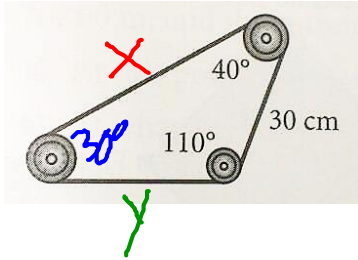


Applications of Trigonometry

Make sure your calculator is in the proper mode - degrees (deg).

Diagrams are not to scale!

1. A mechanic is replacing a belt that wraps around three wheels, as shown.



Determine the total length of the belt, ignoring the curves around the wheels.

$$180 - 110 - 40 = 30^\circ \quad \text{* we have a complete ratio!$$

$$\frac{X}{\sin 110^\circ} = \frac{Y}{\sin 40^\circ} = \frac{30}{\sin 30^\circ}$$

$$\frac{X}{\sin 110^\circ} = \frac{30}{\sin 30^\circ}$$

$$X = \frac{30 \times \sin 110^\circ}{\sin 30^\circ}$$

$$X = 56.4 \text{ cm}$$

$$\frac{Y}{\sin 40^\circ} = \frac{30}{\sin 30^\circ}$$

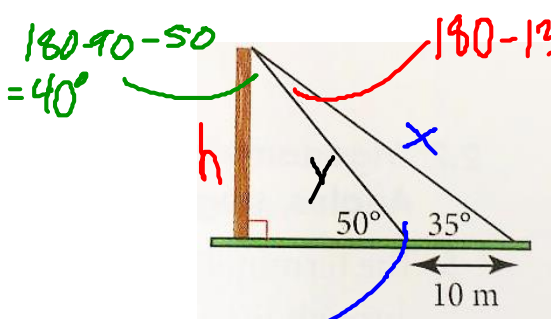
$$Y = \frac{30 \times \sin 40^\circ}{\sin 30^\circ}$$

$$Y = 38.6 \text{ cm}$$

$$\text{Belt} = 30 + 56.4 + 38.6$$

$$= 125 \text{ cm}$$

2. Joanne has to replace the two supporting guy wires for a hydro pole. She measures the distance between the bases of the wires to be 10 m, and their angles of inclination to be 50° and 35° .



- a. Determine the total length of the guy wire to be replaced.

- b. Determine the height of the pole.

$$x + y = 180^\circ$$

$$a.) \quad \frac{x}{\sin 130^\circ} = \frac{10}{\sin 15^\circ}$$

$$x = \frac{10 \times \sin 130^\circ}{\sin 15^\circ}$$

$$x = 29.6$$

$$\text{Total} = 51.8 \text{ m}$$

$$\frac{y}{\sin 35^\circ} = \frac{10}{\sin 15^\circ}$$

$$y = \frac{10 \times \sin 35^\circ}{\sin 15^\circ}$$

$$y = 22.2$$

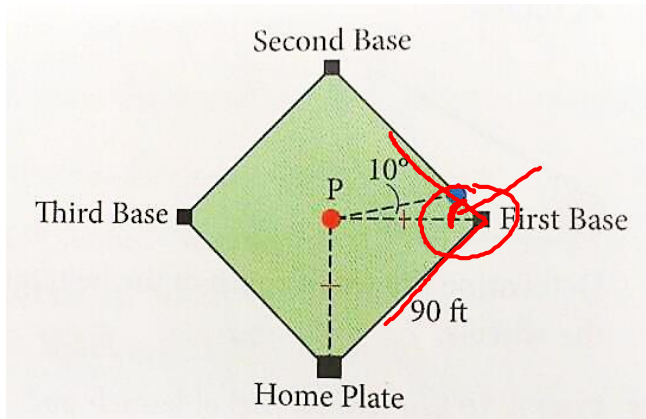


$$\sin 35^\circ = \frac{h}{29.6}$$

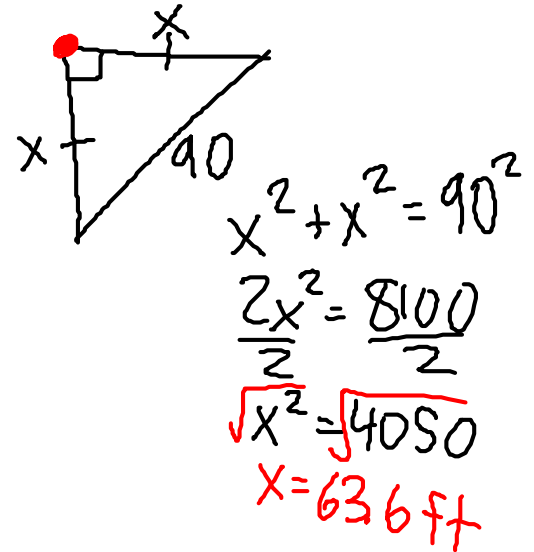
$$h = 29.6 \times \sin 35^\circ$$

$$h = 17 \text{ m}$$

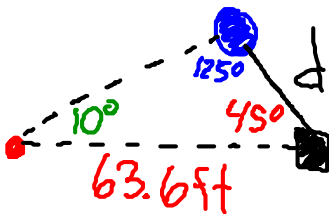
3. Ricky Henderson is edging away from first base, trying to steal second. Pitch Bot, the pitcher, knows that if Ricky is more than 12 ft. from the base, he can throw him out.



Glancing over his shoulder, Pitch Bot observes Ricky at an angle of 10° away from first base. The baseball diamond is square, with each side length equal to 90 ft. Pitch Bot is equidistant from all bases, including home plate.



Can Pitch Bot throw out Ricky at first? Justify!



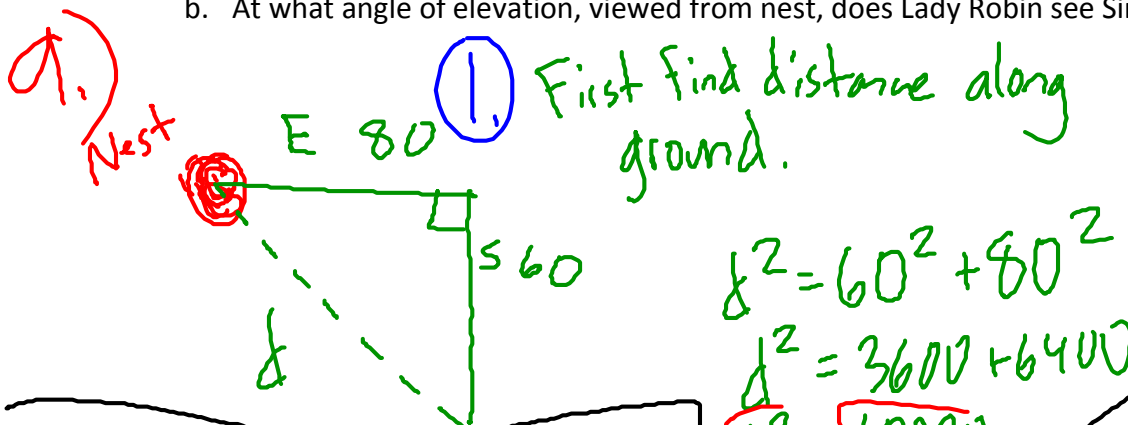
$$\frac{d}{\sin 10^\circ} = \frac{63.6}{\sin 125^\circ}$$

$$d = \frac{63.6 \times \sin 10^\circ}{\sin 125^\circ}$$

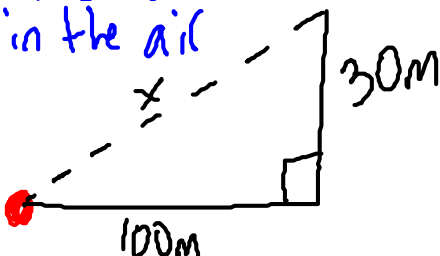
$$d = 13.5 \text{ ft.}$$

He can! He's more than 12ft from base 😊

4. From his nest, Sir Robin flies east for 80 m, the south for 60 m, and then straight up into the sky for 30 m.
- At this point, how far is Sir Robin from his nest?
 - At what angle of elevation, viewed from nest, does Lady Robin see Sir Robin?



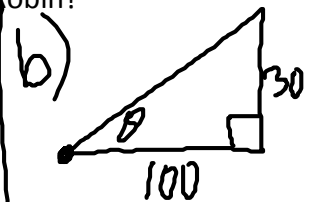
2. Now find distance from nest to bird in the air



$$x^2 = 30^2 + 100^2$$

$$x^2 = 10900$$

$$x = 104.4 \text{ m}$$



$$\tan \theta = \frac{30}{100}$$

$$\tan \theta = 0.3$$

$$\theta = \tan^{-1}(0.3)$$

$$\theta = 16.7^\circ$$