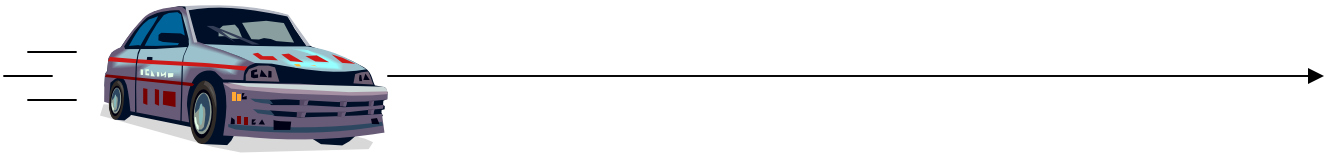
Name _____ Physics

Kinematics!

Kinematics is the science of describing the motion of objects using words, diagrams, numbers, graphs, and equations. The goal of any study of kinematics is to develop sophisticated mental models which serve to describe (and ultimately, explain) the motion of real-world objects.

We have described motion using diagrams, graphs and basic equations; now we will examine accelerated motion and become pros at this stuff.

For Example:



A race car starts from rest and accelerates down a track at a rate of 3.0 m/s^2 for 10 seconds, what is the cars final velocity?

How far did it travel?

What do we need to know to answer this question? **The Kinematic Equations**

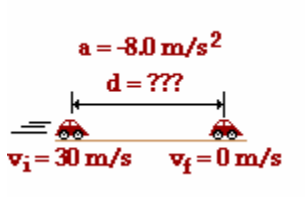
List them below from your reference table:

Is there a procedure to answer these questions correctly? YES!

1. Draw a rough sketch of the problem and set a +, - direction
2. Write the knowns
3. Write the unknowns
4. Find an equation that contains no more than 1 unknown
5. SOLVE THE EQUATION!
6. Plug in numbers and units
7. Perform dimensional analysis to verify you have the correct answer. Does it make sense?

Example #2

Ima Hurryin approaches a stoplight in her car which is moving with a velocity of +30.0 m/s. The light turns yellow, Ima applies the brakes and skids to a stop. If Ima's acceleration is –8.00 m/s^2, determine the displacement of the car during the skidding process. (Note that the direction of the velocity and the acceleration vectors are denoted by a positive (+) and a negative (–) sign, respectively.)



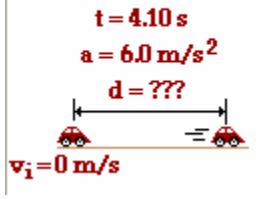
Knowns Unknowns Chosen Equation

Solve Equation, plug in units and perform DA

Example #3

Ben Rushin is waiting at a stoplight in his car. When the light turns green, Ben accelerates from rest at a rate of a 6.00 m/s^2 for an interval of 4.10 seconds. Determine the displacement of Ben's car during this time period.

Diagram:



What is Ben's final velocity?

Directions: Use the equations on your reference tables to answer the following questions

1. A car starts from rest and begins to accelerate at a rate of 3 m/s^2. How fast is the car moving after 10 seconds?

2. An airplane starts from rest and accelerates on a runway at 5 m/s^2 for 7 seconds. How far down the runway is the plane after 7 seconds?

3. Jeff Gordan accelerates his race car at 2.7 m/s^2 and covers a distance of 400 m. What is his final velocity at the end of the 400 m distance?

4. A runner starts from rest and accelerates at a rate of 1.5 m/s^2 and covers 375 m. How long did it take the runner to cover this distance?

5. A plane lands and comes to a complete stop. If the plane covers 200 m and decelerates at 7.5 m/s^2, what was the planes initial velocity as it touched the runway?