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Name: Date: Per:

Speed Practice Problems

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PRACTICE PROBLEMS

1. An airplane travels from Austin to San Antonio in 45 minutes. San Antonio is 65 miles south of Austin. What is the plane's speed?

Givens	Formula	Substitution	Answer and Units
v = d = t =	$S = \frac{d}{t}$	$S = \frac{65 \text{ miles}}{45 \text{ min}}$	$1.44 \frac{\text{miles}}{\text{min}}$

2. A toy car travels down a 90 cm ramp in only 6 seconds. What is the speed of the toy car?

Givens	Formula	Substitution	Answer and Units
v = d = t =	$S = \frac{d}{t}$	$S = \frac{90 \text{ cm}}{6 \text{ sec}}$	15 cm/sec

3. A bus takes you six miles (d) north to downtown Austin and takes an hour and a half (1 hr) to get you there. How fast was the bus going? (S = ?)

Givens	Formula	Substitution	Answer and Units
v = x d = 6 miles t = 1 hour	$S = \frac{d}{t}$	$S = \frac{6}{1}$	6 miles/hr

4. Next time, you decide to drive yourself. You know you can drive 65 miles per hour on I35 (S), so how long will it take you to drive the six miles north to downtown? (t = ?, d)

Givens	Formula	Substitution	Answer and Units
v = d = t =	$S = \frac{d}{t}$ $t = \frac{d}{S}$	$t = \frac{6 \text{ miles}}{65 \frac{\text{miles}}{\text{hr}}}$	$t = 0.09$ hr

→ make sure you can rearrange.

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5. Once you're downtown, you walk from Red River all the way down to Nueces to get to your favorite spot. If it took you 7 minutes to walk there and you walk at a speed of 0.1 miles/min, how far did you walk?

d.? t 5

Givens	Formula	Substitution	Answer and Units
v = d = t =	$s=\frac{d}{t}$ $d=(s)(t)$	$d=(0.1\frac{mi}{min})(7min)$	$d=.7miles$

s t d

6. If I can run at 11.1 mi/hr, how long will it take me to run 10 miles?

Givens	Formula	Substitution	Answer and Units
v = d = t =	$t=\frac{d}{s}$	$t=\frac{10miles}{11.1mi/hr}$	$t=.9hr.$

7. A cross-country runner runs 40 minute race at a speed of 0.25km/min. What distance did she cover?

t s d

Givens	Formula	Substitution	Answer and Units
v = d = t =	$d=(t)(s)$	$d=(40min)(\frac{.25km}{min})$	$d=10km$

d s t

8. Mr. Shapiro wants to run a marathon (26.2 miles). If he runs at 2.5 mi/hr, how long will it take him to finish the marathon?

Givens	Formula	Substitution	Answer and Units
v = d = t =	$t=\frac{d}{s}$	$t=\frac{26.2miles}{2.5mi/hr}$	$t=10.48hr$

t s d

9. A boat drives for 35 minutes at a speed of 0.8 mi/min. What distance did she cover?

Givens	Formula	Substitution	Answer and Units
v = d = t =	$d=(t)(s)$	$d=(35min)(\frac{.8mi}{min})$	$d=28miles$

Watch Units!

Acceleration Problems

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Show all your work, including formula, substitution, and answer with correct units.

1. What is the acceleration of a horse whose speed changed from 3 m/s to 6 m/s in 5 seconds?

Given	Formula	Substitution	Answer & Units
	$a = \frac{V_f - V_i}{\Delta t}$	$a = \frac{6m/s - 3m/s}{5s}$	$= 0.6 m/s^2$

watch units!

2. What is the acceleration of an ice skater whose speed changed from 8 m/s to 10 m/s in 2 seconds?

Given	Formula	Substitution	Answer & Units
		$a = \frac{10m/s - 8m/s}{2s} =$	$1 m/s^2$ = units.

3. What is the acceleration of an airplane going 1000 km/hr and increasing its speed to 2500 km/hr in 5 hours?

Given	Formula	Substitution	Answer & Units
		$a = \frac{2500km/hr - 1000km/hr}{5hr}$	$= 300 km/hr^2$

4. What is the acceleration of a chariot traveling 35 km/hr that is increased to 45 km/hr in 0.5 hours?

Given	Formula	Substitution	Answer & Units
		$a = \frac{45km/hr - 35km/hr}{.5hr}$	$= 20 km/hr^2$

5. What is the acceleration of a flying saucer slowing from 2000 km/hr to 100 km/hr in 4 hours?

Given	Formula	Substitution	Answer & Units
	$a =$ ~~$\frac{V_f - V_i}{\Delta t}$~~	$\frac{100km/hr - 2000km/hr}{4hr}$	$= -475 km/hr$

↳ negative = slowing down

→ Same formula

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6. What is the deceleration of a car going from 22 m/s to 2 m/s in 10 seconds?

Given	Formula	Substitution	Answer & Units
	$a = \frac{22\,m/s - 2\,m/s}{10} = 2\,m/s^2$		

7. A bobsled traveling 8 m/s comes to a stop in 5 seconds. What is its rate of deceleration?

Given	Formula	Substitution	Answer & Units
	$\frac{V_f - V_i}{t}$	$\frac{0 - 8\,m/s}{5\,sec} = -1.6\,m/s^2$	

8. A dragster accelerates from rest to 36 m/s in 9 seconds. Calculate the rate of acceleration.

Given	Formula	Substitution	Answer & Units
	$\frac{36 - 0}{9} = 4\,m/s^2$		

9. A car entering the freeway goes from 35 km/hr to 65 km/hr in 0.2 hours. How fast did it accelerate?

Given	Formula	Substitution	Answer & Units
	$a = \frac{65 - 35}{.2} = 150\,km/hr^2$		

10. A policeman speeds up from 83 km/hr to 100 km/hr in 0.1 hours. What is her acceleration?

Given	Formula	Substitution	Answer & Units
	$\frac{100 - 83}{.1} = 170\,km/hr^2$		

Name: _____

Period: _____

Graphing Speed; Slope

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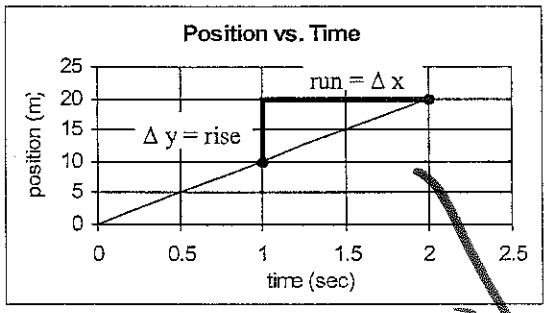
The graph on the right is a *distance versus time graph*. That means that it shows how far an object has traveled after so many seconds.

This is what we call a *linear graph*, because the data creates a **straight line.**



Data

Time (sec)	Distance (m)
0	0
0.5	5
1	10
1.5	15
2	20

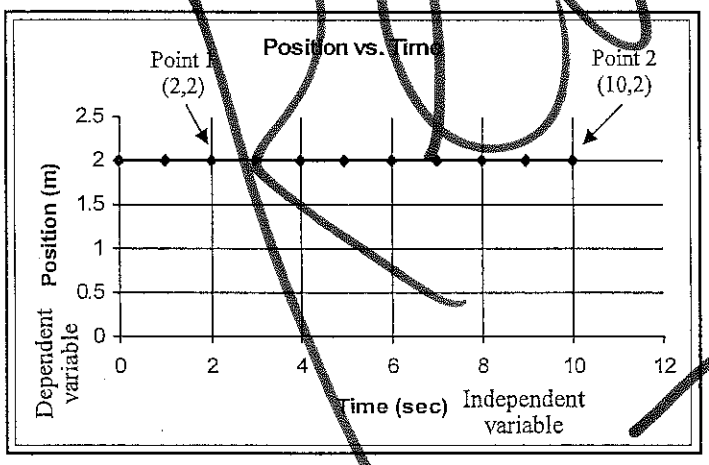
Slope has actual meaning in science –

Slope for the above graph:

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(20 - 10)\text{m}}{(2 - 1)\text{ sec}} = \frac{10\text{m}}{1\text{ sec}} = 10\text{m/s}$$

The slope of a position vs. time graph is <u>SPEED</u>

Graphing Conventions: The independent variable is always on the x-axis.
The dependent variable is always on the y-axis.



Independent variable—Time
Dependent variable—position

Linear graph.

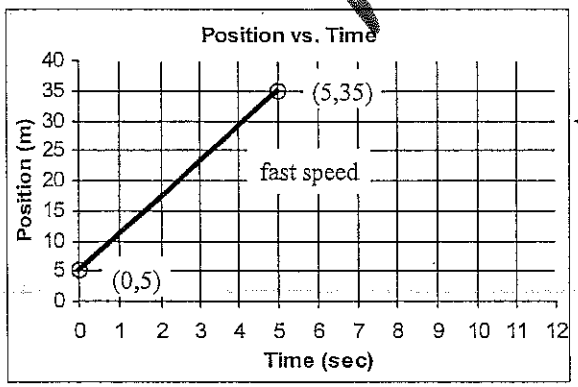
Position vs. time graph, so slope = speed (position/time)

(Pick any two points)
Slope = rise/run = Δy/Δx =

$$\frac{(2 - 2)\text{m}}{(10 - 2)\text{ sec}} = \frac{0\text{ m}}{8\text{ sec}} = 0\text{ m/s}$$

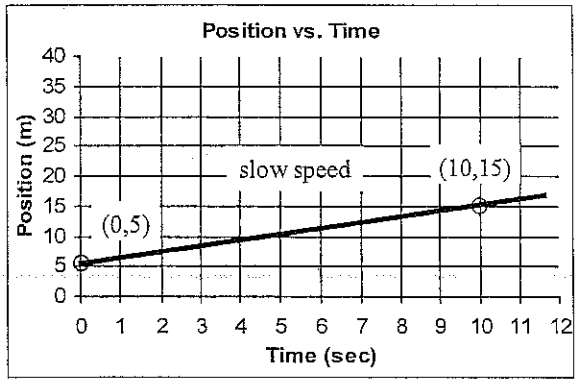
Time is always an independent variable (x-axis).

The slope (speed) of a flat line is zero—<u>no speed</u>. The object is at rest.



Steep slope—fast speed

Gradual slope—slow speed



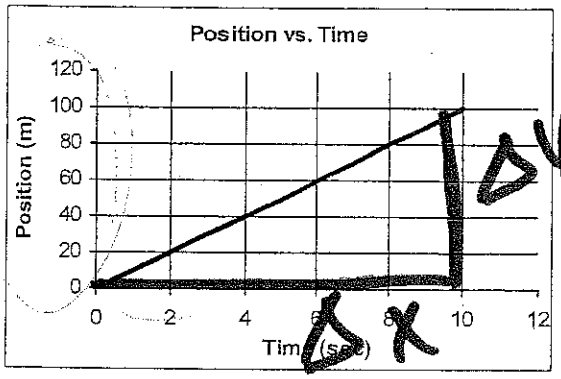
$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{(35 - 5)\text{m}}{(5 - 0)\text{sec}} = \frac{30\text{m}}{5\text{sec}} = 6\text{m/s}$$

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{(15 - 5)\text{m}}{(10 - 0)\text{sec}} = \frac{10\text{m}}{10\text{sec}} = 1\text{m/s}$$

Cont p.23

Ch.1:4

1. Linear	A. The variable on the vertical axis (y-axis).	Which of the following are units for speed?
2. Independent variable	B. A type of graph that looks like a straight line.	km, meters/sec, meters, cm/sec, sec, miles/hour, km/min, meter/sec^2
3. Dependent variable	C. The measure of the steepness of a line.	
4. Slope	D. The variable on the horizontal axis (x-axis).	



Which is the independent variable? _____

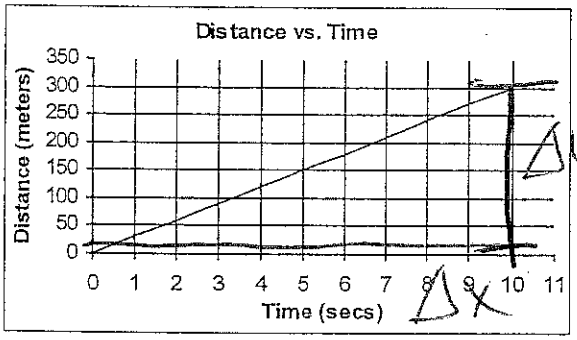
Which is the dependent variable? _____

Where was the object at 4 seconds? _____

Find the slope of the graph (must show work)

10 m/s²

What does the slope you just found stand for? _____



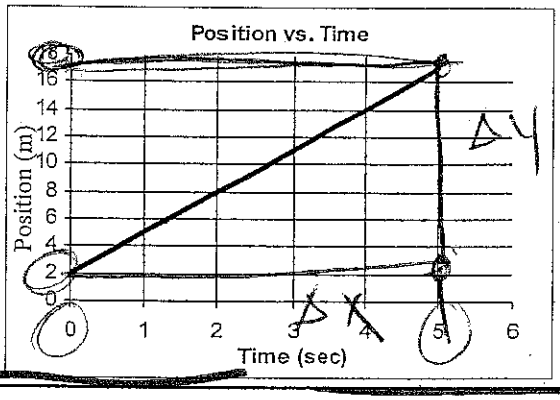
When did the object reach 150 meters? _____

Where was the object at 9 seconds? _____

Find the slope of the graph (must show work) _____

$\frac{\Delta y}{\Delta x} = \frac{300-0}{10-0} = 30\ m/s^2$

What does the slope you just found stand for? speed



Which is the independent variable? T

Which is the dependent variable? P

Where was the object at 4 seconds? 14 m

Find the slope of the graph (must show work)

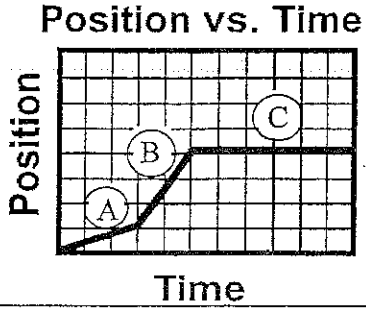
$\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{18-2}{5-0} = \frac{15}{5} = 3\ m/s$

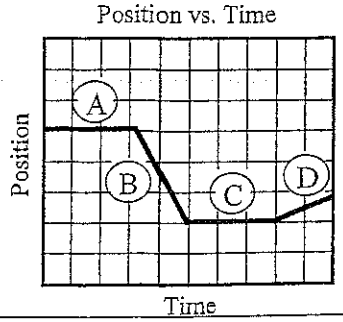
What does the slope you just found stand for? Speed

The slope of this graph means: speed

The segment that shows fast speed: B

The segment that shows slow speed: A





Which graph segments fit the following:

At rest: C + A

Fast speed: B

Slow speed: D

Going backwards: B

Going forward: D

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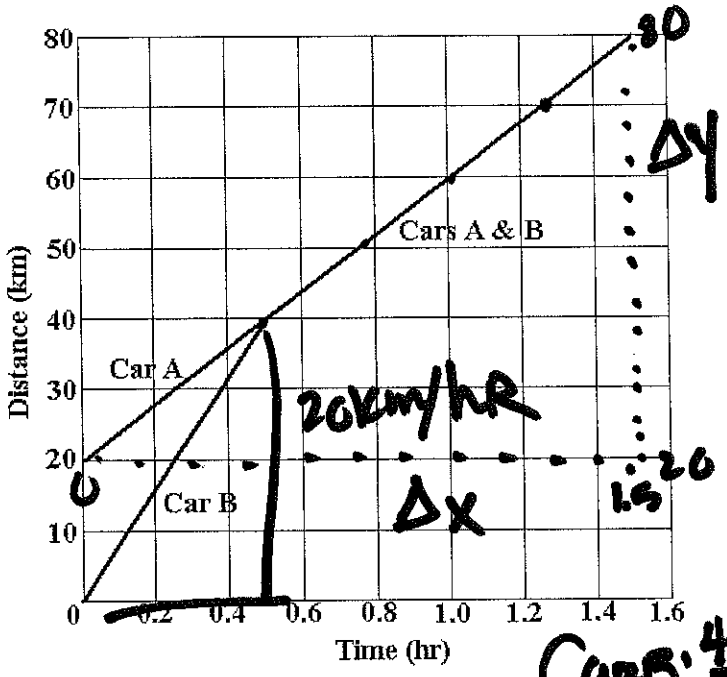
Speed Graphing WS



1. How far did Car A go before it met car B? 20 km ~~20 meters~~

2. How much time did the two cars travel before they met? 0.5 hR

3. How far did both cars travel at the same speed? 40km

4. Which car had constant speed? What was its speed? A

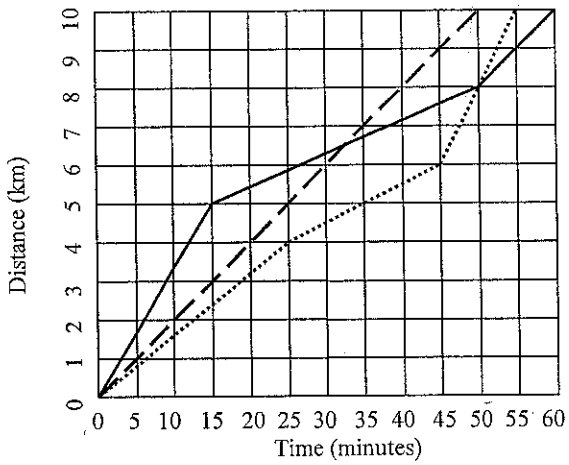
$\frac{\Delta y}{\Delta x} = \frac{80-20}{1.5-0} = \frac{60}{1.5}$

5. What were the speeds of the other car?

$= 40 \frac{km}{hR}$

Car B: $\frac{40}{2} = 20 km/hR$

Sasha, Kim and Barry decided to have a 10 km bicycle race after school. Their race results are shown on the distance-time graph.



Cyclist	Total Distance (km)	Total Time in hours	Average Speed (km/hr)
Kim	10 km	50 min = .83 hR	12 km/hR
Sarah	10 km	55 min = .92 hR	10.87 km/hR
Barry	10 km	60 min = 1 hR	10 km/hR

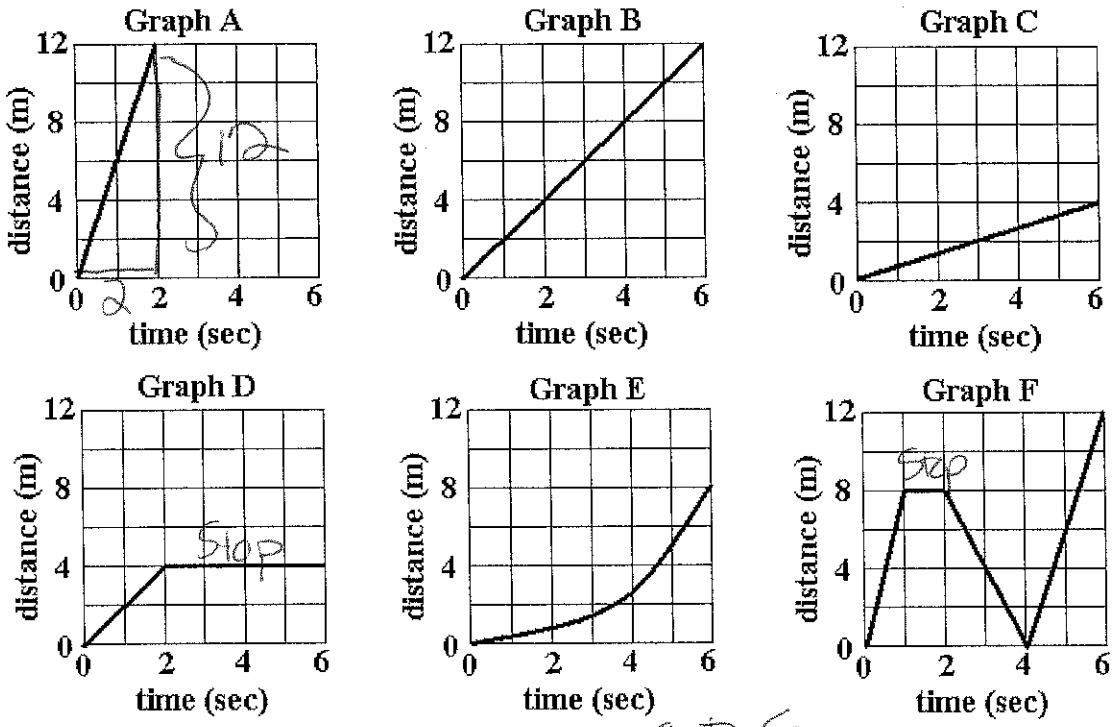
1. Which cyclist kept a constant speed during the entire race? Kim

2. ~~Which cyclist won the race?~~ Kim ~~What was the winning time?~~ 50 minutes

3. Which cyclist placed last? Barry What was the last place time? 60 minutes

4. Which cyclist started off the fastest? Barry How do you know? Steepest slope

cont p. 24



1. Which graphs show constant velocity? A B C D F
2. Which graphs show an object that comes to a stop? D F
3. Which graph shows an object that returns to its starting location? F
4. What is the velocity of Graph A? $\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{12-0}{2-0} = 6\ m/s$
5. Which graph shows the fastest velocity – Graph A, B or C? A -> steepest slope
6. Which graph does not show constant velocity? E It is accelerating

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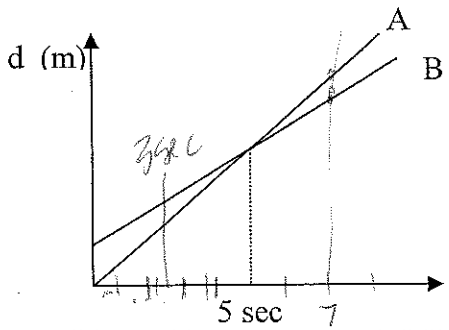
Consider the position vs. time graph below for cyclists A and B.



1. Do the cyclists start at the same point? If not, which one is ahead? NO
2. At t= 7s, which cyclist is ahead? How do you know? A -> Further distance
3. Which cyclist is traveling faster at 3s? How do you know? A - steeper slope than B
4. Are the velocities equal at any time? How do you know? ~~Yes at 5 seconds - same d & t~~
5. What is happening when lines A and B cross? cross each other

Bad Question