

Unit	Lesson	Lesson Objectives
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Right Triangle Relationships and Trigonometry**Triangle Classification Theorems**

- Apply the converse of the Pythagorean theorem and triangle inequality theorems to solve problems.
- Classify a triangle using the converse of the Pythagorean theorem and triangle inequality theorems.
- Determine an unknown side length or range of side lengths of a triangle given its classification.

Special Right Triangles

- Complete the steps to prove special right triangle theorems.
- Determine unknown measures of 30° - 60° - 90° triangles.
- Determine unknown measures of 45° - 45° - 90° triangles.
- Solve real-world problems involving special right triangles.

Trigonometric Ratios

- Given an acute angle of a right triangle, label the hypotenuse, opposite, and adjacent sides.
- Given an acute angle of a right triangle, write ratios for sine, cosine, and tangent.
- Relate trigonometric ratios of similar triangles and the acute angles of a right triangle.

Solving for Side Lengths of Right Triangles

- Apply trigonometric ratios to solve real-world problems.
- Solve for unknown side lengths of right triangles using trigonometric ratios.
- Write equations using trigonometric ratios that can be used to solve for unknown side lengths of right triangles.

Solving for Angle Measures of Right Triangles

- Apply inverse trigonometric functions to solve real-world problems.
- Solve for unknown angles of right triangles using inverse trigonometric functions.
- Write equations that can be used to solve for unknown angles in right triangles.

Law of Sines

- Apply the law of sines to solve real-world problems.
- Complete the steps to prove the law of sines.
- Solve mathematical problems using the law of sines.

Law of Cosines

- Apply the law of cosines to solve real-world problems.
- Complete the steps to prove the law of cosines.
- Solve mathematical problems using the law of cosines.

Area and Perimeter of Triangles

- Derive the area formula $A = \frac{1}{2}ab \sin C$.
- Solve area and perimeter problems using $A = \frac{1}{2}ab \sin C$.
- Solve area and perimeter problems using Heron's formula.

Unit	Lesson	Lesson Objectives
Trigonometric Functions		
Angles and Trigonometric Functions		
Convert between radian and degree measure.		
Evaluate trigonometric functions.		
Use the unit circle to explain key features of the sine and cosine functions.		
Use trigonometric functions to solve problems.		
Graphing Sine and Cosine Functions		
Describe the result of a stretch, compression, or reflection over the x -axis on the sine or cosine function.		
Graph a stretch, compression, or reflection over the x -axis of the sine or cosine function.		
Graph the sine or cosine function, attending to units on the horizontal axis.		
Interpret key features of a sine or cosine function that models a real-world context.		
General Form of Sine and Cosine		
Create an appropriate periodic function to model a real-world context.		
Describe the result of a vertical or horizontal shift on the sine or cosine function.		
Graph a vertical or horizontal shift of the sine or cosine function.		
Interpret key features of a sine or cosine function that models a real-world context.		
Graphing Cosecant and Secant Functions		
Analyze key features of secant and cosecant functions from equations and graphs.		
Graphing Tangent and Cotangent		
Analyze key features of tangent and cotangent functions from equations and graphs.		
Inverse Trigonometric Functions		
Determine the key features of an inverse trigonometric function.		
Evaluate expressions containing inverse trigonometric functions.		
Graph an inverse trigonometric function.		
Use inverse functions to solve trigonometric equations that model real-world scenarios.		
Modeling with Periodic Functions		
Model and solve real-world problems using periodic functions.		
Analytic Trigonometry		
Trigonometric Difference Identities		
Prove the trigonometric subtraction identities for sine, cosine, or tangent.		
Solve a trigonometric equation involving a subtraction identity for sine, cosine, or tangent.		
Use a trigonometric subtraction identity for sine, cosine, or tangent to find the exact trigonometric value of an angle.		
Use a trigonometric subtraction identity for sine, cosine, or tangent to simplify an expression or verify an identity.		

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Trigonometric Sum Identities

Prove the trigonometric addition identity for sine, cosine, or tangent.

Solve a trigonometric equation involving an addition identity for sine, cosine, or tangent.

Use a trigonometric addition identity for sine, cosine, or tangent to find the exact trigonometric value of an angle.

Use a trigonometric addition identity for sine, cosine, or tangent to simplify an expression or verify an identity.

Trigonometric Double Angle Identities

Prove the trigonometric double angle identities for sine, cosine, or tangent.

Solve a trigonometric equation involving a double angle identity for sine, cosine, or tangent.

Use a trigonometric double angle identity for sine, cosine, or tangent to find the exact trigonometric value of an angle.

Use a trigonometric double angle identity for sine, cosine, or tangent to simplify an expression or verify an identity.

Trigonometric Half Angle Identities

Prove the trigonometric half-angle identity for sine, cosine, or tangent.

Solve a trigonometric equation involving a half-angle identity for sine, cosine, or tangent.

Use a trigonometric half-angle identity for sine, cosine, or tangent to find the exact trigonometric value of an angle.

Use a trigonometric half-angle identity for sine, cosine, or tangent to simplify an expression or verify an identity.

Solving Trigonometric Equations

Analyze key features of inverse trigonometric functions from equations and graphs.

Evaluate inverse trigonometric functions over a specified domain.

Solve trigonometric equations over a specified domain.

Complex Numbers and Polar Coordinates**Complex Numbers**

Determine the absolute value of a complex number.

Represent complex numbers in the form $a + bi$ or in the complex plane.

Represent square roots of negative numbers as multiples of i .

Simplify powers of i using their cyclic nature.

Performing Operations with Complex Numbers

Identify the field properties of complex numbers.

Perform addition, subtraction, multiplication, and division of complex numbers.

Distance and Midpoints in the Complex Plane

Calculate the modulus of a complex number.

Solve problems involving distances and midpoints in the complex plane.

Use the average to find the midpoint of a segment in the complex plane.

Use the modulus to find the distance between any two complex numbers in the plane.

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Polar Form of Complex Numbers

- Convert between the rectangular and polar form of a complex number, or between rectangular and polar coordinates.
- Explain why the rectangular and polar forms of a given complex number represent the same number.
- Find conjugates, moduli, and arguments of complex numbers.
- Graph points in the complex or polar plane given polar coordinates or the rectangular or polar form of a complex number.

Graphing Polar Equations

- Convert between polar and rectangular equations.
- Graph or describe the graph of a polar equation.
- Solve a problem involving one or more polar equations.
- Use a polar equation to represent a real-world scenario or interpret parts of a polar equation in terms of a context.

Add and Subtract Complex Numbers

- Find a sum or difference of complex numbers.
- Identify a geometric representation for the sum or difference of complex numbers.

Multiply and Divide Complex Numbers

- Find a product or quotient of complex numbers.
- Identify a geometric representation for the product or quotient of complex numbers.

Vectors**Vectors and Their Components**

- Compute the result of multiplying a vector by a scalar.
- Determine the direction, magnitude, or components of a vector.
- Use multiplication of a vector by a scalar to model or solve a problem.

Vector Addition and Subtraction

- Add vectors geometrically or algebraically.
- Calculate the result of performing two or more of the following operations on vectors: addition, subtraction, scalar multiplication.
- Subtract vectors geometrically or algebraically.

Applying Vectors in the Plane

- Solve a real-world problem involving vector quantities.
- Use vectors to model a real-world problem.
- Write a trigonometric equation that models a real-world problem involving vectors.

Dot Product and Work

- Calculate the dot product of two vectors.
- Interpret the dot product of two vectors.
- Use the dot product to calculate the angle between two vectors.
- Use the dot product to solve work problems.

Performance Task: Vector Operations

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Conic Sections**Conic Sections**

Graph or determine key features (center, radius, vertex, directrix, focus) of a circle or parabola from a given equation.

Identify the conic formed when a plane intersects a double napped cone.

Write the equation of a circle or parabola given a graph or verbal description.

Parabolas

Describe key features of a parabola.

Determine the equation of a parabola given the focus and directrix.

Equations of Ellipses

Identify the center, foci, directrix, and vertices of an ellipse from an equation or graph.

Write the equation of an ellipse from a given graph or information about its center, foci, directrix, or vertices.

Equations of Hyperbolas

Determine the foci, directrices, vertices, and asymptotes of a hyperbola with center at the origin from an equation or graph.

Graph a hyperbola with center at the origin from a given equation.

Write the equation of a hyperbola with center at the origin from a given graph or information about its foci, directrices, or vertices.

Equations of Hyperbolas (continued)

Determine the center, foci, directrices, vertices, and asymptotes of a hyperbola from an equation or graph.

Write the equation of a hyperbola from a given graph or information about its center, foci, directrices, or vertices.