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PROFESSIONAL ENGLISH

(for the students majoring in Mathematics, Physics and
Information Technologies)

Навчальний посібник
з вивчення фахової лексики
для студентів фізико-математичних спеціальностей

Суми, 2017

Чикалова М. М. Professional English (for the students majoring in Mathematics, Physics and Information Technologies) : навчальний посібник з вивчення фахової лексики для студентів фізико-математичних спеціальностей / М. М. Чикалова. – Суми : СДПУ, 2017. – 126 с.

Навчальний посібник призначений для студентів фізико-математичних спеціальностей та спрямований на формування навичок використання фахової лексики. Метою посібника є ознайомлення читачів зі спеціальною англійською термінологією, що дозволить їм читати, писати, слухати лекції іноземних фахівців, розуміти та спілкуватися на професійному рівні тощо. Кожна частина містить тематичний матеріал та тексти, які супроводжуються лексичними й граматичними вправами, з метою активізації та закріплення на практиці навчального матеріалу.

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ПЕРЕДМОВА

На сучасному етапі розвитку суспільства, коли налагоджуються нові та зміцнюються існуючі зв'язки нашої держави з іншими країнами світу, іноземним мовам належить вагоме місце. У навчальних закладах різних рівнів акредитації вивчення багатьох спеціальностей пов'язане з математикою та інформатикою. Розуміння математичних термінів англійською мовою дає можливість майбутнім фахівцям виробити навички самостійної роботи з іноземною фаховою літературою, долучитися до найсучасніших здобутків світової науково-технічної думки, сприяти розвитку вміння спілкуватися на професійні теми англійською мовою, а також виходу української науки і техніки на світову арену.

У наукових студентів добре розвинена здатність до аналогії, яка через недостатнє володіння іноземною мовою часто буває помилковою. Неправильна аналогія, як правило, зустрічається під час перекладу «інтернаціональних» слів. Найчастіше це слова латинського чи грецького походження, які мають подібне написання, але різне значення в англійській та українській мовах. Так, наприклад:

Actual – в англійській мові означає «дійсний», а не актуальний.

Original – означає «первісний», а не «оригінальний».

Progressive – у більшості випадків означає «поступовий», а не «прогресивний» та ін.

При перекладі термінів з англійської мови на українську можуть бути використані такі перекладацькі прийоми: транслітерація, калька, переклад – опис.

Трансliterація – передача літер одного алфавіту за допомогою літер іншої мови: charactran – характран (електронно-променева трубка). Такий переклад супроводжується поясненням.

Калька – дослівний переклад складових частин складного терміну і утворення його структурно-смислової копії: **interdependence** – взаємозамінність.

Переклад-опис – застосовується тоді, коли в українській мові не вдається підібрати короткий, точний і зрозумілий аналог. Проте, незважаючи на багатослівність і громіздкість такого перекладу, його досить часто використовують. Наприклад:

entrance – число однакових інтегральних схем, які можна підключити на вхід до логічного прикладу;

sortrance – число однакових інтегральних схем, які можна підключити на вихід від логічного приладу.

Навчальний посібник складається з чотирьох частин (теоретичного фахового матеріалу та фахових текстів), переліку знаків, символів та скорочень, які використовуються у науках фізико-математичного циклу, а також англо-українського термінологічного словника з математики, фізики та інформатики обсягом 455 лексичних одиниць.

Кожний тематичний матеріал чи текст супроводжується лексичними та граматичними вправами для перевірки та закріплення вивченого матеріалу. Розмовні завдання у вигляді монологів та діалогів розраховано на активізацію комунікативної компетенції студентів у фаховому контексті.

Завдання на виконання літературно-наукового перекладу мотивують студентів до навчання, вдосконалення набутих знань на репродуктивному та креативному рівнях, застосування системи виразних засобів мовлення у білінгвістичному контексті, а також поглиблення фахових інтересів.

Practice makes perfect.

UNIT 1
BASICS OF MATHEMATICS
1.1 DIGITS, FIGURES, NUMERALS, NUMBERS

The words «digit, figure, numeral, number» may present some difficulties for language learners. For example, you can say «the digit 3; the figure 3; the numeral 3; the number 3», but the meanings of these word combinations are not the same.

The word **«digit»** refers to any of Arabic figures from 0 to 9.
Eg: the digit 4; the digit 7; a three-digit number; a group of three digits; use digits to write these numbers.

The word **«figure»** refers to a numerical symbol for a number and can also refer to the numerical value of a number.

Eg: the figure 4; Arabic figures; a six-figure number; a figure of 3.5 million; round figures; write these numbers in figures and in words.

The word **«figures»** can also mean «arithmetic»:
Eg: He is good at figures.

A **«numeral»** is a name used for denoting a number. Numerals can be in the form of any symbols denoting a number. In texts of general character, numerals are usually written as figures or words.

Eg: the numeral 7; the numeral seven; ordinal numerals; Arabic numerals, Roman numerals.

The word **«number»** refers to quantity or amount (in various fields of application) and is one of the main concepts in mathematics.

Eg: whole numbers; natural numbers; prime numbers; even numbers; odd numbers; large numbers; round numbers; negative numbers; the number 12; the number twelve; the number 165.

One of the meanings of the word «number» is «numeral». Because of that, the word «number» can be used in many cases where the word «numeral» is meant, for example, you can say «cardinal numerals» or «cardinal numbers»; «ordinal numerals» or «ordinal numbers».

Task 1. *Match the following word combinations with their meanings in Ukrainian:*

1	large numbers	a	арабські числа
2	cardinal numerals	b	табличка множення
3	a five-figure number	c	квадратне число
4	a natural number	d	округлене число
5	a digit group	e	кількісні числівники
6	round figures	f	цифра одинадцять
7	Arabic numerals	g	великі числа
8	perfect square	h	натуральне ціле
9	the digit eleven	i	цифра п'ять
10	digit-multiplication table	j	група цифр (розрядів)

1.2 ROMAN NUMERALS

Roman Numeral Table

1	I	14	XIV	27	XXVII	150	CL
2	II	15	XV	28	XXVIII	200	CC
3	III	16	XVI	29	XXIX	300	CCC
4	IV	17	XVII	30	XXX	400	CD
5	V	18	XVIII	31	XXXI	500	D
6	VI	19	XIX	40	XL	600	DC
7	VII	20	XX	50	L	700	DCC
8	VIII	21	XXI	60	LX	800	DCCC
9	IX	22	XXII	70	LXX	900	CM
10	X	23	XXIII	80	LXXX	1000	M
11	XI	24	XXIV	90	XC	1600	MDC
12	XII	25	XXV	100	C	1700	MDCC
13	XIII	26	XXVI	101	CI	1900	MCM

HOW TO READ ROMAN NUMERALS

1. *Know the symbols and their values*.

Reading Roman numerals is pretty easy once you have the basic symbols and their corresponding values down pat.

There are seven basic symbols. With these seven symbols you can fashion pretty much any number (with the exception of exotic numbers like negatives, decimals, etc.).

Roman Numerals	Number
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

2. When one or more numeral is used to form a number, the value of each symbol *is (generally) added together from left to right*.

The letters are arranged from left to right in descending order of value to form a number[1]:

- II = 2
- XXX (10+10+10) = 30
- LII (50+1+1) = 52
- MMLVII (1,000+1,000+50+5+1+1) = 2,057

Task 1. Convert the following numbers into Roman ones:

a) 37   b) 89   c) 328   d) 12

e) 2,410   f) 15,543   g) 130,004

Task 2. Convert the following Roman Numbers into decimal system:

a) CXXIII   b) XLVIII

c) CCCXLI   d) MMMDLXXVII

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[1] Roman Numerals [http://www.math-only-math.com/roman-numerals.html

NUMERALS

There are 10 figures in English: from 0 to 9:

- 0 – zero   ['ziərəu]
- 1 – one   [wʌn];
- 2 – two   [tu:];
- 3 – three   [θri:];
- 4 – four   [fɔ:];
- 5 – five   [faiv];
- 6 – six   [siks];
- 7 – seven   ['sev(ə)n];
- 8 – eight   [eit];
- 9 – nine   [nain].

When combining these figures we get various numbers: 37, 94, 125 etc.

1.3 CARDINAL NUMERALS FROM 1 TO 100

We use the cardinal numerals when counting. They answer the question «How many?»: one, two, three, twenty, a hundred… (eg: I have two sisters. She is 19 years old. There are 5 girls in our group.).

Cardinal numerals can be:

1) Simple: *one (1), seven (7), a hundred (100) etc.*
2) Derivatives, those in which there are suffixes: ***-teen*** (from 13 to 19) and *–ty* (indicate tens): *sixteen (16), sixty (60) etc.*

(**Remember**: *13 - thirteen, 15 – fifteen, 18 – eighteen;*

30 – thirty, 40 – forty, 50 – fifty, 80 - eighty).

3) <u>Complex</u>, that consists of two or more words (from 21 to 29, from 31 to 39, etc.): *twenty-five (25), one thousand two hundred and thirty-four (1234) etc.*

(**Remember**: when writing cardinal numerals, you should use a hyphen for numbers from twenty-one to ninety-nine).

1 – one	13 – thirteen	30 – thirty
2 – two	14 – fourteen	40 – forty
3 – three	15 – fifteen	50 – fifty
4 – four	16 – sixteen	60 – sixty
5 – five	17 – seventeen	70 – seventy
6 – six	18 – eighteen	80 – eighty
7 – seven	19 – nineteen	90 – ninety
8 – eight	20 – twenty	100 – one hundred
9 – nine	21 – twenty-one	101 – one hundred and one
10 – ten	22 – twenty-two	200 – two hundred
	23 – twenty-three	1000 – one thousand
	24 – twenty-four	1001 – one thousand and one
11 – eleven		1346 – one thousand, three hundred and forty-six
12 – twelve		3000 – three thousand
		100 000 – one hundred thousand
		1 000 000 – one million
		1 000 000 000 – one milliard (England) and one billion (the USA)

According to classical English rules every three digits are separated by a comma, eg. 123,456,789 (one hundred and twenty three million four hundred and fifty six thousand seven hundred and eighty nine).

(**Remember**: there must be the word *and* after the word *hundred).*

Such cardinal numerals as *hundred, thousand, million* may be used with articles *(a hundred, a thousand, a million)*; they may also be used in the plural *(hundreds of students, thousands of books, millions of people).*

When before the the words *hundred, thousand, million* is any number *or they* are followed by some other cardinal numeral we use them only in the singular: *two million five hundred inhabitants.*

1.4 ORDINAL NUMERALS

Ordinal numerals are used to show the order of persons or things in a series and answer the question «Which?»

eg: ***The second*** *story was very interesting.*

   *He was **the first*** *in everything.*

   *It is **the sixteenth*** *of July.*

Generally, ordinal numerals are used as adjectives and stand before nouns. An ordinal numeral is usually preceded by the definite article «the».

With the exception of the first three *(1- the first, 2 – the second, 3 – the third)* the ordinal numerals are formed from cardinal numerals by adding the suffix *–th* (**but**: 5-ий – the fifth, 8-ий – the

eighth, 9-ий – the ninth, 12-ий – the twelfth, 20-ий – the twent**ie**th).

In ordinal groups only the last number takes the ordinal form: *the fifty-seventh, the eighty-ninth.*

(**Remember:** Ordinal numerals are generally used with the definite article: *the first, the fifth, the tenth,* etc.).

Task 1. *Write out the numerals in words:*

1. 12,374,009
2. 81,607
3. 5,003,106,100
4. Сотні книжок на полицях бібліотек
5. Тисячі студентів в університетах
6. Мільйони людей взяли участь у виборах
7. 678-ий
8. 1 вересня
9. 29-ий
10. 1,234-ий
11. 42-ий
12. 11-ий
13. Двадцять першого століття
14. 98-а
15. 365,003-ій

Task 2. *Learn the following proverbs and sayings:*

Two wrongs don't make a right.	Мінус на мінус – не завжди плюс.
A picture is worth a thousand words.	Краще один раз побачити, ніж сто разів почути.

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Two heads are better than one.	Одна голова добре, а дві краще.
You can't eat your cake and have it	Один пиріг два рази не з'їси. Двом смертям не бувати, а однієї не минути.
Second thoughts are best. Measure thrice and cut once.	Сім разів відміряй, один раз відріж.
Custom is a second nature.	Звичка – друга натура. Посієш звичку – пожнеш долю. Позбудешся і хвороби, і біди, а звички залишаються назавжди
Between two fires.	Опинитися між двох вогнів.
Two edged.	У кожної палиці – два кінці.
Two dogs over one bone seldom agree	Дві собаки за одну кістку погризуться.
To kill two birds with one stone	Вбити двох зайців одним пострілом.
Of two evils choose the best	З двох зол вибирай менше.
Three is a crowd. Two is a company, but three is none.	Де є двоє, там третій – зайвий.
When three know it, all know it.	Якщо троє знають, це вже не таємниця.
Jam tomorrow.	Обіцяного три роки чекають.
One's as good as none, one body is nobody	Один у полі не воїн

Task 3. *Define the part of speech of the following words, fill in each gap with the suitable word and translate them into Ukrainian:* differ, different, difference; create, creation, creative, creator; science, scientific, scientist; apply, application; discover, discoverer, discovery; operate, operation; determine, determination, determinative.

Noun	Adjective	Verb

1.5 FRACTIONAL NUMBERS

In mathematics, a **fraction** (from Latin «*fractus*»: broken) is a concept of a proportional relation between an object part and the object whole. Historically, any number that did not represent a whole was called a «fraction». Each fraction consists of a denominator (bottom) and a numerator (top), representing respectively the number of equal parts that an object is divided into, and the number of those parts indicated for the particular fraction.

In higher mathematics, a fraction is viewed as an element of a field of fractions.

If the number consists of a whole number and a fraction, for example **1½,** this is called a *mixed fraction or a mixed number*.

The most common fractions:

1/2, 1/3, 1/4 are called not only «one second», «one third», «one fourth», but also: «a half», «a third», «a quarter».

Eg: 1/3 (one third / a third) of all goods produced in this country are mostly locally made.

Fractional numbers are divided into:

2) *Common fractions* (also called vulgar fractions),
3) *Decimal fractions* (or decimals).

1.5.1 COMMON FRACTIONS

Common fractions consist of both quantitative (a numerator) and ordinal (a denominator) numerals,

e.g.: *2/3 - two thirds.*

Moreover, if a numerator is a value greater than 1, then in a denominator ending –*s* appears.

So, a **vulgar fraction** (or **common fraction**) is a rational number written as one whole number (a *numerator*) divided by a non-zero whole number (a *denominator*),

e.g.: 1/3, 3/4 and 4/5

• 1/2 – one half, a half • 1/3 – one third, a third • 1/4 – one fourth, a fourth, one quarter, a quarter • 1/5 – one (a) fifth • 2/3 – two **thirds** • 3/4 – three **fourths**, three **quarters** • 4/5 – four **fifths**	• 1/8 – one eighth • 1/10 – a tenth • 1/100 – a hundredth • 1½ – one and a half • 1¾ – one and three quarters • 2 ¼ – two and a fourth / two and a quarter

If a number consists of a whole number and a fraction, for example 1½, it is called *a mixed fraction or a mixed number (mixed numeral).*

Be careful while dealing with *a common fraction* and the related noun: the noun is in the singular and is used with a preposition *of*,

e.g.: ⅔ kilogram (two thirds of a kilogram)

    ¾ kilometre (three fourths of a kilometre)

    ½ bottle (a half of a bottle)

    ½ litre (one half of a litre)

But if we deal with ***a mixed fraction***, then the related noun is used in the plural,

e.g.: 2 ½ kilograms (two and a half kilograms)

3 ¾ kilometre (three and three fourths kilometres)

2 ½ miles (two and a half **miles)**

1¼ bottles (one and a quarter **bottles)**.

1.5.2 DECIMAL FRACTIONS (DECIMALS)

In English in decimals, the whole number is separated from the fraction by a point, rather than a comma, as we have in Ukrainian.

Zero *before* the point is called **zero** (in science):

e.g.: – 23 по Цельсию = twenty-three degrees below zero Centigrade.

or: **nought (**in mathematics): *e.g.: 0.8 – nought point eight;*

or: **nil/nothing** (in sport):   *3:0 – score is three nothing (nil)*

Zero *after* the point can be called **oh** (like as the letter **«O»**), **zero** (AE), **nought** (BE):

e.g.: phone number: *31 02 56 – three one oh two five six;*

If the whole number in the fraction is zero, it is often omitted in the speech, starting to speak immediately with «point».

A whole number is read as a normal ordinal number, for example, 33.5 – *thirty three point five*. But in the fractional part, each digit is read separately. For example: 7.96 – *seven point nine six* (**NOT** seven point ninety six).

Examples:

- 0.1 – point one;
- 0.02 – point nought two;
- 0.35 – point three five;
- 1.25 – one point two five;
- 35.158 – thirty five point one five eight;
- 15.05 – fifteen point zero (nought) five.

1.6 PER CENT

Per cent tells the number of parts in every hundred. This number is followed by the per cent sign (%). *[**NOTE**: When using '%, there should be NO space between the number and the symbol.]* The word *per cent* is always used in the singular:

e.g.:

- 1 % - one per cent;
- 5% - five per cent;
- ¾ % - three fourths per cent (three fourths of one per cent);
- 16 % - sixteen per cent, etc.

The word *per cent* and sign % actually refer to the denominator of a fraction expressed as hundredths.

When working with per cent, we do not write the word, but use the sign %.

The way the verb agrees with the noun after «*of*» depends on whether the noun is used in the singular or in the plural

85 % студентів зазвичай отримують добрі оцінки.	Eighty five per cent of the <u>students</u> usually <u>receive</u> good marks (*students* are used in the plural).
34 % тексту, що	The remaining thirty four per cent of the

залишився, було перекладено наступного дня.	text was translated the following day (*text* is used in the singular).

BUT! *: Of the control group, 40 percent <u>were</u> under the age of thirty.*

One hundred per cent (100%) of quantity is the entire quantity.

Task 1. *Choose the correct verb and translate the statements:*

1) Fifty per cent of the voters **are / is** in favour of reform.

2) The bill directs that 25 per cent of the money **go / goes** to charities.

3) The bill directs that 25 per cent of the prizes **go / goes** to the local institution.

4) We found that 28% of the sampled subjects **were / was** female.

5) 75 percent of our population **are / is** Christian.

6) 10% of the town **are / is** under water.

7) 10% of the city **were / was** destroyed during the war

8) 10% of the students **have / has** failed the exam

9) 70% of voters **were / was** unhappy with Congress.

1.7 BASIC OPERATIONS IN MATHEMATICS

To the four basic mathematical operations we refer:

1) addition,	3) multiplication,
2) subtraction,	4) division.

Noun	**Verb**	**In speech**

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addition	to add	plus
subtraction	to subtract	minus
multiplication	to multiply by	times
division	to divide by	divided by
equality	equals to \ is equal to	equals to\is equal to\is

The arithmetical problem is called ***problem*** or ***sum.*** Solution is called ***answer.***

Examples:

- 1+2=3 – one plus two is equal to (equals to / is) three.
- 15–8=7 – fifteen minus eight is equal to (equals to / is) seven.
- 6x6=36 – six times six is equal to (equals to / is) thirty six.
- 10:2=5 – ten divided by two is five.

BRACKETED EXPRESSIONS IN MATHS

In mathematics we often use various forms of brackets:

1) **( )** – **parentheses** (in elementary algebra they are used to specify the order of mathematical operations. The operations inside this type of brackets are done first, e.g.: 3x(5+7) is 36.

We use the word *quantity* after the expression in parentheses, e.g.: (1+2)x3=9 – one plus two quantity times three makes nine. This type of brackets is also used to indicate grouping for the sake of clarity: in the following formula $(\varepsilon\eta)_x = \varepsilon_x\eta_x$, the parentheses around $\varepsilon\eta$ serve to indicate that the indexing by x is applied to the composition $\varepsilon\eta$, and not just its last component η);

2) **[ ]** – **square brackets** (they are used in complex expressions in place of (or in addition to) parentheses, especially as a group symbol outside an inner set of parentheses, e.g.: [1+2x(3+4)] : 5. Large brackets around an array of numbers,

e.g., $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ indicate a matrix.);

3) **{ }** – **braces / curly** (they are used to identify the elements of a set, e.g.: {a,b,c} denotes a set of three elements.)

INTERVALS

(a, b)	Open interval from **a** to **b**
[a, b]	Closed interval from **a** to **b**
(a, b]	1. Open from the left interval from **a** to **b**
	2. Closed from the right interval from **a** to **b**
[a, b)	1. Open from the right interval from **a** to **b**
	2. Closed from the left interval from **a** to **b**

1.8 RASING TO THE POWER. SQUARE ROOT

To denote the power we use the following expressions: *to the power of five, to the fifth power, raised to the power of five, raised to the fifth power.*

To denote the 2-nd and the 3-rd power we use the term «*squared*» and «*cubed*».

Examples:
- 5^2 — five **squared** / five to the second power.
- 5^3 — five **cubed** / five to the third power.
- 7^4 — seven to the fourth power / seven to the power of four.

- 8^{16} — eight to the power of sixteen.

SQUARE ROOT

$\sqrt{}$ — на английском называется **square root** или просто **root**.
- $\sqrt{25}$ – the square root of twenty five
- $\sqrt{36} = 6$ – the square root of thirty six is six

Task 1. *Write down in written form:*

1) 3^2	4) $\sqrt{49}$
2) 4^3	5) $\sqrt{81}$
3) 9^5	6) $\sqrt{10000}$

1.9 LOGARITHM and INTEGRAL

Task 1. *Match the following Ukrainian words and word combinations with their English equivalents and symbols:*

| логарифм	f	integral
антилогарифм	log	sum/summation
функція	Δ	logarithm
сума	antilog	upper limit
інтеграл	∫	function
різниця	Σ	antilogarithm
верхня межа логарифма		lower limit
нижня межа		delta/difference

Examples:
- логарифм від b: log b / logarithm of b

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- функція від x: f (x) / function of x
- інтеграл f від x по dx: ∫ f(x)dx /integral of the f of x over dx

Task 2. *Write down your own examples (no less than 7)*

1.10 BASIC TRIGONOMETRIC FUNCTIONS

In mathematics, the **trigonometric functions** (also called the **circular functions**) are functions of an angle. They relate the angles of a triangle to the lengths of its sides.
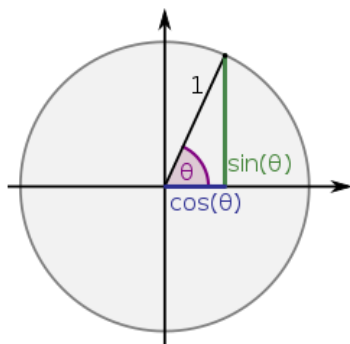
sine	SIN(x)	sine of x	синус
cosine	COS(x)	cosine of x	косинус
tangent	TAN(x)	tangent of x	тангенс
cotangent	COTAN(X)	cotangent of x	котангенс
arc/inverse sine	ARCSIN(x)	inverse sine of x	арксинус

$$\frac{UV}{UT} = \frac{BC}{BA} = \sin\theta$$

$$\frac{TV}{TU} = \frac{AC}{AB} = \cos\theta$$

$$\frac{UV}{TV} = \frac{\sin\theta}{\cos\theta} = \tan\theta$$
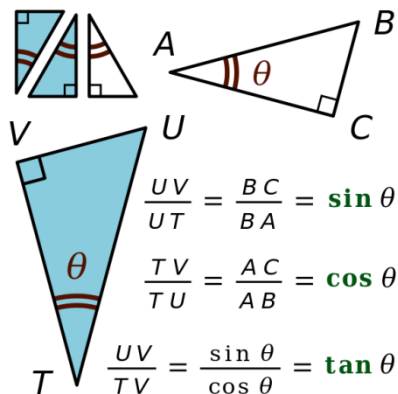
Algebraic expressions for 15°, 18°, 36°, 54°, 72° and 75° are as follows:

$$\sin 15° = \cos 75° = \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$\sin 18° = \cos 72° = \frac{\sqrt{5}-1}{4}$$

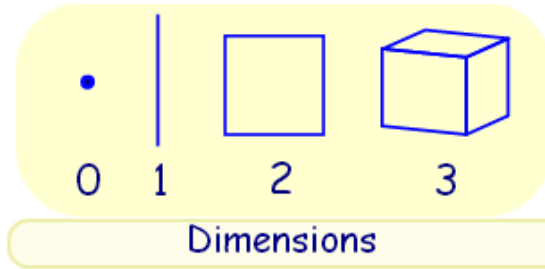$$\sin 36° = \cos 54° = \frac{\sqrt{10-2\sqrt{5}}}{4}$$

$$\sin 54° = \cos 36° = \frac{\sqrt{5}+1}{4}$$

$$\sin 72° = \cos 18° = \frac{\sqrt{10+2\sqrt{5}}}{4}$$

$$\sin 75° = \cos 15° = \frac{\sqrt{6}+\sqrt{2}}{4}$$

1.11 GEOMETRY AND GEOMETRICAL FIGURES

Dimensions

Point, Line, Plane and Solid

A **point** has no dimensions, only position

A **line** is one-dimensional

A **plane** is two dimensional (2D)

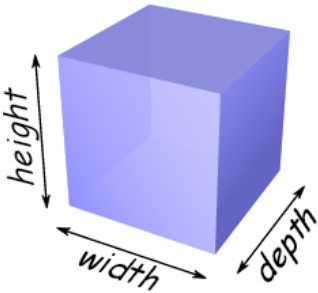A **solid** is three-dimensional (3D)

PLANE GEOMETRY

Plane Geometry is about flat shapes like lines, circles and triangles, i.e., shapes that can be drawn on a piece of paper.

Plane Geometry is all about shapes on a flat surface (like on an endless piece of paper).

SOLID GEOMETRY

is the geometry of three-dimensional space, the kind of space we live in

Three Dimensions

This figure is called **three-dimensional** (or **3D**), because there are three dimensions, such as: **width, depth and height.**

PROPERTIES of SOLIDS (special things about them):

- **volume** (eg, how much water it could hold);
- **surface area** (eg, the area you would have to paint);
- how many **verticles (corner points), faces and edges** they have.

There are two main types of solids:

1) POLYHEDRA *(they must have flat faces)*
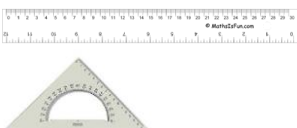
	Cubes and Cuboids
	Platonic Solids
	Prisms

	Pyramids

2) NON-POLYHEDRA *(when any surface is not flat)*
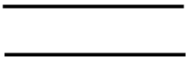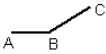
Sphere	Cylinder	Torus	Cone

To draw shapes, angles or lines accurately we use only:

Compass	Straightedge (i.e. ruler)	Pencil
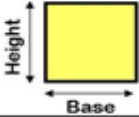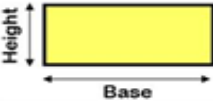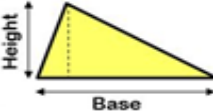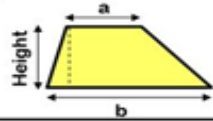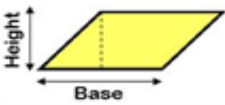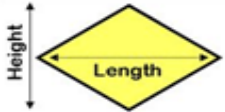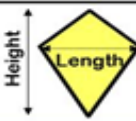
TERMS AND DESCRIPTIONS IN GEOMETRY

Point	A location in space - a dot on a piece of paper	
Line	Connects two points via the shortest path and continues indefinitely (forever) in both directions	
Line Segment	Part of a line between two points	
Perpendicular Line Segment	Line Segments that intersect (cross) at an angle of 90°	

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Parallel Line Segments	Line segments that never intersect (they are always the same distance apart)	
Right Angle	An angle that measures 90°	
Acute Angle	An angle that measures less than 90°	
Obtuse Angle	An angle that measures more than 90°	
Vertex	Point at which two line segments intersect (forming an angle)	
Scalene Triangle	A triangle with all three sides with different lengths	
Isosceles Triangle	A triangle with two equal length sides (and two equal internal angles)	
Equilateral Triangle	A triangle with all three sides of equal length (each internal angles = 60°)	
Radius	Distance (line segment) from centre of a circle to any point on that circle's circumference.	

Diameter	A line segment (or length) joining two points on a circles circumference and passes through the circle's centre (twice the length of the radius)	
Circumference	Distance around a circle (the perimeter)	
Chord	A line segment joining two points on a curve.	
Arc	Part of a curve	

SHAPES and FORMULARS for AREAS

Shape	Name	Formula for Area
Height / Base	Square	Base x Height
Height / Base	Rectangle	Base x Height
Height / Base	Triangle	Base x Perpendicular Height ÷ 2
a / Height / b	Trapezium	$\frac{(a+b) \times height}{2}$
Height / Base	Parallelogram	Base x Perpendicular Height
Height / Length	Rhombus	Length x Height ÷ 2
Height / Length	Kite	Length x Height ÷ 2

SOME CALCULATIONS

1. CYLINDER

- <u>Surface Area:</u> we will need to calculate the surface area on the top, base and sides.

  Area of the top is πr^2

Area of the bottom is πr^2

Area of the sides is $2\pi rh$

Therefore the Formula is:

$$A = 2\pi r^2 + 2\pi rh$$
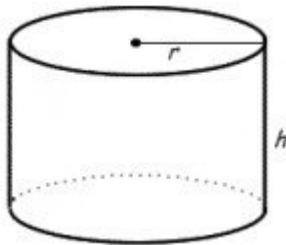
- Volume: $V = \pi r^2 h$

2.   *SQUARE*
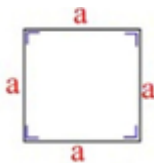
P = a + a + a + a

P = 4a

(P = Sum total of all sides)

1.12   HOW TO SAY THE TIME IN ENGLISH – EXAMPLES AND REFERENCE

Time	Conversational Use	Digital	Timetables and formal use
	It's 6 o'clock.	6:00	It's 6 o'clock.

	It's 5 **past** 6.	6:05	It's six oh five.
	It's a quarter **past** 6.	6:15	It's six fifteen
	It's half **past** 6.	6:30	It's six thirty.
	It's 25 **to** 7.	6:35	It's six thirty-five.
	It's a quarter **to** seven.	6:45	It's six forty-five.
	It's 5 **to** 7.	6:55	It's six fifty-five.

o'clock (abbreviation: *of the clock*)

In English there is no 24-hour-system (sometimes it is used on TV and in timetables).

15:00 is 3 o'clock (p.m.) (on TV: fifteen hundred). That's why you use *a.m.* (Latin: Ante Meridiem) and *p.m.* (Post Meridiem) in situations where it is necessary to point out that you want to say *in the morning* or *in the evening*. In other situations (or when it is clear that school starts in the morning and the party in the evening) it is left out.

Ukraine	England	Ukraine	England
0:00	midnight	12:01	12:01 p.m.
0:01	12:01 a.m.	14:00	2 p.m.
8:00	8:00 a.m.	18:00	6 p.m.
12:00	noon	23:59	11:59 p.m.

➢ a quarter past   → 15 minutes
➢ a quarter to   → 45 minutes
➢ half   → 30 minutes
➢ We leave out the word *minutes*
   (but: 6.01 → It's one minute past 6.)

➢ a.m. = Three o'clock in the morning.
➢ p.m. = Three o'clock in the afternoon / in the evening.

PARTS OF MATHEMATICS
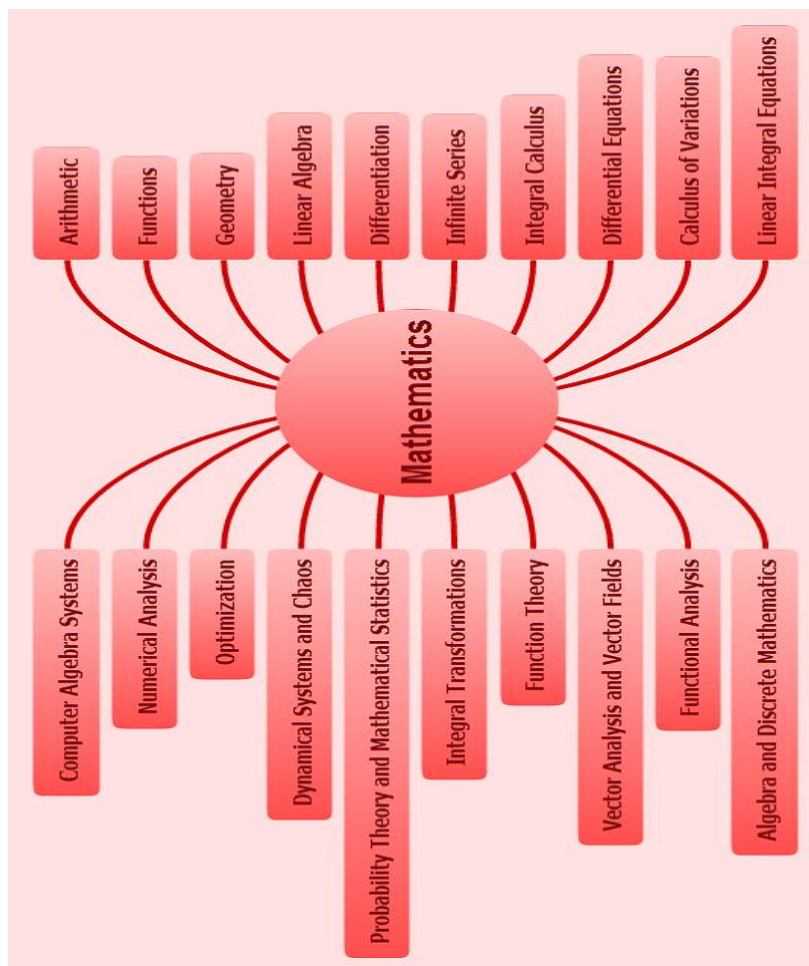
Task 1. *Learn the given components of Mathematics as a science and match them with Ukrainian equivalents.*

UNIT 2
BASICS of PHYSICS
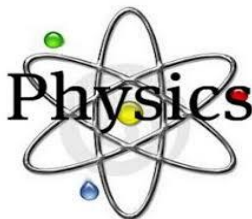
Like mathematics **physics** is one of the most ancient sciences about nature. The word ***physics*** comes from a Greek word **ἡ φύσις** meaning *nature* or *natural things.*

Physics studies **energy** and **matter** in **space** and **time** as well as their interrelation.

Physics, a branch of science, is the study of forces and their impacts on the environment. Modern physics connects ideas together about the **laws of symmetry and conservation** (**energy, momentum, charge, and parity**).

Fields of physics:

Classical physics normally includes the following fields:

• mechanics/mechanical motion,	• magnetism,
• optics,	• acoustics/ sound,
• electricity,	• light,
	• thermodynamics/heat etc.

Modern physics is a term normally used to cover fields which rely on:

✓ quantum theory, including quantum mechanics,
✓ atomic physics,
✓ nuclear physics,
✓ particle physics
✓ condensed matter physics,
✓ as well as the more modern fields of general and special relativity.

QUANTITIES in SI UNITS

Quantity	Symbol	Base SI units	Derived unit
Area	A	m x m	m^2
Volume	V	m x m x m	m^3
Density	ρ	kg/m^3	kg/m^3
Force and weight	F, W	kgm/s^2	N (newton)
Pressure	P	kg/ms^2	N/m^2 (pascal)
Energy	E or U	kgm^2/s^2	Nm = J (joule)
Power	P	kgm^2/s^3	J/s = W (watt)
Frequency	f	s^{-1}	Hz (hertz)
Electric Charge	Q	A x s	C (coulomb)
Electric potential difference	V	kgm^2/As^3	V (volt)
Electrical resistance	R		Ω (ohm)

Task 1. *Make sure that you understand the meaning of the derivatives:*

A (1) **…** is a scientist who has specialized knowledge in the field of (2) …, the exploration of the interactions of matter and energy across the (3) … universe.

a) physics   b) physical   c) physicist

And over the course of the 19th century, the word (1) … became increasingly associated with the (2) … method itself. (3) … identify a question or a problem about nature.

a) scientist   b) scientific   c) science

Task 2. *Guess and match:*

phenomenon (-na)	твердий
heat	світло
sound	рідкий
magnetism	матерія, речовина
light	явище
matter	ядро
substance	інерція
research	магнетизм
solid	звук, акустика
nucleus (-lei)	чинити опір
inertia	субстанція
particle	тепло
to resist	частинка
liquid	наукове дослідження

Task 3. *Try to unscramble the following words and then translate them:*

 m a t o;   g y n e r e;   n e s s i g h t b r;   s c i s y h p;
 c i p l e p r i n;   r i e x m e n t p e;   t u n a r e

Task 3. *Match the definitions with the words:*

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The central and most important part of an atom.	kinetic energy
A very small piece of something.	thermal energy
A stored energy.	nucleus
A change in position relative to fixed objects.	joule
Anything that has mass and volume.	particle
The ability of matter to conduct heat or electricity.	weight
Gravitational force of attraction an object.	sound
Heat energy.	matter
The energy of movement.	potential energy
Something that can be heard.	motion
A unit of energy.	conductivity

Task 4. *Write down the correct form of the given adjectives. Translate the statements:*

1. An atom is the (small) quantity of an element. 2. Physics is one of the (ancient) sciences about nature. 3. A material body can only move with a velocity (low) than that of light. 4. The rhythm of his clock is (fast) than the rhythm of the clocks on the ground. 5. The (fast) the molecules move, the (hot) the substance is. 6. Atoms and molecules are extremely (small). 7. Nuclear energy is the (powerful) kind of energy known.

UNIT 3
INFORMATION TECHNOLOGIES

3.1 TYPES of COMPUTER

TYPES of COMPUTER	NOTES
Mainframes	Large, powerful, expensive. Multi-user systems - used by many people at the same time. Used for processing very large amounts of data. The most powerful mainframes are called supercomputers.
Minicomputers	Used like mainframes. Not as big, powerful, or expensive as mainframes. Less common now because microcomputers have improved.
Microcomputers or Personal computers (PCs)	The most common type of computer. Smaller, cheaper, and less powerful than mainframes and minicomputers.

Examples and types of computers

Desktop computer   Laptop   Netbook   Hybrid   Tablet   Smartphone

TYPE OF PORTABLE	*NOTES*
Laptop	About the size of a small typewriter. Less common now because smaller and lighter portables are available.
Notebook	About the size of a piece of writing paper. The most common type of portable.
Subnotebook	Not quite as big as notebooks. Can fit into a jacket pocket.
Handheld or Palmtop	Small enough to fit into the palm of one hand. Not easy to type with because of their size. Often used as personal organizers.

Nowadays we use computers in many different places.

Task 1. *Guess and match the places in column A with the computer uses in column B:*

A	B
banks	Control machines
factories	Calculate the bill
homes	Look after patient records and medicines
hospitals	Provide entertainment and information

| shops | Control our money |

Task 2. Now fill in the gaps in this paragraph about computer uses.
Computers are now part of our everyday life. In shops, they [1] _____ . In factories, they [2] _____ . In [3] _____, they look after patient records and medicines. When we have a bank account, a computer [4] _____ . In our homes, computers [5] _____ .

Flow of Data through a Computer
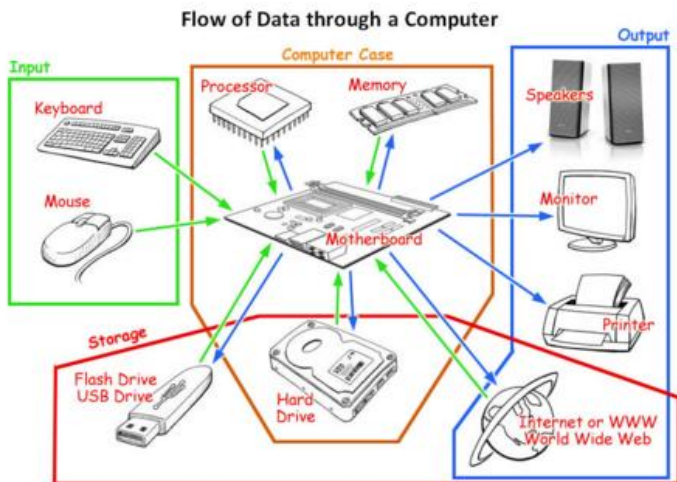
Task 3. *Here are some common nouns in computing. Try to divide them into countable and uncountable nouns. Translate them into Ukrainian.*

1 capacity	4 drive	7 mouse
2 data	5 memory	8 software
3 device	6 monitor	9 speed

Task 4. *Match these key abbreviations with their full names:*

1 Esc	a Alternate
2 Alt	b Page Up
3 Ctrl	c Delete
4 Pgdn	d Insert
5 Pgup	e Escape
6 Ins	f Page Down

7 Del	g Control

Task 5. *Match each item (1–10) with its function (a–j).*

1 RAM	a controls the cursor
2 Processor	b inputs data through keys like a typewriter
3 Mouse	c displays the output from a computer on a screen
4 Clock	d reads DVD-ROMs
5 Flash memory key	e reads and writes to electronic chips on a card
6 Monitor	f holds instructions which are needed to start up the computer
7 Keyboard	g holds data read or written to it by the processor
8 DVD-ROM drive	h provides extremely fast access for sections of a program and its data
9 Cache	i controls the timing of signals in the computer
10 ROM	j controls all the operations in a computer

3.2 THE INTERNET and EMAIL

Electronic mail, which has come to be known as **e-mail**, is one of the most popular services of the Internet. E-mail allows users to send electronic messages. Each user has their own email address which determines where the email messages are stored.

Every email address has two main parts separated by an «at» (@) symbol, i.e.: username@domain name.

Study this typical e-mail address. It belongs to Anna Lock, who works for the Pesto Company in the UK.

locka@pesto.co.ua

userid   domain   type of organization   country

Study these examples of types of organizations and countries.

Abbrev.	Organisations	Abbrev.	Countries
com or co	commercial organization	**at**	Austria
edu/ac	education	au	Australia
gov	government	ca	Canada
int	international organizations	ch	Switzerland
mil	military	de	Germany
net	network provider	es	Spain
org	not-for-profit and other organizations	fr	France
		it	Italy

Task 6. *Match the addresses (1-8) to the list of users (a-h):*

1 redcrossyouth@algonet.se	a) a UN organization based in Italy
2 webmaster@fao.org.it	b) a US politician
3 today@bbc.co.uk	c) a Swedish charity
4 jsmith@smith.senate.gov	d) a student at a French university
5 rossi@cantsoc.com.it	e) a news programme on a public broadcasting service in the UK
6 sales@demon.net	f) an Italian wine co-operative
7 lunchx@swtol.usace.army.mil	g) a military organization based in the US
8 s.larrieu@ly.ac.fr	h) an ISP

TEXTS, LEXICAL AND GRAMMAR EXERCISES

TEXT 1
1. Read the texts, translate them into Ukrainian in written form. 2. Write out all the scientific achievements of the greatest mathematicians and physicists of the past.
3. Make up dialogues about these scientists and their discoveries.

THE GREATEST MATHEMATICIANS and PHYSICISTS OF THE PAST

EUCLID of ALEXANDRIA
(about 322 – 275 BC)
Greece, Egypt

Euclid of Alexandria directed the school of mathematics at the great university of Alexandria. He was the first to prove that there are infinitely many prime numbers; he stated and proved the Unique Factorization Theorem; and he devised Euclid's algorithm for computing gcd. He introduced the Mersenne primes and observed that $(M^2+M)/2$ is always perfect (in the sense of Pythagoras) if M is Mersenne.

Although notions of trigonometry were not in use, Euclid's theorems include some closely related to the Laws of Sines and

Cosines. Among several books attributed to Euclid are The Division of the Scale (a mathematical discussion of music), The Optics, The Cartoptrics (a treatise on the theory of mirrors), a book on spherical geometry, a book on logic fallacies, and his comprehensive math textbook The Elements. The Elements introduced the notions of axiom and theorem; was used as a textbook for 2000 years; and in fact is still the basis for high school geometry, making Euclid the leading mathematics teacher of all time.
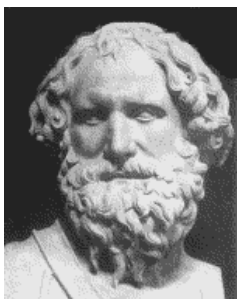
ARCHIMEDES OF SYRACUSE

(287 – 212 BC) Greece

Archimedes made advances in number theory, algebra, and analysis, but is most renowned for his many theorems of plane and solid geometry. He was first to prove Heron's formula for the area of a triangle. His excellent approximation to √3 indicates that he'd partially anticipated the method of continued fractions.

He developed a recursive method of representing large integers, and was first to note the law of exponents, $10a \cdot 10b = 10a+b$. He found a method to trisect an arbitrary angle (using a markable straightedge – the construction is impossible using strictly Platonic rules). One of his most remarkable and famous

geometric results was determining the area of a parabolic section, for which he offered two independent proofs, one using his Principle of the Lever, the other using a geometric series.

Archimedes discovered formulae for the volume and surface area of a sphere, and may even have been first to notice and prove the simple relationship between a circle's circumference and area. For these reasons, π is often called Archimedes' constant. His approximation $223/71 < \pi < 22/7$ was the best of his day. Archimedes' Equiarea Map Theorem asserts that a sphere and its enclosing cylinder have equal surface area (as do the figures' truncations).

Archimedes also proved that the volume of that sphere is two-thirds the volume of the cylinder. He requested that a representation of such a sphere and cylinder be inscribed on his tomb.

ISAAK (SIR) NEWTON (1642 - 1727), England

He is famous for his Three Laws of Motion (inertia, force, reciprocal action).

However Newton was apparently the first person to conclude that the ordinary gravity we observe on Earth is the very same force that keeps the planets in orbit. His Law of Universal Gravitation was revolutionary and due to Newton alone.

Newton published the Cooling Law of thermodynamics.

Newton's greatness is also indicated by the huge range of his physics: even without his Laws of Motion, Gravitation and Cooling, he'd be famous just for his revolutionary work in optics, where he explained diffraction, observed that white light is a mixture of all the rainbow's colours, noted that purple is created by combining red and blue light and, starting from that observation, was first to conceive of a colour hue «wheel». Newton almost anticipated Einstein's mass-energy equivalence, writing «Gross Bodies and Light are convertible into one another... [Nature] seems delighted with Transmutations».
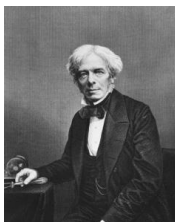
MICHAEL FARADEY
(1791 - 1867)

Michael Faraday is probably the greatest experimental physicist ever. By varying a magnetic field he produced electric current in a wire, and so discovered electromagnetic induction, the means by which nearly all electricity is generated by power plants today. He discovered electromagnetic rotation – the forerunner of the electric motor – and he discovered that diamagnetism is a property of all materials. His laws of electrolysis lie at the heart of

electrochemistry, which he played a large part in founding. He invented the Faraday Cage, which prevents lightning damaging anything within it and prevents external interference affecting sensitive electric and electronic experiments. He discovered that magnetism and light are related by showing that a magnetic field rotates the plane of light polarization. He was the first person to liquefy gases, and he discovered the enormously important chemical compound benzene.
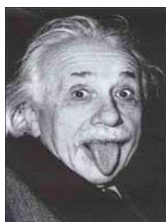
ALBERT EINSTEIN
(1879 – 1955)

Albert Einstein rewrote the laws of nature. He completely changed the way we understand the behaviour of things as basic as light, gravity, space and time. He established that everyone, whatever their own speed relative to light, measures the speed of light to be 300 million meters per second in a vacuum. This led to the strange new reality that time passes more slowly for people travelling at very high speeds than for people moving more slowly. Hence space and time actually merge into the single phenomenon of space-time.

He discovered the iconic equation, $E = mc^2$, which shows that energy and matter can be converted into one another. In his General Theory of Relativity, Einstein showed that matter causes space-time to curve, which produces the phenomenon that we call

gravity; he showed that the path of light follows the gravitational curve of space; and he showed that time passes more slowly when gravity becomes very strong. He also demonstrated the photoelectric effect, establishing that light can behave as both a wave and a particle.

TEXT 2

ARITHMETIC
HOW THE USE OF NUMBERS BEGAN

<u>Many thousands of years ago</u> this was a world without numbers. Everyone knew just what belonged to him and what not.

But <u>some people acquired more and more property</u>. They would count one cow, two cows, three cows; one vase, two vases, and three vases; always one, two, three or more of something they owned.

How far we have advanced from the time of our ancestors! Today, using numbers, numerals and mathematics, man <u>builds</u> bridges, skyscrapers, flies off the earth like a bird, even measures the distance to the moon and the brightness of the light given off by the firefly. But just as important though not so exciting, is that he can tell the time, pay the grocer, count the runs in a baseball game and use the same numbers in many different ways in everyday life.

So you see mathematics and numbers, from simple arithmetic to complex algebraic and geometric calculations, are important to life in our time.

Roman Numerals. The Romans used seven capital letters <u>to represent numbers</u>. They mixed them together to form many different combinations. <u>The Roman system of numbers is based upon the letters, I, V, X, L, C, D and M.</u> This is what each letter represents:

Roman Numeral	I	V	X	L	C	D	M
Hindu-Arabic Numeral	1	5	10	50	100	500	1000

Tasks:

1. *Read carefully and consider if the following sentences are true or false:*

– Numbers appear only last century.
– The Greeks used capital letters to show numbers.
– Letter M means one thousand.
– We have advanced from our ancestors too far.
– Thousands years ago people didn't know numbers but they knew for sure what belonged to him and what not.

2. *Write down different questions to the underlined words in the text.*

TEXT 3

TRIANGLES
WHAT IS A TRIANGLE?

Everyone is familiar with the simplest mathematical objects, such as straight lines and circles and squares, and the counting numbers. To be a mathematician all you have to do is to learn to look at these objects with some insight and imagination, maybe do a few experiments too, and be able to draw reasonable conclusions.

The result of these activities – which are also quite familiar to you from everyday life – is that you soon see the square as more than something with four equal sides and four right angles; a circle as more than just a plain circle; and the number 8 as much more than merely the next number after 7. We are going to start this mathematical adventure by looking at another very simple and common mathematical object, the humble triangle.

What features does it have? The three sides could be any length at all – except that the two shorter sides together must be longer than the longest side, or the triangle would not close. You cannot make a triangle out of three strips of wood of length 3, 5 and 12 meters.

The three angles cannot be chosen as freely as the three sides. In fact, when we know the size of two of them, the other one can be calculated, because their sum is constant and is equal to 180°.

What other properties does the original triangle have? None, until we use our imagination and start asking some searching questions. As soon as we start to pose problems, and to solve them, we inevitably find ourselves discovering more of its many features. One natural question is: how big is this triangle? What is its area? The simplest and traditional way to find the area is to divide the triangle into two right-angled triangles, by drawing an altitude, as in Fig. 1.1, and then drawing a horizontal line which bisects the altitude at right angles. This dissects each right-angled triangle into a rectangle. The original triangle has been transformed into a rectangle of the same height, and half the width. This trick can be performed in three different ways, if all three angles of the triangle are less than a right angle, by starting with each of the three sides. This at once tells us something about the lengths of the altitudes and the sides:

$BC \times AD = CA \times BE = AB \times CF.$
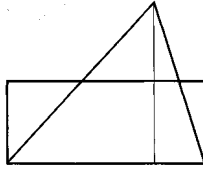
Fig. 1.1

Tasks:

1. *Answer the following questions:*
1. What is a humble triangle?
2. What main features of a humble triangle can you name?
3. What is the sum of all angles in a triangle equal to?
4. How can the area of a humble triangle be found?

2. *Find Ukrainian equivalents to English words and expressions:*
insight, to draw reasonable conclusions, to pose problems, to bisect, to dissect, to be performed.

3. *Find definitions of the following geometrical figures in the dictionaries:* a square, a circle, a triangle, a rectangle.

4. *Make up a plan of the text «What is a triangle?» and retell the text, according to your plan, and using the following words and expressions:*

It is well known, hence, consequently, therefore, so, it is obvious, it is evident, apparently, manifestly.

TEXT 4

1. *Discuss with your group mates:*
   1. How often and for what purposes do you use a computer? How do you feel if your computer is broken?
   2. What kinds of information do you look for and use mostly?

3. Have you ever considered your computer skills as a tool of career choices?

2. *Read the text and write down the specific terminology.*

INFORMATION SYSTEMS

There are two tools that are used to convert data into information and communicate it to the people. They are computers and information systems.

A system is any set of components that work together to perform a task. An information system is a set of components that work together to manage the acquisition, storage, manipulation and distribution of information.

Information systems designed to be used by many users are called multiuser information systems. They are found in most businesses and organizations.

An information system has three basic functions: (1) to accept data (input); (2) to convert data to information (process); and (3) to produce and communicate information in a timely fashion to users for decision making (output).

Many of today's products could not be produced without the effective use of information systems. Aerospace, automotive and industrial manufacturers use information systems to automate production and streamline engineering, speed developing time, reduce costs, keep up with the competition. These industries invest a lot in information systems to compete in cost, quality and delivery.

As you examine potential career choices, you will find that many require knowledge and understanding of computers and information systems as well as the ability to use them.

Possessing knowledge and understanding of computers and information systems in combination with the ability to use them is called computer literacy. Information is the life-blood of the company. Most activities performed by managers – such as problem identification and solution, control and decision-making – are based on information. Automation systems technology is growing rapidly as a business. It can be divided into three major segments: communications, data processing and office automation.

Tasks:

1. Answer the questions:

a) Where are multiuser information systems usually found?

b) Why is it important to have a basic level of knowledge, understanding and skills in using computers and information systems?

c) What are three main functions of information?

d) What activities do managers perform?

2. Give definitions or simply complete the sentences:

a) An information system is . . . .

b) . . . . .are called multiuser information systems.

c) Industries invest a lot in information systems to . . . .

e) Computer literacy means . . . .

f) . . . . are based on information.

TEXT 5

COMPUTER ARCHITECTURE

There are different types of computer of varying size and power, including the following:

– Supercomputer (the most powerful type of mainframe);

– Mainframe (large, very powerful, multi-user i.e. can be used by many people at the same time, multi-tasking i.e. can run many programs and process different sets of data at the same time);

– Minicomputer (smaller than a mainframe, powerful, multi-user, multitasking);

– Personal computer (PC) (single user);

– Desktop computer (suitable size for sitting on an office desk);

– Workstation (most powerful type of desktop, used for graphic design, etc.);

– Portable (can be carried around, can operate with batteries);

– Laptop (large portable, can be rested on user's lap);

– Notebook (size of a sheet of notebook paper);

– Handheld (can be held in one hand);

– Pen-based (main input device is an electronic pen);

– PDA (personal digital assistant, has functions such as task lists, diary, address book). Note that the term PC usually refers to an IBM compatible personal computer i.e. an Apple Mac personal computer is not referred to as a PC.

A computer that provides a service on a network e.g. storing files, sharing a printer, is known as a server computer. Server computers usually have a UPS (uninterruptible power supply)

attached to them. This is a battery that automatically provides an electricity supply to allow the server to shut itself down properly if the main supply fails.

The processor e.g. Pentium, is the most important part of the computer. It processes the data and controls the computer. Powerful computers used as servers often have more than one processor.

There are two main types of memory:

a) RAM (random access memory) holds the program instructions and the data that is being used by the processor;

b) ROM (read only memory) holds the program instructions and settings required to start up the computer.

The combination of the processor and memory is sometimes referred to as the CPU (central processing unit), although sometimes the processor itself is referred to as the CPU. The other parts connected to the CPU are known as peripherals. These can include input devices, output devices, storage devices and communications devices. Input devices include: keyboards, scanners, barcode readers, digital cameras, microphones and video cameras e.g. webcams (small digital video cameras used on the Web).

Output devices include: monitors (VDU display screens), printers, plotters, loudspeakers, headphones.

Storage devices include: magnetic tape, floppy disks (diskettes), hard disks, CD-ROMs, CD-R disks, CD-RW disks, DVDs and MO disks. A common communications device is a modem (a modulator/demodulator used for converting digital signals to analogue signals and vice versa to allow a computer to be connected to the ordinary telephone system). A set of connectors used for

carrying signals between the different parts of a computer is known as a bus. Data is transferred constantly between the processor and memory along the system bus. Each part of memory has its own memory address and the processor determines where processed data is stored by sending an address signal along an address bus and data along a data bus. This is synchronized by an electronic clock in the CPU that determines the operating speed of the processor. Transferring data between the processor and RAM can slow up the computer; therefore, some very expensive, extremely fast memory is usually used as a cache to hold the most frequently used data.

Before a program or data can be used, it must be transferred from the storage device to the main RAM memory. Hard disks consist of a set of magnetic coated metal disks that are vacuum-sealed inside a case to keep out the dust. The magnetic surfaces of the disks are formatted using a read/write head to provide magnetic storage areas. These storage areas form concentric circles called tracks and each track is subdivided into sections called sectors.

There is a variety of optical storage devices that use laser light to read or write to a disk, including: CD-ROMs (compact disk read only memory), CD-R (recordable compact disk), CD-RW (rewritable compact disk), DVD (digital versatile disk - previously known as digital video disk).

When comparing computers, the power of the computer is important. Speed is measured in hertz (Hz) i.e. cycles per second. Capacity is measured in bytes (B) where 1 byte = 8 bits (binary digits) = 1 character.

Tasks:

1. Find in the text and translate into Ukrainian:

Architecture, powerful data, suitable size, graphic design, input device, a server computer, uninterruptible, random access memory, required, input devices, output devices, storage devices, a set of connectors, rewritable compact disk, character.

2. Make up a list of «computer» words in English.

3. Write down all abbreviations and decode them.

4. Fill in gaps with proper prepositions:

a) Each track is subdivided.... sections called sectors.

b) Workstation is the most powerful type ... desktop, used ... graphic design, etc.

c) Handheld can be held ... one hand.

d) Random access memory holds the program instructions and the data that is being used ... the processor.

e) This is synchronized ... an electronic clock.

f) Hard disks consist ... a set of magnetic coated metal disks.

g) Speed is measured ... hertz.

TEXT 6

1. Do you know much about Alfred Nobel, Nobel Prize and its winners? Who were the Nobel Prize winners in your field?

2. Have you ever watched the Nobel award ceremony on TV? What did it look like? What did the participants have to wear? What impressed you most?

3. Check whether you know the words and word combinations below: destructive power, contributions to mankind, to foresee, original legacy, illuminated diploma, to determine, minority.
4. Read the text and translate it in written form.

ALFRED NOBEL AND NOBEL PRIZE

After inventing dynamite, Swedish-born Alfred Nobel (1833-1896) became very rich. He foresaw universally destructive power of his invention too late. Nobel preferred not to be remembered as the inventor of dynamite, so in 1895, just two weeks before his death, he created a Fund to be used for awarding prizes for people who had made great contributions to mankind. Originally the prizes were awarded for outstanding work in physics, chemistry, medicine, literature and the promotion of peace. Economics was added in 1968, just after sixty-seven years after the first awards ceremony.

Nobel's original legacy of nine million dollars was invested, and the interest on this sum is used for the awards which vary from $30,000 to $125,000. No awards were presented from 1940 to 1942 at the beginning of the World War II. Some people have won two prizes, but this is rare; others have shared their prizes.

Every year on December 10, the anniversary of Nobel's death, the awards (gold medal, illuminated diploma and money) are presented to the winners. Sometimes politics plays an important role in the judges' decision.

Every year since 1901 the Nobel Prize has been awarded for achievements in ***physics**, chemistry, physiology or medicine,*

literature and for peace. The Nobel Prize is an international award administered by the Nobel Foundation in Stockholm, Sweden. In 1968, Sveriges Riksbank established The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, founder of the Nobel Prize. Each prize consists of *a medal, personal diploma, and a cash award.*

The Nobel Foundation was founded as a private organisation on 29 June 1900, to manage the finances and administration of the Nobel Prizes.

Each prize is awarded by a separate committee; the Royal Swedish Academy of Sciences awards the Prizes in Physics, Chemistry, and Economics, the Karolinska Institute awards the Prize in Physiology or Medicine, and the Norwegian Nobel Committee awards the Prize in Peace. Each recipient receives a medal, a diploma and a monetary award that has varied throughout the years. In 1901, the recipients of the first Nobel Prizes were given 150,782 SEK, which is equal to 7,731,004 SEK in December 2007. In 2008, the winners were awarded a prize amount of 10,000,000 SEK. The awards are presented in Stockholm in an annual ceremony on December 10, the anniversary of Nobel's death.

1. Georges Charpak, *born in then Poland, now Ukraine*, Physics, 1992

2. Roald Hoffman, *born in then Poland, now Ukraine*, Chemistry, 1981

3. Illia Mechnikov, *born in then Russian Empire, now Ukraine*, Physiology or Medicine, 1908

Tasks:

1. Say whether the following statements are TRUE or FALSE:

a) Alfred Nobel managed to make a big profit of his invention.

b) Physicists, chemists and mathematicians can win the Nobel Prize.

c) The original amount of money made less than ten million dollars.

d) Scientists share their Nobel Prizes quite often.

e) A political factor is of no importance when the Nobel Prize winners are chosen.

2. Answer the questions:

a) What contributions to mankind did Ukrainian scientists who won the Nobel Prize make?

b) What do the winners actually get at the award ceremony?

3. Find as many Ukrainian scientists as you can in different fields who won the Nobel Prize.

TEXT 7

1. Read the text and do the tasks that follow.

FRACTIONS

There are three methods of dealing with fractions:

1. by expressing each fraction as the sum of fraction with unit numerators (одиниця у числівнику), (= одиничні дробові числа) e.g.

$$\frac{5}{6} = \frac{1}{2} + \frac{1}{3}$$

2. by dividing the unit into sub-units which are given special names, e.g. the foot is divided into twelve parts and each twelfth part is called an inch;

3. by using fractions whose denominators (знаменник) are powers (ступені) of the same number, e.g.

$$\frac{3}{4} = \frac{7}{10} + \frac{5}{100}$$

The Egyptians used the first method and developed a high degree of skill in it. The second method was used by the Romans, who divided their pound, their foot and one of their coins into twelfths; these fractions were called *unciae*, from which we get the words inch and ounce. The third method dates back to the Babylonians, who used fractions with denominators which were powers of 60; the Greeks also this method in scientific work.

It was not until Simon Stevin (1548-1620) published his essay on decimal fractions in 1585 that the third method, with denominators which all powers of 10, became generally adopted. Stevin was an important government official in the Netherlands in the time of the struggle against Spain. Many authors had used decimal fractions in particular problems, and decimal point first appeared in print as early as in 1492, but Stevin was the originator of general rules for the use of decimal fractions.

Tasks:

1. Choose the best sentences ending which is true to the text:

1) The Egyptians used:

a) the second method of dealing with fractions.

b) the first method of dealing with fractions and developed a high degree of skill in it.

c) fractions called unciae.

d) fractions with denominators which were powers of sixty.

   2) The third method dates back to

a) The Roman period.

b) 1585 when Simon Stevin published his essay on decimal fractions.

c) Ancient times

d) The Babylonians, who used fractions with denominators which were powers of sixty

2. Rearrange the words to make sentences.

1. with /three /are /methods /of /dealing /There /fractions.

2. method /The /used /Egyptians /the /first.

3. in /print /decimal /as /early /in/ as/ 1492 /point /appeared /The /first.

3. Find specialized words and word-combinations and translate them into Ukrainian.

TEXT 8

Tasks:

1. Read the text carefully and translate it into Ukrainian.

Write down all the underlined words into a specialized vocabulary, translate them and learn by heart.

WHAT IS PER CENT?

We have already learned two ways of writing <u>fractional parts</u>: common fractions and decimal fractions. Another method is by using <u>per cents</u>.

Per cent tells the number of parts in every hundred. This number is followed by the <u>per cent sign</u> (%). The word «per cent» and sign % actually <u>refer to</u> the <u>denominator</u> of a fraction expressed as <u>hundredths</u>.

When working with per cent, we do not write the word, but use the sign %, 20 per cent is written 20% and so on.

In working with <u>problems involving percentage</u>[1] we must be able to change per cents to <u>decimals</u> and decimals to per cents.

We can change a per cent to a decimal <u>by dropping</u> the per cent sign and moving <u>the decimal point</u> two places to the left. We can change a per cent to a common fraction with the given number as <u>the numerator</u> and 100 as <u>a denominator</u>.

One hundred per cent of <u>quantity</u> is <u>the entire quantity</u>.

To find a per cent of a number, change the per cent to the equivalent decimal fraction or common fraction and multiply the number by the fraction. To find the per cent of one number from a second number, <u>form a fraction</u> in which the first number is the numerator, and the second number is the denominator. Divide the numerator into the denominator and change the decimal fraction to a per cent. To find a number when a per cent of it is known, change the per cent to an equivalent decimal fraction or common fraction, divide <u>the given number</u> by this fraction.

Note:

[1] problems involving percentage — задачі на знаходження відсотку

Tasks:

1. Give antonyms of the following words:

common fractions, denominator, moving two places to the left, to find, known, the first, multiply by.

2. Complete the sentences:

a) Per cent tells the number of parts in ....

b) The word «per cent» refer to .....

c) We can change per cents to ....

3. Look through the text again to find all irregular verbs in it. Arrange them alphabetically.

4. Unscramble the words:
   a) r e h u d n d   b) t i f r o n a c c) t i m u p l y l

TEXT 9

Tasks:

1. Read the text carefully and translate it into Ukrainian.

2. Write down all the underlined words into a specialized vocabulary, translate them and learn by heart.

3. Be ready to speak on the topic «The fundamental theorem of the calculus».

THE FUNDAMENTAL THEOREM
OF THE CALCULUS

To formulate the fundamental theorem of the calculus[1] we consider the integral of a function $y = f(x)$ from the fixed lower limit a to the variable upper limit x. To avoid confusion between the upper limit of integration x and the variable x that appears in the symbol $f(x)$ we write this integral in the form

$$F(x) = \int_0^x f(u)\, du,$$

indicating that we wish to study the interval as a function $F(x)$ of the upper limit x. This function $F(x)$ is the area under the curve $y = f(u)$ from the point $u = a$ to the point $u = x$. Sometimes the integral $F(x)$ with a variable upper limit is called as «indefinite» integral.

Now the fundamental theorem of the calculus is:

The derivative of the indefinite interval (1) as a function of x is equal to the value of $f(u)$ at the point x.

On an intuitive basis the proof is very easy. It depends on the interpretation of the integral $F(x)$ as an area, and would be obscured if one tried to represent $F(x)$ by a graph and the derivative $F'(x)$ by its slope. Instead of this original geometrical interpretation of the derivative we retain the geometrical explanation of the integral $F(x)$ but proceed in an analytical way with the differentiation of $F(x)$.

Task 4. Define the functions and the forms of the Gerund.

1. Writing a sentence in algebraic way, as we have seen, involves two steps.
2. The young scientist began experimenting.
3. Reducing a fraction means bringing it to lower terms.
4. The researchers began looking for another solution.
5. You have already learned to use parentheses as a means (for indicating that one group of terms is to be multiplied by another group of terms.

Task 5. *Read these international words and guess their meaning.*

interior, exterior, to classify, hypotenuse, start, base, polygon, parallel, parallelogram, congruent, rhombus, separate, to separate.

TEXT 10
Tasks:
1. *Read the text and translate it in written form.*
2. *Make up Vocabulary with specific terms.*
3. *Write down an abstract of the text (3 sentences + Key words.*
4. *Retell the text (7-10 sentences)*

WHICH IS MORE ELASTIC - STEEL OR DIAMOND?
Definitely the steel is more elastic. This is the main reason why steel can absorb far more kinetic energy than diamond when impact is delivered to it. Materials are divided in two categories; 1) brittle materials (which are easy to break) and 2) ductile materials (which are difficult to break). Fracture toughness and hardness are two different aspects.

Fracture toughness is defined as the resistance of a material to the propagation of cracks in it. Hardness means resistance of the material to local plastic deformation of the material (abrasion, indentation, etc). Plastic deformation (such as abrasion, indentation etc) is defined as the type of deformation that remains on a material after removal of the cause that created it (for example after impact). The opposite of the plastic deformation is

elastic deformation, which is the type of deformation that lasts only as long as the cause that created it remains on it.

A typical example of elastic deformation is the deformation of a tennis ball, when it gets hit by a racquet. At the moment of impact, the tennis ball is greatly deformed; however after the tennis ball leaves from the racquet, the shape of the ball comes back to normal.

If a material is harder than another material, it is able to scratch or cause indentation to the softer material.

However, if a material possesses great hardness but without having also great fracture toughness, it is brittle. For example glass, diamond (etc.) are materials that are very hard (diamond is the hardest material found in nature) but they both have low fracture toughness, and this makes them brittle. Steel is less hard than diamond but it has much higher fracture toughness than diamond. This means that if you hit a diamond with a hammer, the diamond will shatter.

Despite the fact that diamond is extremely hard, it is brittle because it has low fracture toughness (resistance to fracture). The low fracture toughness of diamond is due to flaws in its chemical structure.

More specifically about the rigid chemical structure of a diamond, the atoms of a diamond are held together with extremely strong bonds, (tetrahedrally bonded carbon atoms). These bonds make the diamond extremely hard.

However, if forceful impact is delivered, and these bonds break, the atoms cannot stick back together to that strict, rigid and

extremely dense chemical structure and the diamond breaks. On the contrary, in metals (such as steel) the atoms are held together BY a «sea» of electrons. When impact is delivered to metals, or when a metal is bent, the «sea» of electrons simply bends with the atoms inside it (atoms are held together BY the electrons, as said before) and holds it without breaking.

This happens because in metals, electrons are free to delocalize and move from atom to atom. So, when impact is delivered to a metal, the electrons will delocalize and move from atom to atom, (as a result of the kinetic energy).

Since most of the kinetic energy is absorbed by the movements of the electrons from atom to atom, a great amount of the force is neutralized. This means that steel can greatly absorb a blow. Since diamond has low fracture toughness, (due to its chemical flaws which were described before), it is not capable to absorb well the kinetic energy. These flaws help the driving force on a crack (this is the force that propagates the crack in it) to propagate the crack. Also, there are many types of steel. The harder the steel, the more brittle it is.

The softer the steel, the more elastic it is. Best types of steel are those that are specially made to combine great hardness and fracture toughness.

These types of steel have great hardness on the steel surface, (so the surface is protected from indentations), but inside they have softer steel that gives high fracture toughness, (so the inside part of the steel is able to absorb great amounts of kinetic energy, when impact is delivered to it).

Also, the previously described differences in chemical structures between metals (such as steel) and diamond explain the reason why metals are conductors of electricity, whereas diamond is a non-conductor of electricity. In metals, the electrons are free to delocalize and move from atom to atom. This makes metals conductors of electricity. On the contrary, in diamond, which has a very rigid chemical structure, there are no loosely attracted electrons. The electrons (in the chemical structure of diamond) are not free to move from atom to atom, so diamond is a non-conductor of electricity.

TEXT 11
SCIENTIFIC AND TECHNOLOGICAL PROGRESS

It's difficult to overestimate the role of science and technology in our life. They accelerate the development of civilization and help us in our co-operation with nature. Scientists investigate the laws of the Universe, discover the secrets of nature, and apply their knowledge in practice improving the life of people. Let's compare our life nowadays with the life of people at the beginning of the 20-th century. It has changed beyond recognition. Our ancestors hadn't the slightest idea of the trivial things created by the scientific progress that we use in our everyday life. I mean refrigerators, TV sets, computers, microwave ovens, radio telephones, what not. They would seem miracles to them that made our life easy, comfortable and pleasant.

On the other hand, the great inventions of the beginning of the 20-th century, I mean radio, airplanes, combustion and jet engines

have become usual things and we can't imagine our life without them. A century is a long period for scientific and <u>technological progress</u>, as it's rather <u>rapid.</u> Millions of investigations, the endless number of outstanding <u>discoveries</u> have been made.

Our century has had several names that were connected with a certain era in science and technology. At first it was called <u>the atomic age</u> due to the discovery of the <u>splitting of the atom</u>. Then it became the age of <u>the conquest of space</u> when for the first time in the history of mankind a man overcame <u>the gravity</u> and entered the Universe. And now we live in <u>the information era</u> when the computer network embraces the globe and connects not only the countries and space stations but a lot of people all over the world.

All these things prove the power and the greatest progressive role of science in our life. But every medal has its reverse. And the rapid scientific progress has aroused a number of problems that are a matter of our great concern. These are <u>ecological problems</u>, the safety of <u>nuclear power stations</u>, the nuclear war threat, and the responsibility of a scientist. But still we are grateful to the outstanding men of the past and the present who have courage and patience to disclose the secrets of the Universe.

TASKS:

1. Translate the text into Ukrainian.

2. Translate the underline words and word-combinations.

3. Write down all regular and irregular verbs (irregular verbs – in three columns).

4. Use all possible tense forms in the following sentence. Add any changes if necessary:

Scientists investigate the laws of the Universe.

5. *Put all possible questions to the statement:*

Science and technology accelerate the development of civilization.

TEXT 12

THE ABEL PRIZE

There is no Nobel Prize for mathematics, but many mathematicians have won the prize, most commonly for physics but occasionally for economics, and in one case for literature. For instance, when mathematician John Nash won a Nobel Prize in 1994, it was for a result that had a major impact in economics.

The Abel Prize is intended to give the mathematicians their own equivalent of a Nobel Prize. Such an award was first proposed in 1902 by King Oscar II of Sweden and Norway, just a year after the award of the first Nobel Prizes. However, plans were dropped as the union between the two countries was dissolved in 1905. As a result, mathematics has never had an international prize of the same dimensions and importance as the Nobel Prize.

Plans for an Abel Prize were revived in 2000, and in 2001 the Norwegian Government granted NOK 200 million (about $22 million) to create the new award. Niels Henrik Abel (1802-1829), after whom the prize is named, was a leading 19th-century Norwegian mathematician whose work in algebra has had lasting impact despite Abel's early death aged just 26. Today, every mathematics undergraduate encounters Abel's name in connection

with commutative groups, which are more commonly known as «Abelian groups».

The Abel Prize is awarded annually, and is intended to present the field of mathematics with a prize at the highest level. Laureates are appointed by an independent committee of international mathematicians.

As a result of Norway's action, made in part to celebrate the 200-th anniversary of Abel's birth in 2002, mathematicians now have an award equivalent to the Nobel Prize too. The question is: will the new prize achieve the international luster of a real Nobel? The Nobel Prize in Economics (as it is popularly, but incorrectly, called) achieved that status after it was introduced in 1968, but in that case the Bank of Sweden, which created the award, attached the magic name Nobel to it. One could hardly expect Norway to name their prize after a famous Swede, especially when they have Abel to recognize.

The Fields Medal

The awards to recognize both existing work and the promise of future achievement are:

1) **the medals** to mathematicians, which is awarded every four years, at the Congress, by its organizing body, the International Mathematical Union. «Medals» are more properly known by their official name, «International medals for outstanding discoveries in mathematics».

2) The medal is accompanied by a cash prize of CND$15,000.

There are some unique characteristics of the Fields Medal that make it different from a Nobel Prize. *First* it is awarded only every fourth year. *Second*, it is given for mathematical work done before the recipient is 40 years of age. *Third*, the monetary prize that goes with the Fields Medal is considerably less than the Nobel Prize. *Fourth*, the Fields Medal does not come out of Scandinavia.

Tasks:

1. *Translate the text.*
2. *Find out the sentences in Passive Voice.*
3. *Write down the list of the Abel Prize winners.*
4. *Find the numbers in the text. What do they refer to? Write them in words.*

TEXT 13

WORDS AND EXPRESSIONS TO BE REMEMBERED

Phenomenon – phenomena	accurate	primarily
to correlate	to formulate	theory
on the basis of	to predict	hence
to depend on (upon)	natural	therefore
in terms of	nature	concept
theoretical	distinct	investigation
observation	stable	to surround
to deal with	liquid	to revolve

WHAT IS PHYSICS?

Physics is one of the most ancient sciences about nature. The word «physics» takes its origin from the Greek word «phewsis»

meaning nature. Physics is the science studying various phenomena in nature: mechanical motion, heat, sound, electricity, magnetism and light.

Physics is one of the main sciences about nature. The development of other sciences depends in many respects on the knowledge of physical phenomena. Physics divides itself very naturally into two great branches, experimental physics and theoretical physics. The former is the science of making observations and devising experiments which give us accurate knowledge of the actual behavior of natural phenomena. On the basis of experimental facts theoretical physics formulates laws and predicts the behaviour of natural phenomena. Every physical law is based on experiments and is devised to correlate and to describe accurately these experiments. The wider the range of experience covered by such a law, the more important it is. Physics is divided into half a dozen or more different fields — mechanics, sound, heat, electricity and magnetism, light, molecular, atomic and nuclear physics. These different fields are not distinct but merge into each other.

In all cases physics deals primarily with phenomena that can be accurately described in terms of matter and energy. Hence, the basic concepts in all physical phenomena are the concepts of matter and energy. Therefore, it is important to determine accurately the characteristics of both matter and energy, the laws that govern their transformations, and the fundamental relations that exist between them.

MATTER

Every substance or material that we come in contact with or which is known to man can be divided into particles known as molecules. Chemical reactions indicate that the molecules are composed of smaller units, or atoms, and modern physical methods of investigation have shown that the atom consists of a centrally situated nucleus with a total positive charge surrounded by a number of electrons which revolve about the nucleus. In a stable atom, the total positive charge of the nucleus is equal to the total negative charge of the electrons which surround the nucleus. The total electrical charge is zero and this is the conventional state of most atoms.

Matter can exist in four states: solid, gas, liquid and plasma.

Task 1. *Find the equivalents:*

Actual, on the basis of, to deal with, to cover, to divide, distinct, both ... and, to be equal to, to exist,   to depend on, concept, to revolve

Task 2.

Translate into Ukrainian without using a dictionary:

1. All matter is made up of small particles called molecules. 2. A molecule is so small that it cannot be seen with the most powerful light microscope. 3. But we can count the exact number of molecules in any given volume more accurately than we count the population of a city. 4. An atom is the smallest particle of an element. 5. A molecule is always the combination of atoms two or more. 6. The elements are all different from one another. 7. These differences must mean that atoms like molecules, are made up of smaller particles. 8. Elements differ from one another

because of the different number of electrical charges inside their nuclei. 9. In all electrically neutral elements the number of lectrons is equal to the number of protons inside the nucleus. 10. They neutralize each other. 11. In all chemical reactions only the molecules change and not the atoms. 12. The earth revolves around the sun. 13. The moon revolves around the earth.

Task 3. *Change the following statements to questions beginning with the question words given:*

1. Physics deals with relation between matter and energy, *(what)*

2. Chemistry deals with the composition of matter and reactions between various forms of matter, *(what)*

3. Both chemistry and physics deal with matter, **(what)**

4. The science of physical phenomena in space is called astrophysics, *(what)*

5. This century more and more of the devices and methods of physics have been applied to the study of phenomena in space, *(what)*

6. The scientist plans experiments and observations to test his hypothesis. *(what, who)*

7. When a scientific conclusion becomes generally accepted, it is called a law or principle, *(when)*

8. In physics laws are usually expressed as mathematical formulas, *(how)*

9. The formula is useful in describing natural events and in predicting future events *(when)*

10. Matter is composed of large numbers of very tiny particles called molecules, *(what)*

Task 4. *Translate into English:*

1. Протягом тисячоліть людям були відомі три стани речовини: твердий, рідкий і газоподібний.

2. П'ятдесят років тому учені відкрили четвертий стан матерії - плазму.

3. Більшість речовин Всесвіту знаходиться у четвертому стані.

4. Сонце, зірки і блискавка є теж плазмою.

5. Сьогодні плазма широко використовується в різних сферах.

6. Плазма твердого тіла володіє багатьма властивостями газової плазми.

7. Плазма твердого тіло має більш високу концентрацію заряджених частинок.

TEXT 14.

THE FUTURE OF IT

In IT (Information Technology - the study and practice of techniques or use of equipment for dealing with information), the hardware such as computers, phones and consumer electronics, is converging. So are the applications of IT, with a convergence of information, entertainment, communications, shopping, commerce and education. We must, however, solve the interface problem (the problem of communication between us and machines). Voice and language recognition (computer programs changing speech

into program commands and digital data) will provide an easy interface, avoiding the problem of technophobic users (users who have a fear or strong dislike of technology and technological devices). Telecomms applications (programs used for communications over long distances) will be more common. They will contain smart databases (electronic filing systems with records that can be easily sorted and searched) and virtual environments (environments that are computer simulated), with ID (identity) verification, encryption (the transformation of data into coded form to make it secure), translation and other services based on voice processing (changing speech into digital signals). They will include a natural voice interface to talk to the computer, all the A1 (artificial intelligence - computer programs that perform tasks that can normally only be done using human intelligence) to carry out the request, voice synthesis (the generation of a human-sounding voice using electronic circuits) and visualization technology (systems and devices used to create a virtual reality environment) to get the answer out. E-cash (electronic money) will be used on the Net (the Internet). Changes in work practices may lead to teleworking (working at home while communicating with your office by computer, telephone and fax). High bandwidth connections (communications links with a high signal capacity) will be available in trains and planes. Communicator badges will be used to provide voice links to network computers, and earphones will have built-in voice synthesisers (electronic devices that generate a human-sounding voice).

Homo Cyberneticus is the name used in this unit for humans that have superhuman brainpower because their brains are directly linked to ultra-smart computers.

Homo Optimus is the name given to biologically optimized humans.

Homo Hybridus is a human with both the body of an Olympic athlete and a brain connected to cyberspace (the combination of all the data on all the computer networks throughout the world, accessed using the Internet).

Reverse engineering of the human brain (exploring the human brain from the inside and finding out how it works) will be required to recreate human intelligence. Eventually, tiny scanning robots (computer-controlled mechanical devices) will be sent along blood vessels to map the brain from the 68 inside. At the moment, computers work in serial (processing one item of data at a time) and brains work in parallel (processing lots of different data at the same time). Parallel computers will be able to reproduce some of the higher functions of the human brain.

Smart phones are telephones that use artificial intelligence to translate speech into different languages in real-time (instantly). Intelligent agents (computer programs that can be trained to watch, learn and start communicating) will help users to deal with the deluge of information from the electronic revolution.

Biotechnology (the industrial application of biological science techniques) is another core focus of R&D (research and development). Putting people online (connecting them to the Internet) and allowing them to upload medical information (copy

from a client computer to a server computer) can reduce the pressure on hospitals.

Futurologists predict that humans will be eclipsed by a supercomputer more powerful than the human brain.

Tasks:
1. Read the text and try to understand it without a dictionary.
2. Write down the words in bold and explain them in English.
3. Write a summary of the text.
4. Retell the text in the form of a dialogue with your group mate.

WRITE THE FOLLOWING STATEMENTS AS FORMULAS

a) Two seventh times – brace open – fifteen, plus seven times – bracket open – one half plus three times – parenthesis open – x minus two parenthesis, bracket, brace closed – equals five and two thirds, plus three quarters x

b) The limit of f of x as x tends to x sub one is capital l

c) f prime (or: α as h) of x is limit of f of x plus delta x minus f of x over delta x as delta tends to zero

d) S dot equals ds by dt

e) The integral of small f of x dx equals capital F of x plus capital O if capital F prime is equal to small f of x

f) Capital X equals the open interval minus infinity; plus infinity

g) The limit for delta x tending to zero, of the sum of small f of x sub k delta x taken from x sub k equal to a to x sub k equal to b minus delta x equals the integral from a to b of small f of xdx equals capital F of x between limits a and b equals capital F of minus capital F of a equals capital A

h) The logarithm of a to the power of three n equals the logarithm of the square root of x minus logarithm of the nth power of the fraction a squared over c

i) Set of all fractions p/g where p and g are elements of the set of integers and g cannot be zero

1. ***Translate into English:***

    1) Розділити –

2) Відповідь –

3) Квадратні дужки –

4) Рахувати, виконувати математичні дії –

5) Відсоток -

2. Match the words and word-combinations with their Ukrainian equivalents:

even number	числівник
problem (sum)	арифметична задача
common fractions	парне число
odd number	прості дробові числа
numerator	непарне число

3. Choose the correct answer:

1) Математика:

a) do the maths b) maths   c) to substract d) to divide by

2) десяткові дроби:

a) common fractions b) timesc) decimals d) equals to

3) віднімання

a) point   b) plus   c) minus   d) times

4) знаменник

a) minus   b) point c) denominator d) numerator

5) дорівнює

a) square root b) equals to c) answer d) quarter

4. True or false:

1. Quarter – чверть, четверта частина
2. To round up the numbers – округляти числа
3. Point – додавати
4. To add – два в кубі

5. Times – половина

Physics

Answer tile following questions:

1. What is physics?
2. What phenomena does physics study?
3. From what language does the word "physics" take its origin?
4. Does the development of other sciences depend on the knowledge of physical phenomena?
5. What is experimental physics (theoretical physics)?
6. On what are all physical laws based?
7. What are the basic concepts in all physical phenomena?
8. What are molecules composed of?
9. Describe the structure of matter.
10. Describe the structure of an atom in general terms.
11. What does molecular physics study?
12. What does nuclear physics study?
13. What does mechanics (optics) study?

Physics

1. Where does the word physics take its origin from?

     a) Latin   b) Greek   c) English

2. Physics is a science about:

a) Physiology   b) Nature   c) Mechanics

3. Matter has two types of state:

   a) properties   b) states   c) characteristics

4. Any given body has ….. energy if it is in motion.

   a) potential   b) thermal   c) kinetic

5. People often confuse energy, power and …

   a) force   b) work   c) job

6. When were the first Nobel Prizes awarded?

   a) 1968   b) 1901   c) 1969

7. In what field is the Nobel Prize not awarded?

   a) literature   b) mathematics   c) physics

8. X-rays are measured in

   a) ohms   b) newtons   c) angstroms

9. Who built the first laser

   a) Albert Fert b) Theodore H. Mainman c) Zhores I. Alferov

10. Nuclear energy is also called

   a) heat energy b) atomic energy c) light energy

Information Technologies

1. What is the language we input the data into the electronic spreadsheet?

        1) only special symbols   2) English only

        3) both English and any other language.

2. Key combination to cancel the action:

      1) CTRL+X   2) CTRL+Z   3) CTRL+C

3. Parts of PC

      1) Processor   2) Web-cam   3) USB-drive

4. Pyramid diagram is executed in:

      1) Excel   2) Word   3) PowerPoint

5. Design tools of presentation:

      1) Total Commander   2) Word 3) Microsoft PowerPoint

6. Whish program is text editor (word processor):

      1) Word 2) Excel   3) Paint   4) Access.

7. While text formatting ….. is (are) changed:

      1) font size   2) paragraphing

3) sequence of symbols, words and paras 4) page parameters

8. HTML means:

1) WWW-docs viewer   2) applied program

3) HTML   4) client/server interacting protocol

9. …. is not an archiving program:

1) 7-Zip   2) WinRAR   3) Excel   4) WinZip

10. Computer architecture is:

1) Main assembling of computer parts and their interaction.

2) Interaction between hard disk parts.

3) Basic units of a computer tower.

11. Antivirus tools are not intended for:

1) system testing

2) viruses and Trojan cure programs

3) checking viruses sampling and their cure

12. Who invented the first functional adding machine:

1) Pascal 2) Newton   3) Vohl   4) von Neumann

13. Is it possible to enter a page into electronic spreadsheet?

1) Yes   2) No   3) Only one page

14. To rename the selected item is possible with the help of:

1) DELETE-key   2) F2 -key 3) Home - key

15. … is not free antivirus utility software

1) Dr.Web CureIt   2) Kaspersky Virus Removal Tool

3) AVZ   4) Windows

16. EXCEL helps to create
    1) Graphic   2) Sound   3) Image

17. … is not a sound format:
    1) WAV   2) MP3   3) MIDI   4) DOC

18. … is (are) not an IP – address:
    a) 215.465.55.44   b) a@mail.ru c) 192.168.44.11
    d) http://yandex.ru/yandsearch?clid=9582

19. Paper input device is called:
    1) driver 2) plotter 3) streamer 4) scanner

20. What command is absent in Word:
    1) insert; 2) copy; 3) cut; 4) delete

21. How are the columns notated in Excel space?
    1) numbers 2) drawings 3) nothing 4) letters

22. What sign is at the beginning of the formula in Excel?
    1) sign = 2) sign $ 3) sign &

23. F1-key means:
    1) help topics   2) a document removal 3) sleep mode.

24. PC parts:
    1) motherboard 2) projector   3) stylus

25. … is not an operation system.

     1) MS-DOS 2) Windows 3) Unix 4) Excel

ФРАЗИ ДЛЯ РЕФЕРУВАННЯ ТЕКСТУ (СТАТТІ) АНГЛІЙСЬКОЮ МОВОЮ.

1. Назва статті, автор, стиль

The article I'm going to give a review of is taken from…	Стаття, аналіз якої я хочу зробити, взята з…
The headline of the article is	Заголовок статті…
The author of the article is…	Автор статті…
The article under discussion is …	Стаття, яка обговорюється, …

2. Тема. Логічні частини

The topic of the article is…	Тема статті …
The key issue of the article is...	Ключовим питанням статті є.
The article under discussion is devoted to the problem…	Стаття, яку ми обговорюємо, присвячена проблемі…
In the article the author touches	УВ статті автор торкається

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upon the problem of…	проблеми….
I'd like to comment on the problem of…	Я би хотів прокоментувати проблему…

3. Короткий зміст

At the beginning of the article the author ….	На початку статті автор
describes	описує
touches upon	торкається
explains	пояснює
introduces	знайомить
mentions	згадує
makes a few critical remarks on	
The article begins (opens) with a (the)	Стаття починається із …
description of	опису
statement	твердження
mention of	згадки про
the analysis of a summary of	Короткого аналізу
the characterization of	характеристики
(author's) opinion of	думки автора
the enumeration of	переліку
In conclusion the author	У висновку автор
dwells on	зупиняється на
points out	вказує на
generalizes	узагальнює
reveals	показує

4. Ставлення автора до окремих моментів

The author gives full coverage to..	Автор повністю охоплює..
The article contains the following facts…./ describes in details…	Стаття вміщує такі факти… / детально описує
The author starts with the statement of the problem and then logically passes over to its possible solutions.	Автор починає з постановки проблеми, а потім логічно переходить до шляхів її можливого вирішення.
The author asserts that…	Автор стверджує, що …
Let me give an example…	Дозвольте мені навести приклад …

5. Висновок автора

In conclusion the author says / makes it clear that…/ gives a warning that…	У висновку автор говорить / пояснює, що … / попереджає, що …
At the end of the article the author sums it all up by saying...	У кінці статті автор підводить підсумок, стверджуючи, що …
The author concludes by saying that../ draws a conclusion that / comes to the conclusion that	У висновку автор говорить, що .. / робить висновок, що / приходить до висновку, що

6. Додаткові вислови, які використовуються у статті

To emphasize … the author uses…	Акцентуючи увагу … автор використовує…

To underline … the author uses…	Підкреслюючи … автор використовує …
To stress…	Підсилюючи …

7. Висновок

Taking into consideration the fact that	Приймаючи до уваги факт…
The message of the article is /The main idea of the article is	Основна ідея статті …
In addition… / Furthermore…	Крім того …
On the one hand…, but on the other hand…	С одного боку…, проте з іншого боку …
Back to our main topic…	Повернемося до нашої основної теми
From my point of view…	З моєї точки зору …
As far as I am able to judge…	Наскільки я можу судити ...
My own attitude to this article is…	Моє особисте ставлення до цієї статті…
I fully agree with / I don't agree with	Я повністю погоджуюся з/ Я не погоджуюся з …
I have found the article important / interesting /of great value	Я вважаю статтю важливою/ цікавою/ такою, що має велику цінність (значення)

Examples:

The article I'm going to retell is devoted to...

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The article under consideration presents much interest for everyone.

First of all, the author draws our attention to the fact that...

In the next passage the author's attention is focused on...

The examples mentioned in this article illustrate well enough...

The author remains concentrated on these problems throughout the article.

The author arrives to the following conclusions:

I can find this article skilfully developed.

USEFUL EXPRESSIONS CONCERNING EDUCATION

Learn smth at one's mother's knee	Дізнатися про щось із пелюшок
Mental food	Духовна їжа
Food for thought	Їжа для розуму
Be very quick in	Швидко міркувати
Go one's own way	Йти своїм шляхом
Be head over ears in work	Поринути в роботи з головою
Busy one's brains about smth	Ламати голову над чимось
From cover to cover	Від А до Я
He should go far	Він далеко піде
A walking dictionary \ encyclopaedia	Ходячий словник / енциклопедія
Under pressure	Під тиском, проти волі
Turn a deaf ear to smth	Пропускати повз вуха
In (at) one ear and out (at) the other	До одного вуха увійшло, з іншого вийшло
It's never late to learn	Учитися ніколи не пізно
He, who makes no mistake, makes nothing	Той ніколи не помиляється, хто нічого не робить
Knowledge is power	Знання - сила
Live and learn	Вік живи – вік учись
Like teacher, like pupil	Який вчитель, такий і учень
Study under smb	Навчатися під керівництвом викладача
Money spent on the brain is	Гроші, витрачені на освіту,

| never spent in vain | завжди окупляться |

GREEK ALPHABET USED IN MATHEMATICS, PHYSICS AND INFORMATION TECHNOLOGIES

Capital letter	Small letter	Name of the letter
A	α	alpha
B	β	beta
Γ	γ	gamma
Δ	δ	delta
E	ε	epsilon
Z	ζ	zeta
H	η	eta
Θ	θ	theta
I	ι	iota
K	κ	kappa
Λ	λ	lambda
M	μ	mu
N	ν	nu
Ξ	ξ	xi
O	ο	omicron
Π	π	pi
P	ρ	rho
Σ	σ	sigma
T	τ	tau
Y	υ	upsilon

Φ	φ	phi
X	χ	chi
Ψ	ψ	psi
Ω	ω	omega

<div align="right">**APPENDIX B**</div>

GLOSSARY OF NOTATION

MATHEMATICS

Symbol	Meaning	Example
.	point; or: decimal point	
…	and so on to	1, 2, 3… 25 (read: one, two, three and so on to twenty five)
∞Λ	and so on to infinity	1, 2, 3… (read: one, two, three and so on to infinity)
Θ	since, because	
X_1	x one, or : x sub one	
∞→x	x approaches infinity or: x tends to infinity	
=	is equal to / equals / makes / is	a=b; a equals b or: a is equal to ; or: a is b
≠	is not equal to/ does not equal	a≠ b; a does not equal b / a is not equal to b/ a is not b
α, ~	(is) directly proportional to	p~ q
≈	approximately equals /	$x \approx y$ means x is

	is approximately equal to	approximately equal to y
::	as (in proportions)	p:q :: s:t, read p(is) to q as s (is) to t
≡	is identical to / is always equal to	F(x)= 0 f of x(is) identical to zero
( )	parentheses; or: round brackets	$2 \times (3+5) = 16$
[ ]	brackets; or: square brackets	$[(1+2)\times(1+5)] = 18$
{ }	braces	
<	(is) less than	p<q; p (is) less than q
<	(is) less than	p<q; p (is) less than q
>	(is) greater than	p>q; p (is) greater than q
≤	less than or equal to	$x \leq y$ means x is less than or equal to y
≥	greater than or equal to	$x \geq y$ means x is greater than or equal to y
/	Divided by / over	6 / 2 = 3
∠	angle	∠ABC = 30°
⦦	measured angle	⦦ABC = 30°
◁	spherical angle	◁AOB = 30°
∟	right angle	α = 90°
°	degree	α = 60°
⊥	perpendicular	AC ⊥ BC
∑	summation - sum of all values in range of series	$\sum x_i = x_1+x_2+...+x_n$

φ	golden ratio constant	

PHYSICS

Symbol	Is measured in	Meaning
l,d,r,x,y,z,s	m (meter)	Length, Distance
A	m^2	Area
V	m^3	Volume
m	kg	Mass
t	Sec / s (second)	Time
ρ	kg/m^3	Density
θ, ϕ	rad (radian)	Angle
T	K (Kelvin)	Temperature
v, u, υ	m/s	Velocity
a, a	m/s^2	Acceleration
p, p	kg m/s	Momentum
v, f	Hz (hertz)	Frequency
T, t	s	Period
λ	m	Wavelength
F, F	N (newton)	Force
W,K,E,U,Q	J (joule)	Work, Energy, Heat
P	W (watt)	Power
p	Pa (pascal)	Pressure
I	A (ampere)	Current
q, Q	C (coulomb)	Charge
R	Ω (ohm)	Resistance

C	F (farad)	Capacitance
L	H (henry)	Inductance

INFORMATION TECHNOLOGIES

Symbol or abbreviation	Meaning
IT	Information Technology
exe	executable file: the last part of the name of a program file
Esc	Escape = Cancel
Prt Scr /SysRq	Print Screen
Caps Lock	Locks the keyboard in Capitals mode
Ins	Insert
Del	Delete
Ctrl	Control Key
Alt	Algorithmic Learning Theory, Application Load Table
Win	Windows
Tab	tabulation
GHz	Gigahertz
GIF	Graphic Interchange Format: a type of computer file that contains an image.
LAN	Local Area Network
WWW	The World Wide Web
@	at
bps	bits per second: a unit for measuring the rate

	at which information can be sent over the Internet line
ac	Academic organization: used in the e-mail and web-site addresses of universities, colleges and schools
edu	Educational institution: used in the e-mail and web-site addresses of universities, colleges and schools, especially in the USA
gov	Government organization: used in e-mail and Internet addresses
com	Commercial organization: used in the e-mail and web-site addresses of companies
org	Private organization: used in e-mail and Internet addresses
FAQ	Frequently asked questions: a list of questions with answers provided
FTP	file transfer protocol: a set of rules for moving computer files from one computer to another in a network, especially over the Internet
HTML	Hypertext mark-up language: the computer language used for writing pages on the Internet
kb	kilobyte
Mb	megabyte: a unit for measuring the size of a computer's memory, equal to just over one million bytes
MHz	Megahertz

http	Hypertext transfer protocol
IP-address	Internet Protocol address: a code that represents a particular computer and is used to send messages to it on a network (=group of computers) or the Internet
jpg	the last part of the name of a file that contains a photograph
PDF	Portable document format
TCP/IP	Transmission control protocol/Internet protocol
txt	the last part of the name of a file that contains a text file
URL	Uniform Resource Locator: an Internet address

ENGLISH–UKRAINIAN DICTIONARY

Найбільш вживані основні поняття	
math (mathematics)	математика
do the math	рахувати (математичні дії)
problem (sum)	арифметична задача
to solve	розв'язувати (задачу)
answer	відповідь
digit	цифра
number	число
odd number	непарне число
even number	парне число
to add	додавати
to subtract	віднімати
to multiply by / times	множити на
to divide by / divided by	ділити на
to be equal to/ equals to	дорівнює
plus	плюс
minus	мінус
common fractions	прості дроби
numerator	чисельник
denominator	знаменник
mixed number	змішане число (дроб)
half	половина
quarter	чверть
decimals (decimal	десятковий дріб

fractions)	
point	точка (ув дес. дробах)
percent	відсоток
to the power of five	у п'ятому ступені
two squared	два в квадраті
two cubed	два в кубі
square root	корінь квадратний
round brackets	круглі дужки
brackets	квадратні дужки
to round up the numbers	округлити числа
Математичні терміни та поняття	
accuracy	точність
addition	додавання
adjacent	суміжний
algebra	алгебра
alter	міняти, змінювати
altitude	висота
amount	сума, кількість, об'єм
angle	кут
apply	застосовувати, вживати
appropriate	відповідний
area	площа
average	середній
axis	вісь
binary	бінарний, подвійний
brackets	дужки

calculation	рахунок
cell	елемент комірки
chord	хорда
circle	круг
circumference	коло, окружність
coefficient	коефіцієнт
component	компонент, складова частина
cone	конус
conclude	робити висновок
condition	умова, стан
cube	куб
curve	крива
degree	градус
diameter	діаметр
difference	різниця
domain	область, сфера
equation	рівняння
equivalent	еквівалент
figure	цифра
frequency	частота
function	функція
geometry	геометрія
height	висота
horizontal	горизонталь
identical	однаковий, ідентичний
infinity	нескінченність

interaction	взаємодія
introduce	вводити
invariably	незмінний
inversely	обернено пропорційно
length	довжина
level	рівень
limit	границя, межа
line	лінія, риска
majority	більшість
make up	складати, утворювати
maximum	максимум
mean	середнє число
measure	міряти
medium	середній
minimum	мінімум
notation	система знаків
number	число
numeration	нумерація
numerical	числовий
opposite	протилежний
order	порядок
outcome	результат
pattern	зразок
peak	найвища точка
percentage	процентне співвідношення
phenomenon	явище, феномен

positive	позитивний
power	ступінь
prism	призма
probability	ймовірність
product	добуток
property	властивість, якість
proportion	пропорція
protractor	транспортир
quantity	кількість
quarter	чверть
random	випадковий
range	ряд, лінія, діапазон
reaction	реакція
reflect	відображати
relatively	відносно
residual	залишок, залишковий
result	результат
right-angled	прямокутний
ruler	лінійка
score	рахунок
set-square	угольник, косинець
shape	форма
share	частка, доля
signal	сигнал; знак
similar	подібний
size	розмір

structure	структура
subject	предмет
tangent	тангенс
temporary	тимчасовий
theorem	теорема
therefore	тому, отже
thus	таким чином
total	повний, загальний
triangle	трикутник
trigonometry	тригонометрія
twice	двічі
uniformly	рівномірно
unit	одиниця
value	значення, величина
variant	різновид, варіант
vary	міняти(ся)
vertex	вершина
virtually	фактично

Основні терміни та поняття у сфері комп'ютерних технологій

Access	доступ
active window	активне вікно
algorithm	алгоритм
Anti-virus program	Антивірусна програма
Application	додаток

arrow	стрілка
archive	архів
ASP (application service provider)	провайдер прикладних послуг
BIOS	БСВВ (базова система вводу/виводу)
byte	байт
block diagram	блок-схема
Board	друкована плата
boot	завантаження
browse	продивлятися
Browser	браузер
cancel	відмінити
capacity	Пропускна здатність, об'єм
central processing unit	центральний процесор
click	клацання (кнопкою миші)
clone	копія (аналог)
CMC (Computer-Mediated Communication)	Зв'язок з використанням комп'ютера
colour printer	кольоровий принтер
column	стовпець
command	команда
Computer architecture	комп'ютерна архітектура
Computer users	користувачі
compact disc	компакт диск. Абревіатура CD
computer literacy	комп'ютерна грамотність

Connect speed	швидкість з'єднання
configuration	конфігурація
Connectivity	можливість підключення
cursor	курсор
Data	дані
Database	база даних
device	пристрій
directory	каталог, довідник
display	дисплей
double-click	подвійне натиснення
To download	завантажити
driver	драйвер
dynamic storage	динамічна пам'ять
edit	редагувати
E-mail	електронна пошта
erase	видалити дані
error	помилка
file protection	захист файла
file size	розмір файла
floppy – disk drive	дисковод флопі - диска
Folder	папка
font	шрифт
hacker	хакер
hang	зависання
hard copy	тверда копія
hard disk	жорсткий диск

Hardware	апаратна частина
hexadecimal	шістнадцятковий
icon	ікона, піктограма, образ
ink-jet printer	струменевий принтер
input	ввід, вхідний
insert	вставка, вставити
interactive	діалоговий, інтерактивний
The Internet	Інтернет
interface	інтерфейс, засоби сполучення
invalid	недопустимий, помилковий,
invert	змінити на зворотне
Junk mail	спам
key	клавіша, код, ключ
Keyboard	клавіатура
label	ярлик, мітка, ідентифікатор
laser printer	лазерний принтер
laptop computer	портативний комп'ютер
load	завантажити,завантаження
logical device	логічний пристрій
machine instruction	машинна команда
mailbox	поштова скринька
male connector	штекерний з'єднувач
media	середовища, носії
memory	пам'ять
menu	меню
message	повідомлення

mode	режим
motherboard	базова плата
mouse	«миша»
Multi-tasking	багатозадачність
Navigation system	система навігації
network	мережа, сітка
node	вузол
notepad	блокнот
Operating system	операційна система
output	вихід, вихідний, виводити
page	сторінка
Page Down key	клавіша «Page Down», найчастіше використовується в текстових процесорах для перегляду документа екранними порціями
Page Up key	клавіша «Page Up», використовується в текстових процесорах для перегляду документа екранними порціями
pane	панель, пульт
password	пароль, код (послідовність символів)
path	шлях, маршрут
Peripherals	зовнішнє периферійне обладнання

piracy	піратство
pixel	піксель
printer	принтер
RAM (random access memory)	ОП (оперативна пам'ять)
range	блок, діапазон
reboot	перезапуск
recycle bin	корзина
Remove	видалити, забирати
Remote access	віддалений доступ
ROM (read only memory)	постійний запам'ятовуючий пристрій
Router	роутер
root directory	кореневий каталог
save	зберегти
save as	зберегти як
scan	сканувати
search	шукати, пошук
security	захист, безпека
server	сервер
Smart database	інтелектуальна база даних
Software	програмне забезпечення
SP (Internet service provider)	інтернет-провайдер
spacebar	клавіша пропуск
Storage device	накопичувач

tab character	табулятор, символ табуляції
task	задача
toner	тонер, порошок
undelete	відновити
undo	відмінити
unpack	розпакувати
To upgrade	модернізувати
To upload	завантажити
Username	ім'я користувача
utility	утиліта, сервісна програма
verify	перевіряти
virus	вірус
voice input	голосовий ввід
Webpage	веб-сторінка
winchester disk	диск – «вінчестер»
word processor	текстовий процесор
Wireless networks	безпровідні мережі
Загальноприйняті поняття у галузі фізики	
Applied Physics and Instrumentation	Прикладна фізика та приладобудування
Abelian group	Абелева група
Absolute humidity	Абсолютна вологість
Avogadro constant	Постійна Авогадро
Absolute temperature	Абсолютна температура
beam	промінь, пучок
brightness	яскравість, освітленість

capability	можливість, здатність
cell	елемент, комірка
channel	канал
chip	кристал, інтегральна схема
circuit	ланцюг, контур, схема
compression	стиснення
conversion	перетворення
converter	перетворювач
correction	виправлення
correlator	корелятор
counter	лічильник
current	струм
deflection	відхилення
defocus	дефокусувати
detection	реєстрація (випромінювання)
Detector	детектор, сенсор
optical	фотоелектричний сенсор, фотоприймач
deviation	відхилення
device	прилад, пристрій
diffraction	дифракція
diffusion	розсіювання (світла)
digital	цифровий
diode	діод
laser	лазерний діод
light-emitting	світлодіод

optical	оптрон, оптопара
photoemissive	фотоелемент
discrimination	розпізнавання, роздільна здатність
dispersion	дисперсія
display	дисплей, пристрій відображення, індикатор
distortion	спотворення
distribution	розподіл
echo	відбитий сигнал
edge	край, межа
effect	ефект, вплив, явище
emission	емісія, випромінювання
emissivity	коефіцієнт випромінювання
engineering	техніка, технологія
expansion	розширювання
film	плівка
filter	фільтр
flow	потік
flux	потік, щільність потоку
focus	фокус
force	сила
frequency	частота
gate	логічний елемент
grating	гратка, дифракційна гратка
guide	хвилевід, світловод

hologram	голограма
illuminance	освітлюваність
illuminant	джерело світла
illumination	освітлення
image	зображення
imaging	формування зображення
impedance	опір
intensity	інтенсивність, сила світла
junction	з'єднання, перехід
laser	лазер
lasing	лазерна локація
layer	шар, плівка
LED	світлодіод
lens	лінза
level	рівень
liquid crystal displays	рідинно-кристалічні дисплеї
light	світло, світлове випромінювання
link	лінія зв'язку, канал зв'язку, ділянка
loss	втрата
luminescence	люмінесценція
matrix	матриця
measurement	вимірювання
memory	пам'ять
mixing	змішування

nanoelectronics	наноелектроніка
network	мережа, схема
optical axis	оптична вісь
operation	робота, режим
oscillation	коливання
pattern	зображення, структура
photocell	фотоелемент
photodiode	фотодіод
photosensor	фотоелемент
pipe	хвилевід, магістраль
point	точка, контакт
pulse	імпульс
quality	якість
quantity	величина, кількість
quantization	квантування
quantum	квант
radiance	енергетична яскравість
radiation	випромінювання, радіація
range	діапазон
rate	швидкість, частота, інтенсивність (відмов)
ratio	відношення
ray	промінь, пучок
real-time	у реальному масштабі часу
receiver	приймальний пристрій
receptor	приймач (біон.)

recognition	розпізнавання, ідентифікація
recording	запис, реєстрація
recovery	відновлення, повернення
reduction	зменшення, послаблення
reference	еталон, взірець
reflection	відбиття
reflectivity	коефіцієнт відбиття
reflector	відбивач, дзеркало
refraction	рефракція, заломлення
refringence	заломлення
region	ділянка, зона
relay	трансляція, передача (сигналів)
reliability	надійність
reradiation	перевипромінювання, розсіювання
resistance	опір, резистор
retrieval	пошук (інформації)
return	відбивання (відбивати)
rotation	обернення, поворот
route	маршрут
saturation	насичення
Scale (n) (v)	масштаб, шкала, змінювати масштаб
scan, (n) scanning (v)	сканування, сканувати
Scatter (n)	розсіювання,

(v)	розсіювати
screen	екран
search	пошук (шукати)
selection	селекція, вибір
semiconductor	напівпровідник
sensitivity	чутливість
separation	розділення
set	набір, множина, пристрій. апарат
sheet	шар, діаграма, графік, таблиця
sigh	знак, символ, ознака,
simulation	моделювання, імітація
solid-state	твердотільна
source	джерело
space	простір, ділянка, зона
spectrum	спектр
speed	швидкість, швидкодія
split	розчеплення, розбиття
splitter	світлоподільний елемент
spot	пляма, ділянка, точка
stage	стадія, етап, каскад
standard	еталон, взірцева міра
state	стан, положення
storage (n) (v)	пам'ять, запам'ятовувати
strength	інтенсивність, сила

surface	поверхня
technology	техніка, технологія
transducer	перетворювач
transfer	передача, передавати
transform	перетворення
transparency	транспарант, прозорість
unit	одиниця (фізичної) величини, елемент, прилад, апарат, блок, вузол, модуль
value	(числове) значення
velocity	швидкість
voltage	напруга
wave	хвиля
wavelength	довжина хвилі

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NOTES