ABRHS PHYSICS (CP) NAME: KEY

Centripetal Acceleration Notes

Basic Notes

A. What does the term "centripetal" mean?

Center-Seeking (because the acceleration is to the center of the circle.)

B. If you go in a circle with a constant speed, why are you accelerating?

Because your velocity is changing! Remember that velocity is speed PLUS direction – so v is changing b/c your direction is changing.

C. What is always true about the direction you move when you go around in a circle?

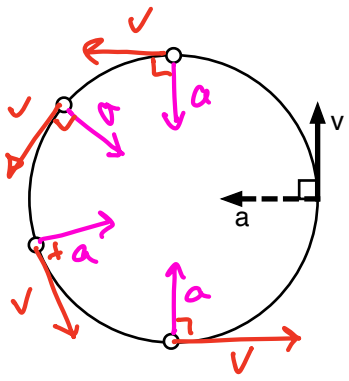
It is tangent to the circle.

D. In which direction are you accelerating when you go around in a circle?

Always to the center of the circle

E. What is the equation that relates centripetal acceleration, speed and radius?

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



F. The diagram to the right represents something going in a circle with a constant speed and constant radius. At one point, the velocity and acceleration are shown. Draw appropriate vectors to represent the velocity and acceleration for the other points on the circle.

Questions

1. How does the direction of your velocity compare to the direction of your acceleration if you are going in a circle with a constant speed?

The acceleration is always ⊥ to the velocity.

2. If you tried to go around a circle twice as fast (but same radius), what has to happen to your acceleration?

Since $a_c = \frac{v^2}{r}$ $\quad \frac{(2v)^2}{r} = 4\frac{v^2}{r}$ So it will be 4 times the acceleration

↑ twice the speed

3. If you tried to go around a circle with twice the radius (but the same speed), what has to happen to your acceleration?

$a_c = \frac{v^2}{r}$ So $\quad \frac{v^2}{2r} = \frac{1}{2}\frac{v^2}{r}$ So it will be $\frac{1}{2}$ the acceleration

↑ twice the radius

Centripetal Acceleration Notes

4. If somehow your acceleration was always perpendicular to your velocity, describe your motion.

You would go in a circle with a constant speed!

5. For each of the following amusement park rides, describe the direction of your acceleration:
   a. On a Ferris Wheel, when you are at the highest point.

a is ↓ (down) The center of the circle is below you

   b. On a Ferris Wheel, when you are at the lowest point.

a is ↑ (up) The center of the circle is above you

   c. On a loop-the-loop coaster, when you are at the highest point.

a is ↓ (down) The center of the circle is below you

   d. On a loop-the-loop coaster, when you are at the lowest point.

a is ↑ (up) The center of the circle is above you

   e. On the Turkish Twist.

In front of you - You are facing the center of the circle.