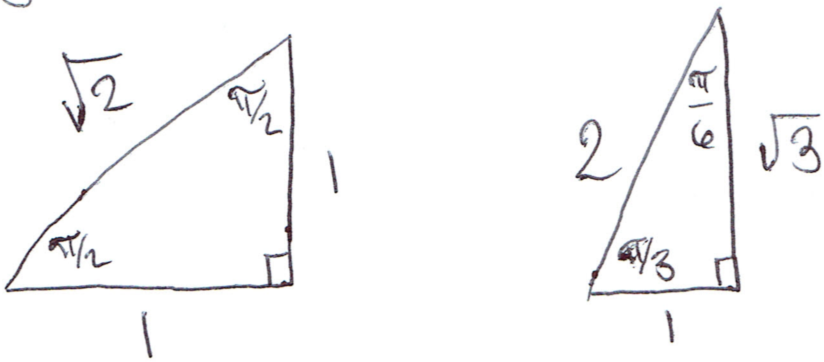
Instead of memorizing the unit circle, you could instead memorize two triangles

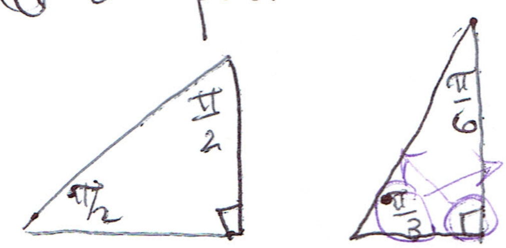


(45-45-90) (30-60-90)

These are easier to remember because:

- first: draw the triangles

- second: put in the angles

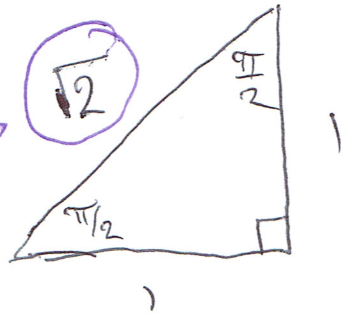


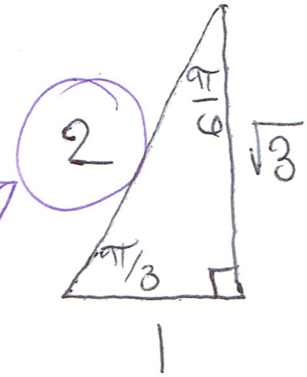
line up the smaller angles with the smaller sides

- third: put a 1 on the smallest side

same angle → same length

• fourth : fill in other sides





remember we need a $\sqrt{3}$ somewhere, put it here

pythagorean theorem

$\sqrt{1^2+1^2} = \sqrt{2}$

pythagorean theorem

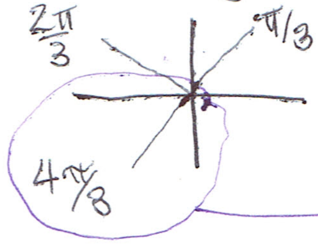
$\sqrt{1^2+(\sqrt{3})^2} = \sqrt{1+3} = \sqrt{4} = 2$

Now we can find cosines, sines, tangents of $\pi/3$, $\pi/2$, $\pi/6$ etc

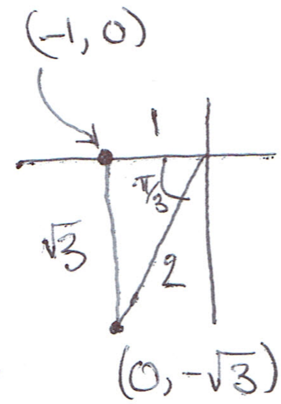
Combining this with our $\begin{array}{c|c} S & A \\ \hline T & C \end{array}$

we can do any angle on the unit circle

ex $\cos \frac{4\pi}{3} = ?$

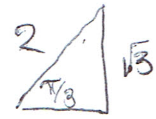


zoom in here
draw in the triangle



$$\cos \frac{4\pi}{3} = \frac{-\sqrt{3}}{2}$$

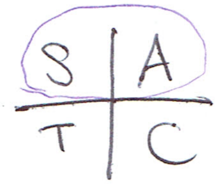
(Alternatively, look at the triangle

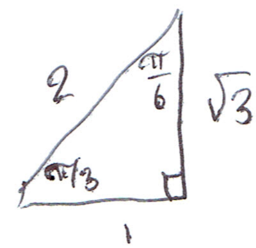


$\cos \frac{\pi}{3} = \frac{\sqrt{3}}{2}$

and then $\begin{array}{c|c} S & A \\ \hline T & C \end{array}$ so it should be negative) ex $\sin^{-1}\left(\frac{1}{2}\right)$

$\frac{1}{2}$ is positive so we want to look Here

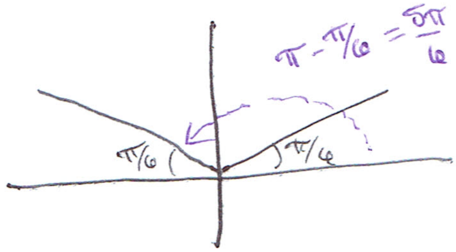




Think back to our triangles

sine is $\frac{\text{opposite}}{\text{hypotenuse}} = \frac{1}{2}$

so the angle we care about is $\frac{\pi}{6}$

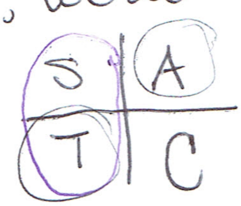


so we want $\frac{\pi}{6}$ and $\frac{5\pi}{6}$

(these are both solutions)

ex $\tan\theta = \frac{7}{5}$, $\cos\theta < 0$

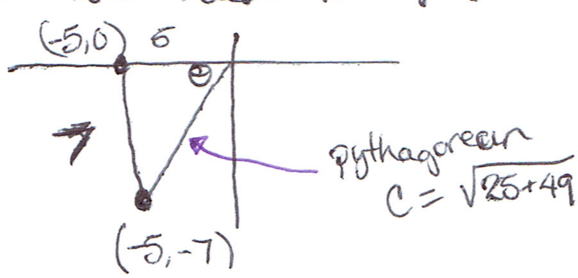
First, we'll look at quadrants



tangent is $\frac{7}{5}$ (positive)
so we could be in quadrant I or quadrant III

$\cos\theta < 0$ so now we must be quadrant II or quadrant III

They overlap in quadrant III so that's where we need to look. $\tan = \frac{\text{opposite}}{\text{adjacent}} = \frac{7}{5}$



$\Rightarrow \cos\theta = \frac{-5}{\sqrt{25+49}}$

$\rightarrow \sin\theta = \frac{-7}{\sqrt{25+49}}$