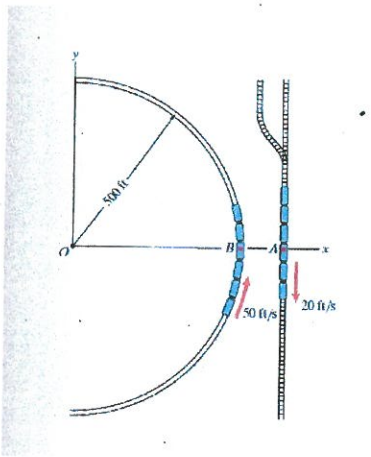
Problem 2: Particle Kinematics II

a. The train on the circular track is traveling at 50 ft/s. The train on the straight track is traveling at 20 ft/s. What is the velocity of passenger ***A*** relative to passenger ***B***?

b. The train on the circular track is traveling at 50 ft/s. The train on the straight track is traveling at 20 ft/s and is increasing its speed at 2 ft/s^2. What is the acceleration of passenger ***A*** relative to passenger ***B***?



a. $\vec{V}_A = \vec{V}_B + \vec{V}_{A/B}$

$\downarrow = \uparrow + \uparrow\rightarrow$ (with $(v_{A/B})_y$, $(v_{A/B})_x$, Y, X)

20 Fps, 50 Fps

$y\uparrow \quad -20 = 50 + (V_{A/B})_y \qquad (V_{A/B})_y = V_{A/B} = -70 = 70 \text{ Fps} \downarrow$

$\rightarrow x: (v_{A/B})_x = 0$

b. $\vec{a}_A = \vec{a}_B + \vec{a}_{A/B}$

$\downarrow = \leftarrow + \uparrow\rightarrow$ (with $(a_{A/B})_y$, $(a_{A/B})_x$)

2 Fps, $\frac{(50)^2}{500}$

$x\rightarrow \quad 0 = -5 + (a_{A/B})_x$

$(a_{A/B})_x = 5 \text{ Fps}^2$

$y\uparrow \quad -2 = 0 + (a_{A/B})_y$

$(a_{A/B})_y = -2 \text{ Fps}^2$

$\vec{a}_{A/B} = [5 \; -2] \text{ Fps}^2$