Mathematics K to 7

Draft Learning Outcomes



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Mathematics Overview

The K to 12 Curriculum

The Mathematics K to 12 curriculum provides students with the experiences and skills needed in the knowledge-based workplace, including probability and statistics, logic, measurement theory, and problem solving. The curriculum has been arranged according to the following four curriculum organizers:

- Number
- Patterns and Relations
- Shape and Space
- Statistics and Probability

The Mathematics K to 12 curriculum reflects that mathematics is a common human activity, beoming more important in our increasingly technological society. A greater proficiency in mathematics will increase opportunities available to the students of British Columbia.

The learning outcomes of the Mathematics K to 12 curriculum were developed as part of the Western Canadian Protocol for Collaboration in Basic Education. They represent the combined efforts and talents of British Columbia educators and education partners and those of the provinces of Alberta, Saskatchewan, and Manitoba, as well as the Yukon Territory and Northwest Territories. These learning outcomes form the Common Curriculum Framework for K to 12 Mathematics for Western Canada.

Mathematics 8 to 12

The Mathematics 8 to 12 curriculum will build on the K to 7 curriculum. The curriculum is intended to prepare students to meet the challenges of a changing workplace by providing them with the mathematical, problem solving, and technological skills, depending upon their personal, education, and career goals.

Mathematics K to 7

The National Council of Teachers of Mathematics (NCTM) Standards were used as a reference by the developers of the Common Curriculum Framework for K to 12 Mathematics. The Kindergarten to Grade 7 learning outcomes have been adapted from the Common Curriculum Framework to meet the needs of British Columbians. There is an increased emphasis on the applications of mathematics, problem solving in real world contexts, and the use of technology in learning and doing mathematics.

Opportunities to meet the prescribed learning outcomes must be equally available to male and female students. The Integrated Resource Package (IRP), available in April 1995, will offer gender-sensitive strategies to ensure that girls and boys are equally attracted to mathematics.

The learning outcomes for Mathematics K to 7 are arranged according to four curriculum organizers. In the Number organizer, the student uses numbers to describe and represent quantities in multiple ways. The student also develops understanding of and proficiency in arithmetic operations and uses calculations to solve problems. The Patterns and Relations organizer focuses on the use of patterns to allow students to solve problems and describe the world around them. In Grades 6 and 7 the concept of patterns is expanded where the student represents algebraic expressions in a variety of ways. In the Shape and Space organizer the student uses measurement to describe and compare real-world phenomena as well as describing the characteristics and relationships of three-dimensional objects and two-dimensional shapes. In the Statistics and Probability organizer, learning centres around collecting and analyzing data to make predictions and draw conclusions.

Implementation Support

The Ministry of Education will support the implementation of the Mathematics K to 7 curriculum in the following ways:

- The Integrated Resource Package (IRP) for Mathematics K to 7 will be available in April 1995. The IRP will provide teachers with the learning outcomes prescribed for each grade level, suggested instructional and assessment strategies, details of recommended learning resources, methods of evaluation, and illustrative examples.
- Throughout the spring, the Ministry will support regional forums and district schoolbased workshops on the Mathematics K to 7 curriculum. These workshops will help

teachers and districts commence implementation of the new curriculum in September 1995. Summer institutes are being planned for July and August 1995 to permit school district personnel to continue developing their implementation plans.

- Full implementation is expected in 1996/97.
- In addition, the Ministry will continue to work with our education partners to support the implementation process in a variety of ways within available resources.

Number (Number Concepts)

Use numbers to describe quantities. Represent numbers in multiple ways. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
 Recognize, describe, and use numbers from zero to 100 in a variety of familiar settings orally count by ones, twos, fives, and tens to 100 estimate and count objects in a set (zero to 50) and compare estimates to the actual number recognize, build, compare, and order sets of objects (zero to 50) using both comparative and numerical terms read number words up to ten explore, represent, and describe numbers up to 50 in a variety of ways, including the use of a calculator or computer for numbers up to 100 demonstrate and explain orally an understanding of half 	 Develop a number sense for whole numbers from zero to 1,000 and common fractions to tenths estimate, then count an increased number of objects in a set, and compare the estimate with the actual number skip count forwards and backwards by twos, fives, tens, 25s, and 100s to 1,000 using starting points that are multiples; and skip count forwards using random starting points recognize, build, compare, and order sets that contain zero to 1,000 elements round numbers to nearest tens and 100s read and write number words to 100, numerals to 1,000 use ordinal numbers to 100 explore, represent, and describe numbers to 1,000 in a variety of ways, including the use of calculators and computers demonstrate concretely and pictorially place-value concepts to give meaning to numbers zero to 1,000 demonstrate whether a number is even or odd recognize and explain whether a number is divisible by two, five, or ten demonstrate and explain in a variety of ways an understanding of halves, thirds, fourths, fifths, and tenths as part of a region or a set 	 Demonstrate a number sense for whole numbers zero to 10,000 and proper fractions estimate, then count the number of objects in a set (zero to 1,000), and compare the estimate with the actual number use skip counting (forwards and backwards) to support understanding of patterns in multiplication and division compare and order numbers up to 10,000 read and write number words to 1,000 reound numbers to nearest ten, 100, and 1,000 represent and describe numbers to 10,000 represent and describe numbers to 10,000 in a variety of ways demonstrate concretely, pictorially, and symbolically place-value concepts to give meaning to numbers up to 10,000 sort numbers into categories using one or more attributes demonstrate an understanding of hundredths as part of a region or set connect proper fractions to decimal fractions (tenths and hundredths) using manipulatives, diagrams, and symbols

Grade 5	Grade 6	Grade 7
Demonstrate a number sense for whole numbers, zero to 100,000, and explore proper fractions and decimal fractions	Develop a number sense for decimal fractions and common fractions and explore number sense for whole numbers	Demonstrate a number sense for decimal fractions and integers (including whole numbers)
 demonstrate concretely and pictorially an understanding of place value from hundredths read and write numerals to a 	 read and write numerals greater than a million use estimation strategies for quantities up to a million 	 recognize, model, identify, and describe common multiples, common factors, least common multiples, greatest common factors, and prime factorization
millionread and write number words to 100,000	 distinguish relationships between multiples, factors, composites, and primes 	 write whole numbers as an expanded numeral using powers of ten and in scientific notation
 use estimation strategies for quantities up to 100,000 	 represent positive powers concretely, pictorially, and symbolically 	 use divisibility rules to determine whether a number is divisible by two, three, four, five,
 recognize, model, and describe multiples, factors, composites, and primes 	 use power, base, and exponent to represent repeated multiplication 	 six, eight, nine, ten, eleven read and write numbers to any number of decimal places
 compare and/or order whole numbers 	 explain the meaning of integers by extending counting numbers to less than zero 	 recognize and illustrate that all fractions and mixed numbers
 represent and describe proper fractions concretely, pictorially, and symbolically 	 identify practical application of integers 	can be represented in decimal form (include terminating and repeating decimals)
 demonstrate and describe equivalent fractions 	 read and write numbers to thousandths 	 convert from terminating decimals to fractions
 compare and/or order proper and decimal fractions to hundredths 	 demonstrate and explain the meaning of improper fractions and mixed numbers (positive), concretely and pictorially 	 convert from single-digit repeating decimal numbers to fractions using patterns
	 demonstrate and describe equivalent mixed numbers and improper fractions, concretely 	 demonstrate concretely and pictorially that the sum of opposite integers is zero represent integers in a variety of
	 and pictorially compare and/or order improper fractions, mixed numbers, and decimal fractions to thousandths 	 concrete, pictorial, and symbolic ways compare and order integers
	 demonstrate and explain the meaning of ratio, concretely and pictorially 	
	 demonstrate and explain the meaning of percentage, concretely and pictorially 	

Number (Number Operations)

Demonstrate an understanding of and proficiency with calculations. Decide which arithmetic operation or operations can be used to solve a problem and then solve the problem. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
Demonstrate and use a variety of methods to show the processes of addition and subtraction on one-digit whole numbers where the maximum sum is 18 • demonstrate and orally describe the process of addition and subtraction of whole numbers to 18 using role play, manipulatives, and diagrams (memorization is not intended)	 Use a variety of strategies to apply a basic operation (=, -, x, +, +) on whole numbers and use these operations in solving problems demonstrate and describe the process of addition and subtraction of whole numbers up to 1,000 with and without regrouping using manipulatives, diagrams, and symbols explore and demonstrate the processes of multiplication and division up to 50 using manipulatives, diagrams, and symbols recall addition and subtraction facts to 18 and multiplication facts to 25 Choose, use, and defend the appropriate calculation strategy or technology to solve problems calculate and justify the choice of methods used to find sums, differences, products, and quotients using estimation strategies, mental math techniques, manipulatives, algorithms, and calculators verify solutions to problems by using inverse operations, estimation, and calculators 	 Apply arithmetic operations on whole numbers and illustrate their use in solving problems demonstrate and describe the process of addition and subtraction of numbers up to 10,000 using manipulatives, diagrams, and symbols demonstrate the process of multiplication (three-digit by one-digit) using manipulatives, diagrams, and symbols demonstrate the process of division (two-digit by one-digit) using manipulatives, diagrams, and symbols demonstrate the process of division (two-digit by one-digit) using manipulatives, diagrams, and symbols recall multiplication and division facts to 81 justify the choice of method for multiplication and division (estimation, calculator, mental math, manipulatives, and algorithms) verify solutions to multiplication and division problems using estimation and calculators verify solutions to multiplication and division problems by using the inverse operation Demonstrate an understanding of addition and subtraction of decimals demonstrate an understanding of addition and subtraction of decimals fractions (tenths and hundredths) using concrete and pictorial representations

Grade 5	Grade 6	Grade 7
<text><list-item></list-item></text>	Apply the arithmetic operations on whole numbers and decimals in solving problems • estimate the solutions to calculations involving whole numbers and decimal fractions	 Apply the arithmetic operations of decimal fractions and integers and illustrate their use in solving problems use patterns, manipulatives, and diagrams to demonstrate the concepts of multiplication and division by decimal fraction use estimation strategies to predict or assess the reasonableness of calculations add, subtract, multiply, and divide decimals (for more than two-digit divisors or multipliers, the use of technology is expected) demonstrate an understanding of order of operations using paper and pencil and calculator add, subtract, multiply, and divide integers concretely, pictorially, and symbolically Illustrate the use of ratios, rates, percentages, and decimal numbers in solving problems estimate and calculate percentages distinguish between rate and ratio explain and demonstrate the use of proportion in solving problems mentally convert among proper fractions, decimal fractions, and percents, to facilitate the solution of problems

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Patterns and Relations (Patterns)

Use patterns to describe the world around you and to solve problems. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
Identify, create, and compare patterns that arise from their daily experiences • identify, reproduce, extend, create, and compare patterns using actions, manipulatives, diagrams, and spoken terms • recognize patterns in the environment	 Investigate, establish, and communicate rules for numerical and non-numerical patterns that arise from daily and mathematical experiences, and use these rules to make predictions identify, create, and describe number and non-number patterns translate patterns from one mode to another using manipulatives, diagrams, charts, calculators, spoken and written terms, and symbols explain the rule for a pattern and make predictions based on patterns using models and objects 	Investigate, establish, and communicate rules for, and predictions from, numerical and non-numerical patterns • identify and explain mathematical relationships and patterns through the use of grids, tables, charts, or calculators • make and justify predictions, using numerical and non- numerical patterns

Grade 5	Grade 6	Grade 7	
Construct, extend, and summarize patterns, using rules, charts, mental math, and calculators • develop charts to record and reveal number patterns • describe how a pattern grows using everyday language in spoken and written form • construct and expand patterns in two and three dimensions, concretely and pictorially • generate number patterns from a problem-solving context • predict and justify pattern extensions	se relationships to summarize, neralize, and extend patterns construct a visual representation of a pattern to clarify relationships and to verify predictions summarize a relationship using everyday language in a spoken or written form create expressions and rules to describe patterns and relationships (e.g., area, perimeter, volume) interpolate number values from a given graph predict pattern relationships	 Express patterns in terms of variables and use expressions containing variables to make predictions create formulae for finding area, perimeter, and volume predict and justify the nth value of a number pattern 	

Patterns and Relations (Variable and Equations)

Represent algebraic expressions in multiple ways. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
Learning outcomes for Patterns and Relations (Variable and Equations) commence in Grade 6	Learning outcomes for Patterns and Relations (Variable and Equations) commence in Grade 6	Learning outcomes for Patterns and Relations (Variable and Equations) commence in Grade 6

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Shape and Space (Measurement)

Describe and compare real world phenomena using either direct or indirect measurement. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
K to 1 Estimate, measure, and compare using whole numbers and nonstandard units of measure • classify, describe, and arrange objects by using comparative language to compare length, size, area, weight, and volume • use comparative terms to describe time and temperature • relate relative sizes of	Grades 2 to 3 Measure, estimate, and compare, using whole numbers and nonstandard and standard units of measure • estimate, measure, record, compare, and order objects and containers using nonstandard and standard units • construct a shape, length, or object using a specific nonstandard unit or standard unit • select the most appropriate standard	Grade 4 Estimate, measure, and compare quanti- ties, using decimal numbers and standard units of measure • construct specific lengths (mm) • select the most appropriate standard unit (mm, cm, m, km) to measure length • describe relationship between mm, cm, m and km
 relate relative sizes of nonstandard units by measuring the same object with different units, and recognize that different objects may have the same mass select an appropriate nonstandard unit to estimate, measure, record, compare, and order objects and containers estimate the number of uniform objects and irregular shapes that will cover a given area and verify by covering and counting compare and sequence events according to the duration of time (using nonstandard units), time of day, days of the week, and the seasons recognize and name the value of pennies, nickels, and dimes use money as a form of exchange create equivalent sets of coins 	 select the most appropriate standard unit for measuring length (cm, m, km), mass (g, kg), volume (L), and time describe relationships between various standard units of measure relate the size of units to the number of units needed when measuring recognize that the size and shape of an object does not necessarily determine its mass make connections among manipulatives, diagrams, spoken terms, and written symbols estimate and measure the passage of time related to seconds, minutes, hours, days, weeks, months, and years and relate the various measures to each other read and write the date, including days of the week, using abbreviations; name the months of year in order read and write time to the nearest minute using 12-hour notation on a digital and analog clock 	 estimate, measure, record, compare, and order objects by length, height, perimeter, and circumference using standard units (mm, cm, m, km) estimate, measure, record, compare and order shapes by area using standard units (cm², m²) construct a number of shapes given a specific area (cm²) select the most appropriate standard unit to measure area relate the size of units to the number of the units needed in measuring the area of an object with different units estimate, measure, record, compare, and order the capacity of containers using standard units (ml, L) relate the number of units to the size of the units needed when measuring mass describe the relationship between grams and kilograms solve problems involving mass using grams and kilograms
up to ten cents in value	 estimate, read, and record temperature to the nearest degree Celsius relate temperature to real life situations identify and use coins and bills (to \$100) to estimate, count, record collections, create equivalent sets, and make change up to \$10 read and write both money notations (89¢ and \$0.89) 	 relate years, decades, centuries, and millenniums read and write time on a 24-hour clock read and write time using a.m. and p.m. estimate, count, and record collections of coins and bills up to \$100 make purchases and change up to \$100

Grade 5	Grade 6	Grade 7
Use measurement concepts and appropriate tools and results of measurements to solve problems in real life contexts	Be able to solve problems involving perimeter, area, surface area, volume, and angle measurement	Solve problems involving the properties of circles and their connections with angles and time zones
 recognize and explain the meaning of length, width, height, depth, thickness, perimeter, and circumference solve problems involving mass using grams, kilograms, and tonnes evaluate the appropriateness of units when selecting different measuring tools estimate and measure the area of irregular shapes by dividing them into parts estimate and measure the perimeter of irregular shapes estimate and measure the effect of changing one or more dimensions of a rectangle on its perimeter or area relate perimeter and area of a rectangle using manipulatives and diagrams relate the units cm³ and ml estimate, measure, record, and order containers by volume using cm³ construct objects of a specific volume expressed in cm³ read and write SI notation for recording date and time 	 convert between commonly used SI units of length, mass, and capacity develop, verify, and use rules or expressions for the perimeter of polygons develop, verify, and use rules or expressions for the area of rectangles estimate, measure, and then calculate the surface area of right rectangular prisms (no formula) discover, generalize, and use rules for the volume of right rectangular prisms determine the volume of an object by measuring the displacement of a liquid by that object (cm³ or ml) recognize angles as being more than 90 degrees, equal to 90 degrees, less than 90 degrees, greater than 180 degrees estimate and measure angles using a circular protractor draw and sketch an angle when the degree measure is specified classify given angles as acute, right, obtuse, straight, reflex identify and compare examples of angles in the environment 	 measure the diameter, radius, and circumference of circles and generalize the relationships solve problems involving circles (radius, diameter, and circumference) explain how time zones are determined determine time in various regions of the world research and report how measurement instruments are used in the community design and construct rectangles given one or both of perimeter and area (whole numbers) demonstrate and generalize that many rectangles are possible for a given perimeter or given area

Shape and Space (Three-Dimensional Objects and Two-Dimensional Shapes)

Describe the characteristics of three-dimensional (3-D) objects and two-dimensional (2-D) shapes and analyze the relationships among them. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
K to I Explore, sort and classify real world and 3-D objects according to their properties • explore and describe real world and 3-D objects using descriptive attributes such as big, little, like a box, like a can • explore, identify, and classify 3-D objects in the environment and according to their properties • construct 3-D objects using materials such as plasticine, blocks, and boxes • identify and describe specific 2-D shapes such as circles, squares, triangles, or rectangles • construct and rearrange a design using a set of 2-D shapes • compare, sort, classify, and pattern 2-D shapes	 Grades 2 to 3 Describe, classify, construct, and relate 3-D objects and 2-D shapes using common language to describe properties compare, contrast, sort, and classify 2-D shapes and 3-D objects using two or more attributes identify, count, and describe faces, vertices, edges, sides, and angles for polygons and solids describe and name 3-D objects (cubes, spheres, cones, cylinders, pyramids, and prisms) and use appropriate 2-D names to describe faces describe and name pyramids and prisms by the shape of the base construct skeletons of a 3-D object from a model and relate skeletons (nets) to models demonstrate through dismantling that a rectangular solid has more than one net make identical, congruent 2-D shapes construct and rearrange a design using a set of 2-D shapes recognize congruent (the same) 3-D objects and 2-D shapes in the environment explore the concepts of points, lines, perpendicular lines, parallel lines, and intersection of 3-D objects 	 Grade 4 Describe, classify, construct, and relate 3-D objects and 2-D shapes, using mathematical vocabulary to describe properties design and construct nets for pyramids and prisms relate nets to 3-D objects compare and contrast pyramids and prisms to describe a relationship identify and sort specific quadrilaterals, such as squares, rectangles, parallelograms, and trapezoids classify angles in a variety of orientations according to whether they are right angle, less than right angle, greater than right angle. recognize, draw, and name the following: point, line, parallel lines, and intersecting lines

Grade 5	Grade 6	Grade 7
Use the visualization of 2-D shapes and 3-D objects to solve problems related to spatial relation • construct, analyze, and classify triangles according to the side measurements • build, represent, and describe geometric objects and shapes • classify and name polygons according to the number of sides (three, four, five, six, eight) • cover 2-D shapes with a set of tangram pieces • complete the drawing of a 3-D object on grid paper given the front face • determine experimentally the minimum information needed to draw/identify a given 2-D shape	Use visualization and symmetry to solve problems involving classification and sketching • classify triangles according to the measurement of their angles • sort quadrilaterals and regular polygons according to number of lines of symmetry • recognize and appreciate optical illusions • reproduce a given geometric drawing on grid paper • sketch 3-D solids and skeletons with or without grids	 Link angle measures to the properties of parallel lines measure and classify pairs of angles, complementary, or supplementary angles identify and name pairs of angles pertaining to parallel lines and transversals including: corresponding angles vertically opposite angles interior angles on the same side of the transversal exterior angles on the small side of the transversal interior alternate angles describe the relationships between the pairs of angles pertaining to parallel lines and transversals use mathematical reasoning to determine the measures of angles in a diagram perform calculations with angle measures construct angle bisectors and perpendicular bisectors explain in more than one way why the sum of the measures of the angles of a triangle is 180 degrees

Shape and Space (Transformations)

Perform, analyze, and create transformations. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
 Describe verbally the relative position of both 3-D objects and 2-D shapes use directional terms such as over, under, beside, near, far, left, and right to describe the relative position of objects and shapes match size and shape of figures by superimposing one on top of the other identify and fit pieces of puzzles or shapes that go together (part to whole relationships) explore and describe reflection in mirrors 	Use positional language, numbers, and directional words to describe relative positions of objects in one dimension and to communicate motion in real world contexts • communicate and apply positional language and cardinal directions (relating to compasses and maps) in written, verbal, or numerical form • graph whole number points on a horizontal or a vertical number line • trace a path on a line using oral or written instructions • make congruent shapes and symmetrical 2-D shapes by folds and reflections	Use number and direction words to describe the relative positions of objects in two dimensions, using real world contexts • communicate and apply terms of directions to maps (north, south, east, and west) • place an object on a grid using columns and rows • describe the position of an object on a grid using columns and rows • trace a path on a grid or map using oral or written instructions and vice versa • create and verify symmetrical 2-D shapes by drawing lines of symmetry

Grade 5	Grade 6	Grade 7
 Grade 5 Describe motion in terms of a slide, a flip, or a turn recognize motion as a slide (translation), turn (rotation), or a flip (reflection) recognize tessellations created with regular and irregular shapes in the environment locate planes of symmetry by cutting solids use co-ordinates to describe the position of objects in two dimensions plot whole number ordered number pairs in the first quadrant with intervals of one, two, five, and ten identify a point in the first quadrant using ordered pairs cover a surface using one or more tessellating shapes create and identify tessellations using regular polygons identify regular polygons that can tessellate a plane 	<text><text><list-item></list-item></text></text>	 Grade 7 Create and analyze patterns and designs using congruence, symmetry, translation, rotation, and reflection create, analyze, and describe designs using rotation (turns), reflections (flips), and translations (slides) use informal concepts of congruence to describe images after rotations (turns), reflections (flips), and translations (slides) draw designs using ordered pairs in all four quadrants of the coordinate grid, together with slide and flip images connect reflections with lines and planes of symmetry

Statistics and Probability (Data Analysis)

Collect, display, and analyze data to make predictions about a population. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
 Collect, organize, and analyze with assistance, data based on first-hand information collect first-hand information by counting objects, conducting surveys, measuring, and performing simple experiments sort objects to one attribute chosen by teacher or student construct a pictograph using one-to-one correspondence compare data using appropriate language including quantitative terms pose oral questions in relation to the data gathered 	 Collect data based on first- and second-hand information, display results in more than one way, interpret data, and make predictions formulate questions and categories for data collection and actively collect first-hand information use a variety of methods to collect and record data, including measuring devices, printed resources, and tallies sort and organize data by one or more attributes and by using graphic organizers such as lists and charts identify attributes and rules in pre-sorted sets display data in more than one way, including concrete graphs, pictographs, bar graphs, and rank ordering discuss data, communicate conclusions, and make predictions and inferences to solve similar problems generate new questions from displayed data obtain new information by performing arithmetic operations on the data 	 Collect first- and second-hand data, assess and validate the data collection process, and graph the data select an appropriate sample or population and organize the collection of data manipulate data to create an interval graph/table for display purposes construct a bar graph and pictograph using many-to-one correspondence and justify the choice of intervals and correspondence used evaluate the process by which the data was collected solve logic problems with a prepared matrix

Grade 5	Grade 6	Grade 7
 Develop and implement a plan for the collection, display, and analysis of data gathered from appropriate samples identify a question to generate appropriate data, and predict results distinguish between a total population and a sample use a variety of methods to collect and record data create classifications and ranges for grouping data display data by hand or by computer in a variety of ways, including: frequency diagrams line plots broken-line graphs evaluate the graphic presentation of the data to ensure clear representation of the results discuss the reasonableness of data and results make inferences to generate a conclusion regarding the data 	 Develop and implement a plan for the collection, display, and analysis of data gathered from appropriate samples formulate a key question from a problem-solving context identify appropriate data sources (first-hand, second-hand, combination) select and justify appropriate methods of collecting data (designing and using structured questionnaires, experiments, observations, and electronic networks) select and justify the choice of an appropriate sample of population to be used to answer a question discuss how data collected are affected by the nature of the sample, the method of collection, the sample size, and biases display data by hand or by computer in a variety of ways including: histograms double bar graphs stem and leaf plots read and interpret graphs that are provided describe the general distribution of data smallest and largest value frequency, which occurs most often/least often value in the middle patterns 	 Develop and implement a plan for the collection, display, and analysis of the data using measures of variability and central tendency formulate questions which explore whether or not a relationship exists in a real world context select and justify appropriate methods of collecting data (designing and using questionnaires, interviews, experiments, and research) display data by hand or by computer in a variety of ways, including circle graphs read and interpret graphs that are provided determine measures of central tendency for a set of data mode median mean determine measures of the distribution of a set of data range extremes, gaps, and clusters quartiles

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Statistics and Probability (Chance and Uncertainty)

Use experimental or theoretical probability to represent and solve problems involving uncertainty. It is expected that students will:

K to I	Grades 2 to 3	Grade 4
Describe concepts of chance and chance events using ordinary vocabulary • predict the chance of an event happening using the terms never, sometimes, always	Use simple experiments designed by others to illustrate and explain probability and chance • describe the likeliness of an outcome using terms such as likely, unlikely, fair chance, probabie, expected • conduct a probability experiment, choose an appropriate recording method, and make conclusions and predictions from the results	Conduct simple probability experiments to explain outcomes • identify an outcome as possible, impossible, certain, uncertain • compare outcomes as equally likely, more likely, less likely • design and conduct experiments to answer his or her own questions

Grade 5

Predict outcomes, conduct experiments, and communicate the probability of single events

- list all possible outcomes of an event
- explain events using the vocabulary of probability
 - best/worst
 - probable/improbable
 - never/less likely/equally
 - · likely/more likely/always
- conduct probability experiments and explain the results using the vocabulary of probability
- conduct probability
 experiments to demonstrate
 that results are not influenced
 by factors such as the age,
 experience, or skills of the
 participant

Grade 6

Use numbers to communicate the probability of single events from experiments and models

- distinguish between experimental and theoretical probability of single events
- using various polyhedrons make the connection between the number of faces and the probability of a single event
- calculate theoretical probability using numbers between zero and one
- demonstrate that different outcomes may occur when repeating the same experiment
- compare experimental results with theoretical results

Grade 7

Create and solve problems using probability

- use a table to identify all possible outcomes of two independent events
- use a given simulation method to solve probability problems, e.g., Monte Carlo method
- create and solve problems using the definition of probability as favourable outcomes over total outcomes



Province of British Columbia Ministry of Education

