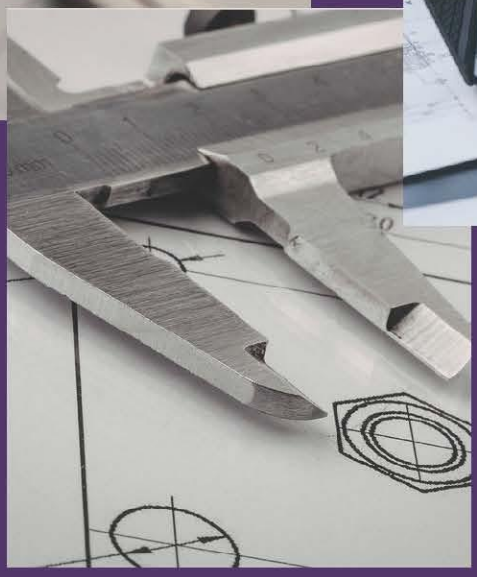
O. A. Matusevich
D. S. Brechko

BASIC ENGLISH FOR POWER ENGINEERING STUDENTS



Министерство образования Республики Беларусь
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BASIC ENGLISH FOR POWER ENGINEERING STUDENTS

Пособие для студентов специальностей
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Авторы:
Матусевич О. А.
Бречко Д. С.

Рецензенты:
кафедра восточных языков
УО «Белорусский государственный университет иностранных языков»,
(зав. кафедрой, кандидат филологических наук, доцент *Н. В. Егоров*),
доцент кафедры лексикологии и стилистики английского языка
УО «Белорусский государственный университет иностранных языков»,
кандидат филологических наук, *Г. А. Назина*

Данное пособие по английскому языку предназначено для студентов специальностей 7-07-0712-02 «Теплоэнергетика и теплотехника», 7-07-0712-03 «Проектирование и эксплуатация атомных электростанций». Целью пособия является формирование и развитие профессиональной иноязычной коммуникативной компетенции.

Пособие состоит из 8 разделов, объединенных по тематическому принципу. Каждый раздел включает аутентичный текстовый материал, лексические задания, а также широкий спектр упражнений, направленный на формирование у обучающихся речевых навыков и развитие умений профессионально ориентированного иноязычного общения в устной и письменной форме в предполагаемых ситуациях профессиональной деятельности.

Пособие также включает ссылки на интерактивные задания.

CONTENTS

UNIT 1
ENGINEERING FUNDAMENTALS

Let's warm up!

Before starting the unit, tell what engineering is and why it is important.

Let's read!

Exercise 1. Follow the QR code to learn the words.

Exercise 2. Read what Ralph J. Smith, Emeritus Professor of Electrical Engineering, Stanford University, California, the author of "Engineering as a Career" writes about engineering.

Engineering is the application of scientific knowledge to the efficient use of natural resources for the benefit of society. The terms "engine" and "ingenious" originate from the Latin word *ingenerare*, meaning "to create", which reflects the creative nature of engineering activity.

Engineering is primarily based on fundamental sciences such as physics, chemistry, and mathematics, as well as their applied branches, including materials science, mechanics, thermodynamics, and system analysis. Professional engineering practice requires not only theoretical knowledge but also the ability to apply this knowledge in real-world situations.

There is a clear distinction between the roles of scientists and engineers. Scientists aim to expand and systematize knowledge about the physical world, whereas engineers use this knowledge to address practical and technical problems. In this sense, science is mainly concerned with understanding, while engineering focuses on application.

Problem solving is a central aspect of engineering. Engineering problems may vary in complexity and may involve technical, economic, or social factors. To solve such problems, engineers combine analytical thinking with practical experience. A key element of this process is design, which involves the integration of ideas to produce effective and optimal solutions.

In general, engineers follow a systematic approach to problem solving. First, they analyze the situation and develop a plan. Then, the problem is clearly defined and simplified if necessary. A solution is obtained either through the application of established principles or through the development of a new design. The proposed solution is carefully tested and evaluated to ensure its accuracy and effectiveness. Finally, the results are interpreted and presented in an appropriate form.

Engineering includes several major functions:

- **Research** involves the investigation of new principles and methods;
- **Development** focuses on applying research results in practice;
- **Design** is concerned with planning structures or products, including the selection of materials and methods;

- **Construction** involves organizing and managing building processes while ensuring safety and quality;
- **Production** deals with manufacturing processes and equipment;
- **Operation** refers to the control and maintenance of systems such as power plants or transportation networks.

In addition, engineers may work in management, where they analyze requirements and develop efficient solutions.

In conclusion, engineering is a discipline that combines scientific knowledge, practical skills, and creative thinking in order to solve real-world problems and improve the quality of life.

Exercise 2. Answer the questions to the text.

1. What is engineering and what is its main purpose?
2. What is the origin of the words “engine” and “ingenious”? What do they mean?
3. Which scientific disciplines form the foundation of engineering?
4. Why is it important for engineers to have both theoretical knowledge and practical skills?
5. What is the main difference between a scientist and an engineer?
6. Why is problem solving considered a central part of engineering?
7. What factors can influence engineering problems?
8. What is the role of design in engineering?
9. What steps do engineers usually follow when solving a problem?
10. What are the main functions of engineers (such as research, development, design, etc.)?

Exercise 3. Make up the word combinations from columns A and B and find their Russian equivalents in C.

A	B	C
1) materials	a) distinction	инженерная деятельность
2) Emeritus	b) engineering	предлагаемое решение
3) society	c) thinking	материальный мир
4) physical	d) experience	творческий характер
5) clear	e) science	почётный профессор
6) engineering	f) world	практический опыт
7) creative	g) process	системный анализ
8) system	h) Professor	Электротехника
9) analytical	i) solution	Материаловедение
10) proposed	j) activity	благо общества
11) practical	k) analysis	аналитический склад ума
12) manufacturing	l) nature	чёткое различие
13) electrical	m) benefit	процесс производства

Exercise 4. Match each word to its synonym.

1) application	a) inventive
2) engineering	b) difference
3) ingenious	c) sophistication
4) engine	d) research
5) to address	e) use
6) field	f) branch
7) efficient	g) precision
8) investigation	h) technology
9) to involve	i) effective
10) complexity	j) to tackle
11) distinction	k) to include
12) accuracy	l) motor

Exercise 5. Match each word to its antonym.

1) to create	a) to disorganize
2) precision	b) artificial
3) complexity	c) to give
4) to systematize	d) unsuitable
5) safety	e) secondary
6) appropriate	f) to destroy
7) major	g) simplicity
8) to obtain	h) theoretical
9) chaotic	i) risk
10) development	j) inaccuracy
11) natural	k) systematic
12) practical	l) regression

Exercise 6. Match the following words with their descriptions.

1) scientist	a) the information, understanding and skills that you gain through education or experience
2) practice	b) the knowledge that somebody has about a particular subject or situation
3) engineering	c) to examine the nature or structure of something, especially by separating it into its parts, in order to understand or explain it
4) quality	d) a person who studies or is an expert in one or more of the natural sciences
5) to improve	e) the standard of something when it is compared to other things like it; how good or bad something is

6) understanding	f) doing an activity or training regularly so that you can improve your skill
7) to analyze	g) the activity of applying scientific knowledge to the design, building and control of machines, roads, bridges, electrical equipment, etc.
8) knowledge	h) to become better than before; to make something/somebody better than before

Exercise 7. Complete the sentences with the words in the box.

scientists, requirement, develop, design, create, engineer, improve, scientific, solution, mathematics, thinking, knowledge, benefits

1. The aim is to _____ your personal skills.
2. You need the advice of a qualified _____ .
3. He took a very _____ approach to management.
4. It will be an opportunity to gain _____ and experience.
5. The new factory will bring considerable _____ to the area.
6. _____ believe there is ice a few inches below the surface of Mars.
7. Attempts to find a _____ have failed.
8. With good, clear _____ one can arrive at an answer.
9. Our immediate _____ is extra staff.
10. The main purpose of industry is to _____ wealth.
11. Both science and _____ show us that the universe has not been around for an infinite duration of time.
12. The machine is quite simple in _____ .
13. Engineers are working to _____ this technology.

Exercise 8. Find the proper continuation of the sentences according to the information in the text.

1) Research engineers	a) organize building processes and ensure safety and quality.
2) Development engineers	b) plan structures and products, choosing materials and shapes.
3) Construction engineers	c) manage manufacturing processes and equipment.
4) Design engineers	d) use these ideas in practice.
5) Operating engineers	e) analyze customer needs and find the best solutions
6) Management engineers	f) study new ideas and develop new methods.
7) Production engineers	g) control systems such as power plants and transport.

Exercise 9. Complete the sentences with the words in the box.

evaluate	*application*	*creates*	*design*	*wizard*	*maintains*
scientists	*skills*	*research*	*reality*	*focus*	*rigor*

Engineers have excellent mathematical [1] _____ , work largely in theory, and [2] _____ systems or carry out [3] _____ . They may manage projects, [4] _____ and test ideas or theories, or design something as tiny as a single switch. They are not as theoretical, perhaps, as engineering [5] _____, but engineers work from theory to the very doorstep of practicality. It is the engineering technologist who today carries the idea across the threshold, into the realm of [6] _____ .

An **Engineering technologist** uses some of the same skills as an engineer, though with a bit less [7] _____ in mathematics and theoretical science. Where the engineer might work largely on theoretical work, an engineering technologist is, frankly, a bit of a [8] _____ . What the engineer devises, the engineering technologist actually [9] _____ , with real parts, products and profits.

An Engineering technologist constructs, [10] _____ and repairs all types of devices, systems and inventions that the engineer designs and draws. The focus is on [11] _____ , not theory.

Education for Engineers vs. Technologists

A key distinction between engineering technologists and engineers is their educational background. While engineers will delve deeply into complex undergraduate mathematics classwork and classes in the pure sciences, engineering technologists [12] _____ more on application of skills through introductory mathematics, survey science courses, and engineering fundamentals.

Exercise 10. Read about Peter Houhiapa, project engineer, Rural Planning Services (RPS Group Limited), telling the Engineers Journal why creativity, curiosity and intention to make the world a better place are at the heart of desire to work in the profession. Match the following questions with the proper sections in the text.

1. How has your career developed differently from your initial expectations?
2. What do you consider to be the most exciting trends in power engineering in the coming years?
3. At what stage did you become interested in engineering as a career?
4. What advice would you give to someone considering studying engineering?
5. What factors influenced your decision to choose engineering?
6. What aspects of your work do you find the most engaging?

I completed a degree in electrical engineering between 2010 and 2014. After graduation, I began my career as a junior engineer in an energy company. Since then, I have been involved in a variety of projects, including power generation systems, renewable energy installations, and electrical distribution networks.

A _____ ?

I first developed an interest in engineering at the age of 16. During my school years, I particularly enjoyed physics and mathematics, which helped me understand the basic principles of electricity and energy systems. I was especially curious about how electrical power is generated and distributed.

B _____ ?

My decision to pursue engineering was influenced by several factors. Firstly, I had a strong interest in science subjects. In addition, I was inspired by large-scale energy infrastructure projects such as wind farms and power plants. I wanted to contribute to a field that plays a crucial role in modern society.

C _____ ?

At the beginning of my career, I expected to specialize only in electrical systems. However, my professional experience has been far more diverse than I had anticipated. I have worked on projects related to renewable energy, energy efficiency, and environmental sustainability. This has shown me that engineering skills are highly transferable across different sectors.

D _____ ?

One of the most engaging aspects of my work is problem solving. Each project presents unique challenges that require both technical knowledge and practical thinking. I am responsible for developing solutions that are not only effective but also safe, reliable, and sustainable.

E _____ ?

Looking ahead, I believe that the most exciting developments in power engineering will be related to renewable energy technologies and smart energy systems. These innovations will improve energy efficiency and help reduce the environmental impact of power generation.

F _____ ?

Based on my experience, I would strongly recommend engineering to anyone with an interest in science and technology. It is important to have a solid foundation in mathematics and physics, as well as a willingness to work hard. Engineering offers a wide range of career opportunities and plays a vital role in the development of modern society.

Let's listen and watch!

Exercise 1. Scan the QR code, watch the video "What is Engineering?" and answer the following questions.

1. What everyday activities at the beginning of the video are made possible by engineers?
2. What motivates engineers to improve the world?
3. What tools do engineers use to solve problems?
4. What examples of simple and complex problems are mentioned in the video?
5. Why are aeroplanes described as easy to take for granted today?
6. What types of engineers are involved in creating an aeroplane? Name at least three.
7. What challenges did engineers face when building the Burj Khalifa?

8. What solution was used to deal with extreme heat during the construction of the Burj Khalifa?
9. What problem did engineers need to solve when designing the Sydney Harbour Bridge?
10. According to the text, what is the main purpose of engineering, and what questions are raised about its future?

Exercise 2. Watch the video again and decide whether the following statements are true or false.

1. The alarm on the phone is set to ring precisely at 7:00.
2. The person immediately feels awake after getting out of bed.
3. The warm shower water serves as a means of helping the person wake up.
4. The person applies a minimal amount of toothpaste while brushing their teeth.
5. Being pressed for time, the individual moves rapidly through the city.
6. The person fails to catch the train on time.
7. Engineers are responsible for the development of everyday technologies such as alarms and traffic control systems.
8. Financial gain is presented as the primary motivation for engineers.
9. Mathematics and science are essential tools in the work of engineers.
10. Air travel has always been simple and easily accessible throughout history.
11. The construction of an aeroplane involves collaboration among various types of engineers.
12. The Burj Khalifa is situated in a relatively cold climate.
13. Engineers addressed extreme heat during the construction of the Burj Khalifa by using cooled concrete at night.
14. The design of the Sydney Harbour Bridge is based on an arch concept inspired by ancient Roman engineering.
15. Engineering is defined as the process of solving problems and transforming innovative ideas into practical solutions.

Let's speak!

Exercise 1. Answer the following questions connected with:

a) Engineering

1. What do you understand by the term "engineering"?
2. Why do you think engineering is important for modern society?
3. What skills are essential for an engineer?
4. Do you think engineering is more practical or theoretical? Why?

b) Power engineering

1. What is power engineering and what does it deal with?
2. How is electricity generated and distributed in modern systems?
3. What are the advantages of renewable energy sources?
4. What challenges does the energy sector face today?

c) Education and career

1. Why did you choose (or would you choose) engineering as a profession?
2. What subjects are most important for engineering students?
3. Do you think engineering studies are difficult? Why or why not?
4. What kind of jobs can engineers do after graduation?

d) Future and technology

1. How will engineering change in the next 10 – 20 years?
2. What role will smart grids and renewable energy play in the future?
3. Would you like to work in the energy sector? Why?

Exercise 2. Read these facts about power engineering. Choose any two facts that you think are the most surprising. Work in pairs and exchange your thoughts.

1. Electricity is the movement of electrons through a conductor, and this motion happens at extremely high speed.
2. Electrical engineering includes many fields, such as power systems, renewable energy, electronics and telecommunications.
3. Power engineering is responsible for generating, transmitting and distributing electricity to homes and industries.
4. A single lightning bolt can carry millions of volts of electricity, making it one of the most powerful natural energy phenomena.
5. Modern power systems must balance electricity supply and demand in real time to avoid blackouts.
6. Renewable energy sources like wind and solar power are becoming increasingly important in modern engineering.
7. Engineers design smart grids to make electricity distribution more efficient and reliable.
8. Even when electrical devices are switched off, many of them still consume small amounts of energy if plugged in.
9. The development of electrical engineering made technologies like telecommunication networks and power stations possible.
10. Engineering is based not only on science, but also on creativity and problem-solving skills.

Exercise 3. Work in pairs. Discuss the topics below, using ideas and vocabulary from the unit as well as your own opinions.

Topics for discussion	**Discussion tips**
I. Engineering and its role in modern society • what engineering is • why it is important today • whether it is more practical or theoretical *II. Skills and education for engineers*	• Give reasons and examples to support your opinions • Use linking words to organize your ideas (*e.g. however, therefore, for*

• key skills • important subjects • reasons for choosing engineering as a profession *III. Power engineering and energy systems* • what power engineering deals with • how electricity is generated and distributed *IV. Energy challenges and solutions* • advantages of renewable energy • current challenges in the energy sector *V. Careers in engineering* • types of jobs • work environment • career opportunities for engineers *VI. Your future in engineering* • your specialization • reasons for your choice • your future career plans	*example, in addition*) • Ask follow-up questions and respond to your partner's answers • Use vocabulary from the unit where appropriate • Try to keep the conversation going by adding comments and asking for clarification

Let's write!

Translate the following sentences into English using your Active Vocabulary.

1. Инженерия – это применение научных знаний для решения практических задач.
2. Инженеры используют природные ресурсы эффективно, чтобы приносить пользу обществу.
3. Физика и математика являются основой инженерного образования.
4. В отличие от учёных, инженеры применяют знания на практике.
5. Инженеры часто работают над сложными проектами, связанными с энергетикой.
6. Проектирование включает выбор материалов и методов для создания продукта.
7. В энергетической инженерии важно учитывать эффективность и устойчивость систем.
8. Многие инженеры работают с возобновляемыми источниками энергии.
9. Умные энергосистемы помогают улучшить распределение электроэнергии.
10. Инженеры должны анализировать ситуацию перед тем, как предложить её решение.
11. Проверка и тестирование являются важной частью инженерного процесса.
12. Карьера инженера может быть более разнообразной, чем ожидается.
13. Инженерия предлагает широкие возможности для профессионального развития.

UNIT 2
NUMERALS

Let's warm up!

Before starting the unit, check if you remember the numbers in English. Below are the symbols and words for cardinal numbers.

Symbol	Word	Symbol	Word	Symbol	Word
0	zero	13	thirteen	60	sixty
1	one	14	fourteen	70	seventy
2	two	15	fifteen	80	eighty
3	three	16	sixteen	90	ninety
4	four	17	seventeen	100	a (one) hundred
5	five	18	eighteen	101	a (one) hundred and one
6	six	19	nineteen	200	two hundred
7	seven	20	twenty	1,000	a (one) thousand
8	eight	21	twenty-one	1,001	a (one) thousand and one
9	nine	22	twenty-two	1,250	a (one) thousand two hundred and fifty
10	ten	30	thirty	100,000	a (one) hundred thousand
11	eleven	40	forty	1,000,000	a (one) million
12	twelve	50	fifty	1,000,000,000	a (one) billion

Below are the ordinal numbers in digital and verbal form.

In figures	Word	In figures	Word
1st	the first	20th	the twentieth
2nd	the second	21st	the twenty-first
3rd	the third	22nd	the twenty-second
4th	the fourth	30th	the thirtieth
5th	the fifth	40th	the fortieth
6th	the sixth	50th	the fiftieth
7th	the seventh	60th	the sixtieth
8th	the eighth	70th	the seventieth
9th	the ninth	80th	the eightieth
10th	the tenth	90th	the ninetieth
11th	the eleventh	100th	the hundredth
12th	the twelfth	101st	the hundred and first
13th	the thirteenth	200th	the two hundredth
14th	the fourteenth	201st	the two hundred and first
15th	the fifteenth	300th	the three hundredth
16th	the sixteenth	400th	the four hundredth
17th	the seventeenth	1,000th	the thousandth
18th	the eighteenth	1,001st	the thousand and first
19th	the nineteenth	1,000,000th	the millionth

Let's read!

Exercise 1. Follow the QR code to learn the words.

Exercise 2. Read the text and explain how the terms *figure, digit, numeral* and *number* differ from each other.

Students learning English sometimes confuse the words "figure", "digit", "numeral" and "number". Although the same symbol (for example, 8) can be mentioned with all these words, each term highlights a different aspect of meaning.

The word *number* is the most general notion and is connected with quantity or amount. It is a key concept in mathematics and is used to describe different types of numerical values: *whole numbers; negative numbers; the number 10; natural number*. In other words, a **number** is a count or measurement that is really an **idea** in our minds. Numbers provide a universal language for communication and analysis, allowing us to make comparisons, perform calculations, and establish relationships across various contexts.

A *numeral* is a special sign that represents a number. Just like how we have letters to write words, we use numerals to express numbers. It may be presented as a word or as a symbol: *the numeral 6; the numeral VI; the numeral six; cardinal and ordinal numerals; Roman or Arabic numerals*. In short, a **numeral** is a **symbol** or **name** that stands for a number.

The term *digit* names one basic numerical sign from 0 to 9. Digits are the elements from which multi-digit numbers are formed: *the digit 4; the digit 7; a three-digit number; a group of five digits; use digits to write these numbers.* In simple terms, a **digit** is a **single symbol** used to make numerals.

The word *figure* is used when we speak about a written sign that represents a number or when we emphasize the size or value expressed by a number: *the figure 9; Arabic figures; an eight-figure number; a figure of 5 million; a six-figure salary; write these numbers in figures and in words.* It can also describe numbers in written form and in some cases refers to arithmetic skills: *She is good at figures.*

For example, in the number 25, the *number* is twenty-five, the *numeral* is '25', and it is made of two *digits* (2 and 5).

Exercise 3. Match the terms with their descriptions.

1.Figure	a) is related to quantity or amount.
	b) names a unit used to express a number.
2.Digit	c) focuses on the value or size of a number.
	d) means one of the symbols from 0 to 9.
3.Numeral	e) refers to a written sign representing a number.
	f) may appear as a word or a symbol.
4.Number	g) is a fundamental concept in mathematics.
	h) can be expressed using different symbolic systems.

Exercise 4. Fill in the gaps to check the understanding of the words (digit, figure, number, numeral).

1. The … 345 contains three … .
2. *(When you are filling out forms)* Write the amount in both words and … .
3. It's been … one in the charts for six weeks.
4. The temperature … dropped significantly last night.
5. The document … is in the top left-hand corner.
6. The … "five" can also be written as 5.
7. The … 0 plays an important role in this … .
8. Roman … were widely used in ancient times.
9. The final … in the report was incorrect.
10. Every … is written using one or more … .
11. The … 12 is a composite … .
12. The invoice shows the total as the … 78.25.
13. The librarian counted the library's volumes by their catalog … , not by their titles.
14. The cashier wrote the total as the … 58.75 on the receipt.
15. The … of participants in the survey was 234, and the … 4 appeared most often in the responses.
16. The street address is a … carved into the bronze plaque.
17. The symbol 7 is a … in the decimal system.
18. The chalk drawing of the person's height was a large … on the wall.
19. The … of students in the class is 28.
20. The sign VI is a … used to represent the value six.

Exercise 5. Read the text to study cardinal and ordinal numerals in English and apply them correctly in speech.

We cannot imagine our life without numbers. Our world is filled with numerical data, which is particularly vital in different fields of engineering: for solving equations or problems, for determining weight, height, length and width, for calculating distances in meters and kilometers, and for other similar tasks. All forms of measurements rely on the application of numerals. In the English language, numerals represent a grammatical category that specifies either quantity or sequence.

This part of speech is categorized into two principal groups: cardinal and ordinal numerals. Additionally, they can be structurally classified as simple (from 1 to 12), derivative (from 13 to 19), and composite (such as 21, 67, or 147).

1. **Cardinal Numerals** express the number, quantity or amount, indicating "how many" items there are. They provide an answer to the question "How many?": *220 volts, 480 kilometers, 35,000 students, 125 tons, 31 plants*.

It is important to note that terms like '*a hundred', 'a thousand'*, and *'a million', 'a billion'* function as nouns rather than numerals. In their singular form, they are consistently paired with the indefinite article '*a*' or the numeral '*one*'. In this specific usage, they do not take a plural ending: *three hundred power plants, eighteen thousand substations, twenty-four million books*. However, these same words can adopt the plural ending '*-s'* when used in a generalized sense with the preposition '*of*' and a subsequent noun: *thousands of students, millions of people, hundreds of questions, billions of particles.*

2. **Ordinal Numerals** denote position or order in a sequence, corresponding to the question "Which one?" Typically, they act as adjectives placed before a noun and are commonly preceded by the definite article '*the*': *The first* laboratory was big. *The second* one was bigger.

In both major variants of English, numerals from one thousand upwards are formatted with commas separating each group of three digits, starting from the right. This is illustrated by numbers like 8,526 (spoken as "*eight thousand five hundred (and) twenty-six*"); 73,965 (*seventy-three thousand nine hundred (and) sixty-five*), 93,005 (*ninety-three thousand five*); 6,540,210 (*six million five hundred forty thousand two hundred ten*).

The digit 0 has multiple spoken forms depending on context:

- Nought/Zero (in Mathematics/Science): 0.7 is "*nought point seven*"; -22°C is "*twenty-two degrees below zero*."
- Nil/Nothing (in sports): A score of 3:0 is read as "*three nil*" or "*three nothing*."
- Oh [oʊ] (in codes/phone numbers): The number 220450 is pronounced "double two oh four five oh."

Exercise 6. Answer the following questions.

1. How is the noun "numerals" defined in English?
2. What are the two primary categories of numerals?
3. Which type of numeral answers the question "How many?"? Please provide your own examples.
4. Which type of numeral answers the question "Which?"? Please provide your own examples.
5. Under what conditions do the words "a hundred," "a thousand," and "a million" take a plural '-s' ending? Illustrate with your own examples.
6. What is the standard convention for writing numerals in groups of three digits for one thousand and above? Provide your own examples.
7. What are the different ways to pronounce the digit '0' in English? Give examples of your own.

Exercise 7. Create your own questions and responses using the model.

Example: a) *A: Is it nineteen* ***[naɪn'tɪ:n]?***
B: No, it's ninety ***['naɪntɪ].***

a) A: 19?
B: ~~19~~ 90
b) A: 50?
B: ~~50~~ 15
c) A: 13?
B:~~13~~ 30
d) A: 80?
B: ~~80~~ 18
e) A: 14?
B: ~~14~~ 40
f) A: 70?
B: ~~70~~ 17
g) A: 16?
B: ~~16~~ 60
h) A: 30?
B: ~~30~~ 13
i) A: 40?
B: ~~40~~ 14

Exercise 8. Read and pronounce the numbers.

359	8,005	74,999	5,015	340,810
2,457	1,000,009	333,765	19,316	7,202
30,818	999,010	52,666,000	95,012	138,287
790,000	7,382	489,000,904	284,402,351	295,303,888

Exercise 9. Read the text to understand how common and decimal fractions work.

A fraction represents a part of a whole or a ratio between two numbers. For example, when measuring length or quantity, the result is often not an integer (or a whole number). In such cases, we use numbers that represent parts of a whole: *one half; one third; one quarter; one fifth; one millionth*, and so on.

In a common fraction written with a slash (/), the number placed before the slash is called the numerator (or top number) and is given in the form of a cardinal numeral. The number written after the slash is the denominator (or bottom number), which is expressed by an ordinal numeral.

Examples of fractions written in symbols and in words:

Symbol	Word	Symbol	Word
½	one-half / a half	¾	three-fourths / three-quarters
⅓	one-third/ a third	7⁄36	seven thirty-sixths
¼	one-fourth / a quarter	33⁄100	thirty-three hundredths
⅕	one-fifth	65⁄1000	sixty-five thousandths
1⁄32	one thirty-second	1 ½	one and a half
1⁄100	one-hundredth	4 ¼	four and a quarter
1⁄1000	one-thousandth	6 ⅜	six and three-sevenths

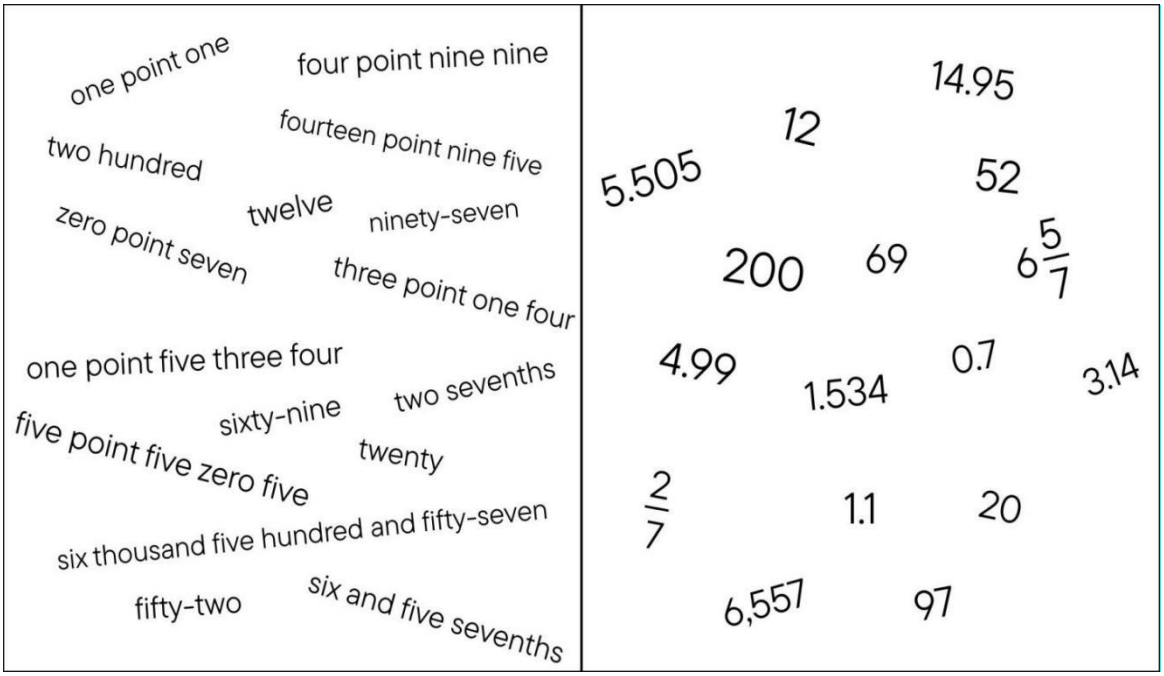
In English, a dot (not a comma) is used to divide the whole part from the fractional part in decimal numbers. Decimals are normally written using figures. When we read such numbers aloud, we say the word ‘point’ to indicate the dot. Each digit after the point is pronounced separately. For example, the number 1.36 is read as *‘one point three six’*.

The digits before the decimal point are usually read as one whole cardinal number, while the digits after the point are spoken one by one. Thus, 546.132 can be pronounced as *‘five hundred forty-six point one three two’*.

Exercise 10. Read out these common and decimal fractions.

¼; ⁴⁄₇; 7 ½; 8 ⁵⁄₉; 21 ⁷⁄₉; 0.25; 0.008; 12.57; 455.67; ²⁄₅; 0.45; 6.22.

Exercise 11. Match words and numbers.



Exercise 12. Make up word combinations from columns A and B and find their equivalents in C.

A	B	C
1) cardinal	a) quantity	решать уравнение
2) to measure	b) calculations	отрасль инженерии
3) power	c) height	определять количество
4) to solve	d) fraction	порядковое числительное
5) numerical	e) numeral	последовательность цифр
6) digit	f) sequence	выполнять вычисления
7) decimal	g) of engineering	сравнивать
8) to determine	h) data	десятичная дробь
9) to make	i) sign	цифровые данные
10) ordinal	j) equation	измерять высоту
11) field	k) plant	считать расстояние
12) to perform	l) number	знак сложения
13) to count	m) comparison	количественное числительное
14) addition	n) distance	электростанция

Exercise 13. Match each word to its synonym.

1) branch	a) to define
2) to calculate	b) numerator
3) to determine	c) quantity
4) amount	d) answer
5) various	e) field
6) top number	f) works
7) point	g) different
8) response	h) to count
9) plant	i) bottom number
10) denominator	j) dot

Exercise 14. Read the text to master writing, saying and reading the dates for real-life communication.

In English, dates can be written and said in several ways depending on whether the style is formal or informal, and also depending on whether British or American English is used. A date consists of three main elements:

- **Day** (Sunday, Monday, Tuesday, etc.)
- **Month** (January, February, March, etc.)
- **Year** (1833, 1999, 2019, etc.)

In British English, the most typical format is:

DATE = DAY / MONTH / YEAR

1 September 2020 – 01.09.2020 – 01/09/2020

In American English, the most common format is:

DATE = MONTH / DAY / YEAR

March 2, 2021 – 03.02.2021 – 03/02/2021

Four-digit years are usually split into two pairs of numbers and pronounced separately, e.g. **1986** – *nineteen eighty-six.*

In years such as **1907** or **1702**, the zero is pronounced as the letter **"o"**, e.g. **1907** – *nineteen o seven;* **1702** – *seventeen o two.*

Years that mark the beginning of a century are commonly read with the word **"hundred"**, e.g. **1600** – *sixteen hundred;* **2000** – *twenty hundred.*

To say the date we use the following construction:

on + the + ordinal number + of + month + year

on the first of September 2025

on the thirteenth of March 1979

Exercise 15. Write and pronounce the following dates first in British and then in American English.

8/4/2000; 5/12/1999; 12/6/1900; 7/9/2009; 2/10/2019; 1/10/2020; 4/3/1988.

Exercise 16. Interview your groupmate. Write down the answers and present them in the classroom. Pay attention to spelling and pronunciation of the dates.

1. What is your date of birth?
2. When did you enter the University?
3. When do you receive your scholarship?
4. What was your first day at the University?
5. When do we celebrate Students' Day?
6. What date is it today?
7. When are you going to graduate from the University?
8. When will you take your first exam this term?
9. When do we celebrate Power Engineers' Day?
10. What is the full date of the foundation of the BNTU?

Exercise 17. Find information and match the dates with the inventions. Then read the completed sentences aloud.

1) October 10, 1911	a) The first transcontinental telegraph line was completed.
2) September 8, 1994	b) John Loud received a patent for the ballpoint pen.
3) August 29, 1831	c) The first artificial satellite was launched into orbit.
4) September 24, 1852	d) Henry Ford patented a transmission mechanism for automobiles.
5) October 30, 1888	e) Rudolf Diesel was granted a patent.
6) November 3, 2020	f) Isaac Newton's great work, "Principia", was published by the Royal Society in England, outlining his laws of motion and universal gravitation.
7) October 24, 1861	g) The airship (or dirigible) was demonstrated for the first time.
8) August 9, 1898	h) Thomas Edison received a patent for his electric lamp that utilized a carbon filament in a sealed, high-vacuum glass bulb.
9) July 5, 1687	i) The first nuclear power reactor in Ostrovets was connected to the grid.
10) October 4, 1957	j) Microsoft officially named its operating system "Windows".
11) January 27, 1880	k) Michael Faraday discovered the electromagnetic induction.

Exercise 18. Study the information and solve the problems.

Addition and Subtraction

5 + 7= 12 → five plus seven equals twelve
66 + 13 = 79 → sixty-six plus thirteen is equal to seventy-nine
15 – 6 = 9 → fifteen minus six equals nine
81 − 33 = 48 → eighty-one minus thirty-three is equal to forty-eight

99 + 77 =	8.5 −3.2 =	315 + 145 =	112.8 – 2.3 =
61 – 50 =	41.7 − 11.3 =	859 – 600 =	5,325 – 0.5 =
114 + 316 =	1,203 + 419 =	4,444 +7,777 =	10.01 + 8.22 =

Multiplication and Division

1 x 1 = 1 → once one is one
2 x 2 = 4→ twice two is four
3 x 3= 9 → three times three equals nine
4 x 4= 16 → four times four is equal to sixteen
12 x 10 = 120 → twelve multiplied by ten is equal to one hundred and twenty
35:7 = 5 → thirty-five divided by seven equals five
1000 : 25 = 40 → one thousand divided by twenty-five is equal to forty

10 x 7 =	56 : 7 =	13 x 3 =	749 : 7 =
100 x 100 =	175 : 25 =	618 : 6 =	3,550 x 5 =
234 x 6 =	12 x 12 =	33 : 33 =	10,660 : 10 =

Exercise 19. Complete the sentences with the words in the box.

solution, digit, subtract, divide, equal, division, equation, power, subtraction, fraction

1. This is an _____ in two unknowns.
2. Here are two numbers for you to _____ .
3. I can't find the 6^{th} _____ of the number manually.
4. It took us about a ten-day period to find the _____ .
5. For example, a student knows that 32 degrees Fahrenheit is freezing and is _____ to 0 degrees Celsius.
6. You should _____ eighty one by nine.
7. The calculator can multiply two five-_____ numbers.
8. You've missed the _____ sign.
9. To convert a _____ to a percentage, divide the numerator by the denominator.
10. When the first positive integer is larger than the second positive integer in a _____ problem, the difference will be positive.

Let's listen and watch!

Watch the video to understand the main idea. Then listen without watching and fill in the blanks with numbers.

1. The question debated constantly "When will we run out of oil?" since the turn of the Millennia. Some say next year some say the next _____ years but most agree that it is a major problem to be tackled within our lifetimes.
2. Last year the world used _____ million barrels of oil per day.
3. This has increased from _____ million _____ years ago.
4. This trend is estimated to continue until around _____ when the vast majority of the world's population will be living in developed nations with a level demand for oil.
5. For example, the UK demand for oil hasn't risen at all since consumption records began in the _____ .
6. Using estimations on current Global Trends we can assume that Global demand will likely reach around _____ million barrels per day in _____ .
7. So "How much oil is there in the world?". There are _____ layers to this question.
8. Most alarmist journalists will have you ignoring the _____ point or even the latter ____ when writing a headline that we're all going to die in ____ years.
9. There are approximately only _____ billion barrels of oil currently stored and waiting to be used in the world.
10. Does this mean we're going to run out of oil in _____ months?
11. We have _____ oil fields drilling existing reserves every single day.
12. There are around _____ trillion barrels of these reserves that we are aware of and can verify.
13. This is enough to last _____ to _____ years with current consumption patterns.
14. Furthermore, the US DOI indicate there is an estimated _____ billion barrels of undiscovered modernly accessible oil in the world.
15. This brings the total to _____ trillion barrels of declared oil available to drill with modern technology.
16. Given the amazing advances in technology that we've seen over the past _____ years?
17. _____ years ago there were _____ billion barrels of oil reserves in the entire world.
18. Since then we have used over _____ trillion barrels.
19. When oil is $ _____ a barrel we can expect producers to sit on their hands as it costs more to lift the oil from the ground than they can sell it for.
20. If oil exceeds all-time Highs at $ _____ a barrel we can expect exploration and technological development to skyrockets as it becomes economically viable to drill harder to access deposits.

Let's speak!

Choose any five random numbers. They can be whole numbers, years, percentages, decimals, fractions, etc. Create a short story about a startup, an invention or a technical problem. Your story must explain what each number represents.

Rules	Example (short model idea)
• Use **all five numbers logically** in your story (e.g.: *2025-4-18-300-75%*). • Explain **what the numbers refer to** (e.g. *4 energy-saving devices, 18 engineers, 300 euros*, etc.). • Use at least **three linking words** (e.g.: *however, therefore, as a result, because, although, in addition*, etc.). • Use at least **two different past tenses** (e.g.: *Past Simple, Past Continuous*, etc.).	In **2025**, a small engineering startup launched **4 energy-saving devices** for smart homes. By that time, the team had been developing the technology for several months, **18 engineers** had tested the prototypes in real conditions and almost **300 euros** had been invested in research and development. However, the results were worth the effort: the new device reduced energy consumption by **75%.** Therefore, the startup quickly gained attention from international investors.

Let's write!

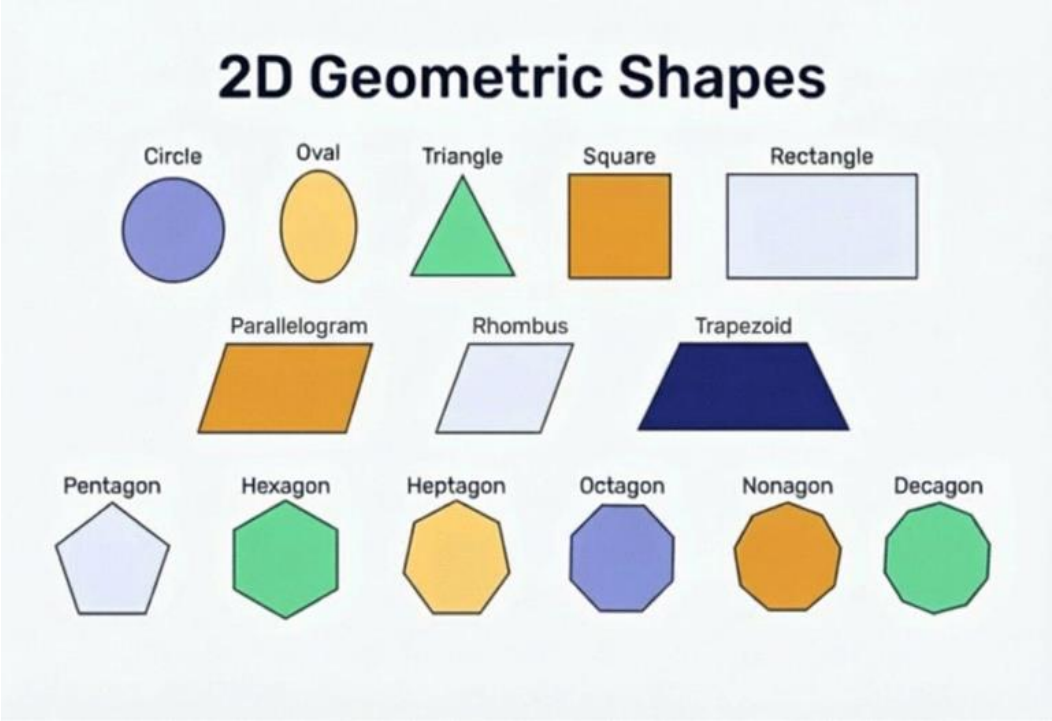
Translate the following sentences into English using your Active Vocabulary.

1. Число 5 обозначает количественное числительное и отвечает на вопрос «Сколько?».
2. День рождения Белорусского национального технического университета – 10 декабря 1920 года.
3. Цифра «7» используется для обозначения числа семьсот семьдесят семь.
4. Тебе сначала нужно решить первое уравнение, потом второе и третье.
5. В БНТУ ежегодно приезжают учиться тысячи иностранных студентов.
6. В английском языке точка используется для обозначения десятичных дробей, а запятая – для тысяч, миллионов и миллиардов.
7. Слово «цифра» обозначает один из основных числовых знаков от 0 до 9.
8. Каждый год 11 ноября на маркетплейсах проходит распродажа «Чёрная пятница».
9. Я родился 23 октября 2009 года.
10. У меня занимает примерно 1 час 20 минут добраться до университета.
11. На следующей неделе у нас будет важная конференция, и мы ожидаем более 130 участников.
12. Я навещаю родителей два раза в месяц.
13. Самый длинный мост в Беларуси – 924 метра – находится в Мозыре.
14. Он точно помнит даты рождения всех своих друзей, но всегда забывает их адреса.
15. На специальности «Электроснабжение» учатся около 400 студентов.
16. Он пришёл первым на соревнованиях.
17. В библиотеке было всего 50 человек.
18. Глубина озера – 12 метров.
19. В 408 аудитории было 17 студентов первого курса.
20. Студент не смог сложить две простые дроби.

UNIT 3
SOME BASIC FIGURES

Let's warm up!

Exercise 1. Check if you remember the geometrical figures in English and tell where we can use the names of shapes in engineering.



Let's read!

Exercise 1. Follow the QR code to learn the words.

Exercise 2. Read the text carefully to understand better the basic concepts in geometry.

Geometry is one of the most elegant branches of mathematics, offering a language through which we can describe the structure of space. At its very foundation lie several simple yet profoundly important ideas: the point, the line, the angle, the plane, and the line segment. Though these concepts may appear elementary at first glance, they form the basis for understanding far more complex geometrical relationships.

The most fundamental element in geometry is the point. A point represents an exact position in space but possesses no length, width, or height. It is purely abstract, serving as a reference from which other geometrical objects can be defined. In diagrams, a point is often represented by a small dot and labelled with a capital letter. Despite its simplicity, the point plays a crucial role: without points, it would be impossible to construct any other figure.

A line can be understood as a straight path that extends infinitely in two opposite directions. Unlike a point, a line has length, but it has no thickness. Lines

are essential in geometry because they allow us to connect points and describe direction and distance. In theoretical terms, a line never begins or ends and it can be either straight or curved (or simply a ‘curve’). Curves are extremely significant in both theoretical and applied geometry, as they help describe natural shapes and motions, such as the arcs of bridges, the outlines of waves, or the trajectories of moving objects.

A line segment is a part of a line bounded by two points. Unlike a full line, which stretches endlessly, a line segment has a definite length that can be measured. Line segments are especially important in practical geometry because they form the edges of many familiar shapes, such as triangles, rectangles, and polygons. In everyday applications – from architecture to engineering – line segments help define the boundaries and dimensions of objects.

When two lines or line segments meet at a common point, they form an angle. Angles can vary widely in size, from acute angles that measure less than ninety degrees to right angles of exactly ninety degrees, and obtuse angles that are larger but still less than one hundred and eighty degrees, and straight angles measuring exactly 180 degrees. We can use a protractor to measure angles. Angles are essential not only in geometry but also in fields such as physics, navigation, and design, where precise measurement of direction is required.

All these figures exist within a broader geometrical setting known as a plane. A plane is a flat, two-dimensional surface that extends infinitely in all directions. It contains an unlimited number of points and lines, providing the stage upon which most classical geometric constructions take place. When we draw shapes on paper, we are effectively working within a small portion of a plane.

In conclusion, the concepts described form the essential vocabulary of geometry. Together they allow mathematicians to describe space with remarkable clarity and precision, transforming simple abstract ideas into powerful tools for understanding the world around us.

Exercise 3. Make up the word combinations from columns A and B and find their Russian equivalents in C.

A	B	C
1) acute	a) letter	точное измерение
2) branch	b) direction	прямой путь
3) line	c) measurement	чрезвычайно важный
4) capital	d) of mathematics	бесконечная линия
5) straight	e) application	отрезок
6) opposite	f) important	прикладная геометрия
7) endless	g) tool	острый угол
8) everyday	h) path	мощный инструмент
9) precise	i) geometry	заглавная буква
10) applied	j) segment	повседневное применение
11) profoundly	k) line	противоположное направление
12) powerful	l) angle	отрасль математики

Exercise 4. Match each word to its synonym.

1) fundamental	a) to stretch
2) to have	b) to stand for
3) foundation	c) to determine
4) to let	d) endlessly
5) dimension	e) basic
6) to extend	f) to build
7) precise	g) size
8) essential	h) basis
9) to represent	i) to possess
10) to define	j) accurate
11) to construct	k) to allow
12) infinitely	l) crucial
13) edge	m) form
14) shape	n) side

Exercise 5. Match the following words with their descriptions.

1) space	a) the quality of being easy to understand or use
2) crucial	b) a particular shape formed by lines or surfaces
3) simplicity	c) extremely important, because it will affect other things
4) geometry	d) any of the flat surfaces of a solid object
5) figure	e) an area or a place that is empty
6) distance	f) the branch of mathematics that deals with the measurements and relationships of lines, angles, surfaces and solids
7) side	g) the space between two lines or surfaces that join, measured in degrees
8) point	h) the amount of space between two places or things
9) plane	i) any flat or level surface, or an imaginary flat surface through or joining material objects
10) angle	j) a small round mark used in writing, especially the mark that separates a whole number from the part that comes after it

Exercise 6. Complete the sentences with the words in the box.

decagon, rectangle, square, dimensions, triangular, straight, circular, distance, direction, line, plane, space, angle

1. The _____ is 5 cm long and 1.9 cm wide.
2. The building was designed to fill a _____ left empty after World War II bombing.
3. In the US, _____ is measured in miles.
4. Which _____ do we have to take?
5. A polygon with ten sides is a _____ .

6. It is important to measure the exact _____ of the room.
7. The vertical line makes an _____ with the horizontal line.
8. We may describe uniquely any point in a _____ by an ordered pair of numbers, called coordinates.
9. He could hear the sound of hammering, then the whine of a _____ saw.
10. She could draw a perfectly _____ line.
11. Draw a chalk _____ on the container to record the level.
12. It was _____ in shape.
13. The area of the office is 35 _____ metres.

Exercise 7. Match the words and the number of sides. Pay special attention to the prefix. Note! – 'gon' from Greek means 'sides'.

Word	**Number of sides**
1) heptagon	a) a lot of
2) polygon	b) five
3) octagon	c) ten
4) hexagon	d) seven
5) decagon	e) twelve
6) hendecagon	f) six
7) pentagon	g) nine
8) dodecagon	h) eleven
9) nonagon	i) eight

Exercise 8. Write down the names of the following shapes in English. Compare your result with your desk neighbor one.

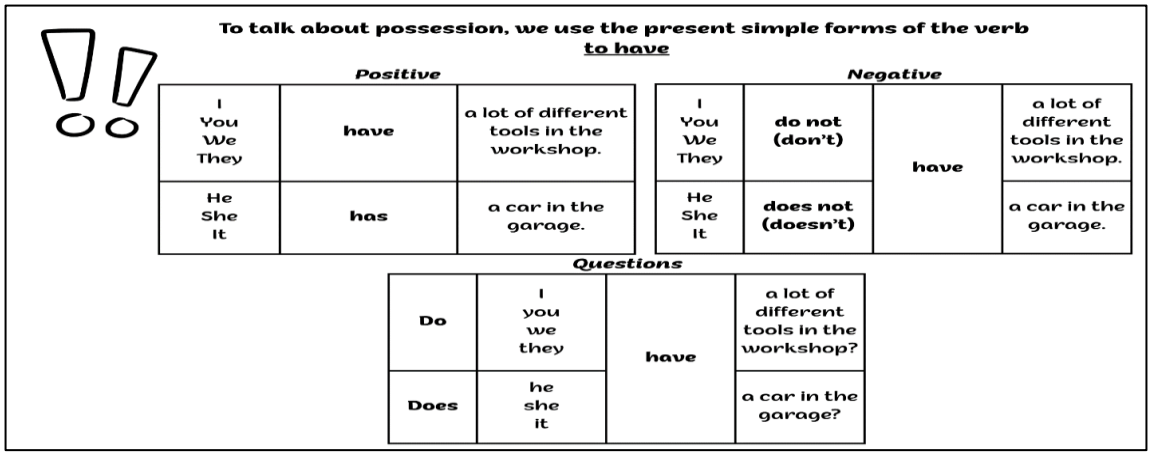
Exercise 9. Match the words with their definitions.

1) helix	a) a shape that is a half of a circle
2) square	b) a combination of two rays with a common endpoint called the vertex
3) cone	c) a shape with a circular base and a top that forms a point
4) oval	d) a seven - sided figure
5) rectangle	e) a shape with four equal and straight sides
6) semi-circle	f) a shape with four sides and right angles
7) heptagon	g) a shape formed by a smooth curve
8) angle	h) an elongated circle

Let's speak!

Exercise 1. Read these facts about shapes. Choose any two facts that you think are the most surprising. Work in pairs and exchange your thoughts.

1. Squares are sneaky; they belong to two families at once: rectangles and rhombuses. That means every square is a rectangle, but not every rectangle is a square.
2. A nonagon has nine sides and a decagon has ten sides, showing how polygons become more circle-like as the number of sides increases.
3. Cubes use squares, cylinders use circles, and pyramids use triangles to make 3D shapes.
4. An octagon has eight sides, with a stop sign being a well-known example.
5. Triangles are the strong superheroes of shapes. Engineers use them in bridges, towers, and roof trusses because triangles don't wobble or collapse easily. That's why even playground climbing frames rely on triangles for safety.
6. A rhombus has four equal sides, but its angles do not need to be 90 degrees.
7. Honeycombs are the classic example of hexagons, but they also appear in snowflakes, basalt columns, and even the patterns on a turtle's shell
8. Weight is evenly distributed when shapes are more symmetrical.
9. The angles inside any triangle always sum to 180 degrees.
10. A pentagon has five sides, with the Pentagon building in the United States being a famous example.



Exercise 2. Fill in the gaps. Use the verb 'to have' in Present Simple in the right form.

1. A triangle _____ three sides.
2. A hexagon _____ six sides?
3. Squares _____ four equal sides.
4. A circle _____ any angles.
5. Pentagons _____ five angles.
6. A triangle _____ more than three angles.
7. Circles _____ any sides?
8. Rectangles _____ four right angles.
9. A hexagon _____ fewer than six sides?

10. A square _____ four equal sides?
11. Triangles _____ fewer than three sides.
12. Hexagons _____ six angles?
13. A square _____ more than four angles.
14. Decagons _____ ten sides?
15. Circles _____ straight angles?
16. A hexagon _____ more than six sides?
17. A circle _____ any sides.
18. Regular triangles _____ three equal sides?
19. A rectangle always _____ four equal right angles.
20. All three sides of a regular triangle _____ the same length.
21. A square _____ a shape of a regular polygon.
22. Rectangles _____ opposite parallel sides.

Exercise 3. Work in pairs and say whether the following statements are true or false. Correct the false ones.

1. A circle is a polygon.
2. A square is a special type of rectangle.
3. A rectangle has four right angles.
4. A circle has a diameter.
5. A triangle always has equal sides.
6. A square is the same as a rectangle.
7. A rectangle has opposite equal sides.
8. A pentagon has more sides than a square.
9. Every rectangle must necessarily have four sides of equal length.
10. The sum of interior angles in a regular pentagon equals 540 degrees.
11. A circle can be classified as a regular polygon with an infinite number of sides.
12. All rectangles are parallelograms, but not all parallelograms are rectangles.
13. A circle has neither angles no sides.
14. The perimeter of a square is found by multiplying one side by four.
15. A pentagon has six sides and six angles.
16. All hexagons have three sides and three angles.
17. A square is a special kind of rectangle with equal sides.
18. The area of a circle is calculated by multiplying π by the radius.
19. A regular pentagon has all sides equal and all angles equal.
20. A rectangle has opposite sides that are parallel and equal in length.

Exercise 4. Complete the text with necessary words. The first letters of the missing words are given.

Everything around us has a different [1]s_____ . Have you noticed the shape of a pizza? It is [2]r_____. If we cut out a slice from the pizza, the slice gets a [3]t_____ shape. Common examples of triangles: sandwiches, birthday caps, ice cream cones, pyramids. Shapes can be classified into [4]v____ categories. Open

shapes are not continuous and are made up of line [5]s_____ or [6]c_____ which do not meet. Letter C is an [7]e_____ of an open shape. [8]C_____ shapes start and end in the same place. Letter D is an example of a closed shape. Further, each shape is classified on the basis of [9]d_____ it has. Two-dimensional shapes, as the name suggests, have only two of these [10]m_____, i.e., a length and a width. Three-dimensional shapes have a length, a width, and a [11]h_____ . A [12]s_____ is a 2D shape, whereas, a [13]c_____ is a 3D shape. A [14]c_____ is a closed shape. It is categorized as a two-dimensional geometric shape that is round in structure. It does not have any lines or [15]a_____ . For example, the wheel of a vehicle, pizza base, dartboard, coins. A square is a closed 2D shape that is formed by four [16]s____ . The [17]l_____ of each side is equal in measurement. For example, a chessboard, bread slices, tiles, keyboard keys. A cuboid is another three-dimensional shape that is formed using [18]r_____. For example, a duster, a book, a pencil box, a door, a window, a table and a phone screen. A sphere is a solid shape that is [19]s_____ to a ball. It is a closed three-dimensional shape formed using a [20]c_____ base. For example, football, basketball, etc.

Let's listen and watch!

Exercise 1. Scan the QR code and listen to the audio "The History of Geometry". After listening choose the best answer.

1. What does the origin of the word "geometry" suggest about its earliest purpose?

a. It was mainly connected with astronomy.
b. It was originally related to measuring land.
c. It focused on artistic design.
d. It was invented for trade and business.

2. Why was geometry especially important for ancient Egyptians?

a. It helped them predict weather conditions.
b. It allowed them to improve sea navigation.
c. It was required for writing religious texts.
d. It was used to rebuild land boundaries after floods.

3. How did Euclid influence the development of geometry?

a. He introduced digital methods for calculations.
b. He invented the coordinate system.
c. He collected and organized geometric principles into a systematic work.
d. He focused mainly on engineering applications.

4. Which statement correctly compares plane geometry and solid geometry?

a. Plane geometry studies flat figures, while solid geometry examines three-dimensional objects.
b. Plane geometry is used only in schools, while solid geometry is used in science.
c. Solid geometry deals with graphs and coordinates.
d. Both branches study exactly the same objects.

5. What is the main function of coordinate geometry?

a. To calculate the volume of objects.
b. To study only circles and triangles.
c. To describe shapes and positions using coordinates and graphs.
d. To explain ancient mathematical theories
6. Why is the Pythagorean theorem considered important in geometry?
a. It measures the area of circles.
b. It describes geometric transformations.
c. It helps calculate the volume of cubes.
d. It explains the relationship between the sides of a right triangle.
7. How do modern digital tools support geometry education?
a. They completely replace traditional learning methods.
b. They allow students to better visualize shapes and transformations.
c. They focus mainly on memorizing formulas.
d. They are used only by professional mathematicians.
8. Which field mentioned in the audio relies on geometry for creating visual environments?
a. Agriculture
b. Literature
c. Computer graphics and video games
d. Biology
9. What can be inferred about geometry from the audio?
a. It is only useful for academic mathematicians.
b. It combines theoretical knowledge with practical applications.
c. It has changed very little since ancient times.
d. It is less important because of modern technology.
10. Which statement best summarizes the role of geometry in modern society?
a. Geometry is essential in many professions and technologies.
b. Geometry is mainly a historical subject.
c. Geometry is important only in architecture.
d. Geometry is gradually disappearing from education.

Exercise 2. Listen again and decide whether the statements are true or false.

1. The term “geometry” originally referred to the study of planets and stars.
2. Geometry is a branch of mathematics that comes from Latin words meaning ‘numbers’ and ‘science.’
3. Ancient Egyptians applied geometry to restore land boundaries after the Nile flooded nearby areas.
4. Only Greek mathematicians contributed to the development of geometry.
5. The Babylonians mainly focused on measurements and angles in their study of geometry.
6. Euclid’s Elements had little influence on mathematics education in later centuries.
7. Plane geometry is concerned with flat figures, whereas solid geometry examines three-dimensional forms.

8. Coordinate geometry describes shapes by using graphs and coordinates.
9. Fractal geometry is described in the audio as an outdated branch of mathematics with few modern uses.
10. The Pythagorean theorem explains the relationship between the sides of any triangle.
11. According to the audio, digital technologies can make geometry easier for students to understand.
12. The audio suggests that geometry is no longer widely used in modern industries and technologies.

Let's write!

Exercise 1. Translate the following sentences into English using your Active Vocabulary.

1. Давайте представим основные фигуры геометрии: треугольник, квадрат, прямоугольник, круг.
2. Прямоугольник – это фигура, которая имеет четыре стороны и четыре прямых угла.
3. Сумма углов треугольника – 180 градусов.
4. Многоугольники – это геометрические фигуры различной формы.
5. У прямоугольника противоположные стороны равны.
6. Это пятиугольник. У него нет параллельных сторон, а все углы – тупые.
7. В геометрии прямоугольник обозначают четырьмя заглавными латинскими буквами.
8. Квадрат – это прямоугольник, у которого все стороны равны.
9. Диаметр круга равен двум его радиусам.
10. Треугольник – это фигура, которая имеет три стороны и три угла.
11. Стороны многоугольника – это отрезки.
12. Круг – это геометрическая фигура, образованная замкнутой кривой линией, все точки которой находятся на одинаковом расстоянии от центра.
13. Чтобы найти площадь прямоугольника нужно умножить его ширину на длину.
14. В правильном треугольнике каждый угол – острый и равен 60 градусов.
15. Диаметр круга – это отрезок, который соединяет две точки круга и проходит через его центр.
16. Фигуры состоят из линий, кривых, углов и поверхностей. К известным геометрическим фигурам относятся квадрат, прямоугольник, круг, цилиндр, параллелограмм и другие.
17. Многоугольник – это геометрическая фигура, имеющая три и более стороны.
18. Часть круга, разделенная двумя радиусами, называется сегментом.

Exercise 2. Describe any device, machine or equipment related to your sphere of engineering from the point of geometry (geometric shapes).

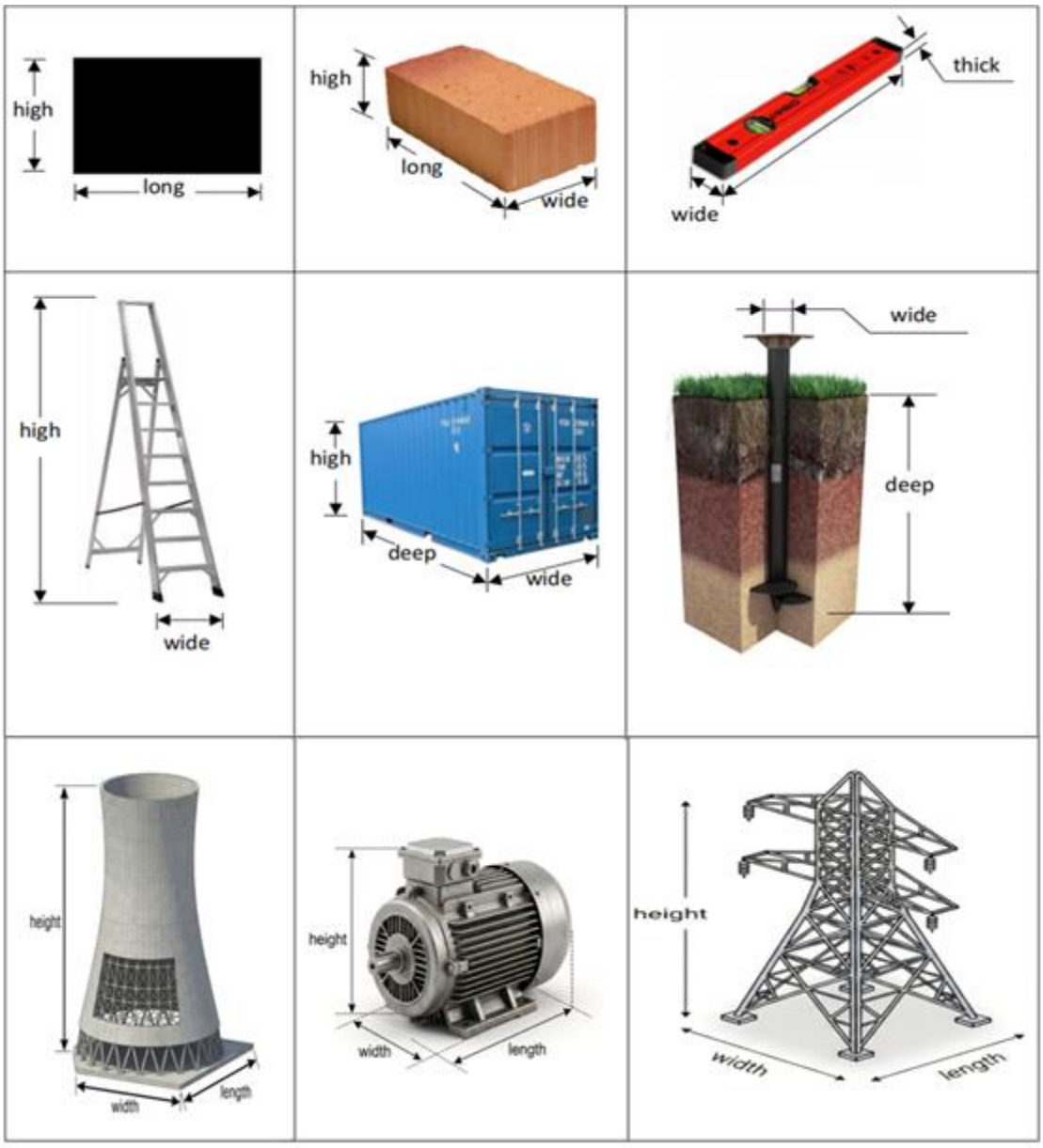
UNIT 4
DIMENSIONS

Let's warm up!

Exercise 1. Before starting the unit, say what dimensions there are and why they are important for the field of engineering.

Exercise 2. Study this information.

We cannot imagine the branch of engineering without dimensions. A dimension is something that allows us to measure a quantity. In the field of engineering dimension usually refers to the linear measurements of any object (e.g. length, width, height, thickness).



Let's read!

Exercise 1. Follow the QR code to learn the words.

Exercise 2. Read the text carefully to understand the most common dimensions in our life.

Dimensions are an essential part of how we describe the physical world. They help us understand the size, shape, and structure of objects in everyday life. The most common dimensions we use are a length, a width, and a height. These three measurements allow us to describe most objects clearly and accurately. In addition, we sometimes use depth and thickness when we need more specific detail.

A length is usually the longest side of an object. For example, when we talk about a table, the length is the distance from one end to the other along its longest side. It helps us understand how big something is from side to side. A width, on the other hand, is the measurement across the shorter side. Together, a length and a width describe the surface area of flat objects, such as a piece of paper or a floor.

A height is another important dimension. It tells us how tall an object is, from the bottom to the top. For instance, the height of a building shows how far it rises above the ground. When we combine a length, a width, and a height, we can describe three-dimensional objects, such as boxes, rooms, or furniture. These three measurements are often used in mathematics, design, and construction.

A depth is similar to a height, but it is used in slightly different situations. It usually refers to how far something goes back or down. For example, the depth of a swimming pool tells us how deep the water is, while the depth of a drawer shows how much space it has from front to back. In this way, a depth gives us a better understanding of space that is not always visible at first glance.

A thickness is another useful measurement, especially when we talk about materials. It describes how thick or thin something is, such as a wall, a book, or a piece of glass. A thickness is often smaller than the other dimensions, but it is still very important. For example, the thickness of a door can affect how strong and secure it is. Similarly, the thickness of clothing can define how warm it keeps us.

In everyday life, we use these dimensions without always thinking about them. When we buy furniture, we check the length, width, and height to make sure it fits in our home. When we travel, we measure the size of our luggage to meet airline rules. Even in cooking, we may consider the depth of a pan or the thickness of food to ensure it cooks properly.

Understanding dimensions is also important in education and work. Students learn about them in maths and science, while professionals such as architects, engineers, and designers use them every day. Accurate measurements help prevent mistakes and ensure that objects are safe and useful.

In conclusion, dimensions such as a length, a width, a height, a depth, and a thickness play a vital role in how we describe and understand the world. They allow us to measure, compare, and create objects with precision. By learning how to use these terms correctly, we can communicate more clearly and make better decisions in both daily life and professional situations.

Exercise 3. Make up the word combinations from columns A and B and find their Russian equivalents in C.

A	B	C
1) essential	a) world	стандартный размер
2) object	b) measurement	важный элемент
3) vital	c) area	ключевая роль
4) common	d) mistakes	форма предмета
5) specific	e) part	площадь поверхности
6) to prevent	f) a decision	с первого взгляда
7) surface	g) role	материальный мир
8) mathematics	h) rules	избегать ошибок
9) three-dimensional	i) detail	плоский предмет
10) at first	j) object	конкретная деталь
11) to meet	k) dimension	математическое измерение
12) flat	l) box	соблюдать правила
13) physical	m) shape	принять решение
14) to make	n) glance	трёхмерная коробка

Exercise 4. Match each word to its synonym.

1) to describe	a) to comprehend
2) common	b) size
3) everyday	c) the same
4) to understand	d) usual
5) measurement	e) helpful
6) object	f) to explain
7) specific	g) item
8) similar	h) daily
9) useful	i) particular

Exercise 5. Form nouns from adjectives and verbs.

Adjectives	**Verbs**
1. thick –	1. to measure –
2. long –	2. to found –
3. simple –	3. to serve –
4. high –	4. to refer –
5. distant –	5. to pose –
6. wide –	6. to define –
7. direct –	7. to apply –
8. deep –	8. to require –
9. basic –	9. to exist –
10. practical –	10. to construct –
11. precise –	11. to shape –

Let's speak!

Exercise 1. Ask your partner about the dimensions of different objects.

Example 1. ***What is the height of this building?***
Its height is 3.5 meters.

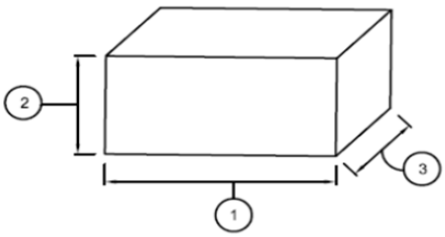
1. width / the box / 67 cm
2. length / this side / about 1.4 m
3. thickness / these blocks / 88 mm
4. height / the classroom / 2.7 m
5. length / the bridge / approximately 22 m
6. depth / the lake /12 m

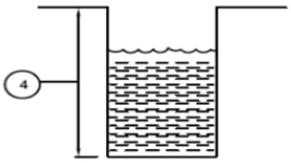
Example 2. ***How long is the wall?***
It's 5 m long.

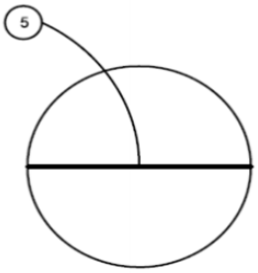
1. wide / the building / 52 m
2. deep / the container / 4.2 cm
3. long / these tubes / 6.9 m
4. thick / the cylinders / 20 cm
5. high / this skyscraper / 828 m
6. wide / the window / 59 "

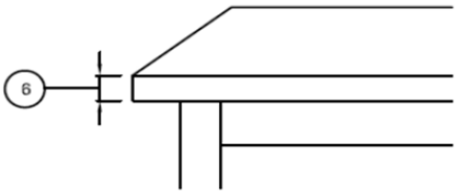
Exercise 2. Match the words with the number.

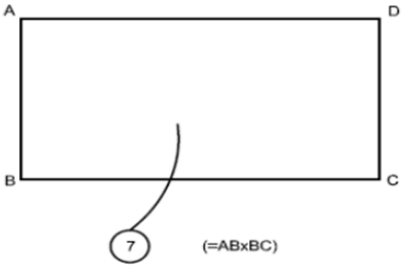
width
diameter
height
volume
thickness
area
length
depth

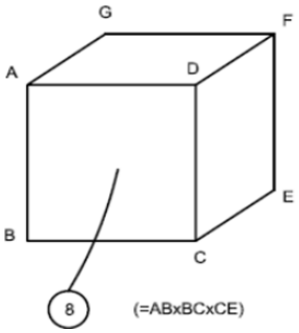






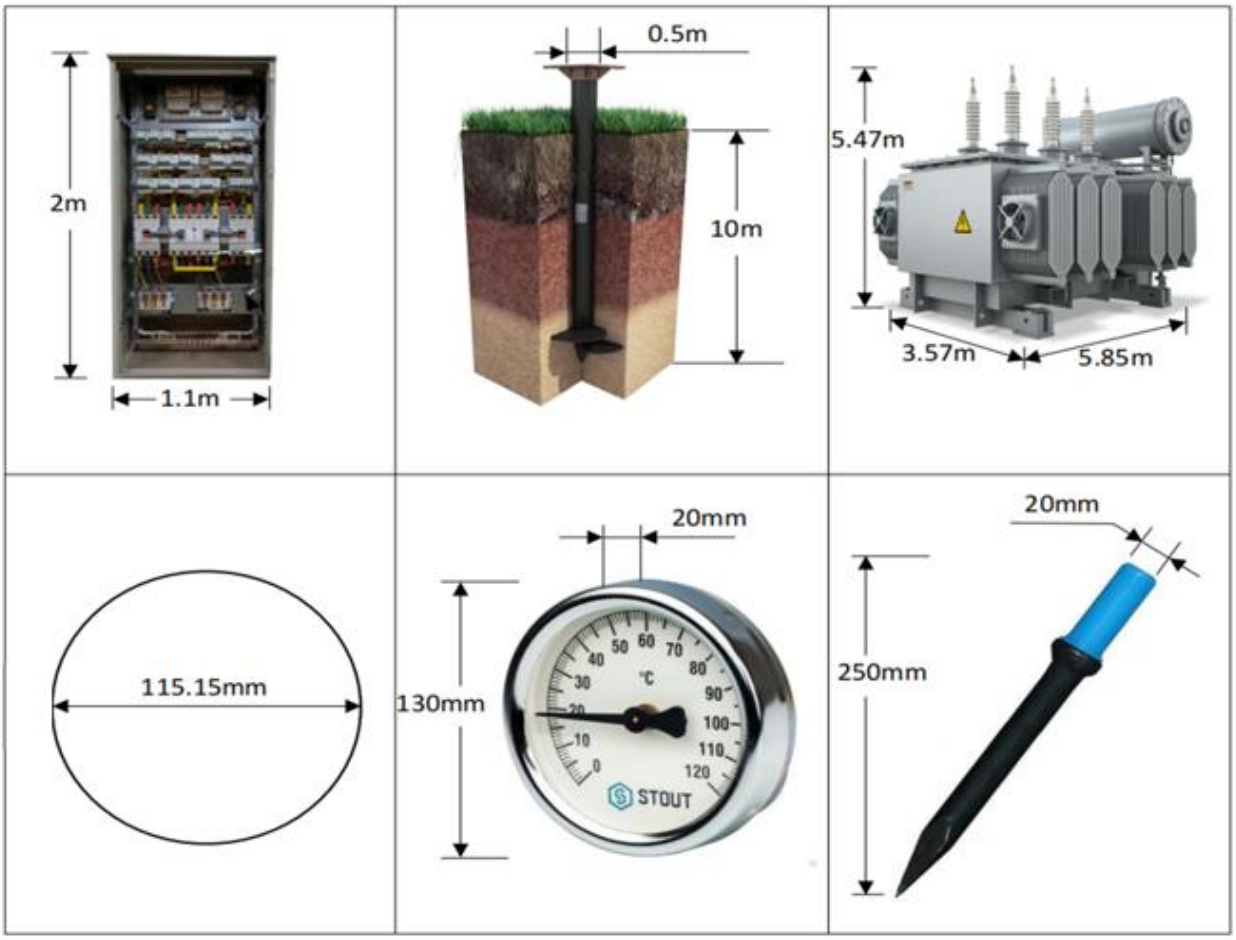






Exercise 3. Make sentences.

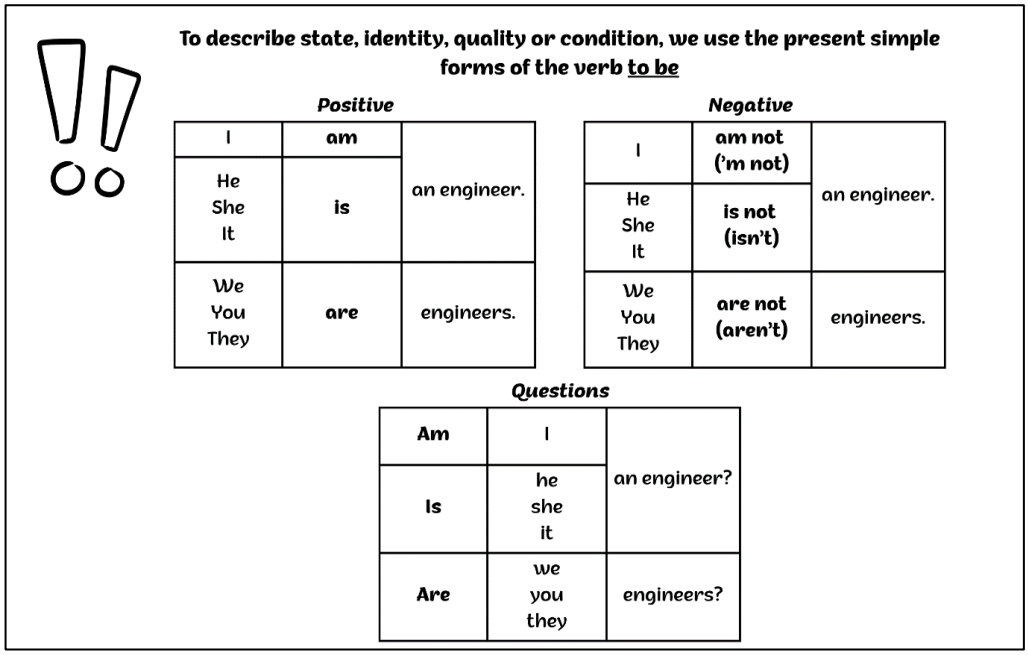
Example: ***The height of the cable distribution cabinets is 2 m and the width is 1.1m.***



Exercise 4. Measure objects in your classroom (or guess their measurements). Make sentences.

Example: **box** – ***The width is about 0.7 m.***
The length is about 0.4 m.
The height is about 1 m.

a) blackboard
b) window
c) eraser
d) door
e) desktop
f) laptop
g) classroom
h) drawer



Exercise 5. Fill in the gaps. Use the verb 'to be' in Present Simple in the right form.

1. A triangle _____ a fundamental two-dimensional closed polygon.
2. Opposite sides of a rectangle _____ equal in length?
3. The sum of all three internal angles of a triangle _____ always 180°.
4. A circle _____ a perfectly round shape.
5. An acute angle _____ less than 90°?
6. Triangles _____ the simplest possible polygons.
7. Circles _____ geometric figures?
8. The sides of a triangle _____ straight line segments.
9. Line segments _____ edges?
10. A square _____ a regular four-sided polygon.
11. A right angle _____ 90 degrees?
12. All four angles of a square _____ right angles?
13. The diagonals of a square _____ equal.
14. Opposite sides of a rectangle _____ parallel?
15. Each interior angle of a rectangle _____ 90°.
16. A straight angle _____ 180°?

Exercise 6. Read these facts about different dimensions. Choose any two facts that you think are the most surprising. Work in pairs and exchange your thoughts.

1. The height of Mount Everest makes it the tallest mountain on Earth above sea level.
2. Some whales can reach an incredible length of over 30 meters.
3. The width of the Amazon River changes depending on the season and rainfall.

4. Scientists continue to investigate the depth of the ocean in search of previously undiscovered species.
5. The thickness of ice in Antarctica can be more than 4 km in some places.
6. The height of a giraffe helps it reach leaves high up in trees.
7. Engineers must precisely calculate the length of bridges to guarantee structural integrity and safety.
8. The width of a human hair is far finer than most people realize.
9. The depth of certain caves remains unknown due to the extreme risks associated with their exploration.
10. The height of waves during severe storms can pose a serious threat to maritime navigation.
11. The immense length of the Great Wall of China extends across thousands of kilometers.
12. The width of roads plays a crucial role in determining the efficiency of urban traffic flow.
13. The depth of a lake can significantly influence the types of fish that live there.
14. The thickness of glass used in skyscrapers is carefully designed to withstand strong winds and pressure.

Let's listen and watch!

Exercise 1. Scan the QR code and listen to the audio "What Careers Use Geometry the Most in Today's Job Market?". After listening find seventeen professions relying heavily on geometry in the puzzle. Read across, down and diagonally.

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

Exercise 2. Listen again and decide whether the following statements are true or false.

1. Engineers rely on geometry to ensure that machine parts fit together with perfect precision.
2. Modern manufacturers can successfully design production processes without using any geometric calculations.
3. Inspectors interpret technical drawings and measure angles to confirm that products meet design standards.
4. Architects rarely use measurements or spatial relationships when planning buildings and infrastructure.
5. A strong understanding of geometry helps builders calculate slopes, volumes, and structural dimensions accurately.
6. Designers and animators apply geometric principles such as symmetry and polygons to create realistic visual effects.
7. Geometry plays no significant role in the development of computer games or digital animation.
8. Teachers specializing in geometry often explain how mathematical concepts can be applied in everyday professions.
9. Tutors generally avoid demonstrating real-world examples when teaching geometric formulas and proofs.
10. Roboticists depend on geometry to program machines that can move and navigate through space correctly.
11. Cartographers use satellite imagery and spatial modeling techniques that require geometric knowledge.
12. Pilots calculate flight paths entirely without the use of vectors, angles, or geometric principles.
13. Criminologists may apply triangulation and trajectory analysis while reconstructing crime scenes.
14. Archaeologists never use grids or geometric mapping methods during excavations.
15. Photographers often use symmetry, leading lines, and the golden ratio to improve visual composition.
16. According to the audio, geometry is limited only to professions connected with mathematics education.
17. Without geometric calculations, many structures could become both unsafe and visually unappealing.
18. The audio suggests that geometry has become less important in today’s technology-driven workplace.
19. The audio emphasizes that geometry is a practical skill that contributes to innovation and problem-solving in many careers.

Let's write!

Translate the following sentences into English using your Active Vocabulary.

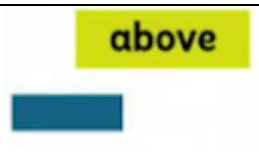
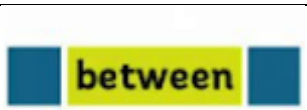
1. Высота этого здания составляет более ста метров.
2. Этот мост очень широкий и может вместить много машин.
3. Длина реки превышает тысячу километров.
4. Толщина льда зимой может достигать нескольких сантиметров.
5. Глубина озера остаётся неизвестной.
6. Ширина дороги недостаточна для двух автомобилей.
7. Мы измерили длину стола с помощью линейки.
8. Глубокий колодец был выкопан много лет назад.
9. Широкая река разделяет два города.
10. Глубокое море скрывает множество тайн.
11. Какой высоты эта стена? – Её высота – приблизительно 3 метра.
12. В комнате одно окно высотой 2 метра и шириной 1 метр.
13. Наша комната прямоугольная. Её площадь составляет 25 $м^2$.
14. Высота этого предмета пять сантиметров, длина – 3 см, ширина – 1 см, следовательно, его объём равен 15 $см^3$.
15. Не мог бы ты мне сказать, какая длина классной комнаты? И какая у неё ширина?
16. Длина этого блока 20 см, ширина – 5 см, высота – 10 см.
17. Высота этого небоскрёба превышает двести метров, что делает его одним из самых высоких зданий в городе.
18. Длина железнодорожной линии составляет несколько тысяч километров.
19. Толщина защитного слоя играет ключевую роль в обеспечении прочности конструкции.
20. Глубокие знания в области физики необходимы для понимания подобных явлений.

UNIT 5
IN THE WORKSHOP

Let's warm up!

Exercise 1. Follow the QR code to see the names of different tools and instruments. Decide which objects are usually found in a workshop and which are not and put the words into two groups. ***Which of these tools do you use or have used?***

Exercise 2. Before starting the unit, check if you remember the prepositions of place in English.

			
На	*в*	*перед*	*за/позади*
			
Над	*ниже/под*	*слева*	*справа*
			
Между	*среди*	*над*	*под*
			
у, возле, рядом с	*около*	*недалеко от*	*далеко от*
			
на/наверх (переместить)	*с/от (отделить)*	*в (внутрь)*	*из*
			
Вверх	*вниз*	*поверните направо*	*поверните налево*
			
к/по направлению	*от/прочь от*	*мимо*	*вдоль*
			
Через	*через (насквозь)*	*прямо вперёд*	*посередине*

Let's read!

Exercise 1. Follow the QR code to learn the words:

Exercise 2. Read the text carefully and learn how to speak about the location of different tools in the workshop.

The workshop is a large and well-organized room where students learn how to work with tools and basic equipment. It is clean, bright, and designed for practical training. When you enter the workshop, you can see different work areas for various tasks.

Along the left wall, there are several workbenches. Each workbench has a vice fixed on the top. Students use the vice to hold metal or wooden parts while cutting or drilling. On the workbenches, there are hand tools such as hammers, screwdrivers, pliers, and spanners. The hammers are used for hitting and shaping materials and also for driving in nails, while screwdrivers are used to tighten or loosen screws. Pliers are useful for holding small parts, and spanners are used for nuts and bolts of different sizes.

Above the workbenches, there is a long shelf. On this shelf, you can find measuring instruments. A ruler and a measuring tape are used to measure length, while a caliper is used for more precise measurements. There is also a spirit level on the shelf. It helps to check if a surface is horizontal or vertical.

In the middle of the workshop, there are several machines. A drilling machine stands near the center of the room. It is used to make holes in metal or plastic parts. Next to it, there is a grinding machine, which is used to smooth rough surfaces. These machines are fixed to the floor for safety.

On the right side of the workshop, there is a tool cabinet. Inside the cabinet, there are power tools such as an electric drill and an angle grinder. The electric drill is used for drilling holes quickly, and the angle grinder is used for cutting and grinding metal. Safety equipment is also stored in this cabinet. Goggles are on the top shelf, and gloves are kept in a box at the bottom.

At the back of the workshop, there is a storage area. Materials such as metal rods, wires, and wooden boards are placed there. The fire extinguisher is mounted on the wall near the exit, and first aid kit is located next to the door.

Everything in the workshop has its own place. Tools are returned to their shelves after work, and machines are switched off after use. This helps to keep the workshop safe and comfortable for all students.

Exercise 3. Make up the word combinations from columns A and B and find their Russian equivalents in C.

A	B	C
1) practical	a) workbench	«болгарка»
2) power	b) area	защитное оборудование
3) safety	c) surface	деревянный верстак
4) precise	d) machine	практическое задание
5) rough	e) grinder	тонкая рукоять
6) storage	f) instrument	шлифовальный станок
7) basic	g) training	шероховатая поверхность
8) technical	h) handle	измерительный прибор
9) wooden	i) task	базовый навык
10) measuring	j) tool	точное измерение
11) angle	k) equipment	ящик с инструментами
12) tool	l) case	электроинструмент
13) thin	m) skill	техническая подготовка
14) grinding	n) measurement	пространство для хранения

Exercise 4. Match each word to its synonym.

1) tool	a) to turn off
2) to check	b) big
3) quickly	c) to strike
4) workpiece	d) to keep
5) large	e) rapidly
6) to mount	f) to locate
7) to hit	g) to install
8) to place	h) instrument
9) to hold	i) detail
10) to switch off	j) to control

Exercise 5. Match each word to its antonym.

1) to tighten	a) to switch off
2) different	b) inaccurate
3) long	c) dangerous
4) precise	d) narrow
5) enter	e) smooth
6) to switch on	f) to increase
7) safe	g) exit
8) rough	h) short
9) to decrease	i) to loosen
10) wide	j) similar

Exercise 6. Match the names of the tools and equipment with their descriptions.

1) vice	a) a large, heavy table with a flat surface, usually made of wood or metal
2) hammer	b) a small box or case, often white or red, with a cross symbol on the outside
3) pliers	c) a long, narrow tool with a straight metal shaft and a shaped tip. It has a plastic or rubber handle
4) spanner	d) a flat metal tool with one or two open or circular ends. It is usually made of steel
5) angle grinder	e) a hand tool with a long handle and a solid metal head, usually rectangular or rounded in shape
6) tool cabinet	f) a compact power tool with a short body and a round flat disc on one side
7) first aid kit	g) a small metal tool with two long arms connected in the middle. The ends are short and flat or slightly curved
8) workbench	h) a long, narrow tool with a solid body. Inside it, there is a small transparent tube with liquid and an air bubble
9) fire extinguisher	i) a metal measuring tool with two or more thin arms. It has a sliding part and a scale
10) screwdriver	j) a metal device with two parallel parts. One part is fixed, and the other can move closer or farther
11) measuring tape	k) a red metal cylinder with a hose on one side and a handle at the top
12) caliper	l) a tall metal storage unit with doors and shelves inside. It is usually rectangular in shape
13) ruler	m) a small case with a thin, flexible metal strip inside. The strip can be pulled out and pushed back in
14) spirit level	n) a straight, flat object with marked lines and numbers on it

Exercise 7. Complete the sentences with the words in the box:

power tools, drawer, cut, workpiece, fire extinguisher, gloves, equipment, workshop, goggles, nuts

1. The result is a small plastic deformation of the surface structure of the _____ .
2. I put the scissors in the _____.
3. After leaving school at 14, he worked in an engineering _____ where he learnt to use a metal lathe and other _____.
4. Susan finally notices her stove is on fire and grabs the _____ _____ .
5. You need a powerful saw to _____ through metal.

6. You should wear _____ , a mask over your nose and mouth, and rubber or latex _____ .
7. If you're happy using _____ _____ like drills and grinding machines, you can do most of the work yourself.
8. The _____ weren't properly tightened and the wheel came off.

Exercise 8. Find twenty objects that you can use in the workshop in the puzzle. Read across, down and diagonally.

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

To talk about the function of an object we use the following constructions:

to be used + for + Gerund

A drill is used for making holes in metal.

or

to be used + to + Bare Infinitive

A drill is used to make holes in metal.

Exercise 9. Complete the sentences using *is/are used for* or *is/are used to* and the words from the box.

hold, make, smoothing, hitting, measure, tighten, checking, protect, holding, cut, storing, measuring

1. A hammer _____ materials.
2. A measuring tape _____ distance.
3. A vice _____ workpieces during work.
4. A ruler _____ length.
5. Goggles _____ eyes from dust and sparks.
6. A drilling machine _____ holes in metal.

7. A grinding machine _____ rough surfaces.
8. An angle grinder _____ metal parts.
9. A spirit level _____ position of surfaces.
10. A screwdriver _____ screws.
11. Pliers _____ small parts.
12. A tool cabinet _____ tools and instruments.

Exercise 10. Complete the sentences from the text "In the Workshop" with the correct prepositions of place. Use *in, on, near, next to, above, at, inside*. After completing the task look through the text and check the answers.

1. Goggles are _____ the shelf.
2. The fire extinguisher is _____ the exit.
3. Hammers, screwdrivers, pliers, and spanners are _____ the workbenches.
4. The first aid kit is _____ the door.
5. The drilling machine is _____ the center of the workshop.
6. Power tools such as an electric drill and an angle grinder are _____ the cabinet.
7. Scissors are _____ the storage area.
8. Gloves are _____ the box.
9. A long shelf with measuring instruments is _____ the workbenches.
10. The vice is fixed _____ the top of the workbench.

Exercise 11. Ask your partner where you can find the following things in the workshop.

Example 1.

in the tool case / a hammer / on the shelf
–Where is the hammer? Is it in the tool case?
–Yes, it is. It is in the tool case. // No, it isn't. It is on the shelf.

1. on the toolboard / a spanner / under the bench
2. in the drawer / a screwdriver / on the workbench
3. above the workbench / a shelf / below the toolboard
4. near the window / a switch / next to the door

Example 2.

in the packet / nuts / among screws
–Where are the nuts? Are they in the packet?
–Yes, they are. They are in the packet. // No, they aren't. They are among screws.

1. on the shelf / screws / in the drawer
2. between the workbench and the bench / tools / on the toolboard
3. on the floor / bolts / under the bench
4. to the left of the workbench / bits / to the right of the workbench

To talk about objects in a place we use the following construction:
there is / there are + object + preposition + place
There is a workbench in the middle of the workshop.
There are spanners on the shelf.

Exercise 11. Rewrite the sentences using *there is* / *there are*. Make affirmative, negative or interrogative sentences as indicated.

Example:

The switch in to the right of the door. (Affirmative).
– Is there a switch to the right of the door?

1. The hammer is on the workbench. (Affirmative)
2. Goggles are on the shelf. (Negative)
3. The bench is near the wall. (Interrogative)
4. Gloves are in the drawer. (Affirmative)
5. The drilling machine is between the workbenches. (Negative)
6. Measuring instruments are on the table. (Interrogative)
7. The first aid kit is behind the door. (Affirmative)
8. Metal rods are in the storage area. (Negative)
9. An electric drill is under the workbench. (Interrogative)
10. Fire extinguishers are at the exit. (Affirmative)

Let's listen and watch!

Scan the QR code and listen to the audio "Before the Practical Class". After listening decide whether the following statements are true or false.

1. Hand tools can be found on the workbenches.
2. Measuring instruments are kept on the tables.
3. The drilling and grinding machines are close to the walls.
4. Goggles are stored in the drawers.
5. Gloves are kept in a box.
6. Materials are stored near the exit.
7. The fire extinguisher is easy to reach.
8. The first aid kit is next to the door.

Let's speak!

Read these facts about different tools and instruments. Choose any two facts that you think are the most surprising. Work in pairs and exchange your thoughts.

1. There are around 4,000 different types of screwdrivers in the world – from tiny ones used for electronics to large ones for heavy machinery.
2. The longest measuring tape in the world is over 60 metres long, much longer than any measuring tape you would normally use.
3. The most expensive tool set in the world – with hundreds of high-quality tools – can cost hundreds of thousands of dollars, far more than the price of an ordinary car.
4. Some power tools can operate underwater – special drills and saws are used by divers and engineers on marine construction projects to cut metal or wood even under water.
5. In many cities there are "tool libraries" where people can borrow tools for home projects just like books, making tools available to everyone.
6. There are titanium hammers that are lighter than steel but just as strong – this reduces fatigue when used for long periods.
7. Some nail guns can send a nail flying out at about 1,400 feet per second, so safety is very important when using them.

Let's write!

Translate the following sentences into English using your Active Vocabulary.

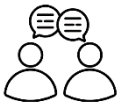
1. Плоскогубцы лежат на полке над верстаком.
2. В центре комнаты стоит сверлильный станок.
3. Гаечный ключ лежит в ящике для инструментов под скамейкой.
4. Эти отвёртки используются для закручивания шурупов.
5. В шкафу для инструментов на верхней полке лежат несколько рулеток.
6. Резиновые перчатки лежат рядом с тисками на рабочем столе.
7. Шлифовальный станок находится между двумя верстаками.
8. На стене позади верстака находится выключатель.
9. Уровень лежит на верстаке справа от двери.
10. Огнетушитель находится возле выхода.
11. Пара ножниц лежит в верхнем ящике стола.
12. У электриков всегда есть набор отвёрток.
13. Пила используется для резки различных материалов.
14. Основное преимущество электроинструмента – возможность его применения в различных отраслях инженерии: сверлении, резке, шлифовке.
15. Существует огромный выбор молотков.
16. К категориям ручных инструментов относят: гаечные ключи, плоскогубцы, молотки, тиски, ножницы, отвёртки, дрели, ножи и многие другие инструменты.
17. Рукоять молотка сделана из дерева, а рабочая часть – из металла.

UNIT 6
FUEL, ENGINES, AND MODERN VEHICLES

Let's warm-up!

Discuss the following questions in pairs.

- Why do people choose different types of engines or vehicles?
- Which types of vehicles do you think are the most popular in your country? Why?
- How important is fel for vehicles?
- How do people decide which fuel to use – petrol, diesel, or gas?
- What do you think will change in vehicles in the next 20 years?



USEFUL LANGUAGE BOX

How to express opinion:

- In my opinion, ...
- I think ...
- I believe ...
- I consider ...
- I guess ...
- As far as I know, ...
- It seems to me that ...
- To my mind ...
- From my point of view, ...
- As for me ...
- As I see it ...

Let's read!

Exercise 1. Follow the QR code to learn the words.

Exercise 2. Read the text carefully and learn more about different types of fuel and engines.

Fuel is very important for modern vehicles. There are three main types of fuel: petrol, diesel, and gas. Petrol and diesel are made from oil, while gas comes from natural sources. Each type of fuel contains many different components, but only a few of them are essential for engines. For example, petrol contains hydrocarbons, a little oxygen, and other additives that help the fuel burn efficiently. Diesel has slightly different hydrocarbons and a little sulfur, which affects the engine's performance. Gas usually contains methane, with a few other gases. Vehicles use a little fuel for short trips, but they need much fuel for long journeys. Understanding the composition of fuel helps engineers and mechanics improve vehicle efficiency and reduce emissions.

Engines convert fuel into movement. There are two main types of engines: two-stroke and four-stroke. Two-stroke engines are smaller, lighter, and simpler in design. They are often used in motorcycles, scooters, outboard motors, and small boats. Two-stroke engines complete a power cycle in just two strokes of the piston, so they produce more power for their size, but they use more fuel in a short time. Four-stroke engines are larger and more powerful, with many moving parts such as pistons, valves, and crankshafts. They are found in cars, trucks, and buses. Four-stroke engines are more efficient because each power cycle uses fuel more carefully, so they consume less fuel for the same distance.

Engines can also be designed with water cooling or air cooling. Water-cooled engines are common in cars and trucks because they maintain a stable temperature even during long drives. Air-cooled engines are lighter and simpler, often used in motorcycles, scooters, and small boats.

Even within the same type of engine, vehicles use different amounts of fuel. A car may need much less fuel than a truck, but it still requires a few liters every day. Some motorcycles use very little fuel, while larger vehicles need a lot. Petrol and diesel remain the most common fuels, but many vehicles also use gas. Today, many new vehicles are electric or hybrid, which use very little fuel or no petrol at all. Electric vehicles are becoming more popular in cities because they are cleaner and more efficient for short trips. Learning about fuel and engines helps us understand how vehicles work and why they use different types of energy. Knowing this information is important for driving safely and using resources wisely.

Exercise 3. Make up the word combinations from columns A and B and find their Russian equivalents in C.

A	B	C
1) natural	a) engine	движущиеся части
2) power	b) performance	рабочий цикл
3) common	c) composition	двигатель с воздушным охлаждением
4) four-stroke	d) parts	распространенные виды топлива
5) moving	e) vehicles	безопасное вождение
6) air-cooled	f) cycle	природные источники
7) electric	g) driving	состав топлива
8) engine’s	h) engine	производительность двигателя
9) safe	i) sources	электрические транспортные средства
10) fuel’s	j) fuels	четырехтактный двигатель

Exercise 4. Match each word to its synonym.

1) additive	a) structure
2) efficiency	b) to upgrade
3) amount	c) significant
4) to remain	d) to transform
5) to maintain	e) to decrease
6) essential	f) to stay
7) to reduce	g) to keep
8) composition	h) performance
9) to improve	i) quantity
10) to convert	j) supplement

Exercise 5. Cross out the odd word in each line. Explain your choice.

1. petrol – electricity – diesel– gas
2. two-stroke engine– four-stroke engine – motorcycle – scooter
3. piston – motorcycle – scooter – truck
4. car – bus – truck – fuel

5. hydrocarbons – methane – piston – sulfur
6. water cooling – air cooling – truck – car
7. piston – valve – crankshaft – scooter
8. petrol – oil – gas – diesel
9. carbon – methane – oxygen – hydrogen
10. bus – motorcycle – scooter – small boat

INDEFINITE PRONOUNS "SOME/ANY/NO"

We use indefinite pronouns when the exact quantity is unknown or unimportant.
We use indefinite pronouns with both countable and uncountable nouns.

some	positive	There is some petrol in the tank. There are some cars in the garage.
any	question	Is there any sulphur in diesel fuel? Are there any engines with air cooling?
(not) any	negative	There isn't any oil in this fuel. There aren't any cars on the road.
no	negative	There is no power in this vehicle. There are no vehicles in the parking area.

Pay attention!
- "some" can be used in questions for offers/requests :

Would you like some diesel for the truck?
Could you bring me some tools for the vehicle?
- "any" can be used in positive sentences with the meaning "it doesn't matter which one/any amount":

You can use any fuel for this test.

Exercise 6. You want to know what objects your friend has in his garage. Ask about their location using *some/any/not any/no.* Pay attention to whether the noun is countable or uncountable.

Example 1.

electric vehicles / in the garage
–Are there any electric vehicles in the garage?
–There are some electric vehicles there.
–There are not any electric vehicles there. // There are no electric vehicles there.

Example 2.

fuel / in the tank
–Is there any fuel in the tank?
–There is some fuel there.
–There is not any fuel there. // There is no fuel there.

spare wheels / in the garage
petrol / in the can
screwdrivers / in the toolbox
tyres / in the trunk
lubricant / in the gearbox
coolant / in the radiator
spanners / on the shelf
brake fluid / in the container
spark plugs / in the engine
charging cables / near the electric cars

Exercise 7. Complete the sentences with *some, any, not any, no.*

1. Are there _____ hybrid engines in the garage for testing?
2. There are _____ screwdrivers in the toolbox, but there aren't _____ spanners.
3. You can choose _____ electric vehicle for the city tour.
4. There isn't _____ fuel in the can near the engine.
5. Are there _____ tools on the workbench?
6. Would you like _____ motor oil for your car?
7. There is _____ coolant in the radiator, so the engine is ready.
8. There are _____ electric vehicles in the parking area.
9. The garage has _____ motor oil, but it has _____ brake fluid.
10. Could I borrow _____ coolant for the radiator?
11. Are there _____ electric cars in this garage?
12. There are _____ tyres in the garage, but not enough for all vehicles.
13. There is _____ electricity in the battery, so the scooter won't start.
14. Are there _____ manuals about engine maintenance on the shelf?
15. The mechanic found _____ leaks in the fuel system yesterday.

Exercise 8. Read the text and learn more about four working cycles of a 4-stroke engine. Follow the QR code to study the picture.

A four-stroke engine completes its work in four stages: intake, compression, power, and exhaust. During one full cycle, the engine performs **many** controlled mechanical actions to convert fuel energy into motion.

In the intake stroke, the intake valve opens and a mixture of air and fuel enters the cylinder. This mixture contains chemical elements such as carbon, hydrogen, and oxygen. The amount of fuel must be precise: too **much** fuel can lead to incomplete combustion, while too **little** fuel may result in unstable engine operation.

During the compression stroke, both valves remain closed, and the piston compresses the fuel-air mixture. At this stage, the mixture becomes denser inside the cylinder, which improves ignition conditions. Only **a few** parts, such as the piston and the head gasket, play a direct role here. They are essential for maintaining pressure and preventing gas leakage. In the power stroke, the spark plug ignites the compressed mixture. This controlled explosion pushes the piston downward and produces useful mechanical energy. In the exhaust stroke, the exhaust valve opens and the engine removes waste gases. This process is necessary to prepare the cylinder for the next cycle.

Overall, a four-stroke engine is a well-balanced system that combines mechanical parts, materials, and chemical processes. A basic understanding of these stages and materials allows future engineers to better evaluate engine performance, reliability, and practical use in different types of vehicles.

Exercise 9. Match the following words and word-combinations to their definitions.

1) intake stroke	a) the stage in which the piston compresses the mixture inside the cylinder
2) spark plug	b) a part of the engine that moves up and down inside the cylinder
3) mechanical energy	c) the stage in which ignition pushes the piston down and creates motion
4) intake valve	d) a thin sealing element that prevents gas leakage between engine parts
5) engine efficiency	e) a situation when gases escape from the engine where they should not
6) exhaust stroke	f) a type of fuel commonly used in heavy vehicles and trucks
7) piston	g) a system that uses liquid to remove heat from an engine
8) head gasket	h) the stage in which burnt gases leave the cylinder through an open valve
9) gas leakage	i) gases or substances released into the air during engine operation
10) internal combustion engine	j) the stage in which fresh air and fuel enter the cylinder
11) power stroke	k) an engine in which fuel burns inside the cylinder to produce power
12) diesel fuel	l) any machine designed to transport people or goods
13) water cooling	m) a device that produces a spark to ignite the fuel–air mixture
14) compression stroke	n) how well an engine converts fuel energy into useful work
15) vehicle	o) energy produced by moving parts that can be used to do work
16) emission	p) a valve that controls the flow of air and fuel into the cylinder

Exercise 10. Find the proper continuation of the sentences according to the information in the text.

1) During the intake stroke, …	a) prevent gas leakage.
2) The main function of the spark plug is to …	b) evaluate engine performance and reliability.
3) Exhaust gases are removed to …	c) waste gases leave the cylinder.
4) Understanding the engine cycle helps engineers to …	d) ignite the compressed mixture.
5) In the exhaust stroke, …	e) prepare the cylinder for the next cycle.
6) The head gasket helps to …	f) fresh air and fuel enter the cylinder.

Exercise 11. Complete the table using the words from the box. Then use the table to explain how a four-stroke engine works.

intake valve	*exhaust valve*	*piston*	*spark plug*
fuel-air mixture	*waste gases*	*compressed*	*mechanical energy*

Four-Stroke Engine Cycle

Stroke	**Main parts involved**	**What happens**
Intake	(1)	The (5) enters the cylinder.
Compression	(2)	The mixture is (6).
Power	(3)	The mixture is ignited and (7) is produced.
Exhaust	(4)	(8) leave the cylinder.

EXPRESSIONS OF QUANTITY "MANY/(A) FEW, MUCH/(A) LITTLE"

	Countable Nouns	Uncountable Nouns
the quantity is large (много)	**many, a lot of**	**much, a lot of**
the quantity is small but enough (немного)	**a few**	**a little**
the quantity is too small, not enough (мало)	**few**	**little**

Examples:
There are many / a lot of nuts in the packet.
There are a few nuts in the packet. Take some.
There are few nuts in the packet. Bring some more.
There is much / a lot of fuel in the tank.
There is a little fuel in the tank. That's enough.
There is little fuel in the tank. I need some more.

Exercise 12. Work in pairs. Make affirmative sentences (+) using *many, a few, few* and translate them into Russian. Use the expressions of opinion.

Example:

four-stroke engine / components

It seems to me that a four-stroke engine has many components.

modern engine / metal parts
cylinder head / valves
engine / parts that produce direct power
motorcycles / four-stroke engines
engine / components that work during one stroke
vehicles / mixed fuel engines
petrol engines / spark plugs
lorries / six wheels
engines / fans
buses / diesel engines
scooters / air-cooled engines
cars / spare wheels
diesel engines / fuel injectors
vehicles / two-stroke engines

Exercise 13. Work in pairs. Ask and answer the questions using *many, a few, few.*

Example:

parts / inside the engine

–Are there many parts inside the engine?

–Yes, there are many parts inside the engine. // –No, there are only a few parts inside the engine.

valves / in the cylinder head
tools / on the shelf
sensors / in a modern engine
spark plugs / in the engine
spare tyres / in the boot
students / in the workshop
switches / near the door of the garage
bolts / in the engine block
car mechanics / among your friends
nails / in the packet
instruments / on the table
a pair of pliers / on the toolboard

Exercise 14. Read the situations and choose the correct option: *much, little,* or *a little.*

1. The engine stopped during operation. There was **(much / little / a little)** fuel in the tank.
2. The mechanic decided not to change the oil yet. There was **(much / little / a little)** oil left in the engine.
3. The warning light came on, and the cooling system could not work properly. There was **(much / little / a little)** coolant in the system.
4. The driver had to stop the car because there was **(much / little / a little)** noise coming from the engine.
5. The vehicle can still drive to the service station nearby. There is **(much / little / a little)** charge left in the battery.
6. The engine stopped working because there was **(much / little / a little)** smoke coming from under the hood.
7. The inspection showed that the tank was nearly empty. There was **(much / little / a little)** diesel fuel inside.
8. The air filter is almost blocked, so the engine receives **(much / little / a little)** air.
9. The garage floor is dangerous now – there is **(much / little / a little)** oil on it.
10. The mechanic added oil because there was **(much / little / a little)** lubrication between the moving parts.

Exercise 15. Work in pairs. Student A reads the situation. Student B reacts using *much, little* or *a little* and the word in brackets. Add your own words if it is necessary.

Example:

A: The tank is almost empty. (fuel)
B: There is little fuel in the tank.

A: The tank is not empty. The car can drive a few kilometers. (fuel)
B: There is a little fuel in the tank.

1. a) The floor is covered with oil. It is dangerous to walk. (oil)
   b) There is only a small stain of oil on the floor. (oil)
2. a) The engine is very loud. Everyone can hear it. (noise)
   b) The engine is quiet, but not perfectly silent. (noise)
3. a) The engine is weak and works badly. (power)
   b) The engine works normally, but not very strongly. (power)
4. a) The garage is full of smoke. (smoke)
   b) There is a small amount of smoke, but it is visible. (smoke)

Exercise 16. Correct mistakes in the following sentences.

1. There is many metal parts in the engine.
2. Are there much fuel in the tank?
3. The vehicle doesn't have no charge left in the battery.
4. There are some nuts on the bench but there aren't some screws.
5. Many large vehicles has four-stroke engines.
6. I have a few nails left. I need to by some more.
7. Could you add any more coolant to the system?
8. There are a lot of hydrogen both in diesel fuel and in petrol.
9. How much sulphur there is in diesel fuel?
10. Are there some boats with two-stroke engines?
11. The nuts is on the workbench.
12. Switch off the drill and then drill the hole.
13. You should hold a workpiece between the vice.
14. There are not much vehicles with two-stroke engines.
15. You have two spare tyres. Bring me the one tyre from the boot.

Let's listen and watch!

Exercise 1. Scan the QR code and listen to the radio program "All About Transport". After listening decide whether the following statements are true or false.

1. The word *bus* comes from Greek and means "for everyone".
2. A velomobile is faster and more comfortable than a normal bicycle because it has an aerodynamic shell.

3. The bicycle was considered Britain's greatest invention before the internal combustion engine.
4. Hovercrafts travel on water only.
5. Trolleybuses are electric vehicles that combine features of buses and cars.
6. Helicopters can land vertically, but cannot take off vertically.
7. Some container ships can carry more than 24,000 containers at once.
8. Cars are allowed everywhere in German cities.

Exercise 2. Listen to the audio again and find eleven types of vehicles mentioned in the audio in the puzzle. Read across, down, and diagonally.

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

<u>Let's speak!</u>
Work in pairs to discuss fuel, engines and modern vehicles. Put the words in the questions in the correct order and complete the dialogue below.

A: I've just listened to an interesting program about fuel, engines and modern vehicles. By the way, fuel / what / main / are / types / the / of?
B: If I'm not mistaken, they are …
A: Exactly. And tell me, fuels / what / do / chemical / contain / elements?
B: As far as I know, fuels contain …
A: That's right.
B: engines / types / what / common / are / most / the / of?
A: You know, there are …
B: And tell me, two-stroke / four-stroke / engines / differ / do / how /and /engines?
A: Well, a four-stroke engine has …, while a two-stroke engine …
B: I see. And used / engines / are / these / where?
A: Four-stroke engines are usually used in …, while two-stroke engines are used in …
B: I've also read that engines / cooling / types / of / different / have / don't / they?
A: Yes, that's true. Some engines use …, while others use …

B: Interesting. And speaking of transport, vehicles / modern / of / what / types / can / name / you?
A: For example, …
B: Many people say that electric vehicles are the future. you / agree / do?
A: In my opinion, …
B: That makes sense. Thanks. Now I understand much more about fuels, engines and modern vehicles.
A: You're welcome.

Let's write!

Translate the following sentences into English using your Active Vocabulary.

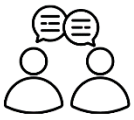
1. Не можешь ли ты мне сказать, сколько углерода содержится в дизельном топливе?
2. В четырёхтактном двигателе есть несколько клапанов и свеча зажигания, которые работают на разных этапах цикла.
3. В топливе содержится немного серы и углерода, но слишком большое количество этих элементов может привести к вредным выбросам.
4. – Как много транспортных средств имеют гибридные двигатели? – Я точно не знаю.
5. В гараже нет никаких электрических транспортных средств, но есть несколько автомобилей с бензиновыми двигателями.
6. В некоторых современных транспортных средствах используется жидкостное охлаждение, потому что воздушного охлаждения недостаточно.
7. Троллейбусы – это электрические транспортные средства, которые сочетают в себе функции автобусов и трамваев.
8. В этом грузовике используется дизельное топливо, потому что такие двигатели более эффективны для перевозки тяжёлых грузов.
9. Во время такта сжатия оба клапана остаются закрытыми, и поршень сжимает топливовоздушную смесь.
10. В мастерской есть немного масла на полу, но этого недостаточно, чтобы создать опасную ситуацию.
11. Сколько бензина в топливном баке? – Я думаю, около 10 литров.
12. Не принесёшь ли ты немного машинного масла? – Вот, пожалуйста.
13. Насколько мне известно, бензиновые двигатели имеют свечи зажигания.
14. Существуют различные виды двигателей – с воздушным и водяным охлаждением.
15. Сколько машин в гараже? – Я точно не знаю, но думаю, что немного.
16. У них есть несколько запасных частей к автомобилю.
17. Этот прибор называется спидометр? – Да, ты прав.
18. Сколько бензина в канистре?
19. Какие мотоциклы имеют двухтактные бензиновые двигатели?
20. Ты случайно не знаешь, сколько свечей зажигания в этом двигателе?

UNIT 7
ENGINEERING MATERIALS

Let's warm up!

Read the statements below. Agree or disagree with each one and give reasons for your choice.

- Engineers must know what materials different objects are made of.
- It is easy to guess what material an object is made of just by looking at it.
- Engineers often choose materials based on how an object will be used.
- Knowing the names of materials is not important for engineers.
- Choosing the wrong material can cause problems even in simple products.



USEFUL LANGUAGE BOX

How to express agreement and disagreement:

• Yes, it is/does.	• No, it isn't/doesn't.
• You are quite right.	• No, you are wrong.
• I can't but agree with you.	• You are mistaken.
• Absolutely right.	• I can't agree with you.
• That's true.	• Far from it.
• Exactly.	• That's not true.
• Certainly.	• Certainly not.
• I think so.	• I don't think so.
• I tend to agree.	• I'm of the opposite opinion.

• I agree only to some extent, because ...

Let's read!

Exercise 1. Follow the QR code to learn the words.

Exercise 2. Read the text carefully and learn more about different types of engineering materials.

Engineering materials are the basis of all technical systems and structures. Every object around us, from simple tools to complex machines, is made of specific materials chosen for practical reasons. For engineers, understanding engineering materials is essential because each component is made of a material that affects its performance and reliability.

All engineering materials are commonly divided into **metals** and **non-metals.** Metals are widely used in mechanical and electrical engineering. Many machine parts, tools, and structural elements are made of metal because these materials are suitable for heavy-duty applications.

Metals are further classified into **ferrous** and **non-ferrous metals**. Ferrous metals are materials that contain iron. Steel and cast iron are typical examples. Steel is made of iron and carbon and is used for beams, frames, shafts, gears, and engine components. Cast iron parts are often made of iron, carbon, and silicon and

are commonly used in engine blocks, pipes, and housings. Many construction elements and industrial machines are made of ferrous metals because they are widely available and economical.

Non-ferrous metals do not contain iron. Aluminium, copper, zinc, nickel, and lead belong to this group. Aluminium components are made of lightweight metal and are often used in vehicles, aircraft structures, and engine parts. Electrical cables and wiring are made of copper because it is widely used in power systems. Batteries and protective coatings are often made of zinc or lead.

In addition to metals, many engineering products are made of non-metallic materials. Plastics are made of synthetic polymers and are used for panels, covers, pipes, and insulation parts. Rubber components are made of elastic materials and are commonly found in tyres, seals, belts, and hoses. Glass is made of silica-based material and is used in windows, control panels, and protective screens. Ceramic parts are made of heat-resistant materials and are used in spark plugs, insulating components, and high-temperature equipment.

Composite materials are also used in modern engineering. These materials are made of two or more different substances combined together. For example, reinforced panels are made of plastic and fibres, while some modern vehicle parts are made of metal and polymer layers.

In engineering practice, choosing the correct material is a key task. Each element is made of a material that matches its function, operating conditions, and production requirements. Knowledge of engineering materials helps engineers design safe, efficient, and modern systems.

Exercise 3. Make up the word combinations from columns A and B and find their Russian equivalents in C.

A	B	C
1) composite	a) panels	условия эксплуатации
2) lead	b) conditions	авиационные конструкции
3) non-ferrous	c) engineering	термостойкое стекло
4) operating	d) glass	композиционные материалы
5) cast	e) batteries	производственные требования
6) reinforced	f) structures	машиностроение
7) synthetic	g) weight	цветные металлы
8) mechanical	h) iron	применение в тяжёлых условиях эксплуатации
9) heat-resistant	i) products	защитное покрытие
10) light	j) materials	армированные панели
11) production	k) coating	чугун
12) heavy-duty	l) polymers	технические изделия
13) aircraft	m) applications	легкий вес
14) protective	n) metals	свинцовые аккумуляторы
15) engineering	o) requirements	синтетические полимеры

Exercise 4. Match each word to its synonym.

1) reason	a) machinery
2) equipment	b) to correspond
3) available	c) fabrication
4) to belong	d) accessible
5) production	e) to select
6) tool	f) to include
7) to match	g) instrument
8) to choose	h) cause
9) efficient	i) demand
10) to combine	j) vital
11) essential	k) detail
12) to contain	l) to relate
13) part	m) to unite
14) requirement	n) to construct
15) to design	o) effective

Exercise 5. Match each word to its antonym.

1) practical	a) traditional
2) different	b) to join
3) modern	c) complex
4) common	d) dangerous
5) to divide	e) heavy
6) metal	f) wrong
7) simple	g) theoretical
8) lightweight	h) connection
9) elastic	i) non-metal
10) safe	j) specific
11) insulation	k) rigid
12) correct	l) similar

Exercise 6. Match the names of the materials with their descriptions.

1) steel	a) a bluish of light grey metal often used as a protective layer on other metals and in battery production
2) aluminium	b) a hard, non-metallic material often used in spark plugs, insulating components, and high-temperature devices
3) lead	c) a heavy metal that is a mixture of iron, carbon, silicon and manganese, commonly used for engine blocks, pipes, and machine housings
4) plastic	d) a reddish-brown metal mainly used for electrical cables, wiring, and connectors in power systems
5) zinc	e) a flexible and elastic material commonly used in tyres, seals,

	belts and hoses
6) glass	f) a lightweight synthetic material used for panels, covers, pipes, containers, and insulation parts
7) cast iron	g) a lightweight, silver-coloured metal often used in vehicles, aircraft structures, and engine components where low weight is important
8) copper	h) a strong, grey metal that is an alloy of iron and carbon, widely used for beams, frames, shafts, and machine parts
9) rubber	i) a very heavy, soft metal usually used in batteries, protective layers, and shielding materials
10) ceramic	j) a transparent material used in windows, screens, control panels, and protective covers for equipment

Exercise 7. Cross out the odd word or word combination in each line. Explain your choice. Then add one more word that fits the group.

1. steel – rubber – cast iron – aluminium
2. electrical wiring – copper – cable – ceramic
3. glass – ceramic – rubber – steel
4. engine block – lightweight metal – aircraft part – aluminium
5. plastic – rubber – glass – lead
6. tyre – seal – beam – rubber
7. protective coating – battery – window – zinc
8. iron –steel – copper – aluminium
9. steel – cast iron – copper – bronze
10. engine block – shaft – gear – cable

Exercise 8. Group all the engineering materials mentioned in the text into the correct categories.

Metals		**Non-metals**
Ferrous	***Non-ferrous***	
1. 2.	1. 2. 3. 4.	1. 2. 3. 4.

Exercise 9. Work in pairs. Student A chooses one engineering material from the text and describes it. Student B listens and guesses the material.

Example:

A: This material is not metal. It doesn't weigh much and you can find it in many everyday objects. For example, covers, pipes, and even some parts of windows are made of it.

B: Is it plastic?

A: Exactly. It's used a lot because it's easy to shape and replace.

To describe materials used in engineering, we use the following constructions:

to be made + of + material

(is used when the original material is still visible or easy to recognise in the finished object)

The frame is made of steel.

Engine parts are made of aluminium.

or

to be made + from + material

(is used when the original material is changed during the process and is not easy to recognise in the finished object)

Plastic is made from synthetic polymers.

Paper is made from wood.

Exercise 10. Choose the correct form: *made of* or *made from*. Explain your choice.

1. The engine frame is made ___ steel.
2. Fuel for modern vehicles is made ___ oil and chemical additives.
3. This spanner is made ___ iron.
4. The cable inside the workshop is made ___ copper.
5. Plastic covers are made ___ synthetic materials.
6. Glass panels are made ___ sand.
7. The housing of the electric motor is made ___ aluminium.
8. This blade is made ___ metal.
9. Paper filters are made ___ wood fibres.
10. Fuel additives are made ___ chemical compounds.

Exercise 11. Rephrase the following sentences and translate them into Russian.

Example 1.

This housing is made of steel.
This is a steel housing.

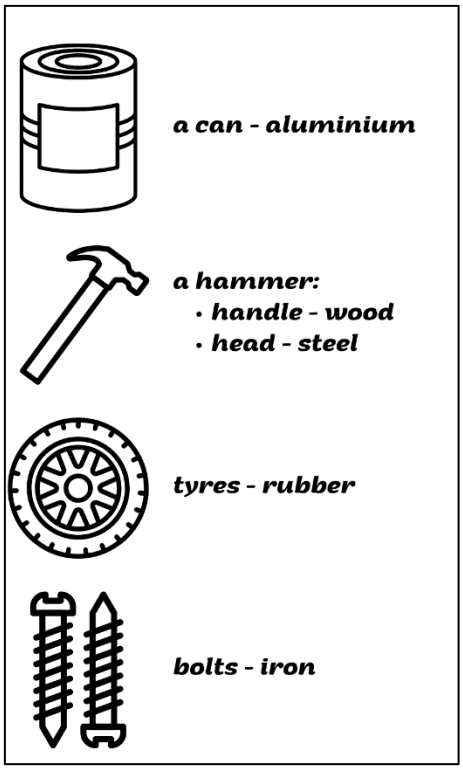
1. This frame is made of metal.
2. These pipes are made of plastic.
3. This tin is made of aluminium.
4. This beaker is made of glass.

Example 2.

This is a zinc coating.
This coating is made of zinc.

1. This is a rubber seal.
2. This is a ceramic insulator.
3. This is an aluminium ruler.
4. These are iron bolts.

Exercise 12. Complete the dialogue.



Paul: What is this object ___ of?
Michael: It ___ made of ___ .
Paul: What ___ it called?
Michael: ___ is called a ___ .
Paul: And what ___ it?
Michael: It ___ a hammer.
Paul: What is the handle of the hammer ___ of?
Michael: ___ is made of ___ .
Paul: The head ___ ___ of ___, isn't it?
Michael: Yes, ___ ___. The head ___ ___ of steel.
Paul: What ___ these tyres ___ of?
Michael: ___ are made of ___ .
Paul: ___ is a tough material, isn't ___?
Michael: Yes, it is. ___ is used for ___ tyres.
Paul: What ___ these bolts ___ of?
Michael: ___ are made of ___ .
Paul: ___ is a hard ___, isn't it?
Michael: ___, it is. ___ is a very ___ material.

Exercise 13. Read the text and learn more about different types of steel.

Steel is one of the most widely used engineering materials in the world. In general terms, steel is an alloy made mainly of iron and carbon. By changing the amount of carbon and adding other elements, engineers can produce steels with different structures and uses. This makes steel suitable for construction, machinery, vehicles, and tools.

One large group is **carbon steel**, which contains iron and carbon as its main components. Depending on the carbon content, carbon steel is usually divided into three types.

- **Mild steel** contains a low percentage of carbon, usually up to about 0.25%. It is commonly used for structural parts, frames, and panels.
- **Medium carbon steel** has a higher carbon content, typically between 0.25% and 0.6%, and is often used for shafts, gears, and machine parts.
- **High carbon steel** contains even more carbon, up to about 1%, which makes it suitable for springs, cutting tools, and wear-resistant components.

Another important group is **alloy steels**. In addition to iron and carbon, these steels contain alloying elements such as **chromium**, **nickel**, **manganese**, or **molybdenum**.

- **Low alloy steels** contain small amounts of these elements and are used in mechanical engineering and vehicle parts.
- **High strength low alloy steels (HSLA)** are designed to provide strength with reduced weight, which is especially important in modern vehicles and construction.

- **Stainless steels** contain chromium, which helps protect the surface from corrosion, and are widely used in equipment, pipes, and household appliances.
- **Tool steels** include elements such as **tungsten** or **vanadium** and are commonly used to make cutting tools and molds.

Some of these terms can cause confusion, as carbon steels are also alloys, and alloy steels also contain carbon.

Exercise 14. Match the chemical elements with their symbols.

1) iron	a) Cu
2) carbon	b) Fe
3) chromium	c) Mn
4) nickel	d) S
5) manganese	e) Al
6) molybdenum	f) H
7) tungsten	g) Cr
8) vanadium	h) Zn
9) aluminium	i) Mo
10) copper	j) Ni
11) zinc	k) V
12) sulphur	l) C
13) hydrogen	m) O
14) oxygen	o) W

Exercise 15. Find words or word combinations in the text that match the descriptions below.

1. An engineering material made mainly of iron and carbon.
2. Equipment designed to carry liquids or gases in industrial systems.
3. A type of carbon steel with a low percentage of carbon.
4. Machines or devices commonly found in homes, often made using stainless steel.
5. A group of steels designed to provide strength with lower weight.
6. A type of steel protected from corrosion by chromium.
7. Mechanical parts that transfer motion or power in machines.
8. A type of carbon steel suitable for springs and cutting instruments.

Exercise 16. Complete the table using the information from the text.

Type of steel	Main elements	Typical use

Let's listen and watch!

Exercise 1. Scan the QR code and watch the video about different alloys. After watching decide whether the following statements are true or false.

1. An alloy is created by mixing one metal with other elements while the metal is in a liquid state.
2. Pure metals are usually harder than alloys because their atoms are arranged in neat layers.
3. When a pure metal is hammered, its atomic layers can move easily, which makes the metal softer.
4. The different sizes of atoms in an alloy prevent the layers from sliding over each other.
5. Bronze is mainly used for statues because it is easy to shape into thin forms.
6. Brass is an alloy of copper and tin.
7. Pure gold is commonly used for jewellery because it is harder than most alloys.
8. The carat system shows how much gold is mixed with other metals in a gold alloy.
9. High-carbon steel is used for car bodies because it is soft and flexible.
10. Aluminium alloys are especially useful in aircraft construction due to their low weight.

Exercise 2. Watch the video again and fill in the gaps in a video summary.

An [1]_____ is a mixture made by combining a metal with other elements. To produce it, the metal is melted, mixed with additional elements, and then cooled. Compared to [2]_____, alloys are generally [3]_____ because their atoms are different sizes and disrupt the [4]_____, preventing them from sliding easily.

Steel is an important alloy of iron and [5]_____, but it has a major disadvantage: it can [6]_____. To solve this problem, stainless steel includes such elements as [7]_____ or [8]_____, which help protect it from corrosion.

Aluminium alloys are also widely used in engineering because they have [9]_____, making them suitable for [10]_____ bodies.

Let's speak!

Work in pairs to discuss engineering materials. Put the words in the questions in the correct order and complete the dialogue below.

A: I've just read an article about engineering materials. By the way, materials / engineering / what / are?
B: As far as I know, they are … .
A: That's right. main / are / groups / what / materials / of / engineering / the?
B: Well, they are usually divided into … .

A: Exactly. metals / further / divided / are / how?
B: If I'm not mistaken, metals are divided into … .
A: I see. ferrous / what / metals / are?
B: Ferrous metals are … .
A: And non-ferrous metals / they / contain / iron / do / not / do?
B: Yes, that's correct.
A: materials / used / are / where / engineering / usually?
B: For example, …
A: And tell me, important / engineers / for / materials / know / is / it / why / to / engineering?
B: Well, because …
A: I agree. Thanks, now the topic is much clearer to me.
B: You're welcome.

Let's write!

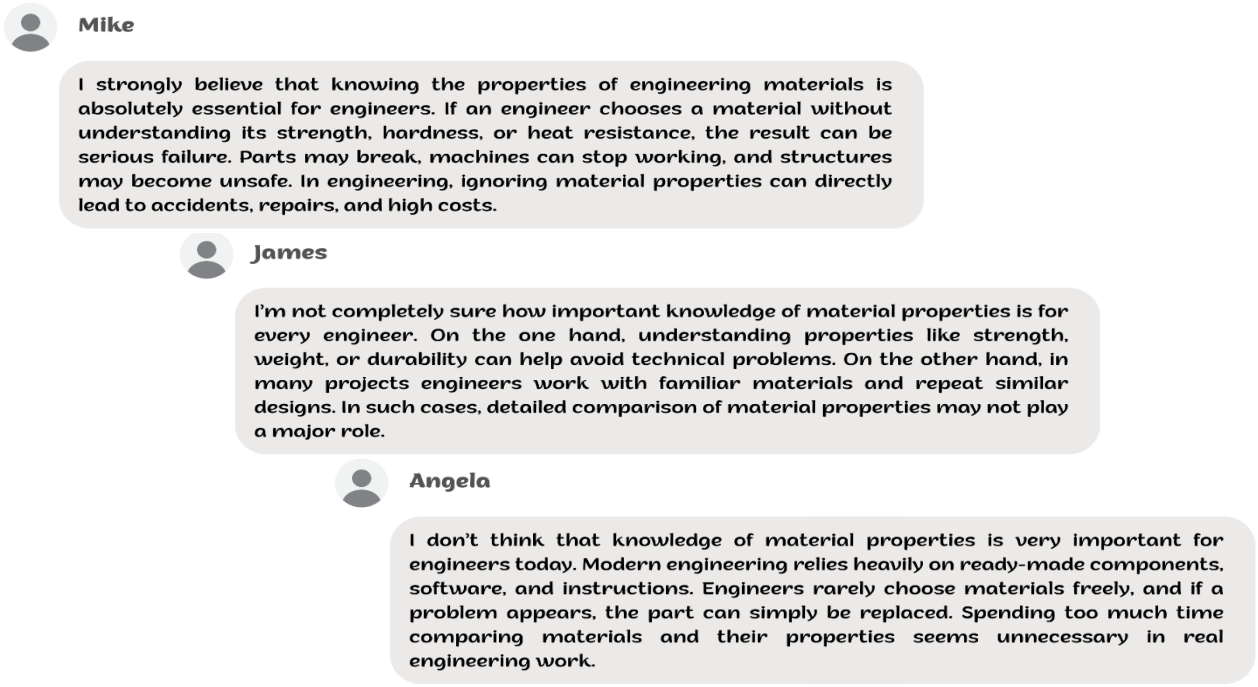
Translate the following sentences into English using your Active Vocabulary.

1. Инженерные материалы играют ключевую роль в машиностроении и гражданском строительстве, а также активно используются для производства современных транспортных средств.
2. – Большинство конструктивных элементов мостов и зданий изготавливаются из стали, которая является чёрным металлом. – Не могу не согласиться с тобой.
3. Многие детали транспортных средств сделаны из сплавов, которые содержат железо, углерод и другие химические элементы.
4. Нержавеющая сталь используется для оборудования, труб и бытовой техники, потому что она устойчива к коррозии.
5. Топливо для современных двигателей производится из нефти и химических компонентов, а не из чистых веществ.
6. – При выборе материалов инженеры в первую очередь обращают внимание на их стоимость, и всегда выбирают самый дешёвый материал из списка. – Нет, ты не прав. При выборе материалов инженеры учитывают назначение будущей конструкции, ее безопасность и условия эксплуатации.
7. Сплавы меди, такие как латунь и бронза, используются в тех случаях, когда необходимо сочетание прочности и удобства обработки.
8. Высокоуглеродистая сталь часто применяется для режущих инструментов, тогда как низкоуглеродистая сталь подходит для корпусов автомобилей и других формуемых деталей.
9. В мастерской можно увидеть инструменты, детали и панели, изготовленные из металлов, пластика, резины и стекла.
10. В процессе производства инженерных материалов металлы плавят, смешивают с другими элементами и охлаждают для получения сплавов с заданными характеристиками.

UNIT 8
PROPERTIES OF ENGINEERING MATERIALS

Let's warm up!

Read these opinions. Which one do you agree with the most and why? Work in pairs and exchange your thoughts. Use the expressions of agreement and disagreement from the previous unit.



Let's read!

Exercise 1. Follow the QR code to learn the words.

Exercise 2. Read the text carefully and learn more about different properties of engineering materials.

When engineers compare different materials, they do not start with formulas or tests. They usually begin with simple questions: how heavy is the material, how much it costs, and whether it is easily available. Some materials may be very strong, but too heavy or too expensive to use. Others may be cheaper and lighter, but less reliable. These basic factors often limit the choice before more specific properties are considered.

One of the key mechanical properties is **strength**. Strength describes how much load a material can carry without breaking or permanently changing its shape. Steel is generally stronger than aluminium, while plastics are less strong than most metals. However, materials with high strength are not always the best solution. In some cases, a material can be strong but too heavy or too rigid for the required design.

Closely related to strength is **hardness**, but these properties are not the same. Hardness shows how resistant a material is to scratching, wear, or surface damage.

High-carbon steel is harder than mild steel, which makes it suitable for cutting tools. At the same time, very hard materials are often more brittle, meaning they can crack or break suddenly under impact.

Another important group of properties includes **elasticity** and **flexibility**. Elastic materials can return to their original shape after deformation, while flexible materials can bend without breaking. Rubber is highly elastic and flexible, whereas glass is rigid and not flexible at all. Metals are generally less elastic than rubber but more flexible than brittle materials.

Engineers also pay close attention to different types of resistance. **Corrosion resistance** is especially important for materials used outdoors or in wet environments. Stainless steel is more resistant to corrosion than ordinary steel. **Thermal resistance** describes how well a material can withstand high temperatures without losing strength or changing shape. Materials with low thermal resistance may deform, melt, or fail under heat.

Another important property is conductivity, which can be electrical or thermal. Copper has very high **electrical conductivity**, which makes it extremely valuable for electrical wiring. Aluminium is also conductive, but less so than copper**. Thermal conductivity** is important in engines and industrial equipment, where materials must either transfer heat efficiently or prevent overheating.

Finally, engineers must balance material properties with practical considerations. Some materials are technically excellent but too expensive, while others are cheaper but less durable. Valuable materials are often used only where their properties are truly necessary. In real engineering practice, the best material is not the strongest or the hardest one, but the one that offers the most suitable combination of properties for a specific task.

Exercise 3. Make up the word combinations from columns A and B and find their Russian equivalents in C.

A	B	C
1) brittle	a) damage	высокая прочность
2) surface	b) wiring	коррозионная стойкость
3) mechanical	c) resistance	повреждение поверхности
4) wet	d) considerations	теплопроводность
5) electrical	e) conductivity	нержавеющая сталь
6) high	f) material	механические свойства
7) stainless	g) environment	режущие инструменты
8) corrosion	h) equipment	электропроводка
9) industrial	i) tools	практические соображения
10) practical	j) properties	промышленное оборудование
11) cutting	k) strength	влажная среда
12) thermal	l) steel	хрупкий материал

Exercise 4. Match each word to its synonym.

1) simple	a) to transmit
2) to limit	b) to begin
3) to transfer	c) to come back
4) ordinary	d) to propose
5) to return	e) to restrict
6) to start	f) constantly
7) expensive	g) easy
8) to offer	h) to resist
9) to withstand	i) costly
10) permanently	j) usual

Exercise 5. Complete the table.

Properties of Engineering Materials		
Adjectives	**Nouns**	
	English	**Russian**
Strong	strength	…
Hard	…	…
…	brittleness	…
…	elasticity	…
Flexible	…	…
…	softness	…
Tough	…	…
Plastic	…	…
…	durability	…
Resistant	…	…
Available	…	…
…	roughness	…

Exercise 6. Guess the properties of the engineering materials from their descriptions. The first letters are given.

1. The ability of a material to return to its original shape after deformation – **e**_____ ;
2. The ability of a material to withstand high temperatures without losing strength or shape – **t**_____ **r**_____ ;
3. How easy it is to obtain a material when it is needed – **a**_____ ;
4. The ability of a material to carry loads without breaking or permanent deformation – **s**_____ ;
5. The ability of a material to bend without breaking – **f**_____ ;
6. The ability of a material to withstand damage caused by humidity, air, or chemicals – **c**_____ **r**_____ ;

7. The tendency of a material to crack or break suddenly under impact – **b**_____ ;
8. The ability of a material to allow electric current to pass through it – **e**_____ **c**_____ ;
9. Resistance of a material to scratching, wear, or surface damage – **h**_____ ;
10. The ability of a material to transfer heat efficiently – **h**_____ **c**_____ .

Exercise 7. Work in pairs. Student A chooses one engineering material from the text and describes its properties and where it is used. Student B listens and guesses the material.

Example:

A: This material is a non-ferrous metal. It is not very heavy, but it has good strength. It is less expensive than some other metals and does not rust easily. It is often used in vehicles and aircraft structures where low weight is important.
B: Is it aluminium?
A: Yes, that's right. It's widely used because it is light, strong enough, and easy to work with.

To compare the properties of engineering materials, we use degrees of comparison of adjectives.

Short adjectives (one syllable, some two-syllable adjectives)

Positive	Comparative	Superlative
small	small**er**	**the** small**est**
heavy	heavi**er**	**the** heavi**est**
big	bigg**er**	**the** bigg**est**
large	larg**er**	**the** larg**est**

Long adjectives (two or more syllables)

Positive	Comparative	Superlative
rigid	**more** rigid	**the most** rigid
expensive	**more** expensive	**the most** expensive
durable	**more** durable	**the most** durable

Short and long adjectives

Positive	Comparative	Superlative
heavy	**less** heavy	**the least** heavy
expensive	**less** expensive	**the least** expensive

Exercise 8. Complete the table.

strong – stronger – the strongest	***brittle – more brittle – the most brittle***
strong – less strong – the least strong	***brittle – less brittle – the least brittle***
long – … – …	plastic – … – …
hard – … – …	elastic – … – …
soft – … – …	flexible – … – …

cheap – … – …	valuable – … – …
light – … – …	reliable – … – …
	resistant – … – …
	conductive – … – …

Exercise 9. Look at the prompts below and make <u>true sentences</u> using the comparative form of the adjective.

Example 1.

steel / aluminium / strong
Steel is stronger than aluminium.

1. aluminium / steel / light
2. glass / rubber / flexible
3. stainless steel / carbon steel / corrosion-resistant
4. aluminium / copper / conductive
5. plastic / metal / expensive
6. high-carbon steel / mild steel / hard

Example 2.

plastic / steel / strong
Plastic is less strong than steel.

1. aluminium / steel / heavy
2. mild steel / high-carbon steel / brittle
3. copper / plastic / conductive
4. rubber / glass / rigid
5. stainless steel / ordinary steel / corrosion-resistant
6. rubber / metal / expensive

Exercise 10. Work in pairs. Ask and answer the questions comparing the properties of different substances.

Example.

steel / plastic / durability
A: Which material is more durable, steel or plastic?
B: Steel is more durable than plastic.

1. high-carbon steel / mild steel / softness
2. wood / glass / brittleness
3. steel / rubber / elasticity
4. copper / iron / corrosion resistance
5. aluminium / steel / weight
6. rubber / glass / flexibility

Exercise 11. Complete the text with the correct words forms from the box.

lighter, the most conductive, more resistant, the strongest, more expensive

Copper, steel and aluminium are three widely used engineering materials, but their properties are different.

Steel is considered [1]_____ material among the three. That is why it is used for constructing bridges and car components.

Aluminium is much [2]_____ than steel, so it is commonly used in transport, where low weight is important. This material also has good corrosion resistance and is [3]_____ to environmental damage than ordinary steel.

Copper, on the other hand, is [4]_____ material when it comes to electrical applications. However, it is also [5]_____ than aluminium and steel, which limits its use in some industries.

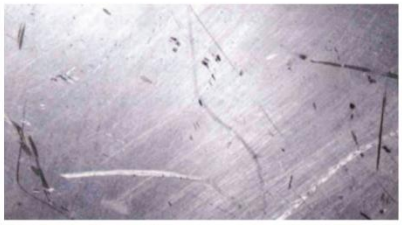
Exercise 12. Correct the mistakes in the given sentences.

1. Steel is more stronger than aluminium.
2. Rubber is the most elastic than steel.
3. Glass is more brittleer than plastic.
4. Copper is the most conductive than aluminium.
5. Rubber is flexibler than glass.
6. Mild steel is the least harder than high-carbon.
7. Aluminium is very flexible than steel.
8. Stainless steel is the most more resistant to corrosion.

Exercise 13. Read the text and learn more about different types of hardness.

Hardness is a material property that describes how well a material can resist damage to its surface. Hard materials are usually more durable and can resist wear, while softer materials are easier to shape but may wear out faster. There are three main types of hardness.

Scratch hardness describes a material's ability to resist being scratched by another material. Materials with a high degree of scratch hardness are said to be good at resisting damage due to abrasion (the action of two surfaces being rubbed together). In other words, such materials have good abrasion resistance.



Scratches

Another type is **indentation hardness.** This type of hardness measures how much a material resists indentations, i.e. permanent deformations when a force is applied to the surface of a material. Indentation hardness is widely used to compare metals and alloys.

Indentations

The third type is **rebound hardness**. It shows how elastic a material is when a force hits its surface and then rebounds. In rebound hardness tests, the higher the rebound, the harder the material. This type of hardness is useful for quick, non-destructive testing of large metal parts.

Exercise 14. Find the endings of these sentences.

1. Hardness is a material property that…	a) remain usable longer because they wear more slowly.
2. Materials with high hardness usually…	b) that are exposed to constant contact and friction.
3. Scratch hardness is important for materials…	c) resists permanent deformation when force is applied.
4. Indentation hardness measures how much a material…	d) it allows quick and non-destructive testing of large metal parts.
5. Rebound hardness is connected with…	e) describes how well a material can resist surface damage.
6. Rebound hardness testing is useful because…	f) how a material reacts after being hit by a force.

Exercise 15. Answer the following questions in pairs.

1. What does hardness describe in engineering materials?
2. Why are hard materials usually more durable than soft ones?
3. What is scratch hardness and why is it important for materials exposed to friction?
4. How is scratch hardness connected with abrasion resistance?
5. What does indentation hardness measure?
6. What happens to a material during a rebound hardness test?
7. Can one material be hard in one way but not in another? Explain your answer.

Exercise 16. Find ten properties in the puzzle. Read across, down, and diagonally.

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

Let's listen and watch!

Exercise 1. Scan the QR code, listen to the radio quiz program "The Smartest" and try to guess as many materials as possible by their descriptions.

1. …
2. …
3. …
4. …
5. …
6. …
7. …
8. …

Exercise 2. Listen to the radio quiz program again and choose the correct option.

1. Material 1 is mainly used because it is:
a) lightweight and flexible;
b) electrically conductive and durable;
c) resistant to corrosion.

2. Material 2 is described as a material that is:
a) heavier than steel;
b) less dense than steel;
c) more brittle than steel.

3. Material 3 is characterized as:
a) soft and elastic;
b) strong and rigid but sometimes brittle;
c) transparent and wear-resistant.

4. One important advantage of Material 4 is that it is:
a) very hard and rigid;
b) valuable and expensive;
c) easy to shape and relatively cheap.

5. Material 5 is different from pure copper because it is:
a) softer and lighter;
b) harder but still easy to form;
c) more brittle and rigid.

6. Material 6 is usually alloyed because:
a) it is too rigid in its pure form;
b) it is too soft when it is pure;
c) it is difficult to shape.

7. The main reason Material 7 is used for seals and tyres is that it is:
a) rigid and durable;
b) elastic and flexible;
c) electrically conductive.

8. Material 8 is suitable for windows because it is:
a) transparent and rigid;
b) elastic and soft;
c) lightweight and flexible.

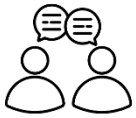
Let's speak!

Work in pairs. Create a short dialogue about the properties of engineering materials. Use the expressions of opinion, agreement and disagreement from the previous units as well as question and answering techniques from the Useful Language Box below.

In your dialogue, make sure you:

- explain what material properties are and why they are important in engineering;
- discuss different types of properties (for example, hardness, strength, elasticity, brittleness, weight);

- talk about how material properties influence material choice in engineering;
- give at least one comparison between two materials using comparative or superlative forms of adjectives.



USEFUL LANGUAGE BOX

How to ask and answer the questions:

- Do you happen to know ...
- I wonder if ...
- Could you (possibly) tell me ...
- I'd like to know ...
- One more question (to you) ...
- Do you agree that ...

- Well ...
- Let me think ...
- I don't know exactly ...
- I'm not sure ...
- It seems to me ...
- As for me ...

Let's write!

Translate the following sentences into English using your Active Vocabulary.

1. Лучшим техническим материалом всегда считается тот, который обладает наиболее подходящим сочетанием свойств для конкретной задачи.
2. Этот материал менее прочный, чем сталь, но гораздо легче и устойчивее к коррозии.
3. Ты случайно не знаешь, почему режущие инструменты обычно изготавливаются из высокоуглеродистой стали?
4. Не все материалы одинаково устойчивы к износу, даже если они выглядят очень прочными.
5. Коррозионная стойкость особенно важна для материалов, используемых на открытом воздухе или во влажной среде.
6. Какое свойство делает этот материал более подходящим для деталей, работающих под нагрузкой?
7. Этот сплав не является самым дорогим материалом, но он один из самых надёжных в инженерных конструкциях.
8. Медь твёрже и прочнее алюминия, но мягче стали.
9. Какие материалы считаются наименее хрупкими и почему они широко используются в строительстве?
10. Твёрдость – это свойство материала сопротивляться царапинам, износу или повреждению поверхности.
11. Резина – очень прочный материал.
12. Литейный чугун – тяжёлый, но он легче, чем медь.
13. Стекло – очень хрупкий материал.
14. К характеристикам цветных металлов относят: высокую электро- и теплопроводимость, высокую коррозиеустойчивость, лёгкий вес и простоту производства.
15. Пластик – очень лёгкий материал.
16. Этот материал обладает свойством пластичности, поэтому он широко используется в производстве.

References

1. Arauzo, A. Introduction to Engineering Materials / A. Arauzo // Mechanical and Materials Engineering for Particle Accelerators and Detectors : proc. of the CERN Accelerator School course, Sint-Michielsgestel, 2-14 June 2024 / CERN ; ed. C. Gonzales [et al.]. – [Sint-Michielsgestel], 2024. – P. 52-62.
2. Britannica: [site]. – URL: https://www.britannica.com/ (date of access: 01.11.2025).
3. Davenport, W. H. Engineering. Its Role and Function in Human Society / W. H. Davenport, D. I. Rosenthal. – Oxford : Pergamon Press, 2013. – 297 p.
4. Engineering Ethics: Concepts and Cases / Ch. E. Harris, M. S. Pritchard, M. J. Rabins [et al.]. – 6th ed. – Boston : Cengage, 2018. – 336 p.
5. Engineering Technology: [site]. – URL: https://engineeringtechnology.org/ (date of access: 21.01.2026).
6. Ibbotson, M. Cambridge English for Engineering / M. Ibbotson. – 1st ed. – Cambridge : Cambridge University Press, 2008. – 88 p.
7. Ibbotson, M. Professional English in Use Engineering with Answers: Technical English for Professionals / M. Ibbotson. – 1st ed. – Cambridge : Cambridge University Press, 2009. – 148 p.
8. iLearn Engineering: [site]. – URL: https://www.ilearnengineering.com/ (date of access: 15.03.2026).
9. Journal of Engineering in Industrial Research: [site]. – URL: https://www.jeires.com/ (date of access: 02.02.2026).
10. LibreTexts. Mathematics: [site]. – URL: https://math.libretexts.org/ (date of access: 12.11.2025).
11. MATH.net: [site]. – URL: https://www.math.net/ (date of access: 18.11.2025).
12. Mathwords: [site]. – URL: https://www.mathwords.com/ (date of access: 12.11.2025).
13. Murugan, S. Mechanical Properties of Materials: Definition, Testing and Application / S. Murugan // International Journal of Modern Studies in Mechanical Engineering. – 2020. – №6 (2). – P. 28-38.
14. Singh, R. Classification of Steels / R. Singh // Applied Welding Engineering: Processes, Codes and Standards / R. Singh. – 1st ed. – Waltham, 2012. – Ch. 6. – P. 51-56.
15. The Engineers Post: [site]. – URL: https://www.theengineerspost.com/ (date of access: 10.01.2026).