**PRECALCULUS**

**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 Mathematics Formal Standards (MAFS) standards. 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.
* 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.**
* **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.**

**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.

1. **(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** |
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| **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? |
| **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? |
| **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: Trigonometric Functions |  | 39 | |
| 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 2: Trigonometric Identities and Equations |  | 21 | |
| Unit 3: Vectors |  | 8 | |
| Unit 4: Polar Coordinates and Complex Numbers |  | 13 | |
| District Assessment (1 day); 9 Weeks Exams (3 days) |  | 4 | |
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| **THIRD QUARTER (January 6 – March 12)** | | **46 DAYS** | |
| **Topic/Assessment** | **Dates Covered** | **Approximate # Days** | |
| Unit 5: Conic Sections |  | 12 | |
| Unit 6: Functions from a Calculus Perspective |  | 19 | |
| Unit 7: Polynomial Functions |  | 11 | |
| District Assessment (1 day); FSA ELA Writing (1 day); 9 Weeks Exams (2 days) |  | 4 | |
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| **FOURTH QUARTER (March 23 – May 27)** | | **46 DAYS** | |
| **Topic/Assessment** | **Dates Covered** | **Approximate # Days** | |
| Unit 8: Rational Functions |  | 12 | |
| Unit 9: Limits |  | 10 | |
| Unit 10: Exponential and Logarithmic Functions (optional) |  | 14 | |
| FSA Tests (7 days); 9 Weeks Exams (3 days) |  | 10 | |

*\*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: Trigonometric Functions** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| F-TF.1.1 | Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle; convert between degrees and radians. | | | | | | 2, 5 |
| F-TF.1.2 | Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle | | | | | | 1, 2, 3 |
| F-TF.1.3 | Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–x, π+x, and 2π–x in terms of their values for x, where x is any real number (conterminal angle). | | | | | | 5, 6 |
| F-TF.1.4 | [Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.](http://www.cpalms.org/Standards/PublicPreviewBenchmark5592.aspx) | | | | | | 2, 3 |
| F-TF.2.5 | Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. | | | | | | 4, 5, 7, 8 |
| F-TF.2.6 | Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. | | | | | | 1, 2 |
| F-TF.2.7 | Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. | | | | | | 1, 4, 5 |
| G-SRT.3.8 | Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. | | | | | | 4, 5 |
| G-SRT.4.9 | Derive the formula A = 1/2 ab sin© for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. | | | | | | 3 |
| G-SRT.4.10 | Prove the Laws of Sines and Cosines and use them to solve problems. | | | | | | 1, 3, 4, 5, 7 |
| G-SRT.4.11 | Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). | | | | | | 1, 4, 5, 6, 7 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P04:** Extend the domain of trigonometric functions using the unit circle.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p04.docx)  [**P05:** Model Periodic phenomena using trigonometric functions](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p05.docx)  [**P08:** Define trigonometric ratios and apply trigonometry to general triangles.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p08.docx) | | | | * Students may confuse the notation for and , while this does not apply for positive exponents. * Students may believe the period of all parent trigonometric functions have the same period. | | | |
| **Math Practices for Unit** | | | **Unit Connections** | | **Instructional Resources** | | |
| 1. Make sense of problems and persevere in solving them. | | 5. Use appropriate tools strategically. | Students in Geometry have seen G.SRT.4.10, G.SRT.4.11  Students in Algebra 2 have seen F-TF.1.1, F, TF.1.2, F-TF-2.5 (sine, cosine, and tangent only)  **For Calculus preparation, please include**   * **Exact values and graphs of co-functions identities.** * **Phase shifts of trigonometric graphs** | |  |  | |
| 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: Trigonometric Functions** | | | | | | |
| **Learning Goals** | [**P04:** Extend the domain of trigonometric functions using the unit circle.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p04.docx)  [**P05:** Model Periodic phenomena using trigonometric functions](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p05.docx)  [**P08:** Define trigonometric ratios and apply trigonometry to general triangles.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p08.docx) | | | | **Suggested # of Days** | **39**  **(3)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 4 | F-TF.1.3  G-SRT.3.8 | 4.1 Right Triangle Trigonometry |  |  | | |
| 3 | F-TF.1.1 | 4.2 Degrees and Radians |  |  | | |
| 4 | F-TF.1.1  F-TF.1.2  F-TF. 1.4  G-SRT.3.8 | 4.3 Trigonometric Functions on the Unit Circle  (include even and odd functions) |  |  | | |
| 5 | F-TF.1.4  F-TF.2.5 | 4.4 Graphing Sine and Cosine Functions  (include even and odd functions) |  |  | | |
| 6 | 4.5 Graphing Other Trigonometric Functions  (include even and odd functions) |  |  | | |
| 5 | F-TF.2.6  F-TF.2.7 | 4.6 Inverse Trigonometric Functions |  |  | | |
| 5 | F-TF.2.7  G-SRT.4.9  G-SRT.4.10  G-SRT.4.11 | 4.7 The Law of Sines and the Law of Cosines |  |  | | |
| 7 |  | Review/Assessments |  |  | | |
| **3** |  | District Assessment (1 day), 9 Weeks Exams (2 days) |  |  | | |

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| **Unit 2: Trigonometric Identities and Equations** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| F-TF.2.7 | Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. | | | | | | 2, 5, 6 |
| F-TF.3.8 | Prove the Pythagorean identity sin²(θ) + cos²(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle. | | | | | | 3, 7 |
| F-TF.3.9 | Prove the addition and subtraction, half-angle, and double-angle formulas for sine, cosine, and tangent and use them to solve problems. | | | | | | 2, 3, 5, 7 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P06:** Prove and apply trigonometric identities.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p06.docx) | | | | * Students may give a restricted solution when no domain restriction is given. * Students may use solving techniques when simplifying or verifying identities. | | | |
| **Math Practices for Unit** | | | **Unit Connections** | | **Instructional Resources** | | |
| 1. Make sense of problems and persevere in solving them. | | 5. Use appropriate tools strategically. | **For Calculus preparation, *if you have time* please include**   * **Power reducing identities** | |  |  | |
| 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 2: Trigonometric Identities and Equations** | | | | | | |
| **Learning Goal** | [**P06:** Prove and apply trigonometric identities.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p06.docx) | | | | **Suggested # of Days** | **21** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 3 | F-TF.3.8 | 5.1 Trigonometric Identities |  |  | | |
| 3 | F-TF.3.8 | 5.2 Verifying Trigonometric Identities |  |  | | |
| 3 | F-TF.2.7 | 5.3 Solving Trigonometric Equations |  |  | | |
| 4 | F-TF.3.9 | 5.4 Sum and Difference Identities |  |  | | |
| 4 | F-TF.3.9 | 5.5 Multiple–Angle Identities  (double and half angles only) |  |  | | |
| 4 |  | Review/Assessments |  |  | | |

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| **Unit 3: Vectors** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| N-VM.1.1 | Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v) | | | | | | 1, 2 |
| N-VM.1.2 | Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. | | | | | | 5 |
| N-VM.1.3 | Solve problems involving velocity and other quantities that can be represented by vectors. | | | | | | 1, 4, 5, 6 |
| N-VM.2.4 | Add and subtract vectors.   1. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. 2. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. 3. Understand vector subtraction **v** – **w** as **v** + (–**w**), where –**w** is the additive inverse of **w**, with the same magnitude as **w** and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise. | | | | | | 2, 3, 5 |
| N-VM.2.5 | Multiply a vector by a scalar.   1. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c(vx , vy) = (cvx , cvy). 2. Compute the magnitude of a scalar multiple c**v** using ||c**v**|| = |c|v. Compute the direction of c**v** knowing that when |c|v ≠ 0, the direction of c**v** is either along **v** (for c > 0) or against **v** (for c < 0). | | | | | | 2, 5 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P10:** Represent and model with vector quantities.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p10.docx)  [**P11:** Perform operations and vectors.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p11.docx) | | | |  | | | |
| **Math Practices for Unit** | | | **Unit Connections** | | **Instructional Resources** | | |
| 1. Make sense of problems and persevere in solving them. | | 5. Use appropriate tools strategically. | Bering is not included in the standards, while it is addressed in the text book. | |  |  | |
| 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 3: Vectors** | | | | | | |
| **Learning Goals** | [**P10:** Represent and model with vector quantities.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p10.docx)  [**P11:** Perform operations and vectors.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p11.docx) | | | | **Suggested # of Days** | **8** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 3 | N-VM.1.1  N-VM.1.2  N-VM.1.3  N-VM.2.4 (a) | 8.1 Introduction to Vectors |  |  | | |
| 3 | N-VM.1.2  N-VM.1.3  N-VM.2.4  N-VM.2.5 | 8.2 Vectors in the Coordinate Plane |  |  | | |
| 2 |  | Review/Assessments |  |  | | |

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| **Unit 4: Polar Coordinates and Complex Numbers** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| N-CN.1.3 | Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. | | | | | | 1, 2 |
| N-CN.2.4 | Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number. | | | | | | 5 |
| N-CN.2.5 | Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, (–1 + √3 i)³ = 8 because (–1 + √3 i) has modulus 2 and argument 120°. | | | | | | 1, 4, 5, 6 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P09:** Represent complex numbers and their operations on the complex plane.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p09.docx) | | | |  | | | |
| **Math Practices for Unit** | | | **Unit Connections** | | **Instructional Resources** | | |
| 1. Make sense of problems and persevere in solving them. | | 5. Use appropriate tools strategically. | In Algebra 2 students have seen complex form of a number, performed addition, subtraction, and multiplication of complex numbers, and solved quadratic equations with complex solutions.  For Calculus preparation, *if time* please include   * Graphing Polar Equations (Section 9.2) | |  |  | |
| 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: Polar Coordinates and Complex Numbers** | | | | | | |
| **Learning Goal** | [**P09:** Represent complex numbers and their operations on the complex plane.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p09.docx) | | | | **Suggested # of Days** | **13**  **(4)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 1 | N-CN.1.3 | 0.2 Operations of Complex Numbers  (Example #4) |  |  | | |
| 2 | N-CN.2.4 | 9.1 Polar Coordinates |  |  | | |
| 2 | 9.3 Polar and Rectangular Forms of Equations  (Examples 1-3) |  |  | | |
| 5 | N-CN.1.3  N-CN.2.4  N-CN.2.5 | 9.5 Complex Numbers and De Moivre’s Theorem |  |  | | |
| 3 |  | Review/Assessments |  |  | | |
| **4** |  | District Assessment (1 day); 9 Weeks Exams (3 days) |  |  | | |

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| **Unit 5: Conic Sections** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| G-GPE.1.1 | Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. | | | | | | 1, 3, 5, 6 |
| G-GPE.1.2 | Derive the equation of a parabola given a focus and directrix. | | | | | | 1, 3, 5, 6 |
| G-GPE.1.3 | Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. | | | | | | 1, 3, 5, 6 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P07:** Translate between the geometric description and the equation for a conic section.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p07.docx) | | | |  | | | |
| **Math Practices for Unit** | | | **Unit Connections** | | **Instructional Resources** | | |
| 1. Make sense of problems and persevere in solving them. | | 5. Use appropriate tools strategically. | Geometry students will have seen graphing circles in standard form.  Algebra 2 students have seen graphing parabolas.  While the standards do not specifically include graphing and identifying critical parts of a conic section, the EOC test questions might require students to identify graphs and critical parts of conic sections using completing the square. | |  |  | |
| 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 5: Conic Sections** | | | | | | |
| **Learning Goal** | [**P07:** Translate between the geometric description and the equation for a conic section.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p07.docx) | | | | **Suggested # of Days** | **12** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 3 | G-GPE.1.2 | 7.1 Parabola |  |  | | |
| 3 | G-GPE.1.1  G-GPE.1.3 | 7.2 Circles and Ellipses |  |  | | |
| 3 | G-GPE.1.3 | 7.3 Hyperbolas |  |  | | |
| 3 |  | Review/Assessments |  |  | | |

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| **Unit 6: Functions from a Calculus Perspective** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| F-BF.1.1 | Write a function that describes a relationship between two quantities.   1. Determine an explicit expression, a recursive process, or steps for calculation from a context. 2. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. 3. Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. | | | | | | 1, 2, 4, 5 |
| F-BF.2.4 | Find inverse functions.   1. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x³ or f(x) = (x+1)/(x–1) for x ≠ 1. 2. Verify by composition that one function is the inverse of another. 3. Read values of an inverse function from a graph or a table, given that the function has an inverse. 4. Produce an invertible function from a non-invertible function by restricting the domain. | | | | | | 3, 5, 8 |
| C.1.1 | Understand the concept of limit and estimate limits from graphs and tables of values. | | | | | | 1, 2, 5 |
| C.1.9 | Understand continuity in terms of limits. | | | | | | 1, 2 |
| C.1.10 | Decide if a function is continuous at a point. | | | | | | 2 |
| C.1.11 | Find the types of discontinuities of a function. | | | | | | 1 |
| C.1.12 | Understand and use the intermediate value theorem on a function over a closed interval. | | | | | | 2, 3 |
| C.1.13 | Understand and apply the extreme value theorem: If f(x) is continuous over a closed interval, then f has a maximum and a minimum on the interval. | | | | | | 2, 3 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P03:** Build functions that model relationships between quantities, and new functions (inverse/composite) from existing functions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p03.docx)  [**P12:** Understand continuity in terms of limits, using graphs, tables, and equations to identify points and types of discontinuity.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p12.docx)  [**P14:** Understand and use the Intermediate and Extreme Value Theorems over closed intervals.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p14.docx) | | | |  | | | |
| **Math Practices for Unit** | | | **Unit Connections** | | **Instructional Resources** | | |
| 1. Make sense of problems and persevere in solving them. | | 5. Use appropriate tools strategically. | From Algebra 2, students have been introduced inverse functions, combinations and composition of functions. | |  |  | |
| 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 6: Functions from a Calculus Perspective** | | | | | | |
| **Learning Goals** | [**P03:** Build functions that model relationships between quantities, and new functions (inverse/composite) from existing functions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p03.docx)  [**P12:** Understand continuity in terms of limits, using graphs, tables, and equations to identify points and types of discontinuity.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p12.docx)  [**P14:** Understand and use the Intermediate and Extreme Value Theorems over closed intervals.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p14.docx) | | | | **Suggested # of Days** | **19** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 2 | F-BF.1.1 (a) | 1.1 Functions |  |  | | |
| 2 | F-BF.1.1 | 1.2 Analyzing Graphs of Functions and Relations |  |  | | |
| 4 | C.1.1  C.1.9  C.1.12 | 1.3 Continuity, End Behavior, and Limits |  |  | | |
| 3 | C.1.10  C.1.11  C.1.13 | 1.4 Extrema and Average Rates of Change  (standards do not include average rates of change, extreme value theorem will need to be supplemented) |  |  | | |
| 2 | F-BF.1.1 (b, c) | 1.6 Function Operations and Compositions |  |  | | |
| 2 | F-BF.2.4 | 1.7 Inverse Relations and Functions |  |  | | |
| 4 |  | Review/Assessments |  |  | | |

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| **Unit 7: Polynomial Functions** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| A-APR.3.4 | Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x² + y²)² = (x² – y²)² + (2xy)² can be used to generate Pythagorean triples. | | | | | | 3, 6 |
| A-APR.3.5 | Know and apply the Binomial Theorem for the expansion of  in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal’s Triangle. | | | | | | 2, 7 |
| N-CN.3.9 | Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. | | | | | | 2, 3, 7 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P01:** Use polynomial to solve mathematical problems, including the fundamental theorem of algebra](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p01.docx). | | | |  | | | |
| **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 review from Algebra 2.** | |  |  | |
| 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 7: Polynomial Functions** | | | | | | |
| **Learning Goal** | [**P01:** Use polynomial to solve mathematical problems, including the fundamental theorem of algebra.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p01.docx) | | | | **Suggested # of Days** | **11**  **(4)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 2 | A-APR.3.4  N-CN.3.9 | 2.2 Polynomial Functions |  |  | | |
| 2 | 2.3 Remainder and Factor Theorems |  |  | | |
| 3 | 2.4 Zeros of Polynomial Functions |  |  | | |
| 2 | A-APR.3.5 | 10.5 The Binomial Theorem |  |  | | |
| 2 |  | Review/Assessments |  |  | | |
| **4** |  | District Assessment (1 day); FSA ELA Writing;  (1 day); 9 Weeks Exams (2 days) |  |  | | |

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| **Unit 8: Rational Expressions** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| A-APR.4.6 | Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system. | | | | | | 3, 6, 7 |
| A-APR.4.7 | Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. | | | | | | 3, 6, 7 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P02:** Rewrite rational expressions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p02.docx) | | | |  | | | |
| **Math Practices for Unit** | | | **Unit Connections** | | **Instructional Resources** | | |
| 1. Make sense of problems and persevere in solving them. | | 5. Use appropriate tools strategically. | Students completed simplifying rational expressions in Algebra 1.  Students completed simplifying rational expressions in Algebra 2.  For Calculus preparation, please include   * Graphing of Rational Functions | |  |  | |
| 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 8: Rational Functions** | | | | | | |
| **Learning Goal** | [**P02:** Rewrite rational expressions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p02.docx) | | | | **Suggested # of Days** | **12** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 5 | A-APR.4.6  A-APR.4.7 | 2.5 Rational Functions |  |  | | |
| 4 | 6.4 Partial Fractions |  |  | | |
| 3 |  | Review/Assessments |  |  | | |

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| **Unit 9: Limits** | | | | | | | |
| **Code** | **Mathematics Florida Standard** | | | | | | **SMP** |
| C.1.1 | Understand the concept of limit and estimate limits from graphs and table of values. | | | | | | 1, 2, 5 |
| C.1.2 | Find limits by substitution. | | | | | | 5, 6 |
| C.1.3 | Find limits of sums, differences, products and quotients. | | | | | | 5, 6, 7 |
| C.1.4 | Find limits of rational functions that are undefined at a point. | | | | | | 5, 6, 7 |
| C.1.5 | Find one-sided limits. | | | | | | 1, 5, 6, 7 |
| **Learning Goal and Scale** | | | | **Instructional Strategies & Misconceptions** | | | |
| [**P13:** Estimate and calculate limits, including operations on functions, one-sided limits, and limits of rational functions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p13.docx) | | | |  | | | |
| **Math Practices for Unit** | | | **Unit Connections** | | **Instructional Resources** | | |
| 1. Make sense of problems and persevere in solving them. | | 5. Use appropriate tools strategically. | * Connect to Precalculus unit 6. | |  |  | |
| 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 9: Limits** | | | | | | |
| **Learning Goal** | [**P13:** Estimate and calculate limits, including operations on functions, one-sided limits, and limits of rational functions.](http://scpsmath.weebly.com/uploads/2/9/1/7/29174797/p13.docx) | | | | **Suggested # of Days** | **10** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 4 | C.1.1  C.1.4  C.1.5 | 12.1 Estimating Limits Graphically |  |  | | |
| 4 | C.1.2  C.1.3  C.1.4  C.1.5 | 12.2 Evaluating Limits Algebraically |  |  | | |
| 2 |  | Review/Assessments |  |  | | |

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| **FOURTH QUARTER** | | | | | | |
| **Unit 10: Exponential and Logarithmic Functions (optional unit – not in standards)** | | | | | | |
| **Learning Goal** |  | | | | **Suggested # of Days** | **14**  **(10)** |
| **Approx. # of Day(s)** | **MAFS** | **Lesson Objective (Instructional Resources)** | **Suggested Assignments/Assessments** | **Ancillary Materials** | | |
| 3 |  | 3.1 Exponential Functions |  |  | | |
| 3 |  | 3.2 Logarithmic Functions |  |  | | |
| 3 |  | 3.3 Properties of Logarithms |  |  | | |
| 3 |  | 3.4 Exponential and Logarithmic Equations |  |  | | |
| 2 |  | Review/Assessments |  |  | | |
| **10** |  | FSA Tests (7 days); 9 Weeks Exams (3 days) |  |  | | |