

## Topics for the entrance exam in mathematics for foreigners to the Cracow University of Technology for the academic year 2026/27

1. **Real numbers:** arithmetic operations (addition, subtraction, multiplication, division, multiplication, rooting, logarithm); divisibility of integers; number interval; absolute value; percentages.
2. **Algebraic expressions:** short multiplication formulas; addition, subtraction, multiplication and division of polynomials and rational expressions.
3. **Equations and inequalities:** linear, quadratic and exponential equations and inequalities; polynomial, rational and logarithmic equations.
4. **Systems of equations:** Systems of linear equations and their geometric interpretation; systems of equations, one of which is linear and the other quadratic.
5. **Functions:** domain, set of values, graph,  $O'$ 's of functions, monotonicity range, largest and smallest value; functions: linear, quadratic, exponential, logarithmic and  $f(x) = \frac{a}{x}$ ; transforming graphs of functions (shift by a vector, symmetry with respect to  $Ox$  and  $Oy$  axes).
6. **Sequences:** monotonicity of a sequence; arithmetic and geometric sequence (formulas for the  $n$ th term of a sequence and for the sum of  $n$  initial terms of a sequence).
7. **Trigonometry:** use of sine, cosine, tangent functions and formulas  $\sin^2 x + \cos^2 x = 1$ ,  $\operatorname{tg} x = \frac{\sin x}{\cos x}$ .
8. **Planimetry:** circle, circle section, arc length of circle, inscribed angle and central angle; polygons - their areas and perimeters; use of theorems: Pythagoras, Tales, sines, cosines; similarity and congruence of figures; inscribed and circumscribed circle on a triangle.
9. **Analytical geometry:** equations of lines, their perpendicularity and parallelism; distance of two points in the plane; distance of a point from a line; equation of a circle.
10. **Stereometry:** the angle between a line and a plane, the dihedral angle, the cross-section of a cuboid by a plane; the angle of dilation of a cone, the angle between the cone's origin and base; areas and volumes: prisms, pyramids, cylinder, cone and sphere.
11. **Combinatorics, probability calculus and statistics:** apply simple combinatorial formulas (permutations, combinations, variations with and without replacement); classical probability; arithmetic mean, weighted mean, median, dominant, expected value and standard deviation.

Candidates are bound by the above topics and their applications in practical problems.