Name: _____

Period: _____

Acceleration and Average Speed

Acceleration

Acceleration is how fast you change speed OR how much the speed changed in a certain amount of time.

Acceleration (in meter/sec^2) → $a = \frac{\Delta V}{\Delta T}$ ← Change of Speed (in meters/sec); Change of Time (in seconds)

Speed equal change of distance divided by change of time.

$\Delta V = V_f - V_i$ $\Delta T = T_2 - T_1$

a = ΔS/ΔT, not a = S/T.
Why? If a car is traveling at 60 m/s for 20 sec, S = 60 m/s, but ΔS = 0 m/s.
No change of speed: no acceleration.

Example: Calculate Acceleration

Ex. A plane starts at rest and ends up going 200 m/s in 10 secs. Calculate acceleration.

Step 1: Variables	Step 2: Find ΔS	Step 3: Formula	Step 4: Solve
S_1 = 0 m/s ("*starts at rest*") S_2 = 200 m/s ΔT = 10 seconds a = ?	$\Delta S = S_2 - S_1$ = 200 - 0 = 200 m/s	a = ΔS/ΔT	a = (200 m/s)/(10 s) = 20 m/s^2

Example: Calculate Deceleration

Ex. A race car starts at 400 m/s and then stops in 20 seconds. Calculate the car's acceleration.

Deceleration means an object is slowing down and has a negative sign.

Step 1: Variables	Step 2: Find ΔS	Step 3: Formula	Step 4: Solve
S_1 = 400 m/s S_2 = 0 m/s ("*then stops*") ΔT = 20 seconds a = ?	$\Delta S = S_2 - S_1$ = 0 - 400 = -400 m/s **NOTICE NEGATIVE ΔS**	a = ΔS/ΔT	a = (-400 m/s)/(20 s) = -20 m/s^2 Negative sign means deceleration.

Average Speed

$$S_{ave} = \frac{D_{total}}{T_{total}}$$

Ex. A person walks 4 miles in 2 hours, then stops for an hour for lunch. After lunch they walk 8 miles in 3 hours. Calculate the person's average speed.

Careful—distance is 0 miles because "*stops ... for lunch*".

	Distance	Time
	4 miles	2 hours
	0 miles	1 hour
	8 miles	3 hours
TOTALS:	12 miles	6 hours

$S_{ave} = D_{total}/T_{total}$
= 12 mi/6 sec
= 2 mph

Speed vs. Velocity

Speed is a **Scalar**
Velocity is a **Vector**

Speed has no direction; Scalars have no direction.
Velocity has direction; Vectors have direction.

A person walks 4 m/s—speed (no direction).
A person walks 2 m/s north— velocity (direction is given).

A car drives 60 mph toward Dallas—velocity.
A car drives 30 mph—speed.

A 14 newton force pull 30^o left of north—vector.
A boat is pulled by a 53 newton force—scalar.

Vectors have magnitude and direction.
Velocity is a vector with magnitude and direction.

Name: _____

Period: _____

speed vs. time graphs;

Ch. 2:1

Speed (S) or Velocity (V)	Scalar (S) or Vector (V)	Match the variables with quantities.	
___ A bike goes 25 m/s toward main street.	____40 mph toward Dallas.	1. a = _____	23 kilograms
___ A person walks 4 mph.	____A 25 N force pulls on a wagon.	2. S or v = _____	23 sec
___ A plane flies 200 m/s.	____10 meters up the hill.	3. m = _____	3 m/s^2
___ A bird flies 100 mph due south.	____12 meter per sec^2.	4. D = _____	23 meters/sec
		5. F = _____	23 meters
		6. T = _____	23 newtons

A person starts running from 2 m/s to 6 m/s in 2 seconds. Calculate the person's acceleration.

Variables:

Formula:

Solve:

A plane stops from 250 mph in 25 seconds. Calculate the planes acceleration.

Variables:

Formula:

Solve:

A guy bikes 15 miles in 1 hour, then rests for an hour. Then he bikes 25 in 2 hours. What was his average speed for the trip?

Variables:

Formula:

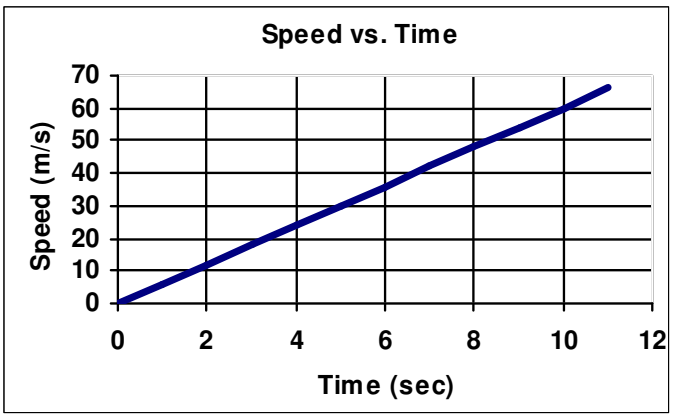
Solve:

A dragster's top acceleration is 60 m/s^2. If it accelerates for 3 seconds from the starting line, how fast will it be going?

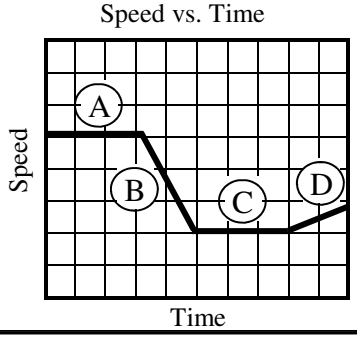
Variables:

Formula:

Solve:



Find the acceleration for the above graph:



Which graph segments fit the following:

Constant speed:

Deceleration:

Accelerating:

The slope of a position vs. time graph means:

The slope of a speed vs. time graph means: