✳ **Radian Measure** | Review
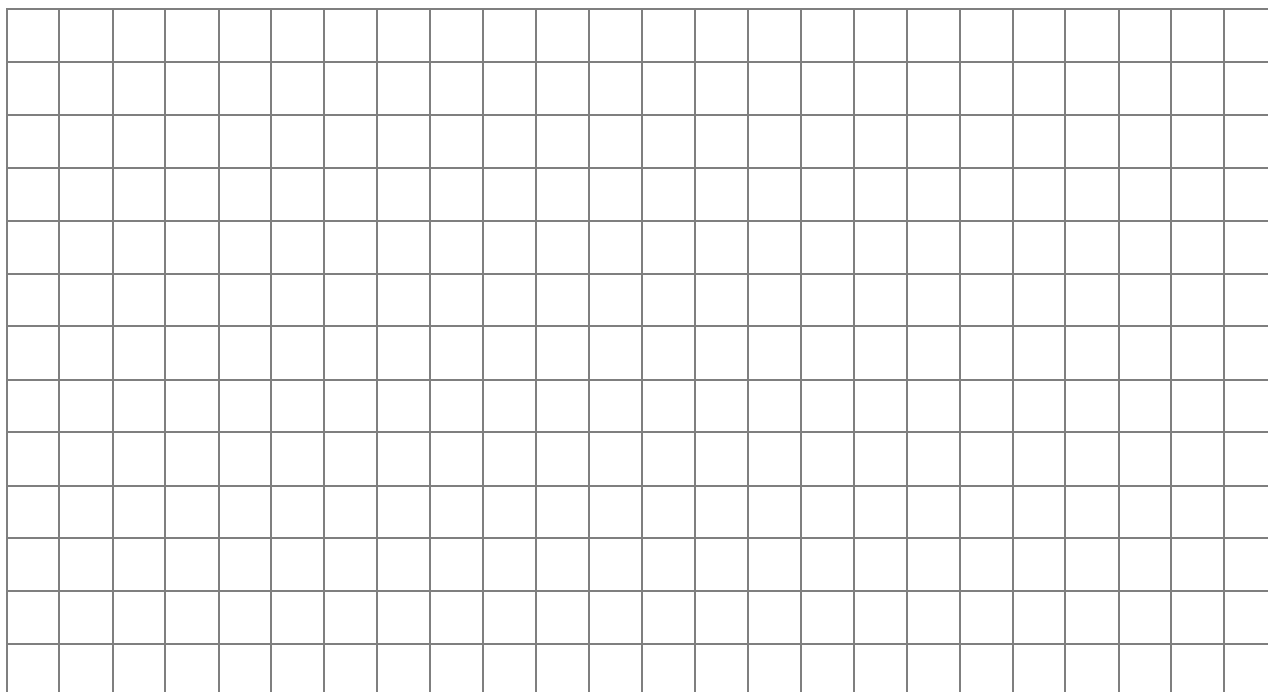
1. Complete the following:

| a) Define a radian in words.	b) Convert 35° to radians.	c) Convert $\frac{7\pi}{15}$ radians to degrees.

2. a) Solve $2\sin\left(\frac{3x}{2}\right) - 1 = 0$ for $0 \le x \le \pi$.

   b) Hence, neatly sketch the graph of $y = \left|2\sin\left(\frac{3x}{2}\right)\right| - 1$ for the domain $0 \le x \le \pi$ on the grid below, clearly showing all features (including all relevant line equations and critical points).

3. $ABCDEF$ is a symmetrical shape with radii $OA = OB = 7$cm
   & $OC = OD = OE = OF = 5$cm. $\angle AOB = 45°$ and $\angle COF = 135°$.
   (Provide all your answers to 2 decimal places.)
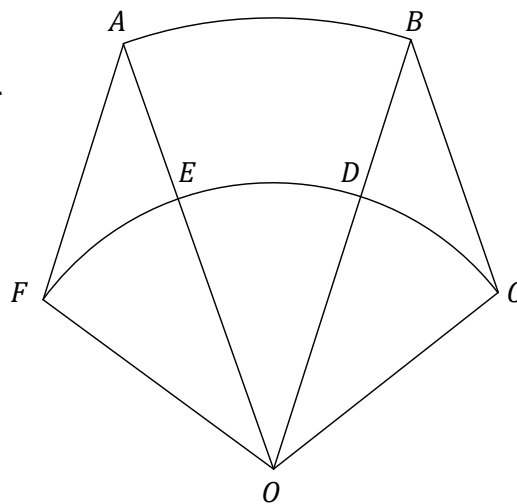
a) Find the arc length AB.	b) Find the length of chord DE.
c) Find the area $ABDE$.	d) If arc length $CD = 2$cm, find the size of $\angle COD$ in radians.
e) Find the area of ΔAOF.	f) Find the area of the shape $ABCDEF$.

1. Complete the following:

| a) Define a radian in words.	b) Convert 35° to radians.	c) Convert $\frac{7\pi}{15}$ radians to degrees.
A radian is the angle made at the centre of a circle by an arc equal in length to the radius.	$35 \times \dfrac{\pi}{180} = \dfrac{7\pi}{36}$ rad.	$\dfrac{7\pi}{15} \times \dfrac{180}{\pi} = 84°$

2. a) Solve $2\sin\left(\frac{3x}{2}\right) - 1 = 0$ for $0 \le x \le \pi$. *(i.e. 3rd & 4th quadrants excluded)*
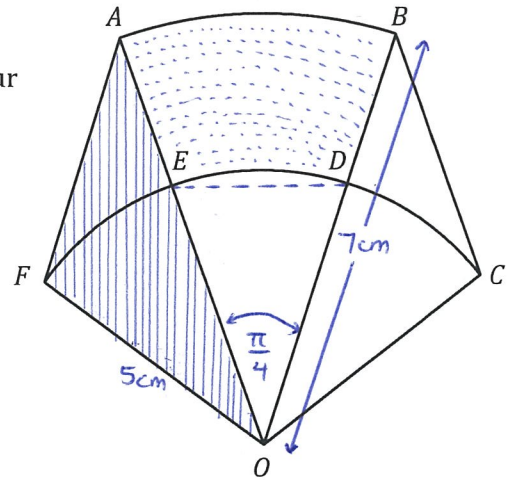
$$\sin\left(\frac{3x}{2}\right) = \frac{1}{2}$$

$$\therefore \quad \frac{3x}{2} = \frac{\pi}{6} \quad \text{OR} \quad \frac{3x}{2} = \frac{5\pi}{6} \qquad (\text{i.e. 1st & 2nd quadrants})$$

$$x = \frac{\pi}{9} \quad \text{OR} \quad \frac{5\pi}{9} \quad \text{radians.}$$

b) Hence, neatly sketch the graph of $y = \left|2\sin\left(\frac{3x}{2}\right)\right| - 1$ for the domain $0 \le x \le \pi$ on the grid below, clearly showing all features (including all relevant line equations and critical points).

$y = 2\sin\left(\frac{3x}{2}\right) - 1$

$y = -2\sin\left(\frac{3x}{2}\right) - 1$
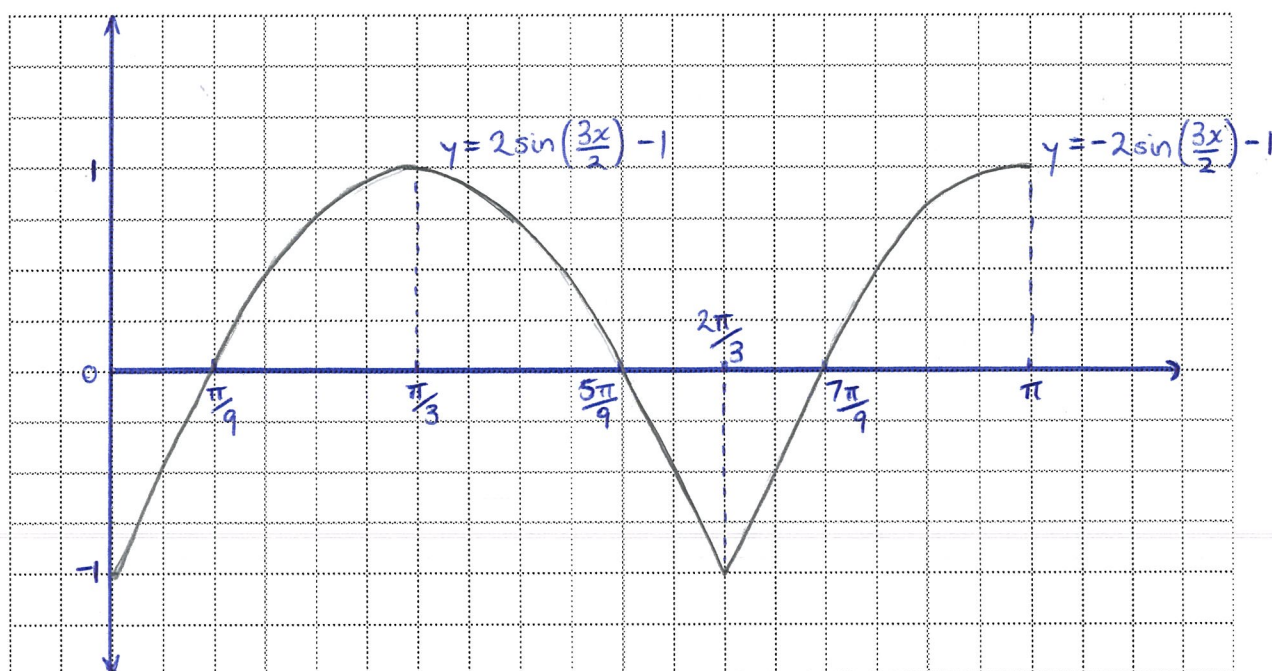
3. *ABCDEF* is a symmetrical shape with radii $OA = OB = 7$cm
   and $OC = OD = OE = OF = 5$cm. $\angle AOB = 45°$. (Provide all your
   answers to 2 decimal places.)

a) Find the arc length AB.	b) Find the length of chord DE.
$l = r\theta$ $$= 7 \times \frac{\pi}{4}$$ $$= 5.497787\cdots$$ $$\approx 5.50 \text{ cm} \quad (2dp)$$	$c^2 = a^2 + b^2 - 2ab\cos C$ $$DE^2 = 5^2 + 5^2 - 2(5^2)\cos\frac{\pi}{4}$$ $$= 50 - 50 \times \frac{1}{\sqrt{2}}$$ $$DE^2 = 14.64466\cdots$$ $$DE = 3.826834\cdots$$ $$DE \approx 3.83 \text{ cm} \quad (2dp)$$
c) Find the area $ABDE$.	d) If arc length $CD = 2$cm, find the size of $\angle COD$ in radians.
$A = \frac{1}{2}R^2\theta - \frac{1}{2}r^2\theta$ $$= \frac{\theta}{2}(R^2 - r^2)$$ $$= \frac{\pi}{8}(49 - 25)$$ $$= 3\pi$$ $$= 9.424778\cdots$$ $$\approx 9.42 \text{ cm}^2 \quad (2dp)$$	$l = r\theta$ $$2 = 5\theta$$ $$\theta = 0.4 \text{ rad}.$$
e) Find the area of $\triangle AOF$.	f) Find the area of the shape $ABCDEF$.
$A = \frac{1}{2}ab\sin C$ $$= \frac{1}{2}(5 \times 7)\sin(0.4)$$ $$= 6.81482\cdots$$ $$\approx 6.81 \text{ cm}^2 \quad (2dp)$$	$A = 2(A_{AOF} - A_{EOF}) + A_{ABDE}$ $$= 2\left[(6.81\cdots) - \left(\frac{1}{2} \times 5^2 \times \frac{2}{5}\right)\right] + 9.42\cdots$$ $$= 13.054418\cdots$$ $$\approx 13.05 \text{ cm}^2 \quad (2dp)$$