The program of the mathematics examination

Theme 1.

Numbers and expressions. Natural numbers . Divisibility. Simple and composite numbers. The greatest common divisor and least common multiple. Integers, rational and real numbers. Percents. The number module, degrees and roots. Numeric and alphabetic expressions. Equality and identity. The formulas of abridged multiplication. Decomposition of a polynomial into factors.

Theme 2.

Equations and inequalities. Range of admissible values equations and inequalities. Systems of equations and inequalities. The equivalence. Solution of linear equations and inequalities. The formula of the quadratic equation roots. The theorem on the decomposition of quadratic polynomial in linear factors. Vieta theorem. Word problems. Solution of square and fractional rational inequalities. Equations and inequalities with the module. Irrational equations and inequalities.

Theme 3.

Logarithms and their properties. Main logarithmic identity. Identical transformations of logarithmic and exponential expressions. Logarithmic and exponential equations and inequalities.

Theme 4.

Trigonometry. Definition of sin x, cosx, tgx, ctgx in a right triangle. Degree and radian measure of the angle. Main trigonometric identity. Reduction formulas. Sine, cosine and tangent of the sum and difference of the two arguments. Formula of double argument. Solution of trigonometric equations.

Theme 5.

Functions and graphs. Domain of definition and range of function meanings. The increase, decrease, frequency, parity, oddness. Graphs of the function. Linear, quadratic, degree, exponential, logarithmic, trigonometric and inverse trigonometric functions, their properties and graphs.

Theme 6.

Elements of probability theory. The probability of the event. The classical formula. The relative frequency of occurrence of the event.

Theme 7.

Derivative and antiderivative functions. The derivative of a function, its physical and geometrical meaning. The equation of the tangent. Rules of differentiation and table of derivatives of basic functions. The derivative of a composite function. Function study on the increase, decrease and extremum using the derivative. The largest and smallest value of the function on the interval. Antiderivative functions. Table of antiderivatives basic functions. The Newton –Leybnitsa formula. The geometric meaning of the definite integral.

Theme 8.

Planimetry. Line, ray, segment and its length. The angle, the value of the angle. The vertical and adjacent angles. Parallel lines. Triangle, its medians, bisectors, heights. Types of triangles. Properties of an isosceles triangle. Signs of equality of triangles. The average line of the triangle. Pythagorean theorem. Theorems of sines and cosines. Similar triangles. Similarity criteria of triangles. Inscribed and circumscribed circles.

Formula of a triangle area. A convex polygon. The theorem on the sum of the interior angles of a convex polygon. Parallelogram, rectangle, rhombus, square, trapezoid. Formulas for determining the areas of these figures. The middle line of the trapezoid. Regular polygons. Conditions for the inscribed and circumscribed circles of quadrangles. Circumference, circle. Radius, chord, diameter, tangent, secant. The arc of a circle and a circular sector. Central and inscribed angles. The length of the circumference and area of a circle.

Theme 9.

Stereometry. Plane. Parallel and intersecting planes. Parallelism and perpendicularity of lines and planes. The angle between the two straight lines, planes, a line and a plane. Skew lines. Perpendicular to the plane. The theorem on three perpendiculars. Dihedral angle. Linear angle of the dihedral angle. Polyhedra, their vertices, edges, faces, diagonals. Direct and the inclined prisms. Parallelepiped and cube. The pyramid, truncated pyramid. Proper prism and regular pyramid. Cylinder, cone, truncated cone, sphere, ball. Center, the diameter and radius of the sphere. Formulas for determining the surface areas and volumes of prisms, pyramids cylinder, cone and sphere.

Theme 10.

Vectors on a plane and in space. The length of the vector. Collinear vectors. Conditions of collinearity of vectors. Addition and subtraction of vectors.

Multiplication of a vector by a number. The scalar product of vectors. Operations on vectors in coordinate form. The sign of perpendicularity of two vectors.