

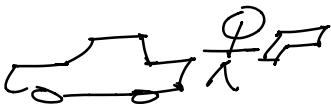
Loops and Orbits - Week 1 - Day 1 - Physics & Math

Slippy terminology we will ~~not~~ use, but let's review it anyway.

$$s \equiv \frac{d}{t} \quad \text{"speed is distance over time"}$$

Notice the triple equals. That means this is the definition of speed

The definition of speed can be made precise. Let's look at one aspect of the definition of speed that is problematic:



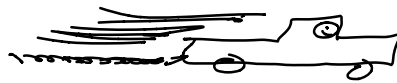
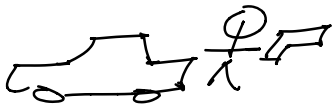
↑ parked cop with radar gun



↑ you, going 60 in a 55 zone

The cop says, "I got you going 60 in a 55 zone."

You say, "that would be true, officer, if this were the situation:"



"But I was going toward you, so my speed was negative 60 and negative 60 is less than 55!"

Velocity

On your day in court the judge explains that an accurate definition of speed does not depend on direction, and that you were confusing speed with velocity. Here is the definition of velocity:

$$v \equiv \frac{\Delta x}{\Delta t}$$

(After this bruising experience you decide you will always prefer to and use velocity, not speed.)

The triangles are capital Greek letter deltas. We read this equation out loud or in our heads as:

"velocity is (by definition) delta x over delta t."

Two things that we'll get more precise about later:

- (1) This is just one equation of 2 or 3 if the movement can be in 2 or 3 dimensions.
- (2) If you are accelerating (speeding up, slowing down, or turning) then we have defined "average velocity" not velocity.

Two things that we'll get more precise about now:

(1) Δx read "delta x " or "the change in x "
is $\Delta x \equiv x_{\text{after}} - x_{\text{before}}$

x is the value on a coordinate axis, which in scientific work is usually measured in meters.

(2) $\Delta t \equiv t_{\text{after}} - t_{\text{before}}$

Δt is read "delta t " or "the change in t ," and it is the elapsed time.

The before time and the after time can be any two times, as long as the before position and the after position are the positions that correspond to those times.

In scientific work time is almost always measured in seconds. The definitions of v , Δx , and Δt don't change, even if you are working in everyday units such as miles and hours. \Rightarrow DO LAO-1-1-WS1