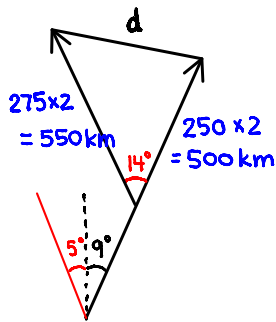


Applying Trigonometry in Real-World Problems

Example 1

An airplane leaves a city. It begins by flying 250 km/h on a course 9° East of North. However wind changes the speed of the plane to 275 km/h and its direction to a course 5° West of North. If the plane continues flying on this new course for 2 hours, how far off course has it gone?



$$d^2 = 550^2 + 500^2 - 2(550)(500)\cos 14$$

$$\doteq 18837.35$$

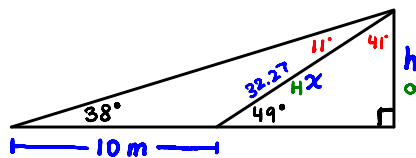
$$d = \sqrt{18837.35}$$

$$\doteq 137$$

The plane has gone 137 km off course.

Example 2

A lumberjack wants to estimate the height of a tree. He begins by measuring the angle of elevation to the top of the tree to 38° . He then walks 10 m closer to the tree and measures the angle of elevation to be 49° . Find the height of the tree.



$$\frac{\sin 11}{10} = \frac{\sin 38}{x}$$

$$x = \frac{10 \sin 38^\circ}{\sin 11}$$

$$\doteq 32.27$$

$$180 - 90 - 49 = 41$$

$$180 - 90 - 38 = 52$$

$$52 - 41 = 11$$



$$\sin 49^\circ = \frac{h}{32.27}$$

$$32.27 \sin 49^\circ = h$$

$$h \doteq 24.35$$

The tree is about 24 m tall.

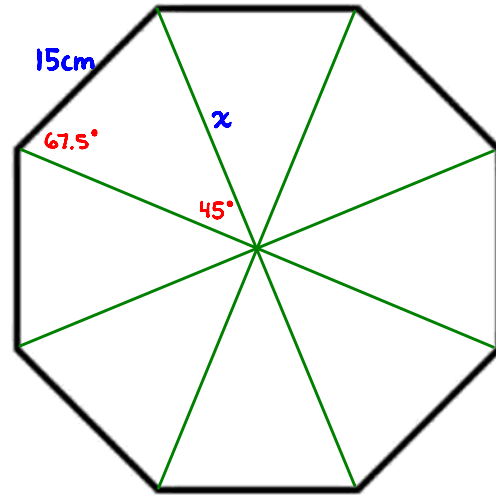
Example 3

A **regular octagon** has all side lengths equal to 15 cm. Find the length of the apothem.

NOTES:

Regular polygon – has all sides and angles equal.

Apothem – the distance from the centre of a regular polygon to one of the vertices.



$$360 \div 8 = 45$$

$$180 - 45 = 135$$

$$135 \div 2 = 67.5$$

$$\frac{\sin 45^\circ}{15} = \frac{\sin 67.5}{x}$$

The apothem has a length of 19.6 cm.

$$x = \frac{15 \sin 67.5}{\sin 45}$$

$$\approx 19.6 \text{ cm}$$