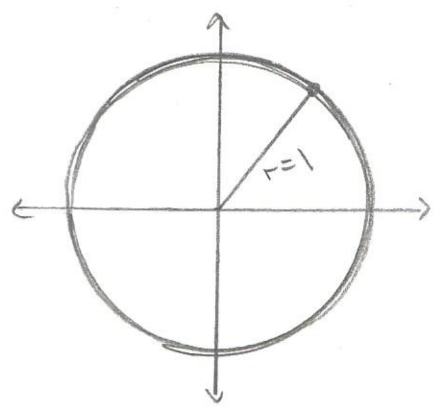
Standard Position

* Determine the value of trig functions given a point on a terminal side & given a value & a quadrant.

* think back to unit ⊙.



* what is special is that the radius is 1.

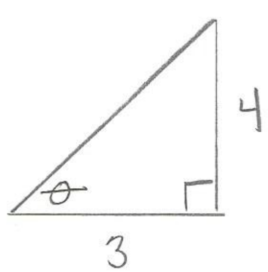
∴ the trig functions were based off x & y values since the radius is <u>1.</u>

- So now what happens beyond the unit ⊙.

* Given a point on the terminal side

(3,4) find $\sin\theta = ?$

- think about a Δ



(3,4)
(x,y)

so: $x^2+y^2=r^2$

$3^2+4^2=r^2$

$25=r^2$

$5=r$

- 3 represents x & 4 reps y.

∴ we are missing the hypotenuse which is the new radius.

- Now $\sin\theta = \frac{y}{r} = \frac{4}{5}$

- So given a coord (x, y), knowing the radius helps determine trig function values.

- <u>Trig Values</u>: $\sin\theta = \frac{y}{r}$ $\quad$ $\csc\theta = \frac{r}{y}$

$\cos\theta = \frac{x}{r}$ $\quad$ $\sec\theta = \frac{r}{x}$

$\tan\theta = \frac{y}{x}$ $\quad$ $\cot\theta = \frac{x}{y}$

<u>ex</u>: $(4, -6)$ find $\csc\theta = ?$

1st: find r

$$x^2 + y^2 = r^2$$
$$4^2 + (-6)^2 = r^2$$
$$52 = r^2$$
$$2\sqrt{13} = r$$

2nd

$$\csc\theta = \frac{r}{y}$$
$$= \frac{2\sqrt{13}}{-6}$$
$$\boxed{\csc\theta = -\frac{\sqrt{13}}{3}}$$

<u>ex</u>: $(-3, 7)$ find $\cos\theta = ?$

$$x^2 + y^2 = r^2$$
$$(-3)^2 + 7^2 = r^2$$
$$58 = r^2$$
$$\sqrt{58} = r$$

$$\cos\theta = \frac{x}{r}$$
$$= \frac{-3}{\sqrt{58}} \cdot \frac{\sqrt{58}}{\sqrt{58}}$$
$$\boxed{\cos\theta = \frac{-3\sqrt{58}}{58}}$$

- Now given a value & quad, find trig value.

* Given $\cos\theta = \frac{5}{13}$ & Quad IV

find $\tan\theta = ?$

- $\cos\theta = \frac{5}{13}$, so we have $\frac{x}{r}$, $\therefore$ $x = 5$, $r = 13$
- to find $\tan\theta = \frac{y}{x}$; we need "y"
- $x^2 + y^2 = r^2$

$5^2 + y^2 = 13^2$

$y^2 = 144$

$y = 12$

- Now $\tan\theta = \frac{12}{13}$

but since QIV, tan is −

so $\tan\theta = \frac{-12}{13}$

ex: $\cot\theta = 3$ & Quad III find $\sin\theta = ?$

$\cot\theta = 3$ which is $\frac{x}{y}$, so $x = 3$, $y = 1$

$3^2 + 1^2 = r^2$

$10 = r^2$

$\sqrt{10} = r$

so, $\sin\theta = \frac{y}{r} = \frac{1}{\sqrt{10}}$

$= \frac{\sqrt{10}}{10}$

* but since QIII

$$\boxed{\sin\theta = -\frac{\sqrt{10}}{10}}$$