PHYSICS UNIT 1
PRACTICE PROBLEMS

1. A race car's velocity increases from 4 m/s to 88 m/s over a 4 sec time interval.
   a. What is its average acceleration?

   #2 $a = \frac{v_f - v_i}{t} = \frac{88\ m/s - 4\ m/s}{4\ sec} = \frac{84\ m/s}{4\ s} = 21\ m/s^2$

   b. How far does the car travel during this time?

   #4 $s = v_i t + \frac{1}{2} a t^2 = (4\ m/s)(4\ s) + \frac{1}{2}(21\ m/s^2)(4\ s)^2 = 184\ m$

2. The car in problem #1 decelerates from 88 m/s to 20 m/s in 3 sec.
   a. What is its average acceleration?

   $a = \frac{v_f - v_i}{t} = \frac{20\ m/s - 88\ m/s}{3\ s} = \frac{-68}{3}\ m/s^2 = -22\frac{2}{3}\ m/s^2$

   b. Over what distance does it travel during this time?

   $s = v_i t + \frac{1}{2} a t^2 = 88\ m/s\,(3\ s) + \frac{1}{2}\left(-22\frac{2}{3}\ m/s^2\right)(3\ s)^2$

3. A car accelerates from rest at 7 m/s^2 to a velocity of 50 m/s.
   a. How long does it take?

   $v_i = 0\ m/s$ #2 $a = \frac{v_f - v_i}{t}$ so $t = \frac{v_f}{a} = \frac{50\ m/s}{7\ m/s^2} = 7\frac{1}{7}\ s$

   b. How far does the car travel in this time?

   $s = \frac{1}{2} a t^2 = \frac{1}{2}(7\ m/s^2)\left(\frac{50}{7}\ s\right)^2 =$ ____ m

4. A bike rider accelerates uniformly at 2.4 m/s^2 to a velocity of 13 m/s. If the bike moved 14 m during this acceleration, calculate the bike's initial velocity.

   Students had NO PROB. with

5. A drag racer accelerates uniformly from rest, traveling 400 meters in 6.5 seconds. What is the car's average and final velocity?

   $v_i = 0\ m/s$ s t

   #1 $v_{av} = \frac{s}{t} = \frac{400\ m}{6.5\ s} = 61.54\ m/s$

   #3 $v_{av} = \frac{v_f}{2}$ so $v_f = 2 v_{av} = 2$ ____ m/s

   $v_f =$ ____

6. An airplane starts from rest and accelerates uniformly for 30 seconds down a 1400 meter runway before leaving the ground.

a. What is its acceleration?

#4 $s = \frac{1}{2}at^2$ so $a = \frac{2s}{t^2} = \frac{2(1400\text{m})}{(30\text{s})^2} = \left(\quad\right)\frac{\text{m}}{\text{s}^2}$

b. How fast was it moving when it took off?

#2 $a = \frac{V_f}{t}$ so $V_f = at = (\quad)(30\text{s}) = \left(\quad\right)\frac{\text{m}}{\text{s}}$

7. A rock, starting from rest, takes 7.5 sec to fall from a height to the ground.

a. Calculate the distance it fell.

$s = \frac{1}{2}at^2 = \frac{1}{2}\left(9.8\frac{\text{m}}{\text{s}^2}\right)(7.5\text{s})^2$

b. Calculate its final velocity just before it lands.

$a = \frac{V_f}{t}$ so $V_f = at = \left(9.8\frac{\text{m}}{\text{s}^2}\right)(7.5\text{s}) =$

8. A brick is dropped from rest from a high scaffold that is 180 meters above the ground.

a. How long does it take for the brick to fall?

#4 $s = \frac{at^2}{2}$ so $t^2 = \frac{2s}{a}$ so $t = \sqrt{\frac{2s}{a}} = \sqrt{\frac{2(180\text{m})}{9.8\frac{\text{m}}{\text{s}^2}}}$

b. What is its velocity after this period of time?

#2 $a = \frac{V_f}{t}$ so $V_f = at = \left(9.8\frac{\text{m}}{\text{s}^2}\right)(\quad)$