Mathematics, Grade 1

Expectations by strand

A. Social-Emotional Learning (SEL) Skills in Mathematics and the Mathematical Processes

This strand focuses on students' development and application of social-emotional learning skills to support their learning of math concepts and skills, foster their overall well-being and ability to learn, and help them build resilience and thrive as math learners. As they develop SEL skills, students demonstrate a greater ability to understand and apply the mathematical processes, which are critical to supporting learning in mathematics. In all grades of the mathematics program, the learning related to this strand takes place in the context of learning related to all other strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout this grade, in order to promote a positive identity as a math learner, to foster well-being and the ability to learn, build resilience, and thrive, students will:

A1. Social-Emotional Learning (SEL) Skills and the Mathematical Processes

apply, to the best of their ability, a variety of social-emotional learning skills to support their use of the mathematical processes and their learning in connection with the expectations in the other five strands of the mathematics curriculum

<table>
<tr><th>To the best of their ability, students will learn to:</th><th>… as they apply the mathematical processes:</th><th>… so they can:</th></tr>
<tr><td>1. identify and manage emotions</td><td rowspan="5">• problem solving: develop, select, and apply problem-solving strategies
• reasoning and proving: develop and apply reasoning skills (e.g., classification, recognition of relationships, use of counter-examples) to justify thinking, make and investigate conjectures, and construct and defend arguments
• reflecting: demonstrate that as they solve problems, they are pausing, looking back, and monitoring their thinking to help clarify their understanding (e.g., by comparing and adjusting strategies used, by explaining why they think their results are reasonable, by recording their thinking in a math journal)
• connecting: make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports)
• communicating: express and understand mathematical thinking, and engage in mathematical arguments using everyday language, language resources as necessary, appropriate mathematical terminology, a variety of representations, and mathematical conventions
• representing: select from and create a variety of representations of mathematical ideas (e.g.,</td><td>1. express and manage their feelings, and show understanding of the feelings of others, as they engage positively in mathematics activities</td></tr>
<tr><td>2. recognize sources of stress and cope with challenges</td><td>2. work through challenging math problems, understanding that their resourcefulness in using various strategies to respond to stress is helping them build personal resilience</td></tr>
<tr><td>3. maintain positive motivation and perseverance</td><td>3. recognize that testing out different approaches to problems and learning from mistakes is an important part of the learning process, and is aided by a sense of optimism and hope</td></tr>
<tr><td>4. build relationships and communicate effectively</td><td>4. work collaboratively on math problems – expressing their thinking, listening to the thinking of others, and practising inclusivity – and in that way fostering healthy relationships</td></tr>
<tr><td>5. develop self-awareness and sense of identity</td><td>5. see themselves as capable math learners, and strengthen their sense of ownership of their learning, as part of their emerging sense of identity and belonging</td></tr>
</table>

6. think critically and creatively	representations involving physical models, pictures, numbers, variables, graphs), and apply them to solve problems • ***selecting tools and strategies:*** select and use a variety of concrete, visual, and electronic learning tools and appropriate strategies to investigate mathematical ideas and to solve problems	6. make connections between math and everyday contexts to help them make informed judgements and decisions

B. Number

Overall expectations

By the end of Grade 1, students will:

B1. Number Sense

demonstrate an understanding of numbers and make connections to the way numbers are used in everyday life

Specific expectations

By the end of Grade 1, students will:

B1.1 Whole Numbers

read and represent whole numbers up to and including 50, and describe various ways they are used in everyday life

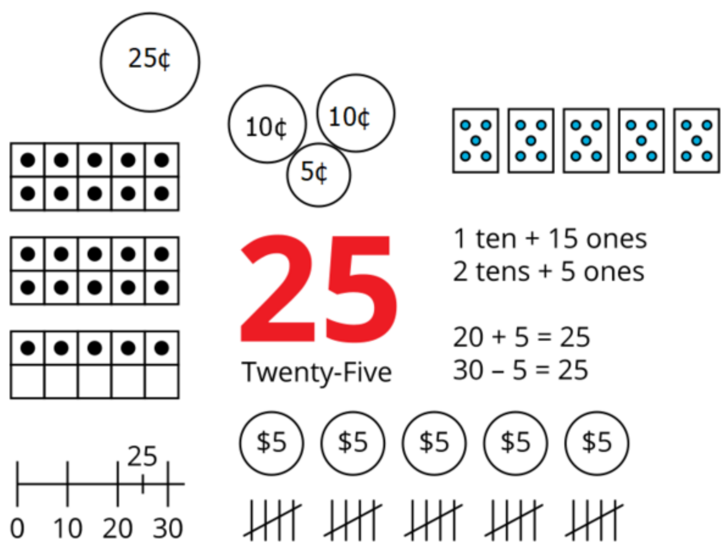
Teacher supports

Key concepts

- Reading numbers involves interpreting them as a quantity when they are expressed in words or numerals, or represented using physical quantities or diagrams.
- The numerals 0 to 9 are used to form numbers. They are referred to as the digits in a number and each digit corresponds to a place value. For example, in the number 25, the digit 2 represents 2 tens and the digit 5 represents 5 ones.
- Sometimes numbers used every day do not represent a quantity. For example:

- Postal codes and license plates are made up of the numerals 0 to 9 and letters.
- Addresses are assigned numbers in order.
- Numbers on sports jerseys organize the players on a team.
- Numbers can rank positions, such as finishing 3rd in a race.

- Sometimes numbers used every day describe quantities (e.g., 12 turtles).
- Recognizing small quantities without counting (subitizing) is helpful for working with numbers.
- Numbers can be represented in a variety of ways including the use of counts such as tallies, position, or distance on a number line, in words, using money, and using mathematical learning tools such as ten frames.



Note

- Every strand in the mathematics curriculum relies on numbers.
- Numbers may have cultural significance.
- Subitizing can help lay the foundation for work with place value, addition and subtraction, and estimation. For example, students looking at the number 32 can visualize 3 ten frames and 2 more; students can see a representation of 7 as 3 + 4. See **SE B1.2**.
- Subitizing is easier when objects are organized (e.g., dots on a die or a domino) than when they are unorganized (i.e., objects randomly positioned).
- Sometimes a quantity is recognized all at once (perceptual subitizing).
- Sometimes a quantity is recognized as smaller quantities that can be added together (conceptual subitizing).

B1.2 Whole Numbers

compose and decompose whole numbers up to and including 50, using a variety of tools and strategies, in various contexts

Teacher supports

Key concepts

- Numbers are composed when two or more numbers are combined to create a larger number. For example, twenty and five are composed to make twenty-five.
- Numbers are decomposed when they are taken apart to make two or more smaller numbers that represent the same quantity. For example, 25 can be represented as two 10s and one 5.

Note

- When a number is decomposed and then recomposed, the quantity is unchanged. This is the conservation principle.
- Numbers can be decomposed by their place value.
- Composing and decomposing numbers in a variety of ways can support students in becoming flexible with their mental math strategies for addition and subtraction.
- Certain tools are helpful for showing the composition and decomposition of numbers. For example:
    - Ten frames can show how numbers compose to make 10 or decompose into groups of 10.
    - Rekenreks can show how numbers are composed as groups of 5s and 10s or decomposed into 5s and 10s.
    - Coins and bills can show how numbers are composed and decomposed according to their values.
    - Number lines can be used to show how numbers are composed or decomposed using different combinations of “jumps”.

B1.3 Whole Numbers

compare and order whole numbers up to and including 50, in various contexts

Teacher supports

Key concepts

- Numbers are compared and ordered according to their “how muchness”.
- Numbers with the same units can be compared directly. For example, 5 cents and 20 cents, 12 birds and 16 birds. Numbers that do not show a unit are assumed to have units of ones (e.g., 5 and 12 are considered as 5 ones and 12 ones).
- Numbers can be ordered in ascending order – from least to greatest – or can be ordered in descending order – from greatest to least.

Note

- The "how muchness" of a number is its magnitude.
- There is a stable order to how numbers are sequenced, and patterns exist within this sequence that make it possible to predict the order and make comparisons.
- The sequence from 1 to 19 has fewer patterns than sequences involving greater numbers and so requires a lot of practice to consolidate.
- The “decades” that follow the teens pick up on the 1 to 9 pattern. Within each decade, the 1 to 9 sequence is repeated. After 9 comes the next decade. The pattern of naming the decade is not always overt in English. For example, 30 means “three tens”, but this connection may not be noticed by hearing the word “thirty”.
- Number lines and hundreds charts model the sequence of numbers and can be used to uncover patterns.

B1.4 Whole Numbers

estimate the number of objects in collections of up to 50, and verify their estimates by counting

Teacher supports

Key concepts

- Estimation is used to approximate quantities that are too great to subitize.
- Different strategies can be used to estimate the quantity in a collection. For example, a portion of the collection can be subitized and then that amount visualized to count the remainder of the collection.
- Although there are many different ways to count a collection (see **SE B1.5**), if the count is carried out correctly, the count will always be the same.

Note

- Estimating collections involves unitizing, for example, into groups of 5, and then counting by those units (skip counting by 5s).
- Estimation skills are important for determining the reasonableness of calculations and in developing a sense of measurement.

B1.5 Whole Numbers

count to 50 by 1s, 2s, 5s, and 10s, using a variety of tools and strategies

Teacher supports

Key concepts

- The count of objects does not change, regardless of how the objects are arranged (e.g., close together or far apart) or in what order they are counted (order irrelevance).
- Counting objects may involve counting an entire collection or counting the quantity of objects that satisfy certain attributes.
- Objects can be counted individually or in groups of equal quantities. The skip count is based on the number of objects in the equal groups.
- Each object in a collection must be touched or included in the count only once and matched to the number being said (one-to-one-correspondence).
- The numbers in the counting sequence must be said once, and always in the standard order (stable order).
- The last number said during a count describes how many there are in the whole collection (cardinality), including when groups are combined to solve an addition problem.

Note

- The counting principles are: one-to-one correspondence, stable order, conservation principle, order irrelevance, and cardinality.
- When skip counting groups of objects of the same quantity, the unit of skip count is the number of objects in each group. For example, when each group has two objects, the counter should count by twos.
- When skip counting a set of objects that leaves remainders or leftovers, the leftovers must still be counted for the total to be accurate. For example, when counting a collection of 37 by 5s, the 2 left over need to be counted individually and added to 35.

- Skip counting is an efficient way to count larger collections, and it also helps build basic facts and mental math strategies and establishes a strong foundation for multiplication and division.
- Counts can be tracked using tally marks. An application of this is identified in the Data strand; see **Data, SE D1.2**.

B1.6 Fractions

use drawings to represent and solve fair-share problems that involve 2 and 4 sharers, respectively, and have remainders of 1 or 2

Teacher supports

Key concepts

- Fair-sharing or equal-sharing means that quantities are shared equally. For a whole to be shared equally, it must be partitioned so that each sharer receives the same amount.

Note

- Words can have multiple meanings. It is important to be aware that in many situations, fair does not mean equal, and equal is not equitable. Educators should clarify how they are using the term "fair share" and ensure that students understand that in the math context fair means equal and the intent behind such math problems is to find equal amounts.
- Fair-share or equal-share problems provide a natural context for encountering fractions and division. Present these problems in the way that students will best connect to.
- Whole numbers and fractions are used to describe fair-share or equal-share amounts. For example, 5 containers of playdough shared between 2 people means that each person receives 2 containers and half of another container. Or each person could receive 5 halves, depending on the sharing strategy used.
- Fractions have specific names. In Grade 1, students should be introduced to the terminology of “half/halves” and “fourth/fourths”.

B1.7 Fractions

recognize that one half and two fourths of the same whole are equal, in fair-sharing contexts

Teacher supports

Key concepts

- When something is shared fairly, or equally as two pieces, each piece is 1 one half of the original amount. Two one halves make up a whole.
- When something is shared fairly, or equally as four pieces, each piece is 1 one fourth of the original amount. Four one fourths make up a whole.
- If the original amount is shared as two pieces or four pieces, the fractions one half and two fourths are equivalent.
- A half of a half is a fourth.
- If something is cut in half, it is not possible for one person to get “the big half” while the other person gets “the small half”. If something is cut in half, both pieces are exactly equal. If there is a “big half”, then it isn’t a half.

Note

- Words can have multiple meanings. It is important to be aware that in many situations, fair does not mean equal, and equal is not equitable. Educators should clarify how they are using the term “fair share” and ensure that students understand that in the math context fair means equal and the intent behind such math problems is to find equal amounts.
- Different fractions can describe the same amount as long as they are based on the same whole.
- The size of the whole matters. If 1 one half and 1 one fourth are based on the same whole, then 1 one half is twice as big as 1 one fourth. But if a small sticky note is cut into halves, and a big piece of chart paper is cut into fourths, then the 1 one fourth of the chart paper is bigger than the 1 one half of the sticky note.
- The fair-share problems that students engage in for learning around **SE B1.6** will provide the opportunity to notice that 1 one half and 2 one fourths are the same amount.
- Students in this grade are not expected to write fractions symbolically; they should write “half”, not “$\frac{1}{2}$”.

B1.8 Fractions

use drawings to compare and order unit fractions representing the individual portions that result when a whole is shared by different numbers of sharers, up to a maximum of 10

Teacher supports

Key concepts

- When one whole is shared equally by a number of sharers, the number of sharers determines the size of each individual portion and is reflected in how that portion is named. For example, if a whole is equally shared among eight people, the whole has been split into *eighths*, and each part is one eighth of the whole. One eighth is a unit fraction, and there are 8 one eighths in a whole.
- The size of the whole matters. When comparing fractions as numbers, it is assumed they refer to the same-sized whole. Without a common whole, it is quite possible for one fourth to be larger than one half.
- Sharing a whole equally among more sharers creates smaller shares; conversely, sharing a whole equally among fewer sharers creates larger shares. So, for example, 1 one fourth is larger than 1 one fifth, when taken from the same whole or set.

B2. Operations

use knowledge of numbers and operations to solve mathematical problems encountered in everyday life

Specific expectations

By the end of Grade 1, students will:

B2.1 Properties and Relationships

use the properties of addition and subtraction, and the relationship between addition and subtraction, to solve problems and check calculations

Teacher supports

Key concepts

- When zero is added or subtracted from a quantity, the quantity does not change.
- Adding numbers in any order gives the same result.
- Addition and subtraction are inverse operations, and the same situation can be represented and solved using either operation. Addition can be used to check the answer to a subtraction question, and subtraction can be used to check the answer to an addition question.

Note

- Students need to understand the commutative and identity properties, but they do not need to name them in Grade 1. These properties help in developing addition and subtraction facts.
- This expectation supports most other expectations in the Number strand and is applied throughout the grade. Whether working with numbers or with operations, recognizing and applying properties and relationships builds a strong foundation for doing mathematics.
- Part-whole models help with noticing the inverse operations of addition and subtraction (see **SE B2.4**).
- The inverse relationship can be used to check that a solution is correct.

B2.2 Math Facts

recall and demonstrate addition facts for numbers up to 10, and related subtraction facts

Teacher supports

Key concepts

- Understanding the relationships that exist among numbers and among operations provides strategies for learning basic facts.
- Knowing the fact families can help with recalling the math facts (e.g., 4 + 6 = 10, 10 – 4 = 6, and 10 – 6 = 4).
- There are many strategies that can help with developing and understanding the math facts:
    - Counting on and counting back supports + 1, + 2, − 1, and − 2 facts.
    - The commutative property (e.g., 6 + 4 = 10 and 4 + 6 = 10).
    - The identity property (e.g., 6 + 0 = 6 and 6 – 0 = 6).
    - Doubles, doubles + 1, and doubles – 1 (e.g., 4 + 5 can be thought of as 4 + 4 plus 1 more; 9 can be thought of as 10 less 1 or double 5 less one).

Note

- Addition and subtraction are inverse operations. This means that addition facts can be used to understand and recall subtraction facts (e.g., 5 + 3 = 8, so 8 – 5 = 3 and 8 – 3 = 5).

- Having automatic recall of addition and subtraction facts is useful when carrying out mental and written calculations and frees up working memory when solving complex problems and tasks.

B2.3 Mental Math

use mental math strategies, including estimation, to add and subtract whole numbers that add up to no more than 20, and explain the strategies used

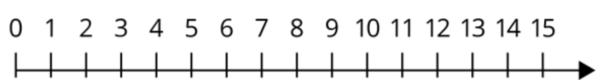
Teacher supports

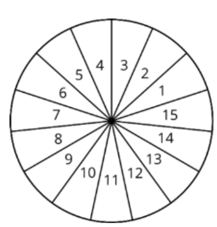
Key concepts

- Mental math refers to doing calculations in one's head. Sometimes the numbers or the number of steps in a calculation are too complex to completely hold in one's head, so jotting down partial calculations and diagrams can be used to complete the calculations.
- Estimation is a useful mental strategy when either an exact answer is not needed or there is insufficient time to work out a calculation.

Note

- To do calculations in one's head involves using flexible strategies that build on known facts, number relationships, and counting strategies. These strategies continue to expand and develop through the grades.
- Mental math may or may not be quicker than paper-and-pencil strategies, but speed is not the goal. The value of mental math is in its portability and flexibility, since it does not require a calculator or paper and pencil. Practising mental math strategies also deepens an understanding of the relationships between numbers.
- Estimation can be used to check the reasonableness of calculations and should be continually encouraged when students are doing mathematics.
- Number lines, circular number lines, and part-whole models can help students visualize and communicate mental math strategies.





B2.4 Addition and Subtraction

use objects, diagrams, and equations to represent, describe, and solve situations involving addition and subtraction of whole numbers that add up to no more than 50

Teacher supports

Key concepts

- Situations involving addition and subtraction may involve:
    - adding a quantity onto an existing amount or removing a quantity from an existing amount;
    - combining two or more quantities;
    - comparing quantities.
- Acting out a situation by representing it with objects, a drawing, or a diagram can support students in identifying the given quantities in a problem and the unknown quantity.
- Set models can be used to add a quantity on to an existing amount or to remove a quantity from an existing amount.
- Linear models can be used to determine the difference between two numbers by comparing quantities.
- Part-whole models can be used to show the relationship between what is known and what is unknown and how addition and subtraction relate to the situation.

Note

- An important part of problem solving is the ability to choose the operation that matches the action in a situation. Addition and subtraction are useful for showing:
    - when a quantity *changes*, either by *joining* another quantity to it or *separating* a quantity from it;
    - when two quantities (parts) are *combined* to make one whole quantity;
    - when two quantities are *compared*.
- In addition and subtraction, what is unknown can vary:
    - In *change* situations, sometimes the result is unknown, sometimes the starting point is unknown, and sometimes the change is unknown.
    - In *combine* situations, sometimes one part is unknown, sometimes the other part is unknown, and sometimes the total is unknown.

- In *compare* situations, sometimes the larger number is unknown, sometimes the smaller number is unknown, and sometimes the difference is unknown.

- It is important to model the corresponding equation that represents the situation. The unknown may appear anywhere in an equation (e.g., 8 + ? = 19; ? + 11 = 19; or 8 + 11 = ?), and matching the structure of the equation to what is happening in the situation reinforces the meaning of addition and subtraction.
- Sometimes changing a "non-standard" equation (where the unknown is not after the equal sign) into its "standard form" can make it easier to carry out the calculation. Part-whole models make the inverse relationship between addition and subtraction evident and help students develop a flexible understanding of the equal sign. These are important ideas in the development of algebraic reasoning.
- Counting up or counting down are strategies students may use to determine an unknown quantity.

B2.5 Multiplication and Division

represent and solve equal-group problems where the total number of items is no more than 10, including problems in which each group is a half, using tools and drawings

Teacher supports

Key concepts

- With equal-group problems, a group of a given size is repeated a certain number of times to create a total. Sometimes the size of each group is unknown, sometimes the number of groups is unknown, and sometimes the total is unknown.

Note

- For this expectation, students are always given the size of the equal groups and they determine either the number of equal groups or the total needed (not to exceed 10). In **SE B1.6**, students solve fair-share problems that find the size of an equal group.
- It is important that students represent equal-group situations using tools and drawings; this enables them to use counting to solve the problem.
- Solving equal-group problems lays a strong foundation for work with skip counting, using doubles as a fact strategy, multiplication and division, and fractions.

C. Algebra

Overall expectations

By the end of Grade 1, students will:

C1. Patterns and Relationships

identify, describe, extend, create, and make predictions about a variety of patterns, including those found in real-life contexts

Specific expectations

By the end of Grade 1, students will:

C1.1 Patterns

identify and describe the regularities in a variety of patterns, including patterns found in real-life contexts

Teacher supports

Key concepts

- Human activities, histories, and the natural world are made up of all kinds of patterns, and many of them are based on the regularity of an attribute.
- The regularity of attributes may include colour, shape, texture, thickness, orientation, or materials.

Note

- Students can engage in mathematics and patterns through the contexts, cultural histories, and stories of various cultures.
- Patterns do not need to be classified as repeating or otherwise in Grade 1. Instead, focus on the attributes that are being used in patterns.

C1.2 Patterns

create and translate patterns using movements, sounds, objects, shapes, letters, and numbers

Teacher supports

Key concepts

- The same pattern structure can be represented in various ways.
- Patterns can be created by changing one or more attributes.

Note

- When patterns are translated, they are being re-represented using the same type of pattern structure (e.g., AB, AB, AB… to red-black, red-black, red-black).

C1.3 Patterns

determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in patterns

Teacher supports

Key concepts

- Patterns can be extended because they are repetitive by nature.
- Pattern rules are generalizations about a pattern, and they can be described in words.
- Patterns can be extended in multiple directions, by showing what comes next or what came before.
- To make a near prediction about a pattern is to state or show what a pattern will look like just beyond the given representation of that pattern. The prediction can be verified by extending that pattern.
- To make a far prediction about a pattern is to state or show what a pattern will look like well beyond the given representation of that pattern. Often calculations are needed to make an informed prediction or to verify a prediction.
- To identify missing elements of patterns is to complete a representation for a given pattern by filling in the missing parts.

Note

- In order to extend, predict, or determine missing elements in patterns, students need to generalize patterns using pattern rules.
- Rules can be used to verify predictions and to critically analyse extensions and solutions for missing elements.

C1.4 Patterns

create and describe patterns to illustrate relationships among whole numbers up to 50

Teacher supports

Key concepts

- There are patterns in numbers and the way that digits repeat from 0 to 9.

Note

- Creating and analysing patterns that involve decomposing numbers will support students in understanding how numbers are related.
- Creating and analysing patterns involving addition and subtraction facts can help students develop fluency with math facts, as well as understand how to maintain equality among expressions.

C2. Equations and Inequalities

demonstrate an understanding of variables, expressions, equalities, and inequalities, and apply this understanding in various contexts

Specific expectations

By the end of Grade 1, students will:

C2.1 Variables

identify quantities that can change and quantities that always remain the same in real-life contexts

Teacher supports

Key concepts

- Quantities that can change are also referred to as “variables”.
- Quantities that remain the same are also referred to as “constants”.

Note

- Identifying quantities in real life that stay the same and those that can change will help students understand the concept of variability.
- Identifying what is constant and what changes is one aspect of mathematical modelling.
- When students create models of 10 by adding numbers (terms), they are implicitly working with variables. These terms are variables that can change (e.g., in coding, a student's code could be TotalSteps = FirstSteps + SecondSteps).
- In mathematics notation, variables are only expressed as letters or symbols. When coding, variables may be represented as words, abbreviated words, symbols, or letters.
- Students are also implicitly working with variables as they are working with attributes (e.g., length, mass, colour, number of buttons), as the value of those attributes can vary.

C2.2 Equalities and Inequalities

determine whether given pairs of addition and subtraction expressions are equivalent or not

Teacher supports

Key concepts

- Numerical expressions are equivalent when they produce the same result, and an equal sign is a symbol denoting that the two expressions are equivalent.
- Numerical expressions are not equivalent when they do not produce the same result, and an equal sign with a slash through it ($\neq$) is a symbol denoting that the two expressions are not equivalent.

Note

- The equal sign should not be interpreted as the "answer", but rather, that both parts on either side of the equal sign are equal, therefore creating balance.

C2.3 Equalities and Inequalities

identify and use equivalent relationships for whole numbers up to 50, in various contexts

Teacher supports

Key concepts

- When numbers are decomposed, the parts are equivalent to the whole.
- The same whole can result from different parts.

Note

- Many mathematical concepts are based on an underlying principle of equivalency.
- The commutative property is an example of an equivalent relationship.

C3. Coding

solve problems and create computational representations of mathematical situations using coding concepts and skills

Specific expectations

By the end of Grade 1, students will:

C3.1 Coding Skills

solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves sequential events

Teacher supports

Key concepts

- In coding, a sequential set of instructions is executed in order.

Note

- Coding can support students in developing a deeper understanding of mathematical concepts.
- Coding can include a combination of pseudocode, block-based coding programs, and text-based coding programs.
- Students can program for various agents such as a pixelated image on a screen, a classmate acting out the code when appropriate, or a physical device (e.g., robot, microcontroller).

- Students can decompose large problems into smaller tasks and develop sequential steps to accomplish each sub-task.

C3.2 Coding Skills

read and alter existing code, including code that involves sequential events, and describe how changes to the code affect the outcomes

Teacher supports

Key concepts

- Changing the sequence of instructions in code may produce the same outcome as the original sequence, but it may also produce a different outcome. It is important for students to understand when the order matters.

Note

- Similarly, for some mathematical concepts, the sequence of instructions does not matter, as illustrated by the commutative property of addition (e.g., $6 + 3 = 3 + 6$). For other concepts, the order does matter; the commutative property does not work for subtraction (e.g., $6 - 3$ is not the same as $3 - 6$).
- Altering code can develop students' understanding of mathematical concepts. Altering code is also a way of manipulating and controlling the outcomes of the code.

C4. Mathematical Modelling

apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations

This overall expectation has no specific expectations. Mathematical modelling is an iterative and interconnected process that is applied to various contexts, allowing students to bring in learning from other strands. Students' demonstration of the process of mathematical modelling, as they apply concepts and skills learned in other strands, is assessed and evaluated.

Read more about the mathematical modelling process.

Teacher supports

Key concepts

- The process of mathematical modelling requires: understanding the problem; analysing the situation; creating a mathematical model; and analysing and assessing the model.

Note

- A mathematical modelling task is different from a real-life application due to the cyclic nature of modelling, which involves examining a problem from outside mathematics, modelling it, and then checking the model against the real-life situation and adjusting as necessary.
- The process of mathematical modelling should not be confused with using a "model" to represent or solve a problem that does not require the whole process.
- Mathematical modelling tasks can be utilized in many ways and can support students with making connections among many mathematical concepts across the math strands and across other curricula.

D. Data

Overall expectations

By the end of Grade 1, students will:

D1. Data Literacy

manage, analyse, and use data to make convincing arguments and informed decisions, in various contexts drawn from real life

Specific expectations

By the end of Grade 1, students will:

D1.1 Data Collection and Organization

sort sets of data about people or things according to one attribute, and describe rules used for sorting

Teacher supports

Key concepts

- Data can be sorted in more than one way, depending on the attribute.
- Data can be sorted into categories using attributes, and the categories can be used to create tables and graphs.

Note

- A variable is any attribute, number, or quantity that can be measured or counted.
- Early experiences in sorting and classifying supports students with understanding how data can be organized.

D1.2 Data Collection and Organization

collect data through observations, experiments, and interviews to answer questions of interest that focus on a single piece of information; record the data using methods of their choice; and organize the data in tally tables

Teacher supports

Key concepts

- Data can either be qualitative (descriptive, e.g., colour, type of pet) or quantitative (numerical, e.g., number of pets, height).
- The type and amount of data to be collected is based on the question of interest.
- Data can be collected through observations, experiments, interviews, or written questionnaires over a period of time.
- Tally tables can be used to organize data as it is collected. The data is recorded in groups of five tallies to make it easier to count.
- The distribution of data among the categories can change as more data is added.

Note

- In the primary grades, students should collect data from a small population (e.g., objects in a bin, the days in a month, students in Grade 1).

D1.3 Data Visualization

display sets of data, using one-to-one correspondence, in concrete graphs and pictographs with proper sources, titles, and labels

Teacher supports

Key concepts

- Different representations can be used to present data, depending on the type of data and the information to be highlighted.
- Both concrete graphs and pictographs allow for visual comparisons of quantities that are represented in the graphs.
- With one-to-one correspondence, there is one object for each piece of data in a concrete graph or one picture for each piece of data in a pictograph.
- The source, title, and labels provide important information about data in a graph or table:
  - The source indicates where the data was collected.
  - The title introduces the data contained in the graph or the table.
  - Labels provide additional information, such as the categories into which the data are sorted. On a pictograph, a key tells us how many each picture represents.

Note

- The source can be included in the title of a graph.
- The structure of a concrete graph can be transformed into a pictograph.

D1.4 Data Analysis

order categories of data from greatest to least frequency for various data sets displayed in tally tables, concrete graphs, and pictographs

Teacher supports

Key concepts

- The frequency of a category represents its count.
- The frequencies in a tally table should match the frequencies in graphs of the same information.

- The category with the greatest frequency has the greatest number of tallies in a tally table, the greatest number of objects in a concrete graph, and the greatest number of pictures in a pictograph.

Note

- Ordering the categories by frequencies will support students when they identify the mode in Grade 2.

D1.5 Data Analysis

analyse different sets of data presented in various ways, including in tally tables, concrete graphs, and pictographs, by asking and answering questions about the data and drawing conclusions, then make convincing arguments and informed decisions

Teacher supports

Key concepts

- Different representations are used for different purposes to convey different types of information. Tally tables, concrete graphs, and pictographs are used to represent counts or frequencies of various categories.
- Information in tally tables, concrete graphs, and pictographs can prompt the asking and answering of questions like, which category has the greatest frequency?
- Sometimes considering the frequency can support making informed decisions, such as what type of books should be ordered for the class library.
- Questions of interest are intended to be answered through the analysis of the representations. Sometimes the analysis raises more questions that require further collection, representation, and analysis of data.

Note

- There are three levels of graph comprehension that students should learn about and practise:
    - Level 1: information is read directly from the graph and no interpretation is required.
    - Level 2: information is read and used to compare (e.g., greatest, least) or perform operations (e.g., addition, subtraction).

    - Level 3: information is read and used to make inferences about the data using background knowledge of the topic.

- Analysing data can be complex, so it is important to provide students with strategies that will support them to build these skills.

D2. Probability

describe the likelihood that events will happen, and use that information to make predictions

Specific expectations

By the end of Grade 1, students will:

D2.1 Probability

use mathematical language, including the terms “impossible”, “possible”, and “certain”, to describe the likelihood of events happening, and use that likelihood to make predictions and informed decisions

Teacher supports

Key concepts

- The likelihood of an event happening ranges from impossible to certain.
- Understanding likelihood can help with making predictions about future events and can influence the decisions people make in daily life.

Note

- The first stage of understanding the continuum is for students to be able to identify events that happen at the two ends and understand that the likelihood of other types of events falls somewhere in between.

D2.2 Probability

make and test predictions about the likelihood that the categories in a data set from one population will have the same frequencies in data collected from a different population of the same size

Teacher supports

Key concepts

- Data can vary from one population to another.
- Data can be used to make predictions that are not based on personal feelings or opinions alone.

Note

- In order to do an accurate comparison between data sets in Grade 1, it is important for students to collect data from a same-sized population (e.g., same number of objects in a bin, days in a month, students in Grade 1).

E. Spatial Sense

Overall expectations

By the end of Grade 1, students will:

E1. Geometric and Spatial Reasoning

describe and represent shape, location, and movement by applying geometric properties and spatial relationships in order to navigate the world around them

Specific expectations

By the end of Grade 1, students will:

E1.1 Geometric Reasoning

sort three-dimensional objects and two-dimensional shapes according to one attribute at a time, and identify the sorting rule being used

Teacher supports

Key concepts

- Geometric shapes exist in two dimensions (pictures or drawings) and in three dimensions (objects).

- Three-dimensional objects and two-dimensional shapes can be sorted by identifying and paying attention to similarities and ignoring differences.
- Shapes and objects have more than one, and often many, attributes, so they can be sorted in more than one way. Sorting rules indicate which attribute to sort for and are used to determine what belongs and what does not belong in a group.
- Attributes are characteristics or features of an object or shape (e.g., length, area, colour, texture, ability to roll). Attributes can be used to describe, compare, sort, and measure.
- Geometric properties are specific attributes that are the same for an entire “class” of shapes or objects. So, for example, a group of shapes might all be red (attribute), but in order for them all to be squares, they must have four equal sides and four right angles (the geometric properties of a square). Geometric properties are used to identify two-dimensional shapes and three-dimensional objects.

Note

- Sorting by attributes is used in counting, measurement, and geometry. When a student counts “this” and not “that”, they have sorted; when they measure length, they focus on one attribute and not another; when they say that this shape is a triangle and not a square, their sorting has led them to identify the shape.

E1.2 Geometric Reasoning

construct three-dimensional objects, and identify two-dimensional shapes contained within structures and objects

Teacher supports

Key concepts

- Each face of a three-dimensional object is a two-dimensional shape. Often, a shape is identified by the number of sides it has. Common shapes on faces of three-dimensional objects are triangles, rectangles, pentagons, hexagons, and octagons.
- While the number of sides often determines a shape’s name, this does not mean, for example, that all triangles look the same even though they all have three sides. Triangles can be oriented differently and have different side lengths, and yet still be triangles.

Note

- Constructing three-dimensional objects helps build understanding of attributes and properties of two-dimensional shapes and three-dimensional objects.

E1.3 Geometric Reasoning

construct and describe two-dimensional shapes and three-dimensional objects that have matching halves

Teacher supports

Key concepts

- If two shapes or objects match in every way, they are congruent. Shapes with matching halves have congruent halves.
- Congruent halves can be superimposed onto one another through a series of slides (translations), flips (reflections), or turns (rotations). This means that congruent halves are also symmetrical.
- Both three-dimensional objects and two-dimensional shapes can have matching, congruent, symmetrical halves.

E1.4 Location and Movement

describe the relative locations of objects or people, using positional language

Teacher supports

Key concepts

- Positional language often includes direction and distance to describe the location of one object in relation to another.
- Words and phrases such as *above*, *below*, *to the left*, *to the right*, *behind*, and *in front* describe the position of one object in relation to another. Numbers can describe the distance of one object from another.

E1.5 Location and Movement

give and follow directions for moving from one location to another

Teacher supports

Key concepts

- Movement encompasses distance and direction.
- Words or phrases such as *above*, *below*, *to the left*, *to the right*, *behind*, or *in front of* describe the direction of one object in relation to another. Numbers can describe the distance of one object from another.
- A combination of words and numbers can describe a path to move from one location to another. The order of the steps taken on this path is often important.

E2. Measurement

compare, estimate, and determine measurements in various contexts

Specific expectations

By the end of Grade 1, students will:

E2.1 Attributes

identify measurable attributes of two-dimensional shapes and three-dimensional objects, including length, area, mass, capacity, and angle

Teacher supports

Key concepts

- Every shape or object has several attributes that can be compared. The same shape or object can be described and compared using different attributes.
- There are particular words that describe commonly measured attributes:
    - length is the distance from one point to the other and can be measured in any direction;
    - area is the amount of surface an object has;
    - mass is how heavy an object is;
    - capacity is the amount an object holds;
    - angle is the amount of turn between one line and another.

E2.2 Attributes

compare several everyday objects and order them according to length, area, mass, and capacity

Teacher supports

Key concepts

- Objects can be compared and ordered according to whether they have more or less of an attribute. Comparing the same objects by different attributes may produce different ordering.
- There are specific words and phrases that help describe and compare attributes:
  - *more*, *less*, *smaller*, and *bigger* often only *describe* general comparisons unless a specific attribute is included (bigger area; smaller capacity);
  - *tall*, *short*, *wide*, *narrow*, *long*, and *distance* are all associated with length;
  - adding the suffix "-er" or "-est" typically creates a comparative term (e.g., heavier, lighter, heaviest, lightest).
- Objects can be directly compared by matching, covering, or filling one object with the other to determine which has more length, mass, area, or capacity.
- When a direct comparison cannot be easily made, a third object can serve as a "go-between" tool to make an indirect comparison. For example, a string can be used to compare the lengths of two objects that are not easily brought together, or a third container can be used to determine which of two containers holds more water. Indirect comparisons require using the transitivity principle and the conservation principle.

E2.3 Time

read the date on a calendar, and use a calendar to identify days, weeks, months, holidays, and seasons

Teacher supports

Key concepts

- Time is an abstract concept that cannot be seen or felt. The passing of time can be measured by counting things that repeat. The passing of a day, for example, is marked by the rising and setting of the sun.
- Calendars keep track of days, weeks, months, and years, as well as holidays and seasons.

- There are other kinds of calendars, such as lunar, solar, agricultural, ecological, and personal calendars, that keep track of personal, social, and religious events.
- Calendars enable people to communicate a date to others.

F. Financial Literacy

Overall expectations

By the end of Grade 1, students will:

F1. Money and Finances

demonstrate an understanding of the value of Canadian currency

Specific expectations

By the end of Grade 1, students will:

F1.1 Money Concepts

identify the various Canadian coins up to 50¢ and coins and bills up to $50, and compare their values

Teacher supports

Key concepts

- Canadian coins and bills differ from one another in value and appearance (e.g., size, shape, colour, image, and/or texture).
- Identifying the correspondence between the abstract concept of value and the concrete representation of coins and bills.

Note

- The value of money can be an abstract concept because it is often represented by currency that is not concrete or accessible.
- Being able to identify Canadian currency by size, shape, colour, image, and/or texture allows for quick recognition of different denominations.
- An understanding of unitizing is applied to identify the relationships between coins and their corresponding values.