Geometry (G.SRT.8)
Unit Two: Trig Applications – Packet (HW24)

Name: _____
Date: _____ Period: _____

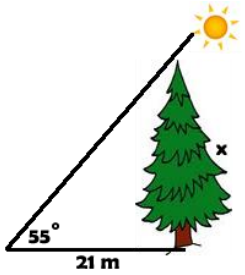
1. Solve the following problems. (All answers to 2 decimals places, unless otherwise instructed.)

a) A tree casts a shadow 21 m long. The angle of elevation of the sun is 55°. What is the height of the tree?

$\tan 55 = \frac{x}{21}$

$x = 21\tan 55$

$x \approx 29.99$ m

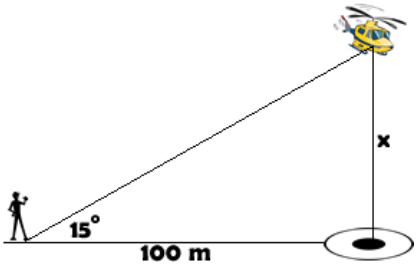


b) A helicopter is hovering over a landing pad 100 m from where you are standing. The helicopter's angle of elevation with the ground is 15°. What is the altitude of the helicopter?

$\tan 15 = \frac{x}{100}$

$x = 100\tan 15$

$x \approx 26.79$ m

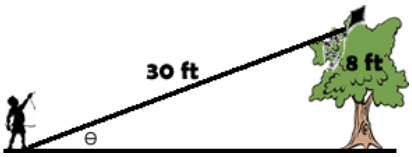


c) You are flying a kite and have let out 30 ft of string but it got caught in a 8 ft tree. What is the angle of elevation to the location of the kite?

$\sin \Theta = \frac{8}{30}$

$\Theta = \sin^{-1}(\frac{8}{30})$

$\Theta \approx 15.47°$

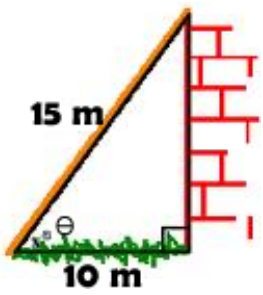


d) A 15 m pole is leaning against a wall. The foot of the pole is 10 m from the wal. Find the angle that the pole makes with the ground.

$\cos \Theta = \frac{10}{15}$

$\Theta = \cos^{-1}(\frac{10}{15})$

$\Theta \approx 48.19°$

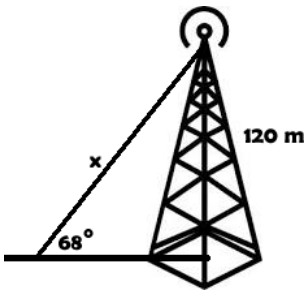


e) A guy wire reaches from the top of a 120 m television transmitter tower to the ground. The wire makes a 68° angle with the ground. Find the length of the guy wire.

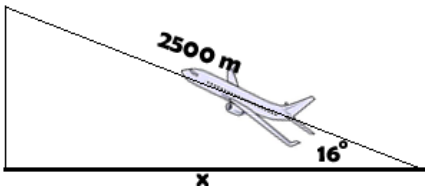
$\sin 68 = \frac{120}{x}$

$x = \frac{120}{sin68}$

$x \approx 129.42$ m



f) An airplane climbs at an angle of 16° with the ground. Find the ground distance the plane travels as it moves 2500 m through the air.

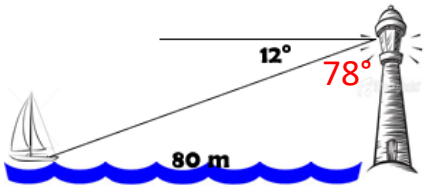


$\cos 16 = \frac{x}{2500}$

$x = 2500\cos 16$

$x \approx 2403.15$ m

g) A lighthouse operator sights a sailboat at an angle of depression of 12°. If the sailboat is 80 m away, how tall is the lighthouse?



$\tan 78 = \frac{80}{x}$

$x = \frac{80}{\tan 78}$

$x \approx 17.00$ m

Solve the following problems.

2. a) How long is the guy wire?

$3^2 + 4^2 = x^2$

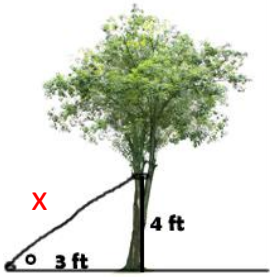
$x = 5$ ft

b) What is the angle formed between the guy wire and the ground?

$\tan \Theta = \frac{4}{3}$

$\Theta = \tan^{-1}(\frac{4}{3})$

$\Theta \approx 53.13°$



3.a) What is the length of the line of sight from the man to the helicopter?

$100^2 + 75^2 = x^2$

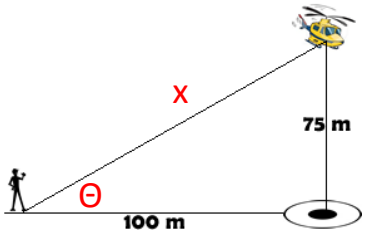
$x = 125$ m

b) What is the angle of elevation from the man to the helicopter?

$\sin \Theta = \frac{75}{125}$

$\Theta = \sin^{-1}(\frac{75}{125})$

$\Theta \approx 36.87°$



4.a) A rectangle has a length of 12 cm and a diagonal of 13 cm. What is the width?

$12^2 + b^2 = 13^2$

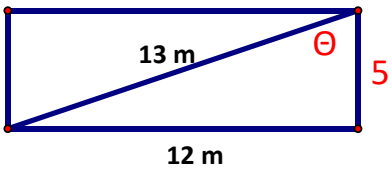
$b = 5$ cm

b) What is the angle formed between the diagonal and the width?

$\tan \Theta = \frac{12}{5}$

$\Theta = \tan^{-1}(\frac{12}{5})$

$\Theta \approx 67.38°$

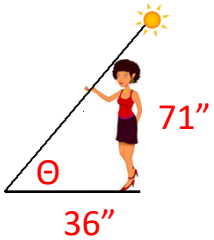


5.a) A 5 ft 11 inch women casts 3 ft shadow. What is the angle that the sun's rays make with the ground?

$\tan \Theta = \frac{71}{36}$

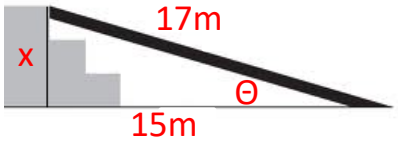
$\Theta = \tan^{-1}(\frac{71}{36})$

$\Theta \approx 63.11°$



6. a) A ramp is 17 m long, if the horizontal distance of the ramp is 15 m. What is the vertical distance?

b) What is the angle of elevation of the ramp?



$x^2 + 15^2 = 17^2$

$x = \sqrt{64}$

$x = 8$ m

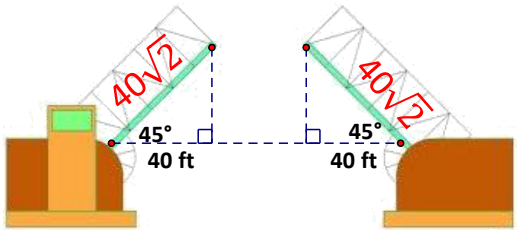
$\cos \Theta = \frac{15}{17}$

$\Theta = \cos^{-1}(\frac{15}{17})$

$\Theta \approx 28.07°$

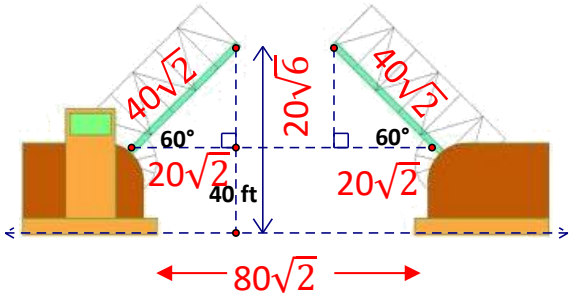
7. a) Using the drawbridge diagram, determine the distance from one side to the other. (exact answer)

$2(40\sqrt{2}) = 80\sqrt{2}$ ft



b) Now that you know the distance from side to side, determine how high the drawbridge would be if the angle of elevation was 60°.(exact answer)

$20\sqrt{6} + 40$ ft



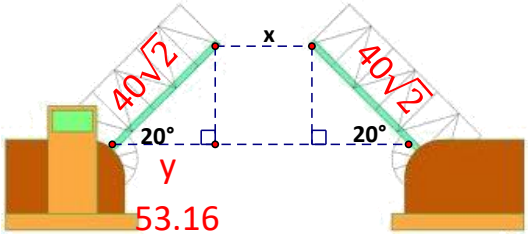
c) How far apart would the drawbridge be if the angle of elevation of the drawbridge was 20°?

$\cos 20 = \frac{y}{40\sqrt{2}}$

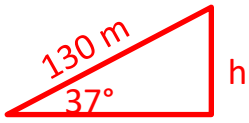
$y = 40\sqrt{2}\cos 20$

$y = 53.16$

$80\sqrt{2} - 2(53.16) \approx 6.82$ ft



8. Sharon is flying a kite on a string 130 m long. Determine the height of the kite if the string is at an angle of 37° to the ground.

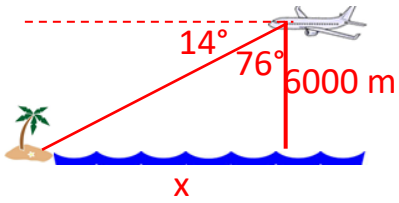


$\sin 37 = \frac{h}{130}$

$h = 130\sin 37$

$h \approx 78.24$ m

9. An airplane is flying at an altitude of 6000 m over the ocean directly toward an island. When the angle of depression of the coastline from the airplane is 14°, how much farther does the airplane have to fly before it crosses the coast?

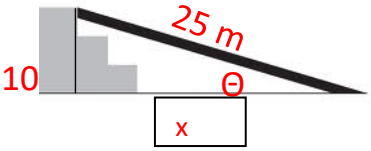


$\tan 76 = \frac{x}{6000}$

$x = 6000\tan 76$

$x \approx 24{,}064.69$ m

10. A loading ramp is 25 m long with a height of 10 m. What is the horizontal distance of the ramp and what is the angle of incline that the ramp forms with the ground?



$x^2 + 10^2 = 25^2$

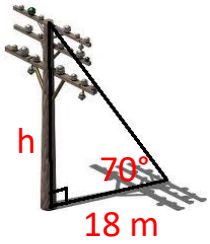
$x = 22.91$ m

$\sin \Theta = \frac{10}{25}$

$\Theta = \sin^{-1}(\frac{10}{25})$

$\Theta \approx 23.58°$

11. A telephone pole casts a shadow 18 m long when the sun's rays strike the ground at an angle of 70°. How tall is the pole?



$\tan 70 = \frac{h}{18}$

$h = 18\tan 70$

$h \approx 49.45$ m

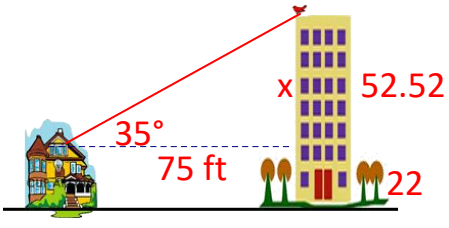
12. How long must a brace to a Satellite Dish be if it is attached to the antenna 3 ft above the ground and forms an angle of 68° with the antenna?

$\cos 68 = \frac{3}{x}$

$x = \frac{3}{\cos 68}$

$x \approx 8.01$ ft

13. Mike Patterson looks out the attic window of his home, which is 22 ft above the ground. At an angle of elevation of 35° he sees a bird sitting at the very top of the large high rise apartment building down the street. How tall is the high rise apartment building, if the two buildings are 75 ft apart?



$\tan 35 = \frac{x}{75}$

$x = 75\tan 35$

$x \approx 52.52$

$52.52 + 22 = 74.52$ ft

14. From an apartment window 24 m above the ground, the angle of depression to the base of a nearby building is 38° and the angle of elevation to the top is 63°. Find the height of the nearby building (to the nearest meter)

$\tan 38 = \frac{24}{x}$

$x = \frac{24}{\tan 38}$

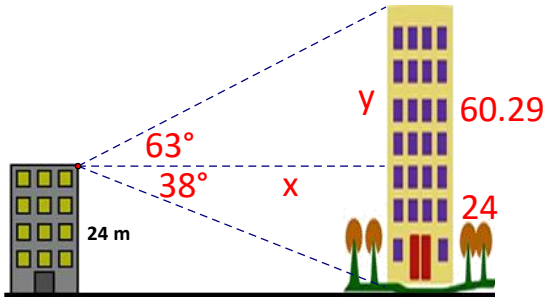
$x \approx 30.72$

$\tan 63 = \frac{y}{30.72}$

$y = 30.72 \tan 63$

$y \approx 60.29$

$24 + 60.29 = 84$ m



15. A flagpole is at the top of a building. 400 ft from the base of the building, the angle of elevation of the top of the pole is 22° and the angle of elevation of the bottom of the pole is 20°. Determine the length of the flagpole (to the nearest foot).

$\tan 20 = \frac{x}{400}$

$x = 400 \tan 20$

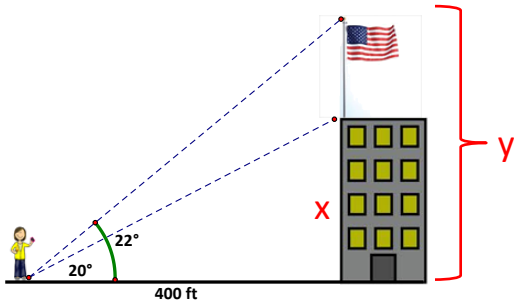
$x \approx 145.59$ ft

$\tan 22 = \frac{y}{400}$

$y = 400 \tan 22$

$y \approx 161.61$ ft

Flagpole = y – x = 161.61 – 145.59 = 16 ft



16. From a lighthouse 1000 ft above sea level, the angle of depression to a boat (A) is 29°. A little bit later the boat has moved closer to the shore (B) and the angle of depression measures 44°. How far (to the nearest foot) has the boat moved in that time?

$\tan 29 = \frac{1000}{y}$

$y = \frac{1000}{\tan 29}$

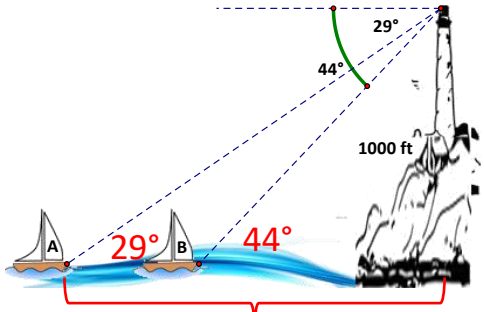
$y \approx 1804.05$ ft

$\tan 44 = \frac{1000}{x}$

$x = \frac{1000}{\tan 44}$

$x \approx 1035.53$ ft

Movement = y – x = 1804.05 – 1035.53 = 769 ft



17. Two trees are 100 m apart. From the exact middle between them, the angles of elevation of their tops are 12° and 16°. How much taller is one tree than the other (2 decimal places)?

$\tan 16 = \frac{y}{50}$

$y = 50 \tan 16$

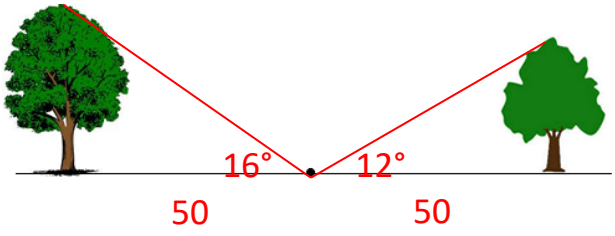
$y \approx 14.34$ m

$\tan 12 = \frac{x}{50}$

$x = 50 \tan 12$

$x \approx 10.63$ m

difference = y – x = 14.34 – 10.63 = 3.71 m



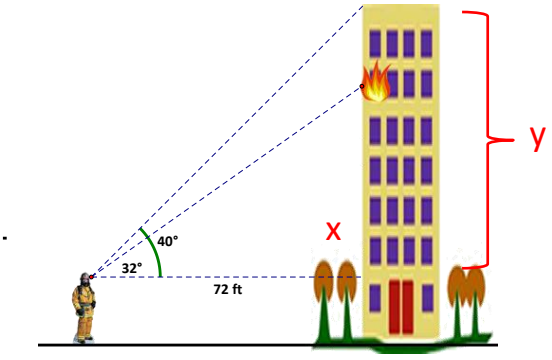
18. A firefighter on the ground sees the fire break through a window. The angle of elevation to the windowsill is 32°. The angle of elevation to the top of the building is 40°. If the firefighter is 72 ft from the building, what is the distance from the roof to the window sill?

$\tan 32 = \frac{x}{72}$ $\qquad$ $\tan 40 = \frac{y}{72}$

$x = 72\tan 32$ $\qquad$ $y = 72\tan 40$

$x \approx 44.99$ ft $\qquad$ $y \approx 60.42$ ft

distance = y – x = 60.42 – 44.99 = 15.43 ft



19. Jack and Jill are on either side of the church and 50 m apart. Jack sees the top of the steeple at 40° and Jill sees the top of the steeple at 32°. How high is the steeple?

$\tan 40 = \frac{h}{x}$ $\qquad$ $\tan 32 = \frac{h}{50-x}$

$x\tan 40 = h$ $\qquad$ $h = (50-x)\tan 32$

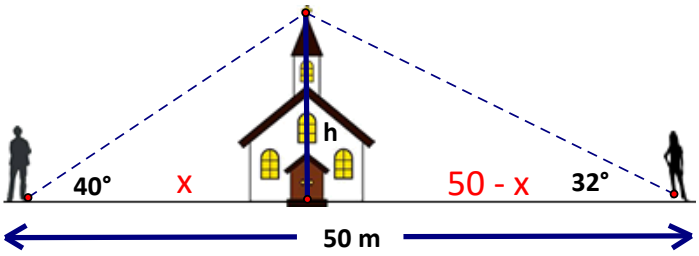
$x\tan 40 = (50-x)\tan 32$

$x\tan 40 = 50\tan 32 - x\tan 32$

$x\tan 40 + x\tan 32 = 50\tan 32$

$x(\tan 40 + \tan 32) = 50\tan 32$

$x = \frac{50\tan 32}{\tan 40+\tan 32} \approx 21.34$ m



$\tan 40 = \frac{h}{21.34}$

$h = 21.34\tan 40$

h ≈ 17.91 m

20. Jack and Jill are 20 m apart. Jack sees the top of the building at 30° and Jill sees the top of the building at 40°. What is the height of building?

$\tan 40 = \frac{h}{x}$ $\qquad$ $\tan 30 = \frac{h}{x+20}$

$x\tan 40 = h$ $\qquad$ $h = (x+20)\tan 30$

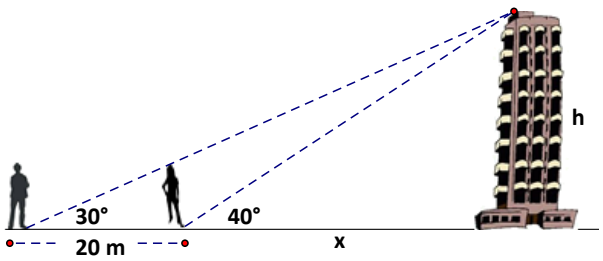
$x\tan 40 = (x+20)\tan 30$

$x\tan 40 = x\tan 30 + 20\tan 30$

$x\tan 40 - x\tan 30 = 20\tan 30$

$x(\tan 40 - \tan 30) = 20\tan 30$

$x = \frac{20\tan 30}{\tan 40-\tan 30} \approx 44.11$ m



$\tan 40 = \frac{h}{44.11}$

$h = 44.11\tan 40$

h ≈ 37.01 m