DATE

TOPIC

Chapter 3 In-Class Homework Problems

Ex. 25 The earth has a radius of 6380 km and turns ....

a.) Radial acceleration at the equator

$$a_{rad} = \frac{v^2}{R} = \left(\frac{2\pi R}{T}\right)^2 \frac{1}{R} = \frac{4\pi^2 R}{T^2} = \frac{4\pi^2 (6380\times10^3\ m)}{(\underbrace{86{,}400\ s}_{1\ day})^2}$$

$$\boxed{a_{rad} = 0.0337\ m/s^2}$$

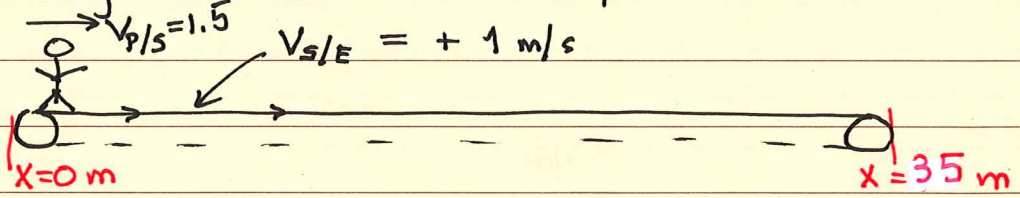
$$a_{rad} = 0.0337\ \frac{m}{s^2}\left(\overbrace{\frac{1\ "g"}{9.8\ m/s^2}}^{conversion}\right) = \boxed{0.00344\ g's}$$

b.) How fast would the earth have to rotate for $\underbrace{a_{rad} = g}_{\text{on the equator}}$?

$$g = \frac{4\pi^2 R}{T^2} = \frac{4\pi^2 (6380\times10^3\ m)}{T^2}$$

$$T = 2\pi\sqrt{\frac{6380\times10^3\ m}{g = 9.8\ m/s^2}} = \underline{5{,}070\ sec}\left(\overbrace{\frac{1\ hr}{3600\ s}}^{conversion}\right) = \boxed{1.41\ hrs}$$

Ex. 35 A "moving sidewalk" in an airport terminal building ....



a.) $V_{p/E} = V_{p/s} + V_{s/E} = +1.5\ m/s + 1.0\ m/s = 2.5\ m/s$

$$X = V_{p/E}\,t \qquad t = \frac{X}{V_{p/E}} = \frac{35\ m}{2.5\ m/s} = \boxed{14.0\ s}$$

b.) Opposite direction $V_{p/E} = V_{p/s} + V_{s/E} = -1.5\frac{m}{s} + 1.0\ m/s$

$V_{p/E} = -0.50\ m/s$

$$X = V_{p/E}\,t \qquad t = \frac{X}{V_{p/E}} = \frac{-35\ m}{-0.50\ m/s} = \boxed{70.\ s}$$

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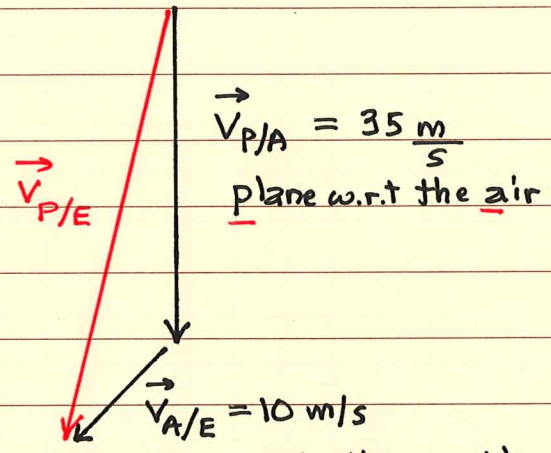
Ex. 40 The nose of an ultralight plane is pointed due south, ...



$$\vec{V}_{P/E} = V_{P/A} + V_{A/E}$$

$$\vec{V}_{P/A} = (0\,\hat{i} \quad -35\,\hat{j})\ m/s$$
$$\vec{V}_{A/E} = (-7.07\hat{i} \quad -7.07\hat{j})\ m/s$$

(b.) $$\vec{V}_{P/E} = (-7.07\,\hat{i} \quad -42.07\,\hat{j})\ m/s$$

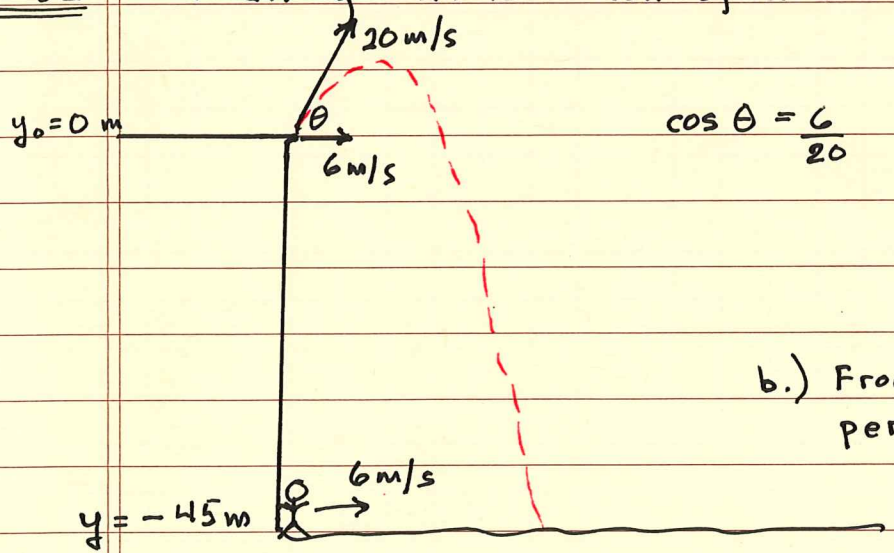
c.) $$|\vec{V}_{P/E}| = \sqrt{(-7.07)^2 + (-42.07)^2}$$

$$|\vec{V}_{P/E}| = \boxed{42.65\ m/s}$$

$$\theta = \text{Tan}^{-1}\left(\frac{V_y}{V_x}\right) = \text{Tan}^{-1}\left(\frac{-42.07}{-7.07}\right)$$

$$\theta = 80.46^\circ + 180^\circ = \boxed{260.^\circ}$$

Prob. 62 A 2.7 kg ball is thrown upward with an initial speed .....



$$\cos\theta = \frac{6}{20} \qquad \theta = \text{Cos}^{-1}\left(\frac{6}{20}\right) = \boxed{72.54^\circ}$$

b.) From the woman's perspective