ONE DIMENSIONAL MOTION PROBLEMS Name _____ Date_____

$\Delta v = \Delta d/\Delta t$ $a = \Delta v/\Delta t$ $v_f = v_i + at$ $v_f^2 = v_i^2 + 2ad$

1. A car travels 400 meters east in 8 seconds, then travels 300 meter north in 5 seconds.
   a. What is the car's distance traveled for the whole trip?
   b. What is the magnitude of the car's displacement?
   c. What is the car's average speed?
   d. What is the magnitude of the car's average velocity?

2. A student runs 100 meters north in 12 seconds, then turns around and runs 100 meters south in 15 seconds. What is …
   a. Distance traveled?
   b. The magnitude of her displacement?
   c. Her average speed?
   d. The magnitude of her Average velocity?

3. A car travels at an average speed of 30 miles/hour. How long will it take the car to travel 45 miles?

4. A car travels an average speed of 20 miles/hour. How far will it travel in 900 seconds?

5. A car starts from rest, and accelerates at a rate of 2 m/s^2. How far will the car travel in 10 seconds?

6. A ball is dropped from rest from a 40 meter high bridge. How long will it take to reach the ground below?

7. A car is traveling at 30 m/s, east, when the brakes are applied. The car comes to a stop while traveling a distance of 40 meters. What are the magnitude and direction of the car's acceleration?

8. A punter kicks a ball upward. It reaches a maximum height of 20 meters.
   a. What is the ball's initial velocity?
   b. What is the total time in the air for the ball?
   c. What will be the velocity of the ball, just as it reaches the ground?

9. An airplane can produce an acceleration of 3 m/s^2 on a runway. If the plane starts from rest, and must be going 50 m/s to take off, what is the minimum length of the runway?

10. The nearest star is 3.8×10^{16} meters away.
    a. How long will it take a spaceship traveling at a constant speed of 1.5×10^8 m/s to reach the star? (Express your answer in years.)
    b. A second spaceship starts from rest, and accelerates at a rate of 2 m/s^2. How long (in years) will it take for the ship to reach the star?

11. A car is traveling at a constant 20 m/s, when a child steps out in front of the car. It takes the driver 0.15 seconds to apply the brakes. The brakes then apply an acceleration of -5 m/s^2. How far does the car travel from the moment the driver sees the child until the car comes to a stop?

DOVE