

Mathematics 4 to 9 IRP: Prescribed Learning Outcomes

Mathematical Processes (Integrated)

The following mathematical processes have been integrated within the prescribed learning outcomes and achievement indicators for all grades: communication [C], connections [CN], mental mathematics and estimation [ME], problem solving [PS], reasoning [R], technology [T], and visualization [V].

	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9
Number	<p>A1 represent and describe whole numbers to 10,000, pictorially, and symbolically [C, CN, V]</p> <p>A2 compare and order numbers to 10,000 [C, CN]</p> <p>A3 demonstrate an understanding of addition of numbers with answers to 10,000 and their corresponding subtractions (limited to 3 and 4-digit numerals) by</p> <ul style="list-style-type: none"> using personal strategies for adding and subtracting estimating sums and differences solving problems involving addition and subtraction [C, CN, ME, PS, R] <p>A4 explain the properties of 0 and 1 for multiplication, and the property of 1 for division [C, CN, R]</p> <p>A5 describe and apply mental mathematics strategies, such as</p> <ul style="list-style-type: none"> skip counting from a known fact using doubling or halving using doubling or halving and adding or subtracting one more group using patterns in the 9s facts using repeated doubling <p>to determine basic multiplication facts to 9×9 and related division facts [C, CN, ME, PS, R]</p> <p>A6 demonstrate an understanding of multiplication (2- or 3-digit by 1-digit) to solve problems by</p> <ul style="list-style-type: none"> using personal strategies for multiplication with and without concrete materials using arrays to represent multiplication connecting concrete representations to symbolic representations estimating products [C, CN, ME, PS, R, V] <p>A7 demonstrate an understanding of division (1-digit divisor and up to 2-digit dividend) to solve problems by</p> <ul style="list-style-type: none"> using personal strategies for dividing with and without concrete materials estimating quotients relating division to multiplication [C, CN, ME, PS, R, V] <p>A8 demonstrate an understanding of fractions less than or equal to one by using concrete and pictorial representations to</p> <ul style="list-style-type: none"> 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] <p>A9 describe and represent decimals (tenths and hundredths) concretely, pictorially, and symbolically [C, CN, R, V]</p> <p>A10 relate decimals to fractions (to hundredths) [CN, R, V]</p> <p>A11 demonstrate an understanding of addition and subtraction of decimals (limited to hundredths) by</p> <ul style="list-style-type: none"> using compatible numbers estimating sums and differences using mental math strategies to solve problems [C, ME, PS, R, V] 	<p>A1 represent and describe whole numbers to 1,000,000 [C, CN, V, T]</p> <p>A2 use estimation strategies including</p> <ul style="list-style-type: none"> front-end rounding compensation compatible numbers in problem-solving contexts [C, CN, ME, PS, R, V] <p>A3 apply mental mathematics strategies and number properties, such as</p> <ul style="list-style-type: none"> skip counting from a known fact using doubling or halving using patterns in the 9s facts using repeated doubling or halving <p>to determine answers for basic multiplication facts to 81 and related division facts [C, CN, ME, R, V]</p> <p>A4 apply mental mathematics strategies for multiplication, such as</p> <ul style="list-style-type: none"> annexing then adding zero halving and doubling using the distributive property [C, ME, R] <p>A5 demonstrate an understanding of multiplication (2-digit by 2-digit) to solve problems [C, CN, PS, V]</p> <p>A6 demonstrate, with and without concrete materials, an understanding of division (3-digit by 1-digit) and interpret remainders to solve problems [C, CN, PS]</p> <p>A7 demonstrate an understanding of fractions by using concrete and pictorial representations to</p> <ul style="list-style-type: none"> create sets of equivalent fractions compare fractions with like and unlike denominators [C, CN, PS, R, V] <p>A8 describe and represent decimals (tenths, hundredths, thousandths) concretely, pictorially, and symbolically [C, CN, R, V]</p> <p>A9 relate decimals to fractions (to thousandths) [CN, R, V]</p> <p>A10 compare and order decimals (to thousandths) by using</p> <ul style="list-style-type: none"> benchmarks place value equivalent decimals [CN, R, V] <p>A11 demonstrate an understanding of addition and subtraction of decimals (limited to thousandths) [C, CN, PS, R, V]</p>	<p>A1 demonstrate an understanding of place value for numbers</p> <ul style="list-style-type: none"> greater than one million less than one thousandth [C, CN, R, T] <p>A2 solve problems involving large numbers, using technology [ME, PS, T]</p> <p>A3 demonstrate an understanding of factors and multiples by</p> <ul style="list-style-type: none"> determining multiples and factors of numbers less than 100 identifying prime and composite numbers solving problems involving multiples [PS, R, V] <p>A4 relate improper fractions to mixed numbers [CN, ME, R, V]</p> <p>A5 demonstrate an understanding of ratio, concretely, pictorially, and symbolically [C, CN, PS, R, V]</p> <p>A6 demonstrate an understanding of percent (limited to whole numbers) concretely, pictorially, and symbolically [C, CN, PS, R, V]</p> <p>A7 demonstrate an understanding of integers, concretely, pictorially, and symbolically [C, CN, R, V]</p> <p>A8 demonstrate an understanding of multiplication and division of decimals (1-digit whole number multipliers and 1-digit natural number divisors) [C, CN, ME, PS, R, V]</p> <p>A9 explain and apply the order of operations, excluding exponents, with and without technology (limited to whole numbers) [CN, ME, PS, T]</p>	<p>A1 determine and explain why a number is divisible by 2, 3, 4, 5, 6, 8, 9, or 10 and why a number cannot be divided by 0 [C, R]</p> <p>A2 demonstrate an understanding of the addition, subtraction, multiplication, and division of decimals (for more than 1-digit divisors or 2-digit multipliers, the use of technology is expected) to solve problems [ME, PS, T]</p> <p>A3 solve problems involving percents from 1% to 100% [C, CN, PS, R, T]</p> <p>A4 demonstrate an understanding of the relationship between positive repeating decimals and positive fractions, and positive terminating decimals and positive fractions [C, CN, R, T]</p> <p>A5 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]</p> <p>A6 demonstrate an understanding of addition and subtraction of integers, concretely, pictorially, and symbolically [C, CN, PS, R, V]</p> <p>A7 compare and order positive fractions, positive decimals (to thousandths) and whole numbers by using</p> <ul style="list-style-type: none"> benchmarks place value equivalent fractions and/or decimals [CN, R, V] 	<p>A1 demonstrate an understanding of perfect squares and square roots, concretely, pictorially, and symbolically (limited to whole numbers) [C, CN, R, V]</p> <p>A2 determine the approximate square root of numbers that are not perfect squares (limited to whole numbers) [C, CN, ME, R, T]</p> <p>A3 demonstrate an understanding of percents greater than or equal to 0% [CN, PS, R, V]</p> <p>A4 demonstrate an understanding of ratio and rate [C, CN, V]</p> <p>A5 solve problems that involve rates, ratios, and proportional reasoning [C, CN, PS, R]</p> <p>A6 demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially, and symbolically [C, CN, ME, PS]</p> <p>A7 demonstrate an understanding of multiplication and division of integers, concretely, pictorially, and symbolically [C, CN, PS, R, V]</p>	<p>A1 demonstrate an understanding of powers with integral bases (excluding base 0) and whole number exponents by</p> <ul style="list-style-type: none"> representing repeated multiplication using powers using patterns to show that a power with an exponent of zero is equal to one solving problems involving powers [C, CN, PS, R] <p>A2 demonstrate an understanding of operations on powers with integral bases (excluding base 0) and whole number exponents [C, CN, PS, R, T]</p> <p>A3 demonstrate an understanding of rational numbers by</p> <ul style="list-style-type: none"> comparing and ordering rational numbers solving problems that involve arithmetic operations on rational numbers [C, CN, PS, R, T, V] <p>A4 explain and apply the order of operations, including exponents, with and without technology [PS, T]</p> <p>A5 determine the square root of positive rational numbers that are perfect squares [C, CN, PS, R, T]</p> <p>A6 determine an approximate square root of positive rational numbers that are non-perfect squares [C, CN, PS, R, T]</p>
Patterns and Relations	<p>B1 identify and describe patterns found in tables and charts, including a multiplication chart [C, CN, PS, V]</p> <p>B2 reproduce a pattern shown in a table or chart using concrete materials [C, CN, V]</p> <p>B3 represent and describe patterns and relationships using charts and tables to solve problems [C, CN, PS, R, V]</p> <p>B4 identify and explain mathematical relationships using charts and diagrams to solve problems [CN, PS, R, V]</p>	<p>B1 determine the pattern rule to make predictions about subsequent elements [C, CN, PS, R, V]</p>	<p>B1 demonstrate an understanding of the relationships within tables of values to solve problems [C, CN, PS, R]</p> <p>B2 represent and describe patterns and relationships using graphs and tables [C, CN, ME, PS, R, V]</p>	<p>B1 demonstrate an understanding of oral and written patterns and their equivalent linear relations [C, CN, R]</p> <p>B2 create a table of values from a linear relation, graph the table of values, and analyze the graph to draw conclusions and solve problems [C, CN, R, V]</p>	<p>B1 graph and analyse two-variable linear relations [C, ME, PS, R, T, V]</p>	<p>B1 generalize a pattern arising from a problem-solving context using linear equations and verify by substitution [C, CN, PS, R, V]</p> <p>B2 graph linear relations, analyse the graph, and interpolate or extrapolate to solve problems [C, CN, PS, R, T, V]</p>
Variables and Equations	<p>B5 express a given problem as an equation in which a symbol is used to represent an unknown number [CN, PS, R]</p> <p>B6 solve one-step equations involving a symbol to represent an unknown number [C, CN, PS, R, V]</p>	<p>B2 solve problems involving single-variable, one-step equations with whole number coefficients and whole number solutions [C, CN, PS, R]</p>	<p>B3 represent generalizations arising from number relationships using equations with letter variables [C, CN, PS, R, V]</p> <p>B4 demonstrate and explain the meaning of preservation of equality concretely, pictorially and symbolically [C, CN, PS, R, V]</p>	<p>B3 demonstrate an understanding of preservation of equality by</p> <ul style="list-style-type: none"> modelling preservation of equality concretely, pictorially, and symbolically applying preservation of equality to solve equations [C, CN, PS, R, V] <p>B4 explain the difference between an expression and an equation [C, CN]</p> <p>B5 evaluate an expression given the value of the variable(s) [CN, R]</p> <p>B6 model and solve problems that can be represented by one-step linear equations of the form $x + a = b$, concretely, pictorially, and symbolically, where a and b are integers [CN, PS, R, V]</p> <p>B7 model and solve problems that can be represented by linear equations of the form</p> <ul style="list-style-type: none"> $ax + b = c$ $ax = b$ $\frac{x}{a} = b, a \neq 0$ <p>concretely, pictorially, and symbolically, where $a, b,$ and c are whole numbers [CN, PS, R, V]</p>	<p>B2 model and solve problems using linear equations of the form:</p> <ul style="list-style-type: none"> $ax = b$ $\frac{x}{a} = b, a \neq 0$ $ax + b = c$ $a(x + b) = c$ <p>concretely, pictorially, and symbolically, where $a, b,$ and c are integers [C, CN, PS, V]</p>	<p>B3 model and solve problems using linear equations of the form</p> <ul style="list-style-type: none"> $ax = b$ $\frac{x}{a} = b, a \leq 0$ $ax + b = c$ $\frac{x}{a} + b = c, a \leq 0$ $ax = b + cx$ $a(x + b) = c$ $ax + b = cx + d$ $a(bx + c) = d(ex + f)$ $\frac{x}{a} = b, x \leq 0$ <p>where $a, b, c, d, e,$ and f are rational numbers [C, CN, PS, V]</p> <p>B4 explain and illustrate strategies to solve single variable linear inequalities with rational coefficients within a problem-solving context [C, CN, PS, R, V]</p> <p>B5 demonstrate an understanding of polynomials (limited to polynomials of degree less than or equal to 2) [C, CN, R, V]</p> <p>B6 model, record, and explain the operations of addition and subtraction of polynomial expressions, concretely, pictorially, and symbolically (limited to polynomials of degree less than or equal to 2) [C, CN, PS, R, V]</p> <p>B7 model, record, and explain the operations of multiplication and division of polynomial expressions (limited to polynomials of degree less than or equal to 2) by monomials, concretely, pictorially, and symbolically [C, CN, R, V]</p>



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Shape and Space	<p>C1 read and record time using digital and analog clocks, including 24-hour clocks [C, CN, V]</p> <p>C2 read and record calendar dates in a variety of formats [C, V]</p> <p>C3 demonstrate an understanding of area of regular and irregular 2-D shapes by</p> <ul style="list-style-type: none"> 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] 	<p>C1 design and construct different rectangles given either perimeter or area, or both (whole numbers) and draw conclusions [C, CN, PS, R, V]</p> <p>C2 demonstrate an understanding of measuring length (mm) by</p> <ul style="list-style-type: none"> selecting and justifying referents for the unit mm modelling and describing the relationship between mm and cm units, and between mm and m units [C, CN, ME, PS, R, V] <p>C3 demonstrate an understanding of volume by</p> <ul style="list-style-type: none"> selecting and justifying referents for cm^3 or m^3 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] <p>C4 demonstrate an understanding of capacity by</p> <ul style="list-style-type: none"> 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] 	<p>C1 demonstrate an understanding of angles by</p> <ul style="list-style-type: none"> 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] <p>C2 demonstrate that the sum of interior angles is:</p> <ul style="list-style-type: none"> 180° in a triangle 360° in a quadrilateral [C, R] <p>C3 develop and apply a formula for determining the</p> <ul style="list-style-type: none"> perimeter of polygons area of rectangles volume of right rectangular prisms [C, CN, PS, R, V] 	<p>C1 demonstrate an understanding of circles by</p> <ul style="list-style-type: none"> describing the relationships among radius, diameter, and circumference of circles relating circumference to pi determining the sum of the central angles constructing circles with a given radius or diameter solving problems involving the radii, diameters, and circumferences of circles [C, CN, R, V] <p>C2 develop and apply a formula for determining the area of</p> <ul style="list-style-type: none"> triangles parallelograms circles [CN, PS, R, V] 	<p>C1 develop and apply the Pythagorean theorem to solve problems [CN, PS, R, V, T]</p> <p>C2 draw and construct nets for 3-D objects [C, CN, PS, V]</p> <p>C3 determine the surface area of</p> <ul style="list-style-type: none"> right rectangular prisms right triangular prisms right cylinders <p>C4 develop and apply formulas for determining the volume of right prisms and right cylinders [C, CN, PS, R, V]</p>	<p>C1 solve problems and justify the solution strategy using circle properties, including</p> <ul style="list-style-type: none"> the perpendicular from the centre of a circle to a chord bisects the chord the measure of the central angle is equal to twice the measure of the inscribed angle subtended by the same arc the inscribed angles subtended by the same arc are congruent a tangent to a circle is perpendicular to the radius at the point of tangency [C, CN, PS, R, T, V]
3-D Objects and 2-D Shapes	<p>C4 describe and construct rectangular and triangular prisms [C, CN, R, V]</p>	<p>C5 describe and provide examples of edges and faces of 3-D objects, and sides of 2-D shapes that are</p> <ul style="list-style-type: none"> parallel intersecting perpendicular vertical horizontal [C, CN, R, T, V] <p>C6 identify and sort quadrilaterals, including</p> <ul style="list-style-type: none"> rectangles squares trapezoids parallelograms rhombuses according to their attributes [C, R, V] 	<p>C4 construct and compare triangles, including</p> <ul style="list-style-type: none"> scalene isosceles equilateral right obtuse acute in different orientations [C, PS, R, V] <p>C5 describe and compare the sides and angles of regular and irregular polygons [C, PS, R, V]</p>	<p>C3 perform geometric constructions, including</p> <ul style="list-style-type: none"> perpendicular line segments parallel line segments perpendicular bisectors angle bisectors [CN, R, V] 	<p>C5 draw and interpret top, front, and side views of 3-D objects composed of right rectangular prisms [C, CN, R, T, V]</p>	<p>C2 determine the surface area of composite 3-D objects to solve problems [C, CN, PS, R, V]</p> <p>C3 demonstrate an understanding of similarity of polygons [C, CN, PS, R, V]</p>
Transformations	<p>C5 demonstrate an understanding of line symmetry by</p> <ul style="list-style-type: none"> 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] 	<p>C7 perform a single transformation (translation, rotation, or reflection) of a 2-D shape (with and without technology) and draw and describe the image [C, CN, T, V]</p> <p>C8 identify a single transformation, including a translation, rotation and reflection of 2-D shapes [C, T, V]</p>	<p>C6 perform a combination of translation(s), rotation(s) and/or reflection(s) on a single 2-D shape, with and without technology, and draw and describe the image [C, CN, PS, T, V]</p> <p>C7 perform a combination of successive transformations of 2-D shapes to create a design, and identify and describe the transformations [C, CN, T, V]</p> <p>C8 identify and plot points in the first quadrant of a Cartesian plane using whole number ordered pairs [C, CN, V]</p> <p>C9 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]</p>	<p>C4 identify and plot points in the four quadrants of a Cartesian plane using integral ordered pairs [C, CN, V]</p> <p>C5 perform and describe transformations (translations, rotations or reflections) of a 2-D shape in all four quadrants of a Cartesian plane (limited to integral number vertices) [CN, PS, T, V]</p>	<p>C6 demonstrate an understanding of tessellation by</p> <ul style="list-style-type: none"> explaining the properties of shapes that make tessellating possible creating tessellations identifying tessellations in the environment [C, CN, PS, T, V] 	<p>C4 draw and interpret scale diagrams of 2-D shapes [CN, R, T, V]</p> <p>C5 demonstrate an understanding of line and rotation symmetry [C, CN, PS, V]</p>
Statistics and Probability	<p>D1 demonstrate an understanding of many-to-one correspondence [C, R, T, V]</p> <p>D2 construct and interpret pictographs and bar graphs involving many-to-one correspondence to draw conclusions [C, PS, R, V]</p>	<p>D1 differentiate between first-hand and second-hand data [C, R, T, V]</p> <p>D2 construct and interpret double bar graphs to draw conclusions [C, PS, R, T, V]</p>	<p>D1 create, label, and interpret line graphs to draw conclusions [C, CN, PS, R, V]</p> <p>D2 select, justify, and use appropriate methods of collecting data, including</p> <ul style="list-style-type: none"> questionnaires experiments databases electronic media [C, PS, T] <p>D3 graph collected data and analyze the graph to solve problems [C, CN, PS]</p>	<p>D1 demonstrate an understanding of central tendency and range by</p> <ul style="list-style-type: none"> determining the measures of central tendency (mean, median, mode) and range determining the most appropriate measures of central tendency to report findings [C, PS, R, T] <p>D2 determine the effect on the mean, median, and mode when an outlier is included in a data set [C, CN, PS, R]</p> <p>D3 construct, label, and interpret circle graphs to solve problems [C, CN, PS, R, T, V]</p>	<p>D1 critique ways in which data is presented [C, R, T, V]</p>	<p>D1 describe the effect of</p> <ul style="list-style-type: none"> bias use of language ethics cost time and timing privacy cultural sensitivity on the collection of data [C, CN, R, T] <p>D2 select and defend the choice of using either a population or a sample of a population to answer a question [C, CN, PS, R]</p> <p>D3 develop and implement a project plan for the collection, display, and analysis of data by</p> <ul style="list-style-type: none"> formulating a question for investigation choosing a data collection method that includes social considerations selecting a population or a sample collecting the data displaying the collected data in an appropriate manner drawing conclusions to answer the question [C, PS, R, T, V]
Chance and Uncertainty		<p>D3 describe the likelihood of a single outcome occurring using words such as</p> <ul style="list-style-type: none"> impossible possible certain [C, CN, PS, R] <p>D4 compare the likelihood of two possible outcomes occurring using words such as</p> <ul style="list-style-type: none"> less likely equally likely more likely [C, CN, PS, R] 	<p>D4 demonstrate an understanding of probability by</p> <ul style="list-style-type: none"> 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] 	<p>D4 express probabilities as ratios, fractions, and percents [C, CN, R, T, V]</p> <p>D5 identify the sample space (where the combined sample space has 36 or fewer elements) for a probability experiment involving two independent events [C, ME, PS]</p> <p>D6 conduct a probability experiment to compare the theoretical probability (determined using a tree diagram, table or another graphic organizer) and experimental probability of two independent events [C, PS, R, T]</p>	<p>D2 solve problems involving the probability of independent events [C, CN, PS, T]</p>	<p>D4 demonstrate an understanding of the role of probability in society [C, CN, R, T]</p>

