

## 2.6 Applying the Trigonometric Ratios

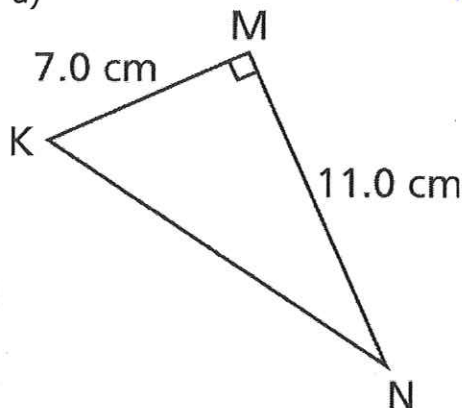
To **solve** a triangle means to find the measures of all 3 sides and all 3 angles.

We can solve a right triangle if we are given:

2 side lengths    OR    1 side length and the measure of 1 acute angle

Example : Solve each triangle. Round answers to the nearest tenth of a unit.

a)



use Pythagorean Theorem to find hypotenuse

$$KN^2 = 7.0^2 + 11.0^2$$

$$KN^2 = 170$$

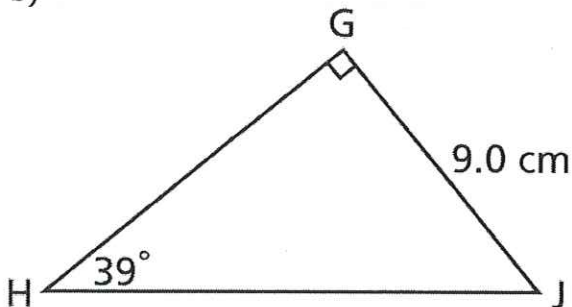
$$KN = \sqrt{170}$$

$$\boxed{KN = 13.0 \text{ cm}}$$

$$\angle N = \tan^{-1}\left(\frac{7.0}{11.0}\right) = 32.5^\circ$$

$$\angle K = \tan^{-1}\left(\frac{11.0}{7.0}\right) = 57.5^\circ$$

b)



$$\angle J = 180^\circ - 90^\circ - 39^\circ = 51^\circ$$

Find GH:

$$\tan 39^\circ = \frac{9.0}{GH}$$

$$GH = \frac{9.0}{\tan 39^\circ}$$

$$\boxed{GH = 11.1 \text{ cm}}$$

To find HJ:

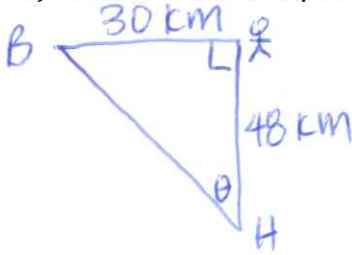
$$\sin 39^\circ = \frac{9.0}{HJ}$$

$$HJ = \frac{9.0}{\sin 39^\circ}$$

$$\boxed{HJ = 14.3 \text{ cm}}$$

**Example:** A helicopter leaves its base, and flies 30 km due east to pick up a sick person. It then flies 48 km due south to a hospital.

- a) When the helicopter is at the hospital, how far is it from its base to the nearest kilometer?



$$BH^2 = 30^2 + 48^2$$

$$BH^2 = 3204$$

$$BH = \sqrt{3204}$$

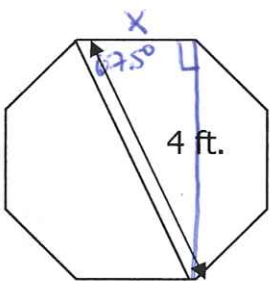
$$= 57 \text{ km}$$

- b) When the helicopter is at the hospital, what is the measure of the angle between the path it took due south and the path it will take to return directly to its base? Write the angle to the nearest degree.

$$\theta = \tan^{-1}\left(\frac{30}{48}\right)$$

$$\theta = 32^\circ$$

**Example:** A window has the shape of a regular octagon. The distance from one vertex to the opposite vertex, measured through the centre of the window, is approximately 4 ft. Determine the length of the wood moulding material that forms the frame of the window, to the nearest foot.



Angles in an octagon add to  $1080^\circ$   
 $\therefore$  each angle is  $135^\circ$



$$\cos 67.5^\circ = \frac{x}{4}$$

$$x = 4 \cos 67.5^\circ$$

$$8 \text{ sided shape} = 8x$$

$$= 12.25 \text{ ft} \approx 12 \text{ ft}$$