

TIPS4RM Targeted Implementation
and Planning Supports for
Revised Mathematics

Grade 8

Grade 8: Content and Reporting Targets

Mathematical Process Expectations across all strands and terms: Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing, Communicating

Term 1 – Content Targets	Term 2 – Content Targets	Term 3 – Content Targets
Number Sense and Numeration* <ul style="list-style-type: none"> integers order of operations powers and square roots representations of numbers Measurement* <ul style="list-style-type: none"> circle measurement relationships Geometry and Spatial Sense <ul style="list-style-type: none"> construction of a circle Patterning and Algebra* <ul style="list-style-type: none"> algebraic expressions multiple representations of patterns writing nth terms Data Management and Probability <ul style="list-style-type: none"> display and interpret data found in patterns 	Number Sense and Numeration* <ul style="list-style-type: none"> fractions percents Measurement* <ul style="list-style-type: none"> surface area and volume of cylinders Geometry and Spatial Sense* <ul style="list-style-type: none"> properties of lines, angles, triangles, and quadrilaterals Patterning and Algebra <ul style="list-style-type: none"> use patterns to develop measurement formulas Data Management and Probability* <ul style="list-style-type: none"> experimental vs. theoretical probability complementary events 	Number Sense and Numeration* <ul style="list-style-type: none"> proportional reasoning rates Measurement <ul style="list-style-type: none"> relationships among units Geometry and Spatial Sense* <ul style="list-style-type: none"> similar figures Pythagorean Relationship properties of polyhedra transformations on the plane Patterning and Algebra* <ul style="list-style-type: none"> solve and verify linear equations Data Management and Probability* <ul style="list-style-type: none"> design and carry out an experiment
Rationale		
Connections between: <ul style="list-style-type: none"> integer size/area of squares integer sign/colour of integer tile integers/order of operations powers and square roots/inverse operations constructing circles/discovering relationships between circle measurements algebraic expressions/generalizations of patterns different algebraic representations of a pattern/the values generated by substitution into those representations statements/algebraic expressions Leading to: <ul style="list-style-type: none"> connection between powers/ measurement units (Term 3) powers and square roots/applying inverse operations to solve equations involving the Pythagorean relationship (Grade 9) combining rational and irrational numbers (Grade 11) connecting order of operations with integers to order of operations with fractions applications of algebraic expressions to unknowns in equations (Term 3) using both theoretical and experimental means of finding patterns (Terms 2) 	Connections between: <ul style="list-style-type: none"> unit rate problems/Term 1 algebra geometric properties/data management angle properties/Term 1 algebra theoretical and experimental probability/ effect of sample size fractions/percents/decimals volume of triangular prism and Grades 6 and 7 concept of Volume = area of base \times height circles/volume of a cylinder connecting properties of triangles/data management Leading to: <ul style="list-style-type: none"> connecting unit rates with percents and fractions (Term 3) connecting fractions and percents to rates, ratios, and proportions (Term 3) combining perimeter/area of irregular shapes with circles (Grade 9) connecting volume of cylinder to volume of any prism (Grade 9) extending probability/statistics (Grade 12) connecting properties of triangles/similar triangles and Pythagorean relationship (Term 3) relating properties of 2-D figures to 3-D figures (Term 3) extending properties of lines, angles, triangles and quadrilaterals (Grade 9) 	Connections between: <ul style="list-style-type: none"> fractions/ratios/unit rates/percent natural/whole/integer/fractional/rational/irrational sets of numbers (combining natural, whole, integer, and fractional numbers) solving equations/Integers and fractions solving equations/unit rates and proportions connecting properties of triangles/similar triangles and Pythagorean relationship data from Term 1 and 2 investigations/ associated concepts/designing an experiment Leading to: <ul style="list-style-type: none"> combining rational numbers (Grade 9)/ irrational numbers (Grade 11 University destination) solving equations requiring collection of like terms (Grade 9) solving equations involving the Pythagorean relationship (Grade 9) extending transformations of 2-D shapes to transformations of functions (Grades 10, 11) extending data management techniques (Grade 12)

* Strands for reporting purposes

Grade 8: Number Sense and Numeration

Term 1	Term 2	Term 3
<p>Mathematical Process Expectations across all strands and terms: Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing, Communicating</p>		
<p><u>Integers</u> 8m16 – solve multi-step problems arising from real-life contexts and involving whole numbers and decimals, using a variety of tools (e.g., graphs, calculators) and strategies (e.g., estimation, algorithms); 8m18 – use estimation when solving problems involving operations with... integers ... to help judge the reasonableness of a solution; 8m21 – represent the multiplication and division of integers, using a variety of tools (e.g., if black counters represent positive amounts and red counters represent negative amounts, you can model $3 \times (-2)$ as three groups of two red counters); 8m22 – solve problems involving operations with integers, using a variety of tools (e.g., two-colour counters, virtual manipulatives, number lines).</p> <p><u>Order of Operations</u> 8m23 – evaluate expressions that involve integers, including expressions that contain brackets and exponents, using order of operations.</p> <p><u>Powers and Square Roots</u> 8m11 – express repeated multiplication using exponential notation (e.g., $2 \times 2 \times 2 \times 2 = 2^4$); 8m24 – multiply and divide decimal numbers by various powers of ten (e.g., “To convert 230 000 cm³ to cubic metres, I calculated in my head $23\ 0000 \div 10^6$ to get 0.23 m³.”); 8m25 – estimate, and verify using a calculator, the positive square roots of whole numbers, and distinguish between whole numbers that have whole-number square roots (i.e., perfect square numbers) and those that do not.</p> <p><u>Representations of Numbers</u> 8m12 – represent whole numbers in expanded form using powers of ten (e.g., $347 = 3 \times 10^2 + 4 \times 10^1 + 7$); 8m13 – represent, compare, and order rational numbers (i.e., positive and negative fractions and decimals to thousandths).</p>	<p><u>Fractions</u> 8m13 – represent, compare, and order rational numbers (i.e., positive and negative fractions and decimals to thousandths); 8m15 – determine common factors and common multiples using the prime factorization of numbers (e.g., the prime factorization of 12 is $2 \times 2 \times 3$; the prime factorization of 18 is $2 \times 3 \times 3$; the greatest common factor of 12 and 18 is 2×3 or 6; the least common multiple of 12 and 18 is $2 \times 2 \times 3 \times 3$ or 36). 8m18 – use estimation when solving problems involving operations with... and fractions to help judge the reasonableness of a solution; 8m19 – represent the multiplication and division of fractions, using a variety of tools and strategies (e.g., use an area model to represent $\frac{1}{4}$ multiplied by $\frac{1}{3}$); 8m20 – solve problems involving addition, subtraction, multiplication, and division with simple fractions.</p> <p><u>Percents</u> 8m14 – translate between equivalent forms of a number, i.e., decimals, fractions, percents) (e.g., $\frac{3}{4} = 0.75$); 8m16 – solve multi-step problems arising from real-life contexts and involving...and decimals, using a variety of tools and strategies (e.g., estimation, algorithms); 8m17 – solve problems involving percents expressed to one decimal place (e.g., 12.5%) and whole-number percents greater than 100 (e.g., 115%); 8m18 – use estimation when solving problems involving operations with... decimals, percents...to help judge the reasonableness of a solution; 8m28 – solve problems involving percent that arise from real-life contexts (e.g., discount, sales tax, simple interest); 8m29 – solve problems involving rates.</p>	<p><u>Proportional Reasoning</u> 8m18 – use estimation when solving problems involving operations with whole numbers, decimals, percents, integers, and fractions, to help judge the reasonableness of a solution; 8m23 – evaluate expressions that involve integers, including expressions that contain brackets and exponents, using order of operations; 8m26 – identify and describe real-life situations involving two quantities that are directly proportional (e.g., the number of servings and the quantities in a recipe, mass and volume of a substance, circumference and diameter of a circle); 8m27 – solve problems involving proportions, using concrete materials, drawings, and variables.</p> <p><u>Rates</u> 8m29 – solve problems involving rates.</p>

Grade 8: Measurement

Term 1	Term 2	Term 3
<p>Mathematical Process Expectations across all strands and terms: Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing, Communicating</p>		
<p><u>Circle Measurement Relationships</u> 8m34 – measure the circumference, radius, and diameter of circular objects, using concrete materials; 8m35 – determine, through investigation using a variety of tools (e.g., cans and string, dynamic geometry software) and strategies, the relationships for calculating the circumference and the area of a circle, and generalize to develop the formulas, [i.e., Circumference of a circle = $\pi \times$ diameter; Area of a circle = $\pi \times$ (radius)²]; 8m36 – solve problems involving the estimation and calculation of the circumference and the area of a circle.</p>	<p><u>Surface Area and Volume of Cylinders</u> 8m32 – research, describe, and report on applications of volume and capacity measurement (e.g., cooking, closet space, aquarium size); 8m33 – solve problems that require conversions involving metric units of area, volume, and capacity (i.e., square centimetres and square metres; cubic centimetres and cubic metres; millilitres and cubic centimetres); 8m37 – determine, through investigation using a variety of tools and strategies (e.g., generalizing from the volume relationship for right prisms, and verifying using the capacity of thin-walled cylindrical containers), the relationship between the area of the base and height and the volume of a cylinder, and generalize to develop the formula (i.e., Volume = area of base \times height); 8m38 – determine, through investigation using concrete materials, the surface area of a cylinder; 8m39 – solve problems involving the surface area and the volume of cylinders, using a variety of strategies.</p>	<p><u>Relationships Among Units</u> 8m33 – solve problems that require conversions involving metric units of area, volume, and capacity (i.e., square centimetres and square metres; cubic centimetres and cubic metres; millilitres and cubic centimetres).</p>

Grade 8: Geometry and Spatial Sense

Term 1	Term 2	Term 3
<p>Mathematical Process Expectations across all strands and terms: Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing, Communicating</p>		
<p><u>Construction of a Circle</u> 8m44 – construct a circle, given its centre and radius, or its centre and a point on the circle, or three points on the circle; 8m45 – investigate and describe applications of geometric properties (e.g., properties of...and circles) in the real world.</p>	<p><u>Properties of Lines, Angles, Triangles, and Quadrilaterals</u> 8m43 – sort and classify quadrilaterals by geometric properties, including those based on diagonals, through investigation using a variety of tools (e.g., concrete materials, dynamic geometry software); 8m45 – investigate and describe applications of geometric properties (e.g., properties of triangles, quadrilaterals...) in the real world; 8m47 – determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials, protractor) and strategies (e.g., paper folding), the angle relationships for intersecting lines and for parallel lines and transversals, and the sum of the angles of a triangle; 8m48 – solve angle-relationship problems involving triangles (e.g., finding interior angles or complementary angles), intersecting lines (e.g., finding supplementary angles or opposite angles), and parallel lines and transversals (e.g., finding alternate angles or corresponding angles).</p>	<p><u>Similar Figures</u> 8m46 – determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials, geoboard), relationships among area, perimeter, corresponding side lengths, and corresponding angles of similar shapes. <u>Pythagorean Relationship</u> 8m49 – determine the Pythagorean relationship, through investigation using a variety of tools (e.g., dynamic geometry software, paper and scissors, geoboard) and strategies; 8m50 – solve problems involving right triangles geometrically, using the Pythagorean relationship. <u>Properties of Polyhedra</u> 8m51 – determine, through investigation using concrete materials, the relationship between the numbers of faces, edges, and vertices of a polyhedron (i.e., number of faces + number of vertices = number of edges + 2). <u>Transformations on the Plane</u> 8m52 – graph the image of a point, or set of points, on the Cartesian coordinate plane after applying a transformation to the original point(s) (i.e., translation; reflection in the x-axis, the y-axis, or the angle bisector of the axes that passes through the first and third quadrants; rotation of 90°, 180°, or 270° about the origin); 8m53 – identify, through investigation, real-world movements that are translations, reflections, and rotations.</p>

Grade 8: Patterning and Algebra

Mathematical Process Expectations across all strands and terms: Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing, Communicating

Term 1	Term 2	Term 3
<p><u>Algebraic Expressions</u> 8m56 – represent, through investigation with concrete materials, the general term of a linear pattern, using one or more algebraic expressions (e.g., “Using toothpicks, I noticed that 1 square needs 4 toothpicks, 2 connected squares need 7 toothpicks, and 3 connected squares need 10 toothpicks. I think that for n connected squares I will need $4 + 3(n - 1)$ toothpicks...”); 8m59 – describe different ways in which algebra can be used in real-life situations; 8m61 – translate statements describing mathematical relationships into algebraic expressions...; 8m62 – evaluate algebraic expressions with up to three terms, by substituting fractions, decimals, and integers for the variables (e.g., evaluate $3x + 4y = 2z$, where $x = \frac{1}{2}$, $y = 0.6$, and $z = -1$).</p> <p><u>Multiple Representations of Patterns</u> 8m57 – represent linear patterns graphically (i.e., make a table of values that shows the term number and the term, and plot the coordinates on a graph), using a variety of tools (e.g., graph paper, calculators, dynamic statistical software).</p> <p><u>Writing the n^{th} Term</u> 8m58 – determine a term, given its term number, in a linear pattern that is represented by a graph or an algebraic equation. 8m60 – model linear relationships using tables of values, graphs, and equations (e.g., the sequence 2, 3, 4, 5, 6... can be represented by the equation $t = n + 1$, where n represents the term number and t represents the term), through investigation using a variety of tools; 8m63 – make connections between solving equations and determining the term number in a pattern, using the general term (e.g., for the pattern with the general term $2n + 1$, solving the equation $2n + 1 = 17$ tells you the term number when the term is 17).</p>	<p><u>Use Patterns to Develop Measurement Formulas</u> 8m61 – translate statements describing mathematical relationships into algebraic expressions and equations; 8m62 – evaluate algebraic expressions with up to three terms, by substituting fractions, decimals, and integers for the variables (e.g., evaluate $3x + 4y = 2z$, where $x = \frac{1}{2}$, $y = 0.6$, and $z = -1$).</p>	<p><u>Solve and Verify Linear Equations</u> 8m56 – represent, through investigation with concrete materials, the general term of a linear pattern, using one or more algebraic expressions (e.g., “Using toothpicks, I noticed that 1 square needs 4 toothpicks, 2 connected squares need 7 toothpicks, and 3 connected squares need 10 toothpicks. I think that for n connected squares I will need $4 + 3(n - 1)$ toothpicks...”); 8m59 – describe different ways in which algebra can be used in real-life situations; 8m61 – translate statements describing mathematical relationships into algebraic expressions and equations (e.g., for a collection of triangles, the total number of sides is equal to three times the number of triangles or $s = 3n$); 8m62 – evaluate algebraic expressions with up to three terms, by substituting fractions, decimals, and integers for the variables (e.g., evaluate $3x + 4y = 2z$, where $x = \frac{1}{2}$, $y = 0.6$, and $z = -1$); 8m63 – make connections between solving equations and determining the term number in a pattern, using the general term (e.g., for the pattern with the general term $2n + 1$, solving the equation $2n + 1 = 17$ tells you the term number when the term is 17); 8m64 – solve and verify linear equations involving a one-variable term and having solutions that are integers, by using inspection, guess and check, and a “balance” model.</p>

Grade 8: Data Management and Probability

Mathematical Process Expectations across all strands and terms: Problem Solving, Reasoning and Proving, Reflecting, Selecting Tools and Computational Strategies, Connecting, Representing, Communicating

Term 1	Term 2	Term 3
<p><u>Display and Interpret Data Found in Problems</u></p> <p>8m68 – collect data by conducting a survey or an experiment to do with themselves, their environment, issues in their school or community, or content from another subject, and record observations or measurements;</p> <p>8m70 – collect and organize... continuous primary data ...and display the data in charts, tables, and graphs...;</p> <p>8m73 – read, interpret, and draw conclusions from primary data (e.g., survey results, measurements, observations)...presented in charts, tables, and graphs;</p> <p>8m74 – determine, through investigation, the appropriate measure of central tendency;</p> <p>8m78 – make inferences and convincing arguments that are based on the analysis of charts, tables, and graphs;</p> <p>8m79 – compare two attributes or characteristics, using a variety of data management tools and strategies (i.e., pose a relevant question, then design an experiment or survey, collect and analyse the data, and draw conclusions).</p>	<p><u>Experimental vs. Theoretical Probability</u></p> <p>8m70 – collect and organize categorical, discrete, or continuous primary data and secondary data (e.g., electronic data from websites such as E-Stat or Census At Schools), and display the data in charts, tables, and graphs (including histograms and scatter plots) that have appropriate titles, labels (e.g., appropriate units marked on the axes), and scales (e.g., with appropriate increments) that suit the range and distribution of the data, using a variety of tools (e.g., graph paper, spreadsheets, dynamic statistical software);</p> <p>8m80 – compare, through investigation, the theoretical probability of an event (i.e., the ratio of the number of ways a favourable outcome can occur compared to the total number of possible outcomes) with experimental probability, and explain why they might differ;</p> <p>8m81 – determine, through investigation, the tendency of experimental probability to approach theoretical probability as the number of trials in an experiment increases, using class-generated data and technology-based simulation models;</p> <p><u>Complementary Events</u></p> <p>8m82 – identify the complementary event for a given event, and calculate the theoretical probability that a given event will not occur.</p>	<p><u>Design and Carry Out an Investigation</u></p> <p>8m68 – collect data by conducting a survey or an experiment to do with themselves, their environment, issues in their school or community, or content from another subject, and record observations or measurements;</p> <p>8m69 – organize into intervals a set of data that is spread over a broad range (e.g., the age of respondents to a survey may range over 80 years and may be organized into ten-year intervals);</p> <p>8m70 – collect and organize categorical, discrete, or continuous primary data and secondary data (e.g., electronic data from websites such as E-Stat or Census At Schools), and display the data in charts, tables, and graphs (including histograms and scatter plots) that have appropriate titles, labels (e.g., appropriate units marked on the axes), and scales (e.g., with appropriate increments) that suit the range and distribution of the data, using a variety of tools (e.g., graph paper, spreadsheets, dynamic statistical software);</p> <p>8m71 – select an appropriate type of graph to represent a set of data, graph the data using technology, and justify the choice of graph (i.e., from types of graphs already studied, including histograms and scatter plots);</p> <p>8m72 – explain the relationship between a census, a representative sample, sample size, and a population (e.g., “I think that in most cases a larger sample size will be more representative of the entire population.”);</p> <p>8m73 – read, interpret, and draw conclusions from primary data (e.g., survey results, measurements, observations) and from secondary data (e.g., election data or temperature data from the newspaper, data from the Internet about lifestyles), presented in charts, tables, and graphs (including frequency tables with intervals, histograms, and scatter plots);</p> <p>8m75 – demonstrate an understanding of the appropriate uses of bar graphs and histograms by comparing their characteristics;</p> <p>8m76 – compare two attributes or characteristics (e.g., height versus arm span), using a scatter plot, and determine whether or not the scatter plot suggests a relationship;</p> <p>8m77 – identify and describe trends, based on the rate of change of data from tables and graphs, using informal language (e.g., “The steep line going upward on this graph represents rapid growth. The steep line going downward on this other graph represents rapid decline.”);</p> <p>8m78 – make inferences and convincing arguments that are based on the analysis of charts, tables, and graphs;</p> <p>8m79 – compare two attributes or characteristics, using a variety of data management tools and strategies (i.e., pose a relevant question, then design an experiment or survey, collect and analyse the data, and draw conclusions).</p>

Grade 8 Year Outline – Planning Tool

P Number of planned lessons (including instruction, diagnostic and formative assessments, summative assessments other than included performance tasks)

J Number of Jazz days

T Total number of days

Term	Unit	Cluster of Curriculum Expectation	Overall Expectations	P	J	T
1	0	Introductory Unit: Developing Social Skills Within the Context of Problem Solving	8m1 develop, select, apply, and compare a variety of problem-solving strategies as they pose and solve problems and conduct investigations, to help deepen their mathematical understanding 8m3 demonstrate that they are reflecting on and monitoring their thinking to help clarify their understanding as they complete an investigation or solve a problem (e.g., by assessing the effectiveness of strategies and processes used, by proposing alternative approaches, by judging the reasonableness of results, by verifying solutions) 8m7 communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions	6 (6 included)	4	10
	1	Integers and Algebraic Expressions	8m9 solve problems involving whole numbers, decimal numbers, fractions, and integers, using a variety of computational strategies	12 (0 included)	4	16
	2	Representing Patterns in Multiple Ways	8m54 represent linear growing patterns (where the terms are whole numbers) using graphs, algebraic expressions, and equations 8m55 model linear relationships graphically, and algebraically and solve and verify algebraic equations, using a variety of strategies, including inspection, guess and check, and using a “balance” model.	7 (6 included)	4	11
	3	From Powers to Circles	8m8 represent, compare, and order equivalent representations of numbers, including those involving positive exponents 8m31 determine the relationships among units and measurable attributes including the area of a circle and the volume of a cylinder 8m40 demonstrate an understanding of the geometric properties of quadrilaterals circles and the applications of these geometric properties in the real world	11 (10 included)	7	18
		Sub-totals		36	19	55
2	4	Lines, Angles, Triangles and Quadrilaterals	8m40 demonstrate an understanding of the geometric properties of quadrilaterals and circles and the applications of geometric properties in the real world 8m41 develop geometric relationships involving lines, triangles, and polyhedra, and solve problems involving lines and triangles	13 (0 included)	3	16
	5	Fractions and Percents	8m8 represent, compare, and order equivalent representations of numbers, including those involving positive exponents 8m9 solve problems involving whole numbers, decimal numbers, and fractions and integers, using a variety of computational strategies 8m10 solve problems by using proportional reasoning in a variety of meaningful contexts	17 (12 included)	7	24

Term	Unit	Cluster of Curriculum Expectation	Overall Expectations	P	J	T
2	6	Probability	8m67 use probability models to make predictions about real-life events	7 (7 included)	3	10
	7	Surface Area and Volume of Cylinders	8m30 research, describe, and report on applications of volume and capacity measurement 8m31 determine the relationships among units and measurable attributes, including the area of a circle and the volume of a cylinder	7 (0 included)	3	10
	Sub-totals			44	16	60
3	8	Proportional Reasoning	8m10 solve problems by using proportional reasoning in a variety of meaningful contexts	8 (8 included)	4	12
	9	Similar Figures	8m40 demonstrate an understanding of the geometric properties of quadrilaterals and circles and the applications of geometric properties in the real world 8m41 develop geometric relationships involving lines, triangles and polyhedra, and solve problems involving lines and triangles	6 (0 included)	2	8
	10	Visualizing Geometric Relationships	8m40 demonstrate an understanding of the geometric properties of quadrilaterals and circles and the applications of geometric properties in the real world 8m41 develop geometric relationships involving lines, circles and triangles, and polyhedra, solve problems involving lines and triangles 8m42 represent transformations using the Cartesian coordinate plane, and make connections between transformations and the real world	14 (4 included)	6	20
	11	Design and Carry Out an Experiment	8m65 collect and organize categorical, discrete, or continuous primary data and secondary data and display the data using charts and graphs, including frequency tables with intervals, histograms, and scatter plots 8m66 apply a variety of data management tools and strategies to make convincing arguments about data 8m67 use probability models to make predictions about real-life events	11 (0 included)	3	14
	12	Solving Equations	8m55 model linear relationships graphically and algebraically and solve and verify algebraic equations, using a variety of strategies, including inspection, guess and check, and using a “balance” model	7 (0 included)	4	11
Sub-totals			46	19	65	
Total Days				126	54	180

The number of planned lessons represents the lessons that could be planned ahead based on the range of student readiness, interests, and learning profiles that can be expected in a class. The extra time available for “instructional jazz” can be taken a few minutes at a time within a pre-planned lesson, or taken a whole class at a time, as informed by teachers’ observations of student needs.

The reference numbers are intended to indicate which lessons are planned to precede and follow each other. Actual day numbers for particular lessons and separations between terms will need to be adjusted by teachers.