## [EN] MANDATORY ENTRANCE EXAM IN MATHEMATICS

Foreign candidates applying for full-time Bachelor's degree programs, who have *obtained their secondary school diploma outside the EU, OECD, or EFTA, as well as those who do not hold an IB/EB diploma or a document confirming education recognized under an international agreement* shall participate in a mandatory exam in mathematics organized by the Faculty of Pure and Applied Mathematics of Wrocław University of Science and Technology.

Candidates whose certificates or diplomas are automatically recognized (information available on the NAWA website) are exempt from the entrance exam in mathematics.

The exam will be conducted online on the ePortal platform of Wrocław University of Science and Technology. It includes about ten open tasks. The maximum score for each task may vary and will be set between 4 and 8 points. A candidate can obtain a maximum of 50 points during the whole exam.

**Structure of the exam:**

The exam includes about ten open tasks which cover the following topics:

1. **Real numbers.** Performing operations on real numbers using properties of powers, roots and logarithms.
2. **Algebraic expressions.** Applying formulas for $(a+b)^2$, $(a-b)^2$, $a^2-b^2$. Conducting short proofs about divisibility and remainders.
3. **Equations and inequalities, systems of equations.** Solving linear and quadratic equations and inequalities. Solving polynomial equations and transforming rational equations to polynomial equations. Solving systems of linear equations and applying them to practical problems.
4. **Functions.** Finding properties of a function using its graph. Finding a formula of a linear or a quadratic function being given information about its graph. Solving problems using a linear or a quadratic function. Using a reciprocal function, an exponential function or a logarithmic function to describe natural and other phenomena. Finding the extreme values of a quadratic function on a closed interval. Solving optimization problems in situations described by a quadratic function.
5. **Sequences.** Calculating elements of a sequence given by a general formula or using recursion. Checking if a sequence is monotone, arithmetic or geometric. Applying a formula for a sum of an arithmetic or a geometric sequence. Using properties of such sequences to solve problems.
6. **Trigonometry.** Using definitions of sine, cosine and tangent function for angles between 0° and 180°, in particular finding the values of these functions for angles 30°, 45°, 60°. Using the Pythagorean trigonometric identity, law of cosines and the formula for the area of a triangle $P = \frac{1}{2}ab\sin\gamma$.
7. **Planar geometry.** Finding radii and diameters of circles, length of chords and tangent line segments i.a. using Pythagorean theorem. Recognizing regular polygons and using its basic properties. Applying properties of angles and diagonals in rectangles, parallelograms, rhombuses and trapezoids. Using properties of inscribed and central angles. Applying Thales's theorem. Using the similarity and congruence of triangles. Conducting geometrical proofs. Applying trigonometrical functions to determine the length of a line segments in planar figures and area of geometric figures. Finding special points associated with triangles (the circumcenter, the incenter, the centroid and the orthocenter) and using its properties in problem solving.
8. **Analytic geometry on cartesian plane.** Recognizing the relative position between two lines. Using an equation of a line in a slope-intercept and in a standard form. Calculating a distance

between two points on a plane. Using the standard equation of a circle. Finding the images of circles and polygons in symmetries with respect to coordinate axes or with respect to the origin.

9. **Solid geometry.** Recognizing the relative position between two lines in space. Using angles between a line and a plane in space and dihedral angles. Finding angles between lines and planes in prisms, pyramids, cylinders and cones. Calculating a volume and a surface area of prisms, pyramids, cylinders, cones and balls. Describing relationship between volumes of similar solid figures.
10. **Combinatorics and probability.** Counting objects in simple combinatorial situations, i.a. using the rule of sum or the rule of product. Calculating probability in a classical model.
11. **Statistics.** Calculating an arithmetic mean and a weighted mean. Finding median and mode in a sample.

**Time of the exam**

The exam will be conducted on July 15, 2025.

**Conditions for taking the exam:**

1. Registration of the application for the selected study programme via the IRK system (by July 11, 2025).
2. Payment of the application fee – the fee must be credited to the candidate's individual bank account number.
3. Possession of a device equipped with a stable internet access and a scanner or a camera.

**Mock exam**

On the day before the exam there will be a mock exam available on the platform. The candidates may become acquainted with the exam structure, exemplary problems and try to upload files.

**Rules for conducting the mathematics exam online:**

- The presence of third parties is not allowed.
- Use of study aids, electronic devices (except using a camera in the smartphone to take photos of the solutions), messengers, chatbots and other supporting applications e.g. driven by AI is strictly prohibited.
- The solutions must be handwritten on paper and later scanned or photographed (for people using cameras in smartphones we recommend to use an app which enhance the quality of the photo and save it as a pdf file). We recommend uploading pdf-type files due to their smaller size and confidence that they will be opened by the reviewer. Uploading graphic files is possible but there is a risk that the solution will be cancelled if the file cannot be opened.
- The time for taking the exam is limited (90 minutes) and is counted from its beginning.
- After the time limit has passed the test will be automatically closed.

**Passing criteria:**

To pass the exam, the candidate must score at least 30% in the exam.

**Information on results:**

The results of the exam will be sent to candidates within 3 working days after the test.