*للحصول على أوراق عمل لجميع الصفوف وجميع المواد اضغط هنا

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* للحصول على أوراق عمل لجميع مواد الصف التاسع المتقدم اضغط هنا

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Guide to Motion Graphs

Position-time graphs

-Horizontal Line shows NO MOVEMENT

-If the line is climbing, you are moving FORWARDS

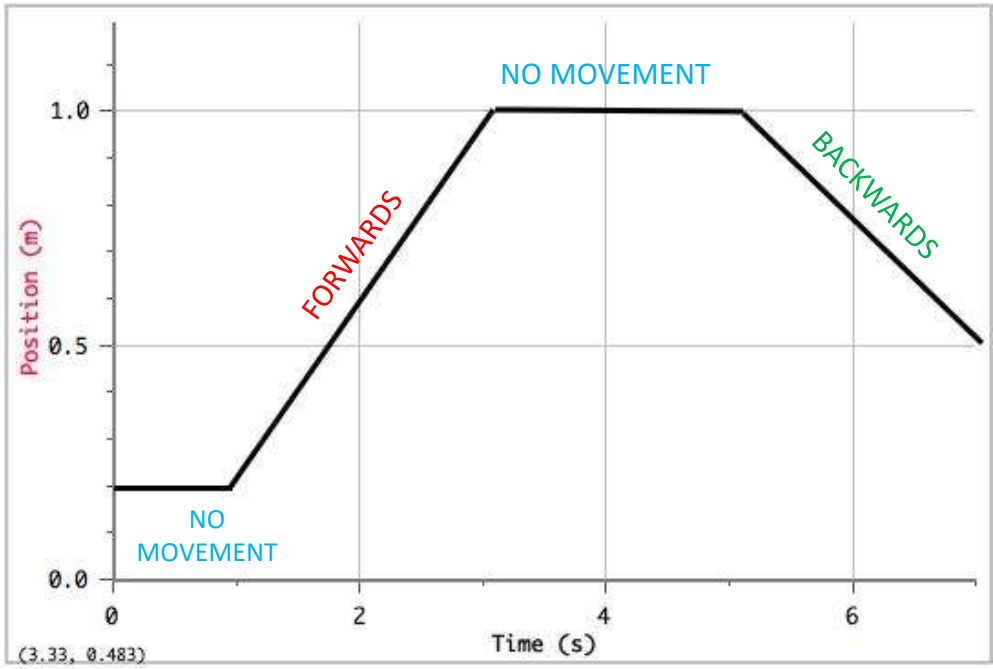
-If the line is moving down the graph, you are moving BACKWARDS

-SLOPE of the line tells you the VELOCITY

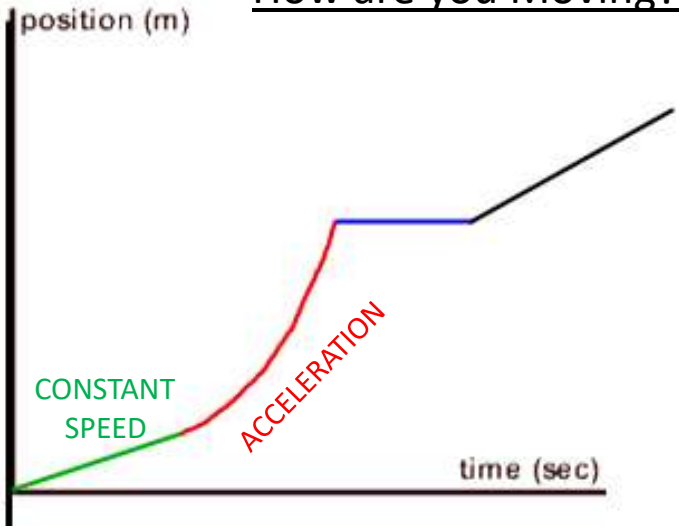
-A STRAIGHT LINE shows CONSTANT SPEED (because the slope is constant!)

-A CURVED line shows ACCELERATION

Which Way are you Moving?



How are you Moving?



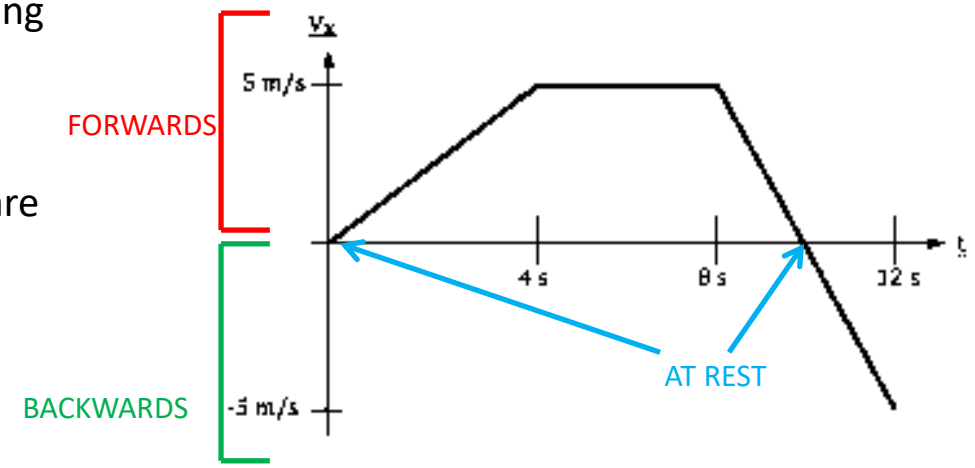
Which Way are you Moving?

Velocity-time graphs

-If the line is above the x-axis, you are moving FORWARDS
(because the velocity ahs a positive value!)

-If the line is moving down the graph, you are moving BACKWARDS

-If the line is <u>on the x-axis</u> , you are at rest



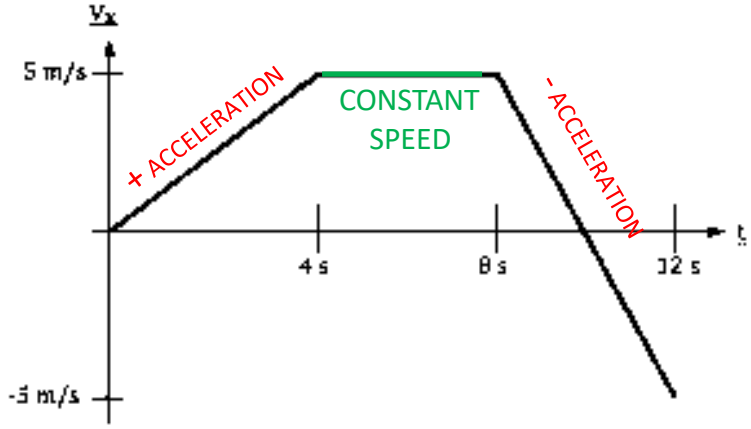
How are you Moving?

-SLOPE of the line tells you the VELOCITY

-A HORIZONTAL line shows CONSTANT SPEED

-A SLOPED line shows ACCELERATION

Moving AWAY from x-axis – getting FASTER
Moving toward x-axis – getting SLOWER



Acceleration-time graphs

Which Way are you Moving?

(assuming Constant acceleration…)

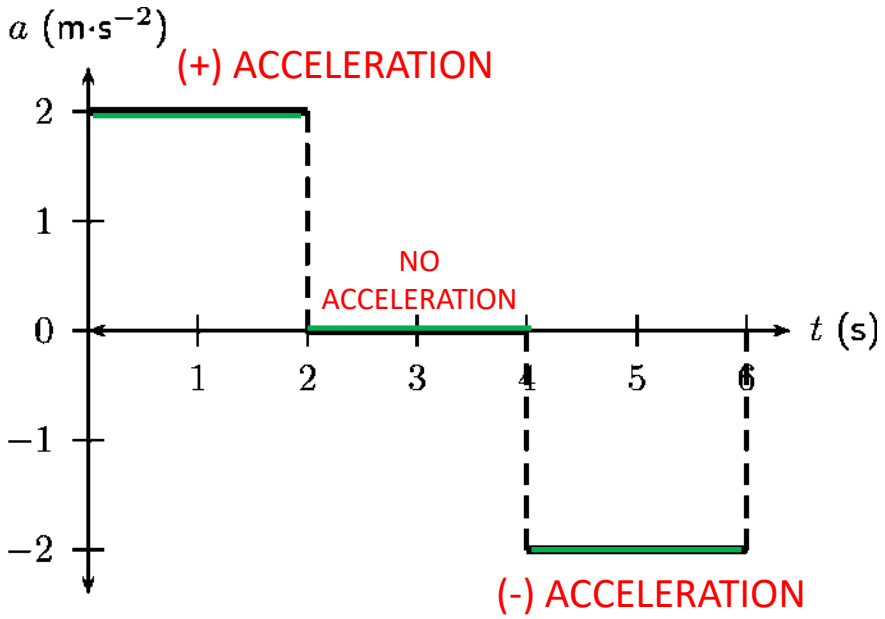
-Pretty boring; always HORIZONTAL lines

-Position of the line shows direction of ACCELERATION

Above X-axis = positive

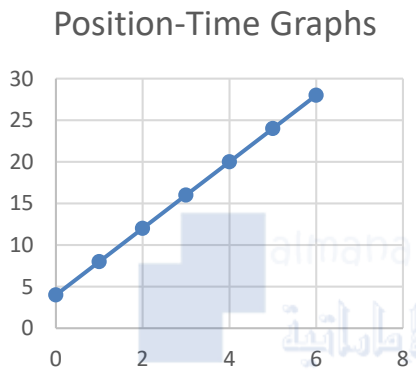
On X-axis = zero

Below X-axis = negative



The magic

SLOPE of a position time graph gets you velocity



What is slope?

$\frac{\text{Rise}}{\text{Run}}$

What is $\frac{\text{Rise}}{\text{Run}}$ for this graph?

$\frac{\text{Rise}}{\text{Run}} = \frac{m}{s}$

Velocity!!

SLOPE of a Velocity-time graph gets you Acceleration

- How can we use the position-time graph to determine how fast the object is traveling?
  - The **slope** of a position time graph give you the **velocity**
  - $v = \frac{\Delta x}{\Delta t} = \frac{x_f - xi}{t_f - ti}$
- Calculate the velocity of the object.

$$v = \frac{\Delta x}{\Delta t} = \frac{xf - xi}{tf - ti} =$$

PHYSICS ACADEMIC NAME Answer Key

CH. 2 REPRESENTING MOTION DATE _____ PD _____

AVERAGE VELOCITY & SPEED: WORD PROBLEMS

SAMPLE PROBLEM #1

1. A car travels a distance of 50 km in 2.5 hours. What is the car's average speed?

given: $\Delta X = 50\ km$
$\Delta t = 2.5\ hrs$

find: V_{avg}

$V_{avg} = \frac{\Delta X}{\Delta t}$

$V_{avg} = \frac{50}{2.5}$

$V_{avg} = 20\ km/hr.$

SAMPLE PROBLEM #2

2. A biker rides 50 km, N in 2.0 hours and then 75 km, S in 3.0 hours.

   a. What is the total distance traveled?

   $\Delta X = 50 + 75$

   $\Delta X = 125\ km$

   b. What is the total time?

   $\Delta t = 2.0 + 3.0$

   $\Delta t = 5.0\ hrs$

   c. Calculate the average speed of the biker.

   $V_{avg} = \frac{\Delta X}{\Delta t}$

   $V_{avg} = \frac{125}{5}$

   $V_{avg} = 25\ km/hr$

   d. What is the total displacement?

   $\Delta X = 50\ km, N + 75\ km, S$

   $\Delta X = 25\ km, S$

   e. Calculate the average velocity of the biker.

   $V_{avg} = \frac{\Delta X}{\Delta t}$

   $V_{avg} = \frac{25}{5}$

   $V_{avg} = 5\ km/h, S$

PRACTICE PROBLEMS.

1. What is the speed of a rocket that travels 9000 meters in 12.12 seconds?

given: $\Delta x = 9000\ m$
$\Delta t = 12.12\ s$

find: v_{avg}

$$v_{avg} = \frac{\Delta x}{\Delta t}$$
$$v_{avg} = \frac{9000}{12.12}$$
$$\boxed{v_{avg} = 742.6\ m/s}$$

2. What is the speed of a jet plane that travels 528 meters in 4 seconds?

given: $\Delta x = 528\ m$
$\Delta t = 4\ s$

find: v_{avg}

$$v_{avg} = \frac{\Delta x}{\Delta t}$$
$$v_{avg} = \frac{528}{4}$$
$$\boxed{v_{avg} = 132\ m/s}$$

3. How long will your trip take (in hours) if you travel 350 km at an average speed of 80 km/hr?

given: $\Delta x = 350\ km$
$v_{avg} = 80\ km/h$

find: Δt

$$v_{avg} = \frac{\Delta x}{\Delta t}$$
$$80 = \frac{350}{\Delta t}$$
$$80\Delta t = 350$$
$$\boxed{\Delta t = 4.4\ h}$$

4. How far (in meters) will you travel in 3 minutes running at a rate of 6 m/s?

given: $\Delta t = 3\ min = 180\ s$
$v_{avg} = 6\ m/s$

find: Δx

$$v_{avg} = \frac{\Delta x}{\Delta t}$$
$$6 = \frac{\Delta x}{180}$$
$$\boxed{\Delta x = 1080\ m}$$

5. A trip to Cape Canaveral, Florida takes 10 hours. The distance is 816 km. Calculate the average speed.

given: $\Delta t = 10\ hrs$
$\Delta x = 816\ km$

find: v_{avg}

$$v_{avg} = \frac{\Delta x}{\Delta t}$$
$$v_{avg} = \frac{816}{10}$$
$$\boxed{v_{avg} = 81.6\ km/h}$$

6. A car travels 800 km, East for 5.5 hours, and then 450 km, West for 3.2 hours.

a. What is the total distance traveled?

$\Delta X = 800\ km + 450\ km$

$\boxed{\Delta X = 1250\ km}$

b. What is the total time of travel?

$\Delta t = 5.5\ hrs + 3.2\ hrs$

$\boxed{\Delta t = 8.7\ hrs}$

c. Calculate the average speed.

$V_{avg} = \frac{\Delta X}{\Delta t}$

$V_{avg} = \frac{1250}{8.7}$

$\boxed{V_{avg} = 144\ km/h}$

d. What is the total displacement?

$\Delta X = 800\ km, E + 450\ km, W$

$\boxed{\Delta X = 350\ Km, E}$

e. Calculate the average velocity.

$V_{avg} = \frac{\Delta X}{\Delta t}$

$V_{avg} = \frac{350}{8.7}$

$\boxed{V_{avg} = 40\ km/h, E}$

PHYSICS ACADEMIC NAME Answer Key

CH. 2 REPRESENTING MOTION DATE _____ PD _____

P-T GRAPHS → V-T GRAPHS

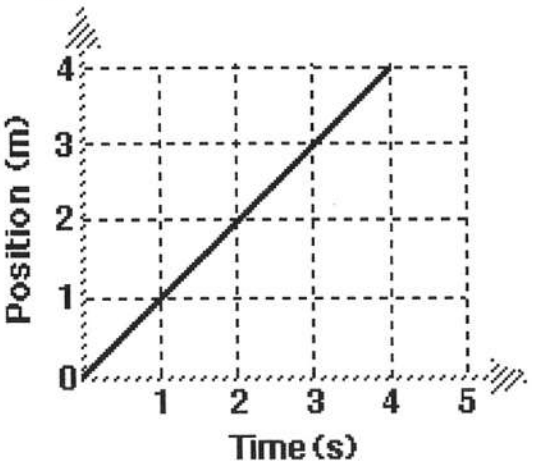
Notes:

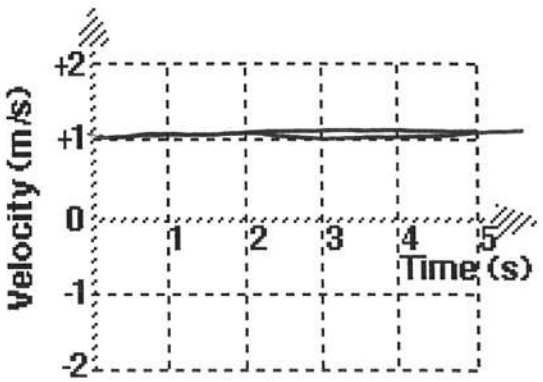
1. What information can a position-time graph give you?
   a. _____
   b. _____
   c. _____
   d. _____
2. Slope of the position-time graphs is velocity.
3. Average speed is distance traveled divided by the time.
4. Average velocity is displacement divided by the time

Practice:

a. Answer the questions for each graph.
b. Draw the velocity vs time graphs for an object whose motion produced the position vs time graphs shown below at left.

1.





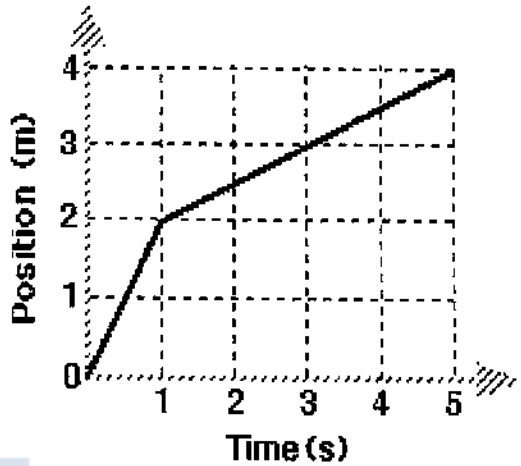
Calculations:

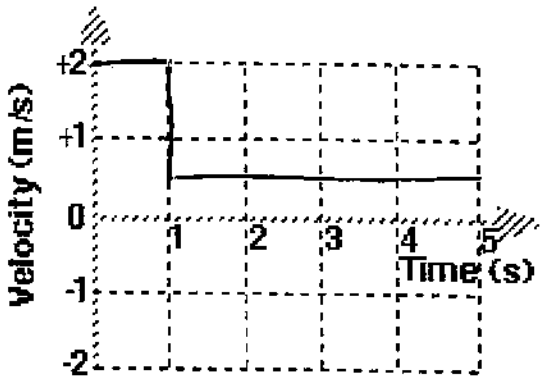
a. How far did the object travel in 4 s? 4 m
b. What is its average speed? 1 m/s

$$V_{avg} = \frac{\Delta x}{\Delta t}$$

$$V_{avg} = \frac{4}{4} = 1 \text{ m/s}$$

2.





a. How far did the object travel in the first second? 2m
b. What is its speed during the first second? 2 m/s
c. How far did the object travel from 1 s to 5 s? 4 - 2 = 2m
d. What is its speed from 1 s to 5 s? 0.5 m/s
e. What is its total distance traveled? 4m
f. What is its average speed from 0 s to 5 s? 0.8 m/s

Calculations:

$$V_{avg} = \frac{\Delta X}{\Delta t}$$

$$V_{avg} = \frac{2}{1} = 2\,m/s$$

$$V_{avg} = \frac{\Delta X}{\Delta t}$$

$$V_{avg} = \frac{2}{4}$$

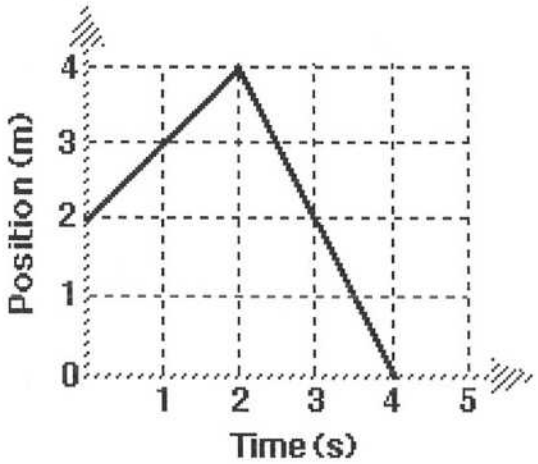
$$V_{avg} = 0.5\,m/s$$

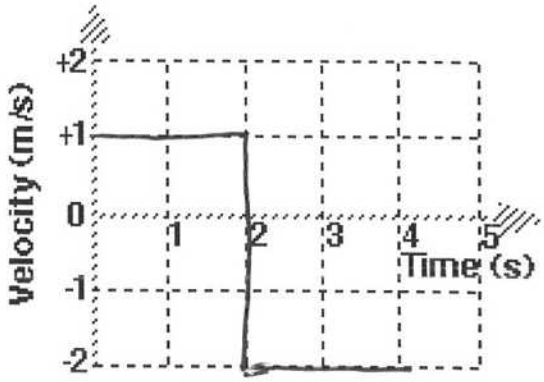
$$V_{avg} = \frac{\Delta X}{\Delta t}$$

$$V_{avg} = \frac{4}{5}$$

$$V_{avg} = 0.8\,m/s$$

3.





a. How far did the object travel from 0 s to 2 s? $4-2=2m$

b. What is its speed from 0 s to 2 s? $1m/s$

c. How far did the object travel from 2 s to 4 s? $|0-4| = |-4m| = 4m$

d. What is its velocity from 2 s to 4 s? $-2m/s$

e. What is the total distance that the object traveled from 0 s to 4 s? $6m$

f. What is the object average speed for the 4 seconds? $1.5\ m/s$

g. What is the object's total displacement for the 4 seconds? $\Delta X = 0-2 = 2m$

h. What is the object's average velocity for the 4 seconds? $-0.5\ m/s$

i. At what time does the object turn around and go back to the origin? $2s$

j. At what position does the object start at t = 0 s? $2m$

Calculations:

$$V_{avg} = \frac{\Delta X}{\Delta t} \qquad V_{avg} = \frac{\Delta X}{\Delta t} \qquad V_{avg} = \frac{\Delta X}{\Delta t}$$

$$V_{avg} = \frac{2}{2} \qquad V_{avg} = \frac{-4}{2} \qquad V_{avg} = \frac{6}{4}$$

$$V_{avg} = 1m/s \qquad V_{avg} = -2m/s \qquad V_{avg} = 1.5\ m/s$$

$$V_{avg} = \frac{\Delta X}{\Delta t}$$

$$V_{avg} = \frac{-2}{4}$$

$$V_{avg} = -0.5\ m/s$$