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?

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

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

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

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

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

   $s = 264m - 11.33\,m(9)$

   $s = 264m - 101.97m$

   $s = 162m$

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

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

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.

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

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?

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

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

$V_i = 0$ t $g = 9.8\frac{m}{s^2}$ hidden givens

a. Calculate the distance it fell.

$$s = v_i t + \frac{1}{2} g t^2 = 0 + \frac{1}{2}\left(9.8\frac{m}{s^2}\right)(7.5s)^2$$

b. Calculate its final velocity just before it lands.

$$s = \left(4.9\frac{m}{s^2}\right)(56.25s^2)$$

$$s = 275.625m$$

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?

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