Module 5a: Determining Angle Measures

Math Practice(s):

-Make sense of problems & persevere in solving them.

-Model with mathematics.

Learning Target(s):

-Setup equations using trig functions to find the measure of acute angles in right triangles.

Homework:

HW#5: 5a ws finish packet

Aug 8-12:20 PM

Warm-up

1. Working with a partner, discuss the statements below to determine the word most appropriate to write in each blank.

A. In a 30° - 60° right triangle the hypotenuse is always _____twice_____ the length of the shortest leg, and the length of the longest leg is always _____radical 3 ($\sqrt{3}$)_____ times the length of the shortest leg. This follows from similarity and the ratios within such a triangle.

B. Therefore, if the shortest leg has length r, the hypotenuse has length _____$2r$_____ and the longest leg has length _____$r\sqrt{3}$_____.

C. Furthermore, if the lengths of a right triangle are related as above, then by similarity the triangle must be a _____ special right triangle.

"45-45-90"

D. In an isosceles right triangle, the hypotenuse is always _____radical 2 ($\sqrt{2}$)_____ times the length of the legs.

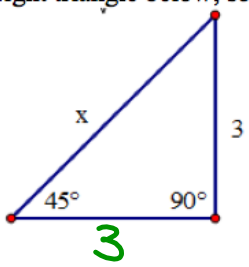
E. Therefore, if the legs of an isosceles right triangle have length r then the hypotenuse has length _____$r\sqrt{2}$_____. Also, if the hypotenuse of an isosceles right triangle has length h, then the legs have length _____$\frac{h\sqrt{2}}{2}$_____

hyp = leg·√2

$h = \frac{\text{leg}\cdot\sqrt{2}}{\sqrt{2}}$ · $\frac{\sqrt{2}}{\sqrt{2}}$

F. Furthermore, if the legs of a right triangle satisfy the above, the triangle must be an _____45°- 45°_____ right triangle.

In each right triangle below, solve for x to determine one of the unknown lengths of the triangle.

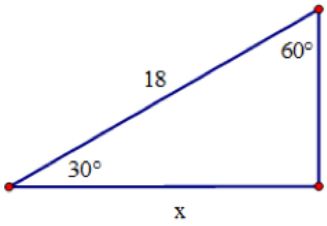


3

$x = 3\sqrt{2}$ units

$\text{hyp} = \text{leg}\cdot\sqrt{2}$

$\sin 45 = \frac{3}{x}$



$x = 9\sqrt{3}$ units

$\frac{\text{hyp}}{\text{SL}} = \frac{2}{1}$ $\frac{\text{SL}}{\text{LL}} = \frac{1}{\sqrt{3}}$

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

$\frac{6\sqrt{2}}{2}$

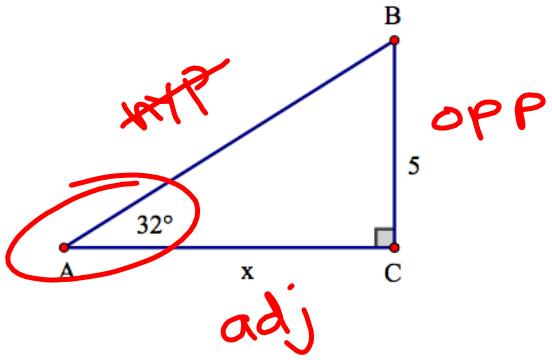
$3\sqrt{2}$

2. In the right triangle below, solve for x to determine one of the unknown lengths of the triangle.

$x(\tan 32^\circ) = \frac{5}{x}$ ×

$\frac{x \cdot \tan 32^\circ}{\tan 32^\circ} = \frac{5}{\tan 32^\circ}$

$x = 8.002$ units



3. Reflect and summarize: work with a partner to discuss the questions below, and then write down a brief summary of your discussion.

A. If you know the lengths of 2 sides of a right triangle, how would you determine the length of the third side?

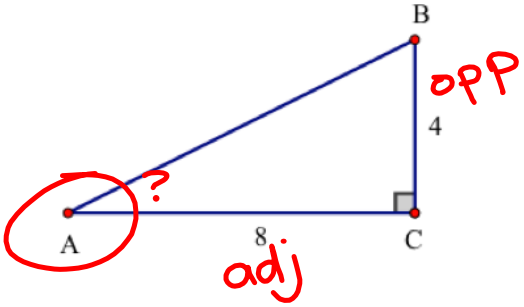
Use the pythagorean thm, because it requires knowing 2 sides to find a third side.

B. Given a right triangle, if you know the length of only one side and the measure of one of the acute angles, how would you determine the lengths of the other 2 sides of the triangle?

Use trig ratios (sine, cosine, & tangent), because it requires an acute ∠ measure in a right △ & 2 sides.

For each of the following triangles, set up an equation involving a trig. ratio (sine, cosine or tangent) that could be used to determine the measure of $\angle A$. Then, use a "guess-and-check" method to estimate the solution to your equation.

Example 1



$\tan A = \frac{4}{8}$

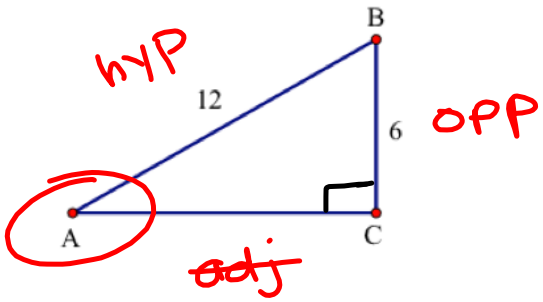
$\tan A = \frac{1}{2}$

$\tan A = 0.5$

$\tan 27^\circ \approx 0.5$

$m\angle A \approx 27^\circ$

Example 2



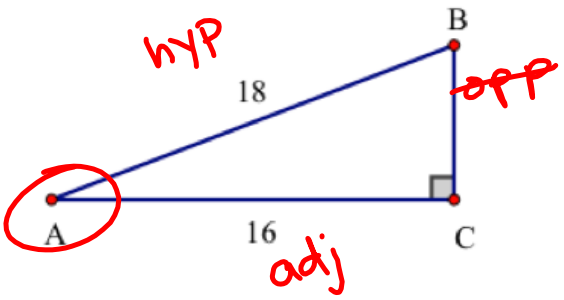
$\sin A = \frac{6}{12}$

$\sin A = 0.5$

$\sin 30^\circ = 0.5$

$m\angle A = 30^\circ$

Example 3



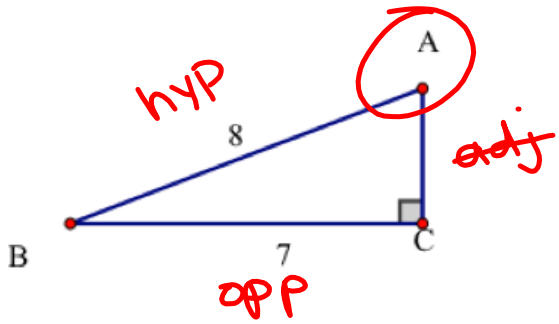
$\cos A = \frac{16}{18}$

$\cos A = 0.\overline{88}$

$\cos 28^\circ \approx 0.\overline{88}$

$m\angle A \approx 28^\circ$

Example 4



$\sin A = \frac{7}{8}$

$\sin A = 0.875$

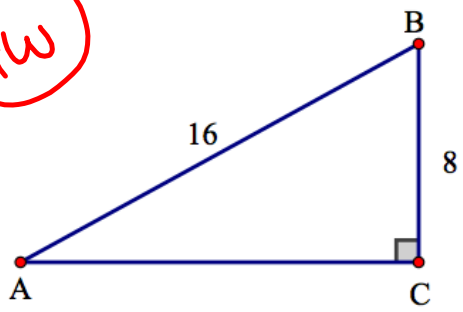
$\sin 61^\circ \approx 0.875$

$m\angle A \approx 61^\circ$

For each of the following questions, set up an equation involving a trig. ratio (sine, cosine or tangent) that could be used to answer the question. You do not need to solve your equation; **simply set up an equation using a trig. ratio.**

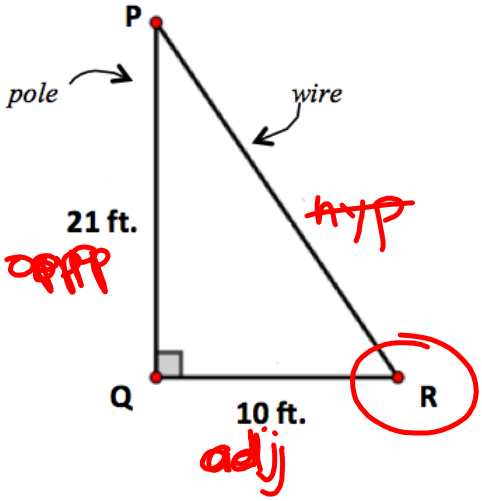
4. Determine the measure of $\angle A$.

HW



5. A pole that stands 21 feet tall is perpendicular to the ground. A wire is attached to the top of the pole, and the other end of the wire is placed on the ground, 10 feet away from the pole. What is the measure of the angle that is formed by the wire and the ground?

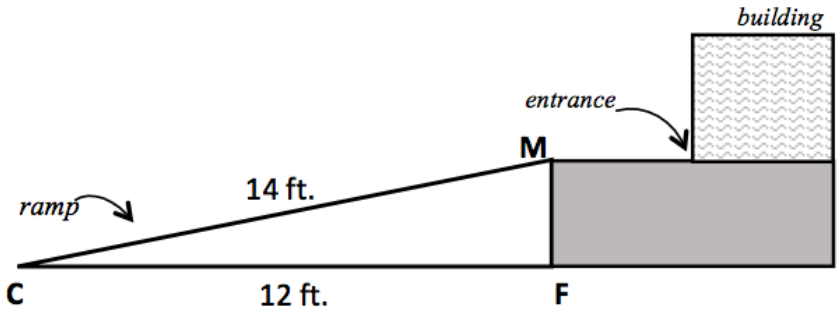
$\tan R = \frac{21}{10}$



HW

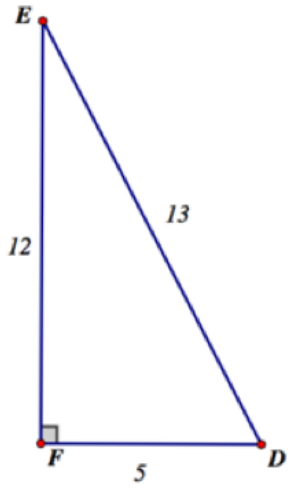
6. A school needs to build a ramp so that someone who uses a wheelchair can easily access the entrance to a building that is not on ground level. The diagram below shows the ramp that will be designed to form a right triangle where the ramp has a length of 14 feet and the beginning of the ramp is 12 feet away from the point on the ground below the top of the ramp.

What is the measure of the angle between the ground and the beginning of the ramp? (Note: the ramp "begins" at vertex C in the triangle in the diagram below.)



HW

7. State 3 different equations (each using a different trig ratio) that could be used to determine the measure of EACH acute angle in the triangle below.



Three equations that could be used to determine the measure of $\angle E$.

Three equations that could be used to determine the measure of $\angle D$.