Mathematical Description of Motion

http://ionaphysics.org/classroom/Physlets2/IonaPuzzles/FlintConstVel/FlintConstVel.html

Chapter 2 Motion

Coordinate System "Frame of reference"

You choose where 0 is, you choose the positive direction, BUT you must be consistent throughout the problem. In other words, if up is positive, then it must always be positive. If down is positive, then it must always be positive during this particular problem.

Distance= total length traveled (in meters) (scalar)
Displacement = change in position $\Delta x = x_f - x_i$ (vector)

$$\text{average speed} = \frac{\text{change in distance}}{\text{change in time}}$$

1. A car travels 30 m in 60 seconds. Find the average speed of the car.

2. How far will the car travel if it maintains the same speed for 10 minutes?

3. How long will it take the car to travel a total distance of 450 m ?

Distance = length traveled

Displacement = change in position

Textbook
Read pages 43-56

Go to

http://ionaphysics.org/classroom/Physlets2/IonaPuzzles/FlintConstVel/FlintConstVel.html

Run the simulation and calculate the speed of the car.

A real easy idea which frequently appears on tests!

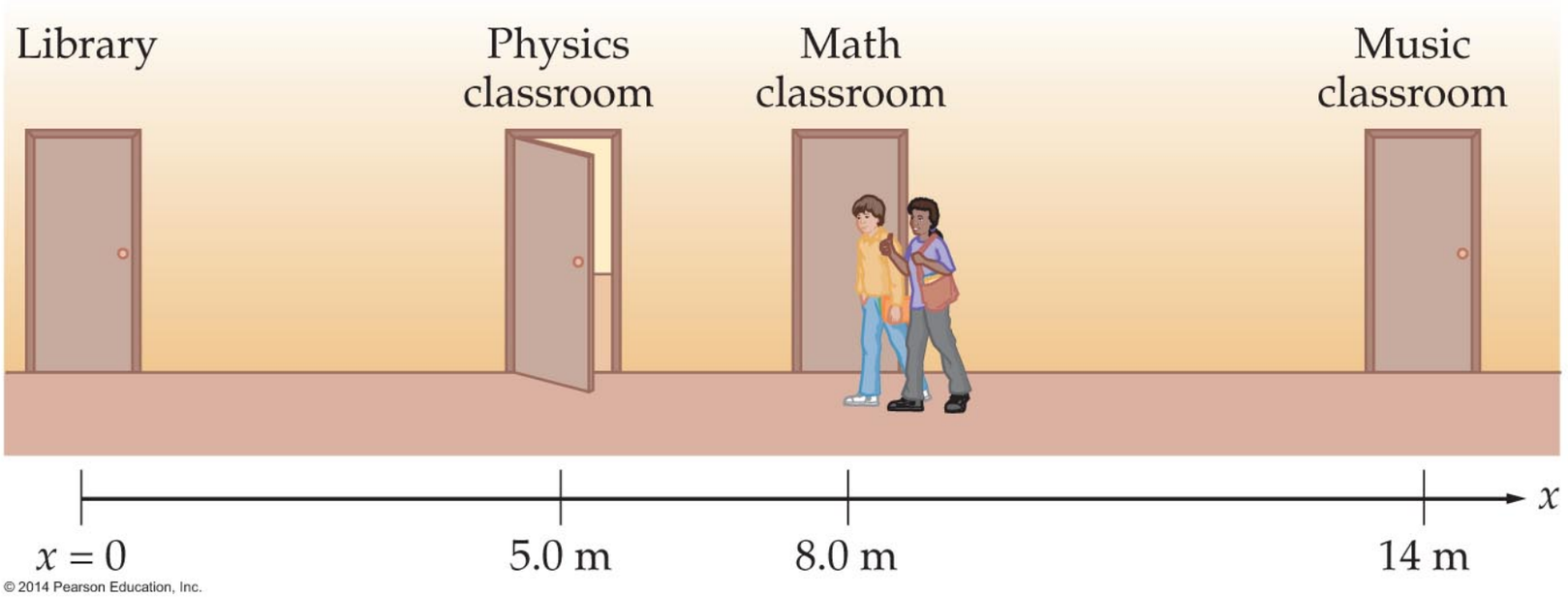
Two types of quantities:

Scalars -

Vectors -

Examples of each

Distance is a scalar
Displacement is a vector



When you add scalars, what you get is called the sum.
When you add vectors, what you get is called the vector sum, or resultant

Resultant: (Vector Sum) A single vector which has the same effect as the combined effects of the vectors being added.

A car moves 40 m North and then 30 m East. Find the total (resultant) displacement of the car.

Adding vectors: TWO METHODS:

First Method: Draw them tail to head:

1. Using some convenient scale, draw the first vector as an arrow.

2. Starting at the head of the previous vector, draw the next one to the same scale.

3. Repeat step 2 if necessary.

4. The resultant is drawn from the tail of the first vector to the head of the last vector.

Second Method: Draw them tail to tail:

1. Using some convenient scale draw the first vector as an arrow.
2. Starting at the TAIL of the previous vector, draw the next one to the same scale.
3. Complete the parallelogram and draw the diagonal from where both vectors start to the opposite vertex. That is your resultant. (Note, this works if you only have two vectors to add.)

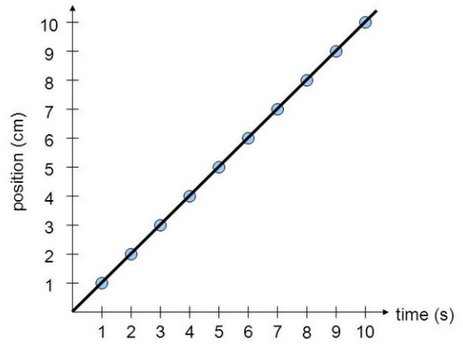
An airplane heads due North. Its air speed is 60 mi/hr. The wind is from the West at 20 mi/hr. Find the resultant ground speed and direction of the plane.

A car travels 30 miles West and then 20 miles North. Find the resultant displacement of the car.

Here is a real good problem which should make you think. Try thinking “out of the box”

The two owners of a dog start 10 m apart. They move toward each other. One is moving 1.3 m/s East and the other 1.3 m/s West. The dog runs back and forth between the owners and stops when they meet. How far did he run? The dog is running at 3.0 m/s. (page 67 # 71)

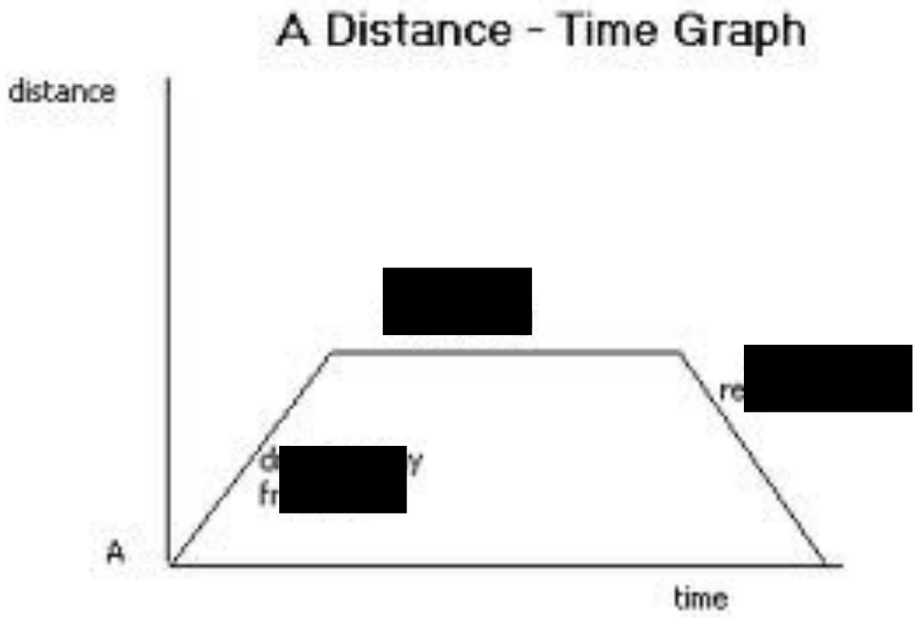
Position-Time Graphs



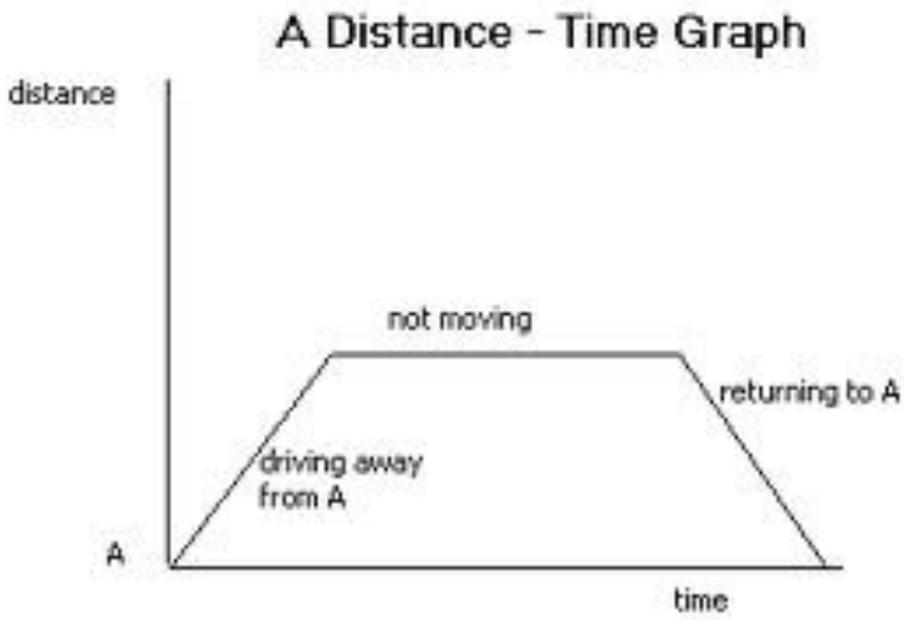
Each axis has a label
Each scale is linear

We will cover this in more detail in the lab.

What is happening in each interval?



What is happening in each interval?



Slope = (change in distance)/(change in time)

But that is the definition of speed

So: the slope of the d/t graph represents the speed!

STUDY GUIDE:

We skipped graphing motion, which will be covered in lab.
We skipped Equation of Motion, which will be covered in chapter 3.

See Textbook page 65