

Georgia Standards of Excellence Grade 8 Mathematics



“Where Young Men Soar to Greater Heights”

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem. FULTON LEADERSHIP ACADEMY | 2575 Dodson Drive * East Point, GA 30344

Unit 1: Transformations, Congruence, and Similarity

4 – 5 weeks

Standards: MGSE8.G.1; MGSE8.G.2; MGSE8.G.3; MGSE8.G.4; MGSE8.G.5;

Concepts

- Understand congruence and similarity using physical models, transparencies, or geometry software.

Unit 2: Exponents

4 – 5 weeks

Standards: MGSE8.EE.1; MGSE8.EE.2; MGSE8.EE.3; MGSE8.EE.4; MGSE8.EE.7,7a,7b; MGSE8.NS.1; MGSE8.NS.2;

Concepts

- Work with radicals and integer exponents.
- Analyze and solve linear equations and pairs of simultaneous linear equations.
- Know that there are numbers that are not rational, and approximate them by rational numbers.

Unit 3: Geometric Applications of Exponents

4 – 5 weeks

Standards: MGSE8.G.6; MGSE8.G.7; MGSE8.G.8; MGSE8.G.9; MGSE8.EE.2;

Concepts

- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones, and sphere.
- Work with radicals and integer exponents.

Unit 4: Functions

2 – 3 weeks

Standards: MGSE8.F.1; MGSE8.F.2;

Concepts

- Define, evaluate, and compare functions.

Unit 5: Linear Functions

3 – 4 weeks

Standards: MGSE8.EE.5; MGSE8.EE.6; MGSE8.F.3;

Concepts

- Understand the connections between proportional relationships, lines, and linear equations.
- Define, evaluate, and compare functions

Unit 6: Linear Models and Tables

5 -6 weeks

Standards: MGSE8.F.4; MGSE8.F.5; MGSE8.SP.1; MGSE8.SP.2; MGSE8.SP.3; MGSE8.SP.4;

Concepts

- Use functions to model relationships between quantities.
- Investigate patterns of association in bivariate data.

Georgia Standards of Excellence Grade 8 Mathematics

Unit 7: Solving Systems of Equations

4 – 5 weeks

Standards: MGSE8.EE.8, 8a, 8b, 8c;

Concepts

- Analyze and solve linear equations and pairs of simultaneous linear equations.

Unit 8: Show What We Know

3 – 4 weeks

Standards: ALL

High School Prep Review

These units were written to build upon concepts from prior units, so later units contain tasks that depend upon the concepts addressed in earlier units. All units will include the Mathematical Practices and indicate skills to maintain.

NOTE: Mathematical standards are interwoven and should be addressed throughout the year in as many different units and tasks as possible in order to stress the natural connections that exist among mathematical topics.

Grades 6-8 Key:

NS = The Number System

RP = Ratios and Proportional Relationships

EE = Expressions and Equations

G = Geometry

SP = Statistics and Probability

Georgia Standards of Excellence Grade 8 Mathematics

Unit 1: Transformations, Congruence, and Similarity

Unit Focus:

This unit centers around geometry standards related to transformations both on and off the coordinate plane – translations, reflections, rotations, and dilations. Students develop understanding of congruence and similarity using physical models, transparencies, or geometry software, and learn to use informal arguments to establish proof of angle sum and exterior angle relationships.

Standards/Elements:

Understand congruence and similarity using physical models, transparencies, or geometry software.

MGSE8.G.1 Verify experimentally the congruence properties of rotations, reflections, and translations: lines are taken to lines and line segments to line segments of the same length; angles are taken to angles of the same measure; parallel lines are taken to parallel lines.

MGSE8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

MGSE8.G.3 Describe the effect of dilations, translations, rotations and reflections on twodimensional figures using coordinates.

MGSE8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

MGSE8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

Additional Resources:

1. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-MathCurriculum-Map.pdf>
2. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-Math-Unit-1.pdf>

Unit 2: Exponents

Unit Focus:

Georgia Standards of Excellence Grade 8 Mathematics

Students explore and understand numbers that are not rational (irrational numbers) and approximate their value by using rational numbers. Students work with radicals and express very large and very small numbers using integer exponents.

Standards/Elements:

Work with radicals and integer exponents.

MGSE8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.

MGSE8.EE.2 Use square root and cube root symbols to represent solutions to equations. Recognize that $x^2 = p$ (where p is a positive rational number and $|x| < 25$) has 2 solutions and $x^3 = p$ (where p is a negative or positive rational number and $|x| < 10$) has one solution. Evaluate square roots of perfect squares < 625 and cube roots of perfect cubes > -1000 and < 1000 .

MGSE8.EE.3 *Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 , and determine that the world population is more than 20 times larger.*

MGSE8.EE.4 Add, subtract, multiply and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Understand scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g. use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology (e.g. calculators).

Analyze and solve linear equations and pairs of simultaneous linear equations.

MGSE8.EE.7 Solve linear equations in one variable.

MGSE8.EE.7a Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).

MGSE8.EE.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Know that there are numbers that are not rational, and approximate them by rational numbers.

Georgia Standards of Excellence Grade 8 Mathematics

MGSE8.NS.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

MGSE8.NS.2 Use rational approximation of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions (e.g., estimate π^2 to the nearest tenth). *For example, by truncating the decimal expansion of $\sqrt{2}$ (square root of 2), show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

Additional Resources:

1. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-MathCurriculum-Map.pdf>
2. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-Math-Unit-2.pdf>

Georgia Standards of Excellence Grade 8 Mathematics

Unit 3: Geometric Applications of Exponents

Unit Focus:

Students extend their work with irrational numbers by applying the Pythagorean Theorem to situations involving right triangles, including finding distance, and will investigate proofs of the Pythagorean Theorem and its converse. Students solve real-world problems involving volume of cylinders, cones, and spheres.

Standards/Elements:

Understand and apply the Pythagorean Theorem.

MGSE8.G.6 Explain a proof of the Pythagorean Theorem and its converse.

MGSE8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

MGSE8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

MGSE8.G.9 Apply the formulas for the volume of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Work with radicals and integer exponents.

MGSE8.EE.2 Use square root and cube root symbols to represent solutions to equations. Recognize that $x^2 = p$ (where p is a positive rational number and $|x| < 25$) has 2 solutions and $x^3 = p$ (where p is a negative or positive rational number and $|x| < 10$) has one solution. Evaluate square roots of perfect squares < 625 and cube roots of perfect cubes > -1000 and < 1000 .

Additional Resources:

1. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-MathCurriculum-Map.pdf>
2. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-Math-Unit-3.pdf>

Georgia Standards of Excellence Grade 8 Mathematics

Unit Focus:

Unit 4: Functions

Students are introduced to relations and functions. Students define, evaluate, and compare functions. Functions are described and modeled using a variety of depictions, including algebraic representation, graphic representation, numerical tables, and verbal descriptions.

Standards/Elements:

MGSE8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

MGSE8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Additional Resources:

1. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-MathCurriculum-Map.pdf>
2. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-Math-Unit-4.pdf>

Unit 5: Linear Functions

Students further explore functions, focusing on the study of linear functions. Students develop understanding of the connections between proportional relationships, lines, and linear equations, and solve mathematical and real-life problems involving such relationships. Slope is formally introduced, and students work with equations for slope in different forms, including comparing proportional relationships depicted in different ways (graphical, tabular, algebraic, verbal).

Standards/Elements:

Understand the connections between proportional relationships, lines, and linear equations.

Georgia Standards of Excellence Grade 8 Mathematics

Unit Focus:

MGSE8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

MGSE8.EE.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .

Define, evaluate, and compare functions.

MGSE8.F.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points $(1,1)$, $(2,4)$ and $(3,9)$, which are not on a straight line.

Additional Resources:

1. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-MathCurriculum-Map.pdf>
2. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-Math-Unit-5.pdf>

Unit 6: Linear Models and Tables

Students extend the study of linear relationships by exploring models and tables to describe rate of change. The study of statistics expands to bivariate data, which can be graphed and a line of best fit determined.

Standards/Elements:

MGSE8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Georgia Standards of Excellence Grade 8 Mathematics

Unit Focus:

MGSE8.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Investigate patterns of association in bivariate data.

MGSE8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

MGSE8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

MGSE8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

MGSE8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.

- a. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects.
- b. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on

Georgia Standards of Excellence Grade 8 Mathematics

whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

Additional Resources:

1. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-MathCurriculum-Map.pdf>
2. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-Math-Unit-6.pdf>

Georgia Standards of Excellence Grade 8 Mathematics

Unit 7: Solving Systems of Equations

Unit Focus:

The final unit broadens the study of linear equations to include situations involving simultaneous equations. Using graphing, substitution, and elimination, students learn to solve systems of equations algebraically, and make applications to real-world situations.

Standards/Elements:

Analyze and solve linear equations and pairs of simultaneous linear equations.

MGSE8.EE.8 Analyze and solve pairs of simultaneous linear equations (systems of linear equations).

MGSE8.EE.8a Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

MGSE8.EE.8b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.

MGSE8.EE.8c Solve real-world and mathematical problems leading to two linear equations in two variables.

Additional Resources:

1. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-MathCurriculum-Map.pdf>
2. <https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-Math-Unit-7.pdf>

Georgia Standards of Excellence Grade 8 Mathematics

Unit 8: Show What We Know

Unit Focus:

ALL

Standards/Elements:

ALL

- Review and Reteach all content standards
- Apply skills and concepts learned from all units
- Engage in problem-based learning
- Demonstrate mastery using summative assessments
- Preview the Unit 1 content for the upcoming grade level