SENIOR SCHOOL

MINISTRY OF EDUCATION
DEPARTMENT OF EDUCATION

Essential Curriculum

2008

Curriculum and Instructional Leadership
Performance Standards Summary

MATHEMATICS

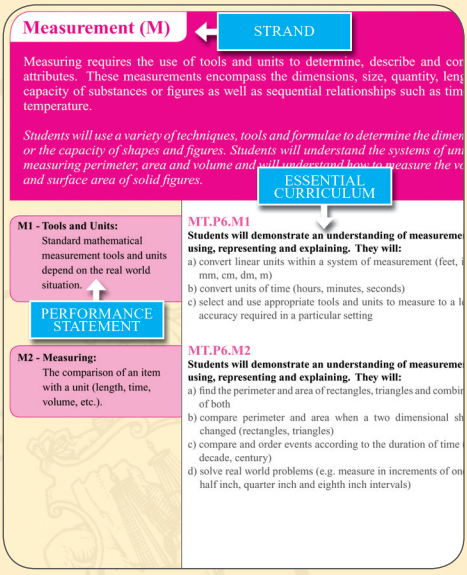

QUO·FATA·FERUNT

PERFORMANCE STANDARDS ARE LEARNING EXPECTATIONS

"THE ESSENTIAL CURRICULUM"

The mission of the Bermuda Public School System (BPSS) is ***to be the first choice in education by providing rigorous and stimulating learning experiences in safe, responsive environments from which our students emerge confident and prepared to compete and contribute locally and globally.***

Performance Standards are statements of what students should know and be able to do and how they should demonstrate their knowledge and skills at the end of each year. Included within the Performance Standards document are **strands, performance statements** and **assessment indicators** for English language arts, mathematics, science and social studies. It is important to note that the assessment indicators listed in this booklet represents the **"Essential Curriculum."** They are the critical guidelines for ongoing and island-wide curriculum based assessment. They are guideposts in the journey our students make from the time they enter our schools to the time they graduate ***confident and prepared to compete and contribute locally and globally.***



Serving as guideposts, performance standards establish shared expectations for the:

- completion of each year of our school system,
- guidance in terms of how we may need to redirect our efforts during any given year of our school system
- direction in terms of what we should be able to expect of students entering each subsequent year of our school system.

As they serve as guideposts for teachers responsible for maximizing students' learning experiences, performance standards tell us not only the ***ultimate*** goals for each year level but also provide direction towards achievement of the goals ***during*** each year.

Bermuda Performance Standards will be used to:

- emphasize the concepts and processes all students should learn with understanding.
- provide explicit goals for student expectation at the end of each year.
- guide Bermuda Criterion Reference and classroom assessments

Mathematics (MT)

Number and Number Operations (N)

Patterns, Functions and Algebra (A)

Geometry (G)

Measurement (M)

Data Handling (D)

S1 MATHEMATICS (MT)

S2 MATHEMATICS (MT)

BERMUDA MATHEMATICS PERFORMANCE STANDARDS (MT)

Many of the elementary terms and concepts of mathematics have concrete applications and examples in the world. For they are part of a language developed to describe the physical (and social) world.
(Ernest, 1991, p.56)

"Improving mathematics education is not a matter of adding a little spice to a dull subject or of making a few minor changes in content or approach. It requires no less than a redefinition of mathematics (instruction) and an understanding that (its) goal must be the development of mathematical power in all students" (Parker, 1993, p. xi). From as early as preschool, we attempt to present the students with a balance of conceptual understanding, skills and problem solving. Mathematics is no longer viewed as the subject to be mastered by the chosen few. *Principles and Standards for School Mathematics,* published by the National Council of Teachers of Mathematics (NCTM 2000, p.4) states that the need to understand and be able to use mathematics in everyday life and in the workplace has never been greater and will continue to increase. While some careers are considered mathematics intensive, all will require fundamental mathematical skills, procedures and understandings.

The *Bermuda Mathematics Performance Standards* were developed from standards defined by the *National Council of Teachers of Mathematics* and from various jurisdictions including the United Kingdom and Canada. The *Bermuda Mathematics Performance Standards* support the Bermuda Mathematics Curriculum. The curriculum identifies the distribution of mathematics content over a 14-year period. It advises when enduring understandings and procedural knowledge should be introduced, reinforced and/or developed. The *Standards* provide a framework for assessing the understandings and applications of essential mathematical ideas, that is, what students should know and be able to do. The assessment indicators listed in the *Standards* define the critical elements of the mathematics programme that will be formally assessed at the end of each year level from Primary 3 through Senior 2. The assessment instruments will be comprised of selected- and constructed-response items with an emphasis on reasoning and problem solving. Students will be required to produce evidence that they are able to use, represent and explain the fundamental components of the mathematics programme. The *Standards* include these conceptual areas:

NUMBER AND NUMBER OPERATIONS (N)

A sense of number implies an ability to describe and apply relationships among numbers including their uses and their representations. These numbers are effectively used for various purposes such as counting, measuring, estimating and problem solving. A range of methods of computation is applied to practical tasks, in real-life situations and within mathematics itself.

N1. **Numerical Representation** - The positions of the digits in numbers determine what they represent, that is, which size group they count, measure or order and these numbers are best understood in terms of familiar real-world experiences, such as budgeting, cooking, carpentry, etc.
N2. **Numerical Operations** - Numerical operations consist of taking apart and combining numbers using a variety of strategies which require an understanding of the properties of the operations. Manipulatives and diagrams are used to model these operations and their inverses and to relate them to their symbolic expressions. The mathematical models or representations are also used to assist with solving contextual problems.
N3. **Numerical Relationships** - Equal shares or equal-sized portions of a whole or unit are compared using a variety of representations. Fractions, decimals and percents can be used interchangeably and equivalent fractions are ways of describing the same amount by using different-sized fractional parts. Ratio and proportion are used to represent relationships between quantities and measures as applied in problem solving

PATTERNS, FUNCTIONS AND ALGEBRA (A)

The generalization of patterns, relationships and change are expressed by means of symbolic notation, algebraic equations and graphical representations. Reasoning is used to generalize, formalize and communicate patterns and regularity in all aspects of mathematics.

A1. **Patterns and Functions** - Patterns are regular and predictable changes. They are found in nature, and numbers, as well as in physical and geometrical situations. Patterns show relationships among variables and can be recognized, extended or generalized.
A2. **Algebraic Representation** - Symbols are used to represent variables and equations. They assist us with understanding the patterns and relationships among forms of representations -

words, tables, graphs and rules. Variables are symbols used to represent quantities that change - time, temperature, distance traveled.

A3. **Algebraic Reasoning** consists of a variety of formats used to assist with understanding, justifying or presenting solutions to problems. Equations and inequalities are used to express the relationships.

GEOMETRY (G)

Spatial sense involves the application of the properties and relationships of points, lines, angles, planes and curves of shapes and solids. The space around us and the measurement of the objects and shapes in that space are defined and categorized according to a specific set of assumptions.

G1. **Classification** - Both two-dimensional and three-dimensional shapes can be described, analysed and classified in a variety of ways and according to their properties and relationships.
G2. **Spatial Reasoning** - Geometric properties, reasoning and visualization can be used to solve problems.
G3. **Transformations** - Draw shapes and build models

MEASUREMENT (M)

Measuring requires the use of tools and units to determine, describe and compare attributes. These measurements encompass the dimensions, size, quantity, length, or capacity of substances or figures as well as sequential relationships such as time and temperature.

S1. **Tools and Units** - Standard mathematical measurement tools and units depend on the real world situation.
M2. **Measuring** - The comparison of an item with a unit (length, time, volume, etc.)

DATA HANDLING (D)

Data may be presented in a variety of representations including graphs to show logical relationships between various quantities and to assist with decision-making. The collection and analysis of data is identified as either statistics or probability. Statistics is the mathematics used for collecting, organizing, and studying data while probability is the measure of the likelihood of an event.

D1. **Data Collection and Organization** - Data are collected and organised to help with the making of decisions, the drawing of inferences or the development of new ideas.
D2. **Representation** - Appropriate representations of data depend on characteristics of that data.
D3. **Analysis and Interpretation** - Provides information on the attributes of data
D4. **Probability** - The occurrence or non-occurrence of an event is characterized as impossible, less likely, equally likely, more likely or certain. The likelihood of an event or its probability is quoted as a ratio between 0 and 1 inclusive.

Mathematics processes are the means by which students use mathematical ideas and procedures to communicate, represent, connect, reason and solve problems. These skills assist in the acquisition of knowledge and the application of ideas. Students are required to use a variety of techniques to understand and solve problems, reason and construct proofs as well as communicate and make connections. They express and extend their mathematical ideas using correct notations, generalizations, inferences and rigorous arguments leading to notions of proof. The solutions involve a process as well as a product.

The use of mathematical process skills are categorized as follows:

1. **Mathematical processes are used to identify and explain everyday experiences, in and outside of school, and to make connections with other disciplines.**
   a) use reasoning ability to analyze, perceive patterns, identify relationships and formulate questions for further exploration
   b) formulate a problem and set limits for acceptable solutions

2. **Mathematical reasoning and problem solving provide a means for making sense of, investigating, evaluating and justifying the solution to problems.**
   a) systematically apply a model (plan) for problem solving - understand the problem, select a strategy, implement the strategy, evaluate the solution.
   b) select or develop an appropriate problem-solving strategy
   c) analyze problems using appropriate processes such as modelling, simplifying, generalizing, etc
   d) validate conclusions using mathematical properties and relationships

3. **Appropriate mathematical representations and technology tools are used to illustrate and assist with the solution process.**
    a) determine the most efficient manner to solve problems
    b) design representations of the problem using technology and appropriate mathematical discourse (terminology, symbols and drawings)
    c) select mathematical ideas and tools to support the reasoning process

4. **Ideas and solutions are communicated mathematically using language and symbols, efficient tools, appropriate units and graphical, numerical, physical or algebraic models.**

    a) communicate logical arguments clearly to show why the solution makes sense

Using the Standards as a framework, the assessment results will provide teachers with information on how well the students perform procedures, understand concepts, solve problems and communicate their reasoning. Administrators will be able to analyze and compare data to ascertain trends in student performance over time. The Bermuda Mathematics Performance Standards define the framework for assessing the depth and breadth our students are engaging in mathematical thinking and are confidently using quantitative and spatial information to make decisions.

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Number and Number Operations (N)

A sense of number implies an ability to describe and apply relationships among numbers, their uses and their representations. These numbers are effectively used for various purposes such as counting, measuring, estimating and problem solving. A range of methods of computation is applied to practical tasks, in real-life situations and within mathematics itself.

Students will explore and make sense of the meaning, relationship and application of numbers, number systems and number operations. They will extend their estimation and computation skills, develop procedural fluency and represent their conceptual understanding using words, formulas, diagrams, charts and graphs.

N1 - Numerical Representation: The positions of the digits in numbers determine what they represent, that is, which size group they count, measure or order and these numbers are best understood in terms of familiar real-world experiences, such as budgeting, cooking, carpentry, etc.

MT.S1.N1

Students will demonstrate an understanding of numbers, by using, representing and explaining. They will:

a) understand and apply the relationship between squares and square roots and cubes and cube roots to solve problems

b) represent and use whole numbers, integers and exponentials in a variety of equivalent forms including in real world and problem situations (also scientific notation)

c) add, subtract, multiply and divide negative rational numbers

d) know and apply the properties of special numbers, 0, 1 and $\prod$

N2 - Numerical Operations: Numerical operations consist of taking apart and combining numbers using a variety of strategies which require an understanding of the properties of the operations. Manipulatives and diagrams are used to model these operations and their inverses and to relate them to their symbolic expressions. The mathematical models or representations are also used to assist with solving contextual problems.

MT.S1.N2

Students will demonstrate an understanding of numbers, by using, representing and explaining. They will:

a) use the calculator functions such as memory, constant and brackets to solve a problem and evaluate expressions

b) use a variety of methods to check results and to determine reasonableness of the solution, including estimation and inverse operations

Number and Number Operations (N) (continued)

A sense of number implies an ability to describe and apply relationships among numbers, their uses and their representations. These numbers are effectively used for various purposes such as counting, measuring, estimating and problem solving. A range of methods of computation is applied to practical tasks, in real-life situations and within mathematics itself.

Students will explore and make sense of the meaning, relationship and application of numbers, number systems and number operations. They will extend their estimation and computation skills, develop procedural fluency and represent their conceptual understanding using words, formulas, diagrams, charts and graphs.

N3 - Numerical Relationships : Equal shares or equal-sized portions of a whole or unit are compared using a variety of representations. Fractions, decimals and percents can be used interchangeably and equivalent fractions are ways of describing the same amount by using different-sized fractional parts. Ratio and proportion are used to represent relationships between quantities and measures as applied in problem solving.

MT.S1.N3

Students will demonstrate an understanding of numbers, by using, representing and explaining. They will:

a) apply fractions, decimals, and percents in a variety of equivalent forms including in real world and problem situations

b) solve simple proportion problems using such methods as unit rate, scaling and finding the proportion equation a/b = c/d

c) apply the relationships and applications of ratio, proportion and percentage (gratuity/tip [15%], customs duty [25%] on all items purchased outside of Bermuda, payroll tax [4.75%], discounts [5% grocery shopping], and simple interest])

Patterns, Functions and Algebra (A)

The generalization of patterns, relationships and change is expressed by means of symbolic notation, algebraic equations and graphical representations. Reasoning is used to generalise, formalise and communicate patterns and regularity in all aspects of mathematics.

Students will explore and make sense of patterns, functions, symbols and models. They will use symbolic forms to represent and analyze mathematical situations and use mathematical models to analyze change in both real and abstract contexts. Students will create and translate multiple representations of mathematical relationships.

A1 - Patterns and Functions:
Patterns are regular and predictable changes. They are found in nature, and numbers, as well as in physical and geometrical situations. Patterns show relationships among variables and can be recognized, extended or generalized.

MT.S1.A1

Students will demonstrate an understanding of algebra, by using, representing and explaining. They will:

a) generalise and extend patterns represented graphically or numerically with words or symbolic rules
b) analyze and create patterns, functions and graphs to represent and solve problems
c) use and interpret formulas to answer questions about quantities and their relationships
d) compare properties of linear functions between or among tables, graphs and equations
e) analyse the nature of change (including slope and intercepts) in quantities in linear relationships

A2 - Algebraic Representation:
Symbols are used to represent variables and equations. They assist us with understanding the patterns and relationships among forms of representations - words, tables, graphs and rules. Variables are symbols used to represent quantities that change - time, temperature, distance traveled.

MT.S1.A2

Students will demonstrate an understanding of algebra, by using, representing and explaining. They will:

a) apply mathematical relationships expressed as numbers and symbols
b) factor polynomials (e.g., $3a - 9$; $a^2 - 9$)
c) multiply and divide expressions with positive exponents/indices/powers
d) interpret negative and fractional exponents (e.g., x^{-1} and $27^{2/3}$
e) apply basic algebraic operations, such as, combining like terms, expanding and substituting for unknowns
f) graph ordered pairs on a coordinate grid

A3 - Algebraic Reasoning:
Algebraic reasoning consists of a variety of formats used to assist with understanding, justifying or presenting solutions to problems. Equations and inequalities are used to express the relationships.

MT.S1.A3

Students will demonstrate an understanding of algebra, by using, representing and explaining. They will:

a) model and solve problems set in their natural context using representations such as patterns, graphs, tables and equations
b) solve linear equations with unknowns on both sides including fractions
c) model inequalities concretely (e.g., algebra tiles) and pictorially (e.g., graphs and tables) and abstractly
d) solve linear equations and simple systems of equations (set in context) and interpret their solution(s)

Geometry (G)

Spatial sense involves the application of the properties and relationships of points, lines, angles, planes and curves of shapes and solids. The space around us and the measurement of the objects and shapes in that space are defined and categorized according to a specific set of assumptions.

Students will use a variety of techniques, tools and formulas to analyze characteristics and properties of two- and three-dimensional geometric objects; apply coordinate geometry and graph theory; and solve problems using visualization and spatial reasoning

G1 - Classification:
Both two-dimensional and three-dimensional shapes can be described, analysed and classified in a variety of ways and according to their properties and relationships.

MT.S1.G1

Students will demonstrate an understanding of geometry by using, representing and explaining. They will:

a) solve problems using geometric properties
b) apply the angle and line properties of a circle
• *angles at the centre of a circle*
• *angles standing on the same arc*
c) classify and analyse similar and congruent triangles
d) describe geometric properties and relationships (slope, intercept, parallelism, perpendicularity) using the coordinate system

G2 - Spatial Reasoning:
Geometric properties, reasoning and visualization can be used to solve problems.

MT.S1.G2

Students will demonstrate an understanding of geometry by using, representing and explaining. They will:

a) solve real-world problems using geometric models
b) determine lengths of sides and measures of angles using trigonometric ratios (sine, cosine, tangent)
c) solve real-world problems using the Pythagorean Theorem

G3 - Transformations:
Draw shapes and build models.

MT.S1.G3

Students will demonstrate an understanding of geometry by using, representing and explaining. They will:

a) identify and describe the properties of figures by using appropriate transformations (translations, rotations, reflections, enlargements)
b) build physical models and use them to describe the relationship among figures and the relationship among their parts
c) draw shapes concisely using appropriate tools

Measurement (M)

Measuring requires the use of tools and units to determine, describe and compare attributes. These measurements encompass the dimensions, size, quantity, length or capacity of substances or figures as well as sequential relationships such as time and temperature.

Students will use a variety of techniques, tools and formulae to determine the dimensions or the capacity of shapes and figures. Students will understand the systems of units for measuring perimeter, area and volume and will understand how to measure the volume and surface area of solid figures.

M1 - Tools and Units:
Standard mathematical measurement tools and units depend on the real world situation.

MT.S1.M1

Students will demonstrate an understanding of measurement by using, representing and explaining. They will:

a) justify the use of various systems of measurement and be proficient in the conversion of units within the same system
b) select the appropriate units which must be used to solve measurement problems

M2 - Measuring:
The comparison of an item with a unit (length, time, volume, etc.).

MT.S1.M2

Students will demonstrate an understanding of measurement by using, representing and explaining. They will:

a) solve problems based on perimeter, area (include trapezoid) and volume using both standard and metric units
b) explain how a change in one or more dimensions of a geometric shape affects perimeter, area, volume and surface area
c) calculate the volumes and surface area of rectangular prisms, pyramids, cylinders, cones and spheres (provide formulae)
d) use proportion to solve measurement problems (give similar figures)
e) use formulae to solve problems involving speed, distance and time

Data Handling (D)

Data may be presented in a variety of representations, including graphs to show logical relationships between various quantities and to assist with decision-making. The collection and analysis of data is identified as either statistics or probability. Statistics is the mathematics used for collecting, organizing, and studying data while probability is the measure of the likelihood of an event.

Mathematics instruction will include data analysis, statistics and probability. Students will be given the opportunity to pose questions and collect, organize, represent and interpret data to answer those questions; develop and evaluate predictions and arguments that are based on data; and apply basic notions of chance and probability. Students will use technology tools to investigate large samples, explore graphical representations and simulate events.

D1 - Data Collection and Organisation:
Data are collected and organised to help with the making of decisions, the drawing of inferences or the development of new ideas.

MT.S1.D1
Students will demonstrate an understanding of data handling by using, representing and explaining. They will:
a) collect, and organise, real-world data (include sampling methods)
b) design and execute surveys or experiments, gather data to answer questions and communicate the results using traditional methods and technology
c) construct frequency tables using ungrouped data

D2 - Representation:
Appropriate representations of data depend on characteristics of that data.

MT.S1.D2
Students will demonstrate an understanding of data handling by using, representing and explaining. They will:
a) represent and display data (graphs, tables, histograms, etc.)

D3 - Analysis and interpretation:
Provides information on the attributes of data.

MT.S1.D3
Students will demonstrate an understanding of data handling by using, representing and explaining. They will:
a) apply mean, median and mode to solve problems
b) analyse interpret and use data for a data display

D4 - Probability:
The occurrence or non-occurrence of an event is characterized as impossible, less likely, equally likely, more likely or certain. The likelihood of an event or its probability is quoted as a ratio between 0 and 1 inclusive.

MT.S1.D4
Students will demonstrate an understanding of data handling by using, representing and explaining. They will:
a) find the probability of dependent and independent events
b) design and use experimental and theoretical probability to represent and solve problems (include the "Fundamental Counting Principle")

PLANNING NOTES

Number and Number Operations (N)

A sense of number implies an ability to describe and apply relationships among numbers, their uses and their representations. These numbers are effectively used for various purposes such as counting, measuring, estimating and problem solving. A range of methods of computation is applied to practical tasks, in real-life situations and within mathematics itself.

Students will explore and make sense of the meaning, relationship and application of numbers, number systems and number operations. They will extend their estimation and computation skills, develop procedural fluency and represent their conceptual understanding using words, formulas, diagrams, charts and graphs.

N1 - Numerical Representation:
The positions of the digits in numbers determine what they represent, that is, which size group they count, measure or order and these numbers are best understood in terms of familiar real-world experiences, such as budgeting, cooking, carpentry, etc.

MT.S2.N1

Students will demonstrate an understanding of numbers, by using, representing and explaining. They will:

a) understand and apply the relationship between squares and square roots and cubes and cube roots to solve problems

b) represent and use whole numbers, integers and exponentials in a variety of equivalent forms including in real world and problem situations (also scientific notations)

c) know and apply the properties of special numbers, 0, 1 and $\prod$

N2 - Numerical Operations:
Numerical operations consist of taking apart and combining numbers using a variety of strategies which require an understanding of the properties of the operations. Manipulatives and diagrams are used to model these operations and their inverses and to relate them to their symbolic expressions. The mathematical models or representations are also used to assist with solving contextual problems.

MT.S2.N2

Students will demonstrate an understanding of numbers, by using, representing and explaining. They will:

a) use the calculator functions such as memory, constant and brackets to solve a problem and evaluate expressions

b) understand and use the inverse relationship between exponents and roots

c) use a variety of methods to check results and to determine reasonableness of the solution, including estimation and inverse operations

d) apply operations using rational numbers

Number and Number Operations (N) (continued)

A sense of number implies an ability to describe and apply relationships among numbers, their uses and their representations. These numbers are effectively used for various purposes such as counting, measuring, estimating and problem solving. A range of methods of computation is applied to practical tasks, in real-life situations and within mathematics itself.

Students will explore and make sense of the meaning, relationship and application of numbers, number systems and number operations. They will extend their estimation and computation skills, develop procedural fluency and represent their conceptual understanding using words, formulas, diagrams, charts and graphs.

N3 - Numerical Relationships : Equal shares or equal-sized portions of a whole or unit are compared using a variety of representations. Fractions, decimals and percents can be used interchangeably and equivalent fractions are ways of describing the same amount by using different-sized fractional parts. Ratio and proportion are used to represent relationships between quantities and measures as applied in problem solving.

MT.S2.N3

Students will demonstrate an understanding of numbers, by using, representing and explaining. They will:

a) apply fractions, decimals and percents in a variety of equivalent forms in real world and problem situations (including compound interest)

b) use direct and inverse proportion to solve problems set in context

Patterns, Functions and Algebra (A)

The generalization of patterns, relationships and change is expressed by means of symbolic notation, algebraic equations and graphical representations. Reasoning is used to generalise, formalise and communicate patterns and regularity in all aspects of mathematics.

Students will explore and make sense of patterns, functions, symbols and models. They will use symbolic forms to represent and analyze mathematical situations and use mathematical models to analyze change in both real and abstract contexts. Students will create and translate multiple representations of mathematical relationships.

A1 - Patterns and Functions:
Patterns are regular and predictable changes. They are found in nature, and numbers, as well as in physical and geometrical situations. Patterns show relationships among variables and can be recognized, extended or generalized.

MT.S2.A1

Students will demonstrate an understanding of algebra, by using, representing and explaining. They will:

a) analyse and extend patterns represented graphically or numerically
b) identify values of functions and use them in applications, e.g., real-world phenomena involving growth and decay
c) perform operations on functions
d) use slope to show rate of change in linear functions arising from real-world situations

A2 - Algebraic Representation:
Symbols are used to represent variables and equations. They assist us with understanding the patterns and relationships among forms of representations - words, tables, graphs and rules. Variables are symbols used to represent quantities that change - time, temperature, distance traveled.

MT.S2.A2

Students will demonstrate an understanding of algebra, by using, representing and explaining. They will:

a) apply mathematical relationships expressed as words, numbers and symbols
b) factor polynomial expressions including trinomials (coefficient of $x^2 = 1$)
c) add, subtract and multiply simple algebraic expressions including binomial multiplication
d) write equations for linear graphs (i.e., given two points, write the equation of the line)
e) use tables and graphs to models the relationships between two real-world quantities (e.g., the relationship between British pounds and Bermuda dollars)
f) evaluate algebraic expressions, including substitution

A3 - Algebraic Reasoning:
Algebraic reasoning consists of a variety of formats used to assist with understanding, justifying or presenting solutions to problems. Equations and inequalities are used to express the relationships.

MT.S2.A3

Students will demonstrate an understanding of algebra, by using, representing and explaining. They will:

a) model and solve problems set in their natural context using representations such as patterns, graphs, tables and equations
b) solve linear equations with unknowns on both sides and with brackets
c) solve linear inequalities
d) solve systems of linear equations (two equations in two variables), including systems that arise from real-world problems using symbolic and graphical methods
e) determine solutions to quadratic equations

Geometry (G)

Spatial sense involves the application of the properties and relationships of points, lines, angles, planes and curves of shapes and solids. The space around us and the measurement of the objects and shapes in that space are defined and categorized according to a specific set of assumptions.

Students will use a variety of techniques, tools and formulas to analyze characteristics and properties of two- and three-dimensional geometric objects; apply coordinate geometry and graph theory; and solve problems using visualization and spatial reasoning

G1 - Classification:
Both two-dimensional and three-dimensional shapes can be described, analysed and classified in a variety of ways and according to their properties and relationships.

MT.S2.G1

Students will demonstrate an understanding of geometry by using, representing and explaining. They will:

a) solve triangles using geometric properties (Pythagoras' Theorem, trigonometric ratios)
b) apply the angle and line properties of a circle
• *angles at the centre of the circle*
• *angles standing on the same arc*
c) classify and analyse similar and congruent triangles
d) describe and characterise geometric properties and relationships (slope, intercept, parallelism, perpendicularity) using the coordinate system
e) perform calculations and simple proofs using lines and angles

G2 - Spatial Reasoning:
Geometric properties, reasoning and visualization can be used to solve problems.

MT.S2.G2

Students will demonstrate an understanding of geometry by using, representing and explaining. They will:

a) demonstrate an understanding of the three ratios used in right-angled triangle trigonometry (sine, cosine, tangent)
b) solve real-world problems using right-angled triangle trigonometry and the Pythagorean Theorem (angles of elevation and depression)

G3 - Transformations:
Draw shapes and build models.

MT.S2.G3

Students will demonstrate an understanding of geometry by using, representing and explaining. They will:

a) analyse the properties of figures by using appropriate transformations (translations, rotations, reflections, enlargements)
b) build physical models and use them to analyse the relationship among figures and the relationship among their parts
c) draw shapes concisely using appropriate tools

Measurement (M)

Measuring requires the use of tools and units to determine, describe and compare attributes. These measurements encompass the dimensions, size, quantity, length or capacity of substances or figures as well as sequential relationships such as time and temperature.

Students will use a variety of techniques, tools and formulae to determine the dimensions or the capacity of shapes and figures. Students will understand the systems of units for measuring perimeter, area and volume and will understand how to measure the volume and surface area of solid figures.

M1 - Tools and Units:
Standard mathematical measurement tools and units depend on the real world situation.

MT.S2.M1

Students will demonstrate an understanding of measurement by using, representing and explaining. They will:

a) justify the use of various systems of measurement and be proficient in the conversion of units within the same system

b) select the appropriate tools and units to solve measurement problems

M2 - Measuring:
The comparison of an item with a unit (length, time, volume, etc.).

MT.S2.M2

Students will demonstrate an understanding of measurement by using, representing and explaining. They will:

a) solve problems based on perimeter, area and volume using both standard and metric units

b) calculate the volumes and surface areas of rectangular prisms, pyramids, cylinders, cones and spheres in problem setting context (provide formulae)

c) solve problems using measurement tools and concepts (e.g., Given a diagram drawn to scale, i.e., 1/4 inch represents 1 foot, use the information to calculate the actual length)

Data Handling (D)

Data may be presented in a variety of representations, including graphs to show logical relationships between various quantities and to assist with decision-making. The collection and analysis of data is identified as either statistics or probability. Statistics is the mathematics used for collecting, organizing, and studying data while probability is the measure of the likelihood of an event.

Mathematics instruction will include data analysis, statistics and probability. Students will be given the opportunity to pose questions and collect, organize, represent and interpret data to answer those questions; develop and evaluate predictions and arguments that are based on data; and apply basic notions of chance and probability. Students will use technology tools to investigate large samples, explore graphical representations and simulate events.

D1 - Data Collection and Organisation:
Data are collected and organised to help with the making of decisions, the drawing of inferences or the development of new ideas.

D2 - Representation:
Appropriate representations of data depend on characteristics of that data.

D3 - Analysis and interpretation:
Provides information on the attributes of data.

D4 - Probability:
The occurrence or non-occurrence of an event is characterized as impossible, less likely, equally likely, more likely or certain. The likelihood of an event or its probability is quoted as a ratio between 0 and 1 inclusive.

MT.S2.D1

Students will demonstrate an understanding of data handling by using, representing and explaining. They will:

a) collect and organize real-world data
b) organise and describe distributions of data by using a number of different methods including tables, histograms, bar graphs etc.
c) design and execute surveys or experiments, gather data to answer questions and communicate the results using traditional methods and technology

MT.S2.D2

Students will demonstrate an understanding of data handling by using, representing and explaining. They will:

a) recognise the appropriateness of the representation of data
b) represent and display data

MT.S2.D3

Students will demonstrate an understanding of data handling by using, representing and explaining. They will:

a) analyse data using mean, mode, median and range
b) identify which measure of central tendency is most appropriate in a given situation
c) analyse, interpret and use data from a data display

MT.S2.D4

Students will demonstrate an understanding of data handling by using, representing and explaining. They will:

a) find combinations and permutations in problem situations
b) find the probability of dependent and independent events

PLANNING NOTES

PLANNING NOTES


QUO·FATA·FERUNT

MISSION STATEMENT

The mission of the Bermuda Public School System is to be the 1st choice in education by providing rigorous and stimulating learning experiences in safe responsive environments from which our students emerge confident and prepared to compete and contribute locally and globally.

MINISTRY OF EDUCATION

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