GRADE 8 PRE-ALGEBRA

1205070

Instructional Resource: McGraw-Hill: *Florida Math, Course 3, Volume 1 & 2*, ©2015

Course Pacing

Unit of Instruction	# of Days	Dates of Instruction
Unit 1: Real Numbers	15	8/19 – 9/9
Remediation/Intervention	3	9/10 – 9/12
Unit 2: Linear Equations in One Variable	13	9/13 – 10/1
Remediation/Intervention	3	10/2 – 10/4
Cycle 1 Assessment (Review and Units 1 & 2)	**1**	**10/7** (9/30 – 10/11)
Unit 3: Linear Equations in Two Variables	15	10/8 – 10/29
Remediation/Intervention	3	10/30 – 11/1
Unit 4: Functions	12	11/4 – 11/19
Remediation/Intervention	3	11/20-11/22
Unit 5: Triangles and Pythagorean Theorem (Split Unit)	7	12/2 – 1/21
Midterm Exam (& Review) **Units 1-4 & 8.G.1.5**	**1**	**12/11 – 12/20**
Unit 5: Triangles and Pythagorean Theorem (Split Unit)	9	12/2 – 1/21
Remediation/Intervention	3	1/22 – 1/24
Unit 6: Transformations, Congruence & Similarity	17	1/27 – 2/19
Remediation/Intervention	3	2/20 – 2/24
Unit 7: Volume Spring Break 3/14 – 3/23	14	2/25 – 3/13
Remediation/Intervention	3	3/24 – 3/26
Unit 8: Scatter Plots and Data Analysis	12	3/27 – 4/14
Remediation/Intervention	3	4/15 – 4/17
FSA Grade 8 Math	**2**	**5/4 – 5/29**

Pinellas County Schools

GRADE 8 PRE-ALGEBRA

2019-2020

August 2019

			1	2	3	
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

September 2019

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

October 2019

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

November 2019

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

December 2019

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Building Community in the Math Classroom

Unit 1: Real Numbers

MAFS.8.NS.1.1 MAFS.8.EE.1.2
MAFS.8.NS.1.2 MAFS.8.EE.1.3
MAFS.8.EE.1.1 MAFS.8.EE.1.4

INTERVENTION DAYS 9/10-9/12

Unit 2: Linear Equations in One Variable

MAFS.8.EE.3.7

INTERVENTION DAYS 10/2-10/4

Cycle 1 Assessment (on Units 1 & 2)
Sept. 30-Oct. 11 (Take as early as possible)

Unit 3: Linear Equations in Two Variables

MAFS.8.EE.2.5 MAFS.8.EE.3.8
MAFS.8.EE.2.6

INTERVENTION DAYS 10/30-11/1

Unit 4: Functions

MAFS.8.F.1.1 MAFS.8.F.2.4
MAFS.8.F.1.2 MAFS.8.F.2.5
MAFS.8.F.1.3

INTERVENTION DAYS 11/20-11/22

Unit 5: Triangles and Pythagorean Theorem

MAFS.8.G.1.5 MAFS.8.G.2.7
MAFS.8.G.2.6 MAFS.8.G.2.8

Midterm Exam (& Review) (on Units 3 & 4)
Dec. 11-Dec. 20

Re-Building Community in the Math Classroom

Unit 5: Triangles and Pythagorean Theorem

MAFS.8.G.1.5 MAFS.8.G.2.7
MAFS.8.G.2.6 MAFS.8.G.2.8

INTERVENTION DAYS 1/22-1/24

Unit 6: Transformations, Congruence & Similarity

MAFS.8.G.1.1 MAFS.8.G.1.4
MAFS.8.G.1.2 MAFS.8.G.1.5
MAFS.8.G.1.3 MAFS.8.EE.2.6

INTERVENTION DAYS 2/20-2/24

Unit 7: Volume

MAFS.8.G.3.9

INTERVENTION DAYS 3/24-2/26

Unit 8: Scatter Plots and Data Analysis

MAFS.8.SP.1.1 MAFS.8.SP.1.3
MAFS.8.SP.1.2 MAFS.8.SP.1.4

INTERVENTION DAYS 4/15-4/17

FSA Testing Window
May 4-29, 2019

January 2020

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

February 2020

						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

March 2020

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April 2020

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May 2020

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June 2020

	1	2	3	4	5	6

Pinellas County Schools **GRADE 8 PRE-ALGEBRA** 2019-2020

Semester 1	**Unit 1: Real Numbers**	15 days: 8/19-9/9
INTERVENTION/REMEDIATION: 3 days, 9/10-9/12		

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.8.NS.1.1 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.	• All irrational numbers excluding *e*. • Only rational numbers with repeating decimal expansions up to thousandths may be used. Calculator: **NO** • Editing Task Choice • Equation Editor • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response
MAFS.8.NS.1.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of* $\sqrt{2}$ *is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*	• All real numbers excluding *e*. • Irrational expressions should only use one operation. Calculator: **NO** • Equation Editor • GRID • Multiple Choice • Multiselect • Open Response
MAFS.8.EE.1.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times 3^{-5} = 3^{-3} = 1/3^2 = 1/27$.	• Exponents must be integers. • Bases must be whole numbers • Variables may not be used. Calculator: **NO** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect
MAFS.8.EE.1.2 Use square root 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. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.	• Square roots and cube roots may be used to represent solutions to equations. • Radicands may be rational or irrational. • Radicands may not include variables. Calculator: **NEUTRAL** • Equation Editor • Matching Item • Multiple Choice • Multiselect
MAFS.8.EE.1.3 Use numbers expressed in the form of a single digit times an integer power of 10 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 times* 10^8 *and the population of the world as 7 times* 10^9*, and determine that the world population is more than 20 times larger.*	• N/A Calculator: **NO** • Editing Task Choice • Equation Editor • Hot Text • Multiple Choice • Open Response
MAFS.8.EE.1.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use 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.	• N/A Calculator: **NO** • Editing Task Choice • Equation Editor • Hot Text • Matching Item • Multiple Choice • Open Response

Open Up Resources Lessons
Grade 8, Unit 7: Exponents and Scientific Notation

- Lesson 1: Exponent Review
- Lesson 2: Multiplying Powers of Ten
- Lesson 3: Powers of Powers of 10
- Lesson 4: Dividing Powers of 10
- Lesson 5: Negative Exponents with Powers of 10
- Lesson 6: What about Other Bases?
- Lesson 7: Practice with Rational Bases
- Lesson 8: Combining Bases
- Lesson 9: Describing Large and Small Numbers Using Powers of 10
- Lesson 10: Representing Large Numbers on the Number Line
- Lesson 11: Representing Small Numbers on the Number Line
- Lesson 12: Applications of Arithmetic with Powers of 10
- Lesson 13: Definition of Scientific Notation
- Lesson 14: Multiplying, Dividing, and Estimating with Scientific Notation
- Lesson 15: Adding and Subtracting with Scientific Notation

Grade 8, Unit 8: Pythagorean Theorem and Irrational Numbers

- Lesson 14: Decimal Representations of Rational Numbers

  Lesson 15: Infinite Decimal Expansions

Decoded Standard

MAFS.8.NS.1.1

Students expand their knowledge of the Real Number System to include irrational numbers. A diagram shows the relationship of the subsets:

see image on page 71 of the Common Core Mathematics Companion

An irrational number is a decimal whose expansion does not terminate or repeat. Irrational numbers cannot be written in fraction form. Using decimal expressions, students compare rational numbers and irrational numbers to show that rational number expansion repeat and irrational numbers expansions do not. The notation "…" means "continues indefinitely without repeating." For example, $0.\overline{3}$ is a ration number that repeats but $\pi = 3.1415\ldots$ does not repeat.

To convert a decimal expansion into a fraction:

Change $0.\overline{5}$ to a fraction

1. Let $x = 0.555\ldots$
2. Multiply both sides so that the repeating digits will be in front of the decimal. In this case, one digit repeats so both sides are multiplied by 10, giving $10x = 5.555\ldots$
3. Subtract the original equation from the new equation.

$$10x = 5.555\ldots$$
$$\underline{-x = 0.555\ldots}$$
$$9x = 5$$

4. Solve the equation by dividing both sides of the equation by 9.
5. $x = \frac{5}{9}$

(*Common Core Mathematics Companion*, Pg. 71)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Rational Numbers Identify rational numbers from a list of real numbers.
- Fraction to Decimal Conversion Given a fraction to convert to a decimal; determine if the decimal repeats.
- Decimal to Fraction Conversion Given several terminating and repeating decimals to convert to fractions.

Lesson Resources

Engage NY

- Grade 8, Module 7, Topic B, Lesson 8 Decimal expansion

McGraw-Hill

Course 3, Chapter 1

Lesson 1

Illustrative Mathematics

- Converting Decimal Representations of Rational Numbers to Fraction Representations Convert repeating decimals into fractions
- Repeating or Terminating? Understand why terminating decimal numbers can also be written as repeating decimals where the repeating part is all 9's.

Decoded Standard

MAFS.8.NS.1.2

Students compare irrational numbers and locate them on a number line by finding their rational approximations. Find rational approximations by creating lists of numbers by answering the following question: Between which two numbers will you find $\sqrt{2}$? Since 1^2 = 1 and 2^2 =4, it is between 1 and 2. To be more precise, it is closer to 1 or 2? Systematically square 1.1, 1.2, 1.3, 1.4….. 1.9. Between which two numbers do you find 2? Repeat the process until the degree of precision you are seeking.

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Approximating Irrational Numbers Plot the square root of eight on three number lines, scaled to progressively more precision.
- Locating Irrational Numbers Graph three different irrational numbers on number lines.
- Comparing Irrational Numbers Estimate the value of several irrational numbers using a calculator and order them on a number line.
- The Irrational Beauty of the Golden Ratio Find and interpret lower and upper bounds of an irrational expression using a calculator.

Illustrative Mathematics

- Comparing Rational and Irrational Numbers Compare rational and irrational numbers without a calculator
- Irrational Numbers on the Number Line Label irrational numbers on a number line

Engaging Tasks

- Decimal Approximations of Roots - Open Middle
- Rational and Irrational Roots - Open Middle
- Number 18 – Which One Doesn't Belong

Lesson Resources

Engage NY

- Grade 8, Module 7, Topic B, Lesson 11 Decimal expansion of roots
- Grade 8, Module 7, Topic B, Lesson 12 Decimal expansions of fractions
- Grade 8, Module 7, Topic B, Lesson 13 Compare and order rational approximations

MARS/Shell

- Rational and Irrational Numbers 2 Understand the properties of rational and irrational number.

McGraw-Hill

Course 3, Chapter 1

Lesson 9; Lesson 10

Decoded Standard

MAFS.8.EE.1.1

Students learn how to compute using integer exponents building on their earlier experiences with adding and subtracting integers. For any non-zero real numbers a and b and integers n and m, the properties of integer exponents are as follows:

1. $a^m a^n = a^{m+n}$
2. $(a^n)^m = a^{nm}$
3. $a^n b^n = (ab)^n$
4. $a^0 = 1$
5. $a^{-n} = \frac{1}{a^n}$
6. $\frac{a^n}{a^m} = a^{n-m}$

(*Common Core Mathematics Companion*, Pg. 118)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Exponents Tabled Complete a table of powers of three and provide an explanation of zero powers.
- Multiplying and Dividing Integer Exponents Apply the properties of integer exponents to generate equivalent numerical expressions.

Illustrative Mathematics

- Raising to the zero and negative powers Use the quotient rule of exponents to help explain how to define the expression c^k

Engaging Tasks

- How Can We Make Stronger Passwords Determine how long it will take to crack your password.

Lesson Resources

Engage NY

- Grade 8, Module 1, Topic A, Lesson 1 Understanding exponential notation
- Grade 8, Module 1, Topic A, Lesson 2 Simplifying exponential expressions
- Grade 8, Module 1, Topic A, Lesson 3 Powers of powers
- Grade 8, Module 1, Topic A, Lesson 4 Base raised to the zero power
- Grade 8, Module 1, Topic A, Lesson 5 Negative exponents
- Grade 8, Module 1, Topic A, Lesson 6 Integer exponents

MARS/Shell

- Applying Properties of Exponents Apply the properties of exponents by a matching activity.

McGraw-Hill

Course 3, Chapter 1

Lesson 3, 4 and 5

Decoded Standard

MAFS.8.EE.1.2

Students learn that squaring and cubing numbers are the inverse operations to finding square and cube roots. This standard works with perfect squares and perfect cubes, and students will begin to recognize those numbers. Equations should include rational numbers such as $x^2 = \frac{1}{4}$ and $x^3 = \frac{1}{64}$ and fractions where both the numerator and denominator are perfect squares or cubes: $x^2 = \frac{1}{4}$

$\sqrt{x^2} = \pm \frac{\sqrt{1}}{\sqrt{4}}$

$x = \pm \frac{1}{2}$

Square roots can be positive or negative because 2 x 2 = 4 and -2 x -2 = 4= 4.

(*Common Core Mathematics Companion*, Pg. 119)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- The Root of the Problem Evaluate perfect square roots and perfect cube roots.
- Dimension Needed Solve problems involving square roots and cube roots.
- Roots and Radicals Use square root and cube root symbols to represent the real solutions of each equation. Then evaluate any square roots of perfect squares and cube roots of perfect cubes. Indicate if any of your solutions are irrational.

Lesson Resources

Engage NY

- Grade 8, Module 7, Topic A, Lesson 2 Square and cube roots

McGraw-Hill

Course 3, Chapter 1

Lesson 8

Decoded Standard

MAFS.8.EE.1.3

This standard emphasizes scientific notation. Students write very large and very small numbers in scientific notation using positive and negative exponents. For example 123,000 written in scientific notation is 1.23 x 10^5, and 0.008 written in scientific notation is 8 x 10^{-4}. When mastered, students use the skill to determine how many times larger (or smaller) one number written in scientific notation is than another. To compare, if the exponent increases by 1, the value increases 10

times. In the example of the U.S. and world populations, the exponent increased by 1, and the 7 is a little more than 2 times 3. So 2 x 10 makes for 20 times larger.
(*Common Core Mathematics Companion*, Pg. 120)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Estimating Extreme Values Estimate each value described below by writing it in the form $a \times 10^n$ where *a* is a single digit number and *n* is an integer.
- How Many Times Given pairs of numbers written in exponential form to compare them multiplicatively.
- Compare Numbers Given pairs of numbers written in scientific notation compare them multiplicatively.
- Order Matters Given pairs of numbers written in the form of an integer times a power of 10. Then compare the numbers in each pair using the inequality symbols.

Illustrated Mathematics

- Ant and Elephant Compare very small and very large quantities using metric system

Lesson Resources

Engage NY

- Grade 8, Module 1, Topic B, Lesson 1 Powers of 10
- Grade 8, Module 1, Topic B, Lesson 2 Translating scientific notation and standard form
- Grade 8, Module 1, Topic B, Lesson 13 Comparing numbers in scientific notation

MARS/Shell

- Applying Properties of Exponents Estimating length using scientific notation.

McGraw-Hill

Course 3, Chapter 1
Lesson 6 (supplement to express how many times larger)

Decoded Standard

MAFS.8.EE.1.4
This standard builds on previous standards as now students use what they know about scientific notation and properties of integer exponents to solve problems. Quantities in the problems can be expressed in scientific notation and decimal form. Students focus on the size of the measurement to determine which units are appropriate for the context such as millimeters for very small quantities. This standard also calls for students to use technology and be able to interpret the scientific notation used. The teacher needs to check the class calculators to be familiar with the notation used by those particular calculators as the notation used by calculators to express scientific notation is not standard.
(*Common Core Mathematics Companion*, Pg. 121)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Mixed Form Operations Given word problems with numbers in both standard and scientific notation to solve problems using various operations.
- Sums and Differences in Scientific Notation Add and subtract numbers given in scientific notation in real-world contexts.
- Scientific Multiplication and Division Multiply and divide numbers given in scientific notation in real-world contexts.
- Scientific Calculator Display Given examples of calculator displays and asked to convert the notation in the display to both scientific notation and standard form.

Engaging Tasks

- Scientific Notation – Math Mistakes

Lesson Resources

Engage NY

- Grade 8, Module 1, Topic B, Lesson 9 Operations with numbers in scientific notation
- Grade 8, Module 1, Topic B, Lesson 10 Operations with numbers in scientific notation
- Grade 8, Module 1, Topic B, Lesson 11 Operations with numbers in scientific notation
- Grade 8, Module 1, Topic B, Lesson 12 Measurement

McGraw-Hill

Course 3, Chapter 1
Lesson 7

Pinellas County School | **GRADE 8 PRE-ALGEBRA** | 2019-2020

Semester 1	**Unit 2: Linear Equations in One Variable**	13 days: 9/13-10/1

INTERVENTION/REMEDIATION: 3 days, 10/2-10/4

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.8.EE.3.7 Solve linear equations in one variable. a. 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). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	• Numbers in items must be rational numbers. Calculator: **YES** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response

Open Up Resources Lessons

Grade 8, Unit 2: Dilations, Similarity, and Introducing Slope
- Lesson 10: Meet Slope
- Lesson 11: Writing Equations for Lines
- Lesson 12: Using Equations for Lines

Grade 8, Unit 3: Linear Relationships
- Lesson 1: Understanding Proportional Relationships
- Lesson 2: Graphs of Proportional Relationships
- Lesson 3: Representing Proportional Relationships
- Lesson 4: Comparing Proportional Relationships
- Lesson 5: Introduction to Linear Relationships
- Lesson 6: More Linear Relationships
- Lesson 7: Representations of Linear Relationships
- Lesson 8: Translating to $y = mx + b$
- Lesson 9: Slopes Don't Have to be Positive
- Lesson 10: Calculating Slope
- Lesson 11: Equations of All Kinds of Lines

Decoded Standard

MAFS.8.EE.3.7

This standard has students solving linear equations. It is explained by 8.EE.3.7a and b. It is best to teach a and b together so that they are not considered isolated skills.

These standards provide the foundation for all future work with linear equations. Students solve equations that have one, zero, or infinitely many solutions and relate those solutions to the context. If the solution is in the form $x = a$, there is only one solution. If $a = a$, there are infinitely many solutions. If $a = b$ results (where a and b are different numbers), there are no solutions.

Linear equations can have fractions and decimals as coefficients and can be solved by expanding expressions with the distributive property and/or collecting like terms. (*Common Core Mathematics Companion*, Pg. 128)

Instructional Resources

Formative Tasks	**Lesson Resources**
Mathematics Formative Assessments (MFAS) • Counting Solutions Worksheet includes three equations where students *identify* whether there is one solution, no solution, or infinitely many solutions.	**Engage NY** • Grade 8, Module 4, Topic A, Lesson 3 Solving equations with variables on both sides

- Equation Prototypes Worksheet includes three questions where students are to *create* equations with one solution, no solution, and infinitely many solutions.
- Linear Equations I Students are to solve one linear equation with only one variable that involves rational numbers (fractions). $\frac{2}{3}x - 4\frac{1}{2} = -8$
- Linear Equations II Students are to solve one linear equation with only one variable that involves rational coefficients (decimals) and distributive property. $-3.5(10x - 2) = -176.75$
- Linear Equations III Students are to solve a linear equation in one variable with rational coefficients and variables on both sides of the equation. $-4(2x + 9) + 3x = 6 - 4(x - 3)$

Engaging Tasks

- Linear Equations with One Solutions Create a linear equation with one solution – Open Middle
- One Solution, No Solutions, Infinite Solutions – Open Middle
- Solving Equations – Math Mistakes
- Solving Systems Algebraically – Math Mistakes
- Number 17 – Which One Doesn't Belong

- Grade 8, Module 4, Topic A, Lesson 4 Solving equations with rational coefficients and variables on both sides
- Grade 8, Module 4, Topic A, Lesson 6 Solving equations with rational coefficients, distributive property and variables on both sides
- Grade 8, Module 4, Topic A, Lesson 7 Understanding the conditions for a=a, a=b and x=a

MARS/Shell

- Solving Linear Equations in One Variable Tasks require students to use rational coefficients, collect like terms, expand using distributive property, and categorize equations as one, none, or infinitely many solutions. Whole class instruction, small group and assessment tasks are available.)
- Classifying Solutions to Systems of Equations . Tasks require students to classify solutions that are represented graphically and use substitution to complete a table of values for linear equations.

McGraw-Hill

Course 3, Chapter 2

Inquiry Lab: Equations with Variables on Each Side; Lesson 4 and 5

Pinellas County Schools **GRADE 8 PRE-ALGEBRA** 2019-2020

Semester 1	**Unit 3: Linear Equations in Two Variables**	15 days: 10/8-10/29
INTERVENTION/REMEDIATION: 3 days, 10/30-11/1		

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.8.EE.2.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*	• Numbers in items must be rational numbers Calculator: **YES** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response
MAFS.8.EE.2.6 Use similar triangles to explain why the slope m is the same distance between 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.	• All triangles must be right triangles and on a coordinate grid. • Numbers in items must be rational numbers. • Functions must be linear. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.8.EE.3.8 Analyze and solve pairs of simultaneous linear equations. a. 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. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.* c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*	• Numbers in items must be rational numbers. • Coefficients of equations in standard form must be integers. • Items written for MAFS.8.EE.3.8a must include the graph or the equations. • Equations in items written for MAFS.8.EE.3.8a must be given in slope-intercept form. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Open Response

Open Up Resources Lessons

Grade 8, Unit 3: Linear Relationships
- Lesson 12: Solutions to Linear Equations
- Lesson 13: More Solutions to Linear Equations

Grade 8, Unit 4: Linear Equations and Linear Systems
- Lesson 1: Number Puzzles
- Lesson 2: Keeping the Equation Balanced
- Lesson 3: Balanced Moves
- Lesson 4: More Balanced Moves
- Lesson 5: Solving Any Linear Equation
- Lesson 6: Strategic Solving
- Lesson 7: All, Some, or No Solutions

- Lesson 8: How Many Solutions?
- Lesson 9: When Are They the Same
- Lesson 10: On or Off the Line?
- Lesson 11: On Both of the Lines
- Lesson 12: Systems of Equations
- Lesson 13: Solving Systems of Equations
- Lesson 14: Solving More Systems
- Lesson 15: Writing Systems of Equations
- Lesson 16: Solving Problems with Systems of Equations

Decoded Standard

MAFS.8.EE.2.5

Students build on their work from Grade 6 with unit rates and their work with proportional relationships in Grade 7 to compare graphs, tables, and equations of liner (proportional) relationships. Students identify the unit rate as slope in graphs, tables, and equations to compare proportional relationships presented using different representations. For example, compare the unit rate in a problem about a phone bill presented in graphic form on a Cartesian plane to a phone bill from a different company where the unit rate can be found represented in an equation or table. (*Common Core Mathematics Companion*, Pg. 123)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Interpreting Slope Using a worksheet, graph a proportionate relationship (from a table of values), find and interpret slope.
- Proportional Paint Interpret a graph through a worksheet including three questions (identify unit rate, find slope, and describe how they are related).
- Compare Slopes Identify, describe, and compare the slopes of two proportional relationships given the graph of one and the equation of the other.

Illustrative Mathematics

- Who has the best job? Compare the rate of change of two functions displayed as a table and an equation.
- Peaches and Plums Reason about the relative costs per pound of the two fruits without actually knowing what the costs are.

Lesson Resources

Engage NY

- Grade 8, Module 4, Topic B, Lesson 11 Constant rate problems displayed in a graph and a table

MARS/Shell

- Buying cars Students will create, compare, and evaluate different representations of functions.
- Defining Lines by Points, Slopes and Equations Find slopes and equations using graphs and use slopes and y intercepts to derive equations

McGraw-Hill

Course 3, Chapter 3

Lesson 1

Decoded Standard

MAFS.8.EE.2.6

Students gain additional knowledge about slope in this standard as they use similar triangles to explain how the slope *m* of a line is the same between any two points on a given non-vertical line. Students understand positive/negative slopes, 0 slope, and undefined slopes. Through the use of similar triangles, teachers lead students to derive the general equation ($y = mx + b$) of a line and discover that *m* is the slope and *b* is the y-intercept. (*Common Core Mathematics Companion*, Pg. 124)

The similarity portion of this standard will be addressed in Unit 6.

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Slope Triangles Use similar triangles to explain why the slope is the same regardless of the points used to calculate it (worksheet uses proportionality of line segments to help students visualize concept).
- Deriving Lines II Students are asked to derive one general equation of a line (using the slope formula) with a y-intercept of (0,b).

Lesson Resources

Engage NY

- Grade 8, Module 4, Topic C, Lesson 15 Interpret slope as rate of change on a graph
- Grade 8, Module 4, Topic C, Lesson 16 Use triangles to explain slope; slope formula to find slope

Illustrative Mathematics

- Slopes between points on a line Help students understand *why* the calculated slope will be the same for any two points on a given line.

- Grade 8, Module 4, Topic C, Lesson 17 Find slope of a line; Transform standard form to slope intercept form
- Grade 8, Module 4, Topic C, Lesson 19 Proof that any point on a line is a point on the graph of the equation of that line.
- Grade 8, Module 4, Topic C, Lesson 20 Any line is the graph of a linear equations
- Grade 8, Module 4, Topic C, Lesson 23 Solving systems with equations in different forms

MARS/Shell

- Defining Lines, by Points, Slopes, and Equations Find slopes and equations with ordered pairs; calculate and use slope and y-intercept to derive an equation. May involve similar triangles to help define slope.

McGraw-Hill

Course 3, Chapter 3
Lesson 4

Decoded Standard

MAFS.8.EE.3.8

This standard has students solving simultaneous linear equations. It is explained by 8.EE.3.8a-c. It is best to consider a, b, and c together as they are not isolated skills.

Students will understand that points of intersection are the solutions to pairs of simultaneous linear equations (also known as systems of linear equations). Students will solve systems graphically, algebraically, and by inspection. Examples in this standard are in real-world contexts and mathematical problems. (*Common Core Mathematics Companion*, Pg. 129)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Identify the Solution Two graphs are given; students are to identify the solutions of the system and justify their answer.
- Solving Systems of Linear Equations Three problems are given; students are asked to solve each algebraically (equations are written in both standard form and slope-intercept form).
- Solving Systems of Linear Equations by Graphing Solve one system of equation problem graphically (written in slope-intercept form), write the solution as an ordered pair and explain why it is the solution.
- How Many Solutions? Determine the number of solutions for each of the four systems of linear equations *without* solving (standard form and slope-intercept form) and justify the answer.
- Writing System Equations Two word problems are given. Students are asked to write a system of linear equations that could be used to solve them.
- System Solutions One word problem (real world context) with both equations provided. Students are to solve the system of linear equations (elimination or substitution).

Engaging Tasks

- Candy and Chips Solve the system to determine the cost of a new order of chips and candy.
- Solutions of Two Linear Equations Given a graphic, provide 4 points that represent 2 distinct lines

Lesson Resources

Engage NY

- Grade 8, Module 4, Topic D, Lesson 24 Intro to Systems of Equations
- Grade 8, Module 4, Topic D, Lesson 25 Solving systems by graphing
- Grade 8, Module 4, Topic D, Lesson 26 Solving systems with parallel lines
- Grade 8, Module 4, Topic D, Lesson 27 Solving systems with no solution
- Grade 8, Module 4, Topic D, Lesson 28 Solving systems by elimination and substitution

MARS/Shell

- Solving Real Life Problems: Baseball Jerseys Tasks require students to select appropriate mathematical methods to interpret and evaluate data generated and identify a break-even point.

McGraw-Hill

Course 3, Chapter 3
Lesson 7

• Create a System of Equations, Given 1 Equation and the Solution Write linear equations so that the solution of the system of that line and equation is a particular point. • System of Equations, Special Case Infinitely Many Solutions Fill in the boxes so that there are infinitely many solutions to the system • Systems of Equations, Special Case No Solution Fill in the boxes so that there is no solution to the system • Solve Linear Equations with Special Cases Complete each equation with the given number of solutions	

Semester 1	**Unit 4: Functions**	12 days: 11/4-11/19
INTERVENTION/REMEDIATION: 3 days, 11/20-11/22		

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.8.F.1.1 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.	• Function notation may not be used. • Nonlinear functions may be included for identifying a function. Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.8.F.1.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*	• Function notation is not used. • Functions must be linear. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.8.F.1.3 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.*	• Function notation may not be used. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.8.F.2.4 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.	• Function notation may not be used. • Functions must be linear. • Rate of change must be simple fractions up to tenths. Calculator: **NEUTRAL** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.8.F.2.5 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	• Linear or nonlinear relationships may use any of the four quadrants. • Graph descriptions move from left to right. • Functional relationships must be continuous.

graph that exhibits the qualitative features of a function that has been described verbally.	Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item

Open Up Resources Lessons

Grade 8, Unit 5: Functions and Volume

- Lesson 1: Inputs and Outputs
- Lesson 2: Introduction to Functions
- Lesson 3: Equations for Functions
- Lesson 4: Tables, Equations, and Graphs of Functions
- Lesson 5: More Graphs of Functions
- Lesson 6: Even More Graphs of Functions
- Lesson 7: Connecting Representations of Functions
- Lesson 8: Linear Functions
- Lesson 9: Linear Models
- Lesson 10: Piecewise Linear Functions

Decoded Standard

MAFS.8.F.1.1

This standard is the students' introduction to functions and involves the definition of function as a rule that assigns to each input exactly one output. Students are not required to use or recognize function notation at this grade but will be able to identify functions using tables, graphs, and equations. A relationship is not a function when there is more than one y-value associated with any x-value. Using the definition, an example of a table that does not represent a function is as follows:

See tables on page 139 of the Common Core Mathematics Companion

(*Common Core Mathematics Companion*, Pg. 139)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- What is a Function? Definition including important properties.
- Identifying Algebraic Functions Determine if each of three equations represents a function.
- Recognizing Functions Determine whether or not each of two graphs represent functions.
- Tabulating Functions Determine whether or not tables of ordered pairs represent functions.

Illustrative Mathematics Assessment Tasks

- Foxes and Rabbits Illustrates examples of functions as well as relationships that are not functions.
- US Garbage, Version 1 Describing a linear function.
- Introduction to Linear Functions Explore the differences between linear and non-linear functions.

Engaging Tasks

- Figure This! Double or Not Would you rather work 7 days at $20 per day or be paid $2 for the first day and have your salary double every day for a week?
- 25 Billion Apps When should you start bombarding the App Store with purchases if you want to win?
- Tables of Values: Not a Function Create a table of values that is not a function
- Tables of Values: Function Create a table of values that is a function

Lesson Resources

Engage NY

- Grade 8, Module 5, Topic A, Lesson 2 Expressing functions by rule, and when input is used with the formula, the outcome is the output.
- Grade 8, Module 5, Topic A, Lesson 6 Determine if a function is linear and interpret the equation y=mx+b as a linear function

McGraw-Hill

Course 3, Chapter 4

Lesson 2

Decoded Standard

MAFS.8.F.1.2

For this standard students will compare the properties of functions. One property of functions is slope. When students are given two different functions, each represented in a different form (algebraically, graphically, in a table, or by a verbal description), students should be able to determine which function has the greater slope. An example follows:

Ruth starts with a $50 gift card for Walmart. She spends $5.50 per week to buy cat food. Let *y* be the amount left on the card and *x* represent the number of weeks.

x	y
0	50
1	44.5
2	39.00
3	33.50
4	28.00

Boyce rents bikes for $5 an hour. He also collects a non-refundable fee of $10.00 for a rental to cover wear and tear. Write the rule for the total cost (*c*) of renting a bike as a function of the number of hours (*h*) rented.

Solution: Ruth's story is an example of a function with a negative slope. The amount of money left on the card decreases each week. The graph has a negative slope of -5.5, which is the amount the card balance decreases every time Ruth buys cat food.

Boyce's bike rental is an example of a function with a positive slope. This function has a positive slope of 5, which is the amount to rent a bike for an hour. An equation for Boyce's bikes could be $c = 5h + 10$.
(*Common Core Mathematics Companion*, Pg. 140)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Innovative Functions Compare the rates of change of two functions presented in different forms (an expression and a table) within a real-world context.
- Speed Reading Compare the rates of change of two functions presented in different forms (an expression and a table) within a real-world context.
- Competing Functions Recognize and compare the initial values of two functions represented in different ways.
- This House is Mine! Compare a specific value of two functions given in different forms (a graph and a verbal description) within a real-world context.

Illustrative Mathematics Assessment Tasks

- Battery Charging Verbal and numerical descriptions of battery life as a function of time.

Engaging Tasks

- Comparing Functions Generate five ordered pairs that represent a linear function that has a greater rate of change than the graph.

Lesson Resources

Engage NY

- Grade 8, Module 5, Topic A, Lesson 7 Compare 2 functions in different way

McGraw-Hill

Course 3, Chapter 4
Lesson 2

Decoded Standard

MAFS.8.F.1.3

In this standard students become familiar with the equation $y = mx + b$ as defining a linear function that will graph as a straight line. Students distinguish between linear (functions that graph into a straight line) and nonlinear functions (functions that do not graph into a straight line such as a curve). Note that standard form and point-slope for are not studied in this grade. (*Common Core Mathematics Companion*, Pg. 141)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- What Am I? Describe a linear function, its graph, and the meaning of its parameters.
- Explaining Linear Functions Describe defining properties of linear functions.
- Nonlinear Functions Provide an example of a nonlinear function and explain why it is nonlinear.
- Linear or Nonlinear? Identify a function as either linear or nonlinear and to justify their decision.

Illustrative Mathematics Assessment Tasks

- Function Rules Connect a function described by a verbal rule with corresponding values in a table.

Lesson Resources

Engage NY

- Grade 8, Module 5, Topic A, Lesson 8 Determine whether an equation is linear or non-linear by examining the rate of change

MARS/Shell

- Meal Out Use equations to solve a problem with a restaurant check.
- Linear Graphs Match equations with linear graphs.

McGraw-Hill

Course 3, Chapter 4
Lesson 4

Decoded Standard

MAFS.8.F.2.4

Students identify the rate of change (slope) and y-intercept (initial value) from tables, graphs, equations, and verbal descriptions of linear relationships. The y-intercept is the y-value when the x-value is 0. Interpretation of slope and the initial value of the function is accomplished using real-world situations. (*Common Core Mathematics Companion*, Pg. 143)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

Lesson Resources

Engage NY

- Construction Function Construct a function to model a linear relationship between two quantities given two ordered pairs in context.
- Profitable Functions Write a function to model a linear relationship given its graph.
- Trekking Functions Construct a function to model a linear relationship between two quantities given a table of values.
- Smart TV Determine the rate of change and initial value of a linear function given a table of values, and interpret the rate of change and initial value in terms of the situation it models.
- Drain the Pool Determine the rate of change and initial value of a linear function when given a graph, and to interpret the rate of change and initial value in terms of the situation it models.

Illustrative Mathematics Assessment Tasks

- Video Streaming Model of a linear function.
- High School Graduation Estimating approximate time name called using a linear function.
- Baseball Cards Interpreting linear functions.

- Grade 8, Module 6, Topic A, Lesson 1 Determine and interpret a linear function from a verbal description
- Grade 8, Module 6, Topic A, Lesson 2 Interpret slope and the initial value; describe the graph of the function based on its slope.
- Grade 8, Module 6, Topic A, Lesson 3 Graph a line based on different characteristics (function, initial value, points

MARS/Shell

- Lines and Linear Functions Interpret speed as the slope of a linear graph and translate between the equation of a line and its graphical representation.
- Interpreting Time-Distance Graphs Interpret distance–time graphs as if they are pictures of situations rather than abstract representations of them.

McGraw-Hill

Course 3, Chapter 4
Lesson 1

Decoded Standard

MAFS.8.F.2.5

Given a graph, students will provide a verbal description of the function, including whether the graph is linear or nonlinear or where the function is increasing or decreasing. Given a function's verbal description, students will be able to sketch the graph displaying qualitative properties of that function. The quantitative features of the graph are not displayed (specific quantities on the axes). (*Common Core Mathematics Companion*, Pg. 144)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Jet Fuel Describe the relationship between two linearly related quantities.
- Population Trend Describe the relationship between two quantities in a nonlinear function.
- Graph the Ride Given a verbal description of the relationship between two quantities and are asked to sketch a graph to model the relationship.
- Bacterial Growth Graph Given a verbal description of the relationship between two quantities and are asked to sketch a graph to model the relationship.

Illustrative Mathematics Assessment Tasks

- Tides Interpreting the graph of a function in terms of the relationship between quantities that it represents.
- Distance Interpret two graphs that look the same but show very different quantities.
- Bike Race Interpret two distance-time graphs in terms of the context of a bicycle race.

Engaging Tasks

- Joules Three Acts Math - Do you think Joules will work as advertised?

Lesson Resources

Engage NY

- Grade 8, Module 6, Topic A, Lesson 4 Describe and sketch qualitatively function relationships.
- Grade 8, Module 6, Topic A, Lesson 5 Qualitatively sketch and describe function relationship

MARS/Shell

- Modeling Situation with Linear Equations Explore relationships between variables in everyday situations.

McGraw-Hill

Course 3, Chapter 4
Lesson 9

Pinellas County Schools **GRADE 8 PRE-ALGEBRA** 2019-2020

Split Across Semester 1 & 2	**Unit 5: Triangles and Pythagorean Theorem**	16 days: 12/2-12/10 and 1/8-1/21

INTERVENTION/REMEDIATION: 3 days, 1/22-1/24

Winter Break is 12/21 – 1/6

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.8.G.1.5 Use informal arguments to establish facts about the angle sum & exterior angle of triangles and about the angle created when parallel lines are cut by a transversal. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	• Do not include shapes beyond triangles. Calculator: **NEUTRAL** • Equation Editor • GRID • Multiple Choice • Multiselect • Open Response
MAFS.8.G.2.6 Explain a proof of the Pythagorean Theorem and its converse.	• For the converse, use only perfect roots. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response
MAFS.8.G.2.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	• If the triangles is part of a 3-dimensional figure, a graphic of the 3-dimensional figure must be included. • No coordinate plane items should be included. • Points on the coordinate grid must be where grid lines intersect. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect
MAFS.8.G.2.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	• Graphics of 3-dimensional figures can be included. • Dimensions must be given as rational numbers. • Figures must not be composite. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect

Open Up Resources Lessons

Grade 8, Unit 1: Rigid Transformations and Congruence

- Lesson 14: Alternate Interior Angles
- Lesson 15: Adding the Angles in a Triangle
- Lesson 16: Parallel Lines and the Angles in a Triangle

Grade 8, Unit 8: Pythagorean Theorem and Irrational Numbers

- Lesson 1: The Areas of Squares and Their Side Lengths
- Lesson 2: Side Lengths and Areas
- Lesson 3: Rational and Irrational Numbers
- Lesson 4: Square Roots on the Number Line

- Lesson 5: Reasoning About Square Roots
- Lesson 6: Finding Side Lengths of Triangles
- Lesson 7: A Proof of the Pythagorean Theorem
- Lesson 8: Finding Unknown Side Lengths
- Lesson 9: The Converse
- Lesson 10: Applications of the Pythagorean Theorem
- Lesson 11: Finding Distances in the Coordinate Plane

Decoded Standard

MAFS.8.G.1.5

Students are expected to make informal arguments while exploring facts about the sum of the angles of a triangle, exterior angles of triangles, angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similar triangles. The example demonstrates how these facts are interrelated. Note that formal two-column proofs are not expected at this grade.

See image on page 184 of the Common Core Mathematics Companion.

(*Common Core Mathematics Companion*, Pg. 184)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Same Side Interior Angles Given same side interior angles, describe relationship and provide justification when not required to find angle measurement.
- Justifying Angle Relationships Describe the relationship between alternate interior angle and provide justification.
- Justifying the Exterior Angle Theorem Justify when it is not required to find angle measurement.
- What is the Triangle Relationship? Describe the relationship between similar triangles.
- Justifying the Triangle Sum Theorem Provide proof using a triangle.

Illustrative Mathematics

- Congruence of Alternate Interior Angles via Rotations Experiment with rigid motions to help visualize why alternate interior angles (made by a transverse connecting two parallel lines) are congruent.
- Find the Angle The task is an example of a direct but non-trivial problem in which students have to reason with angles and angle measurements (and in particular, their knowledge of the sum of the angles in a triangle) to deduce information from a picture.

Engaging Tasks

- Transversals, Tape and Stickies Place sticky notes in their assigned location based on a description

Lesson Resources

Engage NY

- Grade 8, Module 2, Topic C, Lesson 12 Understand equivalent angle relationships when lines are parallel. Understand angle relationships related to translations and rotations. Present informal arguments about angles formed from parallel lines cut by a transversal.
- Grade 8, Module 2, Topic C, Lesson 13 Informal arguments about Angle Sum Theorem for triangles
- Grade 8, Module 2, Topic C, Lesson 14 Informal proof of angle sum theorem. Find missing angle measures and prove their answer is correct.
- Grade 8, Module 3, Topic B, Lesson 10 Informal proof of Angle-Angle criterion and whether or not triangles are similar

MARS/Shell

- Identifying Similar Triangles Categorize diagrams of pairs of triangles based on their similarity.

McGraw-Hill

- Course 3, Chapter 5
  Lesson 3 (review vocabulary pg. 372)

Decoded Standard

MAFS.8.G.2.6

There are many proofs of the Pythagorean Theorem. Students will work through one to understand the meaning of $a^2 + b^2 = c^2$ and its converse. The converse statement is as follows.: If the square of one side o a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle. (*Common Core Mathematics Companion*, Pg. 186)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Pythagorean Squares Demonstrate knowledge of the square root and right triangle in the Pythagorean theorem.
- Explaining a Proof of the Pythagorean Theorem Proof of similar triangles.
- Converse of the Pythagorean Theorem Teacher scenario to prove that the teacher is correct and prove that triangles are congruent.

Engaging Tasks

- How can we correct the Scarecrow How can we correct the Scarecrow's statement so it is mathematically precise?

Lesson Resources

Engage NY

- Grade 8, Module 2, Topic D, Lesson 15 Know the Pythagorean Theorem, show an informal proof of the theorem and use it to find the length of a hypotenuse.
- Grade 8, Module 7, Topic C, Lesson 15 Explain the proof of the Pythagorean Theorem.
- Grade 8, Module 7, Topic C, Lesson 16 Explain the proof of the converse of the Pythagorean Theorem.

MARS/Shell

- The Pythagorean Theorem: Square Areas Use the area of right triangles to deduce the areas of other shapes.

McGraw-Hill

Course 3, Chapter 5

Inquiry Lab: Proofs about Pythagorean Theorem

Decoded Standards

MAFS.8.G.2.7

Students solve problems where they must apply the Pythagorean Theorem. Problems may be real-world or mathematical, and they may involve two- and three-dimensional situations. (*Common Core Mathematics Companion*, Pg. 187)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- New Television Using the measurement given, show if the TV can fit in the space provided.
- How Far to School Use the Pythagorean theorem to find distance.
- Three Dimensional Diagonal Apply the Pythagorean theorem to a rectangular prism's diagonal.
- Pyramid Height Find the height of a pyramid.

Illustrative Mathematics

- Running on the Football Field Reason how to use the Pythagorean Theorem to find the distance ran by Ben Watson and Champ Bailey.
- Area of a Trapezoid Decompose the given trapezoid into other polygons and use the Pythagorean Theorem to find the unknown side-lengths of a trapezoid in order to determine the area.
- Spiderbox Visualize and apply the Pythagorean Theorem to determine the length of a spider's path around the outside of a box.

Engaging Tasks

- Viewmongous TV Is the 80" TV double, triple or quadruple the viewing area of a 55' TV?
- Pythagorean Theorem Problems Math Mistakes examines several student errors with utilizing the Pythagorean Theorem.

Lesson Resources

Engage NY

- Grade 8, Module 2, Topic D, Lesson 16 Use Pythagorean Theorem to find missing side lengths.
- Grade 8, Module 7, Topic C, Lesson 17 Use the Pythagorean Theorem to determine the distance between two points on a coordinate plane.
- Grade 8, Module 7, Topic C, Lesson 18 Apply the Pythagorean Theorem to real world and mathematical problems in two dimensions

McGraw-Hill

Course 3, Chapter 5

Lesson 6

Decoded Standards
MAFS.8.G.2.8 Use the Pythagorean Theorem to find the distance between two points. Problems can best be modeled in a coordinate system. (*Common Core Mathematics Companion*, Pg. 188)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Distance Between Two Points Find the distance between two points on a coordinate grid.
- Distance on the Coordinate Plane Find the distance between two points on a coordinate plain.
- Coordinate Plane Triangle Graph the given coordinates and find the lengths of each side of the triangle.
- Calculate Triangle Sides Graph the given coordinates to find the lengths of each side of the triangle.

Engaging Tasks

- Where's the Nearest Toys R Us? Determine how store locators measure distance and calculate several distances.
- Pythagorean Theorem Problems Math Mistakes examines several student errors with utilizing the Pythagorean Theorem

Lesson Resources

Engage NY

- Grade 8, Module 7, Topic C, Lesson 17 Use the Pythagorean Theorem to determine the distance between two points on a coordinate plane.
- Grade 8, Module 7, Topic C, Lesson 18 Apply the Pythagorean Theorem to real world and mathematical problems in two dimensions

McGraw-Hill

Course 3, Chapter 5

Lesson 7

Semester 2	**Unit 6: Transformations, Congruence and Similarity**	17 days: 1/27-2/19

INTERVENTION/REMEDIATION: 3 days, 2/20-2/24

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.8.G.1.1 Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.	• Assessed though MAFS.8.G.1.2, MAFS.8.G.1.4 Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.8.G.1.2 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.	• The coordinate plane should not be used until (8.G.1.3). • Limit sequences to no more than two transformations. • A pre-image and image should not include apostrophe notation as this would give away the identification of similarity and congruence. • No reference to the definition of congruence or symbols relating to the definition should be used (HS Geometry). Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.8.G.1.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	• Coordinate values of *x* and *y* must be integers. • The number of transformations should be no more than two. • In items that require the student to draw a transformed figure using a dilation or a rotation, the center of the transformation must be given. Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response • Table Item

MAFS.8.G.1.4 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.	• Items should not include the coordinate plane as the coordinate plane is needed in 8.G.1.3. • Limit the sequence to no more than two transformations. • 2-dimensional figures are limited to no more than 7 sides. • A pre-image or image should not include apostrophe notation as this would give away the identification of similarity and congruence. • No reference to the definition of congruence or symbols relating to the definition should be used (HS Geometry). Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.8.G.1.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angle created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	• Do not include shapes beyond triangles. Calculator: **NEUTRAL** • Equation Editor • GRID • Multiple Choice • Multiselect • Open Response
MAFS.8.EE.2.6 Use similar triangles to explain why the slope *m* is the same between 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.	• All triangles must be right triangles and on a coordinate grid. • Numbers in items must be rational numbers. • Functions must be linear. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item

Open Up Resources Lessons
Grade 8, Unit 1: Rigid Transformations and Congruence • Lesson 1: Moving in the Plane • Lesson 2: Naming the Moves • Lesson 3: Grid Moves • Lesson 4: Making the Moves • Lesson 5: Coordinate Moves • Lesson 6: Describing Transformations • Lesson 7: No Bending or Stretching

- Lesson 8: Rotation Patterns
- Lesson 9: Moves in Parallel
- Lesson 10: Composing Figures
- Lesson 11: What is the Same?
- Lesson 12: Congruent Polygons
- Lesson 13: Congruence

Grade 8, Unit 2: Dilations, Similarity, and Introducing Slope

- Lesson 1: Projecting and Scaling
- Lesson 2: Circular Grid
- Lesson 3: Dilations with no Grid
- Lesson 4: Dilations on a Square Grid
- Lesson 5: More Dilations
- Lesson 6: Similarity
- Lesson 7: Similar Polygons
- Lesson 8: Similar Triangles
- Lesson 9: Side Length Quotients in Similar Triangles

Decoded Standard

MAFS.8.G.1.1 – students need multiple opportunities to explore the transformation of figures

Eighth graders add rotations, reflections, and translations to their study of transformations from Grade 7 dilations. Students verify through experimentation with figures on a coordinate plane that lines are taken to lines and line segments to line segments of the same length; angles are taken to angles of the same measure, and parallel lines are taken to parallel lines. This standard is an introduction, and students should spend time exploring these transformations.

See image on page 178 of the Common Core Mathematics Companion.

(*Common Core Mathematics Companion*, Pg. 178)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Segment Transformations Translation, rotation, and reflection
- Angle Transformations Students will need rulers and transparent paper. Students experimentally verify the properties of angle transformations.
- Parallel Line Transformations Students experimentally verify properties of parallel lines transformation.

Engaging Tasks

- How did they make Ms. Pac-Man Describe Ms. Pac-Man's movements with academic vocabulary
- How do Skytypers Write Messages? Use transformation applications to create skytyping messages and translate it into a set of coordinates.
- Naming Coordinates, Feedback and Revision Revise a student error involving translating a quadrilateral
- Best Reflection Students compare 4 images with their reflection to determine which one is the best.
- Pool Bounce Determine where each shot will hit using reflections.
- Transformations – Shortest Sequence What's the fewest number of transformations needed to take pre-image ABCT to A'B'C'D'.

Lesson Resources

Engage NY

- Grade 8, Module 2, Topic A, Lesson 1 Rigid Motion
- Grade 8, Module 2, Topic A, Lesson 2 Translations
- Grade 8, Module 2, Topic A, Lesson 3 Parallel Lines
- Grade 8, Module 2, Topic A, Lesson 4 Reflections
- Grade 8, Module 2, Topic A, Lesson 5 Rotations

MARS/Shell

- Representing and Combining Transformations Combining rigid transformations

McGraw-Hill

Course 3, Chapter 6

Inquiry Lab: Transformations
Lesson 1, 2 and 3

Course 3, Chapter 7

Lesson 1

Decoded Standard

MAFS.8.G.1.2

Students use what they previously learned about transformations to determine congruency between figures. Congruent figures share the same size and shape. When given two congruent figures, students describe the sequence of transformations that occurred to create the congruent figure. Note that dilations cannot be used for congruent figures. (*Common Core Mathematics Companion*, Pg. 180)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Proving Congruence Students are asked to explain congruence in terms of rigid motions.
- Rigid Motion 1 Students are asked to describe the motion and determine if the shapes are congruent. Translation
- Rigid Motion II-Reflection Describe a rigid motion to demonstrate two polygons are congruent.
- Rigid Motion III Describe a rigid motion to demonstrate two polygons are congruent.
- Multistep Congruence Describe a sequence of rigid motions to demonstrate the congruence of two polygons.

Illustrative Mathematics

- Cutting a Rectangle Into Two Shows the congruence of two triangles in a particular geometric context arising by cutting a rectangle in half along the diagonal.
- Congruent Triangles Develop an understanding of rigid motions in the context of demonstrating congruence and reflections refined by orientation.

Engaging Tasks

- Naming Coordinates, Feedback and Revision Revise a student error involving translating a quadrilateral
- Best Reflection Students compare 4 images with their reflection to determine which one is the best.
- Transformations – Shortest Sequence What's the fewest number of transformations needed to take pre-image ABCT to A'B'C'D'.
- Transformations – Three Sequences List three sequences of transformations that take pre-image ABCT to image A'B'C'D'

Lesson Resources

Engage NY

- Grade 8, Module 2, Topic B, Lesson 10 Mapping one figure onto another
- Grade 8, Module 2, Topic C Lesson 11 Congruence through Rigid Motion

MARS/Shell

- Transforming 2D Figures Describe in words the transformation that maps an object to a transformed image. Given a geometric figure and a rotation, reflection or translation, draw the transformed figure (or the original figure if the image is given.) Describe transformations as algebraic functions that take points in the plane as inputs and give other points as outputs.

McGraw-Hill

Course 3, Chapter 7

Lesson 2

Decoded Standard

MAFS.8.G.1.3

Students continue looking at two-dimensional figures on the coordinate plane, concentrating on the coordinates of the resulting figure after transformations, including dilations learned in Grade 7. (*Common Core Mathematics Companion*, Pg. 181)

Instructional Resources

Formative Tasks	Lesson Resources
Mathematics Formative Assessments (MFAS) • Translation Coordinates Two problems both require students to graph a two-dimensional figure's translation and identify the new coordinates. • Rotation Coordinates Two problems both require students to graph a two-dimensional figure's rotation and identify the new coordinates. • Reflection Coordinates Two problems both require students to graph a two-dimensional figure's reflection and identify the new coordinates. **Engaging Tasks** • How do Skytypers Write Messages? Use transformation applications to create skytyping messages and translate it into a set of coordinates. • Naming Coordinates, Feedback and Revision Revise a student error involving translating a quadrilateral • Transformations – Shortest Sequence What's the fewest number of transformations needed to take pre-image ABCT to A'B'C'D'. • How did they make Ms. Pac-Man Describe Ms. Pac-Man's movements with academic vocabulary	**Engage NY** • Grade 8, Module 3, Topic A, Lesson 6 Dilations using Coordinates **MARS/Shell** • Representing and Combining Transformations Students will recognize and visualize transformations of 2D shapes. They will translate, reflect and rotate shapes, and combine these transformations. **McGraw-Hill** Course 3, Chapter 6 Lesson 1 (Translations), Lesson 2 (Reflections), Lesson 3 (Rotations) and Lesson 4 (Dilations)

Decoded Standard
MAFS.8.G.1.4 With this standard, students move from congruence to similarity. Students develop the understanding that similar figures can be created by a series of transformations, including rotations, reflections, dilations, and translation, and can identify those transformations given an image and a pre-image. See image on page 182 of the Common Core Mathematics Companion. (*Common Core Mathematics Companion*, Pg. 182)

Instructional Resources	
Formative Tasks	**Lesson Resources**
Mathematics Formative Assessments (MFAS) • Proving Similarity Explain similarity in terms of transformations • Similarity I Describe a sequence of transformations to show that two polygons are similar. • Similarity II Describe a sequence of transformations to show that two polygons are similar. • Similarity III Describe a sequence of transformations that demonstrates two polygons are similar. **Illustrative Mathematics** • Are they Similar? Provide experience applying transformations to show that two polygons are similar. • Creating Similar Triangles Provide experience applying transformations to show that two polygons are similar. **Engaging Tasks** • Right Triangles – Trapezoids What question comes to mind for the given image?	**Engage NY** • Grade 8, Module 2, Topic B, Lesson 7 Sequencing transformations that enjoy the same properties as a single translation with respect to lengths of segments and angle degrees. • Grade 8, Module 3, Topic B, Lesson 8 Sequence of Transformations that lead to Similarity **McGraw-Hill** Course 3, Chapter 7 Lesson 4

Decoded Standard
MAFS.8.G.1.5

Students are expected to make informal arguments while exploring facts about the sum of the angles of a triangle, exterior angles of triangles, angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similar triangles. The example demonstrates how these facts are interrelated. Note that formal two-column proofs are not expected at this grade.

See image on page 184 of the Common Core Mathematics Companion.

(*Common Core Mathematics Companion*, Pg. 184)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Same Side Interior Angles Describe and justify the relationship between same side interior angles.
- Justifying Angle Relationships Describe and justify the relationship between corresponding angles and alternate interior angles
- Justifying the Exterior Angle Theorem Apply the Exterior Angle of a Triangle Theorem and provide an informal justification
- What is the Triangle Relationship? Describe the relationship between two triangles given that two pairs of corresponding angles are congruent, and provide an informal justification of the relationship (similarity).
- Justifying the Triangle Sum Theorem Provide an informal justification of the Triangle Sum Theorem

Illustrative Mathematics

- Rigid motions and congruent angles Given parallel lines cut by a transversal, prove congruence between angle pairs.
- A Triangle's Interior Angles Given parallel lines with a triangle drawn with its transversals, prove that a+b+c = 180
- Find the Missing Angle Find the measure of a missing angle between parallel lines
- Congruence of Alternate Interior Angles via Rotations Explain why rotating a pair of parallel lines cut by a transversal demonstrates that angles are congruent.
- Street Intersections Apply facts about angles in order to calculate angle measures in the context of a map.

Lesson Resources

Engage NY

- Grade 8, Module 2, Topic C, Lesson 12
  Angle Relationships of Parallel Lines
- Grade 8, Module 2, Topic C, Lesson 13
  Angle Sum Theorem Triangles
- Grade 8 Module 2, Topic C, Lesson 14
  Missing Angle Measures Triangles

McGraw-Hill

Course 3, Chapter 7
Lesson 5

Decoded Standard

MAFS.8.EE.2.6

Students gain additional knowledge about slope in this standard as they use similar triangles to explain how the slope *m* of a line is the same between any two points on a given non-vertical line. Students understand positive/negative slopes, 0 slope, and undefined slopes. Through the use of similar triangles, teachers lead students to derive the general equation ($y = mx + b$) of a line and discover that *m* is the slope and *b* is the y-intercept. (*Common Core Mathematics Companion*, Pg. 124)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Slope with similar Triangles Use similar triangles to explain why the slope is the same regardless of the points used to calculate it.
- Deriving Lines I- Using the slope formula Derive the general equation of a line containing the origin.
- Deriving Lines II Using the slope formula Derive the general equation of a line with a *y*-intercept of (0, *b*)

Lesson Resources

Engage NY

- Grade 8, Module 4, Topic C, Lesson 16 Use similar triangles to explain slope and calculate the slope between two distinct points on a non-vertical line.

McGraw-Hill

Course 3, Chapter 7
Lesson 6

Illustrative Mathematics • Slopes between points on a line Understand why the calculated slope will be the same for any two points on a given line.	

Pinellas County Schools **GRADE 8 PRE-ALGEBRA** 2019-2020

Semester 2	**Unit 7: Volume**	14 days: 2/25-3/13
INTERVENTION/REMEDIATION: 3 days, 3/24-3/26		
Spring Break is 3/14-3/23		

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.8.G.3.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	• Graphics of three-dimensional figures can be included. • Dimensions must be given as rational numbers. • Figures must not be composite Calculator: **YES** • Equation Editor • Multiple Choice • Multiselect

Open Up Resources Lessons

Grade 8, Unit 5: Functions and Volume

- Lesson 11: Filling Containers
- Lesson 12: How Much Will Fit?
- Lesson 13: The Volume of a Cylinder
- Lesson 14: Finding Cylinder Dimensions
- Lesson 15: The Volume of a Cone
- Lesson 16: Finding Cone Dimensions
- Lesson 17: Scaling One Dimension
- Lesson 18: Scaling Two Dimensions
- Lesson 19: Estimating a Hemisphere
- Lesson 20: The Volume of a Sphere
- Lesson 21: Cylinders, Cones, and Spheres

Decoded Standard

MAFS.8.G.3.9

This standard has two distinct parts. First, students learn the volume formulas for cones, cylinders, and spheres. Then they apply this knowledge to solve real-world and mathematical problems. The formulas should be taught through experiments where students figure out the formulas. (*Common Core Mathematics Companion*, Pg. 190)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Cone Formula Write the formula for the volume of a cone, explain what each variable represents, and label the variables on a diagram.
- Cylinder Formula Write the formula for the volume of a cylinder, explain what each variable represents, and label the variables on a diagram.
- Sphere Formula Write the formula for the volume of a sphere, explain what each variable represents, and label the variables on a diagram.
- Sugar Cone Solve a problem that requires calculating the volume of a cone.
- Platinum Cylinder Solve a problem that requires calculating the volume of a cylinder.
- Burning Sphere Solve a problem that requires calculating the volume of a sphere.

Illustrative Mathematics Assessment Tasks

- Comparing Snow Cones Find the volume of a cone.
- Glasses Use volume formulas for cylinders, cones and spheres.
- Flower Vases Use volume formulas for cylinders, cones and spheres.

Lesson Resources

Engage NY

- Grade 8, Module 5, Topic B, Lesson 10
  Volume of Cylinders and Cones; Solve real-world volume problems
- Grade 8, Module 5, Topic B, Lesson 11
  Volume of Spheres; Solve real-world volume problems

McGraw-Hill

Course 3, Chapter 8

Lesson 1 (Cylinders), Lesson 2 (Cones – skip ex. 3), and Lesson 3 (Spheres – skip ex. 4)

Pinellas County Schools **GRADE 8 PRE-ALGEBRA** 2019-2020

Semester 2	**Unit 8: Scatter Plots and Data Analysis**	12 days: 3/27-4/14

INTERVENTION/REMEDIATION: 3 days, 4/15-4/17

Standards/Learning Goals:	Content Limits, Assessment Types, Calculator
MAFS.8.SP.1.1 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.	• Numbers in items must be rational numbers. Calculator: **NEUTRAL** • GRID • Multiple Choice • Multiselect
MAFS.8.SP.1.2 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.	• Numbers in items must be rational numbers. • Trend/association is based on visual inspection. • Line of best fit must be informally assessed. • Trend/association must be linear. Calculator: **NEUTRAL** • GRID • Multiple Choice • Multiselect • Open Response
MAFS.8.SP.1.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope an intercept. *For example, in a linear model for a biology experiment, interpret a slop of 1.5 cm/hr. as meaning that an additional hour of sunlight each day is associated with an additional 1.5cm in mature plant height.*	• Numbers in items must be simple rational numbers (e.g., ½, ¼, to the 10^{th}). • Data are required for all items. • In all items requiring a line of best fit, the equation of that line should be given. Calculator: **NEUTRAL** • Equation Editor • Multiple Choice • Multiselect • Open Response
MAFS.8.SP.1.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between two variables. *For example, collect data from students in your class on 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?*	• Numbers in items must be rational numbers. • Data given should include the grand total of the survey. • Tables must not include more than two columns (plus category and total) and two rows (plus category and total). Calculator: **YES** • Equation Editor • GRID • Multiple Choice • Multiselect • Table Item

Open Up Resources Lessons

Grade 8, Unit 6: Associations in Data

- Lesson 1: Organizing Data
- Lesson 2: Plotting Data
- Lesson 3: What a Point in a Scatter Plot Means
- Lesson 4: Fitting a Line to Data
- Lesson 5: Describing Trends in Scatter Plots
- Lesson 6: The Slope of a Fitted Line
- Lesson 7: Observing More Patterns in Scatter Plots
- Lesson 8: Analyzing Bivariate Data
- Lesson 9: Looking for Associations
- Lesson 10: Using Data Displays to Find Associations

Decoded Standard

MAFS.8.SP.1.1

Students study scatter plots of bivariate data by constructing and interpreting them in terms of patterns they can see. They look for the patterns of clustering, outliers, positive or negative association, and linear or nonlinear association. Examples of scatter plots below show positive and negative associations, clustering, and an outlier.

See the image on page 238 of the Common Core Mathematics Companion

(*Common Core Mathematics Companion*, Pg. 238)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Sleepy Statistics Describe the association between scores on the Epworth Sleepiness Scale and scores on the math test.
- Population Density Describe the relationship between population and land area.
- Infectious Statistics Describe the association between the passage of time and the number of bacteria.
- Cheesy Statistics Describe the association between time spent watching advertisements and the percent of each group willing to buy the company's cheese crackers.
- Bungee Cord Data Construct a scatterplot corresponding to a given set of data.

Illustrative Mathematics Assessment Tasks

- Birds' Eggs Identify a correlation and use it to make interpolative predictions.
- Texting and Grades I Describe the relationship between number of text messages sent and GPA.

Engaging Tasks

- Positive Correlation Create a set of points that have specific characteristics
- Interpreting Graphs Where Up Isn't Good Interpret data on a scatterplot that appears unconventional.

Lesson Resources

Engage NY

- Grade 8, Module 6, Topic B, Lesson 6
  Constructing Scatter Plots
- Grade 8, Module 6, Topic B, Lesson 7
  Patterns in Scatter Plots
- Grade 8, Module 6, Topic C, Lesson 11
  Scatter plots; Fit line to data; Interpret slope

McGraw-Hill

Course 3, Chapter 9
Lesson 1

Decoded Standard

MAFS.8.SP.1.2

Students focus on linear patterns of association in scatter plots and understand that linear models (straight lines) are commonly used to model linear relationships. Then they begin to informally fit a straight line to the data and learn to assess its fit by judging the closeness of the line to the data points. The most appropriate line is the one that comes closest to most data points. The use of linear regression is not expected at this grade. (*Common Core Mathematics Companion*, Pg. 239)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Two Scatterplots Compare how well each line fits its set of data. Explain your reasoning.
- Three Scatterplots (Informally assess three lines fitted to data to determine which fit is the best.)
- Line of Good Fit I Fit a line to model the relationship between two quantitative variables and to assess how well that line fits the data.
- Line of Good Fit II See description above.

Lesson Resources

Engage NY

- Grade 8, Module 6, Topic B, Lesson 8
  Informally fit a line to data in scatter plot
- Grade 8, Module 6, Topic C, Lesson 9
  Informally fit a line to data in scatter plot
- Grade 8, Module 6, Topic C, Lesson 11
  Scatter plots; Fit line to data; Interpret slope

McGraw-Hill

Illustrative Mathematics Assessment Tasks • Hand Span and Height Construct and Interpret Scatter plots by generating and recording data. • Animal Brains Create scatterplots, and think critically about associations and outliers in data as well as informally fit a trend line to data. • Laptop Battery Charge Find and use a linear model answer this question. **Engaging Tasks** • Line of Best Fit Create 4 points that could generate a line of best fit with the equation y=-x+8.	Course 3, Chapter 9 Lesson 2

Decoded Standard

MAFS.8.SP.1.3

Students practice solving contextual linear problems. The problems involve situations using bivariate measurement data such as those collected in a biology experiment. This standard connects with what students have learned about models of linear equations, slope, and intercept. (*Common Core Mathematics Companion*, Pg. 240)

Instructional Resources

Formative Tasks	**Lesson Resources**
Mathematics Formative Assessments (MFAS) • Tuition Use this equation to predict the average tuition cost at a public university. • Stretching Statistics Explain the significance of a point and the y-intercept. • Foot Length Interpret the slope and intercept of a linear function that models the relationship between foot length and height. • Developmental Data Explain the significance of the slope of the equation in terms of a problem's context. **Illustrative Mathematics Assessment Tasks** • US Airports, Assessment Variation Use a linear function to model a relationship between two quantities. • Chicken and Steak, Variation 1 Presents a real world situation that can be modeled with a linear function best suited for an instructional context	**Engage NY** • Grade 8, Module 6, Topic C, Lesson 10 Interpret slope and initial value • Grade 8, Module 6, Topic C, Lesson 11 Scatter plots; Fit line to data; Interpret slope **McGraw-Hill** Course 3, Chapter 9 Lesson 2

Decoded Standard

MAFS.8.SP.1.4

This standard asks students to switch from using numerical data to categorical data and use frequencies to answer questions about possible associations (linear/nonlinear, positive/negative/no association). Students construct and interpret tables that display categorical data on two different variables from the same subjects. A two-way table is a table that shows categorical data classified in two different ways. An example of a two-way table that records possible data from the example in the standard about chores and curfews may be the following:

		CURFEW	
CHORES		YES	NO
	YES	44	20
	NO	20	44

One interpretation of the chart is that of the students who answered yes, they had a curfew, 44 had chores and 20 did not. Of the students who answered no, they did not have a curfew, 20 had chores and 44 did not. From this sample, there

appears to be a positive correlation between having a curfew and having chores. (*Common Core Mathematics Companion*, Pg. 214)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Two-Way Relative Frequency Table Convert raw data to relative frequencies by both rows and columns given a two-way frequency table.
- School Start Time Interpret data given in a two-way table.
- Music and Sports Construct a two-way frequency table given a set of raw data.
- Sibling and Pets Interpret data given in a two-way table.

Illustrative Mathematics Assessment Tasks

- What's Your Favorite Subject? Calculate appropriate relative frequencies using the given data.
- Music and Sports Investigate the association between whether a student plays a sport and whether he or she plays a musical instrument.

Lesson Resources

Engage NY

- Grade 8, Module 6, Topic D, Lesson 13
  Two-way Tables; Row and Column Relative Frequencies
- Grade 8, Module 6, Topic D, Lesson 14
  Association between Two Categorical Values

MARS/Shell

- Testing a New Product Assess how well students are able to organize, represent and analyze bivariate categorical data in an appropriate way.

McGraw-Hill

Course 3, Chapter 9
Lesson 3

MS Math Scoring Criteria (Grade 8 Math)

Number and Quantity: Reason, describe, and analyze quantitatively, using units and number systems to solve problems.				
Scoring Criteria				
Performance Indicators	**Emerging**	**Progressing**	**Meets**	**Exceeds**
G. Students will know that there are numbers that are not rational, and approximate them by rational numbers [8.NS.1.1, 8.NS.1.2]	i. Students can find the square roots of small perfect squares.	i. Students can identify square roots of non-square numbers and pi as irrational numbers; identify rational or irrational numbers and convert familiar rational numbers with one repeating digit to fraction form.	i. Students can place irrational numbers on a number line; identify irrational decimal expansions as approximations; identify rational and irrational numbers and convert less familiar rational numbers to fraction form.	i. Students can use approximations of irrational numbers to estimate the value of an expression; compare and order rational and irrational numbers without a number line.

Algebra: Create, interpret, use, and analyze expressions, equations and inequalities.				
Scoring Criteria				
Performance Indicators	**Emerging**	**Progressing**	**Meets**	**Exceeds**
F. Students will work with radicals and integer exponents. [8.EE.1.1, 8.EE.1.2, 8.EE.1.3, 8.EE.1.4]	i. Students can identify numbers in scientific notation as being a very large number (positive exponent) or a very small number (negative exponent).	i. Students can apply the properties of natural number exponents to generate equivalent numerical expressions. ii. Students can evaluate square roots and solve mathematical equations in the form $x^2 = p$, where p is a positive rational number and is a small perfect square; knows that square root 2 is irrational. iii. Students can use numbers expressed in the form of a single digit times an integer power of 10 to express very large numbers. iv. Students can represent very large and very small	i. Students can apply the properties of integer exponents to generate equivalent numerical expressions. ii. Students can use square root and cube root symbols to represent solutions to mathematical equations in the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number; evaluate cube roots of small perfect cubes. iii. Students can use numbers expressed in the form of a single digit times an integer power of 10 to express very small numbers. iv. Students can perform operations	i. Students can use multiple properties of integer exponents within an expression; analyze the reasonableness of the result of using the properties of integer exponents. ii. Students can write and solve equations representing real-world situations using square root and cube root symbols; justify how square roots and cube roots relate to each other and to their radicands. iii. Students can express how many times as much a number written in the form of a single digit times

		quantities in scientific notation and use units of appropriate sixe for measurements of very large or very small quantities.	with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used; interpret scientific notation generated by technology.	an integer power of 10 is than another number written in the same form. iv. Students can perform operations and interpret values written in scientific notation within a real-world context; analyze the process and solution to given problems using scientific notation.
G. Students will understand the connections between proportional relationships, lines, and linear equations. [8.EE.2.5, 8.EE.2.6]	i. Students can graph a proportional relationship given a table. ii. Students can identify the slope of a line when given an equation in slope-intercept form.	i. Students can graph proportional relationships, interpreting the unit rate as the slope. ii. Students can determine the slope of a line given a graph.	i. Students can identify the unit rate as the slope; compare two different proportional relationships represented in different ways. ii. Students can explain, using similar triangles, why the slope is the same between any two distinct points on a nonvertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin.	i. Students can generate a model of a proportional relationship given specific quantities. ii. Students can derive the equation $y = mx + b$ for a line intercepting the vertical axis at b; compare and contrast situations in which similar triangles would or would not yield the same slope between two distinct points on a nonvertical line in the coordinate plane.
H. Students will analyze and solve linear equations and pairs of simultaneous linear equations. [8.EE.3.7, 8..EE.3.8]	i. Students can use substitution with an equation or pair of equations and a data set to determine if any number(s) from the data set makes the equation true.	i. Students can solve linear equations with integer coefficients and variables on one side. ii. Students can interpret mathematical or real-world problems given the graph, of a system of two linear equations in two variables.	i. Students can solve multistep linear equations in one variable with rational coefficients using the distributive property or collecting like terms on a given side; identify linear equations as having solution of one,	i. Students can justify why an equation has one solution, infinitely many solutions, or no solution; create examples of equations that have one solution, infinitely many solutions, or no solution.

			infinitely many, or none by transforming the given equation into simpler forms by inspection. ii. Students can solve mathematical and real-world systems of two linear equations in two variables with integer coefficients by inspection, algebraically by multiplying only one of the equations by an integer.	ii. Students can solve and analyze a system of equations in two variables with integer and benchmark fraction coefficients; solve and analyze problems involving two linear equations in two variables with rational coefficients or constants.

Functions: Use various forms of functions to interpret and analyze a variety of contexts.				
Scoring Criteria				
Performance Indicators	**Emerging**	**Progressing**	**Meets**	**Exceeds**
A. Students will define, evaluate, and compare functions. [8.F.1.1, 8.F.1.2, 8.F.1.3]	i. Students can define the terms function, linear, nonlinear, and slope.	i. Students can identify, from a graph, if a relation is a function. ii. Students can compare properties (i.e., slope, y-intercept, values) of two linear functions represented in a different way (graph and equation in slope intercept form). iii. Students can determine whether a function is linear or nonlinear from a graph.	i. Students can use a table or graph to demonstrate understanding that a function is a rule that assigns to each input exactly one output and that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output. ii. Students can compare properties (i.e., slope, y-intercept, values) of two linear functions each represented in a different way (algebraically, graphically, numerically in tables, or verbal description). iii. Students can interpret the	i. Students can explain, given a rule, why it is a function or not a function; create a rule, given a table or graph, and explain why it is or is not a function. ii. Students can compare two linear functions and justify whether two functions each represented in a different way (algebraically, graphically, numerically in tables, or verbal description) are equivalent or not by comparing properties; create a function, based on given criterion,

			equation $y = mx + b$ as defining a linear function whose graph is a straight line.	in comparison to a given function. ii. Students can determine whether a function is linear or nonlinear (table or equation); give real-world examples of functions that are linear or nonlinear.
B. Students will use functions to model relationships between quantities. [8.F.2.4, 8.F.2.5]	i. Students can determine the rate of change given points on a coordinate plane.	i. Students can determine the rate of change from two (*x*, *y*) values or from a graph. ii. Students can describe qualitatively the functional relationship between two quantities by analyzing some features of a graph to be linear and nonlinear.	i. Students can 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; construct a function to model a linear relationship between two quantities. ii. Students can describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g, where the function is increasing or decreasing, linear or nonlinear).	i. Students can interpret the rate of change and initial value of a linear function in terms of a verbal description of the linear function; analyze a set of values in either a table or graph to determine changes to be made to make the relationship linear. ii. Students can sketch a graph that exhibits given qualitative features of a function; interpret qualitative features of a function in a context.

Geometry: Understand geometric concepts and constructions, prove theorems, and apply appropriate results to solve problems.				
Scoring Criteria				
Performance Indicators	**Emerging**	**Progressing**	**Meets**	**Exceeds**
D. Students will understand congruence and similarity using physical	i. Students can define/explain the terms translation, rotation,	i. Students can describe a rigid transformation between two congruent figures	i. Students can describe a sequence of up to two rigid transformations	i. Students can use properties of rigid and non-rigid transformations to understand the

models, transparencies, or geometry software. [8.G.1.1, 8.G.1.2, 8.G.1.3, 8.G.1.4, 8.G.1.5]	reflection, and dilation.	that exhibit the congruence between them. ii. Students can describe the effect of a reflection or translation on two-dimensional figures using coordinates.	between two congruent figures. ii. Students can describe the effect of a dilation, translation, rotation, or reflection on two-dimensional figures using coordinates and coordinate notation. iii. Students can identify a sequence of transformations and a dilation that results in similarity.	relationship between transformations and congruence. ii. Students can describe the effect of up to two rigid transformations on two-dimensional figures using coordinates; describe the effect of two transformations, including at least one dilation, on two-dimensional figures using coordinates and coordinate notation. iii. Students can describe a sequence of transformations and a dilation that results in similarity.
E. Students will understand and apply the Pythagorean Theorem. [8.G.2.6, 8.G.2.7, 8.G.2.8]	i. Students can recall the equation for the Pythagorean Theorem.	i. Students can use the Pythagorean Theorem and apply to right triangles. ii. Students can calculate hypotenuse length using the Pythagorean Theorem, given a picture of a right triangle or the lengths of the two legs.	i. Students can model and explain the proof of the Pythagorean Theorem and its converse using a pictorial representation. ii. Students can calculate unknown side lengths using the Pythagorean Theorem; apply the Pythagorean Theorem to find the distance between two points in a coordinate system with the right triangle drawn.	i. Students can apply the Pythagorean Theorem to a real-world situation in two and three dimensions to determine unknown side lengths or the distance between two points in a coordinate system. ii. Students can find multiple leg lengths given a hypotenuse of an isosceles triangle or find multiple leg lengths when two triangles with the same hypotenuse are given; apply the Pythagorean Theorem in multistep problems; find the coordinates of a point which is a given distance

				(nonvertical and nonhorizontal) from another point.
F. Students will solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. [8.G.3.9]	i. Students can identify three dimensional figures as cones, cylinders or spheres.	i. Students can recall the formulas for finding the volume of cones, cylinders and spheres.	i. Students can use the formulas for the volume of cones, cylinders, and spheres to solve real-world and mathematical problems.	i. Students can explain and justify the relationship between formulas for the volume of cones, cylinders, or spheres; explain the derivation of the formulas for cones, cylinders, and spheres.

Statistics and Probability: Interpret and apply statistics and probability to analyze data, reach and justify conclusions, and make inferences.				
Scoring Criteria				
Performance Indicators	**Emerging**	**Progressing**	**Meets**	**Exceeds**
F. Students will investigate patterns of association in bivariate data. [8.SP.1.1, 8.SP.1.2, 8.SP.1.3, 8.SP.1.4]		i. Students can construct a scatter plot and describe the pattern as positive, negative, or no relationship. ii. Students can identify a straight line used to describe a linear association on a scatter plot. iii. Students can identify the slope and y-intercept of a linear model on a scatter plot, given an equation. iv. Students can interpret a two-way table by row or column.	i. Students can conduct and interpret scatter plots for bivariate measurement data to investigate patterns of association between quantities. ii. Students can draw a straight line on a scatter plot that closely fits the data points. iii. Students can interpret the slope and intercept, given context. iv. Students can complete a two-way table of categorical data.	i. Students can describe patterns such as outliers and nonlinear associations. ii. Students can judge how well the trend line fits the data; compare more than one trend line for the same scatter plot and justify the best one. iii. Students can use the equations of a linear model to solve problems in the context of bivariate measurement data; create and use a linear model based on a set of bivariate data to solve a problems involving slope and intercept. iv. Students can construct and/or

				interpret a two-way table to summarize data; describe and/or compare relative frequencies.