DRAFT Kindergarten to Grade 12 Mathematics Scope and Sequence

	K	1	2	3	4	5	6	7	8	9	10	11	12
Essential Understanding	**Algebraic reasoning includes identifying and analyzing patterns, which allows for the generalization and expression of relationships in a variety of contexts.**												
Guiding Questions	How can quantities be compared?	How can quantities be considered equal?	How can equal and non-equal quantities be represented?	How can equality be used to determine unknown values?	How can equations with unknowns model contexts?	How can linear equations with variables model contexts?	How can the process of solving simple linear equations be formalized?	How can the process of solving linear equations be formalized?	How can linear equations be manipulated to preserve equality?	How can linear equations be manipulated to preserve equality?	How can equations model diverse contexts?	How can equations and inequalities model diverse contexts?	How can equations and inequalities model diverse contexts?
Possible Concepts and Procedures	· same and not same · more and less	· same and not same · more and less · equality	· equal and not equal	· one-step equation	· modelling a context · one-step equation	· modelling a context · variables	· preservation of equality · order of operations, excluding exponents and parentheses · computational thinking (supports coding)	· preservation of equality · two-step linear equations · order of operations, including squares, excluding parentheses · computational thinking (supports coding)	· distribution · order of operations, including squares, cubes and parentheses · computational thinking (supports coding)	· variables on both sides · rational coefficients · order of operations · algorithm for order of operations (supports coding) · computational thinking (supports coding)	· linear systems · quadratic equations	· radical equations · absolute value equations · rational equations · linear inequalities	· trigonometric equations · exponential equations · logarithmic equations · trigonometric identities · quadratic inequalities
Guiding Questions	How can non-numerical patterns be identified, described, extended and created?	How can non-numerical patterns be identified, described, extended and created?	How can patterns be identified, described, extended and created?	How can patterns be identified, described, extended and created?	How can numerical patterns be generalized in problem-solving contexts?	How can the generalization of patterns be represented?	How can the generalization of patterns be represented and applied?	How can the generalization of linear relations reflect meaningful contexts?	How can linear relations be modelled in diverse contexts?	How can linear relations be modelled in diverse contexts?	How can functions be used as a model to analyze and generalize information in diverse contexts?	How can functions be used as a model to analyze and generalize information in diverse contexts?	How can functions be used as a model to analyze and generalize information in diverse contexts?
Possible Concepts and Procedures	· concrete patterns · single attribute · computational thinking (supports coding)	· concrete and pictorial patterns · single attribute · translating patterns · computational thinking (supports coding)	· increasing patterns · translating patterns · computational thinking (supports coding)	· decreasing patterns · computational thinking (supports coding)	· patterns involving addition or subtraction · computational thinking (supports coding)	· tables · relationships · pattern rules · computational thinking (supports coding)	· tables · pattern rules · variables · predicting terms · computational thinking (supports coding)	· linear relations	· graphs · equations · table of values	· slope · intercepts · parallel and perpendicular lines	· linear functions · quadratic functions · function notation · domain and range	· operations · reciprocal functions · rational functions · polynomial functions · radical functions	· composition of functions · logarithmic functions · exponential functions · absolute value functions · inverse functions · trigonometric functions

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	K	1	2	3	4	5	6	7	8	9	10	11	12
Guiding Questions													How can functions model instantaneous change?
Possible Concepts and Procedures													· limits · differentiation · integration

	K	1	2	3	4	5	6	7	8	9	10	11	12
Essential Understanding	**Number sense includes organizing and representing quantitative information to make meaningful connections and to develop curiosity and flexibility with numbers.**												
Guiding Questions	How do numbers represent quantity in everyday life?	How do numbers represent quantity in everyday life?	How are numbers used to represent and interpret quantity?	How are numbers represented, interpreted and compared to make meaningful connections?	How are numbers used to represent, interpret and compare quantity?	How can numbers be represented as parts and wholes?	How can numbers be used to communicate quantitative relationships?	How can numbers communicate proportional relationships?	How can percentages be applied in diverse contexts?	How are the subsets of the real number system applied in mathematical and everyday contexts?	How are different number sets used?	How are different number sets used?	How are different number sets used?
Possible Concepts and Procedures	· one-to-one correspon-dence · conservation of number · counting to 10 · subitizing to 6 · cardinality · hierarchical inclusion · composing and decomposing numbers · logical reasoning through puzzles or games	· zero · skip counting by 2, 5 and 10 · conservation of number · counting to 100 · subitizing to 10 · part to whole · composing and decomposing numbers · counting backwards from 20 · cardinality · hierarchical inclusion · one-to-one correspon-dence · place value · estimation · logical reasoning through	· skip counting by 2, 5, 10 and 25 · odd and even · part to whole · half and quarter, concrete representation · composing and decomposing numbers · place value to 100 · rounding · estimation · ordinal numbers · computational thinking (supports coding) · logical reasoning through	· skip counting by 15 · part to whole · comparing fractions with common denominators · composing and decomposing numbers · place value to 1000 · rounding · estimation · logical reasoning through puzzles or games	· counting by simple fractions · comparing and ordering fractions · comparing and ordering decimals to tenths · composing and decomposing numbers · place value from 0.1 to 10 000 · rounding · logical reasoning through puzzles or games	· fractions, decimals and percentages · improper fractions · mixed numbers · ratios · place value from 0.01 to 100 000 · rounding · logical reasoning through puzzles or games	· integers · positive rational numbers · ratio equivalence · part to part and part to whole · percentages from 1 to 100 · place value from 0.001 to 1 000 000 · rounding · logical reasoning through puzzles or games	· rates · fractions, decimals and percentages · logical reasoning through puzzles or games	· fractions, decimals and percentages · percentages from 0 and beyond 100 · logical reasoning through puzzles or games	· real number system · logical reasoning through puzzles or games	· domain and range · discrete and continuous data · logical reasoning through puzzles or games	· set builder notation · interval notation · logical reasoning through puzzles or games	· set theory · logical reasoning through puzzles or games

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DRAFT Kindergarten to Grade 12 Mathematics Scope and Sequence

	K	1	2	3	4	5	6	7	8	9	10	11	12
		puzzles or games	puzzles or games										

	K	1	2	3	4	5	6	7	8	9	10	11	12
Essential Understanding	**Spatial reasoning includes visualizing and describing relationships to create concrete and abstract representations within culturally based experiences, cycles, patterns and place.**												
Guiding Questions	How can familiar objects and shapes in the environment be described, represented and compared?	How can familiar 3-D objects and 2-D shapes be composed, measured, described and compared?	How can 3-D objects and 2-D shapes be composed, decomposed, measured and described?	How can 3-D objects and 2-D shapes be composed, decomposed, measured and described?	How can complex 3-D objects and 2-D shapes be composed, decomposed, measured and described?	How are linear measures used to develop formulae for 2-D shapes?	a. How are linear measures and 2-D measures used to develop formulae for describing 3-D objects? b. How can geometric properties be used to classify angles and triangles?	How can relationships between linear measures of a 2-D shape be described?	How can geometric formulae be used flexibly to solve problems?	How are angles and sides of right triangles related?	a. How are angles and sides of oblique triangles related? b. How can properties of a circle be used to solve problems? c. How can different systems be used for indirect and direct measure-ments?	a. How are angles related to trigonome-tric ratios? b. How can geometric properties be used to develop proofs? c. How is measure-ment affected by the limitations of instruments?	How are trigonometric ratios applied to the unit circle?
Possible Concepts and Procedures	· same and different · sorting · comparative vocabulary · non-standard units · length	· attributes · sorting by 1 attribute · composing 2-D shapes and 3-D objects · symmetry in the environment · non-standard units · vocabulary to compare length · estimation	· 2-D shapes as parts of 3-D objects · sorting by 2 attributes · comparing attributes · decomposing 2-D shapes · representa-tions of familiar objects · spatial representation	· properties · sorting · composing and decomposing 2-D shapes made from other 2-D shapes · congruence (superimposing with concrete objects) · estimating and measuring	· regular and irregular polygons · pyramids and prisms · congruence (pictorially) · tessellations · estimating and measuring area · standard units (cm^2, m^2)	· rectangle · square · parallelogram · increasing dimensionality · height, base · linear measurement with standard units (mm) · identifying 90° angles	a. · volume of right rectangular prisms	· circumference, area and diameter of circles · area of triangles · area of composite shapes, including regular polygons	· Pythagorean theorem · surface area and volume of a cylinder, cone and sphere · volume of prisms and pyramids · formula manipulation	· primary trigonometric ratios · congruent triangles · similar triangles	a. · sine law · cosine law · ambiguous case	a. · primary and reciprocal trigonometric ratios 0° to 360° · angles in standard position	· angle conversions between degrees and radians · trigonometric ratios of all angles (degrees and radians)

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	K	1	2	3	4	5	6	7	8	9	10	11	12
		· direct and indirect comparison	of quantities (number line) · non-standard linear measurement · estimation · direct and indirect comparison	perimeter using standard units · standard units (cm, m)				· surface area of prisms and pyramids · nets					
							b. · classifying triangles · classifying and measuring angles · sum of interior angles in triangles and quadrilaterals				b. · circle geometry	b. · geometric proofs · inductive reasoning · deductive reasoning · computational thinking (supports coding)	
											c. · Système International and imperial system of units and measures	c. · precision · accuracy · uncertainty · tolerance	
Guiding Questions	How can the position of an object in space be described?	How can the position of an object in space be described?	How can location and direction be described and represented?	How can visualization be used to predict and describe changes in position?	How can change in position be analyzed and described from different viewpoints?	How can change in position be described and represented pictorially?	How can position and transformation be described and represented in a Cartesian plane?	How can transformations be described and represented in a Cartesian plane?	How can transformations contribute to design?	How can scale be applied to shape and place?	How can different views be used to analyze and describe 3-D objects?	How are characteristics of a quadratic function affected by transforma-tions?	How are characteristics of relations affected by transforma-tions?
Possible Concepts and Procedures	· positional vocabulary · computational thinking (supports coding) · logical reasoning through puzzles or games	· flips, turns and slides · directions and locations · position relative to other objects · computational thinking (supports coding) · logical reasoning	· diagonal slides and flips · half and quarter turns · grid, map and position of key features · computational thinking (supporting coding) · logical reasoning	· conservation of composition · flips, slides and turns of 2-D shapes and 3-D objects · communicating spatial relationships and place · patterns in arrays	· patterns and design · symmetrical patterns · line of symmetry · logical reasoning through puzzles or games	· single transformation · line and rotational symmetry · views of 3-D objects composed of cubes, from different viewpoints	· single transformation of 2-D shapes · Cartesian plane in quadrant 1 · logical reasoning through puzzles or games	· combinations of transforma-tions of 2-D shapes · Cartesian plane, all quadrants · logical reasoning through puzzles or games	· line and rotational symmetry · computational thinking (supports coding) · logical reasoning through puzzles or games	· enlargement · reduction · similarity · scale factor · logical reasoning through puzzles or games	· top, front and side views of 3-D objects	· reflection · translations · stretch	· dynamic geometry · relations · functions: o trigonome-tric o logarithmic o exponential o absolute value o inverse o reciprocal o rational

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	K	1	2	3	4	5	6	7	8	9	10	11	12
		through puzzles or games	through puzzles or games	· computational thinking (supports coding) · logical reasoning through puzzles or games		· spatial language and gestures · logical reasoning through puzzles or games							○ polynomial ○ radical
Guiding Questions		How can time be used to describe cycles of change in the environment?	How can time be used to measure cycles of change in a variety of contexts?	How can time be measured and communicated?	How can the passage of time be measured?								
Possible Concepts and Procedures		· passage of time in a variety of contexts · non-standard time · seasons, months, days of the week and relative time of the day	· days to weeks · months to years · half-hour and hour · calendar	· standard measures · telling time to hour, half-hour and quarter-hour · passage of time in variety of contexts	· 24-hour clock · passage of time in a variety of contexts								

	K	1	2	3	4	5	6	7	8	9	10	11	12
Essential Understanding	**Data are ethically managed, represented and analyzed using diverse methods and holistic understandings to make predictions and inform decisions.**												
Guiding Questions	How can questions be posed to explore personal interests?	How can questions be posed to explore personal interests and experiences?	How can questions be formulated to identify and gather data about personal interests and experiences?	How can questions be formulated to gather and compare data about personal interests and experiences?	How can questions be formulated to gather and compare numerical or categorical data?	How can questions be formulated to collect data that address relevant community issues?	How can reflecting upon the original question lead to further investigation?	How can reflecting upon the original question and data collected lead to further investigation?	How can reflecting upon the interpretation of the data lead to further investigation?	How might questions introduce bias or other problems?	How can questions be evaluated for validity and the data they generate for reliability?	How can questions be evaluated for validity and the data they generate for reliability?	How can questions be evaluated for validity and the data they generate for reliability?
Possible Concepts and Procedures	· formulating questions	· formulating questions	· formulating purposeful questions	· clarifying the problem · formulating questions	· clarifying the problem · formulating questions · numerical and categorical data	· identifying problems · formulating questions	· formulating further questions	· formulating questions from the collection of data	· formulating questions from the interpretation of data	· bias · ethics in data collection	· validity · reliability	· validity · reliability	· validity · reliability

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DRAFT Kindergarten to Grade 12 Mathematics Scope and Sequence

	K	1	2	3	4	5	6	7	8	9	10	11	12
Guiding Questions	How can observable data be collected and represented concretely?	How can observable data be collected, represented and interpreted?	How can observable data be collected, represented and interpreted?	How can observable data be collected, represented and interpreted?	How do efficient organization and representation of data affect interpretation?	How can data be interpreted and communicated in meaningful ways?	How can the type of data influence representation?	How can the organization of data support analysis?	How can data be represented in an effective and ethical way?	How can data be collected and represented in an effective and ethical way?	How can data collection be evaluated, taking different perspectives, implications and limitations into account?	How can data collection be evaluated, taking different perspectives, implications and limitations into account?	How can data be collected to answer questions and inform decisions in inferential statistics?
Possible Concepts and Procedures	· data collection · concrete graphs · describing data	· data collection · concrete graphs and pictographs (one to one)	· recording first-hand data · concrete graphs and pictographs (one to one)	· recording first-hand data · symbolic graphs	· first-hand and second-hand data · many to one · constructing and interpreting bar graphs and pictographs · interpreting bar graphs · graphic organizers · computational thinking (supports coding)	· distinguishing first-hand from second-hand data · categorizing data · constructing and interpreting double-bar graphs	· methods of collecting data · different representa-tions for the same data · graph selection · visualizing and interpreting circle graphs	· methods of collecting data · frequency table · arrangement of data in tables and graphic organizers · measures of central tendency	· misleading data · interpreting and critiquing graphs · interpreting various plots	· population sample · representative sample · bias and ethics · ethical decision-making for self and society	· data analysis · ethical decision-making for self and society	· data analysis · ethical decision-making for self and society	· random sample · representative sample · sample versus population · ethical decision-making for self and society
Guiding Questions	How can the likelihood of an experience be communicated?	How can the likelihood of an experience be communicated?	How can the likelihood of an event be communicated?	How can the possible outcomes of an experiment be identified?	How can information be used to predict probability?	How can probability be predicted without an experiment?	How can one event influence the probability of another event?	How can potential outcomes of multiple theoretical events be determined?	How can probability be determined for multiple events?	How can probability be determined for multiple events?	How can probability be determined for multiple events?	How can combinatorics be applied to probability?	How can events be predicted using analysis of data?
Possible Concepts and Procedures	· never · always · sometimes	· never · always · likely · unlikely	· possible · impossible · often · rarely · probable · improbable	· possible outcomes	· experimental probability · chance of something occurring · randomness	· single-event theoretical probability	· dependent versus independent events	· sample space · computational thinking (supports coding)	· independent events and dependent events · fundamental counting principle	· probability with “and/or”	· mutually inclusive and exclusive events	· permutations · combinations · computational thinking (supports coding)	· confidence intervals · 95% box plot · normal distribution · z-scores · standard deviation · binomial distribution

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	K	1	2	3	4	5	6	7	8	9	10	11	12
Essential Understanding	**Additive and multiplicative thinking are developed through diverse strategies shaped by cultures, identities and experiences to solve problems involving quantitative information.**												
Guiding Questions		How can strategies be used to build fluency with addition and subtraction?	How can efficient mental mathematics strategies be developed to build fluency with number facts?	How can efficient mental mathematics strategies be developed to build fluency with number facts?	How can efficient mental mathematics strategies be developed to build fluency with number facts?	How can efficient mental mathematics strategies be refined to build fluency with number facts?							
Possible Concepts and Procedures		· strategies for number facts	· number facts to 5 + 5 and related subtraction facts	· number facts to 9 + 9 and related subtraction facts · multiplication facts of 2, 3, 4 and 5, and related division facts	· multiplication facts up to 9 x 9 and related division facts	· fluency with number facts							
Guiding Questions	How can joining and separating be used to describe familiar situations?	How can joining and separating be used to explain and solve problems in familiar contexts?	How can composing and decomposing be used to solve number problems?	How can additive thinking be used to flexibly solve number problems?	How can additive thinking be used to flexibly solve number problems?	How can additive thinking be used to flexibly solve number problems?	How can additive thinking be used to flexibly solve number problems?	How can additive thinking be used to flexibly solve number problems?	How can additive thinking be used to flexibly solve number problems?	How can additive thinking be used to simplify expressions?	How can additive thinking be used to simplify expressions?	How can additive thinking be used to simplify expressions?	How can additive thinking be used to simplify expressions?
Possible Concepts and Procedures	· recognizing joining and separating situations	· addition and subtraction · addition or subtraction with 0 · connections with counting on and back	· composing and decomposing numbers to 100 · addition and subtraction of numbers to 100 · computational estimation · computational thinking (supports coding)	· composing and decomposing numbers to 1000 · addition and subtraction of numbers to 1000 · computational estimation · mental mathematics strategies for 2-digit numbers · computational thinking (supports coding)	· composing and decomposing numbers to 10 000 · addition and subtraction of numbers to 10 000 · computational estimation · decimals to tenths · computational thinking (supports coding)	· composing and decomposing numbers to 100 000 · addition and subtraction of numbers to 100 000 · computational estimation · decimals to hundredths · computational thinking (supports coding)	· composing and decomposing numbers to 1 000 000 · addition and subtraction of numbers to 1 000 000 · computational estimation · decimals to thousandths · proper fractions with common denominators · computational thinking (supports coding)	· fractions (proper fractions) · computational estimation · integers · algorithm for addition or subtraction · computational thinking (supports coding)	· fractions · computational estimation	· polynomial expressions	· radical expressions	· rational expressions	· arithmetic sequences and series · computational thinking (supports coding)

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	K	1	2	3	4	5	6	7	8	9	10	11	12
Guiding Questions	How can sharing and grouping be used to describe familiar situations?	How can collections be shared equally?	How can equal grouping be used to solve number problems in familiar situations?	How can multiplicative thinking be used to solve problems?	How can multiplicative thinking be used to flexibly solve number problems?	How can multiplicative thinking be used to flexibly solve number problems?	How can multiplicative thinking be used to flexibly solve number problems?	How can multiplicative thinking be used to flexibly solve number problems?	How can multiplicative thinking be used to flexibly solve number problems?	How can multiplicative thinking be used to simplify expressions?	How can multiplicative thinking be used to simplify expressions?	How can multiplicative thinking be used to simplify expressions?	How can multiplicative thinking be used to simplify expressions?
Possible Concepts and Procedures	· recognizing sharing and grouping situations · sharing into equal groups	· sharing concrete objects and pictorial representa-tions into equal groups	· sharing concrete objects and pictorial representa-tions into equal groups with remainders	· multiplication and division · many-to-one relationships	· multiplication (2- or 3-digit by 1-digit) · division (1-digit divisor and 2-digit dividend) with remainders · multiples · computational estimation	· multiplication (2- or 3-digit by 2-digit) · division (3-digit by 1-digit) with remainders · mental mathematics strategies (2-digit by 1-digit) · area (square units) · computational estimation	· prime and composite numbers · factors · decimals (by whole number) · decimals by powers of 10 · division into halves, thirds and quarters · computational estimation	· fractions (proper fractions) · integers · computational estimation · percentage of a number · mental mathematics strategies with percentage · equivalent ratios · rates · square · algorithm for multiplication or division · computational thinking (supports coding)	· fractions · cube and cube root · square root · perfect square · estimate square root · solving problems with percentage · computational estimation	· power laws · powers of 10 · polynomial expressions (multiplication and division by monomial)	· radical expressions · negative powers · negative powers of 10 · rational powers · factoring trinomials · factoring a difference of squares · factoring a monomial from a polynomial expression	· rational expressions · factoring polynomials of degree 3 to 5	· logarithmic laws · logarithmic expressions · trigonometric expressions · binomial theorem · geometric sequences and series
Guiding Questions	How are coins the same and different?	How can money be sorted?	How can money be counted?	How can monetary values be represented in different ways?	How can an understanding of money be used to solve problems?	How can an understanding of money be used to solve problems?	How can consumer mathematics be applied to decision making?	How can consumer mathematics be applied to decision making?	How can consumer mathematics be applied to decision making?	How can basic finances be managed?	How can basic finances be managed?	How can financial literacy be applied to solve authentic problems?	How can financial literacy be applied to solve authentic problems?
Possible Concepts and Procedures	· recognizing money	· distinguishing attributes from values of coins and bills · sorting money into groups	· counting money using skip counting	· different values in multiple ways	· planning a simple budget · adding and subtracting coins and bills · recording amounts	· making change	· saving · purchasing	· sales tax · discount · tips	· unit cost · best buy	· simple interest · budgeting · simple banking	· income with deductions · profit versus loss	· compound interest (graphically) · savings and loans	· credit · leasing versus buying · investments · compound interest (algebraically)

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