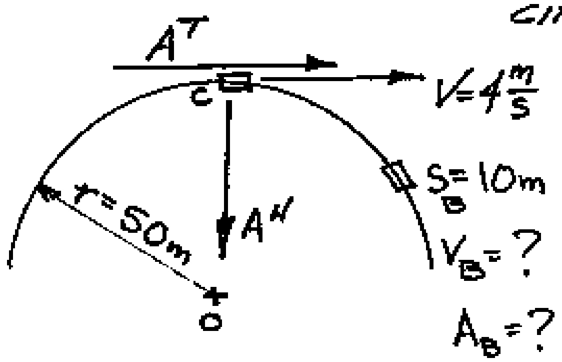
HIBBELER

12-106

CIRCULAR PATH



RADIUS, $r = 50m$

$V = 4 \frac{m}{s}$

$A = \dot{V} = 0.05s$

function of distance not time

$$a = \frac{dv}{dt} = \frac{v\,dv}{ds}$$

Remember: $v = \frac{ds}{dt}$

$\therefore dt = \frac{ds}{v}$

$$a\,ds = v\,dv$$

$$\int_0^{10}(0.05\,s)\,ds = \int_{4\frac{m}{s}}^{v} v\,dv$$

$$0.05\,\frac{s^2}{2}\Big]_0^{10m} = \frac{v^2}{2}\Big]_{4\frac{m}{s}}^{v}$$

$$0.025\,(10m)^2 = \frac{v^2}{2} - \frac{(4\frac{m}{s})^2}{2}$$

$$2\left[0.025(10)^2\right] + 16 = v^2$$

or...

$2a(s - s_o) = V^2 - V_o^2$

$\therefore \boxed{V_B = 4.583\,\frac{m}{s}}$

$A^T = 0.05\,s = 0.05(10m) \therefore A^T = 0.5\,\frac{m}{s^2}$ ✓

TANGENT TO PATH

You must include A^N = PERPENDICULAR TO PATH

$$A^N = \omega^2 r = \frac{V^2}{r} = \frac{(4.583\,\frac{m}{s})^2}{50m} = 0.42\,\frac{m}{s^2} = A^N$$ ✓

$$A^{TOT} = \vec{A^N} + \vec{A^T} = \sqrt{(0.42)^2 + (0.5)^2} = \boxed{0.653\,\frac{m}{s^2} = A_B^{TOT}}$$

NORMAL ACC. = CENTRIPETAL ACC. pulling in toward center of rotation to keep mass on the circular path. It is a function of Velocity ONLY.

TANGENTIAL ACC. = pulls the mass off the path, tangent to path. It is a function of a change in Velocity.