

Nevada Mathematics Standards

Introduction

Comprehensive mathematical knowledge is essential for success in today’s world. Society needs individuals who have sound estimation skills and number and spatial sense, who are competent using and interpreting data, and who can use appropriate technology resources to solve problems and make informed decisions. These skills are essential if students are to become successful citizens, life-long learners, and competitive workers in a global market place.

Mathematics is a basic component of every student's education. Within mathematics, technology should be regarded as a tool that can facilitate a student's understanding of quantitative relationships and that can increase computational proficiency in problem-solving situations. In elementary school, calculators are valuable tools as students explore patterns and investigate mathematical situations. Students should not, however, depend on calculators to help them solve basic computation problems. It is critical that students thoroughly develop basic computational skills at a young age. Technology can be used by students to strengthen and extend their understanding of concepts, explore mathematical functions, engage in problem-solving activities, employ real world applications, and verify results of mathematical activities. When technology is combined with a student's understanding of underlying mathematical concepts, learning is enhanced. Technology can support student learning and provide all students with the tools they need to master the Nevada standards.

The *Nevada Mathematics Standards* are intended to establish common expectations for local communities to develop a clear, shared understanding of what all students should know and be able to do at key points in their K-12 educational careers. The document includes five content standards: Numbers, Number Sense, and Computation; Patterns, Functions, and Algebra; Measurement; Spatial Relationships and Geometry; and Data Analysis. Each of these content standards is essential to accomplishing the goals for mathematics education listed below.

Goals of Mathematics Education in Nevada

- the knowledge of basic mathematical facts and relationships and the ability to perform computations;
- the ability to make sound estimations and to make sense of number relationships;
- the ability to read, interpret, and create graphs, tables, and charts;
- the ability to make geometric observations, measurements, and constructions; and
- the ability to understand the effective, appropriate, and efficient use of models and mathematical tools, including calculators and computer technology.

Additionally, these standards include four process standards: Problem Solving, Mathematical Communication, Mathematical Reasoning, and Mathematical Connections. The processes described within these four standards are also carefully integrated within the content standards to emphasize the interconnectedness among the process and content standards. This integration is meant to emphasize the importance of teaching mathematics within the context of an application so students can not only compute but also can use their computational skills to reason and solve problems.

The *Nevada Mathematics Standards* are intended to provide the framework for a comprehensive K-12 mathematics program and are intended to guide curriculum, instruction, and assessment as well as other policies and practices that affect student learning. They will serve as a foundation for teachers and curriculum specialists as they create curriculum and adopt teaching practices relevant to the needs, strengths, and diversity of Nevada’s students and communities. The standards will also provide clear direction for meaningful pre-service and in-service professional development. In essence, the standards will help Nevada’s school districts build cohesive and comprehensive systems for ensuring that all students achieve at high levels.

Numbers, Number Sense, and Computation

Content Standard 1.0: *To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will accurately calculate and use estimation techniques, number relationships, operation rules, and algorithms; they will determine the reasonableness of answers and the accuracy of solutions.*

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
1.K.1 Use concrete objects to	1.1.1 Identify and model basic	1.2.1 Identify and model basic	1.3.1	1.4.1	Facts

model simple sums and differences.	addition facts (sums through 10) and the corresponding subtraction facts.	addition facts (sums to 18) and the corresponding subtraction facts; immediately recall basic addition facts (sums through 10) and the corresponding subtraction facts.	Immediately recall and use addition and subtraction facts and multiplication facts to 81.	Immediately recall and use multiplication and corresponding division facts through the 12's.	
		1.2.2 Add and subtract multi- digit numbers without regrouping .	1.3.2 Add and subtract multi-digit numbers with regrouping.		Application

Digit – A number.

Regrouping – When adding or subtracting, "carrying" and "borrowing".

Content Standard 1.0: Numbers, Number Sense, and Computation

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
	1.1.3 Write, model, and describe one-step addition and subtraction problems.	1.2.3 Generate and solve one-step addition and subtraction problems based on practical situations.	1.3.3 Generate and solve 2-step addition and subtraction and 1-step multiplication problems based on practical situations using pencil and paper, mental computation, and estimation.	1.4.3 Generate and solve 2-step multiplication and division problems based on practical situations using pencil and paper, mental computation, and estimation.	Word Problems and Number Theory
	1.1.4 Use decimals to show money amounts.	1.2.4 Use decimals to show money amounts.	1.3.4 Add and subtract decimals using money as a model.	1.4.4 Multiply and divide money amounts by a one-digit whole number producing a solution with no remainder.	Decimals
1.K.5 Count to 20.	1.1.5 Use the inherent patterns in numbers to count by 1's, 2's, 5's, and 10's to 100.	1.2.5 Use the inherent patterns in numbers to skip count by 2's, 3's, 5's, and 10's to 100 and beyond.	1.3.5 Use addition to model and explain multiplication.	1.4.5 Multiply multi-digit numbers by a one-digit number with regrouping. Use subtraction to model and explain division.	Computation

Skip Count – To count by multiples of a number (count by twos, fives, tens, etc.)

Solve – To find all the solutions of an equation or other mathematical problem.

Content Standard 1.0: Numbers, Number Sense, and Computation

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
1.K.6 Recognize, read, and write numerals from 0-10; recognize number words from 0-10.	1.1.6 Read, write, order, and compare numerals from 0-100.	1.2.6 Read, write, order, and compare numbers from 0-999.	1.3.6 Read, write, order, and compare numbers from 0-9,999.	1.4.6 Read, write, order, and compare numbers from 0-999,999.	Comparison and Ordering

Content Standard 1.0: Numbers, Number Sense and Computation

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
1.K.7 Estimate the number of objects in a set to 10 and verify by counting; use ordinal positions first to third.	1.1.7 Estimate the number of objects in a set to 10; read and write number words to 10 and use ordinal positions first to tenth.	1.2.7 Estimate the number of objects in a set to 20; read and write number words to 20 and use ordinal positions first to twentieth.	1.3.7 Round to nearest tens and hundreds to determine reasonableness of the answer.	1.4.7 Round to the nearest tens, hundreds, or thousands to determine the reasonableness of the answer.	Estimation and Rounding
1.K.8 Match the number of objects to the correct numeral, 0-10.	1.1.8 Use, model, and identify place value positions of 1's and 10's.	1.2.8 Use, model, and identify place value positions of 1's, 10's, and 100's.	1.3.8 Use, model, and identify place value positions up to 10,000.	1.4.8 Use and identify place value positions up to 100,000.	Place value
	1.1.9 Identify and model a whole; identify and model $\frac{1}{2}$.	1.2.9 Identify, model, and label $\frac{1}{2}$ and $\frac{1}{4}$ as parts of a whole.	1.3.9 Model, sketch, and label fractions with denominators to 10; write fractions with numerals and with number words.	1.4.9 Identify and compare fractions with like denominators using models and drawings.	Fractions

Denominator – The number that is the bottom half of a fraction and that describes the number of parts in the fraction.

Place Value – The value of a digit as determined by its position in a number (in the number "11" the one is worth either 10 or 1, depending on the position).

Verify – Proving a solution or process is correct.

Patterns, Functions, and Algebra

Content Standard 2.0: *To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic*

relations as modeled in practical situations.

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required at the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
2.K.1 Sort and describe objects by similar attributes ; recognize and replicate a pattern.	2.1.1 Recognize, describe, extend, and create simple repeating patterns using symbols, objects, and manipulatives .	2.2.1 Recognize, describe, extend, and create repeating and increasing patterns using symbols, objects, and manipulatives; use patterns and their extensions to solve problems.	2.3.1 Recognize, describe, and create repeating and increasing patterns using numbers; use number patterns and their extensions to solve problems.	2.4.1 Identify, describe, and explain patterns and relationships including those formed by multiples, factors, and powers of 10 using paper and pencil.	Patterns
					Relationships ²
		2.2.3 Use variables and open sentences to express relationships.	2.3.3 Identify missing terms and missing numbers in open number sentences involving number facts in addition and subtraction.	2.4.3 Find solutions to given equalities from a given replacement set, (e.g. find the solution to 3 X 7 =_____, given the replacement set {19, 20, 21}).	Variables (Unknowns)

- Attribute** – Characteristic of an object, such as color, shape, size, etc.
- Factors** – **The numbers that are multiplied to give a product (In 3 * 8 = 24, the factors are 3 and 8).**
- Manipulatives** – Tools, models, blocks, tiles, and other objects which are used to explore mathematical ideas and solve mathematical problems.
- Multiple** – The product of a whole number and any other whole number.
- Relationship** – A description of how particular numbers are connected.
- Power** – Another way to describe the exponent ($12^3 = 12 * 12 * 12$ or 12 to the 3rd power).
- Variable** – A letter used to stand for a number in an expression or an equation.

Content Standard 2.0: Patterns, Functions, and Algebra

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
2.K.4 Identify and create sets of objects with unequal amounts, describing them as having more or less.	2.1.4 Create, compare, and describe sets of objects as having more, less, or equal amounts.	2.2.4 Generate and solve problems based on various numerical sentences.	2.3.4 Complete number sentences with the appropriate words and symbols for addition, subtraction, less than, greater than, and equal to		Number Sentences

			(+, -, <, >, =).		
					Algebraic Basics
					Linear Relations
		2.2.7 Model, explain and solve a number sentence involving addition and subtraction.			Equation Solutions

Measurement

Content Standard 3.0: *To solve problems, communicate, reason and make connections within and beyond the field of mathematics, students will use appropriate tools and techniques of measurement to determine, estimate, record, and verify direct and indirect measurements.*

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required at the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
3.K.1 Compare and order objects by size communicating their similarities and differences.	3.1.1 Compare and order objects by length and weight, communicating their similarities and differences.	3.2.1 Compare and order objects by various measurable attributes (e.g., time, temperature, length, weight, capacity , volume , and area) communicating their similarities and differences.			Comparison and Ordering
	3.1.2 Compare and measure length and weight, using non-standard measurement.	3.2.2 Compare objects to standard whole units to find objects that are greater than, less than, and/or equal to a given unit (e.g., inch, yard, centimeter, meter).	3.3.2 Measure and record to a required degree of accuracy and evaluate for error, identifying the appropriateness of selected units of measure.	3.4.2 Measure and compare length in inches, feet, yards, and miles to the closest fractional part (1/4, 1/2); convert within this system.	Measurement

Area – The size of a region measured in number of square units (i.e., inches squared, square feet).

Capacity – The maximum amount of liquid a container can hold.

Convert – To change from one form to another (1/2 = 50%).

Volume – The number of cubic units that fit inside a space figure.

Content Standard 3.0: Measurement

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
			3.3.3 Estimate and use measuring devices with standard and non-standard units to measure length, surface area, liquid volume, capacity, temperature, and weight, communicating the concepts of more, less, and equivalent.		Estimation
3.K.4 Identify and sort pennies, nickels, and dimes.	3.1.4 Determine the value of any set of pennies, nickels, and dimes.	3.2.4 Determine the value of any given set of coins and bills.	3.3.4 Read, write, and use money notation determining possible combinations of coins and bills to equal given amounts.	3.4.4 Determine totals for monetary amounts in problem- solving situations.	Money
				3.4.5 Describe and determine the perimeter of polygons and the area of rectangles (including squares).	Proportion and Ratio

Non-standard units – Units of measure that are not fixed or set (handful, arm’s length, stride, etc.).

Perimeter – The distance around a geometric shape.

Polygon – A closed plane figure with straight sides (made up of line segments).

Standard Units – Units of measure that have an accepted value like inch, cup, meter, and pound.

Content Standard 3.0: Measurement

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
3.K.6 Recite, in order, the days of the week.	3.1.6 Use a calendar to identify days, weeks, and months; read time to the nearest hour and half hour;	3.2.6 Recite and use the months of the year in order; use a	3.3.6 Tell time to the nearest minute, using analog and		Time

	distinguish between day and night, i.e., between A.M. and P.M.	calendar to identify days, weeks, months, and year; read time to the nearest quarter hour; distinguish between day and night, i.e., between A.M. and P.M.	digital clocks, and identify elapsed time.		
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Spatial Relationships and Geometry

Content Standard 4.0: *To solve problems, communicate, and make connections within and beyond the field of mathematics, students will identify, represent, verify, and apply spatial relationships and geometric properties.*

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
4.K.1 Identify two-dimensional shapes (circles, triangles, rectangles including squares) regardless of position.	4.1.1 Identify, name, sort, and sketch two-dimensional shapes (circles, triangles, rectangles including squares) regardless of position.	4.2.1 Identify, name, sort, sketch, describe, and compare two dimensional shapes (circles, triangles, rectangles including squares) regardless of position.	4.3.1 Describe, sketch, compare, and contrast plane geometric figures.	4.4.1 Identify, draw, and classify angles according to their measurement, including right, obtuse , and acute.	Two-Dimensional Shapes
4.K.2 Use position words (e.g., middle, before, down) to place objects.	4.1.2 Use position words (e.g., between, left, near) to describe location of objects.	4.2.2 Use position words (e.g., before, far, below, left) to describe location of objects and to place objects; compare the size (larger and smaller) of similar two-dimensional figures (e.g., circles, triangles); identify congruent shapes.	4.3.2 Demonstrate and describe the motion (transformation) of geometric figures as a slide, rotation , or a flip.	4.4.2 Use motion geometry including flips, turns, and slides to examine the concepts of similarity, congruence, and symmetry.	Transformations

Congruent – Figures that have the same size and shape.

Obtuse Angle – An angle with a measure that is greater than 90 degrees and less than 180 degrees.

Rotation – A transformation obtained by rotating a figure around a given point.

Two- Dimensional – A two- dimensional, flat figure like a piece of paper. It has length and width, but not height.

Content Standard 4.0: Spatial Relationships and Geometry

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
4.K.3 Identify two-dimensional figures (e.g., windows are shaped like rectangles) as they appear in the environment.	4.1.3 Identify and replicate two-dimensional designs that contain a line of symmetry .	4.2.3 Identify figures with symmetry as they appear in the environment; create two-dimensional designs that contain a line			Coordinate Geometry and Line of Symmetry

		of symmetry.			
		4.2.4 Identify, name, sort, describe, compare, and contrast two- and three-dimensional geometric figures (e.g., circle/sphere, square/cube, triangle/ pyramid).	4.3.4 Describe, sketch, model, build, compare, and contrast two- and three-dimensional geometric figures.	4.4.4 Identify, describe, and classify two- and three-dimensional figures by relevant properties including the number of vertices (corners), edges , and shapes of faces .	Two- and three-dimensional figures
					Linear Slopes and Equations

Edge – The place or line where two sides of a figure meet (the edge of a table).

Face – A flat surface of a three-dimensional figure.

Line of Symmetry - A line that divides a geometric shape into two parts. Folding on the line of symmetry will produce two shapes that are the mirror image of each other.

Pyramid – A three-dimensional figure with a flat base and triangular sides that meet in a point.

Symmetry – When an object can be folded in half to form two mirror image objects.

Three- Dimensional - A figure like a cube that has length, width, and height.

Vertices – The points where two line segments come together (corners).

Content Standard 4.0: Spatial Relationships and Geometry

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
				4.4.6 Identify, describe, and draw geometric figures including points, intersecting, parallel lines , line segments , rays , and angles.	Parallel Lines and Special Angles
					Pythagorean Theorem
					Drawing and Constructing
					Reasoning

Line Segments – A part of a line having two endpoints.

Parallel Lines – Lines in the same plane that are always the same distance apart.

Ray – A part of a line that has one endpoint and extends endlessly in one direction (sunbeam).

Data Analysis

Content Standard 5.0: *To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections.*

By the end of Kindergarten , students know and are able to:	By the end of Grade 1 , students know and are able to do everything required in the previous grade and:	By the end of Grade 2 , students know and are able to do everything required in the previous grades and:	By the end of Grade 3 , students know and are able to do everything required in the previous grades and:	By the end of Grade 4 , students know and are able to do everything required in the previous grades and:	
5.K.1 Collect and describe data.	5.1.1 Collect, organize, and describe data.	5.2.1 Collect, organize, record, and explain classification of data using concrete materials.	5.3.1 Collect, organize, display, and describe simple data using number lines, pictographs , bar graphs , and frequency tables .	5.4.1 Collect, organize, display, describe, and interpret simple data using number lines, pictographs, bar graphs, and frequency tables.	Data Collection and Organization
			5.3.2 Use concepts of probability (e.g., impossible, likely, certain) to make predictions about future events.	5.4.2 Conduct simple probability experiments using concrete materials and represent the results using fractions.	Probability
					Probability Analysis
					Central Tendency
					Data Analysis

Frequency Table – A listing of data that includes the number of times an item occurs.

Graph – A pictorial representation of information or relationships between numbers presented on a coordinate plane used to represent data.

Pictograph – A graph that shows numerical information by using picture symbols.

Probability – The number of favorable outcomes compared to the number of possible outcomes of an experiment.

Problem Solving

Process Standard 6.0: *Students will develop their ability to solve problems by engaging in developmentally appropriate problem solving opportunities in which there is a need to use various approaches to investigate and understand mathematical concepts in order to: formulate their own problems; find solutions to problems from everyday situations; develop and apply strategies to solve a wide variety of problems; and integrate mathematical reasoning, communication and connections.*

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12

6.1 Select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts.							
6.2 Apply previous experience and knowledge to new problem-solving situations.							
6.3 Formulate own problems; use various approaches to investigate and solve problems.							
6.4 Explain and verify results with respect to the original problem.			6.5 Verify, interpret, and evaluate results with respect to the original problem situation, determining an efficient strategy for the given situation.				
6.6 Try more than one strategy when the first strategy proves to be unproductive.							
					6.7 Apply multi-step, integrated, mathematical problem-solving strategies, persisting until a solution is found or until it is clear that no solution exists.		
6.8 Apply solutions and strategies from earlier problems to new problem situations.			6.9 Generalize solutions and strategies from earlier problems to new problem situations.				
				6.10 Interpret and solve a variety of mathematical problems by paraphrasing, identifying necessary and extraneous information, selecting and justifying efficient methods and/or strategies, and ensuring the answer is reasonable.			
							6.11 Apply combinations of proven strategies and previous knowledge to solve non-routine problems.

Process Standard 6.0: Problem Solving

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
6.12 Use technology, including calculators, to understand quantitative relationships, e.g., for skip counting and pattern exploration.									
					6.13 Use technology, including calculators, to solve problems and verify solutions.				
					6.14 Use technology, including calculators, to investigate, define, and describe quantitative relationships such as patterns and functions.				

Mathematical Communication

Process Standard 7.0: *Students will develop their ability to communicate mathematically by solving problems in which there is a need to obtain information from the real world through reading,, listening, and observing in order to: translate this information into a mathematical language and symbols; process this information mathematically; and present results in written, oral and visual formats.*

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
7.1									
Discuss and exchange ideas about mathematics as a part of learning.									
7.2									
Use inquiry techniques (e.g. discussion, questioning, research, data gathering) to solve mathematical problems.									
						7.3			
						Read expository text to learn about mathematics.			
7.4			7.5			7.6			
Use pictorial representations to identify mathematical operations and concepts.			Identify and translate key words and phrases that imply mathematical operations.			Interpret and solve word problems without the necessity of key words or phrases.			
7.7				7.8			7.9		
Use physical materials, models, pictures, or writing to represent and communicate mathematical ideas.				Use physical material, diagrams, and tables to represent and then communicate mathematical ideas through oral, verbal, and written formats.			Model and explain mathematical relationships using oral, written, graphical, and algebraic methods.		
7.10						7.11			
Explain and justify thinking about mathematical ideas and solutions.						Explain and evaluate thinking about mathematical ideas and solutions.			
						7.12			
						Evaluate the effectiveness of written and oral presentations of mathematics.			
				7.13					
				Make conjectures and present arguments in discussions of mathematical ideas.					

Process Standard 7.0: Mathematical Communication

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
						7.14 Explain and evaluate thinking about mathematical ideas and solutions.		7.15 Explain and evaluate thinking about mathematical ideas and solutions based on the role of definitions, properties, common rules, and symbols in solving problems.	
7.16 Use everyday language to explain thinking about strategies and solutions to mathematical problems.									
7.17 Express mathematical ideas and use them to define, compare, and solve problems orally and in writing.									

7.18			
Use mathematical notation to communicate and explain mathematical situations.			

Mathematical Reasoning

Process Standard 8.0: *Student will develop their ability to reason mathematically by solving problems in which there is a need to investigate significant mathematical ideas and **construct** their own learning in all content areas in order to justify their thinking; reinforce and extend their logical reasoning abilities; reflect on and clarify their own thinking; and ask questions to extend their thinking.*

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
8.1 Justify and explain the solutions to problems using manipulative and physical models.					8.2 Justify answers and the steps taken to solve problems with and without manipulatives and physical models.			8.3 Construct, justify, and defend mathematical conclusions using logical arguments, in situations related to mathematics, science, and technology.	
8.4 Use patterns and relationships to analyze mathematical situations; draw logical conclusions about mathematical problems.									
				8.5 Follow a logical argument and judge its validity.					
				8.6 Apply deductive and inductive reasoning in mathematical situations to extend logical reasoning.		8.7 Recognize and apply deductive and inductive reasoning in both concrete and abstract contexts.			
8.8 Ask questions to reflect on, clarify, and extend thinking.									
8.9 Review and refine the assumptions and steps used to derive conclusions in mathematical arguments.									

Process Standard 8.0: Mathematical Reasoning

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
									8.10 Construct valid arguments; make and test conjectures about algebraic and geometric properties based on mathematical principles.
8.11									

Determine relevant, irrelevant, and/or sufficient information to solve mathematical problems.

Mathematical Connections

Process Standard 9.0: *Students will develop the ability to make mathematical connections by solving problems in which there is a need to view mathematics as an integrated whole, identifying relationships between context strands, and integrating mathematics with other disciplines, allowing the flexibility to approach problems in a variety of ways within and beyond the field of mathematics.*

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
9.1 Link new concepts to prior knowledge.									
	9.2 Use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics.								
				9.3 Use models to explain the relationship of concepts to procedures.					
						9.4 Use the connections among mathematical topics to develop multiple approaches to problems.			
9.5 Identify practical applications of mathematical principles that can be applied to other disciplines.									
9.6 Apply mathematical thinking and modeling to solve problems that arise in other disciplines (e.g. rhythm in music and motion in science).									
								9.7 Use and analyze the connections between Mathematics and other disciplines.	
9.8 Identify, explain, and use mathematics in everyday life.									

Numbers, Number Sense, and Computation

Content Standard 1.0: *To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will accurately calculate, use estimation techniques, number relationships, operation rules, and algorithms; they will determine the reasonableness of answers and the accuracy of solutions.*

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
1.5.1 Immediately recall and use multiplication and	1.6.1	1.7.1 Read, write, and compute ratios and proportions ;	1.8.1 Read, write, add, subtract, multiply, and divide real	1.12.1 Calculate and estimate sums, differences,	Facts

corresponding division facts through 12's.	Read, write, add, subtract, multiply, and divide with decimals, fractions, and percents.	read, write, add, subtract, multiply, and divide positive and negative numbers.	numbers in various forms including radicals , exponential, and scientific notation .	products, quotients, powers , and roots using mental math, formulas , and algorithms .	
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- Algorithm** – A rule or procedure for completing or solving a certain type of problem.
- Calculate** – (Compute) The process of adding, subtracting, multiplying, dividing, or finding the square root.
- Estimate** – To give an approximate rather than an exact answer.
- Formula** – An equation that states a fact or rule ($Iw = A$).
- Power** – Another way to describe the exponent ($12^3 = 12 * 12 * 12$ or 12 to the 3rd power).
- Proportions** - A sentence that states two ratios are equal.
- Radicals** – Refers to radical expressions or roots of numbers such as the square root of 5.
- Ratio** – A pair of numbers that compare two quantities or describe a rate.
- Real Numbers** – All of the rational numbers which are all of the numbers that can be written as a fraction.
- Root** – A number that can be used as a factor a given number of times to produce the original number (i.e., the fifth root of 32 is 2 because $2 \times 2 \times 2 \times 2 \times 2 = 32$).
- Scientific Notation** – A particular way of writing a number with the first number being written as a number between 1 and 10 with as many decimal places as necessary and the second number being 10 and the correct exponent (i.e., $7,923 = 7.923 \times 10^3$).

Content Standard 1.0: Numbers, Number Sense, and Computation

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
1.5.2 Generate and solve addition, subtraction, multiplication, and division problems using whole numbers in practical situations.	1.6.2 Apply decimals, fractions, and percents to solve mathematical and practical problems.	1.7.2 Apply ratios, proportions, and negative and positive numbers to solve mathematical and practical problems.	1.8.2 Compute with rational and irrational numbers to solve a variety of problems including rates, recipes, unit cost, and percents (e.g., discounts, interest, sale price, commissions, taxes).	1.12.2 Apply the laws of exponents to perform operations on expressions with integral exponents and scientific notation.	Application
1.5.3 Use order of operations to solve problems.	1.6.3 Use concepts of number theory including prime and composite numbers , factors, multiples , rules of divisibility.	1.7.3 Use absolute value and the value properties of real numbers including distributive, commutative , and associative to solve problems.	1.8.3 Explain and apply concepts of number theory and properties of real numbers to solve problems.	1.12.3 Apply properties and theories of the real number system to everyday situations.	Word Problems and Number Theory

- Absolute Value** – A number’s distance from zero on a number line. The absolute value of 2 is equal to the absolute value of –2.
- Associative** - Refers to the fact that when adding or multiplying three numbers, any order can be used and the answer will be the same.
- Commutative** - The order in which two numbers are added or multiplied does not change the sum.
- Composite Number** - A whole number that is the result of at least two numbers (with "1" not one of the numbers) being multiplied together and that can be broken down into factors ($20 = 2 * 10$).

- Exponent** – A numeral used to tell how many times a number or variable is multiplied by itself ($3^2 = 3 * 3$).
- Multiple** – The product of a whole number and any other whole number.
- Operation** – The process of carrying out rules of procedure, such as addition, subtraction, differentiation.
- Order of Operation** – The order in which a mathematical problem is solved which is generally to multiply and divide before adding and subtracting from left to right.
- Solve** – To find all the solutions of an equation or other mathematical problem.
- Theory** – The belief about a particular concept, along with its proven facts and conjectures.
- Whole Numbers** – The set of natural numbers plus the number zero: (0, 1, 2, 3, 4 ...)

Content Standard 1.0: Numbers, Number Sense, and Computation

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
1.5.5 Multiply and divide multi-digit numbers by 2- digit numbers, including powers of 10.				1.12.5 Perform simple operations on matrices .	Computation
1.5.6 Compare and order negative numbers within the context of everyday happenings (e.g., temperature) and plot those numbers on a number line.	1.6.6 Compare and order groups of fractions and groups of decimals (e.g., on a number line).	1.7.6 Compare and order groups containing a mix of fractions, percents, and decimals (e.g., on a number line).			Comparison and Ordering
1.5.7 When rounding, identify which place value will be most helpful in estimating an answer and determine the reasonableness of the answer.	1.6.7 Round to a given decimal place value; estimate using decimals, fractions, and percents.	1.7.7 Select and round to the appropriate significant digit; estimate using a variety of methods.	1.8.7 Estimate in problem-solving situations and in practical applications; determine the reasonableness of the answer and verify the results.		Estimation and Rounding

- Digit** – A number.
- Matrices** - Plural of matrix, a way of displaying information in a grid form (a chart that lists the various models of cars for various years).
- Place Value** – The value of a digit as determined by its position in a number (in the number "11" the one is worth either 10 or 1, depending on the position).
- Verify** – Proving a solution or process is correct.

Content Standard 1.0: Numbers, Number Sense, and Computation

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
1.5.8 Use and identify place					Place value

value.					
1.5.9	1.6.9		1.8.9		Fractions
Use models and drawings to identify, compare, add, and subtract fractions with like denominators and to add and subtract decimals; use both to solve problems.	Use models and drawings to identify, compare, add, and subtract fractions with unlike denominators; translate between fractions, decimals, and percents.		Explain the relationship between fractions, decimals, and percents and translate among various representations of equal numbers (e.g., from fractions to decimals to percents, various forms of "1" such as 3/3 or 16/16) to solve problems efficiently.		

Denominator – **The number that is the bottom half of a fraction and that describes the number of parts in the fraction.**

Relationship - **A description of how particular numbers are connected.**

Patterns, Functions, and Algebra

Content Standard 2.0: *To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations.*

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
2.5.1	2.6.1	2.7.1	2.8.1		Patterns
Identify, describe, and explain patterns and relationships in the number system (e.g., formed by triangular numbers , perfect squares, arithmetic and geometric sequences) using concrete materials, paper and pencil, and calculators.	Use and create tables and charts to identify, describe, and extend a pattern.	Use and create various coordinate plane graphs including linear, geometric, and exponential forms to identify, describe, and extend patterns and relationships, with and without calculators.	Use inductive reasoning to find the missing term in number and geometric patterns and to generalize basic patterns to the nth term, with and without calculators; use written, oral, and symbolic language to identify and describe patterns, sequences, and functions.		

Extend (pattern) – To continue a pattern or sequence with the same rules.

Function – A relationship between two items, one of which depends on each other, that can be graphed and described algebraically.

Geometric Sequence – A sequence of numbers in which the next term can be found by multiplying the current term by some number (given the number 3 and continuing to multiply by 2 gives the sequence 3, 6, 12, 24...).

Graph – A pictorial representation of information or relationships between numbers presented on a coordinate plane used to represent data.

Inductive Reasoning – A particular type of logic which involves drawing conclusions from several specific, known facts and using them to make generalizations about other, similar situations.

Sequence – A series of numbers that are predictable and can be extended using simple addition or subtraction (4, 7, 10, 13...).

Symbolic Language – Mathematical ideas expressed in a symbol or symbols.

Triangular Number – The numbers 1,3,6,10...are triangular because they can be expressed by employing the number of dots in successive triangular arrays of dots (this can be thought of as "stair-step numbers" or 1, 1+2, 1+2+3, 1+2+3+4, ...).

Content Standard 2.0: Patterns, Functions, and Algebra

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
	2.6.2 Identify, model, describe, and evaluate relationships using charts and tables, with and without technology.	2.7.2 Identify, model, describe, and evaluate relationships using graphs, with and without technology.	2.8.2 Identify, model, describe, and evaluate relationships including functions using diagrams and equations, with and without technology.	2.12.2 Represent, analyze, and solve problem situations using discrete structures including graphs and matrices, with and without technology.	Relationships
2.5.3 Using whole numbers as a replacement set, find possible solutions to such inequalities as $8 + 4 > n$.		2.7.3 Find the value of algebraic expressions using substitutions.	2.8.3 Evaluate formulas and algebraic expressions for given values of a variable (e.g., $A = lw$ given $l = 6$, $w = 2$, then $A = 12$).	2.12.3 Create and use different forms of a variety of equations, proportions, and/or formulas ($I=PRT$ or $R=I/PT$), solving for the needed variable as necessary in given situations.	Variables (Unknowns)

Diagram – A geometrical figure used to illustrate a theorem.

Variable – A letter used to stand for a number in an expression or an equation.

Content Standard 2.0: Patterns, Functions and Algebra

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
2.5.4 Use variables in open sentences and to describe simple functions and relationships.			2.8.4 Add and subtract binomials describing the connection between the algebraic process and the arithmetic process.	2.12.4 Add, subtract, multiply, and factor (1 st and 2 nd degree) polynomials , describing each step in the process and the connection between the algebraic process and the arithmetic process; use simple quadratic equations with integer roots to solve practical and mathematical problems.	Number Sentences and Equations
2.5.5 Generate number sequences given the first term and any basic computation rule (e.g., given a 4 and the rule of add 6, 10, 16, 22, 28, ...).		2.7.5 Combine like terms using variable expressions (e.g., $2a+3a=5a$).	2.8.5 Describe how a change in one variable of a mathematical relationship affects the remaining variables using various tools and methods.	2.12.5 Model practical problems from everyday situations with a variety of models that includes matrices, translating among tabular, symbolic and graphical	Algebraic Basics

				representations of functions, with and without technology.	
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Binomials - Algebraic expressions with exactly two terms ($2x + 3y$).

Polynomials - Algebraic expressions with two or more terms (i.e., $5x + 2y + 3z$).

Content Standard 2.0: Patterns, Functions and Algebra

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
		2.7.6 Model, identify, and solve linear equations and inequalities using concrete and informal methods and relate this process to the order operations.	2.8.6 Model, identify, and solve linear equations and inequalities, using formal and informal methods, and relate this process to the order of operations.	2.12.6 Determine the domain and range of linear relations given a graph or a set of ordered pairs ; explain their importance in problem solving situations.	Linear Equations
2.5.7 Solve simple equations using a variety of methods (e.g. inverse operations , mental math, and estimate and verify).		2.7.7 Given a rule, create a table and represent the ordered pairs on a coordinate grid .	2.8.7 Solve simple linear equations and connect that process to the order of operations.	2.12.7 Solve systems of two linear equations both algebraically and graphically; use graphing calculators as a primary tool in solving these problems and to verify solutions found by other methods.	Equation Solutions

Coordinate Grid – A flat surface divided into square units that are numbered and can be used to locate items on the grid.

Inverse Operations – Two operations that undo each other. Addition and subtraction are inverse operations.

Linear Equations - An algebraic equation that describes or produces a straight line.

Ordered Pair – A pair of numbers that gives the location of a place on a map or a graph (latitude and longitude).

Range – The difference between the greatest and the least numbers in a collection of data.

Measurement

Content Standard 3.0: *To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will use appropriate tools and techniques of measurement to determine, estimate, record, and verify direct and indirect measurements.*

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
	3.6.1 Compare and convert units of measure for	3.7.1 Compare and convert units of measure of capacity, mass, and volume within the same	3.8.1 Compare and convert units of measure for length, weight / mass, and volume within the same	3.12.1 Convert one unit of measure to another	Comparison and Ordering

	length, weight, and liquid and dry measure, within the same measurement system (customary or metric).	measurement system; estimate conversions between like units of the two systems.	measurement system (customary and metric); estimate conversions between like units of the two systems to solve problems.	between customary and metric systems and between monetary systems.	
3.5.2 Measure, compare, and convert length to the closest fractional part (1/4 and 1/2) of inches, feet, yards, and miles; measure, compare, and convert length to the closest decimal unit of milli, centi-, kilo-, and meters.	3.6.2 Explain how the size of the unit used affects the precision; given two measurements of the same object, select the one that is more precise.	3.7.2 Given a measurement, determine the greatest possible error .	3.8.2 Demonstrate an understanding of precision, error and tolerance in measurement using the appropriate measurement tool to the required degree of accuracy.	3.12.2 Select and use measurement tools, techniques, and formulas to calculate and compare rates, cost, distances, interest, temperatures, and weight/mass.	Measurement

Capacity – The maximum amount of liquid a container can hold.

Convert – To change from one form to another (1/2 = 50%).

Greatest Possible Error – The measurement error which always results from rounding or estimating a measure to nearest specified unit of measure.

Mass – The amount of "stuff" (atoms & molecules) inside solid objects. The weight of objects can vary depending on the location (the moon versus Earth), but the mass remains constant.

Volume – The number of cubic units that fit inside a space figure.

Content Standard 3.0: Measurement

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
3.5.3 Estimate measures of length, volume, capacity, quantity, and weight, communicating degree of accuracy needed and when a more precise measure is required.	3.6.3 Estimate, measure to the required degree of accuracy, derive, and apply formulas to find the perimeter , circumference, and area of plane figures .	3.7.3 Estimate, measure to the required degree of accuracy, derive, and apply standard formulas to find the volume and surface area of solid figures (e.g., cylinders , triangular solids).	3.8.3 Estimate, measure to the required degree of accuracy, derive, and apply formulas to find perimeter, circumference and area of plane figures and volume and surface area of solid figures; identify the relationship between changes in area and volume and changes in linear measures of figures.	3.12.3 Distinguish and differentiate among the structures, language and uses of systems of measures (e.g., linear, square units, cubic units); justify and communicate the differences between accuracy, precision, error, and tolerance in measurement; describe how each of these can affect solutions found in problem situations.	Estimation
3.5.4 Determine totals and change due for monetary amounts in problem-solving situations.				3.12.4 Use and interpret consumer data (e.g., amortization tables , tax tables, and compound interest charts) to make informed financial decisions related to practical applications such as budget.	Money

Amortization Table – A table used to display monthly payment costs (principal + interest) based on loan interest rate and the amount of time that will be used to repay the loan.

Area – The size of a region measured in number of square units (i.e., inches squared, square feet).

Cylinder – A three-dimensional figure shaped like a soup can.

Justify – To define or develop a postulate or theorem to explain and support a conclusion.

Perimeter – The distance around a geometric shape.

Plane Figures – A geometric figure that is flat (one whose points are all in one plane).

Content Standard 3.0: Measurement

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
3.5.5 Describe and determine the perimeter of polygons, the area of right triangles and rectangles (including squares), communicating the difference between perimeter and area.	3.6.5 Use ratios to describe and compare relationships between various objects.	3.7.5 Given various situations, set up and solve proportions.	3.8.5 Apply ratios and proportions to calculate rates and as a method of indirect measure (e.g., miles per hour, cost per unit).	3.12.5 Use relationships (e.g., proportions) and formulas (indirect measurement) to determine the measurement of unknown dimensions, angles, areas, and volumes to solve problems.	Proportion and Ratio
3.5.6 Identify equivalent periods of time, including relationships between and among seconds, minutes, hours, days, months, and years (e.g., 60 sec=1 min).					Time

Right Triangles – A triangle in which one angle is equal to 90 degrees.

Spatial Relationships and Geometry

Content Standard 4.0: *To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will identify, represent, explain, verify, and apply spatial relationships and geometric properties.*

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
4.5.1 Draw and classify angles and triangles according to their measurement (e.g., right, obtuse , and acute); identify and draw circles and parts of circles, describing the relationships between the various parts (e.g., central angle, arc , diameter).	4.6.1 Measure angles; identify, describe by properties, classify, compare, and draw regular and irregular quadrilaterals; find the sum of the interior angles of triangles and quadrilaterals.	4.7.1 Identify, describe by properties, classify, compare, and draw regular and irregular polygons such as pentagons, hexagons, octagons, and find the sum of the interior angles.	4.8.1 Identify, classify, compare, and draw regular and irregular polygons such as triangles, quadrilaterals, pentagons, hexagons, and octagons; find the sum of the interior angles of polygons.	4.12.1 Identify and use the properties of polygons (including interior and exterior angles) and elements of circles (e.g., angles, arc, chord , secants and tangents) to solve practical problems.	Two - Dimensional Shapes

Arc – Any section of the circumference of a circle.

Chord – A straight line segment that connects two sides of a circle, but does not go through the exact center.

Obtuse Angle - An angle with a measure that is greater than 90 degrees and less than 180 degrees.

Secant –A straight line intersecting the circle at two points.

Tangent –A straight line intersecting the circle at exactly one point.

Content Standard 4.0: Spatial Relationships and Geometry

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
4.5.2 Identify shapes that have congruence, similarity, and/or symmetry of figures using a variety of methods including transformational motions (e.g., translation /slide, rotation /turn, reflection /flip, enlargement/reduction) and models, drawings, and measurement tools.	4.6.2 Translate map distances and scale drawing measurements to actual measures.	4.7.2 Use ratio and proportions to create scale drawings from actual measurements.	4.8.2 Apply the properties of equality and proportionality to solve problems involving congruent or similar shapes (e.g., create scale drawings, perspective drawings).		Congruence, Similarity, and Transformations

Congruent – **Figures that have the same size and shape.**

Reflection – The mirror image of a figure.

Rotation – A transformation obtained by rotating a figure around a given point.

Symmetry – When an object can be folded in half to form two mirror image objects.

Translation – Changing the position of a geometric figure by sliding it in any direction without any rotation or turn.

Content Standard 4.0: Spatial Relationships and Geometry

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
4.5.3 Using a grid, identify coordinates for a given point or locate points of given coordinates in the first quadrant.	4.6.3 Using a coordinate grid, identify coordinates for a given point and locate points of given coordinates; plot geometric shapes in all four quadrants.	4.7.3 Use coordinate geometry and models to demonstrate geometric transformations including rotate/turn, translate/slide, reflect/flip by finding the ordered pairs that describe the location of the original and the transformed	4.8.3 Use coordinate geometry and models to change scale (enlarge and reduce); demonstrate other geometric transformations by finding the ordered pairs and describe the location of the original and the transformed		Coordinate Geometry and Line of symmetry

		figures.	figures.		
4.5.4	4.6.4	4.7.4	4.8.4		Two and Three Dimensional Figures
Identify, describe, compare, and classify two and three- dimensional figures by relevant properties including number of vertices (corners), edges , and shapes of faces ; identify and predict the effects of combining, dividing, and changing shapes into other shapes.	Make a model of a three dimensional prism from a two-dimensional drawing and make a two-dimensional drawing of a three-dimensional prism.	Make a model of a three-dimensional figure from a two-dimensional drawing and make a two-dimensional drawing of a three dimensional object (e.g., pyramids, cylinders, cones, spheres).	Make a model of a three-dimensional figure from a two-dimensional drawing and make a two-dimensional drawing of a three-dimensional object.		

Edge – The place or line where two sides of a figure meet (the edge of a table).

Face – A flat surface of a three-dimensional figure.

Prism – A three-dimensional figure with triangular faces and two parallel, congruent faces.

Two-Dimensional – A flat figure like a piece of paper. It has length and width, but not height.

Vertices – The points where two line come together (corners).

Content Standard 4.0: Spatial Relationships and Geometry

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
	4.6.5 Model slope (pitch, angle of inclination) using concrete objects and practical examples.	4.7.5 Use coordinate geometry to represent slope, midpoint, and horizontal and vertical distance.	4.8.5 Use coordinate geometry to represent and interpret relationships defined by equations and formulas (including distance, midpoint, and slope) with and without technology.	4.12.5 Use coordinate geometry to graph linear equations, determine slopes of lines, identify parallel and perpendicular lines and find possible solutions to sets of equations; use algebraic techniques to solve problems determined by geometric relationships.	Line Slopes and Linear Equations
4.5.6 Identify, describe, define, and draw geometric figures including points, intersecting, perpendicular and parallel lines , line segments , rays , angles, and planes.	4.6.6 Draw complementary and supplementary angles; identify and find measures of complementary and supplementary angles using arithmetic and geometric methods.	4.7.6 Describe the properties of geometric relationships including parallel lines, perpendicular lines, bisectors, triangles, and quadrilaterals (e.g., properties of angles formed by a transversal of parallel lines).	4.8.6 Form generalizations and validate conclusions about properties of geometric shapes including parallel lines, perpendicular lines, bisectors, triangles, and quadrilaterals.	4.12.6 Use complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal, and angles in polygons to solve practical problems.	Lines, Angles, and Geometric Figures

Angle of Inclination – The positive angle, less than 180 degrees, that measures the steepness of the slope or the rate at which the height of the line changes.

Complementary – Two angles whose measures total exactly 90 degrees.

Line Segments – A part of a line having two endpoints.

Parallel Lines – Lines in the same plane that are always the same distance apart.

- Perpendicular** – Two lines that intersect to form right angles.
- Ray** – A part of a line that has one endpoint and extends endlessly in one direction (sunbeam).
- Slope** – The degree of steepness.
- Transversal** - The name given to a line that intersects two or more other lines in a given plane.
- Validate – **To give evidence that a solution or process is correct.**

Content Standard 4.0: Spatial Relationships and Geometry

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
	4.6.7 Determine the measures of missing angles of triangles based on the Triangle Sum Theorem (the sum of the interior angles of a triangle equals 180 degrees).	4.7.7 Model the Pythagorean Theorem ; solve for the hypotenuse using the theorem.	4.8.7 Verify and explain the Pythagorean Theorem with various methods (e.g., using grid paper, applying it to a missing side of a right triangle); determine missing sides and angles of triangles based on properties of their sides and angles including the Triangle Sum Theorem.	4.12.7 Apply the Pythagorean Theorem, its converse , properties of special right triangles, and right triangle trigonometry to solve practical problems.	Pythagorean Theorem
	4.6.8 Construct circles, angles, and triangles based on given measurements using a variety of methods (e.g., protractor, paper folding).	4.7.8 Construct and verify congruent angles, and parallel and perpendicular lines using hand tools.	4.8.8 Use hand tools, technology, and models to construct figures and bisect angles and line segments; distinguish among constructions, sketches and drawings.	4.12.8 Use tools, technology, and models to sketch, draw, and construct geometric figures in order to solve problems and to demonstrate the properties of geometric figures.	Draw and Construct

- Converse** – A particular type of logic or "truth statement" that describes when the two terms of the statement can be interchanged and the statement remain true (If I am alive, then I will die. If I will die, then I am alive).
- Pythagorean Theorem** – A relationship that occurs in every right triangle written $a^2 + b^2 = c^2$ and meaning that the square of the length of one leg added to the square of the leg of the other length is equal to the square of the hypotenuse.

Content Standard 4.0: Spatial Relationships and Geometry

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
				4.12.9 Construct, justify and defend mathematical conclusions using logical, sequential, deductive reasoning supported by	Logic and Deductive Reasoning

				established mathematical principles.	
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Deductive Reasoning – The process of reasoning that starts from statements accepted as true and applied to a new situation to reach a conclusion (If $5 + 4 = 9$ and $6 + 3 = 9$ then $5 + 4 = 6 + 3$).

Data Analysis

Content Standard 5.0: *To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections.*

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
5.5.1 Collect, organize, read, and interpret data using a variety of graphic representations including tables, line plots, stem and leaf plots , scatter plots, histograms ; use data to draw and explain conclusions and predictions.	5.6.1 Collect, organize, read, and interpret data using circle graphs; use data to draw and explain conclusions and predictions.	5.7.1 Organize, display, read, and analyze data with and without technology using a variety of displays including frequency distributions and circle graphs.	5.8.1 Organize, display, read, and analyze data with and without technology using a variety of displays including circle graphs, frequency distributions , and box and whisker plots.	5.12.1 Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information; use the shape of graphs of normal distributions to compare and analyze information.	Data Collection and Organization

Distribution – Data that is organized by how often it occurs (a display of the numbers of different types of cars purchased in a particular year).

Histogram - A particular kind of graph that compares two kinds of data for different time periods (the speed of female and male runners in each year between 1990 and 1996).

Stem and Leaf Plot - A method of organizing data for the purpose of comparison where the "leaf" is the number in the smallest place value and the "stem" includes the numbers in the larger place values.

Content Standard 5.0: Data Analysis

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
5.5.2 Conduct simple probability experiments using concrete materials and represent the results using fractions.	5.6.2 Conduct simple probability experiments using concrete materials and represent the results using decimals and percents (1/10, 1/4, 1/2) and their respective equivalents.	5.7.2 Find the theoretical probability (the mathematical expectations) of an event using different counting methods (e.g., tree diagrams , sample space , organized lists) and compare those results with actual (experimental) results.	5.8.2 Find the theoretical probability (the mathematical expectations) of an event using different counting methods (e.g., tree diagrams, sample space, organized lists) and compare those results with actual (experimental) results, differentiating between the probability of an event and the odds of an event.	5.12.2 Design, conduct, analyze, and communicate the results of multi-stage probability experiments.	Probability

5.5.3		5.7.3	5.8.3	5.12.3	
Solve probability problems using a variety of methods including constructing sample spaces and tree diagrams.		Find the number of combinations possible in given situations using a variety of counting methods.	Find the number of combinations possible in given situations using a variety of counting methods.	Identify a probability situation as a permutation or a combination and find the possible outcomes using a variety of methods.	Probability Analysis

Odds – The number of ways to win compared to the number of ways to lose (1 to 3 odds means you have a 1 in 4 chance of winning).

Permutation – An arrangement of items in which order is important (a list of the possible 1st, 2nd, and 3rd place winners).

Probability – The number of favorable outcomes compared to the number of possible outcomes of an experiment.

Sample Space – A way to list all the possible results, or outcomes, for a probability experiment.

Theoretical Probability – Counting the number of ways an event can happen using mathematical expectations.

Tree Diagram – A method of finding all of the possible outcomes of an experiment by systematically listing the possibilities.

Content Standard 5.0: Data Analysis

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
5.5.4		5.7.4		5.12.4	Central Tendency
Model and then compute measures of central tendency including mean , median , and mode .		Select, use, and graph (when possible) measures of variability including range, distribution and possible outliers.		Select and use the measures of central tendency such as mean, median, mode and variability including range, distribution and possible outliers that are appropriate for given situations.	
	5.6.5		5.8.5	5.12.5	Data Analysis
	Analyze the effect a change of format will have on interpretation of statistical charts and graphs.		Evaluate arguments that are based on data analysis for accuracy and validity; analyze the effect a change of scale or a change of format will have on statistical charts and graphs.	Analyze the validity of statistical conclusions noting various sources of bias, misuse, and abuse of data caused by a wide variety of factors including choices of scale, probability versus odds, inappropriate uses of measures of central tendency, inaccurate curve fitting and inappropriate uses of controls or sample groups.	

Factors – The numbers that are multiplied to give a product (In $3 * 8 = 24$, the factors are 3 and 8).

Mean – In a collection of data, the sum of all the data divided by the number of data.

Measures of Central Tendency - The mean, the mode, the median, and the geometric mean are commonly used.

Median - The middle number (or average of the two middle numbers where necessary) in a collection of numbers that are arranged in order from least to greatest.

Mode – The number that occurs most often in a collection of data.

Content Standard 5.0: Data Analysis

By the end of Grade 5 , students know and are able to do everything required in previous grades and:	By the end of Grade 6 , students know and are able to do everything required in the previous grades and:	By the end of Grade 7 , students know and are able to do everything required in the previous grades and:	By the end of Grade 8 , students know and are able to do everything required in the previous grades and:	By the end of Grade 12 , students know and are able to do everything required in the previous grades and:	
5.5.6 Describe the limitations of various graph formats; select an appropriate type of graph to accurately represent the data and justify the selection.		5.7.6 Given a set of data, interpolate and extrapolate to make and explain predictions.	5.8.6 Formulate accurate inferences and projections based on interpolations (filling in) and extrapolations (extending) of data to solve problems.	5.12.6 Design, construct, analyze, and select an appropriate type of graph to represent data to communicate the results of statistical experiments (e.g., write a survey question and analyze and communicate the findings).	Design

Extrapolation – Estimating the value of a number using the value of known numbers that precede it.

Interpolation – Estimating the value of a number using the value of known numbers on either side of the missing number.

Problem Solving

Process Standard 6.0: *Students will develop their ability to solve problems by engaging in developmentally appropriate problem solving opportunities in which there is a need to use various approaches to investigate and understand mathematical concepts in order to: formulate their own problems; find solutions to problems from everyday situations; develop and apply strategies to solve a wide variety of problems; and integrate mathematical reasoning, communication and connections.*

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
6.1									
Select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts.									
6.2									
Apply previous experience and knowledge to new problem-solving situations.									
6.3									
Formulate own problems; use various approaches to investigate and solve problems.									
6.4				6.5					
Explain and verify results with respect to the original problem.				Verify, interpret, and evaluate results with respect to the original problem situation, determining an efficient strategy for the given situation.					
6.6									
Try more than one strategy when the first strategy proves to be unproductive.									
					6.7				
					Apply multi-step, integrated, mathematical problem-solving strategies, persisting until a solution is found or until it is clear that no solution exists.				

6.8 Apply solutions and strategies from earlier problems to new problem situations.				6.9 Generalize solutions and strategies from earlier problems to new problem situations.			
				6.10 Interpret and solve a variety of mathematical problems by paraphrasing, identifying necessary and extraneous information, selecting and justifying efficient methods and/or strategies, and ensuring the answer is reasonable.			
							6.11 Apply combinations of proven strategies and previous knowledge to solve non-routine problems.

Process Standard 6.0: Problem Solving

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
6.12 Use technology, including calculators, to understand quantitative relationships, e.g., for skip counting and pattern exploration.									
					6.13 Use technology, including calculators, to solve problems and verify solutions.				
					6.14 Use technology, including calculators, to investigate, define, and describe quantitative relationships such as patterns and functions.				

Mathematical Communication

Process Standard 7.0: *Students will develop their ability to communicate mathematically by solving problems in which there is a need to obtain information from the real world through reading, listening, and observing in order to: translate this information into a mathematical language and symbols; process this information mathematically; and present results in written, oral and visual formats.*

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
7.1									
Discuss and exchange ideas about mathematics as a part of learning.									
7.2									
Use inquiry techniques (e.g. discussion, questioning, research, data gathering) to solve mathematical problems.									
						7.3			
						Read expository text to learn about mathematics.			
7.4			7.5			7.6			
Use pictorial representations to identify mathematical operations and concepts.			Identify and translate key words and phrases that imply mathematical operations.			Interpret and solve word problems without the necessity of key words or phrases.			

7.7 Use physical materials, models, pictures, or writing to represent and communicate mathematical ideas.				7.8 Use physical material, diagrams, and tables to represent and then communicate mathematical ideas through oral, verbal, and written formats.		7.9 Model and explain mathematical relationships using oral, written, graphical, and algebraic methods.	
7.10 Explain and justify thinking about mathematical ideas and solutions.						7.11 Explain and evaluate thinking about mathematical ideas and solutions.	
						7.12 Evaluate the effectiveness of written and oral presentations of mathematics.	
				7.13 Make conjectures and present arguments in discussions of mathematical ideas.			

Process Standard 7.0: Mathematical Communication

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
						7.14 Explain and evaluate thinking about mathematical ideas and solutions.		7.15 Explain and evaluate thinking about mathematical ideas and solutions based on the role of definitions, properties, common rules, and symbols in solving problems.	
7.16 Use everyday language to explain thinking about strategies and solutions to mathematical problems.									
7.17 Express mathematical ideas and use them to define, compare, and solve problems orally and in writing.									
7.18 Use mathematical notation to communicate and explain mathematical situations.									

Mathematical Reasoning

Process Standard 8.0: *Student will develop their ability to reason mathematically by solving problems in which there is a need to investigate significant mathematical ideas and **construct** their own learning in all content areas in order to justify their thinking; reinforce and extend their logical reasoning abilities; reflect on and clarify their own thinking; and ask questions to extend their thinking.*

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
8.1 Justify and explain the solutions to problems using manipulative and physical models.					8.2 Justify answers and the steps taken to solve problems with and without manipulatives and physical models.			8.3 Construct, justify, and defend mathematical conclusions using logical arguments, in situations related to mathematics, science, and technology.	
8.4									

Use patterns and relationships to analyze mathematical situations; draw logical conclusions about mathematical problems.					
				8.5 Follow a logical argument and judge its validity.	
				8.6 Apply deductive and inductive reasoning in mathematical situations to extend logical reasoning.	8.7 Recognize and apply deductive and inductive reasoning in both concrete and abstract contexts.
8.8 Ask questions to reflect on, clarify, and extend thinking.					
8.9 Review and refine the assumptions and steps used to derive conclusions in mathematical arguments.					

Process Standard 8.0: Mathematical Reasoning

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
									8.10 Construct valid arguments; make and test conjectures about algebraic and geometric properties based on mathematical principles.
8.11 Determine relevant, irrelevant, and/or sufficient information to solve mathematical problems.									

Mathematical Connections

Process Standard 9.0: *Students will develop the ability to make mathematical connections by solving problems in which there is a need to view mathematics as an integrated whole, identifying relationships between context strands, and integrating mathematics with other disciplines, allowing the flexibility to approach problems in a variety of ways within and beyond the field of mathematics.*

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 12
9.1 Link new concepts to prior knowledge.									
	9.2 Use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics.								
				9.3 Use models to explain the relationship of concepts to procedures.					

						9.4	Use the connections among mathematical topics to develop multiple approaches to problems.
9.5							
Identify practical applications of mathematical principles that can be applied to other disciplines.							
9.6							
Apply mathematical thinking and modeling to solve problems that arise in other disciplines (e.g. rhythm in music and motion in science).							
							9.7
							Use and analyze the connections between
							Mathematics and other disciplines.
9.8							
Identify, explain, and use mathematics in everyday life.							

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Glossary for Mathematics

- Absolute Value** A number’s distance from zero on a number line. The absolute value of 2 is equal to the absolute value of –2.
- Acute Angle** An angle that measures less than 90 degrees.
- Algorithm** A rule or procedure for completing or solving a certain type of problem.
- Amortization Table** A table used to display monthly payment costs (principal + interest) based on loan interest rate and the amount of time that will be used to repay the loan.
- Angle of Inclination** The positive angle, less than 180 degrees, that measures the steepness of the slope or the rate at which the height of the line changes.
- Arc** Any section of the circumference of a circle.
- Area** The size of a region measured in number of square units (i.e., inches squared, square feet).
- Associative** Refers to the fact that when adding or multiplying three or more numbers, any order can be used and the answer will be the same.
- Attribute** A characteristic of an object, such as color, shape, size, etc.
- Binomials** The algebraic expressions with exactly two terms ($2x + 3y$).
- Box and Whisper Plot** A graphical method used to display the middle (median) of a set of data, the middle (median) of each half of that data, and the extremes of the data.
- Calculate** (Compute) The process of adding, subtracting, multiplying, dividing or finding the square root of an equation/problem.
- Capacity** The maximum amount of liquid a container can hold.
- Chord** A straight line segment that connects two sides of a circle, but does not go through the exact center.
- Commutative** The order in which two numbers are added or multiplied does not change the sum.
- Complementary** Two angles whose measures sum exactly 90 degrees.

Composite Number A whole number that is the result of at least two numbers (with "1" not one of the numbers) being multiplied together and that can be broken down into factors (i.e., $20 = 2 * 10$).

Congruent Figures that have the same size and shape.

Conjecture An idea or theory that has not been proved.

Converse A particular type of logic or "truth statement" that describes when the two terms of the statement can be interchanged and the statement remain true (If I am alive, then I will die. If I will die, then I am alive).

Convert To change from one form to another (i.e., $1/2 = 50\%$).

Coordinate Grid A flat surface divided into square units that are numbered and can be used to locate items on the grid.

Cylinder A three-dimensional figure shaped like a soup can.

Deductive Reasoning The process of reasoning that starts from statements accepted as true and applied to a new situation to reach a conclusion (i.e., if $5 + 4 = 9$ and $6 + 3 = 9$ then $5 + 4 = 6 + 3$).

Denominator The number that is the bottom half of a fraction and that describes the number of parts in the fraction.

Discrete Graph A graph that has discontinuous information that results in breaks in the display (the graph shows the temperatures only for weekdays and not for weekends).

Diagram A sketch used to illustrate an idea.

Digit A number.

Distribution Data that is organized by how often it occurs (i.e., a display of the numbers of different types of cars purchased in a particular year).

Distributive Property Describes that two numbers can be added together before being multiplied by a third number or each multiplied by that third number and then added and still produce the same answer i.e., $\{a (b + c) = ab + ac\}$.

Edge The place or line where two sides of a figure meet (i.e., the edge of a table).

Empirical A statement that is based upon observation and experimental evidence.

Estimates To give an approximate rather than an exact answer.

Exponent A numeral used to tell how many times a number or variable is multiplied by itself (i.e., $3^2 = 3 * 3$).

Extend (pattern) To continue a pattern or sequence with the same rules.

Exterior Polygon A figure with at least four sides, all of which are straight and with a share that has a least one angle going "into" instead of "out of " the shape.

Extrapolation Estimating the value of a number using the value of known numbers that precede it.

Face A flat surface of a three-dimensional figure.

Face Value The value assigned to each digit (0,1,2,3,4,etc.) used in our number system.

Factors The numbers that are multiplied to give a product (In $3 * 8 = 24$, the factors are 3 and 8).

Formula An equation that states a fact or rule ($lw = A$).

Frequency Table A listing of data that includes the number of times an item occurs.

Function A relationship between two items, one of which depends on each other (one tricycle has 3 wheels, two tricycles have 6 wheels, ...) that can be graphed and described algebraically.

Geometric Sequence A sequence of numbers in which the next term can be found by multiplying the current term by some number (given the number 3 and continuing to multiply by 2 gives the sequence 3, 6, 12, 24...).

Graph A pictorial representation of information or relationships between numbers presented on a coordinate plane used to represent data.

Greatest Possible The measurement error which always results from rounding or estimating a

Error measure to nearest specified unit of measure.

Histogram A particular kind of graph that compares two kinds of data for different time periods (the speed of female and male runners in each year between 1990 and 1996).

Hypotenuse The side of a right (90 degree) triangle that is across from the right angle.

Indirect Measure A measure found by using a formula or other strategy and not actually measuring something (i.e., finding the height of a tree without actually holding a ruler next to it).

Inductive Reasoning A particular type of logic which involves drawing conclusions from several specific, known facts and using them to make generalizations about other, similar situations.

Integers Positive and negative whole numbers.

Interpolation Estimating the value of a number using the value of known numbers on either side of the missing number.

Intersecting Lines Lines that cross and have exactly one point in common.

Inverse Operations Two operations that undo each other (i.e., addition and subtraction).

Justify To define or develop a postulate or theorem to explain and support a conclusion.

Line of Symmetry A line that divides a geometric shape into two parts. Folding on the line of symmetry will produce two shapes that are the mirror image of each other.

Line Segments A part of a line having two endpoints.

Linear Equation An algebraic equation that describes or produces a straight line.

Manipulatives Tools, models, blocks, tiles, and other objects which are used to explore mathematical ideas and solve mathematical problems.

Mass The amount of "stuff" (atoms & molecules) inside solid objects. The weight of objects can vary depending on the location (the moon versus Earth), but the mass remains constant.

Mathematical Modeling Representing or showing mathematical ideas and relationships using objects, pictures, graphs, equations and other methods.

Matrices Plural of matrix, a way of displaying information in a grid form (a chart that lists the various models of cars for various years).

Mean In a collection of data, the sum of all the data divided by the number of data.

Measures of Central

Tendency The mean, the mode, the median, and the geometric mean are commonly used.

Median The middle number (or the average of the two middle numbers when necessary) in a collection of numbers that are arranged in order from least to greatest.

Mode The number that occurs most often in a collection of data.

Multiple The product of a whole number and any other whole number.

Multiplicative Inverses Two numbers whose product is one ($7 \cdot \frac{1}{7} = 1$).

Non-Standard Units Units of measure that are not fixed or set (handful, arm’s length, stride).

Obtuse Angle An angle with a measure that is greater than 90 degrees and less than 180 degrees.

Odd A whole number that has 1,3,5,7, or 9 in the ones place.

Operation The process of carrying out rules of procedure, such as addition, subtraction, differentiation.

Order of Operation The order in which a mathematical problem is solved which is generally to multiply and divide before adding and subtracting from left to right.

Ordered Pair A pair of numbers that gave the location of a place on a map or a graph (latitude and longitude).

Parallel Lines Lines in the same plane that are always the same distance apart.

Perimeter The distance around a geometric shape.

Permutation An arrangement of items in which order is important (i.e., a list of the possible 1st , 2nd , and 3rd place winners).

Perpendicular Two lines that intersect to form right angles.

Pictograph A graph that shows numerical information by using picture symbols.

Place Value The value of a digit as determined by its position in a number (in the number "11" the one is worth either 10 or 1, depending on the position).

Plane Figures A geometric figure that is flat (one whose points are all in one plane).

Polygon A closed plane figure with straight sides (made up of line segments).

Polynomials The algebraic expressions with two or more terms (i.e., $5x + 2y + 3z$).

Power Another way to describe the exponent (i.e., $12^3 = 12 * 12 * 12$ or 12 to the 3rd power).

Precision of Measurement Tells how finely a measurement is made.

Prime Number A whole number greater than 1 that can only be divided evenly by itself and 1 (i.e., 17).

Prism A three-dimensional figure with triangular faces and two parallel, congruent faces.

Probability The number of favorable outcomes compared to the number of possible outcomes of an experiment.

Proportions A sentence that states two ratios are equal.

Pyramid A three dimensional figure with a flat base and triangular sides that meet in a point.

Pythagorean Theorem A relationship that occurs in every right triangle written $a^2 + b^2 = c^2$ and meaning that the square of the length of one leg added to the square of the leg of the other leg is equal to the square of the hypotenuse.

Radicals Another name for the roots of numbers such as the square root of 5 or the cube root of 17.

Range The difference between the greatest and the least numbers in a collection of data (i.e., the range of 2, 7, 13, and 17 is 15).

Ratio A pair of numbers that compare two quantities or describe a rate.

Rational Number Any number that can be written as a fraction (fractions may not have zero in the denominator).

Ray A part of a line that has one endpoint and extends endlessly in one direction (sunbeam).

Real Numbers All of the rational numbers which are all of the numbers that can be written as a fraction.

Reflection The mirror image of a figure.

Regrouping In adding or subtracting, "carrying" and "borrowing".

Relationship A description of how particular numbers are connected.

Right Angle An angle that measures exactly 90 degrees.

Right Triangle A triangle in which one angle is a right angle (equal to 90 degrees).

Root A number that can be used as a factor a given number of times to produce the original number (i.e., the fifth root of 32 is 2 because $2 \times 2 \times 2 \times 2 \times 2 = 32$).

Rotation A transformation obtained by rotating a figure around a given point.

Rounding Numbers Expressing a number to the nearest one, nearest ten, nearest hundred and so on.

Sample Space A way to list all the possible results or outcomes for a probability experiment.

Scientific Notation A particular way of writing a number with the first number being written as a number between 1 and 10, with as many decimal places as necessary and the second number being 10 and the correct exponent (i.e., $7,923 = 7.923 \times 10^3$).

Secant A straight line intersecting the circle at two points.

Sequence A series of numbers that are predictable and can be extended using simple addition or subtraction (4, 7, 10, 13...).

Skip Count To count by multiples of a number (count by two, five, tens, etc.)

Slope The degree of steepness.

Solve To find all the solutions of an equation or other mathematical problem.

Standard Units Units of measure that have an accepted value like inch, cup, meter, and pound.

Stem and Leaf Plot A method of organizing data for the purpose of comparison where the "leaf" is the number in the smallest place value and the "stem" includes the numbers in the larger place values.

Strategy A method or way of solving a problem.

Substitution Algebra Substituting or replacing something, a variable or an expression, in one equation with an equivalent expression from the other equation.

Symbolic Language Mathematical ideas expressed in a symbol or symbols.

Symmetry When an object can be folded in half to form two mirror image objects.

Tangent A straight line intersecting the circle at exactly one point.

Tessellation A covering of a plane with congruent shapes that exactly cover the area (tiling).

Theoretical Probability Counting the number of ways an event can happen using mathematical expectations.

Theory The belief about a particular concept, along with its proven facts and conjectures.

Three-Dimensional An object such as a cube that has a length, a width, and a height.

Translation Changing the position of a geometric figure by sliding it in any direction without any rotation or turn.

Transversal The name given to a line that intersects two or more other lines in a given plane.

Tree Diagram A method of finding all of the possible outcomes of an experiment by systematically listing the possibilities.

Triangular Numbers The numbers 1,3,6,10....are triangular because they can be expressed by employing the number of dots in successive triangular arrays of dots (this can be thought of as "stair-step numbers" or 1, 1+2, 1+2+3, 1+2+3+4, ...).

Two-Dimensional A flat figure such as a piece of paper. It has a length and a width, but not height.

Validate To give evidence that a solution or process is correct.

Variable A letter used to stand for a number in an expression or an equation.

Verify Proving a solution or process is correct.

Vertices The points where two lines come together (corners).

Volume The number of cubic units that fit inside a space figure.

Whole Numbers The set of natural numbers plus the number zero: (0,1,2,3,4.....).