Appendix 3
of Regulation No 1 of the Government
of the Republic of 6 January 2011
National Curriculum for Basic Schools

Last amendment 29 August 2014

Subject field: Mathematics

1. General Principles

1.1. Mathematics Competence

The aim of mathematics education is to develop in basic school students mathematics competence, which is adequate for their age; it means the ability to use the language, symbols and methods characteristic of mathematical applications to solve various problems in mathematics as well as in other school subjects and walks of life, to understand social, cultural and personal meaning of mathematics; the skill to formulate problems, identify and implement suitable solution strategies, analyse solution ideas and test the accuracy of results; the skill of logical reasoning, justification and proof by using and understanding different presentation methods.
It is expected that, through mathematics education, basic school graduates will:

1) understand the value of and enjoy mathematics;
2) have knowledge of mathematical concepts and relations;
3) be capable of logical reasoning, justification and proof;
4) use solution strategies for standard problems and be capable of solving mathematical problems;
5) be capable of presenting information in the form of text, graphs, tables, diagrams and formulas;
6) be able to use information and communication technology tools for learning;
7) be capable of analysis and reaching conclusions through reasoning based on available facts;
8) apply mathematical knowledge in other school subjects and in daily life;
9) have knowledge of the specialties and professions in the subject field and assess their abilities and interests in the context of potentially continuing their studies in mathematics-related fields.

1.2. Subjects and Volume of the Subject Field

The subject field includes subject mathematics taught from Forms 1 to 9.
The number of weekly mathematics lessons per stage of study is divided as follows:
1st stage of study – 10 lessons per week
2nd stage of study – 13 lessons per week
3rd stage of study – 13 lessons per week

The distribution of weekly hours of subjects within stages of study is specified in the school curriculum considering that the expected learning outcomes and learning and educational objectives would be

achieved. The subject teacher selects the contents of education for presentation in consideration of achievability of the learning outcomes, subject field competences and general competences.

1.3 Description of the Subject Field

Mathematics involves working with models, describing relations and developing methods. Basic school mathematics education prepares students for understanding and describing logical, quantitative and spatial relations. The mathematics course provides skills of written, calculator and mental arithmetic, presents the properties of planar and spatial objects, and teaches how to create mathematical descriptions of relations. Students acquire necessary basic algebra skills. They obtain a preliminary idea of the surrounding world of random events and the techniques used to describe it. The methods and language learned in the basic school mathematics course can be used by students in other subject fields.

The design of education is focused on ensuring that students understand the contents of learning and on developing logical and creative thinking in students. The importance of accuracy, consistency and students' active thought processes is emphasised throughout the study period. By solving mathematical problems, students can experience enjoyment of success and discovery. Information and communication technology (ICT) resources are utilised in the educational process.

1.4. Options of Forming General Competencies

Studying mathematics develops not only mathematics competences but also all other general competences.

Cultural and value competence. Mathematics is a science that unifies different cultures. Thus, pupils can learn about the works of mathematicians from different countries and eras. Pupils are guided to recognise the elegance of logical trains of thought as well as the beauty of geometric objects under observation and their relation with architecture and nature. Studying mathematics helps to develop such character traits as determination, persistence, perseverance, accuracy and attentiveness while also teaching to follow discipline. Solving of mathematical problems creates interest in the surrounding world and improves understanding of the laws of nature. Pupils will learn to notice the connection of mathematics to daily life and understand that basic mathematical knowledge improves comprehension of other science disciplines.

Social and citizenship competence. Responsibility towards society and fellow citizens is raised by solving tasks with relevant content. Paired and group work tasks enable students to develop their cooperation and mutual assistance skills and to increase tolerance towards students with different mathematical abilities.

Self-management competence. In mathematics independent work has an important role to play. By means of independent task solving, pupils can assess and develop their mathematical abilities.

Learning to learn competence. When studying mathematics, it is essential to perceive the learning material in depth and understand everything. Solving problem tasks develops analytical, rational method finding and critical outcome assessment skills. Generalisation and analogy-using skills are very important: skills in carrying acquired knowledge over to suitable contexts. Pupils are guided towards the understanding that complex tasks can only be solved by using independent thought.

Communication competence. Mathematics develops pupils' ability to express their ideas clearly, briefly and precisely. This is primarily the case when formulating hypotheses and theorems and also when formulating the task solution. Solving of text problems improves the skill of understanding a text: to distinguish between important and unimportant parts and seek out relevant information for a given quantity. Mathematics has an important role in developing preparedness for understanding, associating and communicating information presented in different ways (text, graphs, tables, diagrams and formulas).

Mathematics and natural sciences and technology competence. Mathematics helps to develop skills that are required for evidence-based decision-making. It provides information on methods and techniques of data processing, measurement, comparison, classification and systematisation.

Entrepreneurial competence. Entrepreneurial competence is developed by solving problems with real life data. Identification of different solution paths improves the flexibility of thought and the ability to generate ideas.

1.5. Options for Integrating Mathematics with Other Subject Fields

Mathematics is integrated with other subject fields in two principal ways. Through the use of mathematical methods in other subject fields, students develop an understanding of mathematics as a basic science, with its universal language and methods, that supports other subject fields. The use of problems associated with other subject fields and real life provides students with an idea of application opportunities of mathematics.

Language and literature, including foreign languages. Education develops the skill of clear and relevant oral and written self-expression, creation, interpretation and presentation of texts, including tables, graphs, etc. Students are guided to use appropriate linguistic resources and mathematical vocabulary while observing correct grammar. The solving of text problems helps to develop functional reading skills, including the ability to understand visual information. Attention is paid to the correct writing of numerals, as well as accurate formatting of text, graphs, tables and other information. The meaning of mathematical concepts of foreign origin is explained and foreign language skills can be developed through the search and use of additional resources.

Natural sciences. A mathematics teacher can engage in close cooperation with teachers of natural sciences. The productivity of such cooperation depends, on the one hand, on the mathematics teacher's knowledge of the content of other subject fields and, on the other hand, on the abilities and skills of science teachers to use mathematics and its language in a reasonable and accurate manner in their subject field. Inquiry learning in science subjects requires students to have the ability to analyse the data collected through observations and experiments, and to present the results of observations and experiments as graphs, diagrams and tables.

Social subjects. The solving of problems helps to develop the skill of understanding and selecting information: to differentiate between important and unimportant parts and to identify (in a text, on a drawing, etc.) data required for solving a problem. The formatting of solutions to problems and formulation of hypotheses and theorems helps to develop the skill of clear, concise and accurate expression of thoughts. Information on mathematical concepts can be combined with the provision of information on important social topics, such as population structure and the shares of different social groups, individual and state budget, wages and taxes, interest, interest on arrears, the risks associated with rapid loans, the use of pro mille and percentage point units in daily life, etc. Data from the social sphere is used in the context of

mathematical topics associated with statistics. Students learn how to use different information environments (for instance, assess the accuracy of media-published diagrams based on what they have learned) and gain an overview of the current taxation system. Logical reasoning and factual thinking enable people to make right decisions in life. Practical assignments, group work tasks and participation in projects improve cooperation, mutual support and respect for each other.

Art subjects. Art and geometry (technical drawing, measurement) are closely interconnected. The development of art competence can be supported with resources that demonstrate geometry applications in art fields, such as architecture, interior design, ornamental art, design, etc. Geometric concepts can be used as a basis for analysing objects in art education. Classification of important characteristics of shapes and use of symbols are integral elements of art together with comparison and classification of properties of depicted objects/phenomena. As a result of integration, students will develop the ability to see the beauty of graphs drawn in computer software, to notice the beauty of different geometrical shapes in their home environment and in the nature, to calculate the area and volume of familiar shapes if necessary.

In music, intervals, measures and note durations are usually expressed as common fractions.

Technology. The classes of handicraft and home economics, crafts and technology studies involve practical measurements and calculations, reading and creation of drawings, etc., in connection with designing and creating projects.

Physical education. The skill to interpret numerical data is expressed in the ability to compare sports results and understand the information presented in ranking tables. Text problems are used to explain the importance of healthy lifestyle, physical activity and sports for human health, as well as the importance medical achievements. Students can use objective numerical data to assess their health behaviour, for instance, the quantity of sugar in food, traffic behaviour (speed, braking distance, visibility), etc. Physical activity and movement contribute to understanding the basic concepts of units and measurement systems. One type of mathematical models of reality, namely maps, are used in physical education classes to learn navigation. Consistency, accuracy and the ability to identify the simplest and best solution are integral parts of both mathematics and sports.

1.6. Options for Implementing Cross Curricular Topics

The cross-curricular topics introduced in the general part of the curriculum are primarily realised in basic school mathematics lessons by systematically organising studying activities and giving references to relevant subjects under observation.

Lifelong learning and career planning. Mathematics education communicates the need to learn and helps to develop independent study skills. Mathematics lessons shape the ability to think in an abstract and logical manner. Realistic assessment of one's abilities is one of the most important preconditions of career planning. Students are guided towards developing their studying, communication, cooperation, decision making and information handling skills. Educational activities offer opportunities for direct contacts with the world of employment, e.g., through visits to undertakings, presentations of occupations and professions related to the subject field.

Environment and sustainable development. Actual data regarding the use of environmental resources can be used in mathematics problems. When analysing this data, pupils are encouraged to develop a

sustainable attitude towards their surroundings and taught to value the physical and social environment. Outdoor lessons are possible.–Pupils learn to take personal responsibility for a sustainable future and achieve appropriate values and behaviour models. The perspectives of environmental and human development are assessed based on facts. When handling this particular topic, descriptive mathematics related to percentage calculation, elements of statistics and change and relation.

Citizens' initiative and entrepreneurship. Preparation for cooperation and tolerance towards other people's actions and opinions are developed through cooperative activities (research, group work, projects) that integrate mathematics and other subjects. The percentage calculation and elements of statistics enable the pupils to understand the meaning of numerical data used to describe society and its development.

Cultural identity. Mathematics is a part of both global and national culture. A modern living environment could not exist without mathematics. This can be emphasised by presenting the history of mathematics, the connections between the development of society and mathematical research, etc. By means of percentage calculation and statistics, pupils are able to describe the processes occurring in society in relation to the topic of the multicultural world (different nations, different religions, different social positions in society etc.).

Information environment. The information environment is associated with the skill to present and understand information in different formats (drawing, image, formula, model). An adequate perception of media manipulations is supported by the problems presented in the mathematics course, making use of statistical procedures and percentage calculations. Students are guided towards critical analysis of information.

Technology and innovation. Technological processes and modelling are presented through integration of the mathematics course with technology and natural science subjects. When planning and implementing their activities and assessing the final results, students perform measurements and calculations and use ICT tools for studying and increasing the efficiency of their work. Various educational software applications can be used in mathematics education.

Technology and innovation. By solving problems students learn how to use technological tools and understand the importance of mathematics for scientific and technological development.

Health and safety. Mathematics education can include problems containing health and safety data (e.g., text problems related to the traffic environment, movement of road users and vehicles; other problems and graphs presenting data on risk factors).

Values and morality. Study of mathematics is accomplishable if students develop their systematic approach, consistency, persistence, accuracy, correctness and sense of responsibility. The example of the teacher facilitates development of a tolerant attitude towards other students with different abilities. Studying and teaching mathematics should offer students as many positive emotions as possible.

1.7. Planning and Organizing Study Activities

In planning and organising study activities:

1) the focus is on the basic values, general competences, goals of the subject, learning content and expected learning outcomes of the national curriculum and the course supports integration with other subjects and cross-curricular topics;

2) the aim is to have a moderate study load for students (including homework), ensuring it is distributed across the school year evenly, giving students enough time for rest and recreational activities;
3) differentiated study assignments are used, with content and difficulty supporting an individualised approach and increasing motivation for learning;
4) study environments and study materials and tools based on contemporary information and communication technology are used;
5) students' knowledge, skills and attitudes are developed, with the main emphasis being on the formation of attitudes;
6) a diverse selection of study methods is used with emphasis on active study methods: independent work, conversation, debate, discussion, work in pairs, project study, group work;
7) opportunities are created for preparing essays, study portfolios and research projects, performing practical measurements, etc.;
8) the study environment is extended: computer classes, companies, outdoor learning etc.

1.8. Basis for Assessment

Assessment of learning outcomes is based on the assessment principles specified in the general part of the curriculum. Detailed assessment procedures are specified in the school curriculum.

Formative assessment and summarising grading are used in assessment. In formative assessment, the primary focus is on comparing a student's development with his or her previous accomplishments. In summarising grading, a student's accomplishments are compared with required learning outcomes. Both result and process are assessed in case of practical assignments and problems.

1.9. Physical Learning Environment

1. The school organises education in a classroom which has the necessary tools for drawing on the board.
2. The school provides:
    1) a set of pocket calculators for classroom use;
    2) a set of plane and solid figures for classroom use;
    3) if necessary, use of laptop or personal computers with an Internet connection in the mathematics classroom at the ratio of at least one computer per five pupils;
    4) presentation equipment for visualisation of relations.

2. Syllabuses

2.1. Mathematics

2.1.1. Mathematics Educational and Educational Objectives

The subject-specific educational objectives for developing subject field competence are based on field-specific competences.

2.1.2. Description of the subject Mathematics

The description of the subject is based on the description of the subject field.

2.1.3. Mathematics Learning and Educational Objectives in the 1st Stage of Study

After completing the 3rd grade of study, students:

1) understand the studied rules and are able to apply them;
2) can count objects in the surrounding world and classify and compare them based on one or two parameters;
3) can read, understand and explain age-appropriate mathematical texts;
4) can use suitable tools and measurement units for measuring values;
5) are able to notice mathematics-related elements in daily life and describe them with figures or geometrical shapes;
6) can use digital study materials;
7) understand the importance of mathematics and its connections with the surrounding world.

2.1.4. Learning Outcomes and Learning Content of Mathematics in the 1st stage of study

Calculation

Learning Outcomes

The students:

1) read, write, order and compare natural numbers from 0 to 10,000;
2) present a number as the sum of units, tens, hundreds and thousands;
3) read and write ordinal numbers;
4) add and subtract up to 100 mentally and up to 10,000 in writing;
5) recite the multiplication table (multiply and divide with a one-digit number up to 100 mentally);
6) know the names of the components and results of the four arithmetic operations;
7) find the numerical value of a letter in equations by means of trying or on the basis of analogy; and
8) determine the correct order of operations in expressions (parentheses, multiplication/division and adding/subtracting).

Learning Content

Numbers from 0 to 10,000 and their presentation as the sum of ones, tens, hundreds and thousands. Equation and inequality. Comparison and ordering numbers. Ordinal numbers. Odd and even numbers.
Addition, subtraction, multiplication and division of numbers up to 100 mentally. Addition and subtraction up to 10,000 in writing. Names of components of addition, subtraction, multiplication and division operations (summand, sum; minuend, subtrahend, difference; divisor, product; dividend, divisor, and quotient). Relations between addition and subtraction, and multiplication and division. Relation of multiplication to addition.
Rules of mental and written arithmetic. Letters as symbols of numbers. Finding the numerical value of a letter in equations. Use of computer programmes in order to practise the required calculating skills.

Measurement and Text Problems

Learning Outcomes

The students:

1) explain the meaning of the fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$, on the basis of these fractions find a part of a number;

2) use appropriate measurement units and describe the size of measurement units by means of known quantities;
3) estimate distances in nature and solve traffic safety problems;
4) know the time and calendar and relate this knowledge to activities and events in real life;
5) transform units of length, weight and time (mainly neighbour units);
6) calculate with concrete numbers (simplest cases);
7) analyse and solve various types of word problems with one and two operations independently and, with the help of the teacher, assess the reality of the results achieved; and
8) compile word problems with one operation.

Learning Content

Units of length: *millimetre, centimetre, decimetre, metre, kilometre.* Relations between units of length.
Units of weight: *gram, kilogram, tonne.* Relations between units of weight.
Units of time: *second, minute, hour, day, week, month, year, century.* Relations between units of time. Time and calendar.
Monetary units in use. Relations between monetary units. Unit of volume: *litre.* Unit of temperature: *degree.* The thermometer and its scale. Addition of concrete numbers.
Analysing and solving word problems. Assessment of the reality of results. Compilation of word problems. Use of computer programmes in order to practise transformation of units.

Geometric Objects

Learning Outcomes

The students:

1) distinguish between simple geometric objects (points, lines, segments, circles, triangles, quadrangles, squares, rectangles, pentagons, hexagons, spheres, cubes, cuboids, pyramids, cylinders and cones) and their basic elements;
2) find plane and solid figures, which have been discussed in lessons, in their surroundings;
3) group geometric figures on the basis of their common properties;
4) measure the length of a segment and draw segments with a specified length;
5) draw rectangles and squares;
6) draw equilateral triangles and circles;
7) measure side lengths and calculate perimeters of polygons, which have been covered in lessons;
8) calculate length of broken lines.

Learning Content

Point, line segment, straight line. Length of line segment. Drawing line segments with a given length. Broken lines and their length.
Triangles and quadrangles and their vertexes, sides and angles. Right angle. Square and rectangle. Equilateral triangle and drawing equilateral triangles by means of ruler and compass.
Circle and circumference, center and radius. Drawing circumferences with a given radius.
Cube, cuboid, sphere, cylinder, cone, triangular and quadrangular pyramids; their basic elements (edges, vertexes and facets on the level of distinguishing and recognising). Geometric figures in everyday life.

2.1.5. Mathematics Learning and Educational Objectives in the 2st Stage of Study

After completing the 6rd grade of study, students:

1) use different ways for presenting mathematical information and switch from one presentation manner to another;
2) classify objects and effects and analyse and describe them on the basis of several characteristics;
3) know the general scheme for open-end problems;
4) know that problems can have different solution paths and can select a suitable path;
5) justify their trains of thought and test their correctness;
6) use calculation tools to calculate and test results;
7) use proper study methods, if necessary finding help and information from various sources of information.

2.1.6. Learning Outcomes and Learning Content of Mathematics in the 2st stage of study

Calculations

Learning Outcomes

The students:

1) read, write, order and compare natural numbers (up to one billion), integers and positive rational numbers;
2) know the properties of operations and the relations between the components and results of operations;
3) write natural numbers as the sum of multiples, calculate mentally and in writing with integers and positive rational numbers and know the order of operations;
4) formulate and apply divisibility properties (divisible by 2, 3, 5, 9, and 10);
5) distinguish between odd and even numbers;
6) use the technique of finding the common multiple and the common factor when performing operations with common fractions;
7) round off a number to a given accuracy;
8) find the square, cube, opposite number, reciprocal and absolute value of a number;
9) know common and decimal fractions, visualise them in a row of numbers, and visualise a common fraction as a part of the whole;
10) transform common fractions into decimals, final decimals into common fractions and find the decimal approximation of the common fraction;
11) use digital study materials and computer programmes under the guidance of the teacher and independently.

Learning Content

Natural numbers from 0 to 1,000,000,000 and their presentation (units of power of ten and powers of ten.). Odd and even numbers. Prime and composite numbers. Divisibility properties (divisible by 2, 3, 5, 9, and 10). Opposite number and reciprocal of natural numbers. Integers. Absolute value of numbers. Common fractions and decimals and their transformation. Four basic operations with integers and positive rational numbers. Rounding and comparison. Reading and writing Roman numerals. ~~Roman numerals.~~
Use of computer programmes in order to practise the required skills.

Data and Algebra

Learning Outcomes

The students:

1) know the term 'percent' and find a part of the whole;
2) solve and compose word problems with several operations and check and evaluate the result;
3) draw coordinate axes, mark a point using given coordinates, read the coordinates of a point within the axes;
4) read and draw graphs for temperature and movement;
5) simplify expressions with one variable and calculate the value of letter expression;
6) find the solution to an equation from the numbers given and solve simple equations;
7) gather data for a simple data system, compile a frequency table and calculate an arithmetic mean;
8) illustrate numerical data with bar charts and straight line diagrams; and
9) read data from bar charts and sector diagrams.

Learning Content

Percent, finding a part of the whole.

Coordinate axes, graphs for temperature and movement. Speed.

Numerical and letter expressions. Calculation of the value of letter expression. Formula. Equation. Gathering and arranging numerical data. Scale. Table of frequency. Diagrams (bar, straight-line and sector diagrams). Arithmetic mean.

Use of information technology tools in order to practise the required skills.

Geometric Figures and Measurement

Learning Outcomes

The students:

1) know and transform units of length, area, volume and time;
2) know the meaning of the scale of a plan and use it when solving problems;
3) draw and mark a point, line, ray, segment, broken line, crossing, intersecting and parallel lines, square, rectangle, triangle and circle;
4) draw, classify and measure angles (right, acute, obtuse, straight angle, adjacent angles and vertex angles);
5) construct the mediator of a segment, the bisector of an angle and symmetrical images to a line by means of compass and rulers;
6) give examples of known geometric figures and symmetry in architecture and the fine arts by means of ICT (Internet searches and taking photographs);
7) use the sum of the inner angles of triangles when solving problems;
8) classify triangles by sides and angles, draw the heights of triangles and calculate the area of triangles;
9) calculate the length of the circumference and area of a circle; and
10) calculate the area and volume of a cube and cuboid.

Learning Content

Elementary geometric objects (point, line, segment, ray, broken line and angle). Comparison, measurement and classification of angles. Scale of a plan. Intersection, crossing and parallelism of lines. Adjacent and vertex angles. Symmetry with respect to line. Mediator of segment and bisector of angle. Triangles and their elements. Classification and drawing of triangles and properties of an equality. Finding area of triangle by means of base and height.

Circumference and its length. Circle and its area.

Solid figures (cube and cuboid).

2.1.7. Mathematics Learning and Educational Objectives in the 3st Stage of Study

After completing the 9rd grade of study, students:

1) compile and use appropriate mathematical models in order to solve problems in different fields of life;
2) formulate hypotheses and check, generalise and discuss them in a logical manner;
3) justify assertions;
4) use computer programs and other tools in studying mathematical relations;
5) see relations between different mathematical terms and create a system of terms; and
6) assess their mathematical knowledge and skills and consider them when planning further activities.

2.1.8. Learning Outcomes and Learning Content of Mathematics in the 3st stage of study

Calculation and Data

Learning Outcomes

The students:

1) add, subtract, multiply, divide and rise to a power of rational numbers with exponent of natural number mentally, in writing and by means of a pocket calculator and use the order of operations;
2) write large and small numbers in standard format;
3) round off numbers to a given accuracy;
4) explain the meaning of involution with exponent of natural number and use involution rules;
5) explain the meaning of the square root of a number and find the square root mentally or by means of a pocket calculator;
6) compile dataset on the basis of actual data, arrange them, compile tables of frequency and relative frequency and characterise the dataset by arithmetic means; and
7) explain the meaning of probability and calculate classic probability in simplest cases.

Learning Content

Calculation with rational numbers. Degrees of 10 (including negative integer exponent). Standard format of numbers. Power with exponent of natural number. Square root of numbers.
Dataset and its properties (frequency, relative frequency and arithmetic mean). The term 'probability'.
Use of computer programmes in order to practise required skills.

Percentages

Learning Outcomes

The students:

1) find the whole on the basis of a given partial rate in percentages;
2) express the quotient of two numbers in percentages;
3) find what percentage one number forms of another;
4) determine increase and decrease of quantity in percentages;
5) interpret quantities expressed in percentages in other subjects and in everyday life, including expenses and dangers related to loans (simple interest only); and
6) discuss the importance of taxes in society.

Learning Content

The term 'percentage' (revision). Introduction to the term 'per mil'. Finding the whole on the basis of a percentage. Expression of quotients in percentages. Percentage point. Expression of increase and decrease in percentages. Distinguishing between change in percentage and change in percentage points. Use of computer programmes in order to practise required skills.

Algebra

Learning Outcomes

The students:

1) arrange monomials and multinomials, add, subtract and multiply monomials and multinomials and divide monomials and multinomials by a monomial;
2) factorize multinomials (bring before brackets, use auxiliary formulas and factorize quadratic trinomials);
3) cancel and extend algebraic fractions and add, subtract, multiply and divide algebraic fractions;
4) simplify rational expressions with two operations;
5) solve linear and proportional equations using the basic properties of equations;
6) solve linear equation systems;
7) solve complete and incomplete quadratic equations; and
8) solve word problems by means of equations and equation systems.

Learning Content

Monomial and multinomial. Operations with monomials and multinomials.
Formulas for difference of squares, sum squares and difference squares.
Basic properties of equations. Linear equation. Linear equation system. Complete and incomplete quadratic equation. Proportional equation. Proportional decomposition. Use of computer software for solving equations and linear equations systems.
Algebraic fraction. Operations with algebraic fractions.
Solving word problems by means of equations and equation systems.

Functions

Learning Outcomes

The students:

1) explain the meaning of proportional dependence based on real-life examples;
2) draw graphs of functions by formula (both by hand and by means of a computer programme) and read the values of functions and arguments from the graph;
3) explain the dependence of the position and form of the function's graph (using dynamic drawings made on a computer) on the coefficient in the function's expression (in the case of quadratic function, on the quadratic term's coefficient and a constant member only);
4) explain the meaning of zeros of a function and find zeros on graphs and formulas;
5) read the text of a parabola from the drawing and calculate the coordinates of the vertex of the parabola.

Learning Content

Variable quantity and function. Proportional and inversely proportional dependence. Practical work: determination of proportional and inversely proportional relation (i.e. distance, interval of time and speed). Linear function. Quadratic function.

Geometry

Learning Outcomes

The students:

1) draw and construct (both by hand and computer) plane figures on the basis of given elements;
2) calculate linear elements, perimeter and area and volume of figures;
3) know figures, the midline of a triangle and trapezium, the median of a triangle, the circumscribed and inscribed circles of a triangle and the central angle and peripheral angles of triangle;
4) describe properties of figures and classify figures according to common properties;
5) identify the 'theorem', 'postulate', 'assertion' and 'proof', explain train of thought of proving certain theorems;
6) solve open-end problems with geometrical content;
7) find the linear elements of a right-angled triangle;
8) use similarity between triangles and polygons when solving open-end problems; and
9) use technological tools in discovering regularities and formulating hypotheses.

Learning Content

Definition, theorem, assumption, assertion and proof. Polygons (triangle, parallelogram, trapezium and regular polygon), perimeter and area of polygons.

Circle and circumference. Central angle. Peripheral angle, Thales' Theorem. Tangent of circumference.

Inscribed and circumscribed circles of triangle and regular polygon. Criterion of parallel straight lines. Midline of triangle and trapezium. Median and centre of gravity of a triangle. Similarity properties of triangles. Similarity of polygons.

Planning of areas. Pythagoras' Theorem. Trigonometric functions of acute angles. Solid figures (vertical parallelepiped, vertical prism, pyramid, cylinder, cone and sphere), their area and volume.