Pearson MathXL for School Ontario Curriculum Correlation Grade 10

Principles of Mathematics, Grade 10, Academic (MPM2D)

This course enables students to broaden their understanding of relationships and extend their problem-solving and algebraic skills through investigation, the effective use of technology, and abstract reasoning. Students will explore quadratic relations and their applications; solve and apply linear systems; verify properties of geometric figures using analytic geometry; and investigate the trigonometry of right and acute triangles. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

Mathematical process expectations

	Expectation	Pearson MathXL for School
	The mathematical processes are to be integrated into student learning in all areas of this course.	
Problem Solving	Develop, select, apply, and compare a variety of problem-solving strategies as they pose and solve problems and conduct investigations, to help deepen their mathematical understanding	
Reasoning and Proving	Develop and apply reasoning skills (e.g., recognition of relationships, generalization through inductive reasoning, use of counter-examples) to make mathematical conjectures, assess conjectures, and justify conclusions, and plan and construct organized mathematical arguments	
Reflecting	Demonstrate that they are reflecting on and monitoring their thinking to help clarify their understanding as they complete an investigation or solve a problem (e.g., by assessing the effectiveness of strategies and processes used, by proposing alternative approaches, by judging the reasonableness of results, by verifying solutions)	
Selecting Tools and Computational Strategies	Select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems	
Connecting	Make connections among mathematical concepts and procedures, and relate mathematical ideas to situations or phenomena drawn from other contexts (e.g., other curriculum areas, daily life, current events, art and culture, sports	
Representing	Create a variety of representations of mathematical ideas (e.g., numeric, geometric, algebraic, graphical, pictorial representations; onscreen dynamic representations), connect and compare them, and select and apply the appropriate representations to solve problems	
Communicating	Communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions	

Quadratic Relations of the Form $y = ax^2 + bx + c$

Overall Expectations

By the end of this course, students will:

- determine the basic properties of quadratic relations;
- relate transformations of the graph of $y = x^2$ to the algebraic representation $y = a(x-h)^2 + k$;
- solve quadratic equations and interpret the solutions with respect to the corresponding relations;
- solve problems involving quadratic relations.

Specific Expectations	Pearson MathXL for School Specific Questions
Investigating the Basic Properties of Quadratic Relations By the end of this course, students will:	
1.1 collect data that can be represented as a quadratic relation, from experiments using appropriate equipment and technology (e.g., concrete materials, scientific probes, graphing calculators), or from secondary sources (e.g., the Internet, Statistics Canada); graph the data and draw a curve of best fit, if appropriate, with or without the use of technology ***Sample problem:*** Make a 1 m ramp that makes a 15° angle with the floor. Place a can 30 cm up the ramp. Record the time it takes for the can to roll to the bottom. Repeat by placing the can 40 cm, 50 cm, and 60 cm up the ramp, and so on. Graph the data and draw the curve of best fit	
1.2 determine, through investigation with and without the use of technology, that a quadratic relation of the form $y = ax^2 + bx + c$ ($a \neq 0$) can be graphically represented as a parabola, and that the table of values yields a constant second difference ***Sample problem:*** Graph the relation $y = x^2 - 4x$ by developing a table of values and plotting points. Observe the shape of the graph. Calculate first and second differences. Repeat for different quadratic relations. Describe your observations and make conclusions, using the appropriate terminology	
1.3 identify the key features of a graph of a parabola (i.e., the equation of the axis of symmetry, the coordinates of the vertex, the *y*-intercept, the zeros, and the maximum or minimum value), and use the appropriate terminology to describe them	17.4.3 → 13, MC 17.4-1 → 5 17.9.11 for intercepts
1.4 compare, through investigation using technology, the features of the graph of $y = x^2$ and the graph of $y = 2^x$, and determine the meaning of a negative exponent and of zero as an exponent (e.g., by examining patterns in a table of values for $y = 2^x$;by applying the exponent rules for multiplication and division)	18.3.19 for graph of y=2^x 18.3.13 has some negative exponent values
Relating the Graph of $y = x^2$ and Its Transformations By the end of this course, students will	
2.1 identify, through investigation using technology, the effect on the graph of $y = x^2$ of transformations (i.e., translations, reflections in the *x*-axis, vertical stretches or compressions) by considering separately each parameter *a*, *h*, and *k* [i.e., investigate the effect on the graph of $y = x^2$ of *a*, *h*, and *k* in $y = x^2 + k$, $y = (x-h)^2$, and $y = ax^2$])	17.8.1 → 53, MC 17.8-1 → 6

2.2 explain the roles of a, h, and k in $y = a(x - h)^2 + k$, using the appropriate terminology to describe the transformations, and identify the vertex and the equation of the axis of symmetry	Vertex = 17.9.1 → 9
2.3 sketch, by hand, the graph of $y = a(x - h)^2 + k$ by applying transformations to the graph of $y = x^2$ ***Sample problem:*** Sketch the graph of $y = -\frac{1}{2}(x - 3)^2 + 4$, and verify using technology.	17.8.1→ 53, MC 7.8-1 → 8 17.9.13 → 43, MC 17.9-1 → 8 19.1.1 → 11
2.4 determine the equation, in the form $y = a(x - h)^2 + k$, of a given graph of a parabola	17.9.9 → 11 MC 17.4 – TH 27
Solving Problems Involving Quadratic Relations By the end of this course, students will:	
3.1 expand and simplify second-degree polynomial expressions [e.g., $(2x + 5)^2$, $(2x - y)(x + 3y)$], using a variety of tools (e.g., algebra tiles, diagrams, computer algebra systems, paper and pencil and strategies (e.g., patterning))	12.3.1,7,21,23 → 31, MC 12.3-1,2,10,12, MC 12.3-CEA8
3.2 factor polynomial expressions involving common factors, trinomials, and differences of squares (e.g., $2x^2 + 4x$, $2x - 2y + ax - ay$, $x^2 - x - 6$, $2a^2 + 11a + 5$,$4x^2 - 25$, using a variety of tools (e.g., concrete materials, computer algebra systems, paper and pencil) and strategies (e.g., patterning))	Media 13.1 Factoring by Grouping, Factoring out a Common Factor 13.1.1→53 (odd numbers) MC13.1.6 → 21, MC13.1-EA20, MC13.1-CEA4 Media 13.1 Factoring a Trinomial with a Common Factor 13.2.11→13.2.55 (odd) MC13.2-1→ MC13.2-15 MC13.2-CA7, MC13.2-TH22 Trinomials by Grouping : 13.3.1→ 13.3.39 (odd) MC 13.3-1 →13.3-10 Media13.4: Factoring a Trinomial with a Common Factor 13.4.1 → 13.4.49 (odd) MC 13.4-1 → 13.4-26 MC 13.4-EA23, MC13.4-CEA11 Media 13.5: Factoring a Difference of Squares

	13.5.5 → 13.5.49 (odd) MC 13.5-1 → 13.5-16 13.7: Solving Quadratic Equations by Factoring
3.3 determine, through investigation, and describe the connection between the factors of a quadratic expression and the *x*-intercepts (i.e., the zeros) of the graph of the corresponding quadratic relation, expressed in the form $y = a(x – r)(x – s)$	
3.4 interpret real and non-real roots of quadratic equations, through investigation using graphing technology, and relate the roots to the *x*-intercepts of the corresponding relations.	Media 17.1: Solving Equations by the Square Root Property 17.1.7 → 51, MC 17.1-1 → 14 Non real 16.1.51 Intercepts: 17.9.13, 19, 21, 23, 29, 33, 35, 41, 43 MC 17.9.2, 3, 5
3.5 express $y = ax^2 + bx + c$ in the form $y = a(x – h)^2 + k$ by completing the square in situations involving no fractions, using a variety of tools (e.g. concrete materials, diagrams, paper and pencil)	Media 17.2: Completing the Square 17.2.7 → 39, MC 17.2-1 → 13, MC 12.2-TH29
3.6 sketch or graph a quadratic relation whose equation is given in the form $y = ax^2 + bx + c$, using a variety of methods (e.g., sketching $y = x^2 – 2x – 8$ using intercepts and symmetry; sketching $y = 3x^2 – 12x + 1$ by completing the square and applying transformations; graphing $h = –4.9t^2 + 50t + 1.5$ using technology)	17.9.11 → 23
3.7 explore the algebraic development of the quadratic formula (e.g., given the algebraic development, connect the steps to a numerical example; follow a demonstration of the algebraic development [student reproduction of the development of the general case is not required])	
3.8 solve quadratic equations that have real roots, using a variety of methods (i.e., factoring, using the quadratic formula, graphing) ***Sample problem:*** Solve $x^2 + 10x + 16 = 0$ by factoring, and verify algebraically. Solve $x^2 + x – 4 = 0$ using the quadratic formula, and verify graphically using technology. Solve $–4.9t^2 + 50t + 1.5 = 0$ by graphing $h = –4.9t^2 + 50t + 1.5$ using technology.	Media 13.6: Solving Quadratic Equations by Factoring 13.6.1,3,5→49 (odd) MC13.6-1 → 13.6-19 MC 13.6-CEA12 17.3.1 →43, MC 17.3-1 → 15, MC 17.3-TH30
Solving Problems Involving Quadratic Relations By the end of this course, students will	
4.1 determine the zeros and the maximum or minimum value of a quadratic relation from its graph (i.e., (using graphing calculators or graphing software) or from its defining equation i.e., by applying algebraic techniques))	From graph: 17.9.9,11, MC 17.9-2,3,5

4.2 solve problems arising from a realistic situation represented by a graph or an equation of a quadratic relation, with and without the use of technology (e.g., given the graph or the equation of a quadratic relation representing the height of a ball over elapsed time, answer questions such as the following: What is the maximum height of the ball? After what length of time will the ball hit the ground? Over what time interval is the height of the ball greater than 3 m?)	Media 13.7: Applications of Quadratic Equations (2 available) 13.7.3 → 13.7.35 (odd) MC 13.7-1 → 13.7-21 MC 13.7-TH31 13.6.59

Analytic Geometry

Overall Expectations

By the end of this course, students will:

- model and solve problems involving the intersection of two straight lines
- solve problems using analytic geometry involving properties of lines and line segments
- verify geometric properties of triangles and quadrilaterals, using analytic geometry

Specific Expectations	Pearson MathXL for School Specific Questions
Using Linear Systems to Solve Problems By the end of this course, students will	
1.1 solve systems of two linear equations involving two variables, using the algebraic method of substitution or elimination ***Sample problem:*** Solve $y = ½x – 5$, $3x + 2y = –2$ for x and y algebraically, and verify algebraically and graphically	Media 15.2: Solving Systems of Linear Equations by Substitution 15.2.3 → 15.2.29 (odd) MC 15.2-1 → 15.2 -9 (odd) MC 15.2-10 Media 15.3: Solving Systems of Linear Equations by Elimination 15.3.5 → 15.3.39 (odd) MC15.3-1 → 15.3-7
1.2 solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method ***Sample problem:*** The Robotics Club raised $5000 to build a robot for a future competition. The club invested part of the money in an account that paid 4% annual interest, and the rest in a government bond that paid 3.5% simple interest per year. After one year, the club earned a total of $190 in interest. How much was invested at each rate? Verify your result.	Media 15.4: Solving Applications: Systems of Two Equations 15.4.11 → 15.4.37 (odd) MC 15.4-1 MC 15.4-5 → 15.4-27
Solving Problems Involving Properties of Line Segments By the end of this course, students will:	
2.1 develop the formula for the midpoint of a line segment, and use this formula to solve problems (e.g., determine the coordinates of the midpoints of the sides of a triangle, given the coordinates of the vertices, and verify concretely or by using dynamic geometry software)	11.9.21 → 29 GA.1.20, GA.1.49 →51, GA.1.54
2.2 develop the formula for the length of a line segment, and use this formula to solve problems (e.g., determine the lengths of the line segments joining the midpoints of the sides of a triangle, given the coordinates of the vertices of the triangle, and verify using dynamic geometry software)	11.9.9 → 17 GA.1.52, GA.1.53, GA.1.55
2.3 develop the equation for a circle with centre (0, 0) and radius r, by applying the formula for the length of a line segment	

2.4 determine the radius of a circle with centre (0, 0), given its equation; write the equation of a circle with centre (0, 0), given the radius; and sketch the circle, given the equation in the form $x^2 + y^2 = r^2$	11.9.31, 11.9.41, MC 11.9-16 19.1.13, 19.1.27 GA.11.36, GA.11.53(Part A), GA.11.57
2.5 solve problems involving the slope, length, and midpoint of a line segment (e.g., determine the equation of the right bisector of a line segment, given the coordinates of the endpoints; determine the distance from a given point to a line whose equation is given, and verify using dynamic geometry software)	GA.1.16, GA.1.19, GA.1.21, GA.1.22, GA.1.56 GA 3.37, GA 4.13, GA 4.21 →23, GA 5.31, GA 6.1→11, GA.7.38→39, GA.7.49, GA.7.50
Using Analytic Geometry to Verify Geometric Properties By the end of this course, students will:	
3.1 determine, through investigation (e.g., using dynamic geometry software, by paper folding), some characteristics and properties of geometric figures (e.g., medians in a triangle, similar figures constructed on the sides of a right triangle)	GA.1.51, GA.4.22
3.2 verify, using algebraic techniques and analytic geometry, some characteristics of geometric figures (e.g., verify that two lines are perpendicular, given the coordinates of two points on each line; verify, by determining side length, that a triangle is equilateral, given the coordinates of the vertices)	7.5.15, 7.8.7, GA.4.22, GA.5.4→6
3.3 plan and implement a multi-step strategy that uses analytic geometry and algebraic techniques to verify a geometric property (e.g., given the coordinates of the vertices of a triangle, verify that the line segment joining the midpoints of two sides of the triangle is parallel to the third side and half its length, and check using dynamic geometry software; given the coordinates of the vertices of a rectangle, verify that the diagonals of the rectangle bisect each other).	

Trigonometry

Overall Expectations

By the end of this course, students will:

- use their knowledge of ratio and proportion to investigate similar triangles and solve problems related to similarity
- solve problems involving right triangles, using the primary trigonometric ratios and the Pythagorean theorem
- solve problems involving acute triangles, using the sine law and the cosine law.

Specific Expectations	Pearson MathXL for School Specific Questions
Investigating Similarity and Solving Problems Involving Similar Triangles By the end of this course, students will	
1.1 verify, through investigation (e.g., using dynamic geometry software, concrete materials), the properties of similar triangles (e.g., given similar triangles, verify the equality of corresponding angles and the proportionality of corresponding sides)	Media 7.8: Congruent and Similar Triangles 7.8.1 → 5 GA5.1.1, GA5.1.2, GA5.1.3, GA5.1.6, GA5.1.7, GA5.1.25→33 GA.7.1.2
1.2 describe and compare the concepts of similarity and congruence	GA.5.8 →29, GA.5.31, GA.5.33 →35, GA.5.37 →40
1.3 solve problems involving similar triangles in realistic situations (e.g., shadows, reflections, scale models, surveying) ***Sample problem:*** Use a metre stick to determine the height of a tree, by means of the similar triangles formed by the tree, the metre stick, and their shadows	7.8.21 → 33 GA.8.32, GA.8.41→45, MC 7.7-9 → 12, MC7.7 GT14, G5, TH 35, TH44
Solving Problems Involving the Trigonometry of Acute Triangles By the end of this course, students will:	
2.1 explore the development of the sine law within acute triangles (e.g., use dynamic geometry software to determine that the ratio of the side lengths equals the ratio of the sines of the opposite angles; follow the algebraic development of the sine law and identify the application of solving systems of equations [student reproduction of the development of the formula is not required])	21.2.1
2.2 explore the development of the cosine law within acute triangles (e.g., use dynamic geometry software to verify the cosine law; follow the algebraic development of the cosine law and identify its relationship to the Pythagorean theorem and the cosine ratio [student reproduction of the development of the formula is not required])	
2.3 determine the measures of sides and angles in acute triangles, using the sine law and the cosine law ***Sample problem:*** In triangle ABC, < A = 35°, < B = 65°, and AC = 18 cm. Determine BC. Check your result using dynamic geometry software.	GA.9.16 → 22, GA.9.22, GA.9.24

2.4 solve problems involving the measures of sides and angles in acute triangles	GA.9.26, GA.9.28 → 36 7.7.1 → 37, 7.7.39 -43, MC 7.7-9 → 12, MC7.7 GT14, G5, TH 35, TH44

Foundations of Mathematics, Grade 10, Applied (MFM2P)

This course enables students to consolidate their understanding of linear relations and extend their problem-solving and algebraic skills through investigation, the effective use of technology, and hands-on activities. Students will develop and graph equations in analytic geometry; solve and apply linear systems, using real-life examples; and explore and interpret graphs of quadratic relations. Students will investigate similar triangles, the trigonometry of right triangles, and the measurement of three-dimensional figures. Students will consolidate their mathematical skills as they solve problems and communicate their thinking.

Mathematical process expectations:

	Specific Expectation	Pearson MathXL for School
	The mathematical processes are to be integrated into student learning in all areas of this course.	
Problem Solving	develop, select, apply, and compare a variety of problem-solving strategies as they pose and solve problems and conduct investigations, to help deepen their mathematical understanding	
Reasoning and Proving	develop and apply reasoning skills (e.g., recognition of relationships, generalization through inductive reasoning, use of counter-examples) to make mathematical conjectures, assess conjectures, and justify conclusions, and plan and construct organized mathematical arguments	
Reflecting	demonstrate that they are reflecting on and monitoring their thinking to help clarify their understanding as they complete an investigation or solve a problem (e.g., by assessing the effectiveness of strategies and processes used, by proposing alternative approaches, by judging the reasonableness of results, by verifying solutions)	
Selecting Tools and Computational Strategies	select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems	
Connecting	make connections among mathematical concepts and procedures, and relate mathematical ideas to situations or phenomena drawn from other contexts (e.g., other curriculum areas, daily life, current events, art and culture, sports)	
Representing	create a variety of representations of mathematical ideas (e.g., numeric, geometric, algebraic, graphical, pictorial representations; onscreen dynamic representations), connect and compare them, and select and apply the appropriate representations to solve problems	
Communicating	communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions	

Measurement and Trigonometry

Overall Expectations

By the end of this course, students will:

- use their knowledge of ratio and proportion to investigate similar triangles and solve problems related to similarity
- solve problems involving right triangles, using the primary trigonometric ratios and the Pythagorean theorem
- solve problems involving the surface areas and volumes of three-dimensional figures, and use the imperial and metric systems of measurement.

Specific Expectations	Pearson MathXL for School
Solving Problems Involving Similar Triangles By the end of this course, students will	
1.1 verify, through investigation (e.g., using dynamic geometry software, concrete materials), properties of similar triangles (e.g., given similar triangles, verify the equality of corresponding angles and the proportionality of corresponding sides)	Media 7.8: Congruent and Similar Triangles 7.8.1 → 5 GA5.1.1, GA5.1.2, GA5.1.3, GA5.1.6, GA5.1.7, GA5.1.25→33 GA.7.1.2, GA.8.16
1.2 determine the lengths of sides of similar triangles, using proportional reasoning	GA.8.7, GA.8.8, GA.8.9, GA.8.17, GA.8.25, GA.8.26, GA.8.31, GA.8.34, GA.8.35 → 40
1.3 solve problems involving similar triangles in realistic situations (e.g., shadows, reflections, scale models, surveying) ***Sample problem:*** Use a metre stick to determine the height of a tree, by means of the similar triangles formed by the tree, the metre stick, and their shadows	GA.7.8.21, GA.7.8.23 → 33, GA.8.32, GA.8.41→45
Solving Problems Involving the Trigonometry of Right Triangles By the end of this course, students will	
2.1 determine, through investigation (e.g., using dynamic geometry software, concrete materials), the relationship between the ratio of two sides in a right triangle and the ratio of the two corresponding sides in a similar right triangle, and define the sine, cosine, and tangent ratios (e.g., sin A = *opposite / hypotenuse*)	21.2.1
2.2 determine the measures of the sides and angles in right triangles, using the primary trigonometric ratios and the Pythagorean theorem	Media 7.7: Pythagorean Theorem (Tutorial and Laser Tag) 7.7.1 → 37
2.3 solve problems involving the measures of sides and angles in right triangles in real-life applications (e.g., in surveying, in navigation, in determining the height of an inaccessible object around the school), using the primary trigonometric ratios and the Pythagorean theorem ***Sample problem:*** Build a kite, using imperial measurements, create a clinometer to determine the angle of elevation when the kite is flown, and use the tangent ratio to calculate the height attained.	7.7.1.39 → 43 GA.9.28 → 36 MC 7.7-9 → 12, MC7.7 GT14, G5, TH 35, TH44

2.4 describe, through participation in an activity, the application of trigonometry in an occupation (e.g., research and report on how trigonometry is applied in astronomy; attend a career fair that includes a surveyor, and describe how a surveyor applies trigonometry to calculate distances; job shadow a carpenter for a few hours, and describe how a carpenter uses trigonometry)	
Solving Problems Involving Surface Area and Volume, Using the Imperial and Metric Systems of Measurement By the end of this course, students will:	
3.1 use the imperial system when solving measurement problems (e.g., problems involving dimensions of lumber, areas of carpets, and volumes of soil or concrete);	GA 2.1 → 15 GA10.2, GA10.3, GA10.6, GA10.7, GA10.9, GA10.15, GA10.17, GA10 20 → 24
3.2 perform everyday conversions between the imperial system and the metric system (e.g., millilitres to cups, centimetres to inches) and within these systems (e.g., cubic metres to cubic centimetres, square feet to square yards), as necessary to solve problems involving measurement (Sample problem: A vertical post is to be supported by a wooden pole, secured on the ground at an angle of elevation of 60°, and reaching 3 m up the post from its base. If wood is sold by the foot, how many feet of wood are needed to make the pole?)	GA 2.27 →50
3.3 determine, through investigation, the relationship for calculating the surface area of a pyramid (e.g., use the net of a squarebased pyramid to determine that the surface area is the area of the square base plus the areas of the four congruent triangles)	
3.4 solve problems involving the surface areas of prisms, pyramids, and cylinders, and the volumes of prisms, pyramids, cylinders, cones, and spheres, including problems involving combinations of these figures, using the metric system or the imperial system, as appropriate **Sample problem**: How many cubic yards of concrete are equired to pour a concrete pad measuring 10 feet by 10 feet by 1 foot? If poured concrete costs $110 per cubic yard, how much does it cost to pour a concrete driveway requiring 6 pads?	Media 7.6: Volume (of a Cylinder) and Surface Area (Parts of a Box) GA 12. 13, GA 12. 14 → 17, GA 12. 19 → 33, GA 12. 35 → 48, GA 12. 51 →66

Modelling Linear Relations

Overall Expectations

- By the end of this course, students will:
- manipulate and solve algebraic equations, as needed to solve problems
- graph a line and write the equation of a line from given information
- solve systems of two linear equations, and solve related problems that arise from realistic situations.

Specific Expectations	Pearson MathXL for School
Manipulating and Solving Algebraic Equations By the end of this course, students will:	
1.1 solve first-degree equations involving one variable, including equations with fractional coefficients (e.g. using the balance analogy, computer algebra systems, paper and pencil) ***Sample problem:*** Solve $x/2 + 4 = 3x – 1$ and verify	10.1.5 → 51 10.2.1 → 59 10.3.1 → 47
1.2 determine the value of a variable in the first degree, using a formula (i.e., by isolating the variable and then substituting known values; by substituting known values and then solving for the variable) (e.g., in analytic geometry, in measurement) ***Sample problem:*** A cone has a volume of 100 cm^3. The radius of the base is 3 cm. What is the height of the cone?	10.4.7 → 55 10.5.13 → 41
1.3 express the equation of a line in the form $y = mx + b$, given the form $Ax + By + C = 0$	
Graphing and Writing Equations of Lines By the end of this course, students will:	
2.1 connect the rate of change of a linear relation to the slope of the line, and define the slope as the ratio m = rise/run	11.3.1 → 13 11.3.47 → 59
2.2 identify, through investigation, $y = mx + b$ as a common form for the equation of a straight line, and identify the special cases $x = a$, $y = b$	11.3.35, 11.3.37, 11.3.45
2.3 identify, through investigation with technology, the geometric significance of m and b in the equation $y = mx + b$	11.3.29 → 39
2.4 graph lines by hand, using a variety of techniques (e.g., graph $y = 2/3\,x – 4$ using the y-intercept and slope; graph $2x + 3y = 6$ using the x- and y-intercepts)	11.7.1 → 59 GA.4.14 → 17
2.5 determine the equation of a line, given its graph, the slope and y-intercept, the slope and a point on the line, or two points on the line	11.4.1 → 61 GA 4.18 → 20
Solving and Interpreting Systems of Linear Equations By the end of this course, students will:	

3.1 determine graphically the point of intersection of two linear relations (e.g., using graph paper, using technology) ***Sample problem:*** Determine the point of intersection of $y + 2x = -5$ and $y = 2/3\ x + 3$, using an appropriate graphing technique, and verify.	15.1.5 → 33, MC 15.1-1 → 17
3.2 solve systems of two linear equations involving two variables with integral coefficients, using the algebraic method of substitution or elimination ***Sample problem:*** Solve $y = 2x + 1, 3x + 2y = 16$ for x and y algebraically, and verify algebraically and graphically.	15.2.3 → 9
3.3 solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method ***Sample problem:*** Maria has been hired by Company A with an annual salary, S dollars, given by $S = 32\ 500 + 500a$, where a represents the number of years she has been employed by this company. Ruth has been hired by Company B with an annual salary, S dollars, given by $S = 28\ 000 + 1000a$, where a represents the number of years she has been employed by that company. Describe what the solution of this system would represent in terms of Maria's salary and Ruth's salary. After how many years will their salaries be the same? What will their salaries be at that time?	15.1.35, 15.1.37, MC 15.1-18, MC 15.1-19

Quadratic Relations of the Form $y = ax^2 + bx + c$

Overall Expectations

By the end of this course, students will:

- manipulate algebraic expressions, as needed to understand quadratic relations
- identify characteristics of quadratic relations
- solve problems by interpreting graphs of quadratic relations.

Specific Expectations	Pearson MathXL for School
Manipulating Quadratic Expressions By the end of this course, students will	
1.1 expand and simplify second-degree polynomial expressions involving one variable that consist of the product of two binomials [e.g., $(2x + 3)(x + 4)$] or the square of a binomial [e.g., $(x + 3)^2$], using a variety of tools (e.g., algebra tiles, diagrams, computer algebra systems, paper and pencil) and strategies (e.g. patterning)	12.3.1,7,21,23 → 31, MC 12.3-1,2,10,12, MC 12.3-CEA8
1.2 factor binomials (e.g., $4x^2 + 8x$) and trinomials (e.g., $3x^2 + 9x – 15$) involving one variable up to degree two, by determining a common factor using a variety of tools (e.g., algebra tiles, computer algebra systems, paper and pencil) and strategies (e.g., patterning)	Media 13.1 Factoring by Grouping, Factoring out a Common Factor 13.1.1→53 (odd numbers) MC13.1.6 → 21, MC13.1-EA20, MC13.1-CEA4 Media13.4: Factoring a Trinomial with a Common Factor 13.4.1 → 13.4.49 (odd) MC 13.4-1 → 13.4-26 MC 13.4-EA23, MC13.4-CEA11
1.3 factor simple trinomials of the form $x^2 + bx + c$ (e.g., $x^2 + 7x + 10$, $x^2 + 2x – 8$), using a variety of tools (e.g., algebra tiles, computer algebra systems, paper and pencil) and strategies (e.g., patterning)	13.2.11 → 35, 39 → 45, MC 13.2-1 → 7,10,11, MC 13.2-CA7,8, MC 13.2-TH22
1.4 factor the difference of squares of the form $x^2 – a^2$ (e.g., $x^2 – 16$)	Media 13.5: Factoring a Difference of Squares 13.5.5 → 13.5.49 (odd) MC 13.5-1 → 13.5-16
Identifying Characteristics of Quadratic Relations By the end of this course, students will:	

2.1 collect data that can be represented as a quadratic relation, from experiments using appropriate equipment and technology (e.g., concrete materials, scientific probes, graphing calculators), or from secondary sources (e.g., the Internet, Statistics Canada); graph the data and draw a curve of best fit, if appropriate, with or without the use of technology ***Sample problem:*** Make a 1 m ramp that makes a 15° angle with the floor. Place a can 30 cm up the ramp. Record the time it takes for the can to roll to the bottom. Repeat by placing the can 40 cm, 50 cm, and 60 cm up the ramp, and so on. Graph the data and draw the curve of best fit.	
2.2 determine, through investigation using technology, that a quadratic relation of the form $y = ax^2 + bx + c$ ($a \neq 0$) can be graphically represented as a parabola, and determine that the table of values yields a constant second difference ***Sample problem:*** Graph the quadratic relation $y = x^2 - 4$, using technology. Observe the shape of the graph. Consider the corresponding table of values, and calculate the first and second differences. Repeat for a different quadratic relation. Describe your observations and make conclusions.	17.4.3 → 13 MC 17.4-1
2.3 identify the key features of a graph of a parabola (i.e., the equation of the axis of symmetry, the coordinates of the vertex, the *y*-intercept, the zeros, and the maximum or minimum value), using a given graph or a graph generated with technology from its equation, and use the appropriate terminology to describe the features	MC 17.4-2 → 5 17.8.1 → 53, MC 17.8-1 → 10 19.1.1 → 9 17.9.11 for intercepts
2.4 compare, through investigation using technology, the graphical representations of a quadratic relation in the form $y = x^2 + bx + c$ and the same relation in the factored form $y = (x - r)(x - s)$ (i.e., the graphs are the same), and describe the connections between each algebraic representation and the graph [e.g., the *y*-intercept is *c* in the form $y = x^2 + bx + c$; the *x*-intercepts are *r* and *s* in the form $y = (x - r)(x - s)$] ***Sample problem:*** Use a graphing calculator to compare the graphs of $y = x^2 + 2x - 8$ and $y = (x + 4)(x - 2)$. In what way(s) are the equations related? What information about the graph can you identify by looking at each equation? Make some conclusions from your observations, and check your conclusions with a different quadratic equation.	
Solving Problems by Interpreting Graphs of Quadratic Relations By the end of this course, students will	
3.1 solve problems involving a quadratic relation by interpreting a given graph or a graph generated with technology from its equation (e.g., given an equation representing the height of a ball over elapsed time, use a graphing calculator or graphing software to graph the relation, and answer questions such as the following:What is the maximum height of the ball? After what length of time will the ball hit the ground? Over what time interval is the height of the ball greater than 3 m?);	13.7.29 → 35, MC 13.7-19 → 21, MC 13.7-TH31

3.2 solve problems by interpreting the significance of the key features of graphs obtained by collecting experimental data involving quadratic relations ***Sample problem:*** Roll a can up a ramp. Using a motion detector and a graphing calculator, record the motion of the can until it returns to its starting position, graph the distance from the starting position versus time, and draw the curve of best fit. Interpret the meanings of the vertex and the intercepts in terms of the experiment. Predict how the graph would change if you gave the can a harder push. Test your prediction.	19.9.45 → 53 MC 17.9-9 → 12