Subject Area	Math
Grade Level	12
Topic	Trigonometry
Length of Unit (days)	15

Stage 1 – Desired Results

Established Goals:
General Outcome: Develop trigonometric reasoning

Specific Outcome 1
Demonstrate an understanding of angles in standard position, expressed in degrees and radians.
Specific Outcome 2
Develop and apply the equation of the unit circle.
Specific Outcome 3
Solve problems, using the six trigonometric ratios for angles expressed in radians and degrees.
Specific Outcome 4
Graph and analyze the trigonometric functions sine, cosine and tangent to solve problems.
Specific Outcome 5
Solve, algebraically and graphically, first and second degree trigonometric equations with the domain expressed in degrees and radians.

Understandings:
Students will understand that…

Radians are a better method of measuring angles in mathematics and physic.
Many of the important formula such as Euler's formula $e^{i\theta} = \cos\theta + i\sin\theta$ are designed with radians in mind.
Radians, being unitless (or at least ignorable units) are extremely beneficial in calculus.
There are common relations between the lengths of a right triangle and certain measurements of angles (30, 45, 60)
The unit circle, despite being a circle (polar coordinates) can be graphed in Cartesian plane. The similarities of cos and sin graphs are just a shift away.

Essential Questions:

To what extend do human conventions inhibits proper/better developments?
For example π is considered to be 180 degrees, which makes describing a full revolution 2π. Would it not be easier to use $\tau = 360\ degrees$ instead? Especially when most of the mathematics equations and formula are only concerned with the radius of the circle, while pi is the relationship between the diameter and circumference, therefore making tau superior in notation.

How does proper representations of periodic motions such as circular and simply harmonic motions beneficial in today's society?
Connections of circular motion and simple harmonic motions.

Does the accuracy of a measurement have any direct implications to real world calculation?
When do the digits of pi stop being useful in real life?

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Prior understandings... From their previous year, students learned how to represent the angle in standard position from 0 to 360 degrees, solving problems using trigonometric properties in a right triangle, and learning sine and cosine law. Now, students will be asked to solve for the special cases in right triangles (30, 45, 60 degrees) without the use of a calculator, represent the circle using a sinusoidal function, and using radians instead of degrees.	*Students will be able to…* -Convert from radians to degrees and vice versa. -Choose appropriate units for angles under certain circumstances. -Applying the concepts of the special triangles to solve relation problems about length of a right triangle and angles. -Plot cosine, sine, and tangent graphs without the need of calculators. -Construct cosine, sine, and tangent graphs based on information given on a circle. -Determine the solution of periodic functions such as tangent, cosine, and sine.
Where does this lead? The introduction of radians will prepare students for the more advanced physics and computational sciences where radian is the only form of accepted input for angles. The functions of cosine and sine also prepares students for advanced math where sine and cosine can model various functions.	*Students will know...* The special triangles are a better method to understand the relation of lengths and angles than the unit circle. And that the entire functions of the unit circle can be described by two triangles and the CAST rule. Cosine graphs and sine graphs are just a pi over two shifts away. The importance of pi and how it became the symbol for math

Stage 2 – Assessment Evidence

Pre-Assessment

KWL Sheet

Quizzes, Tests, Assignments **Partnered Quiz** Students will work through a quiz with the elbow partner that is generally randomly assigned every week. Only one copy is needed to hand in with both of their names on it. This quiz will take place early in the unit, and the marked will be replaced by the unit test, if the unit test has higher scores. **Unit Test**	*Performance Tasks, Projects* You are a Ferris Wheel inspector in training, and you will be trained on how to properly represent the movement and dimensions of a Ferris Wheel using sinusoidal functions. Once certified, you will be sent into the dangerous field of Ferris Wheel inspecting, where the regulations are loose and lives are at stake. It is common knowledge that Ferris Wheel tycoons are notorious for their unwillingness to change anything about their equipment and their nitpickiness in court. Therefore, for every Ferris Wheel that needs to change, you will correctly fill out form FW.7.1 then construct a report using precise language (math) in a way that cannot be misinterpreted on what needs to be changed such that they can be used in court. Due to our overwhelmingly large Jurisdiction, you will be sent around the world for your inspection.

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Other Evidence (observations, work samples, dialogues)	*Student self-assessment*
Question of the day A random/interesting question taken out of the homework the day before. Students will be given ten minutes of in class time to work on it. The student who solves it, if comfortable, can explain their thought process to the class. Walk around the class in those 10 minutes, looking at speed, to determine who done the homework, who knows the material but hasn't done the homework, and who doesn't know the material nor done the homework.	**List of materials on unit test** Before the unit test, a list of topics that is covered on the unit test is provided to students. Students will go through the check lists and check off the topics they know/mastered. At the review class, students will take out the list and ask the teacher to clarify certain topics and concepts that they are experiencing difficulties. The review class will go from the most common question to the least common, and if time run out, students can seek direction from their classmates.

Learning Outcomes	Name	Assessments					
		Question of the Day	KWL sheet/ Exit Slip	Checklist of topics on Quiz/Test	Performance Task Ferris Wheel inspector	Partnered Quiz	Unit Test
	Type (Formative/ Summative)	Formative	Formative	Formative	Summative	Formative Summative	Summative
	Weighting	None	None	None	20%	20%	60%
Demonstrate an understanding of angles in standard position, expressed in degrees and radians.		Π	Π	Π		Π	Π
Develop and apply the equation of the unit circle.		Π		Π		Π	Π
Solve problems, using the six trigonometric ratios for angles expressed in radians and degrees.		Π	Π	Π		Π	Π
Graph and analyze the trigonometric functions sine, cosine and tangent to solve problems.		Π		Π	Π		Π
Solve, algebraically and graphically, first and second degree trigonometric equations with the domain expressed in degrees and radians.		Π		Π			Π

Based on *Understanding by Design,* Wiggins and McTighe (2006), Adapted by Richelle Marynowski (2018)

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Assessment Tool Overview

Assessment Tool Name	Brief Description	Assessment		
		FOR	AS	OF
		Learning		
Question of the Day	**Description:** Every day, for 10 minutes, a question is chosen out of the homework from the day before is posted in front, and students work to solve the problem. Additionally, a question from today's topic can be included in the Daily Question that connects the two lessons together. During this time, I can walk around observing or conversing with students to better understand of their knowledge and abilities. After 10 minutes, students can share the answers and I can write down the solution to make sure everyone has it. I can determine whether or not students are having trouble with a certain type of question, such that he can devout a bit of time revisiting that topic in the future, and prepare/prime students for the upcoming lesson.	Π		
KWL sheet	**Description:** Students will complete a worksheet writing down everything they know about the topic that we are about to cover. It will be used twice this unit, once in the beginning and once in the middle. It is used less frequently due to its purpose of providing direction to teaching rather than assessing understandings.	Π	Π	
Checklist of the topics on Quiz/Test	**Description:** This assessment will be used before the quiz and the unit test. It is simply a list of topics that will be covered and the calculations, theorems, and skills that students should be able to do. Students can use this checklist as a study guide to map out areas of weakness, and then address the weakness in the review session offered before the quiz and test.		Π	
Perform. Task Ferris Wheel Inspector	**Description:** For this performance task, the student takes the role of the Ferris Wheel inspector. The inspectors will observe the movements and structures of Ferris Wheels around the world to determine their safety factor. When a faulty Ferris Wheel has been identified, then students have to fill a report detailing why this particular Ferris Wheel failed and how should it be fixed. This is all done using math as supporting evidence. This assessment requires students to hand in a math report which includes a form, three case studies, and clear and logical reasoning (math) page such that it can be used in a court setting. There will be in total of five case studies to choose from, two are mandatory, and students can choose the third one. The students are required to hand in one form which contains the specific math functions (ease of grading) and a math report for reasons which would provide context. This assessment will be handed out after the class on graphing trigonometric functions, and students can have a week to complete this performance task. The task itself is not time consuming, the only time consuming part should be the part that properly communicate math and talking about a real world object but using mathematics as reasoning. Average expected time is three hours.			Π

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	This performance task focuses on the graphing trigonometric functions as well as function manipulation from the beginning of the course.			
Partnered Quiz	**Description:** This assessment will be done once in the middle of the unit, and students will be randomly paired up by a random number generator to complete a quiz. The student score on the quiz will be replaced by the unit test if the unit test has higher grade, otherwise, the quiz mark stays. Students only need to hand in one copy of the quiz, and if disagreement rises, two or more copies can be handed in for grading. The grade boosting effect wouldn't be significant enough to notice due to the fact that this quiz is only a small part of the unit, not to mention the course.	П		П
Unit Test	**Description:** This is a unit test coving all the topics in this unit. It will take place at the end the unit, preceded by a review session where students have the opportunity to ask questions to clear up misunderstandings. Students should use the checklist and review sessions offered to fill-in any gaps in knowledge they had, and additional tutorial time will be offered before the unit test. If the student achieved a higher score on the unit test than the quiz, the quiz mark will be replaced by the unit test mark.			П