

- 1) A bicycle traveled a distance of 100 meters. The diameter of the wheel of this bicycle is 40 cm. Find the number of rotations of the wheel.

$$\text{distance} = 100 \text{ m} = 10000 \text{ cm}$$

$$C = \pi d = 40\pi \text{ cm}$$

$$\frac{10000}{40\pi} = \boxed{79.58 \text{ rotations}}$$

- 2) The wheel of a car made 100 rotations. What distance has the car traveled if the diameter of the wheel is 60 cm?

$$\text{rotations} = \frac{\text{distance}}{\text{circumference}}$$

$$100 = \frac{\text{distance}}{60\pi}$$

$$\boxed{18850 \text{ cm}}$$

- 3) The wheel of a machine rotates at the rate of 300 rpm (rotation per minute). If the diameter of the wheel is 80 cm, what are the angular (in radians per second) and linear speed (in cm per second) of a point on the wheel?

$$\text{Angular Speed} = \frac{\theta}{t} = \frac{300(2\pi)}{1 \text{ min}} = \frac{600\pi}{1 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = \boxed{10\pi \text{ rad/sec}}$$

$$\text{Linear Speed} = \frac{r\theta}{t} = \frac{40(600\pi)}{1 \text{ min}} = \frac{24000\pi}{1 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = 400\pi$$

$$= \boxed{1256.6 \text{ cm/sec}}$$

- 4) The Earth rotates about its axis once every 24 hours (approximately). The radius R of the equator is approximately 4000 miles. Find the angular (in radians per second) and linear (in feet per second) speed of a point on the equator.

Angular Speed

$$\frac{\theta}{t} = \frac{2\pi}{24 \text{ hrs}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = \frac{2\pi}{86400} = \boxed{\frac{\pi}{43200} \text{ rad/sec}}$$

OR .0000727 rad/sec

Linear Speed $R = 4000 \text{ miles} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} = 21120000 \text{ feet}$

$$\frac{r\theta}{t} = \frac{21120000(2\pi) \text{ ft}}{24 \text{ hrs}} \cdot \frac{1 \text{ hr}}{3600 \text{ sec}} = \frac{21120000(2\pi)}{86400 \text{ sec}} = \boxed{1536 \text{ ft/sec}}$$

- 5) Monster truck tires have a radius of 33 inches. How far does a monster truck travel in feet after just three fourths of a tire rotation?

$$\frac{3}{4} = \frac{d}{2\pi(33)}$$

$$4d = 198\pi$$

$$d = 155.51 \text{ inches}$$

$$= \boxed{12.959 \text{ feet}}$$

- 6) A circle has a diameter of 9 centimeters. Find the arc length if the central angle is 60° . Round to the nearest tenth.

$$60^\circ = \frac{\pi}{3} \quad \text{arc length} = r\theta = 4.5\left(\frac{\pi}{3}\right)$$

$$= \boxed{4.7 \text{ cm}}$$

- 7) A tennis player's swing moves along the path of an arc. If the radius of the arc's circle is 4 feet and the angle of rotation is 100° , what is the length of the arc? Round to the nearest tenth.

$$\frac{100^\circ}{1} \cdot \frac{\pi}{180} = \frac{5\pi}{9}$$

$$\text{arc length} = r\theta$$

$$= 4\left(\frac{5\pi}{9}\right)$$

$$= \boxed{7.0 \text{ feet}}$$

- 8) A carousel makes 5 revolutions per minute. The circle formed by the riders sitting in the outside row has a radius of 17.2 feet. The circle formed by riders sitting in the inside row has a radius of 13.1 feet.

- a. Find the angle, in radians, through which the carousel rotates in one second.

$$5 \text{ rpm}$$

$$r = 17.2$$

$$r = 13.1$$

$$\frac{5(2\pi)}{1 \text{ min}} = \frac{10\pi}{1 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = \boxed{\frac{\pi}{6} \text{ rad/sec}}$$

- b. In one second, what is the difference in arc lengths between the riders sitting in the outside row and the riders sitting in the inside row?

outside arc length

$$r\theta = 17.2\left(\frac{\pi}{6}\right)$$

$$= 9 \text{ feet}$$

inside arc length

$$r\theta = 13.1\left(\frac{\pi}{6}\right)$$

$$= 6.86 \text{ ft}$$

$$\boxed{2.14 \text{ feet}}$$

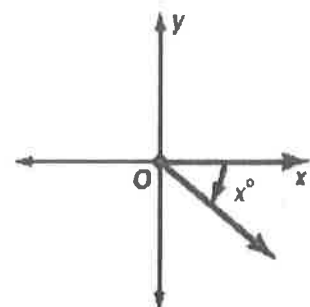
9) Find the error: Tarshia and Alan are writing an expression for the measure of an angle coterminal with the angle shown. Is either of them correct? Explain your reasoning.

Tarshia
The measure of a coterminal angle is $(x - 360)^\circ$.

$x - 360$
 $-45 - 360$
 -405
correct

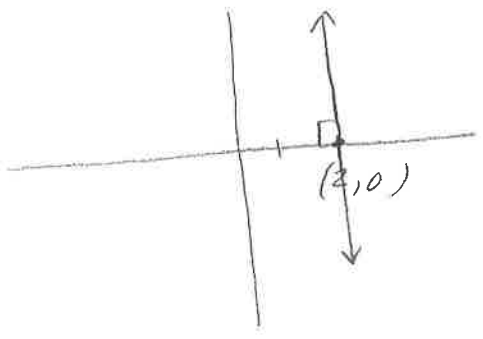
Alan
The measure of a coterminal angle is $(360 - x)^\circ$.

$360 - (-45)$
 $360 + 45$
405
in Q I
wrong!
should be
 $x + 360$



x is a neg \angle
Ex: -45
 $-45 + 360$
 $-45 - 360$

10) A line makes an angle of $\frac{\pi}{2}$ radians with the positive x-axis at the point $(2, 0)$. Find an equation for this line.



$$\frac{\pi}{2} = 90^\circ$$

$$x = 2$$