

## 4.4 The Right Triangle

The right angle is labeled C and the other two vertices A and B.

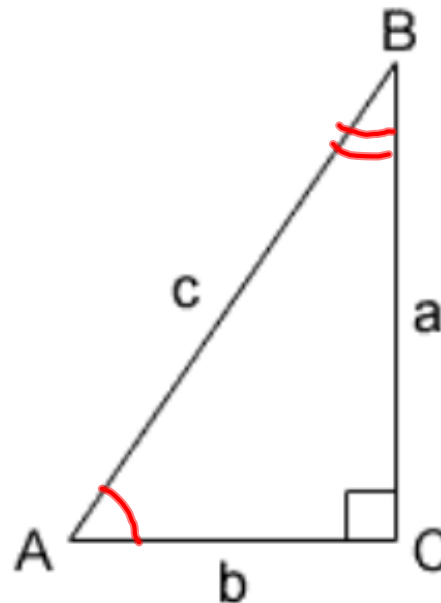
The side opposite  $\angle A$  is side **a**, side opposite  $\angle B$  is side **b**,

and side opposite  $\angle C$  is side **c, the hypotenuse**.

Angles A and B are complementary since  $\angle C$  is a right angle.

$$(A + B = 90^\circ) \quad \checkmark$$

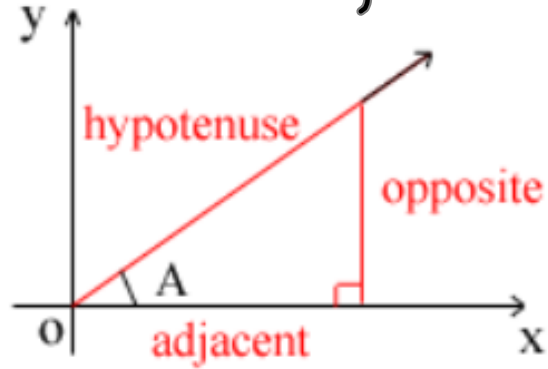
$$a^2 + b^2 = c^2 \quad \checkmark$$



$\sin A = \frac{a}{c}$   
 $\cos A = \frac{b}{c}$   
 $\tan A = \frac{a}{b}$   
 $\csc A = \frac{c}{a}$   
 $\sec A = \frac{c}{b}$   
 $\cot A = \frac{b}{a}$

$\sin B = \frac{a}{c}$   
 $\cos B = \frac{b}{c}$   
 $\tan B = \frac{a}{b}$   
 $\csc B = \frac{c}{a}$   
 $\sec B = \frac{c}{b}$   
 $\cot B = \frac{b}{a}$

# Trig. functions in Right Triangles



$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{opposite}}{\text{adjacent}}$$

$$\cot A = \frac{\text{adjacent}}{\text{opposite}}$$

$$\sec A = \frac{\text{hypotenuse}}{\text{adjacent}}$$

$$\csc A = \frac{\text{hypotenuse}}{\text{opposite}}$$

### Procedure for Solving a Right Triangle

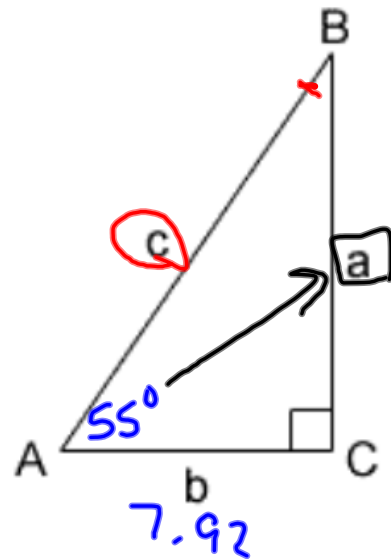
---

1. Sketch a right Triangle and label the known and unknown sides and angles
2. Express each of the three unknown parts in terms of the known parts and solve for the unknown parts
3. Check the results. *The sum of the angles should be 180°*  
*If only one side is given, check the computed side with the Pythagorean theorem. If two side are given, check the angles and computed side by using appropriate trigonometric functions.*

$$\sin 25 = \frac{a}{10}$$

### " Available Tools "

- 1)  $\angle A + \angle B = 90^\circ$
- 2)  $a^2 + b^2 = c^2$  (Pythagorean T.)
- 3) Trig. functions  $\left\{ \begin{array}{l} \sin \theta = \frac{\text{opp}}{\text{hyp}} \\ \cos \theta = \frac{\text{adj.}}{\text{hyp.}} \\ \tan \theta = \frac{\text{opp.}}{\text{adj.}} \end{array} \right.$



$$90^\circ - 55^\circ$$

$$C = 90^\circ$$

$$A = 55^\circ$$

$$B = ? = 35^\circ$$

$$a = ? = 11.31$$

$$b = 7.92$$

$$c = ? = 13.81$$

1. Given  $A = 55^\circ$  and  $b = 7.92$ , solve the right triangle ABC.

$$7.92 \tan 55^\circ = \frac{a}{7.92} \quad \cancel{7.92}$$

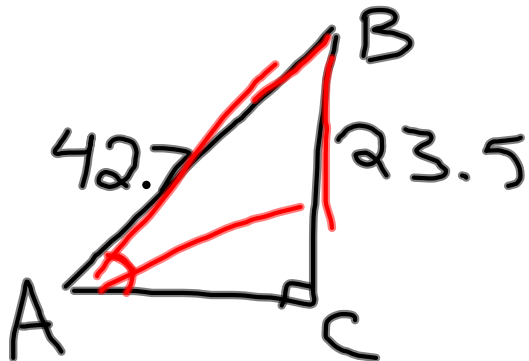
$$7.92 * \tan 55^\circ = a$$

$$c \cdot \cos 55^\circ = \frac{7.92}{c}$$

$$\frac{c \cdot \cos 55^\circ}{\cos 55^\circ} = \frac{7.92}{\cos 55^\circ}$$

$$c =$$

Given  $a = 23.5$  and  $c = 42.7$ , solve the right triangle ABC.



$$b = \sqrt{42.7^2 - 23.5^2}$$

$$b = 35.7$$

$$\sin(A) = \frac{23.5}{42.7}$$

$$\sin(A) =$$

$$C = 90^\circ$$

$$B = 56.6$$

$$A = 33.4$$

---


$$a = 23.5$$

$$b = 35.7$$

$$c = 42.7$$

$$\sin^{-1}\left(\frac{23.5}{42.7}\right) = A$$

$$33.4^\circ = A$$

Try Some problems  
pg 126

$$10) \begin{array}{l} A = 18.4^\circ \\ c = 0.0897 \\ \hline C = 90^\circ \end{array}$$

$$a =$$

$$b =$$

$$B =$$

$$\bar{a} = .0283$$

12)

$$\sin^{-1}\left(\frac{932}{1240}\right) 48.7^\circ$$