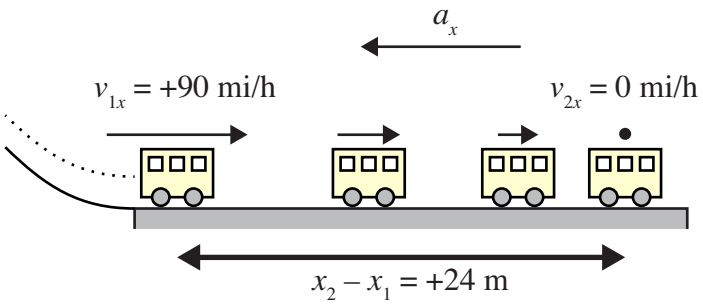
Name_____Sec_____Date_____

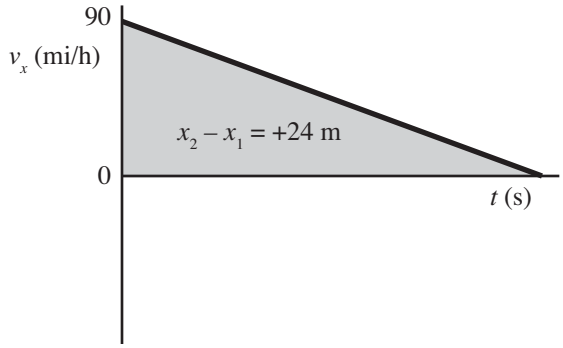
CONSTANT ACCELERATION PROBLEM WORKSHEET
SAMPLE PROBLEM

A cubicle containing eight people at an amusement park has been accelerated as the result of a previous free fall. It has changed direction on a track and is coasting horizontally with a velocity of 90 MPH when the brakes are applied. The cart slows down at a constant acceleration and comes to rest in a distance of 24 m. What is its acceleration due to the braking action? (Mass of the Cubicle = 1.6×10^{3} kg)

Part 1: Motion Diagram



Part 1: Sketched Graph for Velocity vs. Time



Part 2: Table and Unit Conversions

$x_1 = 0.00$ m

$x_2 = +24$ m

$$v_{1x} = +90\frac{\text{mi}}{\text{h}} = \left(+90\frac{\text{mi}}{\text{h}}\right)\left(\frac{0.447\,\text{m/s}}{1\,\text{mi/h}}\right) = +40.2\frac{\text{m}}{\text{s}}$$

$v_{2x} = 0.0\dfrac{\text{m}}{\text{s}}$

$a_x = ?$

$t_1 = 0.00$ s

$t_2 = ?$

Part 2: Equations

$$x_2 = x_1 + v_{1x}(t_2 - t_1) + \frac{1}{2}a_x(t_2 - t_1)^2$$

$$v_{2x} = v_{1x} + a_x(t_2 - t_1)$$

$$v_{2x}^2 = v_{1x}^2 + 2a_x(x_2 - x_1)$$

Part 3: Algebra and Substitution

$$v_{2x}^2 = v_{1x}^2 + 2a_x(x_2 - x_1) \quad so \quad a_x = \frac{v_{2x}^2 - v_{1x}^2}{2(x_2 - x_1)}$$

$$a = \frac{(0\,\text{m/s})^2 - (+40.2\,\text{m/s})^2}{2(+24\,\text{m} - 0\,\text{m})} = -33.7\frac{\text{m/s}}{\text{s}}$$

ANSWER
(w/ proper significant figures, units, and unit vector notation)

$$\boxed{a_x = -34\frac{\text{m/s}}{\text{s}}}$$

Note: Two significant figures

Part 4: Units Check

$$\frac{[\text{m}]}{[\text{s}]^2} = \frac{[\text{m/s}]^2 - [\text{m/s}]^2}{[\text{m}]} = \frac{[\text{m/s}]}{[\text{s}]}$$

OK