

Unit 5 - Linear Relations

Math 9

WCLN.ca

Lesson 1

CARTESIAN COORDINATES

All

1. On the Cartesian Plane below, insert labels for the x -axis, y -axis, and origin.
2. Write out the coordinates for each point. Reminder: The first coordinate in the ordered pair is the value of the x -axis.

A (2, 4)

B _____

C _____

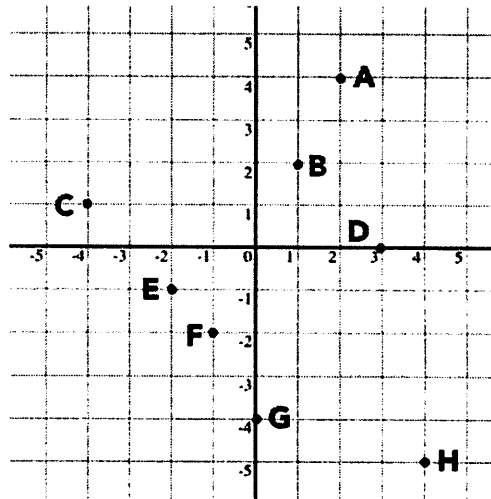
D _____

E _____

F _____

G _____

H _____



All

3. Plot and label the points onto the Cartesian Plane.

A (-2, 7)

B (-5, -1)

C (4, -3)

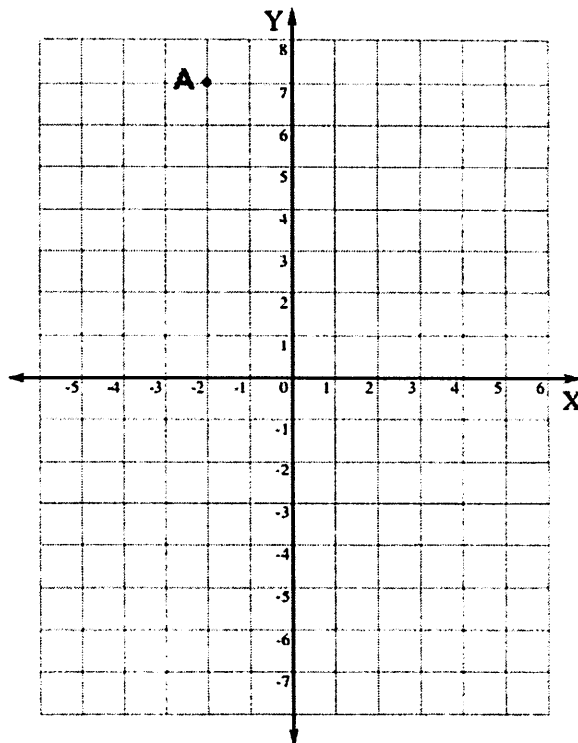
D (0, 0)

E (5, 6)

F (0, -7)

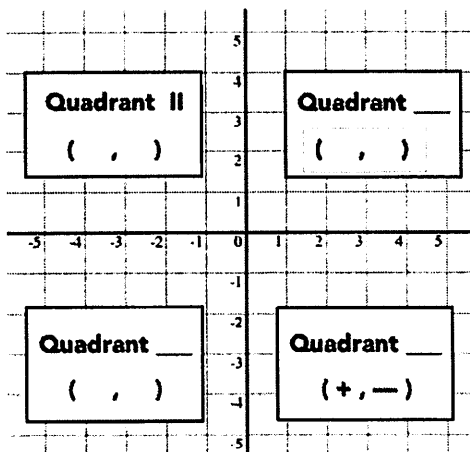
G (-3, 2)

H (1, 8)



All

4. Fill in the missing information below to show the pattern of the coordinates in each quadrant of the Cartesian Plane.



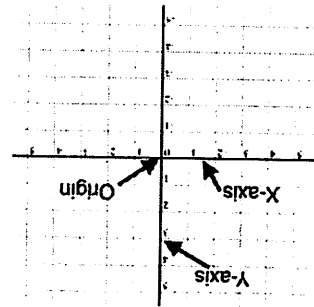
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5. Using the Cartesian Plane above, determine in which quadrant each ordered pair would land. Reminder: Always use a Roman numeral to represent the quadrant number.

	Ordered pair	Pattern	Quadrant
Ex.	(5, -2)	(+, -)	IV
a.	(-6, -2)		
b.	(3, 8)		
c.	(1, -4)		
d.	(-5, 6)		

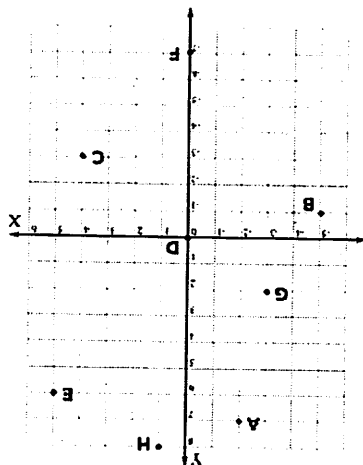
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Lesson 1 answers Cartesian coord notes

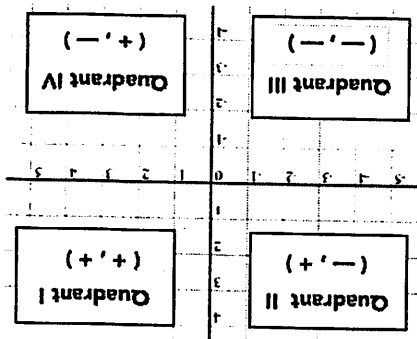


1.

2. B(1,2) C(-4,1) D(3,0) E(-2,-1) F(-1,-2) G(0,-4) H(4,-5)



3.



4.

5. a. (-, -) Quadrant III b. (+, +) Quadrant I c. (+, -) Quadrant IV d. (-, +) Quadrant II

Lesson 2 EQUATIONS, TABLES & GRAPHS

1. Complete each table and its related information. *Reminder: The pattern always needs to be in the form of When x increases by 1, y _____ by ____.*

a.

$y = 2x + 3$	
x	y
1	5
2	
3	
4	
5	

Pattern: When x increases by 1, y increases by 2

Ordered Pairs: (1, 5) (,) (,) (,) (,)

All

b.

$y = -x - 2$	
x	y
0	
1	
2	
3	
4	

Pattern: _____

Ordered Pairs: _____

All

c.

$2y = x + 4$	
x	y
0	
2	
4	
6	
8	

Hint: Before creating your table of values, change the equation so that y is isolated on the left.

Pattern: _____

Ordered Pairs: _____

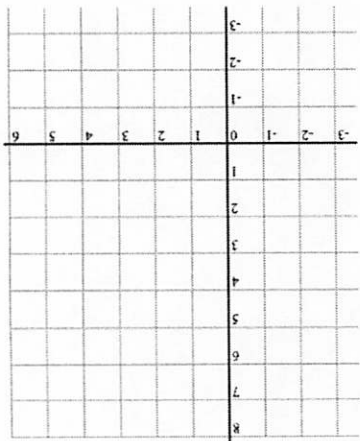
most

2. Create a table of values and graph the following relations. Reminder: The table of values gives you the ordered pairs that you need to plot points on a graph. Start by choosing values for x , then calculate y from those values.

a.

$y = 3x + 1$	
x	y
-1	
0	

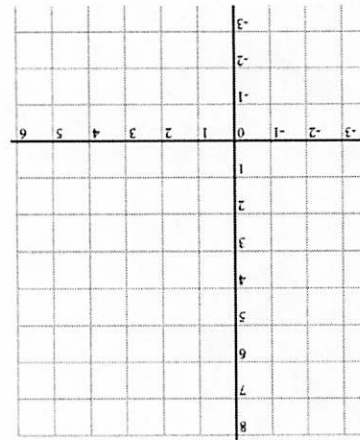
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b.

$y = -2x + 5$	
x	y

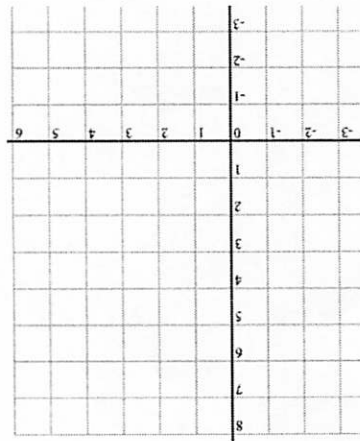
All



c.

$y = -\frac{1}{3}x$	
x	y

most



3. Determine the pattern and the equation for each table of values. *Hint: Remember to use the pattern and the value of y when $x = 0$ to help create your equation.*

Ex.

x	y
0	4
1	6
2	8
3	10

Pattern: When x increases by 1, y increases by 2

Y-intercept: When x is 0, y is 4

Equation: $y = 2x + 4$

a.

x	y
0	2
1	5
2	8
3	11

Pattern: _____

Y-intercept: When x is 0, y is _____

Equation: _____

All

b.

x	y
-1	1
0	-1
1	-3
2	-5

Pattern: _____

Y-intercept: When x is 0, y is _____

Equation: _____

All

c.

x	y
2	1
4	2
6	3
8	4

Pattern: _____

When x is 0, y is _____

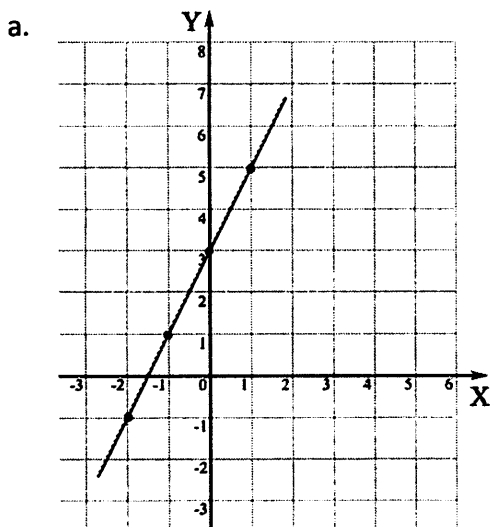
Equation: _____

most

4. Use the graphs to determine the equation of the graphed line. Follow these steps to arrive at the correct equation:

- i. Create a **table of values** from the plotted points.
- ii. Determine the **pattern**. (Must be: *When x increases by 1, y increases/decreases by ____.*)
- iii. Find the **y-intercept**. (The value of y when $x = 0$.)
- iv. Create the **equation**.

All



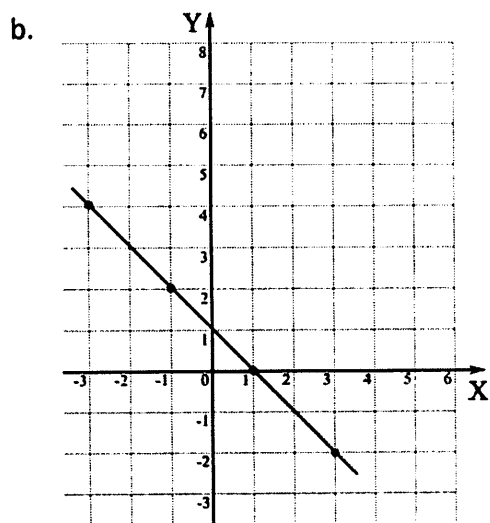
x	y

Pattern: _____

y-intercept _____

Equation: _____

most



x	y

Pattern: _____

y-intercept _____

Equation: _____

5. Canoes cost \$40 a day to rent. Regardless of the number of days that you rent the canoe, you pay a flat rate of \$25 for all of the safety equipment that you need to be out on the water.

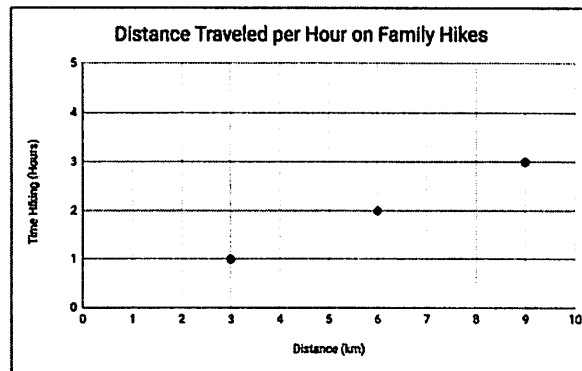
- a. Finish filling in the table of values that relates the total cost (C) to the number of days the canoe is rented (D).
- b. Determine an equation to represent the relationship between the cost and the number of rental days.

All

D	C
1	65
2	
3	
4	
5	

- c. Calculate your total cost if you rented the canoe for 2 weeks.

6. Every weekend, you go on a hike with your family. The graph below shows the relation between the numbers of hours spent hiking and the distance traveled.



most

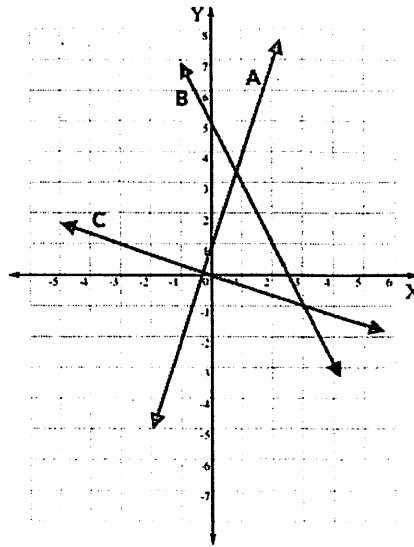
- a. Describe the relationship between the time spent hiking and the distance traveled. Do this in as many ways as you can think of. Ideas: Word sentence, equation, ordered pairs, etc.
- b. How long would an 18 km hike take?
- c. On a multi-day trip, you hiked a total of 27 hours. What distance did you cover?

Lesson 2 Answers

1. a. $y = 7, 9, 11, 13$ Ordered Pairs: $(2, 7) (3, 9) (4, 11) (5, 13)$
 b. $y = -2, -3, -4, -5, -6$ Pattern: When x increases by 1, y decreases by 1. Ordered Pairs: $(0, -2) (1, -3) (2, -4) (3, -5) (4, -6)$
 c. $y = 2, 3, 4, 5, 6$ Pattern: When x increases by 1, y increases by $\frac{1}{2}$. Ordered Pairs: $(0, 2) (2, 3) (4, 4) (6, 5) (8, 6)$

2. A variety of values for x are possible to use.

- a. $(-1, -2) (0, 1) (1, 4) (2, 7) (3, 10)$
 b. $(0, 5) (1, 3) (2, 1) (3, -1) (4, -3)$
 c. $(-3, 1) (0, 0) (1, -\frac{1}{3}) (3, -1) (6, -2)$



3. a. When x increases by 1, y increases by 3. When x is 0, y is +2. $y = 3x + 2$
 b. When x increases by 1, y decreases by 2. When x is 0, y is -1. $y = -2x - 1$
 c. When x increases by 1, y increases by $\frac{1}{2}$. When x is 0, y is 0. $y = \frac{1}{2}x$

4. a.

x	y
-2	-1
-1	1
0	3
1	5

When x increases by 1, y increases by 2. When x is 0, y is +3.

$$y = 2x + 3$$

- b.

x	y
-3	4
-1	2
1	0
3	-2

When x increases by 1, y decreases by 1. When x is 0, y is +1.

$$y = -x + 1$$

5. a. $C = 105, 145, 185, 225$ b. $C = 40D + 25$ c. \$585

6. a. Multiple possible answers. Ex. $(3, 1) (6, 2) (9, 3)$ For each hour hiked, you travel 3 km.

$$D = \frac{1}{3}h. \text{ You could also create a table of values.}$$

- b. 6 hours c. 81 km

Lesson 3DATA TRENDS

1. What kind of information do we get from a correlation coefficient? (ex. $r=0.9$)

All

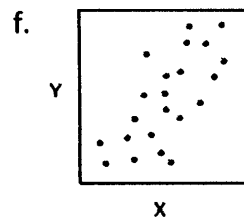
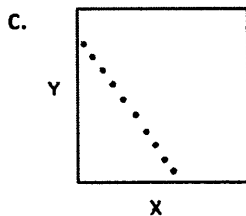
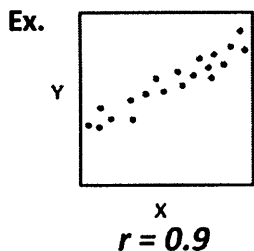
2. Circle which of the following could be correlation coefficients.

All

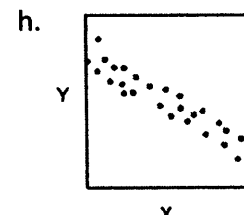
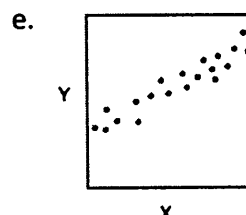
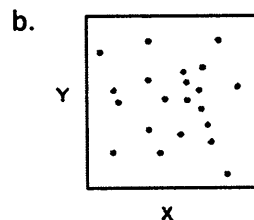
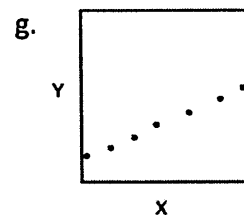
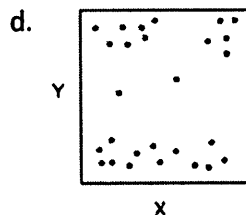
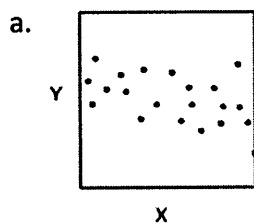
- | | | | | |
|-----------|------------|-----------|------------|------------|
| $r = 0.5$ | $r = 1.9$ | $r = -8$ | $r = -0.5$ | $r = 1$ |
| $r = -1$ | $r = -2.5$ | $r = 0.9$ | $r = 0.75$ | $r = 50\%$ |

3. Match each graph with the correlation coefficient that best represents it.

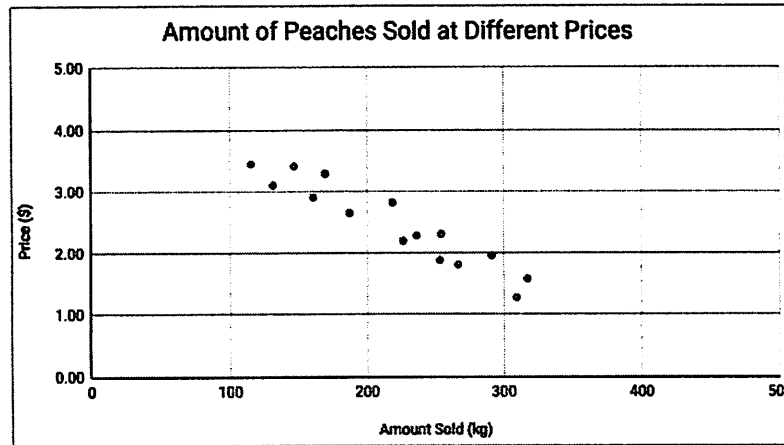
- $r = 1$ $r = 0$ $r = -0.5$ $r = -1$ $r = 0.9$ $r = -0.9$ $r = 0$ $r = 0.5$



All



4. A local fruit stand tracks how many peaches they sell each day versus the price at which they sell the peaches. Make the following predictions and choose whether you based them on interpolation or extrapolation. *Hint: Draw a "best-fit line" through the graph with a ruler before beginning.*



A 11

- a. How many peaches do you expect the fruit stand to sell if they price them at \$1.50?
 _____ Interpolation Extrapolation

A 11

- b. How many peaches do you expect the fruit stand to sell if they price them \$4.00?
 _____ Interpolation Extrapolation

most

- c. What would you predict the peaches were priced at if they sold 200kg in a day?
 _____ Interpolation Extrapolation

most

- d. What would you predict the peaches were priced at if they sold 350kg in a day?
 _____ Interpolation Extrapolation

most

- e. Why is your answer to question 4. b. considered a low-confidence prediction?

Lesson 3 Answers

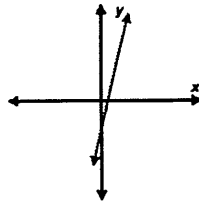
1. A correlation coefficient describes how closely a best-fit line represents the given data. In other words, how closely the collected data follows a trend.
2.

$r = 0.5$	$r = 1.9$	$r = -8$	$r = -0.5$	$r = 1$
$r = -1$	$r = -2.5$	$r = 0.9$	$r = 0.75$	$r = 50\%$
3. a. $r = -0.5$ b. $r = 0$ c. $r = -1$ d. $r = 0$ e. $r = 0.9$ f. $r = 0.5$ g. $r = 1$ h. $r = -0.9$
4. a. ~310 kg, Interpolation b. ~80 kg, Extrapolation c. ~\$2.75, Interpolation d. ~\$1.00, Extrapolation e. There are no data points in that range; therefore, one cannot be certain that the trend would continue as before.

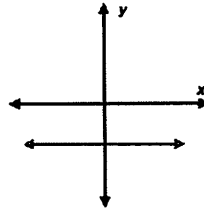
Lesson 4 $Y=MX+B$

1. Identify each slope as a positive slope, negative slope, undefined slope, or no slope.

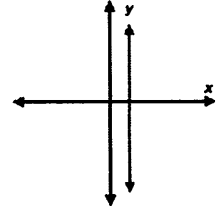
a.



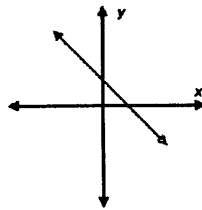
c.



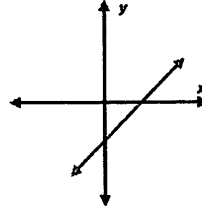
e.



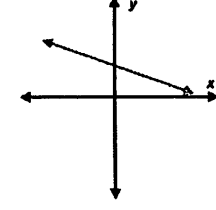
b.



d.



f.



AU

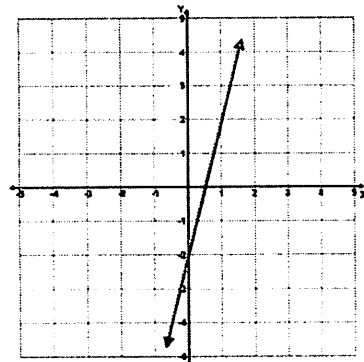
2. Use the graphs from #1 to answer the following questions.

- Which graph has a slope of $m = 1$? _____
- Which graph has a slope of $m = -1$? _____
- Is the slope in graph *a* bigger than or smaller than $m = 1$? _____
- Is the slope in graph *f* bigger than or smaller than $m = 1$? _____

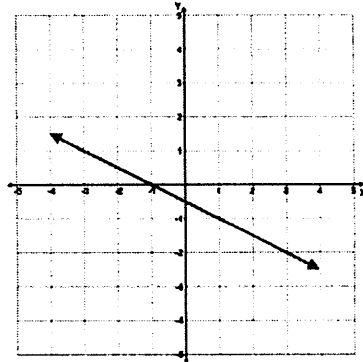
AU

3. Determine the slope of the lines in the following graphs. *Reminder: Draw a triangle linking 2 points on the graph. Pay attention to the direction you move while you count spaces: are you moving in a positive or a negative direction?*

a.

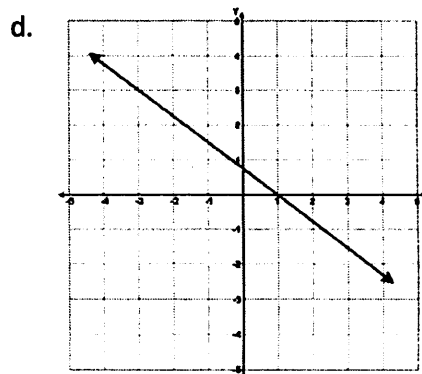
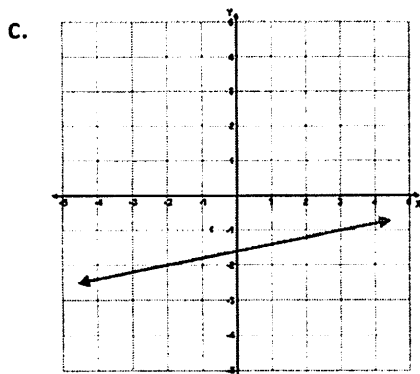


b.



AU

most



4. Use the equation for slope to determine the slope of a line that passes through the given points. Hint: Label the ordered pairs before putting the numbers into the equation.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Ex. $(-1, 4)$ and $(6, 2)$
 $(x_1 - y_1)$ $(x_2 - y_2)$

$$m = \frac{2 - 4}{6 - (-1)}$$

$$m = \frac{-2}{7}$$

c. $(-6, 4)$ and $(3, 1)$

most

All

a. $(2, 6)$ and $(4, 7)$

d. $(-2, -2)$ and $(1, 0)$

most

All

b. $(-1, 3)$ and $(1, 5)$

e. $(2, 5)$ and $(3, -7)$

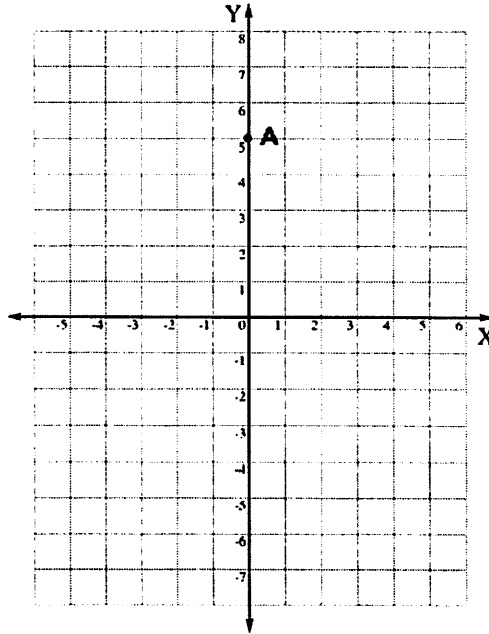
most

all

5. What does *y-intercept* mean? _____

6. Plot and label the y-intercepts of the following equations onto the graph. The first one has been done for you.

- a. $y = \frac{3}{4}x + 5$
- b. $y = -2x + 7$
- c. $y = x - 4$
- d. $y = \frac{1}{3}x + 2$
- e. $2y = 8x - 2$
- f. $y = -3x$
- g. $y = -6$



all

7. Determine the slope of the line equations in #5.

- a.
- b.
- c.
- d.
- e.
- f.
- g.

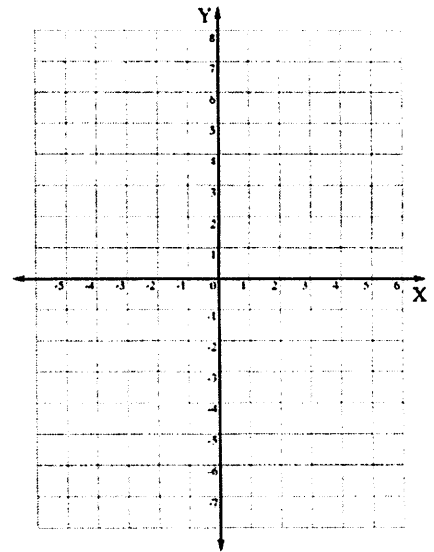
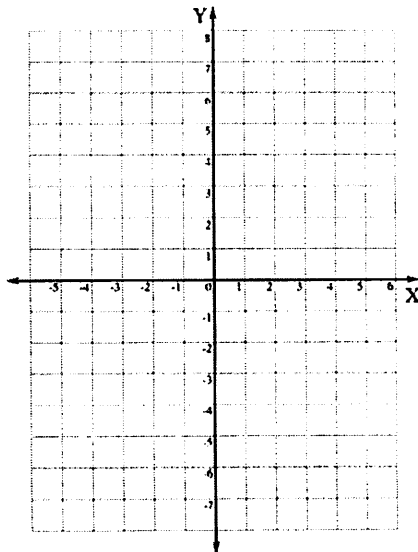
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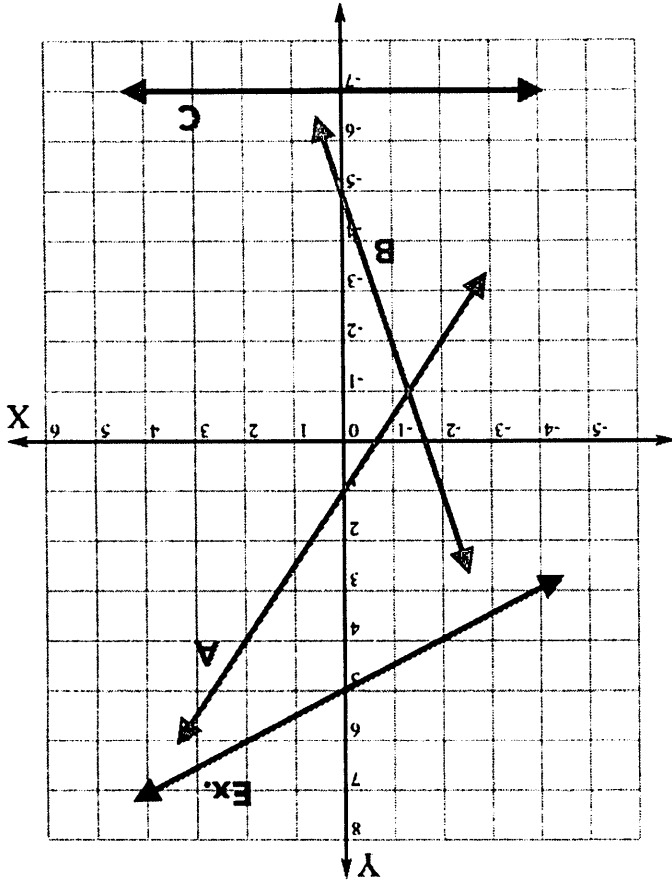
8. Graph the line using only the slope-intercept equation. (ie. Do not use a table.)

Reminder: First plot the point of the y-intercept, then find a second point based on the slope.

a. $y = \frac{1}{3}x + 4$

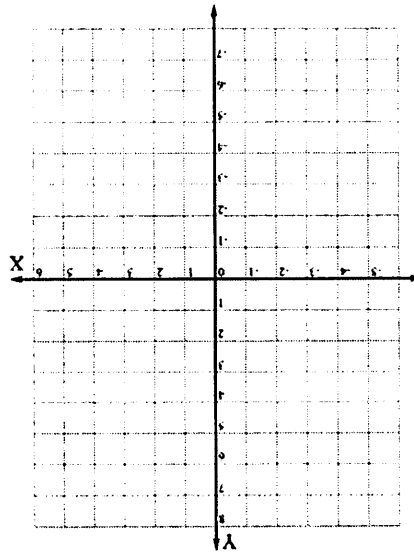
b. $y = -4x - 2$



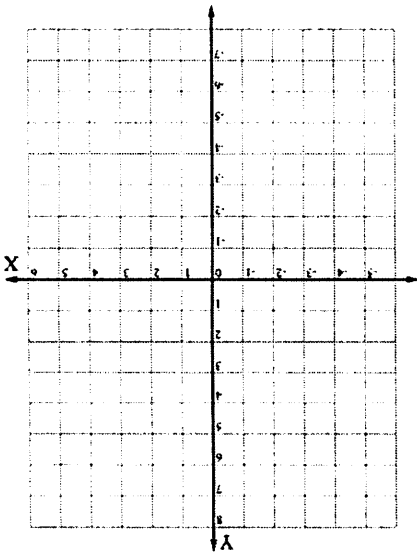


- Ex. $y = \frac{1}{2}x + 5$ _____
- a. _____
- b. _____
- c. _____

9. Determine the equations of the following lines by using the slope-intercept formula $y = mx + b$.

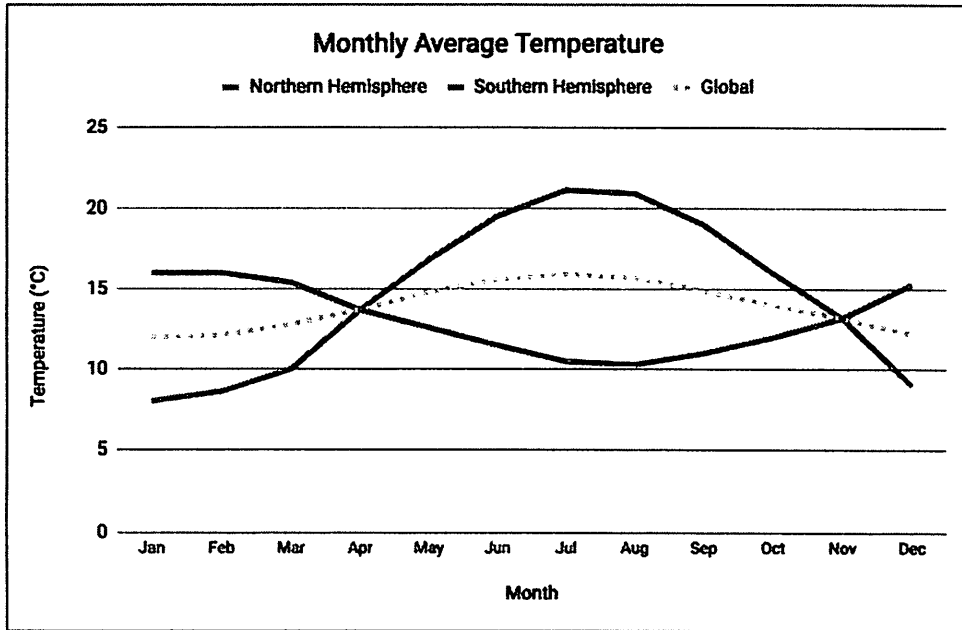


c. $2y + 4 = 5x$



d. $x = -3$

10. Interpret the following graph. What are at least 5 things that you could tell someone about the earth based on this graph?



Lesson 4 Answers

1. a. Positive b. Negative c. No slope d. Positive e. Undefined slope f. Negative

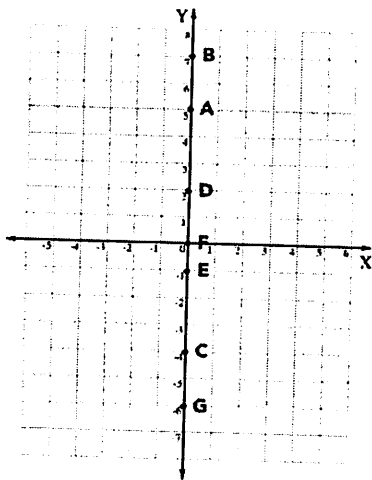
2. a. Graph D b. Graph B c. Bigger than d. Smaller than

3. a. $m = 4$ b. $m = -\frac{1}{2}$ c. $m = \frac{1}{5}$ d. $m = -\frac{3}{4}$

4. a. $m = \frac{1}{2}$ b. $m = 1$ c. $m = -\frac{1}{3}$ d. $m = \frac{2}{3}$ e. $m = -\frac{2}{5}$

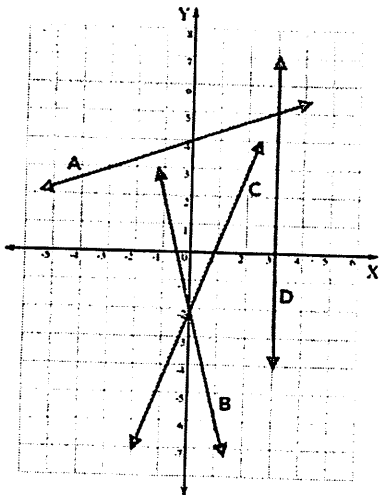
5. It is the point where the line crosses the y-axis.

6.



7. a. $m = \frac{3}{4}$ b. $m = -2$ c. $m = 1$ d. $m = \frac{1}{3}$ e. $m = 4$ f. $m = -3$ g. No slope

8.



9. a. $y = \frac{3}{2}x + 1$ b. $y = -3x - 5$ c. $y = -7$

10. Many possible answers. Ex: The seasons occur at opposite times in the two hemispheres.

The earth is warmer overall when it is summer in the Northern hemisphere. There is a wider temperature range in the Northern hemisphere. The Southern hemisphere has a more temperate climate. Etc.