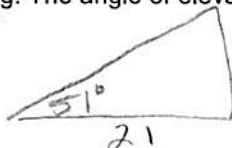


EVALUATE

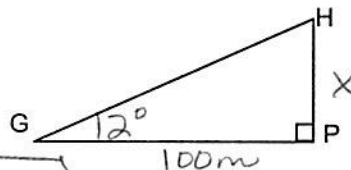
1. A tree casts a shadow 21m long. The angle of elevation of the sun is 51° . What is the height of the tree?



$$\tan 51 = \frac{X}{21}$$

$$X = 25.933 \text{ m}$$

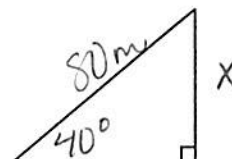
2. A helicopter (H) is hovering over a landing pad (P) 100m from where you are standing (G). The helicopter's angle of elevation with the ground is 12° . What is the altitude of the helicopter?



$$\tan 12 = \frac{X}{100}$$

$$X = 21.256 \text{ m}$$

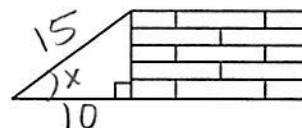
3. You are flying a kite and have let out 80m of string. The kite's angle of elevation with the ground is 40° . If the string is stretched straight, how high is the kite above your hands?



$$\sin 40 = \frac{X}{80}$$

$$X = 51.423 \text{ m}$$

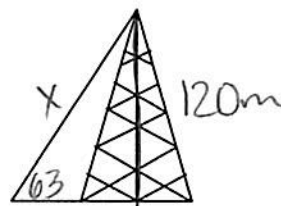
4. A 15 m pole is leaning against a wall. The foot of the pole is 10 m from the wall. Find the angle the pole makes with the ground.



$$\cos^{-1}\left(\frac{10}{15}\right) = X$$

$$X = 48^\circ$$

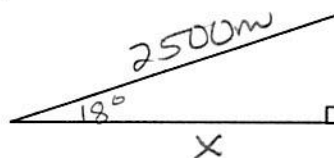
5. A guy wire reaches from the top of a 120 m television transmitter tower to the ground. The wire makes a 63° angle with the ground. Find the length of the guy wire.



$$\sin 63 = \frac{120}{X}$$

$$X = 134.679 \text{ m}$$

6. An airplane climbs at an angle of 18° with the ground. Find the ground distance the plane travels, as it moves 2500 m through the air. Give your answer to the nearest 100m.

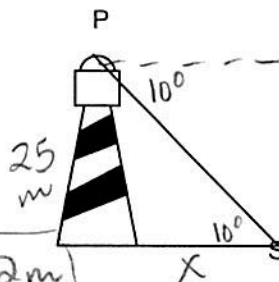


$$\cos 18 = \frac{X}{2500}$$

$$X = 2,377.641$$

$$X = 2,400 \text{ m}$$

7. A lighthouse operator at point P, 25m above sea level sights a sailboat at point S. The angle of depression of the sighting is 10° . How far is the boat from the base of the lighthouse? Give your answer to the nearest 10m.

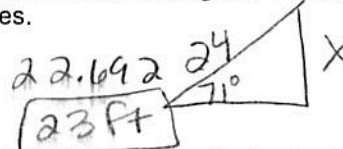


$$\tan 10 = \frac{25}{X}$$


$$X = 141.782 \text{ m}$$

Draw pictures for each problem situation before you solve the problem.

8. A wooden beam 24 feet long leans against a wall and makes an angle of 71° with the ground. Find to the nearest foot how high up the wall the beam reaches.

$$\sin 71 = \frac{x}{24} \quad x = 22.1692$$


9. From the top of a lighthouse 160 feet high, the angle of depression of a boat out at sea is 24° . Find to the nearest foot the distance from the boat to the foot of the lighthouse, if the foot of the lighthouse is at sea level.



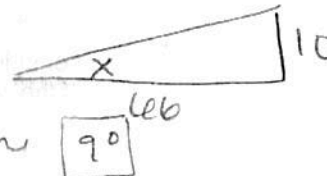
$$\tan 24 = \frac{160}{x}$$

$$x = 359.366$$

359 ft

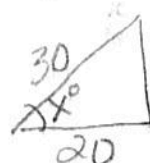
10. The 600 block of Powell Street in San Francisco rises 10 feet for every 66 feet along the horizontal. Find the grade of the road.

$$\tan^{-1}\left(\frac{10}{66}\right) = x$$

$$x = 8.6 \sim 9^\circ$$


$$\frac{10}{66} = 15\% \text{ grade}$$

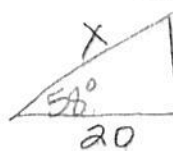
11. A 30 foot steel girder is leaning against a wall. The foot of the girder is 20 feet from the wall. Find to the nearest degree the number of degrees contained in the angle which the girder makes with ground.



$$\cos^{-1}\left(\frac{20}{30}\right) = x$$

$$x = 48^\circ$$

12. A guy wire attached to the top of a pole reaches a stake in the ground 20 feet from the foot of the pole and makes an angle of 58° with the ground. Find to the nearest foot the length of the guy wire.

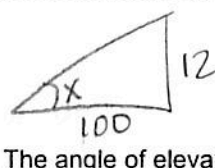


$$\cos 58 = \frac{20}{x}$$

$$x = 37.742$$

38 ft

13. The grade of Maple Street is 12%. Find the angle the street makes with the horizontal.

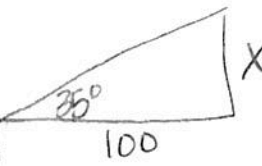


$$\tan^{-1}\left(\frac{12}{100}\right) = x$$

$$6.84 \sim 7^\circ$$

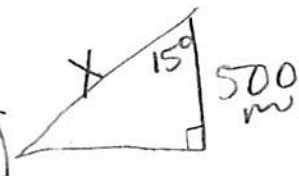
14. A surveyor is 100 meters from the base of a bridge. The angle of elevation to the top of the bridge is 35° . Find the height of the bridge.

$$\tan 35 = \frac{x}{100}$$

$$x = 70.021 \text{ m}$$


15. To secure a 500-meter radio tower against high winds, guy wires are attached to the top of the tower. Each wire forms a 15° angle with the top of the tower. Find the length of the wire from the tower to its anchor in the ground.

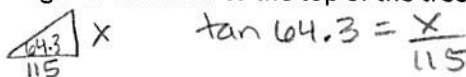
$$\cos 15 = \frac{500}{x}$$

$$x = 517.638 \text{ m}$$


Solve the following Trig Word Problems – on a separate sheet of paper

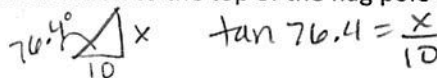
1. From a point 115 feet from the base of a redwood tree, the angle of elevation to the top of the tree is 64.3° . Find the height of the tree to the nearest foot.

$x = 239 \text{ ft}$



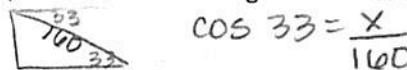
2. From a point 10 feet from the base of a flag pole, the angle of elevation to the top of the flag pole is 76.4° . Find the height of the flag pole to the nearest foot.

$x = 41 \text{ ft}$



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° , find the number of ground miles from a point directly below the plane to the radar station.

$x = 134.187 \text{ m}$



4. A backpacker notes that from a certain point on level ground, the angle of elevation to a point at the top of a tree is 34° . After walking 50 feet closer to the tree, the backpacker notes the angle of elevation is 54° . Find the height of the tree.

5. A submarine traveling 9 mph is descending at an angle of depression of 5° . How many minutes does it take the submarine to reach the depth of 50 feet?

6. The angle of elevation to the top of the Egyptian pyramid Cheops is 36.4° , measured from a point 350 feet from the base of the pyramid. The angle of elevation of a face of the pyramid is 51.9° . Find the height of Cheops.

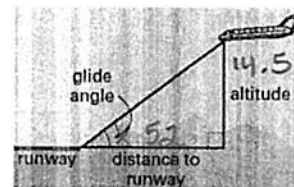
7. During its approach to Earth, the space shuttle's glide angle changes. When the shuttle's altitude is about 14.5 miles, its horizontal distance to the runway is about 52 miles.

What is the glide angle? Round your answer to the nearest tenth.

$\tan^{-1}\left(\frac{14.5}{52}\right)$
 $x = 15.6^\circ$

When the space shuttle is 6 miles from the runway, its glide angle is about 21° . Find the shuttle's altitude at this point in its descent. Round your answer to the nearest tenth.

$\tan 21 = \frac{x}{6}$
 $x = 2.3 \text{ miles}$



8. The altitude to the base of an isosceles triangle is 17 inches long. The measure of a base angle is 41° . Find the measure of the base to the nearest inch.

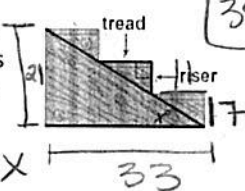
$\tan 41 = \frac{17}{x}$
 $x = 19.556 \times 2 = 39.1125$
 $x = 39 \text{ in}$

9. The horizontal part of a step is called the *tread*. The vertical part is called the *riser*. The ratio of the riser length to the tread length affects the safety of a staircase. Traditionally, builders have used a riser-to-tread ratio of about 8.25 inches: 9 inches. A newly recommended ratio is 7 inches: 11 inches.

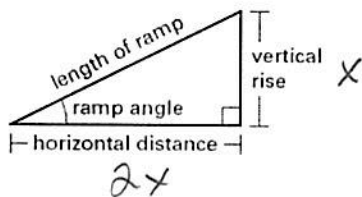
Find the value of x for stairs built using the new riser-to-tread ratio.

$x = 32.471 \sim x = 32^\circ$

$\tan^{-1}\left(\frac{21}{33}\right) = x$



10. You are designing a ramp where the horizontal distance is twice as long as the vertical rise. What will be the ramp angle to the nearest tenth of a degree

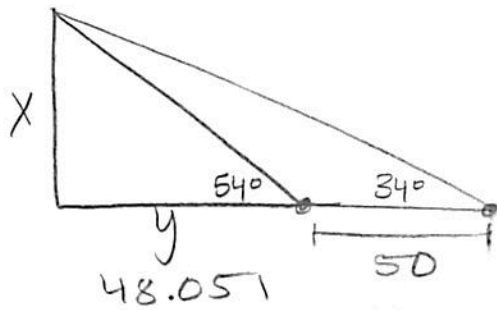


$\tan^{-1}\left(\frac{x}{2x}\right) = \tan^{-1}\left(\frac{1}{2}\right)$

$\theta = 26.6^\circ$

on back
challenging!

4.



$$\tan 54^\circ = \frac{x}{y} \quad x = y \tan 54^\circ$$

$$\tan 34^\circ = \frac{x}{y+50} \quad x = (y+50) \tan 34$$

$$\tan 54 = \frac{x}{48.051}$$

$$y \tan 54 = \cancel{y \tan 34} + 50 \tan 34$$

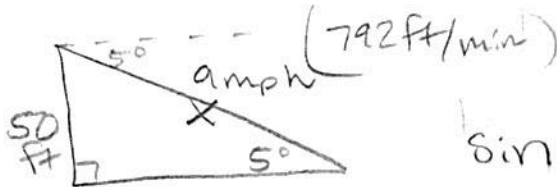
$$-y \tan 34 \quad -y \tan 34$$

$$x = \boxed{66.136 \text{ ft}}$$

$$y (\cancel{\tan 54} - \cancel{\tan 34}) = \frac{50 \tan 34}{(\cancel{\tan 54} - \cancel{\tan 34})} (\tan 54 - \tan 34)$$

$$y = 48.051$$

5.



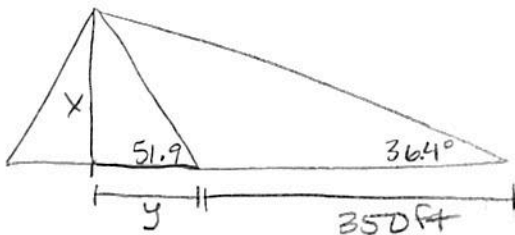
$$\sin 5 = \frac{50}{X}$$

$$1 \text{ mile} = 5,280 \text{ ft}$$

$$X = 573.686 \text{ ft}$$

$$\boxed{.724 \text{ min}}$$

6.



$$\tan 51.9 = \frac{x}{y} \quad x = y \tan 51.9$$

$$\tan 36.4 = \frac{x}{y+350}$$

$$\tan 51.9 = \frac{x}{479.558}$$

$$y \tan 51.9 = \cancel{y \tan 36.4} + 350 \tan 36.4 \quad x = (y+350) \tan 36.4$$

$$x = \boxed{611.603 \text{ ft}}$$

$$y \tan 51.9 - y \tan 36.4 = 350 \tan 36.4$$

$$y (\cancel{\tan 51.9} - \cancel{\tan 36.4}) = \frac{350 \tan 36.4}{(\cancel{\tan 51.9} - \cancel{\tan 36.4})} (\tan 51.9 - \tan 36.4)$$

$$y = 479.558$$