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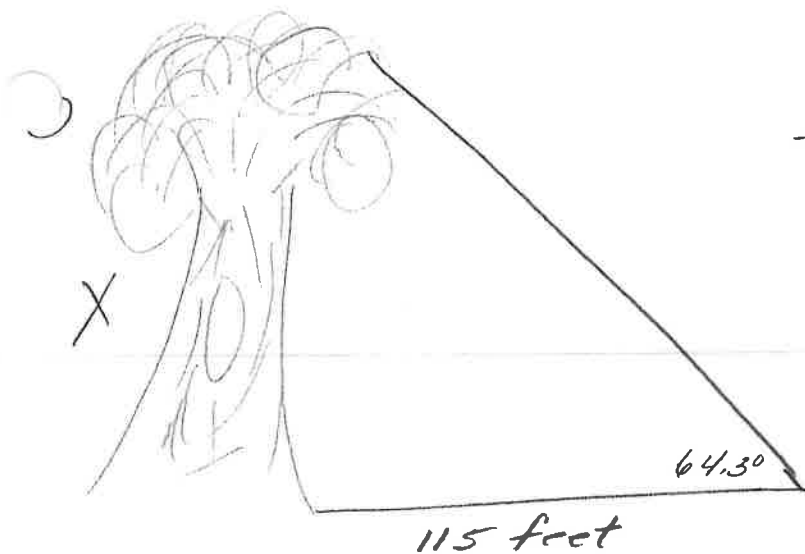
1. From a point 115 feet from the base of a redwood tree, the angle of elevation to the top of the tree is 64.3°. Find the height of the tree to the nearest foot.

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 67.4°. Find the height of the flag pole to the nearest foot.

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.

4. If the distance from a helicopter to a tower is 300 feet and the angle of depression is 40.2°, find the distance on the ground from a point directly below the helicopter to the tower.

5. 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 closer to the tree, the backpacker notes that the angle of elevation is 54°. Find the height of the tree.

6. The angle of elevation from a point 116 meters from the base of the Eiffel Tower to the top of the Tower is 68.9°. Find the approximate height of the tower.

7. A submarine traveling 9 mph is descending at an angle of depression of 5°. How many minutes does it take the submarine to reach a depth of 80 feet?

8. The angle of depression of one side of a lake, measured from a balloon 2500 feet above the lake is 43°. The angle of depression to the opposite side of the lake is 27°. Find the width of the lake.

9. From a point A on a line from the base of the Washington Monument, the angle of elevation to the top of the monument is 42°. From a point 100 feet away and on the same line, the angle to the top is 37.8°. Find the approximate height of the Washington Monument.

10. 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.
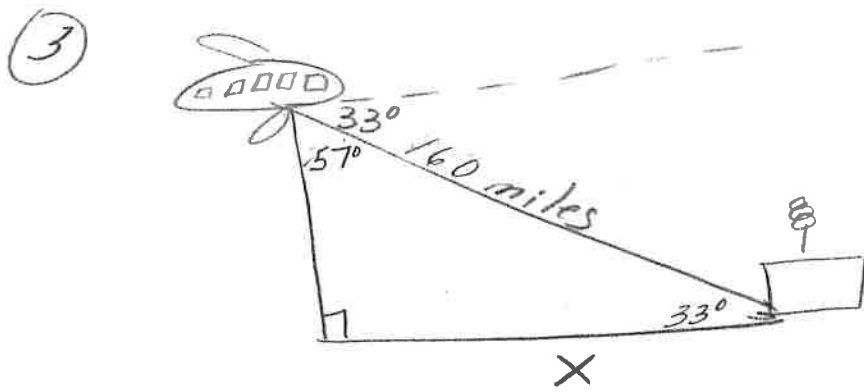
Angles of Depression + Elevation

1)

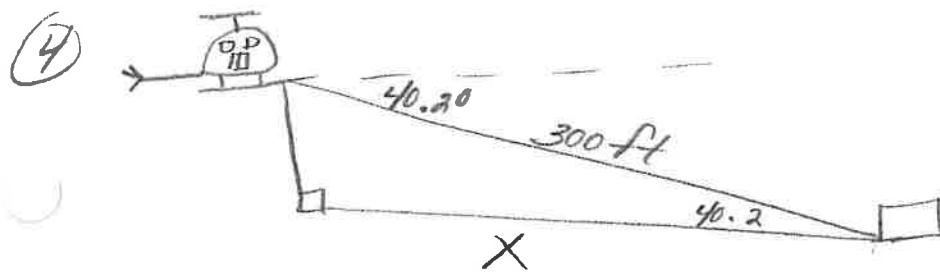$$\text{Tan } 64.3° = \frac{x}{115}$$

$$X = 238.952 \text{ feet}$$

115 feet

2)
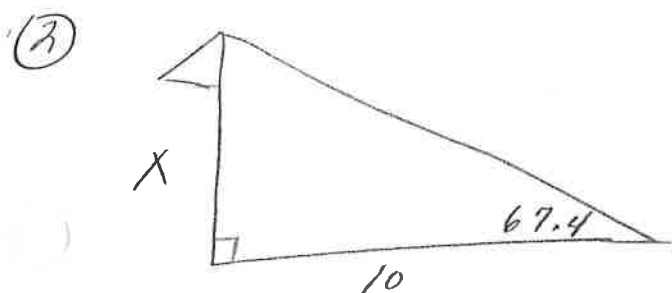
$$\text{Tan } 67.4 = \frac{x}{10}$$

$$X = 24.023 \text{ feet}$$
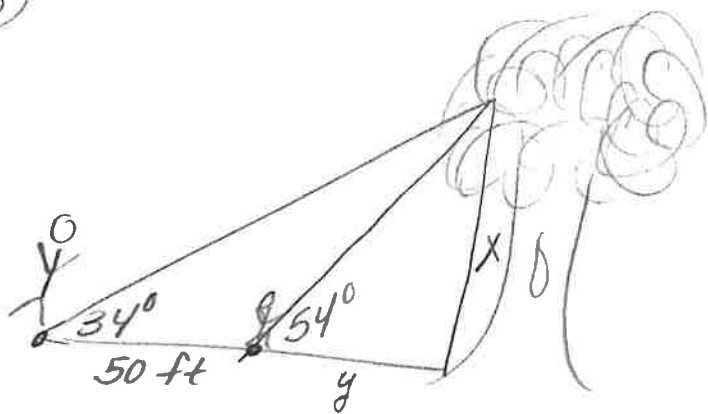
10

3)

$$\cos 33° = \frac{x}{160}$$

$$X = 134.187 \text{ miles}$$

4)

$$\cos 40.2 = \frac{x}{300}$$

$$X = 229.139 \text{ feet}$$

⑤

solve like of
a system
equations !

$\tan 54° = \dfrac{X}{y}$ $\tan 34° = \dfrac{X}{50+y}$

$y \tan 54° = X$ $(50+y) \tan 34° = X$

$y \tan 54° = (50+y) \tan 34°$

$y \tan 54° = 50 \tan 34 + y \tan 34$

$y \tan 54° - y \tan 34° = 50 \tan 34°$

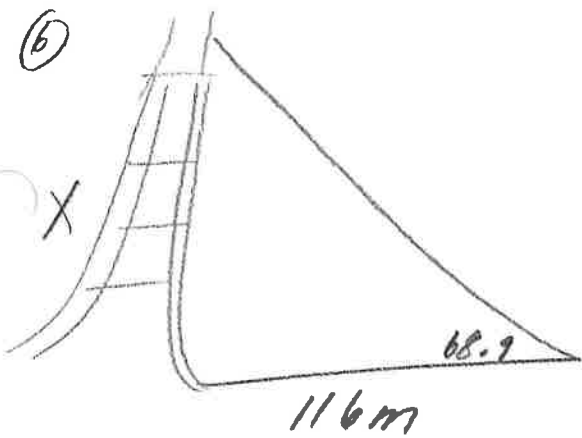$\dfrac{y(\tan 54 - \tan 34)}{(\tan 54 - \tan 34)} = \dfrac{50 \tan 34}{(\tan 54 - \tan 34)}$

$y = 48.05$

$\tan 54° = \dfrac{X}{y}$

$\tan 54° = \dfrac{X}{48.05}$

$\boxed{X = 66.135 \text{ ft}}$

⑥

$$Tan \ 68.9 = \frac{X}{116}$$

$$X = 300.621 \ m$$

X

68.9

116m

⑦

5°

80ft

X

5°
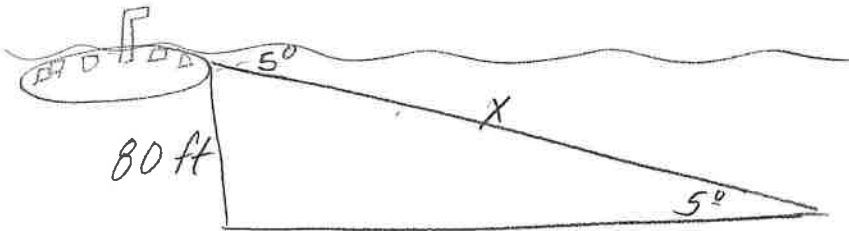
$$Sin \ 5° = \frac{80}{X}$$

$$X = 917.897 ft$$

$$X \approx 918 \ ft$$

Rate

$$\frac{9 \ miles}{1 hr} \cdot \frac{5280 ft}{1 mile} \cdot \frac{1 hr}{60 m} = 792 \ ft/min$$

$$\frac{918}{792} = \boxed{1.16 \ min}$$

⑧

43°   27°

2500 ft

43   27

X   y

$$X + y = 7587.448 ft$$

$$Tan \ 43 = \frac{2500}{X}$$

$$Tan 27 = \frac{2500}{y}$$
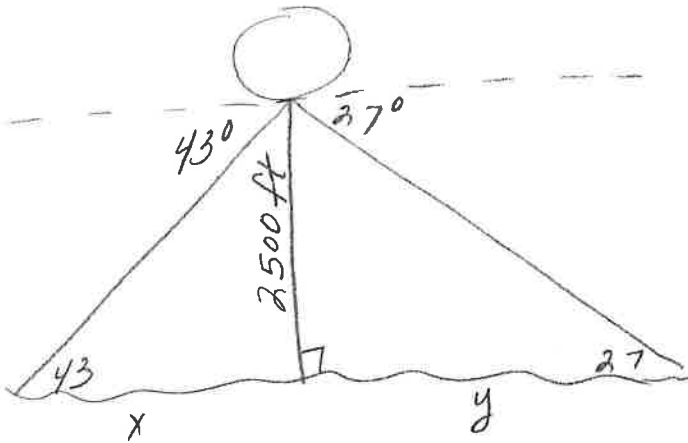
$$X = 2680.922$$

$$y = 4906.526$$

(9)
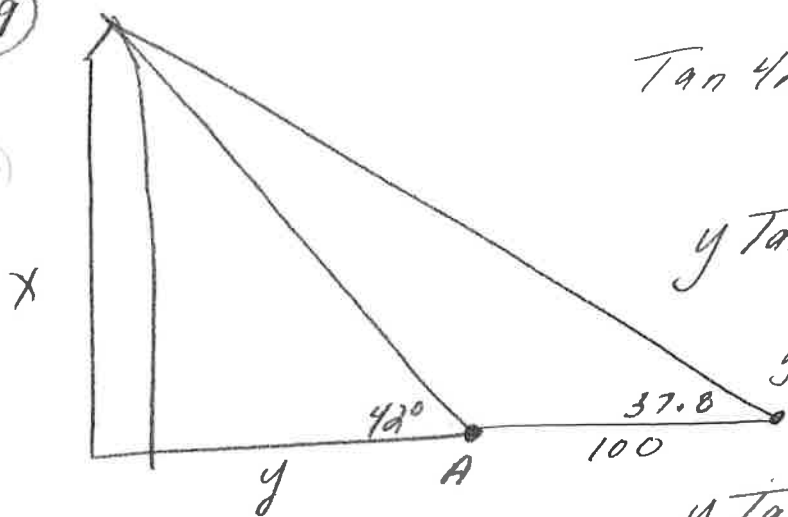
$$\tan 42° = \frac{x}{y} \qquad \tan 37.8 = \frac{x}{y+100}$$

$$y \tan 42' = (y+100) \tan 37.8$$

$$y \tan 42 = y \tan 37.8 + 100 \tan 37.8$$

$$y \tan 42 - y \tan 37.8 = 100 \tan 37.8$$
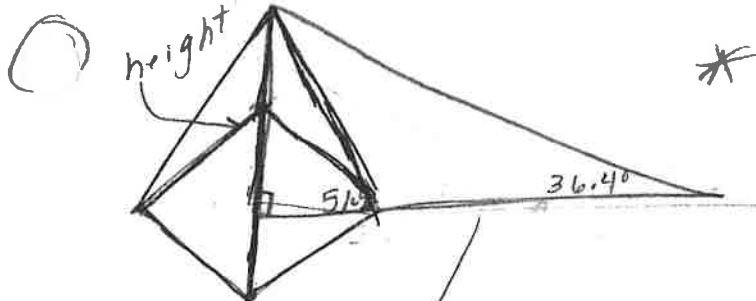
$$y (\tan 42 - \tan 37.8) = 100 \tan 37.8$$

$$y = 621.914$$

$$\tan 42 = \frac{x}{621.914}$$

$$\boxed{x = 559.974 \text{ feet}}$$

height

36.4°   51.9°

* face of the pyramid is on an angle, height is from the top to the center of the base

$$\tan 51.9 = \frac{x}{y} \qquad \tan 36.4 = \frac{x}{y+350}$$

X

51.9   36.4

y   350

$$y \tan 51.9 = (y+350) \tan 36.4$$

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

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

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

$$y = 479.558$$

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

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