Ministry of Education and Science of Ukraine
V.N. Karazin Kharkiv National University

APPROVED BY
Deputy Chairperson of the Admission Committee
Vice-rector of V.N. Karazin Kharkiv National University
Oleksandr HOLOVKO
17 квітня 2026

PROGRAM

of the entrance test in Mathematics in written form (testing) for foreign citizens and stateless persons who enroll in studies to obtain the first (bachelor) level of education (masters of Medical Sciences) on the basis of Complete General Secondary Education, NQF 5, NQF 6, NQF 7

Kharkiv - 2026

This programme is based on the current programme of external independent evaluation in mathematics.

THE LIST OF TOPICS COVERED IN THE EXAM

1. ARITHMETICS, ALGEBRA AND BASICS OF MATHEMATICAL ANALYSIS

1. Properties of operations with real numbers. Rules for real number comparison.

2. Natural numbers and zero. Divisibility of natural numbers. Divisors and multiples of a natural number. Even and odd numbers. Divisibility rules for numbers 2, 3, 4, 5, 6, 9 and 10. Division with remainder. Prime and composite numbers. Decomposition of a natural number into its prime factors. The greatest common divisor, the least common multiple.

3. Common fractions. Comparison of common fractions. Proper and improper fraction. Integer and fractional part of a number. Basic properties of fractions. Fraction reduction. Arithmetic mean. Basic fraction problems.

4. Rational and irrational numbers, their comparison and operations with these numbers.

5. Definition of percentage. Rules for percentage calculating. Proportions.

6. Powers with natural, integer and rational exponents, their properties. Arithmetic root and its properties.

7. Logarithms and their properties. Basic logarithmic identity.

8. Monomials and polynomials. Operations with them. Formulas of abridged multiplication.

9. Polynomials in one variable. Roots of polynomials. Decomposition of a polynomial into factors.

10. The notion of a function. Methods for specifying a function. Domain and range of a function. Inverse function.

11. Graph of a function. Increasing and decreasing functions. Periodic functions. Even and odd functions.

12. Sufficient condition for a function to be increasing/decreasing on an interval. The concept of extremum of a function. A necessary condition for extremum of a function. Maximum and minimum values of a function on a closed interval.

13. Definitions and basic properties of linear, quadratic, power, exponential, logarithmic, and trigonometric functions.

14. Equations. Solving equations, roots of equations. Equivalent equations. Graph of an equation with two variables.

15. Inequalities. Solving inequalities. Equivalent inequalities.

16. Systems of equations and systems of inequalities. Solving systems. System solutions. Equivalent systems of equations and inequalities.

17. Numerical sequences. Arithmetic and geometric progressions. Formulas for the n^{th} term and the sum of the first n terms of progressions.

18. Dependence between trigonometric functions of the same angle. Trigonometric functions of sum and difference of two angles. Half and double angle formulas. Trigonometric reduction formulas.

19. Definition of the derivative, its mechanical and geometric interpretation.

20. Derivative of a sum, difference, product, and quotient. Table of derivatives. Chain rule.

21. Antiderivative and definite integral. Table of antiderivatives. Rules for finding antiderivatives. Newton-Leibniz formula.

22. Permutations (without repetitions), number of permutations. Variations (without repetitions), number of variations. Combinations (without repetitions).

23. Simplest cases for calculating probabilities of random events.

24. Statistical characteristics of datasets.

II. GEOMETRY

1. Line, ray, line segment, broken line. Length of a line segment. Angle, value of an angle. Vertical and adjacent angles. Parallel lines. Equality and similarity of geometric figures. Ratio of the areas of similar figures.

2. Examples of transformation of geometric figures, types of symmetry.

3. Cartesian coordinates. Vectors. Vector operations.

4. Polygons. Vertices, sides, and diagonals of a polygon. Polygons inscribed in a circle and circumscribed around a circle.

5. Triangles. Median, bisector, and altitude of a triangle, their properties. Types of triangles. The relationship between the sides and angles of a right-angled triangle. Law of cosines.

6. Quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid; their properties.

7. Circles and disks. Centre, diameter, radius, chord, secant. Line segment relationships in circles. Tangent lines to circles. Circular arcs. Sectors and segments.

8. Central and inscribed angles, their properties.

9. Formulas for the areas of geometric figures: triangle, parallelogram, rectangle, rhombus, square, trapezoid.

10. Circumference of a circle. Length of a circular arc. Radian measure of an angle. Area enclosed by a circle. Area of a circular sector.

11. Plane. Parallel planes and intersecting planes.

12. Parallel line and plane.

13. Angle between a line and a plane. Line perpendicular to a plane.

14. Dihedral angles. Linear angle of a dihedral angle. Perpendicular planes.

15. Polyhedra. Vertices, edges, and faces of a polyhedron. Right and oblique prisms. Pyramids. Right pyramids. Parallelepipeds, their types.

16. Solids and surfaces of revolution. Cylinders, cones, spheres, and balls. Centre, diameter, and radius of a sphere and a ball. Planes tangent to a sphere.

17. Formulas for surface areas and volumes of prisms, pyramids, cylinders, and cones.

18. Formulas for the surface area of a sphere and the volume of a ball.

The entrance exam in mathematics in written form has a test structure and consists of 21 questions. The maximum number of points that can be obtained for taking the test is 32 points.

If an applicant scored less than 5 points, he or she received an unsatisfactory grade.

If the applicant scored at least 5 points, the total score is converted to the scale of 100-200 according to the table of the Ukrainian Center for Educational Quality Assessment on the conversion of test scores in mathematics of the national multi-subject test to a scale of 100-200.

Transfer of points on a scale of 100-200 points

Points for the test	Scale of 100-200 points	Points for the test	Scale of 100-200 points
5	100	19	151
6	108	20	152
7	115	21	155
8	123	22	159
9	131	23	163
10	134	24	167
11	137	25	170
12	140	26	173
13	143	27	176
14	145	28	180
15	147	29	184
16	148	30	189
17	149	31	194
18	150	32	200

Head of the Subject Examination committee
for conducting interviews in Mathematics  Olena ARSHAVA

Approved at the meeting of the Admission Committee of V. N. Karazin Kharkiv National University, Meeting Minutes № 3 of April 17, 2026

Secretary of
the Admission Committee  Hanna ZUBENKO