Number

BIG IDEA:
The set of real numbers is infinite.

Conceptual Thread: EXTENDING WHOLE NUMBER UNDERSTANDING TO THE SET OF REAL NUMBERS

INDICATORS	Extends whole number understanding to 100 000.	Explores decimal fractions to tenths (e.g., 0.1, 0.5, 0.8) and hundredths (e.g., 0.42, 0.05, 0.90).	Extends whole number understanding to 1 000 000.	Extends decimal number understanding to thousandths.	Understands that there are infinitely many whole numbers and explores the concept of infinity.	Generates fractions and decimal fractions between any two numbers (i.e., rational number density) (e.g., between 2.3 and 2.4 is 2.31; and between 2.3 and 2.31 is 2.305).	Extends whole number understanding to negative numbers.

BIG IDEA:
Numbers are related in many ways.

Conceptual Thread: COMPARING AND ORDERING QUANTITIES (MULTITUDE OR MAGNITUDE)

INDICATORS	Compares, orders, and locates whole numbers based on place-value understanding and records using $<, =, >$ symbols.	Compares, orders, and locates fractions with the same numerator or denominator using reasoning (e.g., $\frac{3}{5} > \frac{3}{6}$ because fifths are larger parts).	Compares, orders, and locates decimal numbers using place-value understanding.	Compares, orders, and locates fractions using flexible strategies (e.g., comparing models; creating common denominators or numerators).	Compares, orders, and locates positive rational numbers using flexible strategies (e.g., $\frac{2}{5} < 0.6$ because $\frac{2}{5}$ is less than one-half).

Conceptual Thread: ESTIMATING QUANTITIES AND NUMBERS

INDICATORS		Rounds whole numbers using place-value understanding (e.g., 4736 can be rounded to 5000, 4700, 4740).	Estimates the location of decimals and fractions on a number line.	Provides approximate decimal values using multiple strategies (e.g., estimation, rounding, truncating).	Estimates the size and magnitude of fractions by comparing to benchmarks.	Estimates quantities using percentage benchmarks (e.g., 25%, 50%, 75%).	Estimates the size and magnitude of rational numbers by comparing to benchmarks.

PURPOSE:
All real numbers can be represented as unique points on an infinitely long number line. Real numbers allow us to measure continuous quantities.

INDICATORS

Describes integers in terms of a positive or negative distance from zero.	Understands that a positive integer and its negative opposite are the same distance from zero (e.g., both 5 and −5 are five units from zero on a number line).	Distinguishes between numbers that do and do not have whole number square roots.	Extends decimal and fraction understanding to positive and negative rational numbers.	Explores irrational numbers (e.g., $\sqrt{2}$ and π are numbers that cannot be expressed as ratios, but have unique locations on the number line).

PURPOSE:
Number relationships provide the basis for developing flexibility with different representations of numbers and fluency with operations.

INDICATORS

	Compares, orders, and locates integers.	Compares, orders, and locates positive and negative rational numbers.	Understands absolute value of rational numbers and makes comparisons of their distance from zero on the number line.

INDICATORS

	Estimates the location of positive and negative rational numbers on a number line.	Estimates square roots of numbers that are imperfect squares (e.g., $\sqrt{28}$ is between 5 and 6, and closer to 5).	Uses scientific notation to approximate large and small values (e.g., 395 674 213 is approximately 4.0×10^8).

Number

BIG IDEA: (cont'd)
Numbers are related in many ways.

4–6

Conceptual Thread: DECOMPOSING AND COMPOSING NUMBERS TO INVESTIGATE EQUIVALENCIES

INDICATORS	Composes and decomposes whole numbers using standard and non-standard partitioning (e.g., 1000 is 10 hundreds or 100 tens).			Composes and decomposes decimal numbers using standard and non-standard partitioning (e.g., 1.6 is 16 tenths or 0.16 tens).	Models and explains the relationship between a fraction and its equivalent decimal form (e.g., $\frac{2}{5} = \frac{4}{10} = 0.4$).	Generates and identifies equivalent fractions using flexible strategies (e.g., represents the same part of a whole; same part of a set; same location on a number line).	Understands that all fractions are equivalent to either terminating or repeating decimals. Decomposes numbers into prime factors.	Models and explains the relationships among fractions, decimals, and percents. Translates flexibly between representations.	Models equivalent forms of improper fractions and mixed numbers using flexible strategies.

Conceptual Thread: USING RATIOS, RATES, PROPORTIONS, AND PERCENTS CREATES A RELATIONSHIP BETWEEN QUANTITIES

INDICATORS				Demonstrates multiplicative reasoning by applying unit rates in whole number contexts (e.g., If she earns $12 per hour, how much will she earn for 5 hours of work?).			Understands the concept of ratio as a relationship between two quantities (e.g., 3 wins to 2 losses).	Understands and applies the concept of unit rates (e.g., If 3 kg is $5, how much is 1 kg or how many kg for $1?).	Understands and applies the concept of percentage as a rate per 100 (e.g., calculating sales tax, tips, or discounts).

BIG IDEA:
Quantities and numbers can be grouped by or partitioned into equal-sized units.

Conceptual Thread: UNITIZING QUANTITIES INTO BASE-TEN UNITS

INDICATORS	Writes and reads whole numbers in multiple forms (e.g., 1358; one thousand three hundred fifty-eight; 1000 + 300 + 50 + 8).	Uses fractions with denominators of 10 to develop decimal fraction understanding and notation (e.g., five tenths is $\frac{5}{10}$ or 0.5).	Counts forward and backward by decimal units (e.g., 0.1, 0.2, ... 0.9, 1.0).	Understands that the value of a digit is ten times the value of the same digit one place to the right.	Understands that the value of a digit is one-tenth the value of the same digit one place to the left.	Writes and reads decimal numbers in multiple forms (i.e., numerals, number names, expanded form).			

PURPOSE:
Number relationships provide the basis for developing flexibility with different representations of numbers and fluency with operations.

INDICATORS

- Selects and justifies the most appropriate rational number representation (i.e., fraction, decimal, percent) for a given context.
- Models and expresses the inverse relationship between perfect squares and square roots (e.g., $10^2 = 100$, and inversely, $\sqrt{100}$ or $100^{\frac{1}{2}} = 10$).

INDICATORS

- Distinguishes between proportional and non-proportional situations.
- Solves for missing values and determines equivalent ratios and rates using flexible strategies (e.g., tables, graphing, unit rates, $\frac{a}{b} = \frac{c}{d}$ relationship).
- Uses equations to represent proportional relationships and solve problems (e.g., using exchange rates to convert between currencies).
- Understands the meaning of percents greater than 100% and less than 1%.
- Uses proportional reasoning in different contexts (e.g., scaling factors).
- Explores percentage increase and percentage decrease to solve problems (e.g., calculating simple and compound interest).

PURPOSE:
Unitizing provides a necessary foundation for multiplication, division, fractions, decimals, and ratios.

INDICATORS

- Uses understanding of place value to write numbers in expanded form using powers of 10 (e.g., $3107 = 3 \times 10^3 + 1 \times 10^2 + 7 \times 10^0$).
- Uses place value, rounding, and powers of 10 to represent very large and very small numbers using scientific notation (e.g., 3 241 782 can be represented as 3.24×10^6).

Number

4–6

BIG IDEA: (cont'd)
Quantities and numbers can be grouped by or partitioned into equal-sized units.

Conceptual Thread: PARTITIONING QUANTITIES TO FORM FRACTIONS

INDICATORS

Partitions fractional parts into smaller fractional units (e.g., partitions halves into thirds to create sixths).	Uses models to describe, name, and count forward and backward by unit fractions.	Decomposes fractions into sums using like denominators (e.g., $\frac{3}{5} = \frac{2}{5} + \frac{1}{5}$).	Understands the meaning of an $\frac{a}{b}$ fraction as a multiple of the unit fraction $\frac{1}{b}$ (e.g., $\frac{3}{5} = 3 \times \frac{1}{5}$).	Understands the fraction $\frac{a}{b}$ as $a \div b$.	Explains that two equivalent fractions represent the same part of a whole, but not necessarily equal quantities (e.g., $\frac{1}{2}$ of a set of 12 and $\frac{1}{2}$ of a set of 6 are equal fractions, but unequal quantities).	Uses models to compose and decompose fractions (e.g., uses area to model $\frac{1}{2} = \frac{1}{4} + \frac{1}{6} + \frac{1}{12}$).	Continues to extend fraction understanding to multiple contexts (e.g., sharing, division, ratios).

BIG IDEA:
Quantities and numbers can be operated on to determine how many and how much.

Conceptual Thread: INVESTIGATING NUMBER AND ARITHMETIC PROPERTIES

INDICATORS

Recognizes and generates equivalent numerical expressions using commutative and associative properties.	Understands operation relationships (e.g., inverse relationship between multiplication/division, addition/subtraction).	Understands the identity of operations (e.g., $5 + 0 = 5$; $7 \times 1 = 7$).	Applies order of operations for whole numbers and explains the effect when order is not followed.	Determines whether one number is a multiple of any one-digit number. Examines and classifies whole numbers based on their properties (e.g., even/odd; prime; composite; divisible by 2, 5, 10).	Generates multiples and factors for numbers using flexible strategies. Develops exponent notation as a compressed form of repeated multiplication for powers of 10 (e.g., $10\,000 = 10 \times 10 \times 10 \times 10 = 10^4$).	Distinguishes between and investigates properties of prime and composite numbers (e.g., prime factorization). Extends exponent notation to any repeated multiplication (e.g., $2 \times 2 \times 2 \times 2 = 2^4$) and evaluates expressions using exponents (e.g., $3^4 = 3 \times 3 \times 3 \times 3 = 81$).	Evaluates equations with brackets using order of operations. Models and applies distributive property understanding to whole number equations (e.g., $75 + 55 = 5(15) + 5(11) = 5(15 + 11)$ OR $75 + 55 = 15(5) + 11(5) = 26(5)$).	Determines the greatest common factor and least common multiple of whole numbers. Uses reasoning and knowledge of factors to examine divisibility of numbers (by 4, 8, 3, 6, and 9).

PURPOSE:
Unitizing provides a necessary foundation for multiplication, division, fractions, decimals, and ratios.

INDICATORS

PURPOSE:
The actions, properties, and meaning of mathematical operations hold true for all real numbers, thereby extending our understanding of a broader range of problems.

INDICATORS

Explains the result of applying order of operations and the distributive property to the same equation (e.g., $3(4 + 2)$ can be visualized as

4	2
4	2
4	2

and solved as either 3×6 using order of operations or as $3 \times 4 + 3 \times 2$ using the distributive property).

Applies order of operations to equations involving exponents to evaluate expressions.

BIG IDEA: (cont'd)
Quantities and numbers can be operated on to determine how many and how much.

Conceptual Thread: DEVELOPING CONCEPTUAL MEANING OF OPERATIONS

INDICATORS	Models and develops meaning for whole number computation to four digits.	Understands and explains the effect of multiplying and dividing whole numbers by powers of 10.	Extends whole number computation models to larger numbers. Multiplies and divides decimals by powers of 10 and explains the effect.	Demonstrates an understanding of decimal number computation through modelling and flexible strategies.	Models and develops meanings for division of whole numbers that result in fractions.	Understands and explains the effect of multiplying and dividing decimal numbers by powers of 10 less than zero (i.e., 0.1, 0.001, etc.).	Explores multiplication as scaling and estimates the resulting product when scaling a given number by a number less than, equal to, or greater than 1 (e.g., $\frac{1}{2} \times 12$; 5.2×12; 0.3×12).	Models and symbolizes fraction addition and subtraction with like denominators (e.g., $\frac{2}{5} + \frac{1}{5}$) and where one denominator is a multiple of the other (e.g., $\frac{2}{5} + \frac{3}{10}$).

Conceptual Thread: DEVELOPING FLUENCY OF OPERATIONS

INDICATORS	Fluently recalls multiplication and division facts to 100.	Estimates the result of whole number operations using contextually relevant strategies (e.g., How many buses are needed to take the Grade 8 classes to the museum?).	Solves whole number computation using efficient strategies (e.g., mental computation, algorithms, calculating cost of transactions and change owing, saving money to make a purchase).	Estimates sums and differences of decimal numbers (e.g., calculating cost of transactions involving dollars and cents).	Solves decimal number computation using efficient strategies.

PURPOSE:

The actions, properties, and meaning of mathematical operations hold true for all real numbers, thereby extending our understanding of a broader range of problems.

INDICATORS

Models and demonstrates an understanding of integer addition and subtraction. Models multiplication of a whole number by a fraction (e.g., $3 \times \frac{2}{3}$).	Models and demonstrates an understanding of fraction addition and subtraction. Models and demonstrates an understanding of multiplying unit fractions (e.g., $\frac{1}{5} \times \frac{1}{3} = \frac{1}{5 \times 3} = \frac{1}{15}$).	Models and demonstrates an understanding of integer multiplication and division. Estimates and explains the results of multiplying a whole number by fractions greater than and less than 1.	Models and demonstrates an understanding of division of a whole number by a unit fraction (e.g., 5 m of ribbon cut into $\frac{1}{3}$ m strips results in 15 strips or $5 \div \frac{1}{3} = 15$).	Models and demonstrates an understanding of squares and square roots.	Models and demonstrates an understanding of multiplication and division of fractions.	Models and solves expressions with whole-number exponents, and positive and negative rational numbers.

INDICATORS

	Estimates and solves integer addition and subtraction using efficient strategies.	Solves fraction addition and subtraction using efficient strategies.	Solves integer multiplication and division using efficient strategies.	Uses reasoning, estimation, efficient strategies, and algorithms to operate on positive and negative rational numbers.	Develops efficient strategies for computing numbers expressed in scientific notation.

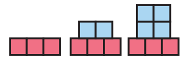
Patterning and Algebra

BIG IDEA:
Regularity and repetition form patterns that can be generalized and predicted mathematically.

4–6

Conceptual Thread: REPRESENTING PATTERNS, RELATIONS, AND FUNCTIONS

INDICATORS

Describes, generates, extends, translates, and corrects number and shape patterns that follow a predetermined rule.	Uses multiple approaches to model situations involving repetition (i.e., repeating patterns) and change (i.e., increasing/decreasing patterns) (e.g., using objects, tables, graphs, symbols, loops and nested loops in coding).	Generates paired values (i.e., ordered pairs) for simple linear relations (e.g., $T = 5 \times p$ generates: (1, 5); (2, 10); (3, 15); etc.).	Represents a numeric or shape pattern using a table of values by pairing the term value with a term number.	Generates a visual model to represent a simple number pattern (e.g., $2n + 3$:  ...).	Represents a mathematical context or problem with expressions and equations using variables to represent unknowns.	Visualizes graphical representations of one-step equations (e.g., $n + 3 = m$; $5x = y$).	Translates one-step and two-step equations to a table of values and represents ordered pairs graphically (e.g., plots points on a coordinate grid or a double number line dynagraph). (Limited to the first quadrant.)

Conceptual Thread: GENERALIZING AND ANALYZING PATTERNS, RELATIONS, AND FUNCTIONS

INDICATORS

Explains the rule for numeric patterns including the starting point and change (e.g., given: 16, 22, 28, 34,... Start at 16 and add 6 each time).	Describes numeric and shape patterns using words and numbers.	Generates terms of a pattern based on a given starting point and rule (limited to addition, subtraction, multiplication: e.g., start at 4 and add 5 each time creates the pattern 4, 9, 14, 19, etc.; writing or altering code to generate patterns).	Investigates and generalizes linear numeric and shape patterns using recursive rules (e.g., add 3 to the previous term) in relation to multiplication tables (e.g., How is 4, 7, 10, 13 similar to 3, 6, 9, 12?).	Investigates representations of input-output (functional) relations (e.g., equations, table of values, graphs) to form generalizations and pattern rules.	Predicts the value of a given element in a numeric or shape pattern using pattern rules.	Recognizes similarities in pattern structures that change by the same value (e.g., 3, 6, 9, 12, ... changes by the same value as 4, 7, 10, 13, ...) and compares the pattern rules (e.g., $3n$ vs. $3n + 1$).	Describes the relationship between two numeric patterns (e.g., for every 4 steps, she travels 3 metres).	Investigates how patterns change by adding or subtracting a constant, or by multiplying or dividing by a constant (e.g., compare $4x$ and $4x - 3$).

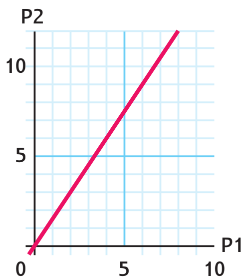
PURPOSE:

Predicting and generalizing patterns contribute to the reasoning necessary for algebra and algebraic thinking.

INDICATORS

Generates ordered pairs for a linear relation and plots the coordinates on a graph. (Limited to integer values on four quadrants.)	Matches different representations of the same linear relation (e.g., graph, equation, table of values).	Differentiates between linear and non-linear relations by their graphical representation.	Describes the characteristics of linear relations (e.g., one or two variables; variable powers not greater than 1; plotting ordered pairs forms a line; constant rate of change).	Models and solves problems with integers using linear equations in different forms (e.g., $ax = b$; $ax + b = c$; $a(x + b) = c$).	Uses the characteristics of linear relations to distinguish between proportional ($y = 4x$) and non-proportional ($y = 4x + 2$) linear relations, and linear ($y = 4x + 2$) and non-linear ($y = \frac{4}{x} + 2$) relations.	Models and solves linear inequalities graphically and symbolically ($a + 5 < 9$).	Models problems and solves linear relations with rational coefficients, variables, and constants in different forms.	Models linear functions with the equation $y = mx + b$ and relates the equation to a graph.

INDICATORS

Analyzes the relationship between values of two linear number patterns (e.g., P1 is 2, 4, 6, 8, ... and P2 is 3, 6, 9, 12, ... (1) as P1 goes up by 2, P2 goes up by 3; (2) P1 $\times$ 1.5 = P2; (3) ).	Investigates whether there is more than one value for variables in expressions and equations (e.g., $2 \times n - 6 = 8$; $n + 4 + s = 12$).	Investigates, analyzes, and compares equations and graphs of linear relations to make generalizations and predictions (e.g., How will the graphs of $y = 3x - 4$ and $y = 3x - 8$ be alike/different?).	Understands functions as a relationship based on rules that assign exactly one output for every input (i.e., domain/co-domain).	Distinguishes between contexts having discrete (e.g., late fees over time) vs. continuous (e.g., plant growth over time) relations. Models a linear relationship between two quantities using a function.	Compares linear relations on the same graph and describes the differences graphically (e.g., y-intercept) and symbolically (e.g., constant).	Recognizes and generates contextual problems that can be modelled with a linear relation where there is one solution, many solutions, or no solution.	Approximates linear relation values between and beyond data through interpolation and extrapolation.

Patterning and Algebra

BIG IDEA:
Patterns and relations can be represented with symbols, equations, and expressions.

4–6

Conceptual Thread: UNDERSTANDING EQUALITY AND INEQUALITY, BUILDING ON GENERALIZED PROPERTIES OF NUMBERS AND OPERATIONS

INDICATORS

Expresses a one-step mathematical problem as an equation using a symbol or letter to represent an unknown number (e.g., Sena had some tokens and used four. She has seven left: □ − 4 = 7).	Determines an unknown number in simple one-step equations using different strategies (e.g., $n \times 3 = 12$; 13 − □ = 8).	Uses arithmetic properties to investigate and transform one-step addition and multiplication equations (e.g., $5 + 4 = 9$ and $5 + a = 9$ have the same structure and can be rearranged in similar ways to maintain equality: $4 + 5 = 9$ and $a + 5 = 9$).	Recognizes that an equal sign between two expressions with variables indicates that the expressions are equivalent (e.g., $5n - 4 = 3n$; $3r = 2 + s$).	Uses arithmetic properties to investigate and transform one-step subtraction and division equations (e.g., $12 - 5 = 7$ and $12 - b = 7$ have the same structure and can be rearranged in similar ways to maintain equality: $12 - 7 = 5$ and $12 - 7 = b$).	Investigates and models the meaning of preservation of equality of single variable equations (e.g., $3x = 12$).

Conceptual Thread: USING VARIABLES, ALGEBRAIC EXPRESSIONS, AND EQUATIONS TO REPRESENT MATHEMATICAL RELATIONS

INDICATORS

Understands an unknown quantity (i.e., variable) may be represented by a symbol or letter (e.g., 13 − □ = 8; $4n = 12$).	Flexibly uses symbols and letters to represent unknown quantities in equations (e.g., knows that 4 + □ = 7; $4 + x = 7$; and $4 + y = 7$ all represent the same equation with □, x, and y representing the same value).	Interprets and writes numeric expressions (e.g., twice the sum of 3 and 4 is $2 \times (3 + 4)$).	Interprets and writes algebraic expressions (e.g., $2n$ means two times a number; subtracting a number from 7 can be written as $7 - n$).	Understands a variable as a changing quantity (e.g., $5s$, where s can be any value). Writes two-variable equations to describe a relationship (e.g., $5s = t$).	Uses expressions and equations with variables to represent generalized relations and algorithms (e.g., $P = 2l + 2w$).	Identifies and describes the meaning of parts of an equation using mathematical terms (e.g., *sum*, *coefficient*, *factor*, *variable*, *constant*).

Pearson mathology

PURPOSE:

Algebraic tools, such as variables, are efficient ways to represent, generalize, and analyze number patterns and properties.

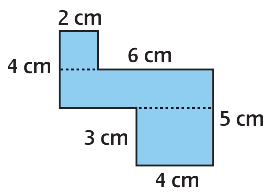
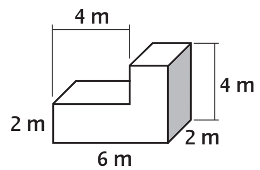
INDICATORS	Applies arithmetic properties (e.g., distributive, commutative, identities) to identify, transform, and generate equivalent numeric expressions (e.g., $3(2+5) = (2+5)+(2+5)+(2+5)$).	Investigates the process of decomposing arithmetic equations and comparing them with the sequence of operations used to solve algebraic equations (e.g., $4 \times 5 + 6 = 26$ compared to solving $4x + 6 = 26$).	Applies arithmetic properties to transform, simplify, and identify equivalent linear expressions (e.g., $x(4+5) = 4x + 5x = 9x$).	Models the preservation of equality to solve equations involving integer coefficients (e.g., $-4m + 16 = -12$).	Applies the distributive property to expressions and identifies common factors to create equivalent expressions (e.g., $4a + 12 = 4(a+3)$).	Applies arithmetic properties to linear expressions with rational coefficients to simplify, factor, expand, equate, and generate new expressions (e.g., $14x - 5(x+8) = 9x - 40$).	Solves linear relations with rational coefficients, constants, and solutions (e.g., $\frac{2}{3}m - 2 = -\frac{7}{6}$).	Applies arithmetic properties to solve inequalities (e.g., $2x > 9$) and determines which inequalities have finite or infinitely many solutions.	Applies arithmetic properties to operate on polynomial expressions and solve problems (e.g., find area of rectangle with sides of $3x$ and $4 + x$). (Limited to degrees of 2.)
INDICATORS		Evaluates algebraic expressions, including formulas, given specific values for the variables (e.g., evaluate $3r - 12$, when $r = 3$; $\frac{1}{2}(bh)$, when base is 12 cm and height is 5 cm).	Writes expressions to describe patterns and contexts representing linear relations (e.g., 5, 8, 11, 14 can be represented as $3n + 2$).			Evaluates algebraic expressions given the rational values of one or more variables (e.g., $3x - 3y + \frac{3}{4}$, if $x = \frac{1}{2}$ and $y = \frac{2}{3}$).		Extends understanding of algebraic expressions to include writing and evaluating expressions with polynomials of degree two (e.g., $3x^2 - 7$).	Distinguishes between polynomials (e.g., $3x$; $4x^2 + 3x - 5$) and non-polynomials (e.g., $\frac{2}{x+2}$; $3y^2$).

Measurement

BIG IDEA:
Many things in our world (e.g., objects, spaces, events) have attributes that can be measured and compared.

Conceptual Thread: UNDERSTANDING ATTRIBUTES THAT CAN BE MEASURED, COMPARED, AND ORDERED

INDICATORS

Understands area as an attribute of 2-D shapes that can be measured and compared.	Understands area is additive (e.g., the area of an irregular shape can be solved by decomposing it into rectangles and adding their areas).  	Compares and orders the area of 2-D shapes through decomposition.	Understands volume and capacity as attributes of 3-D objects that can be measured and compared.	Understands volume is additive (e.g., the volume of a composite 3-D object can be determined by decomposing it into rectangular prisms and adding their volumes).  Understands angle as an attribute that can be measured and compared.	Compares and orders the volume and capacity of 3-D objects through decomposition. Understands angle is additive (e.g., 90° can be visualized as nine sectors that are 10° each).	Understands surface area as an attribute of 3-D objects that can be measured and compared.

BIG IDEA:
Assigning a unit to a continuous attribute allows us to measure and make comparisons.

Conceptual Thread: SELECTING AND USING UNITS TO ESTIMATE, MEASURE, CONSTRUCT, AND MAKE COMPARISONS

INDICATORS

Develops understanding of square units (e.g., square unit, square cm, square m) to measure area of 2-D shapes. Reads and records time (i.e., digital and analogue) and calendar dates.	Measures, constructs, and estimates perimeter and area of regular and irregular polygons.	Chooses the most appropriate unit to measure a given attribute of an object (e.g., classroom area measured in square metres).	Develops understanding of a unit cube and uses unit cubes to estimate and measure volume of 3-D objects.	Measures, constructs, and estimates volume using standard cube units (e.g., cubic centimetres).	Measures, constructs, and estimates angles using degrees.

PURPOSE:

Measurable attributes are a way to quantify and compare seemingly different objects.

INDICATORS

	Understands circumference as the measure around a circle.	Understands a sector as a fraction of a circle and an arc as a fraction of the circumference.

PURPOSE:

Measuring with units is a way we can count and compare "how much" based on continuous attributes that are not immediately countable.

INDICATORS

Constructs circles based on radius and diameter measures.	Measures, constructs, and compares interior angles of regular and irregular polygons.	Relates angle measures to arcs and sectors of a circle.	Applies Pythagorean Theorem to find unknown side lengths and distance between points on a Cartesian plane.

Measurement

BIG IDEA: (cont'd)
Assigning a unit to a continuous attribute allows us to measure and make comparisons.

Conceptual Thread: UNDERSTANDING RELATIONSHIPS AMONG MEASURED UNITS

INDICATORS						
Understands relationship among different measures of time (e.g., seconds, minutes, hours, days, decades).	Understands and applies the multiplicative relationship among metric units of length, mass, and capacity.	Develops and generalizes strategies to compute area and perimeter of rectangles.	Investigates the relationship between perimeter and area in rectangles.	Develops and generalizes strategies to compute area of triangles, quadrilaterals, and other polygons (e.g., decomposing a parallelogram and rearranging to form a rectangle).	Develops and generalizes strategies and formulas to compute volumes of right rectangular prisms.	Uses nets to determine the surface area of 3-D objects composed of rectangles and triangles. Investigates and generalizes sum of interior angles of triangles (i.e., sum of angles of a triangle is 180°).

PURPOSE:

Measuring with units is a way we can count and compare "how much" based on continuous attributes that are not immediately countable.

7–9

INDICATORS								
Investigates the minimum information needed (e.g., side length, angle measure) to yield a unique triangle.	Investigates and generalizes sum of interior angles of quadrilaterals (i.e., sum of angles of a quadrilateral is 360°).	Investigates the proportional effect of a scale factor on side lengths, perimeter, and area of similar (i.e., scalar) 2-D shapes.	Develops and generalizes strategies to compute the circumference and area of circles.	Develops and generalizes strategies to construct, compute, and apply the Pythagorean Theorem.	Develops and generalizes strategies and formulas to compute volume and surface area of regular solids (e.g., cones, cylinders, and spheres).	Investigates and generalizes the sum of interior angles of polygons (e.g., subdivide a hexagon into triangles).	Determines volume and surface area of composite 3-D objects.	Uses circle properties to generalize and solve problems (e.g., central angle, inscribed angle, tangent-radius, triangle applications, chord bisector).

Geometry

BIG IDEA:
2-D shapes and 3-D solids can be analyzed and classified in different ways by their attributes.

4–6

Conceptual Thread: INVESTIGATING GEOMETRIC ATTRIBUTES AND PROPERTIES OF 2-D SHAPES AND 3-D SOLIDS

INDICATORS						
Identifies and draws points, lines (including vertical, horizontal), line segments, and rays.	Identifies and draws parallel, intersecting, and perpendicular lines. Distinguishes between attributes of a specific shape, and properties of a class of shapes (e.g., this shape has 4 sides; all quadrilaterals have 4 sides).	Sorts, describes, constructs, and classifies polygons based on side attributes (e.g., parallel, perpendicular, regular/irregular). Uses conditional statements to describe sorting rules (e.g., if all sides and angles are equal, then it is a regular polygon).	Understands angle as a geometric figure formed from two rays or line segments sharing a common endpoint.	Sorts, describes, constructs, and classifies 3-D objects based on edges, faces, vertices, and angles (e.g., prisms, pyramids). Draws, compares, and classifies angles (i.e., right, acute, obtuse, straight, reflex).	Sorts, describes, and classifies 2-D shapes based on their geometric properties (e.g., side lengths, angles, diagonals).	Classifies 2-D shapes within a hierarchy based on their properties (e.g., rectangles are a subset of parallelograms).

Conceptual Thread: INVESTIGATING 2-D SHAPES, 3-D SOLIDS, AND THEIR ATTRIBUTES THROUGH COMPOSITION AND DECOMPOSITION

INDICATORS					
	Identifies types of lines in 2-D images (e.g., parallel, intersecting, perpendicular).	Investigates 2-D shapes that do or do not have parallel and perpendicular lines.	Identifies and constructs nets for 3-D objects made from triangles and rectangles.	Constructs and decomposes polygons into shapes with known areas (e.g., triangles, rectangles).	Visualizes 3-D objects from 2-D nets, including the spatial location and orientation of their faces (e.g., given cube net with sides numbered 1–6, knows orientation and location of each number when net is folded).

PURPOSE:

Analyzing and classifying help us create categories of different objects by noticing and reasoning about their similarities.

7–9

INDICATORS	Performs geometric constructions to gain insight into properties of lines, angles, and polygons (e.g., constructs perpendicular bisectors, 45° angles, angle bisectors, equilateral triangle).	Sketches polygons based on given conditions (e.g., angle measures, side measures) and generalizes whether there is a unique shape.	Identifies, describes, and constructs circles based on attributes (e.g., radius, diameter, circumference).	Develops and applies understanding of angle relationships of intersecting lines, transversals, and triangles to solve problems.	Extends understanding of circle attributes to include arcs, sectors, chords, tangents, etc.	Uses interior angle properties of polygons to solve problems and determine similarity.

INDICATORS		Identifies and constructs nets for 3-D objects made from polygons and circles (e.g., cylinder, hexagonal prism).	Visualizes and predicts the 2-D shape that results from cross-sectioning 3-D objects (e.g., see and identify a plane section of right rectangular prisms and pyramids).

Geometry

4–6

BIG IDEA:
2-D shapes and 3-D solids can be transformed in many ways and analyzed for change.

Conceptual Thread: EXPLORING 2-D SHAPES AND 3-D SOLIDS BY APPLYING AND VISUALIZING TRANSFORMATIONS

INDICATORS

- Demonstrates an understanding of congruency (i.e., same side lengths and angles).
- Identifies, describes, and performs single transformations (i.e., translation, reflection, rotation) on 2-D shapes.
- Identifies, describes, applies, and creates a combination of successive transformations on 2-D shapes.

Conceptual Thread: EXPLORING SYMMETRY TO ANALYZE 2-D SHAPES AND 3-D SOLIDS

INDICATORS

- Draws and identifies lines of symmetry (i.e., vertical horizontal, diagonal, oblique) in 2-D shapes and designs.
- Sorts, describes, constructs, and classifies 2-D shapes based on line symmetry.
- Explores and classifies quadrilaterals based on lines of symmetry.
- Explores and classifies triangles based on lines of symmetry.
- Draws, creates, and identifies shapes that have rotational symmetry, and identifies the centre of rotation and angle of rotation.

BIG IDEA:
Objects can be located in space and viewed from multiple perspectives.

Conceptual Thread: LOCATING AND MAPPING OBJECTS IN SPACE

INDICATORS

- Extends understanding of locating, describing, and relating the movement of objects on grids and maps.
- Uses cardinal directions (e.g., north, south) to describe movement on maps and in the world.
- Develops understanding of a Cartesian plane as a coordinate system using perpendicular axes.
- Plots and locates points on a Cartesian plane, and relates the location to the two axes. (Limited to the first quadrant.)
- Analyzes and locates the vertices of 2-D shapes after transformation on a Cartesian plane. (Limited to the first quadrant.)

PURPOSE:

Noticing how objects change and stay the same when they are transformed and move through space develops spatial reasoning.

INDICATORS

Verifies congruency of shapes under rigid transformations (i.e., translation, reflection, rotation) based on side and angle measures.	Investigates dilation as a form of transformation and creates scale drawings using scale factors.	Understands similarity as a form of transformation (i.e., dilation) that maintains angle congruence and proportional side length.	Analyzes and explains the properties of shapes (e.g., angles, symmetry, congruency) and transformations that are necessary to tile a plane (e.g., writing code for tiling a plane using one or more subprograms).	Uses properties of shapes and transformations to design tessellations.

INDICATORS

	Explores and analyzes symmetry of 3-D objects (e.g., plane, rotational).

PURPOSE:

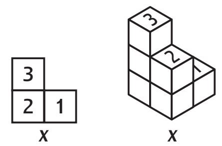
Representing space and spatial relations from different reference points is necessary for navigation and describing how objects move through space.

INDICATORS

Identifies, locates and plots points, polygon vertices, and lines on a Cartesian plane in all four quadrants. (Limited to integers.)	Analyzes and locates points, lines, and shapes on a Cartesian plane after successive transformations.	Extends understanding of congruency and similarity through investigations of shape transformations on a Cartesian plane.	Analyzes and predicts the location of 2-D shapes under transformation on a Cartesian plane.

BIG IDEA: (cont'd)
Objects can be located in space and viewed from multiple perspectives.

Conceptual Thread: **VIEWING AND REPRESENTING OBJECTS FROM MULTIPLE PERSPECTIVES**

INDICATORS				
	Interprets and creates coded plans, and constructs objects from plans (e.g., uses linking cubes to build 3-D object from plan).  Coded Plan 3-D Object	Constructs 3-D models from isometric sketches.	Makes isometric sketches of 3-D rectilinear structures (e.g., linking cube structures).	Investigates, predicts, and draws orthographic projections of 3-D objects (e.g., If you shine a light onto the front of a linking cube structure, what will the shadow look like?).

PURPOSE:

Representing space and spatial relations from different reference points is necessary for navigation and describing how objects move through space.

INDICATORS

Designs and represents compound 3-D objects using 2-D representations from multiple perspectives (e.g., isometric sketches, orthographic sketches, nets).

Data Management and Probability

BIG IDEA:
Formulating questions, collecting data, and consolidating data in visual and graphical displays help us understand, predict, and interpret situations that involve uncertainty, variability, and randomness.

4–6

Conceptual Thread: FORMULATING QUESTIONS TO LEARN ABOUT GROUPS, COLLECTIONS, AND EVENTS BY COLLECTING RELEVANT DATA

INDICATORS

Extends experiences of formulating, clarifying, and refining questions about the class and community (e.g., What kind of litter is in the schoolyard?).	Formulates questions to understand past (statistical) events and predict future (probable) events.	Formulates questions to make comparisons between two groups or events.	Distinguishes between numerical (e.g., What is your heart rate?) and statistical questions involving variability (e.g., What is the typical resting heart rate for 12-year-olds?).

Conceptual Thread: COLLECTING DATA AND ORGANIZING IT INTO CATEGORIES

INDICATORS

Distinguishes between categorical (e.g., pet type, occupation) and discrete (e.g., class size, free throws made) data.	Constructs data organizers to support data collection (e.g., creates tally chart or line plot on a grid to collect survey data).	Records the results of multiple trials of simple events.	Differentiates between primary (i.e., first-hand) and secondary (i.e., second-hand) data sources.	Distinguishes between discrete (e.g., votes) and continuous (e.g., height) data.	Selects and justifies an appropriate method of data collection (e.g., experiment, observation, survey) based on question posed.	Uses a simulator to collect data and explore convergence of experimental and theoretical probability (i.e., Law of Large Numbers).

Conceptual Thread: CREATING GRAPHICAL DISPLAYS OF COLLECTED DATA

INDICATORS

Creates charts and graphs with appropriate titles and labels to represent data collected (e.g., bar graph, line plot, pictograph, stem-and-leaf plot).	Represents data graphically using many-to-one correspondence with appropriate scales and intervals (e.g., each symbol on pictograph represents 10 people).	Chooses and justifies appropriate visual representations for displaying discrete (e.g., bar graph) and continuous (e.g., line graph) data.	Visually represents two or more data sets (e.g., double bar chart, stacked bar graph, multi-line graph, multi-column table).	Chooses and justifies appropriate visual representation for displaying different data types (i.e., nominal, ordinal, discrete, continuous), distribution (i.e., shape), and range (i.e., spread).	Compares the perceived differences of using different graphical representations and scales for a data set.

PURPOSE:

Engaging in a process for comparing past events and predicting future uncertainties helps us make sense of our world and make better decisions.

7–9

INDICATORS		Uses conjectures and inferences of a completed study to formulate new questions.	Formulates questions about a population that require data collection from representative samples.		Generates questions seeking a potential relationship between two variables or attributes (e.g., Does study time impact test scores?).	Investigates questions in society involving statistics (e.g., population growth) and probability (e.g., insurance options, weather).

INDICATORS	Understands variation in data collection and explains the potential sources of variation in collected data (e.g., natural variation of plant height; measurement process variation).	Designs a simulation to generate large-scale data (i.e., greater than 100) for two or more independent events (e.g., rolling number cubes).	Explores methods for collecting data from a population (e.g., census) and a representative sample of a population.	Critiques methods for selecting representative samples from a population (e.g., bias, ethics, cost, privacy).	Generates bivariate data (i.e., two variables such as foot size and height) to explore relationships.	

INDICATORS	Creates graphical representations to illustrate parts of a whole (e.g., circle graph).	Visually represents large-scale data (e.g., histograms, box plots).			Visually represents bivariate data to reveal relationships (e.g., scatter plots; line of best fit; two-way tables).	Informally fits straight lines on a scatter plot to model and assess linear relationships between two variables.

Data Management and Probability

BIG IDEA: (cont'd)
Formulating questions, collecting data, and consolidating data in visual and graphical displays help us understand, predict, and interpret situations that involve uncertainty, variability, and randomness.

Conceptual Thread: READING AND INTERPRETING DATA DISPLAYS AND ANALYZING VARIABILITY

INDICATORS	Reads and interprets data displays using many-to-one correspondence.	Determines range values (e.g., maximum, minimum, difference) and relates values to the variability of data collected.	Visualizes and determines the median value as a middle measure representing a whole data set.	Compares the similarities and differences in distribution (i.e., shape) of data sets represented on the same data display.	Describes data using relative frequency of categories (e.g., $\frac{9}{12}$ soccer games won).	Visualizes and determines the mean of a data set.	Understands that measures of central tendency (i.e., mode, median, mean) are summary measures that represent all values in a data set with a single number (i.e., most frequent value; middle value; balance point of values).	Understands and describes the differences between the central tendency values (i.e., mode, median, mean) and explores which measure is most appropriate for the data collected.

Conceptual Thread: USING THE LANGUAGE AND TOOLS OF CHANCE TO DESCRIBE AND PREDICT EVENTS

INDICATORS	Describes data using frequency counts (e.g., 5 people chose peppermint) and modal value (e.g., dogs are the most common pet).	Locates the likelihood of outcomes on a vocabulary-based probability continuum (e.g., impossible, unlikely, likely, certain).	Distinguishes between equally likely events (e.g., heads or tails on a fair coin) and unequally likely events (e.g., spinner with differently sized sections).	Identifies the sample space of independent events in an experiment (e.g., flipping a cup, drawing a coloured cube from a bag).	Investigates and calculates the experimental probability (i.e., relative frequency) of simple events (e.g., 3 heads in 5 coin tosses is $\frac{3}{5}$).	Compares and explains the differences in the relative frequencies of a given outcome in a repeated experiment (e.g., number of heads in 10 coin tosses, repeated three times).	Determines theoretical probability as a ratio (i.e., number of outcomes for a given event to total number of possible outcomes).	Uses theoretical probability to predict the outcome of an experiment or game.	Extends understanding of the probability continuum by expressing and comparing probabilities using decimals (between 0 and 1), ratios, fractions, and percents.

PURPOSE:
Engaging in a process for comparing past events and predicting future uncertainties helps us make sense of our world and make better decisions.

INDICATORS

Explains the effect of adding, removing, or changing values (including outliers) on measures of central tendency.	Compares two or more data sets based on variability (e.g., range, interquartile range) and numerical summary values (e.g., mean, median).	Uses variability and central tendency measures to make comparisons of populations (e.g., census data), and representative samples from one population (e.g., polls).	Critiques the ways in which data is presented in graphs and tables (e.g., misleading graphs; changing scale).	Explores possible relationships (e.g., positive, negative, linear, non-linear) between two variables (e.g., temperature and heating costs).	Estimates values between and beyond data displayed.	Uses properties of a linear model (e.g., slope, intercepts) to analyze the relationship of bivariate data.

INDICATORS

Determines the relative frequency of each outcome in an experiment involving two independent events by performing multiple trials.	Determines and represents theoretical probability of outcomes for two independent events (e.g., rolling a die and tossing a coin) using graphical tools (e.g., tree diagram, lists, matrix).	Generalizes the multiplication rule of probability for independent events (e.g., probability of tossing two heads is $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$).	Distinguishes between independent and dependent events (e.g., removing marbles without replacement).	Connects random sampling to probability and variability in data sets.

BIG IDEA: (cont'd)
Formulating questions, collecting data, and consolidating data in visual and graphical displays help us understand, predict, and interpret situations that involve uncertainty, variability, and randomness.

Conceptual Thread: DRAWING CONCLUSIONS BY MAKING INFERENCES AND JUSTIFYING DECISIONS BASED ON DATA COLLECTED

INDICATORS					
	Draws conclusions based on data presented.	Uses inferences to make predictions about future events (e.g., Would the pictograph of shoe types look the same every day?).	Interprets the results of data presented graphically from primary (e.g., class survey) and secondary (e.g., online news report) sources.	Interprets results and makes inferences about the similarities and differences of past and future events based on data collected.	Compares short- and long-run experimental probabilities of events to their theoretical expectations, and explains the differences.

PURPOSE:

Engaging in a process for comparing past events and predicting future uncertainties helps us make sense of our world and make better decisions.

7–9

INDICATORS					
Discusses risks associated with decision making based on events involving variability and uncertainty (e.g., purchasing warranties, planning outdoor events).	Investigates how different representations of data may influence interpretations and conclusions drawn.	Generalizes about a population based on the results of two or more representative samples.	Makes comparative inferences about two populations based on representative samples.	Identifies and describes trends in data presented over time, and predicts future results.	Interprets and critiques presented results of an investigation based on potential bias, ethical implications, and cultural context.