



## Unit 7: *Uniform Circular Motion* Notes

1. Define ***uniform circular motion***:

Motion in a circular path at constant SPEED

2. Define ***revolution***:

Movement about an external axis

3. Define ***rotation***:

Movement about an internal axis

4. Define ***period (T)***:

The time for one cycle or rotation/revolution  
*Seconds per cycle*

5. Define ***frequency (f)***:

Number of cycles (rotation/revolution) per unit of time, usually seconds  
Measured in hertz (Hz) = *cycles per second*

$$f = \frac{1}{T} \quad T = \frac{1}{f}$$

6. What is the rotation period of Earth? \_\_\_\_\_ what is its  
revolution period? \_\_\_\_\_

7. Does the moon *rotate* or *revolve* around Earth? \_\_\_\_\_

8. Define ***linear (tangential) speed (v)***:

Distance moved per unit time

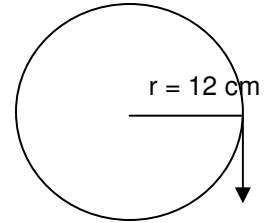
$$v = \frac{2 \pi r}{T}$$

9. Define **rotational (angular) speed**:

Number of rotations/revolutions per unit time (i.e. rpm)

10. A record spins at **33.3 RPMs** (revolutions per minute):

a. What is the *frequency* in hertz (cycles per second)?



b. What is the *period* (seconds per cycle)?

c. What is the *linear speed* at the outer edge? What is the *rotational speed*?

d. What is the *linear speed* at a point half way (6.00 cm) to the outer edge? What is the *rotational speed*?

11. What is the relationship between linear speed and distance from the center of rotation?

12. On a merry-go-round, horses along the outer rail are located **3 times** as far from the axis of rotation as horses along the inner rail. If a boy sitting on an inner horse has a rotational speed of **4 rpm** and a linear speed of **2 m/s**, what will be the rotational and linear speeds of his sister who sits on an outer horse?

13. Define **centripetal acceleration** ( $a_c$ ):

Acceleration toward the center of circular motion

$$a_c = \frac{v^2}{r}$$

14. Define **centripetal force** ( $F_c$ ):

A force that causes an object to follow a circular path  
(remember Newton's 2<sup>nd</sup> law...)

$$F = ma_c \quad \text{or} \quad F = m \frac{v^2}{r}$$

15. A force of some kind is required for any kind of circular motion. Any force that causes an object to follow a circular path is called a \_\_\_\_\_ force, which means “center seeking” or \_\_\_\_\_.

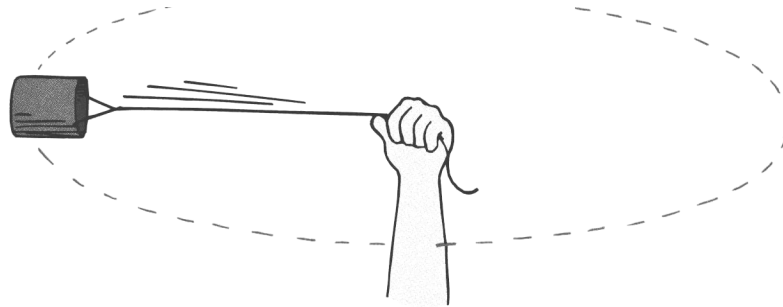
Examples of centripetal force...

16. During the spin cycle of an automatic washing machine, what causes the water to “fly out” of the clothes? Explain!
17. When an automobile rounds a corner, what does the sideways friction between the tires and the road provide? Explain!

18. Centripetal vs. Centrifugal

What forces are acting on the can???

What happens to the spinning can when the string breaks???



<b>Centripetal</b>	<b>Centrifugal</b>
“center seeking”	“center fleeing”
Real force that causes an object to follow a circular path	A “fictitious” force; an <u>effect</u> of rotation and inertia

19. When driving around a curve in the road, what force causes you to slide in your seat toward the outside of the curve?

20. Bubba’s favorite ride at Bush Gardens is the Rotor, which has a radius of 4.0 m. The ride takes 2.0 s to make one full revolution. Bubba’s mass is 92 kg....

a. What is Bubba’s linear speed?

b. What is his centripetal acceleration?

c. What is the force required to make Bubba spin in a circle (centripetal force)?

