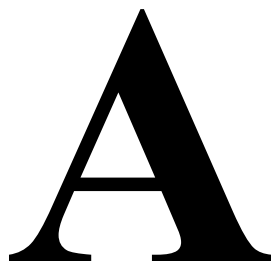


МЕЖГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
ВЫСШЕГО ОБРАЗОВАНИЯ
«БЕЛОРУССКО-РОССИЙСКИЙ УНИВЕРСИТЕТ»

Кафедра «Гуманитарные дисциплины»

НАУЧНЫЙ ПЕРЕВОД. ТЕХНИЧЕСКИЙ ПЕРЕВОД

*Методические рекомендации к практическим занятиям
для студентов направления подготовки
01.03.04 «Прикладная математика»
очной формы обучения*



Могилев 2023

УДК 81*25:811.111
ББК 81.2-7:81.2Англ
Н34

Рекомендовано к изданию
учебно-методическим отделом
Белорусско-Российского университета

Одобрено кафедрой «Гуманитарные дисциплины» «31» августа 2023 г.,
протокол № 1

Составитель ст. преподаватель Е. Н. Мельникова

Рецензент Е. С. Вербицкая

Методические рекомендации направлены на формирование, развитие и совершенствование у студентов умений и навыков чтения и перевода текстов научно-технической тематики.

Учебное издание

НАУЧНЫЙ ПЕРЕВОД. ТЕХНИЧЕСКИЙ ПЕРЕВОД

Ответственный за выпуск	Н. Н. Рытова
Корректор	А. А. Подошево
Компьютерная верстка	Н. П. Полевничая

Подписано в печать . Формат 60×84/16. Бумага офсетная. Гарнитура Таймс.
Печать трафаретная. Усл. печ. л. . Уч.-изд. л. . Тираж 31 экз. Заказ №

Издатель и полиграфическое исполнение:
Межгосударственное образовательное учреждение высшего образования
«Белорусско-Российский университет».
Свидетельство о государственной регистрации издателя,
изготовителя, распространителя печатных изданий
№ 1/156 от 07.03.2019.
Пр-т Мира, 43, 212022, г. Могилев.

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университет, 2023

Тема 1. Особенности перевода научно-технических текстов

Научные статьи представляют собой специализированные тексты, перевод которых требует строгого соблюдения формы и стиля, характерных для научного содержания. Научные материалы отличаются рядом характерных особенностей: информативность и высокая степень формализованности; чёткая последовательность изложения; детальная передача причинно-следственных связей; сжатость изложения; нейтральная лексика; структура (главы, разделы, параграфы). К научным материалам относятся научно-популярные статьи, результаты исследований, дипломные работы и диссертации, доклады для конференций и другие тексты, перевод которых требует доскональных знаний в конкретной области.

Технические тексты – это тексты, насыщенные специализированной лексикой и терминами. Главной особенностью перевода научно-технических текстов является краткость, лаконичность, логичность. Научно-технические тексты на английском языке отличаются обилием сложносочинённых и сложноподчинённых предложений, причастных и деепричастных оборотов, использованием пассивного залога для безличного описания явлений и процессов.

Достижение точности и адекватности – основная задача перевода научно-технических текстов, материалов, статей.

Реферативный перевод – разновидность перевода, при котором происходит сжатие основного содержания исходного текста на одном языке средствами другого языка. Реферативный перевод короче исходного текста и содержит относительно подробные сведения о реферируемом документе – его назначении, тематике, методах исследования, полученных результатах. Примерный перечень глаголов, характерных для реферата:

- «отмечается, что ...»;
- «высказываются предположения, что ...»;
- «делаются выводы о том, что ...»;
- «подчеркивается, что ...»;
- «указывается, что ...».

Аннотационный перевод – это вид технического перевода, заключающийся в составлении аннотации оригинала, в которой отражаются лишь главная тема, предмет и назначение переводимого текста. Аннотация выполняет информационную, ознакомительную функцию.

Примерный перечень выражений, характерных для аннотации:

- «автор приходит к выводу»;
- «анализируется»;
- «выделяются»;
- «излагаются результаты»;
- «идея заключается в следующем»;
- «используются»;
- «исследуются»;
- «классифицируются»;
- «обсуждаются»;

- «определяются»;
- «отмечаются»;
- «описываются»;
- «обобщается опыт»;
- «перечисляются»;
- «приводятся»;
- «предлагаются»;
- «рассматриваются».

Полный письменный перевод – это основная форма технического перевода, передающий смысловое содержание оригинала без пропусков и сокращений текста оригинала.

Адекватный научно-технический перевод должен точно передавать содержание оригинала, иметь общепринятую в языке перевода терминологию и соответствовать нормам языка научно-технической литературы, на который выполняется.

1 Выполните реферативный перевод следующего текста.

In mathematics, a function is a relation between sets that associates to every element of a first set exactly one element of the second set. Typical examples are functions from integers to integers or from the real numbers to real numbers.

Functions were originally the idealization of how a varying quantity depends on another quantity. For example, the position of a planet is a function of time. Historically, the concept was elaborated with the infinitesimal calculus at the end of the 17th century, and, until the 19th century, the functions that were considered were differentiable (that is, they had a high degree of regularity). The concept of function was formalized at the end of the 19th century in terms of set theory, and this greatly enlarged the domains of application of the concept.

A function is a process or a relation that associates each element x of a set X , the domain of the function, to a single element y of another set Y (possibly the same set), the codomain of the function. If the function is called f , this relation is denoted $y = f(x)$ (which is spoken aloud as f of x), the element x is the argument or input of the function, and y is the value of the function, the output, or the image of x by f . The symbol that is used for representing the input is the variable of the function (one often says that f is a function of the variable x).

A function is uniquely represented by the set of all pairs $(x, f(x))$, called the graph of the function. When the domain and the codomain are sets of real numbers, each such pair may be considered as the Cartesian coordinates of a point in the plane. The set of these points is called the graph of the function; it is a popular means to illustrate the function.

Functions are widely used in science, and in most fields of mathematics. It has been said that functions are “the central objects of investigation” in most fields of mathematics.

2 Выполните аннотационный перевод следующего текста.

Mathematics is an area of knowledge that includes the topics of numbers, formulas and related structures, shapes and the spaces in which they are contained, and quantities and their changes.

Most mathematical activity involves the discovery of properties of abstract objects and the use of pure reason to prove them. These objects consist of either abstractions from nature or – in modern mathematics – entities that are stipulated to have certain properties, called axioms. A proof consists of a succession of applications of deductive rules to already established results. These results include previously proved theorems, axioms, and – in case of abstraction from nature – some basic properties that are considered true starting points of the theory under consideration.

Mathematics is essential in the natural sciences, engineering, medicine, computer science and social sciences. Although mathematics is extensively used for modeling phenomena, the fundamental truths of mathematics are independent from any scientific experimentation. Some areas of mathematics, such as statistics and game theory, are developed in close correlation with their applications and are often grouped under applied mathematics. Other areas are developed independently from any application (and are therefore called pure mathematics), but often later find practical applications.

3 Выполните полный письменный перевод следующего текста.

A set is a collection of objects, called the elements or members of the set. The objects could be anything but for us they will be mathematical objects such as numbers, or sets of numbers. The notions of “set” and “membership” can be made mathematically precise by introducing a system of axioms for sets and membership that agrees with our intuition and proving other set-theoretic properties from the axioms. The most commonly used axioms for sets are the ZFC axioms, named somewhat inconsistently after two of their founders (Zermelo and Fraenkel) and one of their axioms (the Axiom of Choice).

Sets are determined entirely by their elements. Thus, the sets X , Y are equal, written $X = Y$, if $x \in X$ if and only if $x \in Y$. It is convenient to define the empty set, denoted by \emptyset , as the set with no elements. (Since sets are determined by their elements, there is only one set with no elements!) If $X \neq \emptyset$, meaning that X has at least one element, then we say that X is nonempty. We can define a finite set by listing its elements (between curly brackets). For example, $X = \{2, 3, 5, 7, 11\}$ is a set with five elements. The order in which the elements are listed or repetitions of the same element are irrelevant. Alternatively, we can define X as the set whose elements are the first five prime numbers. It doesn't matter how we specify the elements of X , only that they are the same. Infinite sets can't be defined by explicitly listing all of their elements

In constructive mathematics and computer science, one may be interested only in sets that can be defined by a rule or algorithm – for example, the set of all prime numbers – rather than by infinitely many arbitrary specifications, and there are some mathematicians who consider infinite sets to be meaningless without some way of constructing them. Similar issues arise with the notion of arbitrary subsets, functions, and relations.

Тема 2. Грамматические особенности перевода

Grammar for revision: Noun: countable and uncountable nouns, singular and plural. Noun phrases.

1. Use the words in brackets in the correct form. Translate the sentences into Russian.

1. A good manual should always contain tables of contents, cross-references, (*index*), and a glossary of technical terms.
2. This year's (*thesis*) on computer science will be collected on a CD-ROM.
3. Did you read the (*memo*) I left on your desk?
4. The software to be developed is formally specified. A state-transition model that shows system responses to (*stimulus*) is used to express the specification.
5. Which science studies such (*phenomenon*) as electricity and conductivity?
6. Computers can complete in minutes computations that used to take days and required complicated (*formula*).
7. The craziness of this phenomenon becomes apparent when we construct a directed graph, called the Collatz graph, whose (*vertex*) are the natural integers, and where there is an edge joining x to y if $y = T(x)$.
8. In APL, the four basic arithmetic operations are defined for vectors (single-dimensioned arrays) and (*matrix*), as well as scalar operands.
9. In a graph, the horizontal and vertical lines form the (*axis*) of a coordinate system.
10. Linguists identify word classes by using syntactic (*criterion*) or tests. These (*criterion*) are the possible occurrence of words of a particular class in a set of grammatical constructions (including morphological inflectional contexts), and their inability to occur in other constructions.

2. Match the words from each column to make compound nouns. Translate them into Russian.

1. barcode	a) counter
2. mainframe	b) program
3. laser	c) bus
4. network	d) decoder
5. floppy	e) computer
6. control	f) reader
7. instructions	g) bar
8. task	h) panel
9. system	i) drive
10. program	j) printer

3. Put the following words in order to form noun phrases. Translate them into Russian.

1. distribution function sample.
2. chip memory designer.
3. sized digital pocket camera.
4. multimedia program compute.
5. language first computer generation.
6. flight program simulation high-end.
7. software incremental development.
8. language programming standard.
9. cluster boundary set.
10. standard package library.

4. Use the words in the box to complete the definitions below. Translate the definitions into Russian.

hub, router, thin client, backbone, server, bridge, LAN, client, gateway, network

1. A ... is an interface enabling dissimilar networks to communicate.
2. A ... is a hardware and software combination used to connect the same type of networks.
3. A ... is a network transmission path handling major data traffic.
4. A ... is a special computer directing messages when several networks are linked.
5. A ... is a number of computers and peripherals linked together.
6. A ... is a network connecting computers over a small distance such as within a company.
7. A ... is a powerful computer storing data shared by all the clients in the network.
8. A ... is a network computer used for accessing a service on a server.
9. A ... is a simple computer comprising a processor and a memory, display, keyboard, mouse and hard drives only.
10. A ... is an electronic device connecting all the data cabling in a network.

Grammar for revision: Formation of adjectives and adverbs. Comparative and superlative forms and patterns.

5. Choose the correct word to complete the sentences. Translate the sentences into Russian.

1. I am *happy/happily* to meet you. They have lived all their life *happy/happily*.
2. The results of our work were *perfect/perfectly*. We have done everything *perfect/perfectly*.
3. I am quite *helpless/helplessly* in solving such problems. She looked at them *helpless/helplessly* not knowing what to do.
4. They think English is an *easy/easily* language.

5. The question can be answered quite *simple/simply*.
6. I don't work for that company. They don't pay *regular/regularly*.
7. Tom didn't do very *good/well* in his examination.
8. Can you please repeat this information *slow/slowly*?
9. The customs officer checked our documents *thorough/thoroughly*.
10. The road isn't *wide/widely* enough for the lorry to get through.
11. GNU compilers collection, more *commonly/common* called GCC, is a comprehensive set of compilers for commonly used languages including the following.
12. When a conflict is detected in the files being checked in, CVS provides a mechanism to merge the files *appropriately/appropriate*.
13. Well-known project management methods are usually *helpful/helpfully* for this task.
14. The latest version of the specifications at the time of writing this book is *available/availably* at <http>
15. You may have to go through multiple cycles during the testing phase as software testers find problems and bugs and developers fix them before a software product is *officially/official* released.
16. Sometimes a developer must react *quick/quickly* and *aggressively/aggressive* to meet ever-changing market demands.
17. JavaScript is included in *virtual/virtually* all browsers; PHP is included in *virtually/virtual* all Web servers.
18. Proofs also play a growing role in computer science; they are used to certify that software and hardware will always behave *correctly/correct*, something that no amount of testing can do.
19. Machine learning builds upon the language of mathematics to express concepts that seem *intuitive/intuitively* obvious but that are *surprising/surprisingly* difficult to formalize.

6. Fill in the blanks with appropriate adjectives. Translate the sentences into Russian.

optical, tremendous, temporary, magnetic, versatile, available, possible, different, suitable, excellent, individual

1. The Internet is the quickest and easiest way of making information ... to all users.
2. RAM provides ... storage for data and information. In fact, it is volatile memory.
3. All modern general-purpose computers are ..., but analogue computer circuits are used in industrial control equipment.
4. Hard disks and floppy disks are ... devices, whereas CD-ROMs and DVDs are ... devices.
5. In the 80s, computer manufacturers immediately realized the ... potential of laser disk technology.

6. Each developer has to write his/her own code and collaborate with other developers to make sure that ... components can interoperate with each other.

7. Many ... products fail because they are either too early or late to market.

8. The marketing and sales people usually decide a ... time frame to bring the product to market.

9. Based on the timeline, the architecture team may drop some features of the product if it is not ... to bring the full-featured product to market within the required time limits.

10. Senior software developers usually create design documents and these documents define ... software components to the level of functions and procedures.

7. Form adjectives from the following words.

access, adapt, add, alter, apply, automate, base, benefit, break, care, change, compare, compete, consider, convince, create, develop, differ, dominate, danger, explain, fault, favour, harm, help, inform, innovate, invent, mean, operate, perceive, period, profit, protect, reason, rely, replace, resist, retrieve, science, serve, specify, succeed, process, type, use, value, vary, wear, week

8. Transform the adjectives given in brackets into adverbs and then use them in the sentences. Translate the sentences into Russian.

Example: Are you tired of using the same keystrokes? Use a macro. (*repeated*) = Are you tired of using the same keystrokes *repeatedly*? Use a macro.

1. You would appreciate this program. (*certain*)

2. The computer can do anything it is programmed for. (*practical*)

3. A word processor can check spelling and grammar. (*ready*)

4. Business graphics software is used to present statistics in a form that can be understood. (*easy*)

5. When using a computerized thesaurus, a click of the mouse will bring up the appropriate set of alternatives. (*instant*)

6. The secretary told him to hold on the line. (*polite*)

7. They use Microsoft Word. (*regular*)

8. He examined the documents. (*attentive*)

9. An integrated package is less expensive to buy. (*normal*)

10. Word processors are versatile, offering you a wide range of capabilities. (*extreme*)

11. There is more effort required to design and build a relational database. (*undoubted*)

12. They provide ready-made tools and commands for performing simple, common operations. (*relative*)

Grammar for revision: Tenses in the Active and Passive Voice

9. Identify any grammatical errors in the following sentences and correct them. Translate the sentences into Russian.

1. Both of these strategies are useful depending how urgent the requirement for new features are.

2. A subprogram that do numerical integration estimate the area under the graph of a function by sampling the function at a number of different points.

3. Compilers and assemblers are the core development tools because they converts source code to executable form.

4. Pure functional languages, such as Haskell, does not have variables, so their functions cannot have side effects.

5. This definition is generic in the sense that it works for any numeric type. However, it does not always works correctly if called with a parameter that has a side effect.

6. The revision control system is a must for any serious development effort where multiple developers works on a software product.

7. When multiple developers is modifying the same file at the same time, conflict may occur between different changes made by multiple developers.

8. The development process need computers, networks, storage, printing and other hardware components.

9. Selection of software development tools depends upon the choice of hardware and operating system.

10. A development manager usually acts as a binding and coordinating force among different parties with conflicting interests.

11. Usually testing starts as soon as the initial parts of the software is available.

12. Every software version contain release notes.

13. Many commercial companies also sells comprehensive development tools.

14. If you is doing some cross-platform development, then your compiler should support code generation for the target machine as well.

15. You may provide an upgrade to the current release as a patch, or wait until you has compiled and developed a list of new features and make a new version.

16. The process of learning a new programming language can be lengthy and difficult, especially for someone who is comfortable with only one or two languages and have never examined programming language concepts in general.

17. Programmers who understand the concepts of object-oriented programming will has a much easier time learning Ruby than those who have never used those concepts.

18. The index data also show that the distribution of usage of programming languages are always changing.

19. Lists have been a central part of functional programming languages since the first such language has appeared in 1959.

20. As applications of machine learning becomes widespread in society, we believe that everybody should have some understanding of its underlying principles.

10. Use the words in brackets in the correct form (*Present, Past or Future Simple Passive*). Translate the sentences into Russian.

1. The names of your files (keep) in a directory on each disk.
2. Programs normally (store) in secondary memory and loaded into main memory as needed.
3. Check that an Ethernet cable (plug) in to the correct card on the rear of the computer.
4. One of the earliest attempts to propel a vehicle by mechanical power (suggest) by Isaac Newton.
5. Main memory commonly (know) as random-access memory, or RAM.
6. Modern skyscrapers (build) with materials such as steel, glass, reinforced concrete and granite, and utilize mechanical equipment such as water pumps and elevators.
7. Our lab (equip) with state of the art electronic test and measurement equipment next year.
8. The energy consumption in our factory (reduce) by 10 per cent next year.
9. Later-model computers (provide) with the capability of handling numerous input devices directly.
10. The delay (cause) by the accident on the motorway.
11. The first practical internal combustion engine (introduce) in the form of a gas engine by the German engineer N. Otto in 1876.
12. In first lathes the work piece (rotate) to and fro by an assistant pulling on the ends of a cord wrapped two or three times around the work.
13. During the Renaissance arts and science underwent great changes. In architecture, these changes (mark) by a return to classical forms and proportions of ancient Roman buildings.
14. The consignment (deliver) to the customer by next Monday.
15. Sensors (use) to check variations of light, heat, temperature, position, moisture and many other physical data.
16. Velocity (measure) in kilometers per hour, miles per hour, or meters per second.
17. In arc welding, the intense heat needed to melt metal (produce) by an electric arc.
18. Diesel engines commonly (use) in heavy machinery, locomotives, ships and in cars.
19. If various objects (connect) to form separate paths between the terminals of a source of electric current, they are said to be “connected in parallel”.
20. Tomorrow the whole presentation (to prepare) using a variety of software applications.
21. The Apple I (to assemble) in a garage by two young engineers, Steve Wozniak and Steve Jobs.
22. Who (to invent) the integrated circuit by?
23. In the near future neural networks (to develop), which will imitate the learning of the human brain.

24. Every day, new more user-friendly technological devices (to build) to solve information problems.

25. Do you know how e-mail spam (to send)?

26. Information (to store) as a sequence of 1s and 0s.

27. A few years ago armies of office workers (to require) for routine tasks.

28. Lexical and syntax analysis (discuss) in Chapter 1, and implementation of subprogram linkage (cover) in Chapter 3. Implementation of some other language constructs (discuss) in various other parts of the book.

29. A complex problem (divide) into several smaller problems and then the smaller problems (solve) one by one.

30. The basic textual problem is the problem called pattern matching. It (use) to access information and probably many computers are solving in this moment this problem as a frequently used operation in some application system.

11. Match the following features to the correct category of software. Put the verbs in brackets into *Present Indefinite Passive*. Translate the sentences into Russian.

1. Grammar exercises (to feature)	a) database
2. Visual representations of values in the form of pie charts can (to make)	b) language-learning software
3. Large amounts of data (to store) digitally	c) word-processing
4. Information (to present) in an attractive and concise manner	d) presentation software
5. Maps can (to display)	e) route planners
6. Different types and sizes of fonts can (to use)	f) spreadsheets

12. Change the following *Active Voice* sentences to *Passive Voice* sentences. Translate the sentences into Russian.

1. In the future we won't need a keyboard to input data.

2. My voice mail program automatically downloads incoming messages.

3. They must take measures to protect the system against viruses.

4. The system administrator doesn't seem to be doing anything about it.

5. People are buying more and more merchandise online.

6. So far in this section, we have been studying univariate change of variables.

7. A *disk drive* stores data by magnetically encoding it onto a circular disk.

8. Somebody always takes care of all the program updates.

9. They are selling monitors at a reduced price.

10. You have to pay a lot of money for the new software.

11. Software engineering principles use two important techniques to reduce problem complexity: *abstraction* and *decomposition*.

12. First, we need to work out the inverse transform, and substitute that into the density of x . Then we calculate the determinant of the Jacobian and multiply the result.

13. The following example illustrates the case of a bivariate random variable.

14. They use pen-drives to store data.

15. You can download music from iTunes.
16. They require sophisticated anti-virus software these days.
17. A *compiler* is a program that translates a high-level language program into a separate machine language program.
18. You should save files on the hard disk.
19. Microsoft has just launched a new powerful operating system.
20. The Japanese are developing Artificial Intelligence projects.

13. Change the following *Passive Voice* sentences to *Active Voice* sentences. Translate the sentences into Russian.

1. Hardware components are built using electronic circuits and mechanical parts.
2. The PC is formed using several major components.
3. In computer systems, data can be stored internally and externally.
4. Read Only Memory chips are commonly called ROM.
5. RAM chips can be erased and written again.
6. The CPU is connected to the RAM and ROM chips by circuitry.
7. When a software product is being developed by a team there must be a clear understanding among team members about when and what to do.
8. Logical deductions, or inference rules, are used to prove new propositions using previously proved ones.
9. In the interest of keeping the book short, many details and more advanced concepts have been left out.
10. Program execution terminates when a stop instruction is encountered, although on an actual computer a stop instruction is rarely executed.
11. Reviews of digital versions of the book were performed by several scientists.
12. During each integration step, the partially integrated system is tested and a set of previously planned modules are added to it.
13. The α -testing is performed by the development team.
14. The following basic questions pertaining to the project should be clearly understood by the analyst in order to obtain a good grasp of the problem.
15. This information is placed in the symbol table by the lexical and syntax analyzers.
16. The same method of indicating subscripts was used by Charles Babbage in programs for his Analytical Engine in the middle of the nineteenth century.
17. All of the software that we use to make our computers useful is created by programmers or software developers.
18. The first of these new languages, named Short Code, was developed by John Mauchly in 1949 for the BINAC computer.
19. ML was originally designed in the 1980s by Robin Milner at the University of Edinburgh as a metalanguage for a program verification system named Logic for Computable Functions.
20. C# (pronounced “c sharp”) language was created by Microsoft around the year 2000 for developing applications based on the Microsoft .NET platform.

14. Use the words in brackets in the correct form (*Active or Passive Voice*). Translate the sentences into Russian.

1. Electric drill (to drive) by an electric motor; while pneumatic drills are equipped with a compressed-air motor.
2. They (to build) a huge plant in this town recently.
3. Diamond often (to use) as working end of drill tools.
4. The answer to this question can (to find) in the encyclopedia.
5. In a car the linear motion (to convert) into rotational motion by the crankshaft, to which the connecting rods (to attach).
6. The piston (to move) down and the air/fuel mixture (to push) into the cylinder by atmospheric pressure.
7. Manufacturing technology (to grow) exponentially over the past two decades, as many auto industry segments (to adopt) methods aimed at reducing labor and material costs while increasing productivity, efficiency and component quality.
8. Many people, including engineers and construction experts, (to involve) in figuring out what type of road should be made.
9. Smart materials are materials (to change) their properties in response to external conditions.
10. Gasoline car engines (to use) spark ignition whereas diesel engines use compression ignition.
11. Some construction work (to do) in Park Avenue now.
12. The Python language (use) an *interpreter*, which is a program that both (translate) and (execute) the instructions in a high-level language program.
13. Street lights (to replace) a year ago.
14. The programmer (use) a *compiler* to translate the code into a machine language program, or an *interpreter* to translate and execute the code.
15. The Unix system (use) as a main feature text files for exchanging information.
16. Bill Gates and Paul Allen (to found) Traf-O-Data in 1971 to sell their computer traffic-analysis systems.
17. The physical devices that a computer is made of are referred to as the computer's hardware. The programs that run on a computer are referred to as software.
18. In addition to external disk drives, many types of devices have been created for copying data, and for moving it to other computers.
19. Software engineering is a branch of computer science, which uses well-defined engineering concepts required to produce efficient, durable, scalable, in-budget and on-time software products.
20. A life cycle model represents all the activities required to make a software product transit through its life cycle phases.

15. Translate the following sentences into Russian paying attention to the *Passive Voice*.

1. We also ignore the important and delicate problem of agreeing on how the value of an expression is to be represented.

2. Matrices are read either by rows or by columns and the number of rows and columns determines the size of the matrix. Hence, a matrix with four rows and three columns is called a four-by-three matrix.

3. In practice, systems of many linear equations are solved indirectly, by either stationary iterative methods, such as the Richardson method, the Jacobi method, the Gauß-Seidel method, and the successive over-relaxation method, or Krylov subspace methods, such as conjugate gradients, generalized minimal residual, or biconjugate gradients.

4. A hyperplane is called a supporting hyperplane of a convex set if it intersects the convex set, and the convex set is contained on just one side of it.

5. The SVD low-rank approximation is frequently used in machine learning for computational efficiency reasons.

6. Another thing to notice is that important or long formulas are written on separate lines.

7. The new software development methodologies that emerged as a result of the research of the 1970s were called top-down design and stepwise refinement.

8. It is widely believed that the depth at which people can think is influenced by the expressive power of the language in which they communicate their thoughts.

9. Computers have been applied to a myriad of different areas, from controlling nuclear power plants to providing video games in mobile phones.

10. The first digital computers, which appeared in the late 1940s and early 1950s, were invented and used for scientific applications.

11. All of the software that we use to make our computers useful is created by individuals working as programmers or software developers.

12. USB drives, which are also known as *memory sticks* and *flash drives*, are inexpensive, reliable, and small enough to be carried in your pocket.

13. Optical devices such as the *CD* (compact disc) and the *DVD* (digital versatile disc) are also popular for data storage. Data is not recorded magnetically on an optical disc, but is encoded as a series of pits on the disc surface.

14. Software is considered to be a collection of executable programming code, associated libraries and documentations.

15. The requirements analysis activity is begun by collecting all relevant data regarding the product to be developed from the users of the product and from the customer through interviews and discussions.

16. Proofs also play a growing role in computer science; they are used to certify that software and hardware will always behave correctly, something that no amount of testing can do.

17. Propositions like these that are simply accepted as true are called axioms.

18. When the statements above the line, called the antecedents, are proved, then we can consider the statement below the line, called the conclusion or consequent, to also be proved.

19. After all ambiguities, inconsistencies, and incompleteness have been resolved and all the requirements properly understood, the requirements specification activity can start.

20. Most of the popular languages of the past 60 years have been designed around the prevalent computer architecture, called the von Neumann architecture, after one of its originators, John von Neumann.

21. Nearly all digital computers built since the 1940s have been based on the von Neumann architecture.

22. Programming languages are often categorized into four bins: imperative, functional, logic, and object oriented.

23. Because the CPU understands only machine language instructions, programs that are written in a high-level language must be translated into machine language. Depending on the language that a program has been written in, the programmer will use either a compiler or an interpreter to make the translation.

24. The Python interpreter can run Python programs that are saved in files, or interactively execute Python statements that are typed at the keyboard.

25. We say that a previous match ends at a position q in the text, if, in some previous iteration, the end of the pattern was positioned at q .

26. Neural network researchers are seeking an understanding of nature's capabilities for which people can engineer solutions to problems that have not been solved by traditional computing.

27. In recent years, several programming languages have been proposed that aim to treat the variables defined in software as random variables corresponding to probability distributions.

28. Long programs are usually broken into a hierarchy of smaller procedures.

29. The requirements analysis activity is begun by collecting all relevant data regarding the product to be developed from the users of the product and from the customer through interviews and discussions.

30. During the integration and system testing phase, the modules are integrated in a planned manner. The different modules making up a software product are almost never integrated in one shot. Integration is normally carried out incrementally over a number of steps.

<i>Grammar for revision: Requirement: need to/have to/must</i>
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16. Fill in the blanks with the appropriate form of the modal verbs, *need to/ have to/must*, to make statements. Translate the sentences into Russian.

1. Technical qualifications ... to be renewed at intervals to ensure they do not go out of date.

2. You ... become an expert in too narrow a field.

3. You ... have good communication skills to become an IT manager.

4. You ... be an expert in hardware to become a programmer.

5. You ... have worked with IBM mainframes for at least two years.

6. You ... to be able to show leadership.

7. You ... have a degree but it ... be in computing science.

8. You ... to have experience in *JavaScript*.

9. You ... be able to use *Java*.
10. These days you ... learn *Python*.

Grammar for revision: Advice: should

17. Complete the sentences using *should/ shouldn't*. Translate the sentences into Russian.

1. If you want to save time, you ... rely on the new voice recognition technology.
2. A monochrome screen ... give you a better display than a color one.
3. If you want to send her an e-mail, you ... know her e-mail address.
4. We ... waste a lot of money on technology we don't know how to use.
5. Before buying a PC, buyers ... get expert advice.
6. They ... also try to see the systems they want to buy in operation.

Grammar for revision: Possibility: may/ might/ can/ can't

18. Fill in the blanks with *can/can't* or *may/might*. More than one answer is possible. Translate the sentences into Russian.

1. With the help of the 'Copy' function, a text block ... be copied in another location in the same file or from file to disk.
2. He said he ... come to the meeting, but he was not sure.
3. A non-computerized database ... provide an accurate record of data, but by today's computer-perfect standard it is no longer acceptable.
4. Users ... select the different options of a spreadsheet by displaying the command line.
5. The user ... upload new applications if he doesn't have an administrator access.
6. Although the design and completion of a book ... be carried out with DTP software, the text is still often written in a word processing package.
7. He ... have forgotten the password!
8. A standard screen ... hold about 20 rows of a worksheet but worksheets with more rows ... be built.
9. Volatile memory means that it ... store information when the power is switched off.
10. PC programs ... run out on a Macintosh system.

19. Translate the following sentences into Russian paying attention to the *Modals*. Translate the sentences into Russian.

1. Assignment statements should not be confused with equations.
2. Before a variable can be used in an expression it must have a value, which is either assigned on input or by an assignment statement.
3. These set operations may be represented by Venn diagrams, which can be used to visualize their properties.
4. A predicate can be understood as a proposition whose truth depends on the value of one or more variables. Like other propositions, predicates are often named

with a letter. Furthermore, a function-like notation is used to denote a predicate supplied with specific variable values.

5. Generally, orthogonal complements can be used to describe hyperplanes in n -dimensional vector and affine spaces.

6. Advances in technology and science are transforming our world at an incredible pace, and our children's future will surely be filled with leaps in technology we can only imagine.

7. A specific eigenvalue's geometric multiplicity must be at least one because every eigenvalue has at least one associated eigenvector. An eigenvalue's geometric multiplicity cannot exceed its algebraic multiplicity, but it may be lower.

8. Adding up dimensions of these two spaces yields a number greater than n , as there must be a nonzero vector in both spaces.

9. Generally, orthogonal complements can be used to describe hyperplanes in n -dimensional vector and affine spaces.

10. We can find approximate solutions to unsolvable linear equation systems using projections.

11. Understanding the process of science can help anyone develop a scientific outlook on life.

12. Kernel methods exploit the fact that many linear algorithms can be expressed purely by inner product computations.

13. In this chapter, we present three aspects of matrices: how to summarize matrices, how matrices can be decomposed, and how these decompositions can be used for matrix approximations.

14. Gaussian elimination can be used to compute the determinant of a matrix.

15. People are keen to know what happens to their data, how they can control how much information they share and what protections they have.

16. Finally, it is essential that practicing programmers know the vocabulary and fundamental concepts of programming languages so they can read and understand programming language descriptions and evaluations, as well as promotional literature for languages and compilers.

17. We know that repeated eigenvalues may result in defective matrices, which cannot be diagonalized.

18. With all the big data being generated from genomics projects and electronic medical records from across the globe, artificially intelligent computers can learn to spot patterns in all that information, leading to faster discoveries and huge jumps forward in our understanding of diseases and how to treat them.

19. The automatic differentiation approach above works whenever we have a function that can be expressed as a computation graph, where the elementary functions are differentiable. In fact, the function may not even be a mathematical function but a computer program. However, not all computer programs can be automatically differentiated, e.g., if we cannot find differential elementary functions. Programming structures, such as for loops and if statements, require more care as well.

20. We can calculate the mean and variance of resulting random variables when we consider affine transformations of random variables. However, we may not be able to obtain the functional form of the distribution under transformations. Furthermore,

we may be interested in nonlinear transformations of random variables for which closed-form expressions are not readily available.

21. Vectors that are orthogonal with respect to one inner product do not have to be orthogonal with respect to a different inner product.

22. In vector spaces with general inner products, we have to pay attention when computing angles and distances, which are defined by means of the inner product.

23. To have a meaningful rotation angle, we have to define what “counterclockwise” means when we operate in more than two dimensions.

24. The chain rule resembles to some degree the rules for matrix multiplication where we said that neighboring dimensions have to match for matrix multiplication to be defined.

25. As machine learning allows us to model more intricate distributions on ever more complex types of data, a developer of probabilistic machine learning models would have to understand these more technical aspects.

26. In summary, because convex sets can be equivalently described by its supporting hyperplanes, convex functions can be equivalently described by a function of their gradient. The *Legendre transform* formalizes this concept.

27. When you use your mathematical knowledge in the future, you may be required to explain your thinking process to another person, and it will be quite likely that this other person will know less math than you do.

28. Hence, mathematics which is written clearly and carefully is more likely to be correct.

29. In addition to key words and operators, each language also has its own *syntax*, which is a set of rules that must be strictly followed when writing a program. The syntax rules dictate how key words, operators, and various punctuation characters must be used in a program. When you are learning a programming language, you must learn the syntax rules for that particular language.

Grammar for revision: Verbals – Participle I (doing) and Participle II (done)

20. Use the words in brackets in the correct form: *Participle I* and *Participle II*. Translate the sentences into Russian.

1. Scientists are experimenting with a system (to allow) drivers to see better after dark.

2. The investigation (to carry out) by the students is very interesting.

3. New technologies reduce the number of workers (to need).

4. The project (to discuss) by the engineers has numerous advantages.

5. The professor (to deliver) a lecture on the use of new engines has a lot of papers in the field of automotive engineering.

6. (to wait) in the hall, he thought over the problem he was planning to discuss with our lecturer.

7. When the analyst detects any inconsistencies, anomalies or incompleteness in the (gather) requirements, he resolves them by carrying out further discussions with customers.

8. A decision tree gives a graphic view of the processing logic (involve) in decision making and the corresponding actions taken.

9. The basic incompleteness results of first-order logic suggest that it is impossible to check absolute correctness of systems (use) theorem (prove) techniques.

10. The architectural design is the highest abstract version of the system. It identifies the software as a system with many components (interact) with each other.

21. Write the sentences correctly paying attention to the use of *Participle I* and *Participle II*. Translate the sentences into Russian.

1. The basic data structures in the book are data structures represented all factors of a given word.

2. This company supplies electrically-driving accessories to provide power for lighting, refrigeration, and other electrical appliances or loads.

3. A new research method using for gathering data led to more reliable results.

4. The Sun radiated a tremendous amount of energy provides us with everything.

5. A drilling machine is a machine tool, usually motor-driven, fitting with an end cutting tool that is rotated in order to create a hole or to enlarge an existing hole in a solid material.

6. Serious faults finding in the project had to be corrected quickly.

7. Caml and its dialect that supports object-orienting programming, OCaml, descended from ML and Haskell.

8. Every imperative programming language designing since 1960 owes something to ALGOL 60.

9. *Syntax error* is a mistake such as a misspelling key word, a missing punctuation character, or the incorrect use of an operator. When this happens the compiler or interpreter displays an error message indicated that the program contains a syntax error.

10. The examples consist of two classes that have features arranging in such a way as to allow us to separate/classify them by drawing a straight line.

22. Translate the following sentences into English paying attention to the use of *Participle I* and *Participle II*.

1. Операционная система выполняет роль связующего звена между аппаратурой компьютера, с одной стороны, и выполняемыми программами, а также пользователем, с другой стороны.

2. Приборы, установленные в лаборатории, будут использоваться студентами во время практики.

3. Насколько конкурентоспособен разрабатываемый продукт?

4. Студенты, разработавшие этот проект, сейчас проходят практику на предприятии.

5. Новая антивирусная программа, представленная этим разработчиком, имеет ряд существенных преимуществ.

6. Человечество, потребляющее огромное количество энергии, скоро может столкнуться с энергетическим кризисом.

7. Необходимо найти инструмент, позволяющий автоматически приводить кодировки всех текстовых файлов к некоей одной.

8. Корректно работающий интерфейс может быть неудобным, а удобный может работать некорректно.

9. Спецификация тест-кейса – документ, описывающий набор тест-кейсов (включая их цели, входные данные, условия и шаги выполнения, ожидаемые результаты) для тестируемого элемента.

10. Соотношение между требующимися программными продуктами и имеющимися на рынке меняется очень быстро.

23. Choose the correct word to complete the sentences paying attention to the use of participles. Translate the sentences into Russian.

1. The engineers tackling/tackled/being tackled the energy problem did not reach a compromise.

2. The equipment delivering/delivered/being delivered yesterday has just been installed.

3. The coils connecting/connected/being connected to each other will be attached to a battery through an on-off switch.

4. Tests of the properties of the electromagnetic circuit carrying/carried/being carried out by this team have shown good results.

5. The high voltage circuit checking/checked/being checked now will be used soon.

6. Technological and environmental applications of science require *qualified/qualifying/being qualified* professionals who acquire their skills through formal education.

7. The basic textual problem is the problem *calling/called/being called pattern matching*.

8. Create the new sequence by going down the diagonal of the matrix and, for each element *encountering/encountered*, add a differing element to the sequence *creating/being created*.

9. We can define *software engineering* as an engineering branch *associating/associated* with the development of software product using well-defined scientific principles, methods and procedures.

10. This has been carried out based on objective (evolution of the number of good candidates and retention of qualified teachers) and subjective (i.e. the responses to the questionnaires and interviews *designing/designed* for this study) criteria.

24. Translate the following word combinations into Russian.

Designed to work with images, a *designing* team, a *performed* operation, an operation *performing* machine, *executing* instructions program, *executed* instructions, *entering* information to the system, *entered* information, *processed* data, constantly *processing* data, *processing* unit, a file *compressing* program, a *pressed* key, a *printed* document, a *printing* device.

25. Translate the following word combinations into English.

1. to display – отображающее результаты устройство; отображенные на мониторе результаты; работать, отображая результаты.

2. to convert – преобразованные в двоичный код данные; преобразовывая звук в цифровые данные.

3. to reboot – перезагружающаяся система; компьютер, перезагруженный правильно; не сохранить результаты, перезагружая компьютер.

4. to store – сохраненная информация; память, сохраняющая информацию временно.

5. to link/ to connect – компьютеры, соединенные в сеть; соединяющие провода; соединяя аппаратное и программное обеспечение.

6. to develop – развивающаяся компания; разработанные технологии.

26. Use the words in brackets in the correct form paying attention to the use of participles. Translate the sentences into Russian.

1. Once (log) in, users can download files, engage in conferencing and so on.

2. Internet is a computer-(base) global information system (compose) of many (interconnect) computer networks (link) thousands of computers.

3. The data are decoded by a processing unit (call) the instruction decoder.

4. Keyboard is similar to a typewriter keyboard with some extra keys (program) to do special tasks.

5. (Click) the left button of the mouse twice you mainly select the items.

6. Modern monitors have LCD or plasma display system (offer) highly-(define) images.

7. Modem connects the computer to the telephone lines (convert) digital signals into analogue.

8. In the 1990s MS-DOS was replaced by Windows, a more user-friendly operating system (develop) by Microsoft.

9. (Store) information may be used as input for other applications, (put) the processing cycle into motion again.

10. Design methodology is an interdisciplinary topic (attract) researchers from miscellaneous design disciplines such as architecture, engineering and industrial design.

11. Special processors, such as the one inside your keyboard that handles the signals (generate) when you press a key, perform (specialize) tasks (design) to get data into and out of the CPU.

12. The current standard for processors is Intel's Pentium chip, the most recent (be) Pentium 6.

13. Modern CPUs (run) at speeds of about 1 gigahertz can consume massive amounts of data, potentially billions of bytes per second.

14. Once (insert) into the CD-ROM drive, the text, video and images can be read in RAM for processing or display.

15. During the process of CD manufacturing, polycarbonate plastic is impressed with microscopic *bumps* (arrange) as a single continuous track (spiral) from the center of the disc to the circumference.

16. In a CD, the *lands* are the unburned flat areas (separate) the *pits*. The lands and pits (represent) the zeros and ones are used to store data.

17. (compare) to a floppy disk, either type of disk has a gigantic storage capacity.

18. Adobe Photoshop is an image editing program that allows you to work with graphic images, such as photos (take) with your digital camera.

19. Main memory is commonly known as *random-access memory*. It is called this because the CPU is able to quickly access data (store) at any random location in RAM.

20. The operating system controls the internal operations of the computer's hardware, manages all of the devices (connect) to the computer, allows data to be saved to and retrieved from storage devices, and allows other programs to run on the computer.

<p><i>Grammar for revision: Verbals -ing-forms</i></p>
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27. Translate the following sentences paying attention to -ing-forms.

1. Smoking causes lung cancer.

2. She suggested seeing a movie after work.

3. I dislike being involved into the discussion, which has nothing to do with my scientific interests.

4. I regret having missed two seminars, but I was ill.

5. This is the basic method of solving problems of statics.

6. In this chapter, we present important tools for constructing stabilizing models.

7. This method is useful for finding optimal control for linear control systems.

8. The characteristics of a STEM (science, technology, engineering and mathematics) graduate usually include: numeracy and the ability to generate, understand and analyze empirical data including critical analysis; an understanding of scientific and mathematical principles; the ability to apply a systematic and critical assessment of complex problems with an emphasis on solving them and applying the theoretical knowledge of the subject to practical problems; the ability to communicate scientific issues to stakeholders and others; ingenuity, logical reasoning and practical intelligence.

9. A cursor is a blinking character that indicates the position of the next keyed-in character on the screen.

10. Scientists have been seeking ways of improving the speed and miniaturization of computers for many years.

11. Before choosing a computer, you should take into consideration upgradability, expandability, and technical support.

12. For the moment we consider expressions whose evaluation involves testing a single (in)equality, called relational expressions.

13. A function might also be defined by a procedure for computing its value at any element of its domain, or by some other kind of specification.

14. Sometimes an argument can be greatly simplified by introducing a variable, devising a special notation, or defining a new term.

15. Computing the gradient can be very time consuming. However, often it is possible to find a "cheap" approximation of the gradient. Approximating the gradient is still useful as long as it points in roughly the same direction as the true gradient.

16. Being able to write clearly is as important a mathematical skill as being able to solve equations.

17. Instead of using binary numbers for instructions, assembly language uses short words that are known as mnemonics.

18. A high-level language allows you to create powerful and complex programs without knowing how the CPU works, and without writing large numbers of low-level instructions.

19. This book describes the fundamental concepts of programming languages by discussing the design issues of the various language constructs, examining the design choices for these constructs in some of the most common languages, and critically comparing design alternatives.

20. A program can have thousands or even millions of binary instructions, and writing such a program would be very tedious and time consuming.

21. A high-level language allows you to create powerful and complex programs without knowing how the CPU works, and without writing large numbers of low-level instructions.

22. When an interpreter encounters a syntax error, it stops executing the program.

23. Python comes with a program named IDLE that simplifies the process of writing, executing, and testing programs.

24. Once Python has been installed and set up on your system, you start the interpreter in interactive mode by going to the operating system's command line and typing the following command: python.

25. The shortcut implementation of a function, for example, may produce the desired results by using a table look-up instead of performing the actual computations.

26. The experience gained in developing the prototype can be used to develop the final product.

27. The analyst starts *requirements gathering and analysis* activity by collecting all information from the customer which could be used to develop the requirements of the system.

28. A formal technique is a mathematical method to specify a hardware and/or software system, verify whether a specification is realizable, verify that an implementation satisfies its specification, prove properties of a system without necessarily running the system, etc.

29. The language *awk* can be considered as a generalization of another Unix tool, *lex*, aimed at producing lexical analyzers.

30. The question of constructing *pattern-matching automata* is an important component having practical application in the *lex* software.

<i>Grammar for revision: Verbals - Infinitive with/ without to</i>
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28. Open the brackets and use the *Infinitive* with or without *to*. Translate the sentences into Russian.

1. This program doesn't let the user (save) the changes in the image.
2. He seems (work) hard on fixing the bugs.
3. We saw him (edit) the photo in Photoshop.
4. Students should (learn) BASIC before they tackle C++.
5. Don't you dare (shut) down my computer like that.

6. I want you (help) me with choosing a good printer.
7. Why not (use) a wireless mouse instead of a wired one.
8. Would you rather (install) Windows or Linux operating system?
9. I am surprised (know) that this site works only in Google Chrome.
10. He is experience enough (be) a Chief System Administrator.
11. At some point Steve Jobs was made (leave) his own company.
12. Last week I noticed him (use) the Internet for his personal purposes at work.
13. When the update came up he was the first (upgrade) the application.
14. The approximation is good enough (produce) an overall linear-time algorithm, and the computation requires only a bounded extra memory space.
15. This training course will make you (become) a better engineer.
16. Let the state s of a program (be) represented as a set of ordered pairs.
17. If you're going to prove a proposition, you'd better (have) a precise understanding of what the proposition means.
18. Let us (have) a closer look at the chain rule.
19. USB drives, which are also known as *memory sticks* and *flash drives*, are inexpensive, reliable, and small enough (be) carried in your pocket.
20. It is difficult (restore) lost files.

Grammar for revision: Complex Object (with let, allow, enable, help)

let + object + \emptyset infinitive

allow, enable + object + *to* infinitive

help + object + *to*/ \emptyset infinitive

29. Use the words in brackets in the correct form. Translate the sentences into Russian.

1. The Help Desk enables users (get) advice on most problems.
2. Adding more memory lets your computer (work) faster.
3. Windows allows you (display) two different folders at the same time.
4. The Shift key allows you (type) in upper case.
5. The MouseKeys feature enables you (use) the numeric keypad to move the mouse pointer.
6. Alt + Tab allows you (switch) between programs.
7. The StickyKeys feature helps disabled people (operate) two keys simultaneously.
8. Alt + PrintScreen lets you (copy) an image of an active window to the Clipboard.

30. Complete the following sentences with let, allow, enable, help. Translate the sentences into Russian.

1. Can you ... me download these documents, please?
2. Peripheral devices ... input and output operations.
3. Please ... us know the exact time of delivery.
4. Electronic mail ... you to send and receive messages over the Internet.

5. Technologies that ... communications and the sharing of resources between different platforms are called cross-platform technologies.

6. What does word-processing software ... you to do? It ... me create text-based documents into which I can integrate images.

7. Who ... you to use my computer?

8. This operating software doesn't ... to download malicious software.

9. Last week, the board of directors officially ... the installation of a new computer system.

10. Are you ready? Just ... me finish this report. I won't take more than five minutes.

11. E-mail is a simple service that ... two people to send messages in a near-real-time manner.

12. ... us look closer at the algorithm *brute_force1* and at its main invariant $inv1(i, j)$.

13. Event handlers ... a program to be responsive to user actions.

14. ... N be the total number of defects in the system and ... n of these defects be found by testing.

15. The configuration management tool ... the engineers to change the various components in a controlled manner.

16. Personal Software Process is a framework that ... engineers to measure and improve the way they work.

17. A good knowledge of the intricacies of the project and the development process ... the managers to effectively identify the important tasks of the project.

18. IDLE also has a built-in text editor with features specifically designed to ... you write Python programs.

19. Microsoft Word is a word processing program that ... you to create, edit, and print documents with your computer.

20. Another benefit of understanding implementation issues is that it ... us to visualize how a computer executes various language constructs.

31. Use the words in brackets in the correct form (*Gerund* or *Infinitive*). Translate the sentences into Russian.

1. He has trouble admitting (make) mistakes.

2. Grace Hopper began (program) one of the very first computers in 1943.

3. Can we really afford (spend) any more money on such expensive application?

4. The reminder function on my phone helps me not to forget (update) the anti-virus software every month.

5. They will have to decide what operating system (install) sooner or later.

6. As expected, she denies even (know) the names of the hackers.

7. Did you ever try (shop) on-line?

8. Please, excuse my (take) so long (scan) your computer for viruses.

9. That's the bottom the line: you have to learn (use) Microsoft Excel or find yourself a new job.

10. You risk (lose) all the files if you don't do backup.

11. We proved this suggestion (be wrong).

12. They continued (experiment) with the substance.
13. They were against (postpone) the meeting.
14. One can hardly imagine (live) in a world without technology.
15. Now one can also study by using mobile phones in which they have to download an educational application from the app store and they can start (learn) from there.
16. The discovery of laser emissions in 1960 was a strictly scientific venture (demonstrate) a physical principle predicted by Einstein in 1917.
17. If we want (reap) the vast benefits that science can provide we have to actually do the science.
18. The internet started to take form in the 1970s, as scientists tried (transmit) messages from one computer to another.
19. Scientific knowledge allows us (develop) new technologies, solve practical problems, and make informed decisions.
20. In discussing the future of science (including industrial science) and society, it is valuable (recount) some of the important points that emerged from the previous discussion.

32. Translate the following sentences into Russian paying attention to the *Infinitive*.

1. They want the new device to be produced by February.
2. The purpose of this book is to describe certain properties of metals.
3. The experiment to be carried out is of great importance for our research.
4. To solve this problem we had to involve experts.
5. Lasers are known to have found application in medicine.
6. The engine must be able to start below freezing point.
7. Science is valued by society because the application of scientific knowledge helps to satisfy many basic human needs and improve living standards.
8. To prevent wear and overheating, the engine has a lubrication system.
9. The designer's objective is to make the exhaust quiet.
10. One way to specify a function is to explicitly list its values, as in Example 2.
11. They wanted the manager to organize all the workers needed for construction jobs.
12. However, we attempt to make the context sufficiently clear to reduce the level of ambiguity.
13. It is time to seriously consider how science and research can contribute to education at all levels of society; not just to engage more people in research and teach them about scientific knowledge, but crucially to provide them with a basic understanding of how science has shaped the world and human civilization.
14. They designed the building structures to support and resist the loads which act on them.
15. Vehicles are not supposed to be driven at speeds which are higher than the posted maximum.
16. The study of programming languages is valuable for some important reasons.

17. It increases our capacity to use different constructs in writing programs, enables us to choose languages for projects more intelligently, and makes learning new languages easier.

18. One of the aims of higher education is to inspire and enable individuals to develop their capabilities to the highest potential levels throughout life, so that they grow intellectually, are well equipped for work, can contribute effectively to society and achieve personal fulfillment.

19. In order to examine the educational implications of technological knowledge, there is a need to delineate between the different types of knowledge which may be espoused within subjects or within particular tasks characteristic of different subjects.

20. A compulsory technological component should be incorporated into educational curricula to provide a comprehensive and general education and to facilitate the holistic development of students.

21. The subjects of Mathematics and English are considered to be compulsory as they are typically required to meet university course entry requirements.

22. Further study is often motivated by a desire to specialize in order to be more employable or to begin a career in research.

23. This report considers the importance of the role of engineering and physical sciences in health and life sciences research and explores how the dependence is likely to develop in the future.

24. Science has demonstrated that it is a supreme mechanism to explain the world, to solve problems and to fulfill human needs. A fundamental condition of science is its dynamic nature: the constant revision and re-evaluation of the existing knowledge. Every scientific theory is always under scrutiny and questioned whenever new evidence seems to challenge its validity.

25. Another aspect to consider is the level of research investment in relevant areas.

26. To determine a definitive causal explanation for the results of this study, a number of questions need to be addressed.

27. High-dimensional data is often hard to analyze or visualize. However, high-dimensional data quite often possesses the property that only a few dimensions contain most information, and most other dimensions are not essential to describe key properties of the data.

28. Scientists use the technologies that engineers create (such as microscopes, monitors, and meters) to conduct their research. And when engineers start to design a new technology, they call on the knowledge of the natural world developed by scientists (for example, the law of gravity or how fluid flows).

29. Though people tend to think of science, engineering, and technology as three separate things, they are actually closely connected.

30. For example, one of the great advances in mathematics was the use of Cartesian coordinates to translate geometry into algebra and the way this was done was to define geometrical objects as sets of points, where points were themselves defined as pairs or triples of numbers.

31. There is an opinion that artificial intelligence is one of the greatest scientific breakthroughs of all time because it enables machines to learn and process more information than we ever could as humans.

32. A model is said to learn from data if its performance on a given task improves after the data is taken into account.

33. Training the model means to use the data available to optimize some parameters of the model with respect to a utility function that evaluates how well the model predicts the training data.

34. To formalize the idea of similarity between vectors, we need to introduce operations that take two vectors as input and return a numerical value representing their similarity.

35. When formalizing intuitive concepts, a common approach is to construct a set of objects (symbols) and a set of rules to manipulate these objects.

36. We can use the cardinality relation to describe the “size” of a set by comparing it with standard sets.

37. It takes a practice and experience to write proofs that merit such praises, but to get you started in the right direction, we will provide templates for the most useful proof techniques.

38. The goal of machine learning is to design general purpose methodologies to extract valuable patterns from data, ideally without much domain-specific expertise.

39. The key insight about why taking a subset of data is sensible is to realize that for gradient descent to converge, we only require that the gradient is an unbiased estimate of the true gradient.

40. We can overcome this difficulty by introducing Lagrange multipliers. The idea of Lagrange multipliers is to replace the step function with a linear function.

Тема 3. Лексические особенности перевода

<i>Revision: Substitutes that, those, one, ones</i>

1. Translate the sentences into Russian; pay attention to the translation of the words “those”, “that”, “one”.

1. Java’s design for supporting object-oriented programming is similar to that of C++, but it employs more consistent adherence to object-oriented principles.

2. The distinction between convex functions and convex sets are often not strictly presented in machine learning literature, but one can often infer the implied meaning from context.

3. Even though the problem is simply formulated, one cannot be certain that the algorithm will terminate given arbitrary input.

4. The statements for dealing with exceptions are similar to those of Java.

5. Without additional information, one should shift and scale all columns of the dataset such that they have an empirical mean of 0 and an empirical variance of 1 .

6. One would now think that very flexible models are generally preferable to simple models because they are more expressive.

7. The orange terms are terms that are linear in θ , and the blue terms are the ones that are quadratic in θ .

8. C# threads, like those of Java, are lightweight, so although they are more efficient, they cannot be as versatile as Ada's tasks.

9. When the basis is not orthogonal, one can convert a set of linearly independent basis functions to an orthogonal basis by using the Gram-Schmidt Process.

10. We omit a derivation that is identical to the one presented in Section 2.

11. One sees that using the nested expression for f , this will involve four multiplication and four additions.

12. Being able to write mathematics well is a good skill to learn, and one which you will keep for a lifetime.

13. To generate the list of successive Fibonacci numbers, you start by writing 0; 1 and then keep adding another element to the list by summing the two previous ones.

14. The template for the two kinds of induction rules looks nothing like the one for the Well Ordering Principle, but this chapter included a couple of examples where induction was used to prove something already proved using well ordering.

15. Induction proofs often provide recursive procedures that reduce large inputs to smaller ones.

16. The overall simplicity of a programming language strongly affects its readability. A language with a large number of basic constructs is more difficult to learn than one with a smaller number.

17. In this algorithm q stores the current value of the quotient, and r that of the remainder.

18. Cantor (1878) raised the question of whether or not there are any sets whose cardinality lies strictly between that of \mathbb{N} and $\mathbb{P}(\mathbb{N})$. The statement that there are no such sets is called the continuum hypothesis, which may be formulated as follows.

19. Verification is the process of determining whether the output of one phase of software development conforms to that of its previous phase, whereas validation is the process of determining whether a fully developed system conforms to its requirements specification.

20. Test cases are designed for statistical testing with an entirely different objective than those of conventional testing.

21. Reliability estimation using statistical testing is more accurate compared to those of other methods such as ROCOF, POFOD etc.

22. In order to classify a product into the identified categories, Boehm not only considered the characteristics of the product but also those of the development team and development environment.

23. Algebraic expressions differ from arithmetical ones in that they contain indeterminates or variables.

24. A FSM consists of a finite number of states corresponding to those of the object being modeled.

25. A finite set is one that has only a finite number of elements.

26. The operator precedence rules of the common imperative languages are nearly all the same, because they are based on those of mathematics.

27. Exercises have a degree of difficulty comparable to that of the examination questions.

28. The inheritance of C++ is more intricate than that of Smalltalk in terms of access control.

29. We discuss the support for object-oriented programming in Objective-C relative to that of C++.

30. Because Java's design of classes, inheritance, and methods is similar to that of C++, in this section we focus only on those areas in which Java differs from C++.

31. Like that of Java, C#'s support for object-oriented programming is simpler than that of C++, which many consider an improvement.

32. Describe the issue of how closely the parameters of an overloading method must match those of the method it overloads.

33. The first efforts to design languages that provide the capability for message passing among concurrent tasks were those of Brinch Hansen (1978) and Hoare (1978).

34. Although C#'s threads are loosely based on those of Java, there are significant differences.

35. F# includes a variety of data types. Among these are tuples, like those of Python and the functional languages ML and Haskell, lists, discriminated unions, an expansion of ML's unions, and records, like those of ML, which are like tuples except the components are named. F# has both mutable and immutable arrays.

2. Translate the following texts from English into Russian.

Text 1

Expert systems have enjoyed significant successes. However, artificial intelligence has encountered problems in areas such as vision, continuous speech recognition and synthesis, and machine learning. Artificial intelligence also is hostage to the speed of the processor that it runs on. Ultimately, it is restricted to the theoretical limit of a single processor. Artificial intelligence is also burdened by the fact that experts don't always speak in rules. Yet, despite the advantages of neural networks over both expert systems and more traditional computing in these specific areas, neural nets are not complete solutions. They offer a capability that is not ironclad, such as a debugged accounting system. They learn, and as such, they do continue to make "mistakes." Furthermore, even when a network has been developed, there is no way to ensure that the network is the optimal network.

Text 2

Java, like many programming languages, was designed for an application for which there appeared to be no satisfactory existing language. In 1990, Sun Microsystems determined there was a need for a programming language for embedded consumer electronic devices, such as toasters, microwave ovens, and interactive TV systems. Reliability was one of the primary goals for such a language. It may not seem that reliability would be an important factor in the software for a microwave oven. If an oven had malfunctioning software, it probably would not pose a grave danger to anyone and most likely would not lead to large legal settlements. However, if the software in a particular model was found to be erroneous after a million units had been

manufactured and sold, their recall would entail significant cost. Therefore, reliability is an important characteristic of the software in consumer electronic products.

3. Translate the following texts from Russian into English.

Text 1

Искусственный интеллект – это технология, которая изучает способы обучить компьютер, роботизированную технику, аналитическую систему также разумно мыслить, как человек. Исследования в сфере искусственного интеллекта ведутся путем изучения умственных способностей человека и переложения полученных результатов в поле деятельности компьютеров. Таким образом, искусственный интеллект получает информацию из самых разных источников и дисциплин: информатика, математика, лингвистика, психология, биология, машиностроение. На основе массива данных с помощью технологии машинного обучения компьютеры пытаются имитировать интеллект человека.

Главные цели искусственного интеллекта – это создание аналитических систем, которые обладают разумным поведением, могут самостоятельно или под надзором человека обучаться, делать прогнозы и строить гипотезы на основе массива данных; реализация интеллекта человека в машине – создание роботов-помощников, которые могут вести себя как люди: думать, учиться, понимать и выполнять поставленные задачи.

Text 2

Python приобретает огромную популярность среди специалистов по обработке данных. Это универсальный язык с легко читаемым кодом. Его применяют в областях искусственного интеллекта и финансовых технологиях. Dart – язык программирования, на котором написан Flutter – набор средств и инструментов разработки для создания мобильных приложений. Он доступен для iOS, Android, Windows, Mac и Linux. В последнее время набирает популярность TypeScript. Этот язык является надстройкой над JavaScript. JavaScript занимает уникальную позицию в качестве самого распространённого языка для браузера, обладающего полной интеграцией с HTML/CSS. Javascript является фронт-энд языком программирования, наиболее широко используемым в мире для разработки веб-приложений. Он позволяет создать все анимации, настроить множество кнопок, управлять мультимедиа и многое другое.

Text 3

Математика – наука о количественных отношениях и пространственных формах действительного мира. Потребности развития самой математики, проникновение математических методов во многие сферы практической деятельности, прогресс вычислительной техники привели к появлению ряда новых математических дисциплин, например, исследование операций, теория игр, математическая экономика и др. В основе построения математической теории лежит *аксиоматический метод*, при котором в фундамент теории

кладутся некоторые исходные положения, называемые *аксиомами* теории, а все остальные предложения теории получаются как логические следствия аксиом.

Основным методом в математических исследованиях являются математические доказательства – строгие логические рассуждения. В математике изучаются математические модели. Это могут быть как непосредственно математические модели реальных явлений, так и объекты (структуры) для изучения этих моделей. Одна и та же математическая модель может описывать свойства далеких друг от друга по своему конкретному содержанию реальных явлений. Для математики важна не природа рассматриваемых объектов, а существующие между ними отношения.

Математика играет важную роль в естественно-научных, инженерно-технических и гуманитарных исследованиях. Без современной математики с ее развитым логическим и вычислительным аппаратом был бы невозможен прогресс в различных областях человеческой деятельности. Математика является не только мощным средством решения прикладных задач и универсальным языком науки, но также и элементом общей культуры. Поэтому математическое образование следует рассматривать как важнейшую составляющую в системе фундаментальной подготовки современного специалиста.

Text 4

Определители и их свойства

Перестановкой чисел $1, 2, \dots, n$ называется любое расположение этих чисел в определенном порядке. В элементарной алгебре доказывается, что число всех перестановок, которые можно образовать из n чисел, равно $1 \cdot 2 \cdot \dots \cdot n = n!$. Например, из трех чисел $1, 2, 3$ можно образовать $3! = 6$ перестановок: $123, 132, 312, 321, 231, 213$. Говорят, что в данной перестановке числа i и j составляют инверсию (беспорядок), если $i > j$, но i стоит в этой перестановке раньше j , то есть если большее число стоит левее меньшего.

Перестановка называется четной (или нечетной), если в ней соответственно четно (нечетно) общее число инверсий. Операция, посредством которой от одной перестановки переходят к другой, составленной из тех же n чисел, называется подстановкой n -й степени. Подстановка, переводящая одну перестановку в другую, записывается двумя строками в общих скобках, причем числа, занимающие одинаковые места в рассматриваемых перестановках, называются соответствующими и пишутся одно под другим.

Text 5

Научный метод – система категорий, ценностей, образцов и т. д., которыми руководствуется в своей деятельности научное сообщество.

Метод включает в себя способы исследования феноменов, систематизацию, корректировку новых и полученных ранее знаний. Умозаключения и выводы делаются с помощью правил и принципов рассуждения на основе эмпирических данных об объекте. Базой получения данных являются наблюдения и эксперименты. Для объяснения наблюдаемых фактов выдвигаются гипотезы и строятся

теории, на основании которых в свою очередь строится модель изучаемого объекта.

Важной стороной научного метода является требование объективности. Не должны приниматься на веру какие-либо утверждения, даже если они исходят от авторитетных учёных. Для обеспечения независимой проверки проводится документирование наблюдений, обеспечивается доступность для других учёных всех исходных данных, методик и результатов исследований.

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