

# Trigonometry – Systems of Equations

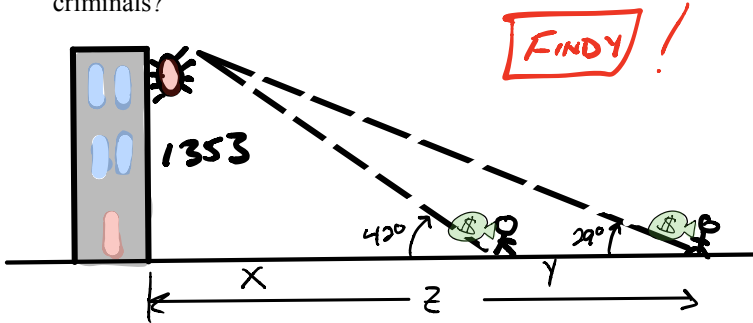
G.SRT.C.8

Hw Section 9.4

Name \_\_\_\_\_

Solve each problem. If needed, round measures of segments to the nearest hundredth and measures of angles to the nearest degree. You must draw a picture and add information to drawing.

#1) Wearing his Spiderman Underoos, George duct taped himself to Sears Tower in Chicago looking for crime. He sights two thieves going due east from the tower. The angles of depression to the two thugs are  $42^\circ$  and  $29^\circ$ . If SpiderGeorge is 1,353 feet high, how far apart are the criminals?



$$\tan(42^\circ) = \frac{1353}{x}$$

$$\tan(29^\circ) = \frac{1353}{z}$$

$$x \cdot \tan(42^\circ) = 1353$$

$$z \cdot \tan(29^\circ) = 1353$$

$$x = \frac{1353}{\tan(42^\circ)}$$

$$z = \frac{1353}{\tan(29^\circ)}$$

$$x \approx 1502.66$$

$$z \approx 2440.88$$

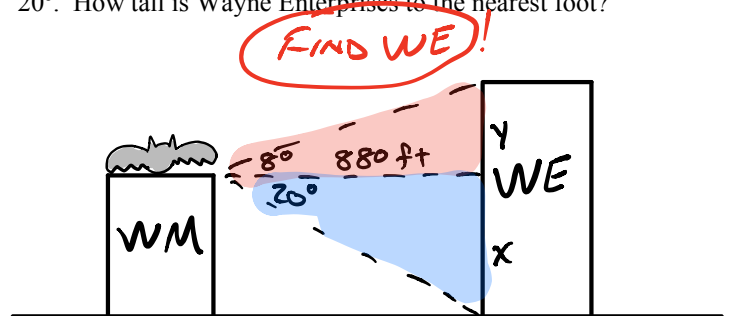
$$x + y = z$$

$$(1502.66) + y = 2440.88$$

$$y = 938.22$$

The two criminals are about 938.22 feet apart.

#2) Wearing his Batman garb, George is standing on top of Wayne Manner looking at Wayne Enterprises building across Gotham River. It is 880 feet between buildings. BatGeorge deduces the angle of elevation to the top of Wayne Enterprises to be  $8^\circ$  and the angle of depression to the ground level to be  $20^\circ$ . How tall is Wayne Enterprises to the nearest foot?



$$\tan(20^\circ) = \frac{x}{880}$$

$$\tan(8^\circ) = \frac{y}{880}$$

$$880 \tan(20^\circ) = x$$

$$880 \tan(8^\circ) = y$$

$$320.29 \approx x$$

$$123.68 \approx y$$

$$\begin{aligned} WE &= x + y \\ &= (320.29) + (123.68) \end{aligned}$$

$$WE = 443.97$$

Wayne Enterprises is 443.97 feet tall.

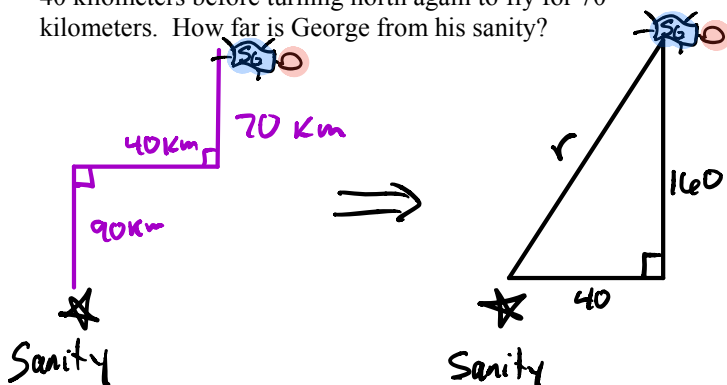
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#3) Wearing his Superman costume, SuperGeorge flies due north from his sanity for 90 kilometers. He then turns east for 40 kilometers before turning north again to fly for 70 kilometers. How far is George from his sanity?



$$x^2 + y^2 = r^2$$

$$(40)^2 + (160)^2 = r^2$$

$$1600 + 25600 = r^2$$

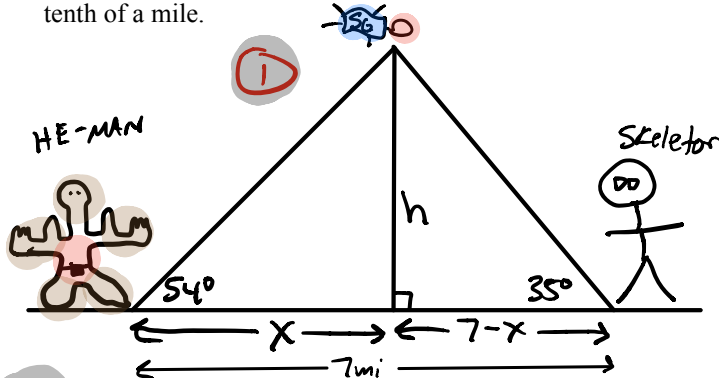
$$27200 = r^2$$

$$\pm \sqrt{27200} = r$$

$$164.92 \approx r$$

George is 164.92 km from his sanity.

#4) Skeletor and He-Man are 7 miles apart with SuperGeorge flying between them. From Skeletor, the angle of elevation to SuperGeorge is  $35^\circ$ . From He-man, the angle of elevation to George is  $54^\circ$ . Find the altitude of the George to the nearest tenth of a mile.



②  $\tan(54^\circ) = \frac{h}{x}$   
 $x \tan(54^\circ) = h$

③  $\tan(35^\circ) = \frac{h}{7-x}$   
 $\tan(35^\circ) = \frac{x \tan(54^\circ)}{7-x}$

$$(7-x) \tan(35^\circ) = x \tan(54^\circ)$$

$$7 \tan(35^\circ) - x \tan(35^\circ) = x \tan(54^\circ)$$

$$7 \tan(35^\circ) = x \tan(54^\circ) + x \tan(35^\circ)$$

$$7 \tan(35^\circ) = x (\tan(54^\circ) + \tan(35^\circ))$$

$$\frac{7 \tan(35^\circ)}{\tan(54^\circ) + \tan(35^\circ)} = x$$

$$2.36 \approx x$$

④

$$x \tan(54^\circ) = h$$

$$2.36 \tan(54^\circ) = h$$

$$3.25 \approx h$$

SuperGeorge is flying 3.25 feet high.