2023/24 PEI Math 521A DRAFT Curriculum Document

The following document streamlines the Math 521A curriculum, by narrowing the instructional focus to key content while maintaining its cognitive integrity. This document represents a research-supported, collaborative initiative between Department of Education and Early Years personnel and mathematics teachers across the province.

This document is intended to supplement (not replace) the current curriculum guide, to aid in an efficient delivery of the curriculum. Teachers should continue to consult the curriculum guide and other resources located on the Learn site.

There are three main parts to the following document:

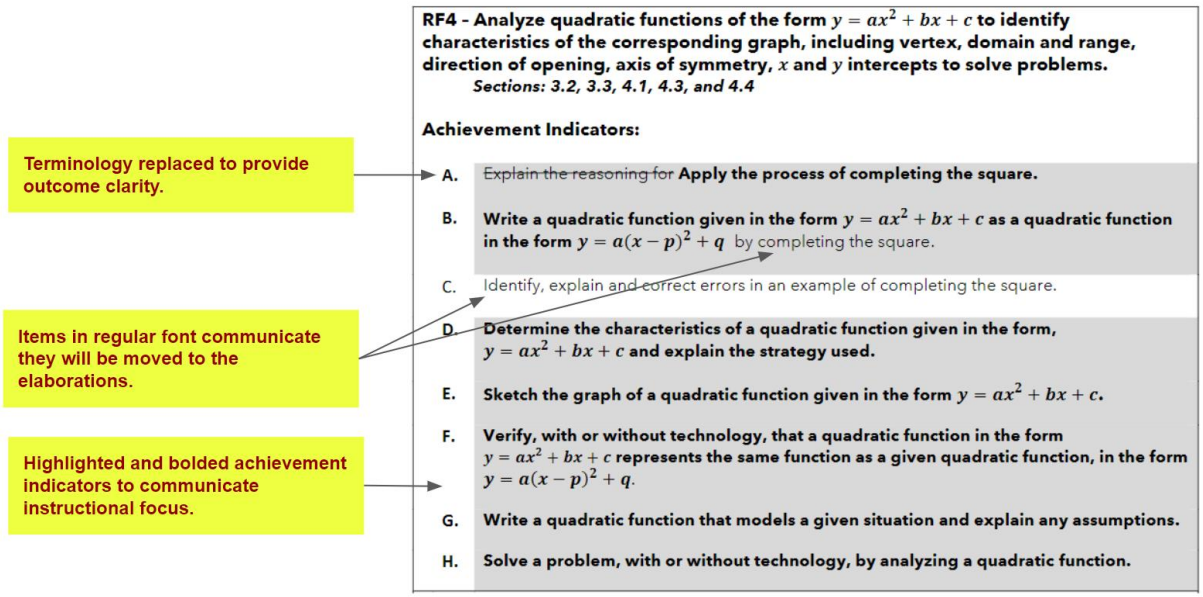
I. Outcomes

Highlighting and bolding have been added to identify key content.

Any text without bolding indicates content that does not need to be directly instructed or summatively assessed. The items not bolded can be used to provide additional instruction or extension opportunities and will be added to the elaborations section of the curriculum guide.

Some wording has been struck through and replaced with terminology to provide clarity.

Note the example outcome from Math 521B provided below:



II. Suggested Sequencing and Timeline

A table providing a recommended sequencing of topics, the outcomes related to that topic, and the suggested instructional time is included. The first two units and the last unit (highlighted in the table) will retain mandatory sequencing.

III. PowerSchool Reporting Structure

A table of the relative and absolute weights in PowerSchool is included.

I. Math 521A Outcomes

Text	Indicators to be retained
~~Text~~	Replaced text to improve clarity
Text	Indicators to be relocated to instructional elaboration

M1 - Solve problems that involve the application of rates.
Section: 8.1 and 8.2

Achievement Indicators:

A.	**Interpret rates in a given context, such as the arts, commerce, the environment, medicine or recreation.**
B.	**Solve a rate problem that requires the isolation of a variable.**
C.	**Determine and compare rates and unit rates.**
D.	**Make and justify a decision, using rates.**
E.	Represent a given rate pictorially.
F.	Draw a graph to represent a rate.
G.	**Explain, using examples, the relationship between the slope of a graph and a rate.**
H.	**Describe a context for a given rate or unit rate.**
I.	**Identify and explain factors that influence a rate in a given context.**
J.	**Solve a contextual problem that involves rates or unit rates.**

M2 - Solve problems that involve scale diagrams, using proportional reasoning.
Section: 8.3

Achievement Indicators:

A.	**Explain, using examples, how scale diagrams are used to model a 2-D shape or a 3-D object.**
B.	**Determine, using proportional reasoning, the scale factor, given one dimension of a 2-D shape or a 3-D object and its representation.**
C.	**Determine, using proportional reasoning, an unknown dimension of a 2-D shape or a 3-D object given a scale diagram or a model.**
D.	Draw, with or without technology, a scale diagram of a given 2-D shape according to a specific scale factor (enlargement or reduction).
E.	**Solve a contextual problem that involves rates or unit rates.**

M3 - Demonstrate an understanding of the relationships among scale factors, areas, surface area, and volumes **of similar 2-D shapes and 3-D objects.**
Section: 8.4, 8.5, *and 8.6*

Achievement Indicators:

A. **Determine the area of a 2-D shape, given the scale diagram, and justify the reasonableness of the result.**

B. Determine the surface area and volume of a 3-D object, given the scale diagram, and justify the reasonableness of the result.

C. **Explain, using examples, the effect of a change in the scale factor on the area of a 2-D shape.**

D. Explain, using examples, the effect of a change in the scale factor on the surface area of a 3-D object.

E. Explain, using examples, the effect of a change in the scale factor on the volume of a 3-D object.

F. **Explain, using examples, the relationships among scale factors and area of a 2-D shape**, surface area of a 3-D object and volume of a 3-D object.

G. **Solve a spatial problem that requires the manipulation of formulas.**

H. **Solve a contextual problem that involves the relationship among scale factors, areas,** and volumes.

G1 - Derive proofs that involve the properties of angles and triangles.
Sections: 2.1, 2.2, 2.3, and 2.4

Achievement Indicators:

A. **Generalize, using inductive reasoning, the relationship between pairs of angles formed by transversals and parallel lines, with or without technology.**

B. ~~Prove~~ **Justify, using deductive reasoning, properties of angles formed by transversals and parallel lines, including the sum of the angles in a triangle.**

C. **Generalize, using inductive reasoning examples, a rule for the relationship between the sum of the interior angles and the number of sides, n, in a polygon with or without technology.**

D. **Identify and correct errors in a given proof of a property involving angles.**

E. **Verify, with examples, that if lines are not parallel, the angle properties do not apply.**

G2 - Solve problems that involve the properties of angles and triangles.
Sections: 2.1, 2.2, 2.3, and 2.4

Achievement Indicators:

A. **Determine the measures of angles in a diagram that involves parallel lines, angles and triangles, and justify the reasoning.**

B. **Identify and correct errors in a given solution to a given problem that involves the measures of angles.**

C. **Solve a contextual problem that involves angles or triangles.**

D. Construct parallel lines, using only a compass or a protractor, and explain the strategy used.

E. **Determine if lines are parallel, given the measure of an angle at each intersection formed by the lines and a transversal.**

G3 - Solve problems that involve the cosine law and the sine law, including the ambiguous case.
Sections: 3.1, 3.2, 3.3, 3.4, *4.1,* ***4.2,*** *4.3,* ***and 4.4***

Achievement Indicators:

A. **Draw a diagram to represent a problem that involves the cosine law or sine law.**

B. Explain the steps in a given proof of the sine law or the cosine law.

C. **Solve a problem involving the cosine law that requires the manipulation of a formula.**

D. Explain, concretely, pictorially, or symbolically, whether zero, one, or two triangles exist, given two sides and a non-included angle.

E. **Solve a problem involving the sine law that requires the manipulation of a formula.**

F. **Solve a contextual problem that involves the sine law or the cosine law.**

G. Determine the relationships between the primary trigonometric ratios of an acute angle and its supplement.

LR1 - Analyse and prove conjectures, using inductive and deductive reasoning, to solve problems.

Sections: 1.1, 1.2, 1.3, 1.4, *1.5, and 1.6*

Achievement Indicators:

A. **Make conjectures by observing patterns and identifying properties and justify the reasoning.**

B. **Explain why inductive reasoning may lead to a false conjecture.**

C. **Compare, using examples, inductive and deductive reasoning.**

D. **Provide and explain a counterexample to disprove a given conjecture.**

E. **Prove** algebraic and number relationships, such as divisibility rules, number properties, mental mathematics strategies or **algebraic number tricks.**

F. Prove a conjecture, using deductive reasoning (not limited to two column proofs).

G. **Determine if a given argument is valid and justify the reasoning.**

H. Identify errors in a given proof; e.g., a proof that ends with $2 = 1$.

I. Solve a contextual problem involving inductive or deductive reasoning.

LR2 - Analyse puzzles and games that involve spatial reasoning, using problem-solving strategies.

Section: 1.7 and throughout the text

Achievement Indicators:

A. **Determine, explain and verify a strategy to solve a puzzle or to win a game. (e.g., guess and check; look for a pattern; make a systematic list; draw or model; eliminate possibilities; simplify the original problem; work backward; develop alternate approaches.**

B. **Identify and correct errors in a solution to a puzzle or in a strategy for winning a game.**

C. Create a variation on a puzzle or game and describe a strategy for solving the puzzle or winning the game.

S1 - Demonstrate an understanding of normal distribution, including: standard deviation; z-scores.

Sections: 5.1, *5.2,* ***5.3, 5.4, and 5.5***

Achievement Indicators:

A. **Explain, using examples, the meaning of standard deviation.**

B. **Calculate, using technology, the population standard deviation of a data set.**

C. **Explain, using examples, the properties of a normal curve, including the mean, median, mode, standard deviation, symmetry, and area under the curve.**

D. **Determine if a data set approximates a normal distribution and explain the reasoning.**

E. **Compare the properties of two or more normally distributed data sets.**

F. **Explain, using examples that represent multiple perspectives, the application of standard deviation for making decisions in situations such as those involving warranties, insurance, or opinion polls.**

G. **Solve a contextual problem that involves the interpretation of standard deviation.**

H. **Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set.**

I. **Solve a contextual problem that involves normal distribution.**

J. **Explore the similarities and differences between two sets of data.**

K. Create frequency tables and graphs from a set of data.

S2 - Interpret statistical data, using confidence intervals, confidence level, and margins of error.

Section: 5.6

Achievement Indicators:

A.	**Explain, using examples, how confidence levels, margins of error and confidence intervals may vary depending on the size of the random sample.**
B.	**Explain, using examples, the significance of a confidence interval, margin of error or confidence level.**
C.	**Make inferences about a population from sample data, using given confidence intervals, and explain the reasoning.**
D.	**Provide examples from print or electronic media in which confidence intervals and confidence levels are used to support a particular position.**
E.	**Interpret and explain confidence intervals and margins of error, using examples found in print or electronic media.**
F.	**Support a position by analysing statistical data presented in the media.**

RF1 - Model and solve problems that involve systems of linear inequalities in two variables.

Sections: 6.1, 6.2, 6.3, 6.4, 6.5, and 6.6

Achievement Indicators:

A.	**Model a problem, using a system of linear inequalities in two variables.**
B.	**Graph the boundary line between two half planes for each inequality in a system of linear inequalities and justify the choice of solid or broken lines.**
C.	**Determine and explain the solution region that satisfies a linear inequality, using a test point when given a boundary line.**
D.	**Determine, graphically, the solution region for a system of linear inequalities, and verify the solution.**
E.	**Explain, using examples, the significance of the shaded region in the graphical solution of a system of linear inequalities.**
F.	**Solve an optimization problem, using linear programming.**

RF2 - Demonstrate an understanding of the characteristics of quadratic functions, including: vertex; intercepts; domain and range; axis of symmetry.
Sections: 7.1, 7.2, 7.3, *7.4, 7.5,* ***7.6, 7.7, and 7.8***

Achievement Indicators:

A.	**Determine, with or without technology, the intercepts of the graph of a quadratic function.**
B.	Determine, by factoring, the roots of a quadratic equation, and verify by substitution.
C.	**Determine, using the quadratic formula, the roots of a quadratic equation.**
D.	**Explain the relationships among the roots of an equation, the zeros of the corresponding function, and the x-intercepts of the graph of the function.**
E.	**Explain, using examples, why the graph of a quadratic function may have zero, one or two x-intercepts.**
F.	Express a quadratic equation in factored form, using the zeros of the corresponding function or the x-intercepts of its graph.
G.	**Determine, with or without technology, the coordinates of a vertex of the graph of a quadratic function.**
H.	**Determine the equation of the axis of symmetry of the graph of a quadratic function, given the x-intercepts of the graph.**
I.	**Determine the coordinates of the vertex of the graph of a quadratic function, given the equation of the function and the axis of symmetry, and determine if the y-coordinate of the vertex is a maximum or a minimum.**
J.	**Determine the domain and range of a quadratic function.**
K.	**Sketch the graph of a quadratic function.**
L.	**Solve a contextual problem that involves the characteristics of a quadratic function.**

MRP1 - Research and give a presentation on a historical event or an area of interest that involves mathematics.

II. Suggested Sequencing and Timeline

The following table contains a suggested topic sequencing as well as an approximate time frame to cover each of the topics. The first two units and the last unit (highlighted in the table) will retain mandatory sequencing. The time frame is based on a total of 80 classes, each with an average length of 75 minutes:

Topic	Outcomes	Suggested Time
Properties of Angles and Triangles	**G1, G2**	9 classes
Trigonometry	**G3**	10 classes
Statistical Reasoning	**S1, S2**	14 classes
Systems of Linear Inequalities	**RF1**	15 classes
Quadratics	**RF2**	17 classes
Proportional Reasoning	**M1, M2, M3**	8 classes
Inductive and Deductive Reasoning	**LR1, LR2**	7 classes
	Total	80 classes

III. PowerSchool Reporting Structure

Topic	Relative (%)	Absolute (%)
Properties of Angles and Triangles	9.3	7
Trigonometry	14.6	11
Statistical Reasoning	18.6	14
Systems of Linear Inequalities	20	15
Quadratics	22.8	17
Proportional Reasoning	8	6
Inductive and Deductive Reasoning	6.7	5
Major Assessment		25