

Mathematics at Work 12

General Curriculum Outcomes

Students will be expected to

- develop spatial sense through direct and indirect measurement
- develop spatial sense
- develop number sense and critical-thinking skills
- develop algebraic reasoning
- develop statistical reasoning
- develop critical-thinking skills related to uncertainty
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Specific Curriculum Outcomes

Performance indicators are samples of how students may demonstrate their performance of the goals of a specific curriculum outcome. The range of samples provided is meant to reflect the scope of the SCO. In the SCOs, the word **including** indicates that any ensuing items *must* be addressed to fully achieve the learning outcome. The phrase **such as** indicates that the ensuing items are provided for clarification only and are **not** requirements that must be addressed to fully achieve the learning outcome. The word **and** used in an outcome indicates that both ideas must be addressed to achieve the learning outcome, although not necessarily at the same time or in the same question.

Process Standards Key

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

Measurement (M)

M01 Students will be expected to demonstrate an understanding of the limitations of measuring instruments, including precision, accuracy, uncertainty, and tolerance, and to solve problems.
[C, PS, R, T, V]

Performance Indicators

- M01.01 Explain why, in a given context, a certain degree of precision is required.
- M01.02 Explain why, in a given context, a certain degree of accuracy is required.
- M01.03 Explain, using examples, the difference between precision and accuracy.
- M01.04 Compare the degree of accuracy of two given instruments used to measure the same attribute.
- M01.05 Relate the degree of accuracy to the uncertainty of a given measure.
- M01.06 Analyze precision and accuracy in a contextual problem.
- M01.07 Calculate maximum and minimum values, using a given degree of tolerance in context.
- M01.08 Describe, using examples, the limitations of measuring instruments used in a specific trade or industry.
- M01.09 Solve a problem that involves precision, accuracy, or tolerance

Geometry (G)

G01 Students will be expected to solve problems by using the sine law and cosine law, excluding the ambiguous case. [CN, PS, V]

Performance Indicators

- G01.01 Identify and describe the use of the sine law and cosine law in construction, industrial, commercial, and artistic applications.
- G01.02 Solve a problem using the sine law or cosine law when a diagram is given.

G02 Students will be expected to solve problems that involve triangles, quadrilaterals, and regular polygons. [C, CN, PS, V]

Performance Indicators

- G02.01 Describe and illustrate properties of triangles, including isosceles and equilateral.
- G02.02 Describe and illustrate properties of quadrilaterals in terms of angle measures, side lengths, diagonal lengths, and angles of intersection.
- G02.03 Describe and illustrate properties of regular polygons.
- G02.04 Explain, using examples, why a given property does or does not apply to certain polygons.
- G02.05 Identify and explain an application of the properties of polygons in construction, industrial, commercial, domestic, and artistic contexts.
- G02.06 Solve a contextual problem that involves the application of the properties of polygons.

G03 Students will be expected to demonstrate an understanding of transformations on a 2-D shape or a 3-D object, including translations, rotations, reflections, and dilations. [C, CN, R, T, V]

Performance Indicators

- G03.01 Identify a single transformation that was performed, given the original 2-D shape or 3-D object and its image.
- G03.02 Draw the image of a 2-D shape that results from a given single transformation.
- G03.03 Draw the image of a 2-D shape that results from a given combination of successive transformations.
- G03.04 Create, analyze, and describe designs, using translations, rotations, and reflections in all four quadrants of a coordinate grid.
- G03.05 Identify and describe applications of transformations in construction, industrial, commercial, domestic, and artistic contexts.
- G03.06 Explain the relationship between reflections and lines or planes of symmetry.
- G03.07 Determine and explain whether a given image is a dilation of another given shape, using the concept of similarity.
- G03.08 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.
- G03.09 Solve a contextual problem that involves transformations.

Number (N)

N01 Students will be expected to analyze puzzles and games that involve logical reasoning, using problem-solving strategies. [C, CN, PS, R]

Performance Indicators

(It is intended that this outcome be integrated throughout the course by using puzzles and games such as Sudoku, Mastermind, Nim, and logic puzzles.)

- N01.01 Determine, explain, and verify a strategy to solve a puzzle or to win a game; for example,
- guess and check
 - look for a pattern
 - make a systematic list
 - draw or model
 - eliminate possibilities
 - simplify the original problem
 - work backwards
 - develop alternative approaches
- N01.02 Identify and correct errors in a solution to a puzzle or in a strategy for winning a game.
- N01.03 Create a variation on a puzzle or a game, and describe a strategy for solving the puzzle or winning the game.

N02 Students will be expected to solve problems that involve the acquisition of a vehicle by buying, leasing, and leasing to buy. [C, CN, PS, R, T]

Performance Indicators

- RF05.01 Describe and explain various options for buying, leasing, and leasing to buy a vehicle.
- RF05.02 Solve, with or without technology, problems that involve the purchase, lease, or lease to purchase of a vehicle.
- RF05.03 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.

N03 Students will be expected to critique the viability of small business options by considering expenses, sales, and profit or loss. [C, CN, R]

Performance Indicators

- N03.01 Identify expenses in operating a small business.
- N03.02 Identify feasible small-business options for a given community.
- N03.03 Generate options that might improve the profitability of a small business.
- N03.04 Determine the break-even point for a small business.
- N03.05 Explain factors, such as seasonal variations and hours of operation, that might impact the profitability of a small business.

Algebra (A)

A01 Students will be expected to demonstrate an understanding of linear relations by

- recognizing patterns and trends
- graphing
- creating tables of values
- writing equations
- interpolating and extrapolating
- solving problems

[CN, PS, R, T, V]

Performance Indicators

- A01.01 Identify and describe the characteristics of a linear relation represented in a graph, table of values, number pattern, or equation.
- A01.02 Sort a set of graphs, tables of values, number patterns, and/or equations into linear and non-linear relations.
- A01.03 Write an equation for a given context, including direct or partial variation.
- A01.04 Create a table of values for a given equation of a linear relation.
- A01.05 Sketch the graph for a given table of values.
- A01.06 Explain why the points should or should not be connected on the graph for a context.
- A01.07 Create, with or without technology, a graph to represent a data set, including scatterplots.
- A01.08 Describe the trends in the graph of a data set, including scatterplots.
- A01.09 Sort a set of scatterplots according to the trends represented (linear, non-linear, or no trend).
- A01.10 Solve a contextual problem that requires interpolation or extrapolation of information.
- A01.11 Relate slope and rate of change to linear relations.
- A01.12 Match given contexts with their corresponding graphs, and explain the reasoning.
- A01.13 Solve a contextual problem that involves the application of a formula for a linear relation.

Statistics (S)

S01 Students will be expected to solve problems that involve measures of central tendency, including mean, median, mode, weighted mean, and trimmed mean. [C, CN, PS, R]

Performance Indicators

- S01.01 Explain, using examples, the advantages and disadvantages of each measure of central tendency.
- S01.02 Determine the mean, median, and mode for a set of data.
- S01.03 Identify and correct errors in a calculation of a measure of central tendency.
- S01.04 Identify the outlier(s) in a set of data.
- S01.05 Explain the effect of outliers on mean, median, and mode.
- S01.06 Calculate the trimmed mean for a set of data, and justify the removal of the outliers.
- S01.07 Explain, using examples such as course marks, why some data in a set would be given a greater weighting in determining the mean.
- S01.08 Calculate the mean of a set of numbers after allowing the data to have different weightings (weighted mean).
- S01.09 Explain, using examples from print and other media, how measures of central tendency and outliers are used to provide different interpretations of data.
- S01.10 Solve a contextual problem that involves measures of central tendency.

S02 Students will be expected to analyze and describe percentiles. [C, CN, PS, R]

Performance Indicators

- S02.01 Explain, using examples, percentile ranks in a context.
- S02.02 Explain decisions based on a given percentile rank.
- S02.03 Explain, using examples, the difference between percent and percentile rank.
- S02.04 Explain the relationship between median and percentile.
- S02.05 Solve a contextual problem that involves percentiles.

Probability (P)

P01 Students will be expected to analyze and interpret problems that involve probability. [C, CN, PS, R]

Performance Indicators

- P01.01 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).
- P01.02 Calculate the probability of an event based on a data set.
- P01.03 Express a given probability as a fraction, decimal, and percent and in a statement.
- P01.04 Explain the difference between odds and probability.
- P01.05 Determine the probability of an event, given the odds for or against.
- P01.06 Explain, using examples, how decisions may be based on a combination of theoretical probability calculations, experimental results, and subjective judgements.
- P01.07 Solve a contextual problem that involves a given probability.