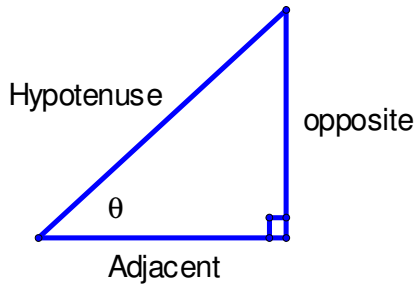


Section 6.4 Trigonometry

Right Triangles



Trigonometric Ratios

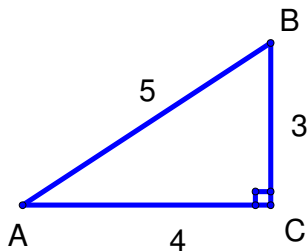
$$\sin \theta = \frac{\text{opp.}}{\text{hyp.}} \quad \csc \theta = \frac{\text{hyp.}}{\text{opp.}}$$

$$\cos \theta = \frac{\text{adj.}}{\text{hyp.}} \quad \sec \theta = \frac{\text{hyp.}}{\text{adj.}}$$

$$\tan \theta = \frac{\text{opp.}}{\text{adj.}} \quad \cot \theta = \frac{\text{adj.}}{\text{opp.}}$$

Example 1

Given the following right triangles find these trigonometric ratios $\sin A$, $\cos A$, and $\tan A$



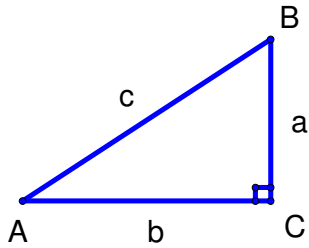
$$\sin a = \frac{\text{opp.}}{\text{hyp.}} = \frac{3}{5}$$

$$\cos a = \frac{\text{adj.}}{\text{hyp.}} = \frac{4}{5}$$

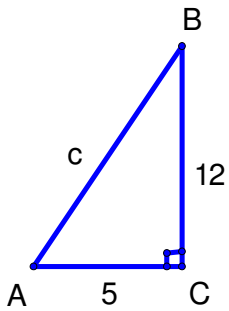
$$\tan A = \frac{\text{opp.}}{\text{adj.}} = \frac{3}{4}$$

Example 2

Use the following figure to answer questions #1-3



- 1) Find $\sin B$, if $a = 5$ and $b = 12$

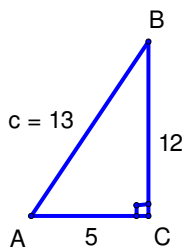


$$c^2 = a^2 + b^2$$

$$c^2 = 5^2 + 12^2$$

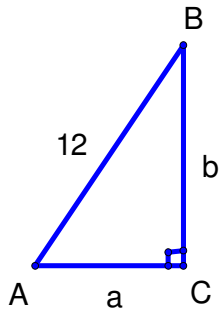
$$c^2 = 169$$

$$c = \sqrt{169} = c = 13$$



$$\sin B = \frac{12}{13}$$

2) Find b , if $\cos A = .7$ and $c = 12$



$$\cos A = \frac{a}{12}$$

$$0.7 = \frac{a}{12}$$

$$a = (.7)(12) = 8.4$$

$$c^2 = a^2 + b^2$$

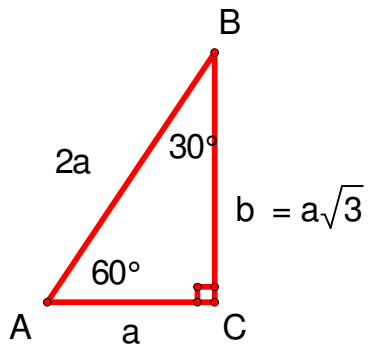
$$12^2 = 8.4^2 + b^2$$

$$144 = 70.56 + b^2$$

$$b^2 = 73.44$$

$$b = \sqrt{73.44} = 8.6$$

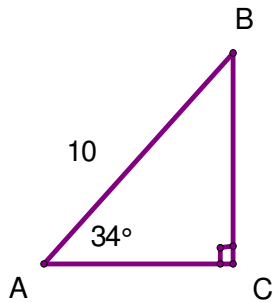
3) Find $\sin B$, if $b = a\sqrt{3}$



$$\sin B = \sin 30 = \frac{a}{2a} = \frac{1}{2}$$

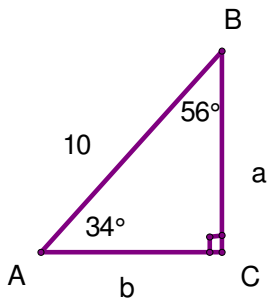
Example 4

Solve the following right triangle



Find the value of the missing angle first.

$$\angle B = 90^\circ - 34^\circ = 56^\circ$$



$$\sin 34 = \frac{a}{10} \qquad \cos 34 = \frac{b}{10}$$

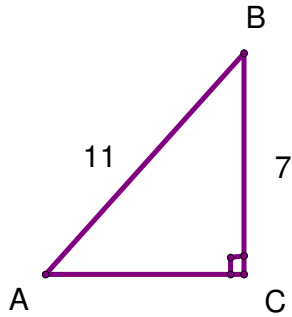
$$.559 = \frac{a}{10} \qquad .829 = \frac{b}{10}$$

$$a = 10(.559) \qquad b = 10(.829)$$

$$a = 5.59 \qquad b = 8.29$$

Example 5

Solve the following right triangle



Find angle A

$$\sin A = \frac{7}{11}$$

$$\sin A = .636$$

$$\angle A = \sin^{-1}(.636) = 39.5^\circ$$

Find B

$$\angle B = 90^\circ - 39.5^\circ = 50.5^\circ$$

Find b

$$11^2 = 7^2 + b^2$$

$$121 = 49 + b^2$$

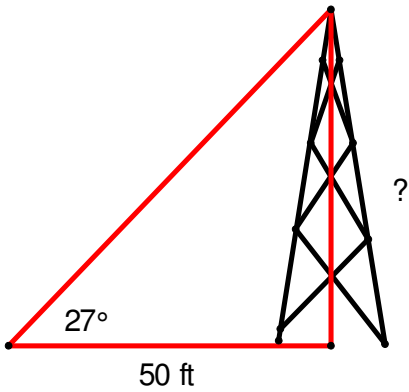
$$121 - 49 = b^2$$

$$b^2 = 72$$

$$b = \sqrt{72} \approx 8.5$$

Example 6

A construction worker is standing 50 feet from the base of the tower with an angle of elevation of 27 degrees. Find the height of the tower?



$$\cos(27^\circ) = \frac{h}{50}$$

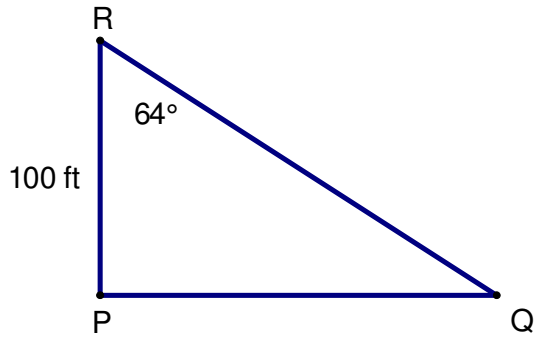
$$.891 = \frac{h}{50}$$

$$h = (.891)50$$

$$h = 44.6 \text{ ft}$$

Example 7

A surveyor at point P wished to measure the distance PQ in the drawing that follows. The surveyor sights point Q, makes a right angle at P and steps off 100 feet to R, and again sights Q. Find PQ.



$$\tan 64 = \frac{PQ}{100}$$

$$2.050 = \frac{PQ}{100}$$

$$PQ = 2.050 \cdot 100$$

$$PQ = 205$$