# Mathematics 10 Curriculum Outcomes (220 hours)

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T] [V]	Technology Visualization

Meas	Measurement (M) (50–55 hours)		
Genera	Il Curriculum Outcome: Students will	be exp	ected to develop spatial sense and proportional reasoning.
Specifi	c Curriculum Outcomes	Perfo	rmance Indicators
		Use tl	he following set of indicators to determine whether students have met the corresponding
		specif	fic outcomes.
M01	Students will be expected to solve	1.1	Provide referents for linear measurements, including millimetre, centimetre, metre,
	problems that involve linear		kilometre, inch, foot, yard, and mile, and explain the choices.
	measurement, using SI and	1.2	Compare SI and imperial units, using referents.
	imperial units of measure,	1.3	Estimate a linear measure, using a referent, and explain the process used.
	estimation strategies, and	1.4	Justify the choice of units used for determining a measurement in a problem-solving
	measurement strategies.		context.
[ME, P	5, V]	1.5	Solve problems that involve linear measure, using instruments such as rulers, calipers, or
			tape measures.
		1.6	Describe and explain a personal strategy used to determine a linear measurement
			(e.g., circumference of a bottle, length of a curve, and perimeter of the base of an irregular
N/02	Students will be expected to apply	2.1	5-D Object).
IVIUZ	proportional reasoning to	2.1	between SI and imperial systems.
	problems that involve conversions	2.2	Solve a problem that involves the conversion of units within or between SI and imperial
	between SI and imperial units of		systems.
	measure.	2.3	Verify, using unit analysis, a conversion within or between SI and imperial systems, and
[C, MI	E, PS]		explain the conversion.
		2.4	Justify, using mental mathematics, the reasonableness of a solution to a conversion
			problem.

[C] [CN]	Communication Connections	[PS] [R]	Problem Solving Reasoning
[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Meas Genera	Measurement (M) (50–55 hours) General Curriculum Outcome: Students will be expected to develop spatial sense and proportional reasoning.			
Specific	Curriculum Outcomes	Perfo	rmance Indicators	
		Use t	he following set of indicators to determine whether students have met the corresponding	
		speci	fic outcomes.	
M03	Students will be expected to solve problems, using SI and imperial units, that involve the surface area and volume of 3-D objects, including right cones, right cylinders, right prisms, right pyramids, and spheres.	3.1 3.2 3.3 3.4	Sketch a diagram to represent a problem that involves surface area or volume. Determine the surface area of a right cone, right cylinder, right prism, right pyramid, or sphere, using an object or its labelled diagram. Determine the volume of a right cone, right cylinder, right prism, right pyramid, or sphere, using an object or its labelled diagram. Determine an unknown dimension of a right cone, right cylinder, right prism, right pyramid, or sphere, given the object's surface area or volume and the remaining dimensions.	
[CN, PS	, R, V]	3.5 3.6	Solve a problem that involves surface area or volume, given a diagram of a composite 3-D object. Describe the relationship between the volumes of right cones and right cylinders with the same base and height, and right pyramids and right prisms with the same base and height.	

[C]	Communication	[PS]	Problem Solving
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[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Measurement (M) (50–55 hours) General Curriculum Outcome: Students will	be expected to develop spatial sense and proportional reasoning.		
Specific Curriculum Outcomes	Performance Indicators		
	specific outcomes.		
M04 Students will be expected to develop and apply the primary trigonometric ratios (sine, cosine, tangent) to solve problems that involve right triangles.	<ul> <li>4.1 Explain the relationships between similar right triangles and the definitions of the primary trigonometric ratios.</li> <li>4.2 Identify the hypotenuse of a right triangle and the opposite and adjacent sides for a given acute angle in the triangle.</li> <li>4.3 Solve right triangles, with or without technology.</li> </ul>		
[C, CN, PS, R, T, V]	<ul> <li>4.4 Solve a problem that involves one or more right triangles by applying the primary trigonometric ratios or the Pythagorean Theorem.</li> <li>4.5 Solve a problem that involves indirect and direct measurement, using the trigonometric ratios, the Pythagorean Theorem, and measurement instruments such as a clinometer or metre stick.</li> </ul>		

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Algeb	Algebra and Number (AN) (50–55 hours)		
Genera	I Curriculum Outcome: Students will	be exp	ected to develop algebraic reasoning and number sense.
Specifi	c Curriculum Outcomes	Perfo	ormance Indicators
		Use t	he following set of indicators to determine whether students have met the corresponding
		speci	fic outcomes.
AN01	Students will be expected to	1.1	Determine the prime factors of a whole number.
	demonstrate an understanding of	1.2	Explain why the numbers 0 and 1 have no prime factors.
	factors of whole numbers by	1.3	Determine, using a variety of strategies, the greatest common factor or least common
	determining the prime factors,		multiple of a set of whole numbers, and explain the process.
	greatest common factor, least	1.4	Determine, concretely, whether a given whole number is a perfect square, a perfect cube, or paither
and cube root 15 Determine using a variety of strategies the square root of a perfect square an		Determine using a variety of strategies, the square root of a perfect square, and explain	
		1.5	the process
	ς, κ]	16	Determine using a variety of strategies, the sube root of a perfect sube, and explain the
		1.0	process.
		1.7	Solve problems that involve prime factors, greatest common factors, least common multiples, square roots, or cube roots.

[C]	Communication	[PS]	Problem Solving
[CN] [ME]	Mental Mathematics	[K] [T]	Technology
	and Estimation	[V]	Visualization

Algeb	Algebra and Number (AN) (50–55 hours)		
Specifi	c Curriculum Outcomes	Perfo	prmance Indicators
•	Use the following set of indicators to determine whether students have met the corresponding specific outcomes.		
AN02	Students will be expected to	2.1	Sort a set of numbers into rational and irrational numbers.
	demonstrate an understanding of	2.2	Determine an approximate value of a given irrational number.
	irrational numbers by	2.3	Approximate the locations of irrational numbers on a number line, using a variety of
	representing, identifying, and		strategies, and explain the reasoning.
	simplifying irrational numbers and	2.4	Order a set of irrational numbers on a number line.
	ordering irrational numbers.	2.5	Express a radical as a mixed radical in simplest form (limited to numerical radicands).
[CN, M	E, R, V]	2.6	Express a mixed radical as an entire radical (limited to numerical radicands).
		2.7	Explain, using examples, the meaning of the index of a radical.
		2.8	Represent, using a graphic organizer, the relationship among the subsets of the real
			numbers (natural, whole, integer, rational, irrational).

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[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Algebra and Number (AN) (50–55 hours)		
General Outcome: Students will be expect	ed to develop algebraic reasoning and number sense.	
Specific Curriculum Outcomes	Performance Indicators	
	Use the following set of indicators to determine whether students have met the corresponding specific outcomes.	
<ul> <li>AN03 Students will be expected to demonstrate an understanding of powers with integral and rational exponents.</li> <li>[C, CN, PS, R]</li> </ul>	3.1 Explain, using patterns, why $a^{-n} = \frac{1}{a^n}$ , $a \neq 0$ . 3.2 Explain, using patterns, why $a^{\frac{1}{n}} = \sqrt[n]{a}$ , $n > 0$ . 3.3 Apply the following exponent laws to expressions with rational and variable bases and integral and rational exponents, and explain the reasoning.	
	• $a^m \cdot a^n = a^{m \cdot m}$ • $a^m \div a^n = a^{m \cdot n}, a \neq 0$ • $a^m \cdot a^n = a^{m \cdot n}$ • $ab^m = a^m b^m$ • $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, b \neq 0$	
	<ul> <li>3.4 Express powers with rational exponents as radicals and vice versa.</li> <li>3.5 Solve a problem that involves exponent laws or radicals.</li> <li>3.6 Identify and correct errors in a simplification of an expression that involves powers.</li> </ul>	

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[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Algeb	Algebra and Number (AN) (50–55 hours)			
Genera	I Curriculum Outcome: Students will	be exp	ected to develop algebraic reasoning and number sense.	
Specifi	c Curriculum Outcomes	Perfo	ormance Indicators	
		Use t	he following set of indicators to determine whether students have met the corresponding	
		speci	fic outcomes.	
AN04	Students will be expected to demonstrate an understanding of the multiplication of polynomial expressions (limited to monomials, binomials, and trinomials), concretely, pictorially, and symbolically.	(It is ) exter 4.1 4.2 4.3	intended that the emphasis of this outcome be on binomial by binomial multiplication, with asion to polynomial by polynomial to establish a general pattern for multiplication.) Model the multiplication of two given binomials, concretely or pictorially, and record the process symbolically. Relate the multiplication of two binomial expressions to an area model. Explain, using examples, the relationship between the multiplication of binomials and the multiplication of two-digit numbers.	
[CN, R,	v]	4.4 4.5 4.6 4.7	Verify a polynomial product by substituting numbers for the variables. Multiply two polynomials symbolically, and combine like terms in the product. Generalize and explain a strategy for multiplication of polynomials. Identify and explain errors in a solution for a polynomial multiplication.	

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[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Algebra and Number (50–55 hou General Curriculum Outcome: Students w	<b>rs)</b> ill be expected to develop algebraic reasoning and number sense.
Specific Curriculum Outcomes	Performance Indicators
	Use the following set of indicators to determine whether students have met the corresponding
	specific outcomes.
AN05 Students will be expected to demonstrate an understanding of	5.1 Determine the common factors in the terms of a polynomial, and express the polynomial in factored form.
common factors and trinomial factoring, concretely, pictorially,	5.2 Model the factoring of a trinomial, concretely or pictorially, and record the process symbolically.
and symbolically. [C, CN, R, V]	5.3 Factor a polynomial that is a difference of squares, and explain why it is a special case of trinomial factoring where $b = 0$ .
	5.4 Identify and explain errors in a polynomial factorization.
	5.5 Factor a polynomial, and verify by multiplying the factors.
	5.6 Explain, using examples, the relationship between multiplication and factoring of polynomials.
	5.7 Generalize and explain strategies used to factor a trinomial.
	5.8 Express a polynomial as a product of its factors.

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[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Relat	Relations and Functions (RF) (70–75hours)			
Genera	I Curriculum Outcome: Students will	be exp	ected to develop algebraic and graphical reasoning through the study of relations.	
Specifi	c Curriculum Outcomes	Perfo	rmance Indicators	
		Use t	he following set of indicators to determine whether students have met the corresponding	
		speci	fic outcomes.	
RF01	Students will be expected to	1.1	Graph, with or without technology, a set of data, and determine the restrictions on the	
	interpret and explain the		domain and range.	
	relationships among data, graphs,	1.2	Explain why data points should or should not be connected on the graph for a situation.	
	and situations.	1.3	Describe a possible situation for a given graph.	
[C, CN,	R, T, V]	1.4	Sketch a possible graph for a given situation.	
		1.5	Determine, and express in a variety of ways, the domain and range of a graph, a set of	
			ordered pairs, or a table of values.	
RF02	Students will be expected to	2.1	Explain, using examples, why some relations are not functions but all functions are	
	demonstrate an understanding of		relations.	
	relations and functions.	2.2	Determine if a set of ordered pairs represents a function.	
[C, R, V	]	2.3	Sort a set of graphs as functions or non-functions.	
		2.4	Generalize and explain rules for determining whether graphs and sets of ordered pairs	
			represent functions.	

[C] [CN]	Communication	[PS] [R]	Problem Solving
[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Relations and Functions (RF) (70–75hours)			
Genera	I Curriculum Outcome: Students will	be exp	pected to develop algebraic and graphical reasoning through the study of relations.
Specifi	c Curriculum Outcomes	Perfo	ormance Indicators
		Use t	he following set of indicators to determine whether students have met the corresponding
		speci	fic outcomes.
RF03	Students will be expected to	3.1	Determine the slope of a line segment by measuring or calculating the rise and run.
	demonstrate an understanding of	3.2	Classify lines in a given set as having positive or negative slopes.
	slope with respect to rise and run,	3.3	Explain the meaning of the slope of a horizontal or vertical line.
	line segments and lines, rate of	3.4	Explain why the slope of a line can be determined by using any two points on that line.
	change, parallel lines, and	3.5	Explain, using examples, slope as a rate of change.
	perpendicular lines.	3.6	Draw a line, given its slope and a point on the line.
[PS, R, '	V]	3.7	Determine another point on a line, given the slope and a point on the line.
		3.8	Generalize and apply a rule for determining whether two lines are parallel or
			perpendicular.
		3.9	Solve a contextual problem involving slope.
RF04	Students will be expected to	4.1	Identify independent and dependent variables in a given context.
	describe and represent linear	4.2	Determine whether a situation represents a linear relation, and explain why or why not.
	relations, using words, ordered	4.3	Determine whether a graph represents a linear relation, and explain why or why not.
	pairs, tables of values, graphs, and	4.4	Determine whether a table of values or a set of ordered pairs represents a linear relation,
	equations.		and explain why or why not.
[C, CN,	R, V]	4.5	Draw a graph from a set of ordered pairs within a given situation, and determine whether
			the relationship between the variables is linear.
		4.6	Determine whether an equation represents a linear relation, and explain why or why not.
		4.7	Match corresponding representations of linear relations.

[C] [CN]	Communication	[PS] [P]	Problem Solving
[CN] [ME]	Mental Mathematics and Estimation	[N] [T] [V]	Technology Visualization

Relations and Functions (RF) (70–75hours)				
General Curriculum Outcome: Students wi	General Curriculum Outcome: Students will be expected to develop algebraic and graphical reasoning through the study of relations.			
Specific Curriculum Outcomes	Performance Indicators			
	Use the following set of indicators to determine whether students have met the corresponding			
	specific outcomes.			
<b>RF05</b> Students will be expected to determine the characteristics of the graphs of linear relations, including the intercepts, slope, domain, and range. [CN, PS, R, V]	<ul> <li>5.1 Determine the intercepts of the graph of a linear relation, and state the intercepts as values or ordered pairs.</li> <li>5.2 Determine the slope of the graph of a linear relation.</li> <li>5.3 Determine the domain and range of the graph of a linear relation.</li> <li>5.4 Sketch a linear relation that has one intercept, two intercepts, or an infinite number of intercepts.</li> <li>5.5 Identify the graph that corresponds to a given slope and <i>y</i>-intercept.</li> <li>5.6 Identify the slope and <i>y</i>-intercept that correspond to a given graph.</li> <li>5.7 Solve a contextual problem that involves intercepts, slope, domain, or range of a linear relation.</li> </ul>			
<b>RF06</b> Students will be expected to relate linear relations to their graphs, expressed in • slope-intercept form (y = mx + b) • general form $(Ax + By + C = 0)$ • slope-point form $(y - y_1) = m(x - x_1)$ [CN, R, T, V]	<ul> <li>6.1 Express a linear relation in different forms, and compare the graphs.</li> <li>6.2 Rewrite a linear relation in either slope-intercept or general form.</li> <li>6.3 Generalize and explain strategies for graphing a linear relation in slope-intercept, general or slope-point form.</li> <li>6.4 Graph, with and without technology, a linear relation given in slope-intercept, general, or slope-point form, and explain the strategy used to create the graph.</li> <li>6.5 Identify equivalent linear relations from a set of linear relations.</li> <li>6.6 Match a set of linear relations to their graphs.</li> </ul>			

[C]	Communication	[PS]	Problem Solving
[CN] [ME]	Mental Mathematics	[K] [T]	Technology
	and Estimation	[V]	Visualization

Relati	Relations and Functions (RF) (70–75hours)		
Genera	I Curriculum Outcome: Students will	be exp	ected to develop algebraic and graphical reasoning through the study of relations.
Specifi	Curriculum Outcomes	Perfo	rmance Indicators
		Use t	ne following set of indicators to determine whether students have met the corresponding
		specif	ic outcomes.
RF07	Students will be expected to determine the equation of a linear	7.1	Determine the slope and y-intercept of a given linear relation from its graph, and write the equation in the form $y = mx + h$
	relation to solve problems, given a graph, a point and the slope, two	7.2	Write the equation of a linear relation, given its slope and the coordinates of a point on the line, and explain the reasoning.
	points, and a point and the equation of a parallel or	7.3	Write the equation of a linear relation, given the coordinates of two points on the line, and explain the reasoning.
[CN, PS	perpendicular line. , R, V]	7.4	Write the equation of a linear relation, given the coordinates of a point on the line and the equation of a parallel or perpendicular line, and explain the reasoning.
		7.5	Graph linear data generated from a context, and write the equation of the resulting line.
		7.6	Determine the equation of the line of best fit from a scatterplot using technology and
			determine the correlation.
		7.7	Solve a problem, using the equation of a linear relation.

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[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics	[T]	Technology
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Relat	Relations and Functions (RF) (70–75hours)			
Genera	al Curriculum Outcome: Students will	be exp	ected to develop algebraic and graphical reasoning through the study of relations.	
Specifi	c Curriculum Outcomes	Perfo	ormance Indicators	
		Use t	he following set of indicators to determine whether students have met the corresponding	
		speci	fic outcomes.	
RF08	Students will be expected to solve problems that involve the distance	8.1	Determine the distance between two points on a Cartesian plane using a variety of strategies.	
	between two points and the midpoint of a line segment.	8.2	Determine the midpoint of a line segment, given the endpoints of the segment, using a variety of strategies.	
[C, CN, PS, T, V]		8.3	Determine and endpoint of a line segment, given the other endpoint and the midpoint, using a variety of strategies.	
		8.4	Solve a contextual problem involving the distance between two points or midpoint of a line segment.	
RF09	Students will be expected to	9.1	Express the equation of a linear function in two variables, using function notation.	
	represent a linear function, using	9.2	Express an equation given in function notation as a linear function in two variables.	
	function notation.	9.3	Determine the related range value, given a domain value for a linear function (e.g., if $f(x) =$	
[CN, M	E, V]		3 <i>x</i> – 2, determine <i>f</i> (–1)).	
		9.4	Determine the related domain value, given a range value for a linear function (e.g., if $g(t)$ =	
			7 + $t$ , determine $t$ so that $g(t) = 15$ ).	
		9.5	Sketch the graph of a linear function expressed in function notation.	

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[ME]	Mental Mathematics	[T]	Technology
	and Estimation	[V]	Visualization

Relations and Functions (RF) (70–75hours)				
Specifi	c Curriculum Outcomes	Performance Indicators		
		Use the following set of indicators to determine whether students have met the corresponding specific outcomes.		
RF10	Students will be expected to solve	10.1	Model a situation, using a system of linear equations.	
	problems that involve systems of	10.2	Relate a system of linear equations to the context of a problem.	
	linear equations in two variables, graphically and algebraically.	10.3	Determine and verify the solution of a system of linear equations graphically, with and without technology.	
[CN, PS	, R, T, V]	10.4	Explain the meaning of the point of intersection of a system of linear equations.	
		10.5	Determine and verify the solution of a system of linear equations algebraically.	
		10.6	Explain, using examples, why a system of equations may have no solution, one solution, or an infinite number of solutions.	
		10.7	Explain a strategy to solve a system of linear equations.	
		10.8	Solve a problem that involves a system of linear equations.	

[C] [CN] [ME]	Communication Connections	[PS] [R] [T]	Problem Solving Reasoning Tochpology
[IVIE]	Mental Mathematics	[1]	Technology
	and Estimation	[V]	Visualization

Financial Mathematics (FM) (40–45 hours)			
Genera	I Curriculum Outcome: Students will	be exp	pected to demonstrate number sense and critical thinking skills.
Specifi	Curriculum Outcomes	Perfo	ormance Indicators
		Use t	he following set of indicators to determine whether students have met the corresponding
		speci	fic outcomes.
FM01	Students will be expected to solve	1.1	Compare the unit price of two or more given items.
	problems that involve unit pricing	1.2	Solve problems that involve determining the best buy, and explain the choice in terms of
	and currency exchange, using		the cost as well as other factors, such as quality and quantity.
	proportional reasoning.	1.3	Compare, using examples, different sales promotion techniques (e.g., deli meat at \$2 per
[CN, M	E, PS, R]		100 g seems less expensive than \$20 per kilogram).
		1.4	Determine the percent increase or decrease for a given original and new price.
		1.5	Solve, using proportional reasoning, a contextual problem that involves currency
			exchange.
		1.6	Explain the difference between the selling rate and purchasing rate for currency exchange.
		1.7	Explain how to estimate the cost of items in Canadian currency while in a foreign country,
			and explain why this may be important.
		1.8	Convert between Canadian currency and foreign currencies, using formulas, charts, or
			tables.

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[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T] [V]	Technology Visualization

Financial Mathematics (FM) (40–45 hours)					
Genera	General Curriculum Outcome: Students will be expected to demonstrate number sense and critical thinking skills.				
Specifi	c Curriculum Outcomes	Perfo	rmance Indicators		
		Use t	he following set of indicators to determine whether students have met the corresponding		
		specif	fic outcomes.		
FM02	Students will be expected to	2.1	Describe, using examples, various methods of earning income.		
	demonstrate an understanding of	2.2	Identify and list jobs that commonly use different methods of earning income (e.g., hourly		
	income to calculate gross pay and		wage, wage and tips, salary, commission, contract, bonus, and shift premiums).		
	net pay, including wages, salary,	2.3	Determine in decimal form, from a time schedule, the total time worked in hours and		
	contracts, commissions, and		minutes, including time and a half and/or double time.		
	piecework.	2.4	Determine gross pay from given or calculated hours worked when given		
[C, CN,	R, T]		the base hourly wage, with and without tips		
			• the base hourly wage, plus overtime (time and a half, double time)		
		2.5	Determine gross pay for earnings acquired by		
			base wage, plus commission		
			single commission rate		
		2.6	Explain why gross pay and net pay are not the same.		
		2.7	Determine the Canadian Pension Plan (CPP), Employment Insurance (EI), and income tax		
			deductions for a given gross pay.		
		2.8	Determine net pay when given deductions (e.g., health plans, uniforms, union dues,		
			charitable donations, and payroll tax).		
		2.9	Investigate, with technology, "what if" questions related to changes in income		
			(e.g., What if there is a change in the rate of pay?)		
		2.10	Identify and correct errors in a solution to a problem that involves gross or net pay.		
		2.11	Describe the advantages and disadvantages for a given method of earning income		
			(e.g., hourly wage, tips, piecework, salary, commission, and contract work).		

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[ME]	Mental Mathematics	(T)	Technology
	and Estimation	[V]	Visualization

<b>Financial</b>	Financial Mathematics (FM) (40–45 hours)			
General Curri	culum Outcome: Students will	be exp	ected to demonstrate number sense and critical thinking skills.	
Specific Curri	culum Outcomes	Perfo	rmance Indicators	
		Use th	ne following set of indicators to determine whether students have met the corresponding	
		specif	ic outcomes.	
FM03 Stude	ents will be expected to	3.1	Identify income and expenses that should be included in a personal budget.	
inves	tigate personal budgets.	3.2	Explain considerations that must be made when developing a budget (e.g., prioritizing, and	
[C, PS, R, T]			recurring and unexpected expenses).	
		3.3	Create a personal budget based on given income and expense data.	
		3.4	Collect income and expense data, and create a budget.	
		3.5	Modify a budget to achieve a set of personal goals.	
		3.6	Investigate and analyze, with or without technology, "what if" questions related to	
			personal budgets.	
FM04 Stude	ents will be expected to	4.1	Collect primary or secondary data (statistical or informational) related to the topic.	
explo	re and give a presentation on	4.2	Organize and present a project.	
an ar	ea of interest that involves	4.3	Create and solve a contextual problem that is related to the project.	
finan	cial mathematics.	4.4	Make informed decisions and plans related to the project.	
[C, CN, ME, PS, R, T, V]		4.5	Compare advantages and disadvantages as part of the project.	