Geometry

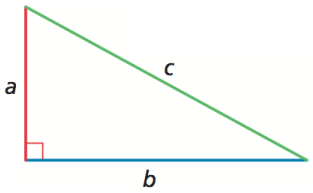
Name _____

Date _____ Period _____

Chapter 9 Right Triangles and Trigonometry

9.1 The Pythagorean Theorem

Pythagorean Theorem	



Pythagorean Triples

Nonzero whole numbers a, b, and c such that

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

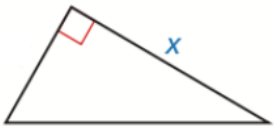
3, 4, 5 → →

5, 12, 13 →

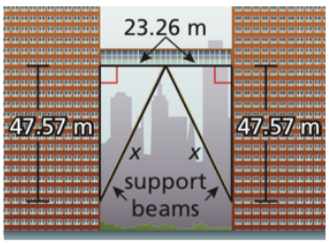
8, 15, 17

7, 24, 25

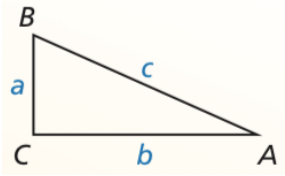
1. Compute x in this triangle. Is it a Pythagorean triple?



2. The skyscrapers shown are connected by a skywalk with support beams. Use the Pythagorean Theorem to approximate the length of each support beam.

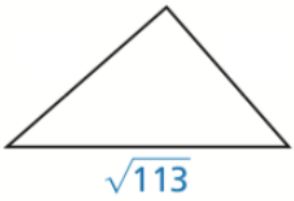


Converse of the Pythagorean Theorem	

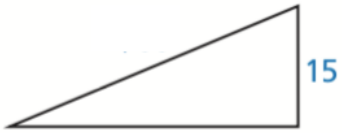


Are these right triangles?

a.

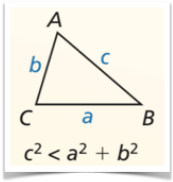


b.

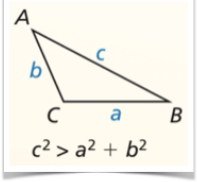


Pythagorean Inequalities Theorem	

Acute Triangle

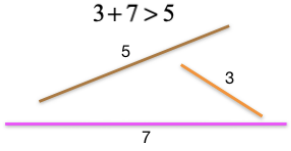


Obtuse Triangle



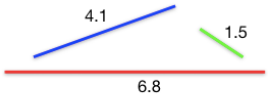
Triangle Inequality Theorem (Ch 6)	

$5+3>7$
$5+7>3$
$3+7>5$



$6.8+4.1>1.5$
$6.8+1.5>4.1$
$1.5+4.1<6.8$

NOT a triangle



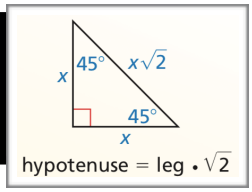
Is this acute, obtuse, or right?

a. Verify that segments with lengths of _____ feet, _____ feet, and _____ feet form a triangle. Is the triangle *acute*, *right*, or *obtuse*?

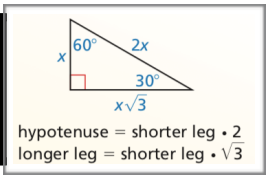
b. Verify that segments with lengths of _____, _____, and _____ form a triangle. Is the triangle *acute*, *right*, or *obtuse*?

9.2 Special Right Triangles

45°- 45°- 90° Triangle Theorem	

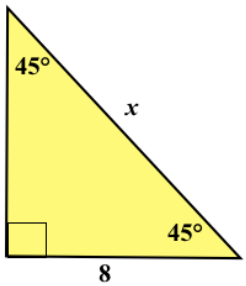


30°- 60°- 90° Triangle Theorem	

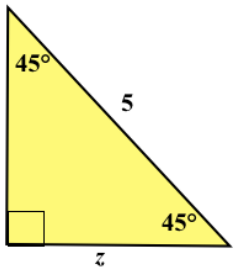


Compute the unknown value.

a.

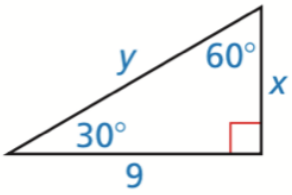


b.

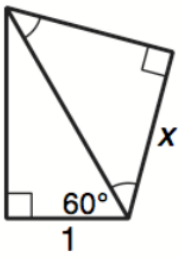


Compute the unknown values.

a.



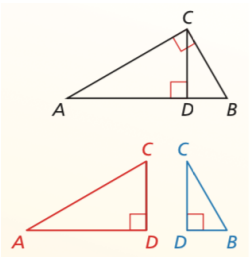
b.



Area Example: The road sign is shaped like an _____ . Estimate the area of the sign.

36 in.

9.3 Similar Right Triangles

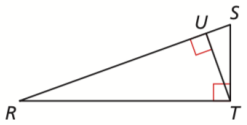


Create a similarity statement for the three triangles ΔABC, ΔACD, and ΔBCD.

ΔABC ~ Δ_____ ~ Δ_____

Right Triangle Similarity Theorem	

Identify the similar triangles in the figure on the right and create their similarity statements.



Calculating Mean

The _____ between two numbers r and s is defined to be $\frac{r+s}{2}$.

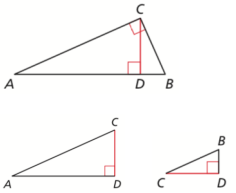
The _____ x between two numbers r and s is defined to satisfy the following expressions:

$\frac{x}{r}=\frac{s}{x}$ $x^2 =$ x =

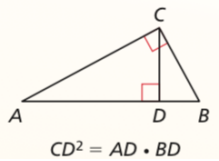
Example: The Geometric Mean between 12 and 24 is:

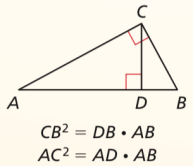
Geometric Mean and Right Triangles

Let's use the similarity statement of the three triangles △CBD ~ △ACD ~ △ABC. Remember, corresponding sides are proportional.



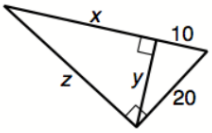
Geometric Mean (Altitude) Theorem	
Geometric Mean (Leg) Theorem	



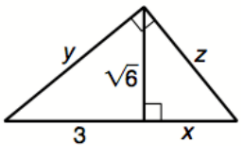


Compute the unknown values.

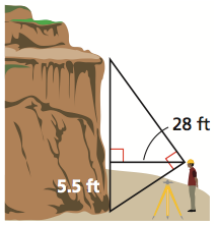
a.



b.

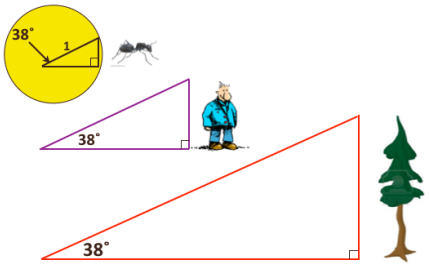


Example: A surveyor's line of sight to the top of a cliff and his line of sight to the bottom form a right angle. What is the height of the cliff to the nearest foot?

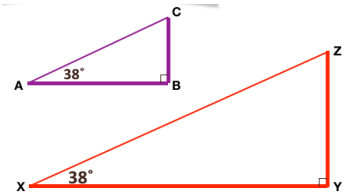


9.4 The Tangent Ratio

Right Triangles: Are these triangles similar?



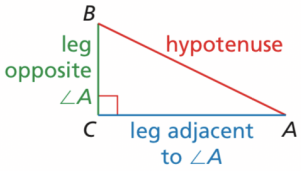
Trigonometric Ratio: The ratio of _____



$$\tan(38°) =$$

Tangent Ratio: The ratio of _____

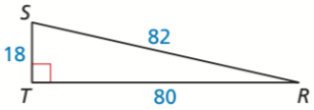
$$\tan(\angle A) =$$



Example: Find the tangent ratios.

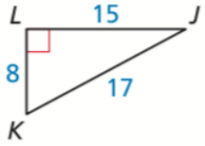
a. $\tan\angle R =$

$\tan\angle S =$



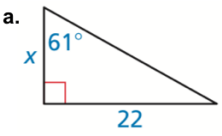
b. $\tan\angle K =$

$\tan\angle J =$

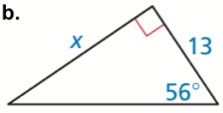


Example: Calculate x for each triangle.

a.

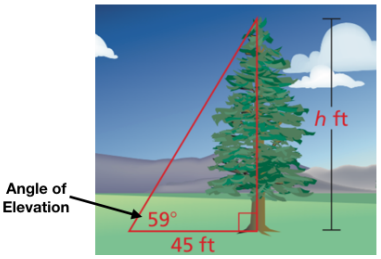


b.



Angle of Elevation: The angle _____

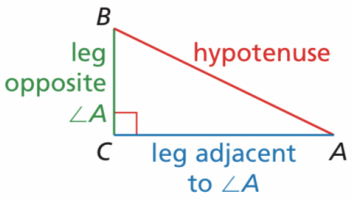
Compute the height of the tree pictured on the right.



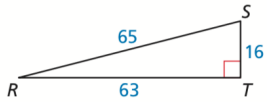
9.5 The Sine and Cosine Ratios

Sine and Cosine Ratios: The ratio of a _____ and _____ of a right triangle.

$\sin\angle A =$ $\cos\angle A =$



Example: Find the sine and cosine ratios of the right triangle.



Sine and Cosine of Complementary Angles

The sine of an _____ angle is equal to the cosine of its _____.

$\sin A = \cos(90^\circ - A) = \cos B$ $\cos A =$

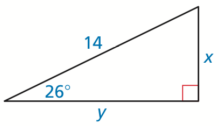
$\sin B =$ $\cos B =$

Using Trigonometric Expressions

a) Write sin(56˚) in terms of cosine.

sin(56˚) = cos(_____)

b) Use sine and cosine to calculate x and y.



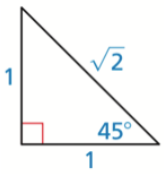
Special Right Triangles

45˚- 45˚- 90˚ triangle

$\sin 45^\circ =$

$\cos 45^\circ =$

$\tan 45^\circ =$

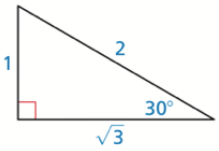


30˚- 60˚- 90˚ triangle

$\sin 30^\circ =$

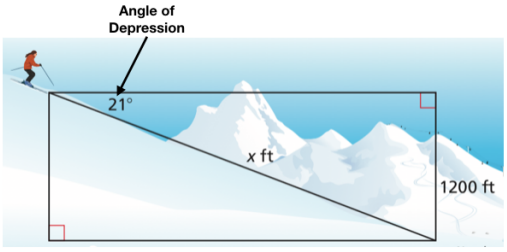
$\cos 30^\circ =$

$\tan 30^\circ =$



Angle of Depression: _____

Compute the distance x skiing.



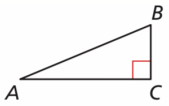
A Little Story

Chief _____

9.6 Solving Right Triangles

Inverse Trigonometric Functions

$\sin^{-1}(\sin \angle A) =$ $\cos^{-1}(\cos \angle A) =$



$\tan^{-1}(\tan \angle A) =$

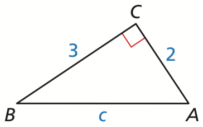
Calculating Angles

Compute the acute angles A, B, and C.

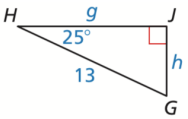
a) tan A = b) sin B = c) cos C =

Solve the Triangle

Compute side c and angles A and B.

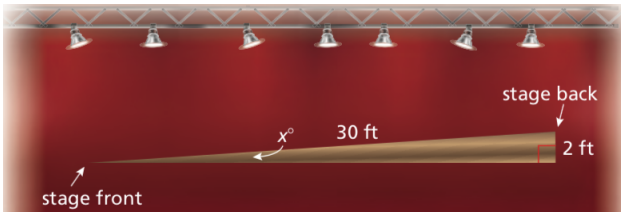


Compute g, h, and angle G.



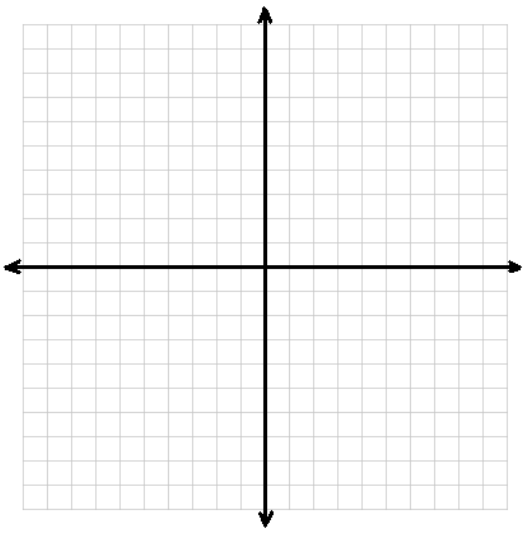
Real World Problem

Your school is building a raked stage.



London Eye Problem

The observation wheel has a radius of 67.5 m and takes 30 minutes to make a complete rotation.



9.7 Law of Sines and Law of Cosines

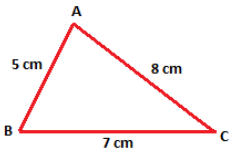
Calculating Obtuse Angles

Use your calculator to compute these angles and notice the values.

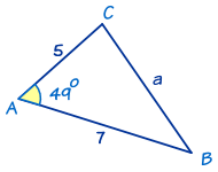
a) tan _____ = b) sin _____ = c) cos _____ =

Area of a Triangle

Heron's formula:

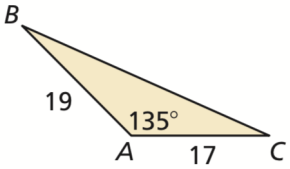


Sine formula:

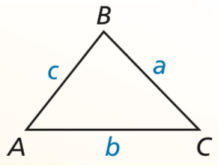


Example

Calculate the area of the triangle.

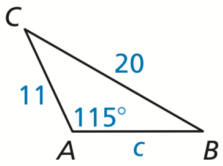


Law of Sines	

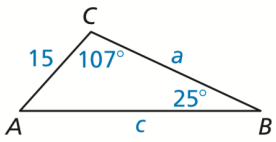


Solve for all the unknown side lengths and angles.

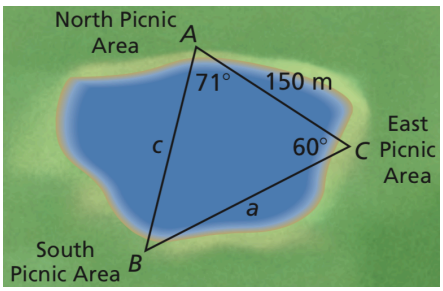
Solve the Triangle (SSA)



Solve the Triangle (AAS)



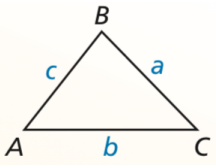
Solve the Triangle (ASA)



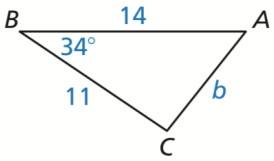
Law of Sines is best for triangles that have: _____, _____, _____

Law of Cosines is best for triangles that have: _____, _____

Law of Cosines	



Solve the Triangle (SAS)



Solve the Triangle (SSS)