

[C] Communication	[PS] Problem Solving
[CN] Connections	[R] Reasoning
[ME] Mental Mathematics and Estimation	[T] Technology
	[V] Visualization

Strand:
Number

General Outcome:
Develop number sense.

Specific Outcomes

It is expected that students will:

Achievement Indicators

*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

- 6.N.1. Demonstrate an understanding of place value for numbers
- greater than one million
 - less than one-thousandth
- [C, CN, R, T]

- 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.
- Provide examples of where large numbers and small decimals are used (e.g., media, science, medicine, technology).

- 6.N.2. Solve problems involving large numbers, using technology.
- [ME, PS, T]

- Identify which operation is necessary to solve a problem and solve it.
- Determine the reasonableness of an answer.
- Estimate the answer and solve a problem.
- Identify and correct errors in a solution to a problem that involves large numbers.

- 6.N.3. Demonstrate an understanding of factors and multiples by
- determining multiples and factors of numbers less than 100
 - identifying prime and composite numbers
 - solving problems involving factors or multiples
- [PS, R, V]

- Identify multiples for a number and explain the strategy used to identify them.
- Determine all the whole-number factors of a number using arrays.
- Identify the factors for a number and explain the strategy used (e.g., concrete or visual representations, repeated division by prime numbers or factor trees).
- Identify common factors and common multiples for 2 or 3 numbers.
- Provide an example of a prime number and explain why it is a prime number.
- Provide an example of a composite number and explain why it is a composite number.
- Sort a set of numbers as prime and composite.
- Solve a problem involving factors, multiples, the largest common factor or the lowest common multiple.
- Explain why 0 and 1 are neither prime nor composite.

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Strand:
Number (*continued*)

General Outcome:
Develop number sense.

Specific Outcomes

It is expected that students will:

Achievement Indicators

*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

6.N.4. Relate improper fractions to mixed numbers.
[CN, ME, R, V]

- Demonstrate using models that an improper fraction represents a number greater than 1.
- Express improper fractions as mixed numbers.
- Express mixed numbers as improper fractions.
- Place a set of fractions, including mixed numbers and improper fractions, on a horizontal or vertical number line, and explain strategies used to determine position.

6.N.5. Demonstrate an understanding of ratio, concretely, pictorially, and symbolically.
[C, CN, PS, R, V]

- Provide a concrete or pictorial representation for a ratio.
- Write a ratio from a concrete or pictorial representation.
- Express a ratio in multiple forms, such as 3:5, $\frac{3}{5}$, or 3 to 5.
- Identify and describe ratios from real-life contexts and record them symbolically.
- Explain the part/whole and part/part ratios of a set (e.g., for a group of 3 girls and 5 boys, explain the ratios 3:5, 3:8, and 5:8).
- Solve a problem involving ratio.

6.N.6. Demonstrate an understanding of percent (limited to whole numbers) concretely, pictorially, and symbolically.
[C, CN, PS, R, V]

- Explain that "percent" means "out of 100."
- Explain that percent is the ratio of a certain number of units to 100 units.
- Use concrete materials and pictorial representations to illustrate a percent.
- Record the percent displayed in a concrete or pictorial representation.
- Express a percent as a fraction and a decimal.
- Identify and describe percents from real-life contexts and record them symbolically.
- Solve a problem involving percents.

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Strand:
Number (*continued*)

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Develop number sense.

Specific Outcomes

It is expected that students will:

Achievement Indicators

*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

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

[C, CN, R, V]

- Extend a horizontal or vertical number line by adding numbers less than zero and explain the pattern on each side of zero.
- Place a set of integers on a horizontal or vertical number line and explain how integers are ordered.
- Describe contexts in which integers are used (e.g., on a thermometer).
- Compare two integers, represent their relationship using the symbols $<$, $>$, and $=$, and verify using a horizontal or vertical number line.
- Order a set of integers in ascending or descending order.

6.N.8. Demonstrate an understanding of multiplication and division of decimals involving

- 1-digit whole-number multipliers
- 1-digit natural number divisors
- multipliers and divisors that are multiples of 10

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

- Place the decimal point in a product using front-end estimation (e.g., for $15.205 \text{ m} \times 4$, think $15 \text{ m} \times 4$, so the product is greater than 60 m).
- Place the decimal point in a quotient using front-end estimation (e.g., for $\$26.83 \div 4$, think $\$24 \div 4$, so the quotient is greater than \$6).
- Predict products and quotients of decimals using estimation strategies.
- Identify and correct errors of decimal point placement in a product or quotient by estimating.
- Solve a problem that involves multiplication and division of decimals using multipliers from 0 to 9 and divisors from 1 to 9.
- Use mental math to determine products or quotients involving decimals when the multiplier or divisor is a multiple of 10 (e.g., $2.47 \times 10 = 24.7$; $31.9 \div 100 = 0.319$).

6.N.9. Explain and apply the order of operations, excluding exponents (limited to whole numbers).

[CN, ME, PS, T]

- Demonstrate and explain with examples why there is a need to have a standardized order of operations.
- Apply the order of operations to solve multi-step problems with or without technology.

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Strand:
Patterns and Relations (Patterns)

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

Specific Outcomes

It is expected that students will:

Achievement Indicators

*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

6.PR.1. Demonstrate an understanding of the relationships within tables of values to solve problems.

[C, CN, PS, R]

- Generate values in one column of a table of values, values in the other column, and a pattern rule.
- State, using mathematical language, the relationship in a table of values.
- Create a concrete or pictorial representation of the relationship shown in a table of values.
- Predict the value of an unknown term using the relationship in a table of values and verify the prediction.
- Formulate a rule to describe the relationship between two columns of numbers in a table of values.
- Identify missing elements in a table of values.
- Identify and correct errors in a table of values.
- Describe the pattern within each column of a table of values.
- Create a table of values to record and reveal a pattern to solve a problem.

6.PR.2. Represent and describe patterns and relationships using graphs and tables.

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

- Translate a pattern to a table of values and graph the table of values (limit to linear graphs with discrete elements).
- Create a table of values from a pattern or a graph.
- Describe, using everyday language, orally or in writing, the relationship shown on a graph.

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Strand:
Patterns and Relations (Variables and Equations)

General Outcome:
Represent algebraic expressions in multiple ways.

Specific Outcomes

It is expected that students will:

Achievement Indicators

*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

6.PR.3. Represent generalizations arising from number relationships using equations with letter variables.

[C, CN, PS, R, V]

- Write and explain the formula for finding the perimeter of any rectangle.
- Write and explain the formula for finding the area of any rectangle.
- Develop and justify equations using letter variables that illustrate the commutative property of addition and multiplication (e.g., $a + b = b + a$ or $a \times b = b \times a$).
- Describe the relationship in a table using a mathematical expression.
- Represent a pattern rule using a simple mathematical expression, such as $4d$ or $2n + 1$.

6.PR.4. Demonstrate and explain the meaning of preservation of equality, concretely, pictorially, and symbolically.

[C, CN, PS, R, V]

- Model the preservation of equality for addition using concrete materials, such as a balance or using pictorial representations, and orally explain the process.
- Model the preservation of equality for subtraction using concrete materials, such as a balance or using pictorial representations, and orally explain the process.
- Model the preservation of equality for multiplication using concrete materials, such as a balance or using pictorial representations, and orally explain the process.
- Model the preservation of equality for division using concrete materials, such as a balance or using pictorial representations, and orally explain the process.
- Write equivalent forms of an equation by applying the preservation of equality, and verify using concrete materials [e.g., $3b = 12$ is the same as $3b + 5 = 12 + 5$ or $2r = 7$ is the same as $3(2r) = 3(7)$].

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Strand:
Shape and Space (Measurement)

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

Specific Outcomes

It is expected that students will:

Achievement Indicators

*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

6.SS.1. Demonstrate an understanding of angles by

- identifying examples of angles in the environment
- classifying angles according to their measure
- estimating the measure of angles using 45° , 90° , and 180° as reference angles
- determining angle measures in degrees
- drawing and labelling angles when the measure is specified

[C, CN, ME, V]

- Provide examples of angles found in the environment.
- Classify a set of angles according to their measure (e.g., acute, right, obtuse, straight, reflex).
- Sketch 45° , 90° , and 180° angles without the use of a protractor, and describe the relationship among them.
- Estimate the measure of an angle using 45° , 90° , and 180° as reference angles.
- Measure, using a protractor, angles in various orientations.
- Draw and label an angle in various orientations using a protractor.
- Describe the measure of an angle as the measure of rotation of one of its sides.
- Describe the measure of angles as the measure of an interior angle of a polygon.

6.SS.2. Demonstrate that the sum of interior angles is

- 180° in a triangle
- 360° in a quadrilateral

[C, R]

- Explain, using models, that the sum of the interior angles of a triangle is the same for all triangles.
- Explain, using models, that the sum of the interior angles of a quadrilateral is the same for all quadrilaterals.

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Strand: Shape and Space (Measurement) <i>(continued)</i>	General Outcome: Use direct or indirect measurement to solve problems.
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Specific Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
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- 6.SS.3. Develop and apply a formula for determining the
- perimeter of polygons
 - area of rectangles
 - volume of right rectangular prisms
- [C, CN, PS, R, V]

- Explain, using models, how the perimeter of any polygon can be determined.
- Generalize a rule for determining the perimeter of polygons.
- Explain, using models, how the area of any rectangle can be determined.
- Generalize a rule for determining the area of rectangles.
- Explain, using models, how the volume of any right rectangular prism can be determined.
- Generalize a rule for determining the volume of right rectangular prisms.
- Solve a problem involving the perimeter of polygons, the area of rectangles, or the volume of right rectangular prisms.

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Strand:
Shape and Space
(3-D Objects and 2-D Shapes)

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

Specific Outcomes
It is expected that students will:

Achievement Indicators
*The following set of indicators **may** be used to determine whether students
have met the corresponding specific outcome.*

6.SS.4. Construct and compare triangles, including

- scalene
- isosceles
- equilateral
- right
- obtuse
- acute

in different orientations.

[C, PS, R, V]

- Sort a set of triangles according to the length of the sides.
- Sort a set of triangles according to the measures of the interior angles.
- Identify the characteristics of a set of triangles according to their sides or their interior angles.
- Sort a set of triangles and explain the sorting rule.
- Draw a triangle (e.g., scalene).
- Replicate a triangle in a different orientation and show that the two are congruent.

6.SS.5. Describe and compare the sides and angles of regular and irregular polygons.

[C, PS, R, V]

- Sort a set of 2-D shapes into polygons and non-polygons, and explain the sorting rule.
- Demonstrate congruence (sides to sides and angles to angles) in a regular polygon by superimposing.
- Demonstrate congruence (sides to sides and angles to angles) in a regular polygon by measuring.
- Demonstrate that the sides of a regular polygon are of the same length and that the angles of a regular polygon are of the same measure.
- Sort a set of polygons as regular or irregular and justify the sorting.
- Identify and describe regular and irregular polygons in the environment.

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Strand:
Shape and Space (Transformations)

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

Specific Outcomes
It is expected that students will:

Achievement Indicators
*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

6.SS.6. Perform a combination of transformations (translations, rotations, or reflections) on a single 2-D shape, and draw and describe the image.
[C, CN, PS, T, V]

- Demonstrate that a 2-D shape and its transformation image are congruent.
- Model a set of successive translations, successive rotations, or successive reflections of a 2-D shape.
- Model a combination of two different types of transformations of a 2-D shape.
- Draw and describe a 2-D shape and its image, given a combination of transformations.
- Describe the transformations performed on a 2-D shape to produce a given image.
- Model a set of successive transformations (translation, rotation, or reflection) of a 2-D shape.
- Perform and record one or more transformations of a 2-D shape that will result in a given image.

6.SS.7. Perform a combination of successive transformations of 2-D shapes to create a design, and identify and describe the transformations.
[C, CN, T, V]

- Analyze a design created by transforming one or more 2-D shapes, and identify the original shape and the transformations used to create the design.
- Create a design using one or more 2-D shapes and describe the transformations used.

[C] Communication	[PS] Problem Solving
[CN] Connections	[R] Reasoning
[ME] Mental Mathematics and Estimation	[T] Technology
	[V] Visualization

Strand:
Shape and Space (Transformations) (*continued*)

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

Specific Outcomes
It is expected that students will:

Achievement Indicators
*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

6.SS.8. Identify and plot points in the first quadrant of a Cartesian plane using whole-number ordered pairs.
[C, CN, V]

- Label the axes of the first quadrant of a Cartesian plane and identify the origin.
- Plot a point in the first quadrant of a Cartesian plane given its ordered pair.
- Match points in the first quadrant of a Cartesian plane with their corresponding ordered pair.
- Plot points in the first quadrant of a Cartesian plane with intervals of 1, 2, 5, or 10 on its axes, given whole-number ordered pairs.
- Draw shapes or designs, given ordered pairs in the first quadrant of a Cartesian plane.
- Determine the distance between points along horizontal and vertical lines in the first quadrant of a Cartesian plane.
- Draw shapes or designs in the first quadrant of a Cartesian plane and identify the points used to produce them.

6.SS.9. Perform and describe single transformations of a 2-D shape in the first quadrant of a Cartesian plane (limited to whole-number vertices).
[C, CN, PS, T, V]

- Identify the coordinates of the vertices of a 2-D shape (limited to the first quadrant of a Cartesian plane).
- Perform a transformation on a given 2-D shape and identify the coordinates of the vertices of the image (limited to the first quadrant).
- 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 (limited to first quadrant).

[C] Communication	[PS] Problem Solving
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Strand:
Statistics and Probability (Data Analysis)

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

Specific Outcomes

It is expected that students will:

Achievement Indicators

*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

6.SP.1. Create, label, and interpret line graphs to draw conclusions.
[C, CN, PS, R, V]

- Determine the common attributes (title, axes, and intervals) of line graphs by comparing a set of line graphs.
- Determine whether a set of data can be represented by a line graph (continuous data) or a series of points (discrete data), and explain why.
- Create a line graph from a table of values or set of data.
- Interpret a line graph to draw conclusions.

6.SP.2. Select, justify, and use appropriate methods of collecting data, including

- questionnaires
- experiments
- databases
- electronic media

[C, PS, T]

- Select a method for collecting data to answer a question, and justify the choice.
- Design and administer a questionnaire for collecting data to answer a question and record the results.
- Answer a question by performing an experiment, recording the results, and drawing a conclusion.
- Explain when it is appropriate to use a database as a source of data.
- Gather data for a question by using electronic media, including selecting data from databases.

6.SP.3. Graph collected data and analyze the graph to solve problems.
[C, CN, PS]

- Select a type of graph for displaying a set of collected data, and justify the choice of graph.
- Solve a problem by graphing data and interpreting the resulting graph.

[C] Communication	[PS] Problem Solving
[CN] Connections	[R] Reasoning
[ME] Mental Mathematics and Estimation	[T] Technology
	[V] Visualization

Strand:
Statistics and Probability
(Chance and Uncertainty)

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

Specific Outcomes

It is expected that students will:

Achievement Indicators

*The following set of indicators **may** be used to determine whether students have met the corresponding specific outcome.*

6.SP.4. Demonstrate an understanding of probability by

- identifying all possible outcomes of a probability experiment
- differentiating between experimental and theoretical probability
- determining the theoretical probability of outcomes in a probability experiment
- determining the experimental probability of outcomes in a probability experiment
- comparing experimental results with the theoretical probability for an experiment

[C, ME, PS, T]

- List the possible outcomes of a probability experiment, such as
 - tossing a coin
 - rolling a die with any number of sides
 - spinning a spinner with any number of sectors
- Determine the theoretical probability of an outcome occurring for a probability experiment.
- Predict the probability of an outcome occurring for a probability experiment by using theoretical probability.
- Conduct a probability experiment, with or without technology, and compare the experimental results to the theoretical probability.
- Explain that as the number of trials in a probability experiment increases, the experimental probability approaches theoretical probability of a particular outcome.
- Distinguish between theoretical probability and experimental probability and explain the differences.