Name_____

Date _____ **Pd** ____

Net Force Particle Model Worksheet 3:

Kinematics & Newton's 2nd Law

The problems on the worksheet require you to use kinematics formulas in addition to Newton's second law. Use the following steps in your solutions:

a. use force diagram analysis to find the net (unbalanced) amount of force.
b. list knowns and unknowns for force and motion variables:

force variables	motion variables
acceleration	**acceleration**
mass	initial velocity
net force	final velocity
	change in time
	displacement
mathematical model	mathematical models
$F_{net} = m*a$	$v_f = a\Delta t + v_i$
	$\Delta x = \frac{1}{2}a\Delta t^2 + v_i\Delta t$
	$v_f^2 = v_i^2 + 2a\Delta x$

c. The variable that ties both lists of variables together is **acceleration**. Depending on the variables you know, use either the force or motion mathematical models to solve for acceleration, and then use the acceleration value to solve for the unknown quantity.

1. A race car has a mass of 710 kg. It starts from rest and travels 40.0m in 3.0s. The car is uniformly accelerated during the entire time. How big is the net force acting on the car? **Make a quantitative force diagram. Write a net force equation for the axis along which forces are not balanced.**

2. Suppose that a 1000 kg car is traveling at 25 m/s (55 mph). Its brakes can apply a force of 5000 N. What is the minimum distance required for the car to stop? **Make a quantitative force diagram. Write a net force equation for the axis along which forces are not balanced.**

3. A 65 kg person dives into the water from the 10 m platform.
   a. What is her speed as she enters the water?

   b. She comes to a stop 4.0 m below the surface of the water. Find the force on the swimmer by the water.

4. During a head-on collision, a passenger in the front seat of a car accelerates from 13.3 m/s (30 miles/hour) to rest in 0.10 s.
   a. Calculate the acceleration of the passenger.

   b. The driver of the car holds out his arm to keep his 25 kg child (who is not wearing a seat belt) from smashing into the dashboard. How much force must he exert on the child?

   c. What is the weight of the child?

   d. Convert the forces in parts b and c from Newtons to pounds. (1 lb = 4.45N). What are the chances the driver will be able to stop the child?