Geometry 8.4

Use right triangles to find trigonometric ratios

Use trig ratios to find angle measures in right triangles

opposite

adjacent

trigonometry

ratio

trig ratio

sine $\frac{o}{h}$

cosine $\frac{a}{h}$

tangent $\frac{o}{a}$

inverse function (algebra 1)

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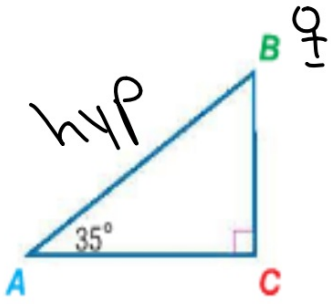

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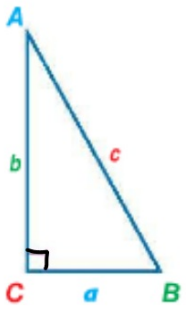
KeyConcept Trigonometric Ratios

Words	Symbols	
If $\triangle ABC$ is a right triangle with acute $\angle A$, then the **sine** of $\angle A$ (written sin A) is the ratio of the length of the leg opposite $\angle A$ (opp) to the length of the hypotenuse (hyp).	$\sin A = \frac{\text{opp}}{\text{hyp}}$ or $\frac{a}{c}$ $\sin B = \frac{\text{opp}}{\text{hyp}}$ or $\frac{b}{c}$	
If $\triangle ABC$ is a right triangle with acute $\angle A$, then the **cosine** of $\angle A$ (written cos A) is the ratio of the length of the leg adjacent $\angle A$ (adj) to the length of the hypotenuse (hyp).	$\cos A = \frac{\text{adj}}{\text{hyp}}$ or $\frac{b}{c}$ $\cos B = \frac{\text{adj}}{\text{hyp}}$ or $\frac{a}{c}$	
If $\triangle ABC$ is a right triangle with acute $\angle A$, then the **tangent** of $\angle A$ (written tan A) is the ratio of the length of the leg opposite $\angle A$ (opp) to the length of the leg adjacent $\angle A$ (adj).	$\tan A = \frac{\text{opp}}{\text{adj}}$ or $\frac{a}{b}$ $\tan B = \frac{\text{opp}}{\text{adj}}$ or $\frac{b}{a}$	

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Make sure your calculator is set to DEGREES

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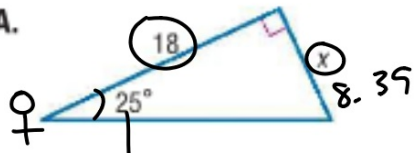
GuidedPractice

Find x to the nearest hundredth.

3A.



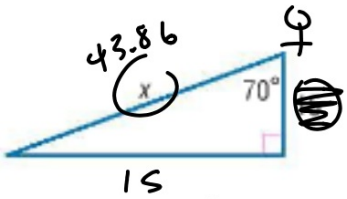
$\tan 25 = \frac{x}{18}$

$\frac{0.4663}{1} = \frac{x}{18}$

$\tan(45) = 1$

$x = 8.39$

3B.



$\sin 70 = \frac{15}{x}$

$\cos 70 = \frac{15}{x}$

$\frac{0.3420}{1} = \frac{15}{x}$

$\frac{0.3420x}{0.3420} = \frac{15}{0.3420}$

43.86

Inverse functions (algebra 1)

ReadingMath

Inverse Trigonometric Ratios

The expression $\sin^{-1} x$ is read *the inverse sine of x* and is interpreted as the angle with sine x. Be careful not to confuse this notation with the notation for negative exponents—

$\sin^{-1} x \neq \frac{1}{\sin x}$.

Instead, this notation is similar to the notation for an inverse function, $f^{-1}(x)$.

$( )^{-1}$

$\times \div$ } Sin, Cos, tan } ratio

$+ \quad -$

$( )^2 = \sqrt{\ }$ } $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$ } angles

$\sin( ) = \sin^{-1}( )$

2nd $\sin(\frac{1}{2}) = 30^\circ$

sine=ratio
inverse sine=angle

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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 $\tan^{-1} x = m\angle A$.

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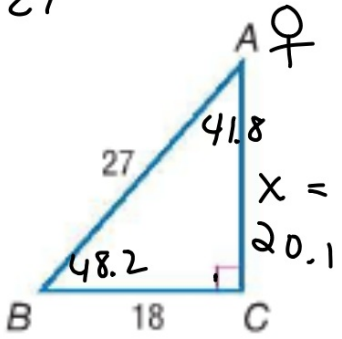
Example 4 Find Angle Measures Using Inverse Trigonometric Ratios

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

"Solve"

Where are you?
What trig function applies?
Use inverse to find angles.

$X^2+18^2=27^2$



$\sin A = \frac{18}{27}$

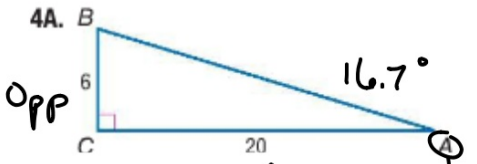
$\sin A = 0.6667$

$\sin^{-1}(0.6667) = 41.8°$

GuidedPractice

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

4A.



16.7°

opp

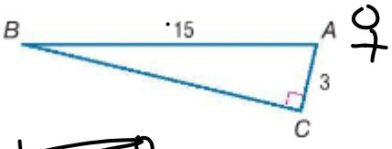
adj

$\tan A = \frac{6}{20}$

$\tan A = 0.3$

$\tan^{-1}(0.3) =$

4B.



~~tan =~~

$\cos A = \frac{3}{15}$

$\cos A =$

$A = 78.5°$

Solve the triangle: find all parts (6)

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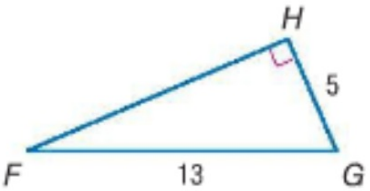
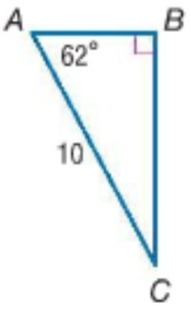
GuidedPractice

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

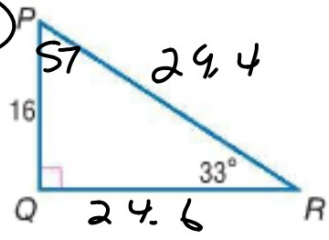
5A.



5B.



5C.



$\tan R =$

$\tan P = \frac{x}{16}$

$\frac{\tan 57}{1} = \frac{x}{16}$ $x = 24.6$

$\frac{\sin 33}{1} = \frac{16}{x}$

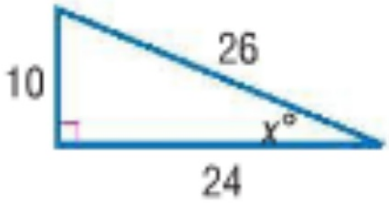
$\frac{0.5446x}{0.5446} = \frac{16}{0.5446}$

$x = 29.4$

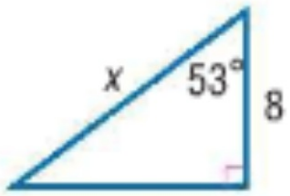
Find x. Round to the nearest tenth, if necessary.

(Lesson 8-4)

13.



14.



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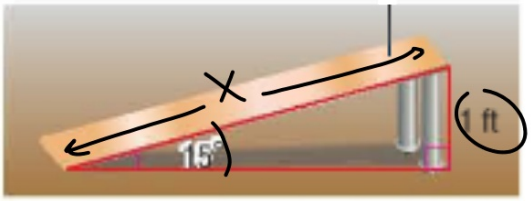
15. SKATEBOARDING Lindsey is bui ding a skateboard ramp. She wants th e ramp to be 1 foot tall at the end and she w ants it to make a 15° angle with the ground. W hat length of board should she buy for the r mp itself? Round to the nearest foot. (Les on 8-4)

$\sin 15^\circ = \frac{1}{x}$



8.4

WB skills 1-13

prac 1-9