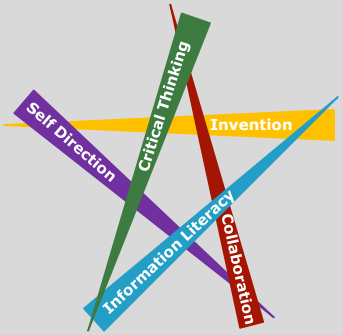
Greeley-Evans School District 6- 8th Grade: 2016-2017

Content Area	*Mathematics*	Grade Level	8th Grade
Course Name/Course Code			

Standard	Grade Level Expectations (GLE)	GLE Code
1. Number Sense, Properties, and Operations	1. In the real number system, rational and irrational numbers are in one to one correspondence to points on the number line	MA10-GR.8-S.1-GLE.1
2. Patterns, Functions, and Algebraic Structures	1. Linear functions model situations with a constant rate of change and can be represented numerically, algebraically, and graphically	MA10-GR.8-S.2-GLE.1
	2. Properties of algebra and equality are used to solve linear equations and systems of equations	MA10-GR.8-S.2-GLE.2
	3. Graphs, tables and equations can be used to distinguish between linear and nonlinear functions	MA10-GR.8-S.2-GLE.3
3. Data Analysis, Statistics, and Probability	1. Visual displays and summary statistics of two-variable data condense the information in data sets into usable knowledge	MA10-GR.8-S.3-GLE.1
4. Shape, Dimension, and Geometric Relationships	1. Transformations of objects can be used to define the concepts of congruence and similarity	MA10-GR.8-S.4-GLE.1
	2. Direct and indirect measurement can be used to describe and make comparisons	MA10-GR.8-S.4-GLE.2

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Mathematical Practices:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Unit Titles	Length of Unit	Dates
Mod 1: Integer Exponents and Scientific Notation	16 days	8/28 – 9/21
Mod 2: The Concept of Congruence	18 days	9/22 – 10/18
Mode 3: Similarity	19 days	10/19 – 11/14
Mod 4: Linear Equations	45 days	11/15 – 2/3
Mod 5: Examples of Functions from Geometry	13 days	2/7 – 2/24
Mod 6: Linear Functions	23 days	2/27 – 4/5
Mod 7: Introduction to Irrational Numbers using Geometry	23 days	4/17 – 5/18

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Suggested Big Idea	Mod 1: Integer Exponents and Scientific Notation			
Content Emphasis Cluster	Expressions and Equations Work with radicals and integer exponents.			
Mathematical Practices	MP.2 Reason abstractly and quantitatively MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.			
Common Assessment	NA			
Graduate Competency	Prepared graduates understand the structure and properties of our number system. At their most basic level numbers are abstract symbols that represent real-world quantities			
CCSS Priority Standards	**Cross-Content Connections**	**Writing Focus**	**Language/Vocabulary**	**Misconceptions**
No Priority Standards	Literacy Connections RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. RST.6-8.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.8 Distinguish among facts, reasoned judgment	Writing Connection WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to	Academic Vocabulary- Apply, base, compare, estimate, expression, power Technical Vocabulary- Equivalent expressions, exponent, exponential function, integer, properties of integer exponents, scientific notation L.6-8.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. L.6-8.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases choosing flexibly	Students mix up the product of powers property with the power raised to a power property. Students multiply base times exponent when evaluating exponential expressions. Students think negative exponents make the product negative. Students mix up positive and negative exponent values when expanding scientific notation.

	based on research findings, and speculation in a text.	create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	from a range of strategies.	

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Unit 1: Module 1	***Integer Exponents and Scientific Notation*** *a) Topic A: Exponential Notation and Properties of Integer Exponents (8.EE.1)* *b) Topic B: Magnitude and Scientific Notation (8.EE.3, 8.EE.4)*	**Length of Unit**	**14 days** 8/26 – 9/16

Content Standards	**Work with radicals and integer exponents.** **8.EE.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.* **8.EE.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 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.* **8.EE.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. **** Prior grade level expectations are noted at the end of each curriculum unit.**
Inquiry Questions	• See Knowledge Packet for specific questions. • How can we multiply and divide when number are really large or really small? • How can we multiply and divide when number are really large or really small (for example, distance to sun or size of an atom)? • Would you rather receive $1.00 per day for a month or start with $0.01 and have the amount you receive double each day for a month?

Key Knowledge and Skills (Procedural Skill and Application)

My students will be able to (Do)…

- Recall and use the properties of exponents to generate equivalent numeric expressions.
- Identify the appropriate property to use and apply it correctly.
- Check the numerical value of an expression involving exponents without using a calculator
- Estimate lengths of everyday objects using scientific notation.
- Convert between decimal and scientific notation.
- Make comparisons of the size of numbers expressed in both decimal and scientific notation.

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Resources	
Technology	Main Resource: EngageNY website Integer Exponent Jeopardy - http://www.math-play.com/Exponents-Jeopardy/Exponents-Jeopardy.html Extra Resources www.phet.colorado.edu Math shell practice questions: http://map.mathshell.org/download.php?fileid=1664
Materials	Scientific Calculators, Graph Paper, Base 10 blocks
Performance/Learning Tasks *(Assessments)*	**Formative assessment is listed in knowledge packets 1 and 2 under "formative assessment options"** **No common unit assessment for this module because there are no priority standards**
Instructional Notes	*****Please see the Knowledge Packets for specific lesson information.** **Topic A: Exponential Notation and Properties of Integer Exponents (8.EE.1)** Lesson 1: Exponential Notation Lesson 2: Multiplication of Numbers in Exponential Form Lesson 3: Numbers in Exponential Form Raised to a Power Lesson 4: Numbers Raised to the Zeroth Power Lesson 5: Negative Exponents and the Laws of Exponents **OMIT-**Lesson 6: Proofs of Laws of Exponents **Topic B: Magnitude and Scientific Notation (8.EE.3, 8.EE.4)** **COMBINE-** Lesson 7: Magnitude - Lesson 8: Estimating Quantities Lesson 9: Scientific Notation Lesson 10: Operations with Numbers in Scientific Notation Lesson 11: Efficacy of the Scientific Notation **COMBINE-** Lesson 12: Choice of Unit - Lesson 13: Comparison of Numbers Written in Scientific Notation and Interpreting Scientific Notation Using Technology **The following lessons are optional materials to support EngageNY scope and sequence. The Mathscapes lessons develop conceptual understanding. The Shell lesson serves as excellent culminating lessons and formative assessments.** **Topic A: Exponential Notation and Properties of Integer Exponents (8.EE.1)** Lesson 1: "Family Portraits" lesson 10 from Mathscape page 296. Intro to Exponential Functions (1 day) Lesson 2: "Family Portraits" Lesson 11 from Mathscape page 298 Graphing Exponential Functions (1 day) Lesson 3: Applying Properties of Exponents –MARS Shell lesson (2 days) **Topic B: Magnitude and Scientific Notation (8.EE.3, 8.EE.4)** Lesson 4: "Family Portraits" lesson 12 from Mathscape page 300 Intro to Scientific Notations (1 day) Lesson 5: Estimating Length Using Scientific Notation –MARS Shell lesson (2 days)

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Foundational Standards	**Understand the place value system.** **5.NBT.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. **6.EE.1** Write and evaluate numerical expressions involving whole-number exponents. **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.** **7.G.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. **7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

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Suggested Big Idea	Mod 2: The Concept of Congruence			
Content Emphasis Cluster	Understand and apply the Pythagorean Theorem.			
Mathematical Practices	MP.2 Reason abstractly and quantitatively MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.			
Common Assessment	No Common Assessment – Not a priority Standard			
Graduate Competency	Prepared graduates use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions			
CCSS Priority Standards	**Cross-Content Connections**	**Writing Focus**	**Language/Vocabulary**	**Misconceptions**
CCSS.MATH.CONTENT.8.G.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	Literacy Connections RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. RST.6-8.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.8 Distinguish among facts, reasoned judgment	Writing Connection WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. f. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. g. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. h. Use appropriate and varied transitions to	Academic Vocabulary- Clockwise, counter-clockwise, relationship, transformation, translation, prove, rotation, reflection Technical Vocabulary- Alternate exterior angles, alternate interior angles, congruent, parallel, perpendicular, transversal, vertical angles L.6-8.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. L.6-8.4 Determine or clarify the meaning of	

	based on research findings, and speculation in a text.	create cohesion and clarify the relationships among ideas and concepts. i. Use precise language and domain-specific vocabulary to inform about or explain the topic. j. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	unknown and multiple-meaning words and phrases choosing flexibly from a range of strategies.	

Unit 2: Module 2	***The Concept of Congruence*** *a) Topic A: Definitions and Properties of the Basic Rigid Motions (8.G.A.1)* *b) Topic B: Sequencing the Basic Rigid Motions (8.G.A.2)* *c) Topic C: Congruence and Angle Relationships (8.G.A.2, 8.G.A.5)* *d) Topic D: The Pythagorean Theorem (8.G.B.6, **8.G.B.7**)*	**Length of Unit**	**6 days** 9/17 – 9/25
Content Standards	**Understand congruence and similarity using physical models, transparencies, or geometry software.** **8.G.A.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. **8.G.A.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. **8.G.A.5** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *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.* **Understand and apply the Pythagorean Theorem.** **8.G.B.6** Explain a proof of the Pythagorean Theorem and its converse. **8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.** **** Prior grade level expectations are noted at the end of each curriculum unit.**		
Inquiry Questions	• See Knowledge Packet for specific questions. • How do patterns in floor or wall tiles use transformations? • What transformations are displayed in architecture and art?		

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Key Knowledge and Skills (Procedural Skill and Application)
My students will be able to (Do)…
• Verify experimentally properties of rotations, reflections and translations. • Show that two figures are congruent by describing a sequence of rotations, reflections and translations. • Describe the effects of translations, rotations and reflections on figures using coordinates. • Describe the relationship between alternate exterior angles, alternate interior angles and vertical angles. • Informally establish facts about the angle sum and exterior angle of triangles and about angles created when parallel lines are cut by a transversal.

Resources	
Technology	Main Resource: EngageNY website Extra Resources www.phet.colorado.edu Transformations on a Coordinate Plane Game http://www.kidsmathgamesonline.com/geometry/transformation.html Michael Serra Patty Paper Geometry – the link should be in schoology Practice options: https://www.illustrativemathematics.org/content-standards/8/G/A/5/tasks/1936 http://cdn.kutasoftware.com/Worksheets/Geo/3-Parallel%20Lines%20and%20Transversals.pdf http://cdn.kutasoftware.com/Worksheets/PreAlg/Angle%20Relationships.pdf
Materials	Graph Paper, Patty Paper, Rulers, Protractor
Performance/Learning Tasks *(Assessments)*	**End of Unit Common Assessment on Schoolcity:** • Scanned into School City or students take the assessment online • Should be in addition to individually developed formative assessments • **Knowledge Packet 3 & 5 have a formative assessment listed under "formative assessment options"**
Instructional Notes	***Please see the Knowledge Packets for specific lesson information.** **Serra Resources:** Throughout this unit, there are supplemental resources called Serra Guided Investigations. The Serra lessons can be found in the Module 2 folder on Office 365. These mini-explore lessons help students discover aspects of the transformations through use of patty paper while the Engage NY curriculum focuses more on performing the transformations. Both texts should be used simultaneously. **Shell Lesson:** The shell lesson assumes that students know how to graph equations in the form y = mx + b. Since students have not been exposed to this yet this year, you should provide them with the lines or plan ahead so that the lesson doesn't slow down due to the new information.

	Topic A: Definitions and Properties of the Basic Rigid Motions (8.G.A.1) **OMIT-**Lesson 1: Why Move Things Around (Intro Lesson) Lesson 2: Definition of Translation and Three Basic Properties **Serra Guided Investigation 9.1 Translations** **OMIT-**Lesson 3: Translating Lines Lesson 4:Definition of Reflections and Basic Properties **Serra Guided Investigation 9.3 Reflections** Lesson 5: Definition of Rotation and Basic Properties **Serra Guided Investigation 9.2 Rotations** **OMIT-**Lesson 6: Rotations of 180 degrees **Topic B: Sequencing the Basic Rigid Motions (8.G.A.2)** **COMBINE-**Lesson 7: Sequencing Translations -Lesson 8: Sequencing Reflections and Translations Lesson 9: Sequencing Rotations Lesson 10: Sequencing of Rigid Motions Shell MARS "Representing and Combining Transformations" (optional) Topic C: Congruence and Angle Relationships (**8.G.A.2**, **8.G.A.5**) Lesson 11:Definition of Congruence and Some Basic Properties Lesson 12: Angles Associated with Parallel Lines **Serra Guided Investigation 1.3 "Vertical Angles"** **Serra Guided Investigation 1.4 "Adjacent Angles and Linear Pairs"** Lesson 13: Angle Sum of a Triangle Lesson 14: More on the Angles of a Triangle (optional) **(Optional) Topic D: The Pythagorean Theorem (8.G.B.6, 8.G.B.7)** Lesson 15: Informal Proof of the Pythagorean Theorem **OMIT-**Lesson 16: Applications of the Pythagorean Theorem
Foundational Standards	**Geometric measurement: understand concepts of angle and measure angles.** **4.MD.C.5** Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles. b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees. **Draw and identify lines and angles, and classify shapes by properties of their lines and angles.**

	4.G.A.1 Draw points, lines, line segments, rays, angles, and perpendicular and parallel lines. Identify these in two-dimensional figures. **4.G.A.2** Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. **4.G.A.3** Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.** **7.G.B.5** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

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Suggested Big Idea	Mod 3: Similarity			
Content Emphasis Cluster	Understand congruence and similarity using physical models, transparencies, or geometry software. Understand and apply the Pythagorean Theorem.			
Mathematical Practices	MP.3 Construct viable arguments and critiques the reasoning of others. MP.4 Model with mathematics. MP.6 Attend to precision.			
Common Assessment	Gr8 Eureka Module 3 Common Assessment 2016-17			
Graduate Competency	Prepared graduates use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions Prepared graduates apply transformation to numbers, shapes, functional representations, and data			
CCSS Priority Standards	**Cross-Content Connections**	**Writing Focus**	**Language/Vocabulary**	**Misconceptions**
CCSS.MATH.CONTENT.8.G.A.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. **CCSS.MATH.CONTENT.8.G.7.** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	Literacy Connections RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. RST.6-8.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.8 Distinguish among facts,	Writing Connection WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. k. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. l. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. m. Use appropriate	Academic Vocabulary- Dilation, enlarge, similar, leg, converse Technical Vocabulary- coordinate plane, proof, hypotenuse, Pythagorean theorem, square root L.6-8.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. L.6-8.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases choosing flexibly from a range of strategies.	Students think they can prove figures are similar if they can show some common features where they are alike. Students do not understand the importance of the location of the center of dilation. Students do not realize the Pythagorean Theorem only applies to right triangles. Students do not realize that c in Pythagorean Theorem must always be the hypotenuse of the triangle. To find distance between two points they just count the dots.

	reasoned judgment based on research findings, and speculation in a text.	and varied transitions to create cohesion and clarify the relationships among ideas and concepts. n. Use precise language and domain-specific vocabulary to inform about or explain the topic. o. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		

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Unit 3: Module 3	***Similarity*** *a) Topic A: Dilation (8.G.A.3)* b) *Topic B: Similar Figures (**8.G.A.4**, 8.G.A.5)*	**Length of Unit**	**29 days** 9/28 – 11/6

Content Standards (Priority Standards)

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

8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

8.G.A.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.**

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

Understand and apply the Pythagorean Theorem.

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

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

**** Prior grade level expectations are noted at the end of each curriculum unit.**

Inquiry Questions

- See Knowledge Packet for specific questions.
- How can we determine distances that are not easily measured?
- What types of similar figures exist in the real world and how can we use the properties of similar figures in order to analyze them?

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Key Knowledge and Skills (Procedural Skill and Application)
My students will be able to (Do)…
• Describe the effects of dilations on figures using coordinates. • Show that two figures are similar by describing a sequence of transformations including dilations. • Explain proof of the Pythagorean Theorem and its converse. • Use the Pythagorean Theorem to find unknown side lengths in right triangles. • Use Pythagorean Theorem to find the distance between two points in a coordinate system. • Determine if triangles are right triangles using the Pythagorean Theorem.

Resources	
Technology	Main Resource: EngageNY website Extra Resources www.phet.colorado.edu Practice options: http://cdn.kutasoftware.com/Worksheets/Geo/12-Translations.pdf http://cdn.kutasoftware.com/Worksheets/Geo/12-Reflections.pdf http://cdn.kutasoftware.com/Worksheets/Geo/12-Rotations.pdf http://www.mathworksheetsland.com/geometry/16dilation/ip.pdf http://cdn.kutasoftware.com/Worksheets/Geo/7-Similar%20Polygons.pdf http://cdn.kutasoftware.com/Worksheets/Geo/7-Similar%20Polygons.pdf https://www.ixl.com/math/grade-8/congruent-figures-side-lengths-and-angle-measures http://www.mathworksheets4kids.com/length/line-segment-cm1.pdf
Materials	Graph paper, calculators, protractors
Performance/Learning Tasks *(Assessments)*	**End of Unit Common Assessment on Schoolcity:** • Scanned into School City or students take the assessment online • Should be in addition to individually developed formative assessments **Knowledge Packet 4 Pre and Post Test** **Pre Test:** 8preGA4_KP4 **Post Test:** 8postGA4_KP4
Instructional Notes	***Please see the Knowledge Packets for specific lesson information. **Topic A: Dilation (8.G.A.3)** Lesson 1: What Lies Behind "Same Shape"? **COMBINE**-Lesson 2: Properties of Dilations

	-Lesson 3: Examples of Dilations **OMIT-**Lesson 4: Fundamental Theorem of Similarity (FTS) **OMIT-**Lesson 5: First Consequences of FTS Lesson 6: Dilations on the Coordinate Plane **OMIT-**Lesson 7: Informal Proofs of Properties of Dilations (optional) **Topic B: Similar Figures (8.G.A.4, 8.G.A.5)** Lesson 8: Similarity Lesson 9: Basic Properties of Similarity **OMIT-**Lesson 10: Informal Proof of AA Criterion for Similarity **OMIT-**Lesson 11: More About Similar Triangles **OMIT-**Lesson 12: Modeling Using Similarity
Foundational Standards	**Understand ratio concepts and use ratio reasoning to solve problems.** **6.RP.A.2** Understand the concept of a unit rate *a/b* associated with a ratio *a:b* with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is ¾ cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* **Analyze proportional relationships and use them to solve real-world and mathematical problems.** **7.RP.A.2** Recognize and represent proportional relationships between quantities. **7.RP.A.3** Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.* **Draw, construct, and describe geometrical figures and describe the relationships between them.** **7.G.A.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. **7.G.A.2** Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

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Suggested Big Idea	Mod 4: Linear Equations			
Content Emphasis Cluster	Understand the connections between proportional relationships, lines, and linear equations Analyze and solve linear equations and pairs of simultaneous linear equations.			
Mathematical Practices	**CCSS.MATH.CONTENT.8.EE.B.5** MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics. MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.	**CCSS.MATH.CONTENT.8.EE.C.7** MP.2. Reason abstractly and quantitatively. MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure	**CCSS.MATH.CONTENT.8.EE.C.8** MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics. MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.	
Common Assessment	Gr8 Eureka Module 4a Common Assessment 2016-17 Gr8 Eureka Module 4c Common Assessment 2016-17 Gr8 Eureka Module 4d Common Assessment 2016-17			
Graduate Competency	Prepared graduates understand that equivalence is a foundation of mathematics represented in numbers, shapes, measures, expressions, and equations Prepared graduates are fluent with basic numerical and symbolic facts and algorithms, and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency			
CCSS Priority Standards	**Cross-Content Connections**	**Writing Focus**	**Language/Vocabulary**	**Misconceptions**
CCSS.MATH.CONTENT.8.EE.B.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. **CCSS.MATH.CONTENT.8.EE.C.7** Solve linear equations in one variable. **CCSS.MATH.CONTENT.8.EE.C.7.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	Literacy Connections RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. RST.6-8.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.	Writing Connection WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. p.Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as	Academic Vocabulary- Variable, solution, inverse, substitution, elimination, graphing Technical Vocabulary- Slope, System of Linear Equations, Solution to a system of linear equations L.6-8.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather	Students think that only the letters x and y can be used for variables. Students think that you always need a variable = a constant as a solution. The variable is always on the left side of the equation. Equations are not always in the slope intercept form, y=mx+b Students confuse one-variable and two-variable equations.

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). **CCSS.MATH.CONTENT.8.EE.C.7.B** Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. **CCSS.MATH.CONTENT.8.EE.C.8** Analyze and solve pairs of simultaneous linear equations. **CCSS.MATH.CONTENT.8.EE.C.8.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. **CCSS.MATH.CONTENT.8.EE.C.8.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. **CCSS.MATH.CONTENT.8.EE.C.8.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.	RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. q. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. r. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. s. Use precise language and domain-specific vocabulary to inform about or explain the topic. t. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	vocabulary knowledge when considering a word or phrase important to comprehension or expression. L.6-8.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases choosing flexibly from a range of strategies.	

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Unit 5: Module 4	***Linear Equations*** *a) Topic A: Writing and Solving Linear Equations (**8.EE.C.7)*** *b) Topic B: Linear Equations in Two Variables and Their Graphs (**8.EE.B.5**)* *c) Topic C: Slope and Equations of Lines (**8.EE.B.5**, 8.EE.B.6)* d) *Topic D: Systems of Linear Equations and Their Solutions (**8.EE.B.5, 8.EE.C.8)***	**Length of Unit**	**65 days** 11/30 – 3/18

Content Standards (Priority Standards)

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

8.EE.B.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.***

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

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

8.EE.C.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.**

8.EE.C.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.***

**** Prior grade level expectations are noted at the end of each curriculum unit.**

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Inquiry Questions	• See Knowledge Packet for specific questions. • What does it mean for an equation to be linear? • What types of real world scenarios can be represented with a one-variable equation or a system of equations?

Key Knowledge and Skills (Procedural Skill and Application)

My students will be able to (Do)…

- Solve linear equations in one variable with one solution, no solutions and an infinite number of solutions.
- Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- Use graphs to solve systems of two linear equations.
- Solve systems of two linear equations algebraically.
- Use algebra or graphs to determine if systems of two linear equations have one solution, no solution or an infinite number of solutions.
- Graph proportional relationships, interpreting unit rate as the slope of the graph.

Resources

Technology	Main Resource: EngageNY Extra Resources www.phet.colorado.edu Stacking Cups to Create Equations http://blog.mrmeyer.com/2008/linear-fun-2-stacking-cups/ Extra Practice: http://www.kutasoftware.com/FreeWorksheets/PreAlgWorksheets/The%20Distributive%20Property.pdf http://www.warrencountyschools.org/userfiles/2600/Combining%20Like%20Terms%20&%20Distributive%20Property.pdf http://jasonstark.com/wordpress/wp-content/uploads/2011/08/10FourColumn.pdf http://www.kenton.k12.ky.us/userfiles/979/Classes/11562/Pizzazz%20Algebra.pdf http://illuminations.nctm.org/Lesson.aspx?id=2881 http://map.mathshell.org/lessons.php?unit=8245&collection=8 http://map.mathshell.org/download.php?fileid=1635 http://cdn.kutasoftware.com/Worksheets/Alg1/Graphing%20Lines%20SI.pdf http://cdn.kutasoftware.com/Worksheets/Alg1/Slope%20From%20a%20Graph.pdf https://www.illustrativemathematics.org/content-standards/8/EE/B/6/tasks/1537 http://www.pbslearningmedia.org/resource/149f8e1c-b3f8-4737-80b8-0bdaa4054821/expressions-and-equations-grade-8-8eeb6/ http://map.mathshell.org/lessons.php?unit=8215&collection=8&redir=1 https://www.illustrativemathematics.org/content-standards/8/EE/C/8/tasks/1364 http://cdn.kutasoftware.com/Worksheets/Alg1/Systems%20of%20Equations%20Graphing.pdf http://cdn.kutasoftware.com/Worksheets/Alg1/Systems%20of%20Equations%20Substitution.pdf http://cdn.kutasoftware.com/Worksheets/Alg1/Systems%20of%20Equations%20Elimination.pdf Videos: https://www.youtube.com/watch?v=ze1eXucHFjc

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	https://www.youtube.com/watch?v=H8z-0UgmoO4
Materials	Graph paper, rulers, calculators
Performance/Learning Tasks *(Assessments)*	**End of Unit Common Assessment on Schoolcity for Module 4: 4A and 4B** **(Packet 8 and 9 Priority Standards)** • Scanned into School City or students take the assessment online • Should be in addition to individually developed formative assessments **Knowledge Packet 8 Pre and Post Tests** **1st Pre Test:** 8preEEC7B_KP8 **1st Post Test:** 8postEEC7B_KP8 **2nd Pre Test:** 8preEEC7A_KP8 **2nd Post Test:** 8postEEC7A_KP8 **Knowledge Packet 9 Pre and Post Tests** **Pre Test:** 8preEEB5_KP9 **Post Test:** 8postEEB5_KP9 **Knowledge Packet 10 has a formative assessment listed under "formative assessment options"** **Knowledge Packet 11 Pre and Post Tests** **Pre Test:** 8preEEC8_KP11 **Post Test:** 8postEEC8_KP11 **School City Assessment for Packet 11 Priority Standards**

Instructional Notes	***Please see the Knowledge Packets for specific lesson information. **Topic A: Writing and Solving Linear Equations (8.EE.C.7)** Lesson 1: Writing Equations Using Symbols Lesson 2: Linear and Non-Linear Expressions in x Lesson 3: Linear Equations in x Lesson 4: Solving a Linear Equation Lesson 5: Writing and Solving Linear Equations **COMBINE-**Lesson 6: Solutions of a Linear Equation -Lesson 7: Classification of Solutions **OMIT-**Lesson 8: Linear Equations in Disguise **OMIT-**Lesson 9: An Application of Linear Equations **Topic B: Linear Equations in Two Variables and Their Graphs (8.EE.B.5)** Lesson 10: A Critical Look at Proportional Relationships Lesson 11: Constant Rate **COMBINE-**Lesson 12: Linear Equations in Two Variables

	-Lesson 13: The Graph of a Linear Equation in Two Variables Lesson 14: The Graph of a Linear Equation—Horizontal and Vertical Lines **Topic C: Slope and Equations of Lines (8.EE.B.5, 8.EE.B.6)** **COMBINE-**Lesson 15: The Slope of a Non-Vertical Line -Lesson 16: The Computation of the Slope of a Non-Vertical Line Lesson 17: The Line Joining Two Distinct Points of the Graph $y = mx + b$ has Slope m Lesson 18: There is Only One Line Passing Through a Given Point with a Given Slope **OMIT-**Lesson 19: The Graph of a Linear Equation in Two Variables is a Line Lesson 20: Every Line is a Graph of a Linear Equation Lesson 21: Some Facts about Graphs of a Linear Equation in Two Variables Lesson 22: Constant Rates Revisited **OMIT-**Lesson 23: The Defining Equation of a Line **Topic D: Systems of Linear Equations and Their Solutions (8.EE.B.5, 8.EE.C.8)** Lesson 24: Introduction to Simultaneous Equations Lesson 25: Geometric Interpretation of the Solutions of a Linear System Lesson 26: Characterization of Parallel Lines Lesson 27: Nature of Solutions of a System of Linear Equations Lesson 28: Another Computational Method of Solving a Linear System Lesson 29: Word Problems **OMIT-**Lesson 30: Conversion Between Celsius and Fahrenheit Shell Lesson - Classifying solutions
Foundational Standards	**Understand ratio concepts and use ratio reasoning to solve problems.** **6.RP.A.2** Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*[1] **6.RP.A.3** **Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.** a. **Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.** b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

[1] Expectations for unit rates in this grade are limited to non-complex fractions.

Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.

a. Write expressions that record operations with numbers and letters standing for numbers. *For example, express the calculation "Subtract y from 5" as* $5 - y$.

b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression* $2(8 + 7)$ *as a product of two factors; view* $(8 + 7)$ *as both a single entity and a sum of two terms.*

c. Evaluate expression at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with side length* $s = \frac{1}{2}$.

Analyze proportional relationships and use them to solve real-world and mathematical problems.

7.RP.A.2 Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as* $t = pn$.

d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.

Use properties of operations to generate equivalent expressions.

7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients.

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is* 54 *cm. Its length is* 6 *cm. What is its width?*

Greeley-Evans School District 6- 8th Grade: 2016-2017

Suggested Big Idea	Mod 5: Examples of Functions from Geometry			
Content Emphasis Cluster	Define, evaluate, and compare functions			
Mathematical Practices	MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics. MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.			
Common Assessment	No Common – Not a priority			
Graduate Competency	Prepared graduates use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions			
CCSS Priority Standards	**Cross-Content Connections**	**Writing Focus**	**Language/Vocabulary**	**Misconceptions**
CCSS.MATH.CONTENT.8.F.A.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.	Literacy Connections RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. RST.6-8.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information	Writing Connection WHST.6-8.2 Write u. informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. u. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. v. Develop the topic with relevant, well-chosen	Academic Vocabulary- Measurement, cube, space, apply Technical Vocabulary- Function, volume, sphere, cone, cylinder, pyramid L.6-8.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. L.6-8.4 Determine or clarify the meaning of unknown and	Some students will mistakenly think of a straight line as horizontal or vertical only. Some students will mix up x- and y-axes on the coordinate plane, or mix up the ordered pairs. When emphasizing that the first value is plotted on the horizontal axes (usually x, with positive to the right) and the second is the vertical axis (usually called y, with positive up), point out that this is merely a convention: It could have been otherwise, but it is very useful for people to agree on a standard customary practice.

	expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	facts, definitions, concrete details, quotations, or other information and examples. w. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. x. Use precise language and domain-specific vocabulary to inform about or explain the topic. y. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	multiple-meaning words and phrases choosing flexibly from a range of strategies.	

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Unit 6: Module 5	***Examples of Functions from Geometry*** • *Topic A: Functions (8.F.A.1, **8.F.A.2,** 8.F.A.3)* • *Topic B: Volume (8.G.C.9)*	**Length of Unit**	**15 days** 3/21 – 4/15 **5 days** 5/16 – 5/20

Content Standards (Priority Standards)	**Define, evaluate, and compare functions.** **8.F.A.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.[2] **8.F.A.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.*** **8.F.A.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.* **Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.** **8.G.C.9** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Inquiry Questions	• See Knowledge Packet for specific questions. • How can a container's shape affect its maximum volume? • How does the volume of a cylinder compare to the volume of a sphere of the same size? • How does the concept of functionality apply to the real world?

Key Knowledge and Skills (Procedural Skill and Application)

My students will be able to (Do)…

- Interpret rates of change and initial values of linear functions in terms of situations they model and in terms of their graphs or tables of values.
- Distinguish linear and non-linear functions from context, tables, graphs and equations.
- Make connections among context, tables, graphs and equations for linear functions.
- Know and apply formulas for volumes of cones, cylinders and spheres and use them to solve real-world and mathematical problems.

[2] Function notation is not required in Grade 8.

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Resources	
Technology	Main Resource EngageNY website Extra Resources www.phet.colorado.edu Practice Options: http://map.mathshell.org/download.php?fileid=1674 http://camsp.net/documents/MixMatchLinear.pdf https://www.illustrativemathematics.org/content-standards/8/F/A/3/tasks/813 http://www.glencoe.com/sec/math/msmath/mac04/course2/add_lesson/rate_of_change_mac2.pdf https://www.illustrativemathematics.org/content-standards/8/G/C/9/tasks/520 https://www.illustrativemathematics.org/content-standards/8/G/C/9/tasks/517 http://map.mathshell.org/download.php?fileid=1691 http://www.101qs.com/1527 http://www.estimation180.com/day-201.html Videos: http://www.youtube.com/watch?v=aLyQddyY8ik.
Materials	Graph paper, calculators
Performance/Learning Tasks *(Assessments)*	**End of Unit Common Assessment on Schoolcity: (combining Packet 12 and 13 Priority Standards (Includes part of Module 5 and 6)** • Scanned into School City or students take the assessment online • Should be in addition to individually developed formative assessments **Knowledge Packet 12 Pre and Post Tests:** **Pre Test:** 8pre_FA2KP12 **Post Test:** 8post_FA2KP12 **Knowledge Packet 16 Formative Assessment listed under "Formative Assessment Options"**
Instructional Notes	***Please see the Knowledge Packets for specific lesson information. **Topic A: Functions (8.F.A.1, 8.F.A.2, 8.F.A.3)** **COMBINE-**Lesson 1: The Concept of a Function -Lesson 2: Formal Definition of a Function **OMIT-**Lesson 3: Linear Functions and Proportionality Lesson 4: More Examples of Functions **OMIT-**Lesson 5: Graphs of Functions and Equations Lesson 6: Graphs of Linear Functions and Rate of Change **OMIT-**Lesson 7: Comparing Linear Functions and Graphs **OMIT-**Lesson 8: Graphs of Simple Non-Linear Functions **Topic B: Volume (8.G.C.9)** Lesson 9: Examples of Functions from Geometry Lesson 10: Volumes of Familiar Solids—Cones and Cylinders

	Lesson 11: Volume of a Sphere
	Geometric measurement: Understand concepts of volume and relate volume to multiplication and to addition. **5.MD.C.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. **5.MD.C.5** Relate volume to the operations of multiplication and addition, and solve real-world and mathematical problems involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems. c. Recognize volume as additive. Find volume of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to real world problems. **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.** **7.G.B.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. **7.G.B.6** Solve real-world and mathematical problems involving area, volume, and surface area of two-and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. **Understand the connections between proportional relationships, lines, and linear equations.** **8.EE.B.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.* **8.EE.B.6** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b. **Analyze and solve linear equations and pairs of simultaneous linear equations.** **8.EE.C.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. **8.EE.C.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.*

Greeley-Evans School District 6- 8th Grade: 2016-2017

Suggested Big Idea	Mod 6: Linear Functions			
Content Emphasis Cluster	Use functions to model relationships between quantities. Investigate patterns of association in bivariate data.			
Mathematical Practices	CCSS.MATH.CONTENT.8.F.B.4 MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics. MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.			CCSS.MATH.CONTENT.8.SP.A.3 MP.2. Reason abstractly and quantitatively. MP.4. Model with mathematics. MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure.
Common Assessment	Gr8 Eureka Module 6a Common Assessment 2016-17 Gr8 Eureka Module 6c Common Assessment 2016-17			
Graduate Competency	Prepared graduates use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions Prepared graduates solve problems and make decisions that depend on understanding, explaining, and quantifying the variability in data			
CCSS Priority Standards	**Cross-Content Connections**	**Writing Focus**	**Language/Vocabulary**	**Misconceptions**
CCSS.MATH.CONTENT.8.F.B.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. CCSS.MATH.CONTENT.8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	Literacy Connections RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. RST.6-8.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. RST.6-8.7 Integrate quantitative or technical information expressed in words in a	Writing Connection WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. z. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.	Academic Vocabulary- Correlation, linear, graph, slope, intercept Technical Vocabulary- Association, Two-way table, Row relative frequency, Column relative frequency, Bivariate Data, Two-way table L.6-8.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or	Students often confuse a recursive rule with an explicit formula for a function. For example, after identifying that a linear function shows an increase of 2 in the values of the output for every change of 1 in the input, some students will represent the equation as $y = x + 2$ instead of realizing that this means $y = 2x + b$. When tables are constructed with increasing consecutive integers for input values, then the distinction between the recursive and explicit formulas is about whether you are reasoning vertically or horizontally in the table. Both types of reasoning—and both types of formulas—are important for developing proficiency with functions. When input values are not increasing consecutive integers (e.g., when the input values are decreasing, when some integers are skipped, or when some input values are not integers), some students have more difficulty identifying the pattern and calculating the slope. It is important that all students have

	text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	aa. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. bb. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. cc. Use precise language and domain-specific vocabulary to inform about or explain the topic. dd. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	expression. L.6-8.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases choosing flexibly from a range of strategies.	experience with such tables, so as to be sure that they do not overgeneralize from the easier examples. Some students may not pay attention to the scale on a graph, assuming that the scale units are always ―one.‖ When making axes for a graph, some students may not using equal intervals to create the scale. Some students may infer a cause and effect between independent and dependent variables, but this is often not the case. Some students graph incorrectly because they don‘t understand that x usually represents the independent variable and y represents the dependent variable. Emphasize that this is a convention that makes it easier to communicate

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Unit 7: Module 6	***Linear Functions*** *a) Topic A: Linear Functions (**8.F.B.4**, 8.F.B.5)* *b) Topic B: Bivariate Numerical Data (8.SP.A.1, 8.SP.A.2)* *c) Topic C: Linear and Nonlinear Models (8.SP.A.1, 8.SP.A.2, **8.SP.A.3**)* *d) Topic D: Bivariate Categorical Data (8.SP.A.4)*	**Length of Unit**	**20 days** 4/18 – 5/13

Content Standards (Priority Standards)

Use functions to model relationships between quantities.

8.F.B.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.**

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

Investigate patterns of association in bivariate data.

8.SP.A.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.

8.SP.A.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.

8.SP.A.3 **Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr. as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.***

8.SP.A.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 the 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?*

Inquiry Questions

- See Knowledge Packet for specific questions.
- How does the way you organize data help you draw conclusions about the context of the data?
- What types of real world scenarios can be modeled by linear functions? What types cannot?
- What does the correlation between two variables reveal about their relationship to one another?

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Key Knowledge and Skills (Procedural Skill and Application)
My students will be able to (Do)…
• Graph proportional relationships, interpreting unit rate as the slope of the graph. • Compare two different proportional relationships represented in different ways. • Write equations in the form y=mx for lines through the origin and equations in the form y=mx+b for lines intercepting the vertical axis at v to model linear situations. • Distinguish linear and non-linear functions form context, tables, graphs and equations. • Use lines of fit to model linear relationships to solve problems and to make predictions. • Construct and analyze two-way tables for bivariate categorical data, including tables using relative frequencies.

Resources	
Technology	Main Resource: EngageNY website Extra Resources www.phet.colorado.edu Algebra vs. Cockroaches (Practice Graphing Lines) http://hotmath.com/hotmath_help/games/kp/kp_hotmath_sound.swf Practice options: https://www.illustrativemathematics.org/content-standards/8/F/B/4/tasks/1206
Materials	Graph paper, calculators, rulers
Performance/Learning Tasks *(Assessments)*	**End of Unit Common Assessment on Schoolcity: (combining Packet 12 and 13 Priority Standards (Includes part of Module 5 and 6 AND Knowledge Packet 14 Priority Standards)** • Scanned into School City or students take the assessment online • Should be in addition to individually developed formative assessments **Knowledge Packet 13 Pre and Post Tests:** **Pre Test:** 8pre_FB4KP13 **Post Test:** 8post_FB4KP13 **Knowledge Packet 14 Pre and Post Tests:** **Pre Test:** 8pre_SPA3KP14 **Post Test:** 8post_SPA3KP14 **Knowledge Packet 15 has formal assessment options under "Formal Assessment Options"**
Instructional Notes	***Please see the Knowledge Packets for specific lesson information. **Topic A: Linear Functions (8.F.B.4, 8.F.B.5)**

	Lesson 1: Modeling Linear Relationships Lesson 2: Interpreting Rate of Change and Initial Value Lesson 3: Representations of a Line Lessons 4: Increasing and Decreasing Functions **OMIT-**Lesson 5: Increasing and Decreasing Functions **Topic B: Bivariate Numerical Data (8.SP.A.1, 8.SP.A.2)** **COMBINE-**Lesson 6: Scatter Plots -Lesson 7: Patterns in Scatter Plots Lesson 8: Informally Fitting a Line Lesson 9: Determining the Equation of a Line Fit to Data **Topic C: Linear and Nonlinear Models (8.SP.A.1, 8.SP.A.2, 8.SP.A.3)** **COMBINE-**Lesson 10: Linear Models -Lesson 11: Using Linear Models in a Data Context Lesson 12: Nonlinear Models in a Data Context (Optional) **Topic D: Bivariate Categorical Data (8.SP.A.4)** Lesson 13: Summarizing Bivariate Categorical Data in a Two-Way Table Lesson 14: Association Between Categorical Variables
Foundational Standards	**Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. **Define, evaluate, and compare functions.** **8.F.B.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.[3] **8.F.B.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.* **8.F.B.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.*

[3] Function notation is not required in Grade 8.

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Suggested Big Idea	Mod 7: Introduction to Irrational Numbers Using Geometry			
Content Emphasis Cluster	Know that there are numbers that are not rational, and approximate them by rational numbers. Understand and apply the Pythagorean Theorem.			
Mathematical Practices	CCSS.MATH.CONTENT.8.NS.A.1 MP.2. Reason abstractly and quantitatively. MP.6. Attend to precision. MP.7. Look for and make use of structure.	CCSS.MATH.CONTENT.8.NS.A.2 MP.2. Reason abstractly and quantitatively. MP.4. Model with mathematics. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.		
Common Assessment	Gr8 Eureka Module 7c Common Assessment 2016-17			
Graduate Competency	Prepared graduates understand the structure and properties of our number system. At their most basic level numbers are abstract symbols that represent real-world quantities Prepared graduates use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions			
CCSS Priority Standards	**Cross-Content Connections**	**Writing Focus**	**Language/Vocabulary**	**Misconceptions**
CCSS.MATH.CONTENT.8.NS.A.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. CCSS.MATH.CONTENT.8.NS.A.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., π2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. CCSS.MATH.CONTENT.8.G.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	Literacy Connections RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. RST.6-8.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	Writing Connection WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ee. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ff. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or	Academic Vocabulary- Expansion, convert, form Technical Vocabulary- Expansion, convert, form L.6-8.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. L.6-8.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases choosing flexibly from a range of	Some students are surprised that the decimal representation of pi does not repeat. Some students believe that if only we keep looking at digits farther and farther to the right, eventually a pattern will emerge. A few irrational numbers are given special names (pi and e), and much attention is given to sqrt(2). Because we name so few irrational numbers, students sometimes conclude that irrational numbers are unusual and rare. In fact, irrational numbers are much more plentiful than rational numbers, in the sense that they are ―denser‖ in the real line.

	RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	other information and examples. gg. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. hh. Use precise language and domain-specific vocabulary to inform about or explain the topic. ii. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	strategies.	

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Unit 4: Module 7	***Introduction to Irrational Numbers Using Geometry*** *a) Topic A: Square and Cube Roots (**8.NS.A.1, 8.NS.A.2, 8.EE.A.2**)* *b) Topic B: Decimal Expansions of Numbers (**8.NS.A.1, 8.NS.A.2,** 8.EE.A.2)* *c) Topic C: The Pythagorean Theorem (8.G.B.6, **8.G.B.7,** 8.G.B.8)* *d) Topic D: Applications of Radicals and Roots (**8.G.B.7**, 8.G.C.9)*	**Length of Unit**	12 days 11/9 – 11/24

Content Standards (Priority Standards)

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

8.NS.A.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.**

8.NS.A.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 $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get a better approximation.***

Work with radicals and integer exponents.

8.EE.A.2 Use square root and cube root symbols to represent solutions to the 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. Understand and apply the Pythagorean Theorem.

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

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

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

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

8.G.C.9 Know the volumes of cones, cylinders, and spheres and use them to solve real world and mathematical problems.

Inquiry Questions

- See Knowledge Packet for specific questions.
- How does the number of irrational numbers compare to the number of rational numbers?
- Where do square roots happen in real life?
- How is a long decimal the same as a fraction?

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Key Knowledge and Skills (Procedural Skill and Application)
My students will be able to (Do)…
• Identify rational and irrational numbers. • Write rational numbers as decimals. • Locate rational and irrational numbers (including square roots) approximately on number line diagrams • Use square root and cube root symbols to represent solutions to equations. • Evaluate square roots of small perfect squares and cube roots of small perfect cubes. • Convert between decimals and fractions.

Resources	
Technology	Main Resource: EngageNY website Extra Resources www.phet.colorado.edu Practice Options: http://map.mathshell.org/download.php?fileid=1694 http://mathslinks.net/faculty/identifying-the-sides-worksheet http://cdn.kutasoftware.com/Worksheets/Geo/8-The%20Pythagorean%20Theorem%20and%20Its%20Converse.pdf http://cdn.kutasoftware.com/Worksheets/Geo/8-Multi-Step%20Pythagorean%20Theorem%20Problems.pdf http://www.wccusd.net/cms/lib03/CA01001466/Centricity/domain/60/lessons/grade%207%20lessons/PythagoreanTheoremActivitiesV2.pdf http://www.pbs.org/wgbh/nova/proof/puzzle/ladder.html http://www.glencoe.com/sites/common_assets/support_pages/MC_Course2/Pythagorean_Theorem.pdf Videos: https://www.youtube.com/watch?v=u5hVS9UEDbI
Materials	Calculators, graph paper
Performance/Learning Tasks *(Assessments)*	**End of Unit Common Assessment on Schoolcity: (combining packet 6 and 7 priority standards)** • Scanned into School City or students take the assessment online • Should be in addition to individually developed formative assessments **Knowledge Packet 6 Pre and Post Test:** **Pre Test:** 8preNSA1.2_KP6 **Post Test:** 8postNSA1.2_KP6 **Knowledge Packet 7 Pre and Post Test:** **Pre Test:** 8preGB7_KP7 **Post Test:** 8postGB7_KP7
Instructional Notes	***Please see the Knowledge Packets for specific lesson information.

	***********A lot of lessons have been omitted due to the fact that they are above 8th grade standards******************* **Topic A: Square and Cube Roots (8.NS.A.1, 8.NS.A.2, 8.EE.A.2)** **Lessons 1 and 2 were already taught in Module 3. Start with Lesson 3** Lesson 3: Existence and Uniqueness of Square and Cube Roots **OMIT-**Lesson 4: Simplifying Square Roots (optional) **Topic B: Decimal Expansions of Numbers (8.NS.A.1, 8.NS.A.2, 8.EE.A.2)** **OMIT-**Lesson 6: Finite and Infinite Decimals **OMIT-**Lesson 7: Infinite Decimals **OMIT-**Lesson 8: The Long Division Algorithm **OMIT-**Lesson 9: Decimal Expansions of Fractions, Part 1 **OMIT-**Lesson 10: Converting Repeating Decimals to Fractions Lesson 11: The Decimal Expansion of Some Irrational Numbers **OMIT-**Lesson 12: Decimal Expansions of Fractions, Part 2 Lesson 13: Comparing Irrational Numbers **OMIT-**Lesson 14: Decimal Expansion of π Lesson 15: Pythagorean Theorem, Revisited **Topic C: The Pythagorean Theorem (8.G.B.6, 8.G.B.7, 8.G.B.8)** Lesson 16: Converse of the Pythagorean Theorem Lesson 17: Distance on the Coordinate Plane **OMIT-**Lesson 18: Applications of the Pythagorean Theorem **Topic D: Applications of Radicals and Roots (8.G.B.7, 8.G.C.9**) **OMIT-**Lesson 19: Cones and Spheres **OMIT-**Lesson 20: Truncated Cones **OMIT-**Lesson 21: Volume of Composite Solids **OMIT-**Lesson 22: Average Rate of Change **OMIT-**Lesson 23: Nonlinear Motion
Foundational Standards	**Compute fluently with multi-digit numbers and find common factors and multiples.** **6.NS.B.2** Fluently divide multi-digit numbers using the standard algorithm. **Apply and extend previous understandings of numbers to the system of rational numbers.** **6.NS.C.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite

of the opposite of a number is the number itself, e.g., $-(-3) = 3$ and that 0 is its own opposite.

b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

c. Find and position integers and other rational numbers on a horizontal and vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.A.2 Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-\frac{p}{q} = \frac{-p}{q} = \frac{p}{-q}$. Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational numbers terminates in 0s or eventually repeats.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.G.A.2 Draw (freehand, with rule and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.G.B.6 Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.