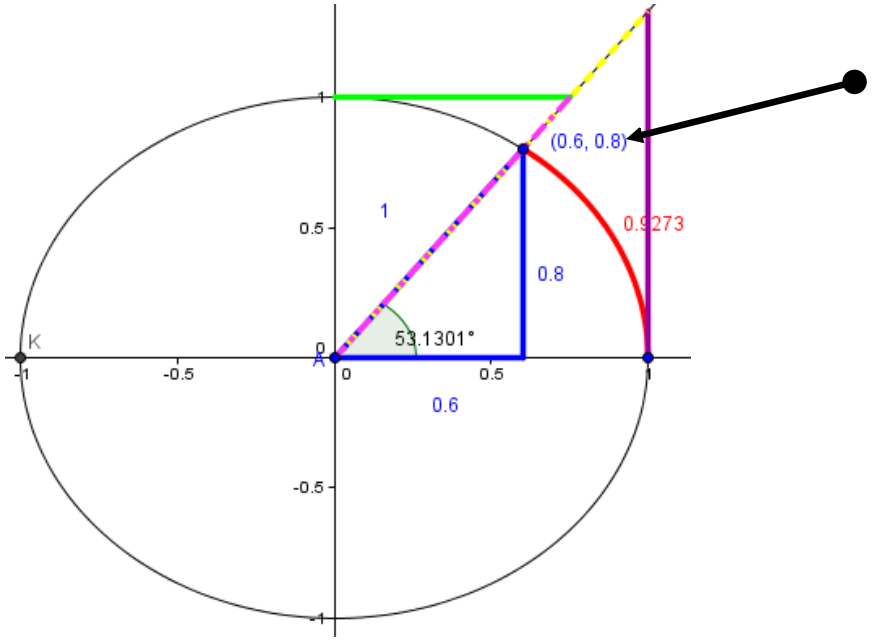
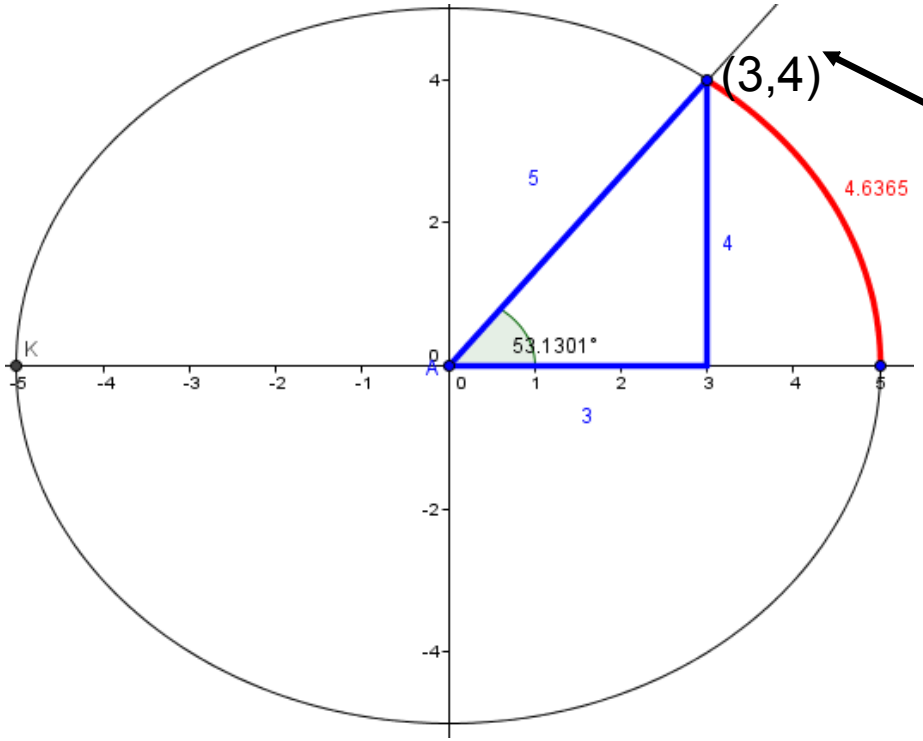
We have studied 7 things that are created when you perform a rotation along a circle.

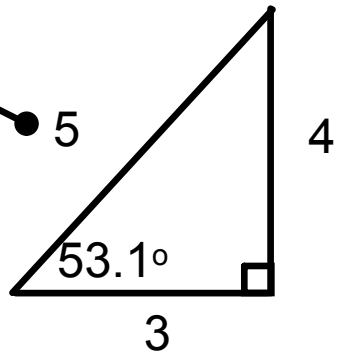
Going to talk about one more, coordinates

- Dealing with circles of any radius
- Working with coordinates and the pythagorean theorem



The terminal side has a coordinate at its end point.



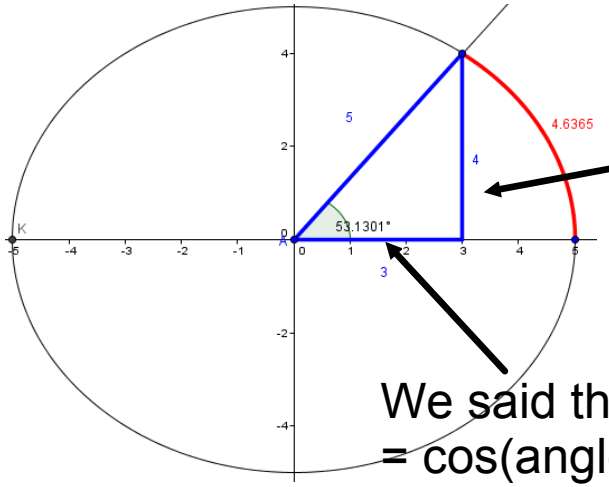


Rotate a radius of length five 53.1° then the coordinates of the radius's end point will be (3,4)

If I told you the length 5 and the rotation of 53.1°, could you figure out the 4 and the 3?

$\sin(53.1^\circ) * 5 = 4$

$\cos(53.1^\circ) * 5 = 3$



We said this over the hypotenuse
= sin(angle of rotation)

$$\sin(\theta) = \frac{hieght}{hypotenuse} = \frac{y}{r}$$

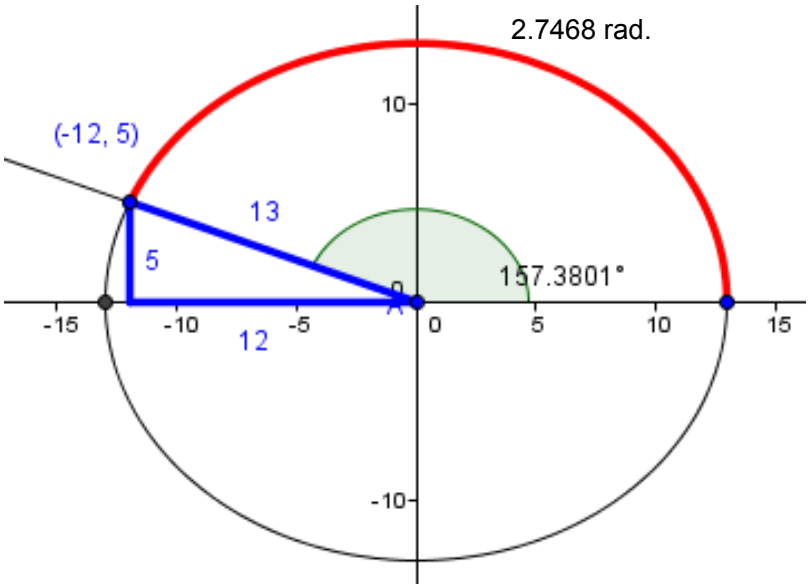
We said this over the hypotenuse
= cos(angle of rotation)

$$\cos(\theta) = \frac{base}{hypotenuse} = \frac{x}{r}$$

sin(angle of rotation) * radius = y coordinate
cos(angle of rotaion) * radius = x coordinate

$$\sin(\theta)r = y$$

$$\cos(\theta)r = x$$

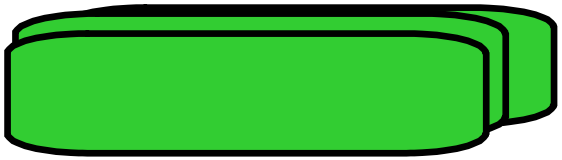


How do we find out the coordinates at the end of this rotation?

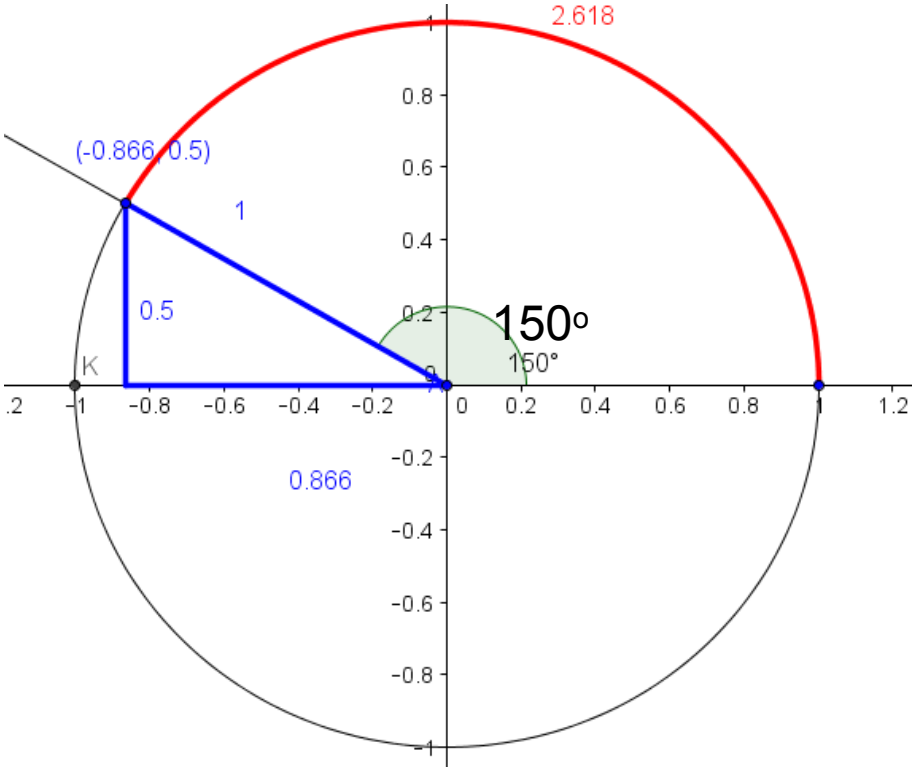
Reference angle:
22.6199°

What is the sine of a 157.3801° angle?

What is the cosine of a 157.3801° angle



So if the reference angle has wrong signs why do we care about it?



So you can figure out these coordinates without a calculator.

We are going to do this WRONG at first, but then fix it.
(Just wait for the correction, don't bother guessing yet.)

$\sin(\theta) = \frac{3}{5}$ What is cos(θ)? DRAW IT

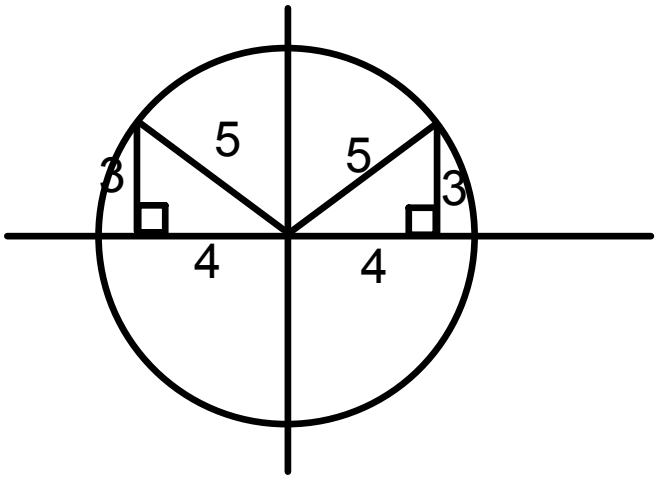
If you know any trig ratio you know two sides of a right triangle. Pythagorean theorem lets you figure out the rest.

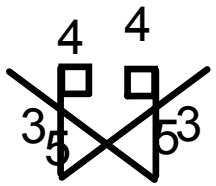
One trig value and the pythagorean theorem lets you figure out all the trig ratios.

HUGE IDEA

What did we do wrong?

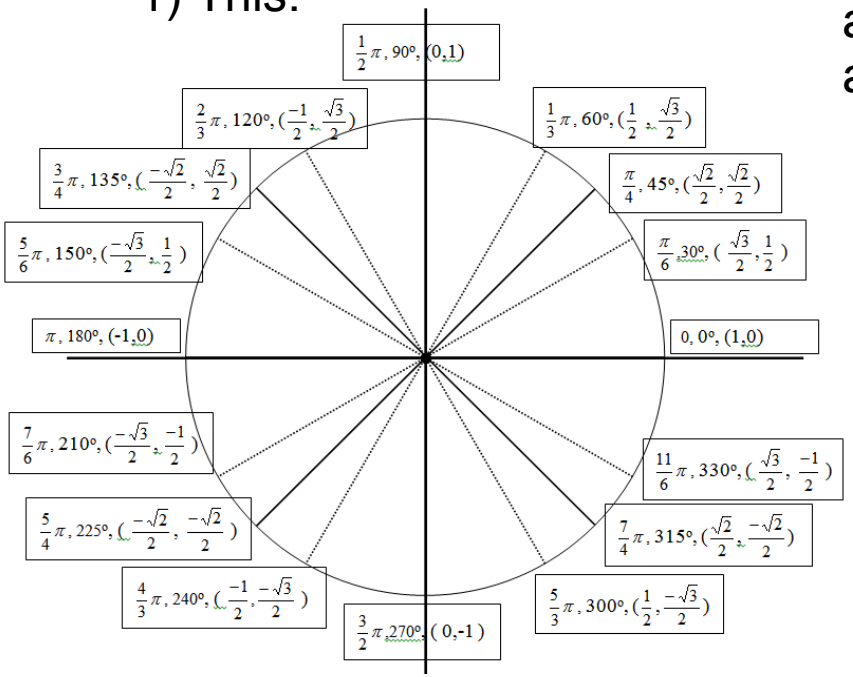
Key question. How many angles have a $\sin(\theta) = \frac{3}{5}$





What you have to be able to do in from memory speed,
even though these are mostly things you can figure out without memorizing.

1) This:



a) Convert from degrees to radians at multiples of 30° and 45°

b) Identify the coordiantes of any point on the unit circle for multiples of 30° and 45°

2) Apply the definitions of the six trig functions to be able to figure them out from sine and/or cosine.

Find the smallest positive coterminal angles

Targets

Evaluate Sec, csc, tan, and cot for angles above $2\pi, 360^{o}$ with and without a calculator.

Given any sine and cosine find the exact value of the remaining functions.

Given sine or cosine and any indicator of quadrant find the remaining trig functions

$\sin(\theta) = \frac{3}{5}$ What is cos(θ)?

Answer: I don't know unless you give me someway to figure out what quadrant we are in.

Could do this in several ways:
- 3rd quadrant
- cosθ <0
- tanθ <0

DRAW IT

$\cos(\theta) = \frac{-5}{13}$ What is $\sin(\theta)$?

Which quadrants could it be in?

$\sin(\theta) > 0$

How do you find the value of

With

$\sec\left(\frac{10\pi}{21}\right)$ or $\cot\left(132^o\right)$

$\sec\left(\frac{100\pi}{15}\right)$ or $\cot\left(920^o\right)$

$\csc(433^o)$

Without

$\sec\left(\frac{10\pi}{3}\right)$ or $\cot\left(600^o\right)$

$\sec\left(\frac{100\pi}{6}\right)$ or $\cot\left(450^o\right)$

$$csc\left(\frac{\pi}{6}\right)-\tan\left(\frac{5\pi}{4}\right)+\sec\left(\frac{\pi}{3}\right)+3\sin\left(\frac{3\pi}{2}\right)$$