Grade 7 Mathematics

ENGLISH Program

Discipline Overview

The Kindergarten to Grade 12 mathematics curriculum in the English Program is designed to meet learners' interests, skills, and needs so they can realize that mathematics is a way of building their understanding of the world and that it is part of their everyday lives.

The learning outcomes of this program of study are divided into four areas:

- Number
- Patterns and relations
- Shape and space
- Statistics (starting in Grade 2) and probability (starting in Grade 5)

These areas reflect the nature of mathematics from Kindergarten to Grade 12.

The study of mathematics promotes the development of global competencies and supports learners' cultivation of enduring understandings. It also fosters the development of logical thinking, problem-solving, and data analysis skills.

Learning experiences and evaluation in the mathematics classroom are based on a problem-based learning approach that allows learners to make connections between their conceptual understanding and various mathematical processes. Integrating these processes into learning helps learners to understand the nature of mathematics, and to make sense of it so they can learn and use mathematics in and out of school throughout their lives.

Course Overview

Grade 7 learners will demonstrate an understanding of percent and of the relationship between decimals and fractions, the four operations of decimals, the addition and subtraction of fractions, and mixed numbers integers, and they will determine and explain divisibility rules. They will demonstrate an understanding of oral and written patterns and their equivalent relations. Learners will construct and graph a table of values, and they will analyze the graph to draw conclusions as well as demonstrate an understanding of preservation of equality.

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They will evaluate an expression given the value of the variable, and model and solve linear equations. Learners will demonstrate an understanding of circles, develop and apply formulas for determining area of shapes, perform geometric constructions, and perform transformations using the Cartesian plane. They will demonstrate an understanding of central tendency and range, determine the effect of an outlier, and learn about circle graphs. Learners will demonstrate an understanding that probability can be expressed as a ratio, fraction, and percent, and they will conduct probability experiments and identify their sample spaces.

Global Competencies in Mathematics

Critical Thinking

Critical thinking in mathematics involves the ability to compare, evaluate, critique, justify, test, and validate ideas, representations, plans, or solutions, using logical arguments, relevant criteria, and evidence. It also requires a metacognitive approach, enabling learners to solve mathematical problems and situations, communicate their reasoning effectively, and make informed and ethical decisions.

When critical thinking as a competency is applied in mathematics, learners

- **research, use and think about** a variety of ideas and information strategically, efficiently, and effectively to make informed decisions and choices
- **evaluate** their own and others' ideas as well as possible solutions by considering different perspectives, potential biases, and the validity and relevance of supporting sources
- use inductive reasoning to explore and record results, analyze mathematical ideas, problems, and situations, identify patterns, formulate generalizations, and test them based on **criteria and evidence**
- recognize that certain math beliefs influence how they **perceive themselves** as math learners in this discipline
- demonstrate a **willingness to reconsider** their ways of thinking and take into account perspectives different from their own regarding mathematical ideas, problems, or situations
- **ask relevant and clarifying questions** to further learning and enhance comprehension of mathematical ideas, concepts, problems, and situations
- **make judgments** based on thoughtful **criteria**, enabling them to make decisions, solve mathematical problems and situations, and act in an informed manner
- use deductive reasoning to solve mathematical problems and situations, draw new conclusions based upon what is already known or accepted, and make ethical decisions

Creativity

Creativity in mathematics involves the adoption of flexible thinking, curiosity, risk-taking and making connections to prior knowledge, enabling learners to formulate new hypotheses or view mathematical problems and situations from a new perspective in order to arrive at innovative solutions.

When creativity as a competency is applied in mathematics, learners

- embrace a learning environment based on trust and respect that encourages them to make choices, **take risks, and think flexibly**, allowing them to make decisions and take action
- wonder, **ask questions** and contemplate different mathematical ideas and concepts
- solve mathematical problems and situations **using different ways** to arrive at innovative solutions
- enrich and refine their reasoning by considering others' ideas
- formulate, adjust, and refine their plans for solving mathematical problems and situations by looking at them from a new angle
- validate and **adapt plans, ideas,** strategies, or solutions to solve mathematical problems and situations while **persevering** through obstacles in order to improve
- seek and use feedback from others to develop and consolidate their conceptual understanding, deepen their reasoning, and reflect on their processes for solving mathematical problems and situations

Citizenship

Citizenship in mathematics involves the development of mathematical literacy that enables the application of ideas and concepts in a variety of everyday contexts, awakening learners' curiosity about their role as citizens who can actively contribute to society, think critically about the world, make informed decisions, and propose solutions to issues from a variety of perspectives.

When citizenship as a competency is applied in mathematics, learners

- use mathematics as a means of developing their **understanding of a range of complex** social, cultural, economic, and political **issues** and to help them reflect on them
- mobilize their mathematical knowledge and skills to analyze and understand issues related to **discrimination, equity, and human rights** by investigating or proposing solutions to a variety of mathematical problems or situations related to these issues
- mobilize their mathematical knowledge and skills to explore, analyze and understand the impact of the **interconnectedness** of self, others, and

the natural world by investigating or proposing solutions to a variety of mathematical problems and situations related to this issue

- show interest in others' approaches to mathematics, and to **different points of view, experiences, and worldviews** to better understand and solve mathematical problems and situations

- **empathize** with ideas that are different from their own, and with solutions to mathematical problems or situations proposed by others

- interact and learn with others in person or online in a **responsible, respectful, and inclusive manner** by welcoming and valuing diverse viewpoints and considering a range of ideas and perspectives when contributing to mathematical exchanges

- realize that their mathematical knowledge and skills will serve not only to improve their quality of life but also that of others

- engage in meaningful mathematical inquiries, individually and in collaboration, in which they ask themselves and others' questions in order to find **equitable solutions** and make **ethical decisions**

- appreciate how mathematics can be used to make and justify **ethical decisions** that lead to responsible and sustainable actions that affect themselves, their community, and the world

Connection to Self

Connection to self in mathematics encompasses the learners' confidence in their ability to undertake and complete tasks, solve mathematical problems and situations, and engage positively in reflective practices that enable them to set goals and make progress.

When connection to self as a competency is applied in mathematics, learners

- believe in their ability to learn and understand the world of mathematics and its impact on their daily lives

- recognize the elements that **shape their identity** as math learners and see themselves as mathematicians

- allow themselves the time they need and implement strategies that foster a growth mindset to develop a positive relationship with mathematics

- view reflection on their decisions, efforts, experiences, and feedback as a learning opportunity that helps them progress in mathematics.reflect on their mathematical learning to **set goals** and make informed decisions that affect their well-being

- believe that their ability to learn, their talents, and their skills in mathematics will continue to improve throughout life through their hard work, perseverance, and effort

- are willing to take risks, ask for help and **persevere**, despite obstacles

- demonstrate the ability to make **changes and adapt** to new mathematical contexts, knowing that they will learn from their mistakes and build on their personal strengths
- develop their autonomy, value their voice, and **commit to their role** in becoming lifelong mathematics learners

Collaboration

Collaboration in mathematics involves adopting a culture of exchanging ideas and perspectives, in which learners learn from and with each other in order to progress individually and collectively, develop their mathematical reasoning, and implement new ideas to solve problems.

When collaboration as a competency is applied in mathematics, learners

- collaborate with others, value diverse points of view and consider a range of ideas and perspectives when participating in mathematical exchanges
- participate actively in learning experiences by sharing thinking and strategies with others to confirm or extend understandings of mathematical ideas; they respectfully voice their opinions, ideas, and conjectures
- recognize the value of others' contributions, allowing diverse perspectives to enrich mathematical exchanges
- practise active listening, question their own and others' mathematical ways of thinking, and ask questions of others to deepen understanding of mathematical concepts and ideas
- demonstrate openness by agreeing to compromise and change their views when presented with convincing arguments during mathematical exchanges
- co-construct their understanding of mathematical concepts and ideas with others in order to make sense of them
- support their peers and take responsibility for their roles throughout the learning process and in the completion of mathematical tasks

Communication

Communication in mathematics involves the learners' ability to express their mathematical ideas, reasoning, and solutions in a variety of ways, including orally, in writing, concretely, graphically, and symbolically, and in various contexts. It enables learners to clarify and validate their ideas and reasoning, while encouraging them to question their attitudes and beliefs about mathematics.

When communication as a competency is applied in mathematics, learners

- express their mathematical ideas and emotions about mathematics, taking into account non-verbal **cues** and adapting what they say according to the context

- present their mathematical ideas visually, orally, in writing, graphically, or symbolically, taking into account the **conventions** related to the mode of communication used, their **audience**, and the types of communication **contexts**, while using clear, precise mathematical language

- understand how their **words and actions shape** their identity as mathematical learners and their relationship with others

- look for oral, non-verbal, or visual **cues** during exchanges to improve their understanding of terminology, what others are saying, ideas presented and various solutions to mathematical problems and situations

- **seek to understand** different points of view and different solutions to a mathematical problem or situation by observing, practising active listening, and asking clarifying questions, thereby contributing to a culture of mutual communication

- recognize and accept that the ways they learn and represent their understanding may be different from those of others

- make sense of mathematical ideas, problems and situations and deepen their understanding by making connections among their own **language**, mathematical terminology, and associated conventions

- participate actively in mathematical exchanges and express their thoughts and emotions about mathematical ideas in a positive and respectful way, whether in person or online

- defend their points of view and their mathematical reasoning, while welcoming those of others in a constructive and responsible manner, recognizing that these exchanges enrich learning for themselves and other members of their **community**

Enduring Understandings

Mathematics, a tool for growth

Developing knowledge and skills in mathematics allows for the understanding of processes, theorems, concepts, situations, and their applications. Building mathematical knowledge allows learners to identify as citizens who believe in their ability to complete a task, a lesson, or a challenge successfully—motivating them to take action and persevere throughout their lifetime to achieve their goals.

Mathematics, a tool for seeing things differently

Mathematics is a part of the living world. It develops one's capacity to think fluidly and creatively, and to understand, interpret, and logically represent various phenomena that can be imperceptible or abstract, to put these phenomena in perspective regarding one another, and to analyze them from a different point of view.

Mathematics, a vital tool for understanding the world

Mathematics contributes to the analysis, the comprehension, the interpretation, and the description of the world in which we live. It allows one to study quantities, orders, spaces, numbers, and figures, and the links that exist among them.

Mathematics, an essential interdisciplinary tool for advancing society

Mathematics plays an important role in people's quest for innovation and solutions for the various problems encountered in advancing society. It is used in other disciplines to understand, describe, and interpret the phenomena that surround us, and it allows researchers to improve quality of life through innovation and the development of new technology.

Mathematics, an essential tool for all aspects of daily life

Mathematics is everywhere in society. Mathematical knowledge and skills are necessary for critically analyzing information in diverse social, personal, economic, political, cultural, and environmental contexts in order to make informed, ethical, and sustainable decisions in all aspects of daily life.

Learning Outcomes

Mathematical Processes

There are critical components that learners must encounter in a mathematics program in order to achieve the goals of mathematics education and encourage lifelong learning in mathematics.

Learners are expected to

- **communicate [C]** in order to learn and express their understanding
- **connect [CN]** mathematical ideas to other concepts in mathematics, to everyday experiences, and to other disciplines
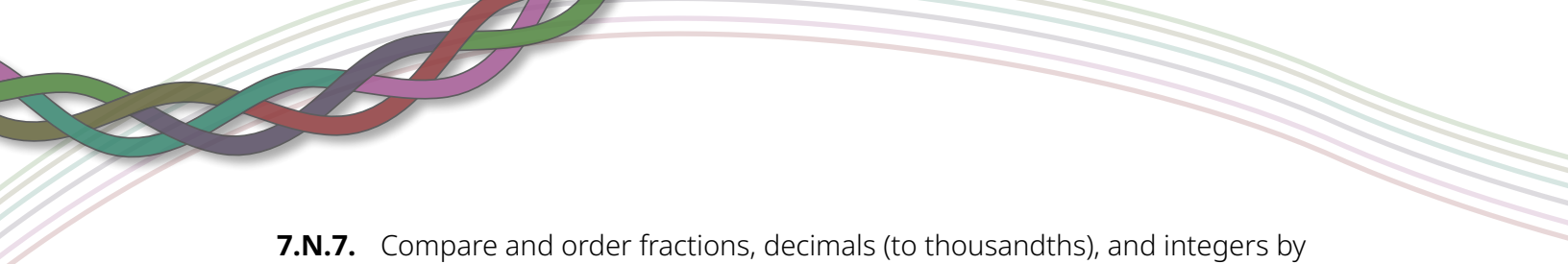- demonstrate fluency with **mental mathematics and estimation [ME]**
- develop and apply new mathematical knowledge through **problem solving [PS]**
- develop mathematical **reasoning [R]**
- select and use **technologies [T]** as tools for learning and solving problems
- develop **visualization [V]** skills to assist in processing information, making connections, and solving problems

The *Common Curriculum Framework* incorporates these seven interrelated mathematical processes that are intended to permeate teaching and learning.

Number

General Learning Outcome: Develop number sense.

7.N.1. Determine and explain why a number is divisible by 2, 3, 4, 5, 6, 8, 9, or 10, and why a number cannot be divided by 0.

[C, R]

7.N.2. Demonstrate an understanding of the addition, subtraction, multiplication, and division of decimals to solve problems (for more than 1-digit divisors or 2-digit multipliers, technology could be used).

[ME, PS, T]

7.N.3. Solve problems involving percents from 1% to 100%.

[C, CN, ME, PS, R, T]

7.N.4. Demonstrate an understanding of the relationship between repeating decimals and fractions, and terminating decimals and fractions.

[C, CN, R, T]

7.N.5. Demonstrate an understanding of adding and subtracting positive fractions and mixed numbers, with like and unlike denominators, concretely, pictorially, and symbolically (limited to positive sums and differences).

[C, CN, ME, PS, R, V]

7.N.6. Demonstrate an understanding of addition and subtraction of integers, concretely, pictorially, and symbolically.

[C, CN, PS, R, V]

7.N.7. Compare and order fractions, decimals (to thousandths), and integers by using

- benchmarks
- place value
- equivalent fractions and/or decimals

[CN, R, V]

Patterns and Relations

General Learning Outcome: Use patterns to describe the world and solve problems.

7.PR.1. Demonstrate an understanding of oral and written patterns and their corresponding relations.

[C, CN, R]

7.PR.2. Construct a table of values from a relation, graph the table of values, and analyze the graph to draw conclusions and solve problems.

[C, CN, R, V]

General Learning Outcome: Represent algebraic expressions in multiple ways.

7.PR.3. Demonstrate an understanding of preservation of equality by

- modelling preservation of equality, concretely, pictorially, and symbolically
- applying preservation of equality to solve equations

[C, CN, PS, R, V]

7.PR.4. Explain the difference between an expression and an equation.

[C, CN]

7.PR.5. Evaluate an expression given the value of the variable(s).

[CN, R]

7.PR.6. Model and solve problems that can be represented by one-step linear equations of the form $x + a = b$, concretely, pictorially, and symbolically, where a and b are integers.

[CN, PS, R, V]

7.PR.7. Model and solve problems that can be represented by linear equations of the form

- $ax + b = c$
- $ax = b$
- $\frac{x}{a} = b, a \neq 0$

concretely, pictorially, and symbolically, where *a, b,* and *c* are whole numbers.

[CN, PS, R, V]

Shape and Space

General Learning Outcome: Use direct or indirect measurement to solve problems.

7.SS.1. Demonstrate an understanding of circles by
- describing the relationships among radius, diameter, and circumference of circles
- relating circumference to pi (π)
- determining the sum of the central angles
- constructing circles with a given radius or diameter
- solving problems involving the radii, diameters, and circumferences of circles

[C, CN, R, V]

7.SS.2. Develop and apply a formula for determining the area of
- triangles
- parallelograms
- circles

[CN, PS, R, V]

General Learning Outcome: Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

7.SS.3. Perform geometric constructions, including
- perpendicular line segments
- parallel line segments
- perpendicular bisectors
- angle bisectors

[CN, R, V]

General Learning Outcome: Describe and analyze position and motion of objects and shapes.

7.SS.4. Identify and plot points in the four quadrants of a Cartesian plane using ordered pairs.

[C, CN, V]

7.SS.5. Perform and describe transformations of a 2-D shape in all four quadrants of a Cartesian plane (limited to integral vertices).

[C, CN, PS, T, V]

Statistics and Probability

General Learning Outcome: Collect, display, and analyze data to solve problems.

7.SP.1. Demonstrate an understanding of central tendency and range by
- determining the measures of central tendency (mean, median, mode) and range
- determining the most appropriate measures of central tendency to report findings

[C, PS, R, T]

7.SP.2. Determine the effect on the mean, median, and mode when an outlier is included in a data set.

[C, CN, PS, R]

7.SP.3. Construct, label, and interpret circle graphs to solve problems.

[C, CN, PS, R, T, V]

General Learning Outcome: Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.

7.SP.4. Express probabilities as ratios, fractions, and percents.

[C, CN, R, T, V]

7.SP.5. Identify the sample space (where the combined sample space has 36 or fewer elements) for a probability experiment involving two independent events.

[C, ME, PS]

7.SP.6. Conduct a probability experiment to compare the theoretical probability (determined using a tree diagram, table, or another graphic organizer) and experimental probability of two independent events.

[C, PS, R, T]

Curriculum Implementation Resources

Curriculum implementation resources are frequently added. Please refer to
https://www.edu.gov.mb.ca/k12/framework/english/math/resources/grade_7.html.