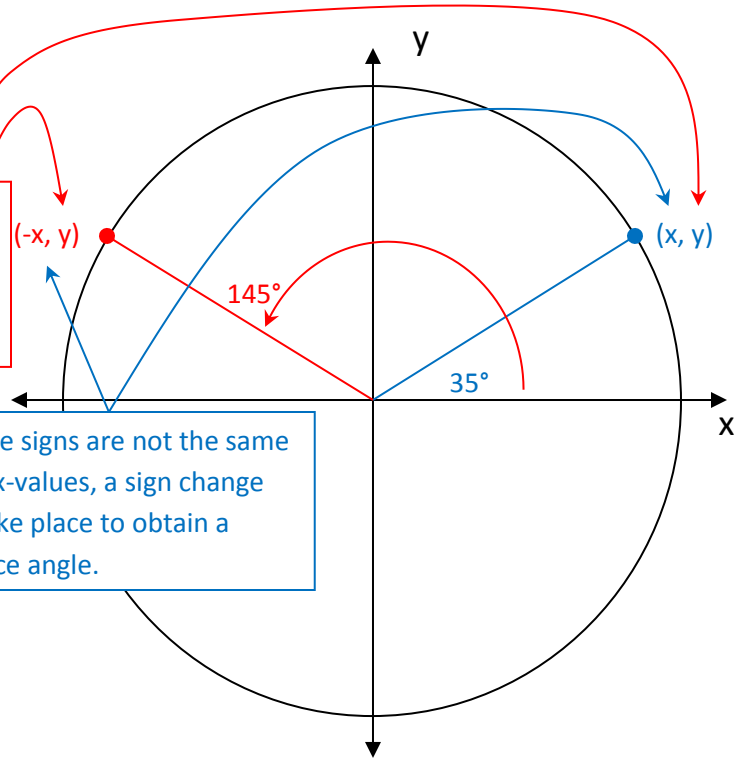
College Review Math
Section 7D

# EVALUATING & GRAPHING SIN & COS

## *Reference angles*

Notice the y-values are the same for both angles. So, their sine's are the same as well.




sin 35° = sin 145°

cos 145° = - cos 35°

and…

Since the signs are not the same for the x-values, a sign change must take place to obtain a reference angle.

## *Reference angle formulas*

Only had room for #1 and #2, sorry.

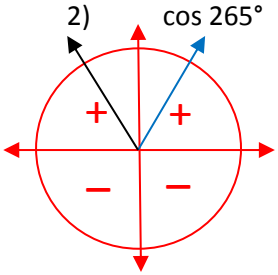
(I) 180° - $\alpha$ or $\alpha$ - 180 or 360 - $\alpha$
(whichever one gets you into the first quadrant)

(II) test the sign

Examples: Name an (acute) reference angle for each angle given.

1) sin 110°

#1) 180 – 110 = 70, 70° is in quad I
So sin 110° = sin 70°?? Use the "sin – sign" chart to determine if a sign change is necessary.



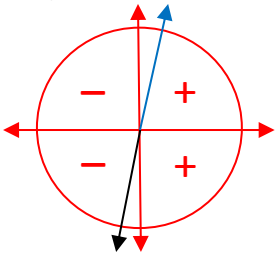

2) cos 265°

Since both angles end in a quadrant with positive y-values, no sign change would take place.
Therefore: sin 110° = sin 70°

3) cos 302°

4) sin 444°

#2) 180 – 265 ≠ quad I
265 – 180 = 85 which is in quad I.
So, cos 265° = cos 85°?? Use the "cos – sign" chart to determine if a sign change is necessary.

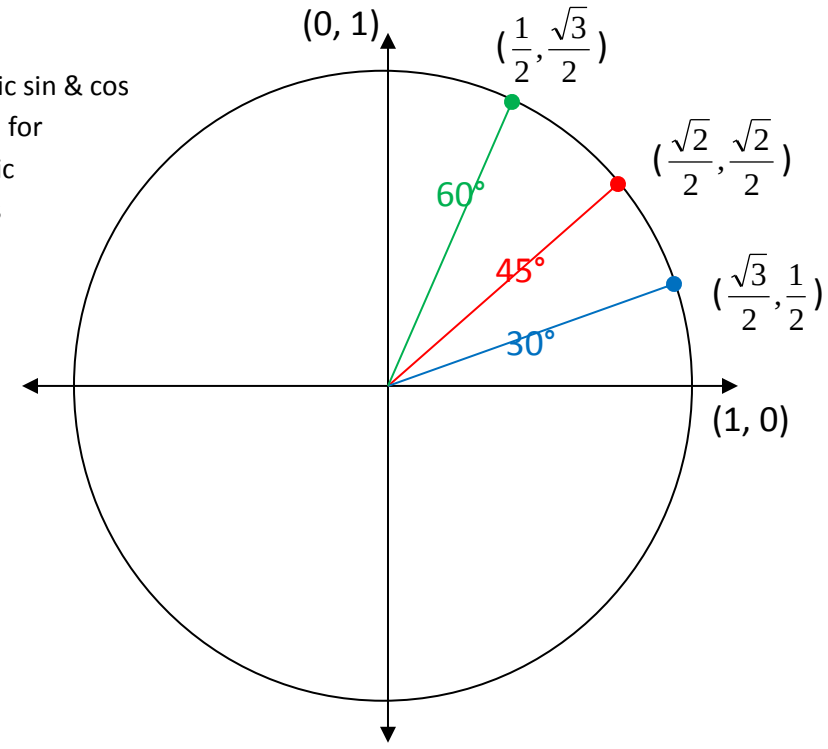



5) sin 705°

Since the two angles have opposite x-value signs, a sign change must take place. Therefore:
cos 265° = – cos 85°

6) cos (-207)°

Specific sin & cos values for specific angles




Give the exact values of each expression using reference angles.

1) cos 240°

240 – 180 = 60 (reference ∠)
cos 240° = cos 60°, but signs are different, so cos 240° = –cos 60°
x-value for 60° = 1/2 so –cos 60° = -1/2. And… cos 240° = -1/2

2) sin 135°

180 – 135 = 45 (reference ∠)
sin 135° = sin 45°, since the signs are the same, no sign change.
y-value for 45° = $\sqrt{2}/2$ so
sin 135° = $\sqrt{2}/2$ also.

3) sin 180°

Since the coordinates on the unit circle are literally (-1, 0) for 180°, there is no need for a reference angle.
sin 180° = 0

4) cos (-60°)

-60 + 360 = 300 (coterminal ∠)
360 – 300 = 60 (reference ∠)
cos (-60°) = cos 60°. Since no sign change, x-value = 1/2, and cos (-60°) =1/2 also.

5) cos $\frac{3\pi}{4}$

cos $3\pi/4$ = cos 135°
180 – 135 = 45 (reference ∠)
Signs for cos 135° and cos 45° are different so cos 135° = –cos 45°.
Therefore cos $3\pi/4 = -\sqrt{2}/2$

6) sin $\frac{5\pi}{3}$

sin $5\pi/3$ = sin 300°
360 – 300 = 60 (reference ∠)
Signs for sin 300° and sin 60° are different so sin 300° = –sin 60°.
Therefore sin $5\pi/3 = -\sqrt{3}/2$

7) cos $7\pi$

cos $7\pi$ = cos $\pi$. Since the coordinates on the unit circle are (-1, 0) for $\pi$, there is no need for a reference angle.
cos $7\pi$ = -1.

8) sin $\frac{5\pi}{6}$

cos $5\pi/6$ = cos 150°
180 – 150 = 30 (reference ∠)
Signs for sin 150° and sin 30° are the same so no sign change.
Therefore sin $5\pi/6$ = 1/2

9) cos 510°

510 – 360 = 150 (coterminal ∠)
180 – 150 = 30 (reference ∠)
Signs for cos 150° and cos 30° are different so cos 150° = – cos 30°
Therefore cos 150° = $-\sqrt{3}/2$