Y13 Pure Chapter 5—Radians

What do I need to be able to do?

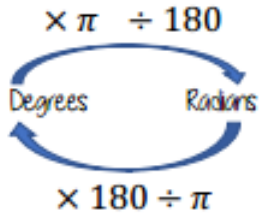
By the end of this chapter you should be able to:

- Convert between degrees and radians
- Know exact values of angles measured in radians
- Find arc length using radians
- Find areas of sectors and segments using radians
- Solve trigonometric equations
- Use small angle approximations

Pure Maths Year 2

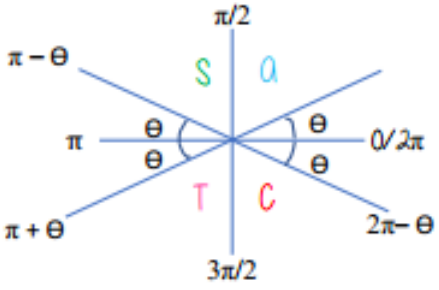
Converting between degrees and radians

2π radians = 360°
π radians = 180°
1 radian = $180/\pi$



Solving Trigonometric Equations

This works the same way as solving trigonometric equations in degrees.



$$\sin\theta = \sin(\pi - \theta)$$
$$\cos\theta = \cos(2\pi - \theta)$$
$$\tan\theta = \tan(\pi + \theta)$$
$$-\sin\theta = \sin(\pi + \theta) = \sin(2\pi - \theta)$$
$$-\cos\theta = \cos(\pi - \theta) = \cos(\pi + \theta)$$
$$-\tan\theta = \tan(\pi - \theta) = \tan(2\pi - \theta)$$

Y13 – Chapter 5 Radians

Key words:

- Radian – The angle made by taking the radius and wrapping it round the circle
- Arc length – The distance along part of the circumference of a circle, or of any curve
- Sector – the area between two radiuses and the connecting arc of a circle
- Segment – The smallest part of a circle made when it is cut by a line

Arc lengths, Sectors and Segments

When working in radians:

Arc length = $r\theta$

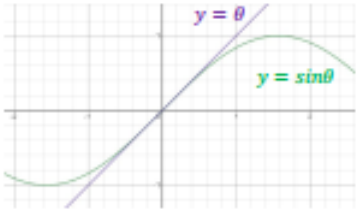
Area of sector = $\frac{1}{2}r^2\theta$

Area of a segment = $\frac{1}{2}r^2(\theta - \sin\theta)$

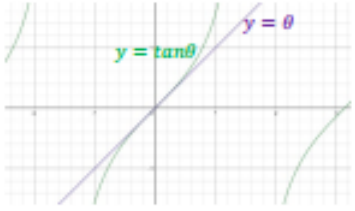
Small Angle Approximations

When θ is small and measured in radians:

$\sin\theta \approx \theta$



$\tan\theta \approx \theta$



$\cos\theta \approx 1 - \frac{\theta^2}{2}$