**Geometry Standard**

**Instructional Plan 2014-2015**

**Mathematics Instructional Plan Writing Committee**

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We would like to express our appreciation for the time, effort and expertise contributed to the writing of the secondary Mathematics Instructional Plans by our team of Seminole County math teachers.

**Purpose:**

The purpose of the Seminole County Public Schools Instructional Plan is to present an organized, responsible strategy of Benchmark presentation that incorporates Math Florida Standards (MAFS). This document will serve as a guide for teachers of mathematics. Latitude in the execution of this document shall be determined by a school rather than by an individual teacher.

**Goals:**

* To establish a classroom environment that values mathematical student discourse
* To engage students in cognitively challenging mathematical tasks
* To promote discussions that focus on student thinking, reasoning, problem solving and student presentation
* To build on student thinking while ensuring the discussion remains focused on the mathematical ideas of the lesson
* Employ questioning techniques that require students to justify, defend and support their ideas

**Instructional Plan Caveats:**

* Suggested practice corresponds to the associated lesson and left at the discretion of the instructor to be used as additional practice or assignment. Problems within the suggested pages may be exhausted or selected for targeted skills.
* Descriptions of the Mathematical Practices can be found on pages 3 – 4. Teachers are encouraged to embed the Questions to Develop Mathematical Thinking on pages 5 – 6 in their daily lessons.
* Learning goals and scales can be accessed through the hyperlinks within the Instructional Plan.
* Each learning scale will include links for formative assessment tasks that teachers are encouraged to use while students are progressing through the learning scale.
* Extended time has been allocated for authentic assessment tasks. Recommendations are made within the instructional plan to include summative assessments and review, authentic assessments, as well as culminating tasks (Amplify projects). District training will be provided on successful implementation of the Amplify projects throughout the year.
* Teachers are encouraged to use appropriate questioning strategies to fully address the instructional standards and expectations, by paying attention to the recommended caveats included throughout the IP to include discussion that may not be included as part of the textbook.
* Please look ahead and plan accordingly for time and copy needs that may arise throughout this year so that all MAFS standards are thoroughly addressed.
* Due to the fact that we do not have Test Item Specifications at this time the targeted Mathematical Practices for each unit are a projection.
* Common Assessments need to be readdressed by PLCs to fit the new units and fully address the standards.
* ***The Common Core Supplements (CC1-CC19) are numbered based off of the supplements from the HONORS numbering. They contain the same material.***
* **Each unit will include at least one learning goal listed under the unit heading. The learning goals and scales correspond to the grade/level specific clusters as defined by the MAFS.**
* **The learning goals and scales are a work in progress and may be modified as needed. They are meant to be a starting point for PLCs to use as they customize the learning goals and scales to best demonstrate student learning.**

 **Test Item Specifications**: [www.fsassessments.org](http://www.fsassessments.org)

**STANDARDS FOR MATHEMATICAL PRACTICE**

**1. (MAFS.K12.MP.1.1) Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**2. (MAFS.K12.MP.2.1) Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**3. (MAFS.K12.MP.3.1) Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**4. (MAFS.K12.MP.4.1) Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**5. (MAFS.K12.MP.5.1) Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**6. (MAFS.K12.MP.6.1) Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, student’s give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**7. (MAFS.K12.MP.7.1) Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well-remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression *x*2 + 9*x* + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(*x* – *y*) 2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers *x* and *y*.

**8. (MAFS.K12.MP.8.1) Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (*y* – 2)/(*x* – 1) = 3. Noticing the regularity in the way terms cancel when expanding (*x* – 1)(*x* + 1), (*x* – 1)(*x*2 + *x* + 1), and (*x* – 1)(*x*3 + *x*2 + *x* + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

| **Summary of Standards for Mathematical Practice** | **Questions to Develop Mathematical Thinking** |
| --- | --- |
| **1. Make sense of problems and persevere in solving them.** |
| * Interpret and make meaning of the problem to find a starting point. Analyze what is given in order to explain to them the meaning of the problem.
* Plan a solution pathway instead of jumping to a solution.
* Monitor their progress and change the approach if necessary.
* See relationships between various representations.
* Relate current situations to concepts or skills previously learned and connect mathematical ideas to one another.
* Continually ask them, “Does this make sense?” Can understand various approaches to solutions.
 | * How would you describe the problem in your own words?
* How would you describe what you are trying to find?
* What do you notice about...?
* What information is given in the problem?
* Describe the relationship between the quantities.
* Describe what you have already tried. What might you change?
* Talk me through the steps you’ve used to this point.
* What steps in the process are you most confident about?
* What are some other strategies you might try?
* What are some other problems that are similar to this one?
* How might you use one of your previous problems to help you begin?
* How else might you organize...represent... show...?
 |
| **2. Reason abstractly and quantitatively.** |
| * Make sense of quantities and their relationships.
* Decontextualize (represent a situation symbolically and manipulate the symbols) and contextualize (make meaning of the symbols in a problem) quantitative relationships.
* Understand the meaning of quantities and are flexible in the use of operations and their properties.
* Create a logical representation of the problem.
* Attends to the meaning of quantities, not just how to compute them.
 | * What do the numbers used in the problem represent?
* What is the relationship of the quantities?
* How is \_\_\_\_\_\_\_ related to \_\_\_\_\_\_\_\_?
* What is the relationship between \_\_\_\_\_\_and \_\_\_\_\_\_?
* What does\_\_\_\_\_\_\_mean to you? (e.g. symbol, quantity, diagram)
* What properties might we use to find a solution?
* How did you decide in this task that you needed to use...?
* Could we have used another operation or property to solve this task? Why or why not?
 |
| **3. Construct viable arguments and critique the reasoning of others.** |
| * Analyze problems and use stated mathematical assumptions, definitions, and established results in constructing arguments.
* Justify conclusions with mathematical ideas.
* Listen to the arguments of others and ask useful questions to determine if an argument makes sense.
* Ask clarifying questions or suggest ideas to improve/revise the argument.
* Compare two arguments and determine correct or flawed logic.
 | * What mathematical evidence would support your solution?
* How can we be sure that...? / How could you prove that...?
* Will it still work if...?
* What were you considering when...?
* How did you decide to try that strategy?
* How did you test whether your approach worked?
* How did you decide what the problem was asking you to find? (What was unknown?)
* Did you try a method that did not work? Why didn’t it work? Would it ever work? Why or why not?
* What is the same and what is different about...?
* How could you demonstrate a counter-example?
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| **4. Model with mathematics.** |
| * Understand this is a way to reason quantitatively and abstractly (able to decontextualize and contextualize).
* Apply the mathematics they know to solve everyday problems.
* Are able to simplify a complex problem and identify important quantities to look at relationships.
* Represent mathematics to describe a situation either with an equation or a diagram and interpret the results of a mathematical situation.
* Reflect on whether the results make sense, possibly improving/revising the model.
* Ask them, “How can I represent this mathematically?”
 | * What number model could you construct to represent the problem?
* What are some ways to represent the quantities?
* What is an equation or expression that matches the diagram, number line..., chart..., table..?
* Where did you see one of the quantities in the task in your equation or expression?
* How would it help to create a diagram, graph, and table...?
* What are some ways to visually represent...?
* What formula might apply in this situation?
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| **5. Use appropriate tools strategically.** |
| * Use available tools recognizing the strengths and limitations of each Unit
* Use estimation and other mathematical knowledge to detect possible errors.
* Identify relevant external mathematical resources to pose and solve problems.
* Use technological tools to deepen their understanding of mathematics.
 | * What mathematical tools could we use to visualize and represent the situation?
* What information do you have?
* What do you know that is not stated in the problem?
* What approach are you considering trying first?
* What estimate did you make for the solution?
* In this situation would it be helpful to use...a graph..., number line..., ruler..., diagram..., calculator..., manipulative?
* Why was it helpful to use...?
* What can using a \_\_\_\_\_\_ show us that \_\_\_\_\_may not?
* In what situations might it be more informative or helpful to use...?
 |
| **6. Attend to precision.** |
| * Communicate precisely with others and try to use clear mathematical language when discussing their reasoning.
* Understand the meanings of symbols used in mathematics and can label quantities appropriately.
* Express numerical answers with a degree of precision appropriate for the problem context.
* Calculate efficiently and accurately.
 | * What mathematical terms apply in this situation?
* How did you know your solution was reasonable?
* Explain how you might show that your solution answers the problem.
* What would be a more efficient strategy?
* How are you showing the meaning of the quantities?
* What symbols or mathematical notations are important in this problem?
* What mathematical language...,definitions..., properties can you use to explain...?
* How could you test your solution to see if it answers the problem?
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| **7. Look for and make use of structure.** |
| * Apply general mathematical rules to specific situations.
* Look for the overall structure and patterns in mathematics.
* See complicated things as single objects or as being composed of several objects.
 | * What observations do you make about...?
* What do you notice when...?
* What parts of the problem might you eliminate.., simplify..?
* What patterns do you find in...?
* How do you know if something is a pattern?
* What ideas that we have learned before were useful in solving this problem?
* What are some other problems that are similar to this one?
* How does this relate to...?
* In what ways does this problem connect to other mathematical concepts?
 |
| **8. Look for and express regularity in repeated reasoning.** |
| * See repeated calculations and look for generalizations and shortcuts.
* See the overall process of the problem and still attend to the details.
* Understand the broader application of patterns and see the structure in similar situations.
* Continually evaluate the reasonableness of their intermediate results
 | * Explain how this strategy works in other situations?
* Is this always true, sometimes true or never true?
* How would we prove that...?
* What do you notice about...?
* What is happening in this situation?
* What would happen if...?
* Is there a mathematical rule for...?
* What predictions or generalizations can this pattern support?
* What mathematical consistencies do you notice?
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| **FIRST QUARTER (August 11 – October 9)**  | **42 DAYS** |
| **Topic/Assessment** | **Dates Covered** | **Approximate # Days** |
| Unit 1 –Tools of Geometry |  | 14 |
| Unit 2 – Reasoning and Proof |  | 10 |
| Unit 3 – Parallel and Perpendicular Lines |  | 15 |
| District Assessment (1 day), 9 Weeks Exams (2 days) |  | 3 |
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| **SECOND QUARTER (October 13 – December 18)**  | **46 DAYS** |
| **Topic/Assessment** | **Dates Covered** | **Approximate # Days** |
| Unit 4 – Congruence Transformations |  | 9 |
| Unit 5 – Congruent Triangles |  | 13 |
| Unit 6 – Relationships within Triangles |  | 10 |
| Unit 7 – Polygons and Quadrilaterals |  | 9 |
| PSAT (1 day); District Assessment (1 day); 9 Weeks Exams (3 days) |  | 5 |
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| **THIRD QUARTER (January 6 – March 12)** | **46 DAYS** |
| **Topic/Assessment** | **Dates Covered** | **Approximate # Days** |
| Unit 8 – Polygons in the Coordinate Plane |  | 9 |
| Unit 9 – Similarity  |  | 13 |
| Unit 10 – Right Triangles in Trigonometry |  | 12 |
| Unit 11 – Area  |  | 8 |
| District Assessment (1 day); FSA ELA/Writing (1 day), 9 Weeks Exams (2 days) |  | 4 |
|   |
| **FOURTH QUARTER (March 23 – May 27)**  | **46 DAYS** |
| **Topic/Assessment** | **Dates Covered** | **Approximate # Days** |
| Unit 12 – Circles  |  | 16 |
| Unit 13 – Volume  |  | 7 |
| Unit 14 – Algebra  |  | 13 |
| FSA Tests (7 days), 9 Weeks Exams (3 days) |  | 9 |

*\*Please note that the suggested number of instructional days per unit and quarter are designed to be a guide. Teachers are encouraged to work within their schools and their PLCs to make the most appropriate timing decisions for their students.\**

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| **Unit # 1: Tools of Geometry**  |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-CO.1.1 | Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. | 6 |
| G-CO.4.12 | Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Including: Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. | 5 |
| G-CO.4.13 | Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. | 5 |
| G-GMD.1.1 | Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri’s principle, and informal limit arguments. | 3 |
| G-GPE.2.6 | Find the point on a directed line segment between two given points that partitions the segment in a given ratio. | 6 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G04:** Students will be able to make geometric constructions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g04.docx) | * Using hands-on models to simulate basic geometry concepts (e.g. toothpicks and gumdrops to simulate angles where the toothpicks represent the rays and the gumdrops represent the vertex)
* Use physical demonstrations to help students visualize that any three noncollinear points in space are contained in exactly one plane.
* Instead of introducing congruence as the book does, define congruence in terms of rigid motions. Helpful activities that demonstrate this concept use patty paper or geometric software. Khan Academy has an excellent online tool that demonstrates this, https://www.khanacademy.org/math/geometry/congruent-triangles/transformations-congruence/e/exploring-rigid-transformations-and-congruence.
* When setting up or solving problems that use diagrams, make sure that students only take into account stated or given information about a diagram rather than how it looks to them (e.g. just because an angle looks like its bisected does not mean it is).
* Challenge students to perform the same construction using a straight edge and string. Use paper folding to produce a reflection; use bisections to produce reflections.
* Ask students to write “how-to” manuals, giving verbal instructions for a particular construction. Offer opportunities for hands-on practice using various construction tools and methods.
* Compare dynamic geometry commands to sequences of compass-and-straightedge steps.
* Some students may believe that a construction is the same as a sketch or drawing. Emphasize the need for precision and accuracy when doing constructions. Stress the idea that a compass and straightedge are identical to a protractor and ruler. Explain the difference between measurement and construction.
* Remind students that the distance formula derives from the Pythagorean Theorem. See p61, Preparing to Teach in the TE.
* Use linear interpolation to generalize the midpoint formula and find the point that partitions a line segment in any specified ratio.
* Use the distance formula to find the length of that altitude and base, and then compute the area of the figure.
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| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * This unit provides a strong foundation to students in every unit of Geometry by teaching the most basic concepts, i.e., points, lines, planes, and angles, and their constructions.
 | Traditional construction tools, straight edge, string, rulers, protractors, geometric construction software (if available), textbook, and other Pearson resources, Khan Academy online resource |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **FIRST QUARTER** |
| **Unit 1: Tools of Geometry** |
| **Learning Goal** | [**G04:** Students will be able to make geometric constructions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g04.docx) | **Suggested # of Days** | **14** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 0 |  | 1-1 Nets and Drawings for Visualizing Geometry (optional) |  |  |
| 7 | G-CO.1.1 | 1-2 Points, Lines, and Planes1-3 Measuring Segments1-4 Measuring Angles1-5 Exploring Angle Pairs1-7 Midpoint and Distance in the Coordinate | p18 #26, 29 p19 #35p24 #19 p25 #12 #13p34 #30, 31p42 #37p63 #19 – 24 |  |
| 1 | G-CO.4.13 | Concept Byte-Compass Design p48 |  |  |
| 2 | G-CO.4.12 | 1-6 Basic Constructions |  |  |
| 1 | G-GMD.1.1 | 1-8 Perimeter, Circumference, and Area |  |  |
| 1 | G-GPE.2.6 | [CC-1 Partitioning a Line Segment](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc1.pdf) | p2 #15-18 |  |
| 2 |  | Review/Assessment |  |  |

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| **Unit # 2: Reasoning and Proof** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-CO.3.9 | Prove theorems about lines and angles; use theorems about lines and angles to solve problems. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment’s endpoints.  | 2, 3, 6 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G03:** Students will be able to prove geometric theorems](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g03.docx) | * Common Core Standards Appendix A states, “Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words.
* Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning” (p. 29). Different methods of proof will appeal to different learning styles in the classroom.
* Classroom teachers and mathematics education researchers agree that students have a hard time learning how to do geometric proofs. An article by Battista and Clements (1995) (http://investigations.terc.edu/library/bookpapers/geometryand\_proof.cfm) provides information for teachers to help students who struggle learn to do proof. The most significant implication for instructional strategies for proof is stated in their conclusion.

“Ironically, the most effective path to engendering meaningful use of proof in secondary school geometry is to avoid formal proof for much of students’ work. By focusing instead on justifying ideas while helping students build the visual and empirical foundation for higher levels of geometric thought, we can lead students to appreciate the need for formal proof. Only then will we be able to use it meaningfully as a mechanism for justifying ideas.”* The article and ideas from Niven (1987) offers a few suggestions about teaching proof in geometry:
	+ Initial geometric understandings and ideas should be taught “without excessive emphasis on rigor.” Develop basic geometric ideas outside an axiomatic framework, and then let the importance of the framework (and the framework itself) emerges from the geometry.
	+ Geometry is visual and should be taught in ways that leverage this aspect. Sketching, drawing and constructing figures and relationships between geometric objects should be central to any geometric study and certainly to proof. Battista and Clement make a powerful argument that the use of dynamic geometry software can be an important tool for helping students understand proof.
	+ “Avoid the deadly elaboration of the obvious” (Niven, p. 43). Often textbooks begin the treatment of formal proof with “easy” proofs, which appear to students to need no proof at all. After presenting many opportunities for students to “justify” properties of geometric figures, formal proof activities should begin with non-obvious conjectures.
	+ Use the history of geometry and real-world applications to help students develop conceptual understandings before they begin to use formal proof.
* Proofs in high school geometry should not be restricted to the two-column format. Most proofs at the college level are done in paragraph form, with the writer explaining and defending a conjecture. In many cases, the two-column format can hinder the student from making sense of the geometry by paying too much attention to format rather than mathematical reasoning.
* A fun game for all students is proof rummy. See link for instructions.
* Research over the last four decades suggests that student misconceptions about proof abound:
* even after proving a generalization, students believe that exceptions to the generalization might exist;
* one counterexample is not sufficient;
* the converse of a statement is true (parallel lines do not intersect, lines that do not intersect are parallel); and
* a conjecture is true because it worked in all examples that were explored.
* Each of these misconceptions needs to be addressed, both by the ways in which formal proof is taught in geometry and how ideas about “justification” are developed throughout a student’s mathematical education.
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| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * In high school, these properties are revisited in a more formal setting, giving greater attention to precise statements of theorems and establishing these theorems by means of formal reasoning.
 | Notecards for proof rummy game, textbook and other Pearson resources |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **FIRST QUARTER** |
| **Unit 2: Reasoning and Proof** |
| **Learning Goal** | [**G03:** Students will be able to prove geometric theorems](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g03.docx) | **Suggested # of Days** | **10** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 7 | G-CO.3.9 | 2-2 Conditional Statements (Converse Only)2-3 Biconditionals and Definitions2-5 Reasoning in Algebra and Geometry2-6 Proving Angles Congruent | p104 #11 – 15p111 #44 | **(Blackboard Resource)**[Proof Rummy Activity](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/proof_rummy_activity_to_supplement_after_2.5-2.6.docx) to help with proof statements and reasons |
| 3 |  | Review/Assessment |  |  |

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| **Unit # 3: Parallel and Perpendicular Lines**  |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-CO.3.9 | Prove theorems about lines and angles; use theorems about lines and angles to solve problems. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment’s endpoints.  | 3 |
| G-CO.3.10 | Prove theorems about triangles; use theorems about triangles to solve problems. Theorems include: measures of interior angles of a triangle sum to 180°; triangle inequality theorem; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. | 3 |
| G-CO.4.12 | Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Including: Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. | 5, 6 |
| G.GPE.2.5 | Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). | 3 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G03:** Students will be able to prove geometric theorems](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g03.docx).[**G04:** Students will be able to make geometric constructions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g04.docx) | * Students should analyze each listed construction in terms of what simpler constructions are involved (e.g., constructing parallel lines can be done with two different constructions of perpendicular lines).
* Compare dynamic geometry commands to sequences of compass-and-straightedge steps. Prove, using congruence theorems, that the constructions are correct.
* Student need to understand that only parallel lines will make special angle pairs congruent or supplementary.
* See math background on pg171 from the TE.
* Students need to understand that the perpendicular line to a horizontal line (a zero slope) is a vertical line (an undefined slope).
* Consider using tracing paper to help demonstrate that corresponding angle pairs are congruent.
* Discuss the role of algebra in providing a precise means of representing a visual image.
* Review the concept of slope as the rate of change of the y-coordinate with respect to the x-coordinate for a point moving along a line, and derive the slope formula.
* Use slopes and the Euclidean distance formula to solve problems about figures in the coordinate plane such as:
	+ Given a line and a point not on it, find an equation of the line through the point that is parallel to the given line.
	+ Given a line and a point not on it, find an equation of the line through the point that is perpendicular to the given line.
	+ Given the equations of two non-parallel lines, find their point of intersection.
* A good kinesthetic activity would be to transform your room into a coordinate plane using tape on the floor and allowing students to become points on the plane.
 |
| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * In high school, students perform formal geometry constructions using a variety of tools. Students will utilize proofs to justify validity of their constructions.
* Students use angle-pair relationships in parallel lines to deduce special properties of quadrilaterals and other Geometric figures.
 | Traditional construction tools, straight edge, string, tracing paper, protractors, tape, geometric construction software (if available), textbook, and other Pearson resources |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **FIRST QUARTER** |
| **Unit 3: Parallel and Perpendicular Lines**  |
| **Learning Goal** | [**G03:** Students will be able to prove geometric theorems.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g03.docx)[**G04:** Students will be able to make geometric constructions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g04.docx) | **Suggested # of Days** | **15****(3)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 5 | G-CO.3.9 | 3-1 Lines and Angles3-2 Properties of Parallel Lines3-3 Proving Lines Parallel3-4 Parallel and Perpendicular Lines | p153 #22 – 25p164 #16, 20, 22p170 #14, 19, 20, 22 – 24p177 #16, 17, 19, 21, 22 |  |
| 2 | G-CO.3.10 | 3-5 Parallel Lines and Triangles | p185 #19, 24, 26, 33, 36 |  |
| 2 | G-CO.4.12 | 3-6 Constructing Parallel and Perpendicular Lines |  |  |
| 3 | G-GPE.2.5 | 3-7 Equations of Lines in the Coordinate Plane3-8 Slopes of Parallel and Perpendicular Lines |  |  |
| 3 |  | Review/Assessment |  |  |
| 1 |  | **District Assessment** |
| 2 |  | **9 Week Review/Assessment** |

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| **Course: Geometry Standard**  | **Unit Title: Congruence Transformations** | **Unit # 4** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-CO.1.2 | Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). | 1, 5 |
| G-CO.1.3 | Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. | 1, 7 |
| G-CO.1.4 | Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. | 1, 7 |
| G-CO.1.5 | Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. | 1, 5 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G01:** Students will be able to experiment with transformations in the plane.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g01.docx) | * Review vocabulary associated with transformations (e.g. point, line, segment, angle, circle, polygon, parallelogram, perpendicular, rotation reflection, translation).
* Provide both individual and small-group activities, allowing adequate time for students to explore and verify conjectures about transformations and develop precise definitions of rotations, reflections and translations.
* Provide real-world examples of rigid motions (e.g. Ferris wheels for rotation; mirrors for reflection; moving vehicles for translation).
* Use graph paper, transparencies, tracing paper or dynamic geometry software to obtain images of a given figure under specified transformations.
* Provide students with a pre-image and a final, transformed image, and ask them to describe the steps required to generate the final image. Show examples with more than one answer (e.g., a reflection might result in the same image as a translation).
* Work backwards to determine a sequence of transformations that will carry (map) one figure onto another of the same size and shape.
* Focus attention on the attributes (e.g. distances or angle measures) of a geometric figure that remain constant under various transformations.
* Make the transition from transformations as physical motions to functions that take points in the plane as inputs and give other points as outputs. The correspondence between the initial and final points determines the transformation.
* Emphasize the importance of understanding a transformation as the correspondence between initial and final points, rather than the physical motion.
* Use a variety of means to represent rigid motions, including physical manipulatives, coordinate methods, and dynamic geometry software.
* A good kinesthetic activity would be to transform your room into a coordinate plane using tape on the floor and allowing students to become points on the plane.

**Misconceptions*** The terms “mapping” and “under” are used in special ways when studying transformations. A translation is a type of transformation that moves all the points in the object in a straight line in the same direction.
* Students should know that not every transformation is a translation. Students sometimes confuse the terms “transformation” and “translation.”
* Students need to understand that the open-circle operator is defined as the composition of two functions and not their product.
 |
| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * Transformations can be studied in terms of functions, where the inputs and outputs are points in the plane, rather than numbers.
* Students need to understand congruence in terms of rigid motions throughout all of Geometry; this unit provides the foundation for that definition.
 | Graph paper, tracing paper, protractor, ruler, dynamic geometry software (if available), physical manipulatives, tape, Khan Academy online transformation resources (<https://www.khanacademy.org/math/geometry/congruent-triangles/transformations-congruence/e/defining-congruence-through-rigid-transformations>), textbook and other Pearson resources, specifically Pearson’s online common core resources that relate to this unit: [CC5](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc5h.pdf), [CC6](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc6h.pdf), [CC7](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc7h.pdf), [CC8](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc8h.pdf), [CC9](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc9h.pdf), [CC10](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc10h.pdf), [CC12](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc12h.pdf). |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **SECOND QUARTER** |
| **Unit 4: Congruence Transformations** |
| **Learning Goal** | [G01: Students will be able to experiment with transformations in the plane.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g01.docx) | **Suggested # of Days** | **9****(1)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 5 | G-CO.1.2G-CO.1.3G-CO.1.4G-CO.1.5 | 9-1 Translations Concept Byte: Paper Folding and Reflections p5489-2 Reflections9-3 Rotations[CC-9 Rotations](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc9h.pdf) (key concept and examples 2-3)Concept Byte: Tracing Paper Transformations p584 | p567 #27 – 29 p574 #16, 19, 25 p582 #24, 32[CC-9](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc9h.pdf) p37-38 #22-25, 38-47 p585 Activities 2 and 3 |  |
| 0 |  | 9-4 Symmetry (Optional)[CC-10 Symmetry](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc10h.pdf) (Activity 1-3) | p591 #22, 32[CC-10](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc10h.pdf) p41 #14-19 |  |
| 2 | G-CO.1.3G-CO.1.4 | 9-6 Compositions of Reflections (example 4 only)[CC-12 Compositions of Isometries](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc12h.pdf) (on example 2, see the TAKE NOTE on composition notation) | p608 #30, 32, 34, 36, 41[CC-12](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc12h.pdf) pg51-52 #26, 39-40 |  |
| 2 |  | Review/Assessment |  |  |
| 1 |  | **PSAT 10/15/14** |

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| **Unit # 5: Congruent Triangles** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-CO.2.6 | Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. | 1, 7 |
| G-CO.2.7 | Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. | 3, 7 |
| G-CO.2.8 | Explain how the criteria for triangle congruence (ASA, SAS, SSS, and Hypotenuse-Leg) follow from the definition of congruence in terms of rigid motions. | 3 |
| G-CO.3.10 | Prove theorems about triangles; use theorems about triangles to solve problems. Theorems include: measures of interior angles of a triangle sum to 180°; triangle inequality theorem; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. | 3 |
| G-SRT.2.5 | Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. | 1 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G02:** Students will be able to understand congruence in terms of rigid motions](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g02.docx) | * Develop the relationship between transformations and congruency. Allow adequate time and provide hands-on activities for students to visually and physically explore rigid motions and congruence.
* Use graph paper, tracing paper or dynamic geometry software to obtain images of a given figure under specified rigid motions. Note that size and shape are preserved.
* Use rigid motions (translations, reflections and rotations) to determine if two figures are congruent. Compare a given triangle and its image to verify that corresponding sides and corresponding angles are congruent.
* Work backwards – given two figures that have the same size and shape, find a sequence of rigid motions that will map one onto the other.
* Build on previous learning of transformations and congruency to develop a formal criterion for proving the congruency of triangles. Construct pairs of triangles that satisfy the ASA, SAS or SSS congruence criteria, and use rigid motions to verify that they satisfy the definition of congruent figures. Investigate rigid motions and congruence both algebraically (using coordinates) and logically (using proofs).
* Have students prove the isosceles triangle theorem in several ways (e.g. using reflections across a line of symmetry, formal proofs using triangle congruency theorems, etc.)
* Have students deduce properties of angles in equilateral triangles using the isosceles triangle theorem.

**Misconceptions*** That combinations such as SSA or AAA are also a congruence criterion for triangles. Provide counterexamples for this misconception. As a note: SSA only works when it’s a right triangle in which case it is called HL.
* That all transformations, including dilations, are rigid motions. Provide counterexamples for this misconception.
* That corresponding vertices do not have to be listed in order
 |
| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * Congruence should be built upon in high school with greater attention to precise definitions, specifically, knowing the definition of congruence in terms of rigid motions.
* Since nearly all two-dimensional shapes studied in Geometry break down into triangles this unit is a particularly useful when deducing properties of Geometric figures which aren’t necessarily triangles.
 | Graph paper, tracing paper, protractor, ruler, dynamic geometry software (if available), physical manipulatives), textbook and other Pearson resources, specifically Pearson’s online common core resources that relate to this unit: [CC13](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc13h.pdf) |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **SECOND QUARTER** |
| **Unit 5: Congruent Triangles** |
| **Learning Goal** | [**G02:** Students will be able to understand congruence in terms of rigid motions](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g02.docx) | **Suggested # of Days** | **13** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 6 | G-CO.2.6G-CO.2.7G-CO.2.8G-SRT.2.5 | 4-1 Congruent Figures[CC-13 Congruence Transformations](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc13h.pdf)*Concept Byte: Building Congruent Triangles p237* (*optional*)4-2 Triangle Congruence SSS and SAS4-3 Triangle Congruence ASA and AAS4-4 CPCTC | p235 #25, 26, 28, 29[CC-13](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc13h.pdf) p58-60 #1-13, 21, 25p242 #8, 13-14, 20, 28-30p253 #3, 4, 6, 7, 11, 14p264 #15 |  |
| 4 | G-CO.2.7G-CO.2.8 G-CO.3.10 | *Concept Byte: Paper Folding Conjectures p265 (optional)*4-5 Isosceles and Equilateral Triangles4-6 Congruence in Right Triangles (include [CC-13](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc13h.pdf))4-7 Congruence in Overlapping Triangles | p279 #11, 23 and [CC-13](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc13h.pdf) p59-61 #17-19. 27p285 #14, 18-19, 26-27, 29 |  |
| 3 |  | Review/Assessment |  |  |

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| **Unit # 6: Relationships within Triangles** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-CO.3.9 | Prove theorems about lines and angles; use theorems about lines and angles to solve problems. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment’s endpoints.  | 7 |
| G-CO.3.10 | Prove theorems about triangles; use theorems about triangles to solve problems. Theorems include: measures of interior angles of a triangle sum to 180°; triangle inequality theorem; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. | 8 |
| G-C.1.3 | Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. | 5 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G03:** Students will be able to prove geometric theorems.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g03.docx) | * Provide meaningful problems (e.g. constructing the centroid or the incenter of a triangle) to offer students practice in executing basic constructions.
* Students should analyze each listed construction in terms of what simpler constructions are involved (e.g., constructing parallel lines can be done with two different constructions of perpendicular lines).
* Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words. Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning. Implementation of G.CO.10 may be extended to include concurrence of perpendicular bisectors and angle bisectors as preparation for G.C.3.
* Use formal geometric constructions to construct perpendicular bisectors of the sides and angle bisectors of a given triangle. Their intersections are the centers of the circumscribed and inscribed circles, respectively.
* Use dynamic geometry software or manipulatives such as paper-folding to help deduce properties of the three points of concurrency by experimenting with alterations to angle measures of the triangles.
* Manipulatives or class demonstrations to help students discover the triangle inequality theorem and that relationship between angle measures and their opposite side lengths.

**Misconception*** Any three side lengths can make a triangle
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| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * Earlier sections of this unit relate to inscribed and circumscribed angles of circles in unit 12. Standardized tests such as the SAT and ACT often ask questions based upon the triangle inequality theorem.
 | GeoGebra software, traditional construction tools, paper folding (with patty paper), text and Pearson resources, straight edge, ruler |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **SECOND QUARTER** |
| **Unit 6: Relationships within Triangles** |
| **Learning Goal** | [**G03:** Students will be able to prove geometric theorems.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g03.docx) | **Suggested # of Days** | **10** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 2 | G-CO.3.9 | 5-2 Perpendicular and Angle Bisectors | p185 #19, 24, 26, 33, 36 |  |
| 1 | G.C.1.3 | Concept Byte: Paper Folding Bisectors p315 |  |  |
| 2 | 5-3 Bisectors in Triangles | p319 #4, 5, 13 | **(Blackboard Resource)**[Paper Folding Introduction to Incenters and Circumcenters](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/incenter_and_circumcenter_paper_folding_supplement_before_5-3.docx) |
| 1 | G-CO.3.10 | 5-4 Medians and Altitudes (omit orthocenter) |  |  |
| 2 | 5-6 Inequalities in One Triangle | p350 #4, 5, 13, 14, 16 |  |
| 2 |  | Review/Assessment |  |  |

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| **Unit # 7: Polygons and Quadrilaterals**  |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-CO.3.11 | Prove theorems about parallelograms; use theorems about parallelograms to solve problems. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. | 3, 6 |
| G-SRT.2.5 | Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. | 6 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G03:** Students will be able to prove geometric theorems.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g03.docx) | * Common Core Standards Appendix A states, “Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words.
* Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning” (p. 29). Different methods of proof will appeal to different learning styles in the classroom.
* Relate all properties of parallelograms back to congruent triangles.
* When proving that the diagonals of a parallelogram bisect one another, you can use previously proved properties of parallelograms to help shorten the proof.
* Use isosceles triangles to help deduce that the diagonals of a rhombus are perpendicular.
* Emphasize the differences in the properties of the diagonals of special parallelograms.
* Use graphic organizers to help differentiate special quadrilaterals.

**Misconceptions*** A rhombus is a diamond.
* All trapezoids are isosceles parallelograms.
* All special parallelograms are squares.
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| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * This unit is just an extension of congruency in triangles, so students should easily be able to deduce the properties using prior knowledge. We will be using properties of quadrilaterals to identify special quadrilaterals on the coordinate.
 | Graphic organizers (see ELL support 6-4), textbook and other Pearson resources. |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **SECOND QUARTER** |
| **Unit 7: Polygons and Quadrilaterals** |
| **Learning Goal** | [**G03:** Students will be able to prove geometric theorems.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g03.docx) | **Suggested # of Days** | **9****(4)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 5 | G-CO.3.11 | 6-2 Properties of Parallelograms (*example 1-3 only*)6-3 Proving that Quadrilateral is a Parallelogram 6-4 Properties of Rhombuses, Rectangles, and Squares 6-5 Conditions for Rhombuses, Rectangles, and Squares |  |  |
| 2 | G-SRT.2.5 | 6-6 Trapezoids and Kites |  |  |
| 2 |  | Review/Assessment  |  |  |
| 1 |  | **District Assessment** |
| 3 |  | **9 Week Review/Assessment** |

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| **Unit # 8: Polygons in the Coordinate Plane** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-GPE.2.4 | Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). | 1, 2 |
| G-GPE.2.7 | Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. | 2, 4 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G07:** Students will be able to use coordinates to prove simple geometric theorems algebraically.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g07.docx) | * Use slopes and the Euclidean distance formula to solve problems about figures in the coordinate plane such as:
	+ Given three points, are they vertices of an isosceles, equilateral, or right triangle?
	+ Given four points, are they vertices of a parallelogram, a rectangle, a rhombus, or a square?
* Given the vertices of a triangle or a parallelogram, find the equation of a line containing the altitude to a specified base and the point of intersection of the altitude and the base. Use the distance formula to find the length of that altitude and base, and then compute the area of the figure.
* Graph polygons using coordinates. Explore perimeter and area of a variety of polygons, including convex, concave, and irregularly shaped polygons.
* Make sure to review over properties of special quadrilaterals before this unit.
* Given a triangle, use slopes to verify that the length and height are perpendicular. Find the area.
* Students need to be able to complete coordinate proofs such as those in the textbook on p441: 5, p442: 22.
* Note to students that theorems about angles are generally not provable by coordinate geometry unless the angle is a right angle or straight angle.
* Students can use the proof of the Trapezoid Midsegment Theorem as a model for the proof of the Triangle Midsegment Theorem, see p440: problem 2
* Consider using graphing software such as Geogebra or Sketchpad to assist or supplement lesson plans.
* A good kinesthetic activity would be to transform your room into a coordinate plane using tape on the floor and allowing students to become points on the plane.

**Misconception*** Students struggle using variables as numbers in coordinate proofs. Provide as much support as possible when introducing this concept to them.
 |
| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * This is the culmination of all units, thus far. Students need to understand a variety of properties triangles and quadrilaterals to apply to coordinate proofs. This unit will also provide a stronger foundation for upcoming topics including area and circles on the coordinate plane.
 | Geogebra or Sketchpad, graph paper, straight edge, tape, text and other Pearson resources. |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **THIRD QUARTER** |
| **Unit 8: Polygons in the Coordinate Plane** |
| **Learning Goal** | [**G07:** Students will be able to use coordinates to prove simple geometric theorems algebraically.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g07.docx) | **Suggested # of Days** | **9** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 0 |  | Review 6-2 to 6-6 (Optional) |  |  |
| 6 | GPE.2.4GPE.2.7 | 6-7 Polygons In The Coordinate Plane6-8 Applying Coordinate Geometry 6-9 Proofs Using Coordinate Geometry |  |  |
| 3 |  | Review/Assessment |  |  |

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| **Unit #9: Similarity** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-C.1.1 | Prove that all circles are similar.  | 3 |
| G-CO.3.10 | Prove theorems about triangles; use theorems about triangles to solve problems. Theorems include: measures of interior angles of a triangle sum to 180°; triangle inequality theorem; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. | 3, 6 |
| G-GPE.2.5 | Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). | 3 |
| G-GPE.2.6 | Find the point on a directed line segment between two given points that partitions the segment in a given ratio. | 1, 6 |
| G-SRT.1.1 | Verify experimentally the properties of dilations given by a center and a scale factor:1. A dilation takes a line not passing through the center of the dilation to a parallel line, & leaves a line passing through the center unchanged.
2. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
 | 1, 3  |
| G-SRT.1.2 | Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides | 3 |
| G-SRT.1.3 | Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. | 1, 6 |
| G-SRT.2.4 | Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. | 3 |
| G-SRT.2.5 | Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. | 3 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G10:** Students will be able to understand similarity in terms of similarity transformations.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g10.docx)[**G11:** Students will be able to prove theorems involving similarity.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g11.docx) | * Allow adequate time and hands-on activities for students to explore dilations visually and physically.
* Use graph paper and rulers or dynamic geometry software to obtain images of a given figure under dilations having specified centers and scale factors. Carefully observe the images of lines passing through the center of dilation and those not passing through the center, respectively. A line segment passing through the center of dilation will simply be shortened or elongated but will lie on the same line, while the dilation of a line segment that does not pass through the center will be parallel to the original segment (this is intended as a clarification of Standard 1a).
* Use graph paper and rulers or dynamic geometry software to obtain the image of a given figure under a combination of a dilation followed by a sequence of rigid motions (or rigid motions followed by dilation).
* Using the theorem that the angle sum of a triangle is 180°, verify that the AA criterion is equivalent to the AAA criterion. Given two triangles for which AA holds, use rigid motions to map a vertex of one triangle onto the corresponding vertex of the other in such a way that their corresponding sides are in line. Then show that dilation will complete the mapping of one triangle onto the other.
* Use cardboard cutouts to illustrate that the altitude to the hypotenuse divides a right triangle into two triangles that are similar to the original triangle. Then use AA to prove this theorem.

**Misconceptions*** Some students often do not recognize that congruence is a special case of similarity. Similarity with a scale factor equal to 1 becomes a congruency.
* Students may not realize that similarities preserve shape, but not size. Angle measures stay the same, but side lengths change by a constant scale factor.
* Students may incorrectly apply the scale factor. For example students will multiply instead of divide with a scale factor that reduces a figure or divide instead of multiply when enlarging a figure.
* Some students often do not list the vertices of similar triangles in order. However, the order in which vertices are listed is preferred and especially important for similar triangles so that proportional sides can be correctly identified.
 |
| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * Topics in this unit lead directly into unit 8 on Trigonometry. Make sure to emphasize the importance of AA~ and similarity in right triangles.
* The similarity in right triangles section (7.4) is essential to understanding the proof for the Pythagorean Theorem in 8.1.
 | Physical manipulatives that demonstrate dilations (rubber bands), graph paper, straight edge |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **THIRD QUARTER** |
| **Unit 9: Similarity** |
| **Learning Goal** | [**G10:** Students will be able to understand similarity in terms of similarity transformations.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g10.docx)[**G11:** Students will be able to prove theorems involving similarity.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g11.docx)  | **Suggested # of Days** | **13** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 1 | G-SRT.1.1G-SRT.1.2G-C.1.1 | [CC-15 Dilations](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc15h.pdf), supplement with 9-5 Dilations  | [CC-15](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc15h.pdf) p67 #19-20 | Honors PH Geometryp580 #40, 44-47**(Blackboard Resource)**[Similar Circles Activity](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/similar_circles_supplement_for_9-5.docx) |
| 2 | G-SRT.1.2 | 7-1 Ratios and Proportions7-2 Similar Polygons | p437 #38-39p445 #21, 48, 51 |  |
| 4 | G-SRT.1.3G-SRT.2.5 G-GPE.2.5 | 7-3 Proving Triangles Similar \*\*7-4 Similarity in Right Triangles[CC-11 Slope Criteria for Parallel and Perpendicular](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc11h.pdf) Lines | p457 #27-28, 37 [CC-11](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc11h.pdf) p44 #13-15 |  |
| 3 | G-CO.3.10G.GPE.2.6G-SRT.2.4G-SRT.2.5 | 7-5 Proportions in Triangles \*\*5-1 Midsegments of Triangles | p306 #25-27 |  |
| 3 |  | Review/Assessment |  |  |

\*\*Sections 7-3 and 7-4 and CC-11 can be taught either before or after 7-5 and 5-1

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| **Unit # 10: Right Triangles in Trigonometry**  |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-SRT.2.4 | Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. | 1, 3 |
| G-SRT.3.6 | Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. | 1, 6 |
| G-SRT.3.7 | Explain and use the relationship between the sine and cosine of complementary angles. | 1, 3, 6 |
| G-SRT.3.8 | Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. | 4 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G12:** Students will be able to define trigonometric ratios and solve problems involving right triangles.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g12.docx) | * Use cardboard cutouts to illustrate that the altitude to the hypotenuse divides a right triangle into two triangles that are similar to the original triangle. Then use AA to prove this theorem. Then, use this result to establish the Pythagorean relationship among the sides of a right triangle (a2 + b2 = c2) and thus obtain an algebraic proof of the Pythagorean Theorem.
* Review vocabulary (opposite and adjacent sides, legs, hypotenuse and complementary angles) associated with right triangles; consider using a graphic organizer to give students a helpful resource.
* Make cutouts or drawings of right triangles or manipulate them on a computer screen using dynamic geometry software and ask students to measure side lengths and compute side ratios. Observe that when triangles satisfy the AA criterion, corresponding side ratios are equal. Side ratios are given standard names, such as sine, cosine and tangent. Allow adequate time for students to discover trigonometric relationships and progress from concrete to abstract understanding of the trigonometric ratios.
* Show students how to use the trigonometric function keys on a calculator. Also, show how to find the measure of an acute angle if the value of its trigonometric function is known.
* Investigate sines and cosines of complementary angles, and guide students to discover that they are equal to one another. Point out to students that the “co” in cosine refers to the “sine of the complement.”
* Observe that, as the size of the acute angle increases, sines and tangents increase while cosines decrease. Stress trigonometric terminology by the history of the word “sine” and the connection between the term “tangent” in trigonometry and tangents to circles.
* Have students make their own diagrams showing a right triangle with labels showing the trigonometric ratios. Although students like mnemonics such as SOHCAHTOA, these are not a substitute for conceptual understanding. Some students may investigate the reciprocals of sine, cosine, and tangent to discover the other three trigonometric functions.
* Use the Pythagorean Theorem to obtain exact trigonometric ratios for 30°, 45°, and 60° angles. Use cooperative learning in small groups for discovery activities and outdoor measurement projects.
* Have students work on applied problems and project, such as measuring the height of the school building or a flagpole, using clinometers and the trigonometric functions.
* Consider using a trig table to help demonstrate that sine and cosine are complementary. See resources provide.
* To assist in the conceptual understanding of the trigonometric consider doing the hands-on activity provided in the lesson plans linked below.
* Draw the connection that the angle of a line on the coordinate plane relates to the tangent of the slope.

**Misconception*** Some students believe that right triangles must be oriented a particular way.
* Some students do not realize that opposite and adjacent sides need to be identified with reference to a particular acute angle in a right triangle.
* Some students believe that the trigonometric ratios defined in this cluster apply to all triangles, but they are only defined for acute angles in right triangles
 |
| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * Trigonometry is not introduced until high school. Right triangle trigonometry (a geometry topic) has implications when studying algebra and functions. For example, trigonometric ratios are functions of the size of an angle, the trigonometric functions can be revisited after radian measure has been studied, and the Pythagorean theorem can be used to show that (sin A)2 + (cos A)2 = 1.
 | Trig charts, manipulatives, graphic organizers for labelling parts of a right triangle, protractor, ruler/tape measure, textbook and other Pearson resources, [CC2](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc2.pdf),Resources for linked lesson plan: (trig charts, notecards, protractors, rulers) |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **THIRD QUARTER** |
| **Unit 10: Right Triangles in Trigonometry** |
| **Learning Goal** | [**G12:** Students will be able to define trigonometric ratios and solve problems involving right triangles.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g12.docx) | **Suggested # of Days** | **12** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 4 | G-SRT.2.4 | 8-1 Pythagorean Theorem and Converse8-2 Special Right Triangles | p519 #28; p522 #11, 21p529 #12, 17, 22, 23 |  |
| 3 | G-SRT.3.6G-SRT.3.7 | 8-3 Trigonometry[CC-2 Complementary Angles and Trig Ratios](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc2.pdf) | p535 #16, 17, 21; p539 #14, p540 #22 | **(Blackboard Resource)**[Trig Ratio Chart](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/trig_chart_supplement_during_8-4.xlsx) which shows relationships between angles[Trig Ratios Activity](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/trigonometric_ratios_activity_supplement_before_8-4.doc) |
| 2 | G-SRT.3.8 | 8-4 Angles of Elevation and Depression | p548 #34, 35 |  |
| 3 |  | Review/Assessment |  |  |

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| **Unit # 11: Area** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-C.1.2 | Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. | 6, 7 |
| G-GMD.1.1 | Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri’s principle, and informal limit arguments. | 7 |
| G-GMD.1.3 | Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). | 4 |
| G-GPE.2.7 | Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.  | 6 |
| G-MG.1.1 | Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder) | 4, 6 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G09:** Students will be able to apply geometric concepts in modeling situations.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g09.docx) | * Find the area and perimeter of a real-world shape using a coordinate grid and Google Earth. Select a shape (yard, parking lot, school, etc.). Use the tool menu to overlay a coordinate grid. Use coordinates to find the perimeter and area of the shape selected. Determine the scale factor of the picture as related to the actual real-life view. Then find the actual perimeter and area.
* A challenge for teaching modeling is finding problems that are interesting and relevant to high school students and, at the same time, solvable with the mathematical tools at the students’ disposal. The resources listed below are a beginning for addressing this difficulty.
* Bring real-life examples that involve density in this problems to give students more buy-in (e.g. provide the layout of the backyard of a house and ask students to compute the cost of sodding it if sod costs $5 per square foot, computing exact rent cost using price per square foot)
* Have students compute the area of physical objects throughout the school then apply density to this.
* Graph polygons using coordinates. Explore perimeter and area of a variety of polygons, including convex, concave, and irregularly shaped polygons.
* Given a triangle, use slopes to verify that the length and height are perpendicular. Find the area.
* Draw the connection to students that every figure they need to find the area of can always be broken down to triangles. (For quadrilaterals, just draw a diagonal).

**Misconceptions*** When students ask to see “useful” mathematics, what they often mean is, “Show me how to use this mathematical concept or skill to solve the homework problems.” Mathematical modeling, on the other hand, involves solving problems in which the path to the solution is not obvious. Geometry may be one of several tools that can be used.
* Students will often multiply two lengths that don’t necessarily represent the base and height of a figure they are trying to find the area. Emphasize that the base and height always make a right angle to help prevent this misunderstanding.
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| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * This unit provides a good foundation deriving volume formulas since students need to know how to find the area of a base.
 | Google Earth, blueprint models, graph paper, rulers/measuring tape, textbook and other Pearson resources. |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **THIRD QUARTER** |
| **Unit 11: Area** |
| **Learning Goal** | [**G09:** Students will be able to apply geometric concepts in modeling situations.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g09.docx)  | **Suggested # of Days** | **8****(4)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 1 | G-GMD.1.3 | Concept Byte: Transforming to Find Area p632 (Activities 1-2) | Activity 3 for HW #11-14 |  |
| 1 | G-MG.1.1G-GPE.2.7 | 10-1 Parallelograms and Triangles (omit example 2) | p638 #16, 26, 28 | **(Blackboard Resource)**[Deriving Area Formulas](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/derivation_of_area_formulas_supplement_during_10.1_and_10.2.pptx) Power Point to be used with 10-1 and 10-2 |
| 1 | G-MG.1.1 | 10-2 Area of Trapezoids, Rhombuses and Kites | p644 #14 p648 #13, 23, 25 |
| 1 | 10-3 Area of Polygons | p656 #27, 35 |  |
| 0 | G-GMD.1.3 | 10-4 Perimeter and Area of Similar Figures |  |  |
| 1 | G-C.1.2G-GMD.1.1 | Concept Byte: Circle Graphs p687p689 Solve it: Exploring Area of a Circle (Optional) |  |  |
| 3 |  | Review/Assessment |  |  |
| 1 |  | **FSA Testing** |
| 1 |  | **District Assessment** |
| 2 |  | **9 Week Review/Assessment** |

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| **Unit # 12: Circles**  |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-C.1.1 | Prove that all circles are similar | 3 |
| G-C.1.2 | Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. | 1 |
| G-C.2.5 | Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. | 3, 7 |
| G-CO.1.1 | Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. | 1, 6 |
| **Learning Goals and Scales** | **Instructional Strategies & Misconceptions**  |
| [**G05:** Students will be able to understand and apply theorems about circles.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g05.docx)[**G06:** Students will be able to find arc lengths and areas of sectors of circles and derive the equation of a circle on a coordinate plane.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g06.docx) | * Given any two circles in a plane, show that they are related by dilation. Guide students to discover the center and scale factor of this dilation and make a conjecture about all dilations of circles.
* Use properties of congruent triangles and perpendicular lines to prove theorems about diameters, radii, chords, and tangent lines.
* Provide plenty of practice in assigning radian measure to angles that are simple fractional parts of a straight angle. Stress the definition of radian by considering a central angle whose intercepted arc has its length equal to the radius, making the constant of proportionality 1. Students who are having difficulty understanding radians may benefit from constructing cardboard sectors whose angles are one radian. Use a ruler and string to approximate such an angle.
* Compute areas of sectors by first considering them as fractional parts of a circle. Then, using proportionality, derive a formula for their area in terms of radius and central angle. Do this for angles that are measured both in degrees and radians and note that the formula is much simpler when the angels are measured in radians.
* Derive formulas that relate degrees and radians.
* Introduce arc measures that are equal to the) measures of the intercepted central angles in degrees or radians. Emphasize appropriate use of terms, such as, angle, arc, radian, degree, and sector.
* Review the definition of a circle as a set of points whose distance from a fixed point is constant.
* Review the algebraic method of completing the square and demonstrate it geometrically.
* Use the Pythagorean theorem to derive the distance formula. Then, use the distance formula to derive the equation of a circle with a given center and radius, beginning with the case where the center is the origin. Starting with any quadratic equation in two variables (x and y) in which the coefficients of the quadratic terms are equal, complete the squares in both x and y and obtain the equation of a circle in standard form.

**Misconceptions*** The method of completing the square is a multi-step process that takes time to assimilate. A geometric demonstration of completing the square can be helpful in promoting conceptual understanding.
* Students sometimes confuse inscribed angles and central angles. For example they will assume that the inscribed angle is equal to the arc like a central angle.
* Students may think they can tell by inspection whether a line intersects a circle in exactly one point. It may be beneficial to formally define a tangent line as the line perpendicular to a radius at the point where the radius intersects the circle.
* Students may confuse the segment theorems. For example, they will assume that the inscribed angle is equal to the arc like a central angle.
* Sectors and segments are often used interchangeably in everyday conversation. Care should be taken to distinguish these two geometric concepts.
* The formulas for converting radians to degrees and vice versa are easily confused. Knowing that the degree measure of given angle is always a number larger than the radian measure can help students use the correct unit.
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| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | In high school, the application is generalized to obtain formulas related to conic sections. Quadratic functions and the method of completing the square are studied in the domain of interpreting functions. The methods are applied here to transform a quadratic equation representing a conic section into standard form. Emphasize the similarity of circles. Note that by similarity of sectors with the same central angle, arc lengths are proportional to the radius. Use this as a basis for introducing radian as a unit of measure.  | Graph paper, traditional construction tools, Google Earth, protractor, straight edge, prior Algebra resources available on blackboard, textbook and Pearson resources, specifically, [CC17](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc17h.pdf) and [CC19](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc19h.pdf). |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **FOURTH QUARTER** |
| **Unit 12: Circles** |
| **Learning Goal** | [**G05:** Students will be able to understand and apply theorems about circles.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g05.docx)[**G06:** Students will be able to find arc lengths and areas of sectors of circles and derive the equation of a circle on a coordinate plane.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g06.docx) | **Suggested # of Days** | **16** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 2 | G.CO.1.1 | 10-6 Circles and Arcs | p685 #17, 18, 26 |  |
| 1 | G-C.1.1G-C.2.5 | [CC-17 Proportions In Circles](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc17h.pdf) (Activity 1-3) | [CC-17](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc17h.pdf) p78 #8-12 |  |
| 1 | G-C.2.5 | 10-7 Area of Circles and Sectors | p693 #22, 24, 30, 32 | **(Blackboard Resource)**[Design Problems Activity](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/design_problems_1_supplement_for_10-7.docx) |
| 5 | G-C.1.2 | 12-1 Tangent Lines12-2 Chords and Arcs12-3 Inscribed Angles | p801 #11, 12, 13p811 #8, 9, 15 – 18p819 #5, 7, 12 – 14 |  |
| 4 | G-C.1.1 | 12-5 Circle in the Coordinate Plane | [CC-19](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/cc19h.pdf) p86 #54 | Complete the Square ACE Algebra I Module 16.5 and 17 |
| 3 |  | Review/Assessment |  |  |

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| **Unit # 13: Volume** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| G-GMD.1.1 | Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri’s principle, and informal limit arguments. | 3, 6 |
| G-GMD.1.3 | Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. | 4 |
| G-GMD.2.4 | Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. | 3, 6 |
| G-MG.1.1 | Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk/human torso as a cylinder). | 4 |
| G-MG.1.2 | Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). | 4 |
| G-MG.1.3 | Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). | 4 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
| [**G08:** Students will be able to explain volume formulas and use them to solve problems, and visualize relationships between 2D and 3D objects.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g08.docx)[**G09:** Students will be able to apply geometric concepts in modeling situations.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g09.docx) | * Using manipulatives such as model cubes, prisms, etc. even allowing students to bring in their own three dimensional objects they can deconstruct.
* Emphasize that one cubic unit is a cube with side lengths of one unit. Use this to build the concept of volume and to help derive the formulas using Cavalieri’s Principle.
* Use animations and visualizations to help students have a better understanding of the derivations of the volume formulas.

**Misconceptions*** Students can use slant height to find volume of pyramids and cones. Make sure to emphasize that height and slant height are two different measurements used for different things.
* Students solve for the radius of a sphere by dividing by three instead of cube rooting. Be sure to review over cubes and their inverses.
 |
| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * Much of this unit is the extension of unit 11 on area. There will be much overlap in the types of modelling problems presented in both units
 | Online resource: matheticsonline, youtube author with great visualizations for proofs <http://www.youtube.com/channel/UCoi8JfyjaFVzoWKzA6Gsg_A>Manipulatives to model 3D figures, textbook and other Pearson resources. |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **FOURTH QUARTER** |
| **Unit 13: Volume** |
| **Learning Goals** | [**G08:** Students will be able to explain volume formulas and use them to solve problems, and visualize relationships between 2D and 3D objects.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g08.docx)[**G09:** Students will be able to apply geometric concepts in modeling situations.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/g09.docx) | **Suggested # of Days** | **7****(7)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 1 | G-GMD.2.4 | 11-1 Space Figures and Cross Sections (Cross sections only) |  |  |
| 1 | G-GMD.1.1 | 11-4 Volumes of Prisms and Cylinders (cylinders only)11-5 Volumes of Pyramids and Cones (cones only) |  |  |
| 2 | G-GMD.1.3G-MG.1.1G-MG.1.2 | 11-5 Volumes of Pyramids and Cones (pyramids)11-6 Surface Area and Volume of Spheres (volume only) |  | **(Blackboard Resource)**[Density Supplement](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/density_supplement_for_11-6_.docx) for 11-6 |
| 0 | G-MG.1.1G-MG.1.2G-MG.1.3 | 11-7 Areas and Volumes of Similar Solids (optional) |  | **(Blackboard Resource)**[Introduction to 11-7 Design Problems](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/design_problems_2_supplement_before_11-7.docx)Design Problems [1](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/design_problems_3_supplement_for_11-7.docx) and [2](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/design_problems_4_supplement_for_11-7.docx) for work with 11-7[Designing Euclid’s Playground](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/designing_euclids_playground_supplement_after_11-7.pdf) for after 11-7 |
| 3 |  | Review/Assessment |  |  |
| 7 |  | **FSA Testing** |

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| **Unit # 14: Algebra** |
| **Code** | **Mathematics Florida Standard** | **SMP** |
| F-BF.2.3 | Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.  | 1 |
| F-IF.3.7b | Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  | 1 |
| **Learning Goal and Scale** | **Instructional Strategies & Misconceptions**  |
|  |  |
| **Math Practices for Unit** | **Unit Connections** | **Instructional Resources** |
| 1. Make sense of problems and persevere in solving them. | 5. Use appropriate tools strategically. | * **This unit is to prepare students for Algebra II after the completion of the end of year FSA exam.**
 |  |  |
| 2. Reason abstractly and quantitatively. | 6. Attend to precision. |
| 3. Construct viable arguments & critique reasoning of others. | 7. Look for and make use of structure. |
| 4. Model with mathematics. | 8. Look for and express regularity in repeated reasoning. |

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| **FOURTH QUARTER** |
| **Unit 14: Algebra** |
| **Learning Goal** | Prepare for Algebra II | **Suggested # of Days** | **13****(3)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** |
| 2 | F-BF.2.3 | Absolute Value Functions introductory power point |  | **(Blackboard Resource)**[Absolute Value Functions and Transformations power point](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/absolute_value_functions_and_transformations.ppt)  |
| 4 | Absolute Value Functions Worksheet (linear)  | See the hw at the end of the word document | **(Blackboard Resource)**[Graphing Absolute Value Linear Functions worksheet](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/graphing_absolute_value_linear_functions.docx) |
| 5 | F-IF.3.7b | Absolute Value Functions Worksheet (quadratics) | See the hw at the end of the word document | **(Blackboard Resource)**[Graphing Absolute Value Polynomial Functions worksheet](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/graphing_absolute_value_polynomial_functions.docx) |
| 2 |  | Review/Assessment |  |  |
| 3 |  | **Nine Week Review/Assessment** |