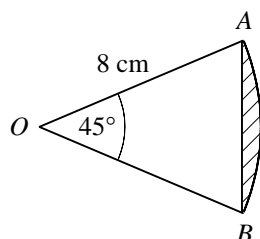## TRIGONOMETRY

1 Find, in terms of π, the values of x in the interval $0 \le x \le 2\pi$ for which

a $3 \tan x - \sqrt{3} = 0$,

b $2 \cos (x + \frac{\pi}{3}) + \sqrt{3} = 0$.

2 Given that $\cos A = \sqrt{3} - 1$,

a find the value of $\sin^2 A$ in the form $p\sqrt{3} + q$ where p and q are integers,

b show that $\tan^2 A = \dfrac{\sqrt{3}}{2}$.

3

The diagram shows sector *OAB* of a circle, centre *O*, radius 8 cm, in which $\angle AOB = 45°$.

a Find the perimeter of the sector in centimetres to 1 decimal place.

b Show that the area of the shaded segment is $8(\pi - 2\sqrt{2})$ cm².

4 Find, to 1 decimal place, the values of θ in the interval $0 \le \theta \le 360°$ for which
$$2 \sin^2 \theta + \sin \theta - \cos^2 \theta = 2.$$

5 Solve, for x in the interval $-\pi \le x \le \pi$, the equation
$$3 \sin^2 x = 4(1 - \sin x),$$
giving your answers to 2 decimal places.

6
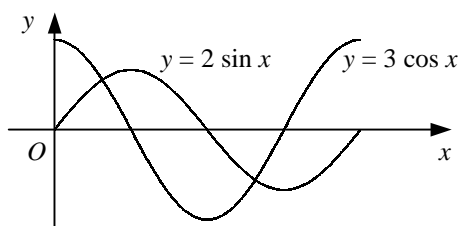
The diagram shows the curves $y = 2 \sin x$ and $y = 3 \cos x$ for x in the interval $0 \le x \le 2\pi$.

Find, to 2 decimal places, the coordinates of the points where the curves intersect in this interval.

7 **a** Sketch the curve $y = \cos 2x°$ for x in the interval $0 \le x \le 360$.

b Find the values of x in the interval $0 \le x \le 360$ for which
$$\cos 2x° = -\tfrac{1}{2}.$$

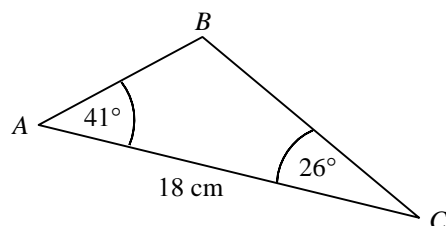**8** Solve, for θ in the interval $0 \le \theta \le 360$, the equation
$$12 \cos \theta° = 7 \tan \theta°,$$
giving your answers to 1 decimal place.

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9 Given that $\tan 15° = \dfrac{\tan 60° - \tan 45°}{1 + (\tan 60° \times \tan 45°)}$,

a show that $\tan 15° = 2 - \sqrt{3}$,

b find the exact value of $\tan 345°$.

10 Find, to an appropriate degree of accuracy, the values of x in the interval $0 \le x \le 360°$ for which
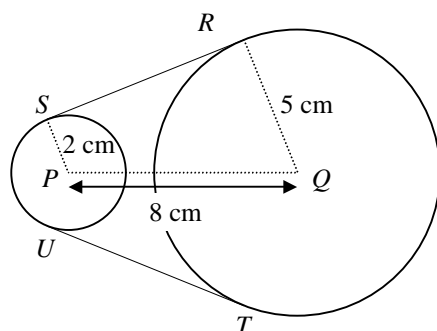$$\sin^2 x + 5 \cos x - 3 \cos^2 x = 2.$$

11

The diagram shows triangle ABC in which $AC = 18$ cm, $\angle BAC = 41°$ and $\angle ACB = 26°$.

Find to 3 significant figures

a the length BC,

b the area of triangle ABC.

12 Solve, for θ in the interval $0 \le \theta \le 360°$, the equation
$$(6 \cos \theta - 1)(\cos \theta + 1) = 3.$$

13 Find, in degrees to 1 decimal place, the values of x in the interval $-180° \le x \le 180°$ for which
$$\sin^2 x + 5 \sin x = 2 \cos^2 x.$$

14 Prove that

a $\sin^4 \theta - 2 \sin^2 \theta \equiv \cos^4 \theta - 1$,

b $\dfrac{\sin \theta}{1 + \cos \theta} + \dfrac{1 + \cos \theta}{\sin \theta} \equiv \dfrac{2}{\sin \theta}$, for $\sin \theta \ne 0$.

15

The gears in a toy are shown in the diagram above.

A thin rubber band passes around two circular discs. The centres of the discs are at P and Q where $PQ = 8$ cm and their radii are 2 cm and 5 cm respectively. The sections of the rubber band not in contact with the discs, RS and TU, are assumed to be taught.

a Show that $\angle PQR = 1.186$ radians to 3 decimal places.

b Find the length RS.

c Find the length of the rubber band in this situation.

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