

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{b}{c}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{a}{c}$$

Angles are measured both in radians and degrees

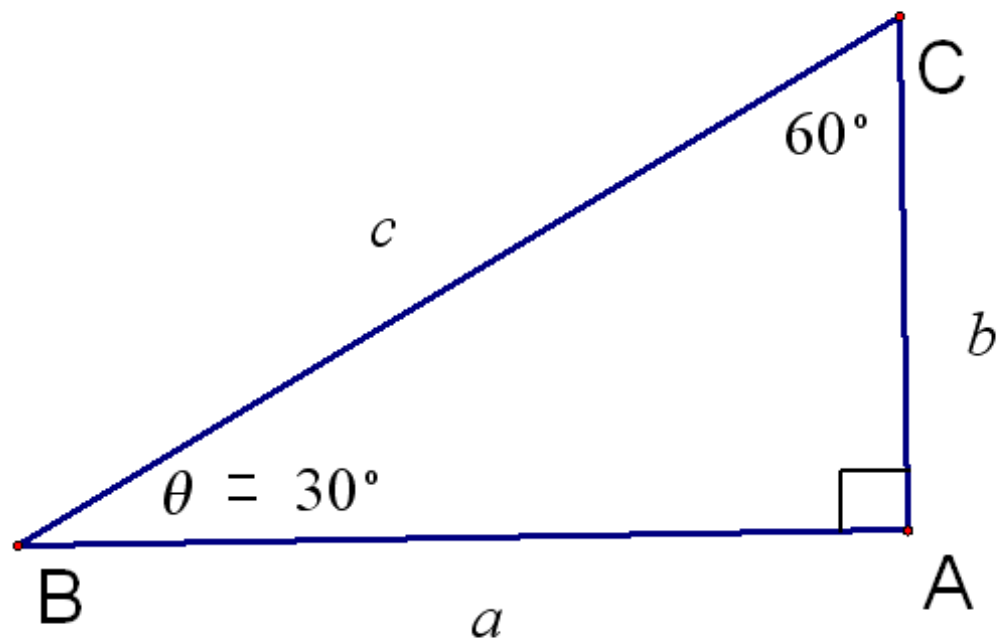
180° is π radians

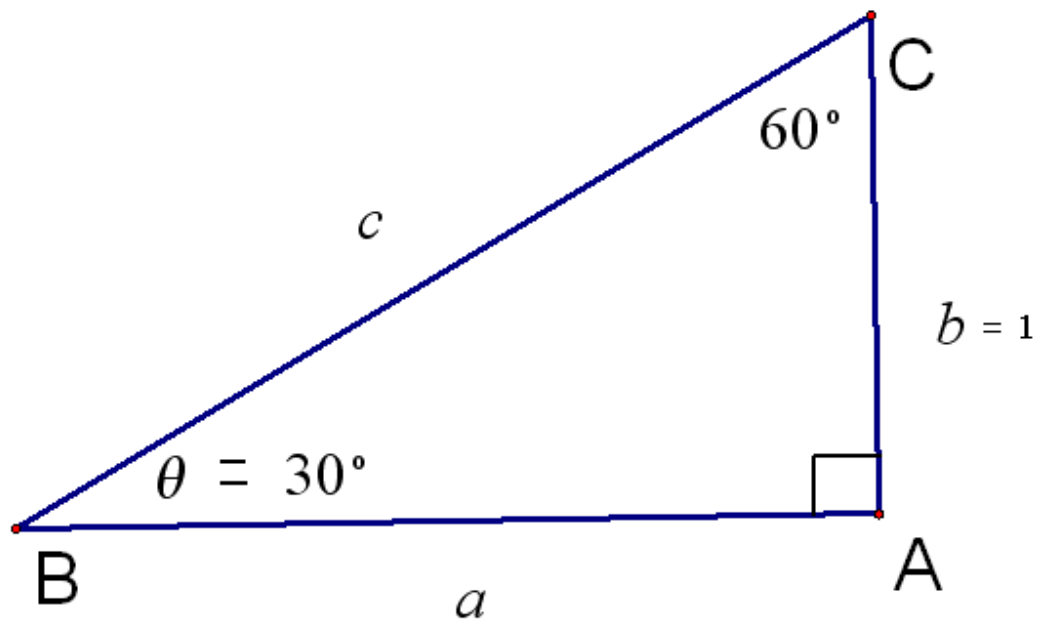
$\pi \approx 3.14159265358979323846264338327950288419716939937510582097494$

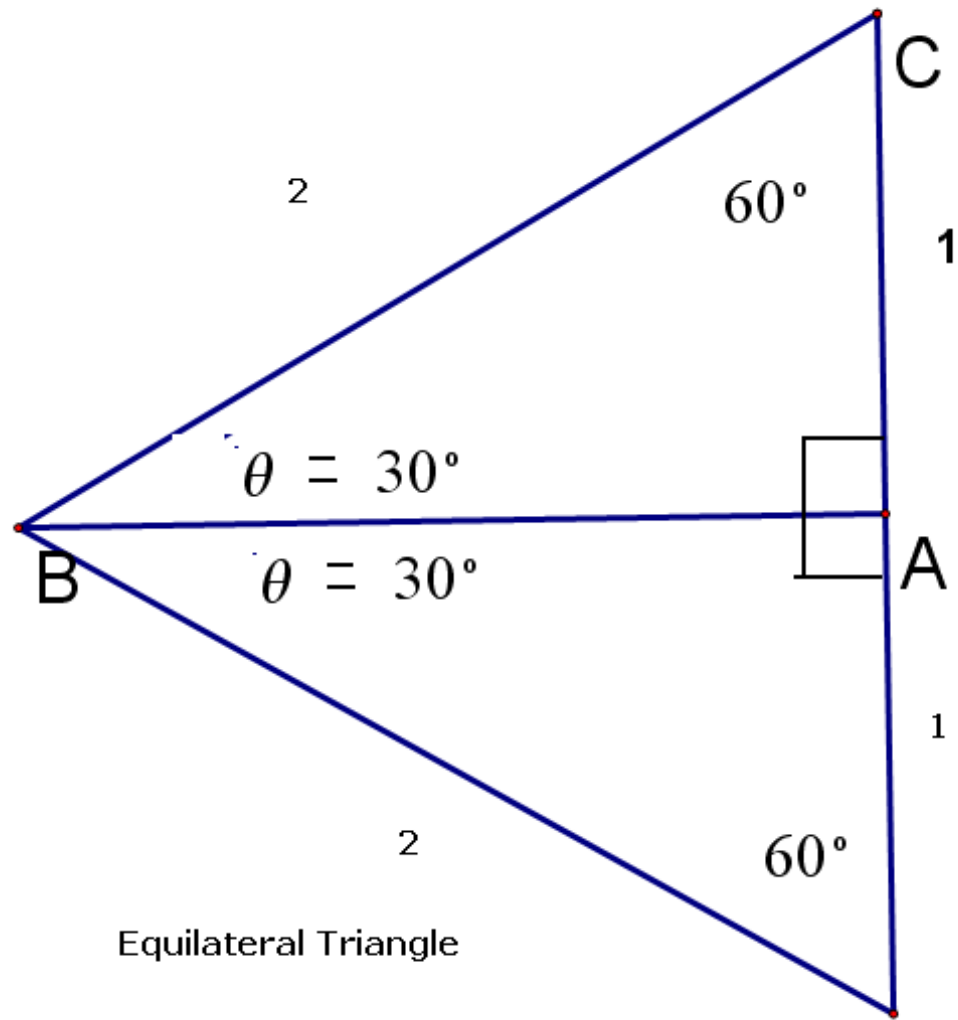
$$\mathbf{30^\circ = \frac{\pi}{6}}$$

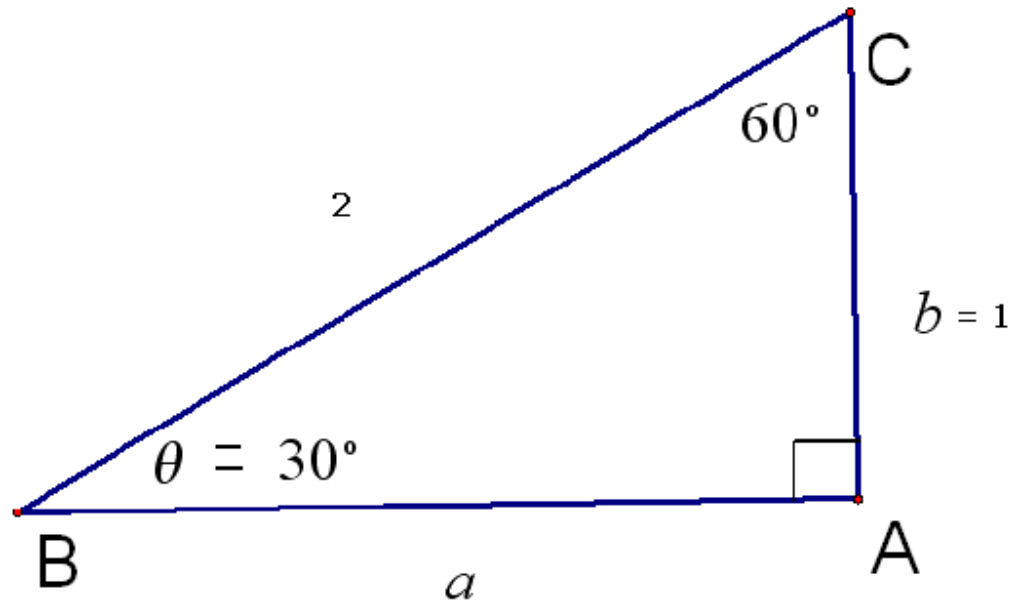
$$\mathbf{60^\circ = \frac{\pi}{3}}$$

$$\mathbf{90^\circ = \frac{\pi}{2}}$$









Pythagorous

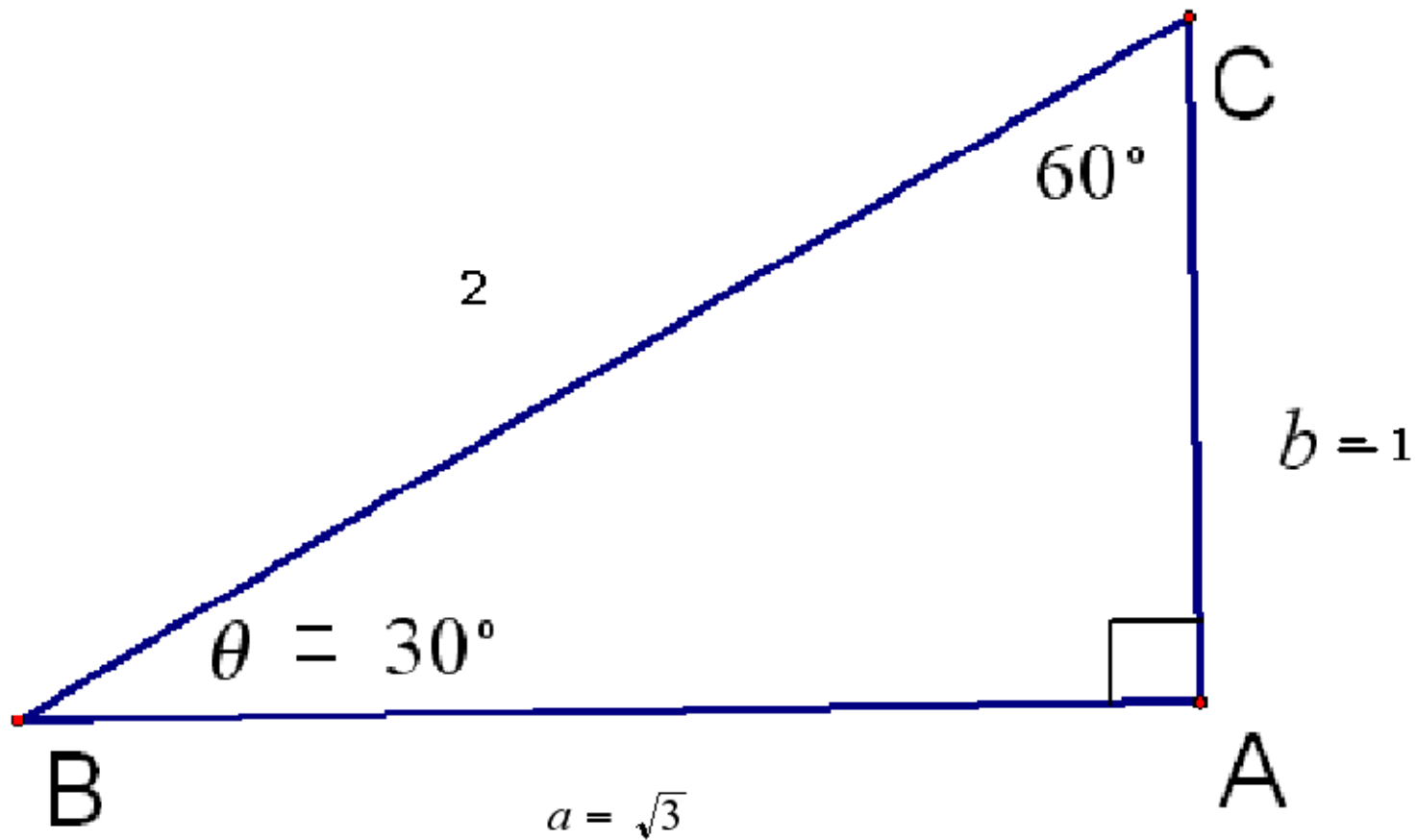
$$\mathbf{a^2 + b^2 = c^2}$$

$$\mathbf{a^2 + 1^2 = 2^2}$$

$$\mathbf{a^2 + 1 = 4}$$

$$\mathbf{a^2 = 4 - 1}$$

$$\mathbf{a = \sqrt{3}}$$

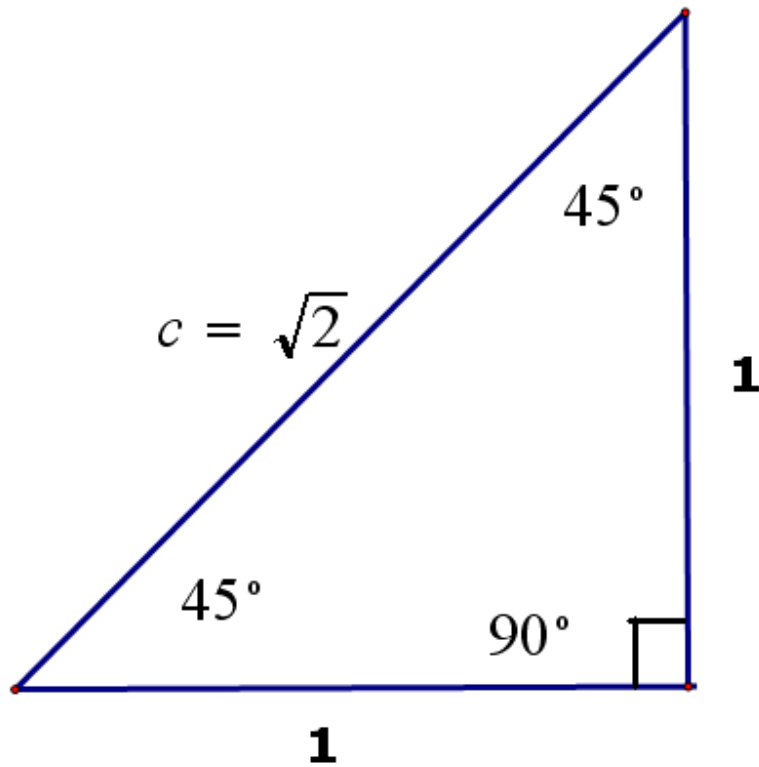


$$\begin{aligned} \sin 30^\circ &= \frac{1}{2} & \cos 60^\circ &= \frac{1}{2} \\ \cos 30^\circ &= \frac{\sqrt{3}}{2} & \sin 60^\circ &= \frac{\sqrt{3}}{2} \end{aligned}$$

The other special triangle is an isosceles triangle

90° 45° 45°

$$\mathbf{c^2 = 1^2 + 1^2} \quad \Rightarrow \quad \mathbf{c = \sqrt{2}}$$



$$c^2 = 1^2 + 1^2 \quad \Rightarrow \quad c = \sqrt{2}$$

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

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

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$\mathbf{a^2 + b^2 = c^2}$$

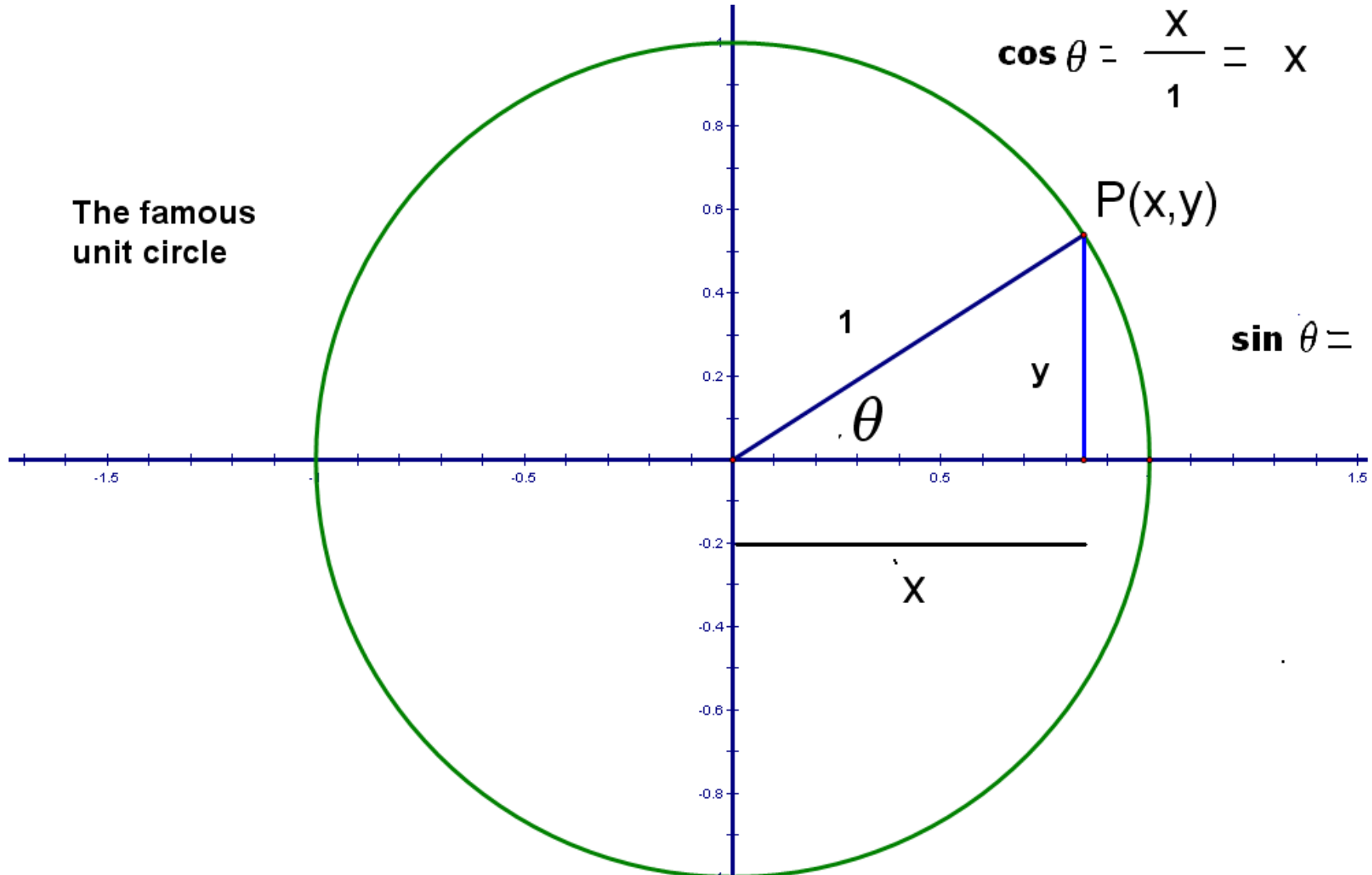
$$\frac{a^2}{c^2} + \frac{b^2}{c^2} = \mathbf{1}$$

For any angle θ

$$\cos^2 \theta + \sin^2 \theta = \mathbf{1}$$

Another way to look at these trig functions

The famous unit circle



$$\cos \theta = \frac{x}{1} = x$$

$$\sin \theta = y$$

$$\sin 90^\circ = 1$$

$$\cos 90^\circ = 0$$

$$\sin 180^\circ = 0 \quad \cos 180^\circ = -1$$