РАССМОТРЕНО

Педагогическим советом
АНОО
«Областной технолицей
им. В.И. Долгих»
Протокол
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УТВЕРЖДЕНО

приказом директора автономной некоммерческой общеобразовательной организации «Областной технолицей им. В.И. Долгих»
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РАБОЧАЯ ПРОГРАММА

автономной некоммерческой общеобразовательной организации
«Областной технолицей им. В.И. Долгих»

учебного предмета
«Maths»

Для 8 класса основного общего образования
на 2023–2024 учебный год

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EXPLANATORY NOTE

This document presents personal and meta-subject outcomes in teaching Mathematics in the basic elementary, primary, and secondary schools, taking into account the approach used in Russian schools and the Cambridge programme.

GENERAL DESCRIPTION OF THE SUBJECT

Mathematics is a universal language of patterns, structures, and relationships that underlie the fabric of the natural world and human thought. It is a discipline that explores abstract concepts and logical reasoning to understand, quantify, and model various phenomena. Mathematics serves as a bridge between the tangible and the abstract, offering tools to analyse both the physical universe and theoretical constructs.

At its core, mathematics encompasses a wide range of topics, including arithmetic, algebra, geometry, calculus, statistics, and beyond. These topics collectively form the foundation of mathematical knowledge, each contributing to a deeper understanding of the world's intricacies. Mathematics is not confined to calculations; it involves the exploration of concepts, theorems, and principles that govern everything from the behaviour of subatomic particles to the movement of planets.

One of the most compelling aspects of mathematics is its versatility. It serves as the backbone of various academic disciplines and industries, including science, engineering, technology, economics, and social sciences. It provides tools for solving practical problems, making informed decisions, and advancing research in numerous fields. Mathematical models and simulations allow scientists and engineers to predict outcomes, test hypotheses, and innovate.

The subject of mathematics is characterised by its precision and logical rigour. It relies on a system of axioms and rules of inference to construct coherent arguments and proofs. Through deductive reasoning, mathematicians establish the truth of mathematical statements and discover new truths based on existing knowledge. This emphasis on proof ensures the reliability and consistency of mathematical concepts.

Mathematics also encourages creative exploration. It prompts individuals to think outside the box, seek alternative solutions, and invent new approaches to problem-solving. The process of mathematical discovery often involves curiosity, imagination, and a willingness to explore uncharted territories.

The study of mathematics is a journey that begins with basic concepts and evolves into complex, specialised areas. It challenges individuals to think critically, analyse patterns, and develop strategies for tackling challenges. Whether one is solving a real-world problem, exploring abstract mathematical structures, or contributing to cutting-edge research, mathematics offers a rich landscape of exploration and intellectual growth.

In essence, mathematics is both a foundational discipline and a dynamic field of inquiry. It is the art of logic, the science of patterns, and the language of the universe. From the practical applications that shape our daily lives to the profound theories that reshape our understanding of reality, mathematics stands as a testament to human curiosity and our capacity to uncover the hidden order of the world.

OBJECTIVES OF THE PROGRAMME

Mathematics is a fundamental subject that plays a crucial role in various aspects of our lives, from daily tasks to complex scientific and technological advancements. The objectives of learning mathematics extend beyond mere calculations; they encompass the development of critical thinking skills, problem-solving abilities, and a deep understanding of the quantitative and logical foundations that underpin our world. Here are some key objectives for learning mathematics:

Build Strong Foundations: The primary objective of learning mathematics is to establish a solid foundation in mathematical concepts and principles. This includes understanding numbers, operations, basic algebra, geometry, and arithmetic, which are essential for advanced mathematical topics.

Develop Logical Reasoning: Mathematics is a discipline that encourages logical reasoning and clear thinking. Through the study of mathematics, individuals develop the ability to analyse problems, identify patterns, and deduce conclusions based on evidence and logic.

Enhance Problem-Solving Skills: Problem-solving is at the heart of mathematics. Learning mathematics equips individuals with strategies to tackle complex problems systematically. These skills are transferable to real-life situations, enabling individuals to address challenges across various domains.

Promote Critical Thinking: Mathematics encourages critical thinking by requiring individuals to examine concepts from multiple angles, evaluate various methods to solve a problem, and determine the most effective approach. This skill extends beyond maths to other subjects and everyday decision-making.

Foster Quantitative Literacy: In today's data-driven world, quantitative literacy is essential. Mathematics helps individuals interpret and analyse data, enabling them to make informed decisions based on evidence and statistics.

Support STEM Education: Science, Technology, Engineering, and Mathematics (STEM) fields heavily rely on mathematics. A strong foundation in maths is crucial for pursuing careers in these disciplines, as it provides the necessary tools for understanding and advancing in fields like physics, engineering, computer science, and more.

Encourage Creativity: Mathematics is not just about following formulae; it also allows for creative problem-solving. Discovering new ways to approach problems

and developing novel mathematical concepts can lead to breakthroughs in various fields.

Cultivate Real-world Application: Mathematics has a wide range of practical applications in everyday life, from managing personal finances to making informed choices about health and well-being. Learning maths equips individuals with skills they can apply in diverse real-world scenarios.

Prepare for Academic and Professional Success: Proficiency in mathematics is often a requirement for pursuing higher education and many careers. Whether in the natural sciences, social sciences, business, or engineering, a solid understanding of maths is invaluable.

Contribute to Cognitive Development: Learning mathematics stimulates cognitive development by challenging individuals to grasp abstract concepts, exercise memory, and enhance problem-solving abilities. It contributes to a well-rounded intellectual growth.

In conclusion, the objectives of learning mathematics extend beyond numerical calculations; they encompass the development of critical thinking, problem-solving skills, and logical reasoning. A solid foundation in mathematics not only prepares individuals for academic and professional success but also equips them with essential skills for navigating the complexities of the modern world.

COURSE CONTENT

1. Number and Place Value:

Consolidation of number skills, including addition, subtraction, multiplication, and division.
Understanding and working with larger numbers.
Rounding and estimating numbers.

2. Fractions, Decimals, and Percentages:

Comparing and ordering fractions, decimals, and percentages.
Converting between fractions, decimals, and percentages.
Solving problems involving fractions, decimals, and percentages.

3. Measurement:

Converting between different units of measurement (e.g., length, weight, volume).
Using and interpreting scales and measuring instruments.
Understanding perimeter, area, and volume.

4. Geometry:

Recognizing and describing 2D and 3D shapes.
Identifying lines of symmetry and rotational symmetry.
Exploring angles and their properties.

5. Data Handling:

Collecting, organising, and interpreting data using graphs and charts.
Calculating and understanding measures of central tendency (mean, median, mode).

6. Ratio and Proportion:

Understanding the concept of ratio and using it to solve problems.
Solving proportion problems involving fractions and percentages.

7. Algebraic Thinking:

Introducing basic algebraic concepts such as variables, expressions, and equations.
Using simple algebraic equations to solve problems.

8. Problem Solving and Reasoning:

Developing problem-solving skills through a variety of real-world and mathematical scenarios.
Applying mathematical reasoning to explain solutions.

9. Mathematical Communication:

Developing skills in explaining and justifying mathematical ideas.
Using appropriate mathematical language and notation.

10. Review and Consolidation:

Revisiting and reinforcing previously learned concepts to ensure a solid understanding.
Throughout the coursebook, there may also be sections dedicated to mental maths exercises, practical applications of mathematical concepts, and activities that encourage critical thinking.

EDUCATIONAL OUTCOMES

PERSONALITY DEVELOPMENT OUTCOMES

Civic Education:

In our maths courses, students engage in collaborative problem-solving activities that mirror real-world scenarios. By working in groups to solve maths problems, students learn the importance of teamwork and respectful communication. They also develop an understanding of diverse perspectives, as classmates may approach problems differently. This encourages them to listen, share ideas, and consider alternative solutions—a valuable lesson in civic engagement that extends beyond maths class.

Patriotic Education:

Mathematics knows no boundaries, and in our course, students explore how mathematical concepts are present in various cultures and historical contexts. By investigating the mathematical contributions of different civilisations, students gain a deeper appreciation for the interconnectedness of mathematical knowledge across the world. This exposure fosters a sense of pride in their own cultural heritage while also encouraging curiosity about others.

Spiritual and Moral Education:

Mathematics provides opportunities for students to make ethical decisions, particularly in cases involving data interpretation and problem-solving. Through discussions on honesty, integrity, and accuracy in mathematical work, students internalise the importance of ethical behaviour. They learn that honesty is a fundamental value in mathematics, just as it is in personal interactions.

Aesthetic Education:

Geometry and patterns are inherent to mathematics, and our maths curriculum often delves into these areas. Students explore the symmetry and aesthetic qualities of shapes and designs. By recognizing patterns and appreciating the visual appeal of geometric concepts, students cultivate an aesthetic sensibility that goes beyond numbers and equations.

Physical Education, Formation of Health Culture, and Emotional Well-being:

While maths is often associated with abstract thinking, our maths course can include activities that incorporate physical movement. Maths games that involve movement or require students to physically arrange objects can promote not only mathematical understanding but also physical health and coordination. Additionally, lessons on data interpretation related to health and wellness foster discussions about emotional well-being and self-care.

Labour Education:

Solving maths problems requires dedication, perseverance, and the willingness to tackle challenges. Our maths course introduces students to progressively complex problems that demand sustained effort. As they work through these challenges, students learn the value of hard work and experience the satisfaction that comes from overcoming obstacles—a lesson that prepares them for future endeavours.

Environmental Education:

Mathematics has a practical application in addressing real-world issues, including environmental challenges. Students engage with data related to environmental concerns, such as pollution levels or resource conservation. By analysing data and discussing potential solutions, students understand how maths can be used to contribute to a more sustainable future.

Adaptation of the Learner to Changing Conditions of Social and Natural Environment:

Mathematics is dynamic and flexible, adapting to changing scenarios. In our maths course, students encounter problems that involve changing variables or evolving situations. By navigating through these scenarios, students learn to think critically, make decisions based on new information, and adapt their strategies—a skill that extends beyond maths and prepares them for life's evolving challenges.

INTERDISCIPLINARY OUTCOMES

1. Proficiency in Cross-Disciplinary Cognitive Skills

Within the context of mathematics education, students develop a repertoire of cross-disciplinary cognitive skills that extend beyond the confines of the subject, nurturing their comprehensive intellectual growth. These skills empower students to navigate the intricacies of mathematical concepts and apply their proficiencies across a spectrum of disciplines. The subsequent subsections elucidate fundamental cognitive skills within this framework:

Foundational Logical Proficiencies:

At the heart of interdisciplinary mathematics learning lies the mastery of foundational logical proficiencies. Students refine their critical thinking capacities, deduction aptitudes, and the art of inference. They become adept at discerning patterns within mathematical structures, analysing relationships between mathematical concepts, and constructing robust mathematical arguments. This skillset equips students with problem-solving tools that transcend mathematics and enable them to make informed decisions across diverse scenarios.

Information Management:

Adeptness in handling mathematical information is pivotal to interdisciplinary competence. Students cultivate the ability to collect, assess, and synthesise mathematical data from various sources. They develop proficiency in interpreting numerical and graphical representations, discriminating between reliable and unreliable mathematical sources, and organising mathematical information coherently. These proficiencies empower students to engage with complex mathematical ideas, approach research tasks with confidence, and contribute substantively to discussions spanning multiple subjects.

Through the development of these cross-disciplinary cognitive skills, students excel not only within the realm of mathematics but also cultivate skills that are indispensable for lifelong learning and active engagement with a dynamic world. The refinement of foundational logical proficiencies and information management capabilities enables students to confidently explore various mathematical disciplines, tackle intricate challenges, and provide insightful contributions that enhance a wide array of academic and real-world contexts.

2. UNIVERSAL ACADEMIC COMMUNICATIVE SKILLS

Within the realm of mathematics education, students foster a collection of universal academic communicative skills that stretch beyond the borders of the subject, nurturing comprehensive intellectual growth. These skills empower students to effectively communicate mathematical concepts, collaborate with peers, and actively engage within various mathematical learning contexts. The subsequent subsections elucidate key communicative actions within this mathematical framework:

Communication:

Effective communication stands as an integral pillar of mathematical comprehension. Students refine their ability to express mathematical ideas lucidly, both in written and verbal formats. They cultivate the knack for conveying intricate mathematical concepts using accessible language, ensuring peers grasp their reasoning. By mastering communication skills, students adeptly articulate their mathematical insights across assorted topics.

Collaborative Endeavours:

Collaborative activities play a pivotal role in fostering mathematical learning. Students participate in group tasks necessitating them to exchange mathematical strategies, explore diverse problem-solving approaches, and jointly dissect mathematical challenges. They embrace respect for varied mathematical viewpoints, contribute meaningfully to mathematical discussions, and amalgamate group insights into coherent solutions. Through collaborative ventures, students cultivate teamwork and negotiation skills relevant to mathematical and real-world scenarios alike.

By honing these universal academic communicative skills tailored to the domain of mathematics, students not only excel in mathematical prowess but also acquire competencies crucial for lifelong communication and active engagement within a dynamic world. The refinement of effective mathematical communication and collaborative abilities empowers them to confidently participate in mathematical dialogues, present mathematical arguments persuasively, and collaborate fruitfully across an extensive spectrum of mathematical and practical contexts.

3. UNIVERSAL ACADEMIC REGULATORY ACTIONS

Mastering Self-Regulation in Mathematical Learning

In the domain of mathematics education, students cultivate a set of universal academic regulatory actions that extend beyond the boundaries of the subject, fostering their comprehensive intellectual development. These actions empower students to navigate mathematical challenges with self-organisation, enhance emotional intelligence, and develop a sense of self-acceptance and empathy for others. The following subsections elucidate key regulatory actions within this mathematical framework:

Self-Organization:

Effective learning in mathematics requires self-organisation. Students develop skills in time management, setting goals, and planning their mathematical tasks. They learn to break down complex mathematical problems into manageable steps, improving their problem-solving efficiency. By mastering self-organisation, students gain the ability to approach mathematical challenges systematically, promoting effective mathematical exploration.

Emotional Intelligence:

Emotional intelligence plays a crucial role in mathematical learning. Students develop an awareness of their emotional responses to mathematical challenges and learn to manage frustration and anxiety. They also cultivate empathy towards their peers' struggles, fostering a supportive learning environment. By enhancing emotional intelligence, students are better equipped to face mathematical difficulties with resilience and a positive mindset.

Self-Acceptance and Empathy:

Mathematics can be challenging, but developing a sense of self-acceptance is vital. Students learn to embrace mistakes as opportunities for growth and understand that learning is a journey. They also develop empathy towards their peers, recognizing that everyone has unique strengths and weaknesses in mathematics. By fostering self-acceptance and empathy, students contribute to a positive mathematical learning community.

Through the cultivation of these universal academic regulatory actions, students not only excel in mathematical competence but also acquire abilities essential for lifelong learning and active participation in a dynamic world. The development of self-organisation, emotional intelligence, and a sense of self-acceptance and empathy equips them to confidently approach mathematical challenges, collaborate effectively, and contribute positively within a wide spectrum of mathematical and practical contexts.

SUBJECT OUTCOMES

Within the context of your mathematics curriculum, students will achieve proficiency in a range of specific mathematical concepts. Each topic equips them with foundational skills that contribute to their overall mathematical understanding. The following outlines the outcomes for each lesson:

Ordering and Rounding:
Students will demonstrate the ability to accurately order numbers and round them to specified place values.

Sequences:
Students will comprehend the concept of sequences and identify patterns within them.

Addition and Subtraction :
Students will master basic addition and subtraction operations, applying them to solve mathematical problems.

Multiplication and Division Facts:
Students will memorise multiplication and division facts, building a strong foundation for further mathematical operations.

Written Methods of Multiplication:
Students will learn written methods for multiplying numbers efficiently.

Written Methods of Division:
Students will learn written methods for dividing numbers accurately.

Factors:
Students will understand the concept of factors and apply them to mathematical operations.

Parallel and Perpendicular:
Students will recognise parallel and perpendicular lines and their significance.

Triangles:
Students will identify types of triangles and understand their properties.

Cubes and Cuboids:
Students will comprehend the properties of cubes and cuboids.

Positive and Negative Numbers:
Students will grasp the concept of positive and negative numbers and their use.

The Decimal System:
Students will learn the decimal system and its application.

Multiplication Strategies:
Students will develop strategies for efficient multiplication.

Doubling and Halving:
Students will practice doubling and halving techniques for mental calculations.

Subtraction:
Students will refine their subtraction skills, applying them to solve a variety of problems.

Addition:
Students will consolidate their addition skills, employing them to solve mathematical challenges.

Adding and Subtracting Money:
Students will apply addition and subtraction skills to monetary calculations.

Percentages:
Students will comprehend the concept of percentages and their practical use.

Equivalent Fractions, Decimals and Percentages:
Students will understand the relationship between equivalent fractions, decimals, and percentages.

Mixed Numbers and Improper Fractions:
Students will differentiate between mixed numbers and improper fractions.

Fraction and Division:
Students will apply their understanding of fractions to division problems.

LESSON PLAN

Lesson number	Theme	Homework
1	Arithmetic with integers	Practice book p. 7
2	Multiple, factors and primes	Practice book p. 8
3	More about prime numbers	Practice book p. 9
4	Powers and roots	Practice book p. 10
5	Quiz	
6	Generating sequences	Practice book p. 11
7	Finding rules for sequences	Practice book p. 12
8	Using *n*th terms	Practice book p. 13
9	Using functions and mappings	Practice book p. 14
10	Constructing linear expressions	Practice book p. 15
11	Deriving and using formulae	Practice book p. 16
12	Quiz/Exam	
13	Finding equivalent fractions, decimals and percentages	Practice book p. 36
14	Converting fractions to decimals	Practice book p. 37
15	Ordering fractions	Practice book p. 38
16	Adding and subtracting fractions	Practice book p. 39
17	Findind fractions of a quantity	Practice book p. 40

18	Multiplying an integer by a fraction	Practice book p. 41
19	Dividing an integer by a fractions	Practice book p. 41
20	Multiplying and dividing fractions	Practice book p. 42
21	Exam/Quiz	
22	Simplifying expressions and solving equations	Practice book p. 49
23	Collecting like terms	Practice book p. 49
24	Expanding brackets	Practice book p. 50,51
25	Constructing and solving equations	Practice book p. 52
26	Quiz/Exam	
27	Calculating percentages	Practice book p. 56
28	Percentage increases and decreases	Practice book p. 57
29	Finding percentages	Practice book p. 58
30	Using percentages	Practice book p. 59
31	Exam/Quiz	
32	Simplifying ratios	Practice book p. 70

EDUCATIONAL AND TEACHING SUPPORT FOR THE EDUCATIONAL PROCESS

COMPULSORY MATERIALS FOR THE STUDENT

Wood, Mary Low, Emma Byrd, Greg Byrd, Lynn. Cambridge Primary Mathematics 8 Student's book. Cambridge Education. 2014;

TEACHER'S BOOK AND RESOURCES

Wood, Mary Low, Emma Byrd, Greg Byrd, Lynn. Cambridge Primary Mathematics 8 Teacher's book. Cambridge Education. 2014;

DIGITAL RESOURCES AND INTERNET RESOURCES

https:// www.mymaths.co.uk

MATERIAL AND TECHNICAL SUPPORT FOR THE EDUCATIONAL PROCESS

TEACHING EQUIPMENT

Projector, computers, tablets, interactive whiteboard, notebooks, pens.

EQUIPMENT FOR PRACTICAL WORK

Projector, computers, tablets, interactive whiteboard, notebooks, pens.