Unit 1 Main Notes and Content Summary

Freshman Physics

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1 Definitions

1.1 Scalars vs Vectors

Scalars can be thought of as single numbers. Some examples include: speed and distance. There's no direction to these quantities, they're just single values. For example, if you're in a taxi and ask the driver how fast you're going, they'll respond with *x mph*.

Vectors have a magnitude AND **direction**. Some examples include: velocity and displacement. These values have a direction. For example, a velocity of a car could be *x mph to the east*. Magnitude refers to the absolute value of the amount. In the above example it would be $|x|$.

1.2 Definitions of Stuff

Units are written in parenthesis.

Distance (m) - The total distance *(means what you think)* travelled by an object. This value is always nonnegative *(think about it)*.

Displacement (m) - The change in distance **with** direction. For example, if someone walked 5 meters to the right then 3 meters to the left, the displacement would be 2 meters to the right.

Velocity (m/s) - The speed of an object **with** direction. The average velocity can be found with:

$$v_{avg} = \frac{\Delta x}{\Delta t}$$

where Δx represents the change in displacement and Δt represents the change in time. This notably looks very similar to the slope formula which should make sense. If you plot the displacement vs time graph, the rate of change (or velocity) is just the speed.

For the math people:

$$v = \frac{dx}{dt}$$

where x represents the position function of t as in $x(t)$ gives the x value at a time t.

Important!

Initial Velocity - The velocity at the very beginning represented by v_o.

Final Velocity - The velocity at the very end represented by v_f.

Speed (m/s) - The magnitude of velocity.

Acceleration (m/s^2) - The rate at which velocity grows **with** direction.

Important!

In all of Freshman Physics, acceleration will be constant. This is because you need calculus if it isn't. The acceleration due to gravity on Earth is $-9.8m/s^2$

The average acceleration can be found with:

$$a_{avg} = \frac{\Delta v}{\Delta t}$$

For the math people:

$$a = \frac{dv}{dt}$$

where v represents the velocity function as in $v(t)$ gives the velocity at a time t;

1.3 Clarification

One might ask: If velocity and acceleration are vectors, why are they represented as single variable values?

This is because in 1-D motion there is only, well, 1 dimension so the direction is assumed.

2 The Big 5