Name: _____ Date: _____

Flying T-Shirt Physics Worksheet Answers

Position, Velocity & Acceleration

The position, velocity and acceleration of an object can be calculated using the following equation:

$$p = p_o + v_o \cdot t + 0.5 \cdot a \cdot t^2$$

where

p = position (m)
p_o = starting position (m)
v_o = starting velocity (m/s)
a = acceleration (m/s^2)
t = time (s)

1. Calculate the distance traveled (p-p_o) by a ball after 6 seconds. Assume its initial velocity is 5 m/s and no acceleration.

   $(p - p_o) = v_o \cdot t + 0.5 \cdot a \cdot t^2$

   $(p - p_o) = 5 \cdot 6 + 0.5 \cdot 0 \cdot 6^2$

   $(p - p_o) = 30$

   The ball traveled 30 meters.

2. Calculate the distance traveled (p-p_o) by a ball after 6 seconds. Assume its initial velocity is 5 m/s and an acceleration of 1 m/s^2.

   $(p - p_o) = v_o \cdot t + 0.5 \cdot a \cdot t^2$

   $(p - p_o) = 5 \cdot 6 + 0.5 \cdot 1 \cdot 6^2$

   $(p - p_o) = 48$

3. Calculate the distance traveled (p-p_o) by a ball after 6 seconds. Assume its initial velocity is 5 m/s and an acceleration of -1 m/s^2. (The minus sign indicates the ball is slowing down as opposed to speeding up.)

   $(p - p_o) = v_o \cdot t + 0.5 \cdot a \cdot t^2$

   $(p - p_o) = 5 \cdot 6 - 0.5 \cdot 1 \cdot 6^2$

   $(p - p_o) = 12$

4. Calculate the amount of time the ball has been moving if it traveled 50 meters, had an initial velocity of 5 m/s and an acceleration of 2 m/s^2. *Hint:* use the quadratic formula to solve.

   $0.5 \cdot a \cdot t^2 + v_o \cdot t - (p - p_o) = 0$

   $0.5 \cdot 2 \cdot t^2 + 5 \cdot t - 50 = 0$

   $$t = \frac{-b \pm \sqrt{b^2 - 4 \cdot a \cdot c}}{2 \cdot a} = \frac{-5 \pm \sqrt{5^2 + 4 \cdot 1 \cdot 50}}{2 \cdot 1}$$

   $t = 5$

   The ball was moving for 5 seconds.