

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.

$$\text{Acceleration (in meter/sec}^2\text{)} \rightarrow a = \frac{\Delta V}{\Delta T}$$

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

Speed equal change of distance divided by change of time.

$a = \Delta S / \Delta T$, not $a = S / T$.
 Why? If a car is traveling at 60 m/s for 20 sec,
 $S = 60$ m/s, but $\Delta S = 0$ 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.*

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

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

$$S_{ave} = D_{total} / T_{total}$$

$$= 12 \text{ mi} / 6 \text{ sec}$$

$$= 2 \text{ mph}$$

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° 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: _____

speed vs. time graphs;

Ch. 2:1

Period: _____

Speed (S) or Velocity (V)	Scalar (S) or Vector (V)	Match the variables with quantities.	
___ A bike goes 25 m/s toward main street. ___ A person walks 4 mph. ___ A plane flies 200 m/s. ___ A bird flies 100 mph due south.	___ 40 mph toward Dallas. ___ A 25 N force pulls on a wagon. ___ 10 meters up the hill. ___ 12 meter per sec ² .	1. a = _____ 2. S or v = _____ 3. m = _____ 4. D = _____ 5. F = _____ 6. T = _____	23 kilograms 23 sec 3 m/s ² 23 meters/sec 23 meters 23 newtons

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

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

Variables:

Formula:

Solve:

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?

A dragster's top acceleration is 60 m/s².
If it accelerates for 3 seconds from the starting line, how fast will it be going?

Variables:

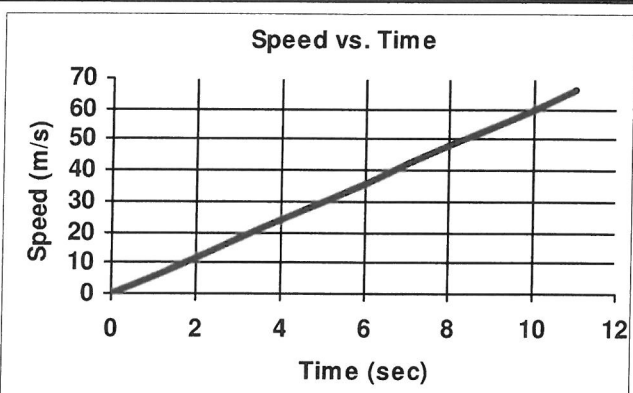
Formula:

Solve:

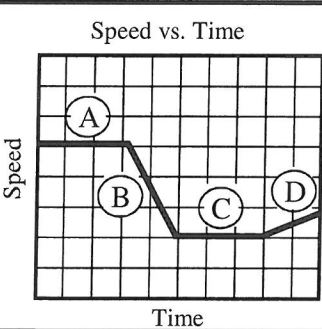
Variables:

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: