part III
English for Students Majoring in Computer Science

Cybercrime

Read the text, write out unknown items of vocabulary from it. Do the tasks after the text.

What is Cybercrime? Types, Examples, and Prevention

The term "cybercrime" was introduced after the latest evolution in the computer industry and networks. Cybercrimes are considered a major risk because they can have devastating effects like financial losses, breaches of sensitive data, failure of systems, and also, it can affect an organization's reputation. In this article, we will discuss more about cybercrimes, and what are they? How do they happen? Who are Cybercriminals? Also, we will demonstrate different types of cybercrimes.

What is Cybercrime?

Cybercrime can be defined as “The illegal usage of any communication device to commit or facilitate in committing any illegal act”.A cybercrime is explained as a type of crime that targets or uses a computer or a group of computers under one network for the purpose of harm. Cybercrimes are committed using computers and computer networks. They can be targeting individuals, business groups, or even governments. Investigators tend to use various ways to investigate devices suspected to be used or to be a target of a cybercrime.

Who are The Cybercriminals?

A cybercriminal is a person who uses his skills in technology to do malicious acts and illegal activities known as cybercrimes. They can be individuals or teams. Cybercriminals are widely available in what is called the “Dark Web” where they mostly provide their illegal services or products.Not every hacker is a cybercriminal because hacking itself is not considered a crime as it can be used to reveal vulnerabilities to report and batch them which is called a “white hat hacker”.However, hacking is considered a cybercrime when it has a malicious purpose of conducting any harmful activities and we call this one “black hat hacker” or a cyber-criminal. It is not necessary for cybercriminals to have any hacking skills as not all cyber crimes include hacking.Cybercriminals can be individuals who are trading in illegal online content or scammers or even drug dealers. So here are some examples of cybercriminals: - Black hat hackers – Cyberstalkers - Cyber terrorists – Scammers. Cybercriminals who conduct targeted attacks are better to be named Threat Actors.

How do Cybercrimes happen? Cybercriminals take advantage of security holes and vulnerabilities found in systems and exploit them in order to take a foothold inside the targeted environment. The security holes can be a form of using weak authentication methods and passwords, it can also happen for the lack of strict security models and policies.

Why are Cybercrimes Increasing? The world is constantly developing new technologies, so now, it has a big reliance on technology. Most smart devices are connected to the internet. There are benefits and there are also risks. One of the risks is the big rise in the number of cybercrimes committed, there are not enough security measures and operations to help protect these technologies. Computer networks allow people in cyberspace to reach any connected part of the world in seconds. Cybercrimes can have different laws and regulations from one country to another, mentioning also that covering tracks is much easier when committing a cybercrime rather than real crimes.

We are listing different below reasons for the big increase in cybercrimes: - Vulnerable devices: As we mentioned before, the lack of efficient security measures and solutions introduces a wide range of vulnerable devices which is an easy target for cybercriminals. **- Personal motivation:** Cybercriminals sometimes commit cybercrimes as a kind of revenge against someone they hate or have any problem with. **- Financial motivation:** The most common motivation of cybercriminals and hacker groups, most attacks nowadays are committed to profit from it.

Two Main Types of Cyber Crimes: **- Targeting computers.** This type of cybercrimes includes every possible way that can lead to harm to computer devices for example malware or denial of service attacks. **- Using computers.** This type includes the usage of computers to do all the classifications of computer crimes.

Most Common Cyber Crimes:

1. Phishing and Scam. Phishing is a type of social engineering attack that targets the user and tricks them by sending fake messages and emails to get sensitive information about the user or trying to download malicious software and exploit it on the target system.

2. Identity Theft occurs when a cybercriminal uses another person's personal data like credit card numbers or personal pictures without their permission to commit a fraud or a crime.

3. Ransomware Attacks are a very common type of cybercrime. It is a type of malware that has the capability to prevent users from accessing all of their personal data on the system by encrypting them and then asking for a ransom in order to give access to the encrypted data.

4. Hacking/Misusing Computer Networks. This term refers to the crime of unauthorized access to private computers or networks and misuse of it either by shutting it down or tampering with the data stored or other illegal approaches.

5. Internet Fraud is a type of cybercrimes that makes use of the internet and it can be considered a general term that groups all of the crimes that happen over the internet like spam, banking frauds, theft of service, etc.

Other Types of Cybercrime

1. Cyber Bullying. It is also known as online or internet bullying. It includes sending or sharing harmful and humiliating content about someone else which causes embarrassment and can be a reason for the occurrence of psychological problems. It became very common lately, especially among teenagers.

2. Cyber Stalking can be defined as unwanted persistent content from someone targeting other individuals online with the aim of controlling and intimidating like unwanted continued calls and messages.

3. Software Piracy is the illegal use or copy of paid software with violation of copyrights or license restrictions.An example of software piracy is when you download a fresh non-activated copy of windows and use what is known as “Cracks” to obtain a valid license for windows activation. This is considered software piracy. Not only software can be pirated but also music, movies, or pictures.

4. Social Media Frauds. The use of social media fake accounts to perform any kind of harmful activities like impersonating other users or sending intimidating or threatening messages. And one of the easiest and most common social media frauds is Email spam.

5. Online Drug Trafficking. With the big rise of cryptocurrency technology, it became easy to transfer money in a secured private way and complete drug deals without drawing the attention of law enforcement. This led to a rise in drug marketing on the internet. Illegal drugs such as cocaine, heroin, or marijuana are commonly sold and traded online, especially on what is known as the "Dark Web".

6. Electronic Money Laundering. Also known as transaction laundering. It is based on unknown companies or online business that makes approvable payment methods and credit card transactions but with incomplete or inconsistent payment information for buying unknown products. It is by far one of the most common and easy money laundering methods.

7. Cyber Extortion is the demand for money by cybercriminals to give back some important data they've stolen or stop doing malicious activities such as denial of service attacks.

8. Intellectual-property Infringements. It is the violation or breach of any protected intellectual-property rights such as copyrights and industrial design.

9. Online Recruitment Fraud. One of the less common cybercrimes that are also growing to become more popular is the fake job opportunities released by fake companies for the purpose of obtaining a financial benefit from applicants or even making use of their personal data.

Answer the questions based on the text.

1. What is Cybercrime?

2. Who are The Cybercriminals? What is the difference between a “white hat hacker” and a “black hat hacker”?

3. How do Cybercrimes happen?

4. Why are Cybercrimes Increasing?

5. What are the Two Main Types of Cyber Crimes?

6. What is Phishing?

7. Dwell upon Ransomware Attacks.

8. What is the difference between cyberbullying and cyberstalking?

9. Define the divergence between Software Piracy and Intellectual-property Infringements.

10. Have you ever been a victim of cybercrime? Which type? Why? How did you cope with it?

Find the appropriate English equivalents in the text above.

Витік конфіденційної інформації, стати жертвою кіберзлочину, здійснювати зловмисні дії та незаконну діяльність, виявляти недоліки, шахрай, використання слабких способів автентифікації та паролів, заходи та операції з забезпечення безпеки, незахищені пристрої, легка мішень для кіберзлочинців, атаки типу "відмова в обслуговуванні", надсилання хибних повідомлень та електронних листів, завантажувати шкідливе програмне забезпечення, отримувати доступу до зашифрованих даних, використовувати чужі персональні дані, несанкціоноване втручання в збережені дані, цькування в інтернеті, надсилання або поширення шкідливого та принизливого контенту, порушення авторських прав або ліцензійних обмежень, надсилання повідомлень із залякуванням або погрозами, переказувати гроші безпечним приватним способом, відмивання грошей, отримання фінансової вигоди від.

Join the term with its explanation.

Term	Definition
1. **white hat**	a) an attack where the attacker disguises himself or herself as another user by means of a false IP network address
2. **warez**	b) an email containing live data intended to cause damage to the recipient's computer
3. **sniffer**	c) a person who combines phone phreaking with computer hacking
4. **IP spoofing**	d) the process of taking over a live connection between two users so that the attacker can masquerade as one of the users
5. **leapfrog attack**	e) slang for pirated software
6. black hat	f) gaining unauthorized access to a computer system via another user's legitimate connection
7. **intranet**	g) data that has been encrypted
8. hijacking	h) using a password or user ID obtained in one attack to commit another attack
9. cryptography	i) a term used to describe a hacker who has the intention of causing damage or stealing information
10. decrypt	j) an attack that causes the targeted system to be unable to fulfill its intended function
11. piggyback	k) a hacker whose intentions are not criminal or malicious
12. phracker	l) protecting information or hiding its meaning by converting it into a secret code before sending it out over a public network
13. denial of service (DoS)	m) the process of converting encrypted information back into normal, understandable text

14. ciphertext	n) a private network used within a company or organization that is not connected to the Internet
15. letterbomb	o) a program designed to capture information across a computer network

Read and translate the text. Fill in the blanks.

Cyber Crimes Examples
- REvil and Kaseya Ransomware

Group/ deploying / ransom / took place /website / bounties /

REvil is a Russian or Russian-speaking hacking____ and it is known as a ransomware-as-a-service operation. The Kaseya incident____ in July - 2021. The incident happened when one of the Kaseya's company's products was ____the famous SODINOKIBI REvil ransomware to endpoints of Kaseya's customer network that attack surface was over 1000 Kaseya's customers worldwide. A few hours later REvil took credit for the attack by posting on their Happy Blog _____on the dark web and demanded a $70 million____ to release a public decryptor that they claim can decrypt all the damaged devices. The attack was so impactful that the United States government offered $10 million ____to anyone that can give any information for arresting REvil members. Yaroslav Vasinskyi, a 22 years Ukrainian, was charged with conducting the attack and unleashing the ransomware against Kaseya and other companies.

- Stuxnet

Drives/ incident /operating systems/ internet /malware/ worm/

The Stuxnet incident is a famous____ that happened in 2010. Stuxnet is the name of a computer____ (type of malware) that targets SCADA (supervisory control and data acquisition) systems. Stuxnet____ left devastating damage to Iran's nuclear power program. It was spreading through USB___ and affected mainly Microsoft Windows_____. The malware functionality was to search for machines that are working as PLCs (programmable logic controllers) and if it was found the malware updates its code over the_____ through the attackers.

- Marriott Hotels

leaked / free access /customers / database /suffered from/ security

In November 2018, Marriott hotels group_____ a massive data breach that affected more than 500 million___. The compromise happened for the guest reservation_____ by an unknown party. The information that was ____contained payment information, mailing addresses, passport numbers, and phone numbers for customers. Marriott Group has immediately conducted incident investigations with a group of _____experts plus setting up a website and a call center. They also sent emails to the affected customers and gave them ________to monitoring tools that monitor the internet and give an alert if any evidence of sharing personal information is found.

- RockYou Data Breach

Unencrypted / hackers/ database /breach /game/ access/ account information/

RockYou is a company that works in the____field and was founded in 2005 by Lance Tokuda and Jia Shen. The company was working well until December 2009 when what is called “the biggest data breach of all time” happened. The data ____exposed and leaked more than 32 million user _______from RockYou database. The company was storing passwords in an______ plain text format which made it easier for the hacker to have ___to all passwords stored. The hacker used a very old and popular SQL vulnerability to leak all data from the____. After this major breach, the total set of passwords that were leaked became a very helpful resource in penetration testing as ____use this wordlist of passwords to test the security and password strength of accounts and products.

Read and translate the text. Do the exercises following it.

How to protect yourself against cybercrime

Anyone using the internet should exercise some basic precautions. Here are 11 tips you can use to help protect yourself against the range of cybercrimes out there.

1. **Use a full-service internet security suite.** It’s a good idea to consider trusted security software like **Norton 360 with LifeLock Select**, which provides all-in-one protection for your devices, online privacy, and identity, and helps protect your private

and financial information when you go online.

2. Use strong passwords. Don't repeat your passwords on different sites, and change your passwords regularly. Make them complex. That means using a combination of at least 10 letters, numbers, and symbols. A **password** management application can help you to keep your passwords locked down.

3. Keep your **software updated**. This is especially important with your operating systems and internet security software. Cybercriminals frequently use known exploits, or flaws, in your software to gain access to your system. Patching those exploits and flaws can make it less likely that you'll become a cybercrime target.

4. Manage your social media settings. Keep your personal and private information locked down. **Social engineering** cybercriminals can often get your personal information with just a few data points, so the less you share publicly, the better. For instance, if you post your pet's name or reveal your mother's maiden name, you might expose the answers to two common security questions.

5. Strengthen your home network. It's a good idea to start with a strong encryption password as well as a virtual private network. A VPN will encrypt all traffic leaving your devices until it arrives at its destination. If cybercriminals do manage to hack your communication line, they won't intercept anything but encrypted data. It's a good idea to use a VPN whenever you a public Wi-Fi network, whether it's in a library, café, hotel, or airport.

6. Talk to your children about the internet. You can teach your kids about acceptable use of the internet without shutting down communication channels. Make sure they know that they can come to you if they're experiencing any kind of online harassment, stalking, or bullying.

7. Keep up to date on major security breaches. If you do business with a merchant or have an account on a website that's been impacted by a security breach, find out what information the hackers accessed and change your password immediately.

8. Take measures to help protect yourself against identity theft. Identity theft occurs when someone wrongfully obtains your personal data in a way that involves fraud or deception, typically for economic gain. How? You might be tricked into giving personal information

over the internet, for instance, or a thief might steal your mail to access account information. That's why it's important to guard your personal data. A VPN — short for virtual private network — can also help to protect the data you send and receive online, especially when accessing the internet on public Wi-Fi.

9. Know that identity theft can happen anywhere. It's smart to know how to protect your identity even when traveling. There are a lot of things you can do to help keep criminals from getting your private information on the road. These include keeping your travel plans off social media and being using a VPN when accessing the internet over your hotel's Wi-Fi network.

10. Keep an eye on the kids. Just like you'll want to talk to your kids about the internet, you'll also want to help protect them against identity theft. Identity thieves often target children because their Social Security number and credit histories frequently represent a clean slate. You can help guard against identity theft by being careful when sharing your child's personal information. It's also smart to know what to look for that might suggest your child's identity has been compromised.

11. Know what to do if you become a victim. If you believe that you've become a victim of a cybercrime, you need to alert the local police and, in some cases, the FBI and the **Federal Trade Commission**. This is important even if the crime seems minor. Your report may assist authorities in their investigations or may help to thwart criminals from taking advantage of other people in the future. If you think cybercriminals have stolen your identity. These are among the steps you should consider: -Contact the companies and banks where you know fraud occurred.-Place fraud alerts and get your credit reports.- Report identity theft to the FTC.

Read the text again and try to fill in the table with the information from the text as in the example.

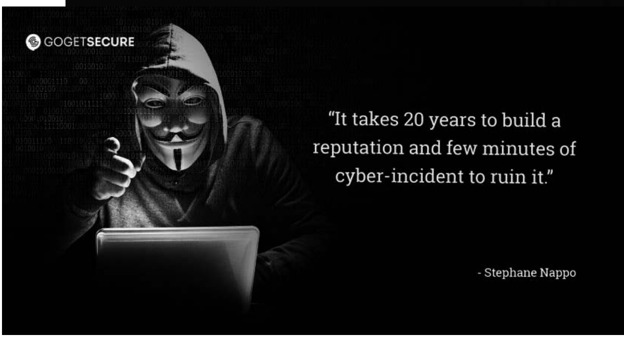
Tip	How to use?
1. Use a full-service <u>internet security suite</u>	**Use security software which provides all-in-one protection for your devices, online privacy, and identity, and helps**

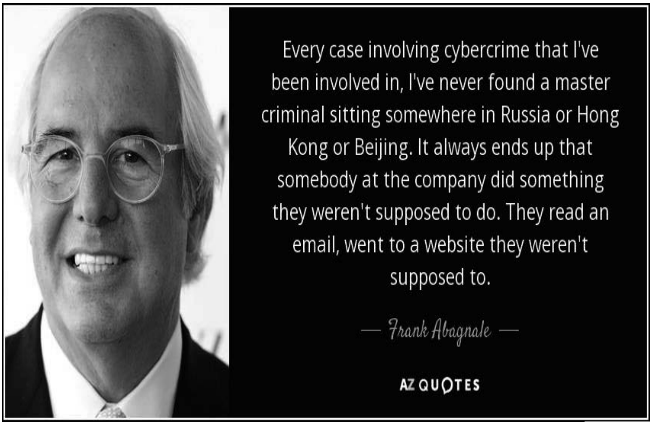
	protect your private and financial information when you go online.
2.	
3.	

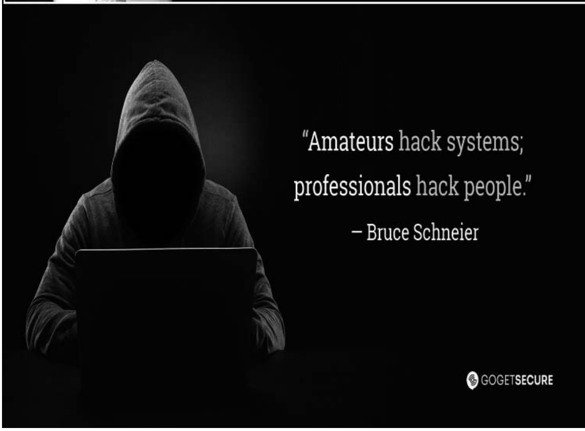
Find the appropriate Ukrainian equivalents for the given words and expressions. Create your own sentences with them in English.

Precautions, security software, to protect private information, to make a complex password, to gain access to a system, exploits and flaws, two common security questions, use strong passwords, to encrypt all traffic, online harassment or stalking or bullying, to have an account on a website, identity theft, public Wi-Fi, to guard your personal data, to thwart criminals from.

Discussion time. Look at the saying by famous people concerning cybercrime and give your opinion upon them.




Every case involving cybercrime that I've been involved in, I've never found a master criminal sitting somewhere in Russia or Hong Kong or Beijing. It always ends up that somebody at the company did something they weren't supposed to do. They read an email, went to a website they weren't supposed to.
— Frank Abagnale —
AZ QUOTES


"Amateurs hack systems; professionals hack people."
– Bruce Schneier
GOGETSECURE

Computer Viruses

Read and translate the text. Write out unknown items of vocabulary from it. Do the tasks following the text.

A computer virus is malicious code that replicates by copying itself to another program, computer boot sector or document and changes how a computer works. A virus spreads between systems after some type of human intervention. Viruses replicate by creating their own files on an infected system, attaching themselves to a legitimate program, infecting a computer's boot process or infecting user documents. The virus requires someone to knowingly or unknowingly spread the infection. In contrast, a computer worm is standalone programming that does not require human interaction to spread. Viruses and worms are two examples of malware, a broad category that includes any type of malicious code.

A virus can be spread when a user opens an email attachment, runs an executable file, visits an infected website or views an infected website advertisement, known as malvertising. It can also be spread through infected removable storage devices, such as Universal Serial

Bus (USB) drives. Once a virus has infected the host, it can infect other system software or resources, modify or disable core functions or applications, and copy, delete or encrypt data. Some viruses begin replicating as soon as they infect the host, while other viruses will lie dormant until a specific trigger causes malicious code to be executed by the device or system. Many viruses also include evasion or obfuscation capabilities designed to bypass modern antivirus and antimalware software and other security defenses. The rise of polymorphic malware development, which can dynamically change its code as it spreads, has made viruses more difficult to detect and identify.

Types of computer viruses

File infectors. Some file infector viruses attach themselves to program files, usually selected COM or EXE files. Others can infect any program for which execution is requested, including SYS, OVL, PRG and MNU files. When the infected program is loaded, the virus is loaded as well. Other file infector viruses arrive as wholly contained programs or scripts sent as an attachment to an email note.

Macro viruses. These viruses specifically target macro language commands in applications such as Microsoft Word and other programs. In Word, macros are saved sequences for commands or keystrokes that are embedded in the documents. Macro viruses, or scripting viruses, can add their malicious code to the legitimate macro sequences in a Word file. Microsoft disabled macros by default in more recent versions of Word; as a result, hackers have used social engineering schemes to convince targeted users to enable macros and launch the virus.

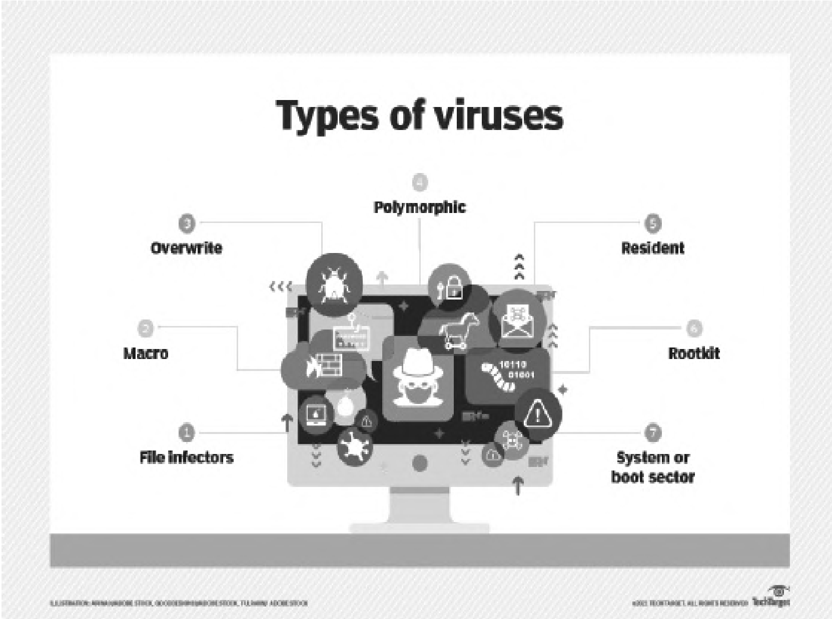
Overwrite viruses. Some viruses are designed specifically to destroy a file or application's data. After infecting a system, an overwrite virus begins overwriting files with its own code. These viruses can target specific files or applications or systematically overwrite all files on an infected device. An overwrite virus can install new code in files and applications that programs them to spread the virus to additional files, applications and systems.

Polymorphic viruses. A polymorphic virus is a type of malware that has the ability to change or apply updates to its underlying code without changing its basic functions or features. This process helps a virus evade detection from many antimalware and threat detection products that rely on identifying signatures of malware; once a polymorphic virus's signature is identified by a security product, the virus can then alter itself so it will no longer be detected using that signature.

Resident viruses. This type of virus embeds itself in the memory of a system. The original virus program isn't needed to infect new files or applications. Even if the original virus is deleted, the version stored in memory can be activated when the operating system (OS) loads a specific application or service. Resident viruses are problematic because they can evade antivirus and antimalware software by hiding in the system's random access memory (RAM).

Rootkit viruses. A rootkit virus is a type of malware that installs an unauthorized rootkit on an infected system, giving attackers full control of the system with the ability to fundamentally modify or disable functions and programs. Rootkit viruses were designed to bypass antivirus software, which typically scanned only applications and files. More recent versions of major antivirus and antimalware programs include rootkit scanning to identify and mitigate these types of viruses.

System or boot sector viruses. These viruses infect executable code found in certain system areas on a disk. They attach to the disk OS (DOS) boot sector on diskettes and USB thumb drives or the master boot record (MBR) on hard disks. In a typical attack scenario, the victim receives a storage device that contains a boot disk virus. When the victim's OS is running, files on the external storage device can infect the system; rebooting the system will trigger the boot disk virus. An infected storage device connected to a computer can modify or even replace the existing boot code on the infected system so that, when the system is booted next, the virus will be loaded and run immediately as part of the MBR. Boot viruses are less common now as today's devices rely less on physical storage media.



Types of viruses

How does a computer virus spread?

The distinguishing characteristic of a virus is it spreads from system to system after a user takes some action that either intentionally or accidentally facilitates that spread. This spread is known as *virus propagation*, and there are many different techniques viruses can use to propagate between systems. The simplest example occurs when a virus is contained within an executable file that a user downloads from the internet, receives in an email message or copies from a removable storage device. As soon as the user executes that file, the virus springs into action, running malicious code that infects the user's system.

Other viruses can spread through more complex mechanisms. In those cases, a virus running on an infected system may take action to begin its own propagation. For example, a virus might copy itself to all removable media installed on a system, attach itself to email messages sent to a user's contacts or copy itself to shared file servers. In those cases, the lines become blurred between viruses, which require human assistance to spread, and worms, which spread on their own by exploiting vulnerabilities. The key difference is the virus will always require a human to take an action that enables that final step in the propagation process, while a worm does not require this human assistance.

Viruses can also spread between systems without ever writing data to disk, making them more difficult to detect with virus protection and virus removal mechanisms. These fileless viruses are often launched when a user visits an infected website and then run completely within the target system's memory, carrying out their malicious payload and then disappearing without a trace.

How do computer viruses attack?

Virus propagation is only half the equation. Once a virus gains a foothold on a newly infected system, it begins to carry out whatever exploit the virus author designed it to perform. This is the payload delivery process, where the virus attacks the target system. Depending on the techniques the virus uses and the privileges of the user who created the infection, the virus may be able to take any action it desires on the target system. This is one of the main reasons that security professionals encourage organizations to follow the principle of least privilege (POLP) and not grant users administrative rights on their own systems. This type of access can magnify the damage caused by a virus.

The payload a virus carries may violate one or more of the principles of cybersecurity: confidentiality, integrity and availability (CIA triad). Confidentiality attacks seek to locate sensitive information stored on the target system and share it with the attacker. For example, a virus might search the local hard drive (HD) for Social Security numbers, credit card numbers and passwords, and then funnel those back to the attacker. Integrity attacks seek to make unauthorized modifications or deletions of information stored on the system. For example, a virus might delete files stored on a system or make unauthorized modifications to the OS to avoid detection. Availability attacks seek to deprive the legitimate user access to the system or the information it contains. For example, ransomware is a type of virus that encrypts information on the user's HD, preventing legitimate access. It then demands the payment of a ransom in exchange for the decryption key.

Viruses may also join a system to a botnet, placing it under the control of the attacker. Systems joined to botnets are commonly used to conduct distributed denial of service (DDoS) attacks against websites and other systems.

Answer the questions to the text:

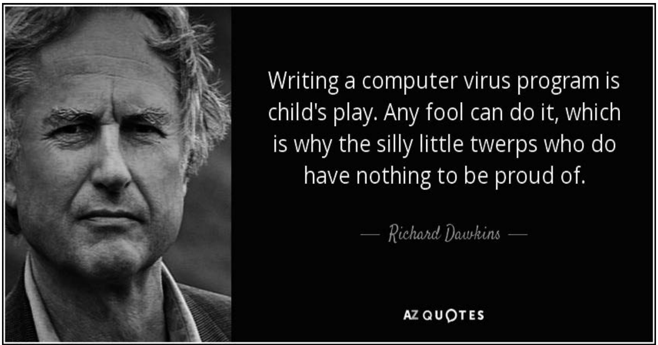
1. What is a computer virus? How does it work?
2. What are the common types of viruses?
3. Name the specifications of file infectors.
4. Dwell upon Macro viruses.
5. How do overwrite viruses work?
6. Why are Resident viruses thought to be problematic?
7. How do Polymorphic viruses infect a computer?
8. What type of virus is designed to bypass antivirus software?
9. Why are Boot viruses less common now?
10. How does a computer virus spread?
11. How do computer viruses attack?
12. Have you ever had a computer virus? Which type? How did you cope with it?

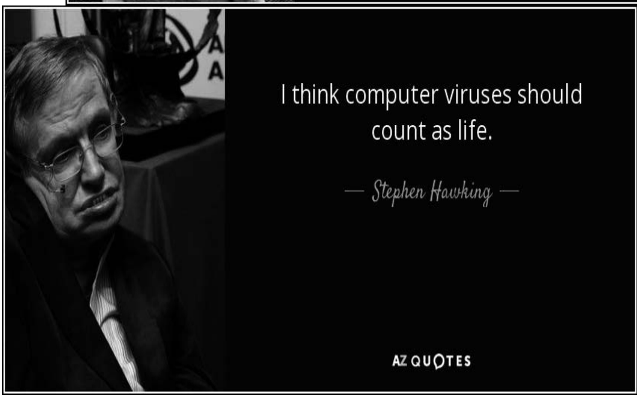
Match the word with its explanation.

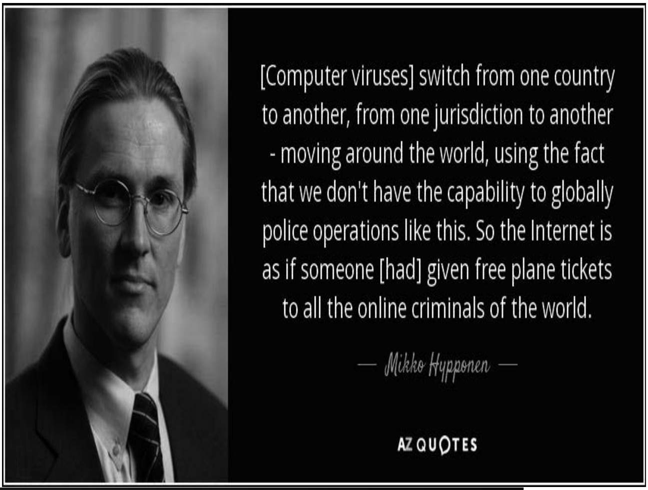
WORD	EXPLANATION
1. intervention	a) intended to damage somebody's computer or data files
2. malicious	b) software such as a virus specifically designed to damage or gain access to a computer system without the user knowing
3. To encrypt	c) action taken to improve or help a situation
4. attachment	d) the act of making something less clear and more difficult to understand, usually deliberately
5. obfuscation	e) the state of being whole and not divided
6. integrity	f) a document that you send to somebody using email

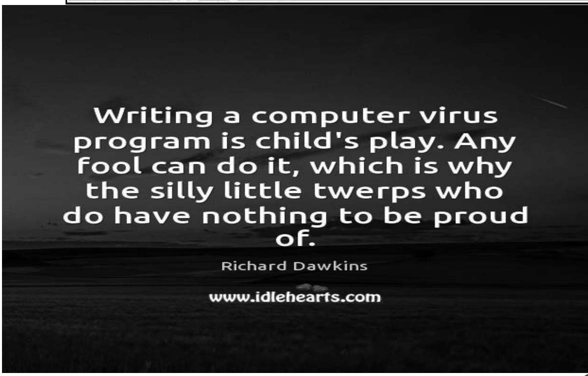
7. malware	g) to put information into a special code, especially in order to prevent people from looking at it without authority
8. To mitigate	h) money that is paid to somebody so that they will set free a person who is being kept as a prisoner by them
9. botnet	i) a group of computers that are controlled by malware (= software such as a virus that the users do not know about or want)
10. ransom	j) to make something less harmful, serious, etc.

Discussion Topics: Do you agree with the quotes of famous inventors and scientists based on computer viruses? YES/NO? Why?









Infected, memory, coining, message, floppy, malicious,virus, term,removing, graduate

Fill in the gaps:

History of computer viruses

The first known computer_____was developed in 1971 by Robert Thomas, an engineer at BBN Technologies. Known as the Creeper virus, Thomas' experimental program_____mainframes on the Advanced Research Projects Agency Network (ARPANET), displaying the teletype message: "I'm the creeper: Catch me if you can."

The first computer virus to be discovered in the wild was Elk Cloner, which infected Apple II OSes through _____disks and displayed a humorous_____on infected computers. Elk Cloner, which was developed by 15-year-old Richard Skrenta in 1982, was designed as a prank, but it demonstrated how a potentially____program could be installed in an Apple computer's _____and prevent users from _____the program.

The_____ *computer virus* wasn't used until a year later. Fred Cohen, a _____student at the University of Southern California (USC), wrote an academic paper titled "Computer Viruses -- Theory and Experiments" and credited his academic advisor and RSA Security co-founder Leonard Adleman with _____the term *computer virus* in 1983.

E/FALSE section.

Famous computer viruses

Notable examples of early computer viruses include the following:

- The **Brain virus**, which initially appeared in 1986, is considered to be the first Microsoft DOS PC virus. Brain was a boot sector virus. It spread through infected floppy disk boot sectors, and once installed on a new PC, it would install itself to the system's memory and subsequently infect any new disks inserted into that PC.
- The **Jerusalem virus**, also known as the **Friday the 13th virus**, was discovered in 1987 and spread throughout Israel via floppy disks and email attachments. The DOS virus would infect a system and delete all files and programs when the system's calendar reached Friday the 13th.

- The **Melissa virus**, which first appeared in 1999, was distributed as an email attachment. If the infected systems had Microsoft Outlook, the virus would be sent to the first 50 people in an infected user's contact list. This virus also affected macros in Microsoft Word and disabled or lowered security protections in the program.
- The **Archiveus Trojan**, which debuted in 2006, was the first known case of a ransomwarevirus that used strong encryption to encrypt users' files and data. Archiveus targeted Windows systems, used Rivest-Shamir-Adleman (RSA) encryption algorithms -- whereas earlier versions of ransomware used weaker and easily defeated encryption technology and demanded victims purchase products from an online pharmacy.
- The **Zeus Trojan**, or **Zbot**, one of the most well-known and widely spread viruses in history, first appeared in 2006 but has evolved over the years and continues to cause problems as new variants emerge. The Zeus Trojan was initially used to infect Windows systems and harvest banking credentials and account information from victims. The virus spreads through phishing attacks, drive-by downloads and man-in-the-browser The Zeus malware kit was adapted by cybercriminals to include new functionality to evade antivirus programs, as well as spawn new variants of the Trojan, such as ZeusVM, which uses steganography techniques to hide its data.
- The **Cabir virus** is the first verified example of a mobile phone virus for the now-defunct Nokia Symbian OS. The virus was believed to be created by a group from the Czech Republic and Slovakia called 29A, who sent it to a number of security software companies, including Symantec in the U.S. and Kaspersky Lab in Russia. Cabir is considered a proof-of-concept (POC) virus because it proves that a virus can be written for mobile phones, something that was once doubted.

1. The Jerusalem virus was spread only throughout Israel via floppy disks and email attachments.
2. The Brain virus once installed on an old PC, it would install itself to the system's memory and subsequently infect any new disks inserted into that PC.

3. If the infected systems had Microsoft Outlook, the Melissa virus would be sent to the first 50 people in an infected user's contact list.

4. The Archiveus Trojan, which debuted in 2006, was the first known case of a ransomwarevirus and demanded victims purchase products from online stores.

5. The Cabir virus was believed to be created by a group from the Czech Republic and Slovakia called 29A and infected only mobile phones.

6. The Zeus Trojan was initially used to infect Windows systems and harvest banking credentials and account information from victims.

Read the following text and write out unknown items of vocabulary.

7 Tips on How to Prevent Computer Viruses

We've all been annoyed with pop-ups, spam emails and all those nuisances that we encounter while browsing the Internet. But computer viruses are far from simply annoying. While a virus making its way onto your computer isn't necessarily the worst thing that can happen, they are continuously present and can spread fast through a network, infecting other computers and wrecking havoc once they get momentum. Any sensitive and confidential information that you store and transmit through your network can be compromised. Preventing computer viruses from infecting your devices consists of cybersecurity best practices that can also ensure you are decently protected against other types of malware as well. We have prepared our best 7 tips on how to prevent computer viruses that we have grounded in our first-hand experience with our clients:

1. Keep your computer up to date

All operating systems on computers get frequent updates that enhance features but also include security patches that will fill security holes before cyber criminals do. While we know that updates are a bit of a pain, they are far less inconvenient thnt getting a virus on your computer. We encourage our clients to enable automatic updates on their computers in addition to running updates for programs such as Adobe and Java. Before you allow any updates, ensure that you are on a secured connection and not at a coffee shop for instance.

2. Don't use Internet Explorer

Old habits can die hard but we now live in an exciting time. We have so many browsers to choose from. Whether you prefer Chrome, Firefox or Opera, any of those choices are safer than Internet Explorer. While the newer versions of Internet Explorer are an improvement over the past versions, they are still a far cry from the quality of Chrome or Firefox. We saw significant improvement in online security with our clients with just switching to a different browser. And when you choose a better browser — keep it updated!

3. Backup your computer

As in our cautionary tale above, some computer viruses just keep coming back and are just impossible to delete off of a computer. When this happens, there can be some of your own data removal involved. In other times, a virus removal will cause damage to the operating system. At these times, we might suggest a reinstall of the operating system. This shouldn't really be a problem — if you have a backup strategy that is. Without a backup, there would be no way to recover the lost data. With your data backed up, the process of virus removal is quicker and more affordable. We recommend backing up all of your data, with sensitive information having priority. Apps such as Google Drive available in Google Workspace offer cloud storage with a large amount of space.

4. Anti-virus basics

Anti-virus software is the basis of computer virus protection — hence the name. While it's important to have a quality anti-virus installed on your computer, there are some best practices to have in mind. Having more than one anti-virus solution on your network is a very unneeded and generally a bad idea. Computer viruses and malware get created and discovered daily. Your anti-virus solution is only as effective as its ability to be up-to-date on computer viruses that are a threat to you. For this reason, be sure your anti-virus program updates automatically and at a reasonable time — not 3am on Wednesday nights… as it's not likely that your computer will be turned on during that time and not at 2pm when you are sure to be in numerous meetings. This way the updates won't be a hassle, and you will be sure you are protected against the most sophisticated viruses out there.

5. Avoid suspicious web sites

There are over a trillion web pages online right now. We spend lots of time browsing the internet, researching, shopping, communicating…and it all involves visiting different websites. While many standards have come out that make sure you are the very least notified you are about to enter an insecure and potentially dangerous website, cyber criminals have found ways to trick those standards and still show up as a legitimate site. Sometimes it's impossible to see right away if the website hosts malicious content. But it is all in the details. Be sure to notice the URL of the web site, check on official sources if the website is real and actually is what it presents like. While obvious, the lock icon next to a URL is one of the first signs that you might be on a potentially malicious website.

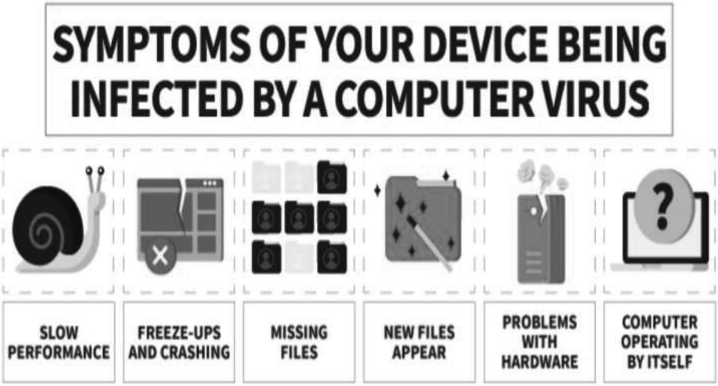
6. Always scan email attachments

One of the oldest ways of infection, and one that made computer viruses so notorious in the early days of the internet is through email. Some people send viruses to their friends and not even know that they did it. At Altitude Integrations, we have encountered many situations where our clients have had their email accounts hacked. Once hacked, the attackers would use that account to send malicious content to the entire address book list. The most reliable way to make sure you are safe is to open an email attachment or click on a link is to scan it with anti-virus software. Your mail provider or email service you are using should also have some sort of email protection against viruses. In Gmail, for example, attachments are automatically scanned for viruses. If a virus is present, the email will be rejected and you will be notified.

7. Use a malware scanner

Anti-virus is important and you should invest in a robust solution, there is still a possibility for the virus to slip through the cracks and get downloaded to your computer. It can often lurk in your network, you being unaware of its presence. In order to make sure viruses don't get the opportunity to spread further through your network and to minimize the damage, a weekly malware scan should be scheduled. Many of these programs are easy, affordable and sometimes even free and they can be used in combination with a backup, so to ensure no malicious files are backed up with your other files.

Study the following charts and try to explaine the ideas form them in your own words.



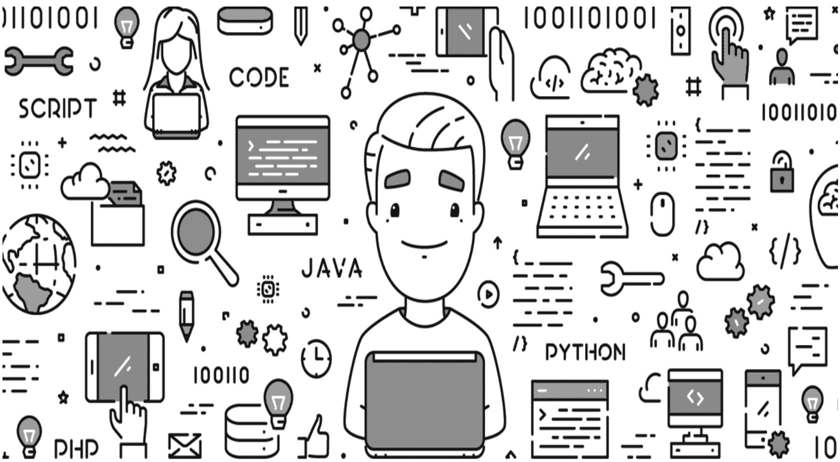
Answer the questions based on the text.

1. Why is it important to get the frequent updates on your computer?
2. Which browsers are recommended to use and which are recommended to abstend from and why?
3. What for do we need to backup your computers?
4. How can we avoide suspicious websites? Which sited do you usually use and what for?

5. How can a simple email damage your computer?
6. Do you use a malware scanner? Which one and what for?
7. Share with us some other tips how to avoid a computer virus.

Find the appropriate English correspondents from the text.

Спливаючі вікна, чутлива та конфіденційна інформація, шкідливе програмне забезпечення, резервне копіювання комп'ютера, перевстановлення операційної системи, відновлювати втрачені дані, входити на незахищений і потенційно небезпечний веб-сайт, вкладені файли електронної пошти, надсилати шкідливий вміст до, ефективне рішення, розповсюджуватися у мережі, шкідливий файл, якісна антивірусна программа встановлена на комп'ютері.



Programming Languages

Read and translate the text, write out unknown items of vocabulary. Do the exercises following the text.

The Most Popular Programming Languages to Learn

A programming language is a way for programmers to communicate with computers. Programming languages consist of a set of rules that allows string values to be converted into various ways of generating machine code, or, in the case of visual programming languages, graphical elements. Generally speaking, a program is a set of instructions written in a particular language (C, C++, Java, Python) to achieve a particular task. ***These languages are also considered to be the best programming languages to learn for beginners.***

1. Javascript is a high-level programming language that is one of the core technologies of the World Wide Web. It is used as a client-side programming language by 97.8 percent of all websites. JavaScript was originally used only to develop web browsers, but they are now used for server-side website deployments and non-web browser applications as well. Javascript was created in 1995 and was initially known as LiveScript. Nowadays, JavaScript is often confused with Java, and although there are some similarities between them, the two languages are distinct. Javascript is the most popular programming language in the world and is in high demand among various organizations.

2. Python is one of the most popular programming languages today and is easy for beginners to learn because of its readability. It is a free, open-source programming language with extensive support modules and community development, easy integration with web services, user-friendly data structures, and GUI-based desktop applications. It is a popular programming language for machine learning and deep learning applications. Python is used to develop 2D imaging and 3D animation packages like Blender, Inkscape, and Autodesk. It has also been used to create popular video games, including Civilization IV, Vegas Trike, and Toontown. Python is used for scientific and computational applications like FreeCAD and Abacus and by popular websites like YouTube, Quora, Pinterest, and Instagram.

3**. Go** was developed by Google in 2007 for APIs and web applications. Go has recently become one of the fastest-growing programming languages due to its simplicity, as well as its ability to handle multicore and networked systems and massive codebases. Go, also known as Golang, was created to meet the needs of programmers working on large projects. It has gained popularity among many large IT companies thanks to its simple and modern structure and syntax familiarity. Companies using Go as their programming language include Google, Uber, Twitch, Dropbox, among many others. Go is also gaining in popularity among data scientists because of its agility and performance.

4. **Java** is one of the most popular programming languages used today. Owned by Oracle Corporation, this general-purpose programming language with its object-oriented structure has become a standard for applications that can be used regardless of platform (e.g., Mac, Windows, Android, iOS, etc.) because of its Write Once, Run Anywhere (WORA) capabilities. As a result, Java is recognized for its portability across platforms, from mainframe data centers to smartphones. Today there are more than 3 billion devices running applications built with Java. Java is widely used in web and

application development as well as big data. Java is also used on the backend of several popular websites, including Google, Amazon, Twitter, and YouTube. New Java frameworks like Spring, Struts, and Hibernate are also very popular. Java is a more complex language to learn, but experienced developers with Java coding skills are in high demand.

5. Kotlin is a general-purpose programming language originally developed and unveiled as Project Kotlin by JetBrains in 2011. The first version was officially released in 2016. It is interoperable with Java and supports functional programming languages. Kotlin is used extensively for Android apps, web application, desktop application, and server-side application development. Kotlin was built to be better than Java, and people who use this language are convinced. Most of the Google applications are based on Kotlin. Some companies using Kotlin as their programming language include Coursera, Pinterest, PostMates among many others.

6. **PHP** is an open-source programming language created in 1990. Many web developers find it essential to learn PHP, as this language is used to build more than 80% of websites on the Internet, including notable sites like Facebook and Yahoo. Programmers mainly use PHP mainly to write server-side scripts. But developers can also use this language to write command-line scripts, and programmers with high-level PHP coding skills can also use it to develop desktop applications. PHP is considered a relatively easy language to learn for beginning developers. PHP professionals have access to several dedicated online communities, making it easy to get support and answers to questions.

7. **C#.** Developed by Microsoft, C# rose to fame in the 2000s for supporting the concepts of object-oriented programming. It is one of the most used programming languages for the NET framework. Anders Hejlsberg, the creator of C#, says the language is more like C++ than Java. C# is best suited for applications on Windows, Android, and iOS, as it takes the help of the integrated development environment product, Microsoft Visual C++. C# is used on the back end of several popular websites like Bing, Dell, Visual Studio, and MarketWatch.

8. **Swift.** A few years ago, Swift made the top 10 in the monthly TIOBE Index ranking of popular programming languages. Apple developed Swift in 2014 for Linux and Mac applications. An open-source programming language that is easy to learn, Swift supports almost everything from the programming language Objective-C. Swift requires fewer coding skills compared with other programming languages, and it can be used with IBM Swift Sandbox and IBM Bluemix. Swift is used in popular iOS apps like WordPress, Mozilla Firefox, SoundCloud, and even in the game Flappy Bird.

9. **R** is an open-source language that is essentially a different version of the S language. Much of the code that developers write for S runs on R without modification. Applications built in R are used for processing statistics, including linear and nonlinear modeling, calculation, testing, visualization, and analysis. Applications coded using R can interface with a number of databases and process both structured and unstructured data. R has a moderate learning curve and is not as easy for beginners to pick up as some other languages in this article. However, like other open-source programming languages, R boasts an active online community of developers, which is always a plus when learning new coding skills.

10. **Ruby.** If you want to start with a language that is known for being relatively simple to learn, consider Ruby. Developed in the 1990s, it was designed to have a more human-friendly syntax while still being flexible from the standpoint of its object-oriented architecture that supports procedural and functional programming notation. A web-application framework that is implemented in Ruby is Ruby on Rails ("RoR"). Ruby developers tout it for being an easy language to write in and also for the relatively short learning time required.

11. **C and C++** is probably the oldest and popular programming language and is the root of other programming languages such as C#, Java, and JavaScript. C++ is an enhanced version of C. Many developers today skip learning C on its own, while others think learning C first provides a valuable foundation for C++ development. Both languages are widely used in computer science and programming. C and C++ developers can make use of compilers for a wide variety of platforms, making applications developed in these

languages largely transportable. Both C and C++ are considered high-performance languages. As such, they are widely used in developing applications where performance is a critical issue, such as client/server applications, commercial products like Firefox and Adobe, and video games

12. **Matlab** is a proprietary programming language owned by MathWorks and originally released in the mid-1980s. It is built specifically for use by scientists and engineers. Programmers use Matlab to build machine learning and deep learning applications. Matlab-based programs enable users to analyze data, create algorithms, process images, and verify research. Generally, Matlab is easier to learn than other programming languages on our list.

13. **TypeScript** is a newcomer to top programming language lists, but it's making headway. It was developed in 2012 by Microsoft and is a typed version of JavaScript that is well suited for large code bases. TypeScript is used to create JavaScript-based projects with typing in both client-side and server-side development, making useful for catching errors and preventing systemic issues.

14. **Scala** is a general-purpose, type-safe Java virtual machine language that combines the best oop and functional programming languages into one special high language. Scala is ideal for reducing and removing bugs in large, complex applications. It supports both object-oriented and functional programming. Programmers can use Scala for any task that they normally would use Java for. Scala is a complex language, but that complexity gives it a lot of flexibility. Companies that use Scala include Netflix, Twitter, and the New York Times.

15. SQL is a standard database query language. It is used to access and manipulate data in databases. SQL is a declarative language that specifies the desired results, but not the steps to achieve those results. SQL is a powerful tool for accessing and manipulating data, and it is the world's most widely used database query language.

16. **HTML** is the standard language for creating web pages and applications. HTML is used to create web pages. You can use HTML to add images, links, and other types of content to your web page. Images and other objects, such as interactive forms, can be embedded within the produced page using HTML structures. It enables the

creation of structured documents by indicating structural semantics for text elements including as headings, paragraphs, lists, links, quotations, and other objects. HTML elements are delineated by tags, which are written in angle brackets.

17. **CSS** (Cascading Style Sheets) is a style sheet language used to describe how a page that was produced in a markup language is presented. A style sheet, which is a set of rules for web browsers, can control an HTML or XML. All HTML tags, including the text in the document's body, headings, paragraphs, and other text elements, are styled using CSS. CSS is used to style all HTML tags, including the body of the document, headings, paragraphs, and other material. CSS can also be used to style how table components, grid elements, and images are displayed. Web developers use CSS to create responsive and accessible websites. CSS can make it easier for web developers to create websites that look good on all devices, including mobile phones and tablets. CSS can also help make websites more accessible to people with disabilities.

18. **Rust** is a programming language designed to be safe, concurrent, and practical. It is a systems programming language that runs blazingly fast, prevents defaults, and guarantees thread safety. Rust is also memory-efficient: it uses minimal memory, making it ideal for embedded systems. Rust is a fast and efficient language used to create high-performance applications. Rust is also a safe and reliable language, which makes it perfect for developing mission-critical software.

19. **Perl** is an interpreted, high-level, general-purpose programming language. Perl was originally developed by Larry Wall in 1987 as a general-purpose Unix scripting language to make report processing easier. Since then, it has undergone many changes and revisions. Perl is widely regarded as the " Swiss Army knife" of programming languages because of its versatility and power. It is used for various tasks, including web development, network programming, system administration, and more. Perl is easy to learn, and its concise syntax makes it an excellent choice for beginners. It is also very versatile, allowing you to write programs in various styles. Perl has excellent support for many databases, making it a good choice for database-driven applications. It also has excellent

support for graphics and multimedia, making it a good choice for media-rich applications.

Answer the questions based on the text.

1. What is a programming language?
2. Define the differences between Java and JavaScript.
3. Where is Python used?
4. What are the peculiarities of C#, C++, and C?
5. What language is built specifically for use by scientists and engineers?
6. What language do Coursera, Pinterest, and PostMates use and why?
7. Where can Perl be used?
8. Dwell upon HTML.
9. Why do Netflix, Twitter, and the New York Times use Scala?
10. Why is Swift so popular?
11. What other languages are also important and why?
12. Which programming language do you personally use and why?

Find the appropriate English equivalents for the Ukrainian words and expressions.

Розробляти веб-браузери, розміщення веб-сайтів на сервері, зручні для користувачів структури даних, керування багатоядерними та мережевими системами і великими кодовими базами, маневреність і продуктивність, портативність на різних платформах, мейнфреймні центри обробки даних, десктопний застосунок, скрипти командного рядка, мова програмування з відкритим вихідним кодом, підтримувати процедурну та функціональну нотацію програмування, перевіряти дослідження, попередження системних проблем, виправлення недоліків у великих, складних програмах, мова запитів до баз даних, виділені тегами, ефективне використання пам'яті.

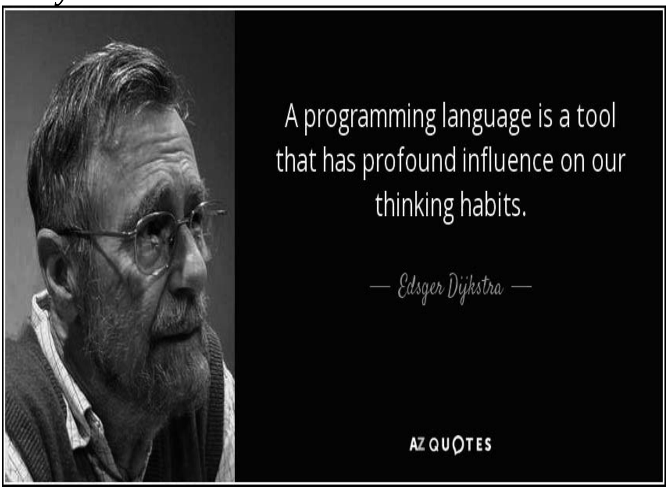
Match the term with its explanation.

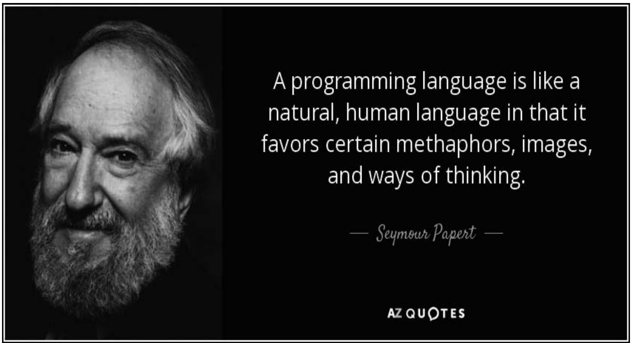
Programming Terms and Definitions for Beginners

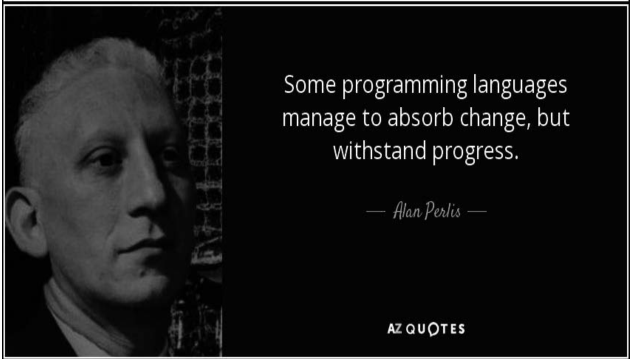
Term	Explanation
1. Algorithm	a) is a set of rules, routines, and protocols to build software applications.
2. Program	b) is a standard that assigns letters, numbers and other characters different slots, available in the 8-bit code. The total number of slots available is 256.
3. Application Programming Interface	c) is a term used to describe a written set of instructions, written using the protocols of a particular language, such as Java, C or Python.
4. ASCII	d) is a sequence of instructions that repeat the same process over and over until a condition is met and it receives the order to stop.
5. Boolean logic	e) is a programming language that lets the developer write programs irrespective of the nature or type of computer.
6. A bug	f) is a set of instructions or rules designed to solve a definite problem.
7. Code or source code	g) is a term used to denote the objects which can be manipulated using different operators.
8. Framework	h) is the smallest individual unit in a program, often referring to a portion of a much larger data piece.
9. A loop	i) is a general term used to denote an unexpected error or defect in hardware or software, which causes it to malfunction.
10. An operand	j) is a single line of code written legally in a programming language that expresses an action to be carried out.
11. High-level language	k) is the time period during which a program is, in fact, running on a computer.

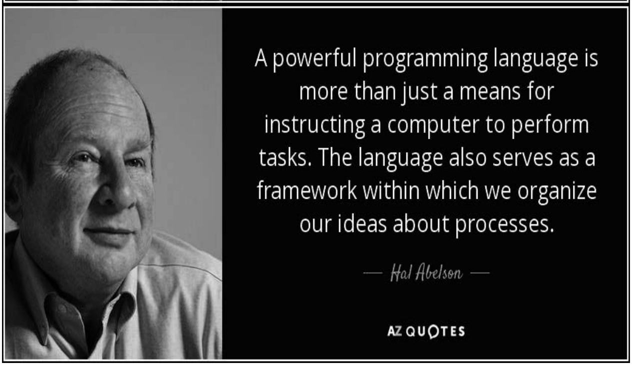
12. Low-level language	l) is a foundation with a specified level of complexity that may be altered by the programmer, making use of their code; might include different software libraries, APIs, compilers and much more.
13. Runtime	m) is a language that is very close to machine language and provides a little abstraction of programming concepts.
14. Token	n) is an expression used for creating statements that are either TRUE or FALSE. ; use AND, OR, XOR, NOT and NOR operators with conditional statements in programming, search engines, algorithms, and formulas.
15. A statement	o) is termed as an organized collection of instructions, which when executed perform a specific task or function: is processed by the central processing unit (CPU) of the computer before it is executed.

Discussion Topics: Do you agree with the quotes of famous inventors and scientists based on programming languages? YES/NO? Why?









Read and translate the text. Do the exercises following it.

Interview: A Day In the Life of a Programmer

Co-founder and CTO of DataSine, Chris Loy, and Front End Engineer Jenny Wem both have plenty of programming experience. We found the time to ask them some questions about life as a programmer, the challenges they face, how things have changed, and *what advice they have for programmers of the future.*

JAXenter: What is a typical day in the life of a programmer?

Jenny: A typical day for me begins with our team's morning stand-up meeting, where we report what we're working on and whether anything is blocking our progress. I then check work tickets on Jira, which is the tool we use to organise tasks that need to be done, and either start a new ticket or continue with one I've been working on. The ticket could be anything from building new features to fixing bugs, and when I've finished building or fixing something, my team reviews the work I've done and suggests any necessary changes. After making these changes, my new code is merged into the 'master' copy of the codebase, and then I'll start a new ticket! My other responsibilities include helping to estimate the complexity of work we need to do, as well as reporting bugs and monitoring automated tests. Every two weeks the team has a meeting where we collectively decide which features we're going to be working on.

JAXenter: What attributes/skills make a programmer successful?

Jenny: The 'typical' background of a programmer would probably involve a computer science or STEM degree, although obviously not all programmers are from a typical background – my team includes people with more typical backgrounds along with people who became programmers after a career change. I actually studied art before completing a coding bootcamp. I think a successful programmer is someone who can adapt rapidly to change, as technology tends to move very fast, and you can find yourself needing to quickly get the hang of new frameworks and libraries. Soft skills are sometimes underestimated, but good communication and a collaborative spirit are really important factors. The need for these soft skills is perennial, whereas technical knowledge of a particular language or framework can quickly become obsolete.

JAXenter: How has the programmer role changed in recent years?

Chris: Like lots of office jobs, the role has generally become less corporate. The influence of Silicon Valley tech giants has meant that traditional corporations have slowly moved from viewing programmers as back-office staff to being the core team responsible for innovation. The internet has really democratized access to skills and expertise. Thanks to the open source ecosystem, and popular sites that enable open collaboration, such as GitHub and Stack Overflow, the barrier to entry is lower than ever. Consequently, the industry is more diverse than it has ever been before. Programmers now need a more malleable skill set in order to advance, as the rate of change in technology outpaces the speed at which traditional educational routes such as universities can teach. While even ten years ago there was more tribalism in the stacks that people learnt, today the best programmers are those able to adapt to new technologies quickly.

JAXenter: Has the rise of robotics and automation impacted the role of a programmer?

Chris: So far the impact of robotics and automation has only been positive. Software engineering is a discipline that differs from traditional engineering because you can go back and change what you've built afterwards. In other words, you can wait until after you build something to test it, unlike when building a suspension bridge or aircraft wing, for example. For this reason we spend a lot of time building processes to enable us to experiment and test. Technology and infrastructure that allows us to automate this time-consuming work means we can spend more time innovating on new products and ideas. As well as this, the rise of robotics has provided good employment opportunities for a lot of programmers, and has drawn lots of existing programmers into machine learning. Industries like manufacturing and transport are bearing the brunt of automation more directly, and within the machine learning / AI world, this is already happening to an extent. Although the history of disruptive startups suggests that someone will try to automate us out of existence at some point, I'm not too worried to be honest. The more automation we have, the more we can focus on the bigger problems that technology can solve.

JAXenter: How does a programmer feel they are adding value and having an impact within a large business?

Jenny: From a business perspective, it can be extremely difficult to have a sense of whether you're adding value in a large company, since a developer may not have any contact with the users of a product they're working on. Technically, I think there's a lot of personal satisfaction to be gained from writing clean, maintainable code that fellow developers will be able to understand and build upon, and this is something that a developer can aim for in a company of any size. It's important to have faith that good code will save a business time and money in the long run. Personally, having worked for both large and small companies, I would advocate working for a startup if you're interested in feeling the impact of the work you're doing.

JAXenter: How difficult is it to attract strong programmers to a business?

Chris: For a small startup like DataSine, it can be very difficult to attract good talent using a traditional approach to hiring. A hiring process that evaluates programmers based on experience, technical skills, computer science degrees and dog-eats-dog ambition will leave you competing with corporate heavy hitters, from Google to major banks, over a relatively small pool of talent. Fortunately, as ever with software, there is a way to hack the system! Because we recognise that a lot of the most important skills are to do with creativity, communication and adaptability, we are able to tap into a much bigger talent pool of amazing programmers that big corporations will often overlook. I've been lucky enough to build an amazing team of programmers without any kind of public profile, by embracing people from non-traditional tech backgrounds, and helping people focus on personal growth and learning instead of CV padding.

JAXenter: Is there a skills shortage?

Jenny: The success of coding bootcamps would certainly suggest that there's something of a shortage of developers. This is much more noticeable at the senior end of the talent pool. There's also still a shortage of female, non-binary and non-white developers, although there is much more awareness of this issue than there used to be and a lot of companies are making significant efforts to ensure that they're hiring from diverse pools of candidates. The percentage of people studying STEM subjects is fairly low, and the percentage of women is lower still. Not having a STEM-related degree is not necessarily an impediment to working as a programmer, but I think people might be more likely to consider programming as a career if they've studied it from an earlier age.

JAXenter: How can firms go about attracting and engaging the best programmer talent?

Jenny: To engage the best talent, firms need to support the ongoing education of their developers, including providing a budget for personal development. Programmers need to keep up with technology and the ability to access books, conference tickets and courses is really helpful. A lot of employers offer fairly superficial perks such as snacks, birthdays off and discounts at retailers etc. These are appreciated but they definitely don't make up for a lousy company culture or low pay or a lack of opportunities.

JAXenter: What will the future programmer workforce look like?

Chris: Sometimes it feels like the software industry is slowly consuming everything else. I see analysts, marketers, financiers, psychologists and many others learning programming skills and using them to improve and automate the parts of their job that previously involved mundane data entry and analysis. I think, in future, programming skills will become as widespread as word processing skills did in the 90s, and that anyone will be able to take advantage of this amazing toolkit in order to improve the way they work. To get to this point, we need to keep working to get coding into schools, to detoxify aspects of the industry that are still stuck in the past and to demystify the programming skill set – which is something anyone capable of completing a crossword can teach themselves. Meanwhile, software engineers will still be sat at the back, happily churning out more tools for other people to use, sharing private jokes, and looking for the next wave of innovation to jump onto.

JAXenter: As companies go about automating processes in their organisation, how will the role of the programmer continue to change?

Chris: As programming skills are democratised, I think the separation between programmers and everyone else will slowly blur. Maybe software engineering and computer programming will start to be seen as different disciplines, with the former all about breaking down the barriers placed there by "user friendly" interfaces like Windows, and the latter all about building reusable tools.

JAXenter: Finally, what advice do you have for people who want to pursue a career in programming?

Chris: My main piece of advice is simply to get coding! If you have a computer and internet access then you can start teaching yourself for free. Find an online course, build a cool website, solve some coding puzzles and get started. It's important to take an interest in tech as well. Podcasts are good, although I prefer tech blogs personally. Look for articles that have code in them or link to a GitHub repository and then play around with the code.

When it comes to choosing where to work, you need to priorities companies that will enable your learning. This is the same whether you've just coded your first web page or you have a master in computer science and have spent 10 years as a bedroom coder. Look for an employer who'll support your growth by giving you access to mentorship, resources and interesting projects to work on. My final piece of advice is to leave your prejudices at the door. Tech is an industry that still suffers from inclusion and diversity problems, but thankfully it's improving and needs open-minded people from all backgrounds to help modernize it.

Circle the right answer.

1. The morning routine of Jenny starts with…

a) A cup of coffee

b) The team's morning stand-up meeting

c) Checking emails and fax with tasks and orders

2. According to the word of Jenny a successful programmer must have the degree in specialty and have good communicative skills. Is this statement …

a) True

b) False

c) Not mentioned

3. Chris mentioned that the role of a programmer changed in the following perspectives:

a) Programmers became more reserved and home working stuff

b) They work mainly on great corporations online with the help of their basic skills and knowledge

c) Programmers became main stuff in any corporation in collaboration and must adapt to new technologies quickly

4. Chris stated that the rise of robotics and automation impacted the role of a programmer in …

a) a positive way

b) a negative way

c) in none of ways

5. Jenny recommends feeling value and impact of the work of a programmer in…

a) amount of money they receive for a project

b) positive feedbacks of clients on your work

c) working for a startup

6. How did Jenny answer the given question: "*How difficult is it to attract strong programmers to a business"?...*

a) Said that it is not a problem because there are a lot of good specialists in the given field

b) Said that it is not the business of him because the boss define whom to choose for a position with the help of special testing system

c) Said that they pay attention to the personnel the most important skills like creativity, communication, adaptability and desire to study

7. ***How can firms go about attracting and engaging the best programmer talent?***

a) with huge salary and amiable co-workers

b) with flexible timetable, apt to choose on what to work over

c) with support the ongoing education of their developers and to keep up with technology

8. ***Is there a skills shortage in IT?***

a) yes, based on gender, nationality and skin color

b) no, not at all

c) not mentioned

9. ***What will the future programmer workforce look like? Chris answered…***

a) IT companies would choose the best from the best to have enough working places in the field

b) programming would be taught at schools and detoxify aspects of the industry that would be still stuck in the past

c) it would not be changed greatly because this industry needs a lot of time for testing and employing new codes

10. Chis recommends an amateur programmer to learn programming by himself, visit courses, read articles on it and find mentors who will teach them to do it. Is it…

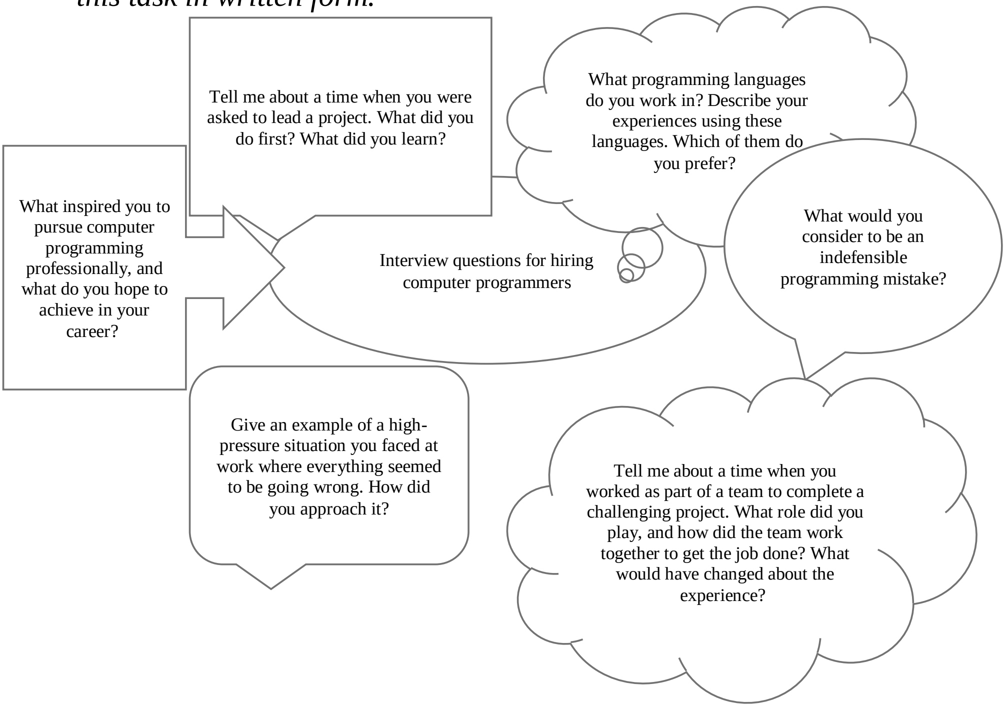
a) true

b) false

c) not mentioned

Creative task.

Imagine yourself being an amateur in programming and you have to get a job in an IT company. The first thing you need to do is to have a job interview with an employer. Here is the list of common job interview questions for hiring IT specialists, so try to get ready for an interview with the help of answering the given questions. Do this task in written form.



History of the Internet

Discuss the following questions.

1. How often do you use the Internet? What for do you use it?
2. What's your favorite website? How often do you visit it?
3. What are the most popular goods (and services) sold online? Have you ever bought anything on the Internet? What was it?
4. Have you ever made new friends on the Internet? Dwell upon it.
5. Do you chat online? Do you visit chat rooms or use instant messaging?
6. Are you a member of a social networking site? Why do you use it?
7. What do you use computers for? How often do you use them?
8. Which Internet browser do you prefer? Why?
9. Have you ever used pirated software? Do you think it is okay to use it?
10. Have you ever downloaded music or video? Which sites did you use?

Read and translate the text, write out unknown items of vocabulary. Do the tasks following the text.

History of the Internet: A Timeline Throughought the Years

The internet has been around for longer than you might think. The first email was sent way back in 1971, and computers first started to digitally share information with each other in 1983. By the 1990s, it had gained widespread attention, partly in thanks to Tim Berners Lee's invention of the World Wide Web in 1989. It introduced the ability to create websites and provided a reason for everybody — not just businesses and computer scientists — to connect to the internet. And by the 21st Century, the internet had become one of the most important inventions of all time. Nowadays, five billion people use the internet regularly. It's become our most-used source for entertainment, life admin, productivity and communication. Many rely on it entirely for their livelihoods, and it's created some of the most popular destinations to spend our social lives and our downtime. Find out what happened to make the internet a reality for us all, and how it became one of humankind's most essential tools.

1980s: the early years. The 1980s was the first decade where the internet resembled something like it does in the modern day. But it wasn't capable of anywhere near what it is now. When it first started to connect computers together, it was powered by a network called USENET. This still relied on phone modems to work, but didn't have a lot of the technology that dial-up eventually developed to be used by the public. As a result, the internet in this decade wasn't widely used by regular people. At this point, it was almost only ever used at big institutions or universities that had the computing power to access it. In 1989, Tim Berners-Lee invented the World Wide Web during his research at CERN in Switzerland. This was instrumental in making the internet a useful tool for the public. Not only did it create the space for web browsers and websites to exist, but it paved the way for people to access visual media online — something we can't imagine the internet without nowadays. If it wasn't for the World Wide Web, the internet would certainly have been used for various functional tasks, like emails or file sharing. But it wouldn't have been the definitive source of information, content and communication that it is today.

1990s: much ado about dial-up. Dial-up internet took off in the 1990s, and the first commercial internet service providers (ISPs) started offering internet connections to regular households. AOL and other web browsers' CD-ROMs were being sold in shops, letting you install and use their web software for a 30-day free trial. Chat rooms sprung up for people across the world to discuss shared interests, paving the way for Reddit and social media. Websites were being created at a blistering pace to help anyone with an internet connection to learn shop and socialize online. Some of the world's biggest websites, such as Amazon, Google, eBay, IMDb and Yahoo, first went online in the '90s. The 'Dot-com bubble' of online marketplaces was growing rapidly, but it wasn't to last for long. At this point, the internet needed full use of home telephone lines in order to work. That meant people were unable to make phone calls and browse the internet at the same time, forcing them to choose between family feuds over who gets to use what, or the cost of a second line.

Dial-up connections also ran at a painfully slow 56kbps. For comparison, a 60Mbps internet connection — which is a very common speed nowadays — is equal to 60,000kbps. That's over a thousand times faster. And now gigabit (1Gbps) speeds are available in the UK, you could get speeds nearly *18,000* times faster than the first connections in our homes.These speeds made it really difficult to download anything apart from text. At full speed, a single, low-quality song (roughly 3.5MB) would take around 10 minutes to download. But internet speeds were much less consistent back then, so realistically it would likely take anything from 30 minutes to a few hours to download one song. If you wanted to download a low-quality movie (around 700MB), it would take 28 hours at full speed, or three to five days at low speed. It's safe to say that in the '90s, dial-up internet had some fundamental issues that made it hard for us to access the full potential of the World Wide Web. But that was all due to change in the next decade, with the introduction of broadband.

2000s: the arrival of broadband. Broadband breathed new life into the internet in the early 2000s by allowing the signal in one line to be split between telephone and internet. This meant users could be online and make phone calls at the same time. It also came with much faster connection speeds, making it a lot easier to browse the internet and download & send files. Like most new technologies, broadband was extremely expensive and not available everywhere when it first launched. The UK was also far behind neighbouring European countries with the rollout of broadband, as countries like Germany and Sweden already had 30-40% take-up.The advent of broadband networks meant that people were able to download and share pictures, songs, videos, TV shows and movies at far more convenient speeds. It opened up a whole new world in online media too.

In the first few years of the 2000s, the Dot-com bubble burst and the growth of online businesses stalled. But the web wasn't going anywhere. Instead, it was time for the entertainment and social side of the internet to boom, and soon enough more of the world's biggest sites were born. These include:Wikipedia in 2001, Linkedin in 2002, Facebook in 2004, YouTube and Reddit in 2005. By 2008, demand for internet data was skyrocketing. Online multiplayer games were all the craze, YouTube was rapidly growing in popularity, and social media sites were seeing thousands of pictures and videos shared every second.

This was the perfect time for fibre-optic broadband to enter. Rather than relying entirely on copper phone lines, fibre cables allowed users to access much faster internet speeds, thanks to its use of light pulses to transfer data. Virgin Media was one of the first to offer this, supplying 50Mbps speeds which were at least double what the competition could offer at the time. The 2000s also saw the birth of 3G and the smartphone, which allowed us to connect to the internet from anywhere with a good mobile internet connection. This removed the need for us to sit at a desk or lug a laptop around to get online, and provided the perfect environment for social media apps to explode onto the scene. By the end of the 2000s, the internet was a staple in most people's lives. There was a computer in almost every home and hundreds in almost every office, and smartphones were rapidly growing in popularity.

2010s: streaming, social media and speed. The 2010s saw the internet become even more essential to everyday life. It helped the web transition from an obscure place for entertainment into a mainstream blockbuster TV and movie platform, thanks to streaming platforms like Netflix and Amazon Prime Video. It allowed anyone to create and upload their own high-quality content and build loyal digital audiences. And coupled with the rise in computing power, it allowed us to work from anywhere we wanted, removing the need for many jobs to be based in an office. Social media became our most-visited destination outside of work and school. 3.5 billion people began sharing their daily lives with friends, family and followers, and started relying on those platforms for news, short-form entertainment and hot takes.

Huge upgrades in home broadband speed took place throughout the 2010s, thanks to the continued rollout of fibre connections and introduction of 4G mobile internet. It meant that people could do more than they ever could before online, and it replaced countless tasks that we previously would've had to do in-person. In 2015, broadband was first recognised as a utility by the UK, as the government issued a 'universal service obligation' to providers. It gave homeowners the legal right to an affordable internet connection, and put broadband alongside water and electricity in terms of importance to home life. As for most of the world, the internet had become as normal as any other utility. It was no longer something you noticed — unless it lost connection, of course. It just became the thing that works in the background that allows us to work, play and socialise.

2020s: working from home, 5G and a full fibre future. Just when we thought we were hitting peak internet, the world was hit with the Covid-19 pandemic. Millions of people had to start working and learning from home, at almost no notice. This put immediate pressure on everyone's home broadband, as suddenly we were staying in and using the internet throughout the whole workday too. It highlighted that, while the internet had been taken for granted by so many, there was a significant number of people who didn't have proper access to it. And at a time when home internet was needed more than ever for maintaining everyone's livelihoods, the digital divide was split even wider. In households without a proper internet connection, children fell behind at school, applying for jobs became far more difficult, and millions of people couldn’t keep in touch with their loved ones. It shone a harsh light on ways the internet should be made more accessible for everyone. That includes: Connecting rural and remote properties; Supporting vulnerable customers; Making broadband more affordable for those on income support; Training people who have had little experience with the internet.

As for the future, the rising demand for internet data shows no sign of stopping. Connections will have to handle increasingly data-heavy tasks, and the internet speed needed will quickly add up. For example, the following technologies would spell a much bigger need for data in the coming years: Online virtual reality experiences; Game streaming services; More smart home devices; 8K picture quality streaming.

Currently, the gigabit rollout is racing forth to ensure our homes can handle these high-data activities. The good news is, gigabit speeds are by far enough to handle this. In fact, they’re faster than almost any home will require right now. But the technology that supplies these speeds is what’s important, because it’s the best way to future-proof your home broadband connection for when devices will start to need much more.

Answer the questions based on the text.

1. How did Tim Berners Lee influence the development of the Internet?
2. What is USENET? How did it work?
3. How and when did Amazon, Google, eBay, IMDb, and Yahoo appear?
4. Dwell upon the peculiarities of dial-up connections.
5. What is broadband? How did it influence the development of the Internet?
6. Explain the "Dot-com bubble" concept.
7. What are the pros of fiber-optic broadband?
8. How the world of the Internet was changed in the 2010s?
9. Did COVID-19 influence the usage of the Internet? From which perspective?
10. How do scientists view the future of the Internet?

Find the appropriate English equivalents in the text and try to create your own sentences with them.

Обмінюватися інформацією в цифровому форматі, створювати сайти, спільний доступ до файлів, доступ до візуальних медіа в Інтернеті, переглядати інтернет-сторінки, швидкісний Інтернет, завантажувати та надсилати файли, доступний Інтернет зв'язок, підключатися до Інтернету, комутований зв’язок, соціальні мережі, підписники, працювати у фоновому режимі.

Join the terms with its explanations. Try to create the sentences of your own with them.

Internet vocabulary

Term	**Definition**
1. avatar	a) a (relatively small) regularly updated website or webpage, often operated by an individual and written in a conversational style.
2. **banner**	b) a small file that a webserver installs on your computer or device to identify and track you.
3. **blog**	c) information system on the internet that allows pages (documents) to be connected to other pages by hypertext links, such that users can search for information by moving from one page to another page
4. browse	d) an icon or symbol representing a particular person in an internet forum or video game etc.
5. browser	e) Sensational content or headlines specifically written to encourage visitors to click.
6. chat	f) one or more webpages under a single domain name and typically based around the same topic and managed by a single organization or person.
7. clickbait	g) unrequested, irrelevant and/or unwanted email, often sent in bulk, for the purposes of advertising, phishing, spreading malware etc.

8. cookie	h) an application on computer, smartphone and other devices for connecting to the internet and navigating between webpages.
9. World Wide Web	i) a system that lets computers, smartphones and other devices connect wirelessly to each other over a limited area or connect to the internet.
10. website	j) a special name used by a user to login to a website, or to post messages or use an email service etc.
11. userna me	k) the full address of a website or webpage
12. unifor m resource locator	l) look around the internet or look through or scan a website
13. Wi-Fi	m) an informal online conversation using text messages in real time.
14. **spam**	n) an advertisement on a webpage in the form of a graphic bar, column or box.

Fill in the gaps.

engineer / to send and receive /communication/ messages / network /text/ machines

The First Network Email Sent by Ray Tomlinson

Much like the first telegraph or phone call, the first email marked an historic moment in the evolution of_____. Unfortunately, the message itself was less than earth shattering. The____of that first electronic missive consisted of "something like QWERTYUIOP."

Sent by computer ______Ray Tomlinson in 1971, the email was simply a test message to himself. The email was sent from one computer to another computer sitting right beside it in Cambridge, Massachusetts, but it traveled via ARPANET, a_____of computers that was the precursor to the Internet.

Working for Bolt Beranek and Newman (the company picked by the U.S. Defense Department to build ARPANET), Tomlinson had been fooling around with two programs called SNDMSG and READMAIL, which allowed users to leave _____for one another on the same machine. He applied the idea behind these programs to a third program called CYPNET, which allowed users ___________files between computers. The combined technology allowed people to send and receive files that could be appended between different_____.

Read and translate the text, write out unknown items of vocabulary. Do the tasks following the text.

Is Internet Addiction a Growing Problem?

Cam Adair finally realised that his addiction to video games was out of control when it made him consider ending his life. "I struggled with it for 10 years," he says. "I dropped out of high school, never went to college, and pretended to have jobs to deceive my family."I eventually wrote a suicide note, and it was on that night that I realised I needed to get help. I'm now 3,860-day-free from my gaming addiction."

Mr Adair, a 32-year-old Canadian, has gone on to become the founder of Game Quitters, an online support group for people struggling with gaming addiction. It now has more than 75,000 members around the globe. While technology, and specifically the internet, has helped to keep the world running during the coronavirus lockdowns, he says it has been difficult for people like him."The pandemic led to me spending more time than usual watching Twitch [a live streaming service that focuses on people playing computer games], and YouTube," says Mr Adair. "Much of that [YouTube] content was game streamers and games too, both of which can be strong triggers to relapse and play. Thankfully I was able to stay away from a relapse, but I know many people in the Game Quitters community who did unfortunately relapse during Covid."

In their paper published in journal, CNS Drugs, on Internet addiction, Martha Shaw and Donald W Black from the Department of Psychiatry, University of Iowa, classify gaming dependency as part of wider internet addiction. The paper defines this as "excessive or poorly controlled preoccupations, urges or behaviours regarding computer use and internet access that lead to impairment or distress".

While many would argue that it is not as serious as alcoholism or drug addiction, it can still be debilitating for sufferers. And Dr Andrew Doan, a neuroscientist and expert on digital addiction, agrees that the lockdowns have exacerbated the problem."Stresses in life leads to cravings for behaviours and escape mechanisms," he says. "The pandemic has increased stress in people's lives, and a convenient way to escape is using entertainment digital media, such as gaming and social media."Excessive use to escape stress is a risk factor for the development of addictive behaviours."

To help combat internet addiction, a number of tech firms have produced tools that can be used to help block or limit access to the web, or gaming websites. Linewize is one such product aimed at children, or - more specifically - their parents.The website and app allow parents and carers to remotely limit and monitor the time children can spend on gaming sites, or the internet overall, be it via the kids' smart phones or laptops. Linewize also contains the usual "parental locks" that prevent access to pornography or violent material.

Teodora Pavkvic, a qualified psychologist, and digital wellness expert at San Diego-based Linewise, says that young people are particularly susceptible to spending too much time online. This is something that parents of teenagers would be quick to agree with."Managing time online in a digitally healthy and balanced way requires highly sophisticated cognitive skills that don't fully develop until we reach the age of 25." She adds: "Online platforms are built to extract and maximise our time, attention and data, and so that - combined with the many sneaky dangers that lurk online - make it exceptionally difficult for children to engage with the online world in a measured, safe and responsible way."

For adults, internet addiction can also blur into gambling addiction, with betting apps and websites fuelling the latter. BetBlocker is an app that allows people to block their access to tens of thousands of gambling websites and apps for a user-determined period of time.Once the restriction is activated, the person cannot access the gambling platforms until the restriction expires.The BetBlocker app - which is free - can also be controlled by someone's partner, friend, or parents. "The ease of access to remote gambling is unquestionably the biggest challenge that anyone with a gambling addiction will face today," says BetBlocker's founder Duncan Garvie. "Everyone is walking around with a casino, or bookie, in their pocket, and it is very easy to play discretely."Users can block gambling sites for hours, days, or weeks. And people can also use the app to block other websites, such as gaming ones. "This is intended to help users, by creating a restriction during known periods of vulnerability," adds Mr Garvie, who is based in Edinburgh.

GamBlock is another app that can be used in a similar way to prevent access to gambling websites. The Australian firm's chief executive David Warr says "we are not anti-gambling". Instead the focus is on helping problem gamblers. Dr Doan's expertise in video games addiction has partly come the hard way - he used to be such an addict himself. "During medical school at The Johns Hopkins University School of Medicine [in Baltimore], and during my residency training, I was playing 80 to 100 hours of video games per week, for about 10 years," he says.

The author of a book called Hooked On Games: The Lure And Cost Of Video Games And Internet Addiction, he says that the internet should be seen as two separate parts. «I break down digital media into two broad categories - digital sugar verses digital veggies.

Digital veggies, such as online therapies, can be utilized to help people manage their stress and reduce their risk for addictive behaviors."[Whereas] the excessive usage of digital sugars like gaming, pornography and non-work related social media can increase the risk of addictive behaviors, in particular when these activities are used to escape daily stressors." Dr. Doan fears that given the amount of time we now all spend online, we will see more gaming and internet addictions.

However, Cam Adair is hopeful that tech firms such as Linewize, BetBlocker and GamBlock can play an important role in helping to alleviate the problem. And it is important to stress that anyone concerned about any form of addiction should contact their doctor. Mr. Adair's work has been published in Psychiatry Research, and he is now an international speaker, talking about addiction. "Asking for help saved my life," he says. "I was deceptive, withdrawn, isolated, hostile and unreachable during my addiction. Now I'm happy, content, and able to cope with normal life's stresses."

Answer the questions to the text.

1. Who is Cam Adair? How did he get his addiction?
2. What does the group Game Quitters do?
3. How did the pandemic influence, addicted people?
4. What must people do to combat internet addiction?
5. Which apps can help to control and restrict people from internet addiction? Give a detailed description of each.
6. How did Dr. Doan explain two terms in his book "digital sugar versus digital veggies"?
7. Do you have an internet addiction?
8. What can you do about internet addiction if you feel you have it?
9. How do you prevent internet addiction?
10. What would life be like without the internet?

TRY TO DEFINE IF YOU ARE INTERNET ADDICTED OR NOT WITH THE HELP OF INTERNET ADDICTION TEST.

This questionnaire consists of 20 statements. After reading

each statement carefully, based upon the 5-point Likert scale, please select the response (0, 1, 2, 3, 4 or 5) which best describes you. If two choices seem to apply equally well, circle the choice that best represents how you are most of the time during the past month. Be sure to read all the statements carefully before making your choice. The statements refer to offline situations or actions unless otherwise specified.

0 = Not Applicable 1 = Rarely 2 = Occasionally 3 = Frequently 4 = Often 5 = Always

1. ___How often do you find that you stay online longer than you intended?

2. ___How often do you neglect household chores to spend more time online?

3. ___How often do you prefer the excitement of the Internet to intimacy with your partner?

4. ___How often do you form new relationships with fellow online users?

5. ___How often do others in your life complain to you about the amount of time you spend online?

6. ___How often do your grades or school work suffer because of the amount of time you spend online?

7. ___How often do you check your email before something else that you need to do?

8. ___How often does your job performance or productivity suffer because of the Internet?

9. ___How often do you become defensive or secretive when anyone asks you what you do online?

10. ___How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?

11. ___How often do you find yourself anticipating when you will go online again?

12. ___How often do you fear that life without the Internet would be boring, empty, and joyless?

13. ___How often do you snap, yell, or act annoyed if someone bothers you while you are online?

14. ___How often do you lose sleep due to being online?

15. ___How often do you feel preoccupied with the Internet

when off-line, or fantasize about being online?

16.___How often do you find yourself saying "just a few more minutes" when online?

17.___How often do you try to cut down the amount of time you spend online and fail?

18.___How often do you try to hide how long you've been online?

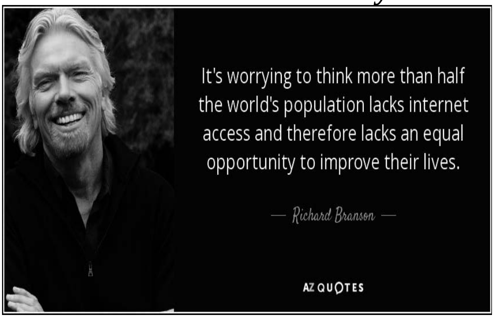
19.___How often do you choose to spend more time online over going out with others?

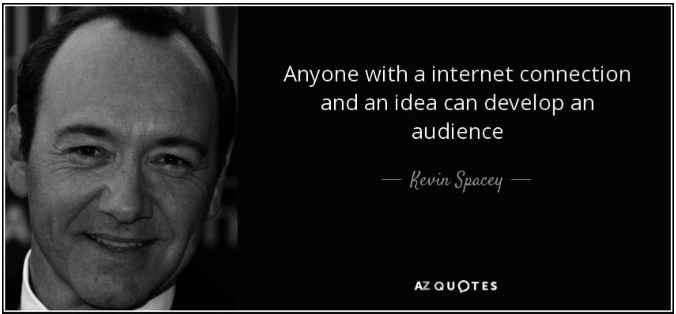
20.___How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?

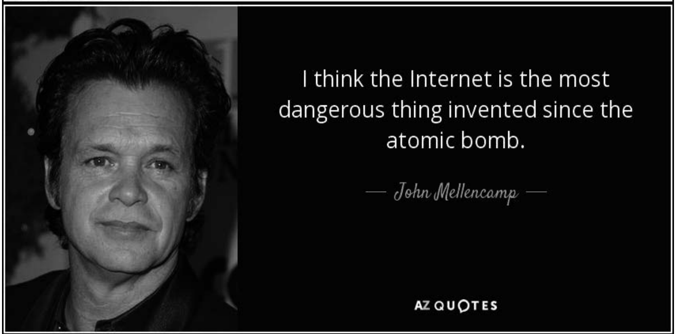
SCORING

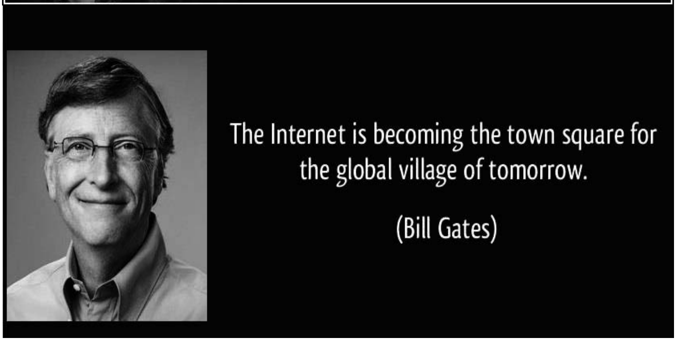
The IAT total score is the sum of the ratings given by the examinee for the 20 item responses. Each item is rated on a 5-point scale ranging from 0 to 5. The maximum score is 100 points. The higher the score is, the higher is the severity of your problem. Total scores that range from 0 to 30 points are considered to reflect a normal level of Internet usage; scores of 31 to 49 indicate the presence of a mild level of Internet addiction; 50 to 79 reflect the presence of a moderate level; and scores of 80 to 100 indicate a severe dependence upon the Internet.

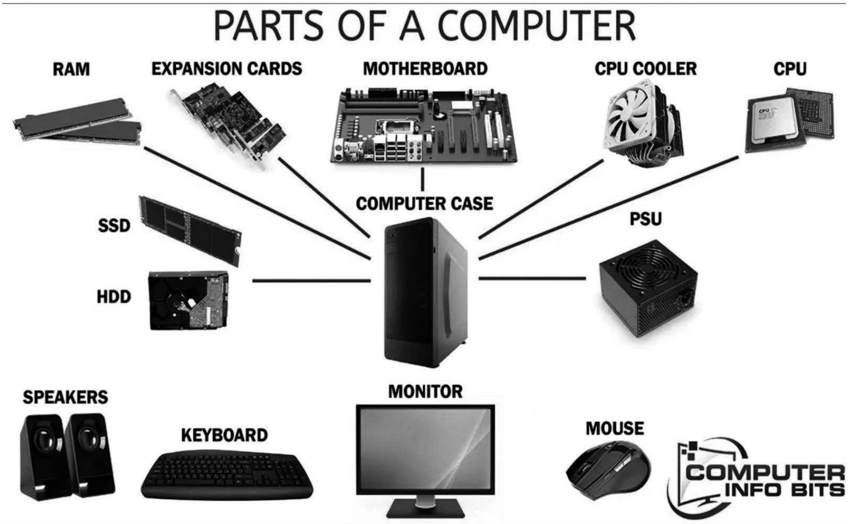
Look through the quotes of famous people on the Internet, choose one from the list and write a short essay on it.




Anyone with a internet connection and an idea can develop an audience
— Kevin Spacey —
AZ QUOTES


I think the Internet is the most dangerous thing invented since the atomic bomb.
— John Mellencamp —
AZ QUOTES


The Internet is becoming the town square for the global village of tomorrow.
(Bill Gates)



Discuss the following questions.

1. Are you computer literate?
2. Do you have a laptop or a desktop computer? Do you have both?
3. Have you ever studied English using your computer?
4. How many times have you upgraded your computer?
5. How powerful is your computer?
6. Where do you use your computer?
7. How often do you use a computer?
8. What do you use a computer for?
9. What operating system do you use?
10. What software do you use the most often?
11. When did you first start using a computer?
12. Who taught you to use a computer?

Parts of a Computer and Their Functions

Going over the basic parts of a computer and their functions will help you understand all the vital components that make up a computer. Knowing what the component is, is good, but we will explain each part's function, giving you a firmer understanding of them.

1. The computer case or system unit. This is the component that holds all of the parts to make up the computer system. It is usually designed in such a manner to make fitting a motherboard, wiring, and drives as easy as possible. Some are designed so well that it is easy to make everything look tidy and presentable. Cases come in all different sizes and shapes to accommodate various types of computer components and satisfy the consumer's needs. Design elements can vary from plain to highly elaborate. You can get a plain grey desktop case or one with colored lighting everywhere to make it look spectacular. Computer cases rely on computer fans inside them to create proper airflow to keep all the internals cool and working reliably. A computer case, like most things, varies in quality. You can get them made from cheap metals or good quality materials that provide you with a sturdy design.

2. Motherboard is the main board that is screwed directly inside the computer case. All other cards and everything else plug directly into the motherboard, hence its name. The CPU, RAM, drives, power supply, and more are connected to it. Its function involves integrating all the physical components to communicate and operate together. A good motherboard offers a wide amount of connectivity options. It also has the least amount of bottlenecks possible. This allows all the components to operate efficiently and to fulfill their maximum potential as they were designed to do. Obviously, as the physical size is reduced, it begins to limit connectivity options and functionality.

3. **Central Processing Unit (CPU** is basically like the brain of computer systems. It processes all the information on a computational level. It takes all the processes from the RAM and processes them to perform the tasks required by the computer system. The central processing unit is usually seated in a socket that utilizes a lever or a latch with a hinged plate with a cut-out in the center to secure the CPU onto the motherboard. It has many copper pads underneath it for the socket contacts to push up against them to make electrical contact. There are other ways CPUs can be attached to the motherboard. Here

are some common examples:

- ZIF (Zero Insertion Force): Although this is a more desirable socket, they are mostly found on older computer motherboards. A lever-operated mechanism to clamp the pins of the processor.
- PGA (Pin Grid Array): It is also a ZIF socket but has a different pin pitch and contains a different pin count.
- LGA (Land Grid Array): More commonly found on motherboards today. A levered hinged plate with a center cut-out clamps down on the processor.
- BGA (Ball Grid Array): The CPU is soldered directly onto the motherboard. This makes it a non-user-swappable component. It is susceptible to bad connectivity.

A processor generates a decent amount of heat, especially when it is working under high loads. It will run even hotter when it is set to a higher clock speed to make it run faster. This is called overclocking. This is why a heatsink and fan assembly are required to draw the heat away from the central processing unit and distribute it to thin sheets or fins of metal for the fan to cool down. There are so many different types of computer processors. The top manufacturers of processors are Intel, AMD, and NVidia.

4. Random Access Memory (RAM) is a data storage device that can provide fast read and write access. RAM is volatile memory, meaning it loses all the stored data when power is lost. The RAM keeps data ready for the CPU to process. The RAM speed is a big contributor to the overall speed of a computer system. It plugs directly into a long slot that has contacts on either side of the slot. It, too, has a clock speed, just like a processor. So, it can also be overclocked to deliver increased performance beyond the intended specification. Certain RAM modules are sold with a heat spreader. It helps dissipate the heat from the individual memory ICs, keeping them cooler. RAM has evolved like any other component. RAM used on the motherboard often uses DDR (Double Data Rate) SDRAM (Synchronous Dynamic Random Access Memory) type memory. RAM Amount always comes in powers of 2, so you will always see numbers like 16GB, 32GB, or 64GB of RAM, to mention some examples of memory units.

5. Graphics Card or Graphics Processing Unit (GPU) is an output device that processes the data from the motherboard and sends the appropriate information to the computer's screen for display. You can connect monitors to it using HDMI, DisplayPort, DVI, or VGA connectors. It can also be referred to as a video or display card. A video card takes the burden of all the video processing from the main CPU. This gives a computer a big boost in performance. Because of the large processing requirements for a gaming GPU, fans are almost a given. A video card plugs into a PCI Express (Peripheral Component Interconnect Express) slot on the motherboard. It is a serial expansion bus slot capable of high bandwidth in two directions.A graphics card has a GPU (Graphics Processing Unit), the main part of a computer system that requires cooling. A GPU is slower than a CPU but is designed to deal with mathematical operations required for video rendering. The card's memory amount varies depending on the manufacturer's design. Video cards use GDDR (Graphics Double Data Rate) SDRAM, which is specially designed to optimize graphics performance. GDDR is built to handle a higher bandwidth compared to plain DDR ram.

6. Sound Card. Most of the time, the sound chip built into the motherboard is used for audio output. But, if you are a sound enthusiast or prefer high-quality audio output while playing a game, you might be inclined to use a sound card. Sound cards plug into a computer in multiple ways. It can be through USB, PCI slot, or PCI Express x 1 slot. External DACs have gained much more popularity and help deliver clearer and more defined audio or high-definition sound output. They connect up using an IO cable like a USB cable to your computer or laptop and provide a line out for your speakers or headphones. A sound processing chip on the card does all of the audio processing and is usually not a very powerful processor. A sound card can offer a wide range of connectivity with various audio equipment. A few examples could be optical audio, a 1/4 inch jack, or RCA connectors.

7. Hard Disk Drive (HDD) is still found in many PCs to this day. A mechanical drive's purpose is to store all your information for retrieval at any time. Apart from storing information for your computer, it also functions as a boot drive to run the operating system (OS) from it. You can install operating systems of many different kinds depending on your needs. An OS is a software program that's installed, making a computer useable, like Microsoft Windows, for example. The biggest vulnerability of a mechanical drive is its physically fragile nature. One bump the wrong way can destroy a whole drive. A mechanical hard drive contains one or more platters that spin anywhere between 5200 to 10000 RPM (revolutions per minute). The read and write heads are spaced only about 0.002 (51 micro M) inches from the platter. This gives you an idea about the physical limitations of its fragile nature. Small areas on the platter can be arranged to represent a 1 or a 0. It can be changed using the drive head to alter the material to represent the correct value magnetically. This is how to write data to the drive for storage. There are various categories of hard drives made for various real-world applications. Some examples include: General use for desktops or laptops; Gaming optimized for desktops or laptops; General high-capacity storage; NAS Devices; Servers; Video recording. They can also be purchased as an external drive that usually connects to your computer by USB cable. An uninterruptible power supply is sometimes used to prevent data loss with mechanical drives where a sudden power outage is experienced, or the power cord is accidentally disconnected while the computer is running. This allows proper shutdowns for desktop systems that have experienced sudden power loss.

8. **Solid State Drive (SSD)** is also a type of hard drive, but it doesn't have any moving bits. It consists of a bank of flash memory that can hold a reasonable amount of information. While SSDs are increasing in size all the time, they aren't cost-effective for storing large amounts. A mechanical drive has a cheaper gigabyte-to-dollar ratio. However, the SSD is a high-performance drive. It's fast and cannot be as easily damaged by dropping it or taking a few bumps. SSDs are available as 2.5-inch laptop encapsulated drives, and an M.2 SDD is the most commonly used kind on the market. That's why I always recommend SSDs for portable-type computers where possible.

9. Power Supply Unit (PSU) mounts inside the computer case. It converts the AC mains supply from the power cord from a wall socket and supplies the correct DC voltages to all the components inside the computer. A computer power supply supplies the following voltages:

+3.3v: This voltage is supplied to the motherboard.

+5V: This voltage is supplied to the motherboard and other computer hardware.

+12V: This voltage is supplied to the motherboard and other components.

-12V: This voltage is supplied to the motherboard.

It plays an important role in keeping a computer running reliably. You get different wattage ratings for power supplies. The higher the wattage, the higher the electrical current that can be made available to everything that needs it to function properly. The higher you go in Watts, the more the power supply will likely cost. A power supply usually also comes with a cooling fan. This helps all the internal components in your computer to stay cool when the power supply is subjected to bigger loads.

10. Monitor or Visual Display Unit (VDU) is an output device used to visualize the graphics information sent from the computer's GPU. There are various types of monitors on the market. A LED (Light Emitting Diode) backlit LCD (Liquid Crystal Display) monitor is the most commonly used with a modern PC. There are also various computer screen sizes with different aspect ratios. The aspect ratio is simply the ratio between height and width. For example, a 16:9 aspect ratio computer screen will have 16 parts wide to 9 parts in height. There are also curved computer monitors, but they are more expensive computer screens. Monitors also have a fast response time to keep up with the high demands required to eliminate delays with user input for gaming.

11. Keyboard is an input device that is one of the ways to communicate with a computer. Typing a key from the keyboard sends a small portion of information to tell the computer which key was pressed. Once the computer receives input from the keyboard, it can use the keystrokes in digital form to produce a specific task in any software that's being used. The computer system can use this information in many ways. An example could be a command or a character that can be used in a document. There are two main different types of keyboards. Mechanical and membrane types.

12. Mouse is an input device that allows the user to move a pointer displayed on the monitor and experience a more intuitive interaction with computer systems. These days mice have more buttons than the common three and offer way more functions than mice in the early days. However, the three main buttons allow the user to select, grab, scroll and access extra menus and options. A computer mouse is a handy pointing device that can be wired or wireless. The latter obviously requires batteries. Optical mice of today allow for very accurate precision and smooth movement.

Common peripheral components for computers

Printer can take an image sent by a computer and deliver it onto a sheet of paper. It does this by using the information from the computer, and by either using toner or ink, it deposits one of these in a controlled and accurate manner to form the image.

Scanner can take anything on paper, and it functions by scanning it to produce a replicated digital image for a computer to save. This is also handy for saving physical photos you want to preserve. Once the photo is stored digitally, it won't decay as a physical photo does over time. The flatbed scanner is the most commonly used today. Many all-in-one devices, also known as multifunction devices, have printer and scanning capabilities in one reasonably compact product.

Computer Speakers can connect to the sound card at the rear of the computer. Another way they can be connected is by a monitor that already has built-in speakers. Generally, the sound quality is poor from a monitor's speakers. That's why most people buy a set of computer speakers for their desks. You can even connect up a 7.1 surround speaker system to certain sound cards for a computer. This can add a nicer experience to gaming, playing music, or watching a film.

Answer the questions based on the text.

1. What is a system unit? What does it include?
2. What is the main task of the motherboard?
3. Give the definition of SPU? How can it be attached to the motherboard?
4. What are the main peculiarities of RAM?

5. How does GPU work?
6. What do people use sound cards?
7. Dwell upon Hard Disk Drive.
8. What are the pros and cons of SSD.
9. What is the role of the Power Supply Unit?
10. Tell about the output devices of a computer.
11. Which input devices do you know? Tell about their functions.
12. Describe peripheral devices and their functions.

Find the appropriate English equivalents in the text above.

Материнська плата, задовольняти потреби користувача, процесор, оперативна пам'ять, накопичувачі, джерело живлення, обмежувати можливості підключення та функціональність, обробляти інформацію, гніздо, працювати під високим навантаженням, блок радіатора та вентилятора, відводити тепло від центрального процесора, енергонезалежна пам’ять, втрачати всі збережені дані при зникненні живлення, надсилати інформацію на екран комп’ютера для відображення, підвищувати продуктивність комп’ютера, відео карта, виводити звук, звук високої чіткості, під’єднувати за допомогою кабелю, колонки та навушники, запуск операційної системи, записувати дані на диск, джерело безперебійного живлення, блок живлення, пристрої введення та виведення інформації.

Join the terms with their explanations.

Term	Explanation
1. cache	A. Used to measure computer memory and storage.
2. CD-ROM	B. a kind of memory used to make a computer work faster
3. CPU	C. a cheap, removable disk used for storing or transferring information.
4. DOS	D. the equipment inside a computer that creates the image on the screen

5. floppy disk	E. a socket at the back of a computer for connecting external equipment or peripherals, especially printers
6. folder	F. This is a PC's heart or "brains".
7. graphics card	G. a small, external device for storing data; it connects through the USB socket.
8. hard disk	H. This describes the speed of computer equipment.
9. Kb, Mb, Gb	I. a sub-division of a computer's hard disk into which you put files
10. MHz	J. The original system used for PCs, where you typed in commands instead of pointing and clicking.
11. parallel port	K. the main disk inside a computer used for storing programs and information.
12. USB flash drive	L. a disk for storing computer information. It looks like an audio CD.

Read and translate the text. Do the exercises following it.

History of the Computer

The computer as we know it today had its beginning with a 19th century English mathematics professor named Charles Babbage. He designed the Analytical Engine and it was this design that the basic framework of the computers of today are based on. Generally speaking, computers can be classified into three generations. Each generation lasted for a certain period of time and each gave us either a new and improved computer or an improvement to the existing computer.

First generation: 1937 – 1946 - In 1937 the first electronic digital computer was built by Dr. John V. Atanasoff and Clifford Berry. It was called the Atanasoff -Berry Computer. In 1943 an electronic computer name the Colossus was built for the military. Other developments continued until in 1946 the first general– purpose digital computer, the Electronic Numerical Integrator and Computer was built. It is said that this computer weighed 30 tons, and had 18,000 vacuum tubes which were used for processing. When this computer was turned on for the first time, lights dimmed in sections of Philadelphia. Computers of this generation could only perform one single task, and they had no operating system.

Second generation: 1947 – 1962 - This generation of computers used transistors instead of vacuum tubes, which were more reliable. In 1951, the first computer for commercial use was introduced to the public; the Universal Automatic Computer. In 1953 the International Business Machine (IBM) 650 and 700 series computers made their mark in the computer world. During this generation of computers over 100 computers programming languages were developed and computers had memory and operating systems. Storage media such as tape and disk were in use.

Third generation: 1963 - present - The invention of integrated circuit brought us the third generation of computers. With this invention, computers became smaller, more powerful and more reliable, and they are able to run many different programmes at the same time. In1980, Microsoft Disk Operating System was born and in 1981 IBM introduced the personal computer (PC) for home and office use. Three years later Apple gave us the Macintosh computer with its icon driven interface and the 1990s gave us the Windows operating system.

As a result of the various improvements to the development of the computer, we have seen the computer being used in all areas of life. It is a very useful tool that will continue to experience new development as time passes.

Define if the following statements are TRUE or FALSE.

1. The first generation of computers was from 1947 to 1962.
2. The modern computer is based on the one designed by a mathematics professor.
3. The first computer for commercial use was introduced to the public in 1961.
4. By 2035, every home will have a personal computer.
5. Third generation computers are more reliable, more powerful and smaller.
6. The second generation computers used the Windows operating system.
7. Charles Babbage also invented radar and the stethoscope.

8. Apple introduced the personal computer for home and office use in 1981.

9. Dr. John V. Atanasoff & Clifford Berry built the first electronic digital computer

10. The Windows operating system arrived in the 1990s.

11. Dr. John V. Atanasoff and Clifford Berry were related.

12. The father of the computer is thought to be Charles Babbage.

Answer the Questions based on the text.

1. Which company developed 100 computer programming languages?
2. In which year did Apple give us the Macintosh computer?
3. What was invented in 1963?
4. What are the 4 main advantages of third generation computers?
5. When was the electronic computer built for the military?
6. How heavy was the Electronic Numerical Integrator & Computer (ENIAC) ?
7. How was information stored by computers in 1953?
8. What was the name of the first commercial computer?
9. When was the Microsoft Disk Operating System (MS-Dos) born?
10. How many tasks was a first generation computer able to perform?
11. What brands of computer do you like and why?
12. For how much longer will computers continue to be developed?

Read and translate the text. Do the quiz after it.

History of Computer Mouse

The first computer mouse was invented by Douglas Engelbart in 1964. It was designed as a wooden box, with two metal wheels that make contact with the surface and only one key. 8 years later, in 1972, Bill English created what we know as the "Ball Mouse". The ball replaced the wheels which allows it to move in every direction.

1973, PARC invented the very first table computer Alto, and put it into market. At that time, these devices possess a special input interface made by SRI. Alto's users were all attracted to the mouse, and proved its potential market capability.

Years later, computer mouse started using wheels. They were replaced, however, in 1999 by an Opic LED design from Microsoft. Unlike the one in 1981, this generation does not require a mouse pad.

In 1981, Steven Kirsch invented a optics model for the computer mouse system. This model uses light instead of balls to trace it's movement. It prevents dirt from getting stuck inside. For it to function, users need to have a mouse pad (which is probably expensive).

Apple started investigating the wired mouse, hoping to make it to be less complicated. Finally in 1998, Apple's first USB interface computer mouse iMac was born. The round shape confused many of its users, and a nickname 'Ice Ball' was given to it.

Until 2000, Apple released a Pro series of computer mouse. It was wrapped in transparent plastic, and push buttons were replaced.

S+ARCK computer mouse was announced by Microsoft in 2004. Invented by Philippe Starck, it is Microsoft's first attempt to put art into its products. Also, this design works well for the left-handed people just the same.

In all these years, very less products could be as creative as the Talk (VN-CX1) SONY released in 2005. This type of mouse can 'transform' into a telephone when its users need to. It combined the typical flip phone and portable computer mouse together.

The modified Pro computer mouse invented by Apple in 2005 contained an all direction rolling ball. The Magic Mouse, in 2009, simplified this even more. On the top is a gesture text input design.

2010, Microsoft pushed out the bendable Arc computer mouse. When not used, this type of mouse can be laid flat. When used, it can bend to adjust to its user's palm shape. Microsoft says that with the Blu-Ray technic, it allows the mouse to be used on wood or even carpet.

Quiz.

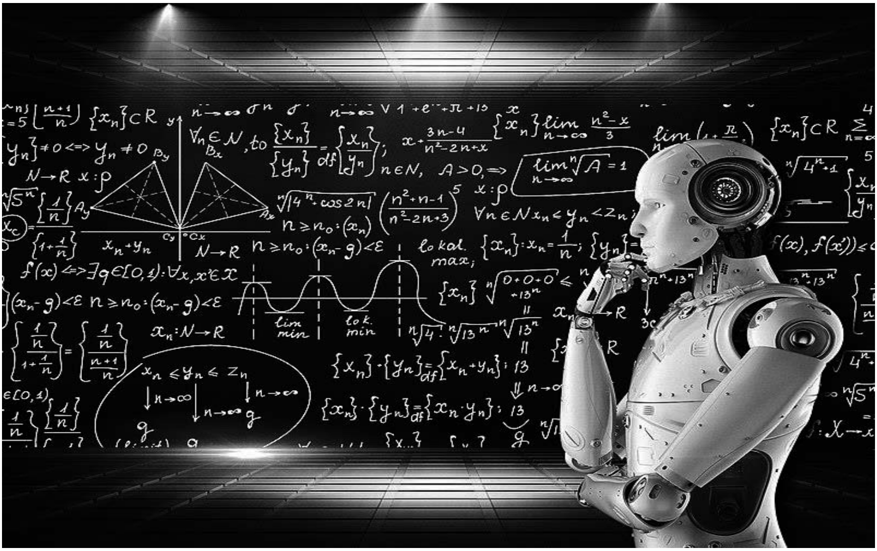
1. When was the first computer mouse invented? A) 1964; B) 1972; C)1962.
2. What nickname was given to Apple's first USB interface computer mouse iMac? A) White Mac; B) Ice Ball; C) Dexter.
3. Who invented the first optic model computer mouse? A) Microsoft; B) Steven Kirsch; C) Apple; D) Sony.
4. The very first table computer Alto was invented in….A) 1975; B) 1973; C) 1969.
5. Who designed the mouse for left-handed? A) Microsoft; B) Apple; C) Samsung;

6. What did create Sony in 2005? A) Wireless mouse; B) Mouse-telephone; C) Laser mouth;

7. Which mouse must be left flat when it is not used? A) The Magic mouse; B) iMack; C) the bendable Arc mouse.

Creative task.

Your friend wants to build his/her own PC for gaming. He/She is worried because it's too complex, too expensive, or too time-consuming. Give the basic instructions and recommendations to your friend on how to build a good computer. In your guide, explain how to build a PC step by step, starting with clarifying his PC needs, understanding the different parts of a computer, and finally guiding him through the PC build process.



Artificial Intelligence

Read and translate the text. Create your own vocabulary based on the text. Do the exercises following it.

Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal. A subset of artificial intelligence is machine learning (ML), which refers to the concept that computer programs can automatically learn from and adapt to new data without being assisted by humans. Deep learning techniques enable this automatic learning through the absorption of huge amounts of unstructured data such as text, images, or video.

Artificial intelligence is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the most simple to those that are even more complex. The goals of artificial intelligence include mimicking human cognitive activity. Researchers and developers in the field are making surprisingly rapid strides in mimicking activities such as learning, reasoning, and perception, to the extent that these can be concretely defined. Some believe that innovators may soon be able to develop systems that exceed the capacity of humans to learn or reason out any subject. But others remain skeptical because all cognitive activity is laced with value judgments that are subject to human experience.

As technology advances, previous benchmarks that defined artificial intelligence become outdated. For example, machines that calculate basic functions or recognize text through optical character recognition are no longer considered to embody artificial intelligence, since this function is now taken for granted as an inherent computer function.

Artificial intelligence can be divided into two different categories: weak and strong. Weak artificial intelligence embodies a system designed to carry out one particular job. Weak AI systems include video games such as the chess example from above and personal assistants such as Amazon's Alexa and Apple's Siri. You ask the assistant a question, and it answers it for you.

Strong artificial intelligence systems are systems that carry on the tasks considered to be human-like. These tend to be more complex and complicated systems. They are programmed to handle situations in which they may be required to problem solve without having a person intervene. These kinds of systems can be found in applications like self-driving cars or in hospital operating rooms.

Artificial intelligence can be categorized into one of four types.

Reactive AI uses algorithms to optimize outputs based on a set of inputs. Chess-playing AIs, for example, are reactive systems that optimize the best strategy to win the game. Reactive AI tends to be fairly static, unable to learn or adapt to novel situations. Thus, it will produce the same output given identical inputs.

Limited memory AI can adapt to past experience or update itself based on new observations or data. Often, the amount of updating is limited (hence the name), and the length of memory is relatively short. Autonomous vehicles, for example, can "read the road" and adapt to novel situations, even "learning" from past experience.

Theory-of-mind AI are fully-adaptive and have an extensive ability to learn and retain past experiences. These types of AI include advanced chat-bots that could pass the Turing Test, fooling a person into believing the AI was a human being. While advanced and impressive, these AI are not self-aware.

Self-aware AI, as the name suggests, become sentient and aware of their own existence. Still in the realm of science fiction, some experts believe that an AI will never become conscious or "alive".

In recent years, AI has seen rapid advancements and has become an increasingly important part of our daily lives. With the explosion of data and the rise of cloud computing, AI systems have become more sophisticated and capable of performing a wider range of tasks. Today, AI is used in a variety of industries, from finance and healthcare to retail and transportation, and it has the potential to revolutionize the way we live and work.

Despite its rapid development, the field of AI still faces many challenges and ethical questions. As AI systems become more powerful, it's important to ensure that they are developed and used in a responsible and ethical manner, to maximize the benefits and minimize the risks. Overall, the history and development of AI is a testament to the incredible potential of the human mind to create machines that can change the world.

Answer the questions based on the text above.

1. Give the definition of AI.
2. What are the ideal characteristics of AI?
3. Define the principles and goals of artificial intelligence.
4. What is the difference between strong and weak AI?
5. Define and describe the four categories of AI.
6. Where is AI used today?
7. Have you ever faced AI in your own experience? Dwell upon this.

Find the appropriate English equivalents in the text. Create sentences with them.

Штучний інтелект, імітувати дії людей, машинне навчання, раціоналізувати та виконувати дії, поглинання величезних обсягів неструктурованих даних, імітація когнітивної діяльності людини,особистий помічник, набір вхідних даних, розвиток хмарного середовища, виконувати широкий спектр завдань.

Read and translate the text. Do the exercises following it.

The History and the Development of AI

Artificial Intelligence (AI) has a rich and storied history that spans several decades. The concept of creating machines that can think and reason like humans dates back to the ancient Greeks, but it wasn't until the mid-20th century that the field of AI truly began to take shape.

In the 1950s, computer scientists such as John McCarthy and Marvin Minsky started to lay the foundations for the field of AI by developing theories about how machines could learn and make decisions. This work was primarily focused on symbolic reasoning and rule-based systems, but it paved the way for future developments.

In the 1960s and 1970s, AI experienced a boom in funding and research, as governments and corporations saw the potential of the field. This led to the development of expert systems, which were designed to perform specific tasks, such as diagnosing diseases or playing chess. However, this initial burst of excitement soon faded, as the limitations of these early systems became apparent.

In the 1980s and 1990s, AI shifted its focus towards machine learning and data-driven approaches. Researchers started to develop algorithms that could learn from data and make predictions, rather than relying on pre-defined rules. This led to the creation of neural networks, which were modeled after the structure of the human brain and could be trained to perform a variety of tasks.

In recent years, AI has seen rapid advancements and has become an increasingly important part of our daily lives. With the explosion of data and the rise of cloud computing, AI systems have become more sophisticated and capable of performing a wider range of tasks. Today, AI is used in a variety of industries, from finance and healthcare to retail and transportation, and it has the potential to revolutionize the way we live and work.

Despite its rapid development, the field of AI still faces many challenges and ethical questions. As AI systems become more powerful, it's important to ensure that they are developed and used in a responsible and ethical manner, to maximize the benefits and minimize the risks. Overall, the history and development of AI is a testament to the incredible potential of the human mind to create machines that can change the world**.**

Answer the questions to the text.

1. When did the concept of creating machines that can think and reason like humans first arise?

2. What were the initial theories about AI developed in the 1950s?

3. What were the expert systems developed in the 1960s and 1970s used for?

4. How did AI shift its focus in the 1980s and 1990s?

5. What inspired the development of neural networks?

6. How has cloud computing impacted the field of AI?

7. What are some of the ethical questions that the field of AI still faces today?

8. How has the field of AI changed over the decades?

9. What were some of the earliest applications of AI?

10. Who are some of the pioneers in the field of AI and what were their contributions?

Match the following terms with their definitions by writing the letter of the definition next to the term.

A. Artificial Intelligence (AI) B. Symbolic reasoning C. Expert systems D. Machine learning E. Neural networks F. Cloud computing

1. A field of computer science concerned with creating machines that can think and reason like humans___

2. A method of AI that involves training systems to learn

from data and make predictions___

3. A type of AI system modeled after the structure of the human brain and capable of performing a variety of tasks___

4. A system designed to perform specific tasks, such as diagnosing diseases or playing chess___

5. A method of AI that involves using symbols and rules to reason and make decisions___

6. A technology that involves delivering computing resources over the internet____.

For each word or phrase below, write a sentence that uses it correctly and draws from the information in the text.

Artificial Intelligence (AI) Example sentence: "Artificial Intelligence, or AI, has a rich and storied history that spans several decades."

Symbolic reasoning, Expert systems, Machine learning, Neural networks, Cloud computing, Ethical questions.

Do the fill in activity.

Important/ revolutionizing /way /years/ presence/ efficiently /common

Artificial Intelligence (AI) has become an increasingly __________ aspect of modern technology and has found its way into many aspects of our daily lives. From virtual assistants like Siri and Alexa, to smart home devices that can control your lights and temperature, AI has made its __________ felt.

In the business world, AI has been __________ the way companies operate, automate repetitive tasks and improve decision-making processes. For example, AI algorithms can help financial institutions analyze market data and make predictions, while customer service bots can assist customers with their inquiries 24/7.

In the medical field, AI is being used to analyze vast amounts of patient data, helping doctors diagnose diseases and develop treatment plans more accurately and __________. AI-powered robots and prosthetics are also providing new possibilities for physical rehabilitation and improving the quality of life for people with disabilities.

The use of AI in education is also growing rapidly, with virtual tutors and personalised learning platforms becoming more __________. AI algorithms can help students learn more effectively by providing tailored feedback and recommending resources based on their individual needs.

However, despite the many benefits of AI, there are also concerns about its impact on society, such as job loss and privacy issues. As AI technology continues to evolve and become more integrated into our lives, it will be important to carefully consider these and other implications to ensure that AI is used in a responsible and ethical __________.

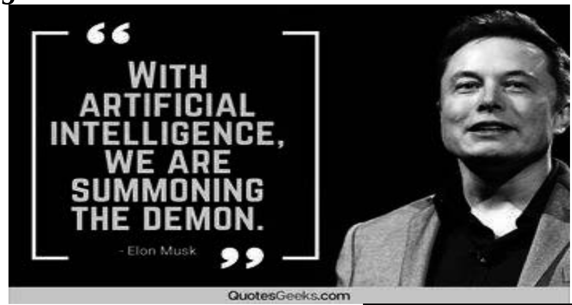
In conclusion, AI is rapidly changing the way we live, work and interacts with each other. While there are still challenges to overcome, the potential benefits of AI are numerous and it is set to play an even more significant role in our lives in the __________ to come.

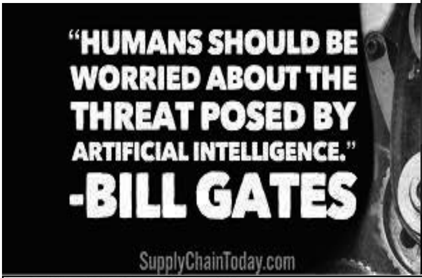
Here are the questions based on the text about the usage of AI nowadays:

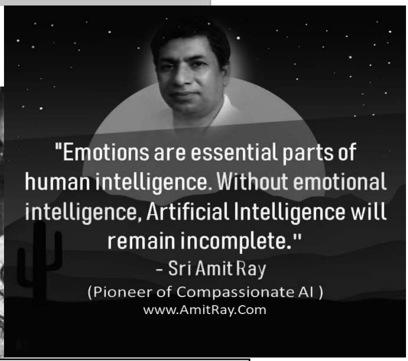
1. What has become an important aspect of modern technology?
2. What are some examples of AI being used in daily life?
3. How is AI changing the way companies operate?
4. In what fields is AI being used to analyze vast amounts of data?
5. What new possibilities are AI-powered robots and prosthetics providing for physical rehabilitation?

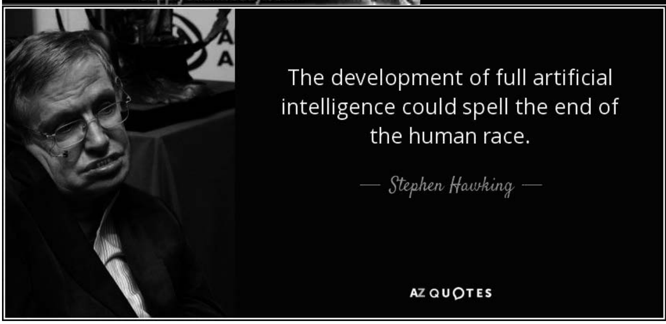
6. How is the use of AI in education growing rapidly?
7. What are some concerns about AI's impact on society?
8. What is the potential impact of AI on our lives in the future?

Discussion Topics: Do you agree with the quotes of famous inventors and scientists based on AI? YES/NO? Why? Explain your thoughts.









Texts and Tasks for Self-Study Work

Self-Study Work for Students Majoring in Math

Text 1

Greek Philosopher Pythagoras and His Famous Theorem

The influence of Pythagoras in mathematics and philosophy remains strong today. Like philosophy and religion, the science of mathematics can change the way we perceive the world and has a massive impact on our lives. In his life 2,500 years ago, the Greek philosopher combined philosophy, mathematics, and religion, and his work and ideas are still influential to this day. The Pythagorean theorem remains fundamental in mathematics and is taught in schools across the world.

The Greek philosopher and mathematician was born on Samos to an aristocratic family in 570 BC. He came from the house of Agaios, who was the founder of the colony of Samos. His father, Mnesarchus was a precious stones engraver. However, his early life is clouded by mystery, modern scholars disagreeing about his education and influences.

Philosopher's lifestyle entailed a number of dietary prohibitions, said to include vegetarianism, although some modern scholars doubt that he advocated for the diet.

Pythagoras' mysterious personality was noticeable during his teaching. Strangely, no notes and questions were allowed in his lessons, which is why a great part of his works are lost. There is no additional information even on the renowned Pythagorean theorem.

He died around 495 BC in Metapontum, Lower Italy, starving himself for 40 days because of his grief over the persecution of the Pythagoreans and the killing of the majority of them.

The Pythagorean School had a very conservative and strict code of conduct. The students had to keep the teachings and theories secret and if that did not happen it could even cost them their lives, it is said.

$$\boxed{\alpha^2=\beta^2+\gamma^2}$$

The Pythagorean Theorem. "Everything is a number" was the motto of the Pythagorean School. Pythagoras was influenced by the Babylonians, so the theorem attributed to his name probably came from them.

The Babylonians assigned numerical values to everything around them, from the movement of the planets to the efficiency of their slaves. That is why their theories are connected with those of Pythagoras.

There is a myth that Pythagoras sacrificed a calf, or a hundred calves according to other versions, to prove his theorem. However, this does not comply with the school's dietary rules, so it is considered almost impossible.

That is, in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the two perpendicular sides.

The Pythagorean is perhaps the best known of the mathematical theorems. It is a theorem that most people claim to know even if they don't understand what it means.

The Pythagorean Theorem was known long before Pythagoras. It was formulated earlier, but only as an empirical, unproven observation.

The simple phrase "The square of the hypotenuse (the side opposite the right angle) is equal to the sum of the squares of the other two sides" is pure mathematical magic.

For this reason the theorem got its name. It was later proven by many mathematicians, both geometrically and algebraically.

The Greek philosopher's theorem remains current 2,500 years later because it is a simple relation of square numbers inside of which all the glamor of mathematical science is hidden.

The Pythagorean theorem is justifiably the most popular and at the same time the most majestic theorem of mathematical science.

Other than his famous theorem, Pythagoras was credited with many mathematical and scientific discoveries, including Pythagorean tuning, the five regular solids, the Theory of Proportions.

Also, Pythagoras made developments regarding the spherical nature of the Earth and identified the morning and evening stars as the planet Venus.

It was said that he was the first man to call himself a philosopher and that he was the first to divide the globe into five climatic zones.

The Pythagorean theorem is everywhere. There are several reasons to love the theorem that changed the history of mathematics. It would be impossible to try to describe in detail the effects that the genius idea of Pythagoras had on the later history of mathematics.

Number Theory, the later "Diophantine Equations" and the study of prime numbers in general have the Pythagorean theorem as their basis.

The more than 370 different proofs of the Greek philosopher Pythagoras' theorem show in the most obvious way the huge scientific spectrum contained in a simple right triangle.

Geometry, trigonometry, algebra, differential equations and even imaginary complex numbers were founded using the Pythagorean theorem.

(Retrieved from: https://greekreporter.com/2022/08/12/pythagoras-greek-philosopher-theorem/)

Comprehension Check

I. Check your understanding.

1. Can the science of mathematics change the way we perceive the world?

2. When and where was Pythagoras born?

3. What do you know about the Greek philosopher and mathematician's lifestyle?

4.What was the reason of his death?

5.What was the motto of the Pythagorean School?

6. Dwell upon the Pythagorean theorem.

7. Was Pythagoras the first to divide the globe into five climatic zones?

8. What subsections of mathematics were founded using the Pythagorean theorem?

II. Are these sentences true (T) or false (F)?

1. The Pythagorean theorem isn't fundamental in mathematics anymore.

2. Pythagoras came from the house of Agaios, who was the founder of the colony of Samos

3. Different notes and questions were allowed in his lessons, which is why a great part of his works are lost.

4. The students had to keep the teachings and theories secret and if that did not happen it could even cost them their lives, it is said.

5. The Babylonians assigned numerical values to everything around them, from the movement of the animals to their own

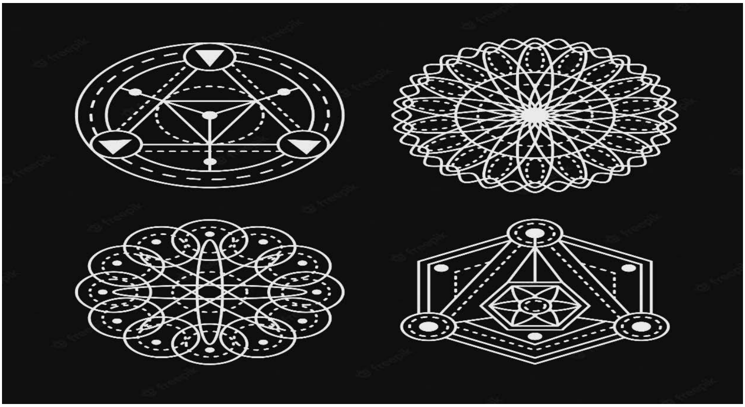
efficiency.

6. Pythagoras made developments regarding the spherical nature of the Earth and identified the morning and evening stars as the planet Venus.

III. Match the numbers to the letters

1. equation	a) the type of mathematics that deals with the relationship between the sides and angles of triangles
2. geometry	b) the act of treating somebody in a cruel and unfair way, especially because of their race, religion or political beliefs
3. persecution	c) a band of coloured lights in order of their wavelengths, as seen in a rainbow and into which light may be separated
4. efficiency	d) a statement showing that two amounts or values are equal
5. trigonometry	e) a type of mathematics in which letters and symbols are used to represent quantities
6. triangle	f) the quality of doing something well with no waste of time or money
7. algebra	g) a flat shape with three straight sides and three angles
8. spectrum	h) the branch of mathematics that deals with the measurements and relationships of lines, angles, surfaces and solids

III. What geometrical shapes can you identify?



Text 2
Ancient Egyptian Numeral System

The Egyptians, like the Romans after them, expressed numbers according to a decimal scheme, using separate symbols for 1, 10, 100, 1,000, and so on; each symbol appeared in the expression for a number as many times as the value it represented occurred in the number itself. For example, stood for 24.

In such a system, addition and subtraction amount to counting how many symbols of each kind there are in the numerical expressions and then rewriting with the resulting number of symbols. The texts that survive do not reveal what, if any, special procedures the scribes used to assist in this. But for multiplication they introduced a method of successive doubling. For example, to multiply 28 by 11, one constructs a table of multiples of 28 like the following:

1	28
2	56
4	112
8	224
16	448
...	...

The several entries in the first column that together sum to 11 (i.e., 8, 2, and 1) are checked off. The product is then found by adding up the multiples corresponding to these entries; thus, 224 + 56 + 28 = 308, the desired product.

To divide 308 by 28, the Egyptians applied the same procedure in reverse. Using the same table as in the multiplication problem, one can see that 8 produces the largest multiple of 28 that is less then 308 (for the entry at 16 is already 448), and 8 is checked off. The process is then repeated, this time for the remainder (84) obtained by subtracting the entry at 8 (224) from the original number (308). This, however, is already smaller than the entry at 4, which consequently is ignored, but it is greater than the entry at 2 (56), which is then checked off. The process is repeated again for the remainder obtained by subtracting 56 from the previous remainder of 84, or 28, which also happens to exactly equal the entry at 1 and which is then checked off. The entries that have been checked off are added up, yielding the quotient: 8 + 2 + 1 = 11. (In most cases, of course, there is a remainder that is less than the divisor.)

For larger numbers this procedure can be improved by considering multiples of one of the factors by 10, 20, or even by higher orders of magnitude (100, 1,000,…), as necessary (in the Egyptian decimal notation, these multiples are easy to work out). Thus, one can find the product of 28 by 27 by setting out the multiples of 28 by 1, 2, 4, 8, 10, and 20. Since the entries 1, 2, 4, and 20 add up to 27, one has only to add up the corresponding multiples to find the answer.

Computations involving fractions are carried out under the restriction to unit parts (that is, fractions that in modern notation are written with 1 as the numerator). To express the result of dividing 4 by 7, for instance, which in modern notation is simply 4/7, the scribe wrote 1/2 + 1/14. The procedure for finding quotients in this form merely extends the usual method for the division of integers, where one now inspects the entries for 2/3, 1/3, 1/6, etc., and 1/2, 1/4, 1/8, etc., until the corresponding multiples of the divisor sum to the dividend. In practice the procedure can sometimes become quite complicated (for example, the value for 2/29 is given in the Rhind papyrus as 1/24 + 1/58 + 1/174 + 1/232) and can be worked out in different ways (for example, the same 2/29 might be found as 1/15 + 1/435 or as 1/16 + 1/232 + 1/464, etc.). A considerable portion of the papyrus texts is devoted to tables to facilitate the finding of such unit-fraction values.

These elementary operations are all that one needs for solving the arithmetic problems in the papyri. For example, "to divide 6 loaves among 10 men" (Rhind papyrus, problem 3), one merely divides to get the answer 1/2 + 1/10. In one group of problems an interesting trick is used: "A quantity (*aha*) and its 7th together make 19—what is it?" (Rhind papyrus, problem 24). Here one first supposes the quantity to be 7: since $1\frac{1}{7}$ of it becomes 8, not 19, one takes 19/8 (that is, 2 + 1/4 + 1/8), and its multiple by 7 (16 + 1/2 + 1/8) becomes the required answer. This type of procedure (sometimes called the method of "false position" or "false assumption") is familiar in many other arithmetic traditions (e.g., the Chinese, Hindu, Muslim, and Renaissance European), although they appear to have no direct link to the Egyptian.

(Retrieved from: https://www.britannica.com/science/mathematics/Mathematics-in-ancient-Egypt)

Comprehension Check

I. Check your understanding.

1. What is a method of successive doubling?

2. Dwell upon the peculiarities of Ancient Egyptian numeral system.

3. What does the procedure for finding quotients in this form merely?

4.What is necessary for solving the arithmetic problems in the papyri?

5.What is a considerable portion of the papyrus texts devoted to?

6. Dwell upon the method of “false assumption”.

7. Call countries where the method of “false assumption” was spread.

II. Are these sentences true (T) or false (F)?

1. For larger numbers this procedure can be improved by considering multiples of one of the factors by 10, 25, or even by higher orders of magnitude (110, 1,000,…)

2. The texts that survive reveal what, if any, special procedures the scribes used to assist in this.

3. Computations involving fractions are carried out under the restriction to unit parts.

4. Computations involving fractions are carried out under the restriction to unit parts.

5. In practice the procedure for finding quotients can sometimes become quite simple.

III. Match the numbers to the letters

1. number	a) the act or process of multiplying numbers
2. symbol	b) one of the straight sections from top to bottom into which text on a page or screen is divided
3. addition	c) a set of figures that is

	used to identify something or communicate by phone, etc.
4. multiplication	d) the number which is left over in a division in which one quantity does not exactly divide another
5. subtraction	e) the process of adding two or more numbers together to find their total
6. column	f) a numerical quantity that is not a whole number
7. remainder	g) a sign, number, letter, etc. that has a fixed meaning, especially in science, mathematics and music
8. fraction	h) the process of taking a number or amount away from another number or amount

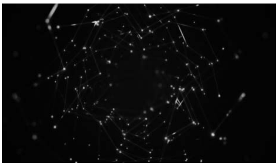
IV. Describe the picture. Make up a short story.

Text 3
Geometry In Everyday Life

The word “Geometry” is derived from the Greek word “Geo” and “Metron” which mean Earth and Measurement respectively. Translating roughly to “Earth’s Measurement,” geometry is primarily concerned with the characteristics of figures as well as shapes. Practically, geometry plays a great role in determining the areas, volumes, and lengths. Euclid is considered to be the “Father of Geometry.”

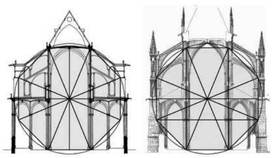
Since birth, humans are attracted to diverse shapes, designs, and colours. The aforesaid can be reinforced by the fact that while buying things in the market, humans are allured by fabrics with fascinating patterns, books with eye-catching covers, sunglasses of one-of-its-kind shapes, jewellery with captivating patterns, tea mugs with beautiful forms, and what-not! Geometry can be referred to as being “omnipresent.” Moreover, geometrical shapes of different toys play an utterly crucial role in the development of the cognitive skills in children during the early stages of their growth. Let’s discuss some important examples of geometry which do not fail even a single chance to play a pivotal role in the daily life of humans.

1. Nature. The most important example of geometry in everyday life is formed by the nature surrounding humans. If one looks closely, one might find different geometrical shapes and patterns in leaves, flowers, stems, roots, bark, and the list goes on. The organisation of the human digestive system as a tube within a tube also ascertains the role of geometry. The leaves on the trees are of varying shapes, sizes, and symmetries. Different fruits and vegetables have different geometrical shapes; take the example of orange, it is a sphere and after peeling it, one might notice how the individual slices form the perfect sphere.



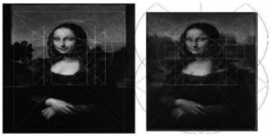
2. Technology. The most common example of geometry in everyday life is technology. Be it robotics or computers or video games, geometry is applied to almost all the underlying concepts. The computer programmers are able to work because the concepts of geometry are always at their disposal. The virtual world of video games is created only because the geometric computations help in designing of the complex graphics of the video games. Raycasting, the process of shooting, employs a 2-D map for stimulating the 3-D world of the video games. Raycasting helps in increasing processing as the calculations are carried out for the vertical lines on the screen.

3. Homes. Geometry does not leave even a single chance to play a significant in homes as well. The windows, doors, beds, chairs, tables, TV, mats, rugs, cushions, etc have different shapes. Moreover, bedsheets, quilts, covers, mats, and carpets have different geometric patterns on them. Geometry is also important cooking. The chef needs to add all the ingredients in accurate proportions and ratio to put forth a delicious dish. Also, while organising a room, each and every space is utilised to make the room look more appealing. A house is made to look more presentable by using vases, paintings, and various decorative pieces, which are of different geometric shapes and have different patterns made on them.



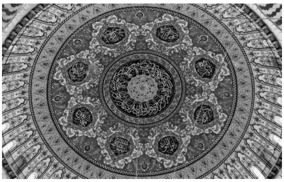
4. Architecture. The construction of various buildings or monuments has a close relationship with geometry. Before constructing architectural forms, mathematics and geometry help put forth the structural blueprint of the building. The theories of proportions and symmetries shape the fixed aspects for all kinds of architectural designs. Pythagoras' "Principles of Harmony" along with geometry were employed in the architectural designs of sixth century BC. Not only were the basics of mathematics coupled with geometry helped in increasing the aesthetics, harmony, and the religious value of large structures but also aided in mitigating various hazards resulting from high-speed winds.

Moreover, the staircase in all the buildings take into consideration the angles of geometry and are constructed at 90 degrees.



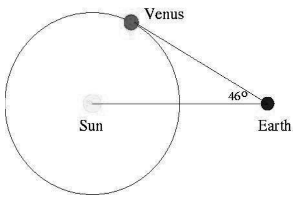
5. Art. What does art include? Art encompasses the formation of figures & shapes, a basic understanding of 2-D & 3-D, knowledge about spatial concepts, and contribution of estimation, patterns & measurement. From the aforesaid, it is evident that there is a close relationship between art and geometry. The formation of shapes is a result of the use of geometrical forms like circle, triangle, square, mandala, or octagon. Moreover, the contents of paintings or sculptures are largely affected by the choice and shape of frames. Not to forget that the principles of projective geometry form the basis of perspective, which is used in most of the painting.

6. Sports. Sports often does not fail a sole chance to make use of geometrical concepts. The buildings of the sports stadiums and athletic fields take into consideration geometric shapes. The athletic fields also employ geometry; hockey, soccer, basketball, and football fields are rectangular in shape. The corner kick spots, goal posts, arcs, D-section, and centre circle are marked on the field. Similarly, the pitches of various other sports like volleyball and basketball take into consideration the geometrical aspects because these pitches have oval as well as circular arcs marked clearly. Talking of track field, semicircular shapes are often noticeable. Angles also play a critical role in predicting the movement of the players, enhancing their performance, and scoring a point.



7. Designing. Geometry is widely applied in the field of designing; the creation of animated figures in the video games require geometry. In the case of art, almost every element of designing is entwined with geometric proportions, which is used to depict a story. Taking the examples of miniature paintings and manuscript illumination, geometric principles are employed to compose the layout. Strict geometric proportions are paid attention to while forming individual letters in calligraphy. In designing, geometry has a symbolic role to play; as is evident from the carvings on the walls, roofs, and doors of various architectural marvels.

8. Computer Aided Design- CAD. Geometry, one of the principle concepts of mathematics, entails lines, curves, shapes, and angles. Before any architectural design is made, a computer software helps in rendering visual images on the screen. CAD, a software, puts forth the blueprint of the design. Moreover, it also aids in the simulation of the architectural forms which allows for the better understanding of the finished product. The principles of geometry are being used extensively in various industrial processes which allows the designing of graphics.



9. Mapping. Geometry helps in the accurate calculation of the physical distances. It is employed in the field of astronomy to map the distances between stars & planets and between different planets. It also aids in the determination of a relationship between the movements of different bodies in the celestial environment. Apart from mapping distances between celestial bodies, geometry also plays a vital role in surveying and navigation. In the case of surveying, measurement of the area of land is a result of the accurate determination of the shape of the land. Moreover, in navigation, the ships, watercraft, and aircraft utilise angles and also depend on other mathematical concepts for carrying out basic operations.

10. Medicine. Techniques like x-rays, ultrasounds, MRIs, and nuclear imaging require the reconstruction of shapes of organs, bones, and tumours, which is based on geometry only. Physiotherapy also employs geometry. Geometric properties and features help in defining the image in digital grids. The geometrical concepts not only aid in visualization, manipulation, image segmentation, correction, and object representation but also play an important role in increasing stability, fidelity, and efficiency. Bisecting angle techniques and parallel techniques are crucial in radiology.

11. Geographic Information Systems. The GPS of the satellites use geometrical principles to calculate the position of the satellites. The use of coordinate geometry in the Global Positioning System (GPS) provides precise information about the location and time. GPS employes coordinates to calculate the distance between any two places. The coordinate geometry helps GPS to track transportation accidents and carry out rescue operations. The coordinate geometry also aids in enhancing flight security weather forecasting, earthquake monitoring, and environmental protection. Moreover, various facets of military operations are equipped with GPS.

(Retrieved from: https://studiousguy.com/examples-of-geometry-in-everyday-life/)

Comprehension Check

I. Check your understanding.

1. Dwell upon the etymology of the word "Geometry".

2. Who is considered to be the "Father of Geometry"?

3. What is the most important example of geometry in everyday life? Give more examples.

4.Is geometry important in cooking?

5. Why geometry has a close relationship with Architecture?

6. Where the geometrical aspects are taken into consideration?

7. How geometry is applied in the field of designing?

8. Give examples of geometry application in Medicine?

9. How geometry is applied in the field of Geographic Information Systems?

II. Are these sentences true (T) or false (F)?

1. Geometry plays a great role in determining the areas, volumes, height, depth and lengths.

2. Geometrical shapes of different toys play an utterly crucial role in the development of the cognitive skills in children during the early stages of their growth.

3. A house is made to look more practical by using vases, paintings, and various decorative pieces, which are of different geometric shapes and have different patterns made on them.

4. The formation of shapes is a result of the use of geometrical forms like circle, triangle, square, mandala, or octagon.

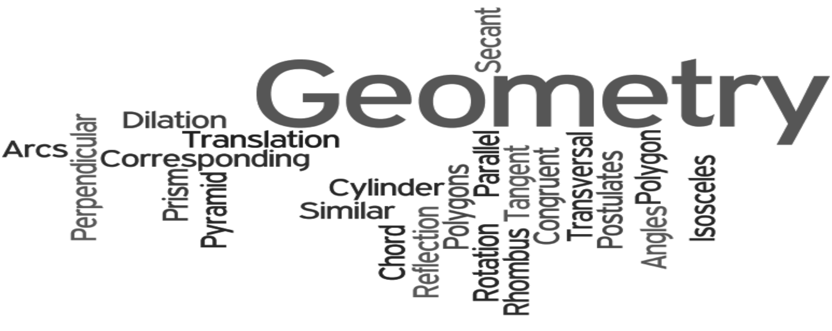
5. Geometry, one of the principle concepts of mathematics, entails lines, curves, shapes, and angles.

6. Geometry is employed in the field of astronomy to map the distances between stars & planets and between different planets, between different countrysides and metropolises.

III. Match the numbers to the letters

1. angle	a) a line or outline which gradually deviates from being straight for some or all of its length.
2. curve	b) is a geometric configuration of symbols
3. circle	c) a plane figure with eight straight sides and eight angles.
4. octagon	d) the instructions that control what a computer does; computer programs
5. mandala	e) a part, share, or number considered in comparative relation to a whole
6. proportion	f) the space between two lines or surfaces that join, measured in degrees
7. software	g) a particular way in which something is done, is organized, or happens
8. pattern	h) a continuous curved line, the points of which are always the same distance away from a fixed central point, or the area inside such a line

IV. Give Ukrainian equivalents of the words you see. Form the sentences using such words and word-combinations.



Text 4

Why is so Important to Learn Algebra?

The majority of us begin our quantitative education by studying the fundamentals of adding. Then we'll move on to subtracting. We move on to multiplying and dividing once we've grasped the pluses and minuses. We all come to a position wherein we need to move on to the more sophisticated arithmetic eventually, that is, algebra.

Algebra is sometimes referred to as the moment in arithmetic where symbols become incorporated. Algebra is the concept of quantitative symbols and the principles that govern their manipulation. Mathematics, physics, engineering, medical, and finance all use it as a foundation for higher study.

In its most basic version, algebra entails solving problems to discover the undefined. Real-world challenges most likely influenced the creation of algebra. The theme can be traced historically to the early Babylonians, who lived about 4,000 years ago.

It gets a lot more advanced in algebra than that basic calculation. Several pupils are left questioning when, if ever, they will have to utilize algebra in actual situations. They wonder if there is any purpose in studying algebra and if they have to, even if they don't want to.

For a variety of reasons, you'll have to master algebra. There are numerous additional real-world applications of algebra, ranging from evaluating pricing on comparable items in a supermarket shop to determining what hour you should leave the residence to visit a buddy outside town on schedule.

Algebra is among the handful of main mathematical subjects that pupils learn from kindergarten to twelfth class. Algebra is crucial since it is typically regarded as a stepping stone to advanced maths and is necessary for all post-secondary education programs. So, have an open mind about why we study algebra and look for opportunities to communicate its uses.

Tutoring. It's critical to have a firm basis in algebra as a college-bound higher education pupil since your marks and standardized testing results will represent it. Many math topic assessments include a large number of primary algebra as well as other mathematical questions that need a strong understanding of algebra ideas. If you're having trouble grasping complex algebraic principles and equations, seeking guidance from a good algebra tutor near you as soon as possible is a good idea.

Algebra is a popular topic to tutor digitally, and it's a great fit for their integrated digital classrooms. Furthermore, one-on-one tutoring lessons with an Algebra teacher can assist you in regaining esteem and making some progress. Whether you need instant assistance with a particular Algebra idea or want to schedule frequent tutoring classes, tutors can assist you with everything.

The beauty of algebra is an extra advantage since it requires a genuine desire to appreciate it. Still, algebra supplies us with a fundamental vocabulary to express a wide range of real-world events, including gravitation and rabbit population increase. It's astounding in its purity that 5 characters may be utilized to represent how a whole genre of materials, optimal gases, operates.

There's also a certain appeal to starting with a seemingly complicated problem and gradually combining and simplifying it until every variable has only one result. The procedure can be delightful, and the outcome can be highly fulfilling.

Algebra is a crucial life ability that should be well-understood. It takes us past the basics of math and precalculus. It is valuable for a variety of professions, including ones that a person might pursue as a side job. Algebra comes in handy around the home and when studying media articles. It's also attractive and promotes rational reasoning.

(Retrieved from: https://www.takethiscourse.net/why-is-so-important-to-learn-algebra-6-amazing-facts/)

Comprehension Check

I. Check your understanding.

1. Dwell upon algebra.
2. When did algebra appeared?
3. What influenced the creation of algebra?

4.When did you have to utilize algebra in actual situations?

5. Is algebra typically regarded as a stepping stone to advanced maths?

6. What should you do if you have trouble grasping complex

algebraic principles and equations?

7. Is here a certain appeal to starting with a seemingly complicated problem and gradually combining and simplifying it until every variable has only one result?

8. Why algebra is a crucial life ability that should be well-understood?

II. Are these sentences true (T) or false (F)?

1. Mathematics, physics, engineering, medical, philologist and finance all use it as a foundation for higher study.

2. The theme can be traced historically to the late Babylonians, who lived about 40,000 years ago.

3. Algebra is among the handful of main mathematical subjects that pupils learn from kindergarten to eleventh class.

4. Many math topic assessments include a large number of primary algebra as well as other mathematical questions that need a strong understanding of algebra ideas.

5. Algebra supplies us with a fundamental vocabulary to express a wide range of real-world events, including gravitation and rabbit population increase.

III. Match the numbers to the letters

1. quantitative	a) having the most modern and recently developed ideas, methods, etc.
2. sophisticated	b) plan that lists all the work that you have to do and when you must do each thing
3. advanced	c) connected with the amount or number of something rather than with how good it is
4. calculation	d) extremely important, because it will affect other things
5. schedule	e) the act of judging or deciding the amount, value, quality, or importance of something, or the judgment or decision that is made

6. crucial	f) to teach a child outside of school, especially in order to give the child extra help with a subject he or she finds difficult
7. tutor	g) lever and complicated in the way that it works or is presented
8. assessment	h) the act or process of using numbers to find out an amount

IV. Give Ukrainian equivalents of the words you see. Form the sentences using such words and word-combinations.

Text 5
Number Theory

Although Euclid handed down a precedent for number theory in Books VII–IX of the *Elements*, later writers made no further effort to extend the field of theoretical arithmetic in his demonstrative manner. Beginning with Nicomachus of Gerasa (flourished c. 100 CE), several writers produced collections expounding a much simpler form of number theory. A favourite result is the representation of arithmetic progressions in the form of "polygonal numbers." For instance, if the numbers 1, 2, 3, 4,…are added successively, the "triangular" numbers 1, 3, 6, 10,…are obtained; similarly, the odd numbers 1, 3, 5, 7,…sum to the "square" numbers 1, 4, 9, 16,…, while the sequence 1, 4, 7, 10,…, with a constant difference of 3, sums to the "pentagonal" numbers 1, 5, 12, 22,…. In general, these results can be expressed in the form of geometric shapes formed by lining up dots in the appropriate two-dimensional configurations. In the ancient arithmetics such results are invariably presented as particular cases, without any general notational method or general proof. The writers in this tradition are called neo-Pythagoreans, since they viewed themselves as continuing the Pythagorean school of the 5th century BCE, and, in the spirit of ancient Pythagoreanism, they tied their numerical interests to a philosophical theory that was an amalgam of Platonic metaphysical and theological doctrines. With its exponent Iamblichus of Chalcis (4th century CE), neo-Pythagoreans became a prominent part of the revival of pagan religion in opposition to Christianity in late antiquity.

An interesting concept of this school of thought, which Iamblichus attributes to Pythagoras himself, is that of "amicable numbers": two numbers are amicable if each is equal to the sum of the proper divisors of the other (for example, 220 and 284). Attributing virtues such as friendship and justice to numbers was characteristic of the Pythagoreans at all times.

Of much greater mathematical significance is the arithmetic work of Diophantus of Alexandria (c. 3rd century CE). His writing, the *Arithmetica*, originally in 13 books (six survive in Greek, another four in medieval Arabic translation), sets out hundreds of arithmetic problems with their solutions. For example, Book II, problem 8, seeks to express a given square number as the sum of two square numbers (here and throughout, the "numbers" are rational). Like those of the neo-Pythagoreans, his treatments are always of particular cases rather than general solutions; thus, in this problem the given number is taken to be 16, and the solutions worked out are 256/25 and 144/25. In this example, as is often the case, the solutions are not unique; indeed, in the very next problem Diophantus shows how a number given as the sum of two squares (e.g., 13 = 4 + 9) can be expressed differently as the sum of two other squares (for example, 13 = 324/25 + 1/25).

To find his solutions, Diophantus adopted an arithmetic form of the method of analysis. He first reformulated the problem in terms of one of the unknowns, and he then manipulated it as if it were known until an explicit value for the unknown emerged. He even adopted an abbreviated notational scheme to facilitate such operations, where, for example, the unknown is symbolized by a figure somewhat resembling the Roman letter S. (This is a standard abbreviation for the word *number* in ancient Greek manuscripts.) Thus, in the first problem discussed above, if S is one of the unknown solutions, then $16 - S^2$ is a square; supposing the other unknown to be $2S - 4$ (where the 2 is arbitrary but the 4 chosen because it is the square root of the given number 16), Diophantus found from summing the two unknowns ($[2S - 4]^2$ and S^2) that $4S^2 - 16S + 16 + S^2 = 16$, or $5S^2 = 16S$; that is, $S = 16/5$. So one solution is $S^2 = 256/25$, while the other solution is $16 - S^2$, or 144/25.

(Retrieved from: https://www.britannica.com/science/mathematics/Number-theory

Comprehension Check

I. Check your understanding.

1. Who handed down a precedent for number theory in Books VII–IX of the Elements?
2. Who were called? Why?
3. Dwell upon neo-Pythagoreans' philosophical theory.
4. What can you tell about the concept of "amicable numbers"?
5. Dwell upon the arithmetic work of Diophantus of

Alexandria.

6. What is common in the neo-Pythagoreans and Diophantus of Alexandria's works?

7. Why did Diophantus of Alexandria adopt an arithmetic form of the method of analysis?

8. What did Diophantus of Alexandria adopt an abbreviated notational scheme for?

II. Are these sentences true (T) or false (F)?

1. Beginning with Nicomachus of Gerasa (flourished c. 100 CE), several writers produced collections expounding a much simpler form of number theory

2. The results can be expressed in the form of geometric shapes formed by lining up dots in the appropriate two-dimensional configurations.

3. Neo-Pythagoreans became a prominent part of the revival of pagan religion in opposition to Christianity in late antiquity.

4. Attributing virtues such as friendship and justice to numbers was characteristic of the Pythagoreans at all times.

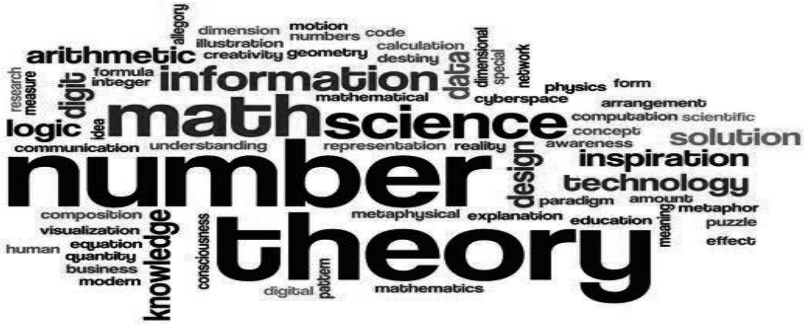
5. Diophantus of Alexandria first reformulated the problem in terms of one of the unknowns, and he then manipulated it as if it were known until an explicit value for the unknown emerged.

III. Match the numbers to the letters

1. solution	a) to make a word or phrase shorter by using only the first letters of each word
2. two-dimensional	b) an arrangement of the parts of something or a group of things; the form or shape that this arrangement produces
3. triangular	c) the process of developing gradually from one stage or state to another
4. abbreviate	d) flat, having width and length but not depth
5. progression	e) continuing one after the other without any break
6. successively	f) an answer to a puzzle or to a

	problem in mathematics
7. configuration	g) a series of related things or events, or the order in which they follow each other
8. sequence	h) a plane figure with three straight sides and three angles.

IV. Give Ukrainian equivalents of the words you see. Form the sentences using such words and word-combinations.



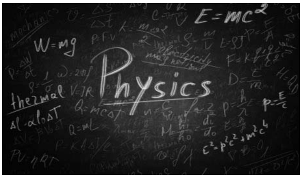
Self-Study Work for Students Majoring in Physics

Text 1

How Physics is Applied in Business

The above topic is much difficult to explain as most of the people are unable to explain and understand the actual role of physics education or degree in running or managing a business. To understand that particular point, we must realize that what is physics?

Physics is the subject which is quite near to nature, i.e., it's a study of matter and energy. Both matter and energy were the basics of life when a man was created by God from the soil. A statue was built, which shows the presence of matter. Then the mighty has put its sprit into that statue, which reflects the presence of energy. It really shows that the life of a human was started from the creation of matter and energy.



In this modern age, science is dominating each and every walk of life. Physics is one of the dominating divisions. It not only helps us to understand the business, but it is a tool to have command on the business strategies using basic rules of physics. Having a Physics degree can not only lead you to live a life as an educational professional of quantum physics, but you can have a leg up in the business. Physics education or degree can play an important role in running or managing a business. Technology has also given a bright boost to the Physics knowledge, and from online Physics calculators to Physics websites, there is a huge world of information to guide you in every way.

Here are some applications of physics in business by using terms commonly used in physics.

Rest and Motion: 1st step to start your own business is to change your position. Let your ideas be floated uninterrupted, which makes you think upon them and with proper study, working, and understanding on it. You may able to choose the best one which suits you under the circumstances you are facing during that course of time. It is the same thing that physics teaches you. When you change your position from rest to motion, it will definitely cover some distance and you may able to reach where you want to be reached.

Same Charges repel each other: It is also a phenomenon that's from the basics of physics. It never means ever copy anybody because the circumstances in which somebody got success in business is not the same for you. Find your own way to be a successful businessman otherwise like the same charges you will be repelled and went far away from your prime goal.

Constants and Variables: In physics, you have some values which are constants and some are variables in business. You also have the same there exist some rules which you may not get changed even you are wrongly thinking to get it altered. Still, these rules are imposed on you just like the constant, which remains the same everywhere. Similarly, some rules can be amended or adjusted depends upon the type of business. These reflect the variables of Physics. You must need to have a balanced opinion between these constant and variable rules for the success of your business.

Vector Quantities: Vector is those quantities which can neither be defined without the reflection of any direction. Your business is also a vector quantity. You may not get it successful until you may not have a particular positive direction for it.

Velocity: Distance covered in a particular direction per unit time is called speed in business; it can be the definite right decision at the right time. This is the velocity of your business. If you remain unable to get this velocity in business, you will become looser.

Newton's Third Law: Every action has its reaction, which is equal in magnitude but opposite in direction. It can be applied everywhere in business. It means when you are going to finalize a strategy to run your business, you must think a hundred times about the impact of that decision. It is because if your plan bounces back to you with the same magnitude, then what would be your action!

Momentum: In physics, it's a product of mass and velocity, is used to quantify how much force a moving object can deliver. In business, it can be transformed as never go against the momentum of the market. Don't try to go against the market trends as it will consume your more time, resources, and money. Maybe this is not 100% correct, but it stands true for most of businesses and entrepreneurs.

Centripetal Force: In physics, it's a force that holds an object while it's moving in a circular path. Its direction is always towards the center. In business, your centripetal force is the skilled and active staff, which makes the success possible for your business. By implementing your directives and ideas correctly, the same as, the direction of the team always is towards the achievement.

Equilibrium: In physics, equilibrium is the condition of a system when neither its state of motion nor its internal energy state tends to change with time. In business, you need to attain the same state. Once you achieve your prime goal of success, you have to work hard with the same spirit with which you have started that work because now this work is not for attaining achievements. Still, it's required to remain stable at the position you achieved in your business through your success.

There is much more to write, but to get it concluded, here these nine points reflect the fact that Physics can also be applied in business. It is also a fact that a person who is a Physics graduate has a better understanding of the market as compared to anyone else. The physics graduate can quickly run an entrepreneur by applying the basics rules of physics to the situation that arises while setting up an entrepreneur.

That's the physics which enable us to study matter and its properties no matter what sort of thing it is! There are some difficulties in understanding some business terms by using concentration skills & knowing the logic behind these terms. A physics graduate can make and run a good entrepreneur in a far better way than others.

(Retrieved from: https://monomousumi.com/how-physics-is-applied-in-business-and-do-physics-graduates-make-good-entrepreneurs/)

Comprehension Check

I. Check your understanding.

1. What is the actual role of physics education in running or managing a business?
2. What is physics?
3. Who has put its sprit into the statue?

4.What did show that the life of a human had been started from the creation of matter and energy?

5.What is the first step to start your own business?

6. What should you do to find your own way to be a successful businessman?

7. What is velocity?

8. What is a force that holds an object while it's moving in a circular path?

II. Are these sentences true (T) or false (F)?

1. Both matter and energy were the basics of life when a man was created by God from the soil.
2. It really shows that the life of a human was started from the creation of matter and energy.
3. Technology has also given a bright boost to the Physics knowledge, and from online Physics calculators to Physics websites, there is a huge world of information to guide you in every way.
4. Let your ideas be floated uninterrupted, which makes you think upon them and with proper study, working, and understanding on it.
5. When you change your position from rest to motion, it will definitely cover some distance and you may able to reach where you want to be reached.
6. You may not get business successful until you may not have a particular positive direction for it.
7. Don't try to go against the market trends as it will consume your more time, resources, and money.
8. In business, your centripetal force is the skilled and active staff, which makes the success possible for your business.
9. Once you achieve your prime goal of success, you have to work hard with the same spirit with which you have started that work because now this work is not for attaining achievements.

III. Match the numbers to the letters

1. velocity	a) the degree of brightness of a star, as represented by a number on a logarithmic scale.

2. equilibrium	b) to make something increase, or become better or more successful
3. magnitude	c) the speed at which an object is travelling
4. Centripetal Force	d) the scientific study of the physical and chemical structure of the stars, planets, etc.
5. boost	e) a vehicle used for travelling in space
6. astrophysics	f) a connection with a political party or religion, or with a larger organization
7. affiliation	g) a state of balance, especially between different forces or influences
8. spacecraft	h) a force that acts on a body moving in a circular path and is directed towards the centre around which the body is moving.

Text 2

What Can You do With a Physics Degree?

If it weren't for physicists, the modern world would be a very different place. The study of physics underlies many pivotal discoveries of the 20th century – including the laser, television, radio, computer technology, and nuclear weapons– and has played a vital role in the development of quantum theory, the theory of relativity, the big bang, and the splitting of the atom.

Physics students need a very strong head for numbers, a good grasp of scientific principles and a keen interest in discoveries relating to the physical world.

The diversity of physics careers is an appealing aspect for prospective students. Physics graduates have skills that are in high demand in diverse sectors. These include skills relating to numeracy, problem-solving, data analysis and the communication of complex ideas, as well as a wider understanding of how the world works on a scientific and human level.

Typical careers in physics. Whether you want to explore space, time, matter or the many other intriguing elements of the physical world, a physics degree can do wonders for your career path. While many physics graduates go on to work within research roles, these are spread across many different industries – including education, automotive and aerospace industries, defense, the public sector, healthcare, energy, materials, technology, computing and IT.

Research scientist careers. Although it's possible to enter into scientific research as a trainee or technician with a good undergraduate degree, those looking to pursue long-term careers in research should consider further study, as senior research roles are often reserved for those with at least a master's degree. As well as the MSc, MPhys and PhD qualifications, leading researchers can also gain the title of 'Chartered Physicist' (CPhys) from the Institute of Physics (IOP).

The main reason to study physics at graduate level is to help you gain more in-depth, specialized knowledge to prepare you to work effectively in a specific field. Potential areas of specialization include astrophysics, particle physics, biotechnology, nanotechnology, meteorology, aerospace dynamics, atomic and laser physics, atmospheric, oceanic and planetary physics and climate science.

Physics careers in space and astronomy. Everyone wants to be an astronaut where they're young, but if you study physics you may actually have a chance! Of course, roles within the space sector are limited and highly competitive, and most do not include any direct involvement in space travel. For administrative and trainee roles in this sector, an undergraduate degree may be sufficient, but for higher-level and more specialized roles, you'll almost certainly need at least a master's degree.

As well as research institutes, within both the public and private sectors, other organizations offering roles related to space and astronomy include museums and planetariums. Many professional astronomers can also be found conducting research and teaching within universities and colleges, or research labs and observatories with affiliations to academic institutions.

As an astronomer, your job would be to study the universe, collecting data from global satellites and spacecraft and operating radio and optical telescopes. Other tasks within this sector include investigation and research of new materials and technologies, measuring performance of existing materials and technologies, and problem-solving at the design stage.

Physics careers in healthcare. Although it may not be the first industry you think of, physics careers in the healthcare sector are numerous. Medical physics overlaps significantly with biomedical engineering, and physicists work alongside biomedical engineers to create, review and maintain medical technologies and equipment. Although cardiology and neurology are areas reserved for those with an additional medical degree, physicists are regularly employed within areas such as radiology, radiation oncology and nuclear medicine, in order to test and approve the latest technologies and equipment.

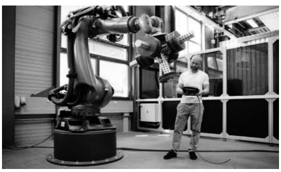
Research-based roles in this field are available within medical technology companies, healthcare providers, research centers and academic institutions. Knowledge of accelerator physics, radiation detection and materials science are valuable for many of these roles, and a master's degree in a relevant specialization will also give you a leg up into the industry.

Physics careers in engineering. The engineering sector provides many careers in physics, particularly within manufacturing and technology-based roles. Physics graduates are often tasked with improving and developing products and manufacturing processes, and benefit from a large range of potential employers spanning multiple industries such as medicine, energy, transport, defense, space exploration and telecommunications.

Physics careers in energy. Whether we're talking about renewable or non-renewable energy, there are plenty of careers in physics within the energy sector. Alongside the rise of renewable energy, oil and gas companies remain big players in the energy market and are major employers for physics graduates. One area of focus is on extracting fossil fuel reserves in the most efficient way possible, using knowledge of the Earth's characteristics and the newest technologies.

With the prospect of fossil fuels running out, energy companies are also branching out into renewable alternatives such as wind and solar energy and are investing heavily in research and development in this area, offering much career potential. Your role here could be to collaborate with other scientists and engineers to develop efficient and functional energy systems which harness the Earth's energy sustainably and cost-effectively.

Physics careers in technology. A broad arena of continual growth and innovation, the technology sector is a constant source of new opportunities, challenges and career paths. For physics graduates, there is scope to work alongside other specialists in order



to develop new ideas and products. Fields with particularly high demand for research and development workers from various backgrounds include relatively young fields such as robotics, nanoscience and nanotechnology.

Technology careers in physics may be based in public or private-sector research centers. Many opportunities for graduates are available within large technology companies such as Philips or Siemens, as these businesses are keen to attract innovative and talented researchers from around the world.

Geophysics and meteorology careers. Those who study physics are also prime candidates for environmental careers, thanks to their scientific understanding of the ways in which the Earth functions. While geophysicists are more concerned with the prediction of natural disasters, meteorologists focus on areas such as daily weather forecasting, as well as researching the long-term effects of climate change.

What can you do with a physics degree if none of the options above appeals to you? You could use your mathematical proficiency to enter into the financial world, or your knowledge of technological innovation to head into a relevant field of the legal sector (such as patent law or forensics). Media and entertainment are two more potential industries, where physicists are in demand for roles such as scientific journalism, computer game programming and film special effects. Other options include roles in teaching, manufacturing, transport, architecture and communications.

(Retrieved from: https://www.topuniversities.com/student-info/careers-advice/what-can-you-do-physics-degree

Comprehension Check

I. Check your understanding.

1.Call pivotal discoveries of the 20th century.

2. What is an appealing aspect for prospective students?

3. What would be your job as an astronomer?

4.What sector does provide many careers in physics?

5.What are big players in the energy market and major employers for physics graduates?

6. Dwell upon the geophysicist's role.

7. Is the technology sector a constant source of new

opportunities, challenges and career paths?

8. Dwell upon physics careers in energy?

II. Are these sentences true (T) or false (F)?

1. Many professional geophysicists can also be found conducting research and teaching within universities and colleges, or research labs and observatories with affiliations to academic institutions.

2. Physics graduates are often tasked with improving and developing products and manufacturing processes.

3. Your role in energy could be to collaborate with other scientists and engineers to develop efficient and functional energy systems which harness the Earth's energy sustainably and cost-effectively.

4. Technology careers in physics may be based in public or private-sector research centers.

5. Those who study physics are also prime candidates for counting careers, thanks to their scientific understanding of the ways in which the Earth functions.

III. Match the numbers to the letters

1. space	a) a branch of physics where the fundamental and the applied aspects of laser science are studied. Basically laser physics is a part of optics which deals with the laser theory.
2. master's degree	b) The branch of astronomy that deals with the phenomena and objects found in the solar system and in planetary systems orbiting stars other than the sun.
3. astrophysics	c) the area around everything that exists, continuing in all directions
4. laser physics	d) that is produced using the sun, wind, etc., or from crops, rather than using fuels such as oil or coal
5. atmospheric	e) the study of weather conditions as they exist over a long period of time

6. planetary physics	f) the type of astronomy that uses physical laws and ideas to explain the behaviour of the stars and other objects in space
7. climatology	g) an academic qualification granted at the postgraduate level to individuals who have successfully undergone study demonstrating a high level of expertise in a specific field of study or area of professional practice.
8. renewable energy	h) relating to the atmosphere of the earth.

Text 3

Top Universities for Physics

There are 601 schools offering physics programs in this year's subject rankings.

Top universities for physics in the US and Canada. The United States has 124 of the 601 top physics universities in the world. Of these, six can be found in the world top ten, including the world leader Massachusetts Institute of Technology (MIT). MIT is the top US institution in terms of research output, accounting for around five percent of the US's total contribution to papers in the field, as indexed by our research partners at Elsevier.

Outside of the top 10, University of California, Los Angeles (UCLA, 12th) rises seven places this year. Meanwhile, Yale University falls three places to joint 16th and Columbia University drops four places to joint 18th. All of these universities scored highly in the research citations per paper indicator, representing the quality of the schools' research. Elsevier found that US universities are tackling big-impact topics with their research, including renewable energy, innovative materials, and the ongoing pursuit to understand the planet and universe.

Canada is home to 19 universities offering physics courses; two of which are located in the world top 50: University of Toronto (joint 26th, falling five places) and University of British Columbia (49th, rising eight positions).

Top universities for physics in Europe. 238 of the world's top universities to study physics can be found in Europe. Of these, 37 are in the United Kingdom . The University of Cambridge and University of Oxford both feature in the global top 10, in fourth and fifth place respectively.

Other notable UK universities include University College London (UCL, down three places this year to joint 31st), the University of Manchester (falling four places to joint 41st) and University of Edinburgh (dropping five places to joint 45th).

Germany is well known for its focus on sciences and is the third largest contributor of Nobel laureates in physics. Germany has 41 universities featuring in the physics and astronomy rankings this year, with three of these in the top 50. Ludwig-Maximilians-Universität München is Germany's highest ranked university for physics in 2021 in joint 22nd.

Italy is home to 25 top universities to study physics and astronomy, including top-ranking Sapienza - Università di Roma in joint 41st. France also performs well with 22 entries this year, including three in the top 50, with Université PSL (Paris Sciences & Lettres) rising six places to joint 31st.

Spain has 14 universities in the rankings this year and the Netherlands has nine, with Delft University of Technology rising seven places to joint 42nd place.

Poland and Switzerland each have six universities in the physics school rankings. Of these, the top ranking is ETH Zurich (Swiss Federal Institute of Technology, ninth). Ecole Polytechnique Fédérale de Lausanne (EPFL) also places in the top 20, in 14th.

Top universities for physics in Australia and New Zealand. Australia has an impressive 17 universities in this year's physics school rankings and New Zealand has five.

Australia's top 50 placing university is Australian National University (ANU, 40th), earning a high score for research citations per paper. Another notable university is the University of Melbourne in joint 66th, earning an admirable score in the employer reputation indicator.

Over in New Zealand the University of Auckland places the highest in 151-200, scoring well in the employer reputation indicator.

(Retrieved from: https://www.topuniversities.com/university-rankings-articles/university-subject-rankings/top-universities-physics-2021)

Comprehension Check

I. Check your understanding.

1. How many schools offering physics programs are there in the world?

2. What are top universities for physics in the US and Canada?

3. How many the world's top universities to study physics can be found in Europe?

4. Is Germany well known for its focus on sciences and is the third largest contributor of Nobel laureates in physics?

5. What are top universities for physics in Australia and New Zealand?

6. Are the University of Cambridge and University of Oxford top physics universities in the world?

II. Are these sentences true (T) or false (F)?

1. United States has 124 of the 601 top physics universities in the world.

2. Germany has 14 universities featuring in the physics and astronomy rankings this year, with three of these in the top 15.

3. France also performs well with 22 entries this year, including three in the top 50.

4. Poland and Switzerland each have six universities in the physics school rankings.

5. Other unnotable UK universities include University College London, the University of Manchester and University of Edinburgh.

III. Match the numbers to the letters

1. output	a) the position of somebody/something on a scale that shows how good or important they are in relation to other similar people or things, especially in sport
2. accounting	b) an amount of something produced by a person, machine, factory, country
3. contribution	c) the skill or activity of keeping records of the money a person or

	organization earns and spends
4. respectively	d) a word or piece of writing taken from a written work
5. laureates	e) in a way that relates or belongs to each of the separate people or things you have just mentioned
6. impressive	f) a gift or payment that is made to a person or an organization in order to help pay for something
7. ranking	g) making you admire them, because they are very large, good, skilful,
8. citation	h) a person who has been given a very high honour because of their ability in a subject of study

Text 4
The Role of Physics in Medicine

The application of physics principles, methods, and techniques in clinical practice and research has revolutionized the entire medical science field to improve human health and overall wellbeing.

Medical physics is a branch of applied physics that utilizes physical sciences to prevent, diagnose, and treat human diseases. Medical physics can be categorized into multiple sub-groups: medical imaging physics, radiation oncology physics, non-ionizing medical radiation physics, nuclear medicine physics, medical health physics, and physiological measurements.

Medical physics primarily focuses on ionizing radiation measurement, magnetic resonance imaging, and applying physics-based technologies (lasers and ultrasound) in medicine.

The term "medical physics" was first introduced by Félix Vicq d'Azir, a French physician, anatomist, and the general secretary of the Royal Society of Medicine, in Paris in 1778. In 1814, the most appropriate definition of medical physics was introduced in the revised edition of Nysten's medical dictionary. In this edition, medical physics was defined as “physics applied to the knowledge of the human body, to its preservation and to the cure of its illnesses”.

Medical physicists are healthcare professionals who have specialized training in applying physics concepts and technologies in medicine. They primarily work in clinical setups or in academic and research institutions. The key roles and responsibilities of medical physicists include the application of medical physics techniques for the diagnosis and treatment of human diseases and the protection of medical staff and patients from ionizing and non-ionizing radiation hazards.

Medical physicists specialized in radiation therapy are primarily involved in providing radiation treatments for cancer patients in collaboration with oncologists and other therapists. The treatments mostly include brachytherapy, wherein a radiation source is placed inside the body, or external beam radiation therapy, wherein linear accelerator-generated radiation is carefully delivered to affected tissues.

Medical physicists specializing in medical imaging are engaged in developing and maintaining various imaging techniques, including x-ray, computed tomography scan (CT-scan), and magnetic resonance imaging.

Medical physicists specialized in nuclear physics mostly conduct functional imaging of patients using positron emission tomography (PET), gamma camera, and biological substances labeled with radioactive markers (radiopharmaceuticals).

In X-rays, signals generated from a narrow X-ray beam transverse the affected area of interest to create planer images. Similarly, cross-sectional X-ray images obtained upon repeated scanning are digitally stacked to generate high-resolution, three-dimensional, or four-dimensional computed tomography (CT) images to analyze dynamic processes.

Besides providing quantitative and reproducible anatomical images, CT can produce high-quality functional information through dynamic perfusion scanning. During the perfusion procedure, a contrasting agent is administered, and repeated imaging of the affected region is performed at an interval of 3 – 5 seconds for 30 seconds. These images are subsequently stacked to form four-dimensional images. This technique is very useful in analyzing hemodynamic parameters, including blood flow and blood volume.

Magnetic resonance imaging (MRI) is a powerful non-invasive medical imaging technique that uses a strong, static magnetic field, magnetic gradients, and computer-induced radio waves to produce high-quality three-dimensional images of tissues and organs. The magnetic field applied to the body realigns the body's photons with that field. Subsequently, radio waves stimulate photons, and MRI sensors are used to detect energy (signal) released from photons.

In quantitative MRI, contrast differences between two tissues are maximized on a single image by utilizing the relaxation time differences of two tissues. The images are weighted based on the properties of one tissue. The modalities commonly used for quantitative MRI include arterial spin labeling for cerebral blood flow measurement and diffusion tensor imaging for microstructural analysis.

Ultrasound is a high-frequency sound wave that generates non-invasive images of different tissues and organs. The difference in mechanical properties at the interface of different organs/tissues causes ultrasound reflection. These reflections are measured to generate ultrasound images.

The main advantages of ultrasound over other medical imaging techniques (CT and MRI) are cost-effectiveness and real-time imaging at the bedside. Contrast enhancing agents, such as microbubbles, are used in ultrasound for functional imaging. Besides disease diagnosis, ultrasound is used for therapeutic purposes. For instance, high-intensity focused ultrasound removes affected tissues inside the body without damaging surrounding healthy tissues. In addition, ultrasound is used for targeted drug delivery.

In nuclear medicine, radioactive probes are used to observe physiological processes. The probes are also used for targeted delivery of therapeutic doses. A very small amount of radioactive probe is administered to the body during the procedure. The probe is subsequently absorbed by the organ/tissue under investigation. The radiation emitted from the probe due to decay is detected by a gamma camera, which generates digital signals for analyzing the functional state of the organ.

A gamma camera generates two-dimensional images when it remains stationary. In single-photon emission computed tomography, the camera is rotated to generate axial slices of the target organ. These slices can be used in PET scans to generate three-dimensional images.

Radiation therapy involves the delivery of ionizing radiation inside the body to destroy and eliminate cancer cells. For deep-seated tumors, high-energy photons are used. For superficial tumors, high-energy electrons are used. In addition, charged particles, including protons, are used in radiotherapy.

During the entire treatment procedure, medical imaging is performed to ensure safe and targeted delivery of the radiation and to assess radiation-induced changes in the anatomy.

(Retrieved from: https://www.news-medical.net/health/The-Role-of-Physics-in-Medicine.aspx)

Comprehension Check

I. Check your understanding.

1. What has revolutionized the entire medical science field to improve human health and overall wellbeing?

2. What is Medical Physics?

3. Call the most significant sub-groups medical physics can be categorized into.

4.What was Félix Vicq d'Azir famouce for?

5.What can CT produce?

6. What are contrast enhancing agents used in ultrasound for?

7. Why is medical imaging performed during the entire treatment procedure?

8. Dwell upon the role of physics in medicine.

II. Are these sentences true (T) or false (F)?

1. Medical physics primarily focuses on ionizing radiation measurement, magnetic resonance imaging, and applying physics-based technologies (lasers and ultrasound) in medicine.

2. Medical physicists specializing in medical imaging are engaged in developing and maintaining various imaging techniques, conduct functional imaging of patients using positron emission tomography (PET), gamma camera, and biological substances labeled with radioactive markers (radiopharmaceuticals).

3. In X-rays, signals generated from a narrow X-ray beam transverse the affected area of interest to create planer images.

4. In quantitative MRI, contrast differences between three tissues are maximized on a single image by utilizing the relaxation time differences of two tissues.

5. The main advantages of ultrasound over other medical imaging techniques (CT and MRI) are cost-effectiveness and analyzing hemodynamic parameters.

6. Radiation therapy involves the delivery of ionizing radiation inside the body to destroy and eliminate cancer cells.

III. Match the numbers to the letters

1. radiotherapy	a) existing or occurring at or on the surface
2. tomography	b) to recognize and name the exact character of a disease or a problem, by examining it
3. nuclear medicine	c) the application of physics to healthcare; using physics for patient imaging, measurement and treatment
4. magnetic resonance	d) the use of X-rays to make three-dimensional images of flat sections of the body
5. medical physics	e) special sound waves used in such processes as examining organs inside the body and directing the route of submarines:
6. diagnose	f) the use of controlled amounts of radiation aimed at a particular part of the body, to treat disease
7. ultrasound	g) a specialized area of radiology that uses very small amounts of radioactive materials to examine organ function and structure.
8. superficial	h) the excitation of particles (such as atomic nuclei or electrons) in a magnetic field by exposure to electromagnetic radiation of a specific frequency

Self-Study Work for Students Majoring in Computer Science

Text 1

What Is Social Networking and Why Is It Important?

Connecting with other people, businesses and organizations can be a crucial component of a business' success or individual's career advancement. Social networking occurs on various platforms where people and businesses to connect with each other, sell products and spread information. Understanding what social networks are and why they're important can help both businesses and individuals use these platforms to expand their professional networks.

A social network is a website that allows users to connect with other people and businesses online. Social networks typically have a similar format, where each business or person has their own profile, which provides personal or business details. Most social networks allow users to send messages, request information, share information, send connection or friend requests and search for people or businesses in a large online database. Many social networks have specific functions, like only sharing videos, pictures or connecting professionals and businesses.

Social networking continues to play an important role in business and individual careers. Here are some reasons social networking remains important:

It connects people and businesses. One of the most important aspects of social networks is that they help connect people and businesses. With social networks, a business in New York can connect with clients and customers anywhere in the world, expanding their customer base and potential business allies. Using social networks can also allow professionals to find jobs with countries in other areas and connect with similar professionals in their industry. Social networks help eliminate cultural and geographical boundaries that might otherwise keep certain people from meeting or working together. This can help create jobs and unique opportunities.

It helps businesses create advertisements. Another key purpose of social networks is to create advertisements for businesses and use targeted ads to find the right audience for the business' products. For example, some social networks collect user data from other websites to determine what products a user might want. Someone who frequently searches for athletic clothing might find their social network feed has ads for such products on a daily basis. These algorithms can help businesses massively increase their brand exposure, audience and revenue by targeting their products only to people who are likely to purchase them.

It allows people to share information. Social networks also help facilitate the spread of information. This can be information about local or national news, products or services, certain businesses, laws and government actions or simply information about friends and family members. Information circulates much quicker over social networks thanks to certain features like the "share" button, which allows users to share a post, ad or link with a single button. This frequent, quick spread of information has both positive and negative consequences, mainly spreading both misinformation and accurate information more effectively and quickly than traditional news outlets.

It facilitates instant communication. Social networks also help facilitate instant communication. Many platforms have built-in messaging systems which allow users to communicate with each other almost instantaneously. This quick communication may help build relationships and new professional connections and helps people connect with each other in an entirely new way than much of humanity's history. Instant communication can result in fewer errors, stronger relationships and even more connections to businesses and professionals inside and outside of your geographical area.

(Retrieved from: https://www.indeed.com/career-advice/finding-a-job/social-networking)

Comprehension Check

I. Check your understanding.

1. Dwell upon the importance of social networks.

2. What does most social networks allow users?

3. How can using social networks allow professionals to find jobs with countries in other areas and connect with similar professionals in their industry?

4. What can help businesses massively increase their brand exposure?

5. What does allow users to share a post, ad or link?

6. Do social networks help facilitate instant communication?

7. How geometry is applied in the field of designing?

8. Give examples of geometry application in Medicine.

9. How geometry is applied in the field of Geographic Information Systems?

II. Are these sentences true (T) or false (F)?

1. One of the most important aspects of social networks is that they seldom help connect people and businesses.

2. Most social networks allow users to send messages, request information, share information, send connection or friend requests and search for people or businesses in a large online database.

3. Social networks help to set up cultural and geographical boundaries that might otherwise keep certain people from meeting.

4. The formation of shapes is a result of the use of geometrical forms like circle, triangle, square, mandala, or octagon.

5. Some social networks collect user data from other websites to determine what products a user might want.

6. Traditional news outlets can spread both misinformation and accurate information the most effectively and quickly.

III. Match the numbers to the letters

1. crucial	a) acquire (something) by paying for it; buy
2. advancement	b) a type of Internet advertising that delivers promotional messages to a customer according to their specific traits, interests, and preferences
3. eliminate	c) decisive or critical, especially in the success or failure of something
4. targeted ads	d) a publication or broadcast program that provides news and feature stories to the public through various distribution channels: newspapers, magazines, radio, television, and web sites
5. purchase	e) to remove or take away someone

	or something
6. facilitate	f) a result of a particular action or situation, often one that is bad or not convenient
7. consequence	g) the process of promoting a cause or plan; a development or improvement
8. media outlet	h) to make something possible or easier

IV. Give Ukrainian equivalents of the words you see. Form the sentences using such words and word-combinations.

Text 2

The History of Information Technology: Past, Present, Future

When we think of information technology (IT), we think of computers and the internet. Right? Even kids can´t imagine that there was a time without computers, cell phones and other mobile devices. We use it everyday and we feel that we can´t live without it. We communicate with others using cell phones, chat rooms, forums and email. We use the internet for research, entertainment, communication, work and school. In today's modern time, kids don't have to go to the library to find information and to do their homework. They conveniently have constant access to the internet in their own homes. Likewise, businesses use computers and the internet not only for research purposes but also for gathering and storing information. They no longer have to rely on paperwork, cabinets and books. However, there was a time when these modern technologies didn´t exist and society used other forms of what was the latest technology at that time. In fact, information technology has been around for a long time and without the evolution of IT throughout history, it wouldn't be where it is today and provide us with the modern technologies that are readily available to us.

Let's go back through history and take a look at the different stages of IT development: Pre Mechanical Age, Mechanical Age, Electromechanical Age, Electronic Age

The Pre Mechanical Age. The earliest age of technology has been dated back to the pre mechanical age (between 3000 B.C. and 1450 A.D.). Human beings at that time primarily communicated with each other using simple picture drawings called petroglyphs. They created these drawings on rock. This form of language was used to tell a story, to keep record of how many animals one owned and to mark their territory. This eventually led to the arrival of the first writing system known as ¨cuniform¨. Instead of using pictures to express words, signs were composed to correspond with spoken sounds. Afterwards, the Phoenician alphabet was created which consisted of a more simplified writing technique using symbols to express single syllables and consonants. Later on, vowels were added and names were given to the letters to create the alphabet that we use today.

As the alphabets and the writing systems became more popular and common, there was more and more recorded information. This resulted in finding better ways to communicate and keep record of information. The first writing material was simply a pen like object to create markings in wet clay. This led to more useful forms of writing materials from writing on bark, leaves, leather to writing on the papyrus plant to making paper with rags to the making of modern-day paper we use today. However, as more and more people used these new early technologies, they had to confront a new problem. How could they safely store all of this information for a long period of time? This resulted in different methods for record keeping such as clay tablets and scrolls which led to books and libraries.

The numbering systems and the abacus, the first calculator, were also invented during this period.

The Mechanical Age. During the mechanical age (between 1450 and 1840) many extraordinary inventions took place. This is where we can see similarities between our modern-day technologies and the rising technologies back then.

Due to many new technological inventions, there was a great interest in computation and information. There were several machines that were invented, one of them being the printing press. With this new movable, metal-type printing machine, the process of composing pages took only a few, short minutes which made written technology easily accessible to the public. This led to other useful techniques such as the development of book indexes and the use of page numbers. These methods of organizing information paved the way of the development of files and databases. Other major machine inventions were the following:

- The slide rule (1600s)- an analog computer that allowed users to multiply and divide.
- The Pascaline (around 1642) – a mechanical computer that allowed users to add, subtract, multiply and divide two numbers.
- The Leibniz's machine (1670s) – a machine that was an improvement of the Pascaline that included additional components that made it easier for users to multiply and divide.

- The difference engine (1820s) – a machine creation that could calculate numbers and print the results.

Even though these machine inventions were not as effective as the latest technologies we use today, they play a big role in the evolution process of information technology.

The Electromechanical Age. During the time of the electromechanical age (between 1840 and 1940), the beginning of telecommunication emerged. Many revolutionary technologies were invented in this stage that led to modern information technology systems. First, a new method of communicating information was discovered with the voltaic battery. This discovery was the first electrical battery that created and stored electricity. Afterwards, the telegraph was invented to communicate with others over great distances through the use of electricity. This led to the development of Morse Code. This was a system built to communicate with others by breaking down the alphabet into dots and dashes, transformed into electrical impulses and transmitted over a wire. This was very similar to today´s digital technologies that break down information. Shortly afterwards, the telephone and radio were invented. Later on, the first digital computer was created. It consisted of electromechanical computing components, data and program readers, automatic typewriters and input/output and control readers. It was different from our modern computers but it resulted an interest to explore other ways to make the system smaller and to operate more effectively.

The Electronic Age. The electronic age (from 1940 to present day) is the stage of information technology that we currently live in. It first started when electronic equipment including computers began to take place. At the beginning of this stage, it was realized that electronic vacuum tubes could be used instead of electromechanical parts. The first high-speed digital computer was the ENIAC, Electronic Numerical Integrator and Computer. It was able to solve a large class of numerical problems through reprogramming. It was also one thousand times faster than that of electro-mechanical machines from the previous age. However, the problem with the ENIAC was that it didn’t have the capacity to store program instructions in its memory. Then, the EDSAC, Electronic Delay Storage Automatic Calculator was created and was recognized as the first stored-program computer. Afterwards, the world's first commercial computer was invented known as LEO (Lyons Electronic Office).

(Retrieved from: https://www.zimegats.com/the-history-of-information-technology-past-present-future/

Comprehension Check

I. Check your understanding.

1. What are stages of IT development?

2. What did lead to the arrival of the first writing system known as ¨cuniform¨?

3. Dwell upon the first writing material?

4. When was the printing press invented?

5. What did lead to other useful techniques such as the development of book indexes and the use of page numbers?

6. Call other major machine inventions in the Mechanical Age.

7.When did the beginning of telecommunication emerge?

8. Dwell upon the development of Morse Code.

9. When was the world's first commercial computer invented? Tell about it.

10. What was the problem with the ENIAC?

II. Are these sentences true (T) or false (F)?

1. We use the internet for research, entertainment, communication, completing many everyday tasks and errands, sending and receiving messages work and school.

2. Human beings at the pre mechanical age primarily communicated with each other using simple picture drawings called petroglyphs.

3. The Phoenician alphabet consisted of a more complected writing technique using symbols to express single syllables and consonants.

4. A new method of communicating information was discovered with the voltaic battery.

5. The first digital computer consisted of electromechanical computing components, data and program readers, automatic

typewriters and input/output and control readers.

6. Numerical Integrator and Computer was able to solve a large class of numerical problems through typewriting.

III. Match the numbers to the letters

1. cuneiform	a) to appear by coming out of something or out from behind something:
2. typewriter	b) a device consisting of a pile of paired plates of dissimilar metals, such as zinc and copper, each pair being separated from the next by a pad moistened with an electrolyte
3. emerge	c) denoting or relating to the wedge-shaped characters used in the ancient writing systems of Mesopotamia, Persia, and Ugarit, surviving mainly on clay tablets
4. capacity	d) take away (a number or amount) from another to calculate the difference.
5. abacus	e) an alphabet or code in which letters are represented by combinations of long and short light or sound signals.
6. voltaic battery	f) a machine with keys for producing alphabetical characters, numerals, and typographical symbols one at a time on paper inserted round a roller.
7. Morse Code	g) a simple device for calculating, consisting of a frame with rows of wires or grooves along which beads are slid.
8. subtract	h) the maximum amount that something can contain; the amount that something can produce

IV. Give Ukrainian equivalents of the words you see. Form the sentences using such words and word-combinations.

Text 3

How The Top 3 Industries Use Information Technology

In today's age, many industries realize that information technology (IT) plays a vital role. They recognize that IT has a variety of benefits – a competitive edge being one of them – to increase profits, provide high-quality customer service and offer new services. From online communications to applications to automation systems, IT has a huge impact on how organizations manage their business operations and connect with other firms worldwide. New information technology opportunities are opening up among different industries due to various ways IT can be applied to support and grow certain areas of a business. There is also a demand for IT professionals to fulfill positions of specific fields of businesses outside of the IT industry. In general, IT is everywhere and a necessity across multiple industry sectors.

Information technology, through the use of the internet, has been a major factor for many industries. In particular, education/academics, retail/sales and healthcare/medicine are some of the top industries that utilize IT to their advantage.

Information Technology in Education/Academics**.** Unlike traditional classroom settings, online classroom settings make it possible to connect educators and students from all over the world. With online platforms, chat rooms, online tools and applications, professors are able to conduct classes/lessons with their students and learners are able to take lessons in the convenience of their own home or at any location other than being physically present in the classroom. Both professors and students also have the opportunity to interact with each other using online videos, forums and email. As a result, this provides a different approach to communicate and a whole new experience to teach and learn. In addition, online training is less expensive and offers flexible study hours.

In the physical classroom setting, information technology is also put to great use. Classrooms are now integrating the online experience to students as part of the classroom curriculum by using online school platforms, interactive online games and the internet. Not only do teachers have other creative, educational options to organize lessons but students are also able to use other forms of interactive and fun learning methods in their schools. Overall, with the use of IT in and out of the classroom environment, teaching and learning techniques are reaching to a new level.

As online education and educational programs are expanding, IT jobs in the education field are becoming critical.

Information Technology in Retail/Sales. Retailers are changing the way they do business and provide customer service due to the evolution of information technology. Communication between vendors and buyers has primarily changed the most, with the transition from phone calls and in-person customer service to online customer service. Since the internet is available anytime, anywhere, retailers are available 24/7 to interact with customers. Buyers are also able to purchase items day or night through online shopping. As more online stores are receiving visitors, they are offering discounts, promotional updates and a selection of online options to encourage their customers to explore their stores outside the physical location.

Data management, software management, business architect and social media specialist are a few information technology careers that are required within this industry. Retailers rely on IT to handle inventory, distribute goods and services, determine trends and pursue customer-purchasing habits.

Information Technology in Healthcare/medicine. Healthcare practitioners and facilities are becoming more open-minded with the importance of information technology and how it can best suit the needs within the healthcare industry. There are numerous technologies available to provide better ways to share and store information and improve healthcare services to patients. These include health record systems for personal information and electronic purposes, personal health tools such as apps to keep track of health and development and to organize information, and online communities to share and discuss information. By using health information technology, medical providers are able to provide accurate patient records, and better understand and organize patients´ medical history. In addition, platforms are being used to place orders which results in accuracy of prescriptions, effective communication and faster time to carry out changes in medication and orders. Health insurance companies are also favoring IT as they enter into healthcare databases.

As the healthcare industry opens up more and more to information technology, it will adapt to meet the needs of both healthcare practitioners and patients. This will lead to more IT positions within this industry. Those interested in IT careers in the healthcare industry will need to obtain professional degrees and specialization. However, those with both degrees in a medical-related field and IT will have more opportunities than those with only IT experience.

Conclusion. Information technology is valuable to a wide-range of industries – primarily in education, retail and healthcare. It drives their business and provides a selection of innovated, virtual options to improve customer service, increase revenue, store and retrieve information, and offer convenient ways of communication. With the use of computers, the internet, software and databases, industries are able to run smoothly and keep up in the modern world. In conclusion, information technology has evolved to where it is today across multiple industries and continues to grow to best fit their needs. For this reason, it is important to understand what IT is and how we can benefit from it.

(Retrieved from: https://www.zimegats.com/how-the-top-3-industries-use-information-technology/)

Comprehension Check

I. Check your understanding.

1. Dwell upon the importance of information technology in today's age.
2. How do organizations manage their business operations with the impact of IT?
3. Is there a demand for IT professionals to fulfill positions of specific fields of businesses outside of the IT industry? Why?
4. What online tools are applied in education?
5. What are advantages of online trainings?
6. When did communication between vendors and buyers was changed?
7. Why do retailers rely on IT?

8. Dwell upon numerous technologies available to provide better ways to share and store information and improve healthcare services to patients?

9. What will lead to more IT positions within the medicine industry?

II. Are these sentences true (T) or false (F)?

1. IT has a variety of benefits to decrease profits, provide high-quality customer service and offer new services.

2. Information technology has been a major factor for many industries: education/academics, retail/sales and healthcare/medicine are some of the top industries that utilize IT to their advantage.

3. Classroom settings, online classroom settings make it possible to connect educators and students from all over the world.

4. Professors and students also have the opportunity to interact with each other using online videos, forums, email, social networks, platforms.

5. Data management, software management, computer programmer, systems analyst, network engineer, business architect and social media specialist are a few information technology careers that are required within this industry.

6. By using health information technology, medical providers are able to provide accurate patient records, and better understand and organize patients´ medical history.

III. Match the numbers to the letters

1. vendor	a) a person or business that sells goods to the public in relatively small quantities for use or consumption rather than for resale.
2. handle	b) a complete list of items such as property, goods in stock, or the contents of a building
3. retailer	c) relating to the publicizing of a product, organization, or venture so as to increase sales or public awareness.
4. customer-	d) a part of an object designed for

purchasing habits	holding, moving, or carrying the object easily; to deal with, have responsibility for, or be in charge of
5. inventory	e) the actions taken (both on and offline) by consumers before buying a product or service
6. application	f) a structured set of data held in a computer, especially one that is accessible in various ways.
7. promotional	g) a person or company offering something for sale, especially a trader in the street
8. databases	h) a formal request to be considered for a position or to be allowed to do or have something, submitted to an authority, institution, or organization

IV. Give Ukrainian equivalents of the words you see. Form the sentences using such words and word-combinations.

Text 4
Handheld Digital Devices

The origins of handheld digital devices go back to the 1960s, when Alan Kay, a researcher at Xerox's Palo Alto Research Center (PARC), promoted the vision of a small, powerful notebook-style computer that he called the Dynabook. Kay never actually built a Dynabook (the technology had yet to be invented), but his vision helped to catalyze the research that would eventually make his dream feasible.

It happened by small steps. The popularity of the personal computer and the ongoing miniaturization of the semiconductor circuitry and other devices first led to the development of somewhat smaller, portable – or, as they were sometimes called, luggable – computer systems. The first of these, the Osborne 1, designed by Lee Felsenstein, an electronics engineer active in the Homebrew Computer Club in San Francisco, was sold in 1981. Soon most PC manufacturers had portable models. At first these portables looked like sewing machines and weighed in excess of 20 pounds (9 kg). Gradually they became smaller (laptop-, notebook-, and then sub-notebook-size) and came with more powerful processors. These devices allowed people to use computers not only in the office or at home but also while traveling—on airplanes, in waiting rooms, or even at the beach.

As the size of computers continued to shrink and microprocessors became more and more powerful, researchers and entrepreneurs explored new possibilities in mobile computing. In the late 1980s and early '90s, several companies came out with handheld computers, called personal digital assistants (PDAs). PDAs typically replaced the cathode-ray-tube screen with a more compact liquid crystal display, and they either had a miniature keyboard or replaced the keyboard with a stylus and handwriting-recognition software that allowed the user to write directly on the screen. Like the first personal computers, PDAs were built without a clear idea of what people would do with them. In fact, people did not do much at all with the early models. To some extent, the early PDAs, made by Go Corporation and Apple, were technologically premature; with their unreliable handwriting recognition, they offered little advantage over paper-and-pencil planning books.

Palm Pilot. The potential of this new kind of device was realized in 1996 when Palm Computing, Inc., released the Palm Pilot, which was about the size of a deck of playing cards and sold for about $400—approximately the same price as the MITS Altair, the first personal computer sold as a kit in 1974. The Pilot did not try to replace the computer but made it possible to organize and carry information with an electronic calendar, telephone number and address list, memo pad, and expense-tracking software and to synchronize that data with a PC. The device included an electronic cradle to connect to a PC and pass information back and forth. It also featured a data-entry system called "graffiti," which involved writing with a stylus using a slightly altered alphabet that the device recognized. Its success encouraged numerous software companies to develop applications for it.

BlackBerry. In 1998 this market heated up further with the entry of several established consumer electronics firms using Microsoft's Windows CE operating system (a stripped-down version of the Windows system) to sell handheld computer devices and wireless telephones that could connect to PCs. These small devices also often possessed a communications component and benefited from the sudden popularization of the Internet and the World Wide Web. In particular, the BlackBerry PDA, introduced by the Canadian company Research in Motion in 2002, established itself as a favorite in the corporate world because of features that allowed employees to make secure connections with their company's databases.

iPod. In 2001 Apple introduced the iPod, a handheld device capable of storing 1,000 songs for playback. Apple quickly came to dominate a booming market for music players. The iPod could also store notes and appointments. In 2003 Apple opened an online music store, iTunes Store, and in the following software releases added photographs and movies to the media the iPod could handle. The market for iPods and iPod-like devices was second only to cellular telephones among handheld electronic devices.

LV enV2. While Apple and competitors grew the market for handheld devices with these media players, mobile telephones were increasingly becoming "smartphones," acquiring more of the functions of computers, including the ability to send and receive e-mail and text messages and to access the Internet. In 2007 Apple once again shook up a market for handheld devices, this time redefining the smartphone market with its iPhone. The touch-screen interface of the iPhone was in its way more advanced than the graphical user interface used on personal computers, its storage rivaled that of computers from just a few years before, and its operating system was a modified version of the operating system on the Apple Macintosh. This, along with synchronizing and distribution technology, embodied a vision of ubiquitous computing in which personal documents and other media could be moved easily from one device to another. Handheld devices and computers found their link through the Internet.

(Retrieved from: https://www.britannica.com/technology/computer/One-interconnected-world)

Comprehension Check

I. Check your understanding.

1. What is the origin of handheld digital devices?
2. What was the role of Alan Kay in the development of a Dynabook?
3. What did lead to the development of somewhat smaller luggable computer systems?
4. When was the Osborne first sold?
5. Dwell upon the personal digital assistants (PDAs).
6. Characterize the early PDAs, made by Go Corporation and Apple.
7. How did the Pilot influence in the development of PC?
8. What did handheld computer devices and wireless telephones often possess?
9. Why did Apple quickly come to dominate a booming market for music players?
10. When did Apple once again shake up a market for handheld devices?

II. Are these sentences true (T) or false (F)?

1. At first the portables looked like sewing machines and weighed in excess of 40 pounds (9 kg).

2. The Palm Pilot, which was about the size of a deck of playing cards and sold for about $1400.

3. Several established consumer electronics firms using Microsoft's Windows CE operating system to sell handheld computer devices and wireless telephones that could connect to PCs.

4. The BlackBerry PDA, introduced by the Australian company Research in Motion in 2002, established itself as a favorite in the corporate world because of features that allowed employees to make secure connections with their company's databases.

5. The market for iPods and iPod-like devices was second only to cellular telephones among handheld electronic devices.

6. The touch-screen interface of the iPhone was in its way more advanced than the graphical user interface used on personal computers,

III. Match the numbers to the letters

1. touch-screen	a) keep or accumulate (something) for future use
2. interface	b) present, appearing, or found everywhere
3. handheld device	c) a device or program enabling a user to communicate with a computer
4. store	d) a piece of computing equipment that can be used in the hand, such as a smartphone or tablet computer
5. graphical user interface	e) a type of application that simplifies the receipt-to-reimbursement process by automating much of it.
6. ubiquitous	f) a display device which allows the user to interact with a computer by touching areas on the screen

7. expense-tracking software	g) occurring or done before the usual or proper time.
8. premature	h) a computer program that enables a person to communicate with a computer through the use of symbols, visual metaphors, and pointing devices

IV. Identify handheld digital devices. Form the sentences using such words.

Text 5

Use of Information Technology in Our Daily Lives

Are you aware that you are surrounded by networks through which information flows constantly? The notions of time and location are evolving and the world seems to have become a “global village” with distance not being a barrier for commercial or social contact anymore.

Sometimes we forget how important is this networked infrastructure in our everyday lives and it is impossible to imagine our lives without it. Simply put, most businesses and companies would crumble without functioning of the IT systems.

Let’s read about the several uses and applications of IT in daily lives.

Access to Information. As the world wide web has turned the world into a social village as it passes unlimited information available on the internet to the visitors and users around the globe. Most of the information you read on social media is actually factual and now you can view the images as well. Not only is there daily news updates available online, but the access to information by anybody has become a simple process.

Modern technologies such as Dell, IBM, Apple etc. allow you to relax at home while gathering all the information you might need on a daily basis, such as new updates, sports updates, cooking recipes and new episodes of your favorite series. With eBooks available on the internet, it has become even better and a replacement to the traditional TV’s and radios.

Employment Growth. Everyday the demand of IT professionals across several industries is increasing with a fast pace. Several emerging economies across the world are aiming at boosting their economies by enhancing the competency in this field.

With greater number of people interested to take up IT as their profession including computer programming, system analysis, testing, developing software and hardware, and designing apps and websites, has impacted the growth of the economy.

Entertainment. The internet works in several devices, from laptops, computers, tablets to smartphones, ipods and other devices, in order to provide us with unrestricted access to diverse entertainment channels available to watch 24 hours a day, 7 days a week.

Now you do not have to even get up from your bed to switch on the TV in order to get your daily updates or to watch that special broadcast you have been waiting for. With the comfort of your bed and convenience of time, you can now download and buy music, movies, web series, TV shows and unlimited games.

Communication. With better information technology in today's world, globalization has reached heights. It has brought the world close and the world economy is becoming a single independent system. Sharing information quickly and easily across the globe, crossing the barriers of linguistic and geographic boundaries, people are continually communicating with each other.

Sharing images and videos online, or just your thought of the day. From messaging someone living on the other end of the map, use of IT has made it possible to connect via internet rooms and open-source apps.

Finance and Business. With information technology, the world has opened all doors for traders and common people to carry out transactions online. From purchasing an item, to sending your family money in the village through online banking, the online financial system has improved the functioning of banks, reaching to millions of people at one time.

The whole process of purchasing or transacting has become much easier, faster and better. Using the bank accounts online has eased the effort of travelling to the bank and waiting in lines, especially in this pandemic, it has helped the business in many ways.

The role of IT can also be recognized across several departments of the business through computers and software programming. It cannot be ignored in the departments such as finance, human resources, manufacturing and security.

Healthcare. Information technology has made the field of medicine and healthcare a tremendous opportunity of growth. Doctors can now send and receive information through computers and internet, they can check and diagnose their patients online, while discussing and taking second opinions from experts across the world.

With extreme reduction in the time taken to complete the paperwork or the time taken to get an appointment, reach the hospital and get diagnosed. Now, sitting at home, the medicines reach you in no time, especially during covid-19, when hospitals have been the epicenter for the virus.

Education. With unlimited access to information online, there is no stopping of education of children. Information technology has enabled the teachers and students to adapt to new techniques along with updating their gadgets to the latest technology such as tablets, laptops, smartphones or mobiles, for home education.

The classes can now be held online, with sharing of notes and presentation through emails and asking questions or doubts in the chat box. It has made the education system work tirelessly for the growth of students and also helps students learn new things.

Security. Security of the online transactions for business or personal use is the foremost use of information technology. Keeping proper records of the online transactions, while managing the system properly can help secure the accounts, online data and computer software.

This kind of IT security has prohibited random people from checking out personal details of any other person without their consent. IT has made these systems password proof with only permissible authority to access the information when required.

In today's world, as crypto currency has become viral and a part of several lives, such security of personal information and data is essential.

Bottom Line. Did you ever imagine that you were always this surrounded by Information Technology in your Daily Life? From using social media to purchasing a new dress online or watching the latest episode of your favorite show, everything is possible with the Use of Information Technology.

(Retrieved from: https://jonasmuthoni.com/blog/use-of-it-in-daily-lives/)

Comprehension Check

I. Check your understanding.

1. Is the networked infrastructure important in our everyday lives?
2. Why has the world wide web turned the world into a social village?
3. What did replace the traditional TV's and radios?
4. What has impacted the growth of the economy?
5. When and how did the world open all doors for traders and common people to carry out transactions online?
6. What does help to cross the barriers of linguistic and geographic boundaries?
7. Call the departments where the role of IT cannot be ignored.
8. What has made the field of medicine and healthcare a tremendous opportunity of growth?
9. Dwell upon the foremost use of information technology in the field of security.
10. Did you ever imagine that you were always this surrounded by Information Technology in your Daily Life?
11. Are you aware of any other applications of IT in your life?

II. Are these sentences true (T) or false (F)?

1. Modern technologies such as Dell, IBM, Apple etc. allow you to relax at home while gathering all the information you might need on a daily basis, such as new updates, sports updates, cooking recipes and new episodes of your favorite series.
2. Several emerging economies across the world are aiming at boosting their economies by enhancing the competency in the field of IT designing.
3. The internet works in order to provide us with restricted access to diverse entertainment channels available to watch 24 hours a day, 7 days a week.
4. Using the bank accounts online has eased the effort of travelling to the bank and waiting in lines, especially in this pandemic, it has helped the business in many ways.
5. Doctors can now send and receive information through

computers and internet, they cann't check and diagnose their patients online, while discussing and taking second opinions from experts across the world..

6. Keeping proper records of the online transactions, while managing the system properly can help secure the accounts, online data and computer software.

III. Match the numbers to the letters

1. password-protected	a) intensify, increase, or further improve the quality, value, or extent of
2. constantly	b) help or encourage (something) to increase or improve
3. crumble	c) involving a computer, website, etc. that you can use only if you have a password
4. enhance	d) a digital currency designed to work as a medium of exchange through a computer network that is not reliant on any central authority, such as a government or bank, to uphold or maintain it
5. boost	e) transmit (a programme or some information) by radio or television
6. crypto currency	f) the personnel of a business or organization, regarded as a significant asset in terms of skills and abilities
7. broadcast	g) continuously over a period of time; always.
8. human resources	h) break or fall apart into small fragments, especially as part of a process of deterioration

***IV. Give Ukrainian equivalents of the words you see. Form the sentences using such words and word-combinations. ***

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