

ESSENTIAL MATHEMATICS

GRADE 12

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

Measurement	General Outcome: Develop spatial sense through direct and indirect measurement.
Specific Outcomes	Achievement Indicators
<i>It is expected that students will:</i>	<i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
12E.M.1. Demonstrate an understanding of the limitations of measuring instruments, including: <ul style="list-style-type: none"> • precision • accuracy • uncertainty • tolerance and solve problems. [C, PS, R, T, V]	1.1 Explain why, in a given context, a certain degree of precision is required. 1.2 Explain why, in a given context, a certain degree of accuracy is required. 1.3 Explain, using examples, the difference between precision and accuracy. 1.4 Compare the degree of accuracy of two given instruments used to measure the same attribute. 1.5 Relate the degree of accuracy to the uncertainty of a given measure. 1.6 Analyze precision and accuracy in a contextual problem. 1.7 Calculate maximum and minimum values, using a given degree of tolerance in context. 1.8 Describe, using examples, the limitations of measuring instruments used in a specific trade or industry; e.g., tape measure versus Vernier caliper. 1.9 Solve a problem that involves precision, accuracy or tolerance.

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Geometry	General Outcome: Develop spatial sense.
Specific Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
12E.G.1.Solve problems by using the sine law and cosine law, excluding the ambiguous case. [CN, PS, V]	1.1 Identify and describe the use of the sine law and cosine law in construction, industrial, commercial and artistic applications. 1.2 Solve a problem, using the sine law or cosine law, when a diagram is given.
12E.G.2.Solve problems that involve: <ul style="list-style-type: none"> • triangles • quadrilaterals • regular polygons. [C, CN, PS, V]	2.1 Describe and illustrate properties of triangles, including isosceles and equilateral. 2.2 Describe and illustrate properties of quadrilaterals in terms of angle measures, side lengths, diagonal lengths and angles of intersection. 2.3 Describe and illustrate properties of regular polygons. 2.4 Explain, using examples, why a given property does or does not apply to certain polygons. 2.5 Identify and explain an application of the properties of polygons in construction, industrial, commercial, domestic and artistic contexts. 2.6 Solve a contextual problem that involves the application of the properties of polygons.

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Geometry (continued)	General Outcome: Develop spatial sense.
Specific Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
12E.G.3. Demonstrate an understanding of transformations on a 2-D shape or a 3-D object, including: <ul style="list-style-type: none"> • translations • rotations • reflections • dilations. [C, CN, R, T, V]	3.1 Identify a single transformation that was performed, given the original 2-D shape or 3-D object and its image. 3.2 Draw the image of a 2-D shape that results from a given single transformation. 3.3 Draw the image of a 2-D shape that results from a given combination of successive transformations. 3.4 Create, analyze and describe designs, using translations, rotations and reflections in all four quadrants of a coordinate grid. 3.5 Identify and describe applications of transformations in construction, industrial, commercial, domestic and artistic contexts. 3.6 Explain the relationship between reflections and lines or planes of symmetry. 3.7 Determine and explain whether a given image is a dilation of another given shape, using the concept of similarity. 3.8 Draw, with or without technology, a dilation image for a given 2-D shape or 3-D object, and explain how the original 2-D shape or 3-D object and its image are proportional. 3.9 Solve a contextual problem that involves transformations.

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Number	General Outcome: Develop number sense and critical thinking skills.
Specific Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
12E.N.1. Analyze puzzles and games that involve logical reasoning, using problem-solving strategies. [C, CN, PS, R]	<p><i>(It is intended that this outcome be integrated throughout the course by using puzzles and games such as Sudoku, Mastermind, Nim and logic puzzles.)</i></p> 1.1 Determine, explain and verify a strategy to solve a puzzle or to win a game; e.g., <ul style="list-style-type: none"> • 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. 1.2 Identify and correct errors in a solution to a puzzle or in a strategy for winning a game. 1.3 Create a variation on a puzzle or a game, and describe a strategy for solving the puzzle or winning the game.
12E.N.2. Solve problems that involve the acquisition of a vehicle by: <ul style="list-style-type: none"> • buying • leasing • leasing to buy. [C, CN, PS, R, T]	2.1 Describe and explain various options for buying, leasing and leasing to buy a vehicle. 2.2 Solve, with or without technology, problems that involve the purchase, lease or lease to purchase of a vehicle. 2.3 Justify a decision related to buying, leasing or leasing to buy a vehicle, based on factors such as personal finances, intended use, maintenance, warranties, mileage and insurance.

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Number (continued)	General Outcome: Develop number sense and critical thinking skills.
Specific Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
12E.N.3.Critique the viability of small business options by considering: <ul style="list-style-type: none"> • expenses • sales • profit or loss. [C, CN, R]	3.1 Identify expenses in operating a small business, such as a hot dog stand. 3.2 Identify feasible small business options for a given community. 3.3 Generate options that might improve the profitability of a small business. 3.4 Determine the break-even point for a small business. 3.5 Explain factors, such as seasonal variations and hours of operation, that might impact the profitability of a small business.

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Algebra	General Outcome: Develop algebraic reasoning.
Specific Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
12E.A.1.Demonstrate an understanding of linear relations by: <ul style="list-style-type: none"> recognizing patterns and trends graphing creating tables of values writing equations interpolating and extrapolating solving problems. [CN, PS, R, T, V]	1.1 Identify and describe the characteristics of a linear relation represented in a graph, table of values, number pattern or equation. 1.2 Sort a set of graphs, tables of values, number patterns and/or equations into linear and nonlinear relations. 1.3 Write an equation for a given context, including direct or partial variation. 1.4 Create a table of values for a given equation of a linear relation. 1.5 Sketch the graph for a given table of values. 1.6 Explain why the points should or should not be connected on the graph for a context. 1.7 Create, with or without technology, a graph to represent a data set, including scatterplots. 1.8 Describe the trends in the graph of a data set, including scatterplots. 1.9 Sort a set of scatterplots according to the trends represented (linear, nonlinear or no trend). 1.10 Solve a contextual problem that requires interpolation or extrapolation of information. 1.11 Relate slope and rate of change to linear relations. 1.12 Match given contexts with their corresponding graphs, and explain the reasoning. 1.13 Solve a contextual problem that involves the application of a formula for a linear relation.

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Statistics	General Outcome: Develop statistical reasoning.
Specific Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
12E.S.1. Solve problems that involve measures of central tendency, including: <ul style="list-style-type: none"> • mean • median • mode • weighted mean • trimmed mean. [C, CN, PS, R]	1.1 Explain, using examples, the advantages and disadvantages of each measure of central tendency. 1.2 Determine the mean, median and mode for a set of data. 1.3 Identify and correct errors in a calculation of a measure of central tendency. 1.4 Identify the outlier(s) in a set of data. 1.5 Explain the effect of outliers on mean, median and mode. 1.6 Calculate the trimmed mean for a set of data, and justify the removal of the outliers. 1.7 Explain, using examples such as course marks, why some data in a set would be given a greater weighting in determining the mean. 1.8 Calculate the mean of a set of numbers after allowing the data to have different weightings (weighted mean). 1.9 Explain, using examples from print and other media, how measures of central tendency and outliers are used to provide different interpretations of data. 1.10 Solve a contextual problem that involves measures of central tendency.
12E.S.2. Analyze and describe percentiles. [C, CN, PS, R]	2.1 Explain, using examples, percentile ranks in a context. 2.2 Explain decisions based on a given percentile rank. 2.3 Explain, using examples, the difference between percent and percentile rank. 2.4 Explain the relationship between median and percentile. 2.5 Solve a contextual problem that involves percentiles.

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Probability	General Outcome: Develop critical thinking skills related to uncertainty.
Specific Outcomes <i>It is expected that students will:</i>	Achievement Indicators <i>The following set of indicators may be used to determine whether students have met the corresponding specific outcome.</i>
12E.P.1. Analyze and interpret problems that involve probability. [C, CN, PS, R]	<p>1.1 Describe and explain the applications of probability; e.g., medication, warranties, insurance, lotteries, weather prediction, 100-year flood, failure of a design, failure of a product, vehicle recalls, approximation of area.</p> <p>1.2 Calculate the probability of an event based on a data set; e.g., determine the probability of a randomly chosen light bulb being defective.</p> <p>1.3 Express a given probability as a fraction, decimal and percent and in a statement.</p> <p>1.4 Explain the difference between odds and probability.</p> <p>1.5 Determine the probability of an event, given the odds for or against.</p> <p>1.6 Explain, using examples, how decisions may be based on a combination of theoretical probability calculations, experimental results and subjective judgements.</p> <p>1.7 Solve a contextual problem that involves a given probability.</p>