

Middle



Mathematics Curriculum Guide for Parents

2010-2011

*F*ulton
County Schools
Where Students Come First

**Mathematics Curriculum Guide for Parents
Middle**

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Introduction

The Fulton County Schools Mathematics Curriculum stresses rigorous concept development, presents realistic and relevant applications, and keeps a strong emphasis on computational skills. A direct instruction approach provides students with specific skills-based instruction from their teachers at the beginning of new lessons followed by both guided and independent practice. Engaging students in problem solving and real world application are important aspects of mathematics instruction. Technology and manipulatives such as graphing calculators and algebra tiles support the conceptual development of mathematical concepts and skills.

The Middle School Mathematics Curriculum focuses on the following:

- Conceptual Understanding
- Skills Mastery
- Problem Solving

Lesson Planning and Instructional Delivery Building Student Understanding and Proficiency

► Lesson Opening

- Steps 1-4 clarify the purpose of learning, engage students, link prior knowledge and build prerequisite skills.

Steps included as a part of the lesson opening include:

1. *Communication of Learning Intentions*
2. *Communication of Success Criteria*
3. *Build Commitment and Engagement*
4. *Teacher Presentation Strategies*

► Work Period

- Step 5 involves opportunities for students to practice, demonstrate, or work through new learning with teacher supervision and appropriate feedback. During this phase of the lesson differentiation is provided through scaffolding, interventions and extensions. This step is known as:

5. *Guided Practice*

► Lesson Summary

- Steps 6 and 7 allow students to form a coherent picture of the major elements of the standards that have been taught and prepare students to work independently. Steps in the lesson summary include:

6. *Closure*
7. *Independent Practice*



Continuous Achievement

The Fulton County School Board supports our mission statement that each child should be given the opportunity to reach their full potential. To that end, the Fulton County School System has long embraced a framework for advancement called Continuous Achievement. Fulton County Schools supports a framework for advancement that allows each child to progress in language arts and math at their optimum pace and depth, expanding and compacting the curriculum as appropriate. While no child will be placed below their current grade level, given the different developmental needs of students, depending upon their age/grade level, advancement within the curriculum will be provided differently in the primary and intermediate grade levels.

Grades 6-8

Middle grade students are afforded opportunities to be placed in an advanced or accelerated curriculum provided they meet the placement criteria. In mathematics, the curriculum is written so that the advanced and the accelerated students learn at a much deeper level, a faster pace, and use different instructional resources to support their learning. Like elementary grades, a student's placement in a course will be considered at a minimum of 18 weeks to ascertain if the student is in the appropriate level to meet his or her learning need.

Georgia Performance Standards

The Georgia Performance Standards provide clear expectations for instruction, assessment, and student work. They define the level of work that demonstrates achievement of the standards, enabling a teacher to know “how good is good enough.” The performance standards isolate and identify the skills needed to problem-solve, reason, communicate, and make connections with other information. They also tell the teacher how to assess the extent to which the student knows the material or can manipulate and apply the information.

The Georgia Mathematics Curriculum focuses on actively engaging the students in the development of mathematical understanding by using manipulatives and a variety of representations, working independently and cooperatively to solve problems, estimating and computing efficiently, and conducting investigations and recording findings. There is a shift towards applying mathematical concepts and skills in the context of authentic problems and for the student to understand concepts rather than merely follow a sequence of procedures. In mathematics classrooms, students will learn to think critically in a mathematical way with an understanding that there are many different ways to a solution and sometimes more than one right answer in applied mathematics. Mathematics is the economy of information. The central idea of all mathematics is to discover how knowing some things well, via reasoning, permit students to know much else—without having to commit the information to memory as a separate fact. It is the connections, the reasoned, logical connections that make mathematics manageable. As a result, implementation of Georgia’s Performance Standards places a greater emphasis on problem solving, reasoning, representation, connections, and communication. Topics should be represented in multiple ways including concrete/pictorial, verbal/written, numeric/data-based, graphical, and symbolic. Concepts should be introduced and used in the context of real world phenomena.

Reading Standard

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

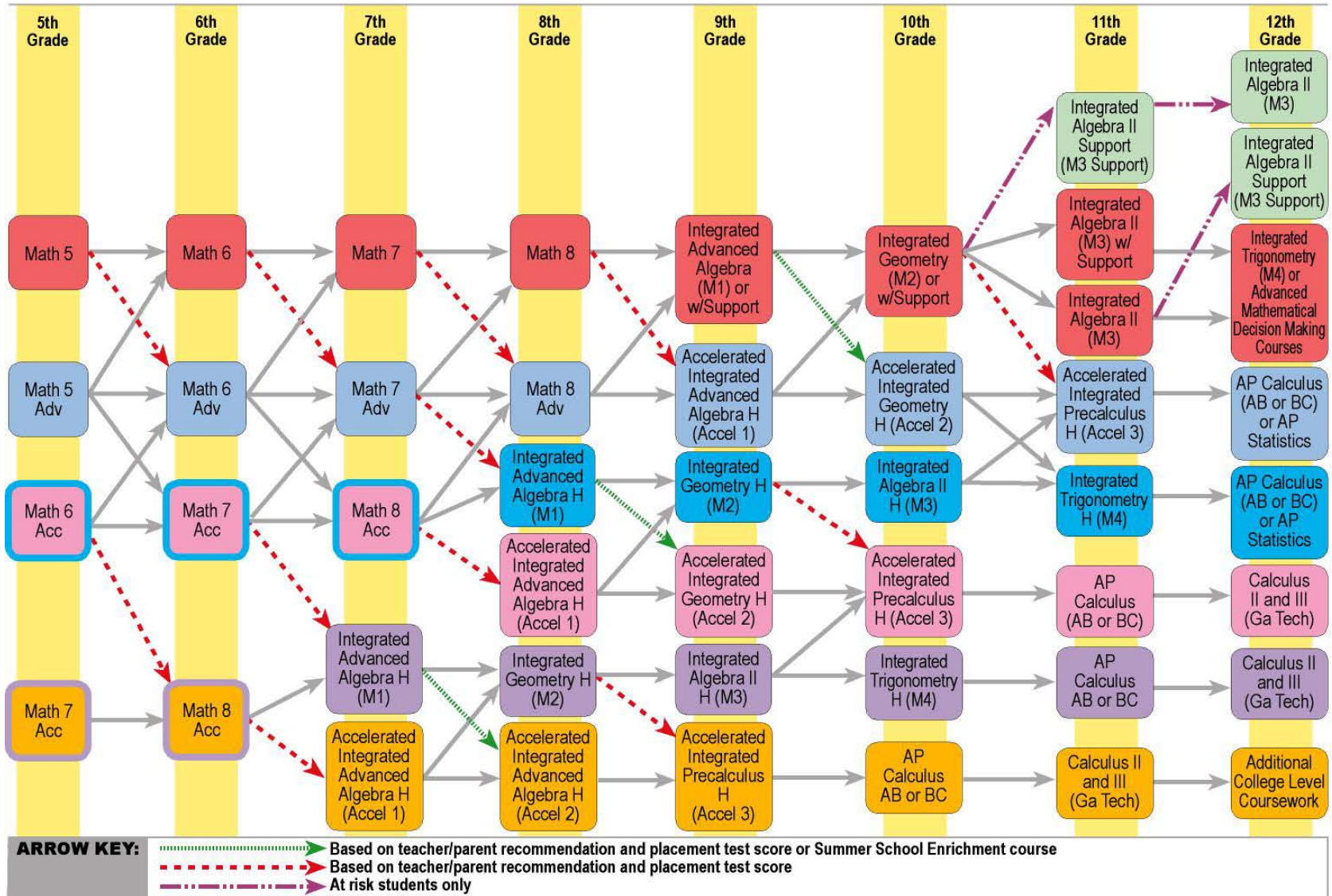
Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

Course Sequence

July 30, 2010

Fulton County Schools 2010-2012 Mathematics Sequence

Routes to GT Calculus II & III: 1) 7th grade students who take Accelerated Integrated Advanced Algebra H or Integrated Advanced Algebra H. 2) 8th grade students who take Accelerated Integrated Advanced Algebra H. 3) 8th grade students who take integrated Advanced Algebra H **and** enroll in summer enrichment course. 4) Must meet enrollment requirements for GT Calculus II and III. 5) Complete AB or BC calculus (both not required). BC includes everything in AB plus additional topics. Score 4 on AB AP Exam or score 3 on BC AP Exam.



Middle School Placement Guidelines for 2009-2010+ School Year

Current Grade Level	Student's Current Course	Student's Current Performance	Next Year Placement	Course Number
5th Grade	Math 5 On-Level	Level 2 on Grade 4 OR Grade 5 CRCT	Math 6 On-Level	27.0210000
		Math 5 On-level Unit Assessment Average $\geq 88\%$ OR ITBS $\geq 90\%$ AND Level 3 on Grade 4 OR Grade 5 CRCT	Math 6 Advanced	27.0210040 27.2210040
	Math 5 Advanced	Math 5 Advanced Unit Assessment Average $\geq 70\%$ Advanced AND Level 3 on Grade 4 OR Grade 5 CRCT	Math 6 Advanced	27.0210040 27.2210040
		Math 5 Advanced Unit Assessment Average $\geq 70\%$ AND Level 2 on Grade 4 CRCT OR Grade	Math 6 On-Level	27.0210000
	Math 6 Accelerated or Advanced Accelerated	Math 6 Accelerated Summative Assessment Average $\geq 70\%$ AND Level 3 on Grade 4 OR Grade 5 CRCT	Math 7 Accelerated	27.0220006 27.2220006
		Math 6 Accelerated Summative Assessment Average $\geq 70\%$ AND Level 1 or 2 on Grade 4 OR Grade 5 CRCT	Math 7 Advanced Accelerated	27.0220046 27.2220046
6th Grade	Math 6 On-Level	Math 6 On-level Summative Assessment Average $\geq 70\%$ Level 2 on Grade 5 AND Grade 6 CRCT	Math 7 On-Level	27.0220000
		Math 6 On-level Summative Assessment Average $\geq 90\%$ AND Level 3 on Grade 5 OR Grade 6 CRCT	Math 7 Advanced	27.0220040 27.2220040
	Math 6 Advanced	Math 6 Advanced Summative Assessment Average $\geq 70\%$ AND Level 3 on Grade 5 OR Grade 6 CRCT	Math 7 Advanced	27.0220040 27.2220040
		Math 6 Advanced Summative Assessment Average $\geq 70\%$ AND Level 2 on Grade 5 or Grade 6 CRCT	Math 7 On-Level	27.0220000
	Math 7 Accelerated or Advanced Accelerated	Math 7 Accelerated Summative Assessment Average $\geq 70\%$ AND Level 3 on Grade 5 OR Grade 6 CRCT	Math 8 Accelerated	27.0230007 27.2230007
		Math 7 Accelerated Summative Assessment Average $\geq 70\%$ AND Level 1 or 2 on Grade 5 OR Grade 6 CRCT	Math 8 Advanced Accelerated	27.0230047 27.2230047
7th Grade	Math 7 On-Level	Math 7 On-level Summative Assessment Average $\geq 70\%$ Level 2 on Grade 6 OR Grade 7 CRCT	Math 8 On-Level	27.0230000
		Math 7 On-level Summative Assessment Average $\geq 90\%$ AND Level 3 on Grade 6 OR Grade 7 CRCT	Math 8 Advanced	27.0230040 27.2230040
	Math 7 Advanced	Math 7 Advanced Summative Assessment Average ($\geq 70\%$) AND Level 3 on Grade 6 OR Grade 7 CRCT	Math 8 Advanced	27.0230040 27.2230040
		Math 7 Advanced Summative Assessment Average ($\geq 70\%$) AND Level 2 on Grade 6 OR Grade 7 CRCT	Math 8 On-Level	27.0230000
	Math 8 Accelerated or Advanced Accelerated	Math 8 Accelerated Summative Assessment Average ($\geq 90\%$) AND Level 3 on Grade 6 OR Grade 7 CRCT	Accelerated Integrated Advanced Algebra Honors	27.0910040 27.2910040
		Math 8 Accelerated Summative Assessment Average ($< 90\%$) AND Level 2 on Grade 6 OR Grade 7 CRCT	Integrated Advanced Algebra Honors	27.0810040 27.2810040
8th Grade	Math 8 On-Level	Math 8 On-level Summative Assessment Average $\geq 70\%$ AND Level 2 on Grade 7 OR Grade 8 CRCT	Integrated Advanced Algebra	27.0810000
		Math 8 On-level Summative Assessment Average $\geq 70\%$ AND Level 1 on Grade 7 OR Grade 8 CRCT	Integrated Advanced Algebra w/Support	27.0810020
		Math 8 On-level Summative Assessment Average $\geq 90\%$ AND Level 3 on Grade 7 OR Grade 8 CRCT	Accelerated Integrated Advanced Algebra Honors	27.0910040
	Math 8 Advanced	Math 8 Advanced Summative Assessment Average $\geq 70\%$ AND Level 3 on Grade 7 OR Grade 8 CRCT	Accelerated Integrated Advanced Algebra Honors	27.0910040
		Math 8 Advanced Summative Assessment Average $\geq 70\%$ AND Level 2 on Grade 7 OR Grade 8 CRCT	Integrated Advanced Algebra	27.0810000
	Integrated Advanced Algebra Honors	IAAH Summative Assessment Average ($\geq 70\%$) AND Level 2 or 3 on Grade 7 OR Grade 8 CRCT	Integrated Geometry Honors	27.0820000
Accelerated Integrated Advanced Algebra	AIAAH Summative Assessment Average ($\geq 70\%$) AND Level 2 on Grade 7 OR Grade 8 CRCT	Accelerated Integrated Geometry Honors	27.0920040	

Middle School Course Descriptions

Course	Offered	Prerequisite	Major Topics	Major Materials
Math 6	ALL	Math 5	By the end of grade six, students will understand the four arithmetic operations as they relate to positive rational numbers; convert between and compute with different forms of rational numbers; understand the concept of ratio and solve problems using proportional reasoning; understand and use line and rotational symmetry; determine the surface area and volume of solid figures; use variables to represent unknown quantities in formulas, algebraic expressions and equations; utilize data to make predictions; and determine the probability of a given event.	Pearson Course 1

Course	Offered	Prerequisite	Major Topics	Major Materials
Math 6 Advanced	ALL	Math 5 Or Math 5 Advanced	By the end of grade six, , students will understand and use rational numbers, including signed numbers; convert between and compute with different forms of rational numbers; understand the concept of ratio and solve problems using proportional reasoning; understand and use line and rotational symmetry; determine the surface area and volume of solid figures; use variables to represent unknown quantities in formulas, algebraic expressions and equations; utilize data to make predictions; and determine the probability of a given event.	Holt 2

Course	Offered	Prerequisite	Major Topics	Major Materials
Math 6 Accelerated <i>(Math 7)</i>	ALL	Math 6 Or Math 6 th Advanced	By the end of grade six, students will understand and use rational numbers, including signed numbers; solve linear equations in one variable; sketch and construct plane figures; demonstrate understanding of transformations; use and apply properties of similarity; examine properties of geometric shapes in space; describe and sketch solid figures, including their cross-sections; represent and describe relationships between variables in tables, graphs, and formulas; analyze the characteristics of linear relationships; and represent and analyze data using graphical displays, measures of central tendency, and measures of variation.	Pearson Course 2

Course	Offered	Prerequisite	Major Topics	Major Materials
Math 7	ALL	Math 6	By the end of grade seven, students will understand and use rational numbers, including signed numbers; solve linear equations in one variable; sketch and construct plane figures; demonstrate understanding of transformations; use and apply properties of similarity; examine properties of geometric shapes in space; describe and sketch solid figures, including their cross-sections; represent and describe relationships between variables in tables, graphs, and formulas; analyze the characteristics of linear relationships; and represent and analyze data using graphical displays, measures of central tendency, and measures of variation.	Pearson Course 2

Course	Offered	Prerequisite	Major Topics	Major Materials
Math 7 Advanced	ALL	Math 6 Or Math 6 Advanced	By the end of grade seven, students will understand and use rational numbers, including signed numbers; solve linear equations in one variable; sketch and construct plane figures; demonstrate understanding of transformations; use and apply properties of similarity; examine properties of geometric shapes in space; describe and sketch solid figures, including their cross-sections; represent and describe relationships between variables in tables, graphs, and formulas including interpreting rate of change as slope; analyze the characteristics of linear relationships; and represent and analyze data using graphical displays, measures of central tendency, and measures of variation.	Holt Course 3

Course	Offered	Prerequisite	Major Topics	Major Materials
Math 7 Accelerated <i>(Math 8)</i>	ALL	Math 7 Or Math 7 Advanced	By the end of grade seven, students will understand various numerical representations, including square roots, exponents and scientific notation; use and apply geometric properties of plane figures, including congruence and the Pythagorean theorem; use symbolic algebra to represent situations and solve problems, especially those that involve linear relationships; solve linear equations, systems of linear equations and inequalities; use equations, tables and graphs to analyze and interpret linear functions; use and understand set theory and simple counting techniques; determine the theoretical probability of simple events; and make inferences from statistical data, particularly data that can be modeled by linear functions.	Pearson Course 3

Course	Offered	Prerequisite	Major Topics	Major Materials
Math 8	ALL	Math 7	By the end of grade eight, students will understand various numerical representations, including square roots, exponents and scientific notation; use and apply geometric properties of plane figures, including congruence and the Pythagorean theorem; use symbolic algebra to represent situations and solve problems, especially those that involve linear relationships; solve linear equations, systems of linear equations and inequalities; use equations, tables and graphs to analyze and interpret linear functions; use and understand set theory and simple counting techniques; determine the theoretical probability of simple events; and make inferences from statistical data, particularly data that can be modeled by linear functions.	Pearson Course 3

Course	Offered	Prerequisite	Major Topics	Major Materials
Math 8 Advanced	ALL	Math 7 Or Math 7 Advanced	By the end of grade eight, students will understand various numerical representations, including square roots, exponents and scientific notation; use and apply geometric properties of plane figures, including congruence and the Pythagorean theorem; use symbolic algebra to represent situations and solve problems, especially those that involve linear relationships; solve linear equations, explore the characteristics of basic functions utilizing tables, graphs, and simple algebraic techniques; systems of linear equations and inequalities; use equations, tables and graphs to analyze and interpret linear functions; use and understand set theory and simple counting techniques; determine the theoretical probability of simple events; make inferences from statistical data, particularly data that can be modeled by linear functions; and utilize counting techniques and determine probability.	Holt Algebra I

HIGH SCHOOL COURSES OFFERED IN MIDDLE SCHOOL

Course	Offered	Prerequisite	Major Topics	Major Materials
Integrated Advanced Algebra Honors <i>(Mathematics I): Algebra/Geometry/Statistics</i>	ALL	Math 8 or Math 8 Advanced	Explore the characteristics of basic functions using tables, graphs, and simple algebraic techniques; operate with radical, polynomial, and rational expressions; solve a variety of equations, including quadratic equations with a leading coefficient of one, radical equations, and rational equations; investigate properties of geometric figures in the coordinate plane; use the language of mathematical argument and justification; discover, prove, and apply properties of polygons; utilize counting techniques and determine probability; use summary statistics to compare samples to populations; and explore the variability of data	Georgia High School Mathematics 1, McDougal-Littel 2008

Course	Offered	Prerequisite	Major Topics	Major Materials
Accelerated Integrated Advanced Algebra Honors <i>(Accelerated Mathematics I): Geometry/Algebra II/Statistics</i>	ALL	Math 8 or Math 8 Advanced	Represent and operate with complex numbers; explore the characteristics of basic functions utilizing tables, graphs, and simple algebraic techniques; operate with radical, polynomial, and rational expressions; solve equations, including quadratic, radical, and rational equations; investigate properties of geometric figures in the coordinate plane; use the language of mathematical argument and justification; discover, prove, and apply properties of polygons, circles and spheres; utilize counting techniques and determine probability; use summary statistics to compare samples to populations; explore variability of data; and fit curves to data and examine the issues related to curve fitting.	Georgia High School Mathematics 1 & 2 McDougal-Littel 2008

*Students will complete work equivalent to a year and a half in one year.

Accelerated Summer Enrichment Course

Purpose:

This course may allow current 8th grade students who are currently enrolled in Integrated Advanced Algebra to move to the Accelerated course track in the next school year. It will also provide enrichment for students who are currently enrolled in Accelerated Integrated Advanced Algebra.

Eligibility to Enroll in High School Summer Course:

- Currently enrolled in Integrated Advanced Algebra
- Currently enrolled in Accelerated Integrated Advanced Algebra
- 90% Assessment average in Integrated Advanced Algebra
- Scored above level one on the 8th grade Math CRCT
- Recommendation from current Math Teacher
- Ability to pay the regular high school summer school tuition

Course Content:

Students will explore the characteristics complex numbers; investigate step and piecewise functions including greatest integer and absolute value functions; investigate the relationships between lines and circles; recognize, analyze, and graph the equations of conic sections; investigate planes and spheres; investigate the issues of curve fitting by finding good linear fits to data; explore the processes of linear and quadratic regression for curve fitting.

This is a **fast paced course**, where students will have to complete work equivalent to three Units in the Accelerated Integrated Advanced Algebra course. The course is offered one period per day during the regular 16 day summer school program. Students **will not** receive credit for this course.

Eligibility to Enroll in Accelerated Integrated Geometry:

- 90% assessment average in the Summer Accelerated Integrated Advanced Algebra Enrichment class
- 100% of assignments must be completed and submitted ON TIME.
- Recommendation from the Accelerated Integrated Advanced Algebra Enrichment summer school teacher

Essential Math Terms

Grade 6

6.1 Extending and Applying Number Theory

Arrays: rectangular arrangements that have equal numbers in the rows and columns.

Decompose: The process of factoring terms and numbers in an expression.

Exponent: The number of times a number or expression (called base) is used as a factor of repeated multiplication. Also called the power.

Factor: When two or more integers are multiplied, each number is a factor of the product. "To factor" means to write the number or term as a product of its factors.

Fundamental Theorem of Arithmetic: Every integer, $N > 1$, is either prime or can be uniquely written as a product of primes.

GCF: Greatest Common Factor: The largest factor that two or more numbers have in common.

Identity property of multiplication: A number that can be multiplied by any second number without changing the second number. The Identity for multiplication is "1".

LCM: Least Common Multiple: The smallest multiple (other than zero) that two or more numbers have in common.

Multiple: A number that is a product of a given whole number and another whole number.

Prime factorization: The expression of a composite number as a product of prime numbers.

Prime number: A positive number that is divisible only by itself and the number one.

Square number: A number that is the product of a whole number and itself. This is also known as a "Perfect Square".

6.2 Understanding Fractions, Decimals and Percents

Benchmark: A convenient number used to replace fractions that are less than one. A "nice" number that can be used to estimate the size of other numbers.

Rational number: A number that can be written as a/b where a and b are integers, but b is not equal to 0.

Fraction: A number that can be written as a quotient of two quantities.

Percent: A fraction or ratio in which the denominator is 100.

Repeating Decimal: A decimal number in which a digit or group of digits repeats without end.

Terminating Decimal: A decimal that contains a finite number of digits.

Essential Math Terms

6.3 Equations Tables and Graphs

Constant of proportionality: The constant value of the ratio of two proportional quantities x and y ; usually written $y = kx$, where k is the constant of proportionality. In a proportional relationship, $y=kx$, k is the constant of proportionality, which is the value of the ratio between y and x .

Direct Proportion (Direct Variation): The relation between two quantities whose ratio remains constant. When one variable increases the other increases proportionally: When one variable doubles the other doubles, when one variable triples the other triples, and so on. When A changes by some factor, then B changes by the same factor: $A=kB$, where k is the constant of proportionality.

Equation: A mathematical sentence that contains an equal sign

Proportion: An equation which states that two ratios are equal.

Ratio compares two quantities that share a fixed, multiplicative relationship.

6.4 Scale Factor and Measurement

Scale Drawings: Drawings that represent relative sizes and placements of real objects or places.

Scale Factor: The ratio of corresponding lengths of the sides of two similar figures.

Similar Figures: Figures that have the same shape but not necessarily the same size.

6.5 Three Dimensional Measurement

Asymmetrical: Describes any figure that cannot be divided into two parts that are mirror images of each other. In other words, asymmetrical means "not symmetrical."

Axis of Symmetry: A line that a figure can be folded over so that one-half of the figure matches the other half perfectly; a line about which a figure is symmetrical.

Line of Symmetry: A line that divides a figure into two parts, each of which is a mirror image of the other.

Line Symmetry: Figures that match exactly when folded in half have line symmetry.

Reflectional Symmetry: A figure has reflectional symmetry if, after reflecting the figure over a line, the figure lines back up with itself.

Rotation: A transformation that turns a figure about a fixed point at a given angle and a given direction.

Rotational Symmetry: A figure has rotational symmetry if, after rotating it by an angle of 180 degrees or less about its center, the figure lines

Symmetry: The property of a figure or expression that allows for parts of it to be interchanged without forcing a change in the whole

Essential Math Terms

Base of a Cone: The flat, circular portion of the cone.

Base of a Pyramid: The face that does not intersect the other faces at the vertex. The base is a polygonal region.

Bases of a Cylinder: The two congruent and parallel circular regions that form the ends of the cylinder.

Bases of a Prism: The two faces formed by congruent polygons that lie in parallel planes, all of the other faces being parallelograms.

Cone: A three dimensional figure with a circular or elliptical base and one vertex.

Cube: A regular polyhedron whose six faces are congruent squares.

Cylinder: A three dimensional object with two parallel, congruent, circular bases.

Edge: The intersection of a pair of faces in a three-dimensional figure.

Face: One of the polygons that makes up a polyhedron.

Lateral Faces: In a prism, a face that is not a base of the figure. In a pyramid, faces that intersect at the vertex.

Net: A two-dimensional figure that, when folded, forms the surfaces of a three-dimensional object.

Polyhedron: A 3-dimensional figure that has polygons as faces.

Prism: A polyhedron with two parallel and congruent faces, called bases, and all other faces that are parallelograms.

Pyramid: A polyhedron with one base and the same number of triangular faces as there are sides of the base.

Surface area: The total area of the 2-dimensional surfaces that make up a 3-dimensional object.

Volume: The amount of space occupied by an object.

6.6 Data Analysis and Probability

Frequency: The number of times an item, number, or event occurs in a set of data.

Ungrouped Frequency Table: A table for organizing a set of data that shows the number of times each item or number appears.

Grouped Frequency Table: The organization of raw data in table form with classes and frequencies.

Event: Any possible outcome of an experiment in probability.

Experimental Probability: The ratio of the number of times an outcome occurs to the total amount of trials performed. $\text{Experimental Probability} = \frac{\text{The number of times event occurrence}}{\text{The total number of trials}}$

Probability: A measure of the likelihood of an event. It is the ratio of the number of ways a certain event can occur to the number of possible outcomes.

Theoretical Probability: The mathematical calculation that an event will happen in theory.

Essential Math Terms

Grade 7

7.1 Integer and Rational Operations

Algebraic Expression: A mathematical phrase involving at least one variable and sometimes numbers and operation symbols.

Absolute value: The distance between a number and zero on the number line. The symbol for absolute value is shown in this equation $88 = |88|$.

Associative property: In addition or multiplication, the result of the expression will remain the same regardless of grouping.

Examples: $a + (b+c) = (a+b) + c$; $a(bc) = (ab)c$

Commutative property: The sum or product of numbers is the same no matter how the numbers are arranged. Examples: $a + b = b + a$; $ab = ba$

Distributive property: The sum of two addends multiplied by a number will be the sum of the product of each addend and the number.

Example: $a(b + c) = ab + ac$

Integers: The set of whole numbers and their opposites

$\{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$

Natural numbers: The set of numbers $\{1, 2, 3, 4, \dots\}$. Natural numbers can also be called counting numbers.

Negative Numbers: The set of numbers less than zero.

Opposite Numbers: Two different numbers that have the same absolute value.

Example: 4 and -4 are opposite numbers because both have an absolute value of 4.

Positive Numbers: The set of numbers greater than zero.

Rational Numbers: The set of numbers that can be written in the form a/b where a and b are integers and $b \neq 0$.

Sign: a symbol that indicates whether a number is positive or negative. Example: in -4 , the $(-)$ sign shows this number is read “negative four”.

Whole numbers: The set of all natural numbers and the number zero.

7.2 Similarity

Dilation : Transformation that changes the size of a figure, but not the shape.

Proportion: An equation which states that two ratios are equal.

Ratio : Comparison of two quantities by division and may be written as

$\frac{r}{s}$, $r:s$, or r to s .

Scale Factor : The ratio of any two corresponding lengths of the sides of two similar figures.

Similar Figures : Figures that have the same shape but not necessarily the same size.

Congruent Figures : Figures that have the same size and shape.

Essential Math Terms

7.3 Variables in Expressions and Equations

Variable: A symbol (often a letter) that represents a number.

Equation: A mathematical sentence that contains an equal sign.

Algebraic Expression: A mathematical phrase involving at least one variable and sometimes numbers and operation symbols.

Coordinate Graph: A graphical representation of pairs of related numerical values that shows the relationship between two variables. It relates the independent variable (shown on the x-axis) and the dependent variable (shown on the y-axis).

Coordinate Pair: An ordered pair, (x,y) , that locates a point in the plane.

Dependent Variable: One of the two variables in a relationship. Its value depends upon or is determined by the other variable called the independent variable.

Independent Variable: One of the variables in a relationship. Its value determines the value of the other variable called the dependent variable.

Pattern: A change that occurs in a predictable way; a set of numbers or objects that are generated by

Relationship: An association between two or more variables. If one of the variables changes, the other variable may also change, and the change may be predictable.

Rule: A summary of a predictable relationship that tells how to find the value of a variable. A rule may be given in words or as an equation.

Scale: A labeling scheme used on each of the axes on a coordinate grid.

Table: A list of values for two or more variables that shows the relationship between them. Tables often represent data made from observations, from experiments, or from a series of arithmetic operations.

x-axis: the number line that is horizontal on a coordinate grid

x-coordinate: The first number of in ordered pair; the position of a point relative to the vertical axis.

y-axis: the number line that is vertical on a coordinate grid

y-coordinate: The second number in an ordered pair; the position of a point relative to the horizontal axis.

7.4 Solving Linear Equations

Coefficient : A number multiplied by a variable in an algebraic expression

Constant term : A quantity that does not change its value.

Equation : A mathematical sentence that contains an equal sign.

Inverse operations : A two-dimensional region determined by a pair of axes and that uses numerical values to represent the location of an object.

Linear equation : An equation in the first degree whose solutions represents a line.

Essential Math Terms

7.5 Direct and Inverse Variation

Variable: A symbol (often a letter) that represents a number.

Proportion: An equation that states two ratios are equal.

Rational Number: A number that can be written as a/b where a and b are integers, but b is not equal to 0.

Equation: A mathematical sentence that contains an equal sign.

Variable: A symbol (often a letter) that represents a number.

Proportion: An equation that states two ratios are equal.

Rational Number: A number that can be written as a/b where a and b are integers, but b is not equal to 0.

Variation and proportion are defined to be the relationship between two or more variables with regard to a constant of proportionality.

- x and y are directly proportional, if $y = kx$ where k denotes a constant of proportionality and $k \neq 0$.
- x and y are inversely proportional, if $xy = k$ where k denotes a constant of proportionality and $k \neq 0$.
- Variation problems describe the proportional relationship between two (or more) different values. In direct variation problems, we usually see the phrase “is directly proportional to” or “varies directly as”. For example, we can state a scale drawing problem two ways:
 - *Real size is directly proportional to scale size. Real size varies directly as scale size.* We can use either one of these statements to write a general formula about real size and scale size. The real size (r) is equal to some number (k) times scale size (s). That is $r = ks$.

7.6 Transformations and Constructions

Transformation: The mapping, or movement, of all the points of a figure in a plane according to a common operation.

Reflection: A transformation that “flips” a figure over a line of reflection

Reflection Line: A line that acts as a mirror or perpendicular bisector so that corresponding points are the same distance from the mirror.

Translation: A transformation that “slides” each point of a figure the same distance in the same direction

Rotation: A transformation that turns a figure about a fixed point through a given angle and a given direction.

Bisector: A bisector divides a segment or angle into two equal parts.

Parallel lines: Two lines are parallel if they lie in the same plane and they do not intersect. $\overline{AB} \parallel \overline{CD}$ denotes that \overline{AB} is parallel to \overline{CD} .

Perpendicular lines: Two lines are perpendicular if they intersect to form right angles. $\overline{AB} \perp \overline{CD}$ denotes that \overline{AB} is perpendicular to \overline{CD} .

Essential Math Terms

Congruent: Having the same size, shape and measure. $\angle A \cong \angle B$ denotes that $\angle A$ is congruent to $\angle B$.

Point: One of the basic undefined terms of geometry. Traditionally thought of as having no length, width, or thickness, and often a dot is used to represent it.

Line: One of the basic undefined terms of geometry. Traditionally thought of as a set of points that has no thickness but its length goes on forever in two opposite directions. \overleftrightarrow{AB} denotes a line that passes through point A and B.

Plane: One of the basic undefined terms of geometry. Traditionally thought of as going on forever in all directions (in two-dimensions) and is flat (i.e., it has no thickness).

Line segment or segment: The part of a line between two points on the line. \overline{AB} denotes a line segment between the points A and B.

Endpoints: The points at an end of a line segment

Intersection: The point at which two or more lines intersect or cross.

Ray: A ray begins at a point and goes on forever in one direction.

Cone: A three-dimensional object with a circular or elliptical base and one vertex.

Base of a cone: The flat circular or elliptical portion of the cone.

Oblique cone: A cone with a vertex that is not aligned directly above the center of the base.

Right circular cone: A cone with a circular base and with a vertex that is aligned directly above the center of the base.

Cross section: A plane figure obtained by slicing a solid with a plane.

Cube: A regular polyhedron whose six faces are congruent squares.

Cylinder: A three-dimensional object with two parallel congruent circular bases.

Bases of a cylinder: The two congruent and parallel circular regions that form the ends of the cylinder.

Oblique cylinder: A cylinder with bases that are not aligned one directly above the other.

Right circular cylinder: A cylinder with circular bases that are aligned one directly above the other.

Polyhedron: A collection of polygons joined at their edges. Each of these polygons is called a "face."

Prism: A polyhedron with two parallel and congruent faces and all other faces that are parallelograms.

Bases of a prism: The two faces formed by congruent polygons that lie in parallel planes, all of the other faces being parallelograms.

Lateral faces of a prism: A face that is not the base of the solid.

Rectangular prism: A prism whose bases are rectangles.

Right rectangular prism: A prism whose faces and bases are rectangles.

Pyramid: A pyramid is a polyhedron with one face (the "base") a polygon and all the other faces triangles meeting at a common point called the vertex.

Essential Math Terms

Base of a pyramid: The face that does not intersect the other faces at the vertex. The base is a polygonal region.

Lateral faces of a pyramid: Faces that intersect at the vertex.

Right pyramid: A pyramid that has its vertex aligned directly above the center of its base.

7.7 Data Analysis

Census: Collection of data from every member of a population.

Sample: A selected part of a population.

Outlier: A value that is very far away from most of the values in a data set.

Quartile: When data in a set are arranged in order, quartiles are the numbers that split the data into quarters (or fourths).

Interquartile range: The difference between the first and third quartiles. (Note that the first and third quartiles are sometimes called *upper* and *lower* quartiles.)

Parameter: A measured characteristic of a population

Statistic: A measured characteristic of a sample.

Essential Math Terms

Grade 8

8.1 Algebraic Expressions and Equations

Absolute Value: The distance a number is from zero on the number line.

Examples: $|-4| = 4$ and $|3| = 3$

Addition Property of Equality: For real numbers a , b , and c , if $a = b$, then $a + c = b + c$. In other words, adding the same number to each side of an equation produces an equivalent equation.

Additive Inverse: Two numbers that when added together equal 0. Example, 3.2 and -3.2

Algebraic Expression: A mathematical phrase involving at least one variable. Expressions can contain numbers and operation symbols.

Equation: A mathematical sentence that contains an equals sign.

Evaluate an Algebraic Expression: To perform operations to obtain a single number or value.

Inequality: A mathematical sentence that contains the symbols $>$, $<$, \geq , or \leq .

Inverse Operation: Pairs of operations that undo each other. Examples: Addition and subtraction are inverse operations and multiplication and division are inverse operations.

Like Terms: Monomials that have the same variable raised to the same power. In other words, only coefficients of terms can be different.

Linear Equation in One Variable: an equation that can be written in the form $ax + b = c$ where a , b , and c are real numbers and $a \neq 0$

Multiplication Property of Equality: For real numbers a , b , and c ($c \neq 0$), if $a = b$, then $ac = bc$. In other words, multiplying both sides of an equation by the same number produces an equivalent expression.

Multiplicative Inverses: Two numbers that when multiplied together equal 1. Example: 4 and $\frac{1}{4}$.

Solution: The value or values of a variable that make an equation a true statement

Solve: Identify the value that when substituted for the variable makes the equation a true statement.

Variable: A letter or symbol used to represent a number.

8.2 Operations with Real Numbers: Square roots, Exponents, & Scientific Notation

Exponent: The number of times a base is used as a factor of repeated multiplication.

Exponential Notation: See *Scientific Notation* below.

Radical: A symbol $\sqrt{\quad}$ that is used to indicate square roots.

Rational: A number that can be written as the ratio of two integers with a nonzero denominator.

Essential Math Terms

Scientific Notation: A representation of real numbers as the product of a number between 1 and 10 and a power of 10, used primarily for very large or very small numbers.

Significant Digits: A way of describing how precisely a number is written.

Irrational: A real number whose decimal form is non-terminating and non-repeating that cannot be written as the ratio of two integers.

Square root: One of two equal factors of a nonnegative number. For example, 5 is a square root of 25 because $5 \cdot 5 = 25$. Another square root of 25 is -5 because $(-5) \cdot (-5) = 25$. The +5 is called the principle square root of 25 and is always assumed when the radical symbol is used.

8.3 Pythagorean Theorem & Parallel Lines Cut by a Transversal

Hypotenuse: The side opposite to the right angle in a right triangle.

Leg: Either of the two shorter sides of a right triangle. The two legs form the right angle of the triangle.

Pythagorean Theorem: A theorem that relates the lengths of the sides of a right triangle: The sum of the squares of the lengths of the legs of a right triangle equals the square of the length of the hypotenuse.

Adjacent Angles: Angles in the same plane that have a common vertex and a common side, but no common interior points.

Alternate Exterior Angles: Alternate exterior angles are pairs of angles formed when a third line (a transversal) crosses two other lines. These angles are on opposite sides of the transversal and are outside the other two lines. When the two other lines are parallel, the alternate exterior angles are equal.

Alternate Interior Angles: Alternate interior angles are pairs of angles formed when a third line (a transversal) crosses two other lines. These angles are on opposite sides of the transversal and are in between the other two lines. When the two other lines are parallel, the alternate interior angles are equal.

Complementary Angles: Two angles whose sum is 90 degrees.

Congruent: Having the same size, shape and measure. Two figures are congruent if all of their corresponding measures are equal.

Corresponding Angles: Angles that have the same relative positions in geometric figures.

Equiangular: The property of a polygon whose angles are all congruent.

Equilateral: The property of a polygon whose sides are all congruent.

Linear Pair: Adjacent, supplementary angles. Excluding their common side, a linear pair forms a straight line.

Parallel Lines: Two lines are parallel if they lie in the same plane and they do not intersect.

Reflection Line: A line that is the perpendicular bisector of the segment with endpoints at a pre-image point and the image of that point after a reflection.

Regular Polygon: A polygon that is both equilateral and equiangular.

Essential Math Terms

Same-Side Interior Angles: Pairs of angles formed when a third line (a transversal) crosses two other lines. These angles are on the same side of the transversal and are between the other two lines. When the two other lines are parallel, same-side interior angles are supplementary.

Same-Side Exterior Angles: Pairs of angles formed when a third line (a transversal) crosses two other lines. These angles are on the same side of the transversal and are outside the other two lines. When the two other lines are parallel, same-side exterior angles are supplementary.

Skew Lines: Two lines that do not lie in the same plane (therefore, they cannot be parallel or intersect).

Supplementary Angles: Two angles whose sum is 180 degrees.

Transversal: A line that crosses two or more lines.

Vertical Angles: Two nonadjacent angles formed by intersecting lines or segments. Also called opposite angles.

System of equations: Two or more equations that together define a relationship between variables

8.4 Functional Relationships

Arithmetic sequence: A sequence of numbers in which the difference between any two consecutive terms is the same

Constant function: A function that is written $y = k$, where k is a real number. The y value is constant for all values of x . The graph of a constant function is a horizontal line.

Explicit Form of a Sequence: See Closed Form of a Sequence

Function: A relation (set of ordered pairs) such that each x value is associated with only one y value.

Graph of a linear inequality: The solutions of a linear inequality, forming a half-plane on one side of a line and may or may not also form the line itself.

Half-plane: The portion of a plane on one side of a line.

Line of best fit: The line that best represents the trend established by the points in a particular scatter plot.

Point-slope form: Derived from the fact that if one point on a line and the slope of that same line are known, the line may be determined or drawn,

$$y - y_1 = m(x - x_1)$$

Recursive Sequence: A type of sequence in which the values of terms originate from other terms in the sequence

Relation: A set

Scatter plot: The graph of a collection of ordered pairs.

Slope: The steepness of a line, which may be calculated by finding the ratio of the difference between the y values of two points on the line to the difference between the corresponding x values of those two points on the line.

Essential Math Terms

Slope-intercept form: One way to write an equation of a line; uses the form $y = mx + b$, where m is the slope and b is the y - intercept.

Standard form: Also known as 'General form' for a linear equation in two variables, x and y . It is usually given as $Ax + By = C$ where, if at all possible, A , B , and C are integers, and A is non-negative, and, A , B , and C have no common factors other than 1.

8.5 Solving Graphing Inequalities

Addition Property of Inequalities: The Addition Property of Inequality states that if you add the same value to each side of an inequality, the relationship between the two sides does not change.

Closed Half-Plane: The part of the coordinate plane on one side of a line which includes the line

Division Property of Inequalities: The Division Property of Inequality states that if you divide an inequality by a positive number, the direction of the inequality is unchanged. If you divide an inequality by a negative number, reverse the direction of the inequality sign.

Greater Than: a symbol that describes a relationship in which the expression on the left is greater than the expression on the right

Greater Than or Equal To: a symbol that describes a relationship in which the expression on the left is greater than or equal to the expression on the right

Less Than: a symbol that describes a relationship in which the expression on the left is less than the expression on the right

Less Than or Equal To: a symbol that describes a relationship in which the expression on the left is less than or equal to the expression on the right

Linear Inequality: An inequality in two variables for which the graphs of the solutions form a half-plane on one side of a line and may or may not also form the line itself

Multiplication Property of Inequality: The Multiplication Property of Inequality states that if you multiply an inequality by a positive number, the direction of the inequality is unchanged. If you multiply an inequality by a negative number, reverse the direction of the inequality sign.

Number Line: A line on which points are marked off at regular intervals (i.e., evenly spaced) and labeled with ordered numbers

Open Half-Plane: The part of the coordinate plane on one side of a line which does not include the line

Solution Set: The set of values that make a statement true.

Subtraction Property of Inequality: When you subtract the same number from each side of an inequality, the relationship between the two sides does not change.

8.6 Systems of Equations and Inequalities

Combination/Elimination Method: a method used to solve systems of equations in which one variable is eliminated by adding or subtracting two equations of the system.

Consistent System: a system with at least one solution.

Coincidental: Two equivalent linear equations overlap when graphed.

Dependent System: has infinitely many solutions. The graph of a dependent system consists of two coincident lines.

Inconsistent System: a system that has no solution.

Independent System: has exactly one solution. The graph of an independent system consists of two intersecting lines.

Intersecting Lines: Two lines in a plane that cross each other. Unless two lines are coincidental, parallel, or skew, they will intersect at one point.

Parallel Lines: Two lines are parallel if they lie in the same plane and they do not intersect.

Perpendicular Lines: Two lines are perpendicular if they intersect at a right angle.

Solution of a System of Linear Equations: an ordered pair that satisfies each equation in the system. So, if an ordered pair is a solution, it will make both equations true.

Solution of a System of Linear Inequalities: any ordered pair that makes the inequality true.

Standard form of a linear equation: $Ax + By = C$ where A, B, and C are real numbers and A and B are not both zero.

System of Equation: Two or more equations that together define a relationship between variables usually in a problem situation. It can have no solution, one solution, or many solutions.

System of Linear Equations: a set of two or more linear equations containing two or more variables.

System of Linear Inequalities: a set of two or more linear inequalities containing two or more variables.

8.7 Probability

Independent events: Events for which the occurrence of one has no impact on the occurrence of the other.

Relative frequency: The number of times an outcome occurs divided by the total number of trials.

Sample space: All possible outcomes of a given experiment.

Event: A subset of a sample space.

Simple Event: An event consisting of just one outcome. A simple event can be represented by a single branch of a tree diagram.

Compound Event: A sequence of simple events.

Essential Math Terms

Complement: The complement of event E, sometimes denoted E' (E prime), occurs when E doesn't. The probability of E' equals 1 minus the probability of E: $P(E') = 1 - P(E)$.

Counting Principle: If an event A can occur in m ways and for each of these m ways, an event B can occur in n ways, then events A and B can occur in $m \cdot n$ ways. This counting principle can be generalized to more than two events that happen in succession. So, if for each of the m and n ways A and B can occur respectively, there is also an event C that can occur in s ways, then events A, B, and C can occur in $m \cdot n \cdot s$ ways.

Tree diagram: A tree-shaped diagram that illustrates sequentially the possible outcomes of a given event.

Complement of a Set: (This is also known as the absolute complement of a set and/or the relative complement of a set.) If a universal set, U , is defined; the complement of A in U is the collection of all items in U not in A and may be denoted by A^c or A' .

Element: A member or item in a set

Intersection of Sets: The set of all elements contained in all of the given sets, but no additional elements

Null Set: A subset which has no elements; also called the 'empty set'

Proper Subset: A subset that does not contain every element of the parent set

Set: A collection of numbers, geometric figures, letters, or other objects that have some characteristic in common

Subset: A collection of items drawn entirely from a single set. A subset can consist of any number of items from a set ranging from none at all (a null subset) all the way up to the entire set (every set is a subset of itself).

Union of Sets: The set of all elements that belong to at least one of the given two or more sets

Venn Diagram: A picture that illustrates the relationship between two or more sets $\{ \}$: "Curly braces" are often used to denote members of a set. For example, the positive, single-digit, even numbers are $\{2,4,6,8\}$.

Support Resources for Middle School Mathematics

Georgia Academic Support Program(ASP) (Walch Education, publisher) is the series adopted for use in middle school. ASP topics are built around Georgia Performance Standards. The ASP includes components that review, instruct as needed, provide practice, and assess students' skills.

Georgia Virtual School Middle School Remediation

The Georgia Virtual School Middle School Remediation Resource is an online resource designed to offer teachers and students the entire curriculum of GPS aligned math for grades 6-8, organized by strand. It is a resource where teachers can direct students to the online lessons for extra reinforcement. This is a resource for teachers to assist students in acquiring the math skills they need before entering high school.

Free On-Line Math Resources

Algebra-Class

<http://www.algebra-class.com/> Offers e-books, resources, and lessons for Algebra concepts (6-8)

Bright Storm

<http://www.brightstorm.com/d/math>

Covers every math topic from order of operation and more.

Interactive Math Tutorials

<http://www.brightstorm.com/d/math> (Math 8 and Integrated Advanced/Accelerated Algebra) (Over 2,000 online videos with top notch teachers)

Class Zone

<http://www.classzone.com/cz/index.htm> Provides lesson activities, eworkbooks, and resources for Math by level and state.

Free Math Help

<http://www.freemathhelp.com/> Many math help resources including lessons, games, and a help message board.

Long Beach Unified School District Beat the Computer Math Drills

http://www.lbusd.k12.ca.us/Main_Offices/Curriculum/Areas/Mathematics/Drills/ These drills help students memorize important facts. Students are challenged to say the answers aloud before the computer shows them the response.

Harcourt School E-Lab 6th – 8th Grade

http://www.harcourtschool.com/elab/grade_6.html

http://www.harcourtschool.com/elab/grade_7.html

http://www.harcourtschool.com/elab/grade_8.html

Interactive games and activities on various mathematical topics.

JrMath Bits

<http://jrmathbits.com/JrMathBits/default.asp> Free lessons and activities

Math Forum

<http://mathforum.org/math.topics.html>

Collection of resources for each math topic Search Internet Mathematics library for specific needs

Math Playground

<http://www.mathplayground.com/mathvideos.html> Math videos covering topics in Arithmetic, Pre-algebra, Algebra, and Geometry.

S.O.S. Mathematics

<http://www.sosmath.com/index.html> Resources for Math 8 and Integrated Advanced/Accelerated Algebra

USA Test Prep

<http://www.usatestprep.com/front/index.php> Provide free practice and instruction

Help students prepare for CRCT and EOCT's (End of Course Testing) FCSS funds county-wide access.

Web Math

<http://www.webmath.com/>

Math-help website that assists with answers to specific math questions and problems entered by a user.

On-line Resources for Students and Parents

- **Resources for Pearson/Prentice-Hall Textbooks:**
http://www.phschool.com/atschool/phmath07/program_page_ms.html
- **Resources for Holt:** <http://www.thinkcentral.com/index.htm>
- **Georgia Mathematics Standards:**
<https://www.georgiastandards.org/Standards/Pages/BrowseStandards/MathStandards.aspx>
- **The Georgia Council of Teachers of Mathematics:** <http://gctm.org/>
- **Center for Education Integrating Science, Mathematics and Computing website with mathematics resources that are aligned to Georgia Performance Standards.**
<http://www.ceismc.gatech.edu/CSI/homepg.html>
- **GADOE Online Assessment System:**
<https://www.georgiaoas.org/servlet/a2l>
Login and password are available through the school.