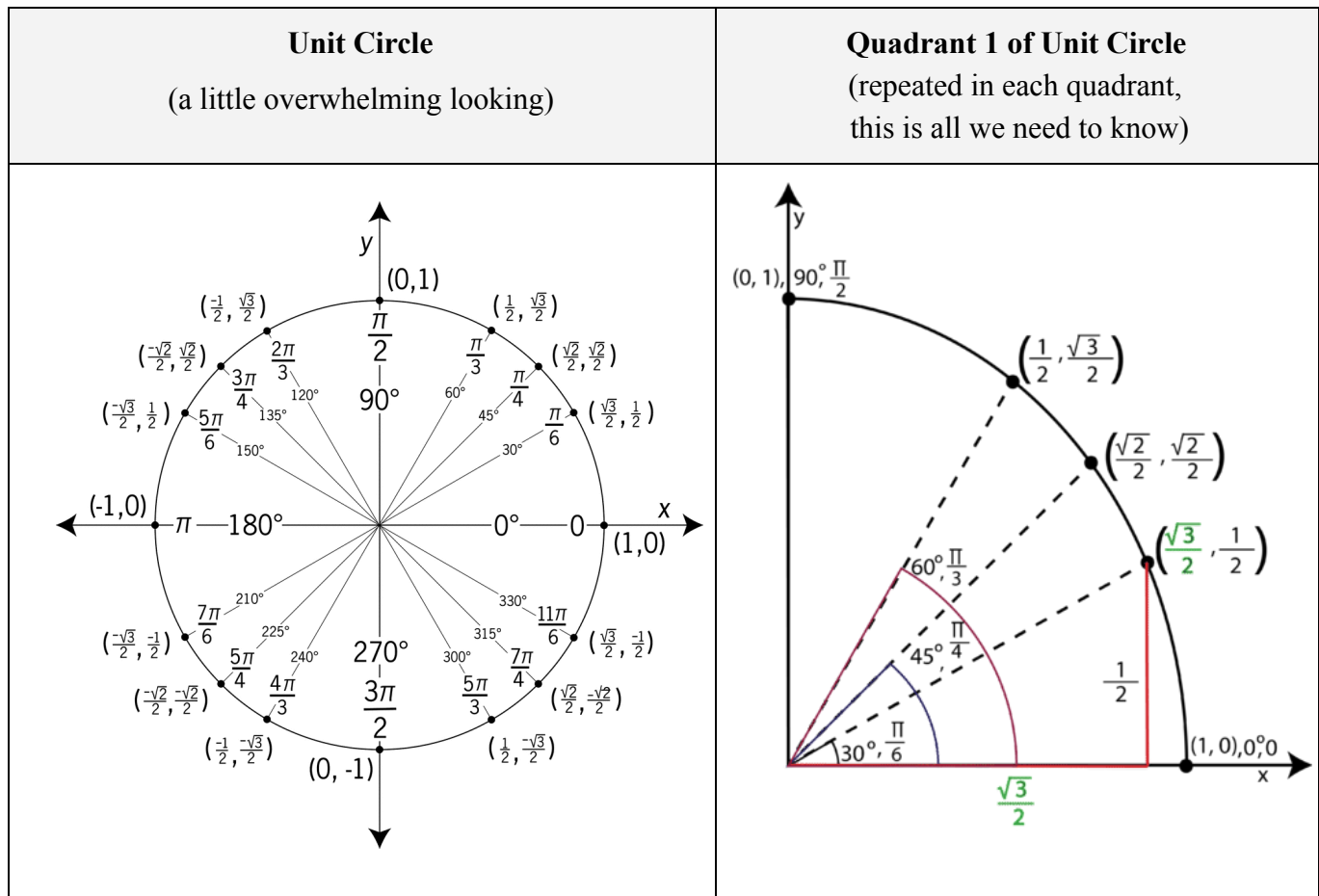


Recall from Algebra 2:

Angle Measure

Angles can be measured in 2 ways, in degrees or in radians. Below is the unit circle, which shows the relationship between the two measurements for the most frequently used angles. Notice, degrees will always have the degree symbol above their measure, as in “452°”, whereas radians are real numbers without any dimensions, so the number “5” without any symbol represents an angle of 5 radians. An angle is made up of an initial side (positioned on the positive x-axis) and a terminal side (where the angle lands). It is useful to note the quadrant where the terminal side falls.



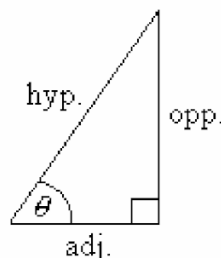
Rotation direction

Positive angles start on the positive x-axis and rotate counterclockwise. Negative angles start on the positive x-axis, also, and rotate clockwise.

The Trigonometric Ratios

The six trigonometric ratios are defined in the following way based on this right triangle and the angle θ

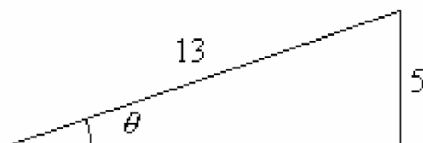
adj. = adjacent side to angle θ
opp. = opposite side to angle θ
hyp. = hypotenuse of the right triangle



$$\boxed{\text{SOH CAH TOA}} \rightarrow \sin \theta = \frac{\text{opp.}}{\text{hyp.}} \quad \cos \theta = \frac{\text{adj.}}{\text{hyp.}} \quad \tan \theta = \frac{\text{opp.}}{\text{adj.}}$$

$$\text{Reciprocal functions} \rightarrow \csc \theta = \frac{\text{hyp.}}{\text{opp.}} \quad \sec \theta = \frac{\text{hyp.}}{\text{adj.}} \quad \cot \theta = \frac{\text{adj.}}{\text{opp.}}$$

Ex. Find the exact values of all 6 trigonometric functions of the angle θ shown in the figure.



SOLUTION: first you'll need to determine the 3rd side using $a^2 + b^2 = c^2 \rightarrow a^2 + 5^2 = 13^2 \rightarrow a = 12$
So for the angle labeled θ , ADJACENT = 12, OPPOSITE = 5 and HYPOTENUSE = 13

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{5}{13} \quad \cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{12}{13} \quad \tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{5}{12}$$

$$\csc \theta = \frac{\text{hyp}}{\text{opp}} = \frac{13}{5} \quad \sec \theta = \frac{\text{hyp}}{\text{adj}} = \frac{13}{12} \quad \cot \theta = \frac{\text{adj}}{\text{opp}} = \frac{12}{5}$$

**If we draw out the reference angle, we can always make a right triangle and then use the trigonometric ratios and/or the special angles 30, 45, 60 we have memorized.*

APPLICATION/PRACTICE:

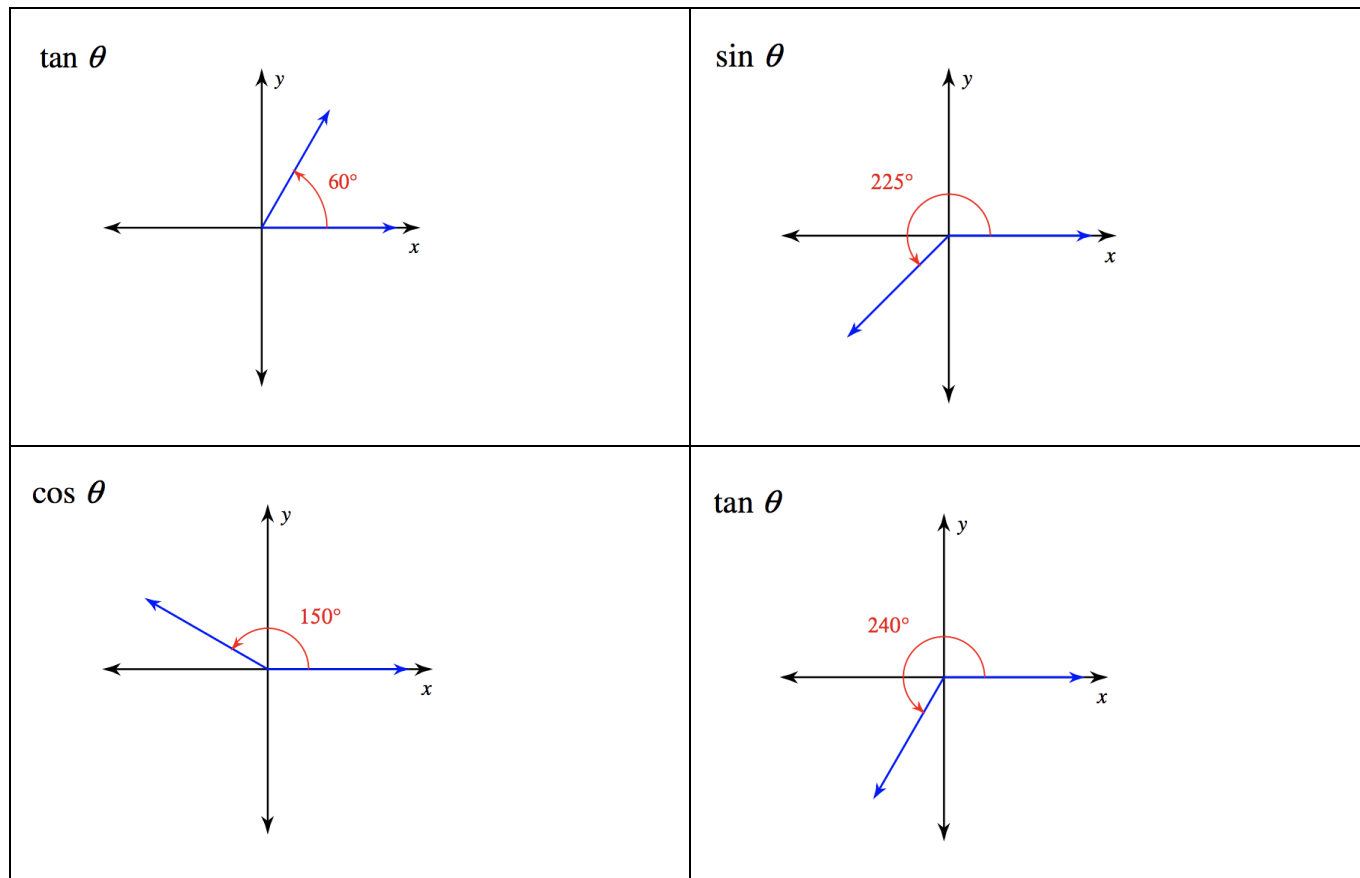
1. Find the sine and cosine of the following angles:

(a) $\theta = 45^\circ$

(b) $\alpha = 210^\circ$

(c) $\beta = 300^\circ$

2. Find the exact value of each trigonometric function.



3. Find the exact value of the following angles.

(a) $\tan 90^\circ$

(b) $\sin \frac{5\pi}{6}$

(c) $\tan (-150^\circ)$

(d) $\cot (600^\circ)$

Video Reference:

1. <https://www.youtube.com/watch?v=e8NHJ2Cmeqc>

2. https://www.google.com/search?q=Draw+and+label+each+angle+in+standard+position%3A&aq=chrome..69i57.190j0j9&sourceid=chrome&ie=UTF-8#kpvalbx=_AyudXuTzBJSKytMPy5GeiAc35