Strand: Number Sense and Algebra (NA)

Overall Expectation *By the end of this course, students will be able to:*	Learning Goal *I will be able to:*	Success Criteria *I can:*
NA1 Demonstrate an understanding of the exponent rules of multiplication and division, and apply them to simplify expressions. (10%)	Explain the exponent rules of multiplication and division, and apply them to numerical and algebraic expressions.	1. Substitute into and evaluate algebraic expressions involving exponents; 2. Describe the relationship between the algebraic and geometric representations of a single variable term up to degree three; 3. Derive the exponent rules for multiplying and dividing monomials, and apply these rules in polynomial expressions; 4. Extend the multiplication rule to derive the power of a power rule, and apply it to simplify expressions.
NA2 Simplify numeric expressions and solve first - degree equations. (15%)	Simplify expressions involving integers and rational numbers, and solve equations using inverse operations.	1. simplify numerical expressions involving integers and rational numbers, with and without the use of technology;* 2. solve problems requiring the manipulation of expressions arising from applications of percent, ratio, rate, and proportion;* 3. Relate my understanding of inverse operations to squaring and taking the square root, and apply inverse operations to simplify expressions and solve equations; 4. Solve first - degree equations, including equations with fractional coefficients, using a variety of strategies; 5. Rearrange formulas involving variables with and without substitution; 6. Solve problems modelled with first degree equations.
NA3 Manipulate numerical and polynomial expressions (10%)	Simplify polynomial expressions using addition, subtraction and multiplication	1. Add and subtract polynomials with up to two variables; 2. Multiply a polynomial by a monomial involving the same variable; 3. Expand and simplify polynomial expressions involving one variable;

Strand: Linear Relations (LR)

Overall Expectation *Students will be able to:*	Learning Goal *I will be able to:*	Success Criteria *I can:*
LR1 Apply data management techniques to investigate relationships between two variables. (6%)	Identify relationships, describe trends and make accurate predictions.	1. Interpret the meanings of points on scatter plots or graphs that represent linear relations, including scatter plots or graphs in more than one quadrant [e.g., on a scatter plot of height versus age, interpret the point (13, 150) as representing a student who is 13 years old and 150 cm tall; identify points on the graph that represent students who are taller and younger than this student] 2. Pose problems, identify variables, and formulate hypotheses associated with relationships between two variables;

		3. Design and carry out an investigation or experiment involving relationships between two variables, including the collection and organization of data, using appropriate methods, equipment, and/or technology (e.g., surveying; using measuring tools, scientific probes, the Internet) and techniques (e.g. making tables, drawing graphs); 4. Describe trends and relationships observed in data, make inferences from data, compare the inferences with hypotheses about the data, and explain any differences between the inferences and the hypotheses.
LR2 Demonstrate an understanding of the characteristics of a linear relation. (7%)	Investigate graphs and data and develop lines that best fit the data.	1. Construct tables of values, graphs, and equations, using a variety of tools (e.g., graphing calculators, spreadsheets, graphing software, paper and pencil), to represent linear relations derived from descriptions of realistic situations (Sample problem: Construct a table of values, a graph, and an equation to represent a monthly cellphone plan that costs $25, plus $0.10 per minute of airtime.); 2. Construct tables of values, scatter plots, and lines or curves of best fit as appropriate, using a variety of tools (e.g., spreadsheets, graphing software, graphing calculators, paper and pencil), for linearly related and non-linearly related data collected from a variety of sources (e.g., experiments, electronic secondary sources, patterning with concrete materials; 3. Identify, through investigation, some properties of linear relations (i.e., numerically, the first difference is a constant, which represents a constant rate of change; graphically, a straight line represents the relation), and apply these properties to determine whether a relation is linear or non-linear; 4. compare the properties of direct variation and partial variation in applications, and identify the initial value; 5. Determine the equation of a line of best fit for a scatter plot, using an informal process (e.g., using a movable line in dynamic statistical software; using a process of trial and error on a graphing calculator; determining the equation of the line joining two carefully chosen points on the scatter plot).
LR3 Connect various representations of a linear relation. (7%)	Investigate graphs and data and develop the equation that represents the relation involving two variables.	1. Determine values of a linear relation by using a table of values, by using the equation of the relation, and by interpolating or extrapolating from the graph of the relation (Sample problem: The equation H = 300 – 60t represents the height of a hot air balloon that is initially at 300 m and is descending at a constant rate of 60 m/min. Determine algebraically and graphically how long the balloon will take to reach a height of 160 m.); 2. Describe a situation that would explain the events illustrated by a given graph of a relationship between two variables (Sample problem: The walk of an individual is illustrated in the given graph, produced by a motion detector and a graphing calculator. Describe the walk [e.g., the initial distance from the motion detector, the rate of walk].); 3. Determine other representations of a linear relation, given one representation (e.g., given a numeric model, determine a graphical model and an algebraic model; given a graph, determine some points on the graph and determine an algebraic model); 4. Describe the effects on a linear graph and make the corresponding changes to the linear equation when the conditions of the situation they represent are varied (e.g., given a partial variation graph and an equation representing the cost of producing a yearbook, describe how the graph changes if the cost per book is altered, describe how the graph changes if the fixed costs are altered, and make the corresponding changes to the equation).

Strand: Analytic Geometry (AG)

Overall Expectation *By the end of this course, students will be able to:*	Learning Goal *I will be able to:*	Success Criteria *I can:*
AG1 Determine the relationship between the form of an equation and the shape of its graph with respect to linearity and non - linearity. (10%)	Express a linear relation in standard form and slope-intercept form. Convert from one form to the other form.	1. Determine, through investigation, the characteristics that distinguish the equation of a straight line from the equations of nonlinear relations (e.g., use a graphing calculator or graphing software to graph a variety of linear and non-linear relations from their equations; classify the relations according to the shapes of their graphs; connect an equation of degree one to a linear relation); 2. Identify, through investigation, the equation of a line in any of the forms y = mx + b, Ax + By + C = 0, x = a, y = b; 3. Express the equation of a line in the form y = mx + b, given the form Ax + By + C = 0.
AG2 Determine, through investigation, the properties of the slope and y - intercept of a linear relation. (10%)	Investigate the equation of a linear relation and its graph. Build linear equations given few facts about the line.	1. Determine, through investigation, various formulas for the slope of a line segment or a line, and use the formulas to determine the slope of a line segment or a line; 2. Identify, through investigation with technology, the geometric significance of m and b in the equation y = mx + b; 3. Determine, through investigation, connections among the representations of a constant rate of change of a linear relation (e.g., the cost of producing a book of photographs is $50, plus $5 per book, so an equation is C = 50 + 5p; a table of values provides the first difference of 5; the rate of change has a value of 5, which is also the slope of the corresponding line; and 5 is the coefficient of the independent variable, p, in this equation); 4. Identify, through investigation, properties of the slopes of lines and line segments (e.g., direction, positive or negative rate of change, steepness, parallelism, perpendicularity), using graphing technology to facilitate investigations, where appropriate.
AG3 Solve problems involving linear relations. (10%)	Use linear relations to make recommendations.	1. Graph lines by hand, using a variety of techniques 2. Determine the equation of a line from information about the line (e.g., the slope and y-intercept; the slope and a point; two points); 3. Describe the meaning of the slope and y-intercept for a linear relation arising from a realistic situation, and describe a situation that could be modelled by a given linear equation (e.g., the linear equation M = 50 + 6d could model the mass of a shipping package, including 50 g for the packaging material, plus 6 g per flyer added to the package); 4. Identify and explain any restrictions on the variables in a linear relation arising from a realistic situation; 5. Determine graphically the point of intersection of two linear relations, and interpret the intersection point in the context of an application (Sample problem: A video rental company has two monthly plans. Plan A charges a flat fee of $30 for unlimited rentals; Plan B charges $9, plus $3 per video. Use a graphical model to determine the conditions under which you should choose Plan A or Plan B.).

Strand: Measurement and Geometry (MG)

Overall Expectation *By the end of this course, students will be able to:*	Learning Goal *I will be able to:*	Success Criteria *I can:*
MG1 Determine, through investigation, the optimal values of various measurements. (5%)	Investigate geometric relations to maximize area given a fixed perimeter and minimize surface area given a fixed volume.	1. Determine the maximum area of a rectangle with a given perimeter by constructing a variety of rectangles, using a variety of tools (e.g., geoboards, graph paper, toothpicks, a pre-made dynamic geometry sketch), and by examining various values of the area as the side lengths change and the perimeter remains constant; 2. Determine the minimum perimeter of a rectangle with a given area by constructing a variety of rectangles, using a variety of tools (e.g., geoboards, graph paper, a premade dynamic geometry sketch), and by examining various values of the side lengths and the perimeter as the area stays constant; 3. Identify, through investigation with a variety of tools (e.g. concrete materials, computer software), the effect of varying the dimensions on the surface area [or volume] of square-based prisms and cylinders, given a fixed volume [or surface area]; 4. Explain the significance of optimal area, surface area, or volume in various applications (e.g., the minimum amount of packaging material; the relationship between surface area and heat loss); 5. Pose and solve problems involving maximization and minimization of measurements of geometric shapes and figures (e.g., determine the dimensions of the rectangular field with the maximum area that can be enclosed by a fixed amount of fencing, if the fencing is required on only three sides).

Strand: Measurement and Geometry (MG)		
MG2 Solve problems involving the measurements of two - dimensional shapes and the surface area and volume of three - dimensional figures. (5%)	Apply the properties of common two-dimensional and three-dimensional geometric shapes to solve problems in the design and construction of these shapes.	1. Relate the geometric representation of the Pythagorean theorem and the algebraic representation a2 + b2 = c2; 2. Solve problems using the Pythagorean theorem, as required in applications (e.g., calculate the height of a cone, given the radius and the slant height, in order to determine the volume of the cone); 3. Solve problems involving the areas and perimeters of composite two-dimensional shapes (i.e., combinations of rectangles, triangles, parallelograms, trapezoids, and circles); 4. Develop, through investigation (e.g., using concrete materials), the formulas for the volume of a pyramid, a cone, and a sphere. 5. Determine, through investigation, the relationship for calculating the surface area of a pyramid (e.g., use the net of a square-based pyramid to determine that the surface area is the area of the square base plus the areas of the four congruent triangles); 6. Solve problems involving the surface areas and volumes of prisms, pyramids, cylinders, cones, and spheres, including composite figures (Sample problem: Break-bit Cereal is sold in a single-serving size, a rectangular prism of dimensions 5 cm by 4 cm by 10 cm. The manufacturer also sells the cereal in a larger size, in a box with dimensions double those of the smaller box. Compare the surface areas and the volumes of the two boxes, and explain the implications of your answers.).
MG3 Verify, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two - dimensional shapes, and apply the results to solving problems. (5%)	Investigate and describe the geometric properties of common geometric.	1. Determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials), and describe the properties and relationships of the interior and exterior angles of triangles, quadrilaterals, and other polygons, and apply the results to problems involving the angles of polygons (Sample problem: With the assistance of dynamic geometry software, determine the relationship between the sum of the interior angles of a polygon and the number of sides. Use your conclusion to determine the sum of the interior angles of a 20-sided polygon.); 2. Determine, through investigation using a variety of tools (e.g., dynamic geometry software, paper folding), and describe some properties of polygons (e.g., the figure that results from joining the midpoints of the sides of a quadrilateral is a parallelogram; the diagonals of a rectangle bisect each other; the line segment joining the midpoints of two sides of a triangle is half the length of the third side), and apply the results in problem solving (e.g., given the width of the base of an A-frame tree house, determine the length of a horizontal support beam that is attached half way up the sloping sides); 3. Pose questions about geometric relationships, investigate them, and present their findings, using a variety of mathematical forms (e.g., written explanations, diagrams, dynamic sketches, formulas, tables) (Sample problem: How many diagonals can be drawn from one vertex of a 20-sided polygon? How can I find out without counting them?); 4. Illustrate a statement about a geometric property by demonstrating the statement with multiple examples, or deny the statement on the basis of a counter-example, with or without the use of dynamic geometry software (Sample problem: Confirm or deny the following statement: If a quadrilateral has perpendicular diagonals, then it is a square.).