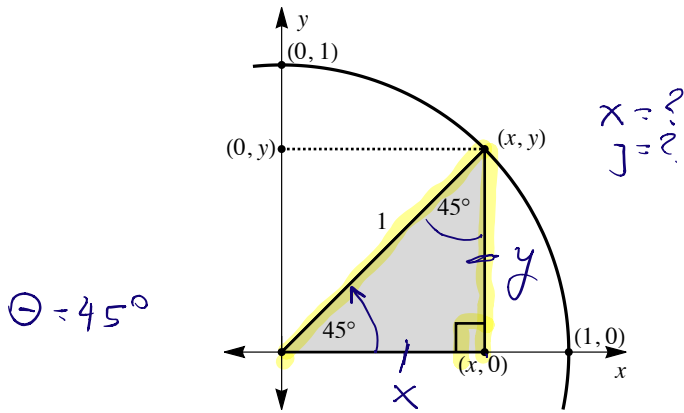


Trigonometry 3: Points on the Unit Circle: $\theta = 45^\circ$

Here is (the first quadrant of the) unit circle with a radial line $\theta = 45^\circ$. Notice how an isosceles triangle is formed that has a base length of x and a height of y .



Because this is an **isosceles triangle**, the two sides adjacent to the right angle must be the same length: the base and height have the same length so $x = y$! If we take the equation for the unit circle:

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

we can substitute $x = y$ and get:

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

$$2x^2 = 1$$

$$x^2 = 1/2$$

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

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

When $\theta = 45^\circ$, the corresponding point on the unit circle is $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$:

