Section 4.2
Part 1

Unit Circle: Ordered Pairs

Objective: Given special right triangles students will be able to find the ordered pairs of the unit circle.

Study Problems

Page 300 #13-35 odd

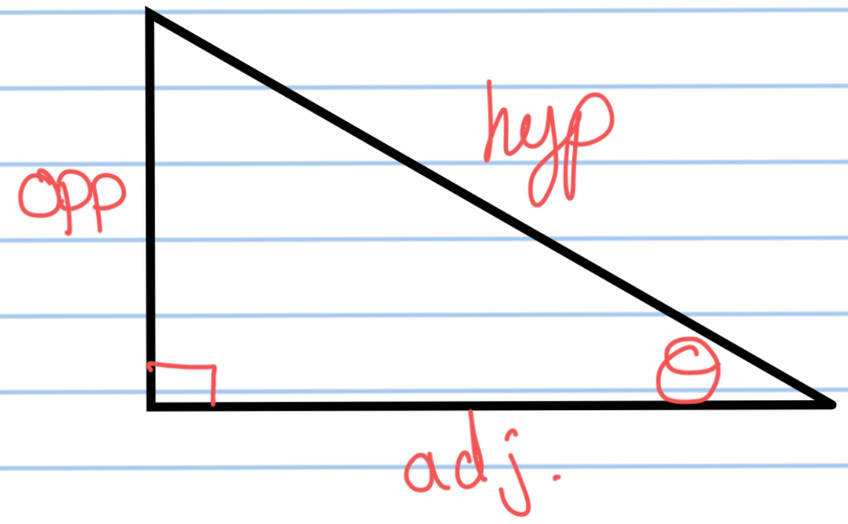
→ cho sha cao

Soh Cah Toa

$\csc\theta = \frac{hyp}{opp}$

$\sec\theta = \frac{hyp}{adj}$

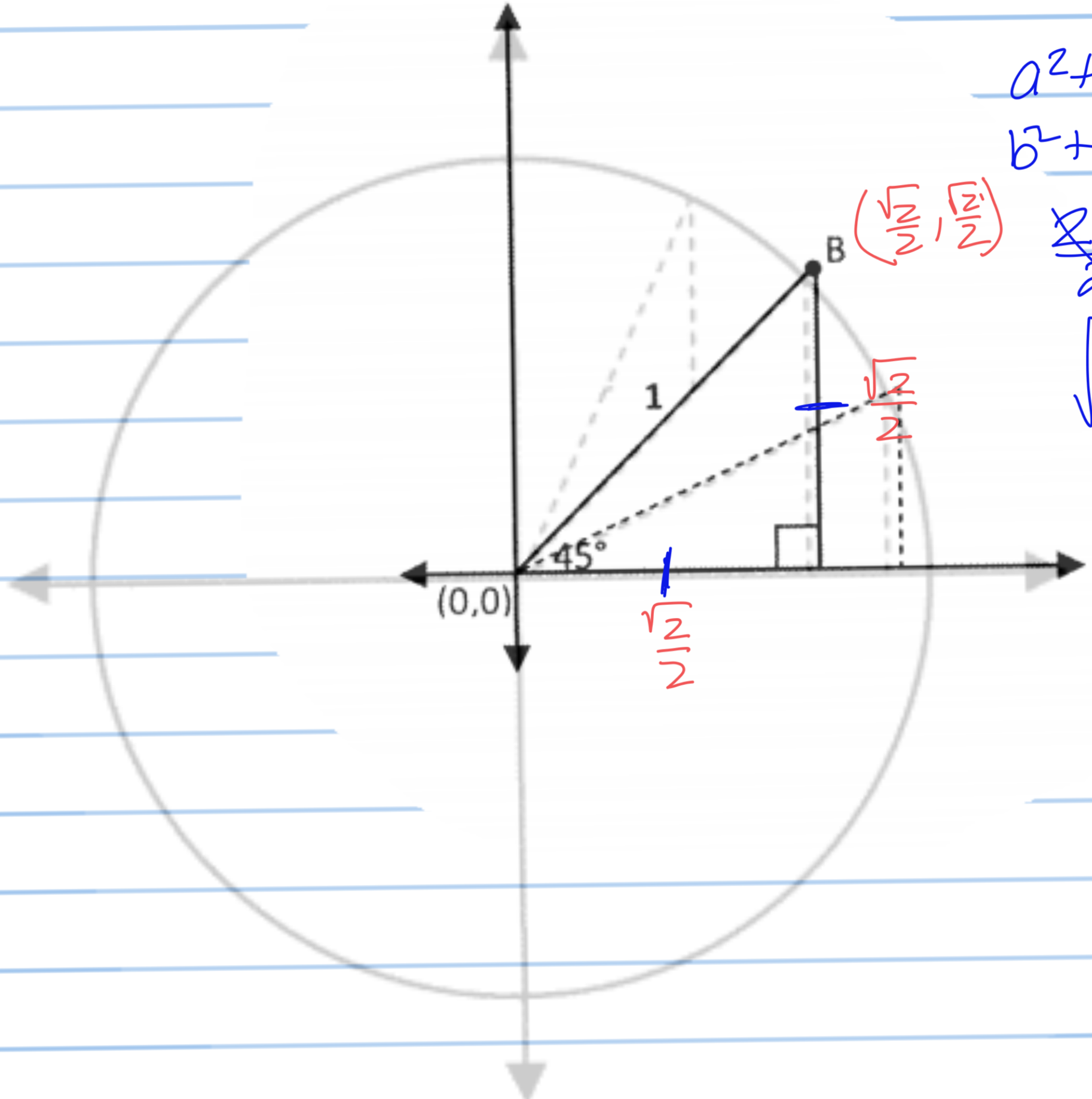
$\cot\theta = \frac{adj}{opp}$



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

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

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



$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

$\frac{\sqrt{2}}{2}$

$\frac{\sqrt{2}}{2}$

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

$b^2+b^2=1^2$

$\frac{2b^2}{2} = \frac{1}{2}$

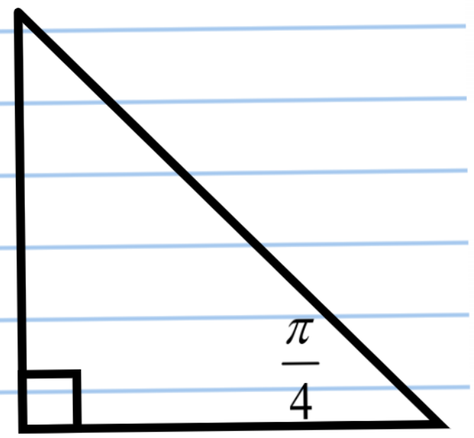
$\sqrt{b^2} = \sqrt{\frac{1}{2}}$

$b = \frac{\sqrt{1}}{\sqrt{2}}$

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

$b = \frac{\sqrt{2}}{2}$

Fill in the ordered pairs for this triangle



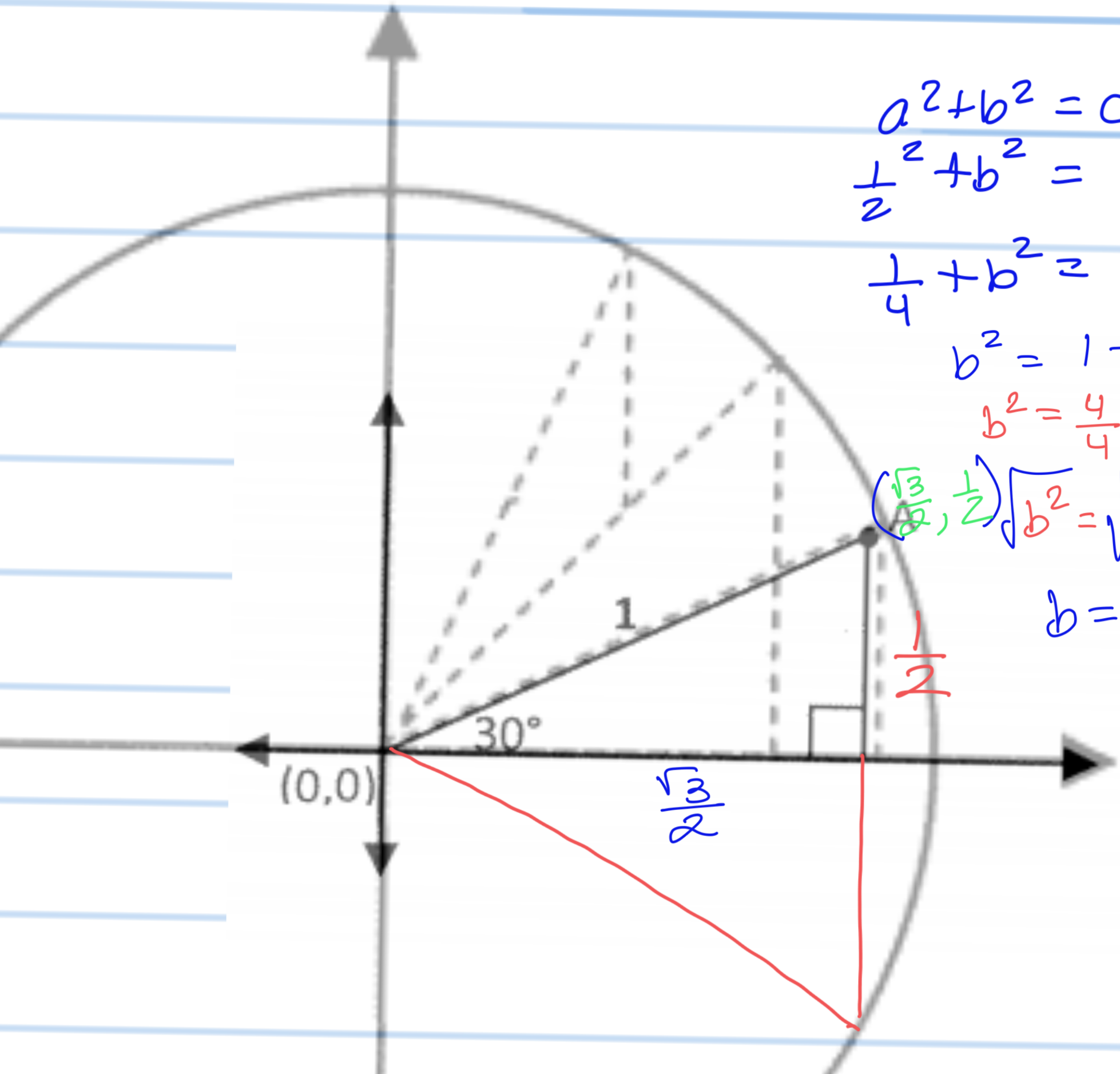
S

A

T

C

Reference angle
reflect
rotate



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

$$\frac{1}{2}^2+b^2=1^2$$

$$\frac{1}{4}+b^2=1$$

$$b^2=1-\frac{1}{4}$$

$$b^2=\frac{4}{4}-\frac{1}{4}$$

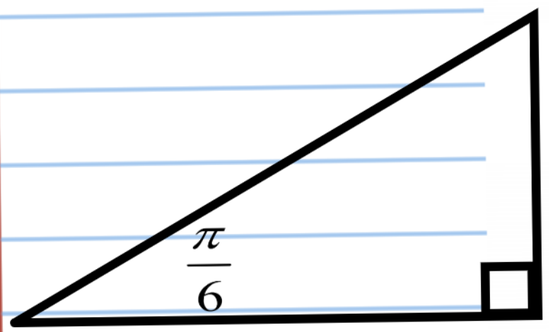
$\left(\frac{\sqrt{3}}{2},\frac{1}{2}\right)$ $\sqrt{b^2}=\sqrt{\frac{3}{4}}$

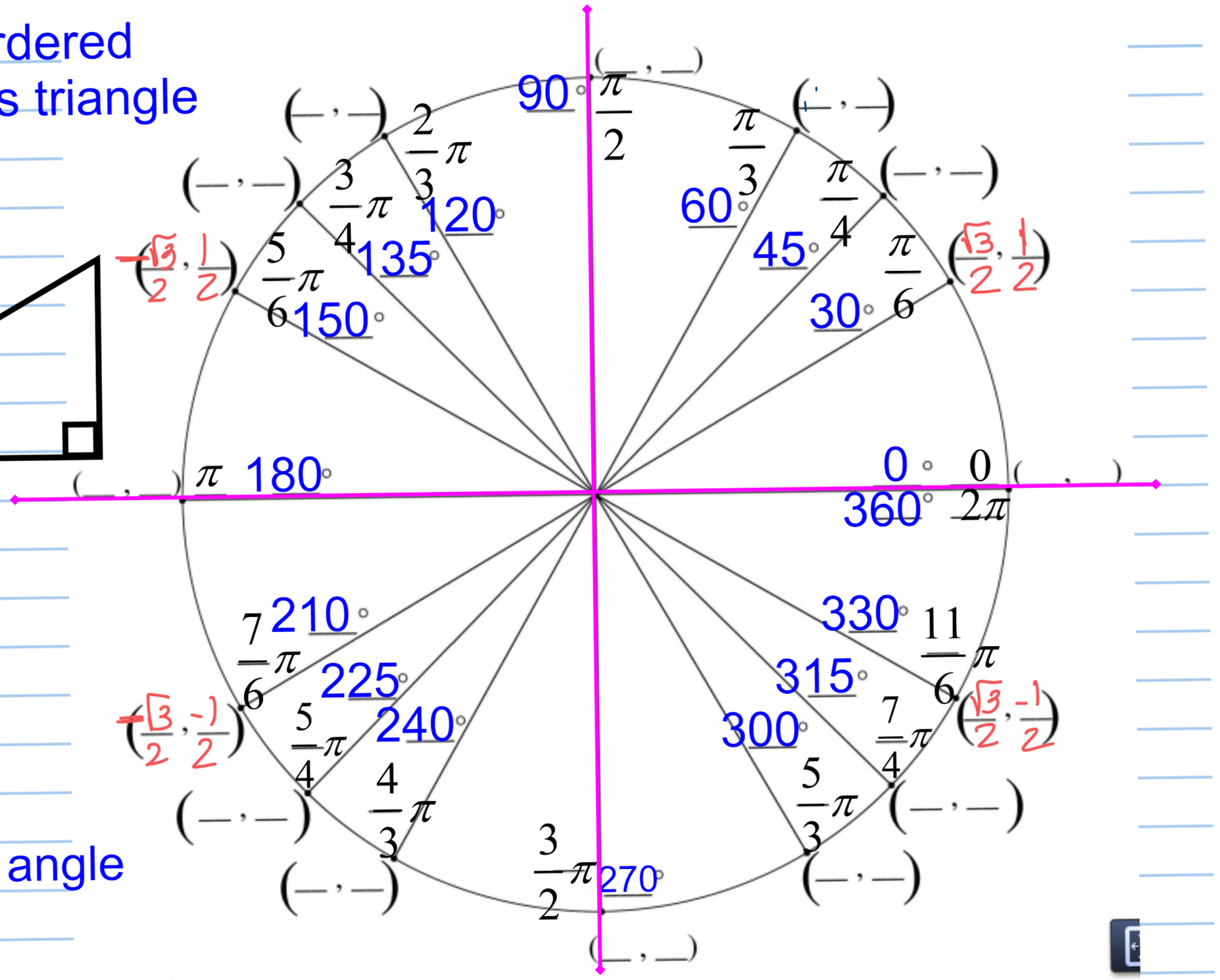
$$b=\frac{\sqrt{3}}{2}$$

$\frac{1}{2}$

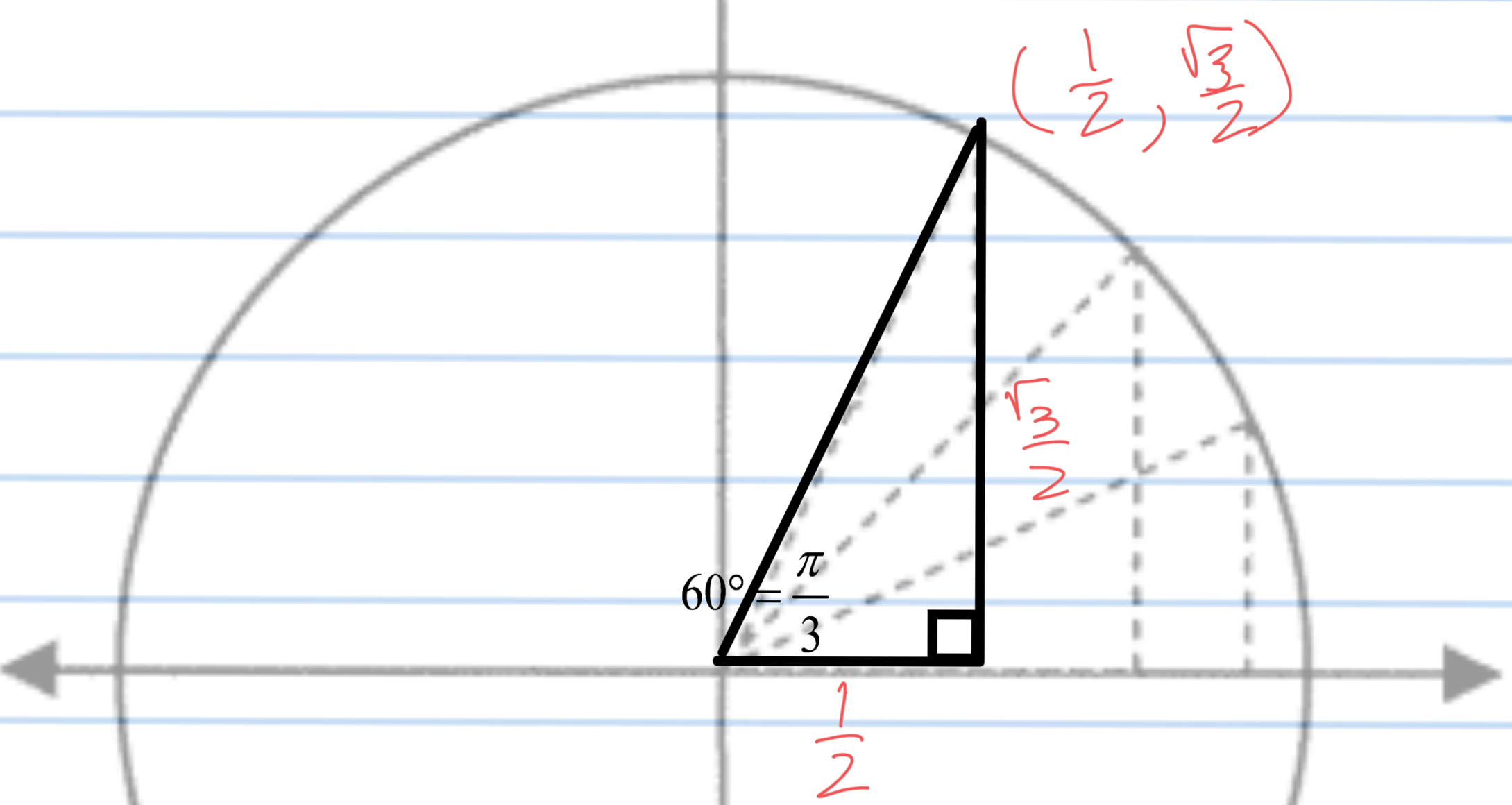
$\frac{\sqrt{3}}{2}$

Fill in the ordered pairs for this triangle

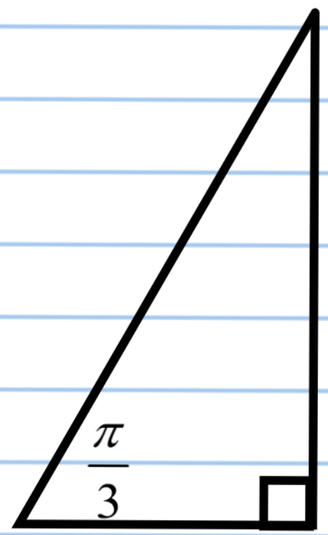




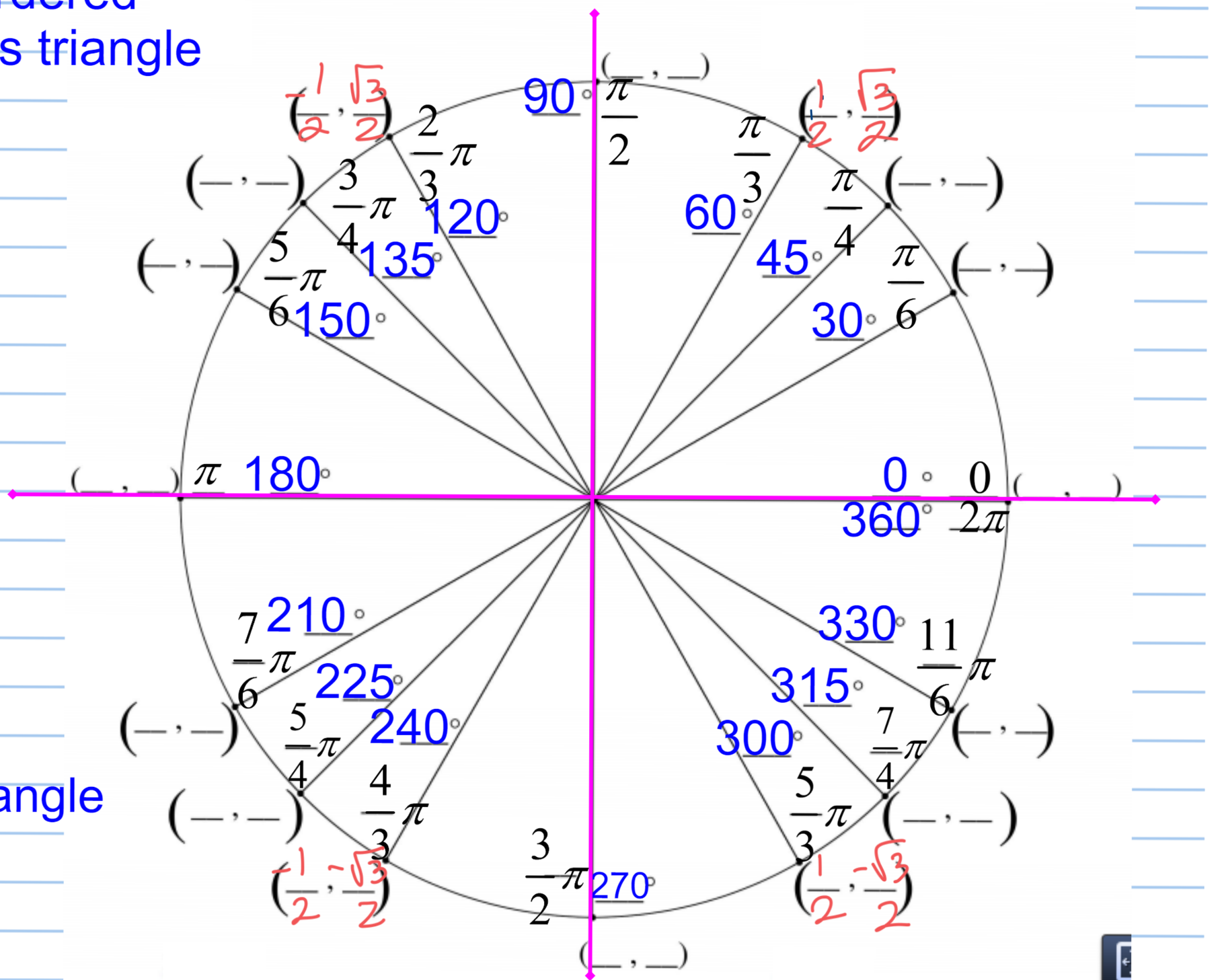
Reference angle
reflect
rotate

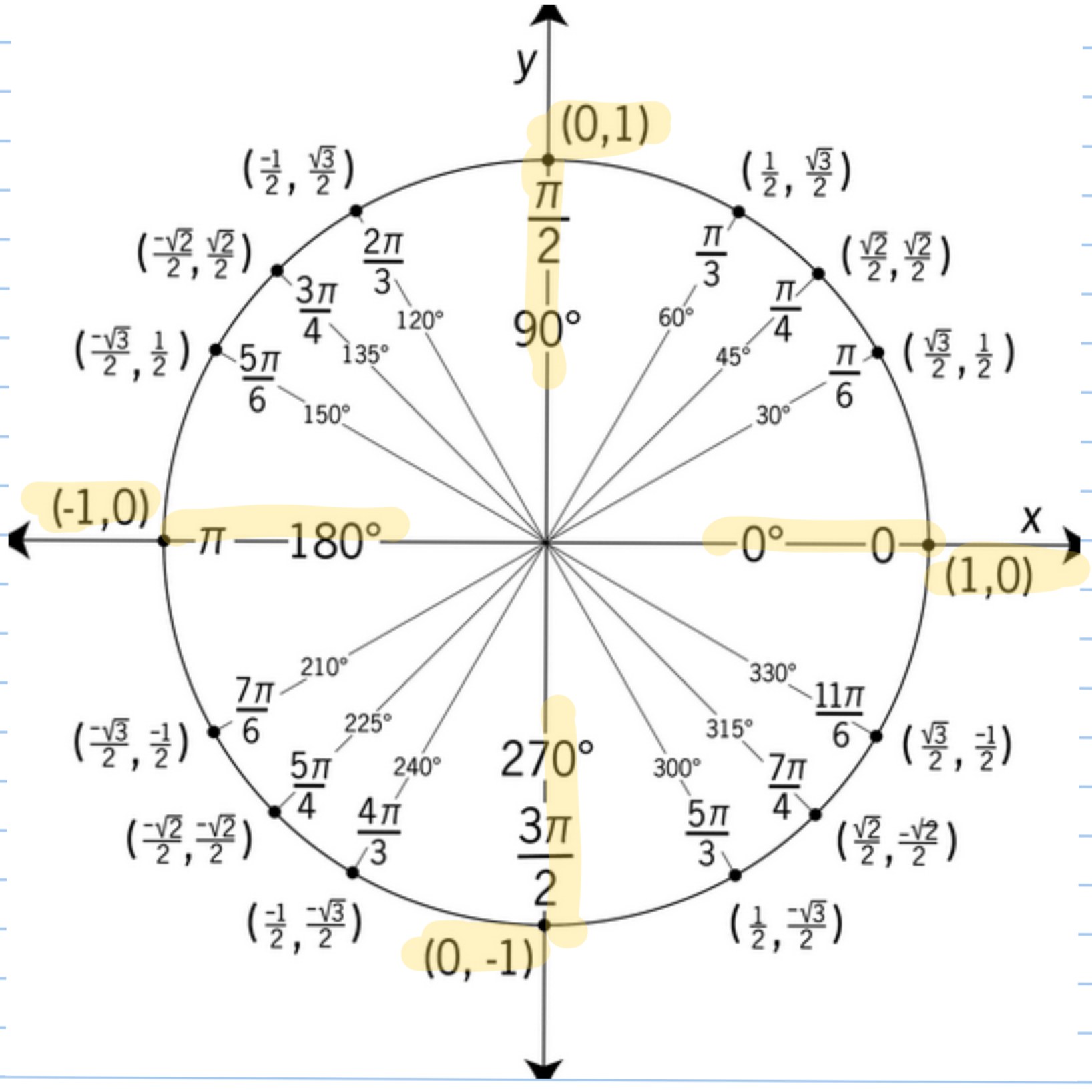

$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
$\frac{\sqrt{3}}{2}$
$60° = \frac{\pi}{3}$
$\frac{1}{2}$

Fill in the ordered pairs for this triangle



Reference angle
reflect
rotate

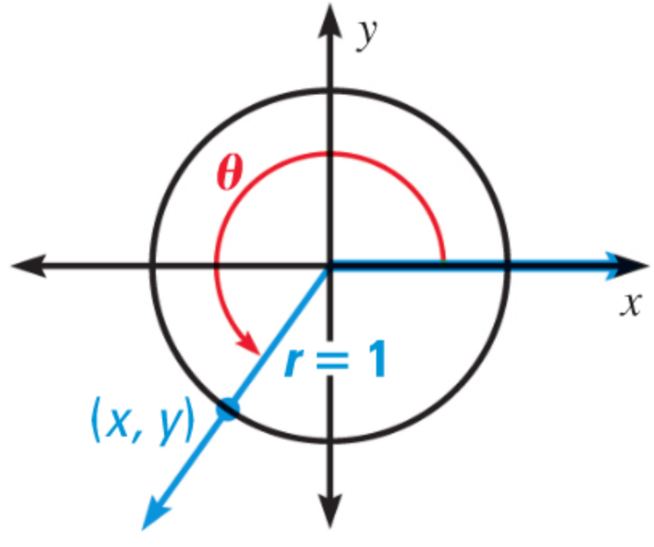



y
x
(0,1)
$\frac{\pi}{2}$
90°
$(\frac{-1}{2}, \frac{\sqrt{3}}{2})$
$\frac{2\pi}{3}$
120°
$(\frac{1}{2}, \frac{\sqrt{3}}{2})$
$\frac{\pi}{3}$
60°
$(\frac{-\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$
$\frac{3\pi}{4}$
135°
$(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$
$\frac{\pi}{4}$
45°
$(\frac{-\sqrt{3}}{2}, \frac{1}{2})$
$\frac{5\pi}{6}$
150°
$(\frac{\sqrt{3}}{2}, \frac{1}{2})$
$\frac{\pi}{6}$
30°
(-1,0)
π
180°
0°
0
(1,0)
$\frac{7\pi}{6}$
210°
$\frac{11\pi}{6}$
330°
$(\frac{-\sqrt{3}}{2}, \frac{-1}{2})$
$\frac{5\pi}{4}$
225°
315°
$(\frac{\sqrt{3}}{2}, \frac{-1}{2})$
$\frac{4\pi}{3}$
240°
270°
300°
$\frac{7\pi}{4}$
$(\frac{-\sqrt{2}}{2}, \frac{-\sqrt{2}}{2})$
$\frac{3\pi}{2}$
$\frac{5\pi}{3}$
$(\frac{\sqrt{2}}{2}, \frac{-\sqrt{2}}{2})$
$(\frac{-1}{2}, \frac{-\sqrt{3}}{2})$
$(\frac{1}{2}, \frac{-\sqrt{3}}{2})$
(0, -1)

KEY CONCEPT *For Your Notebook*

The Unit Circle

The circle $x^2 + y^2 = 1$, which has center (0, 0) and radius 1, is called the **unit circle**.



$$\sin\theta = y \qquad \csc\theta = \frac{1}{y}$$

$$\cos\theta = x \qquad \sec\theta = \frac{1}{x}$$

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

EVALUATING TRIGONOMETRIC FUNCTIONS Reference angles allow you to evaluate a trigonometric function for any angle θ. The sign of the trigonometric function value depends on the quadrant in which θ lies.

KEY CONCEPT *For Your Notebook*

Evaluating Trigonometric Functions

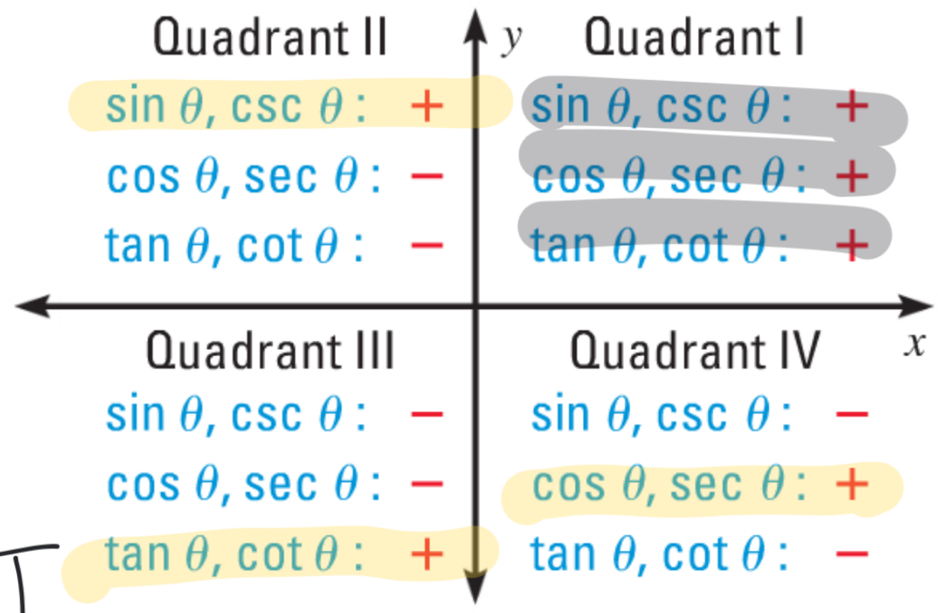
Use these steps to evaluate a trigonometric function for any angle θ:

STEP 1 **Find** the reference angle θ'.

STEP 2 **Evaluate** the trigonometric function for θ'.

STEP 3 **Determine** the sign of the trigonometric function value from the quadrant in which θ lies.

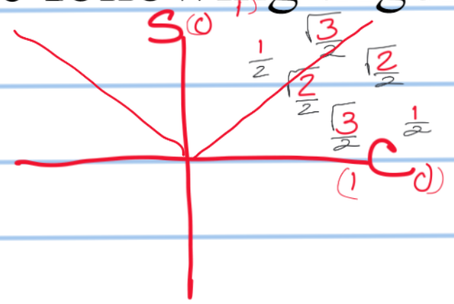
Signs of Function Values



Example

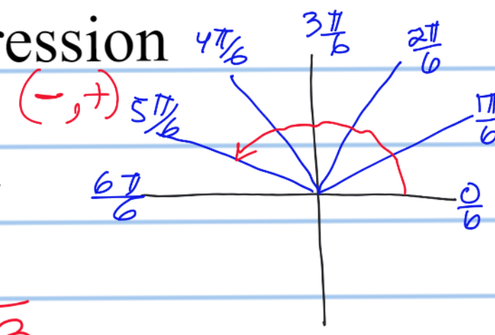
Evaluate the following trigonometric expression

1. $\sin\frac{\pi}{4}$



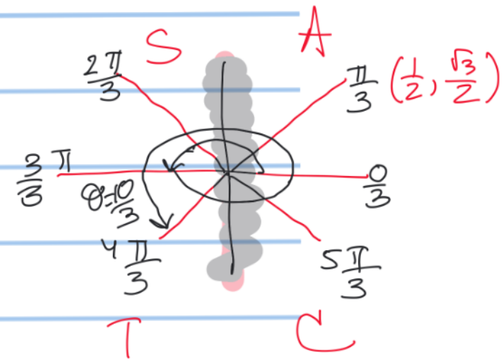
$\frac{\sqrt{2}}{2}$

2. $\cos\frac{5}{6}\pi$



$-\frac{\sqrt{3}}{2}$

3. $\tan\frac{10}{3}\pi$



$\frac{y}{x}$ $\quad -\frac{\sqrt{3}}{2}$

$-\frac{1}{2}$

$\frac{\sqrt{3}}{2} \cdot \frac{2}{1} = \sqrt{3}$

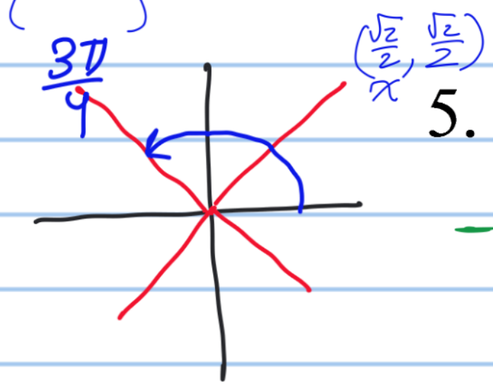
Example

Evaluate the following trigonometric expression

4. $\sec\frac{3}{4}\pi$

$\frac{1}{x}$

$\frac{1}{-\frac{\sqrt{2}}{2}}$



$1 \cdot \frac{-2}{\sqrt{2}}\frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{-2\sqrt{2}}{2}$

$\boxed{-\sqrt{2}}$

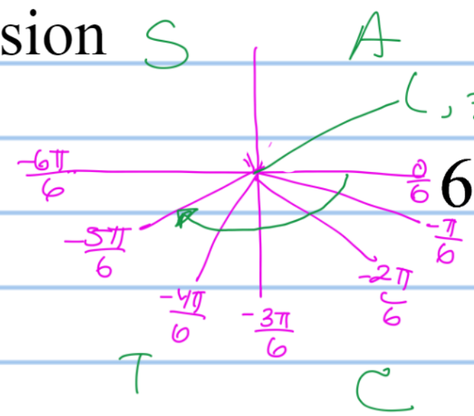
5. $\csc\left(-\frac{5}{6}\pi\right)$

$-\frac{1}{y}$

$\frac{1}{-\frac{1}{2}}$

$1 \cdot \frac{-2}{1}$

$\boxed{-2}$



6. $\cot\frac{8}{3}\pi$

$\frac{x}{y}$

$= \frac{-\frac{1}{2}}{\frac{\sqrt{3}}{2}}$

$-\frac{1}{2} \cdot \frac{2}{\sqrt{3}} = -\frac{1}{\sqrt{3}}\frac{\sqrt{3}}{\sqrt{3}}$

$= \boxed{-\frac{\sqrt{3}}{3}}$