GRADE 10 ESSENTIAL MATHEMATICS (20S)

Grade 10 Essential Mathematics (20S) is intended for students whose post-secondary planning does not include a focus on mathematics and science-related fields. Grade 10 Essential Mathematics (20S) is a one-credit course consisting of two half-credits each emphasizing consumer applications, problem solving, decision making, and spatial sense.

Students are expected to work both individually and in small groups on mathematical concepts and skills encountered in everyday life in a technological society.

Assessment of Grade 10 Essential Mathematics should be a balance of assessment *for* learning, assessment *as* learning, and assessment *of* learning. Assessment tools used in

Grade 10 Essential Mathematics should be varied and may include observation, homework, learning conversations or interviews, summative unit essays, demonstrations, presentations, performance tasks, learning logs, projects, investigations, reflective journals, portfolios, quizzes, tests, and examinations. An appropriately prepared portfolio requires a consistent effort throughout the school term and a commitment to completing quality work on a daily basis.

The following table lists the units of study for each half-course, along with an estimated number of hours for each unit. The time for each unit includes instructional and assessment time.

Grade 10 Essential Mathematics (25S) Half Course I		Grade 10 Essential Mathematics (25S) Half Course II	
Unit	Suggested Hours	Unit	Suggested Hours
Analysis of Games and Numbers	6	Analysis of Games and Numbers	5
Personal Finance	22	Trigonometry	17
Measurement	17	Consumer Decisions	6
2-D Geometry	10	Transformations	12
		Angle Construction	15
Total	**55**	**Total**	**55**

General and Specific Learning Outcomes with Achievement Indicators by Course

Grade 10 Essential Mathematics – Half Course I

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

Strand: Analysis of Games and Numbers	General Learning Outcome: Develop critical thinking skills.

Specific Learning Outcomes *It is expected that students will:*	Achievement Indicators *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*
10E1.A.1. Analyze puzzles and games that involve spatial reasoning, using problem-solving strategies. [C, CN, PS, R] It is intended that this learning outcome be integrated throughout the course by using sliding, rotation, construction, deconstruction, and similar puzzles and games.	■ Determine, explain, and verify a strategy to solve a puzzle or to win a game such as ▪ guess and check ▪ look for a pattern ▪ make a systematic list ▪ draw or model ▪ eliminate possibilities ▪ simplify the original problem ▪ work backward ▪ develop alternative approaches ■ Identify and correct errors in a solution to a puzzle or in a strategy for winning a game. ■ Create a variation on a puzzle or a game, and describe a strategy for solving the puzzle or winning the game.

Grade 10 Essential Mathematics – Half Course I

Strand: Personal Finance	**General Learning Outcome:** Develop an understanding of employment earnings.

Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*
10E1.P.1. Demonstrate an understanding of calculations for gross pay and net pay earned through income sources, including - wages - salary - contracts - commissions - piecework [C, CN, R, T]	- Describe, using examples, various methods of earning income. - Identify and list jobs that commonly use different methods of earning income, such as hourly wage, wage and tips, salary, piecework, commission, contract, bonus, and shift premiums. - Describe the advantages and disadvantages for a method of earning income, such as hourly wage, piecework, salary, commission, and contract. - Determine in decimal form, from a time schedule, the total time worked in hours and minutes, separated into regular time, time and a half, or double time. - Describe the different ways that employers penalize workers for showing up late or missing shifts. - Determine gross pay from various income methods, including - the base hourly wage, with and without tips - the base hourly wage, plus daily or weekly overtime - base wage, plus single commission rate - single commission rate - piecework - contract work - Describe the different ways that employers deal with overtime, including non-monetary compensation. - Explain why gross pay and net pay are not the same. - Determine the Canadian Pension Plan (CPP), Employment Insurance (EI), and income tax deductions for a given gross pay. - Determine net pay when given CPP, EI, and income tax deductions, along with deductions such as health plans, uniforms, union dues, charitable donations, or savings plans. - Investigate, with technology, "what if …" questions related to changes in income. - Identify and correct errors in a solution to a problem that involves gross or net pay.

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

Strand: Personal Finance *(continued)*	General Learning Outcome: Develop an understanding of employment earnings.
Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*

10E1.P.2. Solve problems that require the manipulation and application of formulas related to income. [C, CN, ME, PS, R]	■ Solve a contextual problem that involves the application of a formula that does not require manipulation. ■ Solve a contextual problem that involves the application of a formula that requires manipulation, such as finding the rate of pay given regular pay and hours worked. ■ Create and solve a contextual problem that involves a formula. ■ Identify and correct errors in a solution to a problem that involves a formula.

Grade 10 Essential Mathematics – Half Course I

Strand: Measurement	**General Learning Outcome:** Develop spatial sense through direct and indirect measurement.
Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*

10E1.M.1. Demonstrate an understanding of the Système International (SI) by describing relationships of the units for length, area, volume, capacity, and mass. [C, CN, ME, V] It is intended that this learning outcome be limited to the base units and the prefixes milli, centi, deci, deca, hecto, and kilo.	■ Explain how the SI system was developed, and explain its relationship to base ten. ■ Identify the base units of measurement in the SI system, and determine the relationship among the related units of each type of measurement. ■ Identify contexts that involve the SI system. ■ Match the prefixes used for SI units of measurement with the powers of ten. ■ Explain, using examples, how and why decimals are used in the SI system. ■ Provide an approximate measurement in SI units for a measurement given in imperial units. ■ Convert one SI unit into another SI unit.
10E1.M.2. Demonstrate an understanding of the imperial system by ■ describing the relationships of the units for length, area, volume, capacity, and mass ■ comparing the American and British imperial units for capacity ■ applying strategies to convert between imperial and SI units [C, CN, ME, V]	■ Explain how the imperial system was developed. ■ Identify commonly used units in the imperial system, and determine the relationships among the related units. ■ Identify contexts that involve the imperial system. ■ Explain, using examples, how and why fractions are used in the imperial system. ■ Compare the American and British imperial measurement systems, such as gallons, bushels, or tons. ■ Provide an approximate measure in imperial units for a measurement given in SI units. ■ Convert one imperial unit into another imperial unit. ■ Convert a measurement between imperial and SI units using proportional reasoning

Grade 10 Essential Mathematics – Half course I

Strand: Measurement *(continued)*	**General Learning Outcome:** Develop spatial sense through direct and indirect measurement.
Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*

10E1.M.3. Solve and verify problems that involve SI and imperial linear measurements, including decimal and fractional measurements. [CN, ME, PS, V] It is intended that the four arithmetic operations on decimals and fractions be integrated into the problems.	■ Identify a referent for a common SI or imperial unit of linear measurement. ■ Estimate a linear measurement, using a referent. ■ Measure inside diameters, outside diameters, lengths, and widths of various given objects using various measuring instruments. ■ Measure distances using various measuring instruments. ■ Estimate the dimensions of a given regular 3-D object or 2-D shape, using a referent. ■ Determine the operations that should be used to solve a linear measurement problem. ■ Solve a linear measurement problem including perimeter, circumference, or length + width + height (used in shipping and air travel). ■ Provide an example of a situation in which a fractional linear measurement would be divided by a fraction. ■ Determine, using a variety of strategies, the midpoint of a linear measurement, such as length, width, height, depth, diagonal, or diameter of a 3-D object, and explain the strategies. ■ Explain or verify that a solution to a problem involving linear measurement is reasonable.
10E1.M.4. Solve problems that require the manipulation and application of formulas related to converting measurement. [C, CN, ME, PS, R]	■ Solve a contextual problem that involves the application of a formula that does not require manipulation. ■ Solve a contextual problem that involves the application of a formula that requires manipulation. ■ Convert temperatures between Fahrenheit and Celsius. ■ Describe, using examples, how a given formula is used in a trade or an occupation. ■ Create and solve a contextual problem that involves a formula. ■ Identify and correct errors in a solution to a problem that involves a formula.

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

Strand: 2-D Geometry	**General Learning Outcome:** Develop an understanding of spatial relationships applied to area.

Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*
10E1.G.1. Solve problems that involve SI and imperial area measurements of regular, composite, and irregular 2-D shapes, including decimal and fractional measurements. [ME, PS, R, V]	■ Identify and compare referents for area measurements in SI and imperial units. ■ Estimate an area measurement, using a referent. ■ Identify a situation where a SI or imperial area unit would be used. ■ Estimate the area of a given regular, composite, or irregular 2-D shape, using a SI square grid or an imperial square grid. ■ Solve a contextual problem that involves the area of a regular, a composite, or an irregular 2-D shape. ■ Convert an area measurement expressed in one unit squared into another unit squared using proportional reasoning. ■ Solve a problem, using formulas for determining the areas of regular, composite, or irregular 2-D shapes, including circles. ■ Explain, using examples, the effect of changing the measurement of one or more dimensions on area and perimeter of rectangles. ■ Explain or verify that a solution to a problem involving an area measurement is reasonable.
10E1.G.2. Solve problems that require the manipulation and application of formulas related to ■ perimeter ■ area [C, CN, ME, PS, R]	■ Solve a contextual problem that involves the application of a formula that does not require manipulation. ■ Solve a contextual problem that involves the application of a formula that does require manipulation. ■ Explain or verify that different forms of the same formula are equivalent. ■ Describe, using examples, how a given formula is used in a trade or an occupation. ■ Create and solve a contextual problem that involves a formula. ■ Identify and correct errors in a solution to a problem that involves a formula.

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

Grade 10 Essential Mathematics – Half Course II

Strand: Analysis of Games and Numbers	**General Learning Outcome:** Develop critical thinking skills.

Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific learning outcome.*

10E2.A.1. Analyze puzzles and games that involve spatial reasoning, using problem-solving strategies. [C, CN, PS, R]
 	
 It is intended that this learning outcome be integrated throughout the course by using sliding, rotation, construction, deconstruction, and similar puzzles and games.
	■ Determine, explain, and verify a strategy to solve a puzzle or to win a game such as
	   ■ guess and check
	   ■ look for a pattern
	   ■ make a systematic list
	   ■ draw or model
	   ■ eliminate possibilities
	   ■ simplify the original problem
	   ■ work backward
	   ■ develop alternative approaches
	 ■ Identify and correct errors in a solution to a puzzle or in a strategy for winning a game.
	 ■ Create a variation on a puzzle or a game, and describe a strategy for solving the puzzle or winning the game.

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

Grade 10 Essential Mathematics – Half Course II

Strand: Trigonometry	General Learning Outcome: Develop spatial sense relating to triangles.

Specific Learning Outcomes *It is expected that students will:*	Achievement Indicators *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*
10E2.TG.1. Solve problems involving right triangles using the Pythagorean theorem. [C, CN, PS, V]	■ Explain, using illustrations, why the Pythagorean theorem only applies to right triangles. ■ Describe historical and contemporary applications of the Pythagorean theorem. ■ Determine if a triangle is a right triangle or if an angle is 90° using the Pythagorean theorem. ■ Solve a problem using the Pythagorean theorem.
10E2.TG.2. Demonstrate an understanding of primary trigonometric ratios (sine, cosine, tangent) by ■ applying similarity to right triangles ■ generalizing patterns from similar right triangles ■ solving problems [CN, PS, R, T, V]	■ Explain, for a specified acute angle in a set of similar right triangles, that the ratios of the length of the side opposite to the length of the side adjacent are equal and correspond to the tangent ratio. ■ Explain, for a specified acute angle in a set of similar right triangles, that the ratios of the length of the side opposite to the length of the hypotenuse are equal and correspond to the sine ratio. ■ Explain, for a specified acute angle in a set of similar right triangles, that the ratios of the length of the side adjacent to the length of the hypotenuse are equal and correspond to the cosine ratio. ■ Identify situations where the trigonometric ratios are used for indirect measurement of angles and lengths. ■ Solve a contextual problem that involves right triangles, using the primary trigonometric ratios. ■ Explain or verify that a solution to a problem involving primary trigonometric ratios is reasonable.

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

Grade 10 Essential Mathematics – Half Course II

Strand: Trigonometry *(continued)*	**General Learning Outcome:** Develop spatial sense relating to triangles.
Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*
10E2.TG.3. Solve problems that require the manipulation and application of formulas related to - the Pythagorean theorem - primary trigonometric ratios [C, CN, ME, PS, R]	- Solve a contextual problem that involves the application of a formula that does not require manipulation. - Solve a contextual problem that involves the application of a formula that does require manipulation. - Explain or verify that different forms of the same formula are equivalent. - Describe, using examples, how a given formula is used in a trade or an occupation. - Create and solve a contextual problem that involves a formula. - Identify and correct errors in a solution to a problem that involves a formula.

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

Strand: Consumer Decisions	**General Learning Outcome:** Develop skills to make informed consumer decisions.

Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*
10E2.C.1. Solve problems that involve unit pricing and currency exchange, using proportional reasoning. [CN, ME, PS, R]	■ Determine or compare the unit price of two or more items. ■ Solve problems that involve determining the best buy, and explain the choice in terms of the cost as well as other factors, such as quality and quantity. ■ Compare, using examples, different sales promotion techniques ■ Determine the sale price of an item when given the percent of discount. ■ Determine the percent increase or decrease of an item. ■ Solve, using proportional reasoning, a contextual problem that involves currency exchange. ■ Explain the difference between the selling rate and purchasing rate for currency exchange. ■ Explain how to estimate the cost of items in Canadian currency while in a foreign country, and explain why this may be important. ■ Convert between Canadian currency and foreign currencies, using formulas, charts, or tables.

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

Strand: Transformations	General Learning Outcome: Develop spatial sense.
Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific learning outcome.*

10E2.TF.1. Demonstrate an understanding of transformations on a 2-D shape, including ■ translations ■ rotations ■ reflections ■ dilations [C, CN, R, T, V]	■ Identify a single transformation that was performed, given the original 2-D shape and its image. ■ Draw the image of a 2-D shape that results from a single transformation. ■ Draw the image of a 2-D shape that results from a combination of successive transformations. ■ Create, analyze, and describe designs, using translations, rotations, and reflections . ■ Identify and describe applications of transformations in construction, industrial, commercial, domestic, and artistic contexts. ■ Explain the relationship between reflections and lines or planes of symmetry. ■ Determine and explain whether an image is a dilation of another shape, using the concept of similarity. ■ Draw, with or without technology, a dilation image for a 2-D shape, and explain how the original 2-D shape and its image are proportional. ■ Solve a contextual problem that involves transformations.

Grade 10 Essential Mathematics – Half Course II

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

Strand: Angle Construction	**General Learning Outcome:** Develop spatial sense.

Specific Learning Outcomes *It is expected that students will:*	**Achievement Indicators** *The following set of indicators **may** be used to determine whether students have met the corresponding specific learning outcome.*
10E2.AC.1. Demonstrate an understanding of angles, including acute, right, obtuse, straight, and reflex, by ■ drawing ■ replicating and constructing ■ bisecting ■ solving problems [C, ME, PS, T, V]	■ Draw and describe angles with various measures, including acute, right, straight, obtuse, or reflex angles. ■ Identify referents for angles. ■ Sketch a given angle. ■ Estimate the measure of a given angle, using 22.5°, 30°, 45°, 60°, 90°, and 180° as referent angles. ■ Measure, using a protractor, angles in various orientations. ■ Explain and illustrate how angles can be replicated in a variety of ways, such as with Mira, protractor, compass and straightedge, carpenter's square, or dynamic geometry software. ■ Replicate angles in a variety of ways, with or without technology. ■ Bisect an angle, using a variety of methods. ■ Identify and describe the use of angles in construction, industrial, commercial, or artistic applications. ■ Solve a contextual problem that involves angles.
10E2.AC.2. Solve problems that involve parallel, perpendicular, and transversal lines, and pairs of angles formed between them. [C, CN, PS, V]	■ Identify a set of lines as perpendicular, parallel, or neither, and explain. ■ Illustrate and describe complementary or supplementary angles. ■ Identify, in a set of angles, adjacent angles that are not complementary or supplementary. ■ Explain and illustrate the relationships of angles formed by parallel lines and a transversal. ■ Determine the measures of angles involving parallel lines and a transversal, using angle relationships. ■ Explain, using examples, why the angle relationships do not apply when the lines are not parallel. ■ Determine if lines or planes are perpendicular or parallel, and describe the strategy used. ■ Identify and describe the use of parallel, perpendicular, and transversal lines in construction, industrial, commercial, or artistic applications. ■ Solve a contextual problem that involves angles formed by parallel lines and a transversal.