

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: Pre-Calculus/ Pre-Calculus Honors

Course Number: 034300/ 034200

PART I: Unit Rationale

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: Trigonometric Functions Chapter 4	Unit Summary: In this Unit students learn how to evaluate and graph the trigonometric functions, their inverses, and their reciprocals. The chapter begins by introducing radian measure and the definitions of trigonometric functions on the unit circle. Students then learn how to find trigonometric ratios of the acute angle by drawing a right triangle, and of any angle by drawing a unit circle and a reference angle. They also learn how to graph trigonometric functions and how to identify the basic characteristics of the trigonometric functions, their reciprocals, and their inverses. Finally, students use trigonometric ratios to solve problems in a variety of contexts, such as mechanics, biology, and navigation. Students will use specific math vocabulary associated with trigonometric functions.
Grade Level(s): 10-12	
Essential Question(s): <ul style="list-style-type: none"> • How do you describe angles and angular movement? • How do you evaluate trigonometric functions by using the unit circle? • How do you use trigonometry to find unknown side lengths and angle measures in right triangles? • How do you evaluate trigonometric functions of any angle? • How do you sketch the graphs of sine and cosine functions? • How do you sketch the graphs of other trigonometric functions? • How do you evaluate and graph the inverses of trigonometric functions? • How do you use 	Enduring Understanding(s): <ul style="list-style-type: none"> • Describe angles. • Use radian measure. • Use degree measure and convert between degrees and radians. • Use angles to model and solve real life problems. • Identify the unit circle and describe its relationship to real numbers. • Evaluate trigonometric functions using the unit circle. • Use domain and period to evaluate sine and cosine functions and use a calculator to evaluate trigonometric functions. • Evaluate trigonometric functions of acute angles and use a calculator to evaluate trigonometric functions. • Use fundamental trigonometric identities. • Use trigonometric functions to model and solve real-life problems. • Evaluate trigonometric functions of any angle. • Find reference angles. • Evaluate trigonometric functions of real numbers. • Sketch the graphs of basic sine and cosine functions. • Use amplitude and period to help sketch the graphs of sine and cosine functions. • Sketch translations of graphs of sine and cosine functions. • Use sine and cosine functions to model real-life data. • Sketch the graphs of tangent functions. • Sketch the graphs of cotangent functions.

trigonometric functions to solve real life problems?

- Sketch the graphs of secant and cosecant functions.
- Evaluate and graph inverse sine functions.
- Evaluate and graph other inverse trigonometric functions.
- Evaluate compositions of trigonometric functions.
- Solve real life problems involving right triangles.
- Solve real life problems involving directional bearings.
- Solve real life problems involving harmonic motion.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the New Jersey Student Learning Standards that are applicable.

<u>Learning Target</u>	<u>NJSLS</u>
1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	1. NJSLS-F-TF.A.1 -
2. 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.	2. NJSLS-G-C.B.5 - 3. NJSLS-F-TF.A.2
3. 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.	4. NJSLS-N-HSF-TF.A.4
4. Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.	5. NJSLS-N- HSF-TF.B
5. Model periodic phenomena with trigonometric functions	
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.	6. NJSLS- G-SRT.C.6 7. NJSLS-G-SRT.C.8
7. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	8. NJSLS-F-TF.A.3
8. Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi-x$, $\pi+x$, and $2\pi-x$ in terms of their values for x , where x is any real number.	9. NJSLS-F-TF.C.8
9. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.	
10. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	10. NJSLS-F-TF.B.5
11. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	11. NJSLS-N-Q.A.1 12. NJSLS-F-TF.B.6
12. Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.	13. NJSLS-F-TF.B.7
13. 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.	

Inter-Disciplinary Connections:

Mathematical Modeling:

- Students can determine the measure of an angle generated as a skater performs an axel jump, as shown in Ex. 110 pg. 263.
- Students can model the displacement from equilibrium of an oscillating weight suspended by a spring as a function of time, as shown in Ex. 75 pg. 271.
- Students can approximate the angle of elevation of a zip-line, as shown in Ex. 78 pg. 282.
- Students can use trigonometric functions to model the monthly sales of a seasonal product, such as wakeboards, as shown in Ex. 124 pg. 291.
- Students can use a trigonometric function to model the percent of the moon's face that is illuminated for any given day in 2016 as shown in Ex. 87 pg. 301.
- Students can use a tangent function to model and analyze the distance between a television camera and a parade unit, as shown in Ex. 64 pg. 312.
- Students can investigate the relationship between the height of a cone-shaped pile of rock salt, the angle of the cone shape and the diameter of its base, as shown in Ex. 99 pg. 324.
- Students can use a trigonometric function to model the length of the shadow of the Sundial Bridge in Redding, California, as shown in Ex. 35 pg. 333.

Students will engage with the following text:

Pre-Calculus With Limits A Graphing Approach- 7e Ron Larson

Resources : Coursemate; A variety of technology tools, other texts as per teacher discretion.

Students will write:

Students will write notes and copy class examples to better comprehend the skills being taught. Students will write solutions to open-ended math problems and word problems dealing with real-world applications. Students will graph interpretations of functions.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Section 4.1		
	Regular	Honors
Standards for Mathematical Practice	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.
Practice and Apply Assigning Homework (Tasks are assigned as per the discretion of the teacher.)	Day 1: pp. 261-262 Ex. 5-12, 13-29 odd, 30, 31, 35-85 odd Day 2: pp. 263-264 Ex. 89-107 odd, 108-110, 113-118, 120, 123, 125	Day 1: pp. 261-262 Ex. 5, 6, 20-28 even, 32-42 even, 48-54 even, 68-88 even Day 2: pp. 263-264 Ex. 90-104 even, 105-112, 116-120, 124-128 even
Section 4.2		
	Regular	Honors
Standards for Mathematical Practice	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.
Practice and Apply Assigning Homework (Tasks are assigned as per the discretion of the teacher.)	Day 1: pp. 270-271 Ex. 1-12, 13-69 odd Day 2: pp. 271-272 Ex. 71-87, 91,93	Day 1: pp. 270-271 Ex. 5-8, 10-22 even, 28-46 even, 47-52, 58-70 even Day 2: pp. 271-272 Ex. 72, 74-78, 84-90, 92, 94

Section 4.3

	Regular	Honors
Standards for Mathematical Practice	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.
Practice and Apply Assigning Homework (Tasks are assigned as per the discretion of the teacher.)	Day 1 pp. 280-281 Ex. 1, 3-6, 7-19 odd, 21-52, 53-65 odd Day 2: pp 281-283 Ex. 67-75 odd, 77-81, 84-87, 90-98	Day 1: pp 280-281 Ex. 13-30, 32-36 even, 45-52, 54-58 even, 59-66 Day 2: pp. 281-283 Ex. 68-76 even, 77-83, 87, 88, 90-98

Section 4.4

	Regular	Honors
Standards for Mathematical Practice	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.
Practice and Apply Assigning Homework (Tasks are assigned as per the discretion of the teacher.)	Day 1: pp289-290 Ex. 1-10, 11-21 odd, 23-26, 27-83 odd Day 2: pp 290-291 Ex. 91-117 odd, 123, 124, 126-131, 134, 135-139 odd	Day 1: pp. 289-290 Ex. 1-10, 16-34 even, 35-38, 60-78 even Day 2: pp. 290-291 Ex. 86-108 even, 119-126, 131, 134-140 even

Section 4.5

Standards for Mathematical Practice	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.
Practice and Apply Assigning Homework (Tasks are assigned as per the discretion of the teacher.)	Day 1: pp. 299-300 Ex. 1-20, 21-37 odd, 57-69 odd, 71-74, 75-79 odd Day 2: pp. 301-303 Ex. 81, 82, 83-87 odd, 89-92, 95-99, 101, 102, 105-108	Day 1: pp. 299-300 Ex. 1-9, 10-20 even, 30-38 even, 39-42, 44-52 even, 67-87 Day 2: pp. 301-303 Ex. 85-88, 93-98, 101-108

Section 4.6

	Regular	Honors
Standards for Mathematical Practice	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.
Practice and Apply Assigning Homework (Tasks are assigned as per the discretion of the teacher.)	Day 1: pp. 311-312 Ex. 1-8, 9-19 odd, 29-47, 49, 51-55, 57 Day 2: pp. 312-314 Ex. 59-66, 68-72, 75, 76, 78-87, 89	Day 1: pp. 311-312 Ex. 1, 4-8, 22-34 even, 35-46, 51-58 Day 2: pp. 312-314 Ex. 59-67, 72, 74, 77-86, 88, 90

Section 4.7

	Regular	Honors
Standards for Mathematical Practice	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express

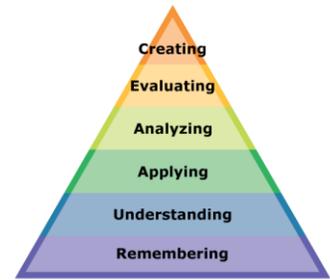
		regularity in repeated reasoning.	regularity in repeated reasoning.	
	Practice and Apply Assigning Homework (Tasks are assigned as per the discretion of the teacher.)	Day 1: pp. 322-323 Ex. 1-4, 5-13odd, 14-16, 17-71 odd Day 2: pp 324-325 Ex. 73-79 odd, 81-100, 102, 104-114, 119-126	Day 1: pp. 322-323 Ex. 1-4, 6-14 even, 15-18, 24-30 even, 34-52 even, 60-72 even Day 2: pp 324-3254 Ex. 73-103, 107-126	

Section 4.8

	Regular	Honors	
Standards for Mathematical Practice	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.	MP 1- Make sense of problems and persevere in solving them MP 2- Reason abstractly and quantitatively MP 3- Construct viable arguments and critique MP 4- Model with mathematics MP 5- Use appropriate tools strategically MP 6- Attend to precision MP 7- Look for and make use of structure MP 8- Look for and express regularity in repeated reasoning.	
Practice and Apply Assigning Homework (Tasks are assigned as per the discretion of the teacher.)	Day 1: pp 332-334 Ex. 1-4, 5-43 odd Day 2: pp. 335-337 Ex. 47-52, 55-66, 68, 71-74, 76, 77-83 odd	Day 1: pp. 332-334 Ex. 12-24even, 28, 30, 31, 36-44 even Day 2: pp. 335-337 Ex. 45-54, 56-62 even, 63-65, 67-69, 76-84 even	

PART IV: EVIDENCE OF LEARNING

**IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.**



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per student IEP or 504 Plan

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Student Learning Standards for Mathematics listed under each chapter in the Pre-Calculus curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Periodic Benchmark Tests
- End of Course Assessment
- Standardized Tests

Accommodations/Modifications:

As per student IEP or 504 Plan

Performance Assessments:

The following assessments requires students to utilize various strands of mathematics.

- Projects
- Performance Tasks

- Homework
- Classwork

Accommodations/Modifications:

As per student IEP or 504 Plan