Name:_____   Date:_____

Math 10/11 Honors: Section 4.2 Radians and Angles in Standard Position

1. Convert the following angles to radians in terms of π. Show your work.

a) $60°$	b) $30°$	c) $150°$	d) $210°$
e) $90°$	f) $135°$	g) $225°$	h) $240°$
i) $315°$	j) $360°$	k) $330°$	l) $1050°$
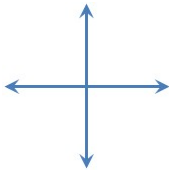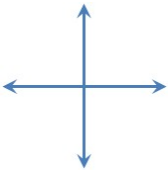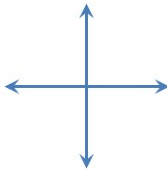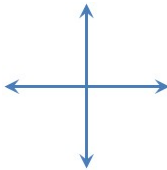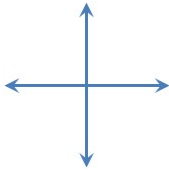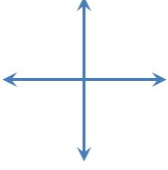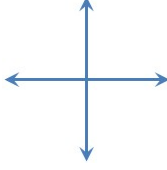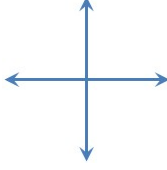
2. Convert the following to the nearest degree. Show your work.

a) $\dfrac{2\pi}{3}$	b) $\dfrac{2\pi}{6}$	c) $\dfrac{2\pi}{4}$	d) $\dfrac{5\pi}{3}$
e) $\dfrac{16\pi}{12}$	f) $\dfrac{11\pi}{3}$	g) $\dfrac{7\pi}{6}$	h) $\dfrac{15\pi}{4}$
i) $\dfrac{\pi}{12}$	j) $\dfrac{5\pi}{6}$	k) $\dfrac{3\pi}{20}$	l) $\dfrac{22\pi}{9}$

3. Determine the arc length that subtends each angle at the center of the circle with radius 10cm.

a) $60°$	b) $150°$	c) $240°$
d) $\dfrac{\pi}{12}$	e) $\dfrac{5\pi}{3}$	f) $\dfrac{7\pi}{6}$

4. Graph each angle in standard position. Find the reference angle.

a) $\dfrac{2\pi}{3}$	b) $-\dfrac{10\pi}{6}$	c) $\dfrac{15\pi}{4}$	d) $-\dfrac{7\pi}{3}$
e) $800°$	f) $1000°$	g) $-500°$	h) $-3000°$

5. In what quadrants are the following angles in?

a) $35°$	b) $900°$	c) $\dfrac{5\pi}{4}$	d) $\dfrac{22\pi}{3}$
e) $-475°$	f) $-2590°$	g) $\dfrac{-9\pi}{5}$	h) $\dfrac{-17\pi}{4}$

6. Evaluate each of the following trigonometric functions without a calculator:

a) $\sin 60°$	b) $\cos 90°$	c) $\tan\dfrac{\pi}{2}$	d) $\cos\dfrac{\pi}{3}$
e) $\sin 45°$	f) $\tan 30°$	g) $\sin\dfrac{\pi}{6}$	h) $\tan 0°$

7. What is the smallest positive coterminal angle of $2000°$?

8. Give a general formula for all the coterminal angles of $-5200°$

9. Find the radius of a circle if an arc of 4cm subtends an angle of $30°$ on the circle.

10. What is the length of an arc subtended from the sector angle $\pi/5$ if the circle has a radius of 20cm?

11. What is the length of the radius of a circle with an arc length of 13.1 cm subtended from a sector of $42°$?

12. As the time changes from 1:00pm to 3:45pm on a clock, determine the change in radians of the minute hand. Determine the change in radians for the hour hand.

13. Derive a formula for the area, A, of a sector of a circle with radius "r", formed by an angle of θ radians. Derive a similar formula when the measure of the angle is in degrees
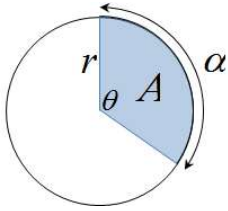
14. If arc "a" is 6π cm long and the central $\theta = 72°$ then what is the area of the sector "A"?

15. Find the radius of a circle if an arc of 3 subtends an angle of $30°$ on the circle

16. Find the angle in degrees if an arc length of 5cm has a radius of 6cm.

17. When an object is moving in a circle, its "angular velocity" is the angle per unit time through which it rotates about the center. A car tire has diameter 64cm. Determine its angular velocity, in radians per second, when the car is travelling at 100km/h.

18. What is the smallest angle formed by the x-axis and the line through the points (2,1) and (-8,7)
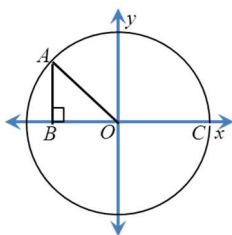
19. What is the sum of: $\sin^2(10°) + \sin^2(20°) + \sin^2(30°) + ... + \sin^2(170°)$

    a) 1   b) 3   c) 5   d) 9   e) 10

20. In the sequence below, each angle is in radians. What is the largest number of consecutive terms of this sequence that can be positive?

$$\cos x, \cos(x+1), \cos(x+2), \cos(x+3), \cos(x+4), \cos(x+5), \cos(x+6)$$

21. Use a geometric approach with an unit circle to show that for any obtuse angle θ, $\sin\theta = \sin(\pi - \theta)$

22. Use the same approach above to show that for any obtuse angle θ, $\cos\theta = -\cos(\pi - \theta)$

23. Challenge: Use the figure below to prove that $\sin(a-b) = \sin a \cos b - \sin b \cos a$. Hint: Use the "Sine Law" if necessary.