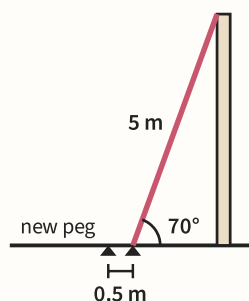


Trigonometry

1

(4 marks)

A 5 m rope runs from the top of a vertical pole to a peg in the ground, making an angle of 70° with the ground. The peg is moved 0.5 m further from the pole and the rope, still 5 m long, is retied lower down the pole. How much lower down the pole is it tied?



Before: height = $5 \sin 70^\circ = 4.698$ m, peg = $5 \cos 70^\circ = 1.710$ m from the pole

After: peg = 2.210 m, height = $\sqrt{5^2 - 2.210^2} = 4.485$ m

Lower by $4.698 - 4.485 = \underline{0.21 \text{ m}}$ (2 dp)

2

(4 marks)

A regular pentagon has sides of 6 cm. Work out its area.

Split into 5 isosceles triangles; each has a 72° angle at the centre

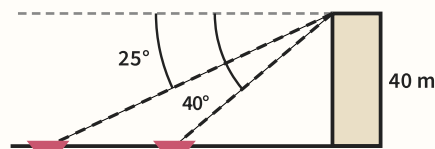
Half of one triangle: base 3, angle 36° at the centre, height = $3 \div \tan 36^\circ = 4.129$

Area = $5 \times \frac{1}{2} \times 6 \times 4.129 = \underline{61.9 \text{ cm}^2}$ (3 sf)

3

(5 marks)

From the top of a 40 m cliff, the angles of depression of two boats are 25° and 40° . The boats are in a straight line with the foot of the cliff. How far apart are the boats?



Far boat: $40 \div \tan 25^\circ = 85.78$ m from the cliff

Near boat: $40 \div \tan 40^\circ = 47.67$ m from the cliff

Distance apart = $\underline{38.1 \text{ m}}$ (3 sf)

4

(4 marks)

Without a calculator, show that the area of a regular hexagon with sides of 4 cm is $24\sqrt{3} \text{ cm}^2$.

Six equilateral triangles of side 4

Each: $\frac{1}{2} \times 4 \times 4 \times \sin 60^\circ = 8 \times \frac{\sqrt{3}}{2} = 4\sqrt{3}$

Total = $6 \times 4\sqrt{3} = \underline{24\sqrt{3} \text{ cm}^2}$