



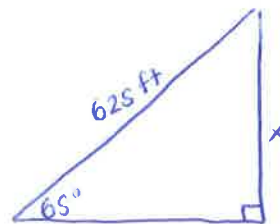
4. A 625 foot long wire is attached to the top of a tower and is connected to the ground. If the wire makes an angle of  $65^\circ$  with the ground, how tall is the tower?

$$\frac{\sin 65}{1} = \frac{x}{625}$$

$$x = 625 \sin 65^\circ$$

$$x \approx 566.4 \text{ ft}$$

The tower is 566.4 ft tall



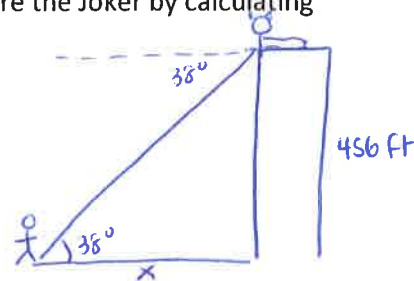
5. Batman is standing on the top of a building making sure crime is silenced. He spots his enemy, the Joker, up to no good. Batman's angle of depression from the top of the building to the Joker who is on the ground is  $38^\circ$ . The height of the building is 456 feet. Help Batman capture the Joker by calculating the Joker's distance from the bottom of the building.

$$\frac{\tan 38}{1} = \frac{456}{x}$$

$$456 = x \cdot \frac{\tan 38}{\tan 38}$$

$$x \approx 583.7$$

The Joker is about 583.7 ft from the building



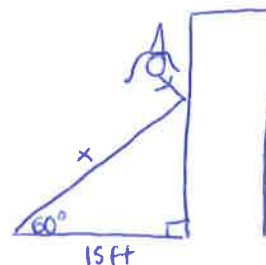
6. A damsel is in distress and is being held captive in a tower. Her knight in shining armor is on the ground below with a ladder. When the knight stands 15 feet from the base of the tower and looks up at his precious damsel, the angle of elevation to her window is  $60^\circ$ . How long does the ladder have to be in order for the knight to rescue her?

$$\frac{\cos 60}{1} = \frac{15}{x}$$

$$15 = x \frac{\cos 60}{\cos 60}$$

$$x \approx 30$$

The ladder must be 30 feet long



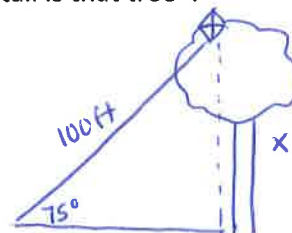
7. Suppose you are flying a kite and it gets caught at the top of the tree. You've let out all 100 feet of string for the kite, and the angle that the string makes with the ground is 75 degrees. Instead of worrying about how you are going to get your kite back, you first wonder "how tall is that tree"?

$$\frac{\sin 75}{1} = \frac{x}{100}$$

$$x = 100 \cdot \sin 75$$

$$x \approx 96.6$$

The tree is about 96.6 ft tall



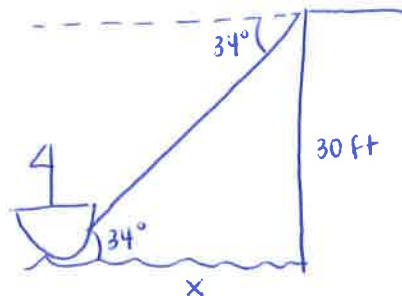
8. You are standing on the top of a cliff that is 30 feet above the ocean. You see a sailboat down in the water below. The angle of depression that you spot the sailboat at is  $34^\circ$ . How far from the base of the cliff is the boat?

$$\frac{\tan 34}{1} = \frac{30}{x}$$

$$30 = x \frac{\tan 34}{\tan 34}$$

$$x \approx 44.5$$

The boat is about 44.5 ft from the base of the cliff



9. Julie is 6 feet tall. If she stands 15 feet from the base of a flagpole and looks up to the top of the flagpole at an angle of  $47^\circ$ , how tall is the flagpole?

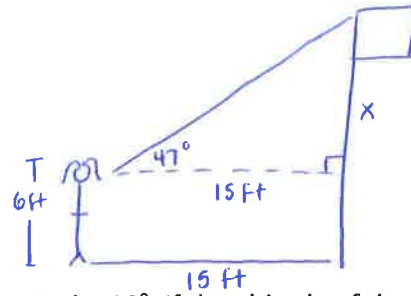
$$\frac{\tan 47^\circ}{1} = \frac{x}{15}$$

$$x = 15 \tan 47^\circ$$

$$x \approx 16.1$$

$$\text{Height} = 16.1 + 6 = 22.1$$

The flagpole is about 22.1 ft tall



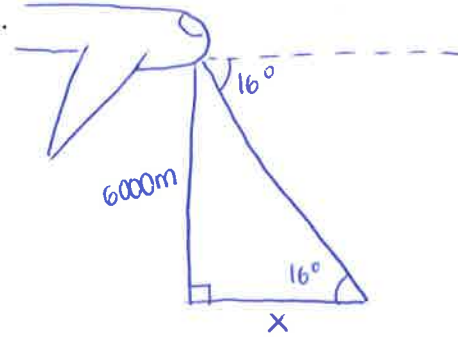
10. The pilot of an airplane finds the angle of depression of an airport to be  $16^\circ$ . If the altitude of the plane is 6,000 meters, find the horizontal distance to the airport.

$$\frac{\tan 16^\circ}{1} = \frac{6000}{x}$$

$$\frac{6000}{\tan 16^\circ} = \frac{x \tan 16^\circ}{\tan 16^\circ}$$

$$x \approx 20924.5$$

The plane is about 20,924.5 m from the airport



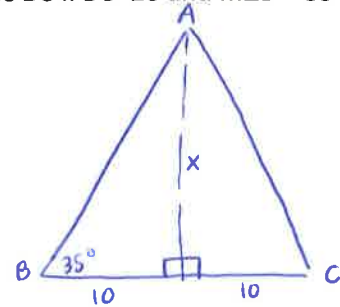
11. In isosceles triangle ABC, find the length of the altitude drawn to the base BC if  $BC=20$  and  $m\angle B = 35^\circ$

$$\frac{\tan 35^\circ}{1} = \frac{x}{10}$$

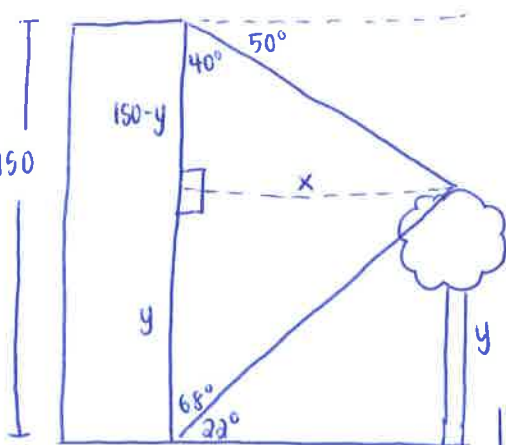
$$x = 10 \tan 35^\circ$$

$$x \approx 7$$

The altitude is about 7 units tall



12. From the foot of a building, I have to look upwards at an angle of  $22^\circ$  to see the top of a tree. From the top of a building 150 meters tall, I have to look down at an angle of depression of  $50^\circ$  to look at the top of the tree. How tall is the tree? How far apart are the building and the tree?



$$\text{Top } \Delta: \frac{\tan 40^\circ}{1} = \frac{x}{150-y}$$

$$x = (150-y) \tan 40^\circ$$

$$\text{Bottom } \Delta: \frac{\tan 68^\circ}{1} = \frac{x}{y}$$

$$x = y \tan 68^\circ$$

$$x = 38 \cdot \tan 68^\circ$$

$$x = 94$$

The building & tree are about 94 ft apart

$$(150-y) \tan 40^\circ = y \tan 68^\circ$$

$$150 \tan 40^\circ - y \tan 40^\circ = y \tan 68^\circ$$

$$150 \tan 40^\circ = y \tan 68^\circ + y \tan 40^\circ$$

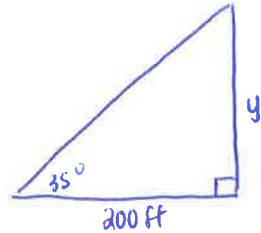
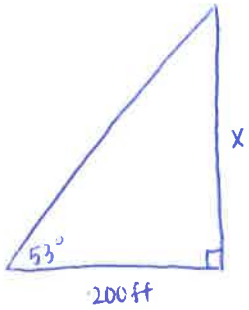
$$150 \tan 40^\circ = y (\tan 68^\circ + \tan 40^\circ)$$

$$\frac{125.8649}{3.3142} = \frac{y(3.3142)}{3.3142}$$

$$y \approx 38$$

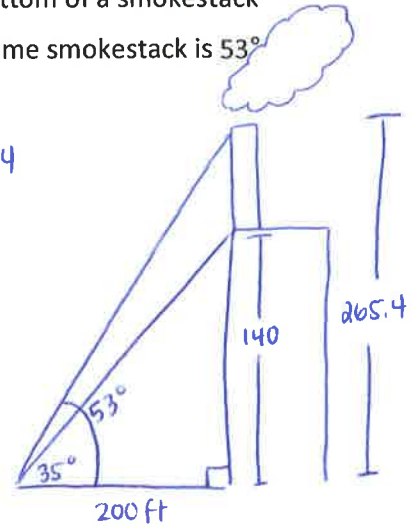
The tree is about 38 ft tall

13. At a point 200 feet from the base of a building, the angle of elevation to the bottom of a smokestack located on the top of the building is  $35^\circ$ . The angle of elevation to the top of the same smokestack is  $53^\circ$ . Find the height of the smokestack.



$$\text{Smokestack} = 265.4 - 140 = 125.4$$

The smokestack is about 125.4 ft tall

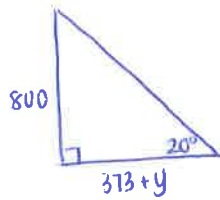
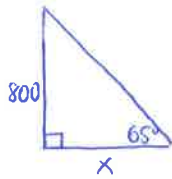
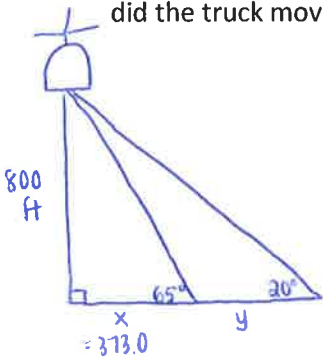


$$\begin{aligned} \tan 53^\circ &= \frac{x}{200} \\ x &= 200 \tan 53^\circ \\ x &= 265.4 \end{aligned}$$

$$\begin{aligned} \tan 35^\circ &= \frac{y}{200} \\ y &= 200 \tan 35^\circ \\ y &= 140.0 \end{aligned}$$

14. A helicopter is hovering 800 feet above a road. A truck driver observes the helicopter at a  $20^\circ$  angle.

Twenty five seconds later, the truck driver notices that the angle to the helicopter is now at  $65^\circ$ . How far did the truck move in those 25 seconds?



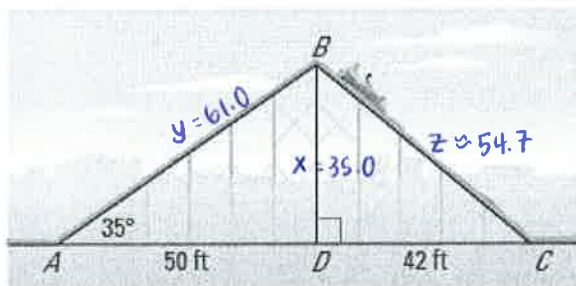
$$\begin{aligned} \tan 65^\circ &= \frac{800}{x} \\ 800 &= x \tan 65^\circ \\ \frac{800}{\tan 65^\circ} &= \frac{x \tan 65^\circ}{\tan 65^\circ} \\ x &= 373.0 \end{aligned}$$

$$\begin{aligned} \tan 20^\circ &= \frac{800}{373+y} \\ 800 &= (373+y) \tan 20^\circ \\ 800 &= 373 \tan 20^\circ + y \tan 20^\circ \\ 800 &= 135.7609 + .3640y \end{aligned}$$

$$\begin{aligned} \frac{664.2391}{.3640} &= \frac{.3640y}{.3640} \\ y &= 1824.8 \end{aligned}$$

The truck moved 1824.8 ft in 25 seconds

15. The design for part of a water ride at an amusement park is shown. How high is the ride above point D? What is the total distance from point A to point B to point C? Round to the nearest tenth.



$$\frac{\tan 35^\circ}{1} = \frac{x}{50}$$

$$\begin{aligned} x &= 50 \cdot \tan 35^\circ \\ x &= 35.0 \end{aligned}$$

$$\frac{\cos 35^\circ}{1} = \frac{50}{y}$$

$$50 = y \cos 35^\circ$$

$$\begin{aligned} y &= \frac{50}{\cos 35^\circ} \\ y &= 61.0 \end{aligned}$$

$$35^2 + 42^2 = z^2$$

$$2989 = z^2$$

$$z \approx 54.7$$

BD = 35 ft  
A to B to C = 115.7 ft