Name _____ Hour _____

Short Answer Review:

Introductory Material:

1. Convert the speed of light (3.00 x 10^8 m/s) into km/hr. (1.08 x 10^9 km/hr)

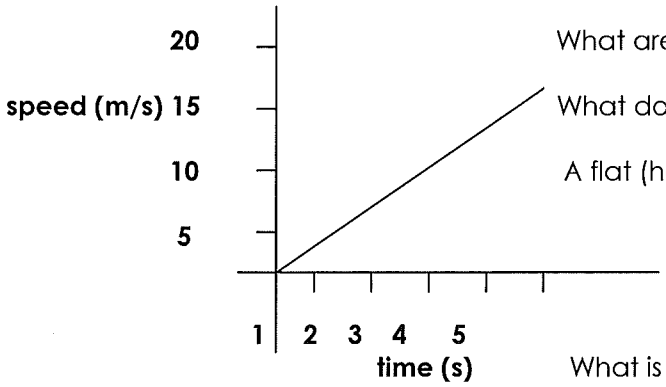
$3\times10^8 \frac{m}{s} \times \frac{1\,km}{1000\,m} \times \frac{3600\,s}{1\,hr} = 1.08\times10^9\ km/hr$

2. What units do you end up with if you multiply acceleration by time.

$\frac{m}{s^2} \cdot s = \frac{m}{s}$

1- Dimensional Motion:

3. Use the graph of a car's motion below to answer the following questions:



What are the units of the slope? m/s^2

What does the slope measure? acc

A flat (horizontal line) on graph means what? constant speed

If you multiply speed x time, what unit do you end up with? $\frac{m}{s} \cdot s = m$

What is the car doing? accelerating at $3\ m/s^2$

How far (Δx) did the car travel in the 5 seconds? Solve this using both:

area under the line (triangle) **AND** a **1-D equation**

$\frac{1}{2} \cdot b \cdot h$

$\frac{1}{2}(5)(15)$

37.5 m

$\Delta x = v_i \Delta t^0 + \frac{1}{2}(3)5^2$

37.5 m

4. Nathan accelerates from rest to 12.5 m/s in 2.5 sec.
   a. What is his acceleration? (5 m/s²)

$\frac{12.5\ m/s - 0}{2.5} = 5\ m/s^2$

   b. How far did he travel? (15.6 m)

$\Delta x = v_i \Delta t^0 + \frac{1}{2} a \Delta t^2$

$\frac{1}{2}(5)(2.5)^2 = 15.6\ m$

5. A bus slows down from 75 km/hr to a stop in 21 sec. How far did it travel? CAREFUL with both units and acceleration! *(219 m)*

$75\ km/hr \times \frac{1000\,m}{1\,km} \times \frac{1\,hr}{3600\,s} = 20.83\ m/s$

$v_i = 20.83\ m/s$

$v_f = 0$

$\Delta t = 21\ sec$

(1) Find a

$a = \frac{v_f - v_i}{\Delta t} \quad \frac{0 - 20.83}{21} = -0.992\ m/s^2$

(2) $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$

$(20.83)(21) + \frac{1}{2}(-.992)(21^2)$

$\Delta x = 218.7\ m$

Name _____ Hour _____

6. A worker drops a wrench from the top of a tower 80.0 m tall. What is the velocity right before the wrench hits the ground? *(-39.6 m/s)*

$\Delta y = 80m$
$a = -9.8 m/s^2$
$V_i = 0$

$V_f^2 = V_i^2 + 2a\Delta y$
$V_f^2 = 2(-9.8)(-80m)$
$V_f^2 = 1568$
$V_f = 39.6 m/s$

7. A cannon ball starts at rest and leaves the cannon at a speed of 12 m/s. The length of the cannon is 1.4 m. How long (Δt) was the cannon ball in the cannon? *(ans. 0.23 sec.)*

① Find a

$V_i = 0$
$V_f = 12 m/s$
$\Delta X = 1.4m$

$V_f^2 = V_i^2 + 2a\Delta X$
$12^2 = 2(a)(1.4)$
$a = 51.43 m/s^2$

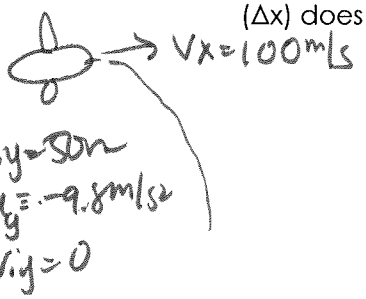
② Find Δt

$a = \frac{V_f - V_i}{\Delta t}$ $\quad 51.43 m/s^2 = \frac{12-0}{\Delta t}$

$\Delta t = 0.23 sec$

Projectile Motion:

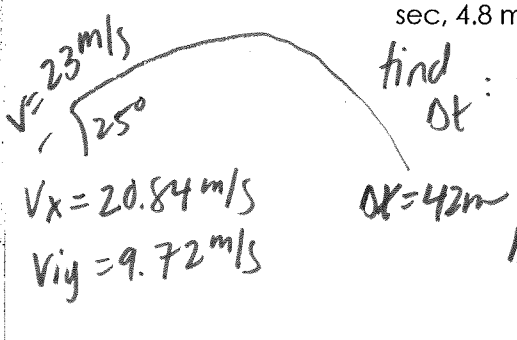
8. A rescue plane drops a package to a stranded party of explorers. The plane is traveling horizontally at 100 m/s at a height of 50 m above the ground. What horizontal distance (Δx) does the package travel before striking the ground? *(ans. 319 m)*



① use $\Delta y = V_{iy}\Delta t + \frac{1}{2} a_y \Delta t^2$ to solve Δt (3.19 sec)

② use $V_x = \frac{\Delta x}{\Delta t}$ to find Δx (319m)

9. A baseball is thrown at an angle of 25° N of E with a velocity of 23 m/s. If the ball travels 42 m horizontally,
   a. How long (Δt) was it in the air, and what was the maximun height of the ball? (2.0 sec, 4.8 m)



find Δt: $a = \frac{V_{fy} - V_{iy}}{\Delta t}$ $\quad V_x = \frac{\Delta x}{\Delta t}$ $\quad 20.84 = \frac{42}{\Delta t}$

$\Delta t = 2.02 sec$

$\Delta y = V_{iy}\Delta t + \frac{1}{2} a_y \Delta t^2$ at ½ way point!
(Δt: 1.01 sec; Δt: 1.01 sec)

10. You launch a tennis ball and it travels 19 m in 1.2 seconds. Calculate the velocity of the ball and the angle it was launched at. (16.9 m/s at 20.3° N of E)

① solve Vx (15.83 m/s)
② solve Viy (5.88 m/s)
$a_y = \frac{V_{fy} - V_{iy}}{\Delta t}$

③ $V^2 = V_x^2 + V_{iy}^2$
④ $\tan\theta = \frac{V_{iy}}{V_x}$