Name: _____ **Precalculus Unit 9, Lesson 3**

Aim: How do we "reduce" trig function values to trig functions of positive acute angles?

I. Do Now:

1. Find the exact value of each:
   (a) $\sin\frac{\pi}{3}$
   (b) $\sin\frac{2\pi}{3}$
   (c) $\sin\frac{4\pi}{3}$
   (d) $\sin\frac{5\pi}{3}$
   (e) $\cos 45°$
   (f) $\cos 135°$
   (g) $\cos 225°$
   (h) $\cos 315°$

2. Find the exact values of all six trigonometric functions of θ if the point $(-8,-11)$ is on the terminal side of θ.

II. "Reducing" Trig Functions of Any Angle to a Trig Function of a Positive Acute Angle

Due to the circular nature of trig functions (they are sometimes referred to as circular functions), the value of a trig function at a given angle is always the same as its value at that angle's reference angle, except when there is a variation in sign. Using A-S-T-C, we can "reduce" any trig function value to a trig function of its reference angle. (Note: Using cofunctions, any trig function can be further "reduced" to a function of a positive acute angle less than 45°.)

Examples:

$$\sin 240° = \pm\sin 60° \qquad \cos 300° = \pm\cos 60°$$
$$= -\sin 60° \qquad = \cos 60°$$
$$= -\frac{\sqrt{3}}{2} \qquad = \frac{1}{2}$$

III. Express as a function of a positive acute angle and find the exact value without using a calculator:

1. $\sin 120°$
2. $\cos 210°$
3. $\tan 135°$
4. $\sec\frac{4\pi}{3}$
5. $\tan\frac{5\pi}{4}$
6. $\csc\frac{5\pi}{6}$
7. $\cot\frac{2\pi}{3}$
8. $\cos\frac{5\pi}{3}$
9. $\sin\frac{17\pi}{3}$
10. $\csc\frac{7\pi}{6}$
11. $\tan\left(-\frac{13\pi}{6}\right)$
12. $\cot\left(-\frac{15\pi}{4}\right)$

IV. Practice with Quadrantal Angles: Evaluate:

13. $\sin 90°$
14. $\cos 180°$
15. $\tan 360°$
16. $\csc 270°$
17. $\cot\frac{\pi}{2}$
18. $\sec 7\pi$
19. $\sin\left(-\frac{11\pi}{2}\right)$
20. $\tan 3\pi$

V. More Practice:

Express the given function as a function of a positive acute angle and, if possible, find the exact value:

21. $\csc 1{,}200°$
22. $\tan 345°$
23. $\cos 208°$
24. $\sin(-250°)$
25. $\sec\frac{50\pi}{3}$
26. $\csc\frac{13\pi}{7}$
27. $\sin\left(-\frac{147\pi}{4}\right)$
28. $\cos\frac{19\pi}{5}$

Find the exact value of the given expression:

29. $\left(\sec\frac{2\pi}{3}\right)\left(\sin\frac{2\pi}{3}\right)$
30. $\csc\frac{\pi}{4} + \cot\frac{3\pi}{4} + \sec 5\pi$
31. $\tan\frac{\pi}{3} + \cot\frac{5\pi}{6}$

HW19
Complete this sheet.