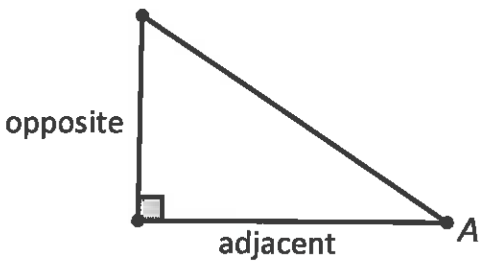
Geometry R – Mr. Bo
Unit 9 – Day 4 Notes

Name notes
Date________________

Trigonometry & Angles of a Right Triangle

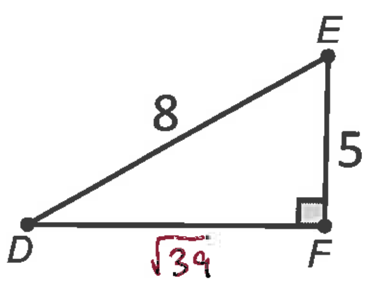
The Tangent Ratio: If $\angle A$ is an ***acute angle*** of a ***right triangle*** then the ratio $\dfrac{\textit{the side opposite } \angle A}{\textit{the side adjacent } \angle A}$ is called the "Tangent of $\angle A$".



We write: $\tan(A) = \dfrac{opposite}{adjacent}$

1.

a. Determine each ratio: tan(D) and tan(E)



$5^2 + x^2 = 8^2$

$25 + x^2 = 64$

$x^2 = 39$

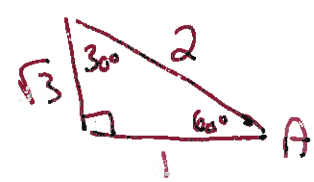
$x = \sqrt{39}$

$\tan(D) = \dfrac{5}{\sqrt{39}}$

$\tan(E) = \dfrac{\sqrt{39}}{5}$

b. $\tan(A) = \sqrt{3}$. What must $m\angle A$ be and why?

$\tan(A) = \dfrac{\sqrt{3}}{1}$ ← opp. / ← adj.

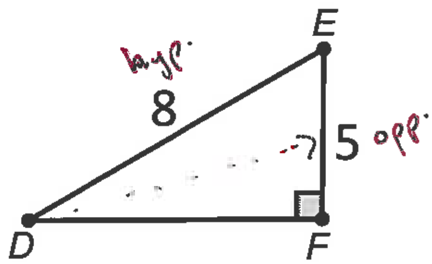


<A must be 60°

Using a Calculator to Find Angles:

You've seen that sine, cosine and tangent ratios can be used to find missing sides of a right triangle, but they can also be used to find the measures of the acute angles as well.

2. Find the measures of $\angle D$ and $\angle E$; round your answers to the nearest degree.



a. To find the measure of $\angle D$, we will first, set up a proportion using one of the sine, cosine or tangent ratios.

$$\sin(D) = \frac{5}{8}$$

(Sine is chosen here because it is the most convenient in this case).

b. Next, use either the $\sin^{-1}$, $\cos^{-1}$, or $\tan^{-1}$ button on your calculator to find the measure of the angle. *Remember, your calculator must be set to degree mode.*

$$\sin^{-1}\left(\frac{5}{8}\right) = m\angle D$$

Notice that the ratio goes inside the parentheses

$$m\angle D = 39^0$$

c. Repeat steps a & b to find m$\angle$E.

$\cos(E) = \frac{5}{8}$

$m\angle E = \cos^{-1}\left(\frac{5}{8}\right)$

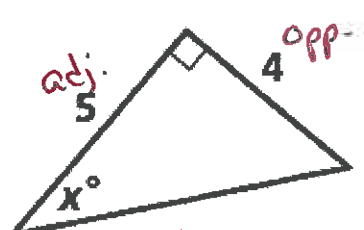
$= 51°$

notice:

$m\angle D + m\angle E = 90°$

2. Find the measure of the indicated angle, to the nearest degree. Show how you arrived at your answer.

a.

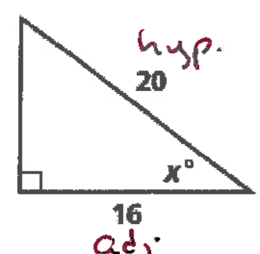


$\tan(x) = \frac{4}{5}$

$x = \tan^{-1}(4/5)$

$= 39°$

b.

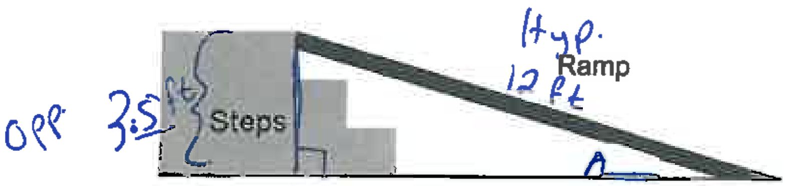


$\cos(x) = \frac{16}{20}$

$x = \cos^{-1}(16/20)$

$= 37°$

3. A 12 foot ramp is constructed to reach the top step of a stairway. The top step is 42 inches above ground level. To meet the local building code, the angle made by the ramp and the ground must not exceed 14 degrees.

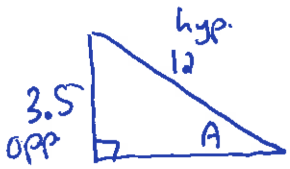


$$\frac{42 \text{ in}}{x \text{ ft}} = \frac{12 \text{ in}}{1 \text{ ft}}$$

$$42 = 12x$$

$$x = \frac{42}{12} = 3.5 \text{ ft}.$$

a. Explain why the ramp does not meet the local building code. Show how you arrived at your answer



$$\sin(A) = \frac{opp}{hyp}$$

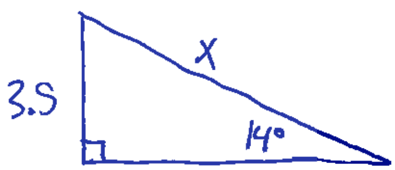
$$\sin(A) = \frac{3.5}{12}$$

$$m\angle A = \sin^{-1}\left(\frac{3.5}{12}\right)$$

$$m\angle A = 17°$$

the angle between the ramp and ground is 17° which exceeds the max allowable angle of 14°.

b. Determine the minimum length of the ramp such that it will meet the local building code. Show how you arrived at your answer.



$$\frac{\sin(14°)}{1} = \frac{3.5}{x}$$

$$x\sin(14) = 3.5$$

$$x = \frac{3.5}{\sin(14)}$$

$$x \approx 14.5 \text{ ft}.$$

the ramp should be a minimum of 14.5 ft.