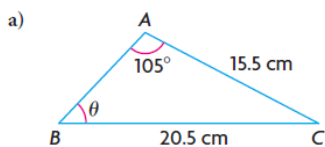


# Solutions

1. Determine the measure of angle  $\theta$  to the nearest degree.



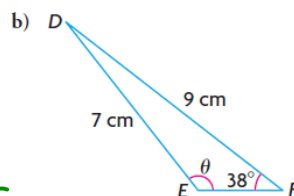
$$\frac{\sin \theta}{15.5} = \frac{\sin 105}{20.5}$$

$$\sin \theta = \frac{15.5 \sin 105}{20.5}$$

$$\sin \theta = 0.7303$$

$$\theta = \sin^{-1}(0.7303)$$

$$\theta = 47^\circ$$



$$\frac{\sin \theta}{9} = \frac{\sin 38}{7}$$

$$\sin \theta = \frac{9 \sin 38}{7}$$

$$\sin \theta = 0.7916$$

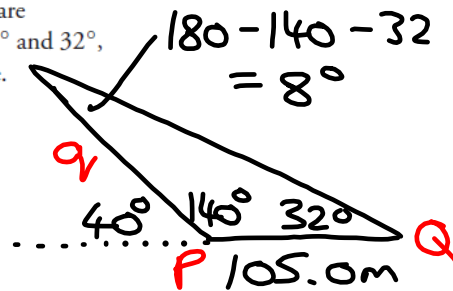
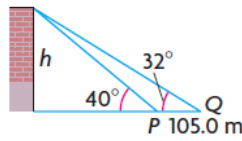
$$\theta = \sin^{-1}(0.7916)$$

$$\theta = 52^\circ \text{ or } 128^\circ$$

$$\Rightarrow \theta = 128^\circ$$

(angle is obtuse in the diagram)

7. A building of height  $h$  is observed from two points,  $P$  and  $Q$ , that are 105.0 m apart as shown. The angles of elevation at  $P$  and  $Q$  are  $40^\circ$  and  $32^\circ$ , respectively. Calculate the height,  $h$ , to the nearest tenth of a metre.



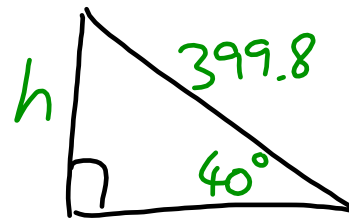
$$\frac{q}{\sin 32} = \frac{105.0}{\sin 8}$$

$$q = \frac{105.0 \sin 32}{\sin 8}$$

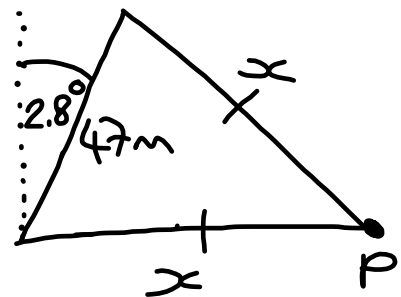
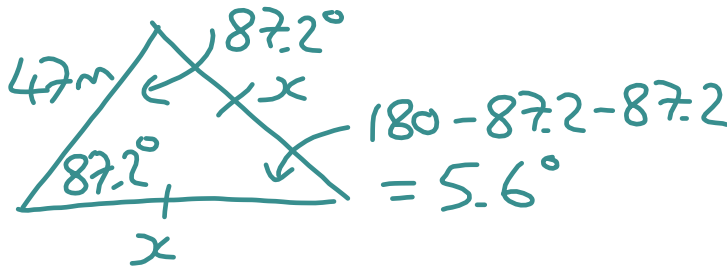
$$q = 399.8 \text{ m}$$

$$\sin 40 = \frac{h}{399.8}$$

$$399.8 \sin 40 = h \Rightarrow h = 257.0 \text{ m}$$



12. The Huqiu Tower in China was built in 961 CE. When the tower was first built, its height was 47 m. Since then it has tilted  $2.8^\circ$ , so it is called China's Leaning Tower. There is a specific point on the ground where you can be equidistant from both the top and the bottom of the tower. How far is this point from the base of the tower? Round your answer to the nearest metre.

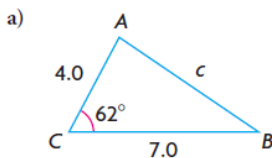


$$\frac{x}{\sin 87.2} = \frac{47}{\sin 5.6}$$

$$x = \frac{47 \sin 87.2}{\sin 5.6}$$

$$x = 481 \text{ m}$$

1. Determine each unknown side length to the nearest tenth.



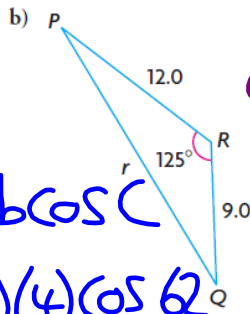
$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$c^2 = 7^2 + 4^2 - 2(7)(4) \cos 62$$

$$c^2 = 38.70959248$$

$$c = \sqrt{\text{ANS}}$$

$$c = 6.2 \text{ units}$$



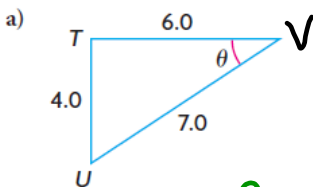
$$r^2 = p^2 + q^2 - 2pq \cos R$$

$$r^2 = 9^2 + 12^2 - 2(9)(12) \cos 125$$

$$r^2 = 348.8925103$$

$$r = \sqrt{\text{ANS}}$$

$$r = 18.7 \text{ units}$$

2. For each triangle, determine the value of  $\theta$  to the nearest degree.

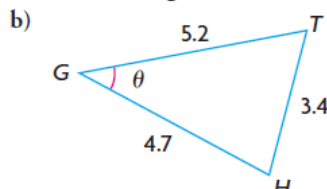
$$\cos V = \frac{t^2 + u^2 - v^2}{2tu}$$

$$\cos V = \frac{7^2 + 6^2 - 4^2}{2(7)(6)}$$

$$\cos V = \frac{69}{84}$$

$$V = \cos^{-1}\left(\frac{69}{84}\right)$$

$$V = 35^\circ$$



$$\cos G = \frac{h^2 + t^2 - g^2}{2ht}$$

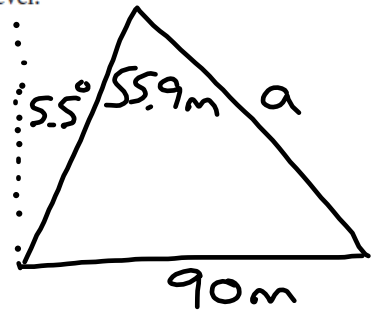
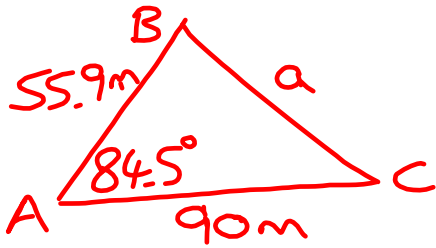
$$\cos G = \frac{5.2^2 + 4.7^2 - 3.4^2}{2(5.2)(4.7)}$$

$$\cos G = \frac{37.57}{48.88}$$

$$G = \cos^{-1}\left(\frac{37.57}{48.88}\right)$$

$$G = 40^\circ$$

10. The Leaning Tower of Pisa is 55.9 m tall and leans  $5.5^\circ$  from the vertical. If its shadow is 90.0 m long, what is the distance from the top of the tower to the top edge of its shadow? Assume that the ground around the tower is level. Round your answer to the nearest metre.



$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = 90^2 + 55.9^2 - 2(90)(55.9) \cos 84.5$$

$$a^2 = 10260.41004$$

$$a = \sqrt{ANS}$$

$$a = 101.3 \text{ m} \Rightarrow 101 \text{ m to the nearest metre}$$