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UNIT 1. HISTORY OF COMPUTERS

Task 1. Lead-in questions.

1. How do you think computers have developed over time?
2. What major inventions influenced the development of computers?
3. Name the scientists who have made the most important contribution to the development of computers. What do you know about their work?

Task 2. Read and translate text A.

Text A. The History of Computers

The first counting tools people used were sticks and stones. However, as the human mind developed over time, new computing devices were designed starting with the invention of the abacus in China, around 1300 BC. It was used to perform basic arithmetical operations – addition, subtraction, multiplication, division. The first mechanical adding machine, *the Pascaline*, was built by Blaise Pascal, a French mathematician and scientist, between 1642 and 1644. *The Pascaline* was able to perform addition and subtraction in short time. The device was basically a wooden box with a number of gears and wheels.

The first machine resembling today's modern computers was *The Analytical Engine* designed in the 1830s by British mathematician Charles Babbage who is often called the father of the computer. He showed his machine at the exhibition in Paris in 1855. *The Analytical Engine* contained an ALU (arithmetic logic unit), control unit, memory, and an input/output system. These are the essential parts of a modern computer. Babbage never finished this work, but many of his ideas were the basis for building today's computers.

The 19th century was a period of a rapid evolution of computing theory and a number of calculating machines began to be used at that time. However, it wasn't until the middle of the 20th century that a major breakthrough in computing technology was made. In 1936 Konrad Zuse, a German engineer, developed the Z1 machine, the first programmable mechanical computing device, which was later followed by the Z2 and the Z3. This series of inventions led to the advent of the first fully-functioning programmable electro-mechanical computer.

The first generation of computers, which used vacuum tubes, came out in the 1940s. The milestone event was the invention of ENIAC (Electronic Numerical

Integrator and Computer) - the first general-purpose electronic digital computer working on vacuum tubes. The project was completed by two engineers at the University of Pennsylvania, John Mauchly and J. Presper Eckert, in 1946. Another important advancement in computers came in 1947, when John von Neumann developed the idea of keeping instructions for the computer inside the computer's memory. UNIVAC I (Universal Automatic Computer), built in 1951, became the first commercially produced digital computer in the United States.

In the late 1950s and early 1960s, the second generation of computers was developed and could work ten times faster than their predecessors. The reason for this high speed was the use of transistors instead of vacuum tubes. The size of the computer also became smaller. The third-generation computers appeared on the market between 1965 and 1972. These computers could do a million calculations per second, which is 1000 times faster than the first-generation computers. Unlike second-generation computers, these were controlled by tiny integrated circuits and were consequently smaller.

In the fourth-generation computers, integrated circuits were greatly reduced in size, which was due to microminiaturization. In these computers, which came out in the mid- to late 1970s, 1000 tiny circuits could fit onto a single chip. Microprocessors even moved beyond the realm of computers and into an increasing number of everyday products. The fifth generation of computers, which is being developed nowadays, is based on parallel processing and Artificial Intelligence, a technology that has many potential applications around the world.

Task 3. Fill in each blank with a word chosen from the list below:

breakthrough / tools / microprocessors / programmable / arithmetical / abacus / vacuum tubes / tiny / reliable / Artificial Intelligence / subtraction / speed

1. The earliest counting _____ used were sticks and stones.
2. Then, the _____ was invented.
3. The abacus can be used to perform common _____ operations.
4. The mechanical adding machine designed by Blaise Pascal could perform addition and _____ in quick time.
5. The major _____ in computing technology was made in 1930s - 1950s.
6. Konrad Zuse is known to build the first _____ electro-mechanical computer.
7. In 1946 the first digital computer was built using parts called _____.

8. The reason for this high _____ was the use of transistors instead of vacuum tubes.
9. The second-generation computers were smaller, faster and more _____ than first-generation computers.
10. The third-generation computers are controlled by _____ integrated circuits.
11. Nowadays, _____ can be found in the increasing number of everyday products.
12. One of the key features of the fifth-generation computers is the use of _____.

Task 4. Fill in the gaps with prepositions in the sentences below.

1. As the human mind developed _____ time, new computing devices were designed.
2. The first mechanical adding machine was built _____ Blaise Pascal.
3. The abacus is still being used _____ some parts _____ the world.
4. *The Analytical Engine* was shown _____ the Paris Exhibition _____ 1855.
5. This series of inventions led _____ the advent of the first fully-functioning programmable electro-mechanical computer.
6. The first generation of computers came _____ in the late 1940s.

Task 5. Make up three questions to the text ‘The History of Computers’. Work with a partner to ask and answer questions.

Task 6. Listen to the recording about the invention called ‘the Difference Engine’ and find out in what connection the following words were mentioned. Audio file 1.1
[\[https://online-edu.mirea.ru/course/view.php?id=10378\]](https://online-edu.mirea.ru/course/view.php?id=10378):

mistakes / The British Government / money / the Science Museum

Task 7. Watch a video at [\[https://www.youtube.com/watch?v=LvKxJ3bORKE\]](https://www.youtube.com/watch?v=LvKxJ3bORKE) and mark the following statements as true or false. Correct the false statements.

1. Knotted cords originated in China.
2. The Jacquard machine used paper punched cards to make programmable patterns.
3. The punched card technology was used to count population in Germany in the census of 1890.

4. One machine was always used both to encode and decipher a message during World War II.
5. The switch from mechanical to electronic computing happened in Philadelphia.
6. The ENIAC machine was first used in the banking sphere.
7. The first computer communication network linked a few American cities on the western coast.

Task 8. Read and translate text B.

Text B. Early computers

The Harvard Mark I Computer

With World War II blazing on, the US government realized that it needed to be more innovative than ever in order to gain the upper hand. At major universities across America, many scientists worked hard on inventing new ways to keep up with the technology that was quickly advancing. Much of the focus was on making rockets and ballistics more precise. They required complex calculations.

At Harvard, the first of the MARK series computers was being built. The MARK I was presented to the public in 1944. This computer was absolutely huge and filled a room that was 55 feet long by 8 feet high. It was an electromechanical computer, which contained a great number of components. In fact, it had over 760,000 parts. It was loud and clicked and clanged like a huge factory. However, the MARK I turned out to be a success. It was utilized by the US Navy for calculations of ballistics. It performed well for the next 15 years, being in service till 1959. The MARK I read its instructions from a punched paper tape; it could perform a wide variety of calculations including addition, subtraction, multiplication, and division and it was able to hold and reference a previous result used in its calculations. It even had the capability to compute numbers with up to 23 decimal places. As for the vastness of this machine, it was not only loud and had hundreds of thousands of parts, but included 500 miles of wire. While the computer itself was high tech for its time, the output was not digital, the MARK I used a simple electric typewriter to display results. Speed was also lacking with a typical multiplication computation taking from 3 to 5 seconds.

The ENIAC Computer

The ENIAC computer is known as being one of the most important achievements in computing. The computer was created during World War II and it was originally commissioned and used by the US military to calculate ballistics tables. The ENIAC

stands for Electrical Numerical Integrator and Computer. It was developed by John Mauchly and John Presper Eckert. While John Mauchly created several previous calculating machines, this machine was different. The ENIAC used vacuum tubes instead of electric motors and levers to speed up calculations. The development of ENIAC started in 1943, however it wasn't built and ready for operation until 1946. The total cost of the ENIAC was \$500,000. While it was originally built for ballistics it was used for various issues including weather forecast and even wind tunnel design. The ENIAC had an enormous amount of vacuum tubes - over 14,000 and included over 5 million soldered joints. It covered a space of 187 square meters and weighed over 30 tons.

Regarding speed, the ENIAC was extremely fast for the technology of that time. Per one second, the ENIAC could perform 5,000 additions, 357 multiplications or 38 divisions. The speed of the ENIAC was about 1,000 times faster than any other calculating device during that era. The ENIAC stayed in operation until 1955.

The UNIVAC

Besides the ENIAC, one of the most popular computers of the past is the UNIVAC. The UNIVAC stands for Universal Automatic Computer. It was designed and built by those who created the ENIAC computer. Instead of working for the US military, the UNIVAC was first sold to the US Census Bureau that required a computer for complex computations dealing with the explosion in the US population. In 1946, the US Census Bureau gave a \$300,000 deposit for the development and creation of the UNIVAC. It was stated in the contract that it would pay no more than \$400,000 for the computer, but eventually the UNIVAC was delivered at the cost of 1,000,000 dollars.

The UNIVAC computer was extremely cutting edge for its day. It was fast and able to handle many computations. In fact, it could add in 120 microseconds, multiply in 1,800 microseconds and divide in 3,600 microseconds. It was also able to read characters that were fed via magnetic tape at a speed of 12,800 characters per second. All in all, it was one of the fastest and most innovative computers of its day. In fact, the UNIVAC received public praise when it was used to predict the next president of the United States.

The IBM computers

The first IBM general purpose computer was the IBM 701. In 1953, the 701 was developed in part due to the Korean War to help the US Government in monitoring the situation in Korea. The company delivered one IBM 701 computer for the Korean War,

while others went to atomic research and to aircraft companies. Some went to research facilities including the US Weather Bureau. At the time, a company or large organization could rent the 701 for \$15,000 per month. It used magnetic tape to store information and it should be noted that the new computer language FORTRAN was utilized in the new IBM 701.

The first commercial transistorized computer produced by the company was the IBM 7090. It was built in 1960 and was the fastest computer of its day. IBM capitalized on the 7090 and it dominated business computers for the next 20 years.

Task 9. Answer the questions to the text above.

1. How many parts did Mark I have?
2. How did Mark I display results of calculations?
3. What was revolutionary about the ENIAC?
4. What does the UNIVAC stand for?
5. Which computer could be rented by large organizations?
6. Which newly-created programming language was used in the IBM 701?

Task 10. Find English equivalents for the following words in the text:

- | | |
|--------------------|--|
| 1) точный | 4) бюро переписи населения |
| 2) пишущая машинка | 5) справляться с большим количеством вычислений |
| 3) вычитание | 6) компьютер общего назначения / универсальный компьютер |

Task 11. Complete the chart:

	<i>time of invention</i>	<i>key features</i>	<i>areas of application</i>
<i>Mark I</i>			
<i>ENIAC</i>			
<i>UNIVAC</i>			
<i>IBM 701</i>			

Task 12. Read the text about the characteristics of different generations of computers and complete the gaps with the words below. Sometimes you will need to change the form of the word:

generate / electricity / heat / reduce / solve / require / take up

The first-generation computers were expensive to operate and used a lot of (1) _____. They (2) _____ a lot of heat, which was often the cause of malfunction. These computers (3) _____ one problem at a time. The machines were enormous in size, (4) _____ entire rooms.

The second-generation computers still produced a lot of (5) _____ but less than first-generation computers and (6) _____ less maintenance. Transistors used in second generation computers were smaller in size compared to vacuum tubes, thus the size of the computer (7) _____.

*power / predecessors / pointing / efficiency / respond /
significantly / make / lead / simulate*

With the third-generation computers, the use of integrated circuit chips increased the speed and (1) _____ of computers. They used less (2) _____ and generated less heat. The cost of the computer went down (3) _____. The maintenance cost of the computer was less compared to their (4) _____.

The fourth-generation computers supported Graphical Use Interface (GUI). The use of semiconductors (5) _____ the computers even smaller in size. *The mouse* has become widely used as a (6) _____ device. Computers became linked to form networks which (7) _____ to the emergence of the Internet.

The fifth-generation computers are based on Artificial Intelligence. They try to (8) _____ the human way of thinking and reasoning. The goal of fifth-generation computing is to develop devices that (9) _____ to natural language input and are capable of learning and self-organization.

Task 13. Match definitions below with the term.

Artificial Intelligence / semiconductor / subtraction / transistor

1. A material, such as silicon, whose ability to conduct electricity increases, when its temperature goes up.
2. A small electronic component, used in television or radio, to control the flow of electricity.
3. An arithmetic operation where the difference between two numbers is calculated.

4. A branch in computer science which studies the way a machine can simulate aspects of human intelligence.

Task 14. Render the text into English.

Одним из поворотных событий в истории ЭВМ стало появление машин с хранимой в памяти программой. Первым в мире функционирующим компьютером с программой в памяти стал EDSAC, созданный в 1949 году в Кембриджском Университете командой учёных во главе с Морисом Винсентом Уилксом (*Maurice Vincent Wilkes*). Конец 1940-х начало 1950-х был периодом энтузиазма и воодушевления. Потребность в более совершенных ЭВМ возрастала с каждым годом, т.к. приходилось выполнять всё больше сложных расчётов как в сфере науки, так и в ходе разработки технических средств по заказу армии.

В мае 1946 года Морис Уилкс получил отчет Джона фон Неймана (*John Von Neumann*), где описывался принцип работы компьютера с памятью способной хранить программы и данные. Прочитав отчет, Уилкс сразу понял, что дальнейшее развитие ЭВМ пойдет по пути записи и хранения программ внутри компьютера. В августе 1946 года Уилкс прослушал курс лекций по «Теории и методам конструирования электронных цифровых компьютеров» в школе Мура при Пенсильванском Университете и после возвращения в Великобританию приступил вместе с коллегами по лаборатории к реализации проекта создания компьютера с хранимой в памяти программой. Для облегчения процесса программирования Морис Уилкс разработал более удобный способ взаимодействия с компьютером – систему, где для обозначения команд вместо двоичного кода использовались буквы и сокращенные английские слова. Он ввел мнемонику, где каждое слово обозначалось одной заглавной буквой: S – «вычитание», T – «передать информацию в память» и т.д.

Ещё одним важным нововведением на EDSAC было наличие библиотеки унифицированных подпрограмм для самостоятельной настройки и размещения подпрограмм внутри основной памяти. Морис Уилкс назвал мнемоническую схему для EDSAC и библиотеку подпрограмм собирающей системой (по-английски *assembly system* — отсюда слово "ассемблер"), поскольку она собирала последовательности подпрограмм. В настоящее время языки программирования, в которых короткие мнемонические имена непосредственно соответствуют отдельным машинным командам, называются языками

ассемблера. Так что Морис Уилкс считается создателем (1949 год) одного из так называемых языков ассемблера.

Task 15. Listen and complete the blanks in the text below. Audio file 1.2

[\[https://online-edu.mirea.ru/course/view.php?id=10378\]](https://online-edu.mirea.ru/course/view.php?id=10378)

In 1965, computer engineer Gordon Moore made a remarkable prediction. He said that computer processing power should (1) _____ every two years. While the rate (2) _____, the overall trend actually follows it quite closely. This theory is known as Moore's law.

Moore's law is based on various factors. As manufacturing improves, the cost of transistors decreases. The (3) _____ in costs corresponds to a rise in production. Engineers can (4) _____ to place more transistors on each circuit. As a result, computing power increases at a (5) _____ rate.

However, not everyone benefits from such rapid (6) _____. As computing power expands, older models fade quickly into obsolescence. Even though costs have (7) _____, computers are still expensive for some. Many average consumers cannot afford a new computer every two years. Some analysts predict that the trend will not (8) _____. They suggest that growth will begin to stabilize in a few years. If (9) _____ are correct, growth may double in three years instead of two.

Task 16. Choose the correct answers.

1. What is the purpose of the article?

- a) to discuss the rate at which computers improve over time;
- b) to explain how consumers influence computer technology trends;
- c) to persuade people to buy more efficient computers;
- d) to describe the need for new processing systems.

2. Which of the following is NOT a component of Moore's law?

- a) a decline in technology costs;
- b) doubled computing power;
- c) a rise in transistors per circuit;
- d) decreased obsolescence.

3. What do analysts predict about the growth of processing power?

- a) It will lead to higher costs.

- b) It will slow down.
- c) It will stop within a few years.
- d) It will become more rapid.

Task 17. Match the words (1-6) with the definitions (a-f):

- | | |
|------------------|--|
| 1) trend | a) to become twice as much |
| 2) steady | b) a rule that says computer power doubles every two years |
| 3) to double | c) a consistent change over time |
| 4) to stabilize | d) to reach a state with infrequent change |
| 5) to correspond | e) not changing or changing slowly |
| 6) Moore's law | f) to have a direct relationship with something |

UNIT 2. TYPES OF COMPUTERS

Task 1. Lead-in questions.

1. What types of computers can you name?
2. What is the difference between the netbook and the laptop?
3. Is it accurate to qualify the smartphone as a type of a computer? What are its benefits and limitations compared to other types of computers?

Task 2. Listen to a conversation between an employee and a co-worker. Mark the following statements as true (T) or false (F). Audio file 2.1 [<https://online-edu.mirea.ru/course/view.php?id=10378>].

1. The woman recently bought a tablet.
2. The woman is still using her laptop.
3. The man wants to replace his old desktop computer.

Task 3. Discuss one of your recent purchases (a smartphone, camera, laptop, graphics card, tablet, headphones, power bank, etc.) with a partner comparing it to the previous model you had by size, features, convenience, etc.

Task 4. Read the texts and say if they are about the laptop, the mainframe, the server, the tablet, the desktop PC, or the supercomputer. Answer the questions below.

TEXT A

1. A _____ is a computer connected to a network of other workstations called 'clients'. Client computers request information from it over the network. They tend to have more storage, memory and processing power than a normal workstation.
2. A _____ is a highly portable PC whose primary interface is a touch screen that occupies the full length/width of the device. It combines the best aspects of smartphones and laptop PCs. However, they don't include all the same hardware components as a full desktop computer or laptop.
3. A _____ is a computer with a high level of performance compared to a general-purpose computer. It contains tens of thousands of processors which allows simultaneous execution of one process on thousands of processors. It can perform billions and trillions of computations per second. Since information moves quickly

between processors in it, they are ideal for data-intensive scientific and engineering purposes such as quantum mechanics, weather forecasting, oil and gas exploration, molecular modeling, physical simulations and aerodynamics.

4. A _____ is a type of computer designed to stay at one location and fits on a desk. It has its own processing unit (or CPU), a monitor, keyboard, mouse, and a tower (system unit).

5. A _____ can process and store large amounts of data. It supports multiple users at the same time and can support more simultaneous processes than a PC. The central system is a large server connected to hundreds of terminals over a network. They are used for large-scale computing purposes in banks, big companies and universities.

6. A _____ is a lightweight computer that you can transport easily. It can work as fast as a desktop PC, with similar processors, memory capacity, and disk drives, but it is portable and has a smaller screen. Instead of a mouse, they have a touchpad built into the keyboard — a sensitive pad that you can touch to move the pointer on the screen. They offer a lot of connectivity options: USB ports for connecting peripherals, slots for memory cards, etc. They come with battery packs, which let you use the computer when there are no electrical outlets available.

1. What features allow the server to leave the ordinary desktop PC behind?
2. What downsides of a tablet can you name compared to a desktop PC?
3. What fields can tablets be applied in?
4. What is another way to call a system unit?
5. What two ways can laptops be powered in?

Task 5. Listen and complete the blanks. Audio file 2.2 [<https://online-edu.mirea.ru/course/view.php?id=10378>]:

1. ... computers can be divided into five main types, _____ on their size and power.
2. The basic configuration of a mainframe consists of a central system which processes _____ very quickly.
3. PCs, or personal computers, carry out their processing on a single microchip. They are usually _____ and portability.
4. A laptop is a _____ computer that has a flat LCD screen and uses batteries for mobile use.

5. The latest models can run as fast as similar desktop computers and have similar _____.
6. Your handwriting is _____ into editable text. You can also input text by using speech recognition or a small keyboard.
7. You can _____ the screen easily.

Task 6. Read the text about a tablet computer and complete the blanks with the following words.

TEXT B

*virtual / lack / access / sharing / rechargeable /
Bluetooth / resemble / gestures / navigate*

A tablet computer, commonly shortened to a tablet, is a mobile device, typically with a mobile operating system and a (1) _____ battery in a single, thin and flat package. Tablets, being computers, do what other personal computers do, but (2) _____ some input/output abilities that others have. Modern tablets largely (3) _____ modern smart phones, the only differences being that tablets are relatively larger than smart phones, with screens 7 inches or larger, measured diagonally, and may not support (4) _____ to a cellular network.

The touch screen display is operated by (5) _____ executed by finger or digital pen (stylus), instead of the mouse, trackpad and keyboard of larger computers. Tablets do not usually have physical keyboards and accept text and other input by use of a (6) _____ keyboard shown on their touch screen displays. To compensate for their lack of a physical keyboard, most tablets can connect to independent physical keyboards by (7) _____ or USB.

A key component among tablet computers is touch input on a touch screen display. This allows the user to (8) _____ easily and type with a virtual keyboard on the screen or press other icons on the screen to open apps or files.

Popular uses for a tablet PC include viewing presentations, video-conferencing, reading e-books, watching movies, (9) _____ photos and more.

Task 7. Modify the word on the right to fill in the gaps.

TEXT C

Are mainframes the same thing as supercomputers? Not at all. Both of them push the limits of what can be accomplished through computing. These two are large and (1) _____ machines, power however, they refer to (2) _____ different kinds of hardware fundamental and types of computing. The (3) _____ distinction between big mainframes and supercomputers is the type of problems they tackle.

Supercomputers conduct large amounts of very fast and complex (4) _____ on data stored in memory. These computers calculate (5) _____ to run complex simulations. build

Mainframes process the large amounts of data that come into them from external sources, such as credit card transactions or payroll processing.

So, the (6) _____ of the supercomputer is higher perform compared to the mainframe as supercomputers can execute billions of (7) _____ per second, processing one single but most operate complex problem at once. Mainframes, in turn, process thousands of queries simultaneously. As a result, their performance is (8) _____. slow

They will both continue to dominate the heavy duty computing needs of (9) _____, science, government, and many busy other fields. Their power and specialized (10) _____ make capable them well-suited for their particular tasks.

Task 8. Watch a video at [<https://youtu.be/ItxwyMR0SnY>] on different types of computers and complete the blanks.

Desktops

1. The reason is desktop computers are not _____, so you can't just _____ and go anywhere with your desktop computer.
2. ... so you _____ portability, but what you gain on the hardware side is a big plus.
3. The computer case _____ you for a lot more customization options when it comes to the computer's _____.

4. Another great thing about desktop computers is they have a _____ keyboard ...
5. Those are some of the _____ of a desktop computer.

Laptops

6. _____, we have laptop computers. They are _____ in two different ways.
7. ... and it won't drain your other power option which is your _____.

Tablets

8. Tablets have some great benefits as well. The main one - they are _____.
9. The main _____ of tablets is that they typically use a mobile operating system.
10. What you _____ in portability you lose in functionality ...

Servers

11. You are _____ that server's information to watch these videos.
12. On the business level, they are used to _____ files.
13. This is a lot faster than running a _____ around the office and giving people files that way and emailing _____.

Task 9. Read a text on mainframes, mark the following statements as True or False and find the English equivalents to the words below.

1. Mainframe computers are thought to be outdated and obsolete because of the recent fast developments in distributed systems, meaning networks of small and cheaper machines.
2. Mainframes ruled supreme in the corporate data centers until the beginning of the 21st century.
3. All companies that use mainframes choose them because they are reliable, secure and easy to maintain.
4. IBM runs special programs helping schools and universities to train mainframe administrators.

TEXT D. Back in Fashion

Geeks may roll their eyes at the news that Namibia is only now getting its first mainframe — a technology that most consider obsolete. Yet the First National Bank of Namibia, which bought the computer, is at the leading edge of a trend. Comeback is too strong a word, but mainframes no longer look that outdated.

Until the 1980s mainframes, so called because the processing unit was originally housed in a huge metal frame, ruled supreme in corporate data centers. Since then, these big bundles of software and hardware have been dethroned by “distributed systems”, meaning networks of smaller and cheaper machines. But many large companies still run crucial applications on the “big iron”: there are still about 10,000 in use worldwide. Withdraw money or buy insurance, and in most cases mainframes are handling the transaction.

Some companies like mainframes because they are reliable, secure and easy to maintain. But others have no choice. Banks, for instance, use decades-old applications to manage customer accounts. Moving these programs to other computers would be expensive and sometimes impossible. Most firms that can move off the mainframe have already done so.

High “switching costs” explain in large part why mainframes are still a good business for IBM. It is the only big firm left selling them, at prices that start at \$100,000 but often reach the millions. Sales of mainframes are said to have brought in about \$3.5 billion a year, on average, in the past decade. Although this is only about 3.5% of the firm’s overall revenue, each dollar spent on hardware pulls in at least as much from sales of software and maintenance contracts.

To preserve its mainframe business, IBM has regularly modernized its line-up of machines, lowering prices and improving performance. It has also given cash and computers to hundreds of universities and schools to get them to train replacements for retiring mainframe administrators.

In addition, IBM is trying to get customers to use mainframes for more functions. For some years, it has offered specialized add-on processors at considerably lower prices to run a greater variety of programs, mostly based on Linux, an open-source operating system. And last year IBM started bundling mainframes with applications at a discount. IBM is also trying to attract new customers, particularly in fast-growing emerging markets. Without mainframes, India’s Housing Development Finance Corporation and the Bank of China in Hong Kong would have a hard time dealing with their explosive growth.

The computer industry seems to be moving IBM’s way. The mainframe may well find a new home in corporate computing clouds, the pools of data processing capacity many firms are building. Many companies are increasingly interested in buying simpler, more integrated computer systems, even if this means a higher price.

- 1) устаревший
- 2) огромный

- 5) совокупная выручка
- 6) снижать цены

- 3) надёжный и лёгкий в
обслуживании
4) в среднем

- 7) улучшать
производительность
8) привлекать новых клиентов

Task 10. Complete the blanks with the correct prepositions.

1. Another great thing ____ desktop computers is that they have a detached keyboard.
2. A tablet computer is a mobile device ____ a mobile operating system.
3. Instead ____ a mouse, laptops have a touchpad built ____ the keyboard.
4. Tablets have some great benefits ____ well.
5. Mainframes process the large amounts of data that comes ____ external sources.
6. They have a lot of connectivity options ____ attaching peripherals.
7. Modern tablets are relatively larger ____ smart phones.
8. Laptops are powered ____ two different ways.
9. The performance ____ the supercomputer is higher compared ____ the mainframe.
10. The biggest distinction ____ mainframes and supercomputers is the type of problems they tackle.

Task 11. Translate from Russian into English.

1. Это переносное устройство, но оснащено тем же объёмом памяти.
2. Считается, что планшеты менее мощные, чем ноутбуки.
3. Сенсорный экран позволяет вводить текст без традиционной клавиатуры.
4. Мейнфреймы могут обрабатывать и хранить большие объёмы данных.
5. В результате их производительность гораздо ниже.
6. Мейнфреймы способны выполнять больше параллельных операций, чем ПК.
7. Эта характеристика может быть как преимуществом, так и недостатком.
8. Ноутбуки оснащены сенсорной панелью, встроенной в клавиатуру.
9. Эта модель имеет доступ к интернету.

Task 12. Match the terms with the definitions:

desktop PC / supercomputer / netbook / tablet / mainframe / laptop / server

1. A central computer that provides services or stores data for many other computers.
2. A hinged computer that is easy to transport.
3. A mobile computer that is typically smaller than a laptop and often has fewer functions.
4. The fastest computer on Earth that could process a considerable number of information very quickly.
5. A portable computer with a flat touch screen which doesn't have a physical keyboard.
6. A large computer with the capability to run many applications simultaneously.
7. A computer intended to be used in a single place.

Task 13. Translate the text into English.

TEXT E

Настольный компьютер — это стационарный персональный компьютер, предназначенный для работы в офисе или в домашних условиях. Основным компонентом этого вида компьютера является системный блок, к которому подключаются монитор, клавиатура, мышь и прочие устройства, такие как принтер, сканер и т.д. Главное достоинство настольных компьютеров — их модульный принцип. Он, во-первых, позволяет собрать устройство исходя из предпочтений пользователя, который может выбрать размер монитора, объём памяти, мощность процессора и заплатить именно за те характеристики компонентов, которые ему действительно нужны. Во-вторых, такие компьютеры в дальнейшем без труда можно будет модернизировать (например, добавив модуль оперативной памяти в свободный разъём или заменив процессор на более мощный) или отремонтировать.

Моноблок является так же стационарным компьютером, но без отдельно стоящего системного блока. Системный блок этого вида компьютеров помещён в единый корпус с монитором, что существенно улучшает его дизайн.

UNIT 3. COMPUTER HARDWARE

Task 1. Lead-in questions.

1. What is the difference between hardware and software?
2. What is the difference between internal and external hardware components?
3. What factors can affect the performance of the CPU?

Task 2. Read the text and answer the questions below.

TEXT A. What is a computer?

A computer is an electronic machine which can accept data in a certain form, process the data, and give the results of the processing in a specified format as information.

First, data is fed into the computer's memory. Then, when the program is run, the computer performs a set of instructions and processes the data. Finally, we can see the results (the output) on the screen or in printed form.

A computer system consists of two parts: hardware and software. Hardware is any electronic or mechanical part you can see or touch. Software is a set of instructions, called a program, which tells the computer what to do. There are three basic hardware sections: the central processing unit (CPU), main memory and peripherals.

Perhaps the most influential component is the central processing unit. Its function is to execute program instructions and coordinate the activities of all the other units. In a way, it is the 'brain' of the computer. The main memory (a collection of RAM chips) holds the instructions and data which are being processed by the CPU. Peripherals are the physical units attached to the computer. They include storage devices and input/output devices.

Storage devices (hard drives, DVD drives or flash drives) provide a permanent storage of both data and programs. Disk drives are used to read and write data on disks. Input devices enable data to go into the computer's memory. The most common input devices are the mouse and the keyboard. Output devices enable us to extract the finished product from the system. For example, the computer shows the output on the monitor or prints the results onto paper by means of a printer.

On the front panel of the computer there are several ports into which we can plug a wide range of peripherals - a modem, a digital camera, a scanner, etc. They allow communication between the computer and the devices.

1. What is a computer?
2. How can the output be delivered?
3. What two parts does any computer system consist of?
4. What is hardware?
5. What is software?
6. What is the function of the CPU?
7. What are peripherals?
8. What are storage devices used for?
9. What is the function of input devices?
10. What are the common input devices?
11. What is the function of output devices?
12. What are the common output devices?

Task 3. Match the terms with their definitions below:

- | | |
|----------------------------|--|
| 1) software | a) the brain of the computer |
| 2) peripherals | b) physical parts that make up a computer system |
| 3) main memory | c) programs which can be used on a particular computer system |
| 4) hard disk drive | d) the information which is presented to the computer |
| 5) hardware | e) results produced by a computer |
| 6) input | f) input and output devices connected to the CPU |
| 7) ports | g) section that holds programs and data while they are executed or processed |
| 8) output | h) magnetic device used to store information |
| 9) central processing unit | i) sockets into which an external device may be connected |

Task 4. Complete the blanks with appropriate words.

TEXT B

software / keyboard / menus / operating system / monitor screen / application programs / data / mouse / output / device / anti-virus programs / peripherals / hardware

A computer is a (1) _____ that processes (2) _____ according to a set of instructions known as a program. The equipment is known as the (3) _____ and the programs and data are the (4) _____. A special set of programs, called an (5) _____, provides an interface for the user and allows (6) _____ to communicate with the hardware. (7) _____ are used to detect and remove viruses (harmful programs that can reproduce themselves and attach themselves to other programs). Some operating systems have graphical user interfaces that allow the computer user to select items from (8) _____ (lists of choices) and to start programs using an input device called a (9) _____. The main device for inputting the data is a (10) _____ and the output is commonly displayed on a (11) _____. A variety of devices known as (12) _____ can be added externally to a computer. One of the most common peripherals is a printer used for printing the computer (13) _____ (the processed data that comes out of a computer system).

Task 5. Watch the video ‘Inside your computer’ at [\[https://www.ted.com/talks/bettina_bair_inside_your_computer?utm_source=tedcomshare&utm_medium=email&utm_campaign=tedspring\]](https://www.ted.com/talks/bettina_bair_inside_your_computer?utm_source=tedcomshare&utm_medium=email&utm_campaign=tedspring) and answer the following questions.

1. How many operations can the CPU handle per second?

- a) billions;
- b) thousands;
- c) millions;
- d) none of the above.

2. In what way are programs encoded and stored in memory?

- a) as raw text;
- b) in HTML;
- c) as electrons;
- d) in ones and zeroes.

3. What is the CPU’s primary task?

- a) retrieving and executing instructions;
- b) storing data;
- c) dealing with input and output from peripheral devices;
- d) editing files in memory.

4. *What does your computer's architecture mainly consist of?*

- a) mouse, motherboard, integrated circuits, wires;
- b) peripherals, BIOS, CPU, programs, memory;
- c) programs, bits, bytes, HTML;
- d) none of the above.

5. *What does BIOS stand for?*

- a) biological input operating system;
- b) basic integer operating system;
- c) basic input/output software;
- d) basic input/output system.

Task 6. Read the text and answer the questions below.

TEXT C. What is inside a PC?

Processing

The nerve center of a PC is the processor, also called the CPU, or central processing unit. This is built into a single chip which executes program instructions and coordinates the activities that take place within the computer system. The chip itself is a small piece of silicon with a complex electrical circuit called an integrated circuit.

The processor consists of three main parts:

- The control unit examines the instructions in the user's program, interprets each instruction and causes the circuits and the rest of the components - monitor, disk drives, etc. - to execute the functions specified.
- The arithmetic logic unit (ALU) performs mathematical calculations (+, -, etc.) and logical operations (AND, OR, NOT).
- The registers are high-speed units of memory used to store and control data. One of the registers (the program counter, or PC) keeps track of the next instruction to be performed in the main memory. The other (the instruction register, or IR) holds the instruction that is being executed.

The power and performance of a computer is partly determined by the speed of its processor. A system clock sends out signals at fixed intervals to measure and synchronize the flow of data. Clock speed is measured in gigahertz (GHz). For example, a CPU running at 4GHz (four thousand million hertz, or cycles, per second) will enable your PC to handle the most demanding applications.

RAM and ROM

The programs and data which pass through the processor must be loaded into the main memory in order to be processed. Therefore, when the user runs a program, the CPU looks for it on the hard disk and transfers a copy into the RAM chips. RAM (random access memory) is volatile - that is, its information is lost when the computer is turned off. However, ROM (read only memory) is non-volatile, containing instructions and routines for the basic operations of the CPU. The BIOS (basic input/output system) uses ROM to control communication with peripherals. RAM capacity can be expanded by adding extra chips.

Buses and cards

The main circuit board inside your system is called the motherboard and contains the processor, the memory chips, expansions slots, and controllers for peripherals, connected by buses - electrical channels which allow devices inside the computer to communicate with each other. For example, the front side bus carries all data that passes from the CPU to other devices. The size of a bus, called bus width, determines how much data can be transmitted. It can be compared to the number of lanes on a motorway - the larger the width, the more data can travel along the bus. For example, a 64-bit bus can transmit 64 bits of data. Expansion slots allow users to install expansion cards, adding features like sound, memory and network capabilities.

1. What does the CPU stand for?
2. What are the three main parts the CPU consists of?
3. What is the function of the control unit?
4. What does ALU stand for?
5. What is the function of the ALU?
6. What registers are mentioned in the text and what is their function?
7. What is the role of the processor's system clock?
8. What unit of frequency is used to measure the clock speed?
9. Where is data loaded on the way from a computer's storage device to the CPU?
10. How do you decipher RAM?
11. Why is RAM called volatile?
12. What memory is non-volatile?
13. How do you decipher ROM?
14. How can RAM capacity be expanded?
15. What word is used to refer to the main circuit board?
16. What components does the motherboard hold?
17. What is the role of a bus inside the computer system?

18. What is the benefit of having expansion slots?

Task 7. Find the appropriate answers for these questions.

- | | |
|---|---|
| 1. What is the brand of your computer? | a) 1920×1080 |
| 2. What is the screen size? | b) 1.1 TB |
| 3. What is the screen resolution? | c) Windows 10 pro |
| 4. What processor does it have? | d) HP |
| 5. What is the processor speed? | e) 1.80 GHz |
| 6. What is the storage type? | f) 15.5 inches |
| 7. What is the hard drive capacity? | g) 8 GB |
| 8. What is the RAM size? | h) Intel Core i7 8th Gen |
| 9. Are there any extra features? | i) HDD + SSD |
| 10. What type of operating system does it have? | j) Bluetooth, fingerprint reader, backlit keys, built-in webcam |

Task 8. Work in pairs. Interview your partner on the following features of his/her laptop:

brand	processor type	storage capacity
screen size	processor speed	RAM size
screen resolution	storage type	extra features

Task 9. Describing functions:

- | | |
|---|---|
| 1) for + gerund | The mouse is a device for controlling the cursor and selecting items on the screen. |
| 2) be used + to + infinitive | It is used to control the cursor and select items on the screen. |
| 3) relative pronoun (which/that) + verb | This is a device which/that controls the cursor and selects items on the screen. |
| 4) relative pronoun (which/that) + be used + to + infinitive | This is a device which/that is used to control the cursor and select items on the screen. |

5) work by + gerund

It works **by figuring out** how much you're moving your hand and in which direction.

Task 10. Describe the functions of the following computer components and devices without naming them. Your groupmates should guess what you are describing:

touch screen / webcam / touchpad on a laptop / scanner / USB flash drive /
headphones / bus / ALU / speakers / SSD / port / microphone /
power supply unit / modem / RAM

Task 11. Read the text and fill in the gaps with the following words.

TEXT D. Types of Computer CPUs

*multitasking / superseded / optimized / peripherals /
switch / component / clock speeds / increase*

The computer central processing unit is a vital (1) _____ that handles all the instructions and calculations that are sent to it from other computer's components and (2) _____. The speed at which software programs operate is also very dependent upon how powerful the CPU is, so it is important to have the right type for what you expect it to handle.

Single core CPUs are the oldest type of computer CPU available. Single core CPUs can only start one operation at a time, so they were not very good at (3) _____. This meant that there were noticeable decreases in performance whenever more than one application was running. Performance on these types of CPUs was largely dependent on their (4) _____, the measurement of their power.

A dual core CPU is a single CPU that has two cores and thus functions like two CPUs in one. Unlike single core CPUs where the processor had to (5) _____ back and forth between different sets of data streams if more than one operation was running, dual core CPUs can handle multitasking much more efficiently. To make the most of a dual core CPU, both the operating system and the programs running on it must have special code called SMT (simultaneous multi-threading technology) written into it. Dual core CPUs are faster than single core ones but not as fast as the quad core CPUs that have (6) _____ them.

Quad Core CPUs are a further refinement of the multi-core CPU design and feature four cores on a single CPU. Just as dual core CPUs could split the workload

between two cores, quad cores allow for even greater multitasking. This doesn't mean that a single operation will be four times faster however, and unless the programs and applications running on it have an SMT code, the speed (7) _____ will not be so noticeable. These types of CPUs are useful for people that need to run a lot of different programs at the same time as well as gamers, as there are a lot of games (8) _____ for multi-core CPUs.

Task 12. Find the following expressions in the text:

- | | |
|--------------------------|----------------------------|
| 1) быть зависимым от ч-л | 5) как можно эффективнее |
| 2) заметное снижение | использовать ч-л |
| 3) тактовая частота | 6) вытеснять, заменять ч-л |
| 4) справляться с | 7) рабочая нагрузка |
| многозадачностью | 8) многоядерный процессор |

Task 13. Complete the blanks with the correct prepositions:

to / inside / between / into / along / into / outside / from

1. A program is read _____ the HDD _____ the main memory.
2. Data moves _____ the CPU and RAM.
3. Data is transferred _____ the data bus.
4. The CPU is a large chip _____ the computer.
5. Peripherals are devices _____ the computer but linked _____ it.
6. The CPU can be divided _____ three main parts: the control unit, the ALU and the registers.

Task 14. Read the text below and decide which word or word combination is best suitable for each space.

TEXT E

What makes a supercomputer so super? As it turns out, that's the secret behind (1) _____. It all comes down to how fast a machine can (2) _____ an operation. Everything a computer does breaks down into math. Your computer's processor (3) _____ any command you (4) _____ as a series of math problems. Faster processors can (5) _____ more calculations per second than slower ones. Within your

computer's CPU is an electronic (6) _____. When you talk about how many (7) _____ your processor has, you're really talking about clock (8) _____. The number (9) _____ to how many electrical pulses your CPU sends out each second.

- 1) computing skills / computing power / computing algorithm / computing task
- 2) produce / perform / perfume / predict
- 3) interprets / interpose / interports / interacts
- 4) respond / provide / exemplify / make
- 5) handle / hand / handout / handover
- 6) watch / chip / clock / calculator
- 7) gigabit / gigaflop / gigabyte / gigahertz
- 8) volume / speed / capacity / performance
- 9) constitutes / implies / defines / refers

Task 15. Find the English equivalents to the Russian terms in the puzzle below:

- | | | | |
|----------------|-----------------|--------------------|---------------------|
| 1) ввод данных | 6) память | 10) программное | 14) хранение |
| 2) данные | 7) переносной | обеспечение | 15) цифровой |
| 3) доступ | 8) планшет | 11) скорость | 16) шина |
| 4) клавиатура | 9) подключаемые | 12) составляющие | 17) экран |
| 5) мощный | устройства | 13) характеристика | 18) энергозависимый |

g	k	d	e	p	m	s	f	c	s	q	d	i	g	i	t	a	l	x	s
w	e	y	s	r	e	x	n	h	p	j	v	l	p	q	h	c	w	y	y
a	y	k	t	a	m	u	t	r	e	s	a	v	c	p	l	s	i	c	o
s	b	u	o	b	o	s	a	m	e	f	c	o	d	o	k	p	u	o	a
a	o	v	r	e	r	e	b	o	d	i	c	l	l	w	d	e	a	m	e
z	a	x	a	d	y	i	l	x	d	w	e	a	x	e	b	r	l	p	q
o	r	i	g	t	s	y	e	w	p	h	s	t	e	r	r	i	n	o	r
p	d	b	e	m	h	e	t	q	o	c	s	i	l	f	j	p	s	n	c
w	d	x	i	z	a	h	a	h	r	q	f	l	q	u	k	h	w	e	f
s	o	f	t	w	a	r	e	r	t	s	i	e	b	l	s	e	i	n	x
v	x	d	j	q	p	o	j	g	a	p	n	f	p	y	n	r	p	t	d
p	f	e	a	t	u	r	e	f	b	g	p	u	f	h	s	a	u	s	a
q	r	a	i	w	s	x	c	n	l	s	u	g	b	r	m	l	i	p	t
u	s	c	r	e	e	n	b	m	e	s	t	b	x	b	u	s	y	j	a

Task 16. Read the text below and fill in the gaps with the suitable words.

TEXT F. What is clock speed?

significant / impact / handle / splits / cycles / outperform / measured

The performance of the CPU has a major (1) _____ on the speed at which programs are loaded and how smoothly they run. There are a few different ways to measure processor performance, but clock speed (“clock rate” or “frequency”) is one of the most (2) _____. The CPU processes many instructions from different programs every second and the clock speed determines the number of (3) _____ the CPU executes per second. Clock speed of modern CPUs is (4) _____ in GHz (gigahertz). For example, a CPU with a clock speed of 3.2 GHz executes 3.2 billion cycles per second.

In general, a higher clock speed means a faster CPU, but other factors should be taken into consideration as well. Since different CPU designs (5) _____ instructions differently, it’s best to compare clock speeds within the same CPU brand and generation.

For example, a CPU with a higher clock speed from five years ago might be outperformed by a new CPU with a lower clock speed, as the newer architecture deals with instructions more efficiently. An X-series Intel® processor might (6) _____ a K-series processor with a higher clock speed, because it (7) _____ tasks between more cores and features a larger CPU cache. But within the same generation of CPUs, a processor with a higher clock speed will generally outperform a processor with a lower clock speed.

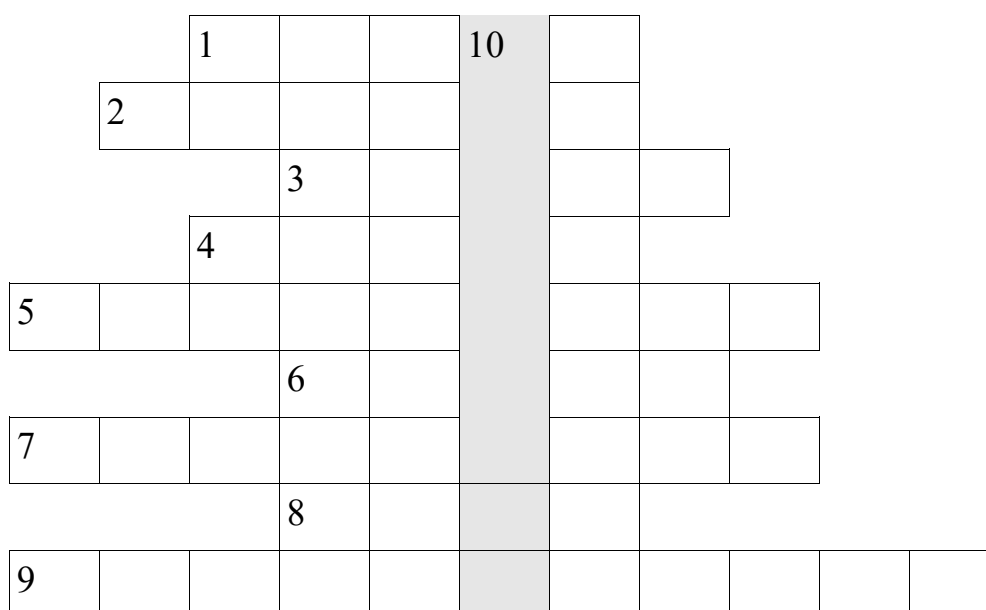
Task 17. Translate into English.

1. Подключаемое оборудование можно разделить на устройства ввода данных, устройства вывода данных и носители информации.
2. Устройства вывода данных включают монитор, наушники, колонки и другое.
3. Существует несколько видов клавиатуры: беспроводная, гибкая, складная и другие.
4. Носители информации могут быть классифицированы по способу хранения информации: оптические, магнитные и полупроводниковые.

5. Процессор получает данные для обработки из оперативной памяти - устройства, предназначенного для временного хранения как входных, так и выходных данных.
6. Чем выше тактовая частота, тем больше инструкций выполняется процессором.
7. Процессор отвечает за выполнение инструкций. Он обрабатывает данные и выдаёт результаты в подходящей форме.

Task 18. Solve the clues and read the vertical word.

1. Intel _____ are used in many computers.
2. Each 0 or 1 is called a bit, short for _____ digit.
3. Special cards can be inserted into expansion _____.
4. A _____ controls the timing within the PC by sending signals to synchronize its circuits and operations.
5. The processor speed is measured in _____.
6. _____ carry signals between different parts of a PC.
7. _____ cards improve the computer's performance.
8. The _____ uses ROM to control the input/output of data.
9. The main circuit board is called the _____.
10. The brain of a computer is called the _____.



Task 19. Match the terms with their definitions:

*input devices / BIOS / mouse / peripherals / bus / scanner / hardware /
ALU / motherboard / speaker / RAM / control unit / output devices*

1. A component of the CPU which performs the actual arithmetic and logical operations asked for by a program.
2. A ROM chip found on motherboards used to perform hardware initialization during the booting process. Its firmware comes pre-installed on a personal computer's system board, and it is the first software to run when powered on.
3. An electrical channel that carries signals between units inside the computer.
4. The units attached to the computer, classified into three types: input devices, output devices and storage devices.
5. A component of the CPU which obtains instructions from the main memory and decodes them into commands.
6. Any electronic or mechanical part of the computer system that you can see or touch.
7. Units of hardware which allow the user to enter information into the computer, e.g. the keyboard, mouse, voice recognition devices, etc.
8. The main circuit board of a computer, which contains the processor, memory chips, expansion slots and controllers for peripherals, connected by buses.
9. A small input device used to specify the position of the cursor or to make choices from menus.
10. An input device that converts images, printed text or handwriting into a digital image.
11. Peripherals that let us extract the results (e.g. the monitor and the printer).
12. The part of the main memory which stores information temporarily while you are working. It requires a continuous power supply to retain information.
13. A device that provides sound output.

Task 20. Translate the text into English.

TEXT G

Процессор – это мозг устройства, он принимает команды от пользователя, делает вычисления и предоставляет результаты. Производительность процессора зависит от ряда факторов. Рассмотрим основные из них.

Тактовая частота процессора определяет минимальное количество времени, за которое процессор выполняет некоторую условную элементарную операцию, и измеряется в мегагерцах. Чем больше (выше) тактовая частота, тем быстрее работает центральный процессор.

Архитектура процессора определяется количеством ядер. Каждое ядро в процессоре может независимо от других выполнять различные задачи, для этого регулярно повторяется следующий цикл действий: получение информации → раскодирование → выполнение вычисления → фиксация результата. Чтобы увеличить производительность процессора, современные компьютерные ядра делятся на 2 потока (логические ядра). Каждый поток занимается выполнением отдельных вычислений, обеспечивая процессору многозадачность и уменьшая очереди задач.

UNIT 4. PRIMARY STORAGE

Task 1. Lead-in questions.

1. What examples of computer storage devices can you give?
2. What does RAM stand for? Why is RAM supposed to be the most important memory in a computer system?
3. What is the function of cache memory?

Task 2. Fill in the gaps with correct prepositions. Then translate the text into Russian.

Difference between primary and secondary storage

into / of / off / of / on / than / to / to / by / by

Data storage is one of the fundamental functions performed (1) _____ a computer system. A computer stores data using various technologies, which creates different levels (2) _____ data storage. Storage media are commonly classified (3) _____ primary and secondary.

The term *primary storage* is used to describe internal storage devices, which can be directly accessed (4) _____ the CPU with minimum or no delay. Primary storage is often referred (5) _____ as primary memory and can be either volatile or non-volatile. Examples of primary volatile computer storage are RAM and cache memory, which lose data as soon as the computer loses power. ROM, on the other hand, can serve as an example (6) _____ primary non-volatile storage medium since it retains its contents even when the computer is turned (7) _____.

Secondary storage devices are another storage solution in the computer's memory hierarchy which is used to keep data (8) _____ the long-term basis. They are sometimes referred (9) _____ as auxiliary storage and can be either internal or external. Unlike primary computer memory, secondary storage media are always non-volatile and are not directly accessed by the CPU. These devices are considerably slower (10) _____ primary storage, but they offer much greater storage capacity. Common examples of secondary storage devices are hard disk drives and solid state drives.

Task 3. Mark the following statements as true or false. Correct the false statements.

1. SSD is an example of a primary storage device.
2. Primary storage can also be referred to as auxiliary storage.
3. Primary storage is always volatile.
4. Secondary storage is always non-volatile.
5. Secondary storage devices work faster than primary storage media.

Task 4. Watch the video “How computer memory works” at [\[https://ed.ted.com/lessons/how-computer-memory-works-kanawat-senanan\]](https://ed.ted.com/lessons/how-computer-memory-works-kanawat-senanan) and answer the following questions.

1. What does *bit* stand for?
2. What is currently the fastest memory in the computer system?
3. Which memory is more expensive and takes up more space, DRAM or SRAM?
4. What do DRAM and SRAM have in common?
5. Which type of long-term storage is the cheapest?
6. Why is the latency of magnetic storage higher than in DRAM?
7. How are bits encoded in optical-based storage devices?

Task 5. Read and translate text A into Russian.

Text A. ROM

ROM (read only memory) is a type of non-volatile storage medium used in computers and other electronic devices, such as washing machines, microwaves and others. Read only memory chip is an integrated circuit which houses the instructions required to start the work of a computer. BIOS software is stored on a non-volatile ROM chip. There are several types of read only memory:

1. MROM (Masked read-only memory);
2. PROM (Programmable read-only memory);
3. EPROM (Erasable programmable read-only memory);
4. EEPROM (Electrically erasable programmable read-only memory);
5. FLASH ROM.

MROM is the earliest kind of read-only memory; it is as old as semiconductor technology. It is no longer in use and has become outdated. This type of memory

contained a set of instructions encoded during the fabrication process. As a result, this type of pre-programmed chip could not be altered, reprogrammed, or erased later.

The **PROM** is a blank memory chip which is programmed later. This type of memory is kept empty while manufacturing, and one can program it using a device called a PROM programmer (or PROM burner). Once the chip has been programmed, its content cannot be altered. Therefore, it is also known as a one-time programmable device.

As the name suggests, an **EPROM** is a special type of memory chip which can be reprogrammed. High voltage can be used to program the programmable read-only memory to write data, and the data is retained until it is exposed to ultraviolet light for up to 10 minutes or longer. Thus, instructions stored in EPROM can be erased by ultraviolet light, and it can be reprogrammed again with new data.

EEPROM is a type of read-only memory that can be programmed and erased electrically. It has about 10,000 reprogramming and erase cycles where both erasing and programming take between 4 and 10 milliseconds. The EEPROM allows users to program and easily erase any selected location. It is erased one byte at a time rather than the entire chip. As a result, reprogramming may be flexible but tedious.

A contemporary variety of EEPROM is **Flash ROM**. Its modern designs have the feature of very high endurance, and flash memory can be erased and rewritten more quickly than conventional EEPROM (exceeding 1,000,000 cycles).

Task 6. Answer the questions.

1. How can data be erased from EPROM?
2. What does EEPROM stand for?
3. Which type of ROM is considered outdated?
4. How many reprogramming cycles does EEPROM have?
5. What makes Flash ROM more advanced?

Task 7. Find in the text above English equivalents to the following words:

- | | |
|---------------------------------|-----------------------|
| 1) интегральная схема | 4) высокое напряжение |
| 2) полупроводниковая технология | 5) стирать |
| 3) устаревший | 6) трудоёмкий |

Task 8. Fill in the gaps in the text below with the correct word in italics. Then read the text and translate it into Russian.

RAM

*term / switched / considerably / available / successive / referred / performance /
function / essential / transferred / volatile / consumption / prevents*

RAM (Random Access Memory) is an (1) _____ hardware component of any computer system. It is a piece of hardware inside a computer that stores data temporarily and is often (2) _____ to as 'working memory'. The main (3) _____ of RAM is to provide quick read and write access to a storage device by the CPU or graphics cards. To this end, a copy of data the CPU is working with at the moment is (4) _____ from the secondary storage to RAM chips. Thus, RAM (5) _____ the CPU from digging through the device's slower storage, like a hard disk drive or a solid-state drive. Since RAM is (6) _____, the data is lost when the computer is (7) _____ off. The amount of RAM installed plays a key role in determining the speed and (8) _____ of the computer. If your computer system has too little RAM, it will (9) _____ slow down the work of the computer.

The (10) _____ 'RAM' usually refers to dynamic random access memory (DRAM) or, more accurately for modern systems, synchronous dynamic random access memory (SDRAM). The most common type of RAM for desktop computers (11) _____ today is DDR4 and the latest systems may use DDR5. The number denotes the RAM's generation: with each (12) _____ generation, there is an increase in speed through greater bandwidth. Moreover, each generation is characterized by physical changes and a reduction in power (13) _____, so they are not always interchangeable.

Task 9. Read text B and translate it into Russian.

Text B. Cache memory

Most PCs are held back not by the speed of the CPU, but by the time it takes to move data in and out of the memory. One of the most important techniques for getting around this bottleneck is the CPU cache. The idea is to use a small number of very fast memory chips as a buffer between the main memory and the processor. Cache is a storage device found on the CPU chip itself. It carries the copies of original data that has been accessed recently and therefore increases the speed at which data is accessed.

Whenever the processor needs to read data, it looks in this cache area first. If it finds the data in the cache, then this counts as a 'cache hit' and the processor need not go through the more laborious process of reading data from the main memory. Only if the data is not in the cache does it need to access main memory, but it copies in the process whatever it finds into the cache so that it is there ready for the next time it is needed. The whole process is controlled by a group of logic circuits called the cache controller.

It is important to ensure that the cache and main memory contain consistent data. Two different techniques can be used to achieve this. In the write-through mode, data is simultaneously updated in cache and main memory. This method is simpler and safer for data coherency. However, the write-through process is quite slow since modifications have to be written in both the cache and main memory. The main alternative is the write-back mode, which allows the processor to write changes only to the cache first. The main memory is not updated until the cache block needs to be replaced. Cache entries that have been changed are flagged as 'dirty' telling the cache controller to write their contents back to the main memory before using the space to cache new data. A write-back cache speeds up the write process but requires a more advanced cache controller. Most cache controllers move a 'line' of data rather than just a single item each time they need to transfer data between main memory and the cache, thus increasing the chance of a cache hit. The amount of data transferred each time is known as the 'line size'.

Task 10. Answer the questions.

1. What is the main function of the CPU cache?
2. What is the difference between write-through cache and write-back cache?
3. What does the term 'line size' refer to?

Task 11. Correct the following statements.

1. The 'write-back' cache slows down the writing process but requires a more intelligent cache controller.
2. The processor looks for data in the main memory first.
3. The whole process is controlled by a group of logic circuits called a 'line size'.
4. The 'write-through' cache is the safest and also the fastest solution.
5. Most cache controllers transfer one item of data at a time.

Task 12. Watch a video about the CPU cache and the way it works at [\[https://www.youtube.com/watch?v=yi0FhRqDJfo\]](https://www.youtube.com/watch?v=yi0FhRqDJfo) and mark the following statements as True or False.

1. Static RAM is constantly refreshed by electricity to store data.
2. SRAM is faster than DRAM.
3. The computer cannot run without the CPU cache.
4. Level one cache is the fastest cache on the computer.
5. If level three cache doesn't have the data, the CPU goes to RAM to find it.
6. Level two cache is larger and faster than level one cache.

Task 13. Watch the video again and fill in the gaps in the sentences.

1. DRAM uses capacitors to _____, and these capacitors have to constantly be refreshed with electricity.
2. ...because SRAM doesn't have to be constantly refreshed, it is _____ than DRAM and it's also very _____.
3. The CPU cache is the CPU's _____ memory, and its job is to store copies of data and instructions from RAM that is waiting _____ by the CPU.
4. The CPU cache acts like a _____ between the CPU and RAM to assist in feeding the CPU the data it needs a lot faster.
5. Level 1 cache is also called _____ cache.
6. Level 2 cache is larger than level 1 cache but it is not _____ level 1 cache.

Task 14. Read about RAM and ROM and guess where the words below should go:

amount / copy / loses / run / expanded / contains / volatile

When you (1) _____ a program, the CPU looks for it on the hard disk and transfers a (2) _____ into the RAM. RAM (random access memory) is temporary or (3) _____, that is, it holds data while your PC is working on it, but (4) _____ this data when the power is switched off. However, ROM (read only memory) is permanent and (5) _____ instructions needed by the CPU; the BIOS (basic input/output system) uses ROM to control communication with peripherals, e.g. disk drives. The (6) _____ of RAM determines the number of programs you can run simultaneously and how fast they operate. It can be (7) _____ by adding extra RAM chips.

Task 15. Translate the text into English.

Оперативная память является одним из главных элементов компьютера. Это память для временного хранения информации о программах или процессах, которые запущены на вашем компьютере. Как известно, любая программа выполняется в процессоре ПК, а файлы этих программ считываются с жесткого диска. Оперативная память в данном случае служит посредником между процессором и жестким диском, т.е. в оперативной памяти хранятся программы, которые выполняются в данный момент. От объёма оперативной памяти и её скорости зависит быстрота выполнения программ, а также какое количество программ она может хранить одновременно. Все данные, которые хранятся в оперативной памяти доступны только при включенном компьютере. При выходе из программы стираются все файлы из оперативной памяти, поэтому внесенные изменения необходимо сохранить на жестком диске или другом устройстве внешней памяти.

UNIT 5. SECONDARY STORAGE

Task 1. Lead-in questions.

1. What are the predecessors of modern storage devices?
2. What are the most common secondary storage devices in modern computers?
3. What can be the criteria for the classification of storage devices?
4. What are the limitations of cloud storage technology?

Task 2. Listen to a message on evolution of storage media and find out in what connection the following words were used. Audio file 5.1

[<https://online-edu.mirea.ru/course/view.php?id=10378>]:

to improve / efficient / unreliable / tiny

Task 3. Choose the correct answers.

1. What is the main idea of the article?
 - a) the rising costs of data storage devices;
 - b) a history of data storage devices;
 - c) materials used to make data storage devices.
2. Which of the following is NOT a benefit of CDs?
 - a) They are lightweight.
 - b) They can be erased and reprogrammed.
 - c) They have a lower capacity than DVDs.
3. Which of the following is NOT TRUE about flash drives?
 - a) They are built into a computer.
 - b) They are designed to move easily from one computer to another.
 - c) They have larger storage capacity than earlier methods, like DVDs.

Task 4. Read the text and answer the questions below.

TEXT A. Magnetic storage



Magnetic storage devices (magnetic tapes, floppy disks, hard disk drives) store data by magnetizing particles on a disk or tape. A floppy disk was so called because it consisted of a flexible sheet of plastic, coated with iron oxide — a magnetizable material. A floppy disk could spin at 360 revolutions per minute and store 1.44 MB of data.

A hard drive, however, can store much more data and retrieve information much faster. It consists of several plates that are made up of a magnetic material and known as platters. The surface of the magnetic plate is divided into billions of tiny compartments where data is stored. When data is recorded on an HDD, it is converted from the digital form (i.e. the binary combination of bits) into the analogue form (magnetized area). Magnetized tiny area of the plate denotes a binary one; whereas, the demagnetized tiny area denotes a binary zero. The transfer of bits takes place with the help of an electromagnet that is attached to the internal mechanism of the hard drive. The data bits containing the information are arranged in circular tracks. The tracks are further divided into smaller areas known as sectors.



Whenever the user provides a command to the computer to save information on the surface of the disk, the OS looks for the appropriate place required to save the data. Once the suitable place is located, the read/write head is made to move on the surface of the platter accordingly. Finally, the area on the surface of the disk gets magnetized and demagnetized as per the input data, and the data is successfully saved. To read the data or to retrieve back the saved information, the process gets reversed.

The OS allows you to create one or more partitions on your hard drive, in effect dividing it into several logical parts. Partitions let you install more than one operating system (e.g. Windows and Linux) on your computer. You may also decide to split your hard drive because you want to store the OS and programs on one partition and your data files on another; this allows you to reinstall the OS when a problem occurs, without affecting the data partition.

The average time required for the read/write heads to move and find data is called seek time (or access time) and it is measured in milliseconds (ms); most hard

drives have a seek time of 7 to 14 ms. Don't confuse this with transfer rate — the average speed required to transmit data from the disk to the CPU, measured in megabytes per second.

A hard disk is a delicate device that requires proper and careful handling.

Here are some tips on how to protect your hard drive:

- Don't hit or move the computer while the hard drive is spinning. Hard drives are very sensitive to vibration and shocks, especially when they are operating; when the read/write head touches the rotating disk, it can scratch and damage the disk surface.
- You shouldn't turn your computer off and on quickly. Wait at least ten seconds to ensure that the drive has stopped spinning.
- To minimize the risk of data loss or corruption, you should install an up-to-date virus scanner. You should also back up your hard drive regularly.

1. Why is a floppy disk called so?
2. What is the capacity of a floppy disk?
3. Describe the construction of an HDD.
4. How is the surface of an HDD organized?
5. Describe the process of recording data on an HDD.
6. What is the benefit of having more than one partition on your disk?
7. What is the difference between seek time and transfer rate? What are they measured in?
8. How should one treat an HDD?

Task 5. Watch a video on Disk Defragmentation at [<https://youtu.be/AtRIOUZuI2c>] and answer the following questions.

1. What is a fragmented disk?
2. What is a defragmented disk?
3. Why do fragmented disks run more slowly?
4. Why don't SSDs require defragmentation?

Task 6. Watch the video again and complete the blanks.

1. All of your data is spread out and _____ with other data files.
2. ... the defrag will reassemble all of the related _____ that have been broken up and it will put them together in the same physical location.

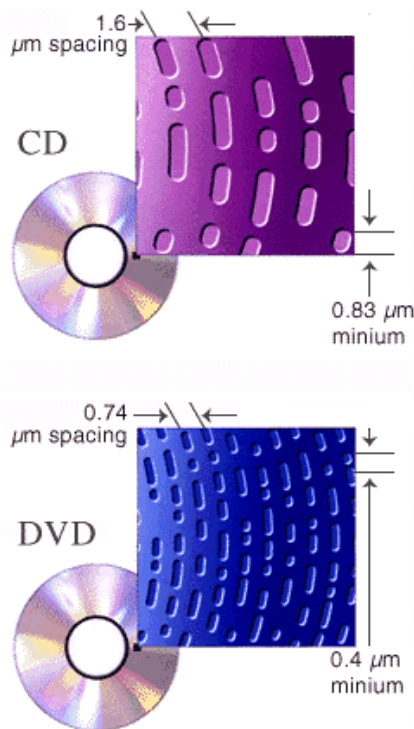
3. ... and it's also going to put all the _____ on the hard drive together as well.
4. Let's install a program on this _____ hard drive.
5. ... which means that when you want to run one of these programs the computer will _____ because the hard drive doesn't have to do extra work by _____ data from different areas of the hard drive.
6. ... the computer may not be able to find enough free space in one location on the hard drive _____ the program because the free space is _____ in different locations.
7. When you have a fragmented hard drive, the computer will _____ ...
8. And after the defrag is _____ the computer will run faster and _____.
9. The computer can just _____ and choose whatever part it needs _____ which memory chip the file is located on.

Task 7. Read the text and answer the questions below.

TEXT B. Optical storage

Optical storage is any storage type in which data is written as a series of reflective marks and read with a laser. Over the years, optical media have taken a variety of forms. The following formats, though, are considered standards in today's optical storage market:

- **The CD** (Compact Disc) represents the first generation of optical storage. Originally, CDs were available only as prerecorded read-only discs, but it wasn't long before they became available as recordable discs (CD-R) and rewritable discs (CD-RW) that could be used for data storage. The CD can hold up to 700 megabytes of data.
- At first sight, **the DVD** (Digital Versatile Disc) is similar to the CD. Both discs are 120 mm in diameter and 1.2 mm thick. They also both use a laser beam to read data. However, they are very different in internal structure and data capacity. In a DVD, the tracks are very close together, thus allowing more tracks. The pits in which data is stored are also smaller, so there are more pits per track. A single-layer DVD can hold 4.7 gigabytes of data, and a double-layer disc can hold 8.5 GB. As well as CDs, DVDs are available in read-only, recordable and rewritable formats.
- **The Blu-ray disc** has emerged as clear leader in today's optical storage market. Unlike CDs and DVDs, which use a red laser to read and write data, a Blu-ray disc



uses a blue laser, which dramatically increases capacities and data transfer rates over CDs and DVDs. Today's Blu-ray discs can store up to 128 GB of data and are available as read-only discs that can hold prerecorded high-definition feature films as well as recordable and rewritable discs for data storage.

One of the biggest advantages of optical storage over other storage media is durability. It's not subjected to wear and no power failure may cause data losses. Among disadvantages of optical storage one can name its speed and capacity. The latest 12-cm Blu-ray discs top out at 128 GB, far below what is now possible with either HDDs or SSDs on a per-centimeter basis. At the same time,

the rise of Internet streaming and USB flash drives has also diminished the reliance on optical discs.

1. What is the principle of optical data storage?
2. What does 'CD' stand for?
3. What types of CDs are there?
4. What does 'DVD' stand for?
5. What is the difference between a DVD and a CD?
6. Why are Blu-ray discs called so?
7. What is the highest capacity of a Blu-ray disc?
8. What are the advantages and disadvantages of optical discs over magnetic disks?

Task 8. Say whether the following characteristics are true for optical storage devices (O) or magnetic storage devices (M):

- 1) slower data reading and writing
- 2) sensitive to vibration
- 3) requires laser light to read and write data onto the disc
- 4) can be readable, writable and re-writable
- 5) offers lesser capacity
- 6) magnetic field can destroy the data stored on the disk

7) always readable and re-writable

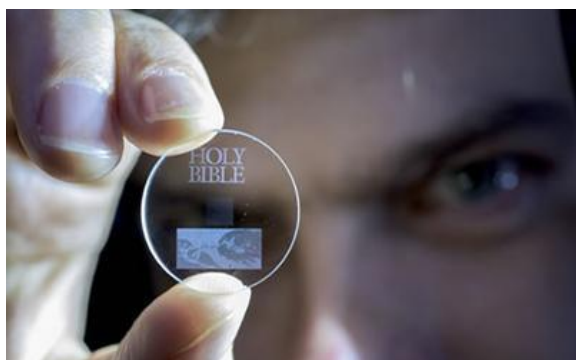
Task 9. Read the text on the innovative optical technology and answer the questions below.

TEXT C. 5D optical data storage

Securely storing large amounts of information over relatively short timescales of 100 years is a challenging problem. Conventional optical data storage technology used in CDs and DVDs has reached capacities of hundreds of gigabits per square inch, but its lifetime is limited to a decade. The major challenge is the lack of appropriate combination of storage technology and medium possessing the advantages of both high capacity and long lifetime.

Scientists at the University of Southampton have developed a 5D glass disc that can store 360 terabytes of data for billions of years. The discs are made out of nanostructured glass, and the data is stored and retrieved using femtosecond laser writing. These discs can store data for up to 13.8 billion years, that's over twice the estimated age of the Earth, and about equal to the estimated age of our universe.

Essentially, the discs are made by a laser that can make microscopic etchings in nanoglass. So what exactly is meant by five-dimensional? The concept of being five-dimensional means that one disc has several different images depending on the three-dimensional position of the nanostructures, the angle that one views it from, and the magnification of the microscope used to view it. Basically, each disc has multiple layers of micro and macro level images.



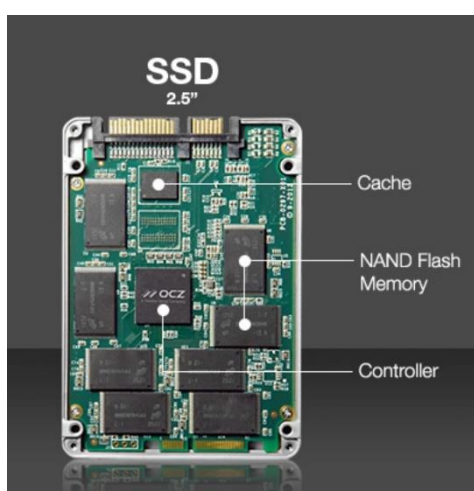
The technology was first experimentally demonstrated in 2013 when a 300 kb digital copy of a text file was successfully recorded in 5D. Now, major documents from human history such as Universal Declaration of Human Rights, Newton's Opticks, and Kings James Bible, have been saved as digital copies that could survive the human race.

As a very stable and safe form of portable memory, the technology could be highly useful for organizations with big archives, such as national archives, museums and libraries, to preserve their information and records. The high cost of the recording equipment, though, prevents this invention from being put into commercial production and mass use.

1. What is the major challenge in storing data nowadays?
2. What are the capacity and lifetime of a 5D glass disc?
3. What is meant by five-dimensional?
4. What books and documents are recorded using this technology?
5. What is the downside to the technology?

Task 10. Read the article on solid-state drives and find synonyms to the following words.

TEXT D



A solid-state drive (SSD) is a type of non-volatile storage media that uses integrated circuit assemblies to store data persistently. Two key components make up an SSD: a flash controller and flash memory chips. The architectural configuration of the SSD controller is optimized to deliver high read and write performance.

Unlike a hard disk drive (HDD), an SSD has no moving parts that can break if dropped. Because of this, SSDs can be subjected to much more shock and vibration than a hard drive, making them ideal for a broad range of portable and mobile devices.

Whereas a spinning HDD reads and writes data magnetically, an SSD reads and writes the data to interconnected flash memory chips, which are fabricated out of silicon. Manufacturers build SSDs by stacking chips in a grid.

SSDs offer significant advantages over standard hard drives. They are smaller and run quieter. Besides, they provide faster access and boot-up time but consume less power. Traditionally, hard drives offer greater capacity and a lower price, but the situation is changing rapidly as SSDs are becoming cheaper and are replacing hard drives in laptops and desktop PCs.

- | | |
|---------------|--------------------|
| 1) endlessly | 5) benefits |
| 2) main parts | 6) size |
| 3) compact | 7) more affordable |
| 4) rotating | 8) substituting |

Task 11. Read the text on cloud computing and make questions for the answers below.

TEXT E

Cloud computing is the delivery of on-demand computing services typically over the Internet and on a pay-as-you-go basis, without direct active management by the user. Rather than owning their own computing infrastructure or data centers, companies can rent access to anything from applications to storage from a cloud service provider.

Not all clouds are the same and not one type of cloud computing is right for everyone. Several different models, types, and services have evolved to help offer the right solution for your needs.

Public clouds are owned and operated by third-party cloud service providers, which deliver their computing resources, like servers and storage, over the Internet. With a public cloud, all hardware, software, and other supporting infrastructure is owned and managed by the cloud provider. You access these services and manage your account using a web browser.

A private cloud refers to cloud computing resources used exclusively by a single business or organization. A private cloud can be physically located on the company's on-site data center. Some companies also pay third-party service providers to host their private cloud. A private cloud is one in which the services and infrastructure are maintained on a private network.

Among the top benefits of cloud computing you can name cost. Cloud computing eliminates the capital expense of buying hardware and software and setting up and running on-site data centers - the racks of servers, the round-the-clock electricity for power and cooling, and the IT experts for managing the infrastructure.

Another argument in favor of this technology is productivity. On-site data centers typically require a lot of hardware setup, software patching, and other time-consuming IT management chores. Cloud computing removes the need for many of these tasks, so IT teams can spend time on achieving more important business goals.

Opponents of cloud computing argue that there are some downsides to the technology as well. It is not necessarily cheaper than other forms of computing, just as renting is not always cheaper than buying in the long term. If an application has a regular and predictable requirement for computing services it may be more economical to provide that service in-house. Additionally, some companies may be reluctant to host sensitive data in a service that is also used by rivals.

1. A third-party cloud service provider.
2. On the company's on-site data center.
3. Buying hardware and software and setting up and running on-site data centers.
4. Because it could be used by rivals.

Task 12. Read the article on data storage and complete the sentences with the following words.

TEXT F

*cloud / contents / emerging / encrypt / flash / loss /
offsite / protect / security / theft / volumes*

Online storage is an emerging (1) _____ method of data storage and back-up. A remote server with a network connection and special software backs up files, folders, or the entire (2) _____ of a hard drive. There are many companies that provide a web-based backup.

One (3) _____ technology in this area is (4) _____ computing. This allows colleagues in an organization to share resources, software and information over the Internet.

Continuous backup and storage on a remote hard drive eliminates the risk of data (5) _____ as a result of fire, flood or (6) _____. Remote data storage and back-up providers (7) _____ the data and set up password protection to ensure maximum (8) _____.

Small businesses and individuals choose to save data in a more traditional way. External drives, such as (9) _____ memory devices or external hard disks, are cheap and widely accessible solutions. These methods are very practical with small (10) _____ of data storage and backup. However, they are not very reliable and do not (11) _____ the user in case of a disaster.

Task 13. Complete the blanks with the correct prepositions.

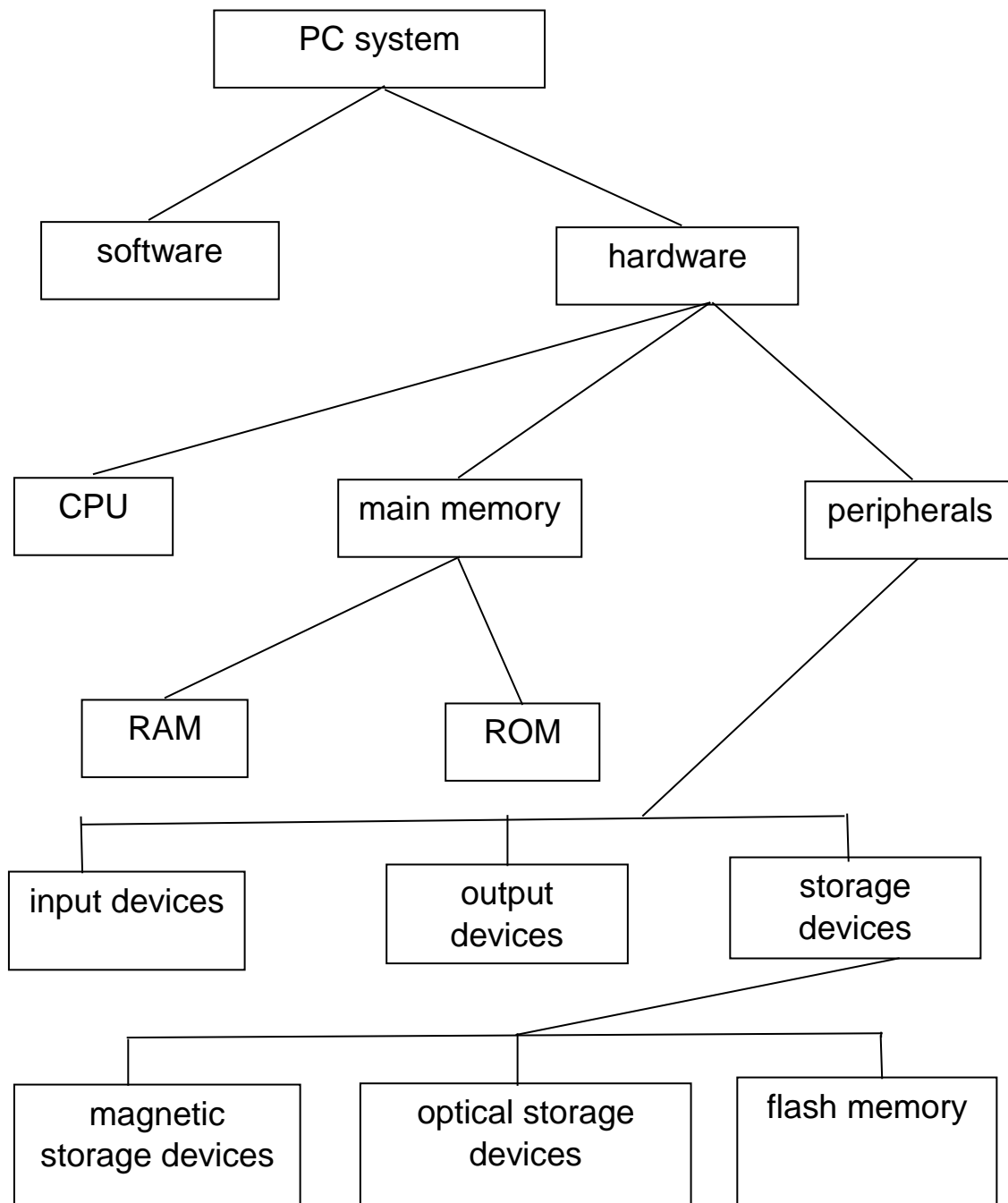
1. A hard drive can hold hundreds of gigabytes _____ data.
2. Hard drives are very sensitive _____ vibration, especially when they are operating.

3. Previously, new disks needed to be formatted _____ you could use them.
4. Formatting can erase any existing files _____ a disk.
5. What are the differences _____ USB flash drives and external hard drives?
6. External hard drives are typically used _____ backup.
7. The term 'flash memory' was invented _____ Toshiba to express how fast it could be erased – 'in a flash'.
8. Cloud computing can also introduce new risks _____ companies using it.
9. Cloud technology is not necessarily cheaper _____ other forms of computing.

Task 14. Translate from Russian into English.

1. Облачные технологии позволяют исключить риск потери данных.
2. Жёсткие диски чувствительны к вибрации, особенно во время работы.
3. Форматирование удаляет все существующие файлы на диске.
4. Внешние жёсткие диски обычно используются для резервного копирования.
5. Жёсткий диск может вмещать сотни гигабайт данных.
6. В отличие от оперативной памяти, флеш-память является энергонезависимой.
7. Фрагментация диска происходит в результате многократного изменения и удаления файлов.
8. Не следует подвергать оптические диски воздействию высокой температуры и прямого солнечного света.
9. CD и DVD диски отличаются по внутренней структуре и по объёму хранения данных.

Task 15. Using the diagram, talk about the architecture of the computer system.



Task 16. Match the terms with their definitions.

*CD-ROM / data transfer rate / HDD / capacity / 5D optical storage /
CD-RW / DVD / access time / SSD / floppy disk / CD-R*

1. The amount of time it takes for a hard drive to search and locate the data you plan to open, copy, move.

2. A storage device which uses optical laser technology and whose storage capacity can reach 17 GB.
3. A type of CD which can be recorded on once only.
4. A type of CD which doesn't allow to change data stored on it.
5. A type of CD whose data can be written, read, erased, and rewritten.
6. The average speed at which data can be transmitted from one device to another, often measured in megabytes per second.
7. A disk made of a flexible plastic material upon which data is stored on magnetic tracks.
8. A non-volatile computer storage device containing magnetic disks, or platters, rotating at high speeds.
9. A non-volatile computer storage device that uses integrated circuits as memory to store data persistently.
10. The maximum amount of data a storage device can contain.
11. A type of optical storage with the capacity exceeding 300 terabytes.

UNIT 6. SOFTWARE

Task 1. Lead-in questions.

1. What is software?
2. Which operating systems are most often used nowadays?
3. What application do you often use in your work or studies? Talk about its main features.

Task 2. Read and translate text A.

Text A. Types of Software

Software is a set of instructions, rules or programs used to operate a computer system and instruct the system to carry out specific tasks. In other words, software is a generic term, which refers to any programs running on desktop PCs, laptops, smartphones or other computer devices. Software can be classified into two main categories: system software and application software.

System Software is general-purpose software, which is used to operate computer hardware. It acts as an interface (i.e. provides communication) between application programs and computer hardware. System software is designed to manage the system resources and provide a platform for application software to run. Some common system software examples include:

- Operating Systems (a set of programs that manage computer hardware and software resources);
- Firmware (a permanent software or set of instructions stored in ROM (read-only memory) of the computer system);
- Device Drivers (a type of software that controls specific hardware of the computer system).

System software is usually written in low-level languages, like assembly languages, so that it could interact with the hardware at the maximum possible speed and provide an effective platform for the application programs.

Application software is designed to help the user perform a specific task, thus it is known as specific-purpose software. Unlike system software, which runs in the background, application software typically runs in the front-end making it more accessible to the user. It should be noted that application software cannot run on its own, it requires a platform created by the system software. Application software is usually written in high-level languages, like Java or C++.

The most common types of application software are:

- Word Processors which are used to create documents as well as edit, format and output text (e.g. MS Word, Google Docs);
- Database Software which helps in creating and managing databases (e.g. Oracle, MySQL);
- Web Browsers which are mainly used for surfing the Internet to help the user find specific web addresses or retrieve data across the web (e.g. Google Chrome, Internet Explorer).

Task 3. Study the following characteristics of software and decide whether they are true for system software or application software.

1. It manages system resources and provides a platform for other software to run.
2. When run by the user, it performs a specific task.
3. It is usually written in high-level programming languages.
4. It is usually written in low-level programming languages.
5. It starts running when the system is turned on and runs until the system is shut down.
6. It runs on the user demand only.
7. It is compulsory for running a computer system.
8. It is not mandatory for running a computer system. It is user specific.

Task 4. Watch a video on system software at

[<https://www.youtube.com/watch?v=MHyXOsHGinE>] and fill in the gaps in the sentences below.

1. Thinking of a total computer system as a layered model, the system software is between hardware and _____.
2. System software runs constantly in the _____, maintaining a computer's basic functions and providing an interface for the user.
3. Apart from an operating system, system software also includes the basic input/output system, _____, an assembler, _____, and other system utilities.
4. System software is usually _____ to provide an effective platform for high-level software.
5. System software is close to the system, which means it is connected directly to the computer _____.

Task 5. Read text B and answer the questions below.

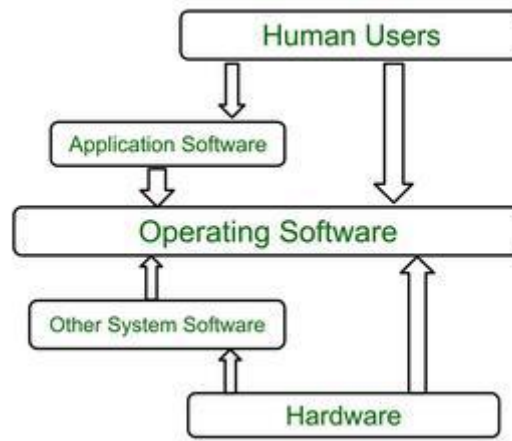
1. What is an operating system?
2. What are the three main functions of an OS?
3. Which classifications of operating systems are provided in the text?
4. What are the advantages of mobile operating systems over desktop operating systems?
5. How do multi-tasking operating systems work?
6. What is the difference between preemptive and cooperative multitasking?
7. Which two subtypes of operating systems are described in the text?
8. What do CLI and GUI stand for?
9. What is the difference between CLI and GUI?
10. What does the acronym WIMP stand for?

Text B. Operating Systems: Hidden Software

When a brand new computer comes off the factory assembly line, it can do nothing. The hardware needs software to make it work. A user can choose which application to install, but an application software package does not communicate directly with the hardware. That is where an Operating System comes in. It acts as an intermediary between application programs and computer hardware. As a user interacts with an application program on the screen, the application program communicates with the operating system and the operating system communicates with the computer hardware.

The work of the operating system takes place in the background and is not always obvious to the user. An operating system has a few main functions:

- managing the computer's hardware resources, such as the central processing unit, memory, and others;
- establishing a user interface;
- providing environment for application programs to run.



Operating systems can be classified according to different criteria.

Desktop and mobile operating systems

The desktop operating systems are designed to manage a personal computer. The most popular desktop operating systems are *Microsoft Windows* and *Mac OS*, while open-source operating systems such as *Linux* for example are also widely used.

The purpose of a mobile OS is to provide environment for application software to run on mobile devices. A mobile OS is similar to desktop OS but it is simpler in comparison, requires less RAM to operate and takes up less time to boot. Most popular mobile operating systems are *Android* and *Apple's iOS*.

Single-tasking and multi-tasking operating systems

A single-tasking system can only run one program at a time. Nothing else will be done while the computer is doing this task. *MS-DOS* is an example of a single-tasking operating system. On the contrary, a multi-tasking operating system allows more than one program to be executed by the CPU simultaneously by switching between the tasks. Multi-tasking Operating Systems are also known as time-sharing systems since the available processor time is divided between multiple processes. These processes are repeatedly interrupted in time intervals by the task scheduling subsystem of the operating system. Most of the present-day operating systems, like *Microsoft Windows*, *Linux*, and *Mac OS* are multi-tasking operating systems.

Multitasking may be characterized in preemptive and cooperative types. In preemptive multitasking, the overall computing time is divided between processes as the operating system allocates a time slice, or quantum, for each process. The OS uses some criteria to decide for how long a process should be executed before allowing another process to use the operating system. Thus, depending on a task's criticality and priority, additional time may be allocated. For example, OS-specific background tasks

may be considered more important than a user application's tasks. Thus, they receive larger time slices than forefront tasks. In cooperative multitasking, the operating system never initiates the switching between processes to share the CPU computing resources. A certain task uses the CPU resources until it voluntarily gives up the computing resources to another task. This type of multitasking is called *cooperative* because all the processes need to cooperate for the scheduling scheme to work.

Single-user and multi-user operating systems

In a single-user operating system, only one user can have access to the computer system at a time. These types of operating systems are common for home computers. Single-user operating systems can be classified into 2 types: single-user single-tasking operating systems and single-user multi-tasking operating systems.

A single-user single-tasking OS, as its name suggests, allows a single user to do only one task at a time. *MS-DOS* can serve as an example of a single-user single-tasking OS. In a single-user multi-tasking OS, a single user can perform multiple tasks simultaneously. This is the types of OS that most users can find on their desktop and laptop computers today. For instance, *Microsoft Windows* and *Mac OS* allow a single user to have multiple programs running simultaneously. Thus, it is possible for a Windows user to be working on a word document while browsing the Internet at the same time.

A multi-user OS, on the other hand, provides resources and services to multiple users concurrently. The operating system needs to make sure that the computing resources are well-shared among different users based on their requirements and that the problems with one user will not affect the other users. *Unix* is a good example of a multi-user OS.

CLI operating systems and GUI operating systems

Some operating systems have the CLI (Command Line Interface); it means that the user runs a program by typing a command. When the command is typed and the *Enter* key is pressed, the command is processed and the output is displayed on the screen. The user needs only a keyboard to work with a CLI since it does not allow the use of any pointing devices. *Unix* is a command-driven operating system mostly used on large multi-user multi-tasking mainframe computers.

Other operating systems have the GUI (Graphical User Interface) that allows the user to use a mouse to click on icons on the screen or choose commands from a list of choices known as a menu. The distinct feature of a GUI is the use of WIMP environment: **w**indows, **i**cons, **m**enus and **p**ointer. The first computer with a graphical

use interface and a mouse was produced by Apple in 1984. Macs were designed with one clear aim: to facilitate interaction with the computer. A few years later, Microsoft launched Windows, another operating system based on graphics and intuitive tools. The GUI is easier for the user to work with since it is graphics-based, but it is slower and consumes more memory in comparison with the CLI.

Task 6. Read the sentences below and fill in the gaps with the suitable words:

multitasking / operating / multiple / market / characterized

1. Time-sharing _____ systems schedule tasks for efficient use of the system.
2. The dominant desktop operating system is Microsoft Windows with a _____ share of around 76.45%.
3. Multitasking is achieved by time-sharing, where the available processor time is divided between _____ processes.
4. Multitasking may be _____ in preemptive and cooperative types.
5. Cooperative _____ works perfectly with single-user operating systems because home computers typically run a small number of well-tested programs.

Task 7. Watch a video about the functions of the Operating System at [\[https://www.youtube.com/watch?v=5AjReRMoG3Y\]](https://www.youtube.com/watch?v=5AjReRMoG3Y) and fill in the gaps in the sentences.

1. The memory manager is in charge of the main memory. It scans every request for memory space and checks if it is valid. It allows _____ of memory spaces that are not _____ already.
2. The process manager decides how to allocate the CPU resources. It _____ of the status of each process.
3. The device manager monitors every device, channel and control unit. It looks for the _____ way to allocate all the system devices which are connected to the computer.
4. The file manager checks every type of file that is on the system. It _____ so that certain users can only see certain files.
5. The network manager provides a way for users _____ hardware and software resources while also controlling _____ to them.

Task 8. What do you know about open-source software? How is it different from proprietary software? Read the text and check your answers.

Text C. Open-source software

With open-source software, what do people think first? Money, usually because open-source software is cheaper or free. However, this is not the only reason. First, there is freedom from the software vendors. Organizations say that freedom is the number one reason to choose open-source software. With open-source software, an organization doesn't have to follow the software vendor's decisions. Anyone can study and modify the open-source code. With proprietary software, the vendor controls software updates and users can't add features to proprietary software themselves.

Sometimes people worry about open-source operating systems. They think that some software they use won't run on open-source operating systems. However, this isn't true because there is a lot of office software, such as word processors and spreadsheets, for open-source operating systems. In fact, there are many kinds of this software and they work well. It is only special areas, such as graphics design, where proprietary software is clearly better.

Task 9. Find synonyms to the following words and expressions in the text above:

- | | |
|--------------------|----------------------------|
| a) more affordable | d) to alter |
| b) sellers | e) patented |
| c) to select | f) an addition to a system |
| | to make it more modern |

Task 10. Listen to a spokesperson for a major software company giving a speech. Audio file 6.1 [<https://online-edu.mirea.ru/course/view.php?id=10378>]. Write down the reasons the speaker gives in favour of proprietary software.

Task 11. Fill in the gaps in text D with the words below:

*courses / core / science / robust / robustness / refers /
released / build / open-source / commercial*

Text D. LINUX

‘Linux’ usually refers to a collection of (1) _____ operating systems developed around the Linux kernel. It was initially created by a young student, Linus Torvalds, who was studying computer (2) _____ at the University of Helsinki in the early 1990s. Like most computer science (3) _____ of that time, a big component of it was taught on (and about) Unix. Unix was the wonder operating system of the 1970s and 1980s: both a textbook example of the principles of operating system design, and sufficiently (4) _____ to be the standard OS in engineering and scientific computing. However, Unix was a (5) _____ product (licensed by AT&T), and cost more than a student could pay. Inspired by the ideas of Free Software Foundation founded by Richard Stallman, Torvalds set out to write his own kernel — the (6) _____ of an operating system, using the GNU programming tools. Version 1.0 of the Linux Kernel, developed under the GNU General Public License, was (7) _____ in 1994, and its source code became freely available to everyone. Over time, Linux’s functionality, adaptability and (8) _____ have made it the main alternative to proprietary Unix and Microsoft operating systems. A number of Linux distributions have been created and are widely used nowadays. The term ‘Linux distribution’ (9) _____ to the Linux kernel and a collection of software that together make up an OS. More developers have been using Linux recently to (10) _____ and run mobile applications; it has also played a key role in the development of affordable devices such as Chromebooks, which run Linux-based operating systems.

Task 12. Match the term in column A with the definition in column B.

A	B
1) kernel	a) an organization of volunteers dedicated to making good software that anyone can use without paying
2) Free Software Foundation	b) a complete and functional OS kit containing the kernel, utilities and additional software
3) source code	c) the core component of an OS
4) distribution	d) a set of instructions written in a specific programming language

Task 13. Match the terms with their definitions:

*open-source software / GUI / operating system /
proprietary software / CLI / compatible*

1. Being able to work with another device or program.
2. A user-friendly interface based on graphics; it uses a WIMP environment.
3. A type of computer software whose copyright holder grants users the rights to use, study, change, and distribute the software to anyone and for any purpose.
4. A set of programs that control the hardware and software of a computer system including the functions of handling input/output operations, running programs and organizing files on disks.
5. Non-free software whose users are not allowed to share, modify it, and distribute the modifications.
6. The way to interact with a computer system through typing various commands in the form of lines of text.

Task 14. Fill in the gaps with appropriate prepositions:

between / on / from / to / of / by / under / than / to / over

1. CLI is still used ____ software developers and system administrators to configure computers, install software, and access features that are not available in the graphical interface.
2. An operating system is a set of programs that lies ____ application software and the computer hardware.
3. Linux is open-source software developed ____ GNU General Public License.
4. What are the benefits of CLI ____ GUI?
5. In case of open-source software, you can adjust a program ____ your needs.
6. GUI is more user-friendly, more convenient to use ____ the command line interface since it uses WIMP environment.
7. Apart ____ the fact that it's freely distributed, Linux's functionality, adaptability and robustness has made it the main alternative ____ proprietary Unix and Microsoft operating systems.
8. The dominant general-purpose desktop operating system is Microsoft Windows with a market share ____ around 77%.
9. One of the functions of an OS is booting, which is the process of turning ____ the computer and powering up the system.

Task 15. Match the heads and the tails of sentences related to the work of an OS.

- | | |
|--|--|
| 1. The OS is in charge of keeping data | a) and coordinating the computer applications and allocating space for programs. |
| 2. Memory management is the process of controlling | b) errors and avoid the malfunctioning of computer system. |
| 3. A multi-tasking OS allows more than | c) safe inside your computer. |
| 4. Operating system constantly monitors the system to detect | d) delay, making information up-to-date, e.g. ticket reservation systems. |
| 5. A real-time OS processes data without significant | e) one program to run at the same time. |

Task 16. Translate the following sentences from Russian into English.

1. Linux - это семейство операционных систем с открытым исходным кодом, выпущенное под лицензией GNU.
2. Windows может изменяться и распространяться только самим разработчиком.
3. Некоторые лицензионные программы не работают на операционных системах с открытым исходным кодом.
4. Большая часть работы операционной системы скрыта от пользователя.
5. Операционная система действует как посредник между программами и аппаратным обеспечением компьютера.
6. Операционные системы распределяют задачи для эффективного использования возможностей компьютера.
7. Хотя в современных операционных системах с графическим интерфейсом навигация происходит с помощью компьютерной мыши, в некоторых программах применяется командная строка.
8. Однозадачная операционная система может одновременно запускать только одну программу, тогда как многозадачная операционная система позволяет запускать несколько программ в одно и то же время.
9. Операционные системы для мобильных устройств уступают по функциональности операционным системам для стационарных компьютеров.

10. По сравнению с графическим пользовательским интерфейсом, интерфейс командной строки требует меньше системных ресурсов для работы.

Task 17. Match the examples of application programs with their types.

Type	Application software
1. Word processing Software	a. Netflix
2. Multimedia Software	b. Lingua Leo
3. Spreadsheet Software	c. Microsoft Power Point
4. Presentation Software	d. Minecraft
5. Entertainment Software	e. MS Word
6. Educational Software	f. Oracle
7. Database Software	g. Microsoft Excel

Task 18. Match the terms used in MS Word with their definitions:

1) margins	a) to arrange in a straight line
2) italic	b) text printed in the bottom margin
3) header	c) to remove and insert
4) footer	d) a type style in which the letters lean to the right
5) indent	e) to join, combine
6) font	f) small letters as opposed to capital letters
7) to cut and paste	g) the size of the blank area between lines in a text
8) to merge	h) the space around the printed matter on a page
9) to align	i) distance between the margins and the text
10) line spacing	j) text printed in the top margin
11) lowercase	k) the size and shape of letters

Task 19. What are some ways to draw attention to parts of a document? Listen to the guidelines on how to format a document and answer the following questions.

Audio file 6.2 [<https://online-edu.mirea.ru/course/view.php?id=10378>].

1. What is the memo about?
2. What size should the margins be?
3. Which font type should be used?
4. Which line spacing should be used?

5. What should be underlined?
6. What should be italicized?
7. How big should the indent be?

Task 20. Listen to an extract from a lecture on spreadsheet programs and answer the questions below. Audio file 6.3 [<https://online-edu.mirea.ru/course/view.php?id=10378>].

1. What is a spreadsheet program usually used for?
2. What is spreadsheet compared to?
3. What do we call the point where a column and a row intersect?
4. What types of information can a cell contain?
5. Which features can be changed using commands in the format menu?

Task 21. Modify the word in brackets to fill in the gaps in the text.

Spreadsheets

Spreadsheet is a computer application for (1) _____ (organize), analysis and (2) _____ (store) of data in tabular form. What makes a spreadsheet program unique is its (3) _____ (able) to calculate values using mathematical formulae and the data in cells. Since spreadsheets were developed as (4) _____ (computerize) analogs of paper accounting worksheets, they help you manage personal finances (e.g. household budgets) and business finances (e.g. keeping track of sales).

Spreadsheets show figures in rows and columns. A column is a vertical line of boxes, (5) _____ (label) with a letter. A row is a horizontal line of boxes, (6) _____ (label) with a number. A cell is the (7) _____ (intersect) of a column and a row. You enter data into the active cell. Each cell can hold three types of data: text, numbers, and formulae. Formulae are entries that have an equation used to calculate the value. Formulae can be used to calculate totals, (8) _____ (percent), discounts, etc. Spreadsheets have many pre-written instructions. For example, = sum (D2:D7) means add up all the values in the cell range D2 to D7.

Task 22. Match the terms with the definitions:

column / shading / printing area / spreadsheet / formula bar / function

- a) a preset formula used to make calculations
- b) cells selected for printing
- c) a display showing the equation used
- d) a program that arranges information in rows and columns
- e) coloring that sets some cells apart from others
- f) a vertical arrangement of cells

Task 23. Complete these sentences with appropriate prepositions.

1. Depending _____ the activity for which it was designed, an application can manipulate text, numbers, audio, or graphics.
2. What's the difference _____ a database and a spreadsheet?
3. Spreadsheets are mathematical tables which show figures _____ rows and columns.
4. You retrieve information _____ the database.
5. Apps built _____ mobile platforms are called mobile apps.

UNIT 7. NETWORKS

Task 1. Lead-in questions.

1. What is a network?
2. What is the role of the router in building a network?
3. What are the weak spots of a wireless network?

Task 2. Read and translate text A.

Text A. The OSI model

OSI (Open System Interconnection) is a reference model that gives an idea of how data is transmitted over networks. This conceptual model was adopted in 1984 by International Organization for Standardization and has been widely used ever since by IT networking professionals as a guideline to describe how traffic moves from one part of the network to another. It is also important to note that this model is often used for troubleshooting if a network problem occurs. The OSI model consists of seven layers and at each layer there is a set of protocols, which may be very different depending on the kind of traffic going over a network.

At the very top of the OSI model there is **the application layer** whose work is implemented by network applications. The application layer is the only part of the communication process that the user sees. With the help of application layer protocols, a user can perform activities, like sending emails, transferring files, surfing the web etc. File transfer, for example, is done with FTP, while web surfing is implemented with HTTP or HTTPS protocols.

The presentation layer ensures that the message is transmitted in a language that the receiving computer can interpret (often ASCII). This layer also manages the encryption and decryption required by the application layer and then compresses the data it receives from the application layer before delivering it to layer 5.

The session layer creates communication channels called sessions. It has to ensure that the sessions are open, functioning and long enough to transfer the data. After all the data is transferred, it closes sessions. Layer 5 can also set checkpoints during communication where data is being transferred. If the session is interrupted, devices can resume the data transfer from the last checkpoint.

The transport layer is responsible for transferring data, providing error-checking mechanisms and data flow control. This layer breaks the data it gets from the

session layer into transportable segments, creates checksum tests – mathematical sums based on the contents of data – that can be used later to determine if the data was scrambled. The transport layer also provides the acknowledgement of the successful data transmission and re-transmits the data if an error is found.

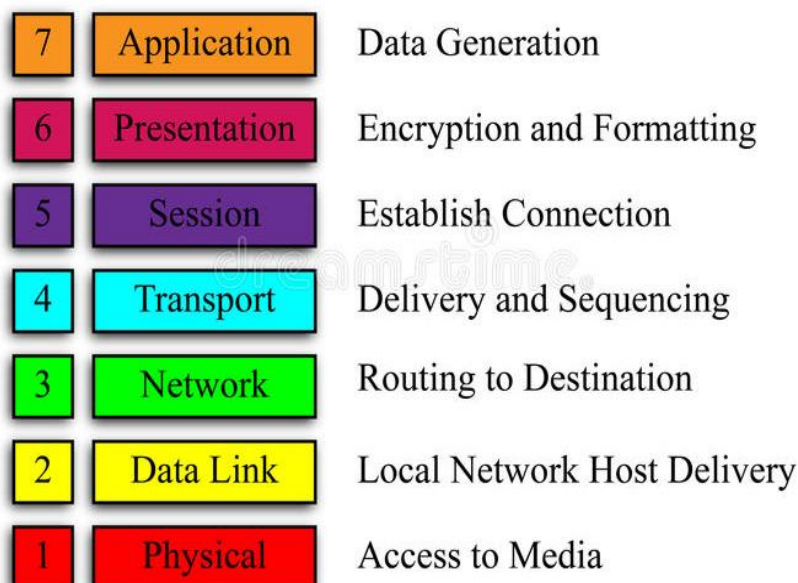
The network layer ensures the transmission of data from one host to the other located in a different network. The segments received from the transport layer are further processed to form packets. Then the best path is found to route the data to its destination. The network layer uses logical addresses (Internet Protocol addresses) to route data to a destination node. IP addresses of the receiving and sending computers are added at this layer.

The data link layer manages data transfer between two devices on the same network. It is also responsible for flow control and error control in intra-network communication. The packets received from the network layer are further divided into frames and transmitted to the appropriate host using its MAC address.

The physical layer is the lowest layer of the OSI model and it is responsible for transmitting raw bits of data from one node to the other over physical cable or wireless connection.

So, in order to accomplish a successful communication between computers, data must travel down the seven layers in the source computer and then go up through the layers in the receiving computer.

OSI Model



Task 3. Answer the following questions.

1. Into what units is data subdivided by the following layers?
 - a) transport layer;
 - b) network layer;
 - c) data link layer.
2. What is the purpose of a checksum test?
3. Which layer ensures that the message is transmitted in a language that the receiving computer can understand?
4. Which layer starts communication between network nodes?
5. Which layer chooses a route for the message to follow?
6. At which layer are packets broken down into frames?

Task 4. Watch a video on OSI model at

[\[https://www.youtube.com/watch?v=LANW3m7UgWs\]](https://www.youtube.com/watch?v=LANW3m7UgWs) and answer the questions.

1. At which layer do switches operate?
2. At which layer do routers work?
3. At which layer are source and destination port numbers added?
4. What are the two major protocols of the transport layer?
5. What is the session layer responsible for?
6. Which layer formats the data in a way that the receiving application can understand?
7. Which common application layer protocols are described in the video?
8. Which mnemonic is suggested to memorize the layers of the OSI model?

Task 5. Read and translate text B. Then answer the questions.

Text B. Types of Networks

A network is a collection of computers, servers and network devices connected to one another to allow the sharing of data. Networks can be classified according to different criteria.

Geographical area

LANs (Local Area Networks) cover a small geographical area such as an office, a home, a building, or a group of buildings. **MANs** (Metropolitan Area Networks) span

an entire city. **WANs** (Wide Area Networks) cover a country or a continent. The largest WAN in existence is the Internet, which connects millions of people all over the world.

Network architecture

The two types of network architecture are peer-to-peer and client-server. In a **client-server** network, one computer acts as a server. It stores and distributes data to the other nodes, or clients. In a **peer-to-peer** network, all the computers have the same capabilities - that is, share files and peripherals without requiring a separate server computer.

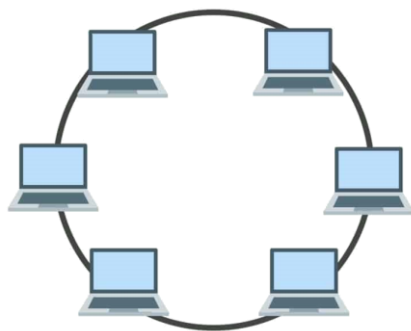
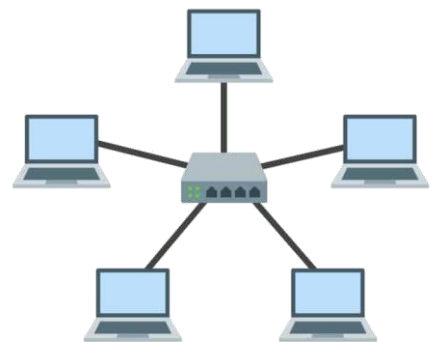
Topology

A network topology is a configuration of the elements of a network. Typical network configurations include the **bus** topology, **mesh** topology, **ring** topology, **star** topology, **tree** topology and **hybrid** topology. In general, the more interconnections there are, the more robust the network is; but the more expensive it is to install. Let's have a look at the distinct features of the network topologies mentioned above.



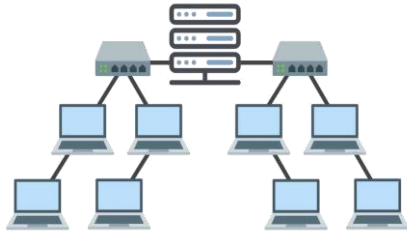
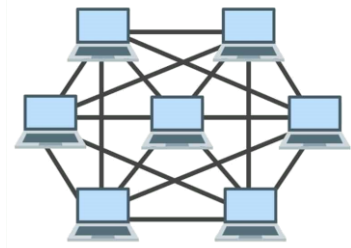
Bus network: all nodes are connected to a single cable that acts as the backbone of the entire network. There is no limit to the number of nodes that can be connected to this network.

Star network: all nodes are connected to a special central node. This is the typical layout found in a Wireless LAN, where each wireless client connects to the central wireless access point.



Ring topology: each device/node is connected with its neighboring node forming the shape of a ring, hence its name. In a ring topology, data circulates from one computer to another. The flow of data in a ring topology can be uni-directional or bi-directional.

Mesh topology: a network topology in which the infrastructure nodes (i.e. bridges, switches, and other infrastructure devices) connect directly and non-hierarchically to as many other nodes as possible.



Tree topology: all the computers are connected like the branches of a tree. In computer networking, tree topology is known as a combination of a bus and star network topologies. The main advantages of this topology are better flexibility and scalability.

Hybrid topology: this type includes a mix of bus topology, mesh topology, ring topology, star topology, and tree topology. The combination of topologies depends on the need of a company.

Wired and wireless networks

In wired LAN, two or more personal computers are connected through such communication media as **coaxial** or **twisted-pair** cables. High-speed **fiber optic cables** are usually used to send data over longer distances.

Wireless networks, on the other hand, use electromagnetic waves, such as radio waves, to transmit data. These are the main types of wireless networks:

- Satellite networks for long distances;
- WiMAX for connecting Wi-Fi hotspots;
- Wi-Fi for medium-range distances;
- Bluetooth for short distances;
- GSM for mobile phones.

Wired networks are considered faster and more reliable. Wireless networks let you move from one access point to another, but they are less secure and subject to interference.

1. According to which criteria can networks be classified?
2. What does MAN stand for?
3. What is the largest WAN in the world?
4. What type of network architecture does not have a dedicated server?
5. In which topology are all the devices interconnected?
6. What cables are used to transfer information over long distances at high speed?
7. What is Bluetooth used for?

8. What are the advantages and disadvantages of wireless networks?

Task 6. Watch a video on different types of network topologies at [\[https://www.youtube.com/watch?v=zbqrNg4C98U\]](https://www.youtube.com/watch?v=zbqrNg4C98U) and mark the statements as True or False.

1. The central point in a ring topology is a hub.
2. Ring topology networks are easy to install.
3. In a star topology, if one computer goes down or there's a single break in the cable, all the data flow will be disrupted.
4. Bus topology is an outdated technology.
5. Signal reflection is a problem of a mesh topology.
6. The redundancy level of a mesh topology is very high.
7. The Internet uses a mesh topology.

Task 7. Fill in the gaps using the following words:

backbone / centralized / layout / redundancy

Network topology is the (1) _____ of a network. In a bus topology, all the computers are connected to a single cable or (2) _____. In a mesh topology, each computer on the network is connected to every other computer. It creates a high (3) _____ level and handles failure very well because the data can be rerouted over a different path to finally reach its destination. In an ad hoc topology, all the devices are wirelessly connected to each other in a single peer-to-peer network without using a (4) _____ device.

Task 8. Read the text on network hardware components and answer the questions below.

In computer networks, we have multiple networking devices such as modems, routers, hubs, switches, bridges, gateways, etc. Each device has its own specification and is used for a particular purpose. Let's have a look at each of them.

A **modem** performs the function of a border device and makes it possible for a computer to transmit data via cable connections or wirelessly. Previously, modems were used to convert digital data into analog signals that could be transmitted over a phone (modulated). At the same time, they converted the analog signals back into digital data on the receiving end (demodulated). So, the modem played a role of

a translator between the digitally-speaking computer and the analog-speaking telephone line. Nowadays, however, regardless of the type of connection, wired or wireless, the Internet signal is delivered in the digital form. So the role of the modem is to modulate a signal of your ISP (i.e., a higher frequency signal) into a signal your local devices can use and vice versa.

A router is a device that connects two or more packet-switched networks. It serves two primary functions: managing traffic between these networks by forwarding data packets to their intended IP addresses and allowing multiple devices to use the same Internet connection. Routers operate at OSI Layer 3.

A network hub is a node that broadcasts data to every computer or Ethernet-based device connected to it without restriction. Network hubs are categorized as Layer 1 devices in the OSI model.

A network switch is identical to a network hub, but a switch is more intelligent than a hub. A network switch inspects packets, determines source and destination address and routes them accordingly. It operates at Layer 2 of the OSI model.

A bridge is a networking device whose purpose is to divide a network into manageable sections having the same protocol. A network bridge unites these segments enabling each section to have separate bandwidth and, as a result, improving network performance. In the OSI model, bridges work at Layer 2.

A gateway is an interface that enables dissimilar networks to communicate, such as two LANs based on different topologies or network operating systems, networks using different protocols. This is done using protocol translation. Gateways embed both protocols of different systems in order to provide interoperability functions.

1. What was the initial role of a modem?
2. Which device is used for forwarding data packets between networks?
3. What hardware component works at OSI Layer 1?
4. Why is a switch considered more intelligent than a hub?
5. What is the role of a network bridge?
6. Is it possible for two networks based on different topologies to communicate efficiently?

Task 9. Watch a video on different types of network hardware at [\[https://youtu.be/1z0ULvg_pW8\]](https://youtu.be/1z0ULvg_pW8) and answer the questions.

1. Why is a hub supposed to be not intelligent?

2. What are the consequences of a hub broadcasting data packets to all of the devices on a network?
3. What makes a switch similar to a hub?
4. How is a switch different from a hub?
5. What kind of networks are hubs and switches used in?
6. Why are hubs and switches not able to route data outside their own network?
7. What are routers used for?

Task 10. Read these texts on network range and speed. Qualify the sentences below as true (T) or false (F).

Range

Wireless networks have limited range. Network range depends on the type of 802.11 protocol, the strength of the device transmitter and the architecture of the surrounding area. Some structures such as walls and metal frames reduce the range of a WLAN by 25%. However, users can extend the range of a WLAN. Repeaters forward the wireless signal to access points or routers and increase the range of a network.

Speed

Bandwidth and latency are the measures of computer network speed, or data transfer rate. Bandwidth is the maximum throughput of data in bits per second. Some modems support 100 Gbit/s, but speed depends on the hardware and software used. Latency is the delay that network creates during the transfer of data. Users have no or very little control over bandwidth and latency.

1. Wireless networks don't have a wide range.
2. Network range depends on different factors.
3. Walls and metal frames can increase the range of a WLAN.
4. It's possible to increase the range of a WLAN.
5. Data transfer rate is measured in bandwidth and latency
6. The minimum throughput of data in bits per second is the latency.
7. Speed depends only on the hardware used.
8. Users can control the latency.

Task 11. Read the sentences below and fill in the gaps with the suitable words:

*communication protocols / network nodes / computers /
topologies / sharing / telecommunication*

A computer network is a group of (1) _____ that use a set of common (2) _____ over digital interconnections for the purpose of (3) _____ resources located on or provided by the (4) _____. The interconnections between nodes are formed from a broad spectrum of (5) _____ network technologies, based on physically wired, optical, and wireless radio-frequency methods that may be arranged in a variety of network (6) _____.

hardware / hostnames / computers / addresses / protocols

The nodes of a computer network may include personal (7) _____, servers, networking (8) _____, or other specialized or general-purpose hosts. They are identified by (9) _____ and network addresses. Hostnames serve as memorable labels for the nodes, rarely changed after initial assignment. Network (10) _____ serve for locating and identifying the nodes by communication (11) _____ such as the Internet Protocol.

Task 12. Translate the following sentences from Russian into English.

1. Компьютерная сеть использует набор протоколов связи и даёт возможность совместного использования ресурсов.
2. Телекоммуникационная сеть даёт возможность получить необходимую информацию для обеспечения деятельности фирмы или удовлетворения личных потребностей пользователя.
3. Локальные сети подходят для использования на небольшой территории, например, в офисе.
4. Компьютерная сеть может состоять из персональных компьютеров, серверов и сетевого оборудования.
5. На создание компьютерных сетей повлиял широкий спектр технологических разработок и исторических событий.
6. Данные технологии стали технической основой для создания Интернета.
7. В частных сетях предусмотрены меры безопасности для предотвращения нежелательных или несанкционированных подключений.

8. Некоторые сети не требуют пароля для подключения, но требуют, чтобы пользователь вошел в систему с помощью веб-браузера прежде чем сможет получить доступ к Интернету.
9. Интернет состоит из большого количества локальных и глобальных сетей, связанных между собой с использованием различных проводных и беспроводных технологий.

Task 13. Read the sentences below and fill in the gaps with the suitable words:

topology / medium / network / criteria

Computer networks may be classified by many (1) _____, for example, the transmission (2) _____ used to carry signals, bandwidth, communications protocols to organize (3) _____ traffic, the network size, (4) _____, traffic control mechanism, and organizational intent.

digital / applications / services / storage / instant

Computer networks support many (5) _____ and (6) _____, such as access to the World Wide Web, (7) _____ video, digital audio, shared use of application and (8) _____ servers and printers, and use of email and (9) _____ messaging applications.

Task 14. Read the sentences below and fill in the gaps with the suitable words:

online / interpersonal / resources / technologies / conferencing / authorized / shared

A computer network extends (1) _____ communications by electronic means with various (2) _____, such as email, instant messaging, (3) _____ chat, voice and video telephone calls, and video (4) _____. A network allows sharing of network and computing (5) _____. Users may access and use resources provided by devices on the network, such as printing a document on a (6) _____ network printer or use of a shared storage device. A network allows sharing of files, data, and other types of information giving (7) _____ users the ability to access information stored on other computers on the network.

Task 15. Match the terms with their definitions:

*ring topology / bridge / wireless / hub / router / gateway /
peer-to-peer / star topology / Bluetooth / topology*

1. A wireless technology that allows mobile devices and other peripheral devices to communicate over short distances.
2. The configuration of the elements (nodes) of a network.
3. A network component which sends data packets to all devices on a network, regardless of any MAC addresses contained in the data packet.
4. A network architecture in which all the computers have the same capabilities, i.e. share files and peripherals, without requiring a separate server computer.
5. A LAN topology, in which all devices are interconnected in a continuous loop.
6. A networking device that can send data packets from one network to another.
7. A LAN topology, in which all data flows through a central hub, a common connection point for the devices on the network.
8. A hardware component connecting networks that use the same protocol.
9. Having no wires; without the use of cables.
10. A hardware component connecting two networks which use different protocols.

GLOSSARY

Learn the terminology:

access time (seek time)	время доступа
application	приложение
backup	резервное копирование
battery pack	аккумулятор
built-in webcam	встроенная камера
bus	шина
bus topology	шинная топология
cache hit	попадание в кэш
calculations	вычисления
clock speed	тактовая частота
compatible	совместимый
cooperative multitasking	кооперативная многозадачность
defragmentation	дефрагментация
desktop PC	настольный компьютер
detached keyboard	съёмная клавиатура
digital	цифровой
directory	каталог
energy consumption	потребление энергии
expansion card	карта расширения
external disk drive	внешний жёсткий диск
floating gate transistor	транзистор с плавающим затвором
floppy disk	дискета
front side bus	системная шина
headphones	наушники
input device	устройство ввода информации
integrated circuit	микросхема, интегральная схема
laser beam	лазерный луч
memory capacity	объём памяти
memory card	карта памяти
mesh topology	топология сетки, ячеистая топология
multi-core CPU	многоядерный процессор
multi-tasking	многозадачный
network backbone	сетевая магистраль
open-source software	программы с открытым исходным
output device	устройство вывода информации
partition	раздел на жёстком диске
peer-to-peer network	одноранговая сеть
performance	производительность
peripherals	подключаемое оборудование
platter	пластина жёсткого диска
power-supply unit	блок питания
preemptive multitasking	вытесняющая многозадачность

proprietary software	проприетарное, запатентованное ПО
punched card	перфокарта
RAM	оперативная память
read/write head	головка чтения/записи
ring topology	кольцевая топология
seek time	время поиска
semiconductor	полупроводник
silicon	кремний
software	программное обеспечение
speakers	колонки
spreadsheet	электронная таблица
storage device	устройство хранения данных
storage medium	носитель информации
system clock	системный тактовый генератор
system unit	системный блок
tablet PC	планшет
to archive	архивировать
to edit	редактировать
to erase	стирать (данные)
to execute instructions	выполнять инструкции
to transmit data	передавать данные
touchpad	сенсорная панель
touchscreen	сенсорный экран
track	дорожка на CD/жёстком диске
transfer rate	скорость передачи данных
USB-flash drive / memory stick	флеш-накопитель
vacuum tube	электронная лампа
virtual keyboard	виртуальная клавиатура
volatile	энергозависимый
wireless access point	беспроводная точка доступа
wireless mouse	беспроводная мышь
write-back cache	кэш с обратной записью
write-through cache	кэш со сквозной записью

What do the following abbreviations and acronyms stand for?

ALU	Arithmetic Logic Unit
BIOS	Basic Input/Output System
CPU	Central Processing Unit
CD-R	Compact Disc Recordable
CD-ROM	Compact Disc Read-Only Memory
CD-RW	Compact Disc Rewritable
CLI	Command Line Interface
DVD	Digital Versatile Disc

GUI	Graphical User Interface
HDD	Hard Disk Drive
LAN	Local Area Network
MAN	Metropolitan Area Network
RAM	Random Access Memory
ROM	Read Only Memory
USB	Universal Serial Bus
SSD	Solid State Drive
WAN	Wide Area Network
WIMP	Windows Icons Menus Pointer

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