1 **a** π **b** $\frac{\pi}{6}$ **c** $\frac{\pi}{4}$ **d** 4π **e** $\frac{\pi}{10}$ **f** $\frac{2\pi}{3}$
g $\frac{\pi}{12}$ **h** $\frac{2\pi}{9}$ **i** $\frac{3\pi}{2}$ **j** $\frac{\pi}{24}$ **k** $\frac{4\pi}{5}$ **l** $\frac{11\pi}{9}$

2 **a** 0.17^c **b** 0.66^c **c** 5.08^c **d** 1.11^c **e** 8.85^c **f** 2.20^c

3 **a** 360° **b** 60° **c** 90° **d** 135° **e** 10° **f** 6°
g 150° **h** 22.5° **i** 540° **j** 24° **k** 420° **l** 81°

4 **a** 114.6° **b** 28.6° **c** 177.6° **d** 81.9° **e** 498.5° **f** 42.5°

5 **a** $s = 12 \times \frac{\pi}{4} = 3\pi$ cm
b $60° = \frac{\pi}{3}$
$s = 15 \times \frac{\pi}{3} = 5\pi$ cm
c $s = 9 \times \frac{5\pi}{6} = \frac{15\pi}{2}$ mm

6 **a** $P = (2 \times 5.2) + (5.2 \times 1.2)$
$= 16.6$ cm
b $P = (2 \times 19.6) + (19.6 \times \frac{2\pi}{3})$
$= 80.3$ cm
c $360° - 97° = 263° = 4.5902^c$
$P = (2 \times 8.5) + (8.5 \times 4.5902)$
$= 56.0$ cm

7 **a** $\theta = 11 \div 16 = 0.69^c$ **b** $\theta = 35 \div 7.2 = 4.86^c$ **c** $\theta = 20.3 \div 17.9 = 1.13^c$

8 **a** $78.5° = 1.3701^c$
$OA = 46.2 \div 1.3701 = 33.7$ cm (3sf)
b $P = (2 \times OA) + 46.2 = 114$ cm (3sf)

9 **a** $A = \frac{1}{2} \times 50^2 \times \frac{\pi}{3}$
$= 1309.0$ cm^2
b $94° = 1.6406^c$
$A = \frac{1}{2} \times (14.2)^2 \times 1.6406$
$= 165.4$ cm^2
c $A = \frac{1}{2} \times 7^2 \times 4.3$
$= 105.4$ cm^2

10 **a** $\theta = 12 \div 8 = 1.5^c$ **b** $A = \frac{1}{2} \times 8^2 \times 1.5 = 48$ cm^2

11 **a** $P = (2 \times 11.6) + (11.6 \times 1.4) = 39.4$ cm
b $2\pi - 1.4 = 4.8832$
$P = (2 \times 11.6) + (11.6 \times 4.8832) = 79.8$ cm
c $A = \frac{1}{2} \times (11.6)^2 \times 1.4 = 94.2$ cm^2
d $A = \frac{1}{2} \times (11.6)^2 \times 4.8832 = 329$ cm^2

12 **a** $A = \frac{1}{2} \times 11^2 \times 0.9$
$= 54.45$ cm^2
b $A = \frac{1}{2} \times 11^2 \times \sin 0.9^c$
$= 47.4$ cm^2 (3sf)
c $A = 54.45 - 47.391$
$= 7.06$ cm^2 (3sf)

13 **a** $A = [\frac{1}{2} \times (16.2)^2 \times 1.05]$
$- [\frac{1}{2} \times (16.2)^2 \times \sin 1.05^c]$
$= 137.781 - 113.823$
$= 24.0$ cm^2 (3sf)
b $A = [\frac{1}{2} \times 32^2 \times \frac{\pi}{4}]$
$- [\frac{1}{2} \times 32^2 \times \sin \frac{\pi}{4}]$
$= 402.124 - 362.039$
$= 40.1$ mm^2 (3sf)
c $130.5° = 2.2777^c$
$A = [\frac{1}{2} \times (62.3)^2 \times 2.2777]$
$- [\frac{1}{2} \times (62.3)^2 \times \sin 2.2777^c]$
$= 4420.1 - 1475.7$
$= 2940$ cm^2 (3sf)

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