Physics 200
Notes: Acceleration

Name: Key

Velocity tells you how something's position changes during one second.

Acceleration tells you how something's velocity changes during one second.

Is acceleration a vector or scalar quantity?

Not just magnitude, but also direction, so I got rid of the word "much."

Acceleration can happen in two fundamentally different ways:

1) Changing Speed
2) Changing Direction

> or both

Negative acceleration is also called deceleration

Common metric units for acceleration are: m/s^2 Sometimes I use m/s/s

The Analogous Relationship between Velocity and Acceleration:

If Pam has a *velocity* of +6m/s, that means she travels 6m for every second that ticks by. Another way to say this is that, **for each passing second, Pam adds 6m to her position.**

Analogously, if Pam's *acceleration* is +6m/s/s, this means... with each passing second, 6m/s is added to her velocity.

Velocity adds meters **each second.**

Acceleration adds meters per second **each second.**

Velocity is the slope of a position **vs** time **graph.**

Velocity is the slope of a velocity **vs** time **graph.**

The acceleration formula:

Velocity describes a change in position over a time interval. Acceleration describes a change in velocity over a time interval.

$a_{average} = \bar{a} = \frac{\Delta v}{\Delta t}$ (Δv in m/s, Δt in s)

Acceleration Formula Practice Problems:

1. Suppose your velocity is 2m/s. One second later, your velocity is 6m/s. What is your average acceleration over this time period?

$$\bar{a} = \frac{\Delta v}{\Delta t} = \frac{4\,m/s}{1s} = 4\,m/s^2$$

2. When your watch reads 8:01:32 AM, your velocity is 6m/s. At 8:01:40 AM (on the same day), your velocity is 2m/s. What is your average acceleration over this time period?

$$\bar{a} = \frac{\Delta v}{\Delta t} = \frac{-4\,m/s}{8s} = -0.5\,m/s^2$$

Motion Graphs:

Each row of graphs below comprises a position vs. time graph, a velocity vs. time graph, and an acceleration vs. time graph. Every graph in a row conveys the same motion. For each row, use the one completed graph to fill in the incomplete graphs with reasonable curves. Some rows will have a wider variety of possible answers. **Assume that all acceleration is constant.**