

**Recall the below Trig ratios:** SOH – CAH - TOA

$$\sin \angle A = \frac{Opp}{Hyp} \quad \cos \angle A = \frac{Adj}{Hyp} \quad \tan \angle A = \frac{Opp}{Adj}$$

**Steps for Solving Right Triangle:**

**A. Find Missing Side**

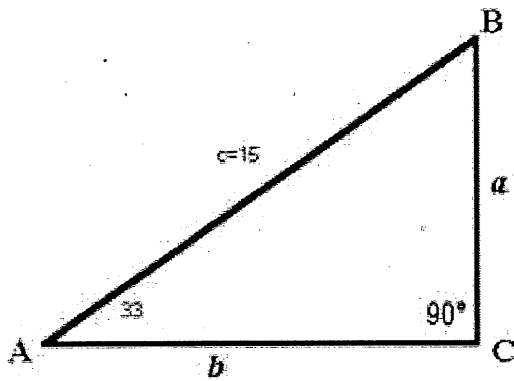
1. Set up trig ratios and use cross product to solve for the variable
2. Use Pythagorean theorem ( $a^2 + b^2 = c^2$ ) if only 1 side is missing

**B. Find Missing Angle**

1. Set up trig ratio to use inverse trig : Example  $\rightarrow \cos A = \frac{12}{13}$  means  $A = \cos^{-1}\left(\frac{12}{13}\right)$
2. Subtract the angles from  $180^\circ$  if only 1 angle is missing.

**Solve the right triangles below:**

1.



angles

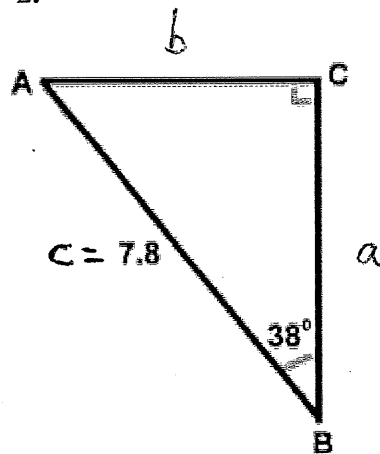
sides

A = \_\_\_\_\_ a = \_\_\_\_\_

B = \_\_\_\_\_ b = \_\_\_\_\_

C = \_\_\_\_\_ c = \_\_\_\_\_

2.



angles

sides

A = \_\_\_\_\_ a = \_\_\_\_\_

B = \_\_\_\_\_ b = \_\_\_\_\_

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$$\sin \angle A = \frac{\text{Opp}}{\text{Hyp}} \quad \cos \angle A = \frac{\text{Adj}}{\text{Hyp}} \quad \tan \angle A = \frac{\text{Opp}}{\text{Adj}}$$

**Word Problems: Find the value of indicated angle**

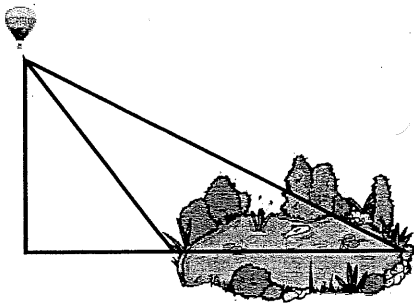
1. The angle of elevation from a point 116 meters from the base of the Eiffel Tower to the top of the Tower is  $67^\circ$ . Find the approximate height of the tower.
2. The angle of elevation to the top of the Egyptian pyramid Cheops is  $36^\circ$ , measured from a point 350 feet from the base of the pyramid. Find the height of Cheops.
3. DME (Distance Measuring Equipment) is standard avionic equipment on a commercial airplane. This equipment measures the distance from a plane to a radar station. If the distance from a plane to a radar station is 160 miles and the angle of depression is  $33^\circ$ , find the number of ground miles from a point directly below the plane to the radar station.
4. If the distance from a helicopter to a tower is 300 feet and the angle of depression is  $40^\circ$ , find the distance on the ground from a point directly below the helicopter to the tower.

5. You are cleaning the gutters on your house. The gutters are at a height of 24 feet. If you have a 50 foot ladder, what is the minimum angle the ladder can form with the ground? How far away from the house is your ladder?
6. An airplane is preparing to land at the airport. The airplane is flying at an altitude of about 1200 feet and is approximately 13,700 feet from the touchdown point on the runway. What angle does the approach path make with the runway?
7. The base of an isosceles triangle is 58 yards long. The altitude to the base is 80 feet long. What are the measures of the base angles? What are the lengths of the legs?
8. A 50 ft pole has a support wire that runs from its top to the ground with an angle of depression of  $75^\circ$ . How far from the base of the pole does the wire connect to the ground? How long is the wire?

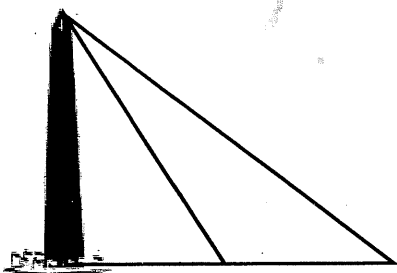
9. According to Chinese legend from the Han Dynasty, General Han Xin flew a kite over the palace. If the general let out 700 meters of string and the kite was flying at a  $40^\circ$  angle of elevation, approximately how far away was the palace? How high was the kite flying?

10. Assume you are flying in a plane at an altitude of 25,000 feet to sky dive. If you can see the landing spot at an angle of depression of  $19^\circ$  how many feet until you are over the landing spot and ready to jump?

11. The angle of depression of one side of a lake, measured from a balloon 2500 feet above the lake is  $43^\circ$ . The angle of depression to the opposite side of the lake is  $27^\circ$ . Find the width of the lake.



12. Kevin is standing  $x$  feet from the base of the Washington Monument and the angle of elevation to the top of the monument is  $42^\circ$ . Mark is standing 100 feet away and the angle of elevation to the top of the monument is  $37^\circ$ . How far away is Kevin standing?



Recall the below Trig ratios: SOH - CAH - TOA

Key

$$\sin \angle A = \frac{\text{Opp}}{\text{Hyp}} \quad \cos \angle A = \frac{\text{Adj}}{\text{Hyp}} \quad \tan \angle A = \frac{\text{Opp}}{\text{Adj}}$$

Steps for Solving Right Triangle:

**A. Find Missing Side**

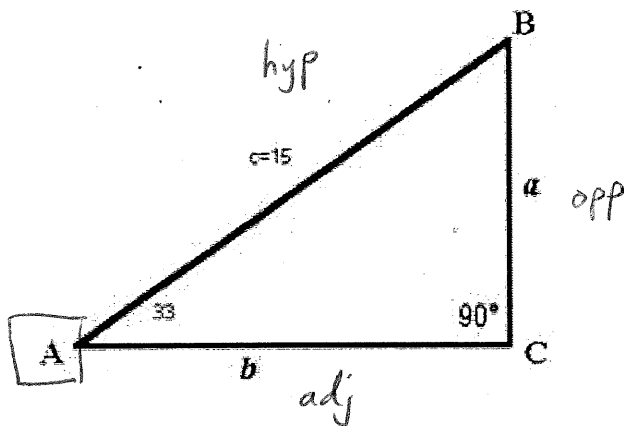
1. Set up trig ratios and use cross product to solve for the variable
2. Use Pythagorean theorem ( $a^2 + b^2 = c^2$ ) if only 1 side is missing

**B. Find Missing Angle**

1. Set up trig ratio to use inverse trig : Example  $\rightarrow \cos A = \frac{12}{13}$  means  $A = \cos^{-1}\left(\frac{12}{13}\right)$
2. Subtract the angles from  $180^\circ$  if only 1 angle is missing.

Solve the right triangles below:

1.



$$\sin A = \frac{a}{15}$$

$$\sin 33 = \frac{a}{15} \quad a = 15 \sin 33$$

$$a = 8.169$$

angles	sides
A = <u>33°</u>	a = <u>8.17</u>
B = <u>57°</u>	b = <u>12.58</u>
C = <u>90°</u>	c = <u>15</u>

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

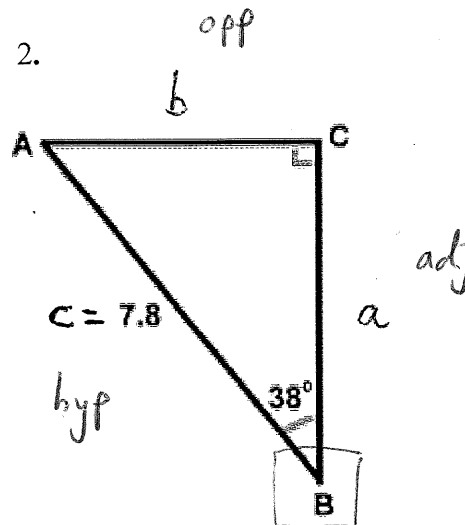
$$(8.17)^2 + b^2 = 15^2$$

$$b^2 = 158.25$$

$$\sqrt{b^2} = \sqrt{158.25}$$

$b = 12.58$

2.



$$\sin B = \frac{b}{7.8}$$

$$\sin 38 = \frac{b}{7.8}$$

$$b = 7.8 \sin 38$$

$$b = 4.80$$

angles	sides
A = <u>52°</u>	a = <u>6.15</u>
B = <u>38°</u>	b = <u>4.8</u>
C = <u>90°</u>	c = <u>7.8</u>

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

$$a^2 + 4.8^2 = 7.8^2$$

$$a^2 = 37.8$$

$$\sqrt{a^2} = \sqrt{37.8}$$

$a = 6.15$

CCGPS Analytic Geometry  
Right Triangle Trigonometry Word Problems

1. The angle of elevation from a point 116 meters from the base of the Eiffel Tower to the top of the Tower is  $67^\circ$ . Find the approximate height of the tower.



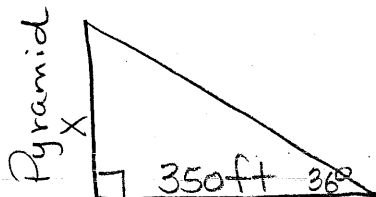
$$\tan 67^\circ = \frac{x}{116}$$

$$116 \tan 67^\circ = x$$

$$273.279 \approx x$$

The height of the Eiffel tower is approximately 273ft.

2. The angle of elevation to the top of the Egyptian pyramid Cheops is  $36^\circ$ , measured from a point 350 feet from the base of the pyramid. Find the height of Cheops.



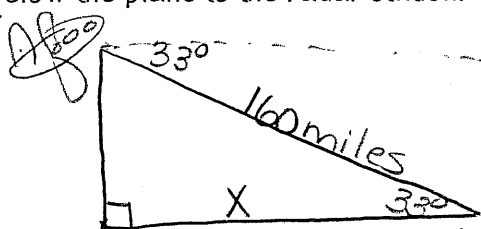
$$\tan 36^\circ = \frac{x}{350}$$

$$350 \tan 36^\circ = x$$

$$254.29 \approx x$$

The height of the pyramid Cheops is approximately 254ft.

3. DME (Distance Measuring Equipment) is standard avionics equipment on a commercial airplane. This equipment measures the distance from a plane to a radar station. If the distance from a plane to a radar station is 160 miles and the angle of depression is  $33^\circ$ , find the number of ground miles from a point directly below the plane to the radar station.



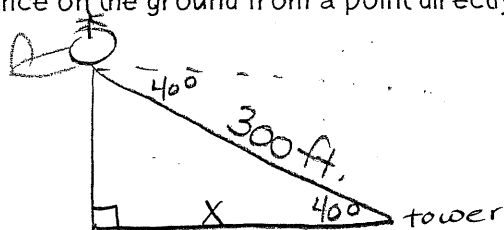
$$\cos 33^\circ = \frac{x}{160}$$

$$160 \cos 33^\circ = x$$

$$134.187 \approx x$$

There are approx. 134 miles from the point directly below the airplane to the radar station

4. If the distance from a helicopter to a tower is 300 feet and the angle of depression is  $40^\circ$ , find the distance on the ground from a point directly below the helicopter to the tower.



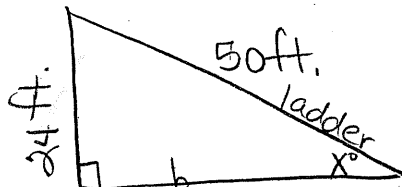
$$\cos 40^\circ = \frac{x}{300}$$

$$300 \cos 40^\circ = x$$

$$229.813 \approx x$$

The distance on the ground from a point below the helicopter to the tower is approx. 230 ft.

5. You are cleaning the gutters on your house. The gutters are at a height of 24 feet. If you have a 50 foot ladder, what is the minimum angle the ladder can form with the ground? How far away from the house is your ladder?



$$\sin x^\circ = \frac{24}{50}$$

$$\sin^{-1}\left(\frac{24}{50}\right) = x^\circ$$

$$28.685^\circ = x$$

$$24^2 + b^2 = 50^2$$

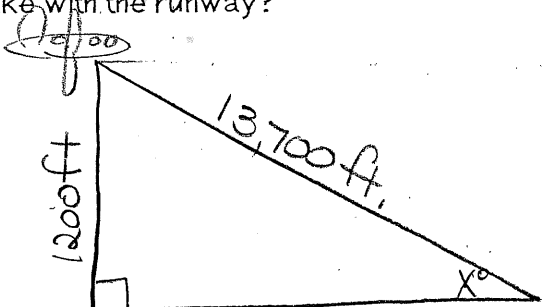
$$576 + b^2 = 2500$$

$$b^2 = 1924$$

$$b = \sqrt{1924}$$

$$b \approx 43.863 \text{ ft.}$$

6. An airplane is preparing to land at the airport. The airplane is flying at an altitude of about 1200 feet and is approximately 13,700 feet from the touchdown point on the runway. What angle does the approach path make with the runway?



$$\sin x^\circ = \frac{1200}{13700}$$

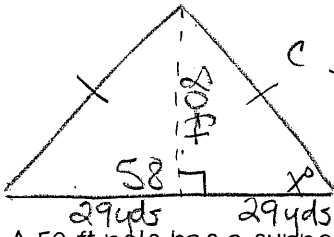
$$\sin^{-1}\left(\frac{1200}{13700}\right) = x^\circ$$

$$5.025^\circ \approx x$$

$$80 \text{ ft} \approx 26.6 \text{ yards}$$

$$29 \text{ yds} \approx 87 \text{ ft}$$

7. The base of an isosceles triangle is 58 yards long. The altitude to the base is 80 feet long. What are the measures of the base angles? What are the lengths of the legs?



$$\tan x^\circ = \frac{80}{87}$$

$$\tan^{-1}\left(\frac{80}{87}\right) = x^\circ$$

$$42.600 \approx x^\circ$$

$$43^\circ \approx x$$

$$\text{Base } \angle s \approx 43^\circ$$

$$80^2 + 29^2 = c^2$$

$$13969 = c^2$$

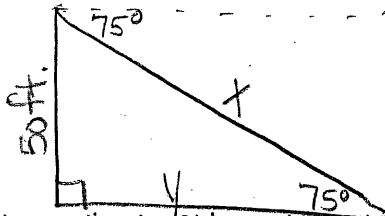
$$118.191 \approx c$$

$$\sin 43^\circ = \frac{80}{c}$$

$$c = \frac{80}{\sin 43^\circ} \approx 117.3$$

$$\begin{array}{r} 26.6 \\ 3 \overline{) 80.0} \\ \underline{6} \phantom{0} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \end{array}$$

8. A 50 ft pole has a support wire that runs from its top to the ground with an angle of depression of  $75^\circ$ . How far from the base of the pole does the wire connect to the ground? How long is the wire?



$$\sin 75^\circ = \frac{50}{x}$$

$$x = \frac{50}{\sin 75^\circ}$$

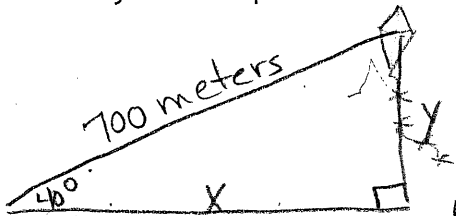
$$x \approx 51.764$$

$$\tan 75^\circ = \frac{50}{y}$$

$$y = \frac{50}{\tan 75^\circ}$$

$$y \approx 13.397 \text{ ft.}$$

9. According to Chinese legend from the Han Dynasty, General Han Xin flew a kite over the palace. If the general let out 700 meters of string and the kite was flying at a  $40^\circ$  angle of elevation, approximately how far away was the palace? How high was the kite flying?



$$\sin 40^\circ = \frac{y}{700}$$

$$700 \sin 40^\circ = y$$

$$449.951 = y$$

$$\cos 40^\circ = \frac{x}{700}$$

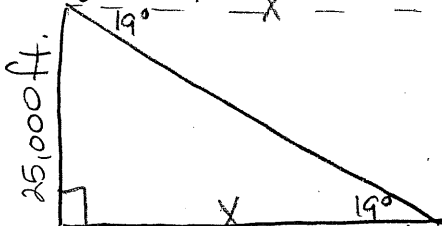
$$700 \cos 40^\circ = x$$

$$536.231 = x$$

Kite is flying 449.951 meters high

The palace is 536.231 meters away.

10. Assume you are flying in a plane at an altitude of 25,000 feet to sky dive. If you can see the landing spot at an angle of depression of  $19^\circ$  how many feet until you are over the landing spot and ready to jump?

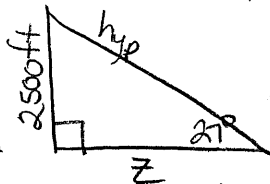
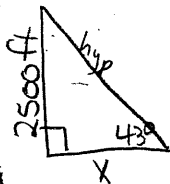
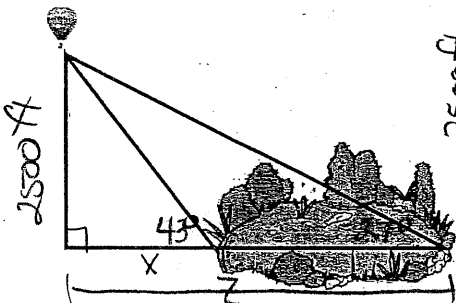


$$\tan 19^\circ = \frac{25000}{x}$$

$$x = \frac{25000}{\tan 19^\circ}$$

$$x \approx 72605.272 \text{ ft until over landing spot.}$$

11. The angle of depression of one side of a lake, measured from a balloon 2500 feet above the lake is  $43^\circ$ . The angle of depression to the opposite side of the lake is  $27^\circ$ . Find the width of the lake.



$$\tan 43^\circ = \frac{2500}{x}$$

$$x = \frac{2500}{\tan 43^\circ}$$

$$x \approx 2680.922 \text{ ft. } z \approx 4906.526 \text{ ft.}$$

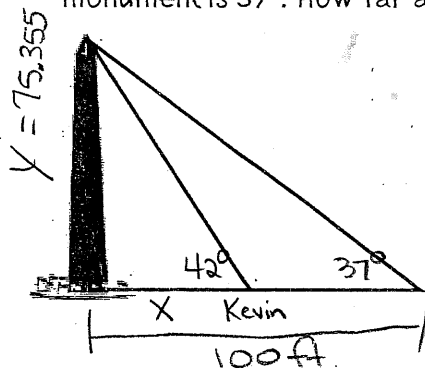
$$\tan 27^\circ = \frac{2500}{z}$$

$$z = \frac{2500}{\tan 27^\circ}$$

$$4906.526 - 2680.922 \approx 2226 \text{ ft}$$

The width lake is approx. 2226 ft.

12. Kevin is standing  $x$  feet from the base of the Washington Monument and the angle of elevation to the top of the monument is  $42^\circ$ . Mark is standing 100 feet away and the angle of elevation to the top of the monument is  $37^\circ$ . How far away is Kevin standing?



$$\tan 37^\circ = \frac{y}{100}$$

$$100 \tan 37^\circ = y$$

$$75.355 \approx y$$

$$\tan 42^\circ = \frac{75.355}{x}$$

$$x = \frac{75.355}{\tan 42^\circ}$$

$$83.691 \approx x$$

Kevin is standing approximately 84 ft. away from the base of the monument.