

- 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° b 0.66° c 5.08° d 1.11° e 8.85° f 2.20°
- 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 $60^\circ = \frac{\pi}{3}$ c $s = 9 \times \frac{5\pi}{6} = \frac{15\pi}{2}$ mm
 $s = 15 \times \frac{\pi}{3} = 5\pi$ cm
- 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 $360^\circ - 97^\circ = 263^\circ = 4.5902^\circ$
 $P = (2 \times 8.5) + (8.5 \times 4.5902) = 56.0$ cm
- 7 a $\theta = 11 \div 16 = 0.69^\circ$ b $\theta = 35 \div 7.2 = 4.86^\circ$ c $\theta = 20.3 \div 17.9 = 1.13^\circ$
- 8 a $78.5^\circ = 1.3701^\circ$
 $OA = 46.2 \div 1.3701 = 33.7$ cm (3sf) b $P = (2 \times OA) + 46.2 = 114$ cm (3sf)
- 9 a $A = \frac{1}{2} \times 50^2 \times \frac{\pi}{3} = 1309.0$ cm² b $94^\circ = 1.6406^\circ$
 $A = \frac{1}{2} \times (14.2)^2 \times 1.6406 = 165.4$ cm² c $A = \frac{1}{2} \times 7^2 \times 4.3 = 105.4$ cm²
- 10 a $\theta = 12 \div 8 = 1.5^\circ$ b $A = \frac{1}{2} \times 8^2 \times 1.5 = 48$ cm²
- 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 $A = \frac{1}{2} \times (11.6)^2 \times 1.4 = 94.2$ cm² d $A = \frac{1}{2} \times (11.6)^2 \times 4.8832 = 329$ cm²
- 12 a $A = \frac{1}{2} \times 11^2 \times 0.9 = 54.45$ cm² b $A = \frac{1}{2} \times 11^2 \times \sin 0.9^\circ = 47.4$ cm² (3sf) c $A = 54.45 - 47.391 = 7.06$ cm² (3sf)
- 13 a $A = [\frac{1}{2} \times (16.2)^2 \times 1.05] - [\frac{1}{2} \times (16.2)^2 \times \sin 1.05^\circ] = 137.781 - 113.823 = 24.0$ cm² (3sf) b $A = [\frac{1}{2} \times 32^2 \times \frac{\pi}{4}] - [\frac{1}{2} \times 32^2 \times \sin \frac{\pi}{4}] = 402.124 - 362.039 = 40.1$ mm² (3sf) c $130.5^\circ = 2.2777^\circ$
 $A = [\frac{1}{2} \times (62.3)^2 \times 2.2777] - [\frac{1}{2} \times (62.3)^2 \times \sin 2.2777^\circ] = 4420.1 - 1475.7 = 2940$ cm² (3sf)