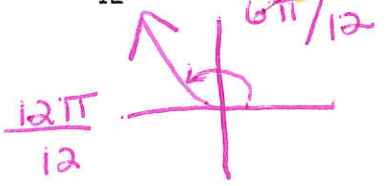
Pre-Calculus CP KEY Review Sec 4.1 September 2015

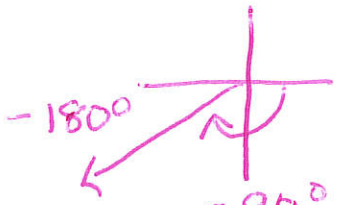
Name_____ Date:_____ Period:_____

1. If each angle has the given measure in standard position, sketch the angle in standard form. Then determine the quadrant that the terminal side lies in. DO NOT CONVERT!

a. $\frac{7\pi}{12}$ Quadrant II



b. -156° Quadrant III



c. 1000° Quadrant IV

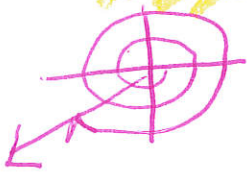
- 360
- 360
280°

d. $\frac{14\pi}{5}$ Quadrant III

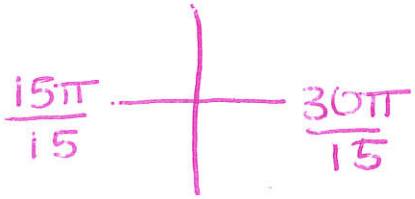
$-\frac{10\pi}{5} = -\frac{4\pi}{5}$

e. -861° Quadrant III

+720
-141



f. $\frac{18\pi}{15}$ Quadrant III



2. Change each degree measure to radian measure in terms of π.

a. -250°_____ b. 145° 29π/36 c. 870°_____ d. 345°_____

$-250 \cdot \frac{\pi}{180} = -\frac{25\pi}{18}$

$870 \cdot \frac{\pi}{180}$

$\frac{87\pi}{18} = \frac{29\pi}{6}$

$345 \cdot \frac{\pi}{180}$

$= \frac{69\pi}{36} = \frac{23\pi}{12}$

3. Change each radian measure to a degree measure.

a. $\frac{3\pi}{16}$ 33.75° b. -2.56 -146.68° c. $-\frac{7\pi}{9}$ -140° d. 12.85 736.25°

$\frac{3\pi}{16} \cdot \frac{180}{\pi}$ (45) $= \frac{135}{4}$

$-2.56 \cdot \frac{180^\circ}{\pi}$

$-\frac{7\pi}{9} \cdot \frac{180^\circ}{\pi}$

$-7 \cdot 20 = -140^\circ$

$12.85 \cdot \frac{180^\circ}{\pi}$

4. Find one positive and one negative angle that are coterminal with the given angle.

a. 70° 430° & -290°

+360 -360

b. $-\frac{2\pi}{5}$ $\frac{8\pi}{5}$ & $-\frac{12\pi}{5}$

$+\frac{10\pi}{5}$ $-\frac{10\pi}{5}$

c. -302° 58° & -662°

+360 -360

d. $\frac{3\pi}{4}$ $\frac{11\pi}{4}$ & $-\frac{5\pi}{4}$

$+\frac{8\pi}{4}$ $-\frac{8\pi}{4}$

e. $\frac{17\pi}{24}$ $\frac{65\pi}{24}$ & $-\frac{31\pi}{24}$

$+\frac{48\pi}{24}$ $-\frac{48\pi}{24}$

f. -546° -186° & 174°

+360 +360

14

$-246 + 60 = -186$

5. Write and expression for all angles that are coterminal with:

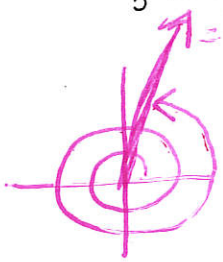
a. $78°$ $78° + 360k$

b. $\frac{53\pi}{85}$ $\frac{53\pi}{85} + 2\pi k$

6. Sketch. Then find the reference angle.

a. $\frac{22\pi}{5}$ $2\pi/5$

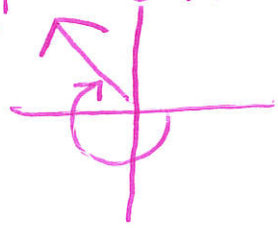
$= \frac{10\pi}{5} + \frac{10\pi}{5} + \frac{2\pi}{5}$



b. $-235°$ $55°$

-270

-180



c. $\frac{98\pi}{23}$ $\frac{6\pi}{23}$

$= \frac{46\pi}{23} + \frac{46\pi}{23} + \frac{6\pi}{23}$

$\frac{23\pi}{23}$

7. The minute hand of a clock is 6 inches long. How far does the tip of the minute hand move in 25 minutes?

Radius = 6 in angle formed at 25 minutes = $\frac{5\pi}{6}$

$r = 6$ in

25 mins $= 5 \cdot \frac{\pi}{6}$

$S = \theta r$

$S = \frac{5\pi}{6} \cdot 6 = 5\pi$ in $\approx$ 15.71 inches

8. A pendulum swings through an angle of 20° each second. If the pendulum is 40 inches long, how far does its tip move each second?

Radius = 40 in angle = $\frac{20° \cdot \pi}{180} = \frac{\pi}{9}$

$S = \theta r$

$S = \frac{\pi}{9} \cdot 40 = \frac{40\pi}{9}$ in $\approx$ 13.96 in

9. An object is traveling around a circle with radius 2 meters. If in 20 seconds the object travels 5 meters then

a) What is the angular speed? (radians/sec)

$r = 2$ m

$\frac{5 \text{ m}}{20 \text{ sec}} \cdot \frac{1 \text{ rad}}{2 \text{ m}} \cdot \frac{5 \text{ rads}}{40 \text{ sec}} \approx .125$ rads/sec

20 sec $= 4 \cdot \frac{\pi}{6} = \frac{2\pi}{3}$ rads

b) What is the linear speed? (meters/min)

$\frac{5 \text{ rads}}{40 \text{ sec}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{5 \text{ m}}{1 \text{ rad}} = \frac{300}{8}$ meters/min

$= 37.5$ meters/min

10. The diameter of each wheel of a bicycle is 26 inches. If you are traveling at a speed of 35 miles per hour on this bicycle, through how many revolutions per minute are the wheels turning?

$r = 13$ in

$$\frac{35 \text{ miles}}{1 \text{ hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{1 \text{ rad}}{13 \text{ in}} \cdot \frac{1 \text{ rev}}{2\pi \text{ rad}} \approx 452.5 \text{ rev/min}$$

11. The radius of each wheel of a car is 15 inches. If the wheels are turning at a rate of 3 revolutions per second, how fast is the car moving in miles per hour?

$$\frac{3 \text{ rev}}{1 \text{ sec}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}} \cdot \frac{15 \text{ in}}{1 \text{ rad}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{1 \text{ mile}}{5280 \text{ ft}} \approx 16.07 \text{ mph}$$

12. To approximate the speed of a current of a river, a circular paddle wheel with radius 4 feet is lowered into the water. If the current causes the wheel to rotate at a speed of 10 revolutions per minute, what is the speed of the current in miles per hour?

$$\frac{10 \text{ rev}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{2\pi \text{ rads}}{1 \text{ rev}} \cdot \frac{4 \text{ ft}}{1 \text{ rad}} \cdot \frac{1 \text{ mile}}{5280 \text{ ft}} \approx 2.86 \text{ mph}$$

13. The spin balancer rotates the wheel of a car at 480 revolutions per minute. If the diameter of the wheel is 26 inches:

a) What road speed is being tested in miles per hour? _____

$$\frac{480 \text{ rev}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}} \cdot \frac{13 \text{ in}}{1 \text{ rad}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{1 \text{ mile}}{5280 \text{ ft}} \approx 37.13 \text{ mph}$$

b) At how many revolutions per minute should the balancer be set to test a road speed of 80 miles per hour?

$$\frac{80 \text{ miles}}{1 \text{ hour}} \cdot \frac{1 \text{ hr}}{60 \text{ mins}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{1 \text{ rad}}{13 \text{ in}} \cdot \frac{1 \text{ rev}}{2\pi \text{ rads}} = 1634.26 \text{ rev/min}$$

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14. At the Cable Car Museum you can see the four cable lines that are used to pull cable cars up and down the hills of San Francisco. Each cable travels at a speed of 9.55 miles per hour, caused by a rotating wheel whose diameter is 8.5 feet. How fast is the wheel rotating in revolutions per minute?

$$\frac{9.55 \text{ miles}}{1 \text{ hour}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} \cdot \frac{1 \text{ rad}}{\frac{8.5}{2} \text{ ft}} \cdot \frac{1 \text{ rev}}{2\pi \text{ rad}} \approx 31.47 \text{ rev/min}$$