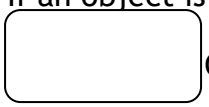
Unit 1: Kinematics in 1D

The Big 3 Kinematics Equations

If an object is accelerating then the formula:



Gives us only the _____ _____

We can also find average velocity using:

In order to solve problems with uniform acceleration we need to use 3 formulae. These 3 formulae use the variables:

v =
v_o =
a =
d =
t =

1)

Ex: A squad car traveling at 7.0 m/s East speeds up to 22.0 m/s East in 1.7 s. What is its acceleration?

2)

Ex: A sprinter starts from rest and accelerates uniformly. He travels 100.0 m south in 9.69 s, what was his average acceleration?

3)

Ex: A banana boat accelerates from 15.0 km/h at 2.00 m/s^2. How far has it traveled when it reaches 30.0 km/h?

Ex 1: The Rocket Truck is traveling at 16.0 m/s when it is passed by a plane. It immediately hits the jets at accelerates at 14.0 m/s^2 for 3.25 s.

a. What final velocity does it reach?

b. How far does it travel in this time?

Ex 2: An arrow strikes a can at 32.0 m/s and exits at 31.0 m/s. If the arrow is 42 cm long find its acceleration as it pierced the can. Ignore the width of the can.

Ex 3: A BMW and an F1 car both cross the finish line traveling at 200.0 km/h. The BMW comes to a stop in 4.05 s and the F1 in 2.12 s. How much further did the BMW travel while stopping than the F1 car?

2. A car starts from rest and accelerates uniformly to reach a speed of 21 m/s in 7.0 s. What was the speed of the object after 2.0 seconds?

3. A bike rider accelerates uniformly at 2.0 m/s^2 for 10.0 s. If the rider starts from rest, calculate the distance traveled in the **fourth** second. (i.e. between t = 3 s and t = 4 s).

4. If a bullet leaves the muzzle of a rifle at 600.0 m/s, and the barrel is 0.90 m long, what was the acceleration of the bullet while in the barrel?

5. The Jamaican bobsled team hit the brakes on their sled so that it decelerates at a uniform rate of 0.43 m/s^2. How long does it take to stop if it travels 85 m before coming to rest?

<u>Bonus:</u> A driver of a car going 90 km/h suddenly sees the lights of a barrier 40.0 m ahead. It takes the driver 0.75 s before he applies the brakes (this is known as reaction time). Once he does begin to brake, he decelerates at a rate of 10.0 m/s^2.

a) Does he hit the barrier?

b) SUPER-BONUS: What would be the maximum speed at which the car could travel and NOT hit the barrier 40.0 m ahead?