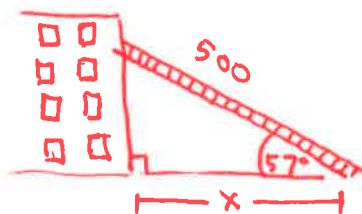


Name: KEY Period: \_\_\_\_\_ Date: \_\_\_\_\_

### 4-1 Right Triangle Trigonometry Word Problems

- Step 1:** Draw a triangle.  
**Step 2:** Label the triangle using the given information.  
**Step 3:** Create and solve an equation to find the missing side or angle.

1. A ladder, 500 cm long, leans against a building. If the angle between the ground and the ladder is 57 degrees, how far from the wall is the bottom of the ladder? Round the answer to the *nearest tenth*.



$$\cos 57^\circ = \frac{x}{500}$$

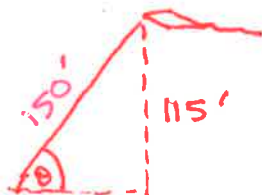
$$500 \cdot \cos 57^\circ = x = \boxed{272.3}$$

2. The sides of a rectangle are 25 cm and 8 cm. What is the measure, to the *nearest degree*, of the angle formed by the short side and a diagonal of the rectangle?



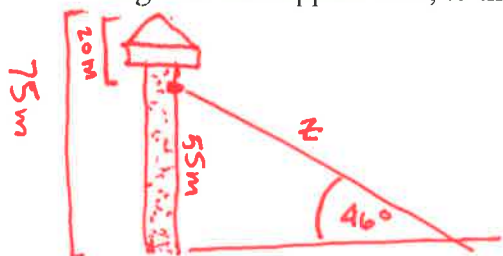
$$\tan^{-1}\left(\frac{25}{8}\right) \approx 72.3^\circ$$

3. A kite is flying 115 ft above the ground. The length of the string to the kite is 150 ft, measured from the ground. Find the angle, to the *nearest degree*, that the string makes with the ground.



$$\sin^{-1}\left(\frac{115}{150}\right) \approx 50.0^\circ$$

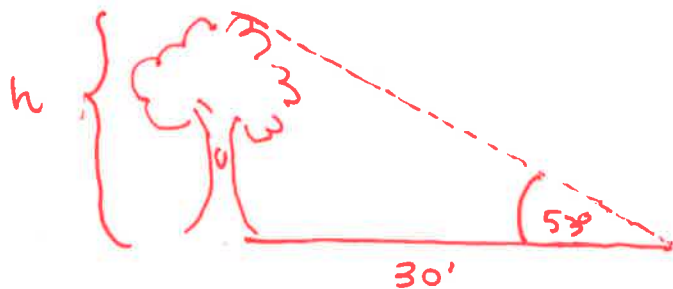
4. An observation tower is 75 m high. A support wire is attached to the tower 20 m from the top. If the support wire and the ground form an angle of 46 degrees, what is the length of the support wire, to the *nearest tenth*?



$$\sin 46^\circ = \frac{55}{z}$$

$$z = \frac{55}{\sin 46} \approx 76.5 \text{ m}$$

5. At a point 30 feet from the base of a tree, the angle formed with the ground looking to the top measures  $53^\circ$ . Find, to the *nearest foot*, the height of the tree.

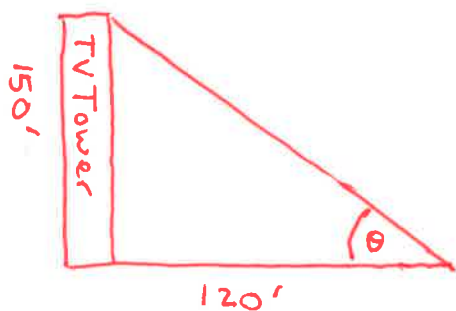


$$\tan 53^\circ = \frac{h}{30}$$

$$30 \tan 53 = h$$

$$39.8' = h$$

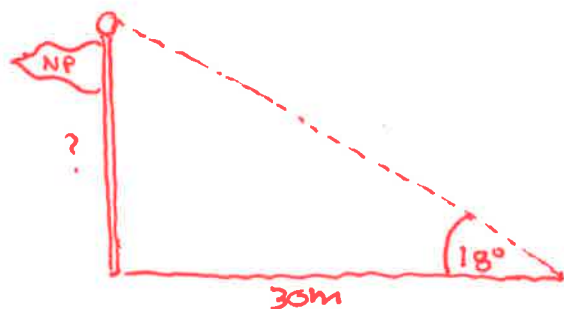
6. An observer is 120 feet from the base of a television tower, which is 150 feet tall. Find, to the *nearest degree*, the angle of elevation of the top of the tower from the point where the observer is standing.



$$\tan \theta = \frac{150}{120}, \text{ therefore } \tan^{-1}\left(\frac{150}{120}\right) = \theta$$

$$51.34^\circ = \theta$$

7. The angle of elevation of the top of a flagpole from a point on the ground 30 meters from the base of the flagpole is 18 degrees. What is the height of the flagpole, to the *nearest meter*?

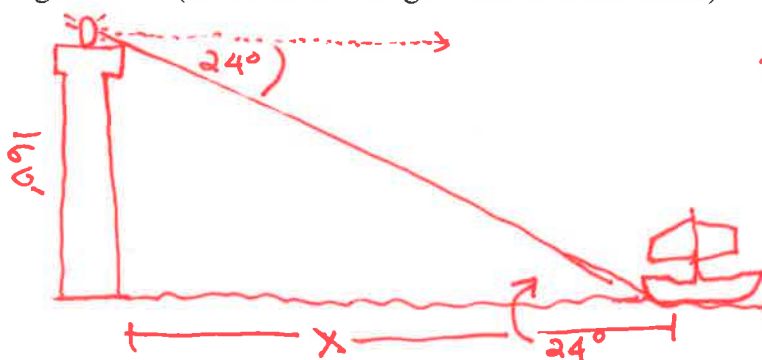


$$\tan 18^\circ = \frac{h}{30}$$

$$30 \cdot \tan 18^\circ = \frac{h}{30} \cdot 30$$

$$9.74\text{m} = h$$

8. From the top of a lighthouse 160 feet high, the angle of depression of a boat out at sea is  $24^\circ$ . Find, to the *nearest foot*, the distance from the boat to the foot of the lighthouse. (The foot of the lighthouse is at sea level.)



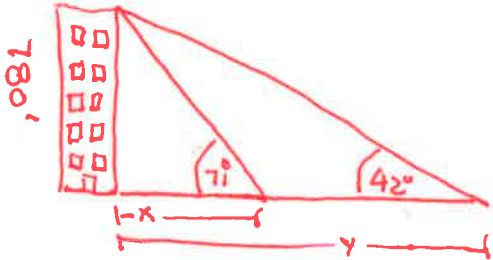
$$\tan 24^\circ = \frac{160}{x}$$

$$x = \frac{160}{\tan 24^\circ}$$

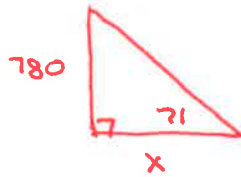
$$x = 359.4 \text{ feet.}$$

because it's an alt. interior angle to the one above lighthouse

9. You are a block away from a skyscraper that is 780 feet tall. Your friend is between the skyscraper and yourself. The angle of elevation from your position to the top of the skyscraper is  $42^\circ$ . The angle of elevation from your friend's position to the top of the skyscraper is  $71^\circ$ . To the nearest foot, how far are you from your friend?



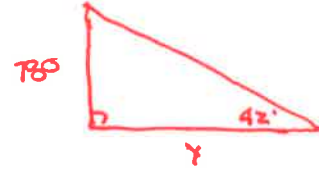
You want to find  $y-x$



$$\tan 71^\circ = \frac{780}{x}$$

$$x = \frac{780}{\tan 71^\circ} =$$

$$x = 268.6'$$



$$\tan 42^\circ = \frac{780}{y}$$

$$y = \frac{780}{\tan 42^\circ} =$$

$$y = 866.3'$$

$$y-x = 597.7'$$

10. At 10:00 am, a person observes a hot air balloon climbing vertically in the air from a point 300 meters away from the launch pad for the balloon. The angle of elevation to the top of the balloon at this time is  $25^\circ$ . At 10:02am, the person observes that the angle of elevation to the balloon is now  $60^\circ$ . What is the change in altitude, to the nearest meter, for the balloon over the 2 minutes between the first and second observations?

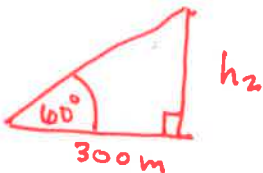
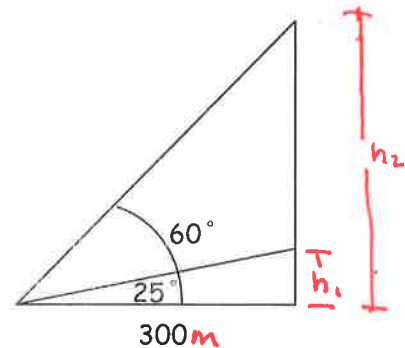
pull the two  $\Delta$ 's apart.



$$\tan 25^\circ = \frac{h_1}{300m}$$

$$300 \cdot \tan 25^\circ = h_1$$

$$139.8 = h_1$$



$$\tan 60^\circ = \frac{h_2}{300m}$$

$$300 \cdot \tan 60^\circ = h_2$$

$$519.6 = h_2$$

The change in altitude is the difference in heights.

$$519.6 - 139.8 = 379.8m$$