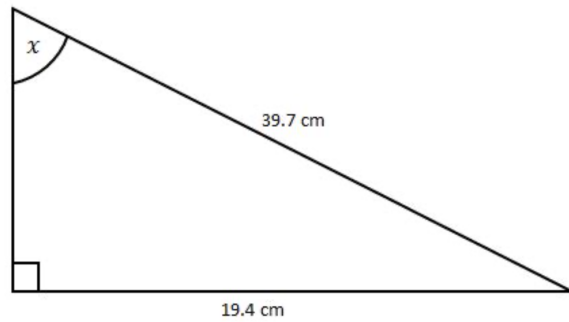


Railway Engineering Mathematics

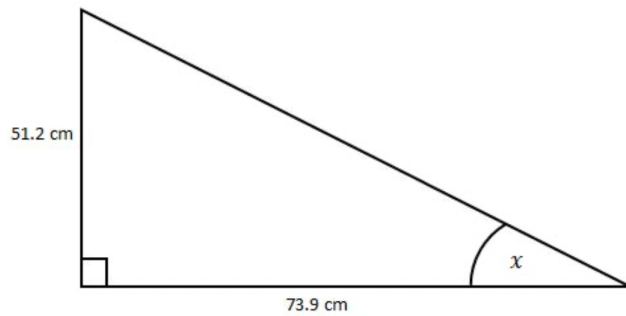
Tutorial Sheet 9

1. Calculate the value of x :

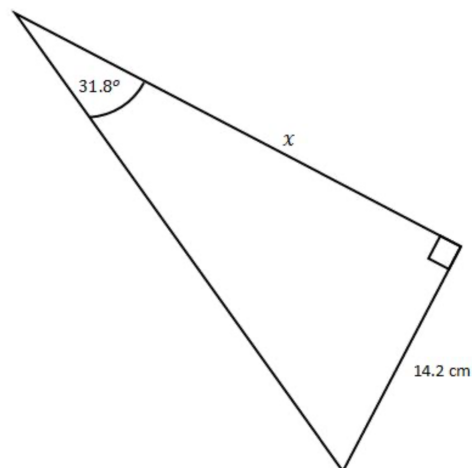
(a)



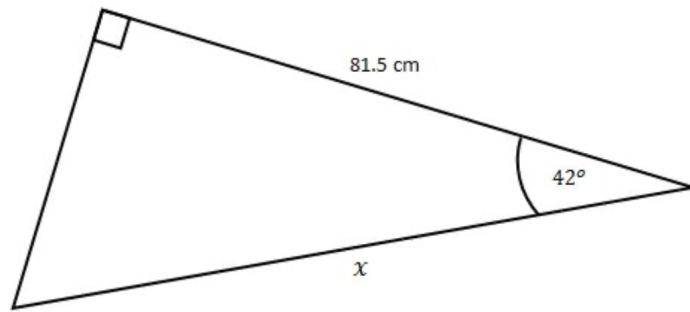
(b)



(c)



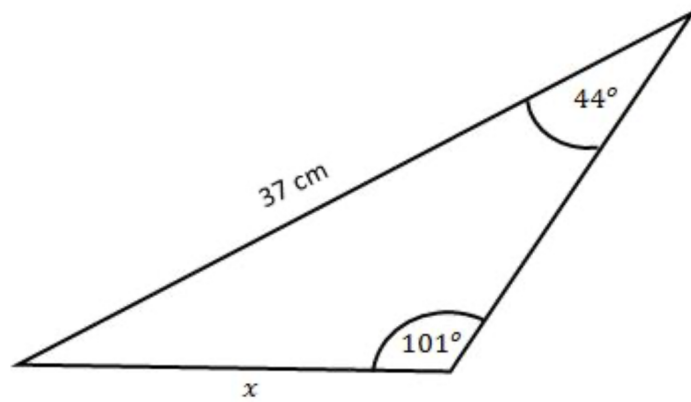
(d)



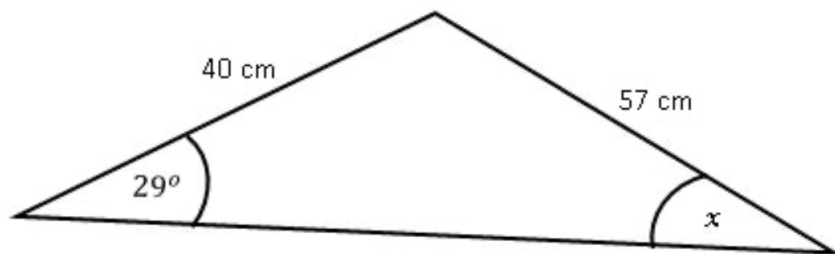
2. The angle of elevation of the top of a tree from a point on the ground that lies 10m from the base of the tree is 28° . What is the height of the tree, to 1 decimal place?
3. The angle of elevation of the top of a 20m high mast from a point at ground level is 34° . How far is the point from the foot of the mast? Give your answer to 2 decimal places.
4. A supporting cable of length 30m is fastened to the top of a 20m high mast. What angle does the cable make with the ground? How far away from the foot of the mast is it anchored to the ground?
5. What is the height (to 1 decimal place) of an isosceles triangle with base angle 65° and sloping sides with length 10cm? What is the length of the base of this triangle (to 1 decimal place)?

6. Calculate the value of x :

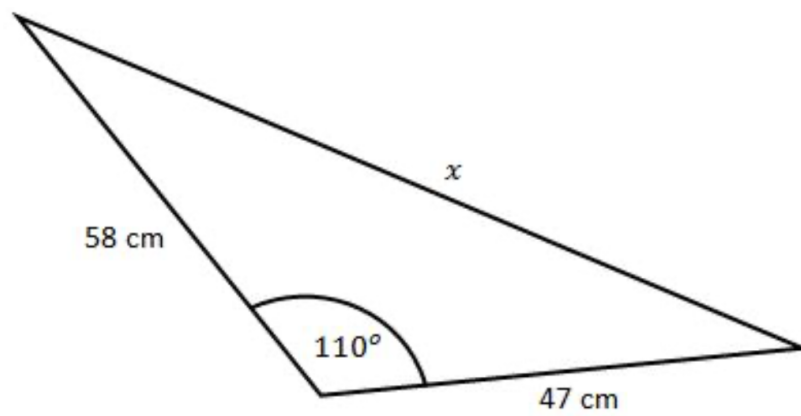
(a)



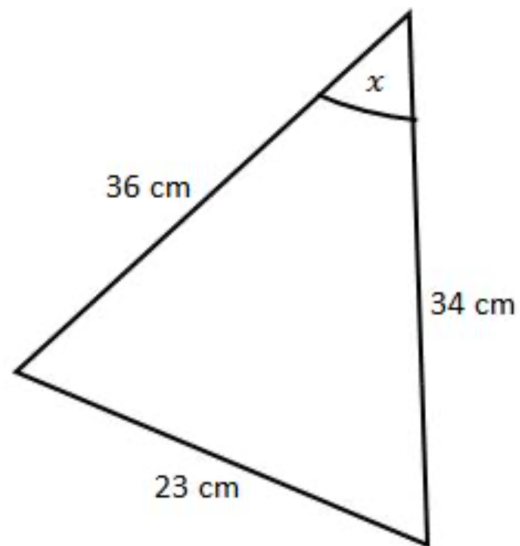
(b)



(c)

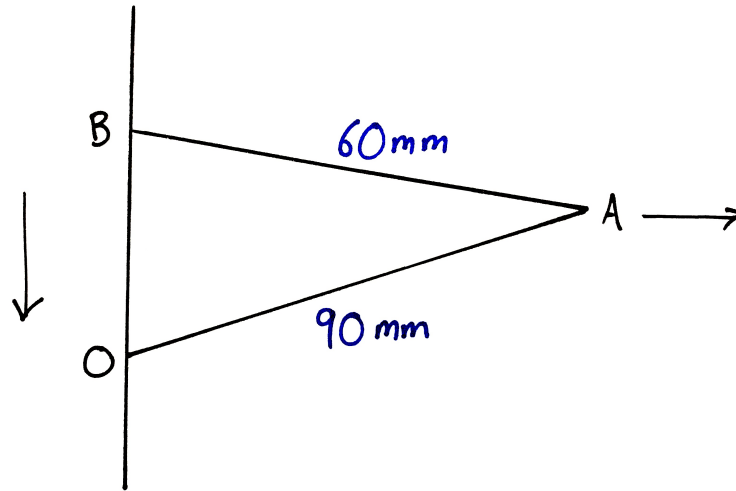


(d)



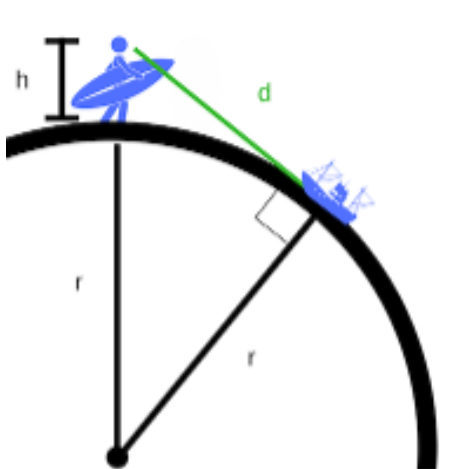
7. Two radar stations located 20 miles apart each detect an aircraft situated between them. The angle of elevation measured by the first station is 35 degrees, whereas the angle of elevation measured by the second station is 15 degrees. Determine the altitude of the aircraft.

8. The figure shows part of a hinge for a window. As the window is opened, part B moves down to the fixed point O while A moves to the right. When angle $A = 22^\circ$, determine the length OB.

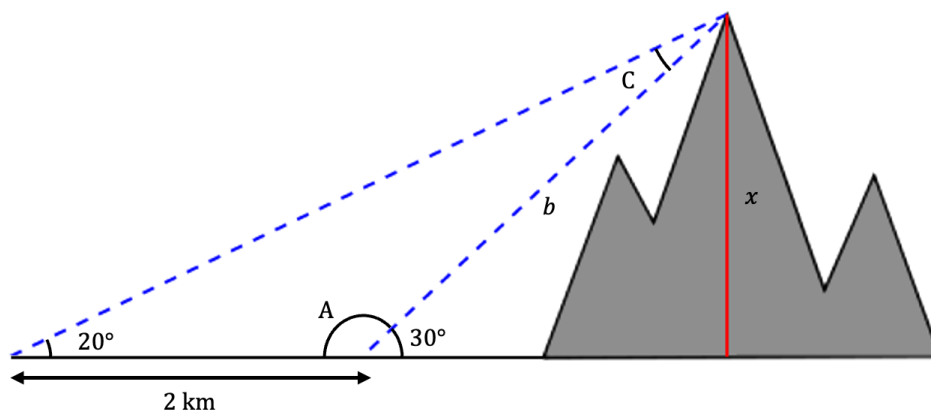


9. A roof of triangular shape has a span (i.e. width) of 10.0m and the two sides make an angle of 40° and 45° at each end. Find the length of these sides.

10. A surfer is looking out to sea when she observes a ship appearing on the horizon. Given that she has a height of $h = 1.8\text{m}$ (approximately 0.001 miles) and that the Earth has radius of $r = 3982$ miles, calculate the distance d to the horizon.



11. A surveyor has been tasked with determining the height x of a mountain. In order to do this, she measures the angular elevation of the summit from two different positions, which are separated on the ground by a distance of 2 km, finding them to be 30° and 20° as indicated on the diagram.



- Determine the size of angles A and C indicated in the diagram.
- By first calculating the length of the side labelled b , determine the height x of the mountain.

12. State the amplitude, period and frequency of the following waves:

(a) $10 \sin(2t)$

(b) $H \sin(\pi t)$

(c) $220 \sin(1000\pi t)$

(d) $\frac{\cos(t/\pi L)}{\pi L}$

13. Determine the amplitude, period and phase (state lead or lag) of the following:

(a) $4 \sin\left(t + \frac{\pi}{3}\right)$

(b) $\sin(100\pi t - 0.25)$

(c) $20 \sin\left[\left(10t + \frac{1}{5}\right)\pi\right]$

(d) $5 + 2 \sin\left(2\pi t - \frac{\pi}{2}\right)$