# Exercise 9.1

$180° = \pi$ radians ✓

$1° = \frac{\pi}{180}$ radians

$\frac{180°}{\pi} = 1$ radian

D° m' s"

From m' to D°
Dividing by 60

From s" to D°
Dividing by 60×60

From D° to m'
Multiply by 60

From D° by s"
Multiplity by 60×60

Q1- i) $30^\circ$

$$= \frac{30}{6} \times \frac{\pi}{180} \text{ radians}$$

$$= \frac{\pi}{6} \text{ radians}$$

viii) $135^\circ$

$$= \frac{135}{180} \times \frac{\pi}{1} \text{ radians}$$

$$= \frac{3\pi}{4} \text{ radians}$$

xi) $35^\circ 20'$

$$= \frac{35^\circ}{1} + \frac{20^\circ}{60}$$

$$= \frac{2100^\circ + 20^\circ}{60}$$

$$= \frac{2120^\circ}{60}$$

$$= \frac{106^\circ}{3}$$

$$= \frac{106}{3} \times \frac{\pi}{180} \text{ radians}$$

$$= \frac{53}{270}\pi \text{ radians}$$

xiii) $120^\circ 40''$

$$= \frac{120^\circ}{60} + \frac{40^\circ}{60 \times 60}$$

$$= \frac{120^\circ}{60} + \frac{40^\circ}{3600}$$

$$= \frac{7200 + 40}{3600}$$

$$= \frac{7240^\circ}{3600}$$

$$= \frac{181^\circ}{90}$$

$$= \frac{181}{90} \times \frac{\pi}{180} \text{ radians}$$

$$= \frac{181}{16200}\pi \text{ radians}$$

Q2:-

i) $\frac{\pi}{8}$

$= \frac{\pi}{8} \times \frac{180^{45^{\circ}}}{\pi}$

$= \frac{45^{\circ}}{2}$

$= 22.5^{\circ}$

$= 22^{\circ} + 0.5^{\circ}$

$= 22^{\circ} (0.5 \times 60)'$

$= 22^{\circ} 30'$

vi) $\frac{2\pi}{3}$

$= \frac{2\pi}{3} \times \frac{180^{60^{\circ}}}{\pi}$

$= 120^{\circ}$

x) $\frac{11\pi}{27}$

$= \frac{11\cancel{\pi}}{27} \times \frac{180^\circ}{\cancel{\pi}}$

$= \frac{220^\circ}{3}$

$= 73.33^\circ$

$= 73^\circ + 0.33^\circ$

$= 73^\circ (0.33 \times 60)'$

$= 73^\circ 18.8'$

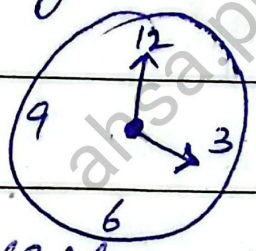
$= 73^\circ (18' + 0.8')$

$= 73^\circ 19' (0.8 \times 60)''$

$= 73^\circ 18' 48''$

Q 3:-

The circular measure of the angle of a watch = $2\pi$




When we divide a circle in 3 halves then we get 4 of each.

The circular measure of the angle of a watch at 4 o'clock $= 2\pi \times \frac{1}{3}$

$= \frac{2\pi}{3}$

Q 4:-

$$l = r\theta$$

$\theta \Rightarrow$ Degree $\Rightarrow$ then convert to radians

Q4:

i) $l = 1.5\,cm$, $r = 2.5\,cm$, $\theta = ?$

Using, $l = r\theta$

$$\frac{l}{r} = \theta$$

$$\frac{1.5}{2.5} = \theta$$

$$0.6\,rad = \theta$$

ii) $l = 3.2\,m$, $r = 2\,m$, $\theta = ?$

Using, $l = r\theta$

$$\frac{l}{r} = \theta$$

$$\frac{3.2}{2} = \theta$$

$$1.6\,rad = \theta$$

Q5:-

i) $\theta = \pi$ rad, $r = 6$cm, $l = ?$

Using, $l = r\theta$

$l = 6 \times \pi$

$l = 6 \times 3.14$

$l = 18.84$ cm

ii) $\theta = 65°20'$, $l = 18$mm, $r = ?$

$\theta = 65° + \left(\frac{20}{60}\right)°$

$\theta = 65° + \frac{1}{3}° = \frac{195° + 1°}{3} = \frac{196°}{3}$

$\theta = \frac{196}{3} \times \frac{\pi}{180} = \frac{196 \times 3.14}{540} = 1.14$ rad

Using, $l = r\theta$

$l = 18 \times 1.14$

$l = 20.5$ mm

Q6. i) $r = ?$, $l = 5\text{cm}$, $\theta = \frac{1}{2}\text{ rad}$

Using, $l = r\theta$

$$\frac{l}{\theta} = r$$

$$\frac{5}{\frac{1}{2}} = r$$

$$\frac{5 \times 2}{1} = r$$

$$10\text{cm} = r$$

ii) $l = 56\text{cm}$, $\theta = 45^\circ$, $r = ?$

$$\theta = \frac{\pi}{4} = \frac{3.14}{4}$$

$$\theta = 0.785\text{ rad}$$

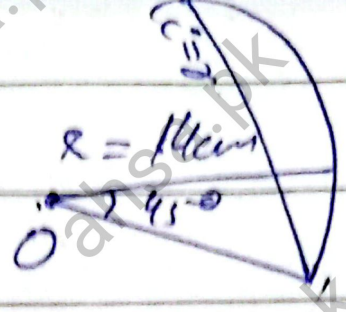
Using $l = r\theta$

$$\frac{l}{\theta} = r$$

$$\frac{56}{0.785} = r$$

$$71.34\text{cm} = r$$

Q7:-




$r = 14cm, \theta = 45^\circ, l = ?$

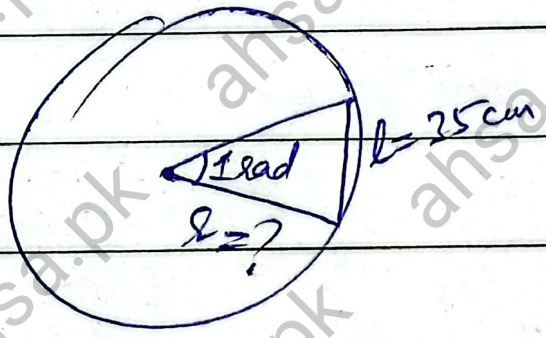
$= \frac{\pi}{4} = \frac{3.14}{4} = 0.785 rad$

Using, $l = r\theta$

$l = 14 \times 0.785$

$l = 10.99 cm.$

Q8:-




$l = 35cm, \theta = 1 rad, r = ?$

Using, $l = r\theta$

$\frac{l}{\theta} = r$

$\frac{35}{1} = r$

$35 cm = r$

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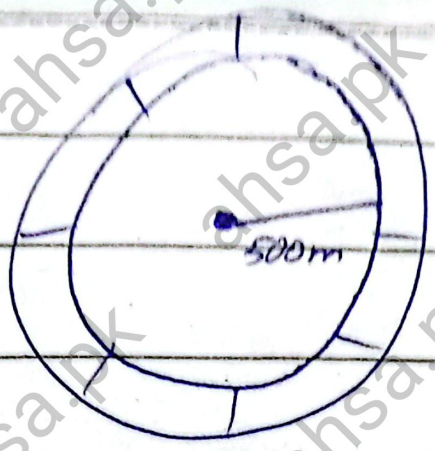



Q9:-

$\theta = ?$

$r = 500m$

$l = ?$

$t = 10s$

$s = 30 km/h$

$= \frac{30 \times 1000}{3600} = 8.33 ms^{-1}$

Speed

$s = \frac{l}{t}$

$l = s \times t$

$l = 8.33 \times 10$

$l = 83.3m$

Using, $l = r\theta$

$\frac{l}{r} = \theta$

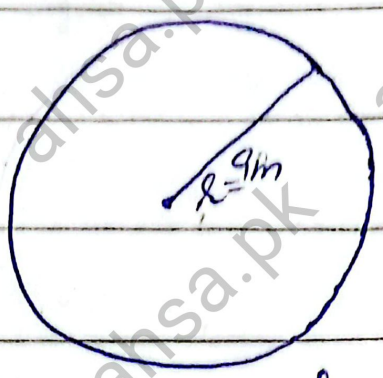
$\frac{83.3}{500} = \theta$

$0.167 rad = \theta$

Q10:-

$r = 9m$

$\theta = 70^\circ = 70 \times \frac{\pi}{180}$




$= \frac{70 \times 3.14}{180} rad = 1.2 rad$

$l = ?$

Using, $l = r\theta$

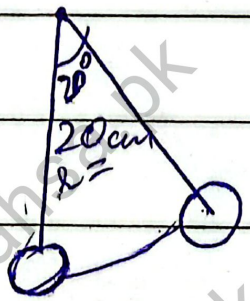
$= 9 \times 1.22$

$= 10.9 rad$

Q11:-

$r = 20cm$

$\theta = 20^\circ = 20 \times \frac{\pi}{180} rad$

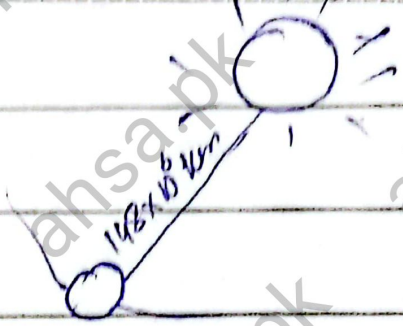



$= \frac{20 \times 3.14}{180} = 0.35 rad$

Using, $l = r\theta$

$l = 20 \times 0.35$

$l = 7cm$




Q.12:-

$r = 148\times10^6$ km

$\theta = 9.3\times10^{-3}$ rad

$l = ?$

Using, $l = r\theta$

$l = 148\times10^6 \times 9.3\times10^{-3}$

$l = 148\times9.3\times10^{6-3}$

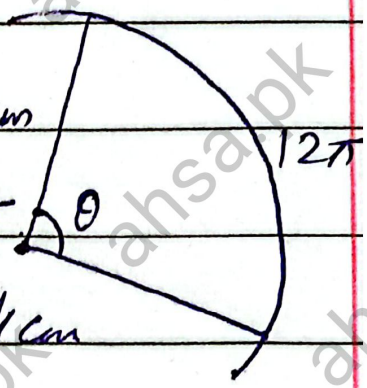
$= 1376.4\times10^3$ km

$= 1376.4\times1000$ km

$= 1376400$ km $= 1.3764\times10^6$ km

Q.13:-

Circumference of circle $= 2\pi r = 2\pi(6) = 12\pi$



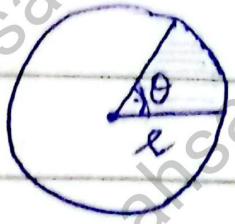

Hence, $l = 12\pi$ cm, $r = 24$ cm

Using, $l = r\theta$

$\Rightarrow \theta = \frac{l}{r}$

$\theta = \frac{12\pi}{24} = \frac{\pi}{2}$ radian

Q14:-




Let

Central Angle of the sector = $\theta$

Area of circle $= \pi r^2$, angle of circle $= 2\pi$

$$\frac{\text{area of sector}}{\text{central angle of sector}} = \frac{\text{area of circle}}{\text{angle of circle}}$$

$$\frac{\text{area of sector}}{\theta} = \frac{\pi r^2}{2\pi}$$

$$\boxed{\text{area of sector} = \frac{1}{2} r^2 \theta}$$

Q15:-

$\theta = 45^\circ + 25^\circ$

$\theta = 70^\circ = \frac{70 \times 3.14}{180}$ rad

$\theta = 1.221$ rad

$r = 6400$ km

Using, $l = r\theta$

$l = 6400 \times 1.221 = 7814.4$ km

Q16:-

$$\theta = 0.5^\circ = 0.5 \times \frac{\pi}{180} = 0.5 \times 0.1745$$

$$\theta = 0.008727 \text{ rad}$$

$$r = 3.844 \times 10^5 \text{ km}$$

Using, $l = r\theta$

$$l = 3.844 \times 10^5 \times 0.008727$$

$$l = 3354.505 \text{ km}$$

It is the diameter of the moon.

Q17:-

$$\theta = 1^\circ 54' = 1^\circ + \left(\frac{54}{60}\right)^\circ = 1^\circ + 0.9^\circ$$

$$= 1.9^\circ = 1.9 \times \frac{\pi}{180} \text{ rad}$$

$$= 1.9 \times 0.1745 = 0.03316 \text{ rad}$$

$$l = 2r = 2 \times 6400 = 12800 \text{ km}$$

$r = ?$

Using, $l = r\theta$

$$\Rightarrow r = \frac{l}{\theta} = \frac{12800}{0.03316}$$

$$r = 386007.24 \text{ km}$$

It is the distance b/w earth and moon.