

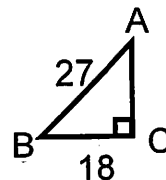
8.4 Trigonometric Ratios in right triangles: Hw: 37-57 odd p. 574-575 skip 47

**Objective:** To find missing angle measures in right triangles using trigonometric ratios.

**Inverse trigonometric Ratios:**

If  $\angle A$  is an acute angle in a right triangle and the  $\sin A = x$ , then the inverse sine of  $x$  is the measure of  $\angle A$ . Same notation is used for inverse cosine and tangent.

Symbols: If  $\sin A = x$  then  $\sin^{-1}x = m\angle A$



$$\sin A = \frac{18}{27} = \frac{2}{3}$$

So the  $m\angle A = \sin^{-1} \frac{2}{3}$ . Use a calculator with this key in sequence:  
 3 2nd sin key  $(2 \div 3) = 42^\circ$

1. Find the  $m\angle B$ . Using what ratio? COS. How do we know this?

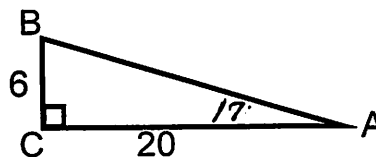
*We have the adjacent side and hypotenuse*  
 $m\angle A = \cos^{-1}(\frac{18}{27}) = 48^\circ$   
 $m\angle A = \cos^{-1}(\frac{2}{3}) = 48^\circ$   
 \* We know  $m\angle B$  should be about  $48^\circ$  since it is complement of  $42^\circ$   
 Check using Trig

Solve for all angles and sides in  $\triangle ABC$ .

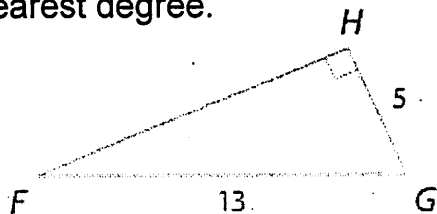
2. Find the  $m\angle A$ . Using what ratio? TAN. How do we know this?

$$m\angle A = \tan^{-1}(\frac{6}{20})$$

$$m\angle A = \tan^{-1}(3/10) = 17^\circ$$



3. Solve the right triangle. Round sides to nearest tenth and angle measures to nearest degree.



Find  $m\angle F$ !

$$\sin^{-1}(5 \div 13)$$

$$= 23$$

$$m\angle G = 90 - 23$$

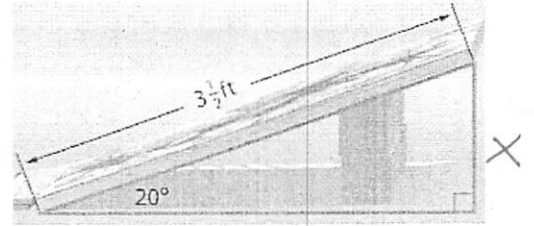
$$= 67$$

$$m\angle G = \cos^{-1}(5 \div 13)$$

$FH = 12$   
 PART OF A  
 PYTHAGOREAN  
 TRIPLE

We can find side lengths of right triangles by only being given one angle and one side.

4. **SPORTS** David is building a bike ramp. He wants the angle that the ramp makes with the ground to be  $20^\circ$ . If the board he wants to use for his ramp is  $3\frac{1}{2}$  feet long, about how tall will the ramp need to be at the highest point?



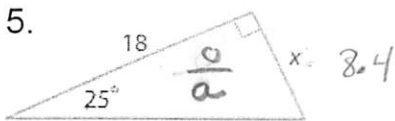
Decide what ratio works with the given information and set up an equation and solve:

\* opp/hyp

$$\sin 20^\circ = \frac{X}{3.5}$$

$$3.5(\sin 20^\circ) = X$$

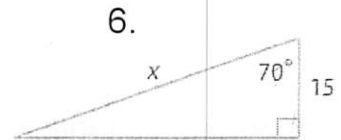
$$\approx 1.2 \text{ ft}$$



$$\tan(25^\circ) = \frac{X}{18}$$

$$18(\tan 25^\circ) = X$$

$$8.4 = X$$



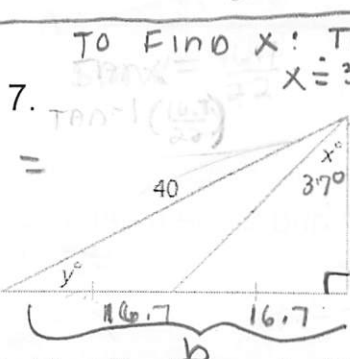
$$\cos 70^\circ = \frac{15}{X}$$

$$X(\cos 70^\circ) = 15$$

$$X = \frac{15}{\cos 70^\circ}$$

$$X \approx 43.9$$

$$\approx 44^\circ$$



To find x:  $\tan^{-1}(\frac{16.7}{22})$   
 $x = 37^\circ$

To find y:  $\frac{a}{h}$   
 $\sin^{-1}(\frac{22}{40})$   
 $m\angle y \approx 33.4$

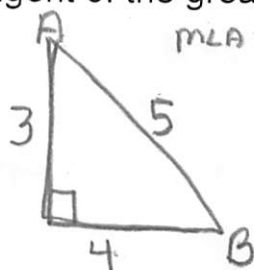
$$22^2 + b^2 = 40^2$$

$$484 + b^2 = 1600$$

$$b^2 = 1116$$

$$b \approx 33.4$$

8. Find the tangent of the greater acute angle in a triangle with side lengths 3, 4, 5



$$m\angle A = \tan^{-1}(\frac{4}{3})$$

$$m\angle A \approx 53$$

$$\tan = \frac{a}{b}$$

$$m\angle B = \tan^{-1}(\frac{3}{4})$$

$$m\angle B \approx 37$$