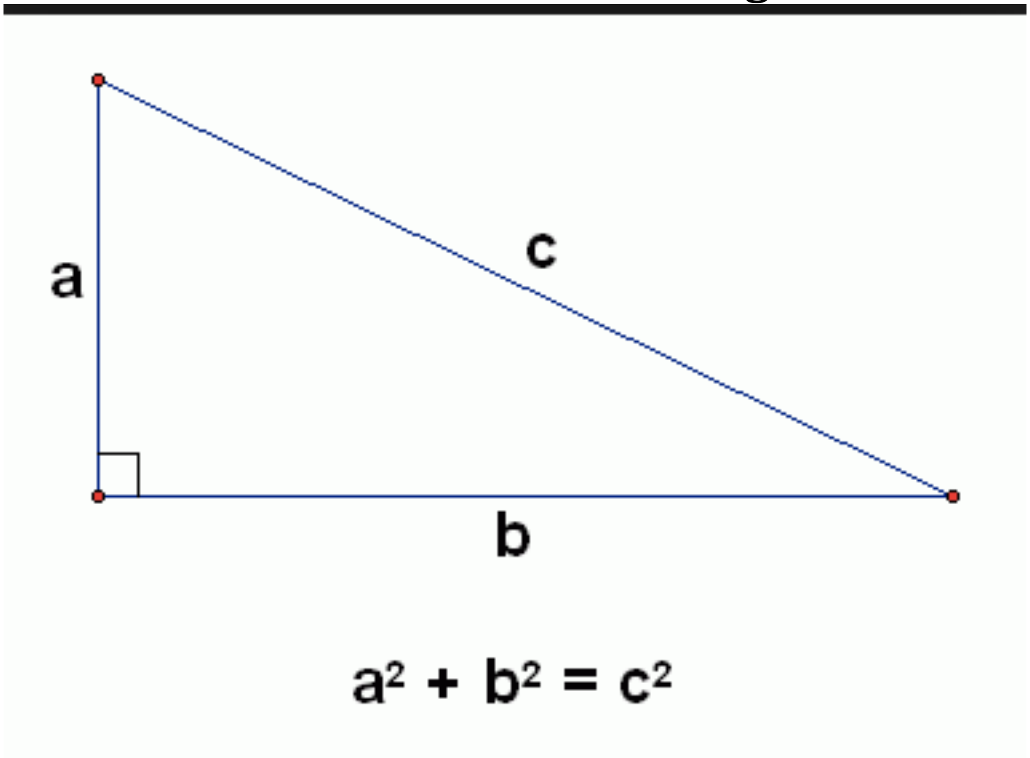
Lesson 22
Special Right Triangles and Pythagorean theorem

Warm-up
Simplify

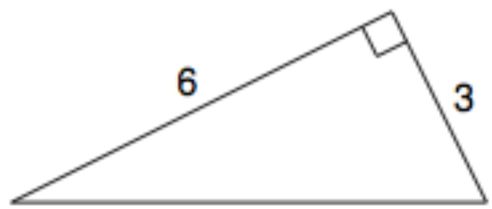
1) $\sqrt{540}$
2) $\sqrt{36}$
3) $\sqrt{48}$
4) $\sqrt{120}$

The Pythagorean Theorem $a^2 + b^2 = c^2$, where c is the longest side of the right triangle.
The longest side of a right triangle is called the **hypotenuse**.

The other two sides are called the **legs.**

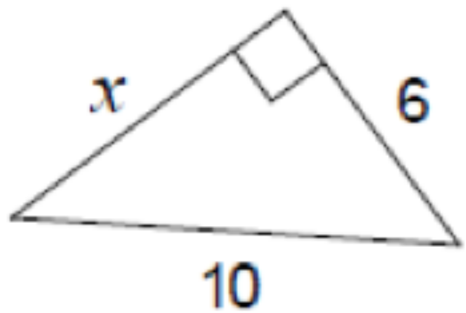


Find the missing length.



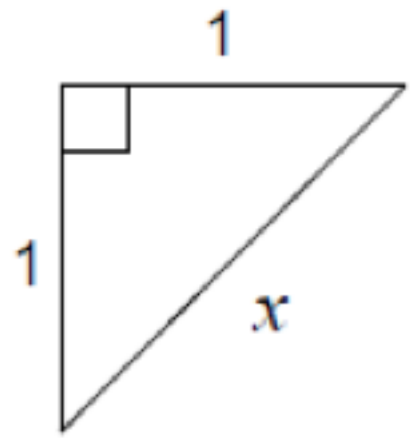
Determine the missing side.	Hypotenuse
Plug givens into equation $a^2 + b^2 = c^2$	$6^2 + 3^2 = c^2$
Solve for the missing side.	$36 + 9 = c^2$ $45 = c^2$ $c = 3\sqrt{5}$

We Try:



Determine the missing side.	
Plug givens into equation $a^2 + b^2 = c^2$	
Solve for the missing side.	

You Try with your partner on the whiteboard:
Solve for x using the Pythagorean theorem.



Determine the missing side.	
Plug givens into equation $a^2 + b^2 = c^2$	
Solve for the missing side.	

I Try:

Identifying triangles
If $a^2 + b^2 < c^2$ obtuse
If $a^2 + b^2 > c^2$ acute

Identify if the triangle is acute, obtuse, or right.

5,6,7

Plug into Pythagorean formula	$5^2 + 6^2 > 7^2$
Identify	Acute

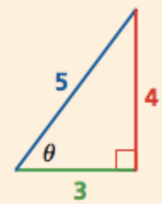
We Try:

Identify if the triangle is acute, obtuse, or right.

2,6,4

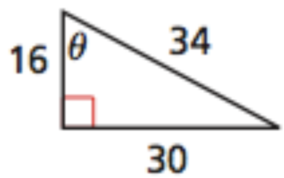
Plug into Pythagorean formula	
Identify	

Trigonometric Functions

WORDS	NUMBERS	SYMBOLS
The **sine** (sin) of angle θ is the ratio of the length of the **opposite** leg to the length of the **hypotenuse**.	$\sin\theta = \frac{4}{5}$	$\sin\theta = \frac{\text{opp.}}{\text{hyp.}}$
The **cosine** (cos) of angle θ is the ratio of the length of the **adjacent** leg to the length of the **hypotenuse**.	$\cos\theta = \frac{3}{5}$ 	$\cos\theta = \frac{\text{adj.}}{\text{hyp.}}$
The **tangent** (tan) of angle θ is the ratio of the length of the **opposite** leg to the length of the **adjacent** leg.	$\tan\theta = \frac{4}{3}$	$\tan\theta = \frac{\text{opp.}}{\text{adj.}}$

Soh Cah Toa

First we need to identify the parts of a triangle!



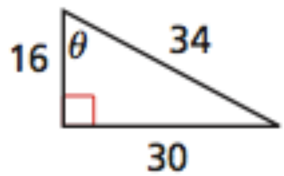
Discuss with your partner about which is the adjacent, hypotenuse, and opposite side? How do you know?

Hypotenuse Side is always the longest side. It is across from the right angle.

Adjacent Side is always the side touching the $\theta\ angle$.

Opposite Side is the side not touching the $\theta\ angle$. It is opposite of θ.

Find the Sine, Cosine, and Tangent functions for θ.



Adjacent=
Opposite=
Hypotenuse=

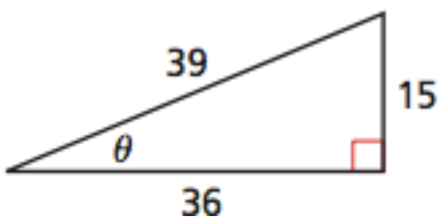
Sine θ = $\frac{Opposite}{Hypotenuse}$=

Cosine θ =$\frac{Adjacent}{Hypotenuse}$ =

$Tangent\theta = \frac{Opposite}{Adjacent}$=

We Try:

Find the Sine, Cosine, and Tangent functions for θ.



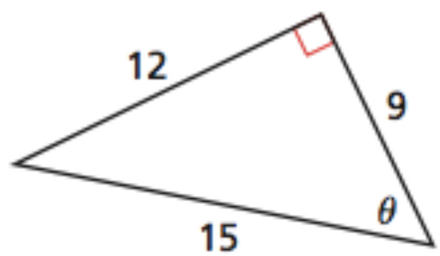
Adjacent=
Opposite=
Hypotenuse=

Sine $\theta = \frac{Opposite}{Hypotenuse} =$

Cosine $\theta = \frac{Adjacent}{Hypotenuse} =$

$Tangent\theta = \frac{Opposite}{Adjacent} =$

You Try on whiteboards: Even Talk, Odd write



Find the Sine, Cosine, and Tangent functions for θ.
Adjacent=
Opposite=
Hypotenuse=

Sine θ = $\frac{Opposite}{Hypotenuse}$=

Cosine θ =$\frac{Adjacent}{Hypotenuse}$ =

$Tangent\theta = \frac{Opposite}{Adjacent}$=

Special Right Triangles
Lesson 23

Warm-up
Simplify

1) $\frac{6}{\sqrt{2}} =$

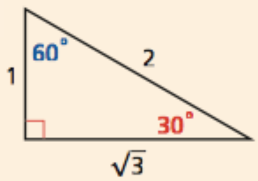
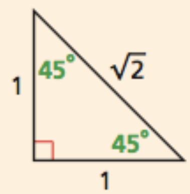
2) $3\sqrt{3} \cdot \sqrt{6} =$

3) $\sqrt{48} =$

4) $\frac{9}{\sqrt{3}} =$

5) $\frac{3\sqrt{2}}{\sqrt{6}} =$

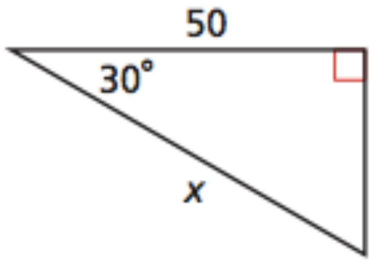
6) $2\sqrt{3} \cdot 4\sqrt{3} =$

Trigonometric Ratios of Special Right Triangles			
Diagram	**Sine**	**Cosine**	**Tangent**
	$\sin 30° = \frac{1}{2}$ $\sin 60° = \frac{\sqrt{3}}{2}$	$\cos 30° = \frac{\sqrt{3}}{2}$ $\cos 60° = \frac{1}{2}$	$\tan 30° = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ $\tan 60° = \frac{\sqrt{3}}{1} = \sqrt{3}$
	$\sin 45° = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$	$\cos 45° = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$	$\tan 45° = \frac{1}{1} = 1$

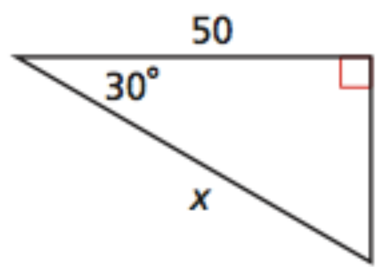
USE RATIO SHORTCU

Sometimes they don't give you the sides!

Solve for x.



DRAW OVERLAY TRIANGLE
CROSS MULTIPLY

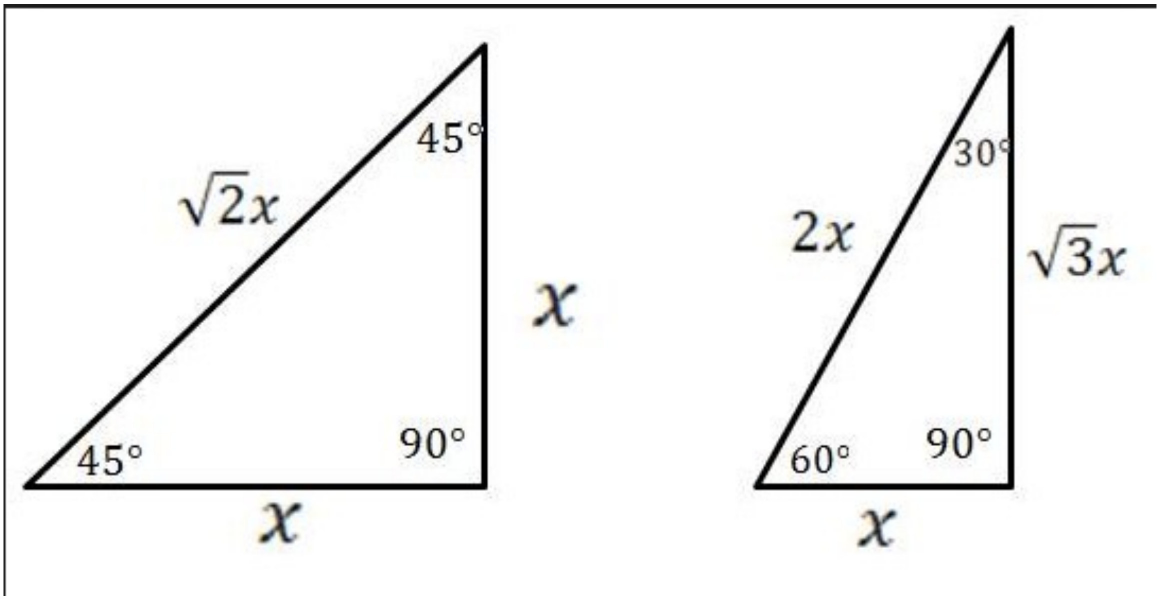
DRAW OVERLAY TRIANGLE	
Create Fractions	$\frac{x}{50} = \frac{2}{\sqrt{3}}$
Solve for x	

We try:

DRAW OVERLAY TRIANGLE	
Create Fractions	
Solve for x	

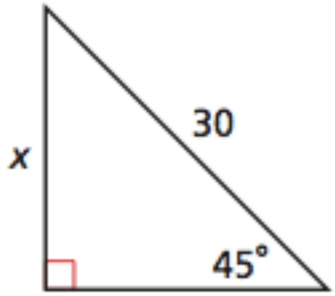
There is a shortcut for some triangles!

What are the special right triangles?



The sides are in a constant ratio!

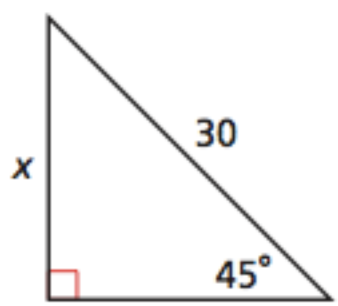
Solve for x using the special right triangle properties.



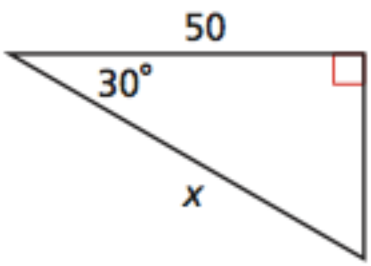
SHORTCUT

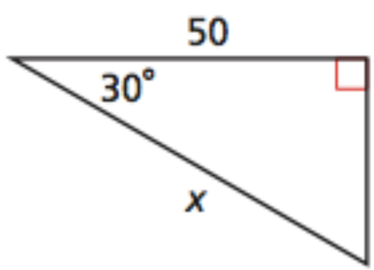
$$Hypotenus \div \sqrt{2} = leg$$

$$LEG \cdot \sqrt{2} = HYPOTENUS$$

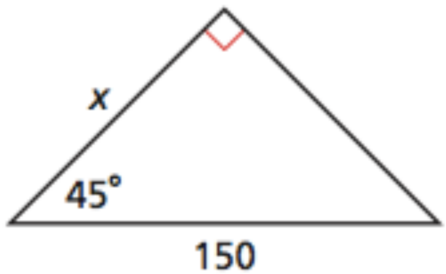
DRAW OVERLAY TRIANGLE	45-45-90
Create Fractions	
Solve for x	

We Try:



DRAW OVERLAY TRIANGLE	
Create Fractions	
Solve for x	

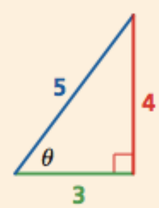
You Try with your partner on whiteboard:
Solve for x.



SOH CAH TOA
4.20.17

Reciprocal Trigonometric Functions

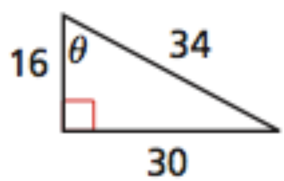
WORDS	NUMBERS	SYMBOLS
The **cosecant** (csc) of angle θ is the reciprocal of the sine function.	$\csc\theta = \frac{5}{4}$	$\csc\theta = \frac{1}{\sin\theta} = \frac{\text{hyp.}}{\text{opp.}}$
The **secant** (sec) of angle θ is the reciprocal of the cosine function.	$\sec\theta = \frac{5}{3}$	$\sec\theta = \frac{1}{\cos\theta} = \frac{\text{hyp.}}{\text{adj.}}$
The **cotangent** (cot) of angle θ is the reciprocal of the tangent function.	$\cot\theta = \frac{3}{4}$	$\cot\theta = \frac{1}{\tan\theta} = \frac{\text{adj.}}{\text{opp.}}$



There are actually six trigonometric properties.
Sine, Cosine, Tangent.
Cosecant, Secant, Cotangent

I try:

Find the Sine, Cosine, and Tangent functions for θ.



Adjacent=

Opposite=

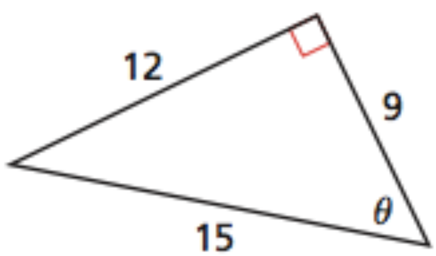
Hypotenuse=

Sine $\theta = \frac{Opposite}{Hypotenuse} =$ Cosecant $= \frac{1}{sin\theta} =$

Cosine $\theta = \frac{Adjacent}{Hypotenuse} =$ Secant$= \frac{1}{cosine\theta} =$

$Tangent\theta = \frac{Opposite}{Adjacent}$= Cotangent=$\frac{1}{tangent\theta}$ =

We Try



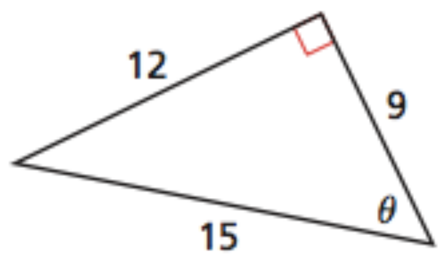
Find the Sine, Cosine, and Tangent functions for θ.
Adjacent=
Opposite=
Hypotenuse=

Sine θ = $\frac{Opposite}{Hypotenuse}$= Cosecant = $\frac{1}{sin\theta}$ =

Cosine θ =$\frac{Adjacent}{Hypotenuse}$ = Secant=$\frac{1}{cosine\theta}$ =

$Tangent\theta = \frac{Opposite}{Adjacent}$= Cotangent=$\frac{1}{tangent\theta}$ =

You Try on whiteboards: Even Talk, Odd write



Find the Sine, Cosine, and Tangent functions for θ.
Adjacent=
Opposite=
Hypotenuse=

Sine θ = $\frac{Opposite}{Hypotenuse}$= Cosecant = $\frac{1}{sin\theta}$ =

Cosine θ =$\frac{Adjacent}{Hypotenuse}$ = Secant=$\frac{1}{cosine\theta}$ =

$Tangent\theta = \frac{Opposite}{Adjacent}$= Cotangent=$\frac{1}{tangent\theta}$ =

A builder is constructing a wheelchair ramp from the ground a height of 18 in. The angle between the ground and the ramp To the nearest inch, what should be the distance *d* between th ramp and the deck?