

Ap Physics 1

Uniform Circular Motion Notes

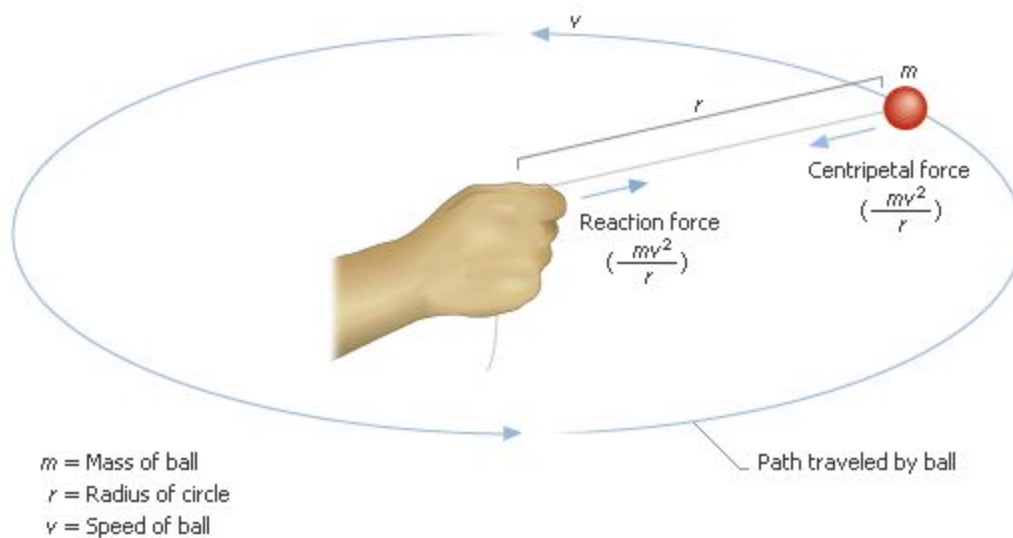
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Description: The Motion of an object in a circle at a constant speed

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Centripetal Force

"Centripetal" means center seeking



$$F_c = \frac{mv^2}{R}$$

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- The force toward the center may be caused by gravity, friction, or another force.
 - if the Force is too small or the object traveling too fast, then it will move outward from the circular path. If the object travels too slowly or the Force is too large, then it will fall inward toward the center. For a given speed and radius, there is only one magnitude of Force which is exactly right for keeping the object moving in a circle.
 - Objects experiencing uniform circular motion travel in a circle at a constant speed.
 - To Calculate the speed of the object use the formula below

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

T is the period or the time it takes for one complete revolution measured in seconds.

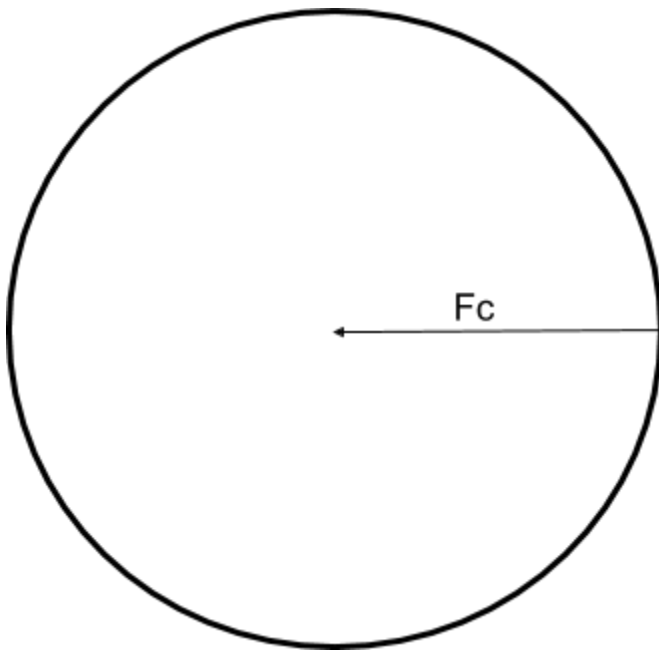
The direction of Instantaneous velocity is always tangent to the circle and is sometimes called tangential velocity. The direction of the velocity is constantly changing; which is why objects in uniform circular motion does not have a constant velocity, even if the speed is constant. The magnitude of this velocity is referred to as tangential speed and is usually constant. Describe the tangential velocity and consider the magnitude and direction of the velocity at that point if asked about motion of an object at a specific point.

You should remember that acceleration is a change in velocity, and since the tangential velocity is not constant. The direction is always changing and the objects in uniform circular motion are constantly accelerating. The acceleration of an object traveling in a circle is called centripetal acceleration.

- Centripetal Acceleration
 - Is a vector and always points toward the center of the circle or radially inward.
 - If an object is undergoing uniform circular motion then the centripetal acceleration is caused by the net force, this can be labeled the centripetal force and both point toward the circle.
 - The Force and acceleration are perpendicular (at an angle of 90° to a given line, plane, or surface) to the velocity and have no components in alignment with the velocity, they act only to change the direction of the motion, causing it to constantly turn or go in a circle rather than causing it to speed up.

Question:

1. A 0.25 kg ball moves in a horizontal circle of radius 1.5 m at a speed of 30 m/s. What is the centripetal force acting on the ball? Hint: (use the free body diagram and the formula to solve the problem)



$$F_c = \frac{Mv^2}{R}$$