Curriculum Sample Template – 8 Pages Max. (12 pages for integrated ELA sample)

Grade Level	10th	**Content Area**	Math
Course Title (grades 9-12 Only)	Geometry		
Expected Prior Knowledge *List the knowledge/skills mastered earlier in the year that are foundational to the mastery of the Required Standard(s).*	Pythagorean Theorem, Distance Formula; Completing the Square, Definition and Properties of Circles (not necessarily on coordinate plane), basic understanding of graphing circles (simple examples)		
Alignment to Program of Instruction *Describe how the methods of instruction found in this sequence of lessons align to the Program of Instruction described in the application package.*	During this unit SDAIE strategies are being employed to engage English learners, but also for the general benefit of the entire student population. Students who are engaged in small group lessons will benefit from the type of instruction described here. Some SDAIE strategies include math journals, special attention to vocabulary; heterogeneous grouping; pair-shares to explain steps of math problems; student friendly objectives; etc. This lesson also adheres to the philosophy laid out by the Understanding by Design framework. For example, "transfer of learning" is used during objective 2 to relate graphs of circle to actual circular objects. Desired results are clearly stated throughout the lesson. Class, group, and individual discussions are throughout the lesson as well ensuring deeper understanding and that the teacher is not simply a "purveyor of knowledge." Finally, students are engaged in higher levels of cognitive thought in accordance with Bloom's Taxonomy.		
Standard Number* and Description *The standard number and description of the Required Standard(s) being instructed and assessed to mastery in the curriculum sample.*	G-GPE.A.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.		
Materials/Resources Needed *List all items the teacher and students will need for the entire sequence of instruction (excluding common consumables)*	Smart Board and computer with Smart Notebook Software, Guided Notes, Student math journals, Math glossary, Desmos.com, Worksheet with a couple circle questions, Pieces of paper with circles and their equations.		

* ***Standard Number****: For English Language Arts (Reading and Writing), use Grade, Strand, Standard (e.g., 3.RI.2). For K-8 Math, use Grade, Domain, Cluster, Standard (e.g., 6.EE.B.7). For HS Math, use Conceptual Category-Domain, Cluster, Standard (e.g., A-REI.C.6).*

Lesson (add as needed)	**Instructional Strategies -** *List and describe teacher actions, lesson by lesson, which will provide students with opportunities to engage the grade-level rigor defined by the Required Standard(s). Indicate alignment of instructional strategies to specific component(s) or content/skill(s) of the Required Standard/component.*	**Student Activities -** *Describe the activities, lesson by lesson, in which students will engage to allow them to master the grade-level rigor defined by the Required Standard(s). Indicate alignment of student activities to specific component(s) or content/skill(s) of the Required Standard/component.*
1	**Objective:** Students will derive the equation of a circle using the Pythagorean theorem. **(Key/Advancing Questions)** • How are the equation of a circle, distance formula, and Pythagorean theorem all related? **Activation of Prior Knowledge:** Using the Smart Board, the **teacher will** assign "warm-up" problems on distance formula and Pythagorean theorem. The **teacher will** check for understanding as students work on the "warm-up." Gauging the class' understanding of prior knowledge, the **teacher will** discuss the warm-up problems. **Introduction to New Material ("INM") / Modeling:** The **teacher will** pass out the guided notes that go with the day's lesson. Using the Smart Board, student laptops, and www.desmos.com/calculator the **teacher will** instruct the students to use the desmos graphing calculator to graph a circle (the equation is pre-programmed in). The **teacher will** give the students various tasks to complete where the students will need to manipulate the equation of a circle to find out what each part of the equation does. The **teacher will** then ask them a series of questions about the radius of a given circle. The **teacher will** ask the students to try to figure out different ways to find or calculate the radius. Students may start to think about distance formula or Pythagorean theorem as a viable option when the graph but not the equation is given. The teacher will derive the equation of a circle using Pythagorean Theorem. The **teacher will** use the different colors of the Smart Board to highlight key parts of the problem and differentiate each step. **Guided Practice.** The **teacher will** pass out poster paper to the students. The **teacher will** assign the students into heterogeneous groups of 3 and the students will need to create a visual to explain how to derive the equation of a circle. The teacher will be clear in their instructions and provide a rubric. The **teacher will** check for understanding while each group is working on the matching activity **Independent Practice**: The **teacher will** give each student a small	**Students will** write the objective in their guided notes. **Students will** write down the key/advancing questions in their journal to answer at the end of class. These questions will serve as a closure/self-reflection for students. **Students will** pull out their materials and work on the warm-up problems. **Students will** look at their past notes, ask their peers, or call for the teacher as needed to complete the warm-up problems to review the Pythagorean theorem. **Students will** ask questions and discuss the warm-up problems until students understand them. **Students will** follow along, writing examples from the board in their guided notes, answer all questions from the teacher, and write down significant information to complete the square to find the center and radius of a circle given by an equation. **Students will** use the student laptops appropriately, not deviating from desmos.com. **Students will** highlight key vocabulary words that they do not understand during the course of the lesson. After a class discussion about the words, looking them up in the math glossary, or during group work time students can rewrite them in their notes using student friendly language. Key vocabulary such as Pythagorean Theorem, radius, center, distance formula. **Students will** work together in their groups to create a poster explaining how to derive the equation of a circle. If there is a student in their group that doesn't understand then the rest of the **group will** explain it to them. After this peer interaction, if there are still students that don't know how to solve the problems, the **students will** call the teacher over to help. **Student will** have a graph visual of what is happening when deriving the equation of a circle

	worksheet with some problems for graphing simple circles and deriving the equation given a prompt. **teacher will** ask the students to complete the problems – students must score at least 3 out of 4 to achieve mastery. **Assessment:** The **teacher will** give an exit ticket to assess whether students know how to derive the equation of a circle. This concept will be on a summative test later in the unit.	**Students will** quietly answer the questions from the board in the Independent Practice section of their guided notes. **Students will** complete the assessment question and take the final moments of class to write an answer for their key/advancing questions on their exit tickets/math journals.
2	**Objective:** Students will complete the square to find the center and radius of a circle **(Key/Advancing Questions)** • How can completing the square help with graphing circles? • How might graphing circles be helpful for real-world application? **Activation of Prior Knowledge:** Using the Smart Board, the **teacher will** assign "warm-up" problems reviewing graphing circles and solving simple quadratic equations. The **teacher will** check for understanding as students work on the "warm-up." Gauging the class' understanding of prior knowledge, the **teacher will** discuss the warm-up problems as needed. **Introduction to New Material ("INM") / Modeling:** The **teacher will** pass out the guided notes that go with the day's lesson. Using the Smart Board, the **teacher will** review a couple ways to solve quadratics. The teacher will remind the class about completing the square and explain that it will be useful for finding the equation in $(x-h)^2+(y-k)^2=r^2$ form. The **teacher will** complete the square for several problems, explaining each step and identifying the radius and center point. The **teacher will** then complete the square for an equation that is not a circle (an ellipse) and ask key questions about the differences. **Guided Practice.** The **teacher will** pass out examples of real-world circles on coordinate planes. The **teacher will** assign the students into heterogeneous groups of 3 The **teacher will** ask the students to match equation of circles (where completing the square is required) to the graphs of real circles. The **teacher will** check for understanding while each group is working on the task **Independent Practice**: The **teacher will** pass out several pairs of circle equations that are identical but in different forms. The teacher will ask the students to complete the square to match the equations. HW will	**Students will** write the objective in their guided notes. **Students will** write down the key/advancing questions in their journal to answer at the end of class. These questions will serve as a closure/self-reflection for students. **Students will** pull out their materials and work on the warm-up problems. **Students will** look at their past notes, ask their peers, or call for the teacher as needed to complete the warm-up problems. **Students will** ask questions and discuss the warm-up problems until students understand them. **Students will** follow along, writing examples from the board in their guided notes, answer all questions from the teacher, and write down significant information to find the equation. **Students will** ask questions if they are unsure of the method or steps. **Students will** highlight key vocabulary words that they do not understand during the course of the lesson. After a class discussion about the words, looking them up in the math glossary, or during group work time students can rewrite them in their notes using student friendly language. **Students will** work together in their groups to work on the task provided. **Students will** need to think deeply about the task and may require some help when writing out the polynomial identity. If there is a student in their group that doesn't understand then the rest of the **group will** explain it to them. After this peer interaction, if there are still students that don't know how to solve the problems, the **students will** call the teacher over to explain it. **Students will** quietly answer the questions from the matching activity as their independent practice.

	also be given. Students need to score 3 out of 4 on a rubric. **Assessment:** The **teacher will** also have an exit ticket to assess student's knowledge on the identities learned.	**Students will** complete the assessment question and take the final moments of class to write an answer for their key/advancing questions on their exit tickets/math journals.
3	The **teacher will** instruct students to complete the summative assessment.	The **students will** complete the summative assessment.
4	*Provide an opportunity for the student to complete the summative assessment items which is clearly separate from instruction and guided or independent practice, and in which the student is assessed independently. In the Student Activities column, provide a brief description of the summative assessment (S.A.) items that will allow students to demonstrate mastery of the rigor of the Required Standard(s)/components, and the context in which the items will be administered.*	1. Describe how the Pythagorean Theorem and the equation of a circle are related? 2. Derive the equation of a circle. Draw a diagram and explain. 3. Analyze an equation to decide if it is a circle or not.
S.A.	*Provide an opportunity for the student to complete the summative assessment items which is clearly separate from instruction and guided or independent practice, and in which the student is assessed independently. In the Student Activities column, provide a brief description of the summative assessment (S.A.) items that will allow students to demonstrate mastery of the rigor of the Required Standard(s)/components, and the context in which the items will be administered.*	1. Describe how the Pythagorean Theorem and the equation of a circle are related? 2. Derive the equation of a circle. Draw a diagram and explain. 3. Analyze an equation to decide if it is a circle or not.

Summative Assessment Items and Scoring: *Below, provide at least three Summative Assessment Items that together accurately measure student mastery of the application of the content and/or skills as defined by the grade-level rigor in the Required Standard(s). For each assessment item, provide an answer key or scoring rubric which clearly describes how assessment items are to be scored and how points will be awarded, such that mastery of the application of the content and/or skills as defined by the grade-level rigor in the Required Standard is clearly demonstrated by an acceptable score.*

Each question is worth one point. Partial credit may be given if the mistake is an accidental computation error

Summative Assessment Item 1 (clearly identify answer key/scoring rubric, and acceptable score):

(1) How are the Pythagorean Theorem and the equation of a circle $(x-h)^2+(y-k)^2=r^2$ related? (1 point)

(2) Derive the equation of a circle $(x-h)^2+(y-k)^2=r^2$ from the Pythagorean Theorem. You may choose to draw diagram to help your explanation. Be thorough in your explanation. (2 points)

Total__/3; 0-2 = Incomplete; 2.1-2.3= C; 2.4-2.6= B; 2.7-3 = A (2.1=Mastery)

Summative Assessment Item 2 (clearly identify answer key/scoring rubric, and acceptable score):

(3) Complete the square on the following relations. (1 point each)

(a) $x^2 - 4x + y^2 + 6y - 4 = 8$

(b) $x^2 - x + y^2 + 10y - 7 = -2$

Total__/2; 0-1.3 = Incomplete; 1.4-1.5 = C; 1.6-1.7 = B; 1.8 = A (1.4=Mastery)

Summative Assessment Item 3 (clearly identify answer key/scoring rubric, and acceptable score): (add as needed):

(4) For the equation $x^2 + 6x + y^2 - 4y - 6 = 8$, decide whether it is a circle of not. Explain how you know. (1 point)

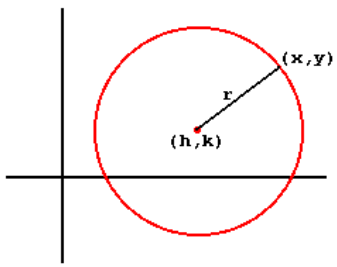
Total__/1; 0-.69 = Incomplete; .7-.79 = C; .8-.89 = B; .9-1.0 = A (.7=Mastery)

Answers:

A typical answer might be:

(1) The graph of a circle is an extension of $a^2 + b^2 = c^2$, where $a = x - h$, $b = y - k$, and $c = r$

(2)



Draw a right triangle where r will be the hypotenuse.
Then plug in the legs: $x - h$ and $y - k$ and the hypotenuse r into the Pythagorean Theorem.
You get $(x - h)^2 + (y - k)^2 = r^2$

*half credit may be given if proof is incorrect due to computation mistake as opposed to conceptual error

(3a)

$$x^2 - 4x + y^2 + 6y - 4 = 8$$
$$x^2 - 4x + 4 + y^2 + 6y + 9 - 4 = 8 + 4 + 9$$
$$(x - 2)^2 + (y + 3)^2 = 25$$

(3b)

$$x^2 - x + y^2 + 10y - 7 = -2$$
$$x^2 - x + \frac{1}{4} + y^2 + 10y + 25 = 5 + \frac{1}{4} + 25$$

$$\left(x-\frac{1}{2}\right)^2+(y+5)^2=30.25$$

(4)

By completing the square for the equation: $x^2+6x+y^2-4y-6=8$, you get the equation: $(x+3)^2+(y-2)^2=27$
This is clearly a circle.
Another answer might be: the coefficient of x^2 and y^2 are the same (and positive). Therefore, this will be a circle.

Total_____/6; 0-4.1 = Incomplete; 4.2-4.7 = C; 4.8-5.3 = B; 5.4-6 = A (Mastery = 4.2)
To achieve master of Standard G-GPE.A.1, students must receive 4.2 out of 6 or 70% on the summative assessment items.