Friday, November 6, 2009

If you were absent, it is important that you try to do the material on each slide before you move to the next one.

When you've finished calculations or graphing, advancing to the next slide will show you the answers. CHECK your work.

Jot down questions you have in the margin of your paper so that you may discuss them with me on Monday.

AFTER you finish these notes, do the page of word problems.

Lose Weight But Not Mass? (SCG - part 3) (8 minutes!)

Quick Calculations –

Location	Allison's Mass	Allison's "Weight"
Earth	60 kg	
Moon		
Jupiter		

Questions:

1. Which tool would be used to measure mass in all locations?
2. Which tool would be used to measure weight in all locations?
3. Why does the one that measures weight change depending on location?
4. What is the approximate force Allison has on Earth? (*EC)

Lose Weight But Not Mass? (SCG - part 3) (8 minutes!)

Quick Calculations –

Location	Allison's Mass	Allison's "Weight"
Earth	60 kg	60 kg
Moon	60 kg	10.2 kg
Jupiter	60 kg	141.6 kg

Questions:

1. Which tool would be used to measure mass in all locations?
2. Which tool would be used to measure weight in all locations?
3. Why does the one that measures weight change depending on location?
4. What is the approximate force Allison has on Earth?

Questions:

1. Balance (triple-beam)
2. Scale (spring)
3. Spring scales depend on GRAVITY to work. Gravity is different at each location.

4. In activity one, we saw that 100 g of mass needs 1 N of force to be lifted. Allison's 60 kg mass = 60,000 g which would need approximately 600 Newton's of force to be lifted.

New vocabulary!

Velocity =

speed *with direction*

Formula for velocity?

Same as speed!

s = d/t is now v = d/t

Group each as either a speed or velocity.

10 km/h	4 ft/sec east	20 mi/h north	4000 km/s up
32 ft/sec	55 mi/h	2 cm/min west	24 in/sec

What is the velocity of a hurricane evacuee from Summerville who took 10 hours to travel the 482 km to Charlotte, NC?

Group each as either a speed or velocity.

10 km/h	4 ft/sec east	20 mi/h north	4000 km/s up
32 ft/sec	55 mi/h	2 cm/min west	24 in/sec

What is the velocity of a hurricane evacuee from Summerville who took 10 hours to travel the 482 km to Charlotte, NC?

482 km/10 hours = 48.2 km/hr *north (or 48.2 km/hr northwest)*

(Just FYI, that is about 30 mi/hr north west.)

A car is stuck in traffic and its *motion changes* based on the traffic pattern. The data for a small portion of the car's trip is below. Calculate the speed for each pair of data given.

Distance (m)	Time (sec)	Velocity/Speed (m/sec)
15	3	
25	2	
10	4	
5	8	
15	3	

A car is stuck in traffic and its *motion changes* based on the traffic pattern. The data for a small portion of the car's trip is below. Calculate the speed for each pair of data given.

Distance (m)	Time (sec)	Vel./Speed (m/sec)
15	3	5
25	2	12.5
10	4	2.5
5	8	.63
15	3	5

Now GRAPH the trip. Remember, since you are showing change of a *single object* *over time*, it should be cumulative.

Cumulative would mean that you would continue to add *new* progress to the *previous* movement.

Distance (m)	Time (sec)	Vel./Speed (m/sec)
15	3	5
25	2	12.5
10	4	2.5
5	8	.63
15	3	5

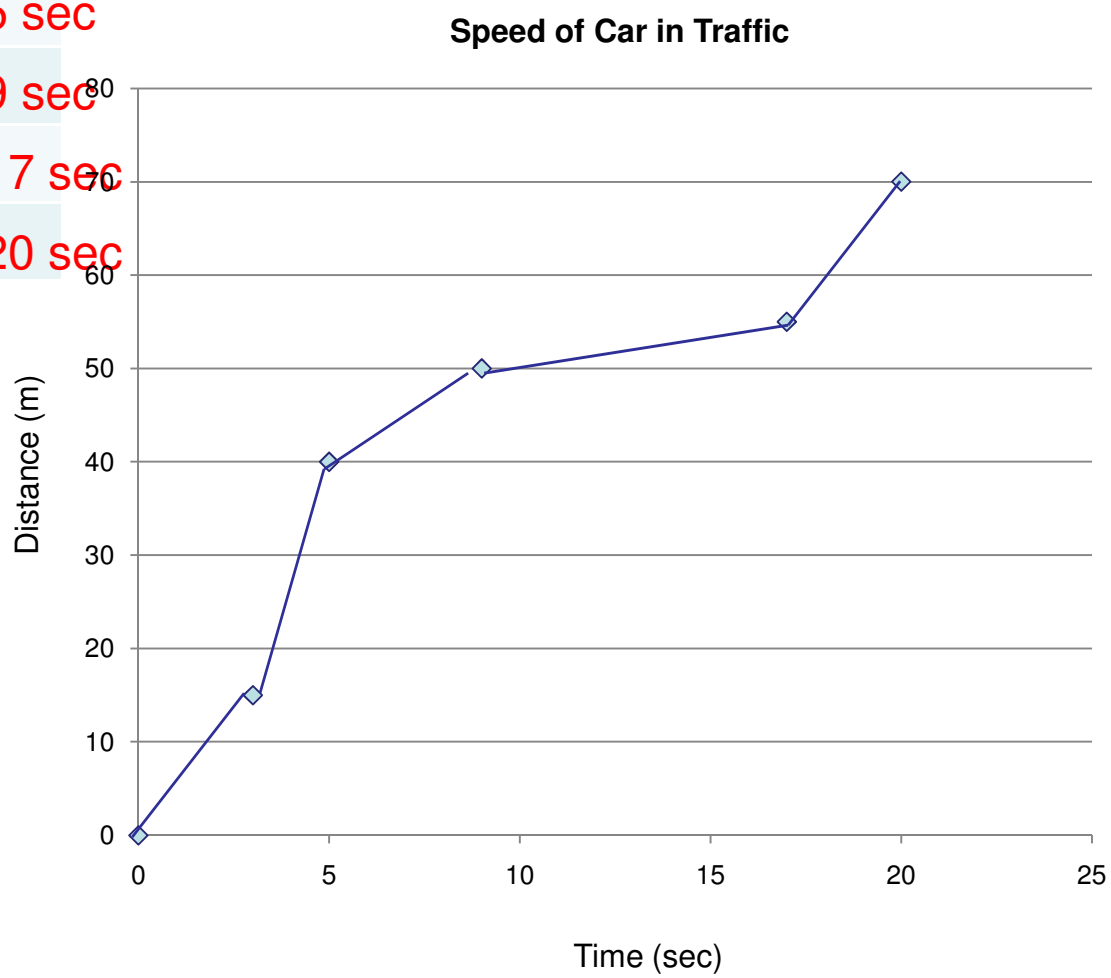
Distance (m)		Time (sec)		Vel./Speed (m/sec)
15		3		5
+ 25	= 40 m	+ 2	= 5 sec	12.5
+ 10	= 50 m	+ 4	= 9 sec	2.5
+ 5	= 55 m	+ 8	= 17 sec	.63
+ 15	= 70 m	+ 3	= 20 sec	5

You would graph the *cumulative* values to see the total trip of the driver.

Cumulative would mean that you would continue to add *new* progress to the *previous* movement.

Distance (m)		Time (sec)	
15		3	
+		+	
25	= 40 m	2	= 5 sec
+		+	
10	= 50 m	4	= 9 sec
+		+	
5	= 55 m	8	= 17 sec
+		+	
15	= 70 m	3	= 20 sec

You would graph the *cumulative* values to see the total trip of the driver.



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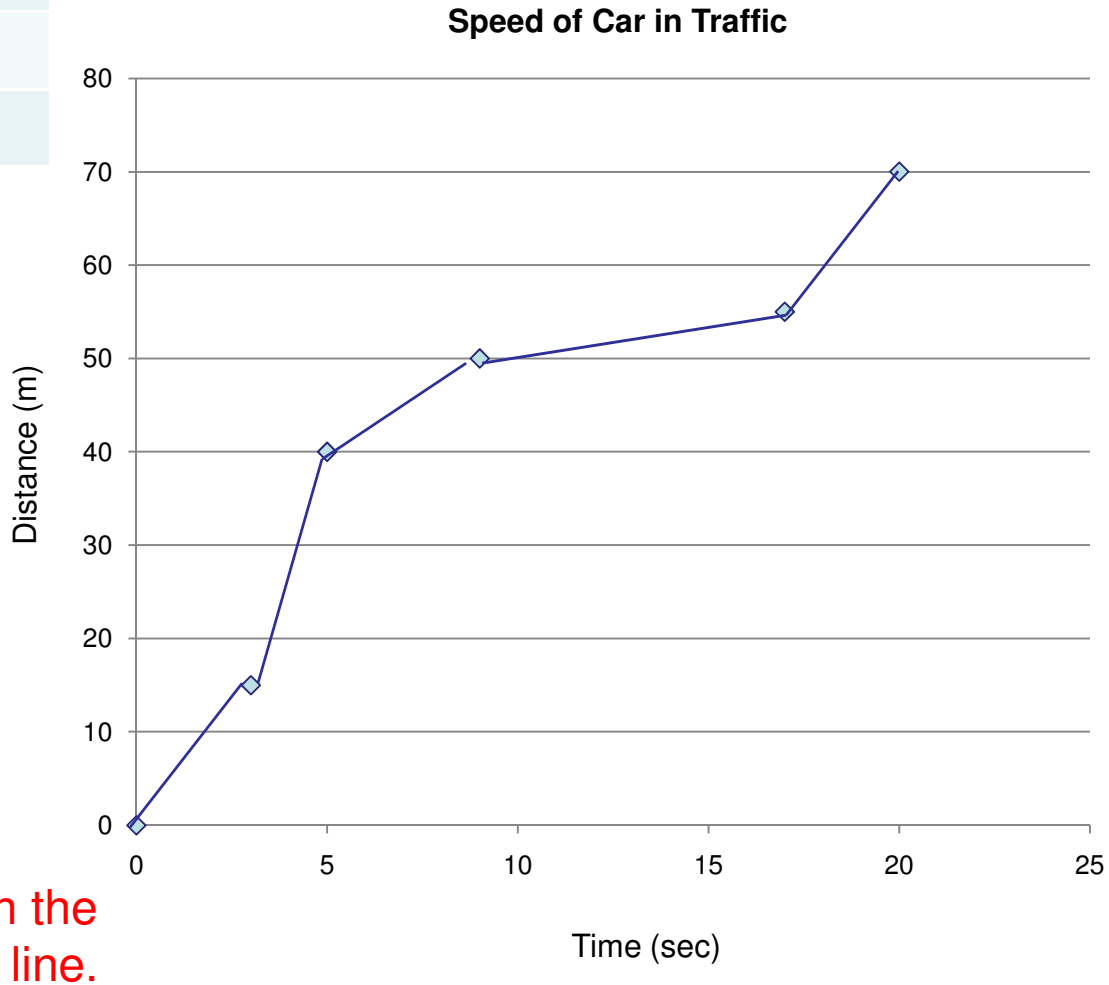


What is the average speed of the car?

Remember, AVG SPEED is

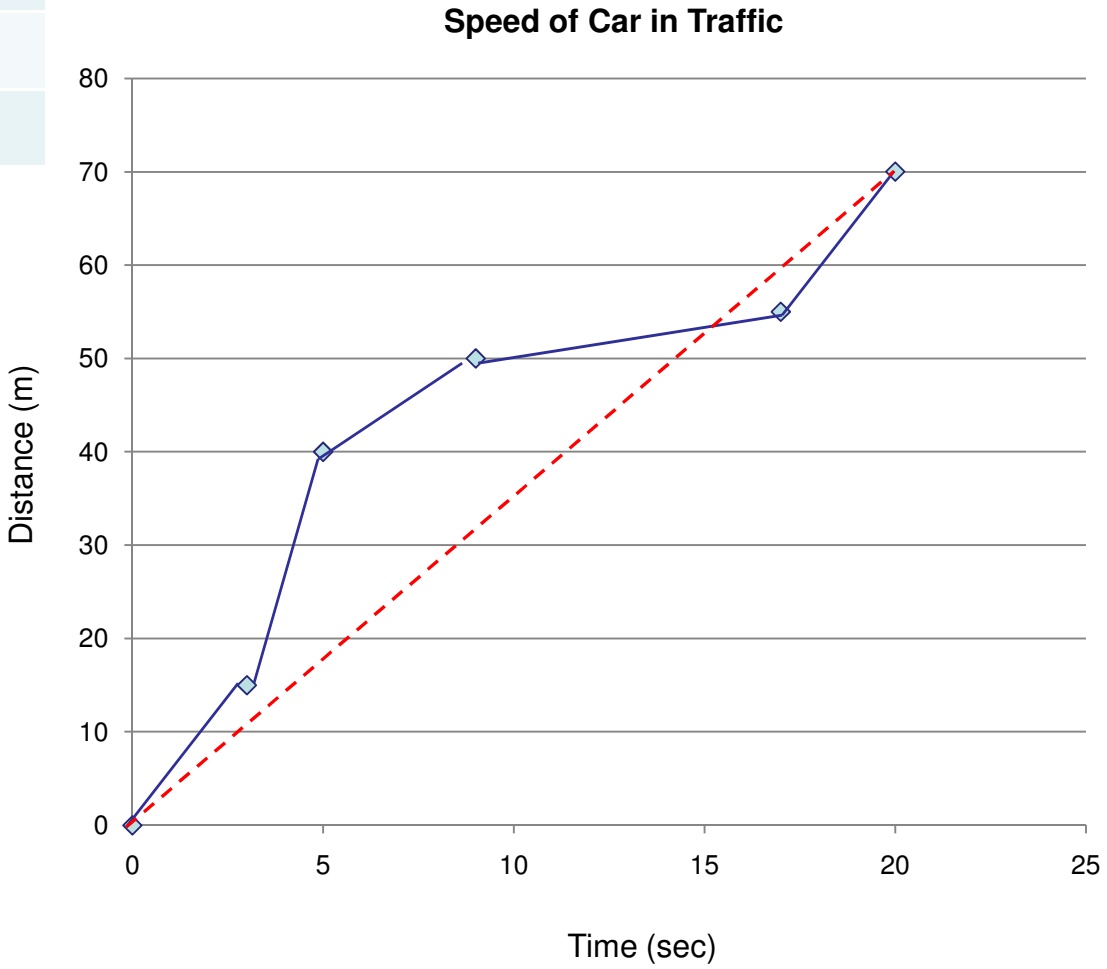
$$\frac{\text{TOTAL distance}}{\text{TOTAL time}}$$

$$\frac{70\text{ m}}{20\text{ sec}} = 3.5\text{ m/sec}$$

Plot average speed on the graph using a dashed line.

Distance (m)	Time (sec)	Vel./Speed (m/sec)
15	3	5
25	2	12.5
10	4	2.5
5	8	.63
15	3	5

Now, mark each segment of the trip as + or – acceleration (in comparison to the segment before it).



What is the average speed of the car?

$$\frac{\text{TOTAL distance}}{\text{TOTAL time}}$$

$$\frac{70}{20}$$

3.5 m/sec

Plot this on the graph using a dashed line.

Distance (m)	Time (sec)	Speed (m/sec)
15	3	5
25	2	12.5
10	4	2.5
5	8	.63
15	3	5

What is the average speed of the car?

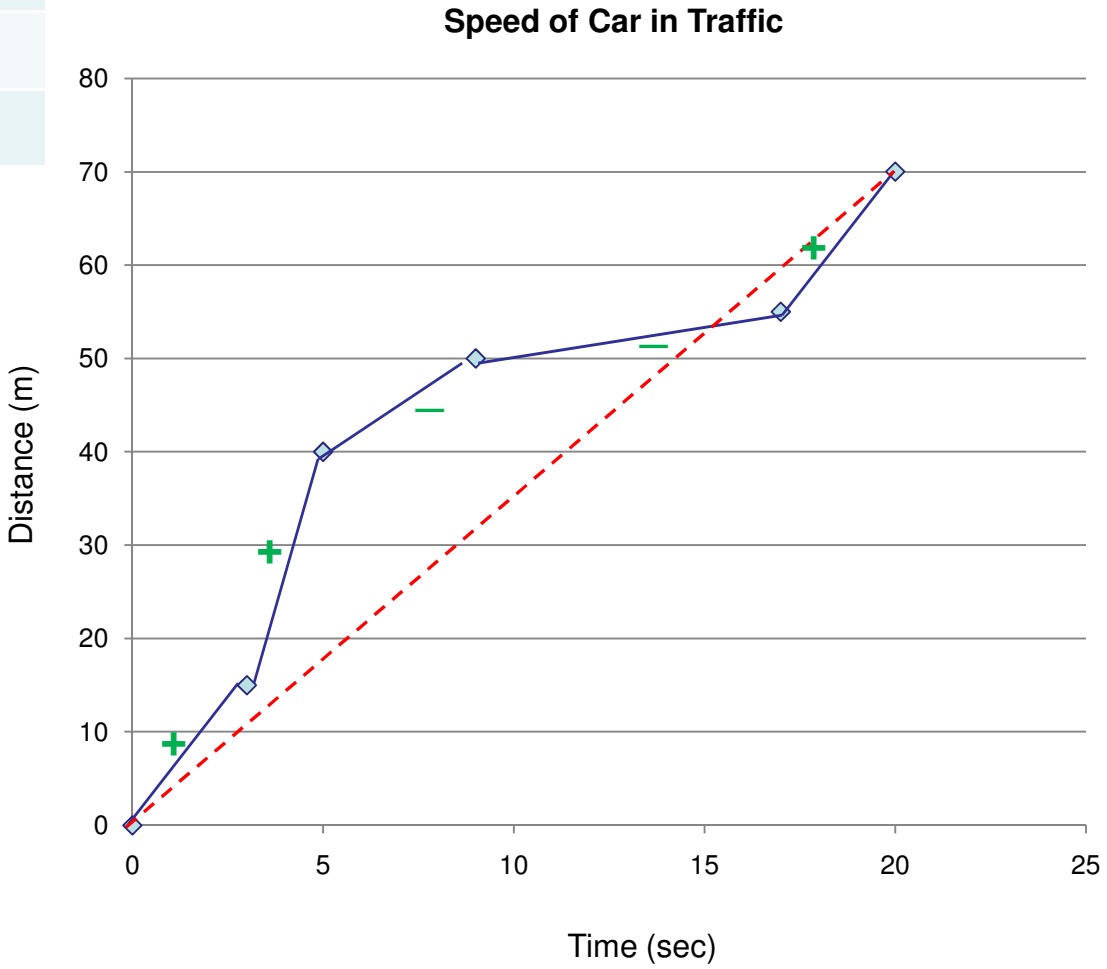
$$\frac{\text{TOTAL distance}}{\text{TOTAL time}}$$

$$\frac{70}{20}$$

3.5 m/sec

Plot this on the graph using a dashed line.

Mark each segment as + or – acceleration.



Newton's Second Law…

An object accelerates if acted upon by unbalanced force. This changes its speed, direction, or *both*.

Soooo…acceleration is any change in velocity .

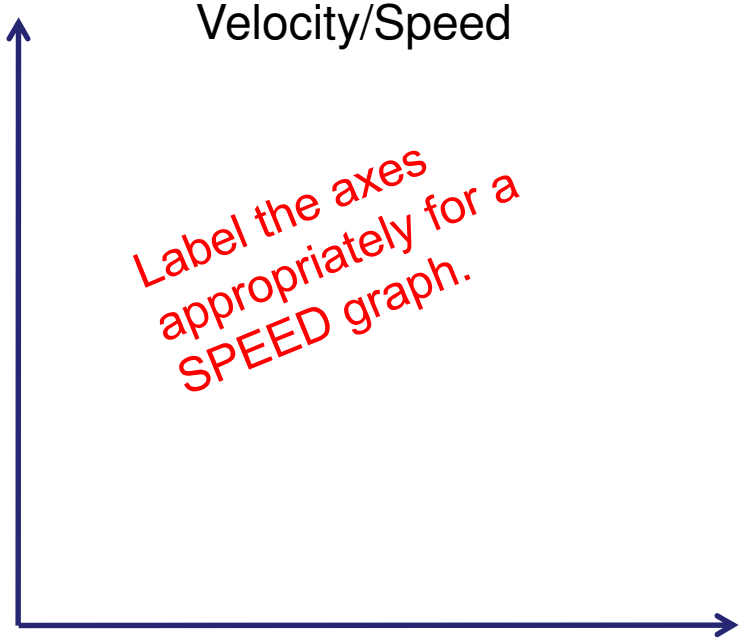
Calculating & Understanding Acceleration

Acceleration is Change…
in velocity
over a period of time.

$$\frac{d}{t}$$

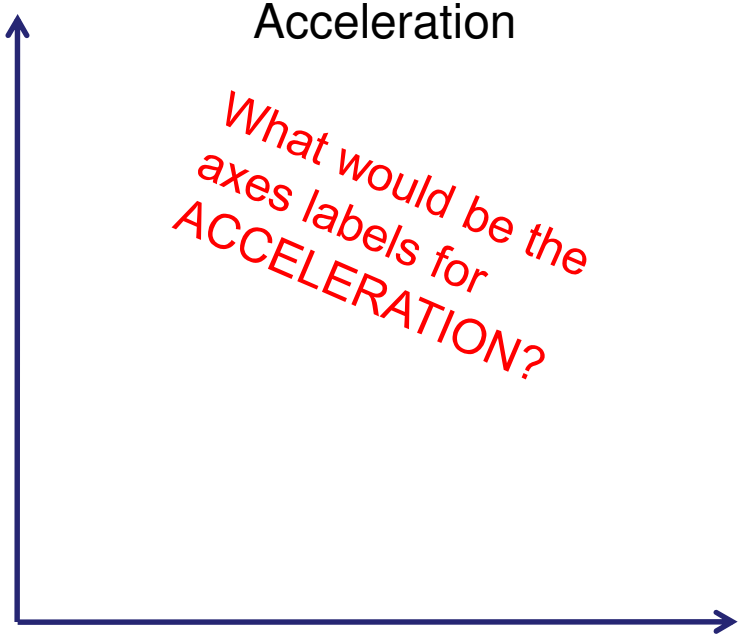
Velocity/Speed

Label the axes appropriately for a SPEED graph.



Acceleration

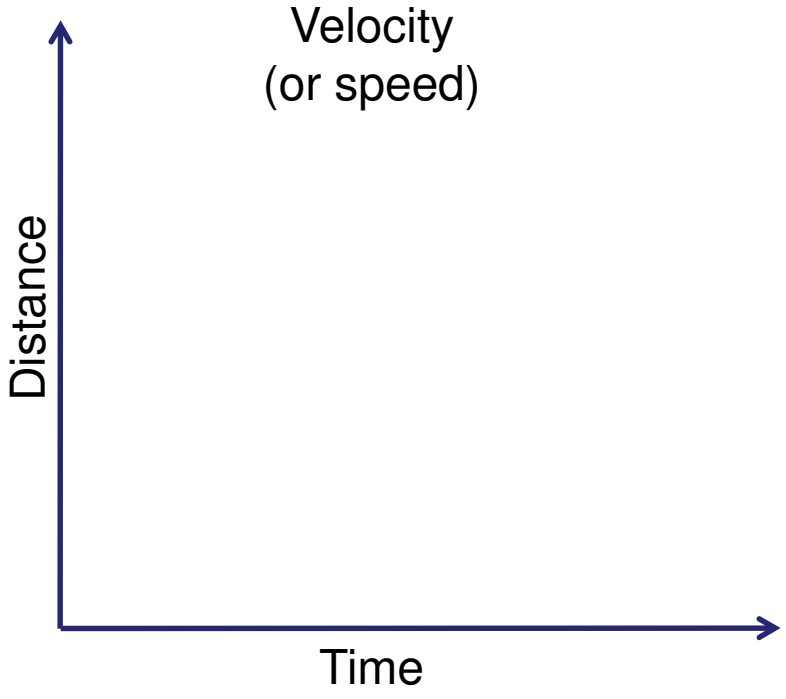
What would be the axes labels for ACCELERATION?

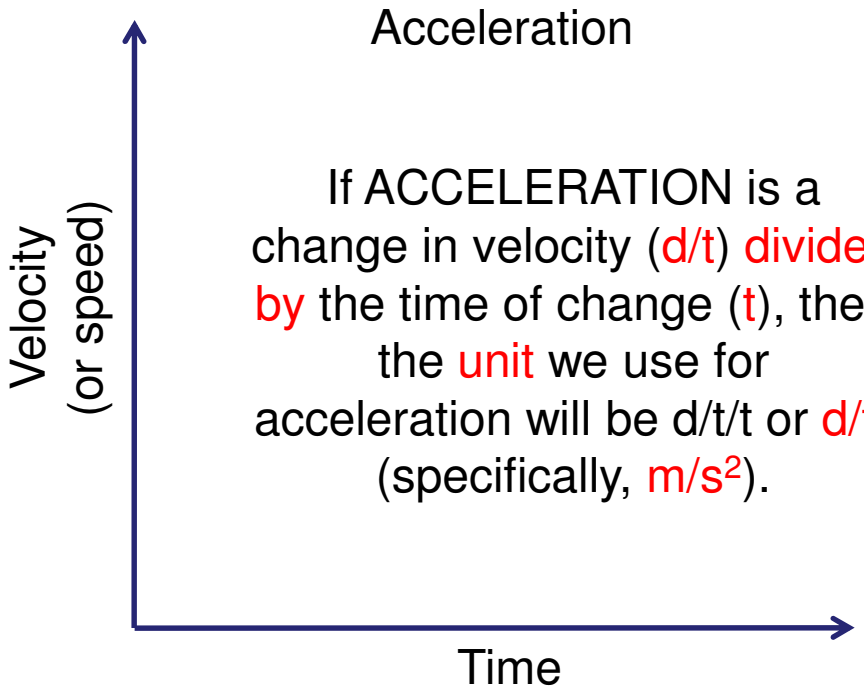


Calculating & Understanding Acceleration

Acceleration is Change…
in velocity
over a period of time

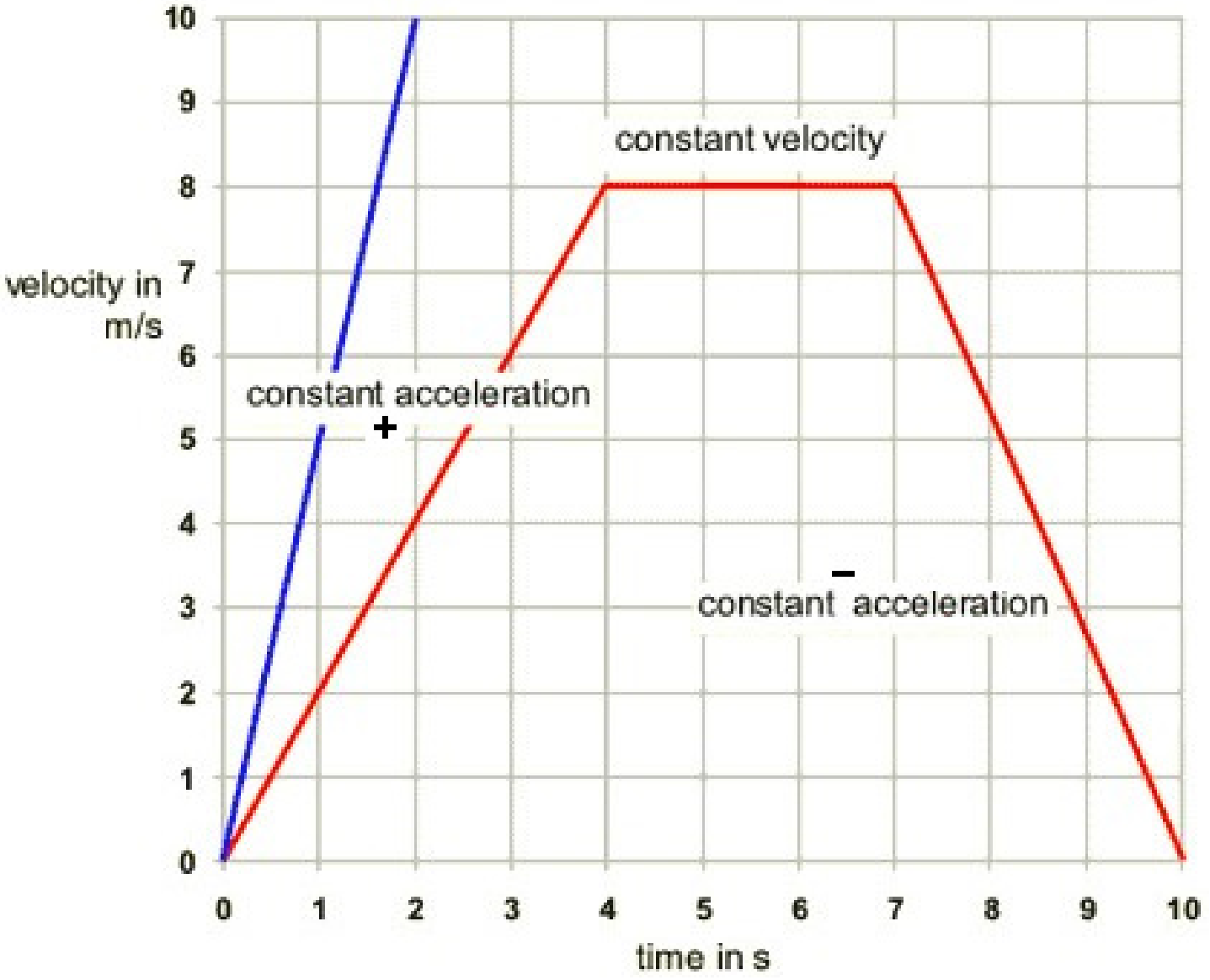
$$\frac{d/t}{t}$$





If ACCELERATION is a change in velocity (d/t) divided by the time of change (t), then the unit we use for acceleration will be d/t/t or d/t^2 (specifically, m/s^2).

Acceleration of Two Objects



Calculation of Acceleration

<u>There are TWO main ways…</u>

select the appropriate formula based on the information given in the problem!!

$$A = \frac{V_2 - V_1}{t}$$

V = velocity

V_2 = ending or final velocity

V_1 = beginning or initial velocity

$V_2 - V_1$ = the CHANGE in velocity

t = the elapsed time

acceleration units = m/s^2

$$A = \frac{F}{m}$$

acceleration units = m/s^2

Newton's 2nd Law (updated)

Objects <u>accelerate:</u>

- **In direct proportion to the applied force.**
- **In inverse proportion to their mass.**

In other words, if force increases, acceleration increases.

If mass increases, acceleration decreases.

Use the appropriate formula to solve the acceleration problems. (In the homework column on my website.)