Undergraduate track program: Applied Mathematics and Artificial Intelligence

This document outlines the scope of themes that may be included in the Olympiad tests. The themes are grouped by areas and are followed by the list of recommended sources in the Russian and English languages.

1. Olympiad winner's skill set

To win the Olympiad, you should have a firm grasp of applied mathematics and artificial intelligence concepts, namely:

- the basic concepts, rules and laws of arithmetic and can apply them when solving applied problems;
- real situations in the language of algebra, equations and inequalities, functions based on the problem statement, the apparatus of algebra;
- real situations in the language of geometry, geometric concepts and theorems;
- the basic concepts of information theory, graph theory, algorithm theory, and information encoding methods.

You should also have a solid command of the following skills:

- solving applied problems, including socio-economic problems, for the largest and smallest values;
- modelling the simplest real situations in the language of probability theory and statistics;
- extracting and analyzing information presented in tables, diagrams, and graphs;
- solving problems on translation between number systems, logical operations, and constructing truth tables;
- writing linear algorithms, algorithms with branching and cycles, functions and procedures, and working with strings.

2. List of degree programs covered by the subject area

2.1 List of bachelor's programs:

01.03.02 Applied Mathematics and Informatics
01.03.01 Mathematics
01.03.03 Mechanics and Mathematical Modelling
01.03.05 Statistics
02.03.02 Fundamental Informatics and Information Technologies
09.03.01 Informatics and Computer Engineering
09.03.04 Software Engineering

2.2 List of specialist programs:

01.05.01 Fundamental Mathematics and Mechanics

3. Content

Mathematical logic

1. Elements of combinatorics

Alternate and simultaneous selection. Rules of addition and multiplication. Permutations, placements and combinations without repetitions and with repetitions. Binomial theorem.

2. Algebra of logics

Basic operations of Boolean algebra: conjunction, disjunction, inversion, implication, equivalence. Truth tables.

Mathematics

1. Actions with numeric and letter expressions

Natural, integer, rational, irrational and real numbers, ordinary and decimal fractions, rules for performing operations on numbers. Polynomials, abbreviated multiplication formulas. Percentage, proportions, basic problems on percentages. Transformation of numerical and letter expressions.

2. Transformations of expressions containing powers and logarithms

Power with natural, integer, rational and real exponent, properties of power. Root of natural power, arithmetic root, properties of roots. Logarithm of number, properties of logarithms. Transformation of expressions containing powers, roots and logarithms.

3. Transformations of trigonometric expressions

Sine, cosine, tangent, cotangent of an arbitrary angle (number), radian measure of an angle. Trigonometric formulas. Transformation of trigonometric expressions.

4. Equations, inequalities, their systems

Linear, quadratic, rational, fractional-rational, irrational, exponential, logarithmic, trigonometric equations and inequalities. Interval method for solving inequalities. Basic methods for solving systems of equations.

5. Functional dependencies

Function of one real variable. Properties of the function. Points of extremum of the function, the greatest and least values of the function. Linear, quadratic, power, exponential, logarithmic, trigonometric, inverse trigonometric functions, a function describing an inverse proportional relationship, their properties and graphs.

6. Elements of Mathematical Analysis

Derivative of a function, geometric and physical meaning of the derivative. Rules for calculating derivatives. Application of the derivative to the study of a function. Indefinite and definite integral, their properties. Newton-Leibniz formula.

7. Planimetry

Parallel and perpendicular lines. Triangle, quadrilateral and its types, regular polygon, circle and circle. Perimeters and area of plane figures. Inscribed and circumscribed circles. Cartesian rectangular coordinate system on the plane. Equation of a circle. Vectors and operations with them. Vector length. Scalar product of vectors.

8. Stereometry

Mutual arrangement of lines, line and plane, planes in space. Perpendicular and inclined, theorem of three perpendiculars. Polyhedra and their types: prism, pyramid. Solids of revolution: cylinder, cone, sphere. Surface areas and volumes of spatial bodies. Cartesian rectangular coordinate system in space. Equation of a sphere. Vectors and operations with them. Scalar product of vectors.

Mathematical Physics

1. Functional dependencies

Function of one real variable. Properties of the function. Points of extremum of the function, the greatest and least values of the function. Linear, quadratic, power, exponential, logarithmic,

trigonometric, inverse trigonometric functions, a function describing an inverse proportional relationship, their properties and graphs.

2. Elements of Mathematical Analysis

Derivative of a function, geometric and physical meaning of the derivative. Rules for calculating derivatives. Application of the derivative to the study of a function. Indefinite and definite integral, their properties. Newton-Leibniz formula. Calculating the area of a plane figure using a definite integral.

3. Stereometry

Cartesian rectangular coordinate system in space. Vectors and operations with them. Scalar product of vectors.

Applied mathematics

1. Operations with numerical and letter expressions

Natural, integer, rational, irrational and real numbers, common and decimal fractions, rules for performing operations on numbers. Polynomials, abbreviated multiplication formulas. Percentage, proportions, basic problems on percentages. Transformation of numerical and letter expressions.

2. Transformations of expressions containing powers and logarithms

Power with natural, integer, rational and real exponent, properties of power. Root of natural power, arithmetic root, properties of roots. Logarithm of number, properties of logarithms. Transformation of expressions containing powers, roots and logarithms.

3. Transformations of trigonometric expressions

Sine, cosine, tangent, cotangent of an arbitrary angle (number), radian measure of an angle. Trigonometric formulas. Transformation of trigonometric expressions.

4. Equations, inequalities, their systems

Linear, quadratic, rational, fractional-rational, irrational, exponential, logarithmic, trigonometric equations and inequalities. Interval method for solving inequalities. Basic methods for solving systems of equations. Application of mathematical methods to solve meaningful problems from various fields of science, interpretation of the result, taking into account real limitations.

5. Functional dependencies

Numerical sequences. Function of one real variable. Properties of the function. Points of extremum of the function, the greatest and least values of the function. Linear, quadratic, power, exponential, logarithmic, trigonometric, inverse trigonometric functions, the function describing the inverse proportionality, their properties and graphs.

6. Elements of Mathematical Analysis

Derivative of a function, geometric and physical meaning of the derivative. Rules for calculating derivatives. Application of the derivative to the study of a function. Indefinite and definite integral, their properties. Newton-Leibniz formula. Calculating the area of a plane figure using a definite integral.

7. Planimetry

Parallel and perpendicular lines. Triangle, quadrilateral and its types, regular polygon, circle and circle. Perimeters and area of plane figures. Inscribed and circumscribed circles. Cartesian rectangular coordinate system on the plane. Equation of a circle. Vectors and operations with them. Vector length. Scalar product of vectors.

8. Stereometry

Mutual arrangement of lines, line and plane, planes in space. Perpendicular and inclined, theorem of three perpendiculars. Polyhedra and their types: prism, pyramid. Solids of revolution: cylinder, cone, sphere. Surface areas and volumes of spatial bodies. Cartesian rectangular coordinate system in space. Equation of a sphere. Vectors and operations with them. Scalar product of vectors.

Statistics & probability

1. Elements of probability theory

Various definitions of the probability of an event. Theorems of addition and multiplication of probabilities. Formula of total probability, Bayes' formula, Bernoulli's formula.

2. Elements of statistics

Tabular and graphical representation of data, numerical characteristics of data series.

Computer science, information systems

1. Information Theory

The concept of information. Types of information, various methods of information coding (alphabetical, graphic, sound). The system of measuring units of information. The principle of binary coding of information.

2. Number systems

Positional number systems (decimal, binary, octal, hexadecimal). Conversion of numbers from one number system to another. Binary arithmetic. Arithmetic operations in different number systems, and various methods of conversion between systems with different bases.

3. Graph theory

Basic concepts of graph theory, construction of adjacency matrix and weight matrix from a graph and vice versa, solving problems on graphs.

4. Algebra of logic (Boolean algebra)

Basic operations of Boolean algebra: conjunction, disjunction, inversion, implication, equivalence. Truth tables.

5. Algorithmization and programming basics

The concept and properties of an algorithm. Methods of presenting algorithms: verbal (written in natural language), graphical (flow charts), programmatic (text in a programming language). Basic algorithmic constructions: following, branching, selection, repetition. Constructing algorithms based on combining action control structures. Organizing nested structures. Developing an algorithm using the method of sequential detailing. The concept of an auxiliary algorithm. Basic algorithms. Basics of programming in one of the languages (C, C++, Python, Pascal, Java). Basics of Internet technologies.

Computer science, artificial intelligence

1. Information Theory

The concept of information. Types of information, various methods of information coding (alphabetical, graphic, sound). The system of measuring units of information. The principle of binary coding of information.

2. Number systems

Positional number systems (decimal, binary, octal, hexadecimal). Conversion of numbers from one number system to another. Binary arithmetic. Arithmetic operations in different number systems, and various methods of conversion between systems with different bases.

3. Graph theory

Basic concepts of graph theory, constructing an adjacency matrix and a weight matrix from a graph and vice versa, solving problems on graphs.

4. Algebra of logic (Boolean algebra)

Basic operations of Boolean algebra: conjunction, disjunction, inversion, implication, equivalence. Truth tables.

5. Algorithmization and programming basics

The concept and properties of an algorithm. Methods of presenting algorithms: verbal (written in natural language), graphical (flow charts), programmatic (text in a programming language). Basic algorithmic constructions: following, branching, selection, repetition. Constructing algorithms based on combining action control structures. Organizing nested structures. Developing an algorithm using the method of sequential detailing. The concept of an auxiliary algorithm. Basic algorithms. Basics of programming in one of the languages (C, C++, Python, Pascal, Java). Basics of databases.

Computer science, cybernetics

1. Information Theory

The concept of information. Types of information, various methods of information coding (alphabetical, graphic, sound). The system of measuring units of information. The principle of binary coding of information.

2. Number systems

Positional number systems (decimal, binary, octal, hexadecimal). Conversion of numbers from one number system to another. Binary arithmetic. Arithmetic operations in different number systems, and various methods of conversion between systems with different bases.

3. Graph theory

Basic concepts of graph theory, constructing an adjacency matrix and a weight matrix from a graph and vice versa, solving problems on graphs.

4. Algebra of logic (Boolean algebra)

Basic operations of Boolean algebra: conjunction, disjunction, inversion, implication, equivalence. Truth tables.

5. Algorithmization and programming basics

Concept and properties of an algorithm. Methods of presenting algorithms: verbal (writing in natural language), graphic (flow charts), programmatic (text in a programming language). Basic algorithmic constructions: following, branching, selection, repetition. Construction of algorithms based on the unification of action control structures. Organization of nesting of structures. Development of an algorithm using the method of successive detailing. Concept of an auxiliary algorithm. Basic algorithms. Fundamentals of programming in one of the languages (C, C++, Python, Pascal, Java).

Computer science, software engineering

1. Information Theory

The concept of information. Types of information, various methods of information coding (alphabetical, graphic, sound). The system of measuring units of information. The principle of binary coding of information.

2. Number systems

Positional number systems (decimal, binary, octal, hexadecimal). Conversion of numbers from one number system to another. Binary arithmetic. Arithmetic operations in different number systems, and various methods of conversion between systems with different bases.

3. Graph Theory

Basic concepts of graph theory, constructing an adjacency matrix and a weight matrix from a graph and vice versa, solving problems on graphs.

4. Algebra of logic (Boolean algebra)

Basic operations of Boolean algebra: conjunction, disjunction, inversion, implication, equivalence. Truth tables.

5. Algorithmization and programming basics

The concept and properties of an algorithm. Methods of presenting algorithms: verbal (written in natural language), graphical (flow charts), programmatic (text in a programming language). Basic algorithmic constructions: following, branching, selection, repetition. Constructing algorithms based on combining action control structures. Organizing nested structures. Developing an algorithm using

the method of sequential detailing. The concept of an auxiliary algorithm. Basic algorithms. Basics of programming in one of the languages (C, C++, Python, Pascal, Java). Basics of the software life cycle.

4. Recommended references

4.1. Reading list

Mathematical logic

Sources in English	Topic
1. Haghverdi E., Liugen Z. Mathematical foundations of information sciences. (English) Singapore: World Scientific, 2024. 151 p. URL://https://zbmath.org/7852534	Algebra of logic
2. Kueker D.W. Notes on Mathematical Logic. UNIVERSITY OF MARYLAND, COLLEGE PARK. 114 p. URL://https://www.infobooks.org/pdfview/7461-notes-on-mathematical-logic-david-w-kueker/	Algebra of logic
3. Morris J. Combinatorics. University of Lethbridge, 2023. 357 p. URL://https://www.infobooks.org/pdfview/17730-combinatorics-joy-morris/	Elements of combinatorics

Sources in Russian	Topic
1. Бродский Я.С. Статистика, вероятность, комбинаторика 10-11 класс. М.: Оникс, 2008. 544 с. URL://https://studylib.ru/doc/6422752/brodskij-ya.s.-statistika.-veroyatnost._.-kombinatorika-2008...?ysclid=lyfwnb0bt510078900	Elements of combinatorics
2. Киселева Л.Г., Смирнова Т.Г. Функции алгебры логики в примерах и задачах: учебно-методическое пособие. Нижний Новгород: Нижегородский госуниверситет, 2017. 58 с. URL://http://www.unn.ru/books/met_files/Alg_log.pdf	Algebra of logic
3. Лютикас В.С. Школьнику о теории вероятностей: Учеб. пособие по факультативному курсу для учащихся 8-10 классов. М.: Просвещение, 1983. 127 с. URL://https://www.ablov.ru/Physics_25/books/Terver.pdf	Elements of combinatorics

Mathematics

Sources in English	Topic
1. Abramson J. College Algebra. OpenStax College, 2017. 619 p.	Equations, inequalities, their systems. Functional dependencies.

URL://https://www.infobooks.org/pdfview/823-college-algebra-jay-abramson/	
2. Gaudet D., Volpe A., Bohart J. Basic Arithmetic Student Workbook. Second Edition April, 2013. 244 p. URL://https://www.infobooks.org/pdfview/1520-basic-arithmetic-student-workbook-donna-gaudet-amy-volpe-jenifer-bohart/	Actions with number and letter expressions, planimetry
3. Hart C.A. Plane and Solid Geometry. Published by Forgotten Books, 2013. 502 p. URL://https://www.infobooks.org/pdfview/782-plane-and-solid-geometry-cahart/	Planimetry Stereometry
4. Indika, Sathish S.H., Leemis, Lawrence M. Exact expressions for trigonometric functions. Coll. Math. J. 55, No. 1, 40-45 (2024). URL://https://zbmath.org/7848819	Transformations of trigonometric expressions Equations, inequalities, their systems
5. Kumar P., I.A.S, K Sundaramoorthy M.E. Engineering Mathematics – I. Directorate of Technical Education Government of Tamilnadu, 2015. 160 p. URL://https://www.infobooks.org/pdfview/835-engineering-mathematics-i-mramalingam-rssuganthi-br-narasimhan/	Transformations of trigonometric expressions Element of mathematical analysis

Sources in Russian	**Topic**
1. Богомолов Н.В. Практические занятия по математике: учебное пособие для вузов. М.: Изд-во Юрайт, 2024. 571 с. URL://https://urait.ru/viewer/prakticheskie-zanyatiya-po-matematike-534965	Operations with numeric and alphabetic expressions Transformations of expressions containing degrees and logarithms Transformations of trigonometric expressions Equations, inequalities, their systems Functional dependencies Stereometry
2. Крамор В. С. Повторяем и систематизируем школьный курс геометрии. 4-е изд. М.: ООО «Издательство Оникс»: ООО «Издательство «Мир и Образование», 2008. 336 с. URL://http://web.krao.kg/book/%D0%9F%D0%BE%D0%B2%D1%82%D0%BE%D1%80%D1%8F%D0%B5%D0%BC%20%D0%B8%20%D1%81%D0%B8%D1%81%D1%82%D0%B5%D0%BC%D0%B0%D1%82%D0%B8%D0%B7%D0%B8%D1%80%D1%83%D0%B5%D0%BC%20(%D0%93%D0%B5%D0%BE%D0%BC%D0%B5%D1%82%D1%80%D	Planimetry Stereometry

0%B8%D1%8F)%D0%92.%D0%A1.%D0%9A%D1%80%D0%B0%D0%BC%D0%BE%D1%80.pdf	
3. Литвиненко В.И., Мордкович А.Г. Практикум по элементарной математике: Алгебра. Тригонометрия. М.: ABF, 1995. 352 с. URL://http://ellikqala.zn.uz/files/2018/04/0288-Практикум-по-элементарной-математике.Алгебра.Тригонометрия_Литвиненко-В.Н-Мордкович-А.Г_1995.pdf	Operations with numeric and alphabetic expressions Transformations of expressions containing degrees and logarithms Transformations of trigonometric expressions Equations, inequalities, their systems Functional dependencies

Mathematical Physics

Sources in English	**Topic**
1. Abramson J. College Algebra. OpenStax College, 2017. 619 p. URL://https://www.infobooks.org/pdfview/823-college-algebra-jay-abramson/	Functional dependencies
2. Hart C.A. Plane and Solid Geometry. Published by Forgotten Books, 2013. 502 p. URL://https://www.infobooks.org/pdfview/782-plane-and-solid-geometry-cahart/	Planimetry Stereometry
3. Kumar P., I.A.S, K Sundaramoorthy M.E. Engineering Mathematics – I. Directorate of Technical Education Government of Tamilnadu, 2015. 160 p. URL://https://www.infobooks.org/pdfview/835-engineering-mathematics-i-mramalingam-rssuganthi-br-narasimhan/	Elements of Mathematical Analysis
4. Stitz C., Zeager J. College Algebra. Lakeland Community College, 2010. 506 p. URL://https://www.infobooks.org/pdfview/826-college-algebra-carl-stitz-jeff-zeager/	Functional dependencies

Sources in Russian	**Topic**
1. Алимов Ш. А., Колягин Ю.М., Ткачёва М. В. и др. Алгебра и начала математического анализа. 10-11 классы: учеб. для общеобразоват. учреждений базовый уровень. М.: Просвещение, 2012. 464 с. URL://https://online.fliphtml5.com/tacrm/kfzm/#p=2	Functional dependencies Elements of Mathematical Analysis
2. Богомолов Н.В. Практические занятия по математике: учебное пособие для вузов. М.: Изд-во Юрайт, 2024. 571 с.	Functional dependencies Stereometry

URL://https://urait.ru/viewer/prakticheskie-zanyatiya-po-matematike-534965	
3. Крамор В. С. Повторяем и систематизируем школьный курс геометрии. 4-е изд. М.: ООО «Издательство Оникс»: ООО «Издательство «Мир и Образование», 2008. 336 с. URL://http://web.krao.kg/book/%D0%9F%D0%BE%D0%B2%D1%82%D0%BE%D1%80%D1%8F%D0%B5%D0%BC%20%D0%B8%20%D1%81%D0%B8%D1%81%D1%82%D0%B5%D0%BC%D0%B0%D1%82%D0%B8%D0%B7%D0%B8%D1%80%D1%83%D0%B5%D0%BC%20(%D0%93%D0%B5%D0%BE%D0%BC%D0%B5%D1%82%D1%80%D0%B8%D1%8F)%D0%92.%D0%A1.%D0%9A%D1%80%D0%B0%D0%BC%D0%BE%D1%80.pdf	Planimetry Stereometry

Applied mathematics

Sources in English	**Topic**
1. Abramson J. College Algebra. OpenStax College, 2017. 619 p. URL://https://www.infobooks.org/pdfview/823-college-algebra-jay-abramson/	Equations and inequalities. Functional dependencies.
2. Gaudet D., Volpe A., Bohart J. Basic Arithmetic Student Workbook. Second Edition April, 2013. 244 p. URL://https://www.infobooks.org/pdfview/1520-basic-arithmetic-student-workbook-donna-gaudet-amy-volpe-jenifer-bohart/	Arithmetic, plane geometry
3. Hart C.A. Plane and Solid Geometry. Published by Forgotten Books, 2013. 502 p. URL://https://www.infobooks.org/pdfview/782-plane-and-solid-geometry-cahart/	Planimetry Stereometry
4. Indika, Sathish S.H.; Leemis, Lawrence M. Exact expressions for trigonometric functions. Coll. Math. J. 55, No. 1, 40-45 (2024). URL://https://zbmath.org/7848819	Transformations of trigonometric expressions Equations, inequalities, their systems
5. Kumar P. I.A.S, K Sundaramoorthy M.E. Engineering Mathematics – I. Directorate of Technical Education Government of Tamilnadu, 2015. 160 p. URL://https://www.infobooks.org/pdfview/835-engineering-mathematics-i-mramalingam-rssuganthi-br-narasimhan/	Transformations of trigonometric expressions. Elements of Mathematical Analysis
6. Moise E.E. Elementary geometry from an advanced standpoint. ADDISON-WESLEY PUBLISHING COMPANY, 1990. 514 p. URL://https://www.ime.usp.br/~toscano/disc/2021/Moise.pdf	Planimetry

Sources in Russian	**Topic**

1. Богомолов Н.В. Практические занятия по математике: учебное пособие для вузов. М.: Изд-во Юрайт, 2024. 571 с. URL://https://urait.ru/viewer/prakticheskie-zanyatiya-po-matematike-534965	Operations with Numeric and Alphabetic Expressions Transformations of Expressions Containing Powers and Logarithms Transformations of Trigonometric Expressions Equations, Inequalities, Their Systems Functional Dependencies Stereometry
2. Болтянский В.Г., Глейзер Г.Д._Геометрия: 7-9 кл: Углубл. курс развивающего матем. образования: Учеб. для 7-9 кл. общеобразоват. учеб. учреждений. М.: Ин-т учеб. «Пайдейя», 1998. 382 с. URL://https://www.mathedu.ru/text/boltyanskiy_gleyzer_geometriya_7-9_1998/p6/	Planimetry
3. Болтянский В.Г., Глейзер Г.Д. Геометрия: Курс развивающего матем. образования для 10-11 кл. М.: «Пайдейя», 2002. 217 с. URL://https://www.mathedu.ru/text/boltyanskiy_gleyzer_geometriya_10-11_2002/p4/	Stereometry
4. Крамор В. С. Повторяем и систематизируем школьный курс геометрии — 4-е изд. — М.: ООО «Издательство Оникс»: ООО «Издательство «Мир и Образование», 2008. — 336 с. URL://http://web.krao.kg/book/%D0%9F%D0%BE%D0%B2%D1%82%D0%BE%D1%80%D1%8F%D0%B5%D0%BC%20%D0%B8%20%D1%81%D0%B8%D1%81%D1%82%D0%B5%D0%BC%D0%B0%D1%82%D0%B8%D0%B7%D0%B8%D1%80%D1%83%D0%B5%D0%BC%20(%D0%93%D0%B5%D0%BE%D0%BC%D0%B5%D1%82%D1%80%D0%B8%D1%8F)%D0%92.%D0%A1.%D0%9A%D1%80%D0%B0%D0%BC%D0%BE%D1%80.pdf	Planimetry Stereometry
5. Литвиненко В.И., Мордкович А.Г. Практикум по элементарной математике: Алгебра. Тригонометрия. М.: ABF, 1995. 352 с. URL://http://ellikqala.zn.uz/files/2018/04/0288-Практикум-по-элементарной-математике.Алгебра.Тригонометрия_Литвиненко-В.Н-Мордкович-А.Г_1995.pdf	Operations with Numeric and Alphabetic Expressions Transformations of Expressions Containing Powers and Logarithms Transformations of Trigonometric Expressions Equations, Inequalities, Their Systems Functional Dependencies

Statistics & probability

Sources in English	**Topic**

1. Evans M.J., Rosenthal J.S. Probability and Statistics: The Science of Uncertainty, University of Toronto URL://https://www.utstat.toronto.edu/mikevans/jeffrosenthal/book.pdf	Elements of Probability Theory Elements of Statistics
2. Probability and Counting Rules. 66 p. URL://https://www.grovecity.k12.pa.us/cms/lib/PA02000125/Centricity/Domain/203/ch04.pdf	Elements of Combinatorics Elements of Probability Theory
3. Ross, Sheldon M. A first course in probability — 8th ed. 545 p. URL://https://www.seyedkalali.com/wp-content/uploads/2016/11/A-First-Course-in-Probability-8th-ed.-Sheldon-Ross.pdf	Elements of probability theory
4. Ross, Sheldon M. Introduction to probability and statistics for engineers and scientists / Sheldon M. Ross, Department of Industrial Engineering and Operations Research, University of California, Berkeley. Fifth edition. 2014. 730 p. URL://https://minerva.it.manchester.ac.uk/~saralees/statbook3.pdf	Elements of Probability Theory Elements of Statistics

Sources in Russian	**Topic**
1. Бродский Я.С. Статистика, вероятность, комбинаторика 10-11 класс. М.: Оникс, 2008. 544 с. URL://https://studylib.ru/doc/6422752/brodskij-ya.s.-statistika.-veroyatnost._.-kombinatorika-2008...?ysclid=lyfwnb0bt510078900	Elements of Combinatorics Elements of Probability Theory Elements of Statistics
2. Денежкина И.Е., Степанов С.Е., Цыганок И.И. Теория вероятностей и математическая статистика: учебное пособие. М.:КНОРУС, 2024. 304 с. URL://https://reader.new.book.ru/?t=eyJhbGciOiJIUzUxMiIsInR5cCI6IkpXVCJ9.eyJ1c2VyX2lkIjoxMDgzOTk3LCJncm91cF9pZCI6MTM0OSwiYm9va19pZCI6OTU0NTI1LCJib29rX2FjY2VzcyI6MSwidXNlcl9lbWFpbCI6Ii0iLCJ1c2VyX3R5cGUiOjEsImV4cCI6MTcyMDcxMDgyMiwiaWF0IjoxNzIwNjg5MTkyfQ.k9o0ag2OpnXgJl4S-KgqyfLY1n0Kra_-VC1uHKku8dAiSGYasdC2TtOfDr8faNDUCZ3uHjuXKKSE-vVpwwGmag&v=0	Elements of Probability Theory Elements of Statistics
3. Лютикас В.С. Школьнику о теории вероятностей: Учеб. пособие по факультативному курсу для учащихся 8-10 классов. М.: Просвещение, 1983. 127 с. URL://https://www.ablov.ru/Physics_25/books/Terver.pdf	Elements of Combinatorics Elements of Probability Theory Elements of Statistics
4. Шибасов Л. П., Шибасова З. Ф. За страницами учебника математики. М.: Просвещение, 1997. 269 с. URL://https://djvu.online/file/GWB1KSNQicUKQ?ysclid=lyfwscya5a641258113	Elements of probability theory

Computer science, information systems

Sources in English	**Topic**

1. Cafiero C. An Introduction to Programming and Computer Science with Python. The University of Vermont, 2022. 402 p. URL://https://www.infobooks.org/pdfview/an-introduction-to-programming-and-computer-science-with-python-clayton-cafiero-210/	Algorithmization and programming basics
2. Das U., Lawson A. Introduction to Python Programming. OpenStax Rice University, 2024. 415 p. URL://https://www.infobooks.org/pdfview/introduction-to-python-programming-udayan-das-aubrey-lawson-210/	Algorithmization and programming basics
3. Guide B. Programming Brian "Beej Jorgensen" Hall, 2024. 332 p. URL://https://www.infobooks.org/pdfview/beejs-guide-to-c-programming-brian-beej-jorgensen-hall-210/	Algorithmization and programming basics
4. Haghverdi E., Liugen Z. Mathematical foundations of information sciences. (English) Singapore: World Scientific, 2024. 151 p. URL://https://zbmath.org/7852534	Algebra of logic
5. Kueker D.W. Notes on Mathematical Logic. UNIVERSITY OF MARYLAND, COLLEGE PARK. 114 p. URL://https://www.infobooks.org/pdfview/7461-notes-on-mathematical-logic-david-w-kueker/	Algebra of logic
6. Morris J. Combinatorics. University of Lethbridge, 2023. 357 p. URL://https://www.infobooks.org/pdfview/17730-combinatorics-joy-morris/	Graph Theory Combinatorics
7. Oram E., Naik B. Lecture note on programming in C. 127 p. URL://https://www.infobooks.org/pdfview/lecture-note-on-programming-in-c-etuari-oram-and-bighnaraj-naik-210/	Algorithmization and programming basics
8. Rozhkovskaya N. Blue Book of Mathematics for Elementary School Teachers URL://https://www.math.ksu.edu/~rozhkovs/math320_Bversion.pdf	Information Theory Number Systems

Sources in Russian	**Topic**
1. Алексеев В. Е., Таланов В. А. Графы и алгоритмы. Структуры данных Модели вычислений. М: Интернет-Университет Информационных Технологий; БИНОМ. Лаборатория знаний,2012. 32 с.. URL://https://fileskachat.com/view/69073_ad995fae111fdf5334d6d86491ae8896.html	Graph Theory Algorithmization and programming basics
2. Босова Л. Л. Информатика. 10 класс: учебник / Л. Л. Босова, А. Ю. Босова. — М.: БИНОМ. Лаборатория знаний, 2016. — 288 с. URL://https://school24.yaguo.ru/newsite/wp-content/uploads/2019/10/informatika_10kl_bu_bosovall.pdf	Information theory, number systems, algebra of logic
3. Босова Л. Л. Информатика. 11 класс. Базовый уровень: учебник / Л. Л. Босова, А. Ю. Босова. — М.: БИНОМ. Лаборатория знаний, 2016. — 256 с.	Information theory, graph theory,

URL://https://school24.yaguo.ru/newsite/wp-content/uploads/2019/10/bosova_uch_11_.pdf	algorithmization and programming
4. Кетков Ю.Л. Введение в языки программирования С и С++. Интернетуниверситет информационных технологий ИНТУИТ, 2016. 291 с. URL://https://obuchalka.org/20220426143516/vvedenie-v-yaziki-programmirovaniya-s-i-c-plus-plus-ketkov-u-l-2016.html	Algorithmization and programming basics
5. Волк В.К. Информатика: учебное пособие для вузов. М.: Изд-во Юрайт, 2024. 226 с. URL://https://urait.ru/viewer/informatika-534979	Information Theory Number Systems
6. Киселева Л.Г., Смирнова Т.Г. Функции алгебры логики в примерах и задачах: учебно-методическое пособие. Нижний Новгород: Нижегородский госуниверситет, 2017. 58 с. URL://http://www.unn.ru/books/met_files/Alg_log.pdf	Algebra of logic

Computer science, artificial intelligence

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1. Cafiero C. An Introduction to Programming and Computer Science with Python. The University of Vermont, 2022. 402p. URL://https://www.infobooks.org/pdfview/an-introduction-to-programming-and-computer-science-with-python-clayton-cafiero-210/	Algorithmization and programming basics
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6. Morris J. Combinatorics. University of Lethbridge, 2023. 357 p. URL://https://www.infobooks.org/pdfview/17730-combinatorics-joy-morris/	Graph Theory Combinatorics
7. Oram E., Naik B. Lecture note on programming in C. 127 p. URL://https://www.infobooks.org/pdfview/lecture-note-on-programming-in-c-etuari-oram-and-bighnaraj-naik-210/	Algorithmization and programming basics

8. Rozhkovskaya N. Blue Book of Mathematics for Elementary School Teachers URL://https://www.math.ksu.edu/~rozhkovs/math320_Bversion.pdf	Information Theory Number Systems
Sources in Russian	**Topic**
1. Алексеев В. Е., Таланов В. А. Графы и алгоритмы. Структуры данных Модели вычислений. М: Интернет-Университет Информационных Технологий; БИНОМ. Лаборатория знаний,2012. 32 с. URL://https://fileskachat.com/view/69073_ad995fae111fdf5334d6d86491ae8896.html	Graph Theory Algorithmization and programming basics
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3. Босова Л. Л. Информатика. 11 класс. Базовый уровень: учебник / Л. Л. Босова, А. Ю. Босова. — М.: БИНОМ. Лаборатория знаний, 2016. — 256 с. URL://https://school24.yaguo.ru/newsite/wp-content/uploads/2019/10/bosova_uch_11_.pdf	Information theory, graph theory, algorithmization and programming
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5. Волк В.К. Информатика: учебное пособие для вузов. М.: Изд-во Юрайт, 2024. 226 с. URL://https://urait.ru/viewer/informatika-534979	Information Theory Number Systems
6. Киселева Л.Г., Смирнова Т.Г. Функции алгебры логики в примерах и задачах: учебно-методическое пособие. Нижний Новгород: Нижегородский госуниверситет, 2017. 58 с. URL://http://www.unn.ru/books/met_files/Alg_log.pdf	Algebra of logic

Computer science, cybernetics

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1. Cafiero C. An Introduction to Programming and Computer Science with Python. The University of Vermont, 2022. 402 p. URL://https://www.infobooks.org/pdfview/an-introduction-to-programming-and-computer-science-with-python-clayton-cafiero-210/	Algorithmization and programming basics
2. Das U., Lawson A. Introduction to Python Programming. OpenStax Rice University, 2024. 415 p.	Algorithmization and programming basics

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7. Oram E., Naik B. Lecture note on programming in C. 127 p. URL://https://www.infobooks.org/pdfview/lecture-note-on-programming-in-c-etuari-oram-and-bighnaraj-naik-210/	Algorithmization and programming basics
8. Rozhkovskaya N. Blue Book of Mathematics for Elementary School Teachers URL://https://www.math.ksu.edu/~rozhkovs/math320_Bversion.pdf	Information Theory Number Systems

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3. Босова Л. Л. Информатика. 11 класс. Базовый уровень: учебник / Л. Л. Босова, А. Ю. Босова. — М.: БИНОМ. Лаборатория знаний, 2016. — 256 с. URL://https://school24.yaguo.ru/newsite/wp-content/uploads/2019/10/bosova_uch_11_.pdf	Information theory, graph theory, algorithmization and programming
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URL://https://obuchalka.org/20220426143516/vvedenie-v-yaziki-programmirovaniya-s-i-c-plus-plus-ketkov-u-l-2016.html	
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6. Киселева Л.Г., Смирнова Т.Г. Функции алгебры логики в примерах и задачах: учебно-методическое пособие. Нижний Новгород: Нижегородский госуниверситет, 2017. 58 с. URL://http://www.unn.ru/books/met_files/Alg_log.pdf	Algebra of logic

Computer science, software engineering

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1. Cafiero C. An Introduction to Programming and Computer Science with Python. The University of Vermont, 2022. 402 p. URL://https://www.infobooks.org/pdfview/an-introduction-to-programming-and-computer-science-with-python-clayton-cafiero-210/	Algorithmization and programming basics
2. Das U., Lawson A. Introduction to Python Programming. OpenStax Rice University, 2024. 415 p. URL://https://www.infobooks.org/pdfview/introduction-to-python-programming-udayan-das-aubrey-lawson-210/	Algorithmization and programming basics
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4. Haghverdi E., Liugen Z. Mathematical foundations of information sciences. (English) Singapore: World Scientific, 2024. 151 p. URL://https://zbmath.org/7852534	Algebra of logic
5. Kueker D.W. Notes on Mathematical Logic. UNIVERSITY OF MARYLAND, COLLEGE PARK. 114 p. URL://https://www.infobooks.org/pdfview/7461-notes-on-mathematical-logic-david-w-kueker/	Algebra of logic
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7. Oram E., Naik B. Lecture note on programming in C. 127 p. URL://https://www.infobooks.org/pdfview/lecture-note-on-programming-in-c-etuari-oram-and-bighnaraj-naik-210/	Algorithmization and programming basics
8. Rozhkovskaya N. Blue Book of Mathematics for Elementary School Teachers URL://https://www.math.ksu.edu/~rozhkovs/math320_Bversion.pdf	Information Theory Number Systems

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3. Босова Л. Л. Информатика. 11 класс. Базовый уровень: учебник / Л. Л. Босова, А. Ю. Босова. — М.: БИНОМ. Лаборатория знаний, 2016. — 256 с. URL://https://school24.yaguo.ru/newsite/wp-content/uploads/2019/10/bosova_uch_11_.pdf	Information theory, graph theory, algorithmization and programming
4. Кетков Ю.Л. Введение в языки программирования C и C++. Интернетуниверситет информационных технологий ИНТУИТ, 2016. 291 с. URL://https://obuchalka.org/20220426143516/vvedenie-v-yaziki-programmirovaniya-s-i-c-plus-plus-ketkov-u-l-2016.html	Algorithmization and programming basics
5. Волк В.К. Информатика: учебное пособие для вузов. М.: Изд-во Юрайт, 2024. 226 с. URL://https://urait.ru/viewer/informatika-534979	Information Theory Number Systems
6. Киселева Л.Г., Смирнова Т.Г. Функции алгебры логики в примерах и задачах: учебно-методическое пособие. Нижний Новгород: Нижегородский госуниверситет, 2017. 58 с. URL://http://www.unn.ru/books/met_files/Alg_log.pdf	Algebra of logic

4.2. Recommended online courses

Mathematical logic

Online courses in English	Link	Summary
Statistics and probability	URL://https://www.khanacademy.org/math/statistics-probability	The course covers combinatorics, probability theory and statistics.
Get ready for probability and combinatorics	URL://https://www.khanacademy.org/math/get-ready-for-precalculus/x65c069afc012e9d0:get-ready-for-probability-and-combinatorics	This course explores the fascinating world of probability and combinatorics through the lens of dice, cards, and puzzles. Engage with interactive articles, activities, and videos to discover the relevance and beauty of these

		concepts while uncovering the patterns within randomness.
Combinatorics and Probability	URL://https://www.coursera.org/learn/combinatorics?irclickid=S%3ALS9awVoxyKRa30qrT6uyWVUkCzxd1O0QZRTc0&irgwc=1&utm_medium=partners&utm_source=impact&utm_campaign=1310690&utm_content=b2c	This course introduces the fundamentals of combinatorics and probability theory.

Online courses in Russian	**Link**	**Summary**
Basic mathematics for digital professions	URL://https://practicum.yandex.ru/math-foundations/	The course covers the following topics: Sets and logic. Numerical sets. Elements of logic. Combinatorics. Factorial and permutations. Placements. Binomial coefficients. Probability theory. Random variables.
Mathematical logic and theory of algorithms	URL://https://www.lektorium.tv/mathlogic	This course teaches you how to bridge the gap between abstract concepts and practical programming. You'll learn to translate information from natural language to mathematical language, then into numerical methods, algorithms, and specific programming languages. You'll also explore techniques for transforming mathematical logic propositions into effective program designs for research or practical applications.
Introduction to mathematical logic	URL://https://ru.hexlet.io/courses/logic?utm_source=youtube&utm_medium=social&utm_campaign=freemium&utm_content=promo-logic&utm_term=playlisttps	This course introduces the language and basic rules of formal logic, equipping you with tools for clear thinking and communication. You'll learn how formal logic can be applied in fields like software engineering, data analytics, and advanced programming, enhancing

		your ability to learn faster, think critically, and approach code from a new perspective.

Mathematics

Online courses in English	Link	Summary
Mathematics for Economists	URL://https://www.xuetangx.com/course/hse0002/21367603	This course shows how to use and apply math by working through concrete examples and exercises.
Mathematics	URL://https://open.etu.ru/	This course combines engaging video lectures on theory and problem analysis with a series of interactive tests for applying your knowledge, providing immediate feedback and reinforcing your understanding.
Geometry (all content)	URL://https://www.khanacademy.org/math/geometry-home	The course provides an overview of the entire course in planimetry.
Pre-University Calculus	URL://https://www.edx.org/learn/calculus/delft-university-of-technology-pre-university-calculus	This course covers such sections of math as functions, equations, differentiation, integration, and analytic geometry.
Introduction to Vectors	URL://https://www.infobooks.org/pdfview/12847-introduction-to-vectors-r-horan-m-lavelle/	The course covers vectors, vector length, actions with vectors, and vector basis decomposition.

Online courses in Russian	Link	Summary
Preparation for the entrance exam in mathematics for foreign applicants	URL://https://mooc.unn.ru/enrol/index.php?id=105	The course consists of video lectures, presenting basic concepts and formulas of mathematics, and revealing methods of solving various problems in the volume corresponding to the school course of mathematics, tutorials and tests aimed at consolidating the studied material and controlling the acquired knowledge
TSU Online School of Entry: Mathematics	URL://https://ido.skills.tsu.ru/course/view.php?id=123	This course combines engaging video lectures on theory and problem analysis with a series of interactive tests for applying your

		knowledge, providing immediate feedback and reinforcing your understanding.
Video lesson "Quadrilaterals and Polygons"	URL://https://videouroki.net/blog/vidieourok-chietyriokhughol-niki-i-mnoghoughol-niki.html	This course provides a foundational understanding of quadrilaterals and polygons, essential for success in Olympiad competitions. Through interactive problem-solving exercises, you'll consolidate your knowledge and develop practical skills in applying these geometric concepts.
Video lesson "Planimetry. Calculating lengths and areas"	URL://https://videouroki.net/blog/b3-planimetriya-vychislenie-dlin-i-ploshchadey.html	This course focuses on calculating lengths and areas of various geometric figures, including triangles, rectangles, rhombuses, parallelograms, arbitrary quadrilaterals, trapezoids, polygons, circles, and their components. It also covers the concepts of vectors and the coordinate plane.
Algebra video lessons for 11th grade	URL://https://www.youtube.com/playlist?list=PLvtJKssE5NrhlWsz1EV0LGlzRSoKt23JB	This course delves into various mathematical concepts, including nth roots and their properties, expressions involving radicals, step, exponential, and logarithmic functions, their characteristics and graphs, exponential, irrational, and logarithmic equations and inequalities, and both indefinite and definite integrals.
Trigonometry	URL://https://ru.khanacademy.org/math/trigonometry	This course explores trigonometric concepts through a series of video lectures, practical exercises, and assessments.

Mathematical Physics

Online courses in English	**Link**	**Summary**
Calculus	URL://https://www.khanacademy.org/math/calculus-1	The course consists of the following units: limits and continuity, derivatives: definition and basic

		rules, applications of derivatives, analysis of functions, integrals, applications of integrals.
Introduction to Vectors	URL://https://www.infobooks.org/pdfview/12847-introduction-to-vectors-r-horan-m-lavelle/	The course covers vectors, vector length, actions with vectors, and vector basis decomposition.
Pre-University Calculus	URL://https://www.edx.org/learn/calculus/delft-university-of-technology-pre-university-calculus	This course covers such sections of math as functions, equations, differentiation, integration, and analytic geometry.

Online courses in Russian	**Link**	**Summary**
Integration of a function of one variable	URL://https://stepik.org/course/195416/promo?search=4818488860	Integration of a function of one variable is one of the basic courses of higher mathematics underlying physics and mathematics education. The course covers the concepts and properties of primes, indefinite and definite integrals, and applications in geometry and physics.
Algebra video lessons for 11th grade	URL://https://www.youtube.com/playlist?list=PLvtJKssE5NrhlWsz1EV0LGlzRSoKt23JB	This course delves into various mathematical concepts, including nth roots and their properties, expressions involving radicals, step, exponential, and logarithmic functions, their characteristics and graphs, exponential, irrational, and logarithmic equations and inequalities, and both indefinite and definite integrals.
Vectors in space	URL://https://project.lektorium.tv/vectors	This course builds on prior knowledge of vectors in the plane and focuses on advanced concepts related to vectors in three-dimensional space through interactive problem-solving practice.

Applied mathematics

Online courses in English	**Link**	**Summary**

Mathematics for Economists	URL://https://www.xuetangx.com/course/hse0002/21367603	This course shows how to use and apply math by working through concrete examples and exercises.
Mathematics	URL://https://open.etu.ru/	This course combines engaging video lectures on theory and problem analysis with a series of interactive tests for applying your knowledge, providing immediate feedback and reinforcing your understanding.
Geometry (all content)	URL://https://www.khanacademy.org/math/geometry-home	The course contains an overview of the entire course of planimetry.
Pre-University Calculus	URL://https://www.edx.org/learn/calculus/delft-university-of-technology-pre-university-calculus	This course covers such sections of math as functions, equations, differentiation, integration, and analytic geometry.
Introduction to Vectors	URL://https://www.infobooks.org/pdfview/12847-introduction-to-vectors-r-horan-m-lavelle/	The course covers vectors, vector length, actions with vectors, and vector basis decomposition.

Online courses in Russian	**Link**	**Summary**
Preparation for the entrance exam in mathematics for foreign applicants	URL://https://mooc.unn.ru/enrol/index.php?id=105	The course consists of video lectures presenting the basic concepts and formulas of mathematics and revealing methods for solving various problems in a volume corresponding to the school mathematics course, training and test tasks aimed at consolidating the material studied and monitoring the knowledge gained
Online school for TSU applicants: Mathematics	URL://https://ido.skills.tsu.ru/course/view.php?id=123	This course combines engaging video lectures on theory and problem analysis with a series of interactive tests for applying your knowledge, providing immediate feedback and reinforcing your understanding.
Video lesson "Quadrangles and polygons"	URL://https://videouroki.net/blog/vidieourok-chietyriokhughol-niki-i-mnoghoughol-niki.html	This course provides a foundational understanding of quadrilaterals and polygons, essential for success in Olympiad competitions. Through interactive problem-solving exercises, you'll consolidate your knowledge and develop practical skills in applying these geometric concepts.

Video lesson "Planimetry. Calculating lengths and areas"	URL://https://videouroki.net/blog/b3-planimetriya-vychislenie-dlin-i-ploshchadey.html	This course focuses on calculating lengths and areas of various geometric figures, including triangles, rectangles, rhombuses, parallelograms, arbitrary quadrilaterals, trapezoids, polygons, circles, and their components. It also covers the concepts of vectors and the coordinate plane.
Video lessons on algebra for grade 11	URL://https://www.youtube.com/playlist?list=PLvtJKssE5NrhlWsz1EV0LGlzRSoKt23JB	This course delves into various mathematical concepts, including nth roots and their properties, expressions involving radicals, step, exponential, and logarithmic functions, their characteristics and graphs, exponential, irrational, and logarithmic equations and inequalities, and both indefinite and definite integrals.
Trigonometry	URL://https://ru.khanacademy.org/math/trigonometry	This course explores trigonometric concepts through a series of video lectures, practical exercises, and assessments.

Statistics & probability

Online courses in English	**Link**	**Summary**
Statistics and probability	URL://https://www.khanacademy.org/math/statistics-probability	The course covers combinatorics, probability theory and statistics.
High school statistics	URL://https://www.khanacademy.org/math/probability	This is an introductory course in statistics.
AP®/College Statistics	URL://https://www.khanacademy.org/math/ap-statistics	A course in statistics

Online courses in Russian	**Link**	**Summary**
Probability and Statistics	URL://https://www.lektorium.tv/probability-statistics-8?_gl=1*uuc0dk*_gcl_au*MTU5Njk1Njg4NC4xNzIwNjc0MDk4*_ga*MTYwOTMxNjU4MC4xNzIwNjc0MDk5*_ga_YSG27FE6BZ*MTcyMDY3NDA5OS4xLjEuMTcyMDY3NDIwMS42MC4wLjA.&_ga=2.44224743.23159879.1720674100-1609316580.1720674099	This course, offered by the Mechanics and Mathematics Faculty of NSU, introduces foundational concepts in probability and statistics for 8th-grade students, covering topics from elementary outcomes to the total probability formula.

Video lessons on algebra for grade 11	URL://https://www.youtube.com/playlist?list=PLvtJKssE5NrhlWsz1EV0LGlzRSoKt23JB	This course delves into various mathematical concepts, including nth roots and their properties, expressions involving radicals, step, exponential, and logarithmic functions, their characteristics and graphs, exponential, irrational, and logarithmic equations and inequalities, and both indefinite and definite integrals.
Statistics for high school	URL://https://ru.khanacademy.org/math/probability	This course explores key concepts in mathematical statistics, providing a combination of video lectures, practical exercises, and assessments.
Fundamentals of Mathematics for Digital Professions	URL://https://practicum.yandex.ru/math-foundations/	The course covers the following topics: Sets and logic. Numerical sets. Elements of logic. Combinatorics. Factorial and permutations. Placements. Binomial coefficients. Probability theory. Random variables.

Computer science, information systems

Online courses in English	**Link**	**Summary**
Computer Arithmetic – Computer Fundamentals. Pradeep K. Sinha & Priti Sinha.	URL://https://www.infobooks.org/pdfview/1532-chapter-05-computer-arithmetic-computer-fundamentals-pradeep-k-sinha-pritisinha/	This presentation provides an overview of number systems.
Computer Science Fundamentals	URL://https://code.org/curriculum/csf	This free curriculum introduces foundational computer science concepts and explores the impact of computers and technology on the world.
Introduction to Artificial Intelligence with Python	URL://https://pll.harvard.edu/course/cs50s-introduction-artificial-intelligence-python	This course explores the concepts and algorithms that underlie modern artificial intelligence and examines the ideas that give rise to technologies such as game engines, handwriting recognition, and machine translation. Through hands-on projects, students gain an

		understanding of the theory behind graph search, classification, optimization, reinforcement learning, and other topics in artificial intelligence and machine learning.
Introduction to Computer Science	URL://https://pll.harvard.edu/course/cs50-introduction-computer-science	This introductory course develops algorithmic thinking and effective problem-solving skills. You'll explore topics such as abstraction, algorithms, data structures, encapsulation, resource management, security, software engineering, and web development. The course covers programming languages including C, Python, SQL, JavaScript, CSS, and HTML, and utilizes problem sets from diverse fields like biology, cryptography, finance, and forensics.

Online courses in Russian	**Link**	**Summary**
Mathematical packages in electronics	URL://https://openedu.ru/course/mephi/mephi_mpie/	This course aims to equip students with the skills to model electronic devices effectively, using both the MathCad and KlypWin software environments. It covers modelling techniques for electronic devices, with a focus on powerful klystrons.
Discrete Mathematics	URL://https://openedu.ru/course/mephi/mephi_dism/	The course is designed for students studying the main topics of the IT areas of the bachelor's degree. It provides a substantive and formal basis for the presentation of knowledge and its manipulation using mathematically sound basic "building blocks" or "units of knowledge".
Programming Workshop	URL://https://stepik.org/course/66699/promo?search=4672004552	This course helps students in grades 6-11 develop practical programming skills in Python, C++, and PascalABC. It provides a foundation for independent programming learning and offers hands-on practice through tested tasks.
Coding and number systems	URL://https://stepik.org/course/5398/promo?search=4672004437	The online course was created to support the topic "Coding and

		number systems" for 8th-11th grades.
Basic course in computer science	URL://https://stepik.org/course/99549/promo?search=4672004471	A basic practical course for middle and high school students introducing the main sections of computer science and methods for solving GIA problems
Algorithms: Theory and Practice. Methods	URL://https://stepik.org/course/217/promo	This course explores key algorithmic techniques including greedy algorithms, divide-and-conquer, and dynamic programming. It goes beyond theory, diving into implementation details in C++, Java, and Python. Students will gain hands-on experience by implementing most of the algorithms discussed, with their solutions rigorously tested using a comprehensive testing system.
Algorithms: Theory and Practice. Data Structures	URL://https://stepik.org/course/1547/promo	This course explores fundamental data structures essential for practical programming, including arrays, lists, queues, stacks, dynamic arrays, priority queues, disjoint set systems, hash tables, and balanced trees. You'll learn how these structures are implemented in various programming languages and gain hands-on experience through practice exercises that involve implementing, using, and extending them.

Computer science, artificial intelligence

Online courses in English	**Link**	**Summary**
Computer Arithmetic – Computer Fundamentals. Pradeep K. Sinha & Priti Sinha.	URL://https://www.infobooks.org/pdfview/1532-chapter-05-computer-arithmetic-computer-fundamentals-pradeep-k-sinha-pritisinha/	This presentation provides an overview of number systems.
Computer Science Fundamentals	URL://https://code.org/curriculum/csf	This free curriculum introduces foundational computer science concepts and explores the impact of computers and technology on the world.

Introduction to Artificial Intelligence with Python	URL://https://pll.harvard.edu/course/cs50s-introduction-artificial-intelligence-python	This course explores the concepts and algorithms that underlie modern artificial intelligence and examines the ideas that give rise to technologies such as game engines, handwriting recognition, and machine translation. Through hands-on projects, students gain an understanding of the theory behind graph search, classification, optimization, reinforcement learning, and other topics in artificial intelligence and machine learning.
Introduction to Computer Science	URL://https://pll.harvard.edu/course/cs50-introduction-computer-science	This introductory course develops algorithmic thinking and effective problem-solving skills. You'll explore topics such as abstraction, algorithms, data structures, encapsulation, resource management, security, software engineering, and web development. The course covers programming languages including C, Python, SQL, JavaScript, CSS, and HTML, and utilizes problem sets from diverse fields like biology, cryptography, finance, and forensics.

Online courses in Russian	**Link**	**Summary**
Mathematical packages in electronics	URL://https://openedu.ru/course/mephi/mephi_mpie/	This course aims to equip students with the skills to model electronic devices effectively, using both the MathCad and KlypWin software environments. It covers modelling techniques for electronic devices, with a focus on powerful klystrons.
Measuring information	URL://https://stepik.org/course/180915/promo?search=4818148884	This course equips you with the skills to understand and calculate information quantities. You'll learn to convert units of measurement, navigate concepts like alphabet power and information volume, calculate the information volume of text messages, estimate memory allocation for storing data, and

		measure the volume of graphic and audio information.
Programming Workshop	URL://https://stepik.org/course/66699/promo?search=4672004552	This course helps students in grades 6-11 develop practical programming skills in Python, C++, and PascalABC. It provides a foundation for independent programming learning and offers hands-on practice through tested tasks.
Coding and number systems	URL://https://stepik.org/course/5398/promo?search=4672004437	The online course was created to support the topic "Coding and number systems" for grades 8 through 11.
Basic course in computer science	URL://https://stepik.org/course/99549/promo?search=4672004471	This is a basic practical course for middle and high school students introducing the main sections of computer science and methods for solving GIA problems
Algorithms: Theory and Practice. Methods	URL://https://stepik.org/course/217/promo	This course explores key algorithmic techniques including greedy algorithms, divide-and-conquer, and dynamic programming. It goes beyond theory, diving into implementation details in C++, Java, and Python. Students will gain hands-on experience by implementing most of the algorithms discussed, with their solutions rigorously tested using a comprehensive testing system.
Algorithms: Theory and Practice. Data Structures	URL://https://stepik.org/course/1547/promo	This course explores fundamental data structures essential for practical programming, including arrays, lists, queues, stacks, dynamic arrays, priority queues, disjoint set systems, hash tables, and balanced trees. You'll learn how these structures are implemented in various programming languages and gain hands-on experience through practice exercises that involve implementing, using, and extending them.

Computer science, cybernetics

Online courses in English	**Link**	**Summary**

Computer Arithmetic – Computer Fundamentals. Pradeep K. Sinha & Priti Sinha.	URL://https://www.infobooks.org/pdfview/1532-chapter-05-computer-arithmetic-computer-fundamentals-pradeep-k-sinha-pritisinha/	This presentation provides an overview of number systems.
Computer Science Fundamentals	URL://https://code.org/curriculum/csf	This free curriculum introduces foundational computer science concepts and explores the impact of computers and technology on the world.
Introduction to Artificial Intelligence with Python	URL://https://pll.harvard.edu/course/cs50s-introduction-artificial-intelligence-python	This course explores the concepts and algorithms that underlie modern artificial intelligence and examines the ideas that give rise to technologies such as game engines, handwriting recognition, and machine translation. Through hands-on projects, students gain an understanding of the theory behind graph search, classification, optimization, reinforcement learning, and other topics in artificial intelligence and machine learning.
Introduction to Computer Science	URL://https://pll.harvard.edu/course/cs50-introduction-computer-science	This introductory course develops algorithmic thinking and effective problem-solving skills. You'll explore topics such as abstraction, algorithms, data structures, encapsulation, resource management, security, software engineering, and web development. The course covers programming languages including C, Python, SQL, JavaScript, CSS, and HTML, and utilizes problem sets from diverse fields like biology, cryptography, finance, and forensics.

Online courses in Russian	**Link**	**Summary**
Mathematical packages in electronics	URL://https://openedu.ru/course/mephi/mephi_mpie/	This course aims to equip students with the skills to model electronic devices effectively, using both the MathCad and KlypWin software environments. It covers modelling

		techniques for electronic devices, with a focus on powerful klystrons.
Measuring information	URL://https://stepik.org/course/180915/promo?search=4818148884	This course equips you with the skills to understand and calculate information quantities. You'll learn to convert units of measurement, navigate concepts like alphabet power and information volume, calculate the information volume of text messages, estimate memory allocation for storing data, and measure the volume of graphic and audio information.
Programming Workshop	URL://https://stepik.org/course/66699/promo?search=4672004552	This course helps students in grades 6-11 develop practical programming skills in Python, C++, and PascalABC. It provides a foundation for independent programming learning and offers hands-on practice through tested tasks.
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Algorithms: Theory and Practice. Data Structures	URL://https://stepik.org/course/1547/promo	This course explores fundamental data structures essential for practical programming, including arrays, lists, queues, stacks, dynamic arrays, priority queues, disjoint set systems, hash tables, and balanced trees. You'll learn how these structures are implemented in

		various programming languages and gain hands-on experience through practice exercises that involve implementing, using, and extending them.

Computer science, software engineering

Online courses in English	Link	Summary
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