AP Physics 1
## Acceleration Practice Problems

1.) A cart with an initial velocity of 4.0 m/s experiences a constant acceleration of 2.0 m/s². What is the cart's displacement during the first 5.0 s of its motion?

2.) A car traveling at 10 m/s accelerates at a rate of 3.0 m/s² for 4.0 s. What is the final velocity of the car?

3.) How far does a car travel if it accelerates from a speed of 20 m/s to 35 m/s in 4.0 s?

4.) An airplane increases its speed from 120 m/s to 150 m/s, at the average rate of 6.0 m/s². How much time does it take for the increase in speed?

5.) How many seconds does it take a train to accelerate from 15 m/s to 35 m/s if it travels a distance of 100 m?

6.) What is the final speed of a car that travels 90 m in a time of 4.0 s from an initial speed of 10 m/s?

7.) A train started from rest and moved with constant acceleration. At one time it was traveling 20 m/s, and 150 m farther on it was traveling 40 m/s.

    a.) What is the acceleration of the train?

    b.) How far did the train travel from rest to the time the train had a speed of 20 m/s?

8.) A hockey puck sliding on a frozen lake comes to rest after traveling 320 m. Its initial velocity is 4.00 m/s.

    a.) How many seconds is the puck in motion?

    b.) What is the puck's acceleration if its acceleration is assumed constant?

    c.) What is the puck's speed after traveling 240 m?

    d.) How many seconds does it take the puck to slow down to 3.00 m/s?

9.) A car starts has an initial speed of 10 m/s and accelerates at 4.0 m/s² for 5.0 s, then maintains that velocity for 30 s, and then decelerates at the rate of -2.0 m/s² until it comes to a stop,

    a.) How many seconds does it take for the   b.) Draw a graph of velocity-time for the entire motion of the car.
         car to stop?
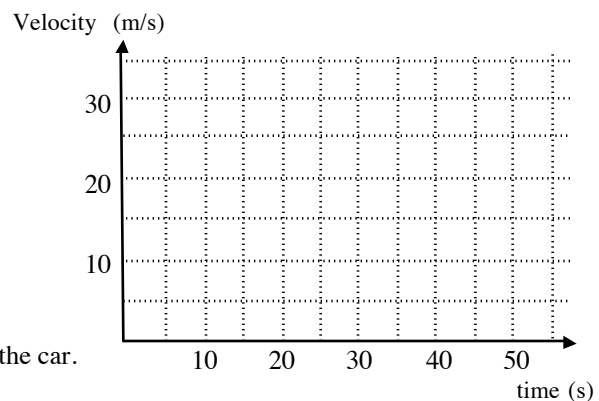
    c.) Find the displacement of the car for the entire motion of the car.

    d.) Find the average acceleration for the entire motion of the car.

10.) Rat is driving at 32.0 m/s when she observes a slow-moving van 140 m ahead traveling at 5.0 m/s. Rat applies her brakes but can decelerate only at -2.0 m/s² because the road is wet. Will there be a collision? If yes, determine how far from the time Rat applies her breaks and at what time the collision occurs.

11.) A rock is dropped a bridge that is 40 m above the water.

    a.) How long does it take the ball to reach the water?

    b.) What is the velocity of the ball just before it enters the water?

12.) A ball is tossed vertically upward from ground level with a velocity of 10 m/s.

    a.) At what time does the ball reach its maximum height?

    b.) What is the maximum height of the ball?

    c.) At what two times does the ball have a speed of 5.0 m/s?

13.) A rock is thrown vertically upward with a speed of 25 m/s from a height of 35 m.

    a.) What is the maximum height of the ball with respect to the ground?

    b.) What is the velocity of the ball just before it hits the ground?

    c.) How much time does it take for the ball to reach the ground?

    d.) At what time is the ball 15 m above the ground?