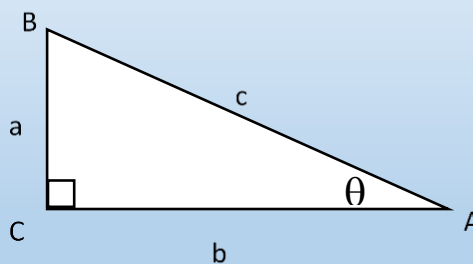


$$a^2 + b^2 = c^2$$



Chapter 8 – Unit 9

Right Triangles and Trigonometry

$$\sin \theta = \frac{a}{c}$$

$$\cos \theta = \frac{b}{c}$$

$$\tan \theta = \frac{a}{b}$$

Name _____

Hour _____

Simplifying Radicals – REVIEW

<p>Review*This is REVIEW material from Algebra II It is imperative that you understand these concepts for the remainder of this chapter!</p>	<p style="text-align: center;">RADICAL VOCABULARY</p> <p style="text-align: center;">\sqrt{a}</p> <ul style="list-style-type: none"> • a is called the radicand. • $\sqrt{\quad}$ is called a radical
<p>Method 1: Simplifying Radicals by Making a Factor Tree</p>	<p>Make a factor tree for each of the following.</p> <p>1) 42 2) 27 3) 68 4) 432 5) 80</p> <p>Simplify each square root.</p> <p>1) $\sqrt{42}$ 2) $\sqrt{27}$ 3) $\sqrt{68}$ 4) $\sqrt{432}$ 5) $\sqrt{80}$</p>
<p>Method 2: Simplifying Radicals by Finding its Perfect Square Factors</p> <p>*this method is how i will typically show examples*</p>	<p>Find the GREATEST perfect square that goes into each number.</p> <p>1) 108 2) 320 3) 98 4) 200 5) 20</p> <p>Simplify each square root.</p> <p>1) $\sqrt{108}$ 2) $\sqrt{320}$ 3) $\sqrt{98}$ 4) $\sqrt{200}$ 5) $\sqrt{20}$</p>

8-2 Pythagorean Theorem and Converse

I can...

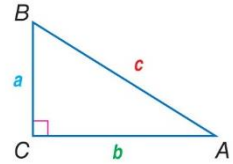
Use the Pythagorean Theorem.

Use the Converse of the Pythagorean Theorem.

Theorem 8.4 Pythagorean Theorem

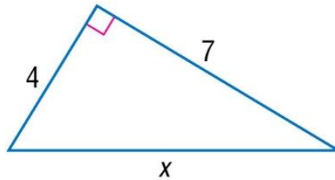
Words In a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.

Symbols If $\triangle ABC$ is a right triangle with right angle C , then $a^2 + b^2 = c^2$.

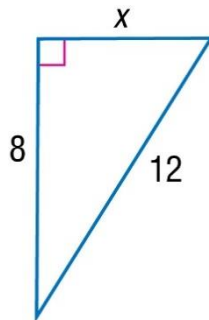


Example 8-2-1: Find Missing Measures Using the Pythagorean Theorem

A. Find x .



B. Find x .



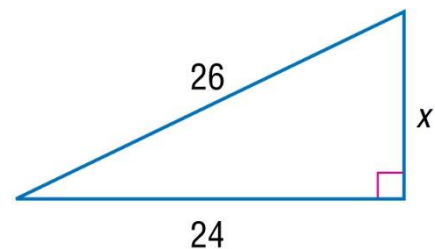
Pythagorean Triples

KeyConcept Common Pythagorean Triples

3, 4, 5	5, 12, 13	8, 15, 17	7, 24, 25
6, 8, 10	10, 24, 26	16, 30, 34	14, 48, 50
9, 12, 15	15, 36, 39	24, 45, 51	21, 72, 75
$3x, 4x, 5x$	$5x, 12x, 13x$	$8x, 15x, 17x$	$7x, 24x, 25x$

Example 8-2-2: Use a Pythagorean Triple

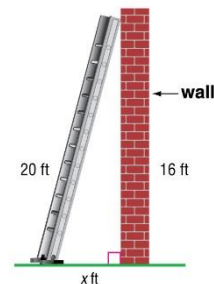
Find x .



Example 8-2-3: Standardized Test Question: Use a Pythagorean Triple

A 20-foot ladder is placed against a building to reach a window that is 16 feet above the ground. How many feet away from the building is the bottom of the ladder?

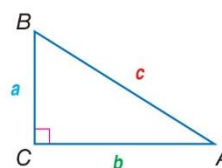
- A) 3
- B) 4
- C) 12
- D) 15



Theorem 8.5 Converse of the Pythagorean Theorem

Words If the sum of the squares of the lengths of the shortest sides of a triangle is equal to the square of the length of the longest side, then the triangle is a right triangle.

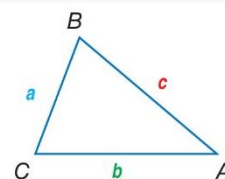
Symbols If $a^2 + b^2 = c^2$, then $\triangle ABC$ is a right triangle.



Theorems Pythagorean Inequality Theorems

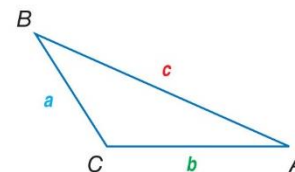
8.6 If the square of the length of the longest side of a triangle is less than the sum of the squares of the lengths of the other two sides, then the triangle is an acute triangle.

Symbols If $c^2 < a^2 + b^2$, then $\triangle ABC$ is acute.



8.7 If the square of the length of the longest side of a triangle is greater than the sum of the squares of the lengths of the other two sides, then the triangle is an obtuse triangle.

Symbols If $c^2 > a^2 + b^2$, then $\triangle ABC$ is obtuse.



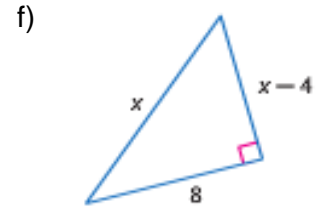
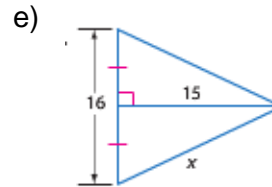
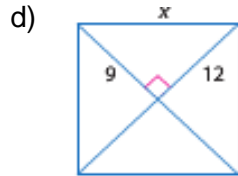
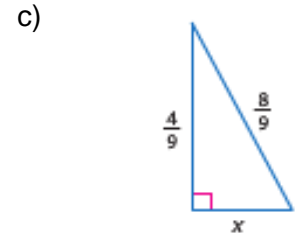
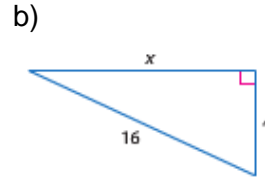
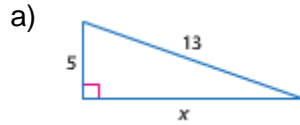
Example 8-2-4: Classify Triangles

A. Determine whether 9, 12, and 15 can be the measures of the sides of a triangle. If so, classify the triangle as *acute*, *right*, or *obtuse*. Justify your answer.

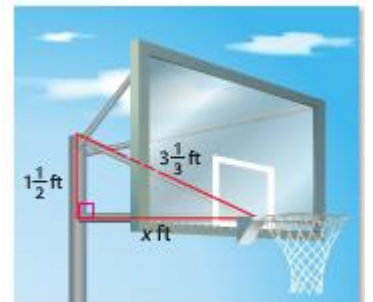
B. Determine whether 10, 11, and 13 can be the measures of the sides of a triangle. If so, classify the triangle as *acute*, *right*, or *obtuse*. Justify your answer.

Guided Practice:

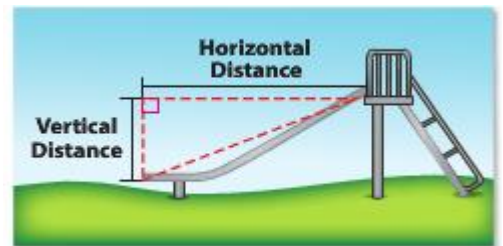
1. Find x .



2. The support for a basketball goal forms a right triangle as shown. What is the length of the horizontal portion of the support?



3. According to the Handbook for Public Playground Safety, the ratio of the vertical distance to the horizontal distance covered by a slide should not be more than 4:7. If the horizontal distance in a slide is 14 feet, how long should the slide be?



8-3 Special Right Triangles

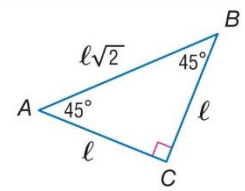
I can...	45-45-90	30-60-90
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Use the properties of 45°-45°-90° triangles.

Theorem 8.8 45°-45°-90° Triangle Theorem

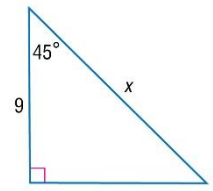
In a 45°-45°-90° triangle, the legs l are congruent and the length of the hypotenuse h is $\sqrt{2}$ times the length of a leg.

Symbols In a 45°-45°-90° triangle, $l = l$ and $h = l\sqrt{2}$.

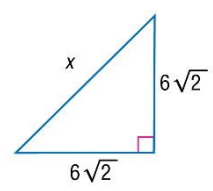


Example 8-3-1: Find the Hypotenuse Length in a 45°-45°-90° Triangle

A. Find x .

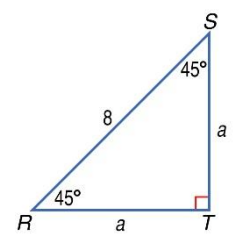


B. Find x .



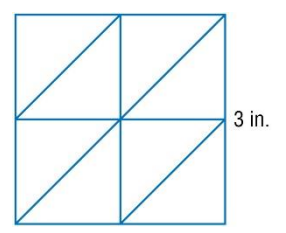
Example 8-3-2: Find the Leg Lengths in a 45°-45°-90° Triangle

Find a

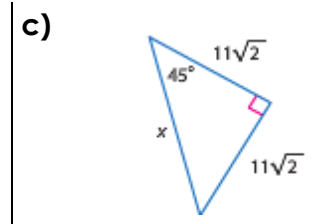
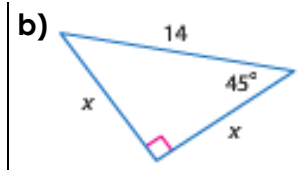
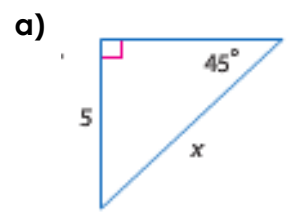


Example 8-3-3: Use Properties of Special Right Triangles

QUILTING A quilt has the design shown in the figure, in which a square is divided into 8 isosceles right triangles. If the length of one side of the square is 3 inches, what are the dimensions of each triangle?



Your Turn, Find x .

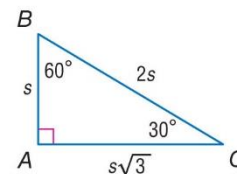


Use the properties of 30° - 60° - 90° triangles.

Theorem 8.9 30° - 60° - 90° Triangle Theorem

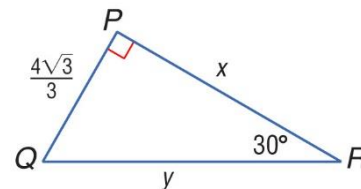
In a 30° - 60° - 90° triangle, the length of the hypotenuse h is 2 times the length of the shorter leg s , and the length of the longer leg ℓ is $\sqrt{3}$ times the length of the shorter leg.

Symbols In a 30° - 60° - 90° triangle, $h = 2s$ and $\ell = s\sqrt{3}$.

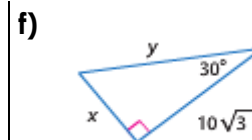
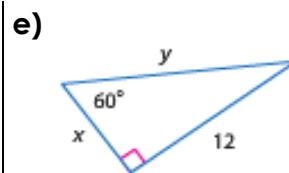
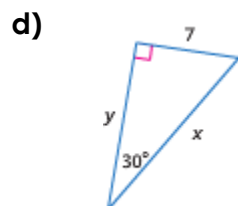


Example 8-3-3: Find Lengths in a 30° - 60° - 90° Triangle

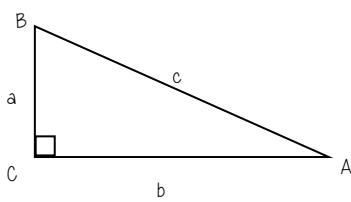
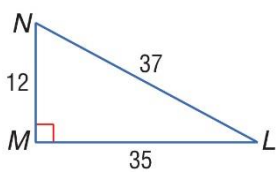
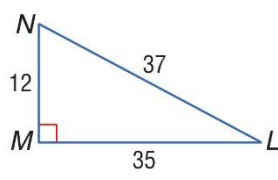
Find x and y .



Your Turn, find x and y .



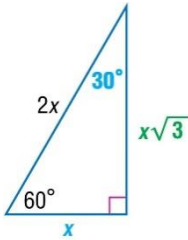
8-4 Right Triangle Trigonometry

<p>I can ...</p>	
<p>Find trigonometric ratios using right triangles.</p> <p>Use trigonometric ratios to find angle measures in right triangles.</p>	<p>The three basic trigonometric ratios are _____, _____, and _____. In a right triangle with acute angle $\angle A$ are defined as follows:</p> <div style="text-align: right; margin-bottom: 10px;">  </div> <p> $\sin A =$ _____ $\cos A =$ _____ $\tan A =$ _____ </p> <p> $\sin B =$ _____ $\cos B =$ _____ $\tan B =$ _____ </p> <p style="text-align: center;"> In a right triangle, $(\sin A)^2 + (\cos A)^2 = 1$ SOH – CAH – TOA </p> <p>Example 8-4-I: Find Sine, Cosine, and Tangent Ratios</p> <ol style="list-style-type: none"> Express $\sin L$ as a fraction and as a decimal to the nearest hundredth. Express $\cos L$ as a fraction and as a decimal to the nearest hundredth. Express $\tan L$ as a fraction and as a decimal to the nearest hundredth. Express $\sin N$ as a fraction and as a decimal to the nearest hundredth. Express $\cos N$ as a fraction and as a decimal to the nearest hundredth. Express $\tan N$ as a fraction and as a decimal to the nearest hundredth.
	
	

Important Notes:

Calculators should be in degrees. (TI-83/84 calculators default to Radians)

θ is a greek letter, theta. It is used to show angles.

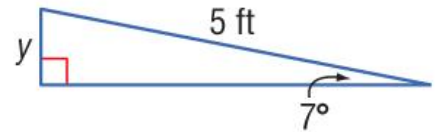


Example 8-4-2: Use Special Right Triangles to Find Trigonometric Ratios

Use a special right triangle to express the cosine of 60° as a fraction and as a decimal to the nearest hundredth.

Example 8-4-3: Estimate Measures Using Trigonometry

EXERCISING A fitness trainer sets the incline on a treadmill to 7° . The walking surface is 5 feet long. Approximately how many inches did the trainer raise the end of the treadmill from the floor?



In word problems, ask yourself the following questions:

What do I know?

What do I need to find?

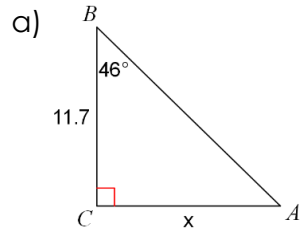
Which trig ratio do I use?

Know:

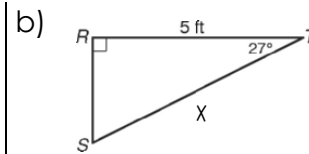
Need:

Use:

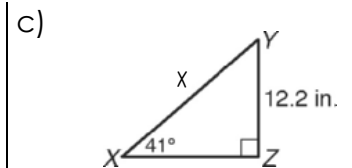
Your Turn, solve for x.



K:
N:
U:



K:
N:
U:



K:
N:
U:



Inverse trig ratios help us find the angle.

KeyConcept Inverse Trigonometric Ratios

Words If $\angle A$ is an acute angle and the sine of A is x , then the **inverse sine** of x is the measure of $\angle A$.

Symbols If $\sin A = x$, then $\sin^{-1} x = m\angle A$.

Words If $\angle A$ is an acute angle and the cosine of A is x , then the **inverse cosine** of x is the measure of $\angle A$.

Symbols If $\cos A = x$, then $\cos^{-1} x = m\angle A$.

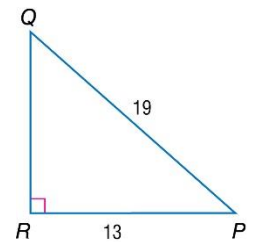
Words If $\angle A$ is an acute angle and the tangent of A is x , then the **inverse tangent** of x is the measure of $\angle A$.

Symbols If $\tan A = x$, then $\tan^{-1} x = m\angle A$.

Example 8-4-4: Find Angle Measures Using Inverse Trigonometric Ratios

Use a calculator to find the measure of $\angle P$ to the nearest tenth.

K:
N:
U:



Solving a right triangle means to determine the _____ of all _____.

You can solve if you know either of the following.

1. two side lengths
2. one side length and one acute angle measure.

In general, for an acute angle A :

- 1) if $\sin A = x$, then $\sin^{-1} x = m\angle A$
- 2) if $\cos A = x$, then $\cos^{-1} x = m\angle A$
- 3) if $\tan A = x$, then $\tan^{-1} x = m\angle A$

Example 8-4-5: Solve a Right Triangle

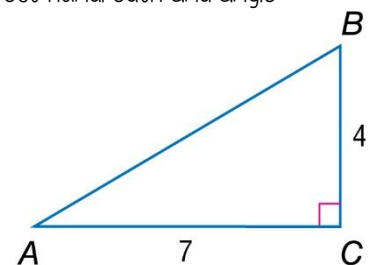
Solve the right triangle. Round side measures to the nearest hundredth and angle measures to the nearest degree.

$AB =$ _____

$\angle A =$ _____

$\angle B =$ _____

$\angle C =$ _____



Example 8-4-6: Solve the Triangle

$FH =$ _____ $\angle F =$ _____

$\angle G =$ _____ $\angle H =$ _____

8-5 Angles of Elevation and Depression

I can...

Solve problems involving angles of elevation and depression.

Use angles of elevation and depression to find the distance between two objects.

Angles of Elevation and Depression

An angle of elevation is the angle formed by a horizontal line and a line of sight to a point *above* the line.

An angle of depression is the angle formed by a horizontal line and a line of sight to a point *below* the line.

Example 8-5-1: Classifying Angles of Elevation and Depression

Classify each angle as an angle of elevation or angle of depression.

a. $\angle 1$

b. $\angle 4$

Example 8-5-2: Application of Angles of Elevation and Depression

a. **When the angle of elevation to the sun is 52° , a tree casts a shadow that is 9 meters long. What is the height of the tree?**

K:
N:
U:

b. **A person snorkeling sees a turtle on the ocean floor at an angle of depression of 38° . She is 14 feet above the ocean floor. How far from the turtle is she?**

K:
N:
U:

Example 8-5-2: Application of Angles of Elevation and Depression

- c. The angle of ascent of the first hill of a roller coaster is 55 degrees. If the length of the track from the beginning of the ascent to the highest point is 98 feet, what is the height of the roller coaster when it reaches the top of the first hill?

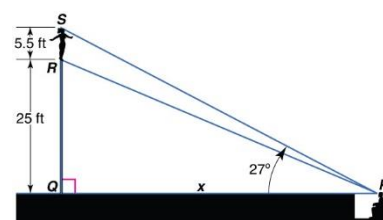


K:
N:
U:

Example 8-5-3: Angle of Elevation

At the circus, a person in the audience at ground level watches the high-wire routine. A 5-foot-6-inch tall acrobat is standing on a platform that is 25 feet off the ground. How far is the audience member from the base of the platform, if the angle of elevation from the audience member's line of sight to the top of the acrobat is 27°?

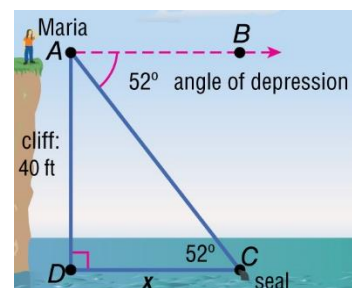
K:
N:
U:



Example 8-5-4: Angle of Depression

DISTANCE Maria is at the top of a cliff and sees a seal in the water. If the cliff is 40 feet above the water and the angle of depression is 52°, what is the horizontal distance from the seal to the cliff, to the nearest foot?

K:
N:
U:



Example 8-5-5: Use Two Angles of Elevation or Depression

Vernon is on the top deck of a cruise ship and observes two dolphins following each other directly away from the ship in a straight line. Vernon's position is 154 meters above sea level, and the angles of depression to the two dolphins are 35° and 36° . Find the distance between the two dolphins to the nearest meter.

Dolphin J

K:

N:

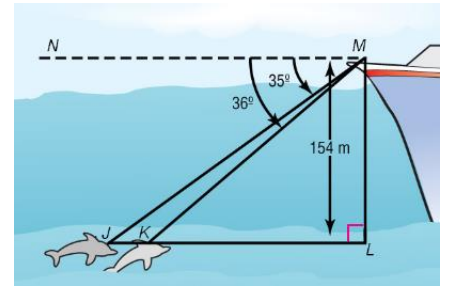
U:

Dolphin K

K:

N:

U:



8-6 Law of Sines

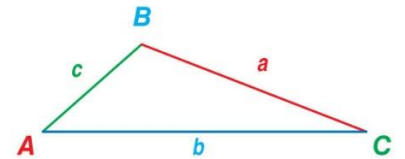
I can...

Use the law of sines to solve triangles

Theorem 8.10 Law of Sines

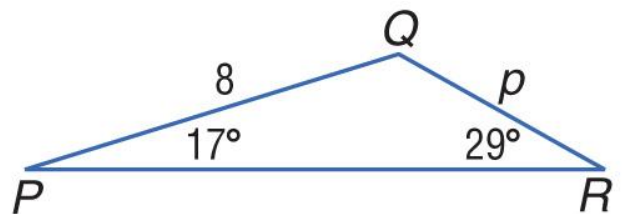
If $\triangle ABC$ has lengths a , b , and c , representing the lengths of the sides opposite the angles with measures A , B , and C , then

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}.$$

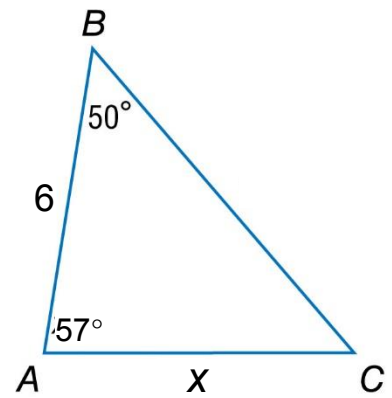


Example 8-6-1: Law of Sines (AAS or ASA)

Find p . Round to the nearest tenth.

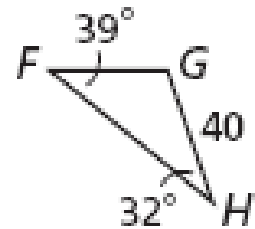


Example 8-6-2: Law of Sines (ASA)
Find x . Round to the nearest tenth.



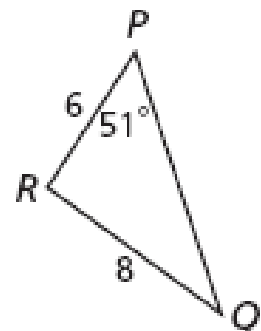
Example 8-6-3: Law of Sines

Find FG. Round lengths to the nearest tenth

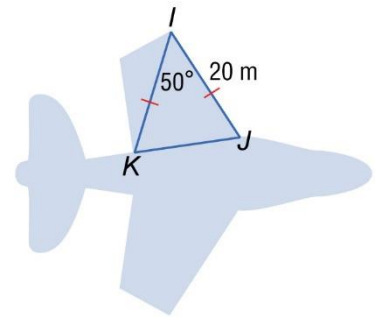


Example 8-6-4: Law of Sines

Find $m\angle Q$. Round angle measures to the nearest degree.



Example 8-6-5: Indirect measurement
From the diagram of the plane shown,
determine the approximate width of
each wing. Round to the nearest tenth
meter.



Example 8-6-6: Solve a Triangle with Law of Sines

