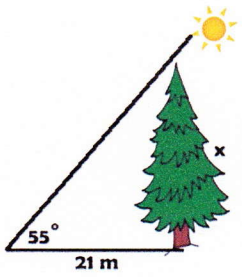
1. Solve the following problems.

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?



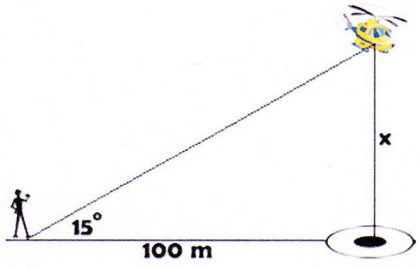
$\tan 55° = \frac{x}{21}$

$x = (\tan 55°)(21)$

$x = 29.99$ m

THE TREE IS 29.99 m TALL.

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?



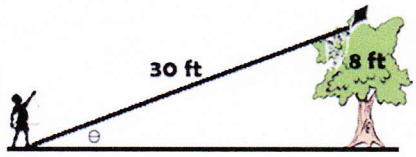
$\tan 15° = \frac{x}{100}$

$x = (\tan 15°)(100)$

$x = 26.79$ m

THE ALTITUDE OF THE HELICOPTER IS 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?



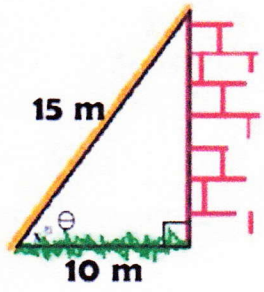
$\sin\theta = \frac{8}{30}$

$\sin^{-1}(8/30) = \theta$

$\theta = 15.47°$

THE ANGLE OF ELEVATION IS 15.47°.

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



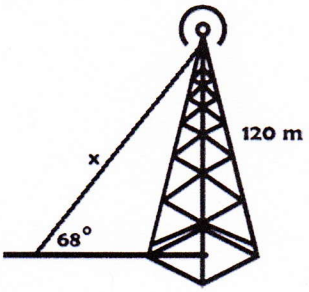
$\cos\theta = \frac{10}{15}$

$\cos^{-1}(10/15) = \theta$

$\theta = 48.19°$

THE ANGLE THE POLE MAKES WITH THE GROUND IS 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.



$\frac{\sin 68}{1} = \frac{120}{x}$

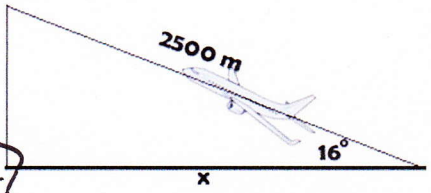
$(\sin 68)x = 120$

$x = \frac{120}{\sin 68°}$

$x = 129.42$ m

THE WIRE IS 129.42 m long.

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.



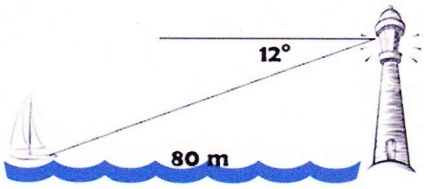
$\cos 16° = \frac{x}{2500}$

$x = (\cos 16°)(2500)$

$x = 2403.15$ m

THE HORIZONTAL DISTANCE IS 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?



$\tan 12^\circ = \frac{x}{80}$

$x = (\tan 12^\circ)(80)$

$x = 17.00\text{m}$

THE LIGHTHOUSE IS 17.00m tall.

Solve the following problems.

2. a) How long is the guy wire?

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

$9 + 16 = x^2$

$25 = x^2$

$5 = x$

WIRE IS 5 Ft

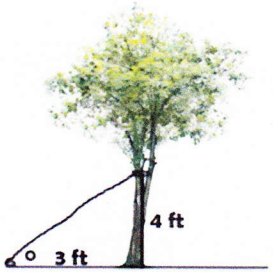
b) What is the angle formed between the guy wire and the ground?

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

$\tan^{-1}(4/3) = \theta$

$\theta = 53.1^\circ$

THE ANGLE IS 53.1°.



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

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

$15{,}625 = x^2$

$125 = x$

LINE OF SIGHT IS 125m.

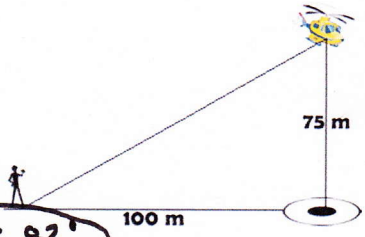
b) What is the angle of elevation from the man to the helicopter?

$\tan\theta = \frac{75}{100}$

$\tan^{-1}(75/100) = \theta$

$\theta = 36.87^\circ$

ANGLE OF ELEVATION IS 36.87°.



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

$12^2 + w^2 = 13^2$

$144 + w^2 = 169$

$w^2 = 25 \quad w = 5$

WIDTH IS 5m

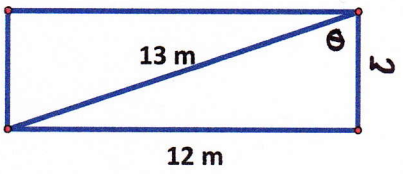
b) What is the angle formed between the diagonal and the width of the field?

$\sin\theta = 12/13$

$\sin^{-1}(12/13) = \theta$

$\theta = 67.38^\circ$

ANGLE FORMED IS 67.38°



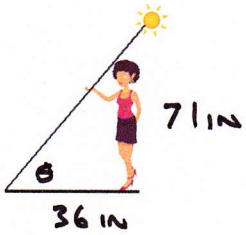
5.a) A 5 ft 11 inch women casts 3 ft shadow. What is the angle that the sun's rays make with the ground?

$\tan\theta = 71/36$

$\tan^{-1}(71/36) = \theta$

$\theta = 63.11^\circ$

THE ANGLE FORMED IS 63.11°



6. a) A ramp is 18 m long. If the horizontal distance of the ramp is 17m, what is the vertical distance?

$x^2 + 17^2 = 18^2$

$x^2 + 289 = 324$

$x^2 = 35$

$x = 5.92\text{cm}$

VERTICAL HEIGHT IS 5.92cm.

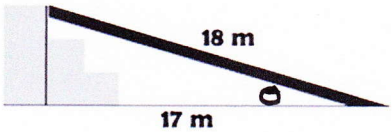
b) What is the angle of elevation of the ramp?

$\cos\theta = \frac{17}{18}$

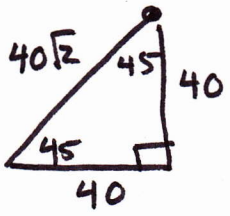
$\cos^{-1}(17/18) = \theta$

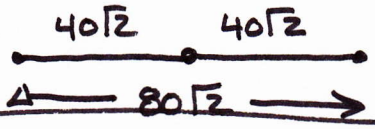
$\theta = 19.19^\circ$

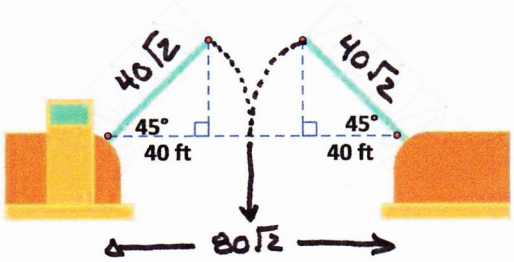
ANGLE OF ELEVATION IS 19.19°



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

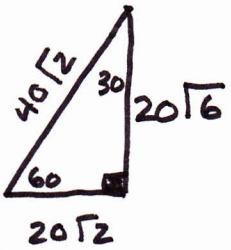


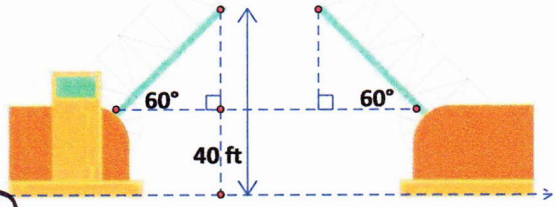




DRAWBRIDGE WIDTH IS $80\sqrt{2}$ ft.

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)

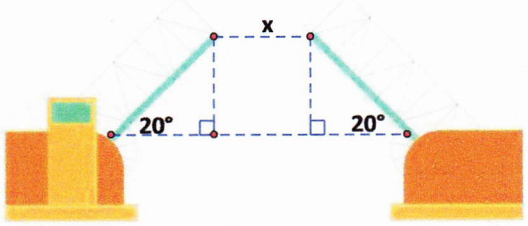


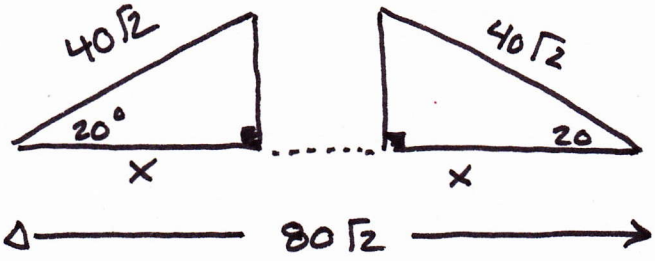


$40 + 20\sqrt{6}$ ft HIGH

≈ 88.99 Ft

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





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

$x = (\cos 20)(40\sqrt{2})$

$x = 53.18$ Ft

TOTAL WIDTH − 2 (HORIZONTAL DISTANCE) = GAP

$80\sqrt{2} - 2(53.18) = \text{GAP}$

6.82 Ft = GAP

THE DRAWBRIDGE IS 6.82 ft apart at that POINT IN time.