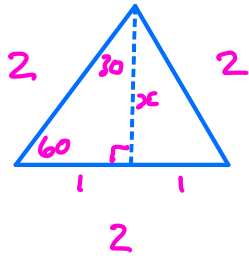


Trigonometry - Exact Values



By Pythagoras

$$x^2 + 1^2 = 2^2$$

$$x^2 + 1 = 4$$

$$x^2 = 4 - 1$$

$$x^2 = 3$$

$$x = \sqrt{3}$$

This gives

$$\sin 30^\circ = \frac{O}{H} = \frac{1}{2}$$

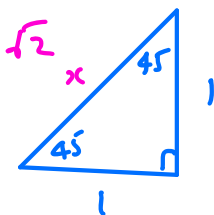
$$\cos 30^\circ = \frac{A}{H} = \frac{\sqrt{3}}{2}$$

$$\tan 30^\circ = \frac{O}{A} = \frac{1}{\sqrt{3}}$$

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

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

$$\tan 60^\circ = \frac{\sqrt{3}}{1} = \sqrt{3}$$



By Pythagoras

$$1^2 + 1^2 = x^2$$

$$1 + 1 = x^2$$

$$2 = x^2$$

$$\sqrt{2} = x$$

$$\sin 45^\circ = \frac{O}{H} = \frac{1}{\sqrt{2}}$$

$$\cos 45^\circ = \frac{A}{H} = \frac{1}{\sqrt{2}}$$

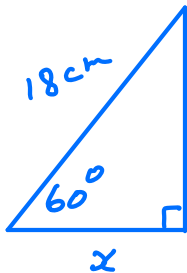
$$\tan 45^\circ = \frac{O}{A} = \frac{1}{1} = 1$$

Summary

	0°	30°	45°	60°	90°
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\frac{\sqrt{3}}{1}$	∞

Examples

1)



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

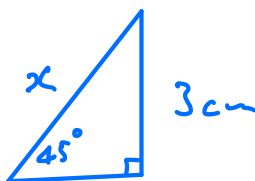
$$\cos 60^\circ = \frac{x}{18}$$

$$18 \cos 60^\circ = x$$

$$18 \times \frac{1}{2} = x$$

$$\underline{x = 9 \text{ cm}}$$

2)



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

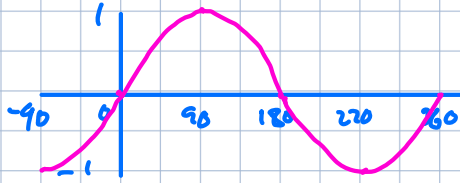
$$\sin 45^\circ = \frac{3}{x}$$

$$\frac{1}{\sqrt{2}} = \frac{3}{x}$$

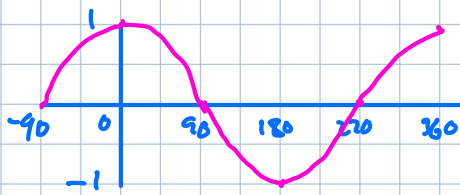
$$\frac{\sqrt{2}}{1} = \frac{x}{3}$$

$$3\sqrt{2} = x$$

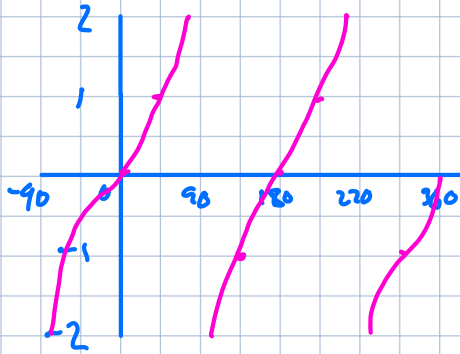
$$x = \underline{3\sqrt{2} \text{ cm}}$$



$$y = \sin x$$



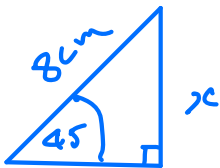
$$y = \cos x$$



$$y = \tan x$$

Exercise

1.



$$\sin 45 = \frac{x}{8}$$

$$\frac{1}{\sqrt{2}} = \frac{x}{8}$$

$$\frac{8}{\sqrt{2}} = x$$

$$x = \frac{8}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{8\sqrt{2}}{2}$$

$$= 4\sqrt{2} \text{ cm}$$