

Section 4.8
Part 2

Right Triangle Trigonometry

Objective:

Students will use trigonometric functions to model and solve real-life problems.

Calculator in degrees

Study Problems:

Worksheet

Example

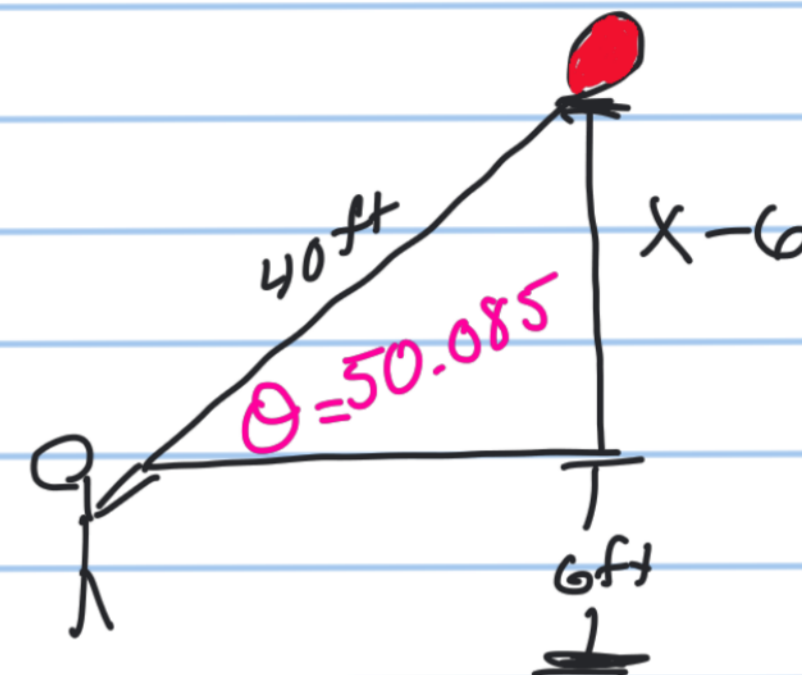
A balloon on a 40ft string makes an angle of $50^{\circ} 5' 8''$ with the ground. How high is the balloon if the hand of the person holding the balloon is 6 feet above the ground?

$$50 + \left(\frac{5}{60}\right) + \left(\frac{8}{3600}\right)$$

$$50 + .083 + .002$$

$$\theta = 50.085$$

The balloon is 36.680 ft above the ground



$$\sin 50.085 = \frac{x-6}{40}$$

$$40 \sin 50.085 = x-6$$

$$(40 \sin 50.085) + 6 = x$$

$$30.68 + 6 = x$$

$$\boxed{36.68 \text{ ft} = x}$$

Ed Puzzle

how to change degrees to minutes and seconds?

54° degrees and 30 minutes: 54° $54 + \left(\frac{30}{60}\right) = 54 + .5 = 54.5^\circ$

42° degrees and 15 minutes: 42° $42 + \left(\frac{15}{60}\right) = 42 + .25 = 42.25^\circ$

What is the decimal degree of $67^\circ 12' 43''$?

$D^\circ M' S'' \Rightarrow$ Decimal

- 1) The number for degrees will be the first number before the decimal
- 2) Divide minutes by 60
- 3) Divide seconds by 3600
- 4) Add, add put with first number

$$D + \frac{M}{60} + \frac{S}{3600}$$

Decimal $\Rightarrow D^\circ M' S''$

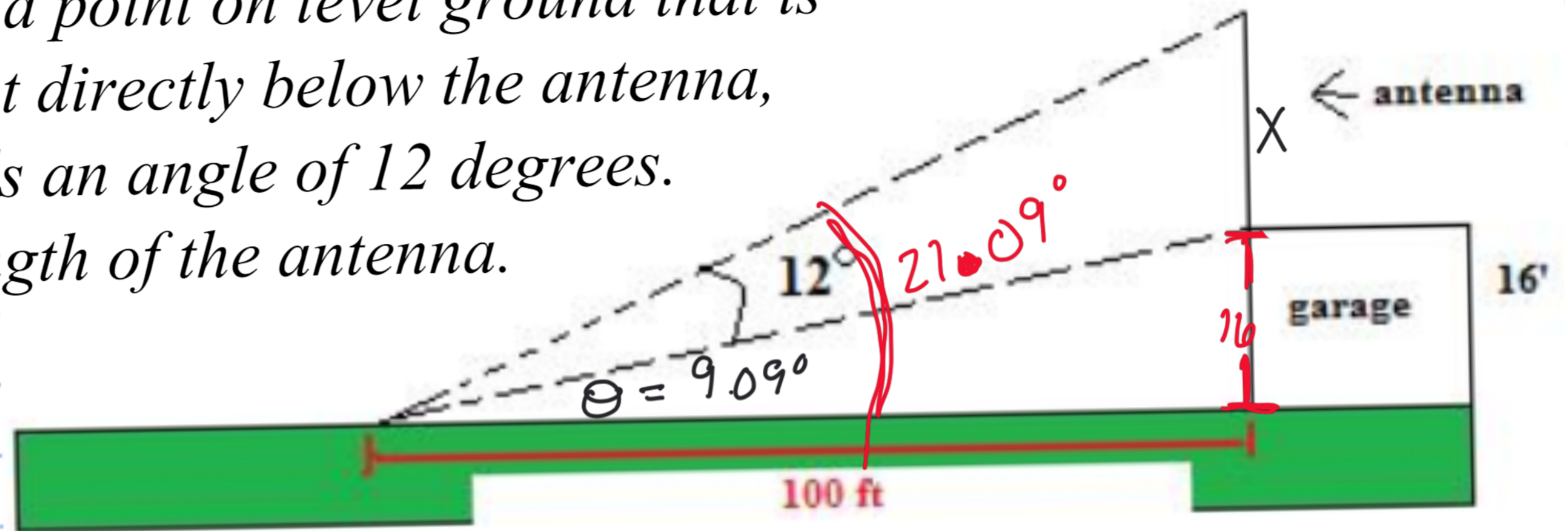
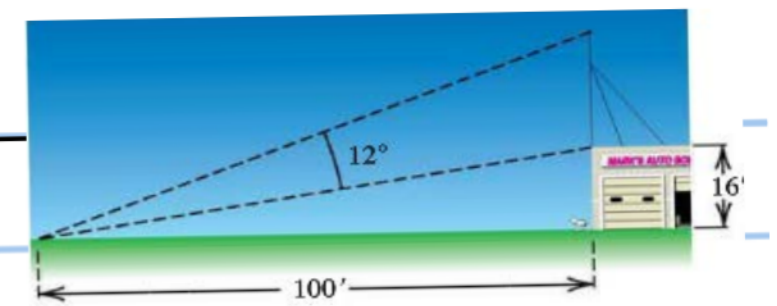
- 1) The number before the decimal will be the degrees **D. stuff**
- 2) Take the number after the decimal and multiply by 60 **M. stuff**
- 3) Take the number after the decimal and multiply by 60 **S. stuff**
(may need to round)

$$67 + \left(\frac{12}{60}\right) + \left(\frac{43}{3600}\right)$$

$$67.21^\circ$$

Example

A CB antenna is located on the top of a garage that is 16 feet tall. From a point on level ground that is 100 feet from a point directly below the antenna, the antenna subtends an angle of 12 degrees. Approximate the length of the antenna.



$$\tan \theta = \frac{16}{100}$$

$$\theta = \tan^{-1} \frac{16}{100}$$

$$\theta = 9.09^\circ$$

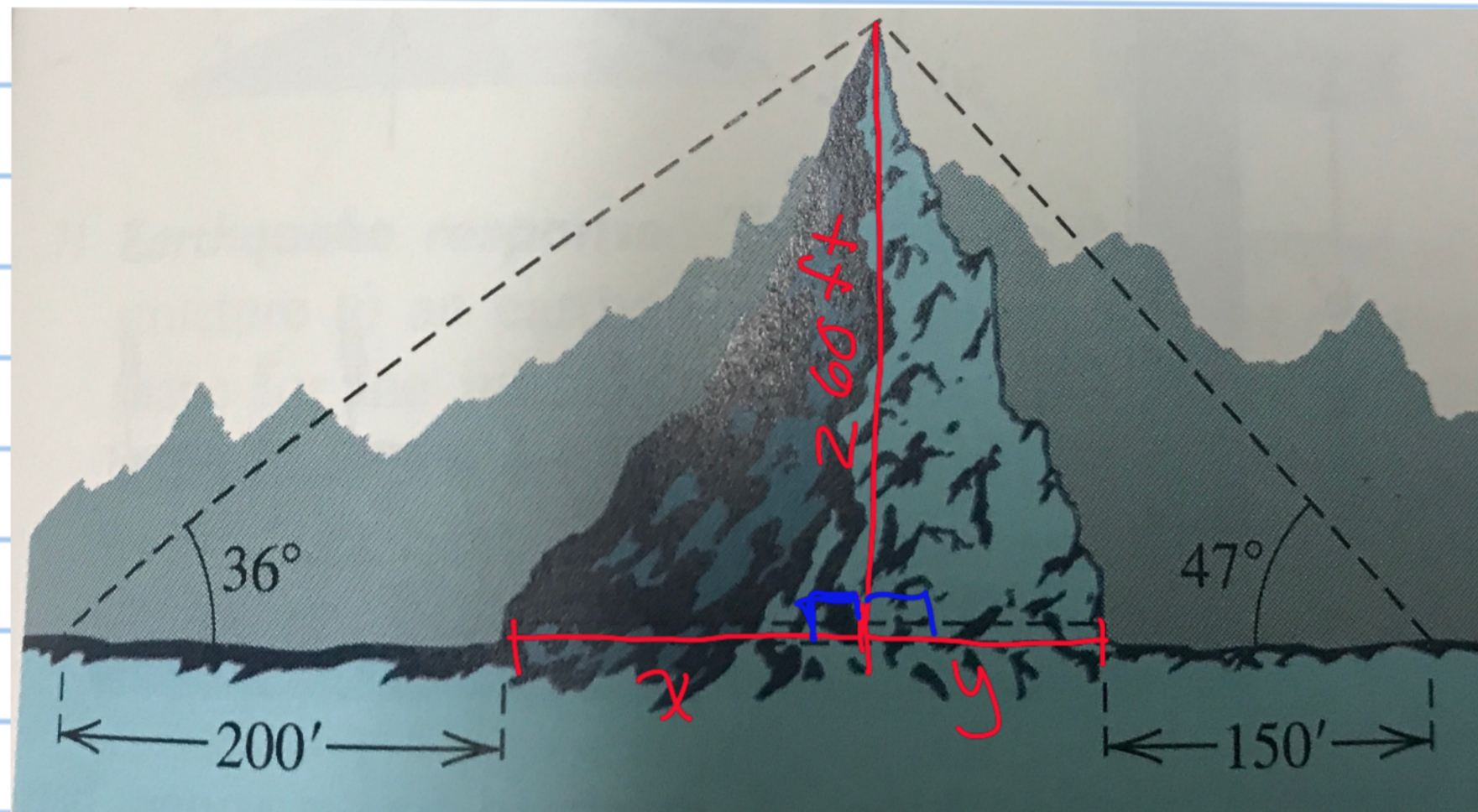
$$\tan 21.09 = \frac{x+16}{100}$$

$$100 \tan 21.09 = x+16$$

$$(100 \tan 21.09) - 16 = x$$

$$\boxed{22.57 \text{ ft} \approx x}$$

Length of tunnel: A tunnel for a new highway is to be cut through a mountain that is 260 feet high. At a distance of 200 feet from the base of the mountain, the angle of elevation is 36° . From a distance of 150 feet on the other side, the angle of elevation is 47° . Approximate the length of the tunnel to the nearest foot.



$$\tan 36 = \frac{260}{x+200}$$

$$x+200 \tan 36 = 260$$

$$x = \frac{260}{\tan 36} - 200$$

$$x \approx \underline{\underline{157.86}}$$

$$\tan 47 = \frac{260}{y+150}$$

$$y+150 \tan 47 = 260$$

$$y = \frac{260}{\tan 47} - 150$$

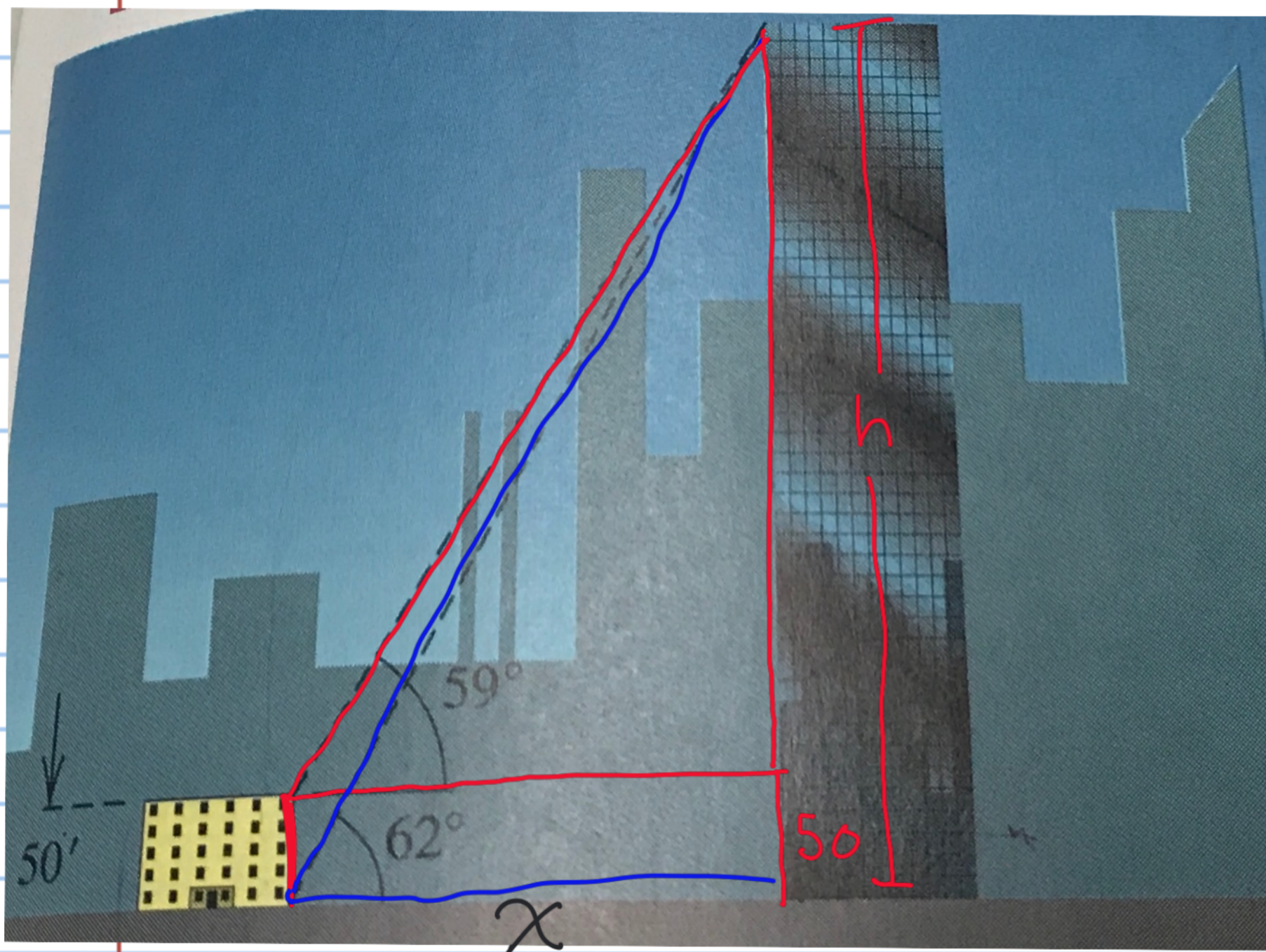
$$y = 92.45$$

$$\begin{array}{r} \text{length} = 157.86 \\ + 92.45 \\ \hline \underline{250.31} \end{array}$$

Height of a skyscraper: When a certain skyscraper is viewed from the top of a building 50 feet tall, the angle of elevation is 59° . When viewed from the street next to the shorter building, the angle of elevation is 62° .

a) Approximate how far apart are the two structures?

b) Approximate the height of the skyscraper to the nearest tenth of a foot.



$$a) \quad \tan 62 = \frac{h}{x}$$

$$x \tan 62 = h$$

$$\tan 59 = \frac{h-50}{x}$$

$$x \tan 59 = h - 50$$

$$(x \tan 59) + 50 = h$$

$$x \tan 62 = (x \tan 59) + 50$$

$$x \tan 62 - x \tan 59 = 50$$

$$x (\tan 62 - \tan 59) = 50$$

$$x = \frac{50}{\tan 62 - \tan 59}$$

$$x \approx 231 \text{ ft}$$

$$b) \quad h = x \tan 62$$

$$= 231 \tan 62$$

$$h = 434 \text{ ft}$$