$v_f = v_i + at$ $x = \frac{1}{2}(v_i + v_f)t$ $v_f^2 = v_i^2 + 2ax$ $x = v_it + \frac{1}{2}at^2$

Academic Physics Name: Key

Accelerated Motion I Date: ______

always use variables initially given!!

Directions: Identify each number given with a variable that stands for it. Use the information to solve for the desired quantity. **Remember the 4 constant acceleration equations!!**

1. A ball starting from rest accelerates at 6 m/s^2 down an inclined plane for 2.5 seconds.
   a. What is the velocity of the ball at the end of the 2.5 seconds?

   $v_f = v_i + at$ $v_f = 0\,m/s + (6\,m/s^2)(2.5\,s)$

   v_f = +15 m/s N

   b. How far does the ball travel during the 2.5 seconds? solve for ax

   * use same given variables * Eqn w/ no v_f

   $v_i = 0\,m/s$, $a = 6\,m/s^2$, $t = 2.5\,s$

   $x = v_it + \frac{1}{2}at^2$ $x = (0\,m/s)(2.5\,s) + \frac{1}{2}(6\,m/s^2)(2.5\,s)^2$ $x = 0 + 18.75\,m$

   Ax = +18.75 m N

2. An airplane flying at a velocity of 165 m/s accelerates at a rate of 7.0 m/s^2 for 5.0 seconds.
   a. What is the final velocity of the plane?

   $v_f = v_i + at$ $v_f = 165\,m/s + (7.0\,m/s^2)(5\,s)$

   v_f = +200 m/s S

   b. How far does the plane travel during the 5.0 seconds? solve for x

   $v_i = 165\,m/s$, $a = 7\,m/s^2$, $t = 5\,s$, $x = ?$

   $x = v_it + \frac{1}{2}at^2$ $x = (165\,m/s)(5\,s) + \frac{1}{2}(7\,m/s^2)(5\,s^2)$ $x = 825\,m + 87.5\,m$

   x = 912.5 m

3. A motorist uniformly accelerates from 26 m/s to 32 m/s in 4.0 seconds while passing another car.
   a. What is the acceleration of the car?

   $v_f = v_i + at$ $32\,m/s = 26\,m/s + a(4\,s)$ $\frac{6\,m/s}{4} = \frac{4a}{4}$

   a = +1.5 m/s^2 E

   b. What distance does the car travel while passing the other car?

   $v_f = 32\,m/s$, $v_i = 26\,m/s$, $t = 4\,s$, $x = ?$

   $x = \frac{1}{2}(v_i + v_f)t$ $x = \frac{1}{2}(26 + 32)4$

   x = 116m

4. A model airplane needs to achieve a velocity of 20 m/s before it can take off. It is capable of accelerating at a rate of 0.80 m/s^2. What is the shortest runway that can be used to operate this plane?

   $v_i = 0\,m/s$, $v_f = 20\,m/s$, $a = 0.8\,m/s^2$, $x = ?$

   $v_f^2 = v_i^2 + 2ax$ $(20\,m/s)^2 = (0\,m/s)^2 + 2(0.8\,m/s^2)x$ $\frac{400\,m^2/s^2}{1.6\,m/s^2} = \frac{1.6\,m/s^2\,x}{1.6\,m/s^2}$

   x = 250 m

5. A motorcycle starts from rest and accelerates uniformly for 5.0 seconds. During this time, it travels a distance of 140 meters. At what rate was it accelerating?

   $v_i = 0\,m/s$, $t = 5\,s$, $x = 140\,m$, $a = ?$

   $x = v_it + \frac{1}{2}at^2$ $140\,m = (0\,m/s)(t) + \frac{1}{2}(a)(5\,s^2)$ $\frac{140\,m}{12.5} = \frac{12.5\,s^2\,a}{12.5}$

   a = +11.2 m/s^2