McGraw-Hill Ryerson

Curriculum Correlation between McGraw-Hill Ryerson Mathematics 9: Applying the Concepts and The Ontario Curriculum *Foundations of Mathematics*, Grade 9, Applied (MFM1P)

This course enables students to develop mathematical ideas and methods through the exploration of applications, the effective use of technology, and extended experiences with hands-on activities. Students will investigate relationships of straight lines in analytic geometry, solve problems involving the measurement of 3-dimensional objects and 2-dimensional figures, and apply key numeric and algebraic skills in problem solving. Students will also have opportunities to consolidate core skills and deepen their understanding of key mathematical concepts.

Prerequisite: none

Number Sense and Algebra

Overall Expectations

By the end of this course, students will:

- consolidate numerical skills by using them in a variety of contexts throughout the course;
- demonstrate understanding of the three basic exponent rules and apply them to simplify expressions;
- manipulate first-degree polynomial expressions to solve first-degree equations;
- solve problems, using the strategy of algebraic modelling.

Specific Expectations

	Chapter/Section	Pages
Consolidating Numerical Skills		
By the end of this course, students will:		
• determine strategies for mental mathematics and estimation, and apply these strategies throughout the course;	1.2 throughout Chapters 1–3	10–15 1–119
• demonstrate facility in operations with integers, as necessary to support other topics of the course (e.g., polynomials, equations, analytic geometry);	1.1 5.1, 5.2	4–9 172–183
• demonstrate facility in operations with percent, ratio and rate, and rational numbers, as necessary to support other topics of the course (e.g., analytic geometry, measurement);	5.4, 5.5, 5.6	191–211
• use a scientific calculator effectively for applications that arise throughout the course;	throughout Chapters 1–5	1–217
• judge the reasonableness of answers to problems by considering likely results within the situation described in the problem;	throughout Chapters 1–5	1–217
• judge the reasonableness of answers produced by a calculator, a computer, or pencil and paper, using mental mathematics and estimation.	throughout Chapters 1–5	1–217

Operating with Exponents		
By the end of this course, students will:		
• evaluate numerical expressions involving natural-number exponents with rational-number bases;	1.3 8.1, 8.2	16–21 342–345
• substitute into and evaluate algebraic expressions involving exponents, to support other topics of the course (e.g., measurement, analytic geometry);	1.4 throughout Chapters 2, 3, 6, and 7	22–27 34–117 222–331
• determine the meaning of negative exponents and of zero as an exponent from activities involving graphing, using technology, and from activities involving patterning;	8.3	347–351
• represent very large and very small numbers, using scientific notation;	8.4	352–357
• enter and interpret exponential notation on a scientific calculator, as necessary in calculations involving very large and very small numbers;	8.4	352–357
• determine, from the examination of patterns, the exponent rules for multiplying and dividing monomials and the exponent rule for the power of a power, and apply these rules in expressions involving one variable.	8.2	342–346
Manipulating Polynomial Expressions and Solving Equations		
By the end of this course, students will:		
• add and subtract polynomials, and multiply a polynomial by a monomial;	9.1, 9.2, 9.3	366–381
• expand and simplify polynomial expressions involving one variable;	9.4	382–385
• solve first-degree equations, excluding equations with fractional coefficients, using an algebraic method;	10.1, 10.2	394–398
• calculate sides in right triangles, using the Pythagorean theorem, as required in topics throughout the course (e.g., measurement);	2.1 2.3	36–41 48–53
• substitute into measurement formulas and solve for one variable, with and without the help of technology.	1.4 Throughout Ch 2 and 3 10.3	22–27 34–117 404–410
Using Algebraic Modelling to Solve Problems		
By the end of this course, students will:		
• use algebraic modelling as one of several problem-solving strategies in various topics of the course (e.g., relations, measurement, direct and partial variation, the Pythagorean theorem, percent);	10.4	411–417
• compare algebraic modelling with other strategies used for solving the same problem;	10.4	399–403
• communicate solutions to problems in appropriate mathematical forms (e.g., written explanations, formulas, charts, tables, graphs) and justify the reasoning used in solving the problems.	throughout Chapter 10	394–437

Relationships

Overall Expectations
By the end of this course, students will:

- determine relationships between two variables by collecting and analysing data;
- compare the graphs of linear and non-linear relations;
- describe the connections between various representations of relations.

Specific Expectations

	Chapter/Section	Pages
Determining Relationships		
By the end of this course, students will:		
• pose problems, identify variables, and formulate hypotheses associated with relationships (*Sample problem*: Does the rebound height of a ball depend on the height from which it was dropped? Make a hypothesis and then design an experiment to test it);	4.1	124–129
• demonstrate an understanding of some principles of sampling and surveying (e.g., randomization, representivity, the use of multiple trials) and apply the principles in designing and carrying out experiments to investigate the relationships between variables (*Sample problem*: What factors might affect the outcome of this experiment? How could you design the experiment to account for them?);	4.2	130–135
• collect data, using appropriate equipment and/or technology (e.g., measuring tools, graphing calculators, scientific probes, the Internet) (*Sample problem*: Drop a ball from varying heights, measuring the rebound height each time);	4.6	156–159
• organize and analyse data, using appropriate techniques (e.g., making tables and graphs, calculating measures of central tendency) and technology (e.g., graphing calculators, statistical software, spreadsheets) (*Sample problem*: Enter the data into a spreadsheet. Decide what analysis would be appropriate to examine the relationship between the variables – a graph, measures of central tendency, ratios);	4.3	136–142
• describe trends and relationships observed in data, make inferences from data, compare the inferences with hypotheses about the data, and explain the differences between the inferences and the hypotheses (*Sample problem*: Describe any trend observed in the data. Does a relationship seem to exist? Of what sort? Is the outcome consistent with your original hypothesis? Discuss any outlying pieces of data and provide explanations for them. Suggest a formula relating the rebound height to the height from which the ball was dropped. How might you vary this experiment to examine other relationships?);	4.3 4.5	136–142 149–155
• communicate the findings of an experiment clearly and concisely, using appropriate mathematical forms (e.g., written explanations, formulas, charts, tables, graphs), and justify the conclusions reached;	4.6	156–159

	Chapter/Section	Pages
• solve and/or pose problems related to an experiment, using the findings of the experiment.	4.5, 4.6	149–159
Comparing Linear and Non-linear Relations		
By the end of this course, students will:		
• construct tables of values, graphs, and formulas to represent linear relations derived from descriptions of realistic situations involving direct and partial variation (e.g., the cost of holding a banquet in a rented hall is $25 per person plus $975 for the hall);	6.1, 6.2 6.3	224–247
• construct tables of values and scatter plots for linearly related data involving direct variation collected from experiments (e.g., the rebound height of a ball versus the height from which it was dropped);	6.1, 6.2, 6.3 7.6	224–247 314–321
• determine the equation of a line of best fit for a scatter plot, using an informal process (e.g., a process of trial and error on a graphing calculator; calculation of the equation of the line joining two carefully chosen points on the scatter plot);	7.6	314–321
• construct tables of values and graphs to represent non-linear relations derived from descriptions of realistic situations (e.g., represent the relationship between the volume of a cube and its side length, as the side length varies);	6.4	248–257
• demonstrate an understanding that straight lines represent linear relations and curves represent non-linear relations.	Chapter 6	224–271
Describing Connections Between Representations of Relations		
By the end of this course, students will:		
• determine values of a linear relation by using the formula of the relation and by interpolating or extrapolating from the graph of the relation (e.g., if a student earns $5/h caring for children, determine how long he or she must work to earn $143);	6.1	224–231
• describe, in written form, a situation that would explain the events illustrated by a given graph of a relationship between two variables (e.g., write a story that matches the events shown in the graph);	Chapter 6 7.1	224–271 280–287
• identify, by calculating finite differences in its table of values, whether a relation is linear or non-linear;	6.5	258–265
• describe the effect on the graph and the formula of a relation of varying the conditions of a situation they represent (e.g., if a graph showing partial variation represents the cost of producing a yearbook, describe how the appearance of the graph changes if the cost per book is altered; describe how it changes if the fixed costs are altered).	Chapter 6	224–271

Analytic Geometry

Overall Expectations

By the end of this course, students will:

- determine, through investigation, the relationships between the form of an equation and the shape of its graph with respect to linearity and non-linearity;
- determine, through investigation, the properties of the slope and y-intercept of a linear relation;
- graph a line and write the equation of a line from given information

Specific Expectations

	Chapter/Section	Pages
Investigating the Relationship Between the Equation of a Relation and the Shape of Its Graph		
By the end of this course, students will:		
• determine, through investigations, the characteristics that distinguish the equation of a straight line from the equations of non-linear relations (e.g., use graphing software to obtain the graphs of a variety of linear and non-linear relations from their equations; classify the relations according to the shapes of their graphs; focus on the characteristics of the equations of linear relations and how they differ from the characteristics of the equations of non-linear relations);	6.3, 6.4 6.6	240–257 266–271
• select the equations of straight lines from a given set of equations of linear and non-linear relations;	6.6	266–271
• identify $y = mx + b$ as a standard form for the equation of a straight line, including the special cases $x = a$, $y = b$.	7.5	306–313
Investigating the Properties of Slope		
By the end of this course, students will:		
• identify practical situations illustrating slope (e.g., ramps, slides, staircases) and calculate the slopes of the inclines;	7.2, 7.3	288–298
• determine the slope of a line segment, using the formula —— ;	7.2	288–293
• identify the geometric significance of m and b in the equation $y = mx + b$ through investigation;	7.5	306–313
• identify the properties of the slopes of line segments (i.e., direction, positive or negative rate of change, steepness, parallelism, perpendicularity) through investigations facilitated by graphing technology, where appropriate.	7.4 7.7	299–305 322–325
Graphing and Writing Equations of Lines		
By the end of this course, students will:		
• plot points on the xy-plane and use the terminology and notation of the xy-plane correctly;	5.3	184–190
• graph lines by hand, using a variety of techniques (e.g., making a table of values, using intercepts, using the slope and y-intercept);	Chapters 6 and 7	222–333
• graph lines, using graphing calculators or graphing software;	Chapters 6 and 7	222–333
• determine the equation of a line, given the slope and y-intercept, the slope and a point on the line, and two points on the line;	10.5, 10.6	418–429

	Chapter/Section	Pages
• communicate solutions in established mathematical form, with clear reasons given for the steps taken.	Chapter 7	278–333

Measurement and Geometry

Overall Expectations

By the end of this course, students will:

- determine the optimal values of various measurements through investigations facilitated by the use of concrete materials, diagrams, and calculators or computer software;
- solve problems involving the measurement of two-dimensional figures and three-dimensional objects;
- formulate conjectures and generalizations about geometric relationships involving two-dimensional figures, through investigations facilitated by dynamic geometry software, where appropriate.

Specific Expectations

	Chapter/Section	Pages
Investigating the Optimal Values of Measurements		
By the end of this course, students will:		
• construct a variety of rectangles for a given perimeter and determine the maximum area for a given perimeter;	2.5	64–71
• construct a variety of square-based prisms for a given volume and determine the minimum surface area for a square-based prism with a given volume;	3.3 3.5	92–99 106–111
• construct a variety of cylinders for a given volume and determine the minimum surface area for a cylinder with a given volume;	3.4, 3.5	100–111
• describe applications in which it would be important to know the maximum area for a given perimeter or the minimum surface area for a given volume (e.g., building a fence, designing a container).	3.4, 3.5	100–111
Solving Problems Involving Measurement		
By the end of this course, students will:		
• solve problems involving the area of composite plane figures (e.g., combinations of rectangles, triangles, parallelograms, trapezoids, and circles);	2.4	54–63
• solve simple problems, using the formulas for the surface area of prisms and cylinders and for the volume of prisms, cylinders, cones, and spheres;	3.1, 3.2 3.3, 3.4	80–105
• solve problems involving perimeter, area, surface area, volume, and capacity in applications;	1.1, 1.4 2.1, 2.3, 2.4 3.3, 3.4	4–10, 22–27 36–41, 48–63 92–105
• judge the reasonableness of answers to measurement problems by considering likely results within the situation described in the problem;	throughout Chapter 2 and 3	36–118
• judge the reasonableness of answers produced by a calculator, a computer, or pencil and paper, using mental mathematics and estimation.	1.2 throughout Chapters 1–3	10–15 1–118

Investigating Geometric Relationships		
By the end of this course, students will:		
• illustrate and explain the properties of the interior and exterior angles of triangles and quadrilaterals, and of angles related to parallel lines;	11.1 11.2	440–449 450–457
• determine the properties of angle bisectors, medians, and altitudes in various types of triangles through investigation;	11.3	458–466
• determine some properties of the sides and the diagonals of quadrilaterals (e.g., the diagonals of a rectangle bisect each other);	11.4	467–473
• communicate the findings of investigations, using appropriate language and mathematical forms (e.g., written explanations, diagrams, formulas, tables).	throughout Chapter 11	438–477