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Trigonometric Phenomena - Lesson 1

Degrees, Radians and Exact Values

LI

- Convert angles from degrees to Radians (and vice versa).
- Know and work out Exact Values of sin, cos and tan.

SC

- Exact Value Table or Triangles.
- Trig. Graphs.

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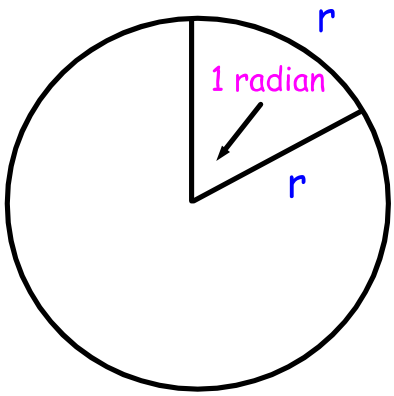
1 radian is the angle made by an arc of length equal to the radius of the circle



$\boxed{\pi \text{ radians} = 180^\circ}$

$1 \text{ radian} \approx 57.3^\circ$

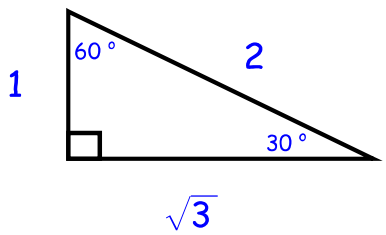
Radians are used to make equations in maths and physics look simpler

Must know these 8 equivalents :

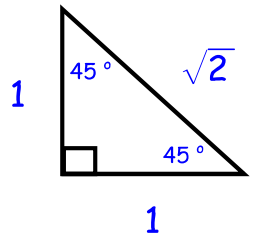
Degrees		Radians
0°	◄ ▪▪▪▪▪▪ ►	0
30°	◄ ▪▪▪▪▪▪ ►	$\frac{\pi}{6}$
45°	◄ ▪▪▪▪▪▪ ►	$\frac{\pi}{4}$
60°	◄ ▪▪▪▪▪▪ ►	$\frac{\pi}{3}$
90°	◄ ▪▪▪▪▪▪ ►	$\frac{\pi}{2}$
180°	◄ ▪▪▪▪▪▪ ►	π
270°	◄ ▪▪▪▪▪▪ ►	$\frac{3\pi}{2}$
360°	◄ ▪▪▪▪▪▪ ►	2π

Exact Values are numerical answers that are not evaluated with a calculator, but left as surds, fractions, expressions with π etc.

Must know standard sin, cos and tan exact values :



Exact Value Triangles



$$\sin 30^\circ = \sin\frac{\pi}{6} = \frac{1}{2}$$

$$\cos 30^\circ = \cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$$

$$\tan 30^\circ = \tan\frac{\pi}{6} = \frac{1}{\sqrt{3}}$$

$$\sin 60^\circ = \sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$$

$$\cos 60^\circ = \cos\frac{\pi}{3} = \frac{1}{2}$$

$$\tan 60^\circ = \tan\frac{\pi}{3} = \sqrt{3}$$

$$\sin 45^\circ = \sin\frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

$$\cos 45^\circ = \cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

$$\tan 45^\circ = \tan\frac{\pi}{4} = 1$$

Patel's Alternative Memory Aid :

S	Angle	C	T
	0°		
	30°		
	45°		
	60°		
	90°		

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Example 1

Change 225° to radians.

$$225^\circ = 180^\circ + 45^\circ$$
$$= \pi + \frac{\pi}{4}$$
$$= \boxed{\frac{5\pi}{4}}$$

Alternative

$$225^\circ = 5 \times 45^\circ$$
$$= 5 \times \frac{\pi}{4}$$
$$= \boxed{\frac{5\pi}{4}}$$

Example 2

Change $\frac{4\pi}{3}$ radians into degrees.

$$\frac{4\pi}{3} = \frac{3\pi + \pi}{3}$$

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

$$= 180^\circ + 60^\circ$$

$$= \boxed{240^\circ}$$

Alternative

$$\frac{4\pi}{3} = 4 \times \frac{\pi}{3}$$

$$= 4 \times 60^\circ$$

$$= \boxed{240^\circ}$$

Mar 3-16:58

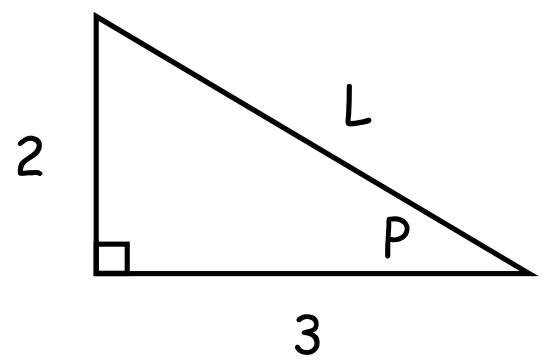
Example 3

If P is an acute angle with $\tan P = \frac{2}{3}$,

find the exact values of $\sin P$ and $\cos P$.

$$L = \sqrt{2^2 + 3^2}$$

$$L = \sqrt{13}$$



$$\sin P = \frac{O}{H}$$

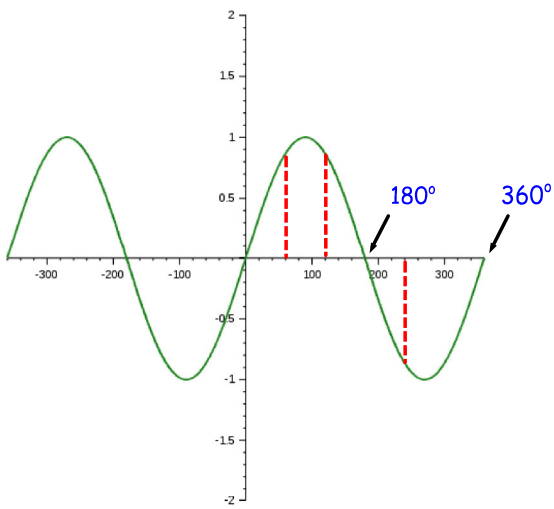
$$\cos P = \frac{A}{H}$$

$$\sin P = \boxed{\frac{2}{\sqrt{13}}}$$

$$\cos P = \boxed{\frac{3}{\sqrt{13}}}$$

Example 4

Find the exact value of $\sin 240^\circ$.



$$\begin{aligned} & \sin 240^\circ \\ = & -\sin 120^\circ \\ = & -\sin 60^\circ \\ = & \boxed{-\frac{\sqrt{3}}{2}} \end{aligned}$$

CfE Higher Maths

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