

Course Title: APPLICATIONS OF GEOMETRY & TRIGONOMETRY

Board Approval Date: 05/19/14

Reviewed Annually

Credit/Hours: 1 credit

Course Description:

This course focuses on mastery of the PA Core Standards for Mathematics. As students progress through this course they will participate in a systematic study of the fundamentals of trigonometry, including discussion of the unit circle, graphing of the six trigonometric functions, solving triangles, and practical applications of trigonometry.

Learning Activities / Modes of Assessment:

Large group instruction
Laboratory experiments
Small group work

Tests and Quizzes
Checklists / Teacher Observation
Projects with Rubrics

Instructional Resources:

Teacher made resources

Course Pacing Guide

Course: Applications of Geometry & Trigonometry

Course Unit(Topic)

Length of Instruction (Days/Periods)

1. Right Triangle Trigonometry Review	35 days
2. Applications of Trigonometry	45 days
3. Angles and the Unit Circle	45 days
4. Periodic Functions and Graphing	30 days
5. Enrichment	<u>15 days</u>
DAYS TOTAL	170 days

Topic: 1. Right Triangle Trigonometry Review

Days: 35

Subject(s):

Grade(s):

Know:

Understand:

Do:

2.5.G.A – Essential PROBLEM SOLVING -
Develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense, and explain how the problem was solved in grade appropriate contexts.

2.5.G.B – Important COMMUNICATION -
Use symbols, mathematical terminology, standard notation, mathematical rules, graphing, and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas, and results.

2.10.G.A – Essential RIGHT TRIANGLES CONCEPTS AND APPLICATIONS -
Identify, create, and solve practical problems involving right triangles using the trigonometric ratios and the Pythagorean Theorem.

2.10.G.B – Essential TRIGONOMETRIC FUNCTIONS -
Intentionally Blank

Pythagorean Theorem/
Converse

Right triangles have a broad range of relationships that lead to many applications and uses.

CC.2.3.HS.A.7 - Apply trigonometric ratios to solve problems involving right triangles.

CC.2.3.8.A.3 - Understand and apply the Pythagorean Theorem to solve problems.

CC.2.3.HS.A.7 - Apply trigonometric ratios to solve problems involving right triangles.

CC.2.3.8.A.3 - Understand and apply the Pythagorean Theorem to solve problems.

Topic: 1. Right Triangle Trigonometry Review

Days: 35

Subject(s):

Grade(s):

Know:

Understand:

Do:

<p>Special Right Triangles</p> <p>Trigonometric Ratios</p> <p>2.5.G.A - PROBLEM SOLVING - Develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense, and explain how the problem was solved in grade appropriate contexts.</p> <p>2.5.G.B - COMMUNICATION - Use symbols, mathematical terminology, standard notation, mathematical rules, graphing, and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas, and results.</p> <p>2.10.G.A - RIGHT TRIANGLES CONCEPTS AND APPLICATIONS - Identify, create, and solve practical problems involving right triangles using the trigonometric ratios and the Pythagorean Theorem.</p> <p>2.10.G.B - TRIGONOMETRIC FUNCTIONS -</p> <p>Intentionally Blank</p>		
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Topic: 1. Right Triangle Trigonometry Review

Days: 35

Subject(s):

Grade(s):

Know:

Understand:

Do:

2.10.11.A - RIGHT TRIANGLES CONCEPTS AND APPLICATIONS - Identify, create, and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.		
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Topic: Right Triangle Trigonometry Review

Days: 30

Subject(s):

Grade(s):

Key Learning: Right triangles have a broad range of relationships that lead to many applications and uses.



Unit Essential Question(s):

How are right triangle properties used to find missing components in triangles within application problems?



Concept:
Pythagorean Theorem



Concept:
Applications of Pythagorean Theorem



Concept:
Special Right Triangles



Lesson Essential Question(s):
What can the Pythagorean theorem tell us about triangles? (A)



Lesson Essential Question(s):
How can using the Pythagorean theorem help us solve application problems? (A)



Lesson Essential Question(s):
What are the relationships of 30-60-90 and 45-45-90 triangles? (A)



Vocabulary:

Vocabulary:

Vocabulary:

Concept:
Special Right Triangle Applications



Concept:
SohCahToa



Concept:
SohCahToa Applications



Lesson Essential Question(s):
How can special right rules help us solve application problems? (A)



Lesson Essential Question(s):
How can the ratios of sine, cosine, and tangent help us find missing parts of right triangles? (A)



Lesson Essential Question(s):
How can the three trig functions be used to solve applications problems? (A)



Vocabulary:

Vocabulary:

Vocabulary:

Additional Information:

Attached Document(s):

Vocab Report for Topic: Angles and the Unit Circle

Days: 25

Subject(s):

Grade(s):

Concept: Angles of Trigonometry

standard position -
initial side -
terminal side -

Concept: Unit Circle in Degrees

special right triangles -

Concept: Unit Circle in Radians

special right triangles -

Concept: Arc Length

arc -
sector -
circumference -

Topic: Angles and the Unit Circle

Days: 25

Subject(s):

Grade(s):

Key Learning:
The Unit Circle helps us find the trigonometric value of virtually any angle.



Unit Essential Question(s):
How does the unit circle help us find arc length?



Concept:
Angles of Trigonometry



Concept:
Unit Circle in Degrees



Concept:
Unit Circle in Radians



Lesson Essential Question(s):
 How is an angle created the coordinated plane? (A)



Lesson Essential Question(s):
 How do the special right triangles help us find the values of sine, cosine, and tangent at particular angles around the unit circle? (A)



Lesson Essential Question(s):
 How do the special right triangles help us find the values of sine, cosine, and tangent at particular angles around the unit circle? (in radians) (A)



Vocabulary:
 standard position, initial side, terminal side

Vocabulary:
 special right triangles

Vocabulary:
 special right triangles

Concept:
Arc Length



Lesson Essential Question(s):
 How do we use radian measure to find lengths of arcs around a circle and in application problems? (A)



Vocabulary:
 arc, sector, circumference

Additional Information:

Attached Document(s):

Topic: 2. Applications of Trigonometry

Days: 45

Subject(s):

Grade(s):

Know:	Understand:	Do:
<p>Law of Sines</p> <p>Law of Cosines</p> <p>Heron's Formula</p> <p>Area of Triangles</p>	<p>Evaluating inverse trigonometric functions</p> <p>To solve triangles</p> <p>To find the area of triangles</p> <p>Applications and Modeling</p>	<p>Real Life Applications</p> <p>F.TF.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.</p> <p>G.SRT.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).</p> <p>G.SRT.10 - (+) Prove the Laws of Sines and Cosines and use them to solve problems.</p> <p>G.SRT.9 - (+) Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.</p>

Topic: Applications of Trigonometry

Days: 25

Subject(s):

Grade(s):

Key Learning:
Solving for the area and missing parts of triangles in application problems



Unit Essential Question(s):
How are the Law of Sines, Law of Cosines, and Heron's formula used to find missing components and area of triangles?



Concept:
Law of Sines



Concept:
Law of Cosines



Concept:
Law of Sines and Cosines Applications



Lesson Essential Question(s):
 How is the law of sines used to find missing sides and angles of triangles? (A)



Lesson Essential Question(s):
 How is the law of cosines used to find missing sides and angles of triangles? (A)



Lesson Essential Question(s):
 How is the law of sines and cosines used to solve application problems? (A)



Vocabulary:

Vocabulary:

Vocabulary:

Concept:
Area of Triangles



Concept:
Area of Triangle Applications



Lesson Essential Question(s):
 How is Heron's formula and sine used to find the area of a triangle without base and height? (A)



Lesson Essential Question(s):
 How can Heron's formula and sine be used to find the area of triangles in application problems? (A)



Vocabulary:
 heron's formula

Vocabulary:

Additional Information:

Attached Document(s):

Vocab Report for Topic: Applications of Trigonometry
Subject(s):

Days: 25
Grade(s):

Concept: Area of Triangles

heron's formula -

Topic: 3. Angles and the Unit Circle
 Subject(s):

Know:	Understand:	Do:
<p>Definitions of the 3 trigonometric functions</p> <p>Radian measure</p> <p>Arc length</p> <p>Area of a sector</p> <p>The Unit Circle</p>	<p>Measuring angles in degrees and radians</p> <p>Evaluating the three trigonometric functions.</p> <p>Applications and Modeling</p>	<p>G.C.2 - Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.</p> <p>G.C.5 - Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.</p> <p>F.TF.1 - Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.</p> <p>F.TF.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.</p> <p>F.TF.3 - Use special triangles to determine geometrically the values of sine, cosine, tangent for $n/3$, $n/4$ and $n/6$, and use the unit circle to express the values of sine, cosines, and tangent for x, $n + x$, and $2n - x$ in terms of their values for x, where x is any real number.</p> <p>F.TF.4 - Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.</p>

Topic: Enrichment
Subject(s):

Days: 25
Grade(s):

Key Learning:
Use probability and statistics to make predictions and generalizations.



Unit Essential Question(s):
How can use probability and statistics to make predictions and generalizations about data?



Concept:
Probability and Statistics



Lesson Essential Question(s):
What is the difference between independent and dependent events? (A)
How can we use statistics to model real life situations? (A)



Vocabulary:
dependent, independent, standard deviation, mean, conditional probability, experimental probability, permutation, combinations

Additional Information:

Attached Document(s):

Vocab Report for Topic: Enrichment

Days: 25

Subject(s):

Grade(s):

Concept: Probability and Statistics

dependent -

independent -

standard deviation -

mean -

conditional probability -

experimental probability -

permutation -

combinations -

Topic: 4. Periodic Functions and Graphing

Days: 30

Subject(s):

Grade(s):

Know:

Understand:

Do:

<p>Graphs of the 3 trigonometric functions</p> <p>Patterns and tendencies of Periodic Functions</p> <p>Radian measure</p>	<p>Measuring angles in degrees and radians</p> <p>Interpreting the graphs of the 3 trigonometric functions</p> <p>Evaluating the three trigonometric functions</p> <p>Applications and Modeling</p>	<p>F.TF.1 - Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.</p> <p>F.TF.4 - Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.</p> <p>F.TF.5 - Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.</p> <p>F.IF.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</p> <p>F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</p> <p>F.IF.7e - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</p>
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Topic: Periodic Functions and Graphing

Days: 25

Subject(s):

Grade(s):

Key Learning:

Periodic functions model real life relationships by using the functions, sine, cosine, and tangent.



Unit Essential Question(s):

How can we model real life situations with periodic functions?



Concept:

Patterns of Periodic Functions



Concept:

Applications of Periodic Functions



Concept:

Graphing Sine, Cosine, and Tangent



Lesson Essential Question(s):

What are the tendencies of periodic functions? (A)



Lesson Essential Question(s):

How can we model real life situations with periodic functions? (A)



Lesson Essential Question(s):

What are the steps for graphing sine, cosine, and tangent? (A)



Vocabulary:

amplitude, frequency, period, maximum, minimum

Vocabulary:

Vocabulary:

vertical shift, horizontal shift, asymptote

Additional Information:

Attached Document(s):

Vocab Report for Topic: Periodic Functions and Graphing

Days: 25

Subject(s):

Grade(s):

Concept: Patterns of Periodic Functions

amplitude -
frequency -
period -
maximum -
minimum -

Concept: Graphing Sine, Cosine, and Tangent

vertical shift -
horizontal shift -
asymptote -

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Topic: 5. Enrichment

Days: 15

Subject(s):

Grade(s):

Know:	Understand:	Do:
<p>Probability and Statistics</p>	<p>conditional probability</p> <p>independent vs dependent probability</p> <p>sample space</p> <p>unions and intersections</p> <p>applications and models</p> <p>combinations and permutations</p> <p>standard deviation</p>	<p>S.CP.1 - Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").</p> <p>S.CP.2 - Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.</p> <p>S.CP.3 - Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.</p> <p>S.CP.5 - Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.</p> <p>S.CP.6 - Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.</p> <p>S.CP.9 - (+) Use permutations and combinations to compute probabilities of compound events and solve problems.</p> <p>S.MD.5.a - Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.</p> <p>S.MD.5 - (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.</p> <p>S.MD.6 - (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).</p> <p>S.MD.7 - (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).</p> <p>S.ID.1 - Represent data with plots on the real number line (dot plots, histograms, and box plots).</p> <p>S.ID.2 - Use statistics appropriate to the shape of the</p>

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Topic: 5. Enrichment

Days: 15

Subject(s):

Grade(s):

Know:

Understand:

Do:

		data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
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