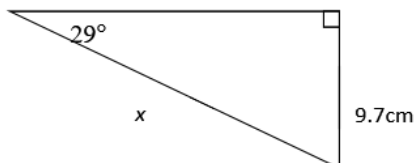


MPM2D

Unit 6, Lesson 5

Trigonometric Ratios – Applications

Warm up – Solve for the variable in each diagram below.

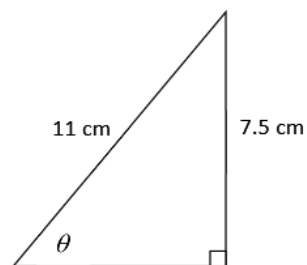


$$\sin 29^\circ = \frac{9.7}{x}$$

$$x \cdot \sin 29^\circ = 9.7$$

$$x = \frac{9.7}{\sin 29^\circ}$$

$$x \approx 20 \text{ cm}$$



$$\sin \theta = \frac{7.5}{11}$$

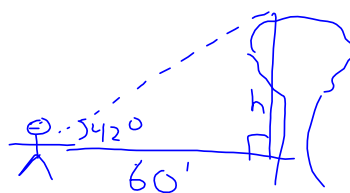
$$\theta = \sin^{-1}\left(\frac{7.5}{11}\right)$$

$$\theta \approx 43^\circ$$

Today we look at simple applications (word problems) using the skills above.

It is important to understand the difference between angle of elevation and angle of depression. Sketch them below.

Example 1 – To measure the height of a tree, Mr. Elliott stands exactly 60 feet from the base of the tree. Using a clinometer he measures the angle of elevation to the top of the tree to be 42° . How tall is the tree?

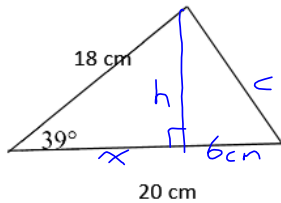


$$\tan 42^\circ = \frac{h}{60}$$

$$h = 60 \tan 42^\circ$$

$$h \approx 54'$$

Example 2 - Find the area and perimeter of the triangle shown below.



$$\sin 39^\circ = \frac{h}{18}$$

$$h = 18 \sin 39^\circ$$

$$h \doteq 11 \text{ cm}$$

$$A = \frac{bh}{2}$$

$$A = \frac{20 \text{ cm} (11 \text{ cm})}{2}$$

$$A \doteq 110 \text{ cm}^2$$

$$18^2 = 11^2 + x^2$$

$$x \doteq 14 \text{ cm}$$

$$11^2 + 6^2 = c^2$$

$$c \doteq 13 \text{ cm}$$

$$P = 20 + 18 + 13$$

$$P \doteq 51 \text{ cm}$$

Example 3

Two boats leave a harbor at the same time. ~~When~~ ^{One} travels directly North at a speed of 25 km/h. The other travels directly East at a speed of 30 km/h.

- How far apart are the boats after 3.5 hours?
- Suppose that the first boat breaks down. What direction will the second boat need to go to rescue the first boat? How long will it take to get to it?



$$d^2 = 87.5^2 + 105^2$$

$$d \doteq 137 \text{ km}$$

$$\tan \theta = \frac{87.5}{105}$$

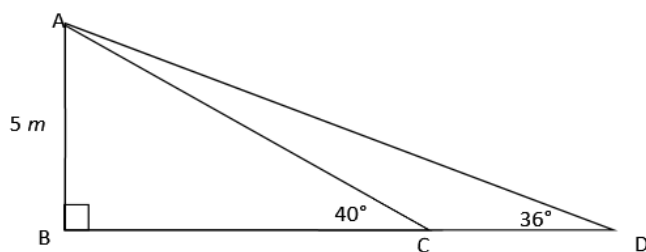
$$\theta = 40^\circ$$

go on a bearing of
320°

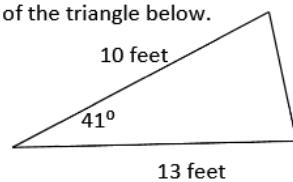
$$t = \frac{137 \text{ km}}{30 \text{ km/h}} \doteq 4.5 \text{ hours}$$

SOH CAH TOA – Applications

1. The top of a lighthouse is 100m above sea level. The angle of elevation from the deck of a boat to the top of the lighthouse is 28° . Calculate the distance between the sailboat and the lighthouse.
2. Text page 349 #3 – 11
3. Find the distance between points C and D in the diagram below.



4. Find the area of the triangle below.



5. Challenging Question! A circular Ferris wheel has a radius of 8m and rotates at a rate of 12° per second. At zero seconds a seat is at its lowest point which is 2m above the ground. How high above the ground is this seat at 40 seconds?

ANSWERS

1. approx. 188m 3. approx.. 0.9m 4. 42.6 square feet 5. 14m