Alberta Mathematics Kindergarten to Grade 12 Scope and Sequence 2017

Alberta Government

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The primary intended audience for this document is:

Administrators	
Counsellors	
General Audience	
Parents	
Students	
Teachers	✓

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Introduction

The *Mathematics Kindergarten to Grade 12 Scope and Sequence* has been derived from the *Alberta Program of Studies for Mathematics K–9 (2007, Updated 2016)* and the *Alberta Program of Studies for Mathematics 10–12 (2008)*. The scope and sequence outlines the progression of concepts in the programs of study. Specifically, the grades K–9 scope and sequence is divided into the four strands that are in the program of studies: Number, Patterns and Relations, Shape and Space, and Statistics and Probability. The last column in each of these tables indicates some of the grades 10–12 high school (HS) concepts that are related to each row of concepts. The grades 10–12 scope and sequence is divided into three separate tables, one for each of the course sequences (-1, -2 and -3). The column titled “Prerequisite Knowledge” indicates the last grade in which students would have studied a particular concept.

Background

The scope and sequence, recommended in the *Mathematics Review – Report to Premier and Minister*, highlights the connections between strands, topics and grades. This scope and sequence is a support resource and does **not** replace the programs of study. It identifies concepts, rather than general and specific outcomes, and does not include the mathematical processes, ICT outcomes or 2016 clarification notes identified in the programs of study. To gain a more complete understanding of the student experience in Kindergarten to Grade 12 Mathematics, and to view the general and specific outcomes in their entirety, the programs of study documents should be examined. The sequences identified in this document are not intended to be exhaustive or prescriptive.

Strands/Topics

K–9 Strands

- Number (N)
- Patterns and Relations (PR)
- Shape and Space (SS)
- Statistics and Probability (SP)

10–12 Topics

- Algebra (A)
- Algebra and Number (AN)
- Geometry (G)
- Logical Reasoning (LR)
- Mathematics Research Project (RP)
- Measurement (M)
- Number (N)
- Number and Logic (NL)
- Permutations, Combinations and Binomial Theorem (PCBT)
- Probability (P)
- Relations and Functions (RF)
- Statistics (S)
- Trigonometry (T)

Alberta Mathematics K–9 Scope and Sequence – Number

	K	1	2	3	4	5	6	7	8	9	HS
Counting	Forward and backward by 1s (1–10) (N1) Subitizing 1–5 (N2)	Forward by 1s, 5s and 10s (0–100); forward by 2s (0–20); and backward by 1s (20–0) (N1) Subitizing 1–10 (N2) Understanding counting (N3) Conservation of number (N7) Estimate to 20 using referents (N6)	Forward and backward by 2s, 5s and 10s (0–100) (N1) Ordinal numbers to tenths (N3) Estimate to 100 using referents (N6)	Forward and backward by 3s, 4s, 5s, 10s, 25s and 100s (0–1000) (N1) Estimate to 1000 using referents (N4)							
Number Concepts	Natural numbers to 10 (N3, N4, N5)	Whole numbers to 20 (N4, N5)	Whole numbers to 100 (N4, N5) Even and odd numbers (N2) Place value to 100 (N7)	Whole numbers to 1000 (N2, N3) Place value to 1000 (N5) Fractions, like denominators and parts of a whole (N13)	Whole numbers to 10 000 (N1, N2) and decimals to hundredths (N9) Fractions and parts of a whole or a set (N8) Decimals to fractions and fractions to decimals (N10)	Whole numbers to 1 000 000 (N1) and decimals to thousandths (N8, N10) Fractions, like and unlike denominators and equivalent fractions (N7) Decimals to fractions and fractions to decimals (N9)	Integers (N7) Percent (N6) Ratio (N5) Place value: greater than 1 million and less than thousandths (N1) Improper fractions and mixed numbers (N4)	Solve problems 1–100% (N3) Fractions and terminating and repeating decimals (N4) Fractions, decimals and whole numbers (N7)	Perfect squares and square roots (N1) Approximate square root (N2) Percent ≥ 0 and > 100 (N3) Rate and ratio (N4, N5)	Square roots of rational numbers (N5, N6) Powers with whole-number exponents (N1) and operations on powers (N2) Rational numbers (N3)	Factors, multiples and roots (10C AN1) Powers (10C AN3) Irrational numbers (10C AN2) Rational expressions (20-1 AN4, 30-2 RF1) Proportional reasoning (10C M2, 10-3 N1)

	K	1	2	3	4	5	6	7	8	9	HS
Number Facts		Addition and subtraction • strategies to 9 + 9 • recall to a sum of 5 (N10)	Addition and subtraction • strategies to 9 + 9 • recall to 5 + 5 (N10)	Addition and subtraction • understand, recall and apply to 9 + 9 (N10) Multiplication and division • understand and recall to 5 x 5 (N11, N12)	Multiplication and division • strategies to 9 x 9 • recall to 7 x 7 (N5)	Multiplication and division • understand, recall and apply to 9 x 9 (N3)					All outcomes where operations are used
Addition and Subtraction		Whole numbers to 20 (N9) Identify 1 or 2 more/less than a number, up to 20 (N8)	Whole numbers to 100 (N9) Effect of zero (N8)	Whole numbers to 1000 (N9) Mental math strategies (N6, N7) Estimation strategies (N8)	Whole numbers to 10 000 (N3) and decimals to hundredths (N11)	Decimals to thousandths (N11) Estimation strategies in context (N2)	Problems using whole numbers and decimals (N2) Order of operations (whole numbers, no exponents) (N9)	Decimals (N2) Fractions (N5) Integers (N6)		Rational numbers, including order of operations (N3, N4)	Rational expressions (20-1 AN5, 30-2 RF2) Radical expressions (20-1 AN2)
Multiplication and Division					Multiplication, including estimation (2- or 3-digit by 1-digit) (N6) Division, including estimation (1-digit divisor, up to 2-digit dividend) (N7) Multiply by 0 and 1 and divide by 1 (N4)	Multiplication (two 2-digit) (N5) Division (3-digit by 1-digit) and remainders (N6) Estimation strategies in context (N2) Mental math strategies for multiplication (N4)	Decimals (1-digit multiplier and divisor) (N8) Problems using whole numbers and decimals (N2) Order of operations (whole numbers, no exponents) (N9) Factors and multiples, prime and composite (N3)	Decimals (N2) Divisibility rules (including 0) (N1)	Fractions (N6) Integers (N7)	Rational numbers, including order of operations (N3, N4)	Rational expressions (20-1 AN5, 30-2 RF2) Radical expressions (20-1 AN2) Factors (10C AN1) Polynomial expressions (10C AN4, AN5)

Alberta Mathematics K–9 Scope and Sequence – Patterns and Relations

	K	1	2	3	4	5	6	7	8	9	HS
Patterns and Relations	Repeating patterns, 2 or 3 elements (PR1)	Repeating patterns, 2 to 4 elements (PR1) Translate from one representation to another (PR2)	Repeating patterns, 3 to 5 elements (PR1) Increasing patterns, numerical (to 100) and non-numerical (PR2)	Increasing and decreasing patterns, numerical (to 1000) and non-numerical (PR1, PR2)	Patterns and relationships in tables, charts or diagrams (PR1, PR3, PR4) Translate representations (table, chart, concrete materials) (PR2)	Pattern rule for predictions (PR1)	Graphs and tables (PR1, PR2)	Oral patterns, written patterns and linear relations (PR1) Table of values, graph, analyze and problem solve with linear relations (PR2)	Graph and analyze two-variable linear relations (PR1)	Problem-solving using linear equations (PR1) Graph, analyze and interpolate and extrapolate linear relations (PR2)	Linear relations (10C RF3-7) Relationships among data and graphs (10C RF1) Arithmetic and geometric sequences and series (20-1 RF9, RF10)
Sort and Sorting Rule	Single attribute (set of objects) (PR2)	Single attribute (set of objects) (PR3)	Two attributes (set of objects) (PR3)	One or more attributes (set of objects or numbers) (PR3)							
Equations, Inequalities and Expressions		Balance and imbalance (PR4) Equal symbol (PR5)	Equality and inequality using symbols (PR4, PR5)	One-step equation, addition and subtraction (symbol for unknown number) (PR4)	Express problem as one-step equation (symbol for unknown number) and solve (PR5, PR6)	Express problem as one-step equation (letter variable for unknown number) and solve (PR2, PR3)	Express problem as equation, letter variable for unknown number and solve (PR3, PR4) Preservation of equality (PR5)	One-step and two-step linear equations (single variable) (PR6, PR7) Difference between expression and equation (PR4) Evaluate using given value (PR5) Preservation of equality (PR3)	Two-step linear equations (single variable) (PR2)	Multi-step linear equations (single variable) (PR3) Linear inequalities (single variable) (PR4) Polynomials (degree less than or equal to 2) (PR5) Polynomial operations (PR6, PR7)	Manipulate formulas (10-3 A1) Systems of linear equations (10C RF9) Linear and quadratic inequalities (20-1 RF7, RF8) Multiplying and factoring polynomials (10C AN4, AN5)

Alberta Mathematics K–9 Scope and Sequence – Shape and Space

	K	1	2	3	4	5	6	7	8	9	HS
Measurement	Direct comparison (length, mass and volume) (SS1)	Measurement as comparing (SS1)	Nonstandard units (length, height, distance around and mass) (SS2, SS3, SS4) Days to a week and months to a year (SS1)	Length and perimeter (cm, m); mass (g, kg) (SS3, SS4, SS5) Nonstandard and standard units of time (SS1, SS2)	Area of regular and irregular shapes (cm^2, m^2) (SS3) Time (digital and analog clocks, 24-hour clocks) (SS1) Calendar dates (SS2)	Length (mm), volume (cm^3, m^3) and capacity (mL, L) (SS3, SS4, SS5) Rectangles, given perimeter or area (SS2) Identify 90° angles (SS1)	Perimeter (polygons), area (rectangles) and volume (rectangular prisms) (SS3) Angles (SS1) Sum of interior angles (triangle and quadrilateral) (SS2)	Area (triangles, parallelograms and circles) (SS2) Circles (radius, diameter and circumference) (SS1)	Surface area and nets (rectangular and triangular prisms, cylinders) (SS2, SS3) Volume (rectangular and triangular prisms, cylinders) (SS4) Pythagorean theorem (SS1)	Surface area of composite 3-D objects (SS2) Circle properties (SS1)	Surface area, volume (10C M3) Area (10-3 M4) SI and imperial units (10C M1; 10-3 M3) Angles (10-3 G6, 30-1 T1) Line and angle problems (10-3 G5, G6) Properties of angles and triangles (20-2 G1, G2) Pythagorean theorem (10-3 G2) Primary trigonometric ratios (10C M4, 10-3 G4)

	K	1	2	3	4	5	6	7	8	9	HS
Geometric Characteristics and Relationships	Sort 3-D objects, single attribute (SS2) Build 3-D objects (SS3)	Sort (one attribute), replicate and compare 3-D objects and 2-D shapes (SS2, SS3) Compare 2-D shapes to parts of 3-D objects (SS4)	Sort (two attributes), describe, compare and construct 3-D objects and 2-D shapes (SS6, SS7, SS8) Identify 2-D shapes as parts of 3-D objects (SS9)	Sort regular and irregular polygons (triangles, quadrilaterals, pentagons, hexagons and octagons) (SS7) 3-D objects (faces, edges and vertices) (SS6)	Describe and construct rectangular and triangular prisms (SS4)	Quadrilaterals (rectangles, squares, trapezoids, parallelograms and rhombuses) (SS7) Parallel, intersecting, perpendicular, vertical and horizontal (edges, faces and sides) (SS6)	Triangles (scalene, isosceles, equilateral, right, obtuse and acute) (SS4) Regular and irregular polygons (SS5)	Geometric constructions (SS3)	Top, front and side views (3-D objects) (SS5)	Similarity, polygons (SS3)	Similarity, polygons (10-3 G3) Line and angle problems (10-3 G5, G6) 3-D objects and their views (20-3 G3, G4)
Position and Transformations			Orientation and measurement (SS5)		Congruency (SS5) Line symmetry (SS6)	Single transformation concretely (SS8, SS9)	Plot points (1st quadrant of Cartesian plane) (SS8) Single transformation (SS6, SS9) Combination of transformations of 2-D shapes (SS7)	Plot points (all quadrants) (SS4) Single transformation (all quadrants) (SS5)	Congruency, polygons (SS6)	Scale diagrams (SS4) Line and rotation symmetry (SS5)	Scale (20-2 M2, M3; 20-3 G2, G4) Transformations (30-3 G3) Quadratic functions (20-1 RF3, 20-2 RF1)

Alberta Mathematics K–9 Scope and Sequence – Statistics and Probability

	K	1	2	3	4	5	6	7	8	9	HS
Data Collection			Gather and record data (SP1)	Collect and organize first-hand data (SP1)		First-hand and second-hand data (SP1)	Methods of collecting data (SP2)			Data project (SP3) Factors that affect data collection (SP1) Population vs. sample (SP2)	Research project (20-2 RP1)
Data and Graphs			Concrete graphs and pictographs (one-to-one correspondence) (SP2)	Bar graphs (one-to-one correspondence) (SP2)	Bar graphs and pictographs (many-to-one correspondence) (SP1, SP2)	Double bar graphs (SP2)	Line graphs (SP1) Graph collected data and analyze graph (SP3)	Circle graphs (SP3) Central tendency, range and outliers (SP1, SP2)	Critique representation of data in graphs (SP1)	Data project (SP3)	Graphs (20-3 S1) Statistical data (20-2 S2) Normal distribution (20-2 S1) Central tendency (30-3 S1)
Probability						Likelihood of one or two outcomes (using words) (SP3, SP4)	Experimental vs. theoretical probability (SP4)	Experimental vs. theoretical probability (two events, sample space) (SP5, SP6) Probability as ratio, fraction and percent (SP4)	Independent events (SP2)	Role of probability in society (SP4)	Probability problems (30-2 P1–3, 30-3 P1) Fundamental counting principle (30-1 PCBT1, 30-2 P4)

Alberta Mathematics 10C, 20-1 and 30-1 Scope and Sequence

	Prerequisite Knowledge	10C	20-1	30-1
Equations and Inequalities	Multi-step linear equations (Grade 9 PR3) Linear inequalities (Grade 9 PR4)	System of linear equations in two variables (RF9)	Quadratic equations (RF5) System of linear-quadratic and quadratic-quadratic equations (RF6) Radical equations (AN3) Rational equations (AN6) Linear and quadratic inequalities in two variables (RF7) Quadratic inequalities in one variable (RF8)	Exponential and logarithmic equations (RF10) Trigonometric equations (T5)
Relations and Functions	Single transformation (all quadrants) (Grade 7 SS5) Problem solving using linear equations (Grade 9 PR1) Graph, analyze, interpolate and extrapolate linear relations (Grade 9 PR2) Line and rotation symmetry (Grade 9 SS5)	Relations and functions (RF2) Characteristics of linear relations (RF3, RF4, RF5, RF6, RF7) Function notation (RF8) Relationships among data and graphs (RF1)	Quadratic functions (RF3, RF4) Absolute value functions (RF2) Reciprocal functions (RF11)	Operations and compositions of functions (RF1) Polynomial functions (RF12) Exponential and logarithmic functions (RF9) Radical functions (RF13) Rational functions (RF14) Trigonometric functions (T4) Transformation of functions (RF2, RF3, RF4, RF5) Inverses of relations (RF6)
Combinatorics	Sample space (Grade 7 SP5)			Fundamental counting principle (PCBT1) Permutations (PCBT2) Combinations (PCBT3)
Patterns	Problem solving using linear equations (Grade 9 PR1)		Arithmetic sequences and series (RF9) Geometric sequences and series (RF10)	
Operations	Polynomials (Grade 9 PR5) Polynomial operations (Grade 9 PR6, PR7) Rational numbers (Grade 9 N3) Square roots of rational numbers (Grade 9 N5, N6) Powers with whole-number exponents (Grade 9 N1) and exponent laws (Grade 9 N2)	Multiplying polynomial expressions (AN4) Common factors and factoring trinomials (AN5) Powers with integral and rational exponents (AN3)	Factoring polynomials with quadratic patterns (RF1) Radicals and radical expressions (AN2) Rational expressions (AN4, AN5)	Factoring polynomials of degree greater than 2 (RF11) Expand powers of a binomial, including binomial theorem (PCBT4) Logarithms and laws of logarithms (RF7, RF8)

	Prerequisite Knowledge	10C	20-1	30-1
Number	Factors and multiples (Grade 6 N3) Rational numbers (Grade 9 N3)	Factors, multiples and roots (AN1) Irrational numbers (AN2)	Absolute value of real numbers (AN1)	
Measurement	Linear measurements (SI) (Grade 5 SS3) Rate and ratio (Grade 8 N5)	Linear measurement, SI and imperial units (M1) Conversions between SI and imperial units (M2)		
Surface Area and Volume	Volume of cylinders and prisms (Grade 8 SS4) Surface area of composite 3-D shapes (Grade 9 SS2)	Cones, cylinders, prisms, pyramids and spheres (M3)		
Trigonometry	Sum of interior angles (Grade 6 SS2) Pythagorean theorem (Grade 8 SS1) Similarity, polygons (Grade 9 SS3)	Primary trigonometric ratios (M4)	Primary trigonometric ratios (0° to 360°) (T2) Sine law and cosine law, including the ambiguous case (T3)	Trigonometric ratios (degrees and radians) (T3) Unit circle (T2) Trigonometric functions (T4) Trigonometric equations (T5) Trigonometric identities (T6)
Angles	Angles (Grade 6 SS1)		Angles in standard position (0° to 360°) (T1)	Angles in standard position (degrees and radians) (T1)

Alberta Mathematics 10C, 20-2 and 30-2 Scope & Sequence

	Prerequisite Knowledge	10C	20-2	30-2
Equations and Inequalities	Multi-step linear equations (Grade 9 PR3) Linear inequalities (Grade 9 PR4)	System of linear equations in two variables (RF9)	Quadratic equations (RF2) Radical equations (NL4)	Rational equations (RF3) Exponential equations (RF5)
Relations and Functions	Problem solving using linear equations (Grade 9 PR1) Graph, analyze, interpolate and extrapolate linear relations (Grade 9 PR2)	Relations and functions (RF2) Characteristics of linear relations (RF3, RF4, RF5, RF6, RF7) Function notation (RF8) Relationships among data and graphs (RF1)	Characteristics of quadratic functions (RF1)	Represent data and solve problems using exponential, logarithmic, polynomial and sinusoidal functions (RF6, RF7, RF8)
Combinatorics	Sample space (Grade 7 SP5)			Fundamental counting principle (P4) Permutations (P5) Combinations (P6)
Operations	Rational numbers (Grade 9 N3) Square roots of rational numbers (Grade 9 N5, N6) Polynomials (Grade 9 PR5) Polynomial operations (Grade 9 PR6, PR7) Powers with whole-number exponents (Grade 9 N1) and exponent laws (Grade 9 N2)	Multiplying polynomial expressions (AN4) Common factors and factoring trinomials (AN5) Powers with integral and rational exponents (AN3)	Radicals and radical expressions (NL3)	Rational expressions (RF1, RF2) Logarithms and laws of logarithms (RF4)
Number	Factors and multiples (Grade 6 N3) Rational numbers (Grade 9 N3) Square roots of rational numbers (Grade 9 N5, N6)	Factors, multiples and roots (AN1) Irrational numbers (AN2)		
Logical Reasoning	All Number and Shape and Space outcomes		Inductive and deductive (NL1) Puzzles and games that involve spatial reasoning (NL2) Derive proofs (G1)	Set theory (LR2) Puzzles and games that involve numerical and logical reasoning (LR1)
Measurement	Linear measurements (SI) (Grade 5 SS3) Rate and ratio (Grade 8 N5)	Linear measurement, SI and imperial units (M1)		

	Prerequisite Knowledge	10C	20-2	30-2
Proportional Reasoning	Rate and ratio (Grade 8 N5) Scale diagrams (Grade 9 SS4)	Conversions between SI and imperial units (M2)	Applications of rates (M1) Scale diagrams (M2) Scale factors (areas, surface areas and volumes of similar 2-D shapes and 3-D objects) (M3)	
Surface Area and Volume	Volume of cylinders and prisms (Grade 8 SS4) Surface area of composite 3-D objects (Grade 9 SS2)	Cones, cylinders, prisms, pyramids and spheres (M3)	Scale factors (areas, surface areas and volumes of similar 2-D shapes and 3-D objects) (M3)	
Trigonometry	Sum of interior angles (Grade 6 SS2) Pythagorean theorem (Grade 8 SS1) Similarity, polygons (Grade 9 SS3)	Primary trigonometric ratios (M4)	Cosine and sine laws, excluding the ambiguous case (G3)	Represent data and solve problems using sinusoidal functions (RF8)
Properties of Angles and Triangles	Angles (Grade 6 SS1) Sum of interior angles (Grade 6 SS2) Similarity, polygons (Grade 9 SS3)		Derive proofs (G1) Solve problems (G2)	
Represent and Interpret Data and Graphs	Central tendency (Grade 7 SP1, SP2) Data project (Grade 9 SP3)		Normal distribution (S1) Statistical data (S2)	
Probability	Percent ≥ 0 and > 100 (Grade 8 N3) Independent events (Grade 8 SP2)			Odds and probability statements (P1) Mutually exclusive and non-mutually exclusive events (P2) Probability of two events (P3)
Research Mathematics in Society	Factors that affect data collection (Grade 9 SP1) Data project (Grade 9 SP3)		Historical event or area of interest (RP1)	Current event or area of interest (RP1)

Alberta Mathematics 10-3, 20-3 and 30-3 Scope & Sequence

	Prerequisite Knowledge	10-3	20-3	30-3
Measurement	Linear measurements (SI) (Grade 5 SS3) Rate and ratio (Grade 8 N4) Surface area of composite 3-D shapes (Grade 9 SS2)	Conversions between SI and imperial units (M1, M2) SI and imperial linear measurements (decimal and fractional measurements) (M3)		Limitations of measuring instruments, and solve problems (M1)
Area, Surface Area, Volume and Capacity	Volume of cylinders and prisms (Grade 8 SS4) Surface area of composite 3-D shapes (Grade 9 SS2)	Area and surface area, SI and imperial units (decimal and fractional measurements) (M4)	Surface area, volume and capacity (SI and imperial units) (M1, M2)	
Manipulating and Applying Formulas	Volume of cylinders and prisms (Grade 8 SS4) Powers with whole-number exponents (Grade 9 N1) Multi-step linear equations (Grade 9 PR3) Circle properties (Grade 9 SS1) Surface area of composite 3-D shapes (Grade 9 SS2)	Perimeter, area, Pythagorean theorem, primary trigonometric ratios and income (A1)	Volume and capacity, surface area, slope and rate of change, simple interest and finance charges (A1)	
Geometric Reasoning	Quadrilaterals (Grade 5 SS7) Angles (Grade 6 SS1) Sum of interior angles (Grade 6 SS2) Geometric constructions (Grade 7 SS3) Transformations (Grade 7 SS5) Pythagorean theorem (Grade 8 SS1) Nets (Grade 8 SS2) Views (Grade 8 SS5) Similarity, polygons (Grade 9 SS3)	Angles (G6) Angles and parallel, perpendicular and transversal lines (G5) Pythagorean theorem (G2) Primary trigonometric ratios (G4) Similarity of polygons (G3)	Problems with 2 and 3 right triangles (G1) 3-D objects and their views (G3) Exploded views (G4)	Sine law and cosine law, excluding ambiguous case (G1) Problem solving with triangles, quadrilaterals and regular polygons (G2) Transformations (G3)
Finance	All outcomes where operations are used	Income (N2) Unit pricing, currency exchange (N1)	Personal budgets, compound interest, financial institution services, credit options (N2, N3, N4, N5)	Acquisition of a vehicle (N2) Small business options (N3)
Proportional Reasoning	Percent ≥ 0 and > 100 (Grade 8 N3) Rate and ratio (Grade 8 N5) Scale diagrams (Grade 9 SS4)	SI and imperial linear measurements (decimal and fractional measurements) (M3) Area and surface area, SI and imperial units (decimal and fractional measurements) (M4)	Proportional reasoning and unit analysis (A3) Scale (G2, G4)	

	Prerequisite Knowledge	10-3	20-3	30-3
Relations and Functions	Problem solving using linear equations (Grade 9 PR1)		Slope (A2)	Linear relations (A1)
Reasoning	All Number and Shape and Space outcomes	Puzzles and games that involve spatial reasoning (G1)	Puzzles and games that involve numerical reasoning (N1)	Puzzles and games that involve logical reasoning (N1)
Data and Graphs	Central tendency (Grade 7 SP1, SP2) Data project (Grade 9 SP3)		Problem solving (S1)	Central tendency (S1) Percentiles (S2)
Probability	Independent events (Grade 8 SP2)			Probability (P1)