Write yo name here on this line man! Key

AP Physics 1: 7.3 Centripetal Force Intro (Groups)

1) Imagine you're in a car with your buddy, he's driving. Your sitting at a stop light and it just turns green, your buddy hits the gas as hard as he possibly can.
   a) Which direction is the car accelerating? Draw an arrow on the car to show which direction.

      Forward

   b) Which direction does your body fly towards?

      Backwards

2) So now you and your buddy are flying down the street at a very fast pace and a cute little kitty cat walks into the middle of the road, since you're a nice person you hit the brakes as hard as you can to avoid running over the cute little kitty cat.
   a) Which direction is the car accelerating? Draw an arrow on the car to show which direction.

      Backward

   b) Which direction does your body fly towards?

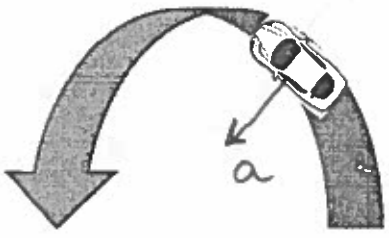
      Forward

3) So now your back to driving down the street and you just realized you forgot something back at the house. You yell to your buddy, make a U-turn we gotta go back home! So your bud turns around as quick as he can.
   a) In which direction does your body fly towards as he turning around?

      away from the turn

   b) So on this picture below, draw an arrow of which direction you believe the acceleration is directed.

      toward the center



**********CHECKPOINT**********

Write yo name here on this line man!_____

4) When a car, or any object, turns its acceleration is directed towards the center of turn. We call this acceleration directed towards the center of a turn, centripetal acceleration. Locate the formula for centripetal acceleration on your formula chart.

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

5) If a ball is being spun in a circle on a string that has a length of 2 meters at a constant velocity of 30 m/s. What is the centripetal acceleration of the ball?

$$a_c = \frac{(30)^2}{2} = \frac{900}{2} = 450\ m/s^2$$

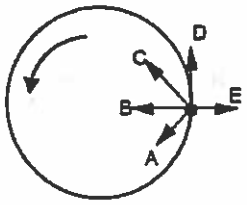
6) In problem #5 the ball being spun in a circle has a centripetal acceleration directed towards the middle of the circle at all times. The ball also has a mass. What's a formula we know that involves mass and acceleration?

$$F = ma$$

This means that all things moving in a circle or turning must not only have a centripetal acceleration but also a centripetal force. So create a formula for centripetal force that uses the variables mass, velocity and radius.

$$F_c = m\left(\frac{v^2}{r}\right) = \frac{mv^2}{r}$$

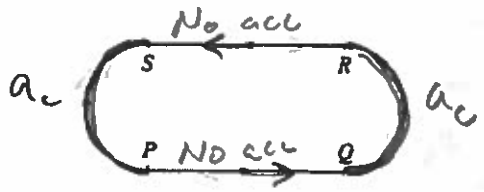
**********CHECKPOINT**********



18. An object shown in the accompanying figure moves in uniform circular motion. Which arrow best depicts the net force acting on the object at the instant shown?
(A) A (B) B (C) C (D) D (E) E

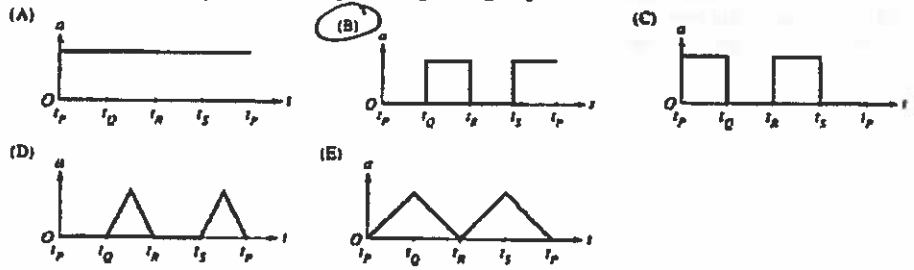
Centripetal Force

Write yo name here on this line man!_____



$\frac{v^2}{r}$ since both those values are non-changing through the turn than its a constant a_c

15. A figure of a dancer on a music box moves counterclockwise at constant speed around the path shown above. The path is such that the lengths of its segments, *PQ*, *QR*, *RS*, and *SP*, are equal. Arcs *QR* and *SP* are semicircles. Which of the following best represents the magnitude of the dancer's acceleration as a function of time t during one trip around the path, beginning at point *P* ?



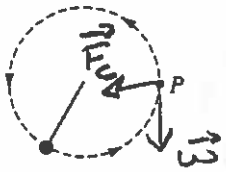
2. A ball attached to a string is whirled around in a horizontal circle having a radius r. If the radius of the circle is changed to 4r and the same centripetal force is applied by the string, the new speed of the ball is which of the following?

(A) One-quarter the original speed
(B) One-half the original speed
(C) The same as the original speed
(D) Twice the original speed
(E) Four times the original speed

original F_c $\rightarrow$ $F_c = \frac{mv^2}{r}$ $\rightarrow$ $v = \sqrt{\frac{F_c r}{m}}$

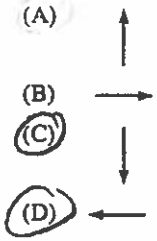
New F_c $\rightarrow$ $F_c = \frac{m(v)^2}{4r}$ $\rightarrow$ $v = \sqrt{\frac{4rF_c}{m}} = 2\sqrt{\frac{F_c r}{m}}$

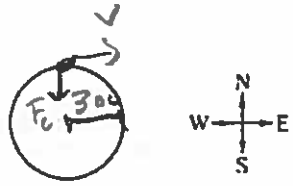
Write yo name here on this line man!_____



Side View

132. A ball attached to a light string swings in a counterclockwise vertical circle, as shown above. Which of the following arrows represent one of the forces exerted on the ball at the moment it passes through point *P* ? Select two answers.





View of Track from Above

3. A racing car is moving around the circular track of radius 300 meters shown above. At the instant when the car's velocity is directed due east, its acceleration is directed due south and has a magnitude of 3 meters per second squared. When viewed from above, the car is moving

(A) clockwise at 30 m/s (B) clockwise at 10 m/s (C) counterclockwise at 30 m/s
(D) counterclockwise at 10 m/s (E) with constant velocity

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

$$3 = \frac{v^2}{300} \qquad v = \sqrt{3 \cdot 300} = \sqrt{900} = 30$$

5. In which of the following situations would an object be accelerated?

I. It moves in a straight line at constant speed.
II. It moves with uniform circular motion. ← centripetal acceleration
III. It travels as a projectile in a gravitational field with negligible air resistance. ← gravity is accelerating it.

(A) I only (B) III only (C) I and II only (D) II and III only (E) I, II, and III.