SM 3H

Date: 1/30/24 Section: 6.3

Objective: I can find angles and sides of triangles using special right triangles and right triangle trig

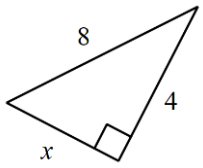
Review: Simplify each radical.

1. $\sqrt{24}$ $2\sqrt{6}$

2. $\frac{4}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$ rationalize denom

3. $\frac{5\sqrt{2}}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$ $\frac{5\sqrt{6}}{6}$

Find the missing side. Leave answers in simplest radical form. (Use square roots, not decimals.)

1. 

Pythag thm

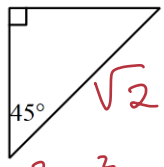
$x^2 + 4^2 = 8^2$

$x^2 = 48$

$x = 4\sqrt{3}$

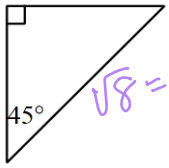
$\sqrt{8^2 - 4^2} = x$

Find the missing sides of these isosceles triangles. Leave answers in simplest radical form. (Use square roots, not decimals.) Triangles are not drawn to scale.

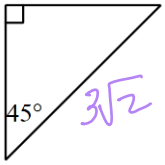
1. 

leg, leg 1, $\sqrt{2}$

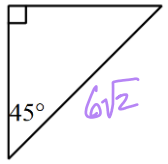
$1^2 + 1^2 = 2$

2. 

2, $\sqrt{8} = 2\sqrt{2}$

3. 

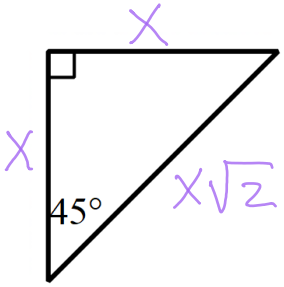
3, $3\sqrt{2}$

4. 

6, $6\sqrt{2}$

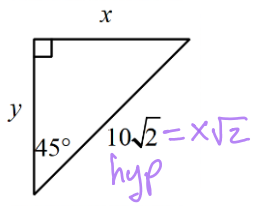
What pattern do you see? leg times $\sqrt{2}$

This pattern works for every isosceles right triangle or $45° - 45° - 90°$ triangles. So, we can use this pattern to find the missing sides without needing to show work.

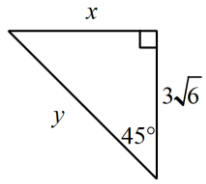


PATTERN for $45° - 45° - 90°$ special right triangles:

Use the pattern for $45° - 45° - 90°$ special right triangles to find the missing sides. Leave answers in simplest radical form.

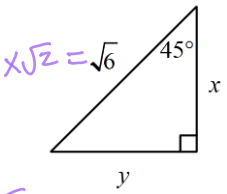
1. 

$x =$ 10 $y =$ 10

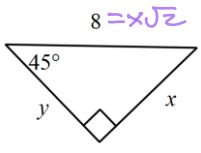
2. 

$x =$ $3\sqrt{6}$ $y =$ $6\sqrt{3}$

$3\sqrt{6} \cdot \sqrt{2} = 3\sqrt{12}$

3. 

$x =$ $\sqrt{3}$ $y =$ $\sqrt{3}$

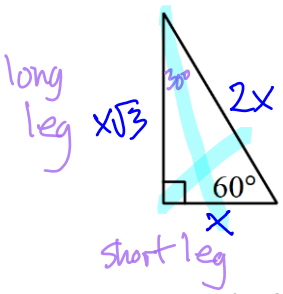
4. 

$x =$ $\frac{8}{\sqrt{2}}$ $y =$ $4\sqrt{2}$

$\frac{8}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

There is another right triangle that has a pattern. It is a $30° - 60° - 90°$ triangle.

PATTERN for $30° - 60° - 90°$ special right triangles:

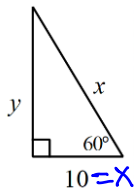


NOTICE: Long ~~side~~ leg is across from 60°

Short ~~side~~ leg is across from 30°

Use the pattern for $30° - 60° - 90°$ special right triangles to find the missing sides. Leave answers in simplest radical form.

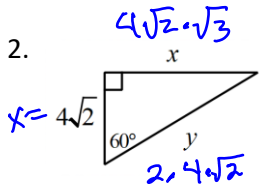
1.



$x =$ 20

$y =$ $10\sqrt{3}$

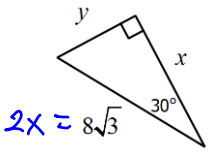
2.



$x =$ $4\sqrt{6}$

$y =$ $8\sqrt{2}$

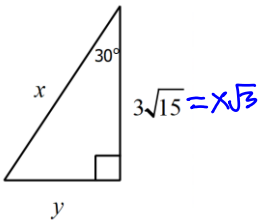
3.



$x =$ 12

$y =$ $4\sqrt{3}$

4.

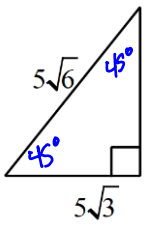


$x =$ $6\sqrt{5}$

$y =$ $3\sqrt{5}$

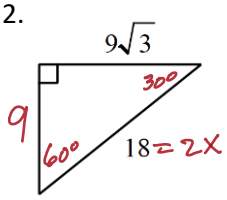
Given the sides of the right triangle, decide which type of special right triangle it is, ($30° - 60° - 90°$ or $45° - 45° - 90°$). Then write the degree measures of the missing 2 angles in the correct spot. **Triangles are not drawn to scale.**

1.



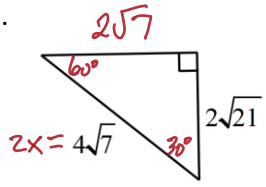
$5\sqrt{3}\cdot\sqrt{2}$

2.



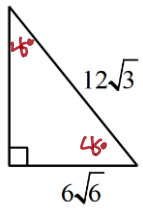
$9\sqrt{3}\cdot\sqrt{2}$

3.



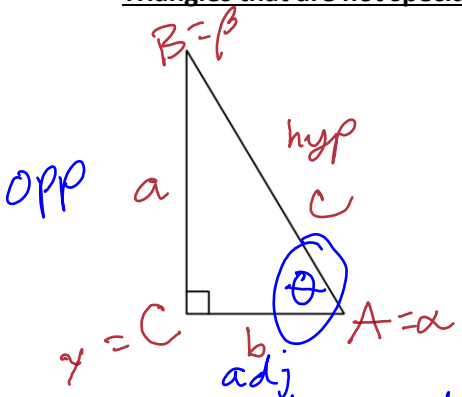
$2\sqrt{21}\cdot\sqrt{2}$

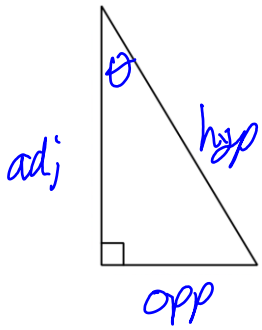
4.



$6\sqrt{6}\cdot\sqrt{2}$

Triangles that are not special right triangles





Hypotenuse: longest side Opposite side: across from angle Adjacent side: touching angle

Ratios of the sides are the same for every angle. Example: No matter how long the sides are of a 53.1° angle, when you divide the 2 sides you will always get the same decimal.

There are 6 trigonometric functions.

$\sqrt{16}=4$ $\sqrt{x}=4$

Sine = $\sin\theta = \frac{o}{h} = \frac{1}{\csc\theta}$ SOH

Cosine = $\cos\theta = \frac{a}{h} = \frac{1}{\sec\theta}$ CAH

Tangent = $\tan\theta = \frac{o}{a} = \frac{1}{\cot\theta}$ TOA

Cosecant = $\csc\theta = \frac{h}{o} = \frac{1}{\sin\theta}$

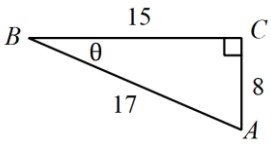
Secant = $\sec\theta = \frac{h}{a} = \frac{1}{\cos\theta}$

Cotangent = $\cot\theta = \frac{a}{o} = \frac{1}{\tan\theta}$

used to type in calc

Example: Find all 6 trigonometric ratios.

1.



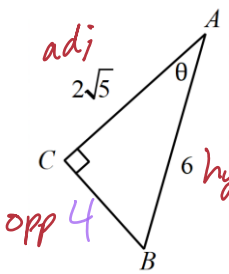
$\sin\theta =$ _____ $\csc\theta =$ _____

$\cos\theta =$ _____ $\sec\theta =$ _____

$\tan\theta =$ _____ $\cot\theta =$ _____

ratio = fraction

2.



$\sqrt{6^2-(2\sqrt{5})^2}$

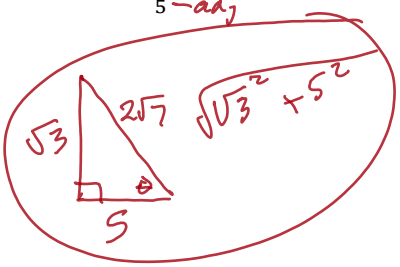
$\sin\theta = \frac{2}{3}$ $\csc\theta = \frac{3}{2}$

$\cos\theta = \frac{\sqrt{5}}{3}$ $\sec\theta = \frac{3}{\sqrt{5}} = \frac{3\sqrt{5}}{5}$

$\tan\theta = \frac{2}{\sqrt{5}}$ or $\frac{2\sqrt{5}}{5}$ $\cot\theta = \frac{\sqrt{5}}{2}$

Example: Given one trig function, find the other 5.

1. $\tan\theta = \frac{\sqrt{3}}{5}$ $\frac{\text{opp}}{\text{adj}}$



$\sin\theta = \frac{\sqrt{3}}{2\sqrt{7}}$ $\csc\theta = \frac{2\sqrt{7}}{\sqrt{3}}$

$\cos\theta = \frac{5}{2\sqrt{7}}$ $\sec\theta = \frac{2\sqrt{7}}{5}$

$\tan\theta = \frac{\sqrt{3}}{5}$ $\cot\theta = \frac{5}{\sqrt{3}}$

Example: Find the value of each. Round you answers to the nearest ten-thousandth.

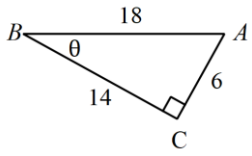
1. $\cos 65° =$ .4226

2. $\csc 28° =$ 2.1301

$\frac{1}{\sin 28°}$

Example: Use a trigonometric ratio to find the indicated angle. ******INVERSE of trig function is used ONLY to find an angle!!!!!!!!!!!

1.



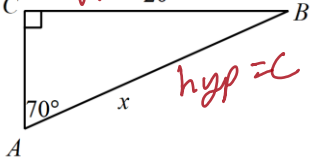
$\sin^{-1}\sin\theta = \sin^{-1}\frac{6}{18}$

$\theta = \sin^{-1}\left(\frac{6}{18}\right)$

$\theta \approx 19.5°$

Example: Use a trigonometric ratio to find the indicated side.

1.



opp 20 a

hyp = c

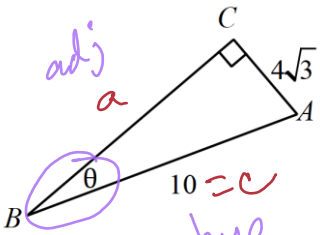
$\sin 70° = \frac{20}{x}$

$20\left(\frac{1}{\sin 70°} = \frac{x}{20}\right)$

$x \approx 21.3$

Example: Use right triangle trigonometry to find all the missing parts of the right triangle.

1.



adj a

$4\sqrt{3} = b$ opp

10 = c hyp

180°

$m\angle A =$ 46.1° $a =$ $2\sqrt{13}$

$m\angle B =$ 43.9° $b =$ $4\sqrt{3}$

$m\angle C =$ 90° $c =$ 10

$\sqrt{10^2 - (4\sqrt{3})^2}$

$\sin B = \frac{4\sqrt{3}}{10}$

$\sin^{-1}\left(\frac{4\sqrt{3}}{10}\right) = B$

Example: Find the exact answer without a calculator.

1. $\sin\frac{\pi}{4} = \frac{4}{4\sqrt{2}} = \frac{1}{\sqrt{2}}$ or $\frac{\sqrt{2}}{2}$

$\frac{\pi}{4} = 45°$

Example: Find the angle without a calculator.

1. $\cos^{-1}\left(\frac{1}{2}\right)$ $\frac{\text{adj}}{\text{hyp}}$ $= 60°$