Author: Naga Karthik

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5·2 - Arc length

(1) a) $r=18$, $\theta=2\cdot5$ rad $\quad l=r\theta \Rightarrow l=18(2\cdot5)=45$ cm

b) $r=6\cdot5$, $\theta=2\pi/3 \quad l=r\theta \Rightarrow l=6\cdot5(2\pi/3)=\frac{13}{3}\pi$ cm

c) $r=2\cdot3$, $\theta=0\cdot35$ rad $\quad l=r\theta \Rightarrow l=2\cdot3(0\cdot35)=0\cdot805$ cm

(2) a) $l=5\sqrt{3}$, $\theta=\pi/6 \quad r=l/\theta \Rightarrow 5\sqrt{3}\times\frac{6}{\pi}=16\cdot5$cm

b) $l=20$, $\theta=1\cdot8$ rad $\quad r=l/\theta \Rightarrow \frac{20}{1\cdot8}=11\cdot1$cm

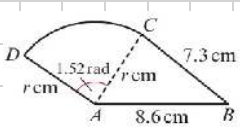
c) $l=9\cdot25$, $\theta=0\cdot45$ rad $\quad r=l/\theta \Rightarrow \frac{9\cdot25}{0\cdot45}=20\cdot6$cm

(3) a) $l=12\cdot1$, $r=3\cdot4 \quad \theta=l/r \Rightarrow \frac{12\cdot1}{3\cdot4}=3\cdot56$ rad

b) $l=7\cdot235$, $r=0\cdot92 \quad \theta=l/r \Rightarrow \frac{7\cdot235}{0\cdot92}=7\cdot86$ rad

c) $l=\sqrt{5}$, $r=\sqrt{2} \quad \theta=l/r=\frac{\sqrt{5}}{\sqrt{2}}=\frac{\sqrt{10}}{2}=1\cdot58$ rad

(4)

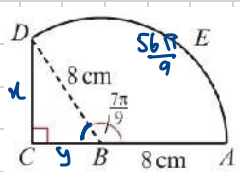


AB = 8·6cm DAC = 1·52 rad BC = 7·3cm $l=6\cdot08$ cm

a) $l=r\theta \Rightarrow 6\cdot08=r(1\cdot52)$ $\boxed{r=4\text{cm}}$

b) perimeter of ABCD $= r+8\cdot6+7\cdot3+l = 4+8\cdot6+7\cdot3+6\cdot08 = 25\cdot98$cm

(5)



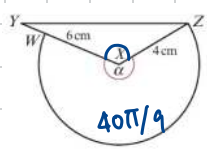
AB = 8 cm $\angle ABD = \frac{7\pi}{9}$ rad

a) length of DEA $\Rightarrow l=r\theta \Rightarrow l=8\left(\frac{7\pi}{9}\right)=\frac{56\pi}{9}$ cm

b) $\angle DBC = \pi-\frac{7\pi}{9}=\frac{2\pi}{9}$, as ΔDCB is $\perp$ $\Rightarrow \sin\left(\frac{2\pi}{9}\right)=\frac{x}{8}$

$x=8\times\sin\left(\frac{2\pi}{9}\right)=5\cdot1423\ldots$ | $\Rightarrow \cos\left(\frac{2\pi}{9}\right)=\frac{y}{8} \Rightarrow y=6\cdot1284\ldots$

Perimeter $=\frac{56\pi}{9}+8+5\cdot1423\ldots+6\cdot1284\ldots = 38\cdot8$ (3sf)

⑥ 

$XY = 6cm \quad XZ = 4cm \quad r = 4cm \quad l = \frac{40\pi}{9}$

a) $l = r\theta \Rightarrow \frac{40\pi}{9} = 4a \Rightarrow a = \frac{10}{9}\pi$

b) $\angle ZXY = 2\pi - \frac{10\pi}{9} = \frac{8\pi}{9}$

$\Rightarrow$ Area of triangle $\Rightarrow = \frac{1}{2}ab\sin C = \frac{1}{2}(6)(4)\sin\left(\frac{8\pi}{9}\right) = 4.1\,cm^2$

⑦ $l = 5\pi/3\ cm$

a) $\theta = 2\pi/12 = \pi/6 \Rightarrow r = l/\theta \Rightarrow \frac{5\pi}{3} \times \frac{6}{\pi} = 10\ cm$

$d = 2r = 20cm$

b) $\frac{\pi}{6}$