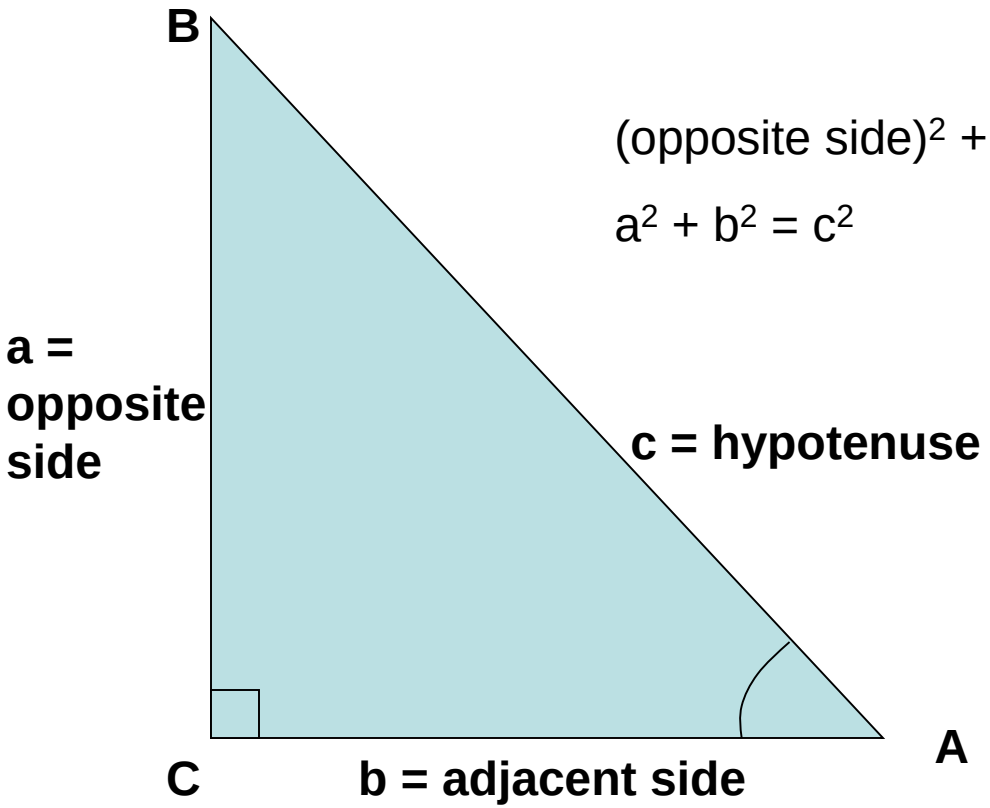
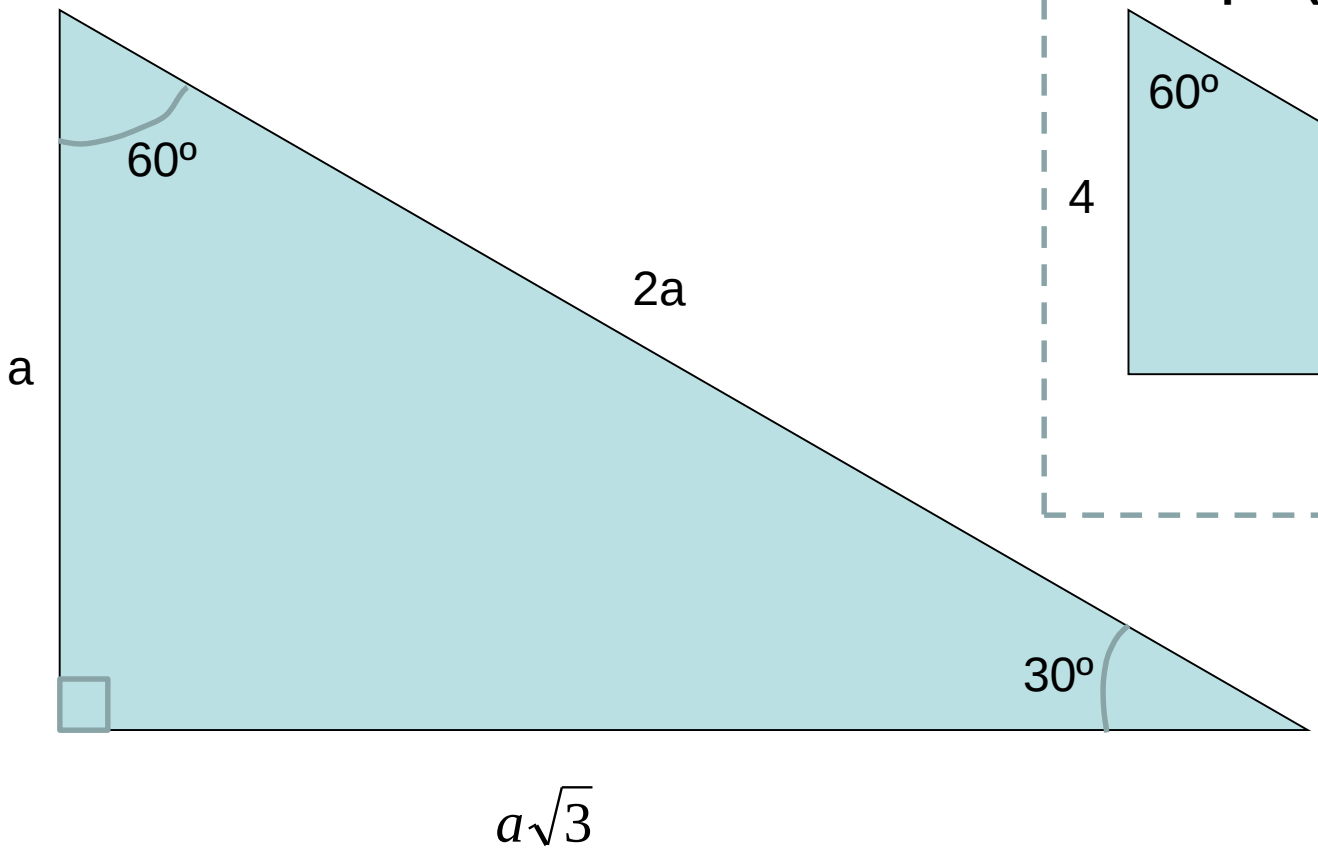
Pythagorean Theorem



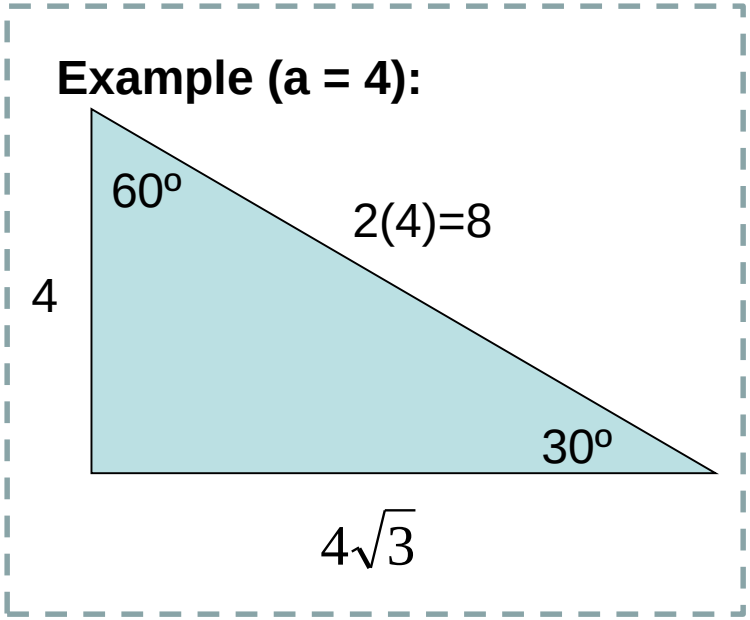
$(\text{opposite side})^2 + (\text{adjacent side})^2 = \text{hypotenuse}^2$

$a^2 + b^2 = c^2$

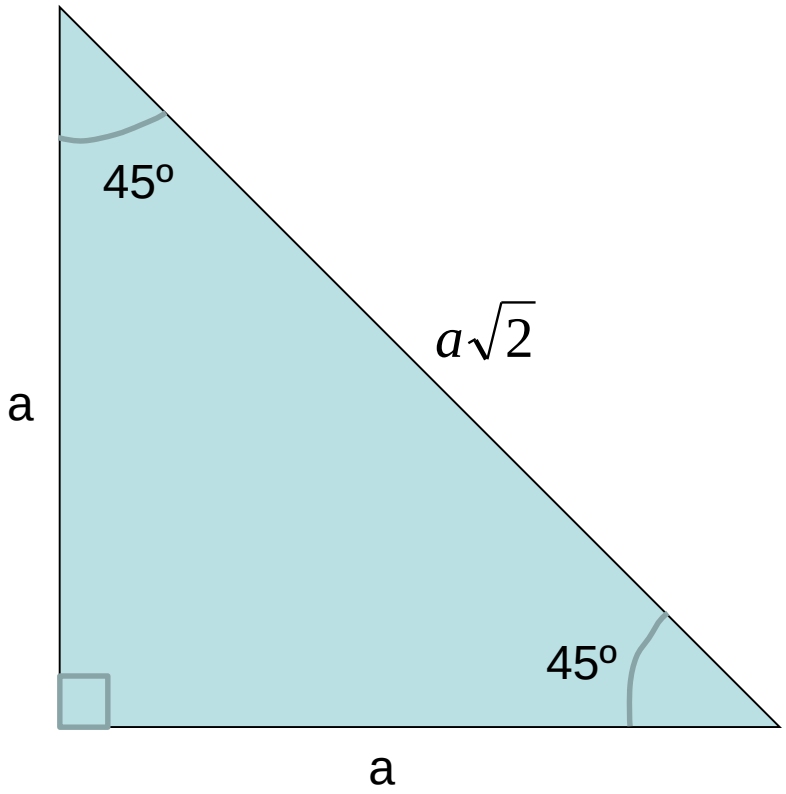
30-60-90 Right Triangle



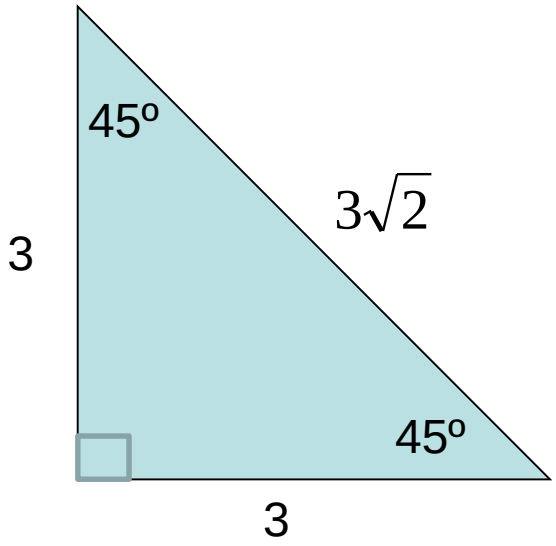
Example (a = 4):



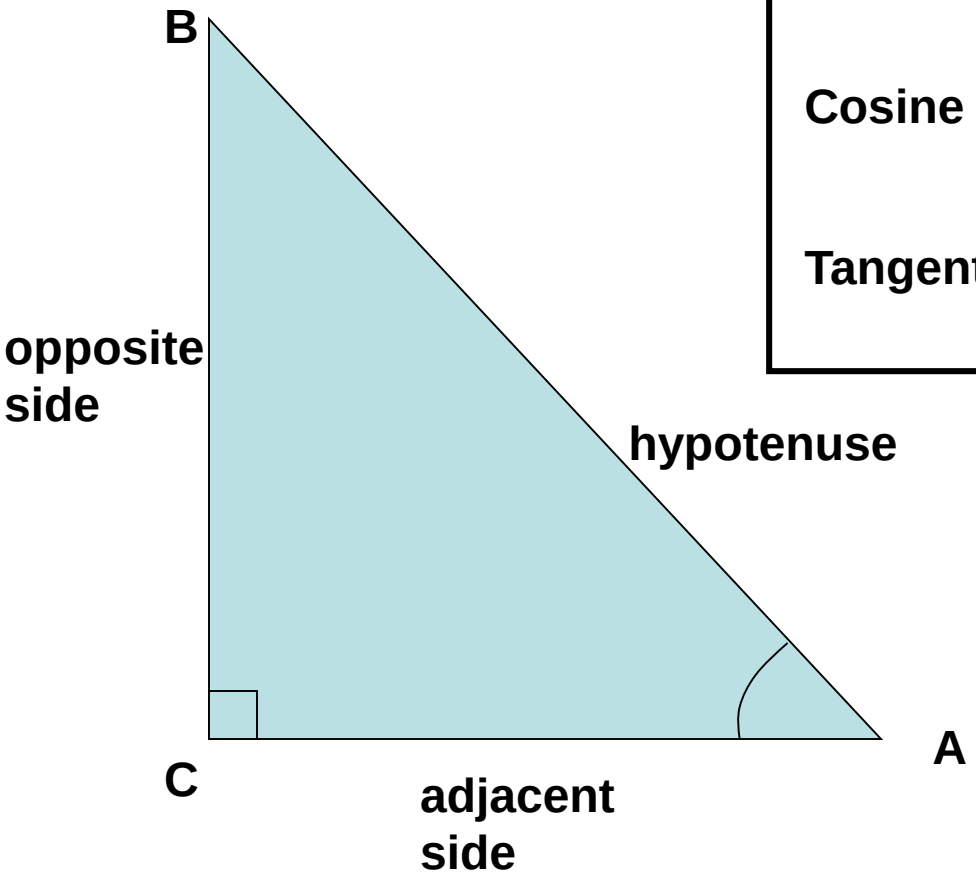
45-45-90 Right Triangle



Example (a = 3):



SOH-CAH-TOA



Sine of angle A = $\sin A = \dfrac{opposite}{hypotenuse}$

Cosine of angle A = $\cos A = \dfrac{adjacent}{hypotenuse}$

Tangent of angle A = $\tan A = \dfrac{opposite}{adjacent}$

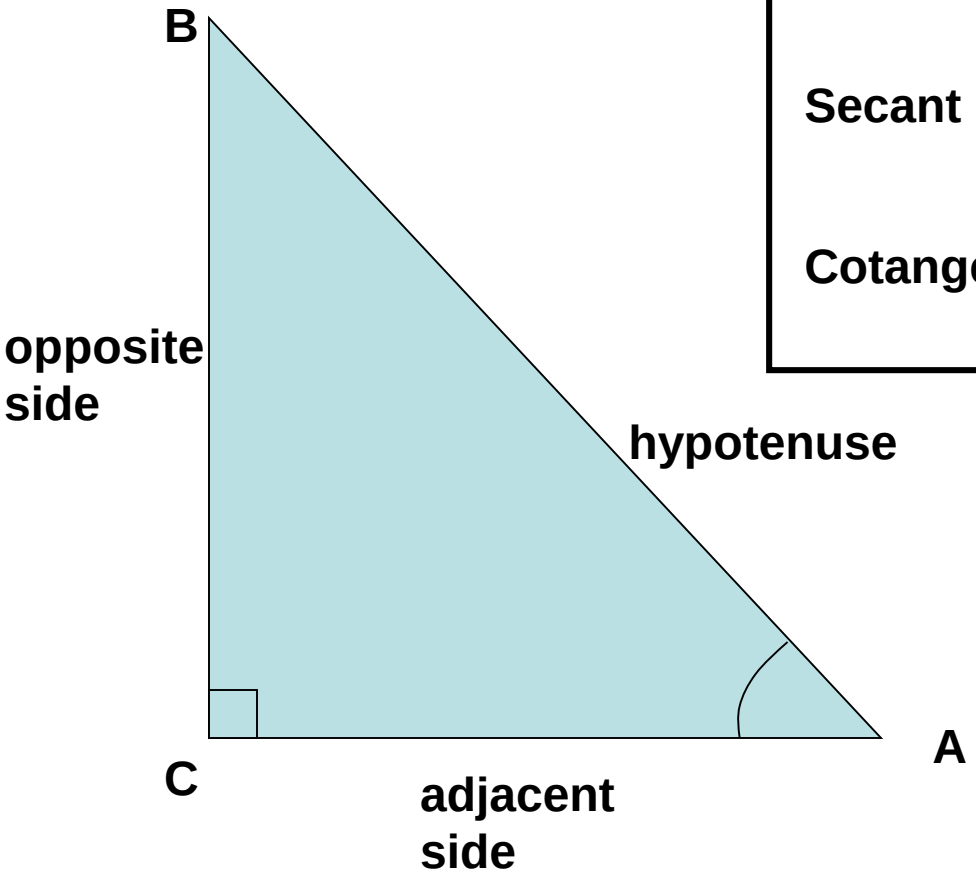
$$\tan A = \frac{\sin A}{\cos A}$$

The Other Trig Functions

Cosecant of angle A = $\csc A = \dfrac{hypotenuse}{opposite}$

Secant of angle A = $\sec A = \dfrac{hypotenuse}{adjacent}$

Cotangent of angle A = $\cot A = \dfrac{adjacent}{opposite}$



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

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

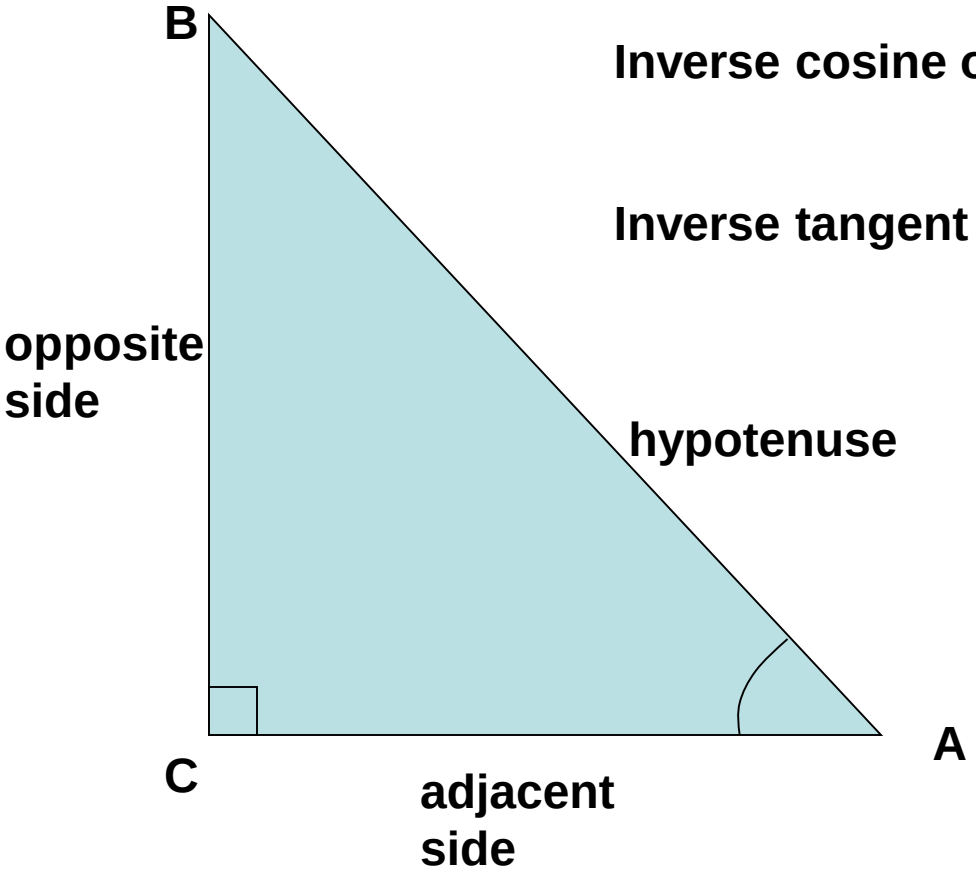
$$\cot A = \frac{1}{\tan A}$$

Inverse Trig Functions

Inverse sine of angle A: $A = \sin^{-1}\left(\frac{opposite}{hypotenuse}\right)$

Inverse cosine of angle A: $A = \cos^{-1}\left(\frac{adjacent}{hypotenuse}\right)$

Inverse tangent of angle A: $A = \tan^{-1}\left(\frac{opposite}{adjacent}\right)$

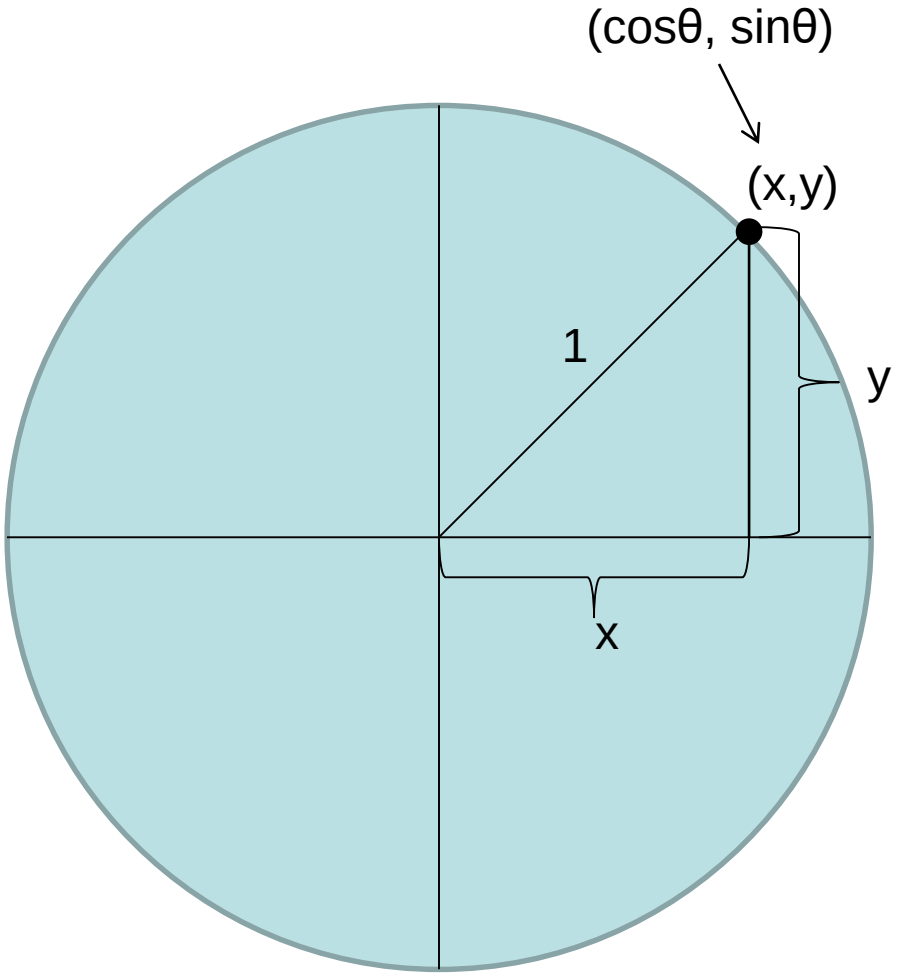


$$A = \csc^{-1}\left(\frac{hypotenuse}{opposite}\right)$$

$$A = \sec^{-1}\left(\frac{hypotenuse}{adjacent}\right)$$

$$A = \cot^{-1}\left(\frac{adjacent}{opposite}\right)$$

Unit Circle Diagram



SOH CAH TOA:

$$\sin\theta = \frac{opp}{hyp} = \frac{y}{1} = y$$

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

$$\tan\theta = \frac{opp}{adj} = \frac{y}{x} = \frac{\sin\theta}{\cos\theta}\,(identity\#1)$$

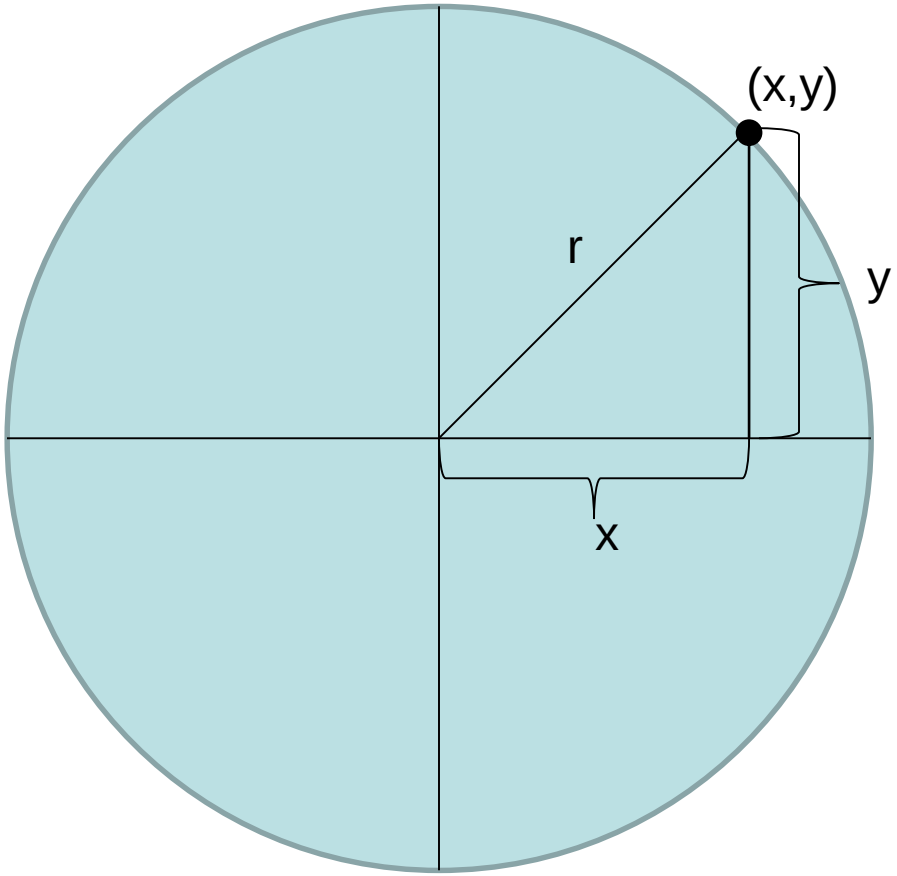
Pythagorean Theorem:

$$x^2 + y^2 = 1\ (also\ the\ circle\ equation)$$

$$(\cos\theta)^2 + (\sin\theta)^2 = 1$$

$$\Rightarrow \cos^2\theta + \sin^2\theta = 1\,(identity\#2)$$

General (non-unit) Circle Diagram



SOH CAH TOA:

$$\sin\theta = \frac{opp}{hyp} = \frac{y}{r}$$

$$\cos\theta = \frac{adj}{hyp} = \frac{x}{r}$$

$$\tan\theta = \frac{opp}{adj} = \frac{y}{x}$$

Polar Coordinate Transform:

$$x^2 + y^2 = r^2 \ \ (also\, the\, circle\ equation)$$

$$x = r\cos\theta$$

$$y = r\sin\theta$$

$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$