Degrees and Radians

Level 1 – 2

1. Complete the following table:

Radians	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π	$\frac{7\pi}{3}$	4π
Degrees								

2. Complete the following table, writing your answers to 2 decimal places:

Radians								
Degrees	10°	25°	45°	90°	120°	180°	300°	407°

3. Complete the following table by writing the exact value:

Radians								
Degrees	30°	45°	60°	90°	120°	180°	300°	450°

4. Complete the following table, writing your answers to 3 decimal places:

Radians	0.4	1	1.3	2.5	3.05	5	5.3	6
Degrees								

5. Paul typed the following into his calculator, which then displayed the given values. In each case determine whether his calculator was in degrees or radians mode.

Calculation	Calculated Value (to 2 decimal places)	Mode
$\cos 120$	-0.5	
$\tan(-3)$	0.14	
$\sin^{-1} 0.76$	49.46	
$\tan 45$	1	
$\cos 180$	-0.60	

6. Write the following in order, from smallest to largest:

<div style="text-align:center">120° 3 rad 0.2 rad 10° π rad 181° 2π rad 400°</div>

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7. Using appropriate diagrams (and without using your calculator) complete the following table.

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$
$\pi/6$			$\dfrac{\sqrt{3}}{3}$
$\pi/4$	$\dfrac{\sqrt{2}}{2}$		
$\pi/3$			

Draw your triangles here

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8. Determine the following values without using your calculator.

a) $\sin\frac{2\pi}{3}$ ....   b) $\cos\pi$ ....

c) $\tan\frac{4\pi}{3}$ ....   d) $\cos\frac{-\pi}{3}$ ....

e) $\sin 4\pi$ ....   f) $\tan\frac{5\pi}{4}$ ....

g) $\cos\frac{7\pi}{4}$ ....   h) $\sin\frac{-7\pi}{6}$ ....

i) $\sin\frac{7\pi}{3}$ ....   j) $\tan\frac{-\pi}{2}$ ....

9. A child is riding on a merry-go-round. The child is 5 m from the centre of the merry-go-round which is rotating 1 radian every 4 seconds. Calculate the distance the child travels if she rides the merry-go-round for 2 minutes.

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10. a) A car has wheels of radius 30 cm. The wheels are spinning at 10 radians per second. Calculate the speed of the car in m/s.

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b) An identical car has wheels which are spinning at 1000 degrees per second. Calculate the speed of the car in m/s. Write your answer to four decimal places.

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c) Look at your answers to parts a) and b). Explain an advantage of using radians instead of degrees in a question like this.

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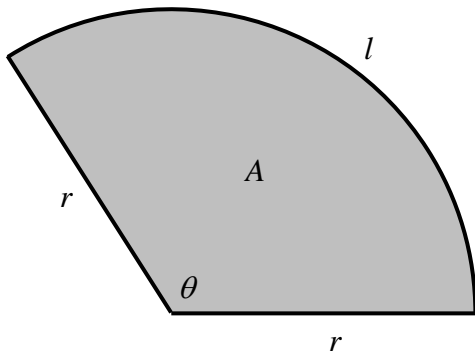
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11. If θ is measured in radians derive expressions for the arc length, l, and the sector area, A.

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12. Solve the following equations.

a) $\sin 2x = \frac{1}{2}$ for $0 \le x < 2\pi$

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b) $\cos\left(\frac{x}{3}\right) = -1$ for $-4\pi \le x \le 4\pi$ ………………………………………………

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c) $\sin(x + \pi) = 0$

for $-3\pi \le x < 3\pi$

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Level 7 – 8

13. Solve the following

a) $\sin\theta + \cos\theta = -1$ for $-\pi \le \theta \le \pi$

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b) $2\cos^2\theta + 11\cos\theta + 5 = 0$ for $-2\pi \le \theta \le 2\pi$

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14. A Ferris wheel has a radius of 50 m. Its centre is 52 m above the ground. It rotates at 2 radians per minute. A rider boards the Ferris wheel at its lowest point. Determine the amount of time in seconds during the first three minutes that the rider is below a height of 15 m.

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