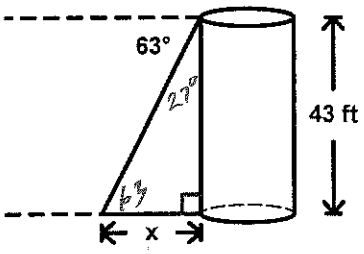
Section 4.3 Application Problems Name: KEY

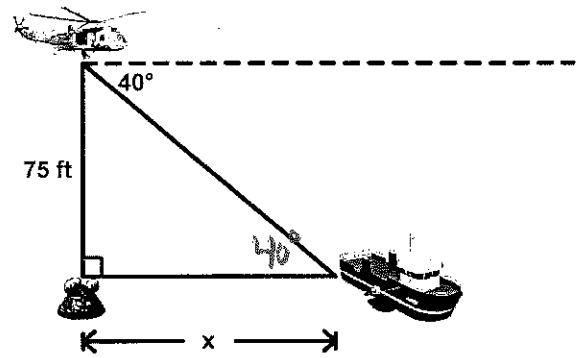
1. The angle of depression is measured from the top of a 43-ft tower to a reference point on the ground. Its value is found to be 63°. How far is the base of the tower from the point on the ground?



$\tan 63° = \frac{43}{x}$

$\Rightarrow x = \frac{43}{\tan 63°}$ ≈ 21.91 ft

2. A NASA recovery helicopter hovers 75 ft above a space capsule. If the angle of depression to the recovery ship is $\frac{2\pi}{9}$ *radians*, how far is the ship from the space capsule?

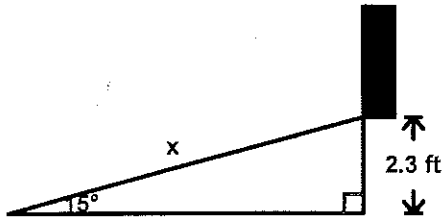


$\frac{2\pi}{9}\left(\frac{180}{\pi}\right) = 40°$

$\tan 40° = \frac{75}{x}$

$\Rightarrow x = \frac{75}{\tan 40°}$ ≈ 89.38 ft

3. The entrance of the old town library is 2.3 ft above ground level. A ramp from the ground level to the library entrance is scheduled to be built. The angle of elevation from the base of the ramp to its top is to be 15°. Find the length of the ramp.

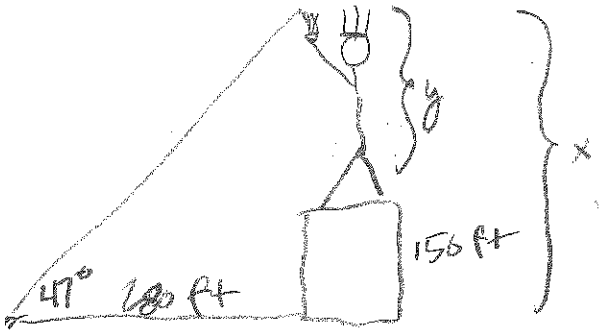


$\sin 15° = \frac{2.3}{x}$

$\Rightarrow x = \frac{2.3}{\sin 15°}$ ≈ 8.89 ft

Section 4.3 Application Problems Name: _____

4. The Statue of Liberty stands on a 150 ft pedestal. From a point 280 ft from the base of the pedestal, the angle of elevation to the top of Liberty's torch is 47°. Find the height of the statue.



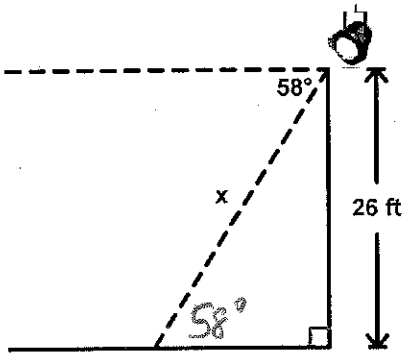
$\tan 47° = \frac{x}{280}$

$\Rightarrow x = 280(\tan 47°)$

$x \approx 300.26$ ft

$y \approx 300.26 - 150 \approx 150.26$ ft

5. The angle of depression from a searchlight to its target is 58°. How long is the beam of light, if the searchlight is 26 ft above ground?

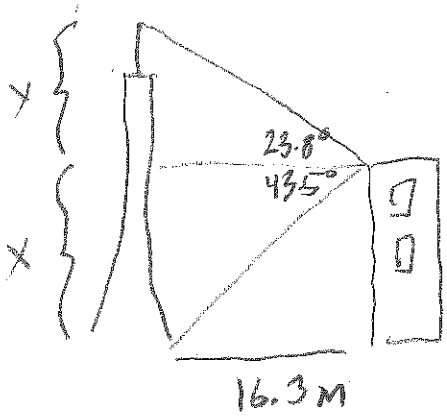


$\sin 58° = \frac{26}{x}$

$x = \frac{26}{\sin 58°}$

$x \approx 30.66$ ft

6. A building is 16.3 m from a television tower. From the top of the building, the angle of depression to the base of the tower is 43.5°, and the angle of elevation to the top of the tower is 23.8°. Find the height of the tower.



$\tan 43.5° = \frac{x}{16.3}$

$\Rightarrow x = 16.3(\tan 43.5°)$

$x \approx 15.47$

$\tan 23.8° = \frac{y}{16.3}$

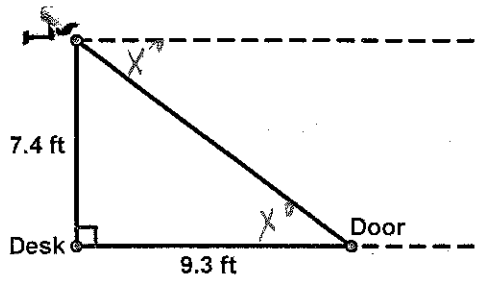
$\Rightarrow y = 16.3(\tan 23.8°)$

$y \approx 7.19$

Tower $= x + y \approx 15.47 + 7.19$

≈ 22.66 m

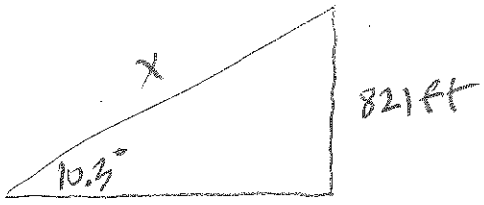
7. A closed-circuit television camera is mounted on a wall 7.4 ft above a security desk in an office building. It is used to view an entrance door 9.3 ft from the desk. Find the angle of depression from the camera lens to the entrance door.



$\tan x^\circ = \frac{7.4}{9.3}$

$\Rightarrow x \approx 38.51^\circ$

8. The angle of elevation from the bottom of the world's longest slide, located in Peru, VT, is approximately 10.3°. The slide has a vertical drop of 821 ft. Find the length of the slide.

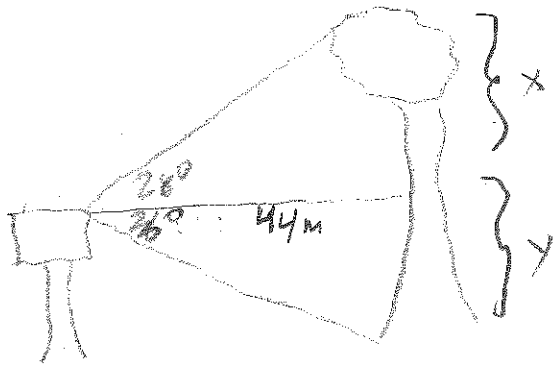


$\sin 10.3^\circ = \frac{821}{x}$

$\Rightarrow x = \frac{821}{\sin 10.3^\circ}$

$x \approx 4591.67$ ft

9. A ranger's tower is located 44 m from a tall tree. From the top of the tower, the angle of elevation to the top of the tree is 28°, and the angle of depression is 36°. How tall is the tree?



$\tan 28^\circ = \frac{x}{44}$

$\Rightarrow x = 44(\tan 28^\circ)$

$x \approx 23.40$

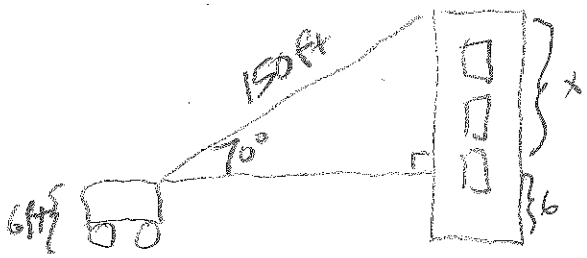
$\tan 36^\circ = \frac{y}{44}$

$\Rightarrow y = 44(\tan 36^\circ)$

$y \approx 31.97$

tree $= x + y \approx 55.37$ m

10. The extension ladder on TOP of a 6 ft high hook and ladder truck is 150 ft long. If the angle of elevation of the ladder is 70°, to what height on a building will the ladder reach?



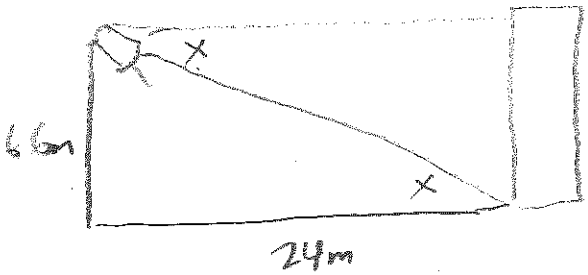
$\sin 70° = \frac{x}{150}$

$\Rightarrow x = 150(\sin 70°)$

$x \approx 140.95$

height $= x + 6$ ≈ 146.95 ft

11. To illuminate the entrance of an apartment building, a night light is mounted on a 6.6 m pole. If the base of the pole is 24 m from the entrance, find the angle of depression from the light.

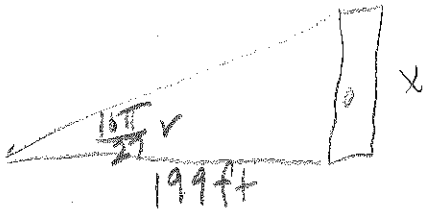


$\tan x = \frac{6.6}{24}$

$\Rightarrow x \approx 15.38°$

12. The largest doors in the world are located in the Vehicle Assembly Building near Cape Canaveral, FL. If the angle of elevation from a point on the ground 199 ft from the base of the doors is $\frac{10\pi}{27}$ radians, how high are the doors?

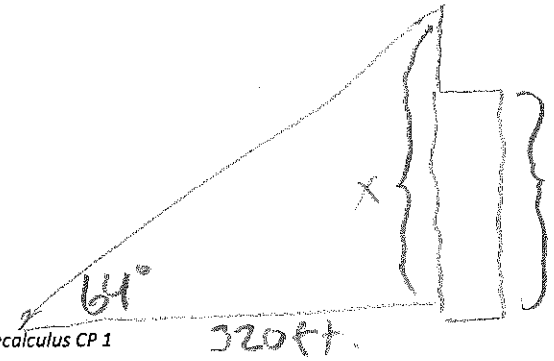
$\frac{10\pi}{27}\left(\frac{180°}{\pi}\right) = \frac{200°}{3}$



$\tan\left(\frac{200°}{3}\right) = \frac{x}{199}$

$\Rightarrow x = 199\tan\left(\frac{200°}{3}\right)$ ≈ 461.33 ft

13. A television antenna stands on the edge of the top of a 52 story building. Froma a point 320 ft from the base of the building, the angle of elevation to the top of the antenna is 64°. If each story is 12 ft high, find the height of the antenna.



$\tan 64° = \frac{x}{320}$

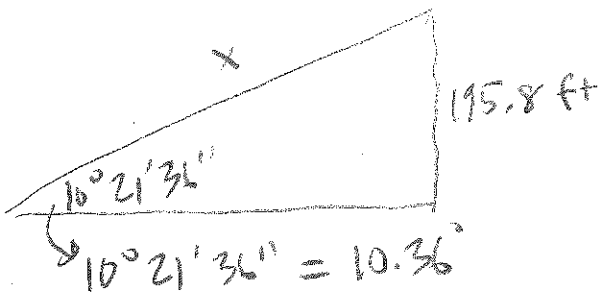
$\Rightarrow x = 320\tan 64°$

≈ 690.1 ft

tower $= x - 624$

≈ 32.1 ft

14. The world's longest escalator is at the Leningrad Underground in Lenin Square. The escalator has an angle of elevation of 10°21'36'' and a vertical rise of 195.8ft. Find the length of the escalator.

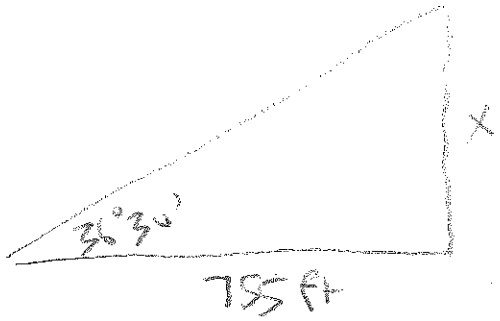


$\sin 10.36° = \frac{195.8}{x}$

$\Rightarrow x = \frac{195.8}{\sin 10.36°}$

≈ 1088.79 ft

15. The world's tallest fountain is in Fountain Hills, AZ. If the angle of elevation to the top of the fountain from a point 755 ft from its base is 36°30', find the height of the fountain.

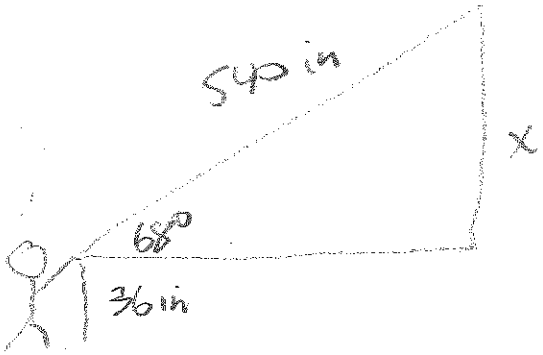


$\tan 36.5° = \frac{x}{755}$

$\Rightarrow x = 755(\tan 36.5°)$

≈ 558.67 ft

16. A child holds the end of a kite string 36 in above the ground. The string is taut and it makes a 68° angle with the horizontal. How high off the ground is the kite, if 540 in of string are out?



$\sin 68° = \frac{x}{540}$

$\Rightarrow x = 540 \sin 68°$

≈ 500.68 in

height $= x + 36$

≈ 536.68 in