Government of Saskatchewan Outcomes and Indicators for Elementary School Math

Kindergarten

Outcome: NK.1

Say the whole number sequence by 1s starting anywhere from 0 to 10 and from 10 to 0. [C, CN, V]

a. State the whole number that comes after a given number, zero to nine.
b. State the whole number that comes before a given number, one to ten.
c. Recite the whole number names from a given number to a stated number (forward - zero to ten, backward - ten to zero) using visual aids.

Outcome: NK.2

Recognize, at a glance, and name familiar arrangements of 1 to 5 objects, dots, or pictures. [C, CN, ME, V]

a. Look briefly at a given familiar arrangement of 1 to 5 objects or dots, and identify the whole number that represents the number of objects or dots without counting.
b. Identify the whole number that represents an arrangement of objects, dots, or pictures on a five frame.

Outcome: NK.3

Relate a numeral, 0 to 10, to its respective quantity. [C, R, V]

a. Construct or draw a set of objects corresponding to a given numeral.
b. Identify the number of objects in a set.
c. Hold up the appropriate number of fingers for a given numeral.
d. Match numerals with pictorial representations.

Outcome: NK.4

Represent the partitioning of whole numbers (1 to 10) concretely and pictorially. [C, CN, ME, R, V]

a. Show a whole number in two parts, using fingers, counters, or other objects and name the number of objects in each part.
b. Show a whole number in two parts, using pictures, and name the number of objects in each part.

Outcome: NK.5

Compare quantities, 0 to 10, using one-to-one correspondence. [C, CN, V]

a. Construct a set to show more than, fewer than, or as many objects as in a given set of objects.
b. Compare two sets through direct comparison, and describe the relationship between the sets using words such as: more, fewer, as many as, or the same number.

Outcome: PK.1

Demonstrate an understanding of repeating patterns (two or three elements) by:

- **identifying**
- **reproducing**
- **extending**
- **creating**

patterns using manipulatives, sounds, and actions. [C, CN, PS, V]

a. Distinguish between repeating patterns and non-repeating sequences by identifying the part that repeats.
b. Copy a repeating pattern (e.g., action, sound, colour, size, shape, or orientation) and describe the pattern.
c. Extend repeating patterns by two more repetitions.
d. Create a repeating pattern, using manipulatives, musical instruments, or actions and describe the pattern.
e. Identify and describe a repeating pattern in the classroom, the school, and outdoors (e.g., in a familiar song, in a nursery rhyme, in a game, on the street, on the playground).

Outcome: SSK.1

Use direct comparison to compare two objects based on a single attribute, such as:

- **length including height**
- **mass**
- **volume**
- **capacity.**

C, CN, PS, R, V]

a. Compare the length or height of two objects and explain how they compare using the words shorter, longer, taller, or almost the same.
b. Compare the mass of two objects and explain how they compare using the words lighter, heavier, or almost the same.
c. Compare the volume of two objects or capacity of two containers and explain how they compare using the words less, more, bigger, smaller, or almost the same.

Outcome: SSK.2

Sort 3-D objects using a single attribute. [C, CN, PS, R, V]

- Sort a set of familiar 3-D objects using a single attribute, such as size or shape, and explain the sorting rule.
  Determine the difference between two pre-sorted sets by identifying the sorting rule used to sort each of them.

Outcome: SSK.3

Build and describe 3-D objects. [C, PS, V]

- Create a representation of a 3-D object using materials such as modelling clay and building blocks, and compare the representation to the original 3-D object.
- Describe a 3-D object using words such as big, little, round, like a box, and like a can.

Government of Saskatchewan Outcomes and Indicators for Elementary School Math

Grade 1

Outcome: N1.1

Say the number sequence, 0 to 100, by:

- **1s forward and backward between any two given numbers**
- **2s to 20, forward starting at 0**
- **5s and 10s to 100, forward starting at 0.**

[C, CN, V, ME]

a. Recite forward by 1s the number sequence between two whole numbers (0 to 100).
b. Recite backward by 1s the number sequence between two whole numbers.
c. Record a numeral (0 to 100) symbolically when it is presented orally.
d. Read a numeral (0 to 100) when it is presented symbolically.
e. Skip count by 2s to 20 starting at 0.
f. Skip count by 5s to 100 starting at 0.
g. Skip count forward by 10s to 100 starting at 0.
h. Identify and correct errors and omissions in a number sequence.

Outcome: N1.2

Recognize, at a glance, and name familiar arrangements of 1 to 10 objects, dots, and pictures. [C, CN, ME, V]

a. Look briefly at a familiar arrangement of objects or dots and identify the number represented without counting.
b. Look briefly at a familiar arrangement and identify how many objects there are without counting.
c. Identify the number represented by an arrangement of objects or dots on a ten frame.

Outcome: N1.3

Demonstrate an understanding of counting by:

- **indicating that the last number said identifies "how many"**
- **showing that any set has only one count using the counting on strategy**
- **using parts or equal groups to count sets.**

[C, CN, ME, R, V]

a. Answer the question, "How many are in the set?" using the last number counted in a set.
b. Identify and correct counting errors in a counting sequence.
c. Show that the count of the number of objects in a set does not change regardless of the order in which the objects are counted.
d. Count the number of objects in a set, rearrange the objects, predict the new count, and recount to verify the prediction.
e. Determine the total number of objects in a given set, starting from a known quantity and counting on.
f. Determine the total number of objects in a set using groups of 2s, 5s, or 10s and counting on.

Outcome: N1.4

Represent and describe whole numbers to 20 concretely, pictorially, and symbolically. [C, CN, V]

a. Represent a whole number using a variety of manipulatives, including ten frames and base ten materials.
b. Read whole number words to 20.
c. Partition any quantity into 2 parts and identify the number of objects in each part.
d. Model a whole number using two different objects (e.g., 10 desks represents the same number as 10 pencils).
e. Place whole numbers on a number line by using benchmarks 0, 5, 10, and 20.

Outcome: N1.5

Compare sets containing up to 20 elements to solve problems using:

- **referents (known quantity)**
- **one-to-one correspondence.**

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

a. Build a set equal to a given set that contains up to 20 elements.
b. Build a set that has more, fewer, or as many elements as a given set.
c. Build several sets of different objects that have the same number of elements in the set.
d. Compare two sets using one-to-one correspondence and describe them using comparative words, such as more, fewer, or as many.
e. Compare a set to a referent using comparative language.
f. Solve a story problem (pictures and words) that involves the comparison of two quantities.

Outcome: N1.6

Estimate quantities to 20 by using referents. [C, ME, PS, R, V]

a. Estimate a quantity by comparing it to a referent.
b. Select an estimate for a given quantity by choosing between at least two possible options and explain the choice.

Outcome: N1.7

Demonstrate, concretely, physically, and pictorially, how whole numbers can be represented by a variety of equal groupings with and without singles. [C, R, V]

a. Represent a whole number in a variety of equal groupings with and without singles (e.g., 17 can be represented by 8 groups of 2 and one single, 5 groups of 3 and two singles, 4 groups of 4 and one single, and 3 groups of 5 and two singles).
b. Recognize that for a number of counters, no matter how they are grouped, the total number of counters does not change.
c. Group a set of counters into equal groups in more than one way.

Outcome: N1.8

Identify the number, up to 20, that is one more, two more, one less, and two less than a given number. [C, CN, ME, R, V]

a. Name the whole number that is one more, two more, one less or two less than a given whole number.
b. Represent the number on a ten frame that is one more, two more, one less, or two less than a whole number.

Outcome: N1.9

Demonstrate an understanding of addition of numbers with answers to 20 and the corresponding subtraction facts, concretely, pictorially, physically, and symbolically by:

- **using familiar and mathematical language to describe additive and subtractive actions from their experience**
- **creating and solving problems in context that involve addition and subtraction**
- **modelling addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically.**

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

a. Act out a story problem presented orally or through shared reading. b) Indicate if the scenario in a story problem represents additive or subtractive action.
b. Represent the numbers and actions presented in a story problem by using manipulatives, and record them using sketches and/or number sentences.
c. Create a story problem involving addition that connects to personal experience and simulate the action with counters.
d. Create a story problem involving subtraction that connects to personal experience and simulate the action with counters.
e. Create a word problem for a whole number addition or subtraction sentence.
f. Represent a story problem pictorially or symbolically to show the additive or subtractive action and solve the problem.

Outcome: N1.10

Describe and use mental mathematics strategies (memorization not intended), such as:

- **counting on and counting back**
- **making 10**
- **doubles**
- **using addition to subtract**

to determine basic addition facts to 18 and related subtraction facts. [C, CN, ME, PS, R, V]

(It is not intended that students recall the basic facts but become familiar with strategies to mentally determine sums and differences.)

a. Use and describe a personal strategy for determining a sum.
b. Use and describe a personal strategy for determining a difference.
c. Write the related subtraction fact for a given addition fact.
d. Write the related addition fact for a given subtraction fact.

Outcome: P1.1

Demonstrate an understanding of repeating patterns (two to four elements) by:

- **describing**
- **reproducing**
- **extending**
- **creating patterns using manipulatives, diagrams, sounds, and actions.**

[C, PS, R, V]

a. Describe a repeating pattern containing two to four elements in its core.
b. Identify errors made in a repeating pattern.
c. Identify the missing element(s) in a repeating pattern.
d. Create and describe a repeating pattern using a variety of manipulatives, diagrams, musical instruments, and actions.
e. Reproduce and extend a repeating pattern using manipulatives, diagrams, sounds, and actions.
f. Identify and describe a repeating pattern found in the environment (e.g., classroom, outdoors) using everyday language.
g. Identify repeating events (e.g., days of the week, birthdays, seasons).

Outcome: P1.2

Translate repeating patterns from one form of representation to another. [C, R, V]

a. Represent a repeating pattern using another mode (e.g., action to sound, colour to shape, ABC ABC to blue yellow green blue yellow green).
b. Describe a repeating pattern using a letter code (e.g., ABC ABC…).

Outcome: P1.3

Describe equality as a balance and inequality as an imbalance, concretely, physically, and pictorially (0 to 20). [C, CN, R, V]

a. Construct two equal sets using the same objects (same shape and mass) and demonstrate their equality of number using a balance scale.
b. Construct two unequal sets using the same objects (same shape and mass) and demonstrate their inequality of number using a balance scale.
c. Create two groups of students and explain if the groups are equal or not in quantity.
d. Draw pictures to demonstrate inequality or equality and explain.
e. Determine if two given concrete sets are equal or unequal, and explain the process used.

Outcome: P1.4

Record equalities using the equal symbol. [C, CN, PS, V]

a. Represent a given equality using manipulatives or pictures.
b. Represent a given pictorial or concrete equality in symbolic form.
c. Provide examples of equalities where the given sum or difference is on either the left or right side of the equal symbol (=).
d. Record different representations of the same quantity (0 to 20) as equalities.

Outcome: SS1.1

Demonstrate an understanding of measurement as a process of comparing by:

- **identifying attributes that can be compared**
- **ordering objects**
- **making statements of comparison**
- **filling, covering, or matching.**

[C, CN, PS, R, V]

a. Identify common attributes, including length, height, mass, volume, capacity, and area that could be used to compare two objects.
b. Compare two objects and identify the attribute(s) used to compare.
c. Determine which of two or more objects is longest or shortest by matching and explain the reasoning.
d. Determine which of two or more objects is heaviest or lightest by comparing and explain the reasoning.
e. Determine which of two or more given objects holds the most or least by filling and explain the reasoning.
f. Determine which of two or more given objects has the greatest/least area by covering and explain the reasoning.

Outcome: SS1.2

Sort 3-D objects and 2-D shapes using one attribute, and explain the sorting rule. [C, CN, R, V]

a. Sort a set of familiar 3-D objects or 2-D shapes using a given sorting rule.
b. Sort a set of familiar 3-D objects using a single attribute determined by the student and explain how the objects were sorted.
c. Sort a set of 2-D shapes using a single attribute determined by the student and explain how the shapes were sorted.
d. Determine the difference between two given pre- sorted sets of familiar 3-D objects or 2-D shapes and explain a possible sorting rule used to sort them.

Outcome: SS1.3

Replicate composite 2-D shapes and 3-D objects. [CN, PS, V]

a. Select 2-D shapes from a set of 2-D shapes to reproduce a composite 2-D shape.
b. Select 3-D objects from a set of 3-D objects to reproduce a composite 3-D object.
c. Predict and select the 2-D shapes used to produce a composite 2-D shape, and verify by deconstructing the composite shape.
d. Predict and select the 3-D objects used to produce a composite 3-D object, and verify by deconstructing the composite object.

Outcome: SS1.4

Compare 2-D shapes to parts of 3-D objects in the environment. [C, CN, V]

- Identify 3-D objects in the environment that have parts similar to a given 2-D shape.

Grade 2

Outcome: N2.1

Demonstrate understanding of whole numbers to 100 (concretely, pictorially, physically, orally, in writing, and symbolically) by:

- **representing (including place value)**
- **describing**
- **skip counting**
- **differentiating between odd and even numbers**
- **estimating with referents**
- **comparing two numbers**
- **ordering three or more numbers.**

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

a. Describe the patterns related to quantity and place value of adjacent digit positions moving from right to left within a whole number.
b. Describe the meaning of quantities to 100 by relating them to self, family, or community and explain what effect each successive numeral position has on the actual quantity.
c. Pose and solve problems that explore the quantity of whole numbers to 100 (e.g., a student might wonder: "How many pets would there be if everyone in the class brought their pets to class").
d. Represent quantities to 100 using proportional materials (e.g., tallies, ten frames, and base ten blocks) and explain how the representation relates to the numeral used to represent the quantity.
e. Represent quantities to 100 using non-proportional materials (e.g., stir sticks and popsicle sticks, and coins) and explain how the representation relates to the numeral used to represent the quantity.
f. Identify whole numbers to 100 stated as a numeral or word form in everyday situations and read the number out loud (e.g., 24 on the classroom door would be read as twenty-four, and read out loud "seventy-three" when found in a piece of writing being read in class).
g. Create different decompositions for a given quantity using concrete manipulatives or pictures and explain orally how the different decompositions represent the original quantity.
h. Write numbers to twenty in words when said out loud or given as a numeral.
i. Analyze a sequence of numbers in order to describe the sequence in terms of a skip counting strategy (by 2s, 5s, or 10s as well as forward and backward) and extend the sequence using the pattern.
j. Analyze an ordered number sequence (including a hundred chart) for errors or omissions and explain the reasoning.
k. Sort a set of personally relevant numbers into odd and even numbers.
l. Hypothesize and verify strategies for skip counting by 10s beginning at any whole number from 0 to 9 (e.g., in a hundred chart, the skip counted numbers always lie on a vertical line; using base ten blocks, skip counting by 10s always increases the number of rods by one; or using numerals, the tens place value always increases by 1 (meaning 10) when skip counting by 10s forwards).
m. Order a set of personally relevant numbers in ascending or descending order and verify the resulting sequence (e.g., using a hundred chart, number line, ten frames, or place value).
n. Analyze a number relevant to one's self, family, or community to determine if it is odd or even and verify the conclusion by using concrete, pictorial, or physical representations.
o. Estimate a quantity from one's life, family, or community by using a referent (known quantity), including 10, and explain the strategies used.
p. Select a referent for determining a particular quantity and explain the choice.
q. Critique the statement "A referent for 10 is always a good referent to use".
r. Represent a 2-digit numeral using ten frames or other proportional base ten materials.

s. Create representations of different decompositions of the same quantity and explain how the representations represent the same amount.
t. Explain, using concrete or pictorial representations, the meaning of each digit within a 2-digit numeral with both digits the same (e.g., for the numeral 22, the first digit represents two tens - twenty counters - and the second digit represents two ones - two counters).
u. Defend the statement "The value of a digit depends on its placement within a numeral".
v. Demonstrate how to count objects using groupings of 10s and 1s and explain how those groups help in the writing of the 2-digit number that represents the quantity of objects.

Outcome: N2.2

Demonstrate understanding of addition (limited to 1 and 2-digit numerals) with answers to 100 and the corresponding subtraction by:

- **representing strategies for adding and subtracting concretely, pictorially, and symbolically**
- **creating and solving problems involving addition and subtraction**
- **estimating**
- **using personal strategies for adding and subtracting with and without the support of manipulatives**
- **analyzing the effect of adding or subtracting zero**
- **analyzing the effect of the ordering of the quantities (addends, minuends, and subtrahends) in addition and subtraction statements.**

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

a. Generalize rules for adding when one addend is zero and for subtracting zero from a quantity and use concrete, pictorial, physical, or oral models to explain the reasoning.
b. Verify rules generalized for addition and subtraction involving a quantity of zero.
c. Model concretely, pictorially, or physically situations that involve the addition or subtraction of 1 and 2-digit numbers (with answers to 100) and explain how to record the process shown in the model symbolically.
d. Generalize and apply strategies for adding and subtracting 1 and 2-digit numbers (with answers to 100).
e. Create, model symbolically (and concretely, pictorially, or physically if desired), and solve addition and subtraction problems related to situations relevant to one's self, family, or community.
f. Critique the statement "You can add or subtract numbers in any order and still get the same answer" and provide examples to support the critique.
g. Select and explain a mental mathematics strategy that can be used to determine a sum of up to 18 (or related difference):
    - doubles (e.g., for 4 + 6, think 5 + 5)
    - doubles plus one (e.g., for 4 + 5, think 4 + 4 + 1)
    - doubles take away one (e.g., for 4 + 5, think 5 + 5 – 1)
    - doubles plus two (e.g., for 4 + 6, think 4 + 4 + 2)
    - doubles take away two (e.g., for 4 + 6, think 6 + 6 – 2)
    - making 10 (e.g., for 7 + 5, think 7 + 3 + 2)
    - building on a known double (e.g., 6 + 6 = 12, so 6 + 7 = 12 + 1 = 13)

Outcome: P2.1

Demonstrate understanding of repeating patterns (three to five elements) by:

- **describing**
- **representing patterns in alternate modes**
- **extending**
- **comparing**
- **creating patterns using manipulatives, pictures, sounds, and actions.**

[C, CN, PS, R, V]

a. Identify and describe repeating patterns found in familiar situations and justify why the descriptions are those of repeating patterns (e.g., "Every day I get up, brush my hair, wash my face, have breakfast" - this is a repeating pattern because I do the same pattern over and over again).
b. Analyze a repeating pattern to identify the core of the pattern.
c. Analyze a repeating pattern for its core and extend the pattern so the core appears twice more.
d. Analyze an intended repeating pattern to identify possible errors.
e. Create a repeating pattern and explain the reasoning.
f. Predict an upcoming element in a repeating pattern and verify the prediction.
g. Analyze two repeating patterns that are represented using different materials or modes (e.g., a diagram of a repeating pattern with a core of red, red, blue, blue, blue and a sound pattern with a core of buzz, buzz, snap, snap, snap) and present ways in which the patterns are related (e.g., there are two different elements in the core of each pattern, and the core pattern is element 1, element 1, element 2, element 2, element 2 in both patterns).

Outcome: P2.2

Demonstrate understanding of increasing patterns by:

- **describing**
- **reproducing**
- **extending**
- **creating patterns using manipulatives, pictures, sounds, and actions (numbers to 100).**

[C, CN, PS, R, V]

a. Identify and describe increasing patterns in familiar situations (e.g., hundred chart, number line, addition tables, calendar, a tiling pattern or drawings, apartment numbers, years, or age).
b. Analyze a numerical increasing pattern for its pattern rule and extend the pattern.
c. Analyze a non-numerical increasing pattern and extend the pattern.
d. Reproduce an increasing numerical pattern using an alternate form (e.g., sound, action, concrete objects, or diagrams) and explain the reasoning.
e. Reproduce a concrete or pictorial increasing pattern using numbers and explain the reasoning.
f. Solve problems involving increasing patterns (e.g., determine the house number for a particular house given the house numbers for the other homes on the block, or determining the number of cubes in the missing structure) and explain the reasoning.
g. Create an increasing pattern, represent the pattern in different modes (using manipulatives, diagrams, sounds, actions, and/or physical movements), and explain the pattern rule.

Outcome: P2.3

Demonstrate understanding of equality and inequality concretely and pictorially (0 to 100) by:

- **relating equality and inequality to balance**
- **comparing sets**
- **recording equalities with an equal sign**
- **recording inequalities with a not equal sign**
- **solving problems involving equality and inequality.**

[C, CN, R, V]

a. Compare two quantities of the same object (same shape and mass) by using a balance scale to determine if the quantities are equal or not.
b. Construct two unequal sets using identical objects and verify orally and concretely that the sets are not equal.
c. Analyze the impact of changing one of two equal sets upon the equality of the two sets.
d. Analyze the impact of making changes (equal and unequal) to both of two equal sets upon the equality of the sets.
e. Analyze and sort sets according to equality and explain the reasoning.
f. Model two number expressions to determine if the expressions are equal (=) or not equal (≠) and write a number sentence to show the relationship (e.g., 3 + 2 and 4 + 1 are both equal to 5, so the two expressions are = and I write 3 + 2 = 4 + 1; 7 - 5 and 3 are not the same quantity, so I write 7 – 5 ≠ 3).
g. Create statements of equality and non-equality and model the statements to verify the relationship.

Outcome: SS2.1

Demonstrate understanding of non-standard units for linear measurement by:

- **describing the choice and appropriate use of non-standard units**
- **estimating**
- **measuring**
- **comparing and analyzing measurements.**

[C, CN, ME, R, V]

a. Defend the choice of a non-standard unit for measuring a length in a situation relevant to one's self, family, or community.
b. Estimate a personally relevant length, including the distance around a space, using one's own choice of standard unit.
c. Compare estimates of the same length made by different units and provide reasons for different values being stated for the measurements.
d. Critique the statement "It is possible to get an exact length measurement".
e. Devise and apply strategies for determining estimates for linear and non-linear lengths using non-standard units.
f. Explain why overlapping or leaving gaps does not result in accurate measurements.
g. Explain why the same non-standard unit should be used to determine length measurements that are to be compared.
h. Compare and order sets of related objects, possibly including people, according to a length measurement.

Outcome: SS2.2

Demonstrate understanding of non-standard units for measurement of mass by:

- **describing the choice and appropriate use of non-standard units**
- **estimating**
- **measuring**
- **comparing and analyzing measurements.**

[C, CN, ME, R, V]

a. Defend the choice of a non-standard unit for measuring a mass in a situation relevant to one's self, family, or community.
b. Estimate the mass of a personally relevant object using one's own choice of standard unit.
c. Identify a non-standard unit for measuring mass that would not be a good choice in a particular situation and explain the reasoning (e.g., to measure the mass of a desk, it would not make sense to use an eraser as the standard unit because a desk has so much more mass than an eraser and so it would take too many erasers, or to measure the mass of a library book using the standard unit of a student in the class because the student already has a greater mass than the book).
d. Compare estimates of the mass of the same object determined using different standard units and provide reasons for different values being stated for the measurements.
e. Explain why the same non-standard unit should be used to determine mass measurements that are to be compared.
f. Compare and order sets of related objects according to mass measurements and explain the reasoning.

Outcome: SS2.3

Describe, compare, and construct 3-D objects, including:

- **cubes**
- **spheres**
- **cones**
- **cylinders**
- **pyramids.**

[C, CN, R, V]

a. Identify examples of cubes, spheres, cones, cylinders, and pyramids as found in the classroom, home, and community.
b. Sort a set of personally relevant 3-D objects and explain the sorting rule used.
c. Compare the attributes of cubes, spheres, cones, cylinders, and pyramids and generalize descriptions of each category of 3-D objects.
d. Compare two 3-D objects of the same type (e.g., both are cylinders) and explain how the dimensions of the objects can be used to compare the objects (one-to-one correspondence or non-standard units).
e. Compare two 3-D objects in different orientations (e.g., "If I was to flip this object over, the two objects would have the same height.").
f. Create and describe a concrete representation of a personally relevant 3-D object.
g. Sort 3-D objects according to two attributes and explain the sorting rule used.

Outcome: SS2.4

Describe, compare, and construct 2-D shapes, including

- **triangles**
- **squares**
- **rectangles**
- **circles.**

[C, CN, R, V]

a. Identify examples of triangles, rectangles, squares, and circles as found in personal experiences.
b. Compare the attributes of triangles, squares, rectangles, and circles and generalize descriptions of each category of 2-D shapes objects.
c. Critique the statement "A 2-D shape can either be a rectangle or a square, but not both".
d. Compare two 2-D shapes of the same type (e.g., both are circles) and explain how the dimensions of the shapes can be used to compare the shapes (one-to-one correspondence or non-standard units).
e. Classify 2-D shapes arranged in different orientations according to the type (triangle, rectangle, square, or circle) and explain the impact of the orientation of shape on its classification.
f. Create a model to represent a 2-D shape.
g. Sort regular and irregular 2-D shapes according to two attributes and explain the sorting rule used.

Outcome: SS2.5

Demonstrate understanding of the relationship between 2-D shapes and 3-D objects. [C, CN, R, V]

a. Analyze the differences between two pre-sorted sets of objects and/or pictures of shapes and explain how the objects and shapes were sorted.
b. Analyze a set of objects and/or pictures of shapes to identify two common attributes of each member of the set.
c. Describe the faces of a personally relevant 3-D object by comparing the faces to 2-D shapes (such as triangles, squares, rectangles, or circles).
d. Analyze (using concrete models of 3-D objects) a set of descriptions of the 2-D faces of a 3-D object to identify the 3-D object (e.g., "A 3-D object has one rectangular face and four triangular faces – what type of object is it?" "A pyramid.").
e. Analyze and correct the statement "The tissue box is a rectangle".

Outcome: SP2.1

Demonstrate understanding of concrete graphs and pictographs. [C, CN, PS, R, V]

a. Formulate a question relevant to one's self, family, or community that can be answered by gathering information from people.
b. Select an organizational structure, such as sets of concrete objects, tallies, checkmarks, charts, or lists, for the collection of data that are gathered.
c. Pose questions related to gathered data and explain how the data can be used to answer those questions.
d. Analyze concrete graphs to identify and define the common attributes of a concrete graph.
e. Analyze pictographs to identify and define the common attributes of a pictograph.
f. Create a concrete graph to display collected data and make and support conclusions based upon the graph.
g. Create a pictograph (using one-to-one correspondence) to display collected data and make and support conclusions based on the graph.
h. Create and solve a problem for which data can be collected from individuals in the class, at home, in the school, or within the community and give a presentation of how the collection, organization, display, and analysis of data were done to attain a solution to the problem.

Grade 3

Outcome: N3.1

Demonstrate understanding of whole numbers to 1000 (concretely, pictorially, physically, orally, in writing, and symbolically) including:

- **representing (including place value)**
- **describing**
- **estimating with referents**
- **comparing two numbers**
- **ordering three or more numbers.**

[C, R, V]

a. Observe, represent, and state the sequence of numbers for a given skip counting pattern (forwards or backwards) including:
   - by 5s, 10s, or 100s using any starting point
   - by 3s, 4s, or 25s using starting points that are multiples of 3, 4, and 25 respectively.
b. Analyze a sequence of numbers to identify the skip counting pattern (forwards or backwards) including:
   - by 5s, 10s, or 100s using any starting point
   - by 3s, 4s, or 25s using starting points that are multiples of 3, 4, and 25 respectively.
c. Create and explain the reasoning for a sequence of numbers that have different skip counting patterns in it (e.g., 3, 6, 9, 12, 16, 20, 24).
d. Explore and present First Nations and Métis methods of determining and representing whole number quantities (e.g., in early Cree language, quantity was a holistic concept addressing sufficiency for a group such as none/nothing, a little bit/not many, and a lot).
e. Analyze a proposed skip counting sequence for errors (including omissions and incorrect values) and explain the errors made.
f. Solve situational questions involving the value of coins or bills and explain the strategies used (such as grouping or skip counting).
g. Identify errors (such as the use of commas or the word 'and') made in speech or in the writing of quantities that occur in conversations (personal), recordings (such as TV, radio, or podcasts) and written materials (such as the Internet, billboards, or newspapers).
h. Write (in numerals for all quantities, and in words if the quantity is a multiple of 10 and less than 100 or a multiple of 100 and less than 1000) and read aloud statements relevant to one's self, family, or community that contain quantities up to 1000 (e.g., a student might write, "Our town has a population of 852" and read the numeral as eight hundred fifty-two).
i. Create different decompositions of the same quantity (concretely using proportional or non-proportional materials, physically, orally, or pictorially), explain how the decompositions represent the same overall amount, and record the decompositions as symbolic expressions (e.g., 300 – 44 and 236 + 20 are two possible decompositions that could be given for 256).
j. Sort a set of numbers into ascending or descending order and justify the result (e.g., using hundred charts, a number line, or by explaining the place value of the digits in the numbers).

k. Create as many different 3-digit numerals as possible, given three non-repeating digits, and sort the numbers in ascending or descending order.
l. Select and use referents for 10 or 100 to estimate the number of groups of 10 or 100 in a set of objects.
m. Analyze a sequence of numbers and justify the conclusion of whether or not the sequence is ordered.
n. Identify missing whole numbers on a section of a number line or within a hundred chart.
o. Record, in more than one way, the quantity represented by proportional (e.g., base ten blocks) or non-proportional (e.g., coins) concrete materials.
p. Explain, using concrete materials or pictures, the meaning of each digit in a given 3-digit numeral with all the same digits.
q. Provide examples of how different representations of quantities, including place value, can be used to determine sums and differences of whole numbers.

Outcome: N3.2

Demonstrate understanding of addition of whole numbers with answers to 1000 and their corresponding subtractions (limited to 1, 2, and 3-digit numerals) including:

- **representing strategies for adding and subtracting concretely, pictorially, and symbolically**
- **solving situational questions involving addition and subtraction**
- **estimating using personal strategies for adding and subtracting.**

[CN, ME, PS, R, V]

a. Describe personal mental mathematics strategies that could be used to determine a given basic fact, such as:
   - doubles (e.g., for 6 + 8, think 7 + 7)
   - doubles plus one (e.g., for 6 + 7, think 6 + 6 + 1)
   - doubles take away one (e.g., for 6 + 7, think 7 + 7 – 1)
   - doubles plus two (e.g., for 6 + 8, think 6 + 6 + 2)
   - doubles take away two (e.g., for 6 + 8, think 8 + 8 – 2)
   - making 10 (e.g., for 6 + 8, think 6 + 4 + 4 or 8 + 2 + 4)
   - commutative property (e.g., for 3 + 9, think 9 + 3)
   - addition to subtraction (e.g., for 13 – 7, think 7 + ? = 13)

b. Observe and generalize personal strategies from different types of representations for adding 2-digit quantities (given concrete materials, pictures, and symbolic decompositions) such as:
   - Adding from left to right (e.g., for 23 + 46 think 20 + 40 and 3 + 6)
   - Taking one or both addends to the nearest multiple of 5 or 10 (e.g., for 28 + 47, think 30 + 47 - 2, 50 + 28 – 3, or 30 + 50 – 2 – 3)
   - Using doubles (e.g., for 24 + 26, think 25 + 25, or for 25 + 26, think 25 + 25 + 1).

c. Observe and generalize personal strategies for subtracting 2-digit quantities (given concrete materials, pictures, and symbolic decompositions) such as:
   - Taking the subtrahends to the nearest multiple or 10 (e.g., for 48 - 19, think 48 – 20 + 1)
   - Thinking of addition (e.g., 62 – 45, think 45 + 5, 50 + 12 to get from 45 to 62, so the difference is 5 + 12)
   - Using doubles (e.g., for 25 - 12, think 12 + 12 = 24 and 24 is one less than 25, so difference is 12 + 1).

d. Apply and explain personal mental mathematics strategies to determine the sums and differences of two-digit quantities.
e. Create a situational question that involves either addition or subtraction and that has a given quantity as the solution.
f. Model (concretely or pictorially) a process for the addition of two or more given quantities (with a sum less than 1000) and record the process symbolically.
g. Model (concretely or pictorially) a process for the subtraction of two or more quantities (less than 1000) and record the process symbolically.
h. Generalize (orally, in writing, concretely, or pictorially) personal strategies for estimating the sum or difference of two 2-digit quantities.
i. Extend personal mental mathematics strategies to determine sums and differences (of quantities less than 1000) and explain the reasoning used.
j. Transfer knowledge of the basic addition facts up to 18 and the related subtraction facts to determine the sums and differences of quantities less than 1000.
k. Generalize rules for the addition and subtraction of zero.
l. Provide examples to show why knowing about place value is useful when adding and subtracting quantities.

Outcome: N3.3

Demonstrate understanding of multiplication to 5 x 5 and the corresponding division statements including:

- **representing and explaining using repeated addition or subtraction, equal grouping, and arrays**
- **creating and solving situational questions**
- **modelling processes using concrete, physical, and visual representations, and recording the process symbolically**
- **relating multiplication and division.**

[C, CN, PS, R]

Note: The focus of this outcome is for the students to become familiar with multiplication and division and strategies for mentally determining products and quotients. It is not intended that students memorize the basic facts.

a. Observe and describe situations relevant to self, family, or community that can be represented by multiplication and write and solve a multiplication statement for each situation.
b. Observe and describe situations relevant to self, family, or community that can be represented by equal sharing or grouping and write and solve a division statement for each situation.
c. Explain and represent concretely, pictorially, orally, or physically, as well as symbolically, the relationship between repeated addition and multiplication and the relationship between repeated subtraction and division.
d. Represent and solve an orally presented multiplication or division statement, concretely, physically, or pictorially, using equal groupings, an array, repeated addition, or repeated subtraction (e.g., 3 x 4 shown using equal groupings of snowballs).
e. Apply and explain personal strategies for determining products and quotients.
f. Model the commutative property of multiplication and write the symbolic multiplication equation represented.
g. Represent and solve an orally presented situational question that involves division.
h. Relate multiplication and division orally and by using concrete, physical, or pictorial models, including repeated addition/subtraction and arrays/dimensions.
i. Create multiplication or division statements and determine the resulting products or quotients related to a given situational question.
j. Create and solve a situational question that relates to a given symbolic multiplication or division statement.

Outcome: N3.4

Demonstrate understanding of fractions concretely, pictorially, physically, and orally including:

- **representing**
- **observing and describing situations**
- **comparing**
- **relating to quantity.**

[C, CN, R]

a. Identify and observe situations relevant to self, family, or community in which fractional quantities would be measured or used and explain what the fraction quantifies.
b. Explore First Nations and Métis methods of observing and representing fractional quantities (e.g., consider the concept of sharing from a First Nations or Métis holistic worldview).
c. Explain the relationship of a representation of a fraction to both a quantity of zero and a quantity of one (the whole or entire group, region, or length).
d. Divide a whole, group, region, or length into equal parts (concretely, physically, or pictorially), demonstrate that the parts are equal in quantity, and name the quantity represented by each part.
e. Analyze a set of diagrams or concrete representations to sort the representations into those that represent the same fraction and those that do not, and explain the sorting.
f. Analyze representations of a set of fractions of a whole, group, region, or length that all have the same numerator (e.g., 2/3, 2/4, 2/5) and explain what about the fractional quantities is similar and what is different.
g. Analyze representations of a set of fractions of a whole, group, region, or length that all have the same denominator (e.g., 0/5, 1/5, 2/5, 3/5, 4/5, 5/5) and explain what about the fractional quantities is similar and what is different.
h. Explain the role of the numerator and denominator in a fraction.
i. Demonstrate how a fraction can represent a different amount if a different size of whole, group, region, or length is used.
j. Compare, concretely, pictorially, physically, or orally, and order a set of fractions with either equivalent denominators or equivalent numerators.
k. Represent a fraction as part of a whole, group, region, or length and explain the representation.
l. Explain how a region can be divided into unequal parts, but the parts still represent a fraction of the region (e.g., Canada divided into provinces and territories which are not equal in area).

Outcome: P3.1

Demonstrate understanding of increasing and decreasing patterns including:

- **observing and describing**
- **extending**
- **comparing**
- **creating patterns using manipulatives, pictures, sounds, and actions.**

[C, CN, PS, R, V]

Note: It is intended that decreasing patterns will not go past zero.

a. Identify and observe situations relevant to self, family, and community that contain an increasing or decreasing pattern, identify the starting value of the pattern, and describe the rule for the pattern and how the pattern would continue.
b. Verify (concretely, visually, orally, pictorially, or physically) whether or not a given sequence of numbers represents an increasing or decreasing pattern.
c. Observe various patterns (increasing or decreasing) found on a hundred chart, such as horizontal, vertical, and diagonal patterns, and describe the pattern rule.
d. Compare visual patterns for skip counting (forwards or backwards) by 2s, 5s, 10s, 25s, and 100s and relate to increasing and decreasing patterns.
e. Visualize and create oral, concrete, physical, pictorial, or symbolic representations for a given increasing or decreasing pattern rule and explain how the representations are related.
f. Create a concrete, physical, pictorial, or symbolic pattern (increasing or decreasing) and describe the pattern rule.
g. Describe strategies used to solve situational questions involving increasing or decreasing patterns, including determining missing elements within the pattern.
h. Research (e.g., through Elders, traditional knowledge keepers, naturalists, and media) and present about the role and significance of increasing and decreasing patterns (e.g., making of a star blanket, beading, music, and patterns found in nature) in First Nations and Métis practices, lifestyles, and worldviews.

Outcome: P3.2

Demonstrate understanding of equality by solving one-step addition and subtraction equations involving symbols representing an unknown quantity. [C, CN, ME, R]

a. Share, compare, and distinguish between understandings and uses of the word equal, including those represented in First Nations and Métis worldviews.
b. Observe and describe situations relevant to self, family, or community in which a symbol could be used to represent an unknown quantity.
c. Explain the purpose of the symbol, such as a triangle or a circle, in an addition or subtraction equation.
d. Compare two equations involving the same operations and quantities, but using different symbols.
e. Solve addition and subtraction equations concretely, pictorially, or physically.
f. Verify (concretely, pictorially, or physically) which of a set of given quantities is the solution to a one-step addition or subtraction equation and explain the reasoning.
g. Generalize strategies, including guess and test, for solving one-step addition and subtraction equations and verify the strategies concretely, pictorially, or physically.
h. Explain why the unknown in a given addition or subtraction equation has only one value.
i. Create and solve one-step equations related to situational questions.
j. Create and solve situational questions that relate to given one-step equations.

Outcome: SS3.1

Demonstrate understanding of the passage of time including:

- **relating common activities to standard and non-standard units**
- **describing relationships between units**

- **solving situational questions.**

[C, CN, PS, R]

a. Observe and describe activities relevant to self, family, and community that would involve the measurement of time.
b. Explore the meaning and use of time-keeping language from different cultures, including First Nations and Métis.
c. Select and use a personally relevant non-standard unit of measure for the passage of time (such as television shows, a pendulum swing, sunrise, sundown, moon cycles, and hunger patterns) and explain the choice.
d. Suggest and sort activities into those that can or cannot be accomplished in a minute, hour, day, month, or year.
e. Select and justify personal referents for minutes and hours.
f. Create and solve situational questions using the relationship between the number of minutes in an hour, days in a particular month, days in a week, hours in a day, weeks in a year, or months in a year (e.g., "A student was on holiday for 10 days. Is that more or less than one week long?").
g. Identify the day of the week, the month, and the year for an indicated date on a calendar.
h. Identify today's date, and then explain how to determine yesterday's and tomorrow's date.
i. Locate a stated or written date (day, month, and year) on a calendar and explain the strategy used.
j. Identify errors in the ordering of the days of the week and the months of the year.
k. Create a calendar using the days of the week, the calendar dates, and personally relevant events.
l. Describe ways in which the measurement of time is cyclical.

Outcome: SS3.2

Demonstrate understanding of measuring mass in g and kg by:

- **selecting and justifying referents for g and kg**
- **modeling and describing the relationship between g and kg**
- **estimating mass using referents**
- **measuring and recording mass.**

[C, CN, ME, R]

a. Observe and describe situations relevant to self, family, and community that involve measuring mass.
b. Create and solve situational questions that involve the estimating or measuring of mass using g or kg.
c. Analyze 3-D objects to determine personal referents for 1 kg, 100 g, 10 g, and 1 g.
d. Analyze the relationships between 1 g, 10 g, 100 g, 1000 g, and 1 kg and explain the strategies used (e.g., 1 kg is heavier than 100 g, 10 g, and 1 g, or 1 kg is the same mass as 1000 g.)
e. Select, with justification, an appropriate unit for measuring the mass of a given 3-D objects (e.g., kg would be used to measure a motorbike).
f. Determine, using a scale, and record the mass of an object relevant to one's self, family, or community.
g. Estimate the mass of an object relevant to one's self, family, or community and explain the strategy used.
h. Directly compare the mass of two 3-D objects and then verify the comparison by measuring the actual masses using a scale.
i. Generalize statements about the mass of a specific amount of matter when reformed into different shapes or sizes (e.g., use clay to make an object, measure the mass of the object, reform the clay into another object and measure the mass of the two objects; an empty balloon versus a full balloon; or water versus ice).
j. Observe and document conversations, mass media reports, and other forms of text that use the term "weight" rather than "mass".

Outcome: SS3.3

Demonstrate understanding of linear measurement (cm and m) including:

- **selecting and justifying referents**
- **generalizing the relationship between cm and m**
- **estimating length and perimeter using referents**
- **measuring and recording length, width, height, and perimeter.**

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

a. Observe and describe situations relevant to self, family, and community that involve measuring lengths, including perimeter, in cm or m.
b. Measure and compare different lengths on 3-D objects to select personally relevant referents for 1 cm, 10 cm, and 1 m.
c. Create models to generalize a numerical relationship between cm and m (i.e., 100 cm is equivalent to 1 metre).
d. Pose and solve situational questions that involve the estimating or measuring of length (including perimeter) using cm or m.
e. Identify and determine the length of the dimensions of a personally relevant 2-D shape or 3-D object.
f. Explain why sometimes different names are used for different length measurements (e.g., height, width, or depth).
g. Sketch a line segment of an estimated length and describe the strategy used.
h. Draw a line segment of a given length and explain the process used.
i. Relate measuring using a referent for 10 cm to skip counting quantities by 10s.
j. Create a picture of a 2-D shape with specified length and width (or length and height) and explain whether the 2-D shape was constructed using estimates or actual lengths.
k. Measure and record the perimeter of regular 2-D polygons and circles located on 3-D objects, and explain the strategy used.
l. Measure and record the perimeter of a given irregular 2-D shape, and explain the strategy used.
m. Construct or draw more than one 2-D shape for the same given perimeter (cm, m).
n. Estimate the perimeter of a given 2-D shape (cm, m) using personal referents and explain the strategies used.
o. Critique the statement "perimeter is a linear measurement".
p. Sort a set of 2-D shapes into groups with equal perimeters.

Outcome: SS3.4

Demonstrate understanding of 3-D objects by analyzing characteristics including faces, edges, and vertices. [C, V]

a. Observe and describe the faces, edges, and vertices of given 3-D objects, including cubes, spheres, cones, cylinders, pyramids, and prisms (e.g., drum, tipi, South American Pyramids, and other objects from the natural environment).
b. Critique the statement "the face of a 3-D object is always a 2-D shape".
c. Observe and describe the 2-D shapes found on a 3-D object.
d. Construct a skeleton of a given 3-D object and describe how the skeleton relates to the 3-D object.

e. Determine the number of faces, edges, and vertices of a given 3-D object and explain the reasoning and strategies.
f. Critique the statement "a vertex is where three faces meet".
g. Sort a set of 3-D objects according to the faces, edges, or vertices and explain the sorting rule used.

Outcome: SS3.5
Demonstrate understanding of 2-D shapes (regular and irregular) including triangles, quadrilaterals, pentagons, hexagons, and octagons including:
- **describing**
- **comparing**
- **sorting.**

[C, CN, R]
a. Identify the sorting rule used on a pre-sorted set of polygons.
b. Generalize definitions for regular and irregular polygons based on a concept attainment activity or from pre-sorted sets.
c. Observe, describe the characteristics of, and sort polygons found in situations relevant to self, family, or community (including First Nations and Métis), into irregular and regular polygons (e.g., the bottom of a kamatiq, the screen of a TV, the bottom of a curling broom, and an arrowhead).
d. Analyze irregular and regular polygons in different orientations in terms of the characteristics of the polygons (such as number or measurement of sides and angles).

Outcome: SP3.1
Demonstrate understanding of first-hand data using tally marks, charts, lists, bar graphs, and line plots (abstract pictographs), through:
- **collecting, organizing, and representing**
- **solving situational questions.**

[C, CN, PS, R, V]

a. Observe and describe situations relevant to self, family, or community in which a particular type of data recording or organizing strategy might be used, including tally marks, charts, lists, and knots on a sash.
b. Analyze a set of line plots to determine the common attributes of line plots.
c. Create a line plot from a pictograph.
d. Analyze a set of bar graphs to determine the common attributes of bar graphs.
e. Answer questions related to the data presented in a bar graph or line plots.
f. Collect and represent data using bar graphs or line plots.
g. Pose and solve situational questions related to self, family, or community by collecting and organizing data, representing the data using a bar graph or line plot, and interpreting the data display.
h. Analyze interpretations of bar graphs or line plots and explain whether or not the interpretation is valid based on the data display.
i. Examine how various cultures past and present, including First Nations and Métis, collect, represent, and use first-hand data.

Grade 4

Outcome: N4.1
Demonstrate an understanding of whole numbers to 10 000 (pictorially, physically, orally, in writing, and symbolically) by:
- **representing**
- **describing**
- **comparing two numbers**
- **ordering three or more numbers.**

[C, R,V]
a. Read a four-digit numeral without using the word "and" (e.g., 5321 is five thousand three hundred twenty one, NOT five thousand three hundred AND twenty one).
b. Write a numeral using proper spacing without commas (e.g., 4567 or 4 567, 10 000).
c. Write a numeral (0 – 10 000) in words.
d. Represent a numeral using a place value chart or diagrams.
e. Explain the meaning of each digit in a numeral.
f. Express a numeral in expanded notation (e.g., 321 = 300 + 20 + 1).
g. Write the numeral represented by an expanded notation expression.
h. Explain and show the meaning of each digit in a 4-digit numeral with all digits the same (e.g., for the numeral 2222, the first digit represents two thousands, the second digit two hundreds, the third digit two tens, and the fourth digit two ones).
i. Explain the meaning of each digit in a 4-digit number representing a particular quantity.
j. Order a set of numbers in ascending or descending order, and explain the order by making references to place value.
k. Create and order three different 4-digit numerals.
l. Identify the missing numbers in an ordered sequence or shown on a number line.
m. Identify incorrectly placed numbers in an ordered sequence or shown on a number line.
n. Decompose and represent a 4-digit number at least three different ways.
o. Explain why two or more number compositions represent the same quantity.

Outcome: N4.2
Demonstrate an understanding of addition of whole numbers with answers to 10 000 and their corresponding subtractions (limited to 3 and 4-digit numerals) by:
- **using personal strategies for adding and subtracting**
- **estimating sums and differences**
- **solving problems involving addition and subtraction.**

[C, CN, ME, PS, R]
a. Explain how to keep track of digits that have the same place value when adding or subtracting numbers.

b. Describe a situation in which an estimate rather than an exact answer is sufficient.
c. Estimate sums and differences using different strategies (e.g., front-end estimation and compensation).
d. Explain the strategies used to determine a sum or difference.
e. Solve problems that involve addition and subtraction of more than two numbers.

Outcome: N4.3

Demonstrate an understanding of multiplication of whole numbers (limited to numbers less than or equal to 10) by:

- **applying mental mathematics strategies**
- **explaining the results of multiplying by 0 and 1**

[C, CN, R]

a. Explain the strategy used to determine a product.
b. Explain the strategy used in a given solution to a product. For example:
   - for 4 x 3, thinking 2 x 3 = 6 and 4 x 3 = 6 + 6 or 6 + 2 = 12 (halving and doubling)
   - for 3 x 7 think 2 x 7 = 14 and 14 + 7 = 21 (doubling and adding one more group)
   - for 9 x 6, think 10 x 6 = 60 and 60 – 6 = 54 (multiplying by ten and subtracting one group)
   - knowing 2 x 6 = 12, then 4 x 6 = 12 x 2 = 24 (doubling)
   - for 64 ÷ 8, think 8 x = 64 (relating division to multiplication)
   - for 8 x 5, knowing that 5 x 5 = 25, and then skip counting by 5 three times to get 25 + 5 + 5 + 5 = 40.
c. Explain the property for determining the answer when multiplying numbers by one.
d. Explain the property for determining the answer when multiplying numbers by zero.

Outcome: N4.4

Demonstrate an understanding of multiplication (2- or 3-digit by 1-digit) by:

- **using personal strategies for multiplication, with and without concrete materials**
- **using arrays to represent multiplication**
- **connecting concrete representations to symbolic representations**
- **estimating products**
- **solving problems.**

[C,ME, PS, R, V]

a. Model a multiplication problem (concretely or symbolically) using the distributive property (e.g., 8 × 365 = (8 × 300) + (8 × 60) + (8 × 5)).
b. Use concrete materials, such as base ten blocks or their pictorial representations, to represent multiplication and record the process symbolically.
c. Create and solve a multiplication problem that is limited to a 2- or 3-digit number times a 1-digit number.
d. Estimate a product using a personal strategy (e.g., 2 × 243 is close to or a little more than 2 × 200, or close to or a little less than 2 × 250).
e. Model and solve a multiplication problem using an array, and record the process.
f. Solve a multiplication problem and explain the strategies or processes used.

Outcome: N4.5

Demonstrate an understanding of division (1-digit divisor and up to 2-digit dividend) to solve problems by:

- **using personal strategies for dividing with and without concrete materials**
- **estimating quotients**
- **explaining the results of dividing by 1**
- **solving problems involving division of whole numbers**
- **relating division to multiplication.**

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

(It is not intended that remainders be expressed as decimals or fractions.)

a. Solve a division problem without a remainder using arrays or base ten materials.
b. Solve a division problem with a remainder using arrays or base ten materials.
c. Solve a division problem using a personal strategy and record the process symbolically.
d. Create and solve a word problem involving a 1- or 2-digit dividend (the number being divided into).
e. Estimate a quotient using a personal strategy (e.g., 86 ÷ 4 is close to 80 ÷ 4 or close to 80 ÷ 5).
f. Explain the property for determining the answer when dividing numbers by one.
g. Explain, using examples, the relationship between division and multiplication.

Outcome: N4.6

Demonstrate an understanding of fractions less than or equal to one by using concrete and pictorial representations to:

- **name and record fractions for the parts of a whole or a set**
- **compare and order fractions**
- **model and explain that for different wholes, two identical fractions may not represent the same quantity**
- **provide examples of where fractions are used.**

[C, CN, PS, R, V]

a. Represent a fraction using concrete materials.
b. Represent a fraction based on a symbolically concrete representation (e.g., circles for cookies).
c. Name and record the fraction for the included and not included parts of a set.
d. Name and record the shaded and non-shaded (included and not included) parts of a whole.
e. Represent a fraction pictorially by indicating parts of a given set.
f. Represent a fraction pictorially by indicating parts of a whole.
g. Explain how denominators can be used to compare two unit fractions with numerator 1.
h. Order a set of fractions that have the same numerator and explain the ordering.
i. Order a set of fractions that have the same denominator and explain the ordering.
j. Identify which of the benchmarks 0, 1/2 or 1 is closer to a given fraction.

k. Name fractions between two benchmarks on a number line.
l. Order a set of fractions by placing them on a number line with given benchmarks.
m. Provide examples of when two identical fractions may not represent the same quantity (e.g., half of a large apple is not equivalent to half of a small apple; half a group of ten cloudberries is not equivalent to half of a group of sixteen cloudberries).
n. Provide an example of a fraction that represents part of a set, a fraction that represents part of a whole, or a fraction that represents part of a length from everyday contexts.

Outcome: N4.7

Demonstrate an understanding of decimal numbers in tenths and hundredths (pictorially, orally, in writing, and symbolically) by:

- **describing**
- **representing**
- **relating to fractions.**

[C, CN, V]

a. Write the decimal for a concrete or pictorial representation of part of a set, part of a region, or part of a unit of measure.
b. Represent a decimal concretely or pictorially.
c. Explain the meaning of each digit in a given decimal with all digits the same.
d. Represent a decimal using money (dimes and pennies).
e. Record a money value using decimals.
f. Provide examples of everyday contexts in which tenths and hundredths are used.
g. Model, using manipulatives or pictures, that a tenth can be expressed as hundredths (e.g., 0.9 is equivalent to 0.90 or 9 dimes is equivalent to 90 pennies).
h. Read and write decimals as fractions (e.g., 0.5 is zero and five tenths).
i. Express orally and in symbolic form a decimal in fractional form.
j. Express orally and in symbolic form a fraction with a denominator of 10 or 100 as a decimal.
k. Express a pictorial or concrete representation as a fraction or decimal (e.g., 15 shaded squares on a hundred grid can be expressed as 0.15 or 15/100).
l. Express orally and in symbolic form the decimal equivalent for a fraction (e.g., 50/100 can be expressed as 0.50).

Outcome: N4.8

Demonstrate an understanding of addition and subtraction of decimals limited to hundredths (concretely, pictorially, and symbolically) by:

- **using compatible numbers**
- **estimating sums and differences**
- **using mental math strategies**
- **solving problems.**

[C, ME, PS, R, V]

a. Approximate sums and differences of decimals using estimation strategies.
b. Solve problems, including money problems, which involve addition and subtraction of decimals, limited to hundredths.
c. Determine the approximate solution of a problem not requiring an exact answer.
d. Estimate a sum or difference using compatible numbers.
e. Count back change for a purchase.
f. Explain the strategies used to determine a sum or difference.
g. Represent a sum or difference of two decimals concretely or pictorially, and record the solution to the sum or difference symbolically.

Outcome: P4.1

Demonstrate an understanding of patterns and relations by:

- **identifying and describing patterns and relations in a chart, table or diagram**
- **reproducing patterns and relations in a chart, table, or diagram using manipulatives**
- **creating charts, tables, or diagrams to represent patterns and relations**
- **solving problems involving patterns and relations**

[C, CN, PS, R]

a. Identify and describe a variety of patterns in a multiplication chart.
b. Determine the missing element(s) in a table or chart and explain the strategies used.
c. Identify and correct error(s) in a table or chart.
d. Describe the pattern found in a table or chart.
e. Create a concrete representation of a pattern displayed in a table or chart.
f. Explain why the same relationships exist within a pattern in a table and its concrete representation.
g. Extend patterns found in a table or chart to solve a problem.
h. Translate the information provided in a problem into a table or chart.
i. Identify and extend the patterns in a table or chart to solve a problem.
j. Solve a problem by completing a Carroll diagram using given data.
k. Determine where new data belong in a Carroll diagram.
l. Identify the sorting rule for a Venn diagram.
m. Describe the relationship shown in a given Venn diagram when the circles intersect, when one circle is contained in the other, and when the circles are separate.
n. Determine where new data belong in a Venn diagram.
o. Solve a problem by using a chart or diagram to identify mathematical relationships.

Outcome: P4.2

Demonstrate an understanding of equations involving symbols to represent an unknown value by:

- **writing an equation to represent a problem**
- **solving one step equations.**

[C, ME, PS, R]

a. Explain the purpose of the symbol, such as a triangle or circle, in an addition, subtraction, multiplication, or division equation with one unknown (e.g. 36 ÷ = 6).
b. Write an equation in symbolic form for a given pictorial or concrete representation.
c. Identify the unknown in a story problem, represent the problem with an equation, and solve the problem concretely, pictorially, or symbolically.
d. Create a problem in context for an equation with one unknown.
e. Solve a one-step equation using manipulatives.
f. Solve a one-step equation using guess and test.
g. Explain what is meant by "one-step equation with one unknown".
h. Represent and solve an addition or subtraction problem involving a "part-part-whole" or comparison context using a symbol to represent the unknown.
i. Represent and solve a multiplication or division problem involving equal grouping or partitioning (equal sharing) using a symbol to represent the unknown.

Outcome: SS4.1
Demonstrate an understanding of time by:
- **reading and recording time using digital and analog clocks (including 24 hour clocks)**
- **reading and recording calendar dates in a variety of formats.**

[C, CN, V]
a. State the number of hours in a day.
b. Express the time orally and numerically shown on a 12-hour analog clock.
c. Express the time orally and numerically shown on a 24-hour analog clock.
d. Express the time orally shown on a 12-hour digital clock.
e. Express time orally shown on a 24-hour digital clock.
f. Express time orally as "minutes to" or "minutes after" the hour.
g. Explain the meaning of AM and PM, and provide an example of an activity that occurs during the AM and another that occurs during the PM.
h. Write dates in a variety of formats (e.g., yyyy/mm/dd; dd/mm/yyyy; March 21, 2006; dd/mm/yy).
i. Relate dates written in the format yyyy/mm/dd to dates on a calendar.
j. Identify possible interpretations of a date (e.g., 06/03/04).

Outcome: SS4.2
Demonstrate an understanding of area of regular and irregular 2-D shapes by:
- **recognizing that area is measured in square units**
- **selecting and justifying referents for the units cm^2 or m^2**
- **estimating area by using referents for cm^2 or m^2**
- **determining and recording area (cm^2 or m^2)**
- **constructing different rectangles for a given area (cm^2 or m^2) in order to demonstrate that many different rectangles may have the same area.**

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

a. Describe area as the measure of surface recorded in square units.
b. Identify and explain why the square is a most efficient unit for measuring area.
c. Provide a referent for a square centimetre and explain the choice.
d. Provide a referent for a square metre and explain the choice.
e. Determine which standard square unit is represented by a referent.
f. Estimate the area of a 2-D shape using personal referents.
g. Determine the area of a regular 2-D shape and explain the strategy used.
h. Determine the area of an irregular 2-D shape and explain the strategy used.
i. Construct a rectangle with a given area.
j. Illustrate, and verify, how more than one rectangle is possible for a given area by drawing at least two different rectangles with that area (e.g., identifying the dimensions of each rectangle drawn, or superimpose the rectangles on each other).

Outcome: SS4.3
Demonstrate an understanding of rectangular and triangular prisms by:
- **identifying common attributes**
- **comparing**
- **constructing models.**

[C, CN, R, V]
a. Identify and name common attributes of rectangular prisms from sets of rectangular prisms.
b. Identify and name common attributes of triangular prisms from sets of triangular prisms.
c. Sort a set of rectangular and triangular prisms using the shape of the base.
d. Identify examples of rectangular and triangular prisms found in the environment.
e. Construct and describe a model of rectangular and triangular prisms.
f. Construct rectangular prisms from their nets.
g. Construct triangular prisms from their nets.
h. Construct nets for rectangular or triangular prisms.

Outcome: SS4.4
Demonstrate an understanding of line symmetry by:
- **identifying symmetrical 2-D shapes**
- **creating symmetrical 2-D shapes**
- **drawing one or more lines of symmetry in a 2-D shape.**

[C, CN, V]
a. Identify the characteristics of given symmetrical and non-symmetrical 2-D shapes.

b. Sort a set of 2-D shapes as symmetrical and non-symmetrical.
c. Complete a symmetrical 2-D shape given half the shape and its line of symmetry.
d. Explain how symmetry and fractions are related.
e. Identify lines of symmetry in a set of 2-D shapes and explain why each shape is symmetrical.
f. Determine whether or not a given 2-D shape is symmetrical by using a Mira or by folding and superimposing.
g. Create a symmetrical shape with and without manipulatives.
h. Provide examples of symmetrical shapes found in the environment and identify the line(s) of symmetry.
i. Sort a given set of 2-D shapes as those that have no lines of symmetry, one line of symmetry, or more than one line of symmetry. **Outcome: SS4.4**

Outcome: SP4.1
Demonstrate an understanding of many-to-one correspondence by:

- **comparing correspondences on graphs**
- **justifying the use of many-to-one correspondences**
- **interpreting data shown using a many-to-one correspondence**
- **creating bar graphs and pictographs using many-to-one correspondence.**

[C, R, T, V]

a. Compare graphs in which different correspondences are used and explain why the correspondence may have been used.
b. Compare graphs in which the same data have been displayed using a one-to-one and a many-to-one correspondence, and explain how they are the same and different.
c. Explain why a many-to-one correspondence is sometimes used rather than a one-to-one correspondence.
d. Find examples of graphs in which a many-to-one correspondence is used in print and electronic media, such as newspapers, magazines, and the Internet, and describe the correspondence used.
e. Select many-to-one correspondence for displaying a set of data in a graph and justify the choice.
f. Create and label (with categories, title, and legend) a pictograph to display a set of data using a many-to-one correspondence, and justify the choice of correspondence used.
g. Create and label (with axes and title) a bar graph to display a set of data using a many-to-one correspondence, and justify the choice of correspondence used.
h. Answer a question using a graph in which data are displayed using a many-to-one correspondence.

Grade 5

Outcome: N5.1
Represent, compare, and describe whole numbers to 1 000 000 within the contexts of place value and the base ten system, and quantity. [C, CN, R, T, V]

a. Write and say the numeral for a quantity using proper spacing without commas and without the word "and" (e.g., 934 567, nine hundred thirty-four thousand five hundred sixty-seven).
b. Critique the way numbers have been said or numerals written in examples of whole numbers found in various types of media and personal conversations, and provide reasons for why certain errors in speech or writing might occur.
c. Describe the patterns related to quantity and place value of adjacent digit positions moving from right to left within a whole number.
d. Visualize and explain concrete or pictorial models for the place value positions of 100 000 and 1 000 000.
e. Describe the meaning of quantities to 1 000 000 by relating them to self, family, or community and explain the contribution each successive numeral position makes to the actual quantity.
f. Pose and solve problems that explore the quantity of whole numbers to 1 000 000 (e.g., a student might wonder: "How does the population of my community compare to those of surrounding communities?").
g. Provide examples of large numbers used in print or electronic media and explain the meaning of the numbers in the context used.
h. Visualize a representation of a given numeral and explain how the representation is related to the numeral's expanded form.
i. Express a given numeral in expanded notation (e.g., 45 321 = (4 x 10 000) + (5 x 1000) + (3 x 100) + (2 x 10) + (1 x 1) or 40 000 + 5000 + 300 + 20 + 1) and explain how the expanded notation shows the total quantity represented by the given numeral.
j. Compare and order examples of whole numbers found in various types of media and print.

Outcome: N5.2
Analyze models of, develop strategies for, and carry out multiplication of whole numbers. [C, CN, ME, PS, R, V]

a. Describe mental mathematics strategies used to determine multiplication facts to 81 (e.g., skip counting from a known fact, doubling, halving, 9s patterns, repeated doubling, or repeated halving).
b. Explain concretely, pictorially, or orally why multiplying by zero produces a product of zero.
c. Recall multiplication facts to 81 including within problem solving and calculations of larger products.
d. Generalize and apply strategies for multiplying two whole numbers when one factor is a multiple of 10, 100, or 1000.
e. Generalize and apply halving and doubling strategies to determine a product involving at least one two-digit factor.
f. Apply and explain the use of the distributive property to determine a product involving multiplying factors that are close to multiples of 10.
g. Model multiplying two 2-digit factors using an array, base ten blocks, or an area model, record the process symbolically, and describe the connections between the models and the symbolic recording.
h. Pose a problem which requires the multiplication of 2-digit numbers and explain the strategies used to multiply the numbers.
i. Illustrate, concretely, pictorially, and symbolically, the distributive property using expanded notation and partial products (e.g., 36 x 42 = (30 +6) x (40+2) = 30 x 40 + 6 x 40 +30 x 2 + 6 x 2).
j. Explain and justify strategies used when multiplying 2-digit numbers symbolically.

Outcome: N5.3
Demonstrate, with and without concrete materials, an understanding of division (3-digit by 1-digit) and interpret remainders to solve problems. [C, CN, PS, R]

a. Identify situations in one's life, family, or community in which division might be used and explain the reasoning.
b. Model the division process as equal sharing or equal grouping using various models and record the resulting process symbolically.

c. Explain concretely, pictorially, or orally why division by zero is not possible or undefined (e.g., 8 ÷ 0 is undefined or not possible to determine).
d. Generalize, relate, and apply concrete, pictorial, and symbolic strategies for dividing 3-digit whole numbers by 1-digit whole numbers.
e. Justify the choice of what to do with a remainder for a quotient depending upon the situation:
   - disregard the remainder (e.g., dividing 22 books among 4 students)
   - round up the quotient (e.g., the number of five passenger cars required to transport 13 people)
   - express remainders as fractions (e.g., five apples shared by two people)
   - express remainders as decimals (e.g., measurement and money).
f. Solve a division problem that is relevant to self, family, or community using personal strategies and record the process symbolically.
g. Recall the division facts to a dividend of 81 including in problem-solving situations.

Outcome: N5.4

Develop and apply personal strategies for estimation and computation including:

- **front-end rounding**
- **compensation**
- **compatible numbers.**

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

a. Describe a situation relevant to self, family, or community for when estimation is used to:
   - make predictions
   - check reasonableness of an answer
   - determine approximate answers.
b. Develop and use strategies to estimate the results of whole-number computations and to judge the reasonableness of such results.
c. Critique the statement "an estimate is never good enough".
d. Identify and describe situations relevant to self, family, or community when it is best to overestimate or when it is best to underestimate and explain the reasoning.
e. Determine an approximate solution to a problem not requiring an exact answer and explain the strategies and reasoning used (e.g., number of fish, deer, or elk required to feed a family over a winter; amount of money a family spends on groceries).
f. Explain estimation and computation strategies, including compatible numbers, compensation, and front-end rounding, and how each strategy relates to different operations.
g. Identify if a strategy used in solving a problem involved estimation or computation.
h. Apply and explain the choice of estimation or computation strategy such as compatible numbers, compensation, and front-end rounding.

Outcome: N5.5

Demonstrate an understanding of fractions by using concrete and pictorial representations to:

- **create sets of equivalent fractions**
- **compare fractions with like and unlike denominators.**

[C, CN, PS, R, V]

a. Create concrete, pictorial, or physical models of equivalent fractions and explain why the fractions are equivalent.
b. Model and explain how equivalent fractions represent the same quantity
c. Verify whether or not two given fractions are equivalent using concrete materials, pictorial representations, or symbolic manipulation.
d. Generalize and verify a symbolic strategy for developing a set of equivalent fractions.
e. Determine equivalent fractions for a fraction found in a situation relevant to self, family, or community.
f. Explain how to use equivalent fractions to compare two given fractions with unlike denominators.
g. Position a set of fractions, with like and unlike denominators, on a number line and explain strategies used to determine the order.
h. Justify the statement, "If two fractions have a numerator of 1, the larger of the two fractions is the one with the smaller denominator".

Outcome: N5.6

Demonstrate understanding of decimals to thousandths by:

- **describing and representing**
- **relating to fractions**
- **comparing and ordering.**

[C, CN, R, V]

a. Tell a story (orally, in writing, or through movement) that explains what a concrete or pictorial representation of a part of a set, part of a region, or part of a unit of measure illustrates and record the quantity as a decimal.
b. Represent concretely or pictorially a decimal identified in a situation relevant to self, family, or community.
c. Recognize and generate equivalent forms (decimal or fraction) of fractions and decimals found in situations relevant to one's life, family, or community.
d. Demonstrate, using concrete or pictorial models to explain, how a quantity in tenths or hundredths can also be recorded as hundredths or thousandths (e.g., 0.2 can be written as 0.200).
e. Describe the quantity represented by each digit in a given decimal.
f. Make and test conjectures about the relationship of equality of quantities written in decimal and fractional form (e.g., 0.7 and 7/10) and verify concretely, pictorially, or logically.
g. Use and explain personal strategies for writing decimals as fractions.
h. Use and explain personal strategies for writing fractions with a denominator of 10, 100, or 1000 as a decimal.
i. Explain, by providing examples, how to write decimals as a fraction with a denominator of 10, 100, or 1000.
j. Identify benchmarks on a number line that could be used to order a given set of decimals and explain the choices made.
k. Use benchmarks to order a set of decimals from a situation related to one's life, family, or community.

Outcome: N5.7

Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths). [C, CN, PS, R, V]

a. Identify and describe situations relevant to one's life, family, or community experiences in which sums and differences of decimals might be determined.
b. Use personal strategies to predict sums and differences of decimals and evaluate the effectiveness of the strategies.

c. Create concrete or pictorial models to represent the determination of the sum or difference of two decimal numbers, explain the model, and record the process symbolically.
d. Explain how estimation can be used to determine the position of the decimal point in a sum or difference.
e. Identify and correct errors in the calculation of sums and differences of decimals and explain the reasoning.
f. Explain how understanding place value is necessary in calculating sums and differences of decimals.
g. Solve a given problem that involves addition and subtraction of decimals and explain the strategies used.

Outcome: P5.1

Represent, analyse, and apply patterns using mathematical language and notation. [C, CN, PS, R, V]

a. Describe situations from one's life, family, or community in which patterns emerge, identify assumptions made in extending the patterns, and analyze the usefulness of the pattern for making predictions.
b. Describe, using mathematics language (e.g., one more, seven less) and symbolically (e.g., r + 1, p – 7), a pattern represented concretely or pictorially that is found in a chart.
c. Create alternate representations, including concrete or pictorial models, charts, and mathematical expressions, for a given pattern (numeric or geometric).
d. Predict subsequent elements (terms or values) in a pattern (with and without concrete materials or pictorial representations) and explain the reasoning including the assumptions being made.
e. Verify whether or not a particular number belongs to a given pattern.
f. Solve problems and make decisions based upon the mathematical analysis of a pattern and other contributing factors.

Outcome: P5.2

Write, solve, and verify solutions of single-variable, one-step equations with whole number coefficients and whole number solutions. [C, CN, PS, R]

a. Identify aspects of experiences from one's life, family, and community that could be represented by a variable (e.g., temperature, cost of a DVD, size of a plant, colour of shirts, or performance of a team goalie).
b. Describe a situation for which a given equation could apply and identify what the variable represents in the situation.
c. Solve single-variable equations with the variable on either side of the equation, explain the strategies used, and verify the solution.

Outcome: SS5.1

Design and construct different rectangles given either perimeter or area, or both (whole numbers), and draw conclusions. [C, CN, PS, V]

a. Construct (concretely or pictorially) and record the dimensions of two or more rectangles with a specified perimeter and select, with justification, the dimensions that would be most appropriate in a particular situation (e.g., a rectangle is to have a perimeter of 18 units, what are the dimensions of the possible rectangles, which rectangle would be most appropriate if the rectangle is to be the base of a shoe box or a dog pen).
b. Critique the statement "A rectangle with dimensions of 1 cm by 8 cm is different from a rectangle with dimensions of 8 cm by 1 cm". (Note: Any dimensions could be used to demonstrate the idea of orientation and point of view.)
c. Construct (concretely or pictorially) and record the dimensions of as many rectangles as possible with a specified area and select, with justification, the rectangle that would be most appropriate in a particular situation (e.g., a rectangle is to have an area of 24 units^2, what are the dimensions of the possible rectangles, which rectangle would be most appropriate if the rectangle is to fence off the largest garden possible or be the base of a box on a shelf that is 10 units by 8 units).
d. Critique the statement: "A rectangle with dimensions of 3 cm by 4 cm is different from a rectangle with dimensions of 2 cm by 5 cm". (Note: Any dimensions with the same perimeter could be used to demonstrate the idea of same perimeter not necessarily resulting in the same area or shape of the rectangle).
e. Generalize patterns discovered through the exploration of the areas of rectangles with the same perimeter and through the exploration of the perimeters of rectangles with the same area (e.g., greater areas do not imply greater perimeters and vice versa, the rectangle for a situation closest to a square will have the greatest area, or the rectangle with the smallest width for a given perimeter will have the smallest area).
f. Identify situations relevant to self, family, or community where the solution to problems would require the consideration of both area and perimeter, and solve the problems.

Outcome: SS5.2

Demonstrate understanding of measuring length (mm) by:

- **selecting and justifying referents for the unit mm**
- **modelling and describing the relationship between mm, cm, and m units.**

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

a. Choose and use referents for 1 mm to determine approximate linear measurements in situations relevant to self, family, or community and explain the choice.
b. Generalize measurement relationships between mm, cm, and m from explorations using concrete materials (e.g., 10 mm = 1 cm, 0.01m = 1 cm).
c. Provide examples of situations relevant to one's life, family, or community in which linear measurements would be made and identify the standard unit (mm, cm, or m) that would be used for that measurement and justify the choice.
d. Draw, construct, or physically act out a representation of a given linear measurement (e.g., the students might be asked to show 4 m; this could be done by drawing a straight line on the board that is 4 m in length, constructing a box (or different boxes) that has a base with a perimeter of 4 m, or carrying out a physical movement that results in moving 4 m).
e. Pose and solve problems that involve hands-on linear measurements using either referents or standard units

Outcome: SS5.3

Demonstrate an understanding of volume by:

- **selecting and justifying referents for cm^3 or m^3 units**
- **estimating volume by using referents for cm^3 or m^3**
- **measuring and recording volume (cm^3 or m^3)**
- **constructing rectangular prisms for a given volume.**

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

a. Provide referents for cm^3 and m^3 and explain the choice.

b. Describe strategies developed for selecting and using referents to determine approximate volume measurements in situations relevant to self, family, or community.
c. Estimate the volume of 3-D objects using personal referents.
d. Decide what standard cubic unit is represented by a specific referent, and verify.
e. Determine the volume of a 3-D object using manipulatives, describe the strategy used, and explain whether the volume is exact or an estimate.
f. Construct possible rectangular prisms for a given volume, identify the dimensions of each prism, and explain which prism would be most appropriate for a particular situation.

Outcome: SS5.4
Demonstrate understanding of capacity by:

- **describing the relationship between mL and L**
- **selecting and justifying referents for mL or L units**
- **estimating capacity by using referents for mL or L**
- **measuring and recording capacity (mL or L).**

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

a. Show, using concrete materials, that 1000 mL has the same capacity as 1 L.
b. Provide referents for 1 millilitre and 1 litre and explain the choice.
c. Describe strategies for selecting and using referents to determine approximate capacity measurements in situations relevant to self, family, or community.
d. Decide what standard capacity unit is represented by a specific referent, and verify.
e. Estimate the capacity of a container using personal referents.
f. Determine the capacity of a container using concrete materials that closely take on the shape of the container, describe the strategy used, and explain whether the volume is exact or an estimate (e.g., if beads are used, discuss the impact on accuracy because of the space between the beads compared to the accuracy if water is used).
g. Sort a set of containers from least to greatest capacity, explain the strategies used, and verify by determining or estimating the capacity.

Outcome: SS5.5
Describe and provide examples of edges and faces of 3-D objects, and sides of 2-D shapes that are:

- **parallel**
- **intersecting**
- **perpendicular**
- **vertical**
- **horizontal.**

[C, CN, R, T, V]

a. Identify and describe examples of parallel, intersection, perpendicular, vertical, and horizontal lines, edges, and faces of 2-D shapes and 3-D objects found within one's home, school, and community (including 2-D shapes and 3-D objects in the natural environment, print and multimedia texts).
b. Sketch a 2-D shape or 3-D object that is relevant to self, family, or others and identify any lines, edges, or faces that are parallel, intersecting, perpendicular, vertical, or horizontal.
c. Describe, orally, in writing, or through physical movement, what it means for a line, edge, or face of a 2-D shape or 3-D object to be parallel, intersecting, perpendicular, vertical, or horizontal.

Outcome: SS5.6
Identify and sort quadrilaterals, including:

- **rectangles**
- **squares**
- **trapezoids**
- **parallelograms**
- **rhombuses**

according to their attributes. [C, R, V]

a. Identify and provide examples for the types of quadrilaterals that are found in one's home, school, and community.
b. Compare different quadrilaterals using concrete materials and pictures, identify common and differing attributes, and sort the quadrilaterals according to one of the attributes (e.g., relationships between side lengths, or number of pairs of parallel sides).
c. Analyze a set of sorted quadrilaterals and determine where a new quadrilateral would belong in the sorted set.
d. Describe, orally or in writing, the attributes of different quadrilaterals including rectangles, squares, trapezoids, parallelograms, and rhombuses.
e. Create a model to illustrate the relationships between different quadrilaterals (e.g., demonstrating that a square is a rectangle and a parallelogram is a trapezoid) including rectangles, squares, trapezoids, parallelograms, and rhombuses.

Outcome: SS5.7
Identify, create, and analyze single transformations of 2-D shapes (with and without the use of technology). [C, CN, R, T, V]

a. Carry out different transformations (translations, rotations, and reflections) concretely, pictorially (with or without the use of technology), or physically and generalize statements regarding the position and orientation of the transformed image based upon the type of transformation.
b. Determine if a given 2-D shape and its transformed image match a set of transformation instructions and explain the conclusion reached.
c. Draw a 2-D shape, translate the shape, and record the translation by describing the direction and magnitude of the movement.
d. Draw a 2-D shape, rotate the shape, and describe the direction of the turn (clockwise or counter clockwise), the fraction of the turn, and the point of rotation.
e. Draw a 2-D shape, reflect the shape, and identify the line of reflection and the distance of the image from the line of reflection.
f. Predict the result of a single transformation of a 2-D shape and verify the prediction.
g. Describe a single transformation that could be used to replicate the given image of a 2-D shape.
h. Identify transformations found within one's home, classroom, or community, describe the type and amount of transformations evident (e.g., translation to the left and up, ¼ of a rotation in a clockwise direction, and reflection about the right side of the shape), and create a concrete or pictorial model of the same set of transformations.

Outcome: SP5.1

Differentiate between first-hand and second-hand data. [C, R, T, V]

a. Provide examples of data relevant to self, family, or community and categorize the data, with explanation, as first-hand or second-hand data.
b. Formulate a question related to self, family, or community which can best be answered using first-hand data, describe how that data could be collected, and answer the question (e.g., "What game will we play at home tonight?" "I can survey everyone at home to find out what games everyone wants to play.").
c. Formulate a question related to self, family, or community, which can best be answered using second-hand data (e.g., "Which has the larger population – my community or my friend's community?"), describe how those data could be collected (I could find the data on the StatsCan website), and answer the question.
d. Find examples of second-hand data in print and electronic media, such as newspapers, magazines, and the Internet, and compare different ways in which the data might be interpreted and used (e.g., statistics about health-related issues, sports data, or votes for favourite websites).

Outcome: SP5.2

Construct and interpret double bar graphs to draw conclusions. [C, PS, R, T, V]

a. Compare the attributes and purposes of double bar graphs and bar graphs based upon situations and data that are meaningful to self, family, or community.
b. Create double bar graphs, without the use of technology, based upon data relevant to one's self, family, or community. Pose questions, and support answers to those questions using the graph and other identified significant factors.
c. Pose and solve problems related to the construction and interpretation of double bar graphs.

Outcome: SP5.3

Describe, compare, predict, and test the likelihood of outcomes in probability situations. [C, CN, PS, R]

a. Describe situations relevant to self, family, or community which involve probabilities and categorize different outcomes for the situations as being impossible, possible, or certain (e.g., it is possible that my little sister will be put to bed by 8:00 tonight or it is impossible that I will have time to watch a movie tonight because I have two hockey games).
b. Design and conduct probability experiments to determine the likelihood of a specific outcome and explain what the results tell about the outcome including whether the outcome is impossible, possible, or certain.
c. Identify all possible outcomes in a probability experiment and classify the outcomes as less likely, equally likely, or more likely to occur and explain the reasoning (e.g., for an upcoming Pow Wow, list the dances that could be done and then classify the likelihood of each of the dances occurring, or of the dances occurring while you are in attendance).
d. Predict how the likelihood of two outcomes in a probability experiment, carry out the experiment, compare the results to the prediction, and identify possible reasons for discrepancies.

Grade 6

Outcome: N6.1

Demonstrate understanding of place value including:

- **greater than one million**
- **less than one thousandth**

with and without technology. [C, CN, R, PS, T]

a. Explain, concretely, pictorially, or orally, how numbers larger than one million found in mass media and other contexts are related to one million by referencing place value and/or extending concrete or pictorial representations.
b. Change the representation of numbers larger than one million given in decimal and word form to place value form (e.g., $1.8 billion would be changed to $1 800 000 000) and vice versa.
c. Explain, concretely, pictorially, or orally, how numbers smaller than one thousandth found in mass media and other contexts are related to one thousandth by referencing place value and/or extending concrete or pictorial representations.
d. Explain how the pattern of the place value system (e.g., the repetition of ones, tens, and hundreds), makes it possible to read and write numerals for numbers of any magnitude.
e. Solve situational questions involving operations on quantities larger than one million or smaller than one thousandth (with the use of technology).
f. Estimate the solution to a situational question, without the use of technology, involving operations on quantities larger than one million or smaller than one thousandth and explain the strategies used to determine the estimate.

Outcome: N6.2

Demonstrate understanding of factors and multiples (concretely, pictorially, and symbolically) including:

- **determining factors and multiples of numbers less than 100**
- **relating factors and multiples to multiplication and division**
- **determining and relating prime and composite numbers.**

[C, CN, ME, PS, R]

a. Determine the whole-numbered dimensions of all rectangular regions with a given whole-numbered area and explain how those dimensions are related to the factors of the whole number.
b. Represent a set of whole-numbered multiples for a given quantity concretely, pictorially, or symbolically and explain the strategy used to create the representation.
c. Explain how skip counting and multiples are related.
d. Explain why 0 and 1 are neither prime nor composite.
e. Analyze a whole number to determine if it is a prime number or composite and explain the reasoning.
f. Determine the prime factors of a whole number and explain the strategy used to determine the factors.
g. Explain how the composite factors of a whole number can be determined from the prime factors of the whole number and vice versa.
h. Solve situational questions involving factors, multiples, and prime factors.
i. Analyze two whole numbers for their common factors.
j. Analyze two whole numbers to determine at least one multiple (greater than both whole numbers) that is common to both.

Outcome: N6.3

Demonstrate understanding of the order of operations on whole numbers (excluding exponents) with and without technology. [CN, ME, PS, T]

a. Explain, with the support of examples, why there is a need to have a standardized order of operations.
b. Verify, by using repeated addition and repeated subtraction for multiplication and division respectively, whether or not the simplification of an expression involving the use of the order of operations is correct.
c. Verify, by using technology, whether or not the simplification of an expression involving the use of the order of operations is correct.
d. Solve situational questions involving multiple operations, with and without the use of technology.
e. Analyze the simplification of multiple operation expressions for errors in the application of the order of operations.

Outcome: N6.4

Extend understanding of multiplication and division to decimals (1-digit whole number multipliers and 1-digit natural number divisors). [C, CN, ME, PS, R]

a. Observe and describe situations in which multiplication and division of decimals would occur.
b. Explain, with justification, where the decimal place should be placed in the solution of a multiplication statement.
c. Explain, with justification, where the decimal place should be placed in the solution of a division statement.
d. Estimate products and quotients involving decimals.
e. Develop a generalization about the impact on overall quantity when multiplied by a decimal number between 0 and 1.
f. Develop a generalization about the impact on overall quantity when a decimal number is divided by a whole number.
g. Solve a given situational question that involves multiplication and division of decimals, using multipliers from 0 to 9 and divisors from 1 to 9.

Outcome: N6.5

Demonstrate understanding of percent (limited to whole numbers to 100) concretely, pictorially, and symbolically. [C, CN, PS, R, V]

a. Observe and describe examples of percents (whole numbered to 100) relevant to self, family, or community, represent the percent concretely or pictorially (possibly physically), and explain what the percent tells about the context in which it is being used.
b. Solve situational questions, and provide justification for possible decisions, using whole-numbered percents to 100.
c. Create and explain representations (concrete, visual, or both) that establish relationships between whole number percents to 100, fractions, and decimals.
d. Write the percent modeled within a concrete or pictorial representation.
e. Explain why 100 is an important number when relating fractions, percents, and decimals.
f. Describe a situation in which 0% or 100% might be stated.

Outcome: N6.6

Demonstrate understanding of integers concretely, pictorially, and symbolically. [C, CN, R, V]

a. Explore and explain the representation and meaning of negative quantities in First Nations and Métis peoples, past and present.
b. Observe and describe examples of integers relevant to self, family, or community and explain the meaning of those quantities within the contexts they are found.
c. Compare two integers and describe their relationship symbolically using <, >, or =.
d. Represent integers concretely, pictorially, or physically.
e. Order a set of integers in increasing or decreasing order and explain the reasoning used.
f. Identify and correct errors in the ordering of integers on a number line.
g. Extend a given number line by adding numbers less than zero and explain the pattern on each side of zero.
h. Explain the role of zero within integers and how it is different from other integers.

Outcome: N6.7

Extend understanding of fractions to improper fractions and mixed numbers. [CN, ME, R, V]

a. Observe and describe situations relevant to self, family, or community in which quantities greater than a whole, but which are not whole numbers, occur and describe those situations using either an improper fraction or a mixed number.
b. Demonstrate, concretely, pictorially, or physically, how an improper fraction and a mixed number can be used to represent the same quantity.
c. Explain, with the use of concrete or visual representations, how to express an improper fraction as a mixed number (and vice versa) and write the resulting equality in symbolic form.
d. Explain the meaning of a given improper fraction or mixed number by setting it into a situation.
e. Place a set of fractions, including whole numbers, mixed numbers, and improper fractions, on a number line and explain strategies used to determine position.
f. Respond to the question “Can quantities less than 1 be represented by a mixed number or improper fraction?”.

Outcome: N6.8

Demonstrate an understanding of ratio concretely, pictorially, and symbolically. [C, CN, PS, R, V]

a. Observe situations relevant to self, family, or community which could be described using a ratio, write the ratio, and explain what the ratio means in that situation.
b. Critique the statement “Ratios and fractions are the same thing”.
c. Create representations of and compare part/whole and part/part ratios (e.g., from a group of 3 boys and 5 girls, compare the representations boys to girls, boys to entire group, and girls to entire group – 3:5, 3:8, and 5:8 respectively).
d. Express a ratio in colon and word form.
e. Describe a situation in which a ratio (given in colon, word, or fractional form) might occur.
f. Solve situational questions involving ratios (e.g., the ratio of students from a Grade 6 class going to a movie this weekend to those not going to a movie is 15:8. How many students are likely in the class and why?)

Outcome: N6.9

Research and present how First Nations and Métis peoples, past and present, envision, represent, and use quantity in their lifestyles and worldviews.

a. Gather and document information regarding the significance and use of quantity for at least one First Nation or Métis peoples from a variety of sources such as Elders and traditional knowledge keepers.

b. Compare the significance, representation, and use of quantity for different First Nations, Métis peoples, and other cultures.
c. Communicate to others concretely, pictorially, orally, visually, physically, and/or in writing, what has been learned about the envisioning, representing, and use of quantity by First Nations and Métis peoples and how these understandings parallel, differ from, and enhance one's own mathematical understandings about numbers

Outcome: P6.1
Extend understanding of patterns and relationships in tables of values and graphs. [C, CN, PS, R]

a. Create and describe a concrete or visual model of a table of values.
b. Create a table of values to represent a concrete or visual pattern.
c. Determine missing values and correct errors found within a table of values and describe the strategy used.
d. Analyze the relationship between consecutive values within each of the columns in a table of values and describe the relationship orally and symbolically.
e. Analyze the relationship between the two columns in a table of values and describe the relationship orally and symbolically.
f. Create a table of values for a given equation.
g. Analyze patterns in a table of values to solve a given situational question.
h. Translate a concrete, visual, or physical pattern into a table of values and a graph (limit graphs to linear relations with discrete elements).
i. Describe how a graph and a table of values are related.
j. Identify errors in the matching of graphs and tables of values and explain the reasoning.
k. Describe, using everyday language (orally or in writing), the relationship shown on a graph (limited to linear relations with discrete elements).
l. Describe a situation that could be represented by a given graph (limited to linear relations with discrete elements).
m. Research a current or past topic of interest relevant to First Nations and Métis peoples and present the data as a table of values or a graph.

Outcome: P6.2
Extend understanding of preservation of equality concretely, pictorially, physically, and symbolically. [C, CN, R]

a. Model, and explain orally, the preservation of equality for addition, subtraction, multiplication, and division concretely (e.g., balances), pictorially, or physically.
b. Create, and record symbolically, equivalent forms of an equation by applying the preservation of equality (of a single operation) and verify the results concretely or pictorially (e.g., $3b = 12$ is the same as $3b + 5 = 12 + 5$ or $2r = 7$ is the same as $3(2r) = 3(7)$).

Outcome: P6.3
Extend understanding of patterns and relationships by using expressions and equations involving variables. [C, CN, R]

a. Analyze patterns arising from the determination of perimeter of rectangles and generalize an equation describing a formula for the perimeter of all rectangles.
b. Analyze patterns arising from the determination of area of rectangles and generalize an equation describing a formula for the area of all rectangles.
c. Describe and represent geometric patterns and relationships relevant to First Nations and Métis peoples and explain how those patterns or relationships could be represented mathematically.
d. Develop and justify equations using letter variables that illustrate the commutative property of addition and multiplication (e.g., $a + b = b + a$ or $a \times b = b \times a$).
e. Generalize an expression that describes the relationship between the two columns in a table of values.
f. Write an equation to represent a table of values.
g. Generalize an expression or equation that describes the rule for a pattern (e.g., the expression $4d$ or the equation $2n + 1 = 8$).
h. Provide examples to explain the difference between an expression and an equation, both in terms of what each looks like and what each means.

Outcome: SS6.1
Demonstrate understanding of angles including:

- **identifying examples classifying angles**
- **estimating the measure**
- **determining angle measures in degrees**
- **drawing angles**
- **applying angle relationships in triangles and quadrilaterals.**

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

a. Observe, and sort by approximate measure, a set of angles relevant to self, family, or community.
b. Explore and present how First Nations and Métis peoples, past and present, measure, represent, and use angles in their lifestyles and worldviews.
c. Describe and apply strategies for sketching angles including 0°, 22.5°, 30°, 45°, 60°, 90°, 180°, 270°, and 360°.
d. Identify referents for angles of 45°, 90°, and 180° and use the referents to approximate the measure of other angles and to classify the angles as acute, obtuse, straight, or reflex.
e. Explain the relationship between 0° and 360°.
f. Describe how measuring an angle is different from measuring a length.
g. Measure angles in different orientations using a protractor.
h. Describe and provide examples for different uses of angles, such as the amount of rotation or as the angle of opening between two sides of a polygon.
i. Generalize a relationship for the sum of the measures of the angles in any triangle.
j. Generalize a relationship for the sum of the measures of the angles in any quadrilateral.
k. Provide a visual, concrete, and/or oral informal proof for the sum of the measures of the angles in a quadrilateral being 360° (assuming that the sum of the measures of the angles in a triangle is 180°).
l. Solve situational questions involving angles in triangles and quadrilaterals.

Outcome: SS6.2
Extend and apply understanding of perimeter of polygons, area of rectangles, and volume of right rectangular prisms (concretely, pictorially, and symbolically) including:

- **relating area to volume**
- **comparing perimeter and area**

- **comparing area and volume**
- **generalizing strategies and formulae**
- **analyzing the effect of orientation**
- **solving situational questions.**

[CN, PS, R, V]

a. Generalize formulae and strategies for determining the perimeter of polygons, including rectangles and squares.
b. Generalize a formula for determining the area of rectangles.
c. Explain, using models, the relationship between the area of the base of a right rectangular prism and the volume of the same 3-D object.
d. Generalize a rule (formula) for determining the volume of right rectangular prisms.
e. Analyze the effect of orientation on the perimeter of polygons, area of rectangles, and volume of right rectangular prisms.
f. Solve a situational question involving the perimeter of polygons, the area of rectangles, and/or the volume of right rectangular prisms.
g. Critique the following statements using concrete or pictorial models:
    - "For any two right rectangular prisms, the one with the greater volume will be the prism that has the greatest base area".
    - "For any two rectangles, the rectangle with the greatest perimeter will also have the greatest area".

Outcome: SS6.3

Demonstrate understanding of regular and irregular polygons including:

- **classifying types of triangles**
- **comparing side lengths**
- **comparing angle measures**
- **differentiating between regular and irregular polygons**
- **analyzing for congruence.**

[C, CN, R, V]

a. Observe examples of polygons, including triangles, found in situations relevant to self, family, or community and sort the polygons into irregular and regular polygons.
b. Analyze the types of triangles (scalene, isosceles, equilateral, right, obtuse, and acute) to determine which, if any, represent regular polygons.
c. Compare two regular polygons (using superimposing or measuring) to determine whether or not the two polygons are congruent.
d. Analyze a set of regular polygons and a set of irregular polygons to identify the characteristics of regular polygons.
e. Critique the following statement: "When viewed from different perspectives, the same triangle can be classified in different ways."
f. Draw and classify examples of different types of triangles (scalene, isosceles, equilateral, right, obtuse, and acute) and explain the reasoning.
g. Replicate a polygon in a different orientation and informally prove that the new polygon is congruent and explain the reasoning.

Outcome: SS6.4

Demonstrate understanding of the first quadrant of the Cartesian plane and ordered pairs with whole number coordinates. [C,CN, V]

a. Explain why the axes of the Cartesian plane should be labelled.
b. Plot a point in the first quadrant of the Cartesian plane given its ordered pair.
c. Analyze the coordinates of the ordered pairs of points that lie on the horizontal axis and generalize a strategy for identifying the ordered pairs of points on the horizontal axis without plotting them.
d. Analyze the coordinates of the ordered pairs of points that lie on the vertical axis and generalize a strategy for identifying the ordered pairs of points on the vertical axis without plotting them.
e. Explain how to plot points on the Cartesian plane given the scale to be used on the axes (by 1, 2, 5, or 10).
f. Create a design in the first quadrant of the Cartesian plane, identify the coordinates of points on the design, and write or record orally directions for recreating the design.
g. Generalize and apply strategies for determining the distance between pairs of points on the same horizontal or vertical line.

Outcome: SS6.5

Demonstrate understanding of single, and combinations of, transformations of 2-D shapes (with and without the use of technology) including:

- **identifying**
- **describing**
- **performing.**

[C, CN, R, T, V]

a. Observe and classify different transformations found in situations relevant to self, family, or community.
b. Model the translation, rotation, or reflection of 2-D shapes.
c. Analyze 2-D shapes and their respective transformations to determine if the original shapes and their transformed images are congruent.
d. Determine the resulting image of applying a series of transformations upon a 2-D shape.
e. Describe a set of transformations, that when applied to a given 2-D shape, would result in a given image.
f. Verify whether or not a given set of transformations would transform a given 2-D shape into a given image.
g. Identify designs within situations relevant to self, family, or community that could be described in terms of transformations of one or more 2-D shapes.
h. Analyze a given design created by transforming one or more 2-D shapes, and identify the original shape(s) and the transformations used to create the design.
i. Create a design using the transformation of two or more 2-D shapes and write, or record orally, instructions that could be followed to reproduce the design.
j. Describe the creation and use of single and multiple transformations in First Nations and Métis lifestyles (e.g., birch bark biting).
k. Identify the coordinates of the vertices of a given 2-D shape (limited to the first quadrant of the Cartesian plane).
l. Perform a transformation on a given 2-D shape and identify the coordinates of the vertices of the image (limited to the first quadrant).
m. Describe a transformation of a 2-D shape shown in the first quadrant of the Cartesian plane that would result in the image of the 2-D shape also being in the first quadrant.

Outcome: SP6.1

Extend understanding of data analysis to include:

- **line graphs**
- **graphs of discrete data**
- **data collection through questionnaires, experiments, databases, and electronic media**
- **interpolation and extrapolation.**

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

a. Explain the importance of accurate labelling of line graphs.
b. Determine whether a set of data should be represented by a line graph (continuous data) or a series of points (discrete data) and explain why.
c. Describe patterns seen in a given line graph or a graph of discrete data points, and describe a situation that the graph might represent.
d. Construct a graph (line graph or a graph of discrete data points) to represent data given in a table for a particular situation.
e. Interpret (through interpolation and extrapolation) the line graph or graphs of discrete data points for a situation to make decisions or solve problems.
f. Observe and describe situations relevant to self, family, or community in which data might be collected through questionnaires, experiments, databases, or electronic media.
g. Select a method for collecting data to answer a given question and justify the choice.
h. Answer a self-generated question by performing an experiment, recording the results, graphing the data, and drawing a conclusion.
i. Answer a self-generated question using databases or electronic media to collect data, then graphing and interpreting the data to draw a conclusion.
j. Justify the selection of a type of graph for a set of data collected through questionnaires, experiments, databases, or electronic media.

Outcome: SP6.2

Demonstrate understanding of probability by:

- **determining sample space**
- **differentiating between experimental and theoretical probability**
- **determining the theoretical probability**
- **determining the experimental probability**
- **comparing experimental and theoretical probabilities.**

[C, PS, R, T]

a. Observe situations relevant to self, family, or community where probabilities are stated and/or used to make decisions.
b. List the sample space (possible outcomes) for an event (such as the tossing of a coin, rolling of a die with 10 sides, spinning a spinner with five sections, random selection of a classmate for a special activity, or guessing a hidden quantity) and explain the reasoning.
c. Explain what a probability of 0 for a specific outcome means by providing an example.
d. Explain what a probability of 1 for a specific outcome means by providing an example.
e. Explore and describe examples of the use and importance of probability in traditional and modern games of First Nations and Métis peoples.
f. Predict the likelihood of a specific outcome occurring in a probability experiment by determining the theoretical probability for the outcome and explain the reasoning.
g. Compare the results of a probability experiment to the expected theoretical probabilities.
h. Explain how theoretical and experimental probabilities are related.
i. Critique the statement: “You can determine the sample space for an event by carrying out an experiment.”

Grade 7

Outcome: N7.1

Demonstrate an understanding of division through the development and application of divisibility strategies for 2, 3, 4, 5, 6, 8, 9, and 10, and through an analysis of division involving zero. [C, CN, ME, R]

a. Investigate division by 2, 3, 4, 5, 6, 8, 9, or 10 and generalize strategies for determining divisibility by those numbers.
b. Apply strategies for determining divisibility to sort a set of numbers in Venn or Carroll diagrams.
c. Determine or validate the factors of a number by applying strategies for divisibility.
d. Explain the result of dividing a quantity of zero by a non-zero quantity.
e. Explain (by generalizing patterns, analogies, and mathematical reasoning) why division of non-zero quantities by zero is not defined.

Outcome: N7.2

Expand and demonstrate understanding of the addition, subtraction, multiplication, and division of decimals to greater numbers of decimal places, and the order of operations. [C, CN, ME, PS, R, T]

a. Provide a justification for the placement of a decimal in a sum or difference of decimals up to thousandths (e.g., for 4.5 + 0.73 + 256.458, think 4 + 256 so the sum is greater than 260; thus, the decimal will be placed so that the sum is in the hundreds).
b. Provide a justification for the placement of a decimal in a product (e.g., for $12.33 × 2.4, think $12 × 2, so the product is greater than $24; thus, the decimal in the final product would be placed so that the answer is in the tens).
c. Provide a justification for the placement of a decimal in a quotient (e.g., for 51.50 m ÷ 2.1, think 50 m ÷ 2 so the quotient is approximately 25 m; thus, the final answer will be in the tens). (Note: If the divisor has more than one digit, students should be allowed to use technology to determine the final answer.)
d. Solve a problem involving the addition, or subtraction, of two or more decimal numbers.
e. Solve a problem involving the multiplication or division of decimal numbers with 2-digit multipliers or 1-digit divisors (whole numbers or decimals) without the use of technology.
f. Solve a problem involving the multiplication or division of decimal numbers with more than a 2-digit multiplier or 1-digit divisor (whole number or decimal), with the use of technology.
g. Check the reasonableness of solutions using estimation.
h. Solve a problem that involves operations on decimals (limited to thousandths) taking into consideration the order of operations.
i. Explain by using examples why it is important to follow a specific order of operations when calculating with decimals and/or whole numbers.

Outcome: N7.3

Demonstrate an understanding of the relationships between positive decimals, positive fractions (including mixed numbers, proper fractions and improper fractions), and whole numbers. [C, CN, ME, R, T]

a. Predict the decimal representation of a fraction based upon patterns and justify the reasoning (e.g., knowing the decimal equivalent of 1/8 and 2/8, predict and verify the decimal representation of 7/8).
b. Match a set of fractions to their decimal representations.
c. Sort a set of fractions into repeating or terminating decimals.
d. Explain and demonstrate how any terminating decimal can also be written as a repeating decimal.
e. Express a fraction as a terminating or repeating decimal.
f. Express a repeating decimal as a fraction.
g. Express a terminating decimal as a fraction.
h. Explain the relationship between fractions, decimals, and division.
i. Provide an example where the decimal representation of a fraction is an approximation of its exact value.
j. Order a set of numbers containing decimals, fractions, and/or whole numbers in ascending or descending orders and justify the order determined.
k. Identify, with justification, a number that would be between two given numbers (decimal, fraction, and/or whole numbers) in an ordered sequence or shown on a number line.
l. Identify incorrectly placed numbers within an ordered sequence or shown on a number line.
m. Order the numbers in a set of numbers by using benchmarks on a number line such as 0, ½ , and 1.

Outcome: N7.4

Expand and demonstrate an understanding of percent to include fractional percents between 1% and 100%. [C, PS, R]

a. Create a representation (concrete, pictorial, physical or oral) of a fractional percent between 1% and 100%.
b. Express a percent as a decimal or fraction.
c. Solve a problem that involves finding a percent.
d. Solve a problem that involves finding percents of a value.
e. Determine the answer to a percent problem where the answer requires rounding and explain why an approximate answer is needed, e.g., total cost including taxes.
f. Explain the meaning of a percent given in a particular context.
g. Make and justify decisions, or suggest courses of action based upon known percents for the situation.

Outcome: N7.5

Develop and demonstrate an understanding of adding and subtracting positive fractions and mixed numbers, with like and unlike denominators, concretely, pictorially, and symbolically (limited to positive sums and differences). [C, CN, ME, PS, R, V]

a. Estimate the sum or difference of positive fractions and/or mixed numbers and explain the reasoning.
b. Model addition and subtraction of positive fractions and/or mixed numbers using concrete or visual representations, and record the process used symbolically.
c. Determine the sum or difference of two positive fractions or mixed numbers with like denominators and explain the strategy used.
d. Explain how common denominators for fractions and/or mixed numbers and factors are related.
e. Explain how a common denominator can help when adding fractions and/or mixed numbers.
f. Determine the sum or difference of two positive fractions or mixed numbers with unlike denominators and explain the strategy used.
g. Simplify a positive fraction or mixed number by identifying and dividing off the common factor between the numerator and denominator.
h. Generalize and explain personal strategies for determining the sum or difference of positive fractions and/or mixed numbers.
i. Solve a problem involving the addition or subtraction of positive fractions or mixed numbers.
j. Explain how the sum or difference of positive fractions and/or mixed numbers can be represented symbolically in different ways.

Outcome: N7.6

Demonstrate an understanding of addition and subtraction of integers, concretely, pictorially, and symbolically. [C, CN, PS, R, V]

a. Represent opposite integers concretely, pictorially, and symbolically and explain why they are called opposite integers.
b. Explain, using concrete materials such as integer tiles and diagrams, that the sum of opposite integers is zero (e.g., a move in one direction followed by an equivalent move in the opposite direction results in no net change in position).
c. Illustrate, using a number line, the results of adding or subtracting negative and positive integers.
d. Add two integers using concrete materials or pictorial representations and record the process symbolically.
e. Subtract two integers using concrete materials or pictorial representations and record the process symbolically.
f. Investigate patterns in adding and subtracting integers to generalize personal strategies for adding and subtracting integers.
g. Solve problems involving the addition and subtraction of integers.

Outcome: P7.1

Demonstrate an understanding of the relationships between oral and written patterns, graphs and linear relations. [C, CN, R]

a. Represent a relationship found within an oral or written pattern using a linear relation.
b. Analyse whether an oral or written pattern is linear in nature.
c. Provide a context for a linear relation.
d. Identify a pattern from the environment that is linear in nature and write a linear relation to describe the pattern.
e. Identify assumptions made when writing a linear relation for a pattern.
f. Create a table of values for a linear relation by evaluating the relation for different variable values.
g. Create a table of values using a linear relation and graph the table of values (limited to discrete points).
h. Sketch the graph from a table of values created for a linear relation and describe the patterns found in the graph.
i. Describe the relationship shown on a graph using everyday language in spoken or written form.
j. Analyze a graph in order to draw a conclusion or solve a problem.
k. Match a set of linear relations to a set of graphs and explain the strategies used.
l. Match a set of graphs to a set of linear relations and justify the selections made.
m. Describe a situation which could result in a graph similar to one that is shown.

Outcome: P7.2

Demonstrate an understanding of equations and expressions by:

- **distinguishing between equations and expressions**
- **evaluating expressions**
- **verifying solutions to equations.**

[C, CN, ME]

a. Explain what a variable is and how it is used in an expression.
b. Provide an example of an expression and an equation, and explain how they are similar and different.
c. Explain how to evaluate an expression and how that result is different from a solution to an equation.
d. Verify a possible solution to a linear equation using substitution and explain the result.

Outcome: P7.3

Demonstrate an understanding of one- and two-step linear equations of the form $ax/b + c = d$ (where a, b, c, and d are whole numbers, $c \leq d$ and $b \neq 0$) by modeling the solution of the equations concretely, pictorially, physically, and symbolically and explaining the solution in terms of the preservation of equality. [C, CN, PS, R, V]

a. Model the preservation of equality for each of the four operations using concrete materials or using pictorial representations, explain the process orally and record it symbolically.
b. Generalize strategies for carrying out operations that involve the use of the preservation of equality.
c. Solve an equation by applying the preservation of equality.
d. Identify and provide an example of a constant term, a numerical coefficient, and a variable in an expression and an equation.
e. Represent a problem with a linear equation and solve the equation using concrete models, (e.g., counters, integer tiles) and record the process symbolically.
f. Draw a representation of the steps used to solve a linear equation.
g. Verify the solution to a linear equation using concrete materials or diagrams.
h. Explain what the solution for a linear equation means.
i. Represent a problem situation using a linear equation.
j. Solve a problem using a linear equation.

Outcome: P7.4

Demonstrate an understanding of linear equations of the form (where a and b are integers) by modeling problems as a linear equation and solving the problems concretely, pictorially, and symbolically. [C, CN, PS, R, V]

a. Represent a problem with a linear equation of the form where a and b are integers and solve the equation using concrete models (e.g., counters, integer tiles) and record the process symbolically.
b. Verify a solution to a problem involving a linear equation of the form where a and b are integers.

Outcome: SS7.1

Demonstrate an understanding of circles including circumference and central angles. [C, CN, R, V]

a. Identify the characteristics of a circle.
b. Define and illustrate the relationship between the diameter and radius of a circle.
c. Answer the question "how many radii does a circle have and why?"
d. Answer the question "how many diameters does a circle have and why?"
e. Explain (with illustrations) why a specified point and radius length (or diameter length) describes exactly one circle.
f. Illustrate and explain the relationship between a radius and a diameter of a circle.
g. Generalize, from investigations, the relationship between the circumference and the diameter of a circle.
h. Define pi (π) and explain how it is related to circles.
i. Sort a set of angles as central angles of a circle or not.
j. Demonstrate that the sum of the central angles of a circle is 360°.
k. Draw a circle with a specific radius or diameter with and without a compass.
l. Solve problems involving circles.

Outcome: SS7.2

Develop and apply formulas for determining the area of:

- **triangles**
- **parallelograms**
- **circles.**

[CN, PS, R, V]

a. Illustrate and explain how the area of a rectangle can be used to determine the area of a triangle.
b. Generalize, using examples, a formula for determining the area of triangles.
c. Illustrate and explain how the area of a rectangle can be used to determine the area of a parallelogram.
d. Generalize, using examples, a formula for determining the area of parallelograms.
e. Illustrate and explain how to estimate the area of a circle without the use of a formula.
f. Illustrate and explain how the area of a circle can be approximated by the circumference of the circle times its radius.
g. Generalize a formula for finding the area of a circle.
h. Solve problems involving the area of triangles, parallelograms, or circles.

Outcome: SS7.3

Demonstrate an understanding of 2-D relationships involving lines and angles. [CN, R, V, T]

a. Identify and describe examples of parallel line segments, perpendicular line segments, perpendicular bisectors, and angle bisectors in the environment.

b. Identify, with justification, line segments on a diagram that are parallel or perpendicular.
c. Investigate and explain how paper, pencil, compass, and rulers can be used to construct parallel lines, perpendicular lines, angle bisectors, and perpendicular bisectors.
d. Investigate how paper folding can be used to construct parallel lines, perpendicular lines, angle bisectors, and perpendicular bisectors.
e. Use technology to construct parallel lines, perpendicular lines, angle bisectors, and perpendicular bisectors.
f. Draw a line segment perpendicular to another line segment and explain why they are perpendicular.
g. Draw a line segment parallel to another line segment and explain why they are parallel.
h. Draw the bisector of a given angle using more than one method and verify that the resulting angles are equal.
i. Draw the perpendicular bisector of a line segment using more than one method and verify the construction.
j. Use geometric constructions to create a design or picture, and identify the constructions present in the design.

Outcome: SS7.4

Demonstrate an understanding of the Cartesian plane and ordered pairs with integral coordinates. [C, CN, V]

a. Label the axes of a four quadrant Cartesian plane and identify the origin.
b. Explain how orientation (the direction in a situation) can influence the labelling of the axes on a Cartesian plane.
c. Identify the location of a point in any quadrant of a Cartesian plane using an ordered pair with integral coordinates.
d. Plot the point corresponding to an ordered pair with integral coordinates on a Cartesian plane with a scale of 1, 2, 5, or 10 on its axes.
e. Draw shapes and designs, using integral ordered pairs, in a Cartesian plane.
f. Create shapes and designs, and identify the points used to produce the shapes and designs in any quadrant of a Cartesian plane.

Outcome: SS7.5

Expand and demonstrate an understanding of transformations (translations, rotations, and reflections) of 2-D shapes in all four quadrants of the Cartesian plane. [CN, PS, T, V]

(It is intended that the original shape and its image have vertices with integral coordinates.)

a. Identify the coordinates of the vertices of a 2-D shape shown on a Cartesian plane.
b. Describe the horizontal and vertical movement required to move from one point to another point on a Cartesian plane.
c. Describe the positional change of the vertices of a 2-D shape to the corresponding vertices of its image as a result of a transformation or successive transformations on a Cartesian plane.
d. Determine the distance between points along horizontal and vertical lines in a Cartesian plane.
e. Perform a transformation or consecutive transformations on a 2-D shape and identify coordinates of the vertices of the image.
f. Describe the positional change of the vertices of a 2-D shape to the corresponding vertices of its image as a result of a transformation or a combination of successive transformations.
g. Describe the image resulting from the transformation of a 2-D shape on a Cartesian plane by identifying the coordinates of the vertices of the image.

Outcome: SP7.1

Demonstrate an understanding of the measures of central tendency and range for sets of data. [C, CN, PS, R, T]

a. Concretely represent mean, median, and mode and explain the similarities and differences among them.
b. Determine mean, median, and mode for a set of data, and explain why these values may be the same or different.
c. Determine the range of a set of data.
d. Provide a context in which the mean, median, or mode is the most appropriate measure of central tendency to use when reporting findings and explain the choice.
e. Solve a problem involving the measures of central tendency.
f. Analyze a set of data to identify any outliers.
g. Explain the effect of outliers on the measures of central tendency for a data set.
h. Identify outliers in a set of data and justify whether or not they should be included in the reporting of the measures of central tendency.
i. Provide examples of situations in which outliers would and would not be used in reporting the measures of central tendency.
j. Explain why qualitative data, such as colour or favourite activity, cannot be analyzed for all three measures of central tendency.

Outcome: SP7.2

Demonstrate an understanding of circle graphs. [C, CN, PS, R, T, V]

a. Identify common attributes of circle graphs, such as:
    - title, label, or legend
    - the sum of the central angles is 360°
    - the data is reported as a percent of the total and the sum of the percents is equal to 100%.
b. Create and label a circle graph, with and without technology, to display a set of data.
c. Find, describe, and compare circle graphs in a variety of print and electronic media such as newspapers, magazines, and the Internet.
d. Translate percents displayed in a circle graph into quantities to solve a problem.
e. Interpret a circle graph to answer questions.
f. Identify the characteristics of a set of data that make it possible to create a circle graph.

Outcome: SP7.3

Demonstrate an understanding of theoretical and experimental probabilities for two independent events where the combined sample space has 36 or fewer elements. [C, ME, PS R, T]

a. Explain what a probability tells about the situation to which it refers.
b. Provide an example of two independent events, such as:
    - spinning a four section spinner and an eight-sided die
    - tossing a coin and rolling a twelve-sided die
    - tossing two coins
    - rolling two dice
c. and explain why they are independent.

d. Identify the sample space (all possible outcomes) for each of two independent events using a tree diagram, table, or another graphic organizer.
e. Determine the theoretical probability of an outcome involving two independent events.
f. Conduct a probability experiment for an outcome involving two independent events, with and without technology, to compare the experimental probability to the theoretical probability.
g. Solve a probability problem involving two independent events.
h. Explain how theoretical and experimental probabilities are related and why they cannot be assumed to be equal.
i. Represent a probability stated as a percent as a fraction or a decimal.
j. Represent a probability stated as a fraction or decimal as a percent.

Grade 8

Outcome: N8.1

Demonstrate understanding of the square and principle square root of whole numbers concretely or pictorially and symbolically. [CN, ME, R, T, V]

a. Recognize, show, and explain the relationship between whole numbers and their factors using concrete or pictorial representations (e.g., using a set number of tiles, create rectangular regions and record the dimensions of those regions, and describe how those dimensions relate to the factors of the number).
b. Infer and verify relationships between the factors of a perfect square and the principle square root of a perfect square.
c. Determine if specific numbers are perfect squares through the use of different types of representations and reasoning, and explain the reasoning.
d. Describe and apply the relationship between the principle square roots of numbers and benchmarks using a number line.
e. Explain why the square root of a number shown on a calculator may be an approximation.
f. Apply estimation strategies to determine approximate values for principle square roots.
g. Determine the value or an approximate value of a principle square root with or without the use of technology.
h. Identify a number with a principle square root between two given numbers and explain the reasoning.
i. Share the story, in writing, orally, drama, dance, art, music, or other media, of the role and significance of square roots in a personally selected historical or modern application situation (e.g., Archimedes and the square root of 3, Pythagoras and the existence of square roots, role of square roots in Pythagoras' theorem, use of square roots in determining dimensions of a square region from the area, use of square roots to determine measurements in First Nations beading patterns, use of square roots to determine dimensions of nets).

Outcome: N8.2

Expand and demonstrate understanding of percents greater than or equal to 0% (including fractional and decimal percents) concretely, pictorially, and symbolically. [CN, PS, R, V]

a. Recognize, represent, and explain situations, including for self, family, and communities, in which percents greater than 100 or fractional percents are meaningful (e.g., the percent profit made on the sale of fish).
b. Represent a fractional percent and/or a percent greater than 100 using grid paper.
c. Describe relationships between different types of representation (concrete, pictorial, and symbolic in percent, fractional, and decimal forms) for the same percent (e.g., how do 345 coloured grid squares relate to 345%, or why is 345% the same as 3.45).
d. Record the percent, fraction, and decimal forms of a quantity shown by a representation on grid paper.
e. Apply understanding of percents to solve problems, including situations involving combined percents or percents of percents (e.g., PST + GST, or 10% discount on a purchase already discounted 30%) and explain the reasoning.
f. Explain, using concrete, pictorial, or symbolic representations, why the order of consecutive percents does not impact the final value (e.g., a decrease of 15% followed by an increase of 5% results in the same quantity as an increase of 5% followed by a decrease of 15%).
g. Demonstrate, using concrete, pictorial, or symbolic representations, that two consecutive percents applied to a specific situation cannot be added or subtracted to give an overall percent change (e.g., a population increase of 10% followed by a population increase of 15% is not a 25% increase, a decrease of 10% followed by an increase of 10% will result in an overall change).
h. Analyze choices and make decisions based upon percents and personal or community concerns and issues (e.g., deciding whether or not to have surgery if given a 75% chance of survival, deciding how much to buy if you can save 25% when two items are purchased, deciding whether or not to hunt for deer when a known percent of deer have chronic wasting disease, deciding about whether or not to use condoms knowing that they are 95% effective as birth control, making decisions about diet knowing that a high percentage of Aboriginal peoples have or will get diabetes).
i. Explain the role and significance of percents in different situations (e.g., polls during elections, medical reports, percent down on purchases).
j. Pose and solve problems involving percents stated as a percent, fraction, or decimal quantity.

Outcome: N8.3

Demonstrate understanding of rates, ratios, and proportional reasoning concretely, pictorially, and symbolically. [C, CN, PS, R, V]

a. Identify and explain ratios and rates in familiar situations (e.g., cost per music download, traditional mixtures for bleaching, time for a hand-sized piece of fungus to burn, mixing of colours, number of boys to girls at a school dance, rates of traveling such as car, skidoo, motor boat or canoe, fishing nets and expected catches, or number of animals hunted and number of people to feed).
b. Identify situations (such as providing for the family or community through hunting) in which a given quantity of a/b represents a:
    - fraction
    - rate
    - quotient
    - percent
    - probability
    - ratio.
c. Demonstrate (orally, through arts, concretely, pictorially, symbolically, and/or physically) the difference between ratios and rates.
d. Verify or contradict proposed relationships between the different roles for quantities that can be expressed in the form a/b. For example:
    - a rate cannot be represented by a percent because a rate compares two different types of measurements while a percent compares two measurements of the same type
    - probabilities cannot be used to represent ratios because probabilities describe a part to whole relationship but ratios describe a part to part relationship
    - a fraction is not a ratio because a fraction represents part to whole
    - a ratio cannot be written as a fraction, unless the quantity of the whole is first determined (e.g., 2 parts white and 5 parts red paint is 2/7 white)

- a ratio cannot be written as percent unless the quantity of the whole is first determined (e.g., a ratio of 4 parts blue and 6 parts red paint can be described as having 40% blue).

e. Write the symbolic form (e.g., 3:5 or 3 to 5 as a ratio, $3/min or $3 per one minute as a rate) for a concrete, physical, or pictorial representation of a ratio or rate.
f. Explain how to recognize whether a comparison requires the use of proportional reasoning (ratios or rates) or subtraction.
g. Create and solve problems involving rates, ratios, and/or probabilities.

Outcome: N8.4

Demonstrate understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially, and symbolically. [C, CN, ME, PS]

a. Identify and describe situations relevant to self, family, or community in which multiplication and division of fractions are involved.
b. Model the multiplication of two positive fractions and record the process symbolically.
c. Compare the multiplication of positive fractions to the multiplication of whole numbers, decimals, and integers.
d. Generalize and apply strategies for determining estimates of products of positive fractions
e. Generalize and apply strategies for multiplying positive fractions.
f. Critique the statement "Multiplication always results in a larger quantity" and reword the statement to capture the points of correction or clarification raised (e.g., ½ x ½ - ¼ which is smaller than ½).
g. Explain, using concrete or pictorial models as well as symbolic reasoning, how the distributive property can be used to multiply mixed numbers. For example, 2½ x 3¼ = (2 + ½) x (3 + ¼) = (2 x 3) + (2 X ¼) + (½ x 3) + (½ x ¼).
h. Model the division of two positive fractions and record the process symbolically.
i. Compare the division of positive fractions to the division of whole numbers, decimals, and integers.
j. Generalize and apply strategies for determining estimates of quotients of positive fractions.
k. Estimate the quotient of two given positive fractions and explain the strategy used.
l. Generalize and apply strategies for determining the quotients of positive fractions.
m. Critique the statement "Division always results in a smaller quantity" and reword the statement to capture the points of correction or clarification raised (e.g., ½ ÷ ¼ = 2 but 2 is bigger than ½ or ¼).
n. Identify, without calculating, the operation required to solve a problem involving fractions and justify the reasoning.
o. Create, represent (concretely, pictorially, or symbolically) and solve problems that involve one or more operations on positive fractions (including multiplication and division).

Outcome: N8.5

Demonstrate understanding of multiplication and division of integers concretely, pictorially, and symbolically. [C, CN, PS, R, V]

a. Identify and describe situations that are relevant to self, family, or community in which multiplication or division of integers would be involved.
b. Model the multiplication of two integers using concrete materials or pictorial representations, and record the process used symbolically.
c. Model the division of two integers using concrete materials or pictorial representations, and record the process used symbolically.
d. Identify and generalize patterns for determining the sign of integer products and quotients.
e. Generalize and apply strategies for multiplying and dividing integers.
f. Create and solve problems involving the multiplication or division (without technology for one-digit divisors, with technology for two-digit divisors) of integers.
g. Explain how the order of operations can be extended to include integers and provide examples to demonstrate the use of the order of operations.
h. Create and solve problems requiring the use of the order of operations on integers.

Outcome: P8.1

Demonstrate understanding of linear relations concretely, pictorially (including graphs), physically, and symbolically. [CN, ME, PS, R, T, V]

a. Analyze and describe the relationship shown on a graph for a given situation (e.g., "The graph is showing that, as the temperature rises, the number of people in the mall decreases").
b. Explain how a given linear relation is represented by a given table of values.
c. Model a linear relation shown as an equation, a graph, a table of values, or a concrete or pictorial representation in one or more other forms.
d. Analyze a set of equations, graphs, ordered pairs, and tables of values, sort the set according to representing the same linear relations, and explain the reasoning.
e. Determine the missing coordinate of an ordered pair given the equation of a linear relation, a table of values, or a graph and explain the reasoning.
f. Determine which of a set of graphs, equations, tables of values, sets of ordered pairs, and concrete or pictorial representations represent a linear relationship and justify the reasoning.
g. Determine if an ordered pair satisfies a linear relation given as a table of values, concrete or pictorial representation, graph, or equation and explain the reasoning.
h. Identify situations relevant to self, family, or community that appear to define linear relations and determine, with justification, whether the graph for the situation would be shown with a solid line or not.

Outcome: P8.2

Model and solve problems using linear equations of the form:

- **ax = b**
- **x/a = b, a ≠ 0**
- **ax + b = c**
- **x/a + b = c, a ≠ 0**
- **a(x + b) = c**

concretely, pictorially, and symbolically, where a, b, and c are integers. [C, CN, PS, V]

a. Identify and describe situations, which are relevant to self, family, or community, that can be modeled by a linear equation (e.g., the cost of purchasing x fish from a fisherman).
b. Model and solve linear equations using concrete materials (e.g., counters and integer tiles) and describe the process orally and symbolically.
c. Discuss the importance of the preservation of equality when solving equations.

d. Explain the meaning of and verify the solution of a given linear equation using a variety of methods, including concrete materials, diagrams, and substitution.
e. Generalize and apply symbolic strategies for solving linear equations.
f. Identify, explain, and correct errors in a given solution of a linear equation.
g. Demonstrate the application of the distributive property in the solving of linear equations (e.g., $2(x + 3)$; $2x + 6 = 5$)
h. Explain why some linear relations (e.g., $x/a = b$, $a \neq 0$ and $x/a + b = c$, $a \neq 0$) have a given restriction and provide an example of a situation in which such a restriction would be necessary.
i. Identify and solve problems that can be represented using linear equations and explain the meaning of the solution in the context of the problem.
j. Explain the algebra behind a particular algebra puzzle such as this puzzle written for 2008:
   - Pick the number of times a week that you would like to go out to eat (more than once but less than 10).
   - Multiply this number by 2 (just to be bold).
   - Add 5.
   - Multiply it by 50.
   - If you have already had your birthday this year add 1758. If you have not, add 1757.
   - Now subtract the four digit year that you were born.

   You should have a three digit number. The first digit of this was your original number. The next two numbers are your age.

Outcome: SS8.1

Demonstrate understanding of the Pythagorean Theorem concretely or pictorially and symbolically and by solving problems. [CN, PS, R, T, V]

a. Generalize the results of an investigation of the expression $a^2 + b^2 = c^2$ (where a, b, and c are the lengths of the sides of a right triangle, c being the longest):
   - concretely (by cutting up areas represented by a^2 and b^2 and fitting the two areas onto c^2)
   - pictorially (by using technology)
   - symbolically (by confirming that $a^2 + b^2 = c^2$ for a right triangle).

b. Explore right and non-right triangles, using technology, and generalize the relationship between the type of triangle and the Pythagorean Theorem (i.e., if the sides of a triangle satisfy the Pythagorean equation, then the triangle is a right triangle which is known as the Converse of the Pythagorean Theorem)
c. Explore right triangles, using technology, using the Pythagorean Theorem to identify Pythagorean triples (e.g., 3, 4, 5 or 5, 12, 13), hypothesize about the nature of triangles with side lengths that are multiples of the Pythagorean triples, and verify the hypothesis.
d. Create and solve problems involving the Pythagorean Theorem, Pythagorean triples, or the Converse of the Pythagorean Theorem.
e. Give a presentation that explains a historical or personal use or story of the Pythagorean Theorem (e.g., Pythagoras and his denial of irrational numbers, the use of the 3:4:5 right triangle ratio in the Pyramids, squaring off the corner of a sandbox being built for a sibling, or determining the straight line distance between two towns to be travelled on a snowmobile).

Outcome: SS8.2

Demonstrate understanding of the surface area of 3-D objects limited to right prisms and cylinders (concretely, pictorially, and symbolically) by:

- **analyzing views**
- **sketching and constructing 3-D objects, nets, and top, side, and front views**
- **generalizing strategies and formulae**
- **analyzing the effect of orientation**
- **solving problems.**

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

a. Manipulate concrete 3-D objects to identify, describe, and sketch top, front, and side views of the 3-D object on isometric paper.
b. Sketch a top, front, or side view of a 3-D object that is within the classroom or that is personally relevant, and ask a peer to identify the 3-D object it represents.
c. Predict the top, front, and side views for a 3-D object that is to be rotated by a multiple of 90°, discuss the reasoning for the prediction, and then verify concretely and pictorially.
d. Identify and describe nets of 3-D objects that are used in everyday experiences (e.g., such as patterns or materials for clothing and banker boxes).
e. Relate the parts (using one-to-one correspondence) of a net to the faces and edges of the 3-D object it represents.
f. Create a net for a 3-D object, have a peer predict the type of 3-D object that the net represents, explain to the peer the reasoning used in designing the net, and have the peer verify the net by constructing the 3-D object from the net.
g. Build a 3-D object made of right rectangular prisms based on the top, front, and side views (with and without the use of technology).
h. Demonstrate how the net of a 3-D object (including right rectangular prisms, right triangular prisms, and cylinders) can be used to determine the surface area of the 3-D object and describe strategies used to determine the surface area.
i. Generalize and apply strategies for determining the surface area of 3-D objects.
j. Create and solve personally relevant problems involving the surface area or nets of 3-D objects.

Outcome: SS8.3

Demonstrate understanding of volume limited to right prisms and cylinders (concretely, pictorially, or symbolically) by:

- **relating area to volume**
- **generalizing strategies and formulae**
- **analyzing the effect of orientation**
- **solving problems.**

[CN, PS, R, V]

a. Identify situations from one's home, school, or community in which the volume of right prism or right cylinder would need to be determined.
b. Describe the relationship between the area of the base of a right prism or right cylinder and the volume of the 3-D object.
c. Generalize and apply formulas for determining the area of a right prism and right cylinder.
d. Explain the effect of changing the orientation of a right prism or right cylinder on the volume of the 3-D object.
e. Create and solve personally relevant problems involving the volume of right prisms and right cylinders.

Outcome: SS8.4

Demonstrate an understanding of tessellation by:

- **explaining the properties of shapes that make tessellating possible**
- **creating tessellations**
- **identifying tessellations in the environment.**

[C, CN, PS, T, V]

a. Identify, describe (in terms of translations, reflections, rotations, and combinations of any of the three), and reproduce (concretely or pictorially) a tessellation that is relevant to self, family, or community (e.g., a Star Blanket or wall paper).
b. Predict and verify which of a given set of 2-D shapes (regular and irregular) will tessellate and generalize strategies for determining whether a new 2-D shape will tessellate (i.e., an angle must be a factor of 360°).
c. Identify one or more 2-D shapes that will tessellate with a given 2-D shape and explain the choice (e.g., knowing that the sum of the measures of one angle from each of the 2-D shapes must be a factor of 360°, and if the given shape has an angle of 12°, then two shapes with angles of 13° and 5° can be used to tessellate with the original shape because 12+13+5=30 which is a factor of 360 – these shapes would need to be repeated at least 12 times because 30 x 12 is 360).
d. Design and create (concretely or pictorially) a tessellation involving one or more 2-D shapes, and document the mathematics involved within the tessellation (e.g., types of transformations, measures of angles, or types of shapes).
e. Identify different transformations (translations, reflections, rotations, and combinations of any of the three) present within a tessellation.
f. Make a new tessellating shape (polygonal or non-polygonal) by transforming a portion of a known tessellating shape and use the new shape to create an Escher-type design that can be used as a picture or wrapping paper.

Outcome: SP8.1

Analyze the modes of displaying data and the reasonableness of conclusions. [C, CN, R]

a. Investigate and report on the advantages and disadvantages of different types of graphs, including circle graphs, line graphs, bar graphs, double bar graphs, and pictographs (e.g., circle graphs are good for qualitative data such as favourite activities and categories such as money spent on clothes, whereas line graphs are good for quantitative data such as heights and ages
b. Engage in a project that involves:
c. the collection and organization of first- or second-hand data related to a topic of interest (such as local wildlife counts or surveying of peers)
d. representation of the data using a graph
e. explanation of type of graph chosen by self and peer
f. description of the project, challenges, and conclusions
g. self-assessment.
h. Suggest alternative ways to represent data from a given situation and explain the choices made.
i. Find examples of graphs of data in media and personal experiences and interpret the information in the graphs for personal value.
j. Analyze a data graph found in media for features that might bias the interpretation of the graph (such as the size of intervals, the width of bars, and the visual representation) and suggest alterations to remove or downplay the bias.
k. Provide examples of misrepresentations of data and data graphs found within different media and explain what types of misinterpretations might result from such displays.

Outcome: SP8.2

Demonstrate understanding of the probability of independent events concretely, pictorially, orally, and symbolically. [C, CN, PS, T]

a. Ask questions relevant to self, family, or community in which probabilities involving two events are known or which can be researched.
b. Explore and explain the relationship between the probability of two independent events and the probability of each event separately.
c. Make and test predictions about the results of experiments and simulations for two independent events.
d. Create and solve problems related to independent events, probabilities of independent events, and decision making.

Grade 9

Outcome: N9.1

Demonstrate (concretely, pictorially, and symbolically) understanding of powers with integral bases (excluding base 0) and whole number exponents including:

- **representing using powers**
- **evaluating powers**
- **powers with an exponent of zero**
- **solving situational questions.**

[C, CN, PS, R, T]

a. Demonstrate the difference between the exponent and base of a power by representing two powers with exponent and base interchanged (e.g., 2^3 and 3^2 or 10^3 and 3^{10}) using repeated multiplication or concrete models and describe the result.
b. Predict which of two powers represents the greater quantity, explain the reasoning, and verify using technology.
c. Analyze the role of brackets in powers by using repeated multiplication [e.g., $(-2)^4$, (-2^4), and -2^4] and generalize strategies for evaluating powers involving brackets.
d. Justify why a^0, $a \neq 0$, must equal to 1.
e. Predict whether the value of a given power will be positive or negative (e.g., what will the sign of -7^{15} be?).
f. Evaluate powers with integral bases (excluding base 0) and whole number exponents, with or without the use of technology.
g. Generalize, using repeated multiplication to represent powers, the exponent laws of powers with integral bases (excluding base 0) and whole number exponents:

$$(a^m)(a^n) = a^{m+n} \quad \frac{a^m}{a^n} = a^{m-n}, m > n \quad (a^m)^n = a^{mn} \quad (ab)^m = a^m b^m$$

h. Apply the exponent laws to expressions involving powers, and determine the quantity represented by the expression, with or without the use of technology.
i. Prove by contradiction that $a^m + a^n \neq a^{mn}$, $a^m - a^n \neq a^{m-n}$, and $a^m - a^n \neq a^{\frac{m}{n}}$.
j. Describe and apply strategies for evaluating sums or differences of powers.
k. Analyze a simplification of an expression involving powers for errors.

Outcome: N9.2

Demonstrate understanding of rational numbers including:

- **comparing and ordering**
- **relating to other types of numbers**
- **solving situational questions.**

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

a. Order a given set of rational numbers, in fraction and decimal form, by placing them on a number line and explaining the reasoning used (e.g., 3/5, - 0.666, 4,… , 0.5, -5/8).
b. Determine a rational number between two given rational numbers and describe the strategy used.
c. Create a representation depicting how whole numbers, fractions, decimals, integers, square roots, and rational numbers are related to each other.
d. Provide examples to explain how knowing about how to add, subtract, multiply, and divide integers and positive rational numbers informs knowing how to add, subtract, multiply, and divide rational numbers.
e. Provide examples to demonstrate how the order of operations can be extended to rational numbers.
f. Solve situational questions involving operations on rational numbers, with or without the use of technology.
g. Analyze a simplification of an expression involving rational numbers for errors.

Outcome: N9.3

Extend understanding of square roots to include the square root of positive rational numbers. [CN, ME, R, T, V]

a. Develop a generalization about what type of number results from the squaring of a rational number.
b. Describe strategies for determining if a rational number is a perfect square.
c. Determine the square root of a rational number that is a perfect square.
d. Determine the rational number for which a given rational number is its square root (e.g., 4/3 is the square root of what rational number?).
e. Explain and apply strategies involving benchmarks for determining an estimate of the square root of a rational number that is not a perfect square.
f. Determine, with the use of technology, an approximate value for the square root of a rational number that is not a perfect square.
g. Explain why the value shown by technology may only be an approximation of the square root of a rational number.
h. Describe a strategy that, if applied to writing a decimal number, would result in an irrational number (e.g., students describe a strategy in which they repeatedly write the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 but separate each group of these digits by an increasing number of repeats of the digit 7 or 0.0123456789701234567897701234567897770123…).
i. Determine a rational number whose square root would be between two given rational numbers and explain the reasoning used (e.g., a rational number whose square root is between 1/2 and 1/3 would be between 1/4 and 1/9 because those are 1/2 and 1/3 squared. I need to find a number between 1/4 and 1/9. I can do this by making the two fractions into fractions of the same type: 9/36 and 4/36. One number between these is 6/36 or 8/36).

Outcome: P9.1

Demonstrate understanding of linear relations including:

- **graphing**
- **analyzing**
- **interpolating and extrapolating**
- **solving situational questions.**

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

a. Observe and describe a situation relevant to self, family, or community that a given graph might represent and explain the meaning conveyed by the graph.
b. Sort a set of graphs into representations of linear and non-linear relations.
c. Sketch graphs for given linear relations, including horizontal and vertical lines, with and without the use of technology.
d. Generalize strategies for determining if a given linear relation will have a graph that is horizontal, vertical, increasing, or decreasing.
e. Extrapolate to determine a value for either variable in a linear relation beyond the shown graph.
f. Verify an extrapolated value from a graph by using substitution in the related linear relation.
g. Interpolate to determine a value for either variable in a linear relation within the shown graph.
h. Verify an interpolated value from a graph by using substitution in the related linear relation.
i. Solve situational questions by graphing linear relations and interpreting the resulting graphs.

Outcome: P9.2

Model and solve situational questions using linear equations of the form:

- **$ax = b$ $x/a = b, a \neq 0$ $ax + b = c$ $x/a + b = c, a \neq 0$ $ax = b + cx$ $a(x + b) = c$ $ax + b = cx + d$ $a(bx + c) = d(ex + f)$ $a/x = b, x \neq 0$**

where a, b, c, d, e, and f are rational numbers. [C, CN, PS, V]

a. Explain why the equation a/x = b, cannot have a solution of x = 0.
b. Write a linear expression representing a given pictorial, oral, or written pattern.
c. Write a linear equation to represent a particular situation.
d. Observe and describe a situation relevant to self, family, or community which could be represented by a linear equation.
e. Write a linear equation representing the pattern in a given table of values and verify the equation by substituting values from the table.
f. Model the solution of a linear equation using concrete or pictorial representations, and explain how to record the process symbolically.
g. Explain how the preservation of equality is involved in the solving of linear equations.
h. Verify, by substitution, whether or not a given rational number is a solution to a given linear equation.
i. Solve a linear equation symbolically.
j. Analyze the given solution for a linear equation that has resulted in an incorrect solution, and identify and explain the error(s) made.
k. Provide examples from the modern world in which linear equations are used and solved.

Outcome: P9.3

Demonstrate understanding of single variable linear inequalities with rational coefficients including:

- **solving inequalities**

- **verifying**
- **comparing**
- **graphing.**

[C, CN, PS, R, V]

a. Observe and describe situations relevant to self, family, or community, including First Nations and Métis communities, that involve inequalities and classify the inequality as being less than, greater than, less than or equal to, or greater than or equal to.
b. Verify whether or not a given rational number is part of the solution set for a linear inequality.
c. Generalize and apply rules for adding or subtracting a positive or negative number to determine the solution of an inequality.
d. Generalize and apply a rule for multiplying or dividing by a positive or negative number to determine the solution of an inequality.
e. Solve a linear inequality algebraically and explain the strategies used.
f. Compare and explain the process for solving a linear equation to the process for solving a linear inequality.
g. Explain how knowing the solution to a linear equality can be used to determine the solution of a related linear inequality, and provide an example.
h. Critique the statement: "For any linear equality, there are two related linear inequalities".
i. Graph the solution of a linear inequality on a number line.
j. Explain why there is more than one solution to a linear inequality.
k. Verify the solution of a given linear inequality using substitution for multiple elements, in the solution and outside of the solution.
l. Solve a situational question involving a single variable linear inequality and graph the solution.

Outcome: P9.4

Demonstrate understanding of polynomials (limited to polynomials of degree less than or equal to 2) including:

- **modeling**
- **generalizing strategies for addition, subtraction, multiplication, and division**
- **analyzing**
- **relating to context**
- **comparing for equivalency.**

[C, CN, R, V]

a. Model (concretely or pictorially) and describe the relationship between x and x^2.
b. Represent polynomials concretely or pictorially, and describe how the concrete or pictorial model reflects the symbolic form
c. Write a polynomial for a given concrete or pictorial representation.
d. Identify the variables, degree, number of terms, and coefficients, including the constant term, of a given simplified polynomial expression and explain the role or significance of each.
e. Identify the type of expression that is represented by a polynomial of degree 1.
f. Sort a set of polynomials into monomials, binomials, and trinomials.
g. Critique the statement "A binomial can never be a degree 2 polynomial".
h. Write equivalent forms of a polynomial expression by interchanging terms or by decomposing terms, and justify the equivalence.
i. Explain why terms with different variable exponents cannot be added or subtracted.
j. Generalize, from concrete and pictorial models, and apply strategies for adding and subtracting polynomials symbolically.
k. Verify whether or not the simplification of the addition or subtraction of two polynomials is correct and explain.
l. Describe the relationship between multiplication of a polynomial and a monomial, and determining the area of a rectangular region.
m. Generalize, from concrete and pictorial models, and apply strategies for multiplying a polynomial by a monomial.
n. Generalize, from concrete and pictorial models, and apply strategies for dividing a polynomial by a monomial.
o. Verify whether or not the simplification of the multiplication or division of a polynomial by a monomial is correct.

Outcome: SS9.1

Demonstrate understanding of circle properties including:

- **perpendicular line segments from the centre of a circle to a chord bisect the chord**
- **inscribed angles subtended by the same arc have the same measure**
- **the measure of a central angle is twice the measure of an inscribed angle subtending the same arc**
- **tangents to a circle are perpendicular to the radius ending at the point of tangency.**

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

a. Observe and describe situations relevant to self, family, or community that involve circles, chords, central angles, inscribed angles, radii, arcs, and/or points of tangency.
b. Construct a tangent line to a circle by applying the knowledge that a tangent line to the circle is perpendicular to a radius of the circle.
c. Generalize, from personal explorations, the relationship between the measures of inscribed angles subtended by the same arc.
d. Generalize, from personal explorations, the relationship between the measure of a central angle and the measure of inscribed angles subtended by the same arc.
e. Generalize, from personal explorations, the relationship between a perpendicular line segment from the centre of a circle to a chord and the chord.
f. Model how to find the diameter of a circle using an inscribed angle of 90° and explain why the strategy works.
g. Describe examples of where First Nations and Métis, past and present, lifestyles and worldviews demonstrate one or more of the circle properties (e.g., tipi and medicine wheel).
h. Solve a situational question involving the application of one or more of the circle properties.

Outcome: SS9.2

Extend understanding of area to surface area of right rectangular prisms, right cylinders, right triangular prisms, to composite 3-D objects. [CN, PS, R, V]

a. Describe 3-D composite objects from the natural and constructed world, including objects relevant to First Nations and Métis people (e.g., Mesoamerican pyramids).
b. Analyze a composite 3-D object to identify areas of overlap and explain the impact of these areas on determining the surface area of the composite 3-D object.
c. Critique the statement "To find the surface area of a composite 3-D object, add together the surface areas of the individual 3-D objects from which the composite 3-D object is comprised".

d. Determine the surface area of composite 3-D objects.
e. Solve situational questions involving the surface area of composite 3-D objects.
f. Give dimensions for a single 3-D object that will have the same surface area as a composite 3-D object.
g. Approximate the surface area of a 3-D object from the natural environment using composites of standard 3-D objects such as right rectangular prisms, right cylinders, and right triangular prisms.

Outcome: SS9.3
Demonstrate understanding of similarity of 2-D shapes. [C, CN, PS, R, V]

a. Observe and describe 2-D shapes, relevant to self, family, or community, that are similar.
b. Explain the difference between similarity and congruence of polygons.
c. Verify whether or not two polygons are similar.
d. Explain how ratios and proportionality are related to similarity of polygons.
e. Draw a polygon similar to a given polygon and explain the strategies used.
f. Solve situational questions involving the similarity of polygons.
g. Identify and describe situations relevant to self, family, or community that involve scale diagrams and explain the meaning of the scale factor involved.
h. Explain how scale diagrams are related to similarity, ratios, and proportionality.
i. Draw a diagram to scale that represents an enlargement or reduction of a given 2-D shape and explain the strategies used.
j. Explain how to determine the scale factor for a given 2-D shape and an enlargement or reduction of the shape.
k. Verify whether or not a given diagram is a scale diagram of a 2-D shape and, if it is, identify the scale factor for the diagram.
l. Solve situational questions involving scale diagrams and scale factors.

Outcome: SS9.4
Demonstrate understanding of line and rotation symmetry. [C, CN, PS, V]

a. Observe and describe examples of line and rotation symmetry in situations relevant to self, family, or community.
b. Classify different 2-D shapes or designs made of 2-D shapes, according to the number of lines of symmetry.
c. Complete a 2-D shape or design given part of a shape or design and one or more lines of symmetry.
d. Determine, with justification, if a given 2-D shape or design has rotation symmetry about the point at the centre of the shape or design and, if it does, state the order and angle of rotation.
e. Identify a line of symmetry, or the order and angle of rotation symmetry, in a given tessellation.
f. Describe examples of the use and significance of line and rotation symmetry in First Nations and Métis art.
g. Analyze different transformations of 2-D shapes on the Cartesian plane and describe the type of symmetry, if any, that results.
h. Determine whether or not two 2-D shapes on the Cartesian plane are related by either rotation or line symmetry and explain.
i. Create or provide an art work (such as a painting or dance) that demonstrates line and rotation symmetry, and identify the line(s) of symmetry and the order and angle of rotation.

Outcome: SP9.1
Demonstrate understanding of the effect of:

- **bias**
- **use of language**
- **ethics**
- **cost**
- **time and timing**
- **privacy**
- **cultural sensitivity and**
- **population or sample on data collection.**

[C, PS, R, T]

a. Analyze given case studies of data collection, including data pertaining to First Nations and Métis peoples, and identify potential problems related to bias, use of language, ethics, cost, time and timing, privacy, or cultural sensitivity.
b. Provide examples to illustrate how bias, use of language, ethics, cost, time and timing, privacy, or cultural sensitivity may influence the data collected.
c. Identify situations relevant to self, family, or community where a set of data was collected and classify each situation as involving a sample or the population.
d. Provide an example of a situation in which a population may be used to answer a question, and justify the choice.
e. Provide an example of a question where a limitation precludes the use of a population and describe the limitation (e.g., too costly, not enough time, limited resources).
f. Identify and critique given examples in which a generalization from a sample of a population, including from First Nations and Métis data, may or may not be valid for the population.
g. Explain different strategies for trying to minimize negative effects on data collection.
h. Explain the importance of protocols for respectful data collection and information sharing.

Outcome: SP9.2
Demonstrate an understanding of the collection, display, and analysis of data through a project. [C, PS, R, T, V]

a. Devise a project plan related to a situation relevant to self, family, or community, that involves:
    - formulating a question for investigation
    - choosing a data collection method that includes social considerations
    - electing a population or a sample, and justifying the choice
    - collecting the data
    - displaying the collected data in an appropriate manner
    - drawing conclusions to answer the question.
b. Create and apply a rubric to assess a project that includes the assessment of all requirements for the project.
c. Complete the project according to the plan, draw conclusions, and communicate findings to an audience.

Outcome: SP9.3

Demonstrate an understanding of the role of probability in society. [C, CN, R, T]

a. Observe examples of probabilities that impact or influence aspects of one's self, family, community, or environment and describe those impacts or influences.
b. Analyze the meaningfulness of a probability against the limitations of assumptions associated with that probability.
c. Provide examples of how a single probability could be used to support opposing positions.
d. Explain, using examples, how decisions based on probability may be a combination of theoretical probability, experimental probability, and subjective judgement.

Outcome: SP9.4

Research and present how First Nations and Métis peoples, past and present, envision, represent, and make use of probability and statistics.

a. Gather and document information regarding the significance and use of probability and statistics for at least one First Nation or Métis peoples from a variety of sources such as Elders and traditional knowledge keepers.
b. Compare the significance, representation, and use of probability and statistics for different First Nations and Métis peoples, and other cultures.
c. Communicate concretely, pictorially, orally, visually, physically, and/or in writing, what has been learned about the envisioning, representing, and use of probability and statistics by First Nations and Métis peoples and how these understandings parallel, differ from, and enhance one's own mathematical understandings about probability and statistics.