



**Allamuchy Township School District  
Allamuchy, NJ**

**Math  
Grade 8**

**CURRICULUM GUIDE**

**August 2017**

**Mr. Joseph E. Flynn, Superintendent**

**Developed by:  
Sam Greco**

**This curriculum may be modified through varying techniques,  
strategies and materials, as per an individual student's  
Individualized Education Plan (IEP).**

**Approved by the Allamuchy Board of Education  
At the regular meeting held on August 28, 2017  
And  
*Aligned with the New Jersey Core Curriculum Content Standards  
And Common Core Content Standards***

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## **Philosophy and Rationale**

This School Level Math Curriculum was designed to be consistent with the Common Core Standards for Mathematics and the NJDOE Model Curriculum Unit format. The content of each course; Grade 6 Math, Grade 7 Math, Grade 7 Accelerated Math, Grade 8 Math and Algebra 1 was designed in collaboration with representatives from the middle schools within the Hackettstown sending district cluster. The standards included in each course are organized by unit as recommended by the NJDOE. The curriculum provides a correlation between standards, officially adopted textbook resources and sample assessment items for each student learning objective.

### **Mission Statement**

The mission of the Allamuchy Township District, in partnership with the larger community, is to provide a comprehensive, caring program for all of our students which:

- \*Nurtures the unique talents and interests of each individual
- \*Supports social responsibility and a love of learning
- \*Embraces the total development of each student intellectually, morally and physically
- \*Develops confidence, creativity and skills necessary to face the challenges of a technologically advanced and ever-changing society
- \*Promotes a culture of mutual respect with all other community members
- \*Supports the attainment of the New Jersey Core Curriculum Content Standards

The District seeks to exceed objective standards of achievement set by both the State and Federal government and to provide an educational experience beyond the boundaries established by the Core Curriculum Standards.

### **Scope and Sequence**

#### **Stage 1: Desired Results**

##### **Unit 1**

Topic: Geometry in 2 Dimensions

Content Standards: 8.G.1-5

Essential Questions

1. What parts of a figure will be matched by a congruence transformation?

Enduring Understandings

1. Transformations can be used to construct figures with different kinds of symmetry
2. Symmetry transformations can be used to compare the size and shape of figures to see whether they are congruent
3. Properties of congruent triangles can be used to solve problems about shapes and measurement

Knowledge and Skills (SWBAT embedded course proficiencies)

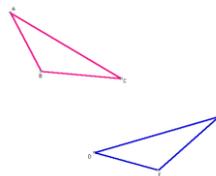
1. Utilize the properties of rotation, reflection, and translation to model and relate pre-images of lines, line segments, and angles to their resultant image through physical representations and/or Geometry software.
2. Apply an effective sequence of rotations, reflections, and transitions to prove that two dimensional figures are congruent.
3. Use the coordinate plane to locate pre-images of two-dimensional figures and determine the coordinates of a resultant image after applying dilations, rotations, reflections, and translations.
4. Recognize dilation as a reduction or an enlargement of a figure and determine the scale factor.
5. Apply an effective sequence of transformations to determine similar figures in which corresponding angles are congruent and corresponding sides are proportional. Write similarity statements based on such transformations.
6. Justify facts about angles created when parallel lines are cut by a transversal.
7. Justify facts about the exterior angles of a triangle, the sum of the measures of the interior angles of a triangle and the angle-angle relationship used to identify similar triangles.

**Stage 2: Evidence of Understanding, Learning Objectives and Expectations**

Benchmarks (embedded student proficiencies)

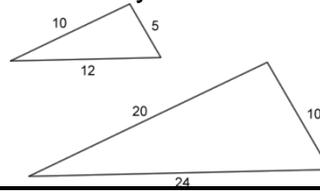
1. You are asked to design a garden layout. You divide a grid into 4 quadrants and start by drawing a shape in one quadrant. Reflect, rotate, and translate the shape into the other three quadrants.
- 2.

Prove that the two scalene triangles shown below are congruent by using rotation, reflections or transitions. Label corresponding sides and angles using labels.



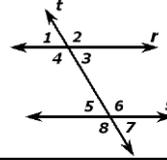
3. The vertices of a square are A(1, -2), B(3,-2), C(3,-4) and D(1,-4). Draw the figure and image on the coordinate plane after translation 4 units left and 6 units up.
4. Rectangle WXYZ has vertices W(-4,-6), X(-4,8), Y(4,8), Z(4, -6). Draw the image after a dilation with a scale factor of 0.5. Identify the type of dilation.
- 5.

Determine if the two triangles are similar figures. Explain how you know.



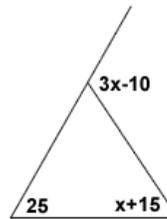
6.

Identify the corresponding angle pairs with the image below. Justify your reasoning.



7.

Find the measure of the exterior angle of the triangle. What is true about the sum of the measures of the interior angles? Would this help you when trying to find the exterior angle? Explain.



Assessment: Assessments may include, but are not limited to homework, class discussions, internet practice utilities (such as IXL.com) and mid unit quizzes as forms of formative assessment. End of unit tests and projects are the primary form of summative assessment.

### Stage 3: Learning Plan

A. To show evidence students may complete the following assessment:

- Projects
- Homework
- Classwork
- Open-Ended questions
- Class discussions

B. Instructor will provide differentiated instruction through any and all of the following strategies:

- Readiness/ability
- Adjusting questions
- Compacting Curriculum
- Tiered Assignments
- Acceleration/Deceleration
- Peer teaching

C. Students will reflect, rethink, revise, and refine by:

- Assessment corrections
- Group work



### Knowledge and Skills (SWBAT embedded course proficiencies)

1. Compare rational and irrational numbers to demonstrate that the decimal expansion of irrational numbers do not repeat; show that every rational number has a decimal expansion which eventually repeats and convert such decimals into rational numbers.
2. Use rational numbers to approximate and locate irrational numbers on a number line and estimate the value of expressions involving irrational numbers.
3. Apply the properties of integer exponents to simplify and write equivalent numerical expressions.
4. Use scientific notation to estimate and express the values of very large or very small numbers and compare their values (how many times larger/smaller is one than the other).
5. Perform operations using numbers expressed in scientific notation, including problems where both decimals and scientific notation are used (interpret scientific notation generated when technology has been used for calculations).
6. In real-world problem solving situations choose units of appropriate size for measurement of very small and very large quantities.

### Stage 2: Evidence of Understanding, Learning Objectives and Expectations

#### Benchmarks (embedded student proficiencies)

1. Write the repeating decimal as a fraction:  
-0.23(23 repeats). Show that such decimals will eventually repeat and convert into a rational number. Would  $\pi$  be considered an irrational or rational number? How do you know?
2. Estimate  $\sqrt{23}$  to the nearest integer. Use rational numbers and perfect squares on a number line to locate the value.
3. Evaluate the following expressions:  
 $2^2$                        $2^4 \bullet 2^5$   
 $2^6$
4. Express the following information in scientific notation. Explain what this value represents.  
The diameter of a human hair is 0.000099 meter.
5. How many times greater is the diameter of the Sun (1,400,000 km) than the diameter of the Earth ( $1.28 \times 10^4$  km)?
6. The circumference of Mars is 55,100,000 meters. Name a unit of measurement that would be more appropriate for the circumference. Explain your choice. Write the number in scientific notation.

Assessment: Assessments may include, but are not limited to homework, class discussions, internet practice utilities (such as IXL.com) and mid unit quizzes as forms of formative assessment. End of unit tests and projects are the primary form of summative assessment.

### Stage 3: Learning Plan

- A. To show evidence students may complete the following assessment:
  - Projects
  - Homework
  - Classwork
  - Open-Ended questions
  - Class discussions
- B. Instructor will provide differentiated instruction through any and all of the following strategies:



6. Sample size can influence the variability of the distribution of sample means or medians
7. Probability can be used to select random samples from populations
8. There are different ways to group and display data for a given situation.
9. There is a relationship between paired values of numerical variables.

Knowledge and Skills (SWBAT embedded course proficiencies)

1. Define linear functions as a rule that assigns one output to each input and determine if data represented as a graph or in a table is a function.
2. Compare two functions each represented in a different way (numerically, verbally, graphically, and algebraically) and draw conclusions about their properties (rate of change and intercepts).
3. Utilize equations, graphs, and tables to classify functions as linear or nonlinear, recognizing that  $y = mx + b$  is linear with a constant rate of change.
4. Using a linear equation to model real life problems then solve it by interpreting the meaning of the slope and the intercept.
5. Construct and interpret scatter plots for bivariate measurement data and identify and interpret data patterns (clustering, outliers, positive or negative association, possible lines of best fit, and nonlinear association).
6. Construct frequency/relative frequency tables to analyze and describe possible associations between two variables.

**Stage 2: Evidence of Understanding, Learning Objectives and Expectations**

Benchmarks (embedded student proficiencies)

1. Determine whether the relation is a function. Explain how you know.

x	3	4	5	6
y	3	4	6	7
	6	8	0	2

2. Compare the two functions to determine which one has the greater rate of change.

Function 1:  $y = 2x + 4$

Function 2:

x	-1	0	2
y	-6	-3	3

3. Does the table or graph represent a linear or nonlinear function? Explain

$y = -2x^2 + 3$

x	3	4	5	6
y	1	2	3	4

4. The table below shows the # of customers, y, in line at a bank in x minutes after noon. Develop a line of fit and equation using the scatter plot you create and interpret the slope and intercepts.

x	1	2	3	4	5
y	1	1	1	9	6
	5	3	2		

5. Use the information below to construct a scatter plot. Does the data have a positive or negative association? Find the line of best fit.

Date: 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005

Life Expectancy (in years): 70.8, 72.6, 73.7, 74.7, 75.4, 75.8, 76.8, 77.4

6. Twenty-five students were surveyed and asked if they received an allowance and if they did chores. Create a two-way table to display the information and describe possible associations between the two variables. 15 do chores and receive allowance, 5 do chores and do not receive an allowance, 3 do not do chores but receive an allowance and 2 do not do chores and do not receive an allowance.

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### **Stage 3: Learning Plan**

A. To show evidence students may complete the following assessment:

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B. Instructor will provide differentiated instruction through any and all of the following strategies:

- Readiness/ability
- Adjusting questions
- Compacting Curriculum
- Tiered Assignments
- Acceleration/Deceleration
- Peer teaching

C. Students will reflect, rethink, revise, and refine by:

- Assessment corrections
- Group work

**Time Allotment:** 14 Class Meetings

**Resources:** Big Ideas Math Chapter 6, Lessons 1-4  
Chapter 9, Lessons 1-4

- Teacher created resources
- Rulers
- Graph paper
- Colored pencils
- Pennies
- Small paper cups
- Strips of paper
- Watches
- String
- Square tiles
- Unit cubes

Technology:

- Online Graphing Utility
- SmartBoard
- Online textbook

## **Stage 1: Desired Results**

### Unit 4

### Topic: Equations

Content Standards: 8.EE.5-8  
8.F.4-5

### Essential Questions

1. How do you solve linear equations with one or more solutions?
2. What expression or equation represents the pattern or relationship in a context?
3. Can you write an equivalent expression for a given expression to provide new information about a relationship?
4. What operations can transform a given equation or expression into an equivalent form that can be used to answer a question?
5. How can symbolic reasoning help confirm a conjecture?
6. What patterns relate the coordinates of points on lines and curves?
7. What patterns relate the points whose coordinates satisfy linear equations?
8. Does the problem involve an equation or an inequality?
9. Does the problem call for writing and/or solving a system of equations? If so, what method would be useful for solving the system?
10. Are there systematic methods that can be used to solve any systems of linear equations?
11. How do you understand congruence and similarity using physical models?

### Enduring Understandings

1. Understand the connections between proportional relationships, lines, and linear equations.
2. Analyze and solve linear equations and pairs of simultaneous linear equations.
3. Linear and nonlinear patterns can be recognized in tables and graphs
4. Data patterns can be described using words and symbols

- Use functions to model relationships between quantities.

Knowledge and Skills (SWBAT embedded course proficiencies)

- Graph and analyze the different representations of proportional relationships and interpret the unit rate as the slope of the graph which indicates the rate of change.
- Derive the equation of a line ( $y = mx$  for a line through the origin and the equation  $y = mx + b$  for a line intercepting the vertical axis at  $b$ ) and use similar triangles to explain why the slope ( $m$ ) is the same between any two points on a non-vertical line in the coordinate plane.
- Solve linear equations in one variable with rational number coefficients that might require expanding expressions using the distributive property and/or combining like terms, including examples with one solution, infinite solutions, or no solution.
- Solve systems of linear equations in two variables by inspection, algebraically, and/or graphically (estimate solutions) to demonstrate solutions correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
- Construct a function to model the linear relationship between two variables and determine the rate of change and initial value of the real world data it represents from either graphs or tabulated values.
- Sketch a graph of a function from a qualitative description and give a qualitative description of a graph of a function.

**Stage 2: Evidence of Understanding, Learning Objectives and Expectations**

Benchmarks (embedded student proficiencies)

- Compare the scenarios to determine which represents a greater speed. Explain your choice including a written description of each scenario. Be sure to include the unit rates in your explanation.

Scenario 1:  $y = 55x$ ;

Scenario 2:

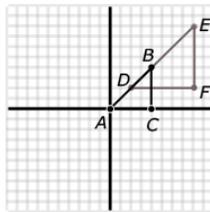
X	1	4	5
y	60	24	30
		0	0

x is time in hours

y is distance in miles

2.

Explain why  $\triangle ACB$  is similar to  $\triangle DFE$ , and deduce that  $\overline{AB}$  has the same slope as  $\overline{DE}$ . Express each line as an equation.



- Solve the following equations. Explain what the solution means:

$$5 - 6x = -8 - 6x$$

$$\frac{1}{4}(8x - 12) = 2x + 3$$

$$m - 4 = 2m$$

4. Solve the system of linear equations by graphing. Check your answer algebraically.

$$Y = 2x + 2$$

$$Y = 3x - 3$$

5. The table below shows the cost of renting a car. The company charges \$45 a day for the car as well as charging a one-time \$25 fee for the car's navigation system (GPS). Write an expression for the cost in dollars,  $c$ , as a function of the number of days,  $d$ .

Days ( $d$ )	Cost ( $c$ ) in dollar s
1	70
2	115
3	160
4	205

6. Sketch the graph that represents the following situation. Describe using words the relationship between the two quantities. After takeoff, the altitude of an airplane increases at a constant rate, then remains constant for a time, then decreases at a constant rate until the airplane lands.

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### **Stage 3: Learning Plan**

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- Assessment corrections
- Group work

**Time Allotment:** 14 Class Meetings

**Resources** Big Ideas Math Chapter 1, Lessons 2-4  
Chapter 4, Lessons 1-7  
Chapter 5, Lessons 1, 4

## Chapter 6, Lessons 3, 5

• Teacher created resources • Rulers • Graph paper • Markers • Square tiles

Technology: • Online Graphing Utility • SmartBoard • Online textbook • Internet websites

### **Stage 1: Desired Results**

#### Unit 5

Topic: Geometry in 3 Dimensions

Content Standards: 8.EE.2  
8.G.6-9

#### Essential Questions

1. How can I estimate the square root of a number?
2. Is it appropriate and useful to use the Pythagorean Theorem in this situation? How do I know this?
3. Do I need to find the distance between two points?

#### Enduring Understandings

1. Perfect squares yield whole number square roots.
2. Understand and apply the Pythagorean Theorem
3. The Pythagorean Theorem can find the distance between two points on a coordinate grid.
4. The Pythagorean Theorem can be used to solve real world problems involving right angles
5. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres

#### Knowledge and Skills (SWBAT embedded course proficiencies)

1. Evaluate square roots and cubic roots of small perfect squares and cubes respectively and use square and cube root symbols to represent solutions to equations of the form  $x^2 = p$  and  $x^3 = p$  where  $p$  is a positive rational number.
2. Identify  $\sqrt{2}$  as irrational
3. Explain a proof of the Pythagorean Theorem and its converse.
4. Utilize the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensions to solve real-world and mathematical problems
5. Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane.
6. Know and apply the appropriate formula for the volume of a cone, a cylinder, or a sphere to solve real-world and mathematical problems.

### **Stage 2: Evidence of Understanding, Learning Objectives and Expectations**

Benchmarks (embedded student proficiencies)

1. Evaluate the following:

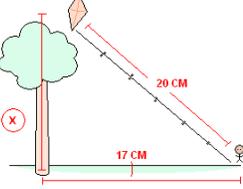
- $\sqrt{25}$
- $3^2$
- $-\sqrt{9/16}$
- $(1/3)^3$
- $\sqrt[3]{8}$

2. Explain why  $\sqrt{2}$  is classified as an irrational number.

3. Using a model, prove that the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.

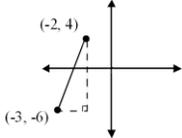
4.

How tall is the tree? Use the given information and Pythagorean Theorem to determine the tree's height.



5.

Determine the distance between the two given points.



6.

James wanted to plant pansies in his new planter. He wondered how much potting soil he should buy to fill it. Use the diagram below to determine the planter's volume.



Assessment: Assessments may include, but are not limited to homework, class discussions, internet practice utilities (such as IXL.com) and mid unit quizzes as forms of formative assessment. End of unit tests and projects are the primary form of summative assessment.

**Stage 3: Learning Plan**

A. To show evidence students may complete the following assessment:

- Projects
- Homework
- Classwork



## New Jersey Core Curriculum and Common Core Content Standards

<http://www.state.nj.us/education/cccs/>

### **Integration of 21<sup>st</sup> Century Theme(s)**

The following websites are sources for the following 21<sup>st</sup> Century Themes and Skills:

<http://www.nj.gov/education/code/current/title6a/chap8.pdf>

<http://www.p21.org/about-us/p21-framework> .

<http://www.state.nj.us/education/cccs/standards/9/index.html>

### **21st Century Interdisciplinary Themes (into core subjects)**

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy
- Environmental Literacy

### **Learning and Innovation Skills**

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

### **Information, Media and Technology Skills**

- Information Literacy
- Media Literacy
- ICT (Information, Communications and Technology) Literacy

### **Life and Career Skills**

- Flexibility and Adaptability
- Initiative and Self-Direction
- Social and Cross-Cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

### **Integration of Digital Tools**

- Classroom computers/laptops/Chromebooks
- Technology Lab
- Voice amplification device
- Other software programs