Mathematics, Grade 2

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

To the best of their ability, students will learn to:	… as they apply the mathematical processes:	… so they can:
1. identify and manage emotions	• ***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.,	1. express and manage their feelings, and show understanding of the feelings of others, as they engage positively in mathematics activities
2. recognize sources of stress and cope with challenges		2. work through challenging math problems, understanding that their resourcefulness in using various strategies to respond to stress is helping them build personal resilience
3. maintain positive motivation and perseverance		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
4. build relationships and communicate effectively		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
5. develop self-awareness and sense of identity		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

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 2, 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 2, students will:

B1.1 Whole Numbers

read, represent, compose, and decompose whole numbers up to and including 200, using a variety of tools and strategies, 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, in standard notation, or represented using physical objects 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 107, the digit 1 represents 1 hundred, the digit 0 represents 0 tens, and the digit 7 represents 7 ones.

- There are patterns in the way numbers are formed. Each decade repeats the 0 to 9 counting sequence. Any quantity, no matter how great, can be described in terms of its place-value.
- A number can be represented in expanded form (e.g., 187 = 100 + 80 + 7 or 1 × 100 + 8 × 10 + 7 × 1) to show place-value relationships.
- Numbers can be composed and decomposed in various ways, including by place value.
- Numbers are composed when two or more numbers are combined to create a larger number. For example, 30, 20, and 5 are composed to make 55.
- Numbers are decomposed when they are represented as a composition of two or more smaller numbers. For example, 125 can be represented as 100 and 25; or 50, 50, 20, and 5.
- Numbers are used throughout the day, in various ways and contexts. Most often numbers describe and compare quantities. They express magnitude and provide a way to answer questions such as "how much?" and "how much more?".

Note

- Every strand in the mathematics curriculum relies on numbers.
- Numbers may have cultural significance.
- When a number is decomposed and then recomposed, the quantity is unchanged. This is the conservation principle.
- There are non-standard but equivalent ways to decompose a number using place value, based on understanding the relationships between the place values. For example, 187 could be decomposed as 18 tens and 7 ones or decomposed as 10 tens and 87 ones, and so on.
- Composing and decomposing numbers in a variety of ways can support students in becoming flexible with 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 using 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".

- Breaking down numbers and quantities into smaller parts (decomposing) and reassembling them in new ways (composing) highlights relationships between numbers and builds strong number sense.
- Composing and decomposing numbers is also useful when doing a calculation or making a comparison.
- As students build quantities to 200 concretely, they should use both written words and numerals to describe the quantity so that they can make connections among the representations.

B1.2 Whole Numbers

compare and order whole numbers up to and including 200, in various contexts

Teacher supports

Key concepts

- Numbers are compared and ordered according to their “how muchness” or magnitude.
- Numbers with the same units can be compared directly (e.g., 145 minutes compared to 62 minutes). Numbers that do not show a unit are assumed to have units of ones (e.g., 75 and 12 are considered as 75 ones and 12 ones).
- Benchmark numbers can be used to compare quantities. For example, 32 is less than 50 and 62 is greater than 50, so 32 is less than 62.
- Numbers can be compared by their place value. For example, 200 is greater than 20 because the digit 2 in 200 represents 2 hundreds and the 2 in 20 represents 2 tens; one hundred is greater than one ten.
- Numbers can be ordered in ascending order – from least to greatest – or they can be ordered in descending order – from greatest to least.

Note

- Moving between concrete (counting objects and sets) and abstract (symbolic and place value) representations of a quantity builds intuition and understanding of numbers.
- Understanding place value enables any number to be compared and ordered. 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 to describe the number of tens in a number. This pattern is not always overt in English. For example, 30 means “three tens”, but this connection may not be noticed by only hearing the word “thirty”.
- Within each decade, the 1 to 9 sequence is repeated. After 9 comes the next decade. After 9 decades comes the next hundred.
- The 1 to 9 sequence names each hundred. Within each hundred, the decade sequence and the 1 to 99 sequences are repeated.
- Number lines and hundreds charts model the sequence of numbers and can be used to uncover patterns.

B1.3 Whole Numbers

estimate the number of objects in collections of up to 200 and verify their estimates by counting

Teacher supports

Key concepts

- Estimation is used to approximate large quantities and develops a sense of magnitude.
- Different strategies can be used to estimate the quantity in a collection. For example, a small portion of the collection can be counted, and then used to visually skip count the rest of the collection.
- The greater the number of objects in the skip count, the fewer the number of counts are needed.
- Although there are different ways to count a collection (see **SE B1.4**), if the count is carried out correctly, the count will always be the same.

Note

- Estimation strategies often build on “unitizing” an amount (e.g., “I know this amount is 10”) and visually repeating the unit (e.g., by skip counting by 10s) until the whole is filled or matched. Unitizing is an important building block for place value, multiplication, measurement, and proportional reasoning.

B1.4 Whole Numbers

count to 200, including by 20s, 25s, and 50s, 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).
- Counting usually has a purpose, such as determining how many are in a collection, how long before something will happen, or to compare quantities and amounts.
- Counting objects may involve counting an entire collection or counting the quantity of objects that satisfy certain attributes.
- A count can start from zero or from any other starting number.
- The unit of skip count is identified as the number of objects in a group. For example, when counting by twos, each group has two objects.
- Counting can involve a combination of skip counts and single counts.

Note

- 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 number of objects must remain the same, regardless of how they are arranged, whether they are close together or spread far apart (conservation principle).
- The objects can be counted in any order, and the starting point does not affect how many there are (order irrelevance).
- The last number said during a count describes how many there are in the whole collection. It does not describe only the last object (cardinality).
- When all objects are not accounted for by using a skip count then the remaining objects are counted on either individually or by another type of skip count. For example, when counting a collection of 137 objects by 5s, the 2 left is counted on either by 1s or by 2s.
- Counting by ones up to and over 100 reinforces the concept that the 0 to 9 and decade sequence that appeared in the first hundred repeats in every hundred.
- Skip counting is an efficient way to count collections, and it also helps build basic facts and mental math strategies and establishes a strong foundation for multiplication and division.

B1.5 Whole Numbers

describe what makes a number even or odd

Teacher supports

Key concepts

- A whole number is even if it can be shared into two equal-sized groups or many groups of 2 without a remainder.
- A whole number is odd if it cannot be shared into two equal-sized groups or into many groups of 2 without a remainder.

Note

- There are patterns in the number system that can be used to identify a whole number as even or odd. For example, if a whole number with more than one digit ends in an even number, it is even.

B1.6 Fractions

use drawings to represent, solve, and compare the results of fair-share problems that involve sharing up to 10 items among 2, 3, 4, and 6 sharers, including problems that result in whole numbers, mixed numbers, and fractional amounts

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 students to encounter 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, 4 pieces of ribbon shared between 3 people means that each person receives 1 whole ribbon and 1 one third of another ribbon.

- When assigning these types of problems, start with scenarios where there is a remainder of 1. As students become adept at solving these problems, introduce scenarios where there is a remainder of 2 that needs to be shared equally.
- Fractions have specific names. In Grade 2, students should be using the terminology of “halves", "fourths", and "thirds”.

B1.7 Fractions

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

Teacher supports

Key concepts

- When something is shared fairly, or equally as three pieces, each piece is 1 one third of the original amount. Three one thirds make up a whole.
- When something is shared fairly, or equally as six pieces, each piece is 1 one sixth of the original amount. Six one sixths make up a whole.
- If the original amount is shared as three pieces or six pieces, the fractions 1 one third and 2 one sixths (two sixths) are equivalent, and 2 one thirds (two thirds) and 4 one sixths (four sixths) are equivalent.

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.
- Fair-share problems involving six sharers that result in remainders (see **SE B1.6**) provide a natural opportunity to recognize that 1 one third and 2 one sixths (two sixths) are equal.

B2. Operations

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

Specific expectations

By the end of Grade 2, students will:

B2.1 Properties and Relationships

use the properties of addition and subtraction, and the relationships between addition and multiplication and between subtraction and division, to solve problems and check calculations

Teacher supports

Key concepts

- When zero is added or subtracted from a quantity, the quantity does not change.
- Two numbers can be added in any order because either order gives the same result.
- When adding more than two numbers, it does not matter which two numbers are added first.
- 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.
- Repeated addition can be used as a multiplication strategy by adding equal groups of objects to determine the total number of objects.
- Repeated addition can also be used as a division strategy by adding equal groups of objects to reach a given total number of objects.
- Repeated subtraction can be used as a division strategy by removing equal groups of objects from a given total number of objects.
- Repeated addition or repeated subtraction can be used to check answers for multiplication and division calculations when they are not used as the initial strategy to do the multiplication or division calculation.
- The commutative property for addition states that the order in which two numbers are added does not change the total. For example, 5 + 3 is the same as 3 + 5, because 3 can be added onto 5 or 5 can be added onto 3; either way the result is 8. This is particularly helpful when learning math facts (see **SE B2.2**).
- The commutative property does not hold true for subtraction. For example, 5 – 4 = 1; however, it is not the same as 4 – 5 = –1. Students in Grade 2 do not need to know that 4 – 5 = –1, only that it has a result that is less than zero. To help students grasp this concept, show them how the scale on a thermometer includes numbers less than zero.
- The associative property states that when adding a group of numbers, the pair of numbers added first does not matter; the result will be the same. For example, in determining the sum of 8 + 7 + 2, 8 and 2 can be added first and then that result can be

added to 7. Using this property is particularly helpful when doing mental math (see **SE B2.3**) and when looking for ways to “make 10” is useful.

Note

- 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.
- Students need to develop an understanding of the commutative, identity, and associative properties, but they do not need to name them in Grade 2. These properties help to develop automaticity with addition and subtraction facts.
- Support students in making connections between skip counts and repeat addition.

B2.2 Math Facts

recall and demonstrate addition facts for numbers up to 20, and related subtraction facts

Teacher supports

Key concepts

- The focus in Grade 1 math facts was on recalling and demonstrating addition facts for numbers up to 10, and related subtraction facts. In Grade 2, students will expand their range to include numbers that add up to 20, e.g., 9 + 9 = 18 and related subtraction facts, e.g., 18 – 9 = 9.
- There are many strategies that can help with developing and understanding math facts:
    - Working with fact families, such as 7 + 6 = 13; 6 + 7 = 13; 13 – 7 = 6; 13 – 6 = 7.
    - Using doubles with counting on and counting back; for example, 7 + 9 can be thought of as 7 + 7 plus 2 more; 15 can be thought of as 16 less 1 (double 8 less one).
    - Using the commutative property (e.g., 5 + 8 = 13 and 8 + 5 = 13).
    - Using the identity property (e.g., 6 + 0 = 6 and 6 – 0 = 6).
    - "Making 10" by decomposing numbers in order to make 10. For example, to add 8 and 7, the 7 can be decomposed as 2 and 5, resulting in 8 + 2 + 5.

Note

- Ten is an important anchor for learning basic facts and mental math computations.

- 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 important when carrying out mental or written calculations, and frees up working memory to do complex calculations, 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 50, and explain the strategies used

Teacher supports

Key concepts

- Mental math refers to doing a calculation 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.
- Mental math involves using flexible strategies that build on basic facts, number relationships, and counting strategies. These strategies continue to expand and develop through the grades.
- Number lines, circular number lines, and part-whole models can be used to show strategies for doing 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 solution.

Note

- Strategies for doing mental calculations will vary depending on the numbers, facts, and properties that are used. For example:
  - For 18 + 2, simply count on.
  - For 26 + 13, decompose 13 into 10 and 3, add 10 to 26, and then add on 3 more.
  - For 39 + 9, add 10 to 39 and then subtract the extra 1.
- 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.

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 100

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 represent adding a quantity to an existing amount or removing a quantity from an existing amount.
- Linear models can be used to determine the difference between two numbers by comparing two 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 situations, 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.

- In order to reinforce the meaning of addition and subtraction, it is important to model the correct equation by matching its structure to the situation and placing the unknown correctly; for example, 8 + ? = 19, or ? + 11 = 19, or 8 + 11 = ?.
- 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 support students in developing a flexible understanding of the equal sign. These are important ideas in the development of algebraic reasoning.

B2.5 Multiplication and Division

represent multiplication as repeated equal groups, including groups of one half and one fourth, and solve related problems, using various tools and drawings

Teacher supports

Key concepts

- Multiplication can describe situations involving repeated groups of equal size.
- Multiplication names the unknown *total* when the *number of groups* and the *size of the groups* are known.

Note

- Multiplication as repeated equal groups is one meaning of multiplication. In later grades, other meanings that students will learn include scaling, combinations, and measures, all of which require a major shift in thinking from addition.

- With addition and subtraction, each number represents distinct and visible objects that can be counted. For example, 7 + 3 can be represented by combining 7 blocks and 3 blocks. However, with multiplication involving repeated equal groups, one number refers to the number of objects in a group, and the other number refers to the number of

groups or number of counts of a group. For example, 7 × 2 can be interpreted as 7 *groups of* 2 blocks or a *group of* 7 blocks, 2 times.
- Multiplication requires a "double count". One count keeps track of the number of equal groups. The other count keeps track of the total number of objects. Double counting is evident when people use fingers to keep track of the number of groups as they skip count towards a total.

B2.6 Multiplication and Division

represent division of up to 12 items as the equal sharing of a quantity, and solve related problems, using various tools and drawings

Teacher supports

Key concepts

- Division, like multiplication, can describe situations involving repeated groups of equal size.
- While multiplication names the unknown *total* when the *number of groups* and the *size of the groups* are known, division names *either* the unknown number of groups *or* the unknown size of the groups when the *total* is known.

Note

- The inverse relationship between multiplication and division means that any situation involving repeated equal groups can be represented with either multiplication or division. While this idea will be formalized in Grade 3 (see **SE B2.1**), it is helpful to notice this relationship in Grade 2 as well.
- While it may be important for students to develop an understanding of these operations separately at first, it is also important for students to observe both multiplication and division situations together, to recognize similarities and differences.
- There are two different types of division problems.
    - Equal-sharing division (also called "partitive division"):
        - *What is known*: the total and number of groups.
        - *What is unknown*: the size of the groups.
        - *The action*: a total is shared equally among a given number of groups. Equal-sharing division is also being used to develop an understanding of fractions in **SEs B1.6** and **B1.7**.

- Equal-grouping division (also called “measurement division” or “quotative division”):
  - *What is known*: the *total* and the *size* of groups.
  - *What is unknown*: the number of groups.
  - *The action*: from a total, equal groups of a given size are measured out. (Students often use repeated addition or subtraction to represent this action.)

- Equal-group situations can be represented with objects, number lines, or drawings, and often the model alone can be used to solve the problem. It is important to model the corresponding equation (addition or subtraction and division) for different situations and to make connections between the actions in a situation, the strategy used to solve it, and the operations themselves.
- Although the number sentences representing both division situations might be the same, the action suggested and the drawing used to represent each of them would be very different. It is important to provide students with experiences representing both types of division situations.

C. Algebra

Overall expectations

By the end of Grade 2, 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 2, students will:

C1.1 Patterns

identify and describe a variety of patterns involving geometric designs, 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 geometric designs.
- Patterns may involve attributes such as colour, shape, texture, thickness, orientation, or material.

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 2. Instead, focus on the geometric design – are shapes being repeated? Do shapes appear to grow? Do shapes appear to shrink?

C1.2 Patterns

create and translate patterns using various representations, including shapes and numbers

Teacher supports

Key concepts

- The same pattern structure can be represented in various ways.
- Patterns can be created by varying a single attribute, or more than one.
- Pattern structures can be generalized.

Note

- Comparing translated patterns highlights the equivalence of their underlying mathematical structure, even though the representations differ.

C1.3 Patterns

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

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, such as up, down, right, and left.
- 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 the 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, students need to generalize patterns, using pattern rules.
- Rules should 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 100

Teacher supports

Key concepts

- Patterns exist in increasing and decreasing numbers based on place value.

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 2, students will:

C2.1 Variables

identify when symbols are being used as variables, and describe how they are being used

Teacher supports

Key concepts

- Symbols can be used to represent quantities that change or quantities that are unknown.
- 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 find different addends for a sum no more than 100, 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 what needs to be added to or subtracted from addition and subtraction expressions to make them equivalent

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 (≠) is a symbol denoting that the two expressions are not equivalent.

Note

- When using a balance model, the representations of the addition or subtraction expressions are manipulated until there is an identical representation on both sides of the balance.
- When using a balance scale, the objects on the scale are manipulated until the scale is level.

C2.3 Equalities and Inequalities

identify and use equivalent relationships for whole numbers up to 100, in various contexts

Teacher supports

Key concepts

- When numbers are decomposed, the sum of the parts is 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 and associate properties of addition are founded on equivalency.

C3. Coding

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

Specific expectations

By the end of Grade 2, 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 and concurrent events

Teacher supports

Key concepts

- In coding, a sequential set of instructions is executed based on the order of instructions given (e.g., a pixelated image stops its motion and then changes colours).
- Concurrent events are when multiple things are occurring at the same time (e.g., a pixelated image is changing its colours while moving).
- Sometimes concurrent programs need to use time delays or wait blocks. For example, to ensure that two pixelated images do not collide on the screen, or, similarly that robots do not collide in real life, one may need to pause while the other passes.
- Some sequential events can be executed concurrently if they are independent of each other (e.g., two pixelated images are moving across the screen at the same time).

Note

- Coding can support the development of a deeper understanding of mathematical concepts.
- Coding can provide an opportunity for students to communicate their 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).

C3.2 Coding Skills

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

Teacher supports

Key concepts

- Code can be altered to develop students' understanding of mathematical concepts, and to ensure that the code is generating the expected outcome.
- Changing the sequence of instructions in code can sometimes produce the same outcome and can sometimes produce a different outcome.
- Predicting the outcome of code allows students to visualize the movement of an object in space or imagine the output of specific lines of code. This is a valuable skill when debugging and problem solving.
- When predicting the outcomes of programs involving time delays or wait blocks, it is important to confirm that the action is actually possible; for example, one agent pauses to allow another agent to pass when both are trying to occupy the same location at the same time.

Note

- It is important for students to understand when order matters.
- Some mathematical concepts are founded on the idea that the sequence of instructions does not matter; for example, the commutative and associative properties of addition. The order for subtraction, however, does affect the result.

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 2, 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 2, students will:

D1.1 Data Collection and Organization

sort sets of data about people or things according to two attributes, using tables and logic diagrams, including Venn and Carroll diagrams

Teacher supports

Key concepts

- Data can be sorted in more than one way. For example, the same set of data can be sorted in a Venn diagram, a Carroll diagram, and a two-way table.
- Different sorting tools can be used for different purposes.

- A two-circle Venn diagram can be used to sort data based on two characteristics (e.g., red and large) of two attributes (e.g., colour and size).
- A Carroll diagram can be used to sort data into complementary sets for two characteristics (e.g., red – not red, large – not large) of two attributes (e.g., colour and size).
- A two-way table can be used to sort data into all the possible combinations of the characteristics of two attributes.

Note

- A variable is any attribute, number, or quantity that can be measured or counted.

D1.2 Data Collection and Organization

collect data through observations, experiments, and interviews to answer questions of interest that focus on two pieces of information, and organize the data in two-way tally tables

Teacher supports

Key concepts

- The type and amount of data to be collected is based on the question of interest.
- Data can either be qualitative (e.g., colour, type of pet) or quantitative (e.g., number of pets, height).
- Data can be collected through observations, experiments, interviews, or written questionnaires over a period of time.
- A two-way tally table can be used to collect and organize data involving two attributes. The data is recorded in groups of 5 tallies to make it easier to count.

Note

- In the primary grades, students are collecting data from a small population (e.g., same number of objects in a bin, days in a month, students in the Grade 2 class).

D1.3 Data Visualization

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

Teacher supports

Key concepts

- The same data can be represented using a concrete graph, pictograph, line plot, or a bar graph.
- The order of the categories in graphs does not matter for qualitative data.
- The categories for concrete graphs, pictographs, line plots, and bar graphs can be represented horizontally or vertically.
- 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 table.
    - Labels provide additional information, such as the category represented by each bar in a bar graph, or each “X” in a line plot. On a pictograph, a key tells how many each picture represents.

Note

- Support students with making connections between the different graphs so that they can transition between concrete and abstract representations of the data.

D1.4 Data Analysis

identify the mode(s), if any, for various data sets presented in concrete graphs, pictographs, line plots, bar graphs, and tables, and explain what this measure indicates about the data

Teacher supports

Key concepts

- A mode of a variable is the category that has the greatest count (frequency).
- Multiple modes of a variable exist when two or more categories have equivalent frequencies that are greater than any others.
- A variable has no mode when there is no category that has a frequency greater than any others.

Note

- When data is presented in a two-way table, the mode must be identified for each variable.

D1.5 Data Analysis

analyse different sets of data presented in various ways, including in logic diagrams, line plots, and bar graphs, 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.
- Venn and Carroll diagrams are used to compare data with two different attributes. They help to ask and answer questions like, “What’s the same?” and “What’s different?”
- Line plots and bar graphs are used to show the differences between frequencies quickly and at a glance. They help to ask and answer questions like, “Which is greatest?” and “Which is least?”
- 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 2, students will:

D2.1 Probability

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

Teacher supports

Key concepts

- The likelihood of an event can be represented along a continuum from impossible to certain.
- Complementary events are events that cannot happen at the same time.
- If the likelihood of selecting a red marble out of a bag is certain, then its complement of not selecting a red marble out of a bag is impossible.
- Understanding likelihood can help with making predictions about future events.

D2.2 Probability

make and test predictions about the likelihood that the mode(s) of a data set from one population will be the same for data collected from a different population

Teacher supports

Key concepts

- Data can vary from one population to another.
- If two populations are similar, the modes for the two data sets will more than likely be the same.
- Data can be used to make predictions that are not based on personal feelings or opinions alone.

Note

- In order for students to do an accurate comparison in Grade 2, it is important for them to collect data from the same-sized population (e.g., the same number of days in a month, cubes in a container, or students in Grade 2).

E. Spatial Sense

Overall expectations

By the end of Grade 2, 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 2, students will:

E1.1 Geometric Reasoning

sort and identify two-dimensional shapes by comparing number of sides, side lengths, angles, and number of lines of symmetry

Teacher supports

Key concepts

- Two-dimensional shapes have geometric properties that allow them to be identified, compared, sorted, and classified.
- Geometric properties are attributes that are the same for an entire group of shapes. Some attributes are relevant for classifying shapes. Others are not. For example, colour and size are attributes but are *not* relevant for geometry since there are large rectangles, small rectangles, blue rectangles, and yellow rectangles. Having four sides is an attribute *and* a property because all rectangles, by definition, have four sides.
- Two-dimensional shapes can be sorted by comparing geometric attributes such as:
    - the number of sides;
    - the number of angles and whether the corners (vertices) are square;
    - the number of equal (congruent) side lengths and how those sides are arranged;
    - whether the sides are curved or straight;
    - whether there are any parallel sides (sides that run side by side in the same direction and remain the same distance apart);
    - the number of lines of symmetry.

- Each class of two-dimensional shapes has common properties, and these properties are unaffected by the size or orientation of the shape.
- A line of symmetry is an imaginary “mirror line” over which one half folds onto the other. Line symmetry is a geometric property of some shapes. For example, rectangles have two lines of symmetry and squares have four lines of symmetry. Some triangles have three lines of symmetry, some have one line of symmetry, and some have no lines of symmetry.

E1.2 Geometric Reasoning

compose and decompose two-dimensional shapes, and show that the area of a shape remains constant regardless of how its parts are rearranged

Teacher supports

Key concepts

- Two-dimensional shapes can be combined to create larger shapes (composing) or broken into smaller shapes (decomposing). All shapes can be decomposed into smaller shapes. The ability to compose and decompose shapes provides a foundation for developing area formulas in later grades.
- If a two-dimensional shape is broken into smaller parts (decomposed) and reassembled in a different way (composed), the area of the shape remains the same even though the shape itself has changed. This is known as the property of conservation.

E1.3 Geometric Reasoning

identify congruent lengths and angles in two-dimensional shapes by mentally and physically matching them, and determine if the shapes are congruent

Teacher supports

Key concepts

- Congruent two-dimensional shapes can fit exactly on top of each other. They have the same shape and the same size.

- Checking for congruence is closely related to measurement. Side lengths and angles can be *directly compared* by matching them, one against the other. They can also be measured.
- Non-congruent shapes can have specific elements that are congruent. For example, two shapes could have a congruent angle or a congruent side length (i.e., those elements match), but if the other side lengths are different, or the angles between the lengths are different, then the two shapes are not considered congruent.

Note

- Visualizing congruent shapes – mentally manipulating and matching shapes to predict congruence – is a skill that can be developed through hands-on experience with shapes.

E1.4 Location and Movement

create and interpret simple maps of familiar places

Teacher supports

Key concepts

- A three-dimensional space can be represented using a two-dimensional map by noting where objects are positioned relative to each other. A map provides a bird's-eye view of an area.
- Words such as *above*, *below*, *to the left*, *to the right*, *behind*, and *in front of* can orient the location of one object in relation to another.
- A grid adds a structure to a map. It helps to show where one object is in relation to another and can be a guide to determining distances and pathways. The location of objects on a map grid corresponds to an actual or virtual grid overlaid on the corresponding three-dimensional space.
- Sometimes location on a grid is described by the intersection of the grid lines – this provides a precise location. Sometimes location on a grid is described by the space or region between the grid lines – this describes a more general location. It is important to be clear about which approach is used.
- Labelling a grid, with either numbers or letters, helps to describe locations on the grid more accurately.

E1.5 Location and Movement

describe the relative positions of several objects and the movements needed to get from one object to another

Teacher supports

Key concepts

- A three-dimensional space can be represented on a two-dimensional map by noting where objects are positioned relative to each other. A map provides a bird's-eye view of an area.
- Words such as *above*, *below*, *to the left*, *to the right*, *behind*, and *in front of* can orient the location of one object in relation to another (direction). Numbers describe the distance one object is from another.
- A combination of words, numbers, and units are used to describe movement from one location to another (e.g., 5 steps to the left).
- The order of these steps is often important when describing the movement needed to get from one object to another.

E2. Measurement

compare, estimate, and determine measurements in various contexts

Specific expectations

By the end of Grade 2, students will:

E2.1 Length

choose and use non-standard units appropriately to measure lengths, and describe the inverse relationship between the size of a unit and the number of units needed

Teacher supports

Key concepts

- A length is the distance between two points, in any direction. Width, height, and depth are all measurements that compare length, or the distance between two points.

- Units quantify comparisons and are used to change from comparison questions (e.g., which is longer?) to measurement questions (e.g., how long, how much longer?).
- An appropriate unit is one that matches the attribute well (e.g., a unit of length to measure length, a unit of time to measure time) and is easy to repeat.
- To directly measure an object:
    - select a unit that matches the attribute being measured (e.g., a paper clip to measure length);
    - repeat (iterate) the unit or copies of the unit without gaps or overlaps;
    - determine how many units it takes to match the object completely;
    - choose smaller units (or partial units) for greater accuracy.
- Measurements of continuous quantities are always approximate. The smaller the unit chosen, the greater the potential accuracy of the measurement. If different-sized units are used to match an object more completely, each unit is counted and tracked separately.
- The size of the unit affects the count – there is an inverse relationship between the size of the unit and the number of units it takes to cover, match, or fill an attribute. The smaller the unit, the greater the count; the larger the unit, the smaller the count. Regardless of whether a small or large unit is used to measure the length of an object, the object's length is constant; only the count changes. This is known as the conservation property.

E2.2 Length

explain the relationship between centimetres and metres as units of length, and use benchmarks for these units to estimate lengths

Teacher supports

Key concepts

- Standard units make it possible to reliably communicate measurements. Centimetres and metres are standard metric units for measuring length. There are 100 centimetres in 1 metre.
- Measurements of continuous quantities, such as lengths, are always approximate. The smaller the unit selected, the greater the potential accuracy. Different-sized units can be used to match an object more completely, but the count of each unit must be tracked separately.

- To measure a length that is, for example, between 1 metre and 2 metres, a combination of metres and centimetres can be used, or centimetres only, or rounding the length to the nearest metre.

Note

- In Grade 2, students are not using decimals in their measurements.
- Having familiar reference points (benchmarks) for centimetres and metres makes it easier to estimate the length of objects.

E2.3 Length

measure and draw lengths in centimetres and metres, using a measuring tool, and recognize the impact of starting at points other than zero

Teacher supports

Key concepts

- Rulers, measuring tapes, tape measures – in fact, all measuring tools – replace the need to lay out and count actual physical units. The measuring tool repeats the unit so there are no gaps or overlaps and includes a scale to keep track of the unit count.
- A scale – such as the scale on a ruler – starts at the beginning of the first unit, which is labelled 0 because no units have been laid out. At the end of the first unit, the scale is labelled 1, because 1 complete unit has been laid out. The scale continues to count full units.
- When the edge of an object is matched with the 0 on the measuring tool, the scale accurately keeps track of the count. However, a length can be measured from any starting point, as long as the count is adjusted based on the starting point to accurately reflect the length of the object.
- The distance between two end points stays constant, no matter where on the scale the count begins. A measurement counts the number of units between the start of a length and the end of a length.

E2.4 Time

use units of time, including seconds, minutes, hours, and non-standard units, to describe the duration of various events

Teacher supports

Key concepts

- Measuring time involves questions such as: "What time is it?" and "How much time has passed?". The focus in Grade 2 is on the second question.
- The passage of time is measured by counting units of time that repeat in a regular and predictable manner: the beats of a metronome; the dripping of a faucet; the natural cycles of a day; the swing of a pendulum; the seconds, minutes, and hours of a clock.
- Similar to measuring physical length, a length of time can be measured using different units of different sizes. The smaller the unit of time used, the more precise the measurement. Similar to all continuous attributes, the measurement of time is always approximate.
- Around the world, standard units of time – seconds, minutes, hours – are used to communicate the length of time of an event. Measuring tools, such as stopwatches, keep track of the unit count.

F. Financial Literacy

Overall expectations

By the end of Grade 2, students will:

F1. Money and Finances

demonstrate an understanding of the value of Canadian currency

Specific expectations

By the end of Grade 2, students will:

F1.1 Money Concepts

identify different ways of representing the same amount of money up to Canadian 200¢ using various combinations of coins, and up to $200 using various combinations of $1 and $2 coins and $5, $10, $20, $50, and $100 bills