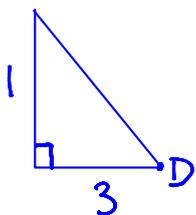


3.2a The Sine and Cosine Ratios

Warm-up:

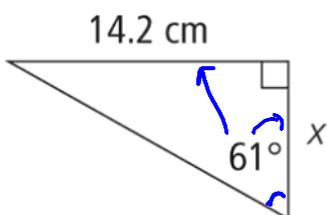
- Draw and label a right triangle to show the tangent ratio.
- Determine the measure of the angle, to the nearest degree.

$$\tan D = \frac{O}{A} = \frac{1}{3}$$



$$\begin{aligned} \tan D &= \frac{1}{3} \\ D &= \tan^{-1}\left(\frac{1}{3}\right) \\ D &= 18.4^\circ \end{aligned}$$

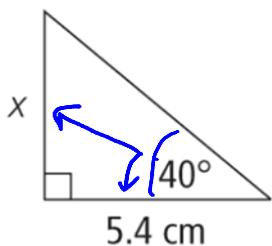
- Determine the measurement of the indicated side.



$$\tan 61 = \frac{14.2}{x} \quad \leftarrow \text{bottom, } \div \text{ by ratio}$$

$$x = \frac{14.2}{\tan 61}$$

$$x = 7.9$$

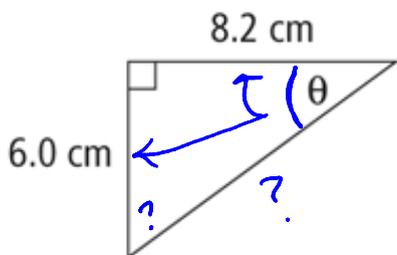


$$\tan 40 = \frac{x}{5.4} \quad \leftarrow \text{top, } \times \text{ by ratio}$$

$$x = 5.4 \tan 40$$

$$x = 4.5$$

- Calculate θ to the nearest degree.

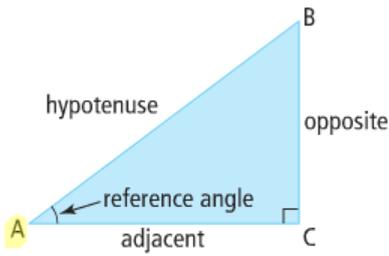


$$\tan \theta = \frac{6}{8.2}$$

$$\theta = \tan^{-1}\left(\frac{6}{8.2}\right)$$

$$\theta = 36.2^\circ$$

3.2a Sine and Cosine Ratios



$$\text{Sine (A)} = \frac{\text{length of side opposite A}}{\text{length of hypotenuse}}$$

$$\text{Cosine (A)} = \frac{\text{length of side adjacent A}}{\text{length of hypotenuse}}$$

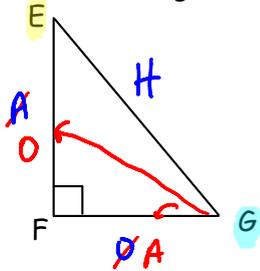
$$\text{Sin A} = \frac{O}{H}$$

$$\text{Cos A} = \frac{A}{H}$$

$$\text{tan A} = \frac{O}{A}$$

Memory tool: **SOH CAH TOA**

Write each trig ratio:



$$\text{sin E} = \frac{FG}{EG}$$

$$\text{sin G} = \frac{EF}{EG}$$

$$\text{cos E} = \frac{EF}{EG}$$

$$\text{cos G} = \frac{FG}{EG}$$

$$\text{tan E} = \frac{FG}{EF}$$

$$\text{tan G} = \frac{EF}{FG}$$

SOH CAH TOA

- Evaluate each trig ratio to four decimal places. What do the ratios mean?

a) $\text{sin } 60^\circ = 0.8660$ $\frac{O}{H}$

b) $\text{sin } 30^\circ = 0.5$

c) $\text{cos } 45^\circ = 0.7071$ $\frac{A}{H}$



- What is the measure of each angle, to the nearest degree?
(Remember....to find an angle, use the inverse of the ratio.)

$$\sin \beta = 0.4384$$

$$\beta = \sin^{-1}(0.4384)$$

$$\beta = 26^\circ$$

$$\text{b) } \cos \theta = 0.2079$$

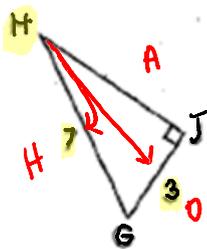
$$\theta = \cos^{-1}(0.2079)$$

$$\theta = 78^\circ$$

How to find an angle

1. Name sides of the triangle with respect to to the **unknown** angle.
2. Choose sine, cosine or tangent using the two known sides
3. Solve for the angle using the inverse ratio function

- Find angle H.

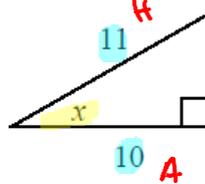


$$\sin H = \frac{3}{7}$$

$$H = \sin^{-1}\left(\frac{3}{7}\right)$$

$$H = 25.4^\circ$$

- Find x.

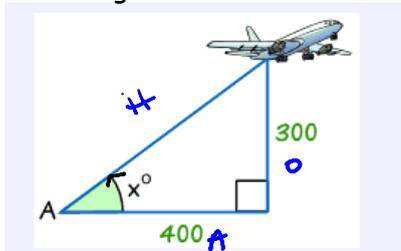


$$\cos x = \frac{10}{11}$$

$$x = \cos^{-1}\left(\frac{10}{11}\right)$$

$$x = 24.6^\circ$$

- Find the angle of elevation.



$$\tan x = \frac{300}{400}$$

$$x = \tan^{-1}\left(\frac{3}{4}\right)$$

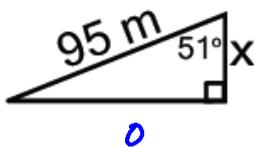
$$x = 36.9^\circ$$

Finding missing sides:

1. Name sides of the triangle with respect to to the **known** angle.
2. Choose sine, cosine or tangent using one known side and the other unknown side.
3. Solve for the unknown side.

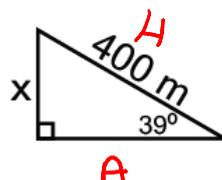
5. Find the missing sides.

a)



$$\cos 51 = \frac{x}{95}$$

b)



$$\sin 39 = \frac{x}{400}$$

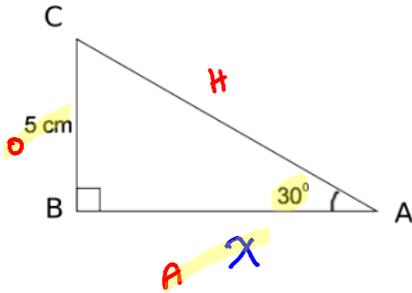
$$x = 400 \sin 39$$

45

$$\begin{aligned} x &= 95 \cos 51 \\ x &= 59.8^\circ \end{aligned}$$

$$x = 251.7$$

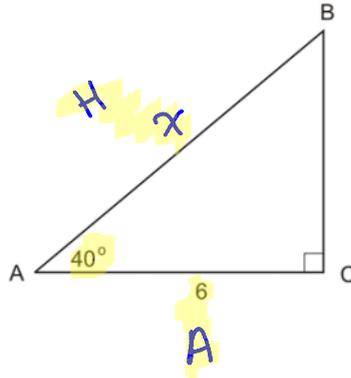
c) Find AB



$$\tan 30 = \frac{5}{x}$$

$$\begin{aligned} x &= \frac{5}{\tan 30} \\ x &= 8.66 \end{aligned}$$

d) Find AB



$$\begin{aligned} \cos 40 &= \frac{6}{x} \\ x &= \frac{6}{\cos 40} \\ x &= 7.8 \end{aligned}$$

Hint: When solving for a missing side....

- If the unknown is in the numerator, multiply by the ratio.
- If the unknown is in the denominator, divide by the ratio.

Assignment p120 #1-6