

**CONTENTS OF MATHEMATICS  
CURRICULUM  
(Bosnia and Herzegovina)**

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## **Introduction**

We give here the short summary of contents of the school curriculum for area of mathematics in high-schools and elementary schools in Bosnia and Herzegovina, including major topics and some subtopics.

The school system in Bosnia and Herzegovina includes:

- Elementary school - eight grades (from age 6-14)
- Secondary school - four grades for some vocational schools and gymnasiums, three grades for some vocational schools (from age 15-17 or 18)
- Universities (from two till six years of study – depends on the major subject)

In this document, following contents can be found.

- primary school level (first four grades in elementary school)
- higher grades of elementary school
- gymnasium<sup>1</sup>

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<sup>1</sup> Four grades vocational schools have similar curriculum as gymnasium with some differences according to a vocation. Three grades vocational schools have different simplified curriculum, also according to a vocation.

# CURRICULUM FOR ELEMENTARY SCHOOL

## 1. PRIMARY SCHOOL (grades 1-4)

### 1<sup>st</sup> grade

- Recognition of basic geometric figures and bodies: triangle, square, rectangle, cube, rectangular parallelepiped, sphere, pyramid
- Sets: elements of sets, correspondence between sets, operations with sets, intersection of two sets, union of two sets, difference of two sets
- Learning natural numbers 1, 2, 3, 4, 5 using set approach
- Operations of adding and subtracting in set 1-5 using set approach
- Mathematical signs for addition, subtraction, equation...
- Learning natural numbers 6-10 using combined set and number approach, counting, number line
- Natural numbers 1-20, adding, subtracting
- Natural numbers 1-100, counting

### 2<sup>nd</sup> grade

- Set of natural numbers 1-100
- Decade units
- Adding, subtracting, multiplication (without remainder and with remainder) and division in set 1-100
- Measures: meter, decimeter, centimeter, kilograms
- Circumference and area of square and rectangular

### 3<sup>rd</sup> grade

- Natural numbers 1-1000
- Decade units
- Adding, subtracting, multiplication (without remainder and with remainder) and division in set 1-1000
- Geometry (recognition of acute, right and obtuse angle, triangles, circumference of triangle, circle, construction of a circle, line, segment line, point of line, parallel and perpendicular lines)
- Measures (millimeter, gram, time measures)

### 4<sup>th</sup> grade

- Set of natural numbers 1-1 000 000
- Decade units
- Adding, subtracting, multiplication (without remainder and with remainder) and division in set 1-1 000 000
- Numerical expressions

- Circumference and area of square and rectangle
- Solids: cube and rectangular parallelepiped, circumference, area and volume

## 2. CURRICULUM FOR HIGHER CLASSES OF ELEMENTARY SCHOOL

### 5<sup>th</sup> grade

- Sets and correspondence between sets: union, intersection, difference and direct product; convex sets of points, polygonal line and circle; function, graphic of function, forms of function; bijection; equipotential sets; number ray and rectangular coordinate system.
- Set of natural numbers; presentation of natural numbers on the number line; operations with natural numbers; extension of natural numbers set.
- Angle: convex and inconcave triangles; central angle in the circle; chord; equal angles; addition and subtraction of angles by graphical method; measurement of angles; relative position of angles
- Division of numbers: division with the rest value in  $\mathbf{N}$ ; simple factorization – rules; prime and composite numbers; greatest common factor; lowest common denominator
- Fractions: notion of fraction  $a/b$ ; nominator and denominator; forms of fractions; comparison of fractions; decimal fraction; decimal numbers; equations with fractions

### 6<sup>th</sup> grade

- Integer and rational numbers: notion of negative integer; representation of integer and rational numbers on number line; absolute value; opposite and reciprocal numbers; basic operations in  $\mathbf{Q}$  and  $\mathbf{Z}$ ; expressions with rational numbers; equations and inequations with rational numbers
- Isometrics, congruence and triangle: vectors – basic properties; isometric transformations in plane; congruency; triangles – sorts of triangles; construction of angles; central and peripheral angle; mutual position of line and circle; characteristic points of triangle with construction
- Rectangular: sum of angles in rectangular; rectangular forms; construction
- Area and circumference of triangle and rectangular; figures with equal areas

### 7<sup>th</sup> grade

- Real numbers set: square of rational number; equations  $x^2=a$  ( $a \geq 0$ ); square root; rational and irrational numbers; ordering of numbers in  $\mathbf{R}$ ; basic operations in  $\mathbf{R}$
- Pitagora's theorem: constructions of irrational numbers value; application of Pitagora's theorem
- Proportions and inverse proportions; graphics; Tales theorem; rectangular coordinate system in the plane;

- Integer rational forms; powers; basic operations with powers; polynomials; basic operations with polynomials; factorization
- Polygons; sum of angles and number of diagonals in polygons; construction of regular polygons (6,8,12 angles); area and circumference of polygons; area and circumference of circle; length of the arc

### **8<sup>th</sup> grade**

- Rational forms; basic operations with rational forms
- Linear function  $y = ax + b$ , graphic and analysis; equations – graphical methods of solution; inequations; algebraic methods of solving inequations; practical problems
- Systems of linear equations
- Point, line and plane in space. Stereometrics.

## **CURRICULUM FOR GYMNASIUM**

### **1<sup>st</sup> grade**

- Sets of numbers: natural numbers, integer numbers, rational numbers, real numbers
- Mathematical operations in the set of real numbers
- Algebraic forms (monomials, binomials, trinomials, polynomials)
- Factorization of algebra forms
- Algebraic fractions; operations with algebraic fractions
- Linear equations and inequations
- Absolute value of real numbers
- Equations and inequations with absolute value (module)
- Linear function
- Graphic of linear function, analysis of graphic
- Graphic of absolute value function, analysis of graphic
- Systems of linear equations and inequations
- Rectangular coordinate system
- Point, line and metrics in rectangular coordinate system
- Congruent figures and application, geometrical constructions using congruency theorems
- Similar figures and application, geometrical constructions using similarity theorems, Euclid's theorem
- Homothetic, Tales theorem, geometrical constructions
- Planimetry problems
- Exponential forms

## 2<sup>nd</sup> grade

- Set of complex numbers
- Algebraic form of complex number
- Operations with complex numbers
- Absolute value of complex numbers
- Gaussian plane
- Quadratic equations – forms of quadratic equations
- Solution of general form of quadratic equation
- Nature of solution of quadratic equation
- Viète's formulas
- Biquadratic equations
- Symmetric equations
- Systems of quadratic equations
- Polynomials of second degree and graphic
- Quadratic inequations
- Trigonometric functions of acute angle
- Application on right triangle
- Application in planimetry
- Exponential function and graphics
- Logarithmic function and graphics
- Exponential and logarithmic equations and inequations
- Geometry of space
- Solids: cube, quadratic prism, proper poliedres, pyramids, cylinder, cone, sphere

## 3<sup>rd</sup> grade

- Unit cycle
- Odd and even trigonometric functions
- Period of trigonometric functions
- Basic relations between trigonometric functions
- Addition theorems
- Reduction theorems
- Trigonometric functions of double argument
- Basic trigonometric transformations
- Graphics of trigonometric functions
- Trigonometric equations and inequations
- Sine theorem, cosine theorem, tangents theorem, Molveida's formulas
- Application in planimetry
- Vectors – basic properties
- Vectors in rectangular coordinate system
- Dot, cross and triple product of vectors
- Division of line segment

- Analytical geometry in plane – metrics, line equations, parallel and rectangular lines
- Conic sections – equations of cycle, ellipse, hyperbola, parabola and relative relation with a line

#### **4<sup>th</sup> grade**

- Systems of numbers
- Set of natural numbers: Pean's axioms
- Principle of mathematics induction
- Axiomatic of the set of real numbers
- Binomial coefficients
- Binomial theorem
- Trigonometric form of complex number
- Basic algebra theorem
- Series: algebraic, geometric, infinite geometric series
- Limit value of series
- Real functions: area of definition, odd and even functions, periodical functions, monotonous functions, limited functions
- Limit value of function
- Derivation of function: rules of derivation, derivation of composite function, derivation of inverse function, tangent line of a curve
- Graphics of exponential and rational function, graphics analysis
- Integrals: primitive function, indefinite integral, Newton-Leibnitz formula, definite integral, rotation bodies