Teacher supports

Key concepts

- There are a variety of ways to represent the same amount of money.
- There are various strategies to determine the different ways to represent the same amount of money; for example, using an organized list, representing the amounts with drawings, or using money manipulatives.

Note

- Combining a variety of coins and bills to produce a set amount requires an understanding of the relationship between the denominations of coins and bills and their value.
- Skip-counting skills and the ability to compose and decompose numbers support learning about different ways to make money amounts.

Mathematics, Grade 3

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 3, 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 3, students will:

B1.1 Whole Numbers

read, represent, compose, and decompose whole numbers up to and including 1000, 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 4107,

the digit 4 represents 4 thousands, 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., 3187 = 3000 + 100 + 80 + 7 or 3 × 1000 + 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, 300, 200, and 6 combine to make 506.
- Numbers are decomposed when they are represented as a composition of two or more smaller numbers. For example, 512 can be represented as 250 and 250 and 10 and 2.
- Tools may be used when representing numbers. For example, 362 may be represented as the sum of 36 ten-dollar bills and 1 toonie or 3 base ten flats, 6 base ten rods, and 2 base ten units.
- 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, 587 could be decomposed as 58 tens and 7 ones or decomposed as 50 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.
- Closed, partial, and open number lines are important tools for representing numbers and showing the composition and decomposition of numbers. Numbers on a closed number line can be represented as a position on a number line or as a distance from zero. Partial number lines can be used to show the position of a number relative to other numbers. Open number lines can be used to show the composition of large numbers without drawing them to scale.
- 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 1000 concretely, they should also 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 1000, in various contexts

Teacher supports

Key concepts

Concepts

- Numbers are compared and ordered according to their “how muchness” or magnitude.
- Numbers with the same units can be compared directly (e.g., 645 days compared to 625 days). 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).
- Sometimes numbers without the same unit can be compared, such as 625 weeks and 75 days. Knowing that the unit "weeks" is greater than the unit "days", and knowing that 625 is greater than 75, one can infer that 625 weeks is a greater length of time than 75 days.
- Benchmark numbers can be used to compare quantities. For example, 132 is less than 500 and 620 is greater than 500, so 132 is less than 620.
- Numbers can be compared by their place value. For example, when comparing 825 and 845, the greatest place value in which the numbers differ is compared. For this example, 2 tens (from 825) and 4 tens (from 845) are compared. Since 4 tens is greater than 2 tens, 845 is greater than 825.
- Numbers can be ordered in ascending order – from least to greatest – or can be ordered in descending order – from greatest to least.

Note

- 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 of numbers and make comparisons.
- Once millimetres have been introduced (see **Spatial Sense SE, E2.2**), the millimetre markings on a metre stick can serve as a physical number line that spans from 0 to 1000.

Using the centimetre labels to determine the count of millimetres connects the Number strand to the Spatial Sense strand and strengthens the “times ten” mental math focus in **SE B2.2**.

B1.3 Whole Numbers

round whole numbers to the nearest ten or hundred, in various contexts

Teacher supports

Key concepts

- Rounding numbers is often done to estimate a quantity or measure, estimate the results of a computation, and make an estimated comparison.
- How close a rounded number is to the original number depends on the unit or place value that it is being rounded to. A number rounded to the nearest ten is closer to the original number than a number being rounded to the nearest hundred.
- Whether a number is rounded “up” or “down” depends on the context. For example, when paying by cash in a store, the amount owing is rounded to the nearest five cents.
- In the absence of a context, numbers are typically rounded based on the midpoint. This approach involves considering the amount that is halfway between two units and determining whether a number is closer to one unit than other:
    - Rounding 237 to the nearest 10 becomes 240, since 237 is closer to 240 than 230.
    - Rounding 237 to the nearest 100 becomes 200, since 237 is closer to 200 than 300.
- If a number is exactly on the midpoint, the “half round up”, which is the common method for rounding would round up to the nearest 10. So, 235 rounded to the nearest 10 becomes 240.

Note

- The degree to which a number is rounded is often determined by the precision that is required.

B1.4 Whole Numbers

count to 1000, including by 50s, 100s, and 200s, using a variety of tools and strategies

Teacher supports

Key concepts

- Counting usually has a purpose, such as determining how many are in a collection, determining how long before something will happen, or comparing quantities and amounts.
- A count can start from zero or any other starting number.
- The unit of skip counting 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.
- The 0 to 9 and decade counting sequences that appear in the first hundred repeat in every subsequent hundred.

Note

- Skip counting helps build basic facts and mental math strategies and establishes a strong foundation for multiplication and division.
- Counting up to and over each of the hundreds reinforces the 0 to 9 pattern in the place value system.

B1.5 Whole Numbers

use place value when describing and representing multi-digit numbers in a variety of ways, including with base ten materials

Teacher supports

Key concepts

- Any whole number can be described using the place value of its digits.
- The *place* (or position) of a digit determines its *value* (*place value*). The 5 in 511, for example, has a value of 5 hundreds (500) and not 5.
- The order of the digits makes a difference. The number 385 describes a different quantity than 853.
- The digits in a number represent groups of ones, tens, hundreds, and so on. A zero in a column indicates that there are no groups of that size in the number. It serves as a placeholder, holding the other digits in their correct “place”. For example, 57 means 5 tens and 7 ones, but 507 means 5 hundreds, 0 tens, and 7 ones.

- Expanded notation represents a number according to place value. For example, 987 means there are 9 groups of 100, 8 groups of 10, and 7 ones, which in expanded notation is 900 + 80 + 7 or 9 × 100 + 8 × 10 + 7 × 1.

Note

- The value of the digits in each of the positions follows a “times ten” multiplicative pattern. For example, 50 is ten times greater than 5, and 500 is ten times greater than 50.
- Base ten materials are important for demonstrating the quantities of numbers and for reinforcing that each digit represents a place value.
- Understanding place value is foundational for understanding the magnitude of numbers and is important for various calculation strategies and algorithms.
- There is a “hundreds-tens-ones” pattern that repeats within each period (e.g., units, thousands, millions). Although students in Grade 3 are working with numbers only to 1000, early exposure to this larger pattern and the names of the periods – into millions and beyond – satisfies a natural curiosity around “big numbers”.

Place Value Patterns

one billions	hundred millions	ten millions	one millions	hundred thousands	ten thousands	one thousands	hundreds	tens	ones

B1.6 Fractions

use drawings to represent, solve, and compare the results of fair-share problems that involve sharing up to 20 items among 2, 3, 4, 5, 6, 8, and 10 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.
  - Sometimes the share is a whole number (e.g., if 4 pieces of ribbon are shared equally among 2 people, each person gets 2 pieces of ribbon).
  - Sometimes the share is a fractional amount (e.g., if 4 pieces of ribbon are shared equally among 8 people, each person gets one half of a ribbon).

- Sometimes the share results in a whole plus a fractional amount (mixed number) (e.g., if 4 pieces of ribbon are shared equally among 3 people, each person gets 4 one thirds or 1 and one third pieces of the ribbon).

- Comparing two different sharing situations involves reviewing the relationship (ratio) between the amount to be shared and the number of sharers.
    - If the amounts to be shared are the same, then the greater the number of sharers, the less each sharer gets.
    - If the number of sharers is the same, then the greater the amount to be shared, the greater each sharer gets.
    - If the amounts to be shared are the same as the number of sharers, then the amount each sharer gets is the same for each situation.

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.
- Fractional amounts can be expressed as a count of unit fractions (e.g., 2 one thirds), as words (e.g., two thirds), as a combination of numbers and words (e.g., 2 thirds), and symbolically (e.g., $\frac{2}{3}$). As students come to understand fraction terms (halves, fourths, and so on) and use them independently, it is appropriate to introduce the corresponding symbolic fractional notation (see **SE B2.9**). Continuing to use all four ways of expressing fractions helps to reinforce the meaning behind the symbols.

B1.7 Fractions

represent and solve fair-share problems that focus on determining and using equivalent fractions, including problems that involve halves, fourths, and eighths; thirds and sixths; and fifths and tenths

Teacher supports

Key concepts

- When something is shared fairly or equally as five pieces, each piece is 1 one fifth of the original amount. Five one fifths make up a whole.
- When something is shared fairly or equally as ten pieces, each piece is 1 one tenth of the original amount. Ten one tenths make up a whole.
- Fractions are equivalent when they represent the same value or quantity.
- If the original amount is shared as five pieces or ten pieces, the fractions one fifth and 2 one tenths (two tenths) are equivalent. Similarly 2 one fifths (two fifths) and 4 one tenths (four tenths) are equivalent, 3 one fifths (three fifths) and 6 one tenths (six tenths) are equivalent, 4 one fifths (four fifths) and 8 one tenths (eight tenths) are equivalent, and 5 one tenths (five fifths), and 10 one tenths (ten tenths) are equivalent.
- Different fractions can describe the same amount. Five tenths, four eighths, three sixths, and two fourths all represent the same amount as one 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.
- Fair-share or equal-sharing scenarios provide a natural context for students to encounter and use equivalent fractions (see **SE B1.6**). Present these problems in the way that students will best connect to.
- Patterns that exist between equivalent fractions can be used to generate other equivalent fractions.
- When two fractions (or ratios) are equivalent, the relationships among the numerators and the denominators are constant. For example, in $\frac{1}{2}$ and $\frac{3}{6}$, the denominator in both fractions is twice the numerator; and the numerator of one fraction is three times that of the other, just as the denominator of one is three times that of the other.

B2. Operations

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

Specific expectations

By the end of Grade 3, students will:

B2.1 Properties and Relationships

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

Teacher supports

Key concepts

- Multiplication and division 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.
    - Division names *either* the number of groups *or* the size of the groups when only one is known along with the *total*.
- Multiplication and division are inverse operations. (See **SEs B2.2**, **B2.6**, and **B2.7**.)
- Any division question can be thought of as a multiplication question unless 0 is involved (e.g., 16 ÷ 2 = ? is the same as ? × 2 = 16), and vice versa. This inverse relationship can be used to perform and check calculations.

Note

- Multiplication and division problems can be solved in various ways, depending on the numbers that are given and the facts that are known.
- Since students are developing their multiplication and division facts for 2, 5, and 10 in Grade 3, it is important for them to solve problems concretely so that they can make connections to these facts and how they can be used to solve any multiplication problem.
- Students need to understand the distributive property of multiplication over addition, and the commutative and associative properties of multiplication. They should be able to use these properties authentically as they solve problems, but they do not need to name them.
- This expectation supports many other expectations in the Number strand and is applied throughout the grade. Whether working with numbers or operations, recognizing and applying properties and relationships builds a strong foundation for doing mathematics.

B2.2 Math Facts

recall and demonstrate multiplication facts of 2, 5, and 10, and related division facts

Teacher supports

Key concepts

- Multiplication and division are inverse operations, and the basic facts for division can be rephrased using multiplication (see **SE B2.1**). For example, 16 ÷ 2 can be rewritten as ? × 2 = 16, and thought of as “how many groups of 2 are in 16?” (i.e., grouping division).

Note

- Using repeated equal groups to model multiplication and division facts builds understanding of the facts as well as the operations (see **SE B2.6**).
- Having automatic recall of multiplication and division facts is important when carrying out mental or written calculations and frees up working memory when solving complex problems and tasks.
- Working with doubles, halving, and skip counting by 2, 5, and 10 provides a strong foundation and starting point for learning the multiplication facts of 2, 5, and 10.
- Multiplication and division involve a “double count”. One count keeps track of the number of equal groups. The other count keeps track of the running total. Double counting can be observed when students use fingers to keep track of the number of groups as they skip count towards a total.

B2.3 Mental Math

use mental math strategies, including estimation, to add and subtract whole numbers that add up to no more than 1000, 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 are can be used to complete the calculations.

- Number lines, circular number lines, and part-whole models can be used to show strategies for doing the calculations.
- Estimation by rounding (see **SE B1.3**) 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 to do mental calculations will vary depending on the numbers, facts, and properties that are used. For example:

  - For 187 + 2, simply count on.
  - For 726 + 38, decompose 38 as 34 and 4, add 4 to 726 to get 730, and then add on 34 to get 764.
  - For 839 + 9, add 10 onto 839 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 numbers.
- 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.
- 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

demonstrate an understanding of algorithms for adding and subtracting whole numbers by making connections to and describing the way other tools and strategies are used to add and subtract

Teacher supports

Key concepts

- The most common standard algorithms for addition and subtraction in North America use a very compact organizer to *decompose* and *recompose* numbers based on place value (see **SEs B1.1** and **B1.5**).

- The North American algorithms for addition and subtraction both start from the right and move to the left, digit by digit.
- The digits in the unit column are added or subtracted.
- When the sum of two digits exceeds 9 or the difference is below zero, a “regroup” or a “trade” (decomposing and recomposing) from the next column is made so that the operation can be carried out.
- The process is repeated for every column and small numbers are used to track and manage the regroupings.
- The example below shows how North American addition and subtraction algorithms are often written. They also include one way to represent the hidden place-value compositions and decompositions that occur as part of the algorithm.

How It Is Written

$$\begin{array}{r} {}^{1\,1} \\ 479 \\ +\,269 \\ \hline 748 \end{array}$$

What It Means

$$\begin{array}{rl} 479 & \\ +\,269 & \\ \hline 18 & (9+9) \\ 130 & (70+60) \\ 600 & (400+200) \\ \hline\hline 748 & \end{array}$$

How It Is Written | What It Means

$$\begin{array}{rcl} {}^{8\,9\,1} & & \\ \cancel{9}\cancel{0}0 & \rightarrow & 800 + 90 + 10 \\ -\,247 & \rightarrow & 200 + 40 + 7 \\ \hline 653 & \rightarrow & 600 + 50 + 3 \end{array}$$

Note

- An algorithm describes a process or set of steps to carry out a procedure. A standard algorithm is one that is known and used by a community. Different cultures have different standard algorithms that they use to perform calculations.
- Algorithms for addition or subtraction describe the steps needed to carry out the operation; organize the steps efficiently; and, if performed accurately, produce the correct answer.
- When working with standard algorithms, it is important to reinforce the actual quantities that are being used in the calculations by continuously referring to the *place* value of the digits rather than their *face* value (see **SE B1.5**). For example, when talking about adding 126 + 287, instead of using the digits (7 + 6; 8 + 2; 1 + 2), use the values (7 + 6; 20 + 80; 100 + 200) of the numbers that are being added together.

B2.5 Addition and Subtraction

represent and solve problems involving the addition and subtraction of whole numbers that add up to no more than 1000, using various tools and algorithms

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 help support students to identify the given quantities in a problem and the unknown quantity.
- Set models can be used to add 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 quantities by comparing them visually.
- 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. For additive situations – situations that involve addition or subtraction – there are three “problem structures” that describe a different usage of the operation:
    - *Change* situations, where one quantity is changed, by having an amount either *joined* to it or *separated* from it. Sometimes the result is unknown; sometimes the starting point is unknown; sometimes the change is unknown.
    - *Combine* situations, where two quantities are *combined*. Sometimes one part is unknown; sometimes the other part is unknown; sometimes the result is unknown.
    - *Compare* situations, where two quantities are being *compared*. Sometimes the larger amount is unknown; sometimes the smaller amount is unknown; sometimes the difference between the two amounts is unknown.

- Representing a situation with a drawing helps visualize the actions and quantities in a problem. Part-whole models are helpful for showing the relationship between what is known and unknown, and how addition and subtraction relate to the situation.
- In order to reinforce the meaning of addition and subtraction, it is important to model the corresponding equation that represents the situation, and to place the unknown quantity correctly (e.g., 125 + ? = 275, or ? + 150 = 275, or 125 + 150 = ?). 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 support students in developing a flexible understanding of the equal sign. These are all important ideas in the development of algebraic reasoning.
- Mental addition and subtraction strategies can be used to solve any computation. As numbers become greater, or there is a need to communicate strategies with others, the steps may need to be written down.
- Algorithms, including many for addition and subtraction, use place value to produce a procedure that will work with any numbers (see **SE B2.4**). When working with algorithms, it is important to reinforce the actual quantities in the equation by continuously referencing the *place* value of the digits rather than their *face* value (see **SEs B1.1** and **B1.5**). For example, if adding 26 + 32 from left to right, talk about adding 20 and 30, then 6 and 2).

B2.6 Multiplication and Division

represent multiplication of numbers up to 10 × 10 and division up to 100 ÷ 10, using a variety of tools and drawings, including arrays

Teacher supports

Key concepts

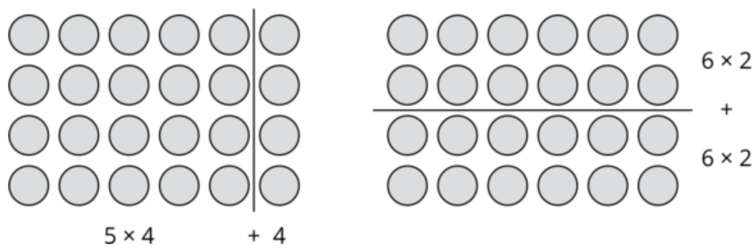
- One way to model multiplication and division is to use repeated groups of equal size.
- Multiplication and division are related. A division problem can be thought of as a multiplication problem with a missing factor (unless 0 is involved). So 24 ÷ 6 can be rewritten as 6 × ? = 24.
- The array can be a very useful model for multiplication and division because it structures repeated groups of equal size into rows and columns.
    - In a multiplication situation the number of rows and the number of columns for the array are both known.

- In a division situation the total number of objects is known, as well as either the number of rows or the number of columns. In order to create an array to represent a division situation, the objects are arranged into the rows or columns that are known until all the objects have been distributed evenly.

Note

- The array helps make visual connections to skip counting, the distributive property, and the inverse relationship between multiplication and division.

Using the Distributive Property with 6 × 4 and 4 × 6



- The beads on a rekenrek are arranged as an array and can be adjusted to show columns and rows up to 10 × 10. The rows of beads that are set up as 5 red and 5 white can support students with making connections to the distributive property and understanding numbers in terms of their relationship to 5 and 10.
- Several tools can be used to model multiplication and division, including ten frames, relational rods, and hops on a number line.

B2.7 Multiplication and Division

represent and solve problems involving multiplication and division, including problems that involve groups of one half, one fourth, and one third, using tools and drawings

Teacher supports

Key concepts

- Multiplication and division are both useful for describing 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.
  - Division names *either* the unknown *size of groups* (sharing division), *or* the unknown *number of groups* (grouping division) when the *total* is known.

- The inverse relationship between multiplication and division means that any situation involving repeated equal groups can be represented with either multiplication or division. See also **SE B2.1**.
- There are two 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 shared equally among a given number of groups. (See **SEs B1.6** and **B1.7** for connections between equal-sharing division and fractions.)
  - Equal-grouping division (sometimes 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.
- Repeated addition and repeated subtraction are often used as strategies to solve multiplication and division problems.
- Repeated addition is often used as a multiplication strategy, by adding equal groups to find the total.
- Repeated addition is also often used as a division strategy, by thinking of the division as multiplication with a missing factor (e.g., thinking of 15 ÷ 3 as 3 × ? = 15 and asking how many groups of 3 are in 15).
- Repeated subtraction is often used as a division strategy, by removing equal groups from the given total. Each round of sharing is "unitized" as a group and subtracted from the total. Each repeated round is represented as a subtracted group.

Note

- The use of drawings, tools (arrays, number lines), and objects can help to visualize the quantities and the actions involved in the situation, as well as what is known and unknown.
- Often the representation alone may be enough for a problem to be solved by counting. In these cases, it is important to also include the corresponding multiplication or division equation to make connections to the operations and build algebraic reasoning.

B2.8 Multiplication and Division

represent the connection between the numerator of a fraction and the repeated addition of the unit fraction with the same denominator using various tools and drawings, and standard fractional notation

Teacher supports

Key concepts

- The denominator is the bottom number of a fraction expressed in fractional notation and represents the relative size of each part (the unit fraction). If a whole is divided into five equal-sized parts, each part is one fifth ($\frac{1}{5}$). The greater the number of partitions of a whole, the smaller the unit fraction is relative to the whole.
- The numerator is the top number of a fraction expressed in fractional notation and represents the count of equal parts (unit fractions). If there are 2 one fifths, it is written as $\frac{2}{5}$. This count can be represented with repeated addition (e.g., $\frac{2}{5}$ is one fifth plus one fifth).

B2.9 Multiplication and Division

use the ratios of 1 to 2, 1 to 5, and 1 to 10 to scale up numbers and to solve problems

Teacher supports

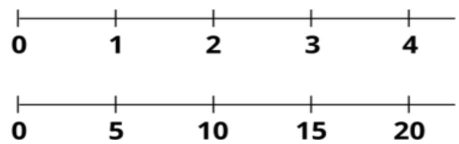
Key concepts

- Ratios deal with multiplicative relationships in a variety of contexts. For example:
  - If the ratio of vowels to consonants in a word is 1 to 2, then there are twice as many consonants in the word as there are vowels.
  - If a set has 1 red object and 5 blue objects, then the ratio of red to blue is 1 to 5.
  - If there are ten times as many birds as there are kittens in the pet store, then the ratio of birds to kittens is 10 to 1 or the ratio of kittens to birds is 1 to 10.

Note

- A ratio of "*a* to *b*" can be written symbolically as *a*:*b*, for example, 1 to 2 can be written as 1:2.

- To scale up means to multiply a starting number by a factor. An application of this is scaling a number line. To support this understanding, use a double number line with one number line showing the starting values and the second number line showing the scaling. For example, scaling the numbers 0 to 4 by 5 is illustrated on a double number line below.



C. Algebra

Overall expectations

By the end of Grade 3, 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 3, students will:

C1.1 Patterns

identify and describe repeating elements and operations in a variety of patterns, including patterns found in real-life contexts

Teacher supports

Key concepts

- Patterns may involve a repeating element and a repeating operation (e.g., in a design, different sizes of squares may be repeated).
- The shortest string of elements that repeat in a pattern is referred to as the “pattern core”.
- The quantifying measure or numerical value in a pattern may involve a repeat of addition, subtraction, multiplication, or division.

Note

- Students can engage in mathematics and patterns through the contexts, cultural histories, and stories of various cultures.
- Have students focus on how attributes are staying the same and how they are changing.
- A repeat operation involving addition and subtraction of zero will result in a pattern whose elements are not altered.
- A repeat operation involving multiplication and division by one will result in a pattern whose elements are not altered.

C1.2 Patterns

create and translate patterns that have repeating elements, movements, or operations using various representations, including shapes, numbers, and tables of values

Teacher supports

Key concepts

- The same pattern structure can be represented in various ways.
- Patterns with a repeating element can be based on attributes (e.g., colour, size, orientation).
- Patterns with a repeating operation can be based on repeating operations of addition, subtraction, multiplication, and/or division.
- Pattern structures can be generalized.
- When translating a pattern from a concrete representation to a table of values, each iteration of the pattern can be referred to as the term number, and the number of elements in each iteration can be referred to as the term value. In a table of values, the term number is shown in the left-hand column and the term value is shown in the right-hand column.

Note

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

C1.3 Patterns

determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in patterns that have repeating elements, movements, or operations

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 – up, down, right, left, diagonally.
- 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 1000

Teacher supports

Key concepts

- Patterns can be used to understand relationships among numbers.
- There are many patterns within the whole number system.

Note

- Many number strings are based on patterns and the use of patterns to develop a mathematical concept.

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 3, students will:

C2.1 Variables

describe how variables are used, and use them in various contexts as appropriate

Teacher supports

Key concepts

- Variables are used in formulas (e.g., the perimeter of a square can be determined by four times its side length (s), which can be expressed as $4s$).
- Variables are used in coding so that the code can be run more than once with different numbers.
- Variables are defined when doing a mathematical modelling task.

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 200, they are implicitly working with variables. These numbers are like 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 sets of addition, subtraction, multiplication, and division expressions are equivalent or not

Teacher supports

Key concepts

- Numerical expressions are equivalent when they produce the same result, and an equal sign is the symbol denoting two equivalent expressions.
- 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.
- Various strategies can be used to determine whether expressions are equivalent. Visual representations of the expressions can be manipulated until they look the same or close to the same.

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 1000, 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 properties of addition and multiplication 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 3, 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, concurrent, and repeating events

Teacher supports

Key concepts

- Loops make code more readable and reduce the number of instructions that need to be written. Loops can also help to emphasize the repetitive properties of some mathematical tasks and concepts.
- Using loops helps students organize their code and provides a foundation for considering efficiencies in program solutions.

Note

- Coding can support students in developing a deeper understanding of mathematical concepts.
- Loops provide an opportunity to experience the power of code and the process of automating algorithmic components.
- By manipulating conditions within a loop and the number of times that the loop will be repeated, students can determine the relationship between variables in lines of code.
- 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, concurrent, and repeating 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.
- Altering code to use loops can simplify instructions while generating the same outcome.
- The placement of a loop in the code can affect the outcome.
- Changing the sequence of instructions in code can sometimes produce the same outcome and can sometimes produce a different outcome.

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.
- 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 code and problem solving.

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 3, 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 3, students will:

D1.1 Data Collection and Organization

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

Teacher supports

Key concepts

- Data can be sorted in more than one way.
- Two-way tables are used to sort data into all of the possible combinations for the characteristics of two attributes.
- A three-circle Venn diagram can be used to sort data based on three characteristics (e.g., red, large, stripes) for three attributes (e.g., colour, size, markings).
- A Carroll diagram can be used to sort data into complementary sets for two characteristics (e.g., red – not red, stripes – no stripes) for two attributes (e.g., colour, markings).
- A tree diagram can be used to sort data into all the possible combinations of characteristics for two or more attributes (e.g., red stripes, red dots, blue stripes, blue dots, green stripes, green dots).

Note

- A variable is any attribute, number, or quantity that can be measured or counted.
- The number of possible combinations of categories can be determined by multiplying together the number of possibilities for each attribute (variable) under consideration. For example, there are 24 possible combinations for four shapes – circle, rectangle, triangle, hexagon combined with three colours – red, blue, green and combined with two sizes – large, not large (i.e., 4 × 3 × 2 = 24).

D1.2 Data Collection and Organization

collect data through observations, experiments, and interviews to answer questions of interest that focus on qualitative and quantitative data, and organize the data using frequency 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.
- Frequency tables are an extension of tally tables, in which the tallies are counted and represented as numerical values for each category.

Note

- In the primary grades, students are collecting data from a small population (e.g., objects in a container, the days in a month, students in Grade 3).
- When students are dealing with a lot of categories for data involving two attributes, one strategy is to reorganize the categories into their complements and use a Carroll diagram to organize the data.

D1.3 Data Visualization

display sets of data, using many-to-one correspondence, in pictographs and bar graphs with proper sources, titles, and labels, and appropriate scales

Teacher supports

Key concepts

- The order of the categories in graphs does not matter for qualitative data (i.e., the categories can be arranged in any order).
- The categories for pictographs and bar graphs can be drawn either horizontally or vertically.
- Graphing data using many-to-one correspondence provides a way to show large amounts of data within a reasonable view and is indicated by the scale of the frequency on the bar graph and the key for a pictograph.
- The source, titles, 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 labels on the axes of a graph that describe what is being measured (the variable).

Note

- Have students use scales of 2, 5, and 10 to apply their understanding of multiplication facts for 2, 5 and 10.

D1.4 Data Analysis

determine the mean and identify the mode(s), if any, for various data sets involving whole numbers, and explain what each of these measures indicates about the data

Teacher supports

Key concepts

- Modes can be identified for qualitative and quantitative data. A variable can have one, none, or multiple modes.
- The mean can only be determined for quantitative data. The mean of a variable can be determined by dividing the sum of the data values by the total number of values in the data set.
- Depending on the data set, the mean and the mode may be the same value.

Note

- The mean and the mode are two of the three measures of central tendency. The median is the third measure and is introduced in Grade 4.
- The mean is often referred to as the average. Support students with conceptually understanding the mean by decomposing and recomposing the values in the data set so that all values are the same.

D1.5 Data Analysis

analyse different sets of data presented in various ways, including in frequency tables and in graphs with different scales, 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.
- Frequency tables show numerically how often an item or value occurs in a set of data. They are quicker and easier to read than tallies.

- Graphs of quantitative data show the distribution and the shape of the data. For example, the data on a vertical bar graph may be skewed to the left, skewed to the right, centered, or equally distributed among all of the categories.
- It is important to pay attention to the scale on pictographs and other graphs. If the scale on a pictograph is that one picture represents 2 students, then the frequency of a category is double what is shown.
- Data that is presented in tables and graphs can be used to ask and answer questions, draw conclusions, and make convincing arguments and informed decisions.
- 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 3, students will:

D2.1 Probability

use mathematical language, including the terms “impossible”, “unlikely”, “equally likely”, “likely”, 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 occurring can be represented along a continuum from impossible to certain with benchmarks in between of unlikely, equally likely, and likely.
- "Equally likely" is sometimes thought of as an equal chance of events happening, such as rolling a 4 on a die or rolling a 6.
- Understanding likelihood can help with making predictions about future events.

Note

- Students' ability to make predictions depends on an informal understanding of concepts related to possible outcomes, randomness, and independence of events. (These terms are for teacher reference only; students are not expected to use or define these terms.)
    - Possible outcomes: To make a prediction in a situation of chance, it is necessary to know all possible outcomes. For example, when drawing a cube from a bag containing red, blue, and yellow cubes, a possible outcome is a yellow cube, whereas an impossible outcome is a green cube.
    - Randomness: A random event is not influenced by any factors other than chance. For example, when a regular die is rolled, the result showing any number from 1 to 6 is entirely by chance and each roll has an equal chance of happening.
    - The independence of an event is connected to whether or not the outcome of that event is influenced by another event. For example, if you throw a dice two times, the outcome of the first toss does not impact the second toss.

D2.2 Probability

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

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 and the means will be relatively close.
- Data can be used to make predictions that are not based on personal feelings or opinions alone.

Note

- In the primary grades, students are collecting data from a small population. A population is the total number of individuals or items that fit a particular description (e.g., the days in a month, cubes in a container, students in Grade 3).
- In order to do an accurate comparison, it is important to survey the same number of individuals or items in the different populations.

E. Spatial Sense

Overall expectations

By the end of Grade 3, 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 3, students will:

E1.1 Geometric Reasoning

sort, construct, and identify cubes, prisms, pyramids, cylinders, and cones by comparing their faces, edges, vertices, and angles

Teacher supports

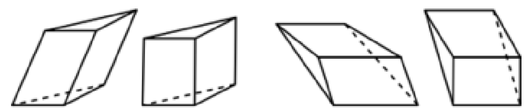
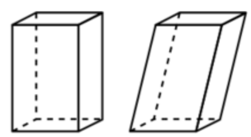
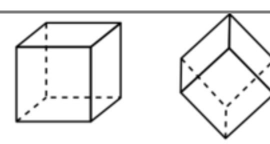
Key concepts

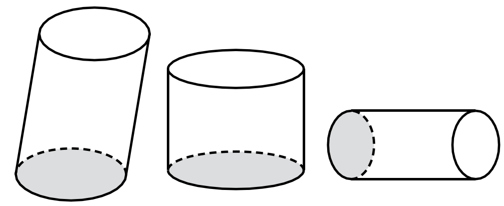
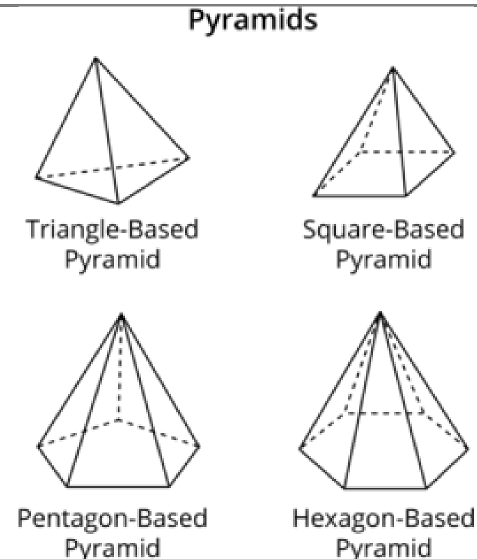
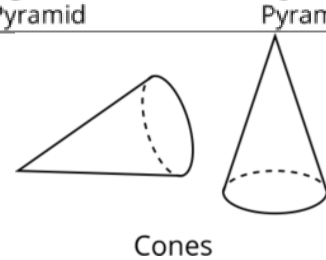
- Three-dimensional objects have attributes that allow them to be identified, compared, sorted, and classified.
- Geometric properties are attributes that are the same for an entire group of three-dimensional objects. Some attributes are relevant for classifying objects by geometry. Others are not. For example, colour and size are attributes but are *not* relevant for geometry since there are large cubes, small cubes, blue cubes, and yellow cubes. Having six congruent faces, where each side is a square, is an attribute *and* a geometric property because all cubes, by definition, have this property.

- When sorting and building objects, some of the attributes that are useful to name and notice are the number and shape of the faces, the number of edges, and the number of vertices and angles.
- When three-dimensional objects are sorted by geometric properties or categories, classes emerge. Each class of three-dimensional object has common geometric properties, and these properties are unaffected by the size or orientation of an object.

Note

- Constructing three-dimensional objects highlights the geometric properties of an object. Properties can be used as a “rule” for constructing a certain class of objects.
- The following table lists properties of some common three-dimensional objects.

Prisms	• Prisms have two congruent, polygon faces. These faces form the base of the prism. (Note that and the base may or may not be the “bottom” of the prism). • The two bases are connected by rectangles or parallelograms of the same height (e.g., the bases are parallel). • A prism is named by the shape of its base. For example, triangle-based prisms have two bases that are triangles, which are connected by rectangles or parallelograms.	 Triangle-Based Prisms  Rectangle-Based Prisms
Cubes	• Cubes have six congruent faces and each face is a square. • Because cubes have all the properties of a prism, they can also be called square-based prisms.	 Cubes or Square-Based Prisms

Cylinders	• Cylinders have two congruent bases; straight lines of equal length can be drawn that join one base to the other. • Cylinders are named by the shape of their base. For example, a tin can is a circular cylinder.	
Pyramids	• Pyramids have a single polygon for a base. • Triangles join each side of the base and meet at a vertex called the apex. • A pyramid is named by the shape of its base. For example, a square-based pyramid has a square for its base and four triangular faces.	
Cones	• Cones have one base; straight lines can be drawn from any point on the base's edge to its top point, called its apex. • Cones are named by the shape of their base. For example, an ice cream cone is a circular cone.	

E1.2 Geometric Reasoning

compose and decompose various structures, and identify the two-dimensional shapes and three-dimensional objects that these structures contain

Teacher supports

Key concepts

- Structures are composed of three-dimensional objects with faces that are two-dimensional shapes. Recognizing and describing the shapes and objects in three-dimensional structures provides insight into how structures are built.

- Objects and structures can be decomposed physically and visually (e.g., using the “mind’s eye”). Visualization is an important skill to develop.
- Triangles are useful for strengthening and stabilizing a structure; rectangular prisms are commonly used because of their ability to be stacked. This expectation is closely related to the strand Understanding Structures and Mechanisms, Grade 3 expectations 3.1–3.10, in *The Ontario Curriculum, Grades 1-8: Science and Technology, 2007*.

E1.3 Geometric Reasoning

identify congruent lengths, angles, and faces of three-dimensional objects by mentally and physically matching them, and determine if the objects are congruent

Teacher supports

Key concepts

- Congruence is a relationship between three-dimensional objects that have the same shape and the same size. Congruent three-dimensional shapes match every face exactly, in the exact same position.
- 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.
- Two objects that are not congruent can still have specific elements that are congruent. For example, two objects might have a face that is congruent (i.e., the face is the same size and shape), but if the other faces are different in any way (e.g., the faces have different angles or side lengths), then the two objects are not congruent. Likewise, even if all faces are congruent but they are in a different arrangement, the two objects would not be congruent because they would not be the exact same shape.

Note

- The skill of visualizing congruent objects – mentally manipulating and matching objects to predict congruence – can be developed through hands-on experience.

E1.4 Location and Movement

give and follow multistep instructions involving movement from one location to another, including distances and half- and quarter-turns

Teacher supports

Key concepts

- Instructions to move from one location to another location requires information about direction and distance from a given location.

  - Numbers and units describe distance (e.g., 5 steps; 3 kilometres).
  - Absolute direction can be conveyed using cardinal language (i.e., N, S, E, W), which were introduced in Grade 2 to locate selected communities, countries, and/or continents on a map (See *The Ontario Curriculum: Social Studies, Grades 1 to 6; History and Geography, Grades 7 and 8, 2018*, Grade 2, B3.3).
  - Relative direction can be conveyed using qualitative language (*right*, *left*, *forward*, *backward*, *up*, *down*).
  - Relative direction can be quantified and made more precise by describing the amount of turn.

- The amount of a turn involves the measure of angles, a skill that is more formally developed in Grades 4 and 5. In Grade 3, the language of half- and quarter-turn parallels the minute hand of an analog clock. A turn may be clockwise (moving in the same direction as the hands of a clock) or counterclockwise (the opposite direction from the hands of a clock).

  - A full turn is a full circle that results in an object facing in the same direction (e.g., start at 12 o'clock, end at 12 o'clock). A full turn clockwise or counterclockwise produces the same result.
  - A half-turn results in an object facing the opposite direction, (e.g., start at 12 o'clock, end at 6 o'clock). A half-turn clockwise or counterclockwise produces the same result.

A quarter-turn results in an object facing either 9 o'clock or 3 o'clock, (i.e., start at 12 o'clock, and go a quarter-turn right, and end at 3 o'clock, or go a quarter-turn left, and end at 9 o'clock).

E2. Measurement

compare, estimate, and determine measurements in various contexts

Specific expectations

By the end of Grade 3, students will:

E2.1 Length, Mass, and Capacity

use appropriate units of length to estimate, measure, and compare the perimeters of polygons and curved shapes, and construct polygons with a given perimeter

Teacher supports

Key concepts

- Perimeter is the total length or distance around an object or region. A perimeter measurement is a length measurement.
- If a perimeter is made up of straight lines, the parts are measured with a ruler and the measurements are combined. This is an application of the additivity property.
- Curved perimeters are difficult to measure accurately with a ruler. A “go-between”, like a string, is used to match the perimeter of the object and then measured. The measurement of the go-between is used as the measurement of the perimeter. This is an application of the transitivity property.
- Different shapes can have the same perimeter. A shape with a perimeter of 20 cm could be a 5 cm by 5 cm square, a skinny rectangle that is 2 cm by 8 cm, or a completely curved shape. To construct a shape with a given perimeter, the amount of length must always be tracked so that the remaining length can be distributed appropriately around the rest of the shape.
- Measurements of continuous quantities, like length, are always approximate. The smaller the unit, the greater the potential accuracy. If different-sized units are used to measure an object, each unit is counted and tracked separately.
- Because measurements are approximate, a combination of units might be used for greater accuracy (e.g., a combination of centimetres and millimetres for a length between 5 cm and 6 cm).
- The appropriate unit of length depends on the reason for measuring an object. Larger units are used for approximate measurements; smaller units are used for precise measurements and detailed work. While non-standard units are appropriate for quick, personal measurements, standard units are used when communicating measurements.

Note

- In Grade 3, students should not use decimals in their measurements.

E2.2 Length, Mass, and Capacity

explain the relationships between millimetres, centimetres, metres, and kilometres as metric units of length, and use benchmarks for these units to estimate lengths

Teacher supports

Key concepts

- Millimetres, centimetres, metres, and kilometres are standard metric units of length. The metre is the metric standard or base unit of length.
  - 1 metre is equal to 100 centimetres or 1000 millimetres.
  - 1000 metres is 1 kilometre long.
- For convenience, there are symbols for metric units: millimetre (mm), centimetre (cm), metre (m), kilometre (km).
- Standard and non-standard units are equally accurate (provided that the measurement itself is carried out well). However, *standard* units allow people to communicate distances and lengths with others in ways that are consistently understood. Metric units are the standard for all but three countries in the world and are the focus of this expectation.
- The metric system is universally used by scientists because it uses standard prefixes which helps understanding of measurements and conversions.

Note

- Canada officially adopted the metric system in 1970, through the Weights and Measures Act. This act was amended in 1985 to allow Canadians to use a combination of metric and imperial units (called “Canadian” units in the *Weights and Measures Act)*. In addition to metric units, other common standard units of length are inches, feet, yards, and miles. The process for measuring length with imperial units is the same as for using metric and non-standard units. Only the length of the unit and the measuring tools differ.

E2.3 Length, Mass, and Capacity

use non-standard units appropriately to estimate, measure, and compare capacity, and explain the effect that overfilling or underfilling, and gaps between units, have on accuracy

Teacher supports

Key concepts

- Capacity is the amount a container can hold. It can be directly compared by pouring the contents of one container into another.
- Similar to measuring length, capacity can be quantified and measured by determining how many equal-sized units something holds. Using units supports moving from comparison questions (Which holds more?) to measurement questions (How much? How much more?).
- To directly measure the capacity of an object:
    - choose a unit of capacity (e.g., the capacity of a container lid or a paper cup);
    - repeat (iterate) the unit without overfilling or underfilling it (e.g., filling a unit with marbles creates more gaps than using rice, sand, or water);
    - count how many units it takes to fill the container completely (i.e., without overfilling or underfilling the container).
- If different-sized units are used to fill an object more completely, each unit is counted and tracked separately.

Note

- In Grade 3, students are not using decimals in their measurements.

E2.4 Length, Mass, and Capacity

compare, estimate, and measure the mass of various objects, using a pan balance and non-standard units

Teacher supports

Key concepts

- Mass is the amount of matter in an object. Objects with more mass have more weight.

- Although the weight of an object may vary in different locations, its mass is constant. For example, the weight of an object on Jupiter is more than it is on Earth because weight is affected by gravity, but the mass of the object is the same in both places.
- Mass is quantified and measured by using units of mass and finding out how many units it takes to match the mass of the object. Any collection of uniform objects with the same amount of mass can serve as a unit of mass. Units enable a move from comparison questions (Which is heavier?) to measurement questions (How much heavier?).
- Two-pan balance scales or spring scales are used to indirectly compare and measure the mass of an object.
    - Before measuring, ensure that the two pans on the balance are “balanced” or the spring scale is set to start at zero. This is equivalent to eliminating gaps or overlaps when measuring other attributes.
    - For a balance scale, place the object on one pan and add units of mass to the other pan until the two pans balance.
    - For spring scales, place the object on the spring scale and record the distance the spring scale moves; remove the object and replace it with just enough units of mass to pull the spring down the same distance.
    - Count how many units it takes to match the object.
- If different-sized units are used to match an object’s mass more exactly, each unit is counted and tracked separately. For example, if 5 small washers equal 1 large washer, then 2 large washers and 3 small washers could be written as $2\frac{3}{5}$ large washers.

E2.5 Length, Mass, and Capacity

use various units of different sizes to measure the same attribute of a given item, and demonstrate that even though using different-sized units produces a different count, the size of the attribute remains the same

Teacher supports

Key concepts

- Measurement is more than a count; it is a spatial comparison. Units enable a spatial comparison to be quantified.
- How much length, mass, area, or capacity an object has remains constant unless the object itself has been changed (conservation principle). An amount is not changed by

measuring with different units; only the count of units changes. Using smaller units produces a greater count than using larger units (inverse relationship).

E2.6 Time

use analog and digital clocks and timers to tell time in hours, minutes, and seconds

Teacher supports

Key concepts

- Clocks can answer two questions: “What time is it?” and “How much time has passed?”. The focus in Grade 3 is on the first question.
- A colon (:) is used to separate units of time. Generally, time is read in hours and minutes, so 12:36 means 36 minutes after 12:00. To describe time more precisely, another colon is used to show seconds, so 12:36:15 means it is 15 seconds after 12:36.
- Analog clocks use fractions of a circle to provide benchmark times: quarter past the hour; half past the hour; and quarter to the hour. Benchmark times are not evident in digital clocks.
- Analog clocks have a face with three different scales. Navigating these scales can make reading an analog clock challenging.
    - The shorter hour hand (0 to 12, numbered scale) measures broad approximate time.
    - The longer minute hand (0 to 60, unnumbered markings) measures time more precisely.
    - The optional second hand (same 0 to 60 scale as that used by the minute hand) is used for precise time.
- The 24-hour clock is widely used in transportation schedules and in the military. For many parts of the world, it is the standard way of describing time.

Note

- Digital clocks are easier to read but may be more challenging to understand. To know that 9:58 is almost 10:00 requires an understanding that there are 60 minutes in an hour. This is unlike the place-value system, which moves in groups of 10 and 100. Using both digital and analog clocks helps make the 0 to 60 scale visible.

E2.7 Area

compare the areas of two-dimensional shapes by matching, covering, or decomposing and recomposing the shapes, and demonstrate that different shapes can have the same area

Teacher supports

Key concepts

- Area is the amount of surface or space inside a two-dimensional region. An area can be directly compared to another area by covering and matching the areas to determine which is larger.
- The same area can take the form of an infinite number of shapes.
- To better compare two areas, an area can be decomposed and "re-shaped" to make covering and matching easier. If the amount of an area doesn't change, the comparison is valid.

E2.8 Area

use appropriate non-standard units to measure area, and explain the effect that gaps and overlaps have on accuracy

Teacher supports

Key concepts

- Units quantify comparisons and are used to change comparison questions (e.g., Which is longer?) into measurement questions (e.g., How long and how much longer?). A unit of area is used to measure area.
- A unit of area is an amount of area. It is not a shape. Two different shapes, if they have the same area, can represent the same unit.
- Area is measured by counting how many units of area it takes to cover (tile) a surface without gaps or overlaps.
- Gaps between units produce an underestimate, and overlaps produce an overestimate. Both affect the accuracy of the count.
- Units of area can be decomposed, rearranged, and redistributed to better cover an area and minimize gaps or overlaps. If the amount of area is preserved, the unit is constant, regardless of its form.
- Choosing an appropriate object or shape to represent a unit of area is an important decision when measuring area. The object must:

- tile a surface without gaps or overlaps;
- retain a constant area;
- be able to be decomposed and rearranged as necessary.

E2.9 Area

use square centimetres (cm^2) and square metres (m^2) to estimate, measure, and compare the areas of various two-dimensional shapes, including those with curved sides

Teacher supports

Key concepts

- Squares tile a grid without gaps or overlaps and are the conventional shape used to describe units of area. A square with a side length of 1 unit (i.e., a unit square) has 1 square unit of area. Any standard unit of length (i.e., metric or imperial) can produce a standard unit of area.
- Square centimetres and square metres are standard metric units of area.
  - A square with dimensions 1 cm × 1 cm has an area of one square centimetre (1 cm^2).
  - A square with dimensions 1 m × 1 m has an area of 1 square metre (1 m^2).
  - Square centimetres and square metres are amounts of area. Although they both “start out” as squares, they can come in any shape.
- Area is measured by counting the number of full or partial units needed to cover a surface. For example, a surface that is completely covered by eighteen 1-unit squares has an area of 18 square units.

Note

- Since the same unit of area can come in any shape, objects used to represent these units may need to be decomposed, rearranged, and redistributed to better cover an area and minimize gaps and overlaps.
- Shapes chosen to represent square centimetres and square metres must retain a constant area, even if they are rearranged into a different shape or form. Tracking the count of partial units and combining partial units into whole units ensures that the measurement is as accurate as possible.
- If students are using a three-dimensional object to determine the area of another shape, they should pay attention to the area of the face that they are using to measure with.

F. Financial Literacy

Overall expectations

By the end of Grade 3, students will:

F1. Money and Finances

demonstrate an understanding of the value and use of Canadian currency

Specific expectations

By the end of Grade 3, students will:

F1.1 Money Concepts

estimate and calculate the change required for various simple cash transactions involving whole-dollar amounts and amounts of less than one dollar

Teacher supports

Key concepts

- Addition and subtraction skills can be applied to estimate and calculate change during simple cash transactions.

Note

- Real-life contexts build understanding of simple cash transactions while developing proficiency with addition, subtraction, mental math strategies, and math facts.
- Tasks involving only whole-dollar amounts support an understanding of place value. (The concept of place value up to hundredths is not addressed until Grade 5.)