

Circular motion

Centripetal acceleration

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

Centripetal acceleration = $\frac{(\text{tangential velocity})^2}{\text{radius}}$

Tangential Velocity - The speed of the object in circular motion. The tangential velocity depends on the distance from the object to the center of the circular path.

Centripetal acceleration is due to the change in direction.

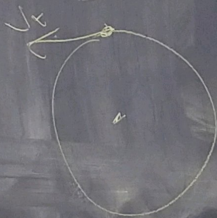
$$a = \frac{\Delta v}{\Delta t}$$

Velocity is a vector, it has magnitude & direction!

Centripetal force

$$F_c = m a_c$$

$$F_c = \frac{m v_t^2}{r}$$



P.E. (potential) $mg h$

A car is 48.2 m from the center of the track, it has a centripetal acceleration of 8.05 m/s^2 . What is the tangential speed of the car?

$$a_c = \frac{v_t^2}{r} \quad v_t^2 = a_c \cdot r$$

$$v_t = \sqrt{a_c \cdot r} = \sqrt{(8.05 \text{ m/s}^2)(48.2 \text{ m})}$$

$$v_t = 19.7 \text{ m/s}$$

Classwork

1. A yo-yo has a centripetal acceleration of 250 m/s^2 . If the yo-yo's string is 0.50 m long, what is the yo-yo's tangential velocity?

2. A dog sits 1.50 m from the center of a merry-go-round & has a tangential velocity of 1.80 m/s . If the dog's mass is 18.5 kg, what is the centripetal force on the dog?