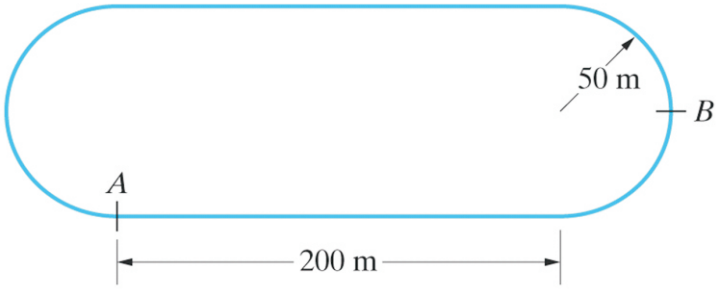
Name

Date

**Week:** _____ **Problem:** _____

## Given:

In the preliminary design of a sun-powered car, a group of engineering students estimates that the car's acceleration will be 0.6 m/s$^2$. Suppose that the car starts from rest at $A$ and the tangential component of its acceleration is $a_t = 0.6$ m/s$^2$. What are the car's velocity and acceleration in terms of normal and tangential components when it reaches $B$?




## Required:

## Solution:

**Solution:**

$$a_t = v\frac{dv}{ds} = 0.6 \text{ m/s}^2 \Rightarrow \int_0^v v\,dv = \int_0^s (0.6 \text{ m/s}^2)\,ds$$

$$v^2 = 2(0.6 \text{ m/s}^2)s$$

At point $B$

$$s_B = \left(200 + \frac{50\pi}{2}\right) m \Rightarrow v_B = 18.28 \text{ m/s}, \quad a_{Bn} = \frac{v_B^2}{50 \text{ m}} = 6.68 \text{ m/s}^2$$

Thus

$$\mathbf{v}_B = (18.28\mathbf{e}_t) \text{ m/s}$$
$$\mathbf{a}_B = (0.6\mathbf{e}_t + 6.68\mathbf{e}_n) \text{ m/s}^2$$