

6-1 Solving Right Triangles

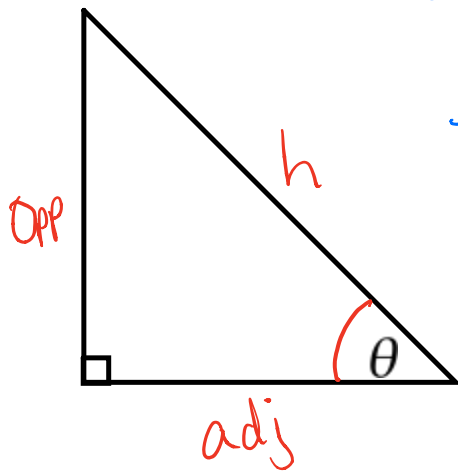
Objectives:

6-1a: I can write all six trigonometric ratios from a right triangle.

6-1b: I can solve right triangles using trigonometric functions.

Label the opposite, adjacent and hypotenuse sides

Use the angle θ to determine the opposite side and the adjacent side. The hypotenuse is always opposite of the 90° angle.



Trig Ratios

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\csc \theta = \frac{\text{hyp}}{\text{opp}}$$

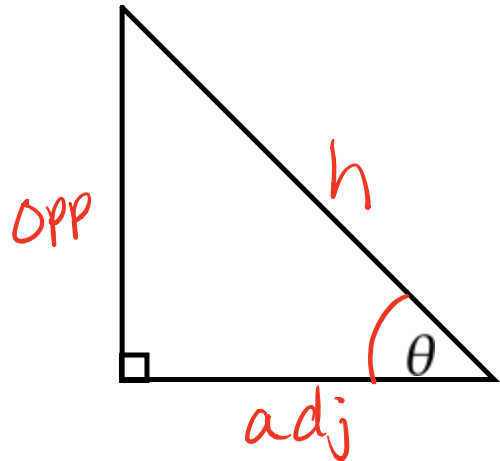
$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\sec \theta = \frac{\text{hyp}}{\text{adj}}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\cot \theta = \frac{\text{adj}}{\text{opp}}$$

SohCahToa



Soh

Sin - opposite - hypoteneuse

Cah

Cosine - adjacent - hypoteneuse

Toa

Tangent - opposite - adjacent

Write all six trig functions for the given right triangle.

$$\sin \theta = \frac{4}{5}$$

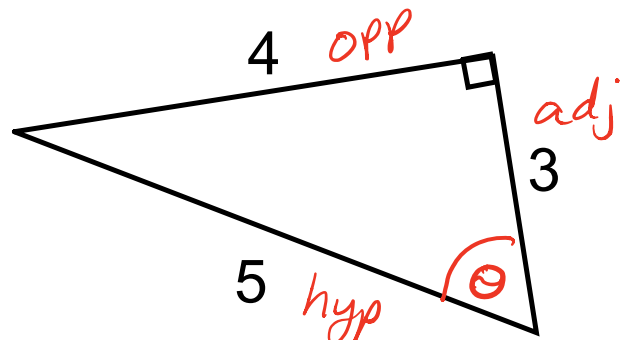
$$\csc \theta = \frac{5}{4}$$

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

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

$$\tan \theta = \frac{4}{3}$$

$$\cot \theta = \frac{3}{4}$$



To "solve" a triangle means to find ALL side lengths and angle measures. * key pts

REMEMBER

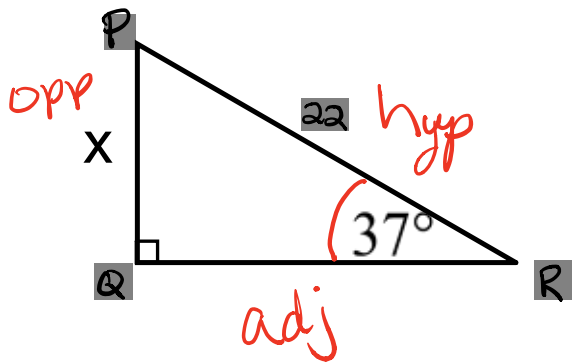
- All triangles have an angle sum of 180 degrees *
- *Pythagorean Theorem to find a missing side when you know other two sides (right triangles only) $a^2 + b^2 = c^2$
- Inverse Trig to find a missing angle (right triangles only)

First, label each side. Then find the side labeled x

To find x I will use the Soh.

$$22 \cdot \sin 37^\circ = \frac{x}{22} \cdot 22$$

$$x = 22 \cdot \sin 37^\circ$$

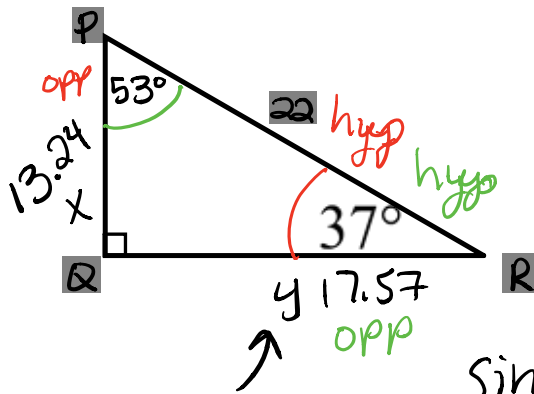


Find all remaining sides and angles

$$180 - 37 - 90 = 53$$

which is angle P.

$$\sin 37 = \frac{x}{22}$$
$$22 \sin 37 = x$$
$$13.24 = x$$

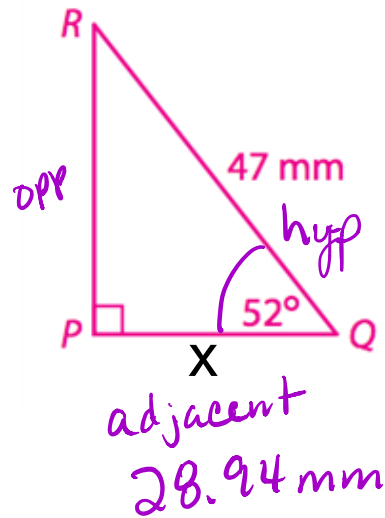


$$\sin 53 = \frac{y}{22}$$

$$22 \sin 53 = y$$

$$17.57 = y$$

Find the side labeled x

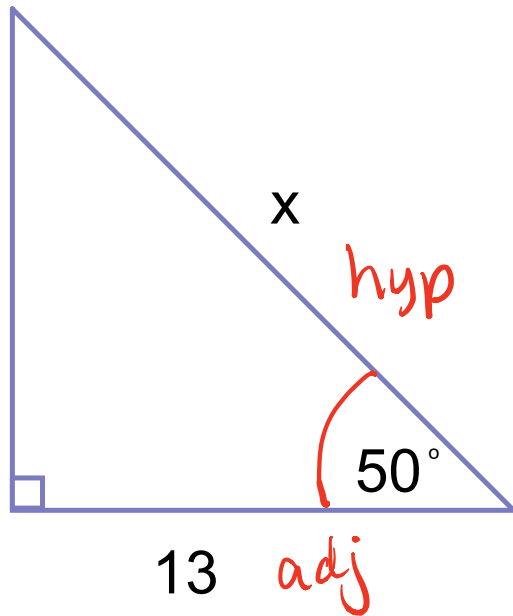


Calc

$$\cos 52 = \frac{x}{47}$$

$$47 \cos 52 = 28.94$$

Find the side labeled x



Calc

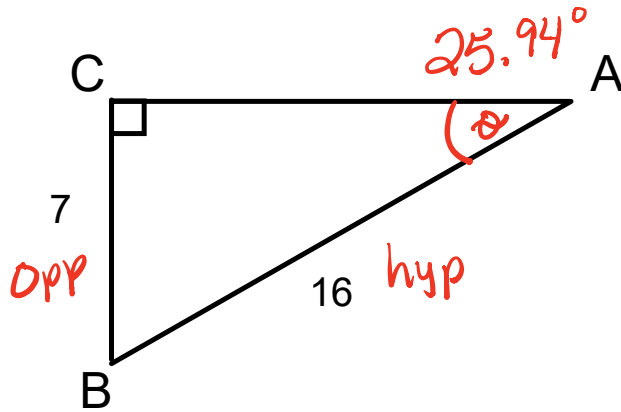
$$\cos 50 = \frac{13}{x}$$

$$x \cos 50 = 13$$

$$x = \frac{13}{\cos 50}$$

$$x = 20.22$$

Find angle A



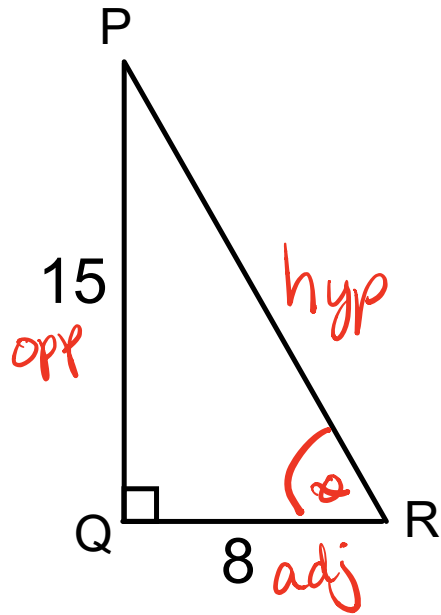
Soh

$$\sin^{-1} \sin \theta = \frac{\sin^{-1} 7}{16}$$

Use \sin^{-1} in calculator

$$\theta = \sin^{-1} \frac{7}{16}$$

$$\theta = 25.94^\circ$$



Find angle R

I will be using the opposite and adjacent sides so I am going to use Toa

$$\tan^{-1} \tan \theta = \frac{8}{15}$$

$$\theta = \tan^{-1} \frac{8}{15} \quad \text{use your calculator}$$

$$\text{2nd } \tan\left(\frac{8}{15}\right) =$$

$$\theta = 28.07$$

A building casts a 33-m shadow when the Sun is at an angle of 27° to the vertical. How tall is the building, to the nearest meter? How far is it from the top of the building to the tip of the shadow? What angle does a ray from the Sun along the edge of the shadow make with the ground?



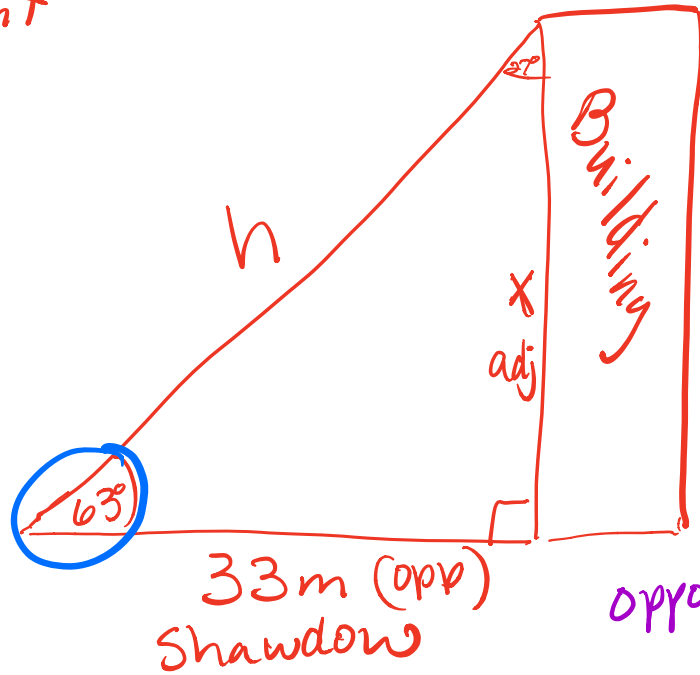
opposite and adjacent

$$\tan 27^\circ = \frac{33}{x}$$

$$x \tan 27^\circ = 33$$

$$x = \frac{33}{\tan 27^\circ}$$

$$x = 64.77 \text{ m tall}$$



opposite & hypotenuse

$$180 - 90 - 27 = 63^\circ$$

Soh

$$\sin 27^\circ = \frac{33}{h}$$

$$h \sin 27 = 33$$

$$h = \frac{33}{\sin 27}$$

$$h = 72.69 \text{ m}$$