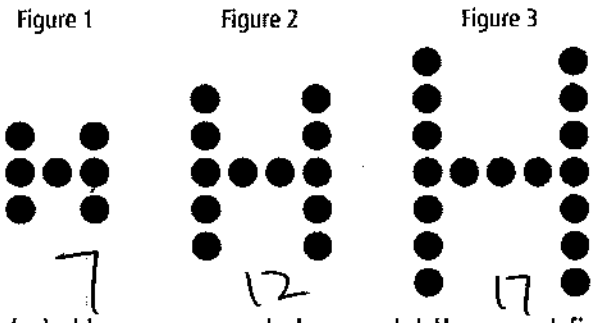
Math 9
Chapter 4 Review: Linear Relations

Name: Key
Period:

LEARNING OUTCOME: 4A: I can recognize and extend a pattern using a drawing, a table of values (TOV), words, and by writing an equation.

1. Use the figure to answer the following questions:



(a) How many dots would the next figure contain? 22.

(b) Which table of values represents the number of dots in the pattern?

a.

Figure Number	Number of Dots
1	7
2	12
3	17

+6, +5, +6, +5

c.

Figure Number	Number of Dots
1	5
2	10
3	15

b.

Figure Number	Number of Dots
1	7
2	10
3	13

d.

Figure Number	Number of Dots
1	6
2	10
3	14

(c) Determine an equation that represents the relationship between figure number (f) and the number of dots (n) in the figure?

$n = mf + b$. $m = \frac{5}{1} = 5$. $n = 5f + b$. $7 = 5(1) + b$. $7 = 5 + b$, $b = 2$. $\therefore n = 5f + 2$

(d) Using the equation, how many dots are in the sixth figure?

$n = 5(6) + 2 =$ 32 dots

(e) Using the equation, which figure number will have 42 dots?

$42 = 5f + 2$, $-2 \quad -2$, $\frac{40}{5} = \frac{5f}{5}$, $\therefore f = 8$

LEARNING OUTCOME: 4B: I can graph a linear relation by using a TOV.

2. Complete the table of values for each linear relation.

a)

$y = 2x - 1$	
x	y
1	1
2	3
3	5
4	7
5	9

b)

$y = -3x + 2$	
x	y
-2	8
0	2
2	-4
4	-10
6	-16

c)

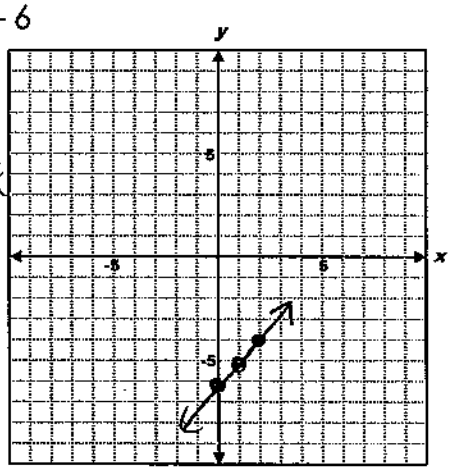
$x + 2y = 10$	
x	y
2	4
4	3
6	2
8	1
10	0

3. Graph each linear relation. Explain your work or show it. You can create a table of values if needed.

a) $y = x - 6$

$y = \frac{1}{1}x - 6$

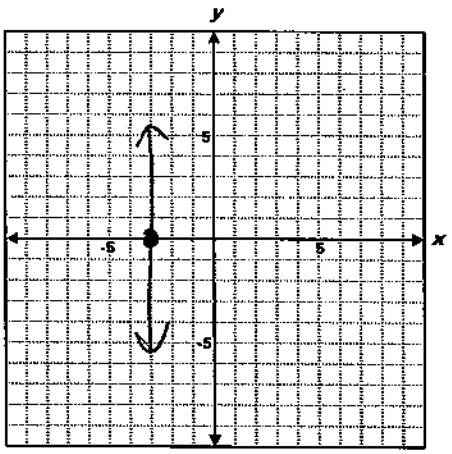
$\frac{\text{rise}}{\text{run}}$ y-int



b) $x + 3 = 0$

$\overset{-3}{} \quad \overset{-3}{}$

$x = -3$



c) $2y - 3 = 6$

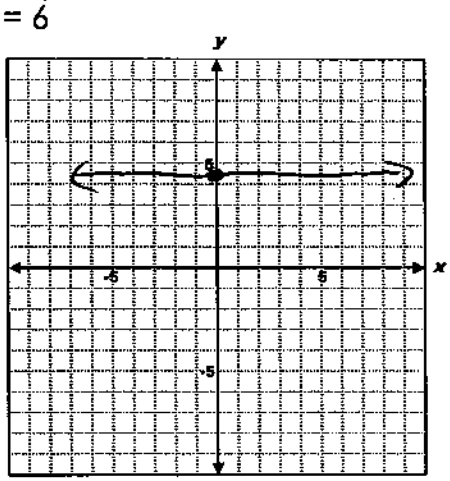
$\overset{+3}{} \quad \overset{+3}{}$

$\frac{2y}{2} = \frac{9}{2}$

$y = \frac{9}{2}$

or

$y = 4.5$



d) $2x + y = 6$

$\overset{-2x}{} \quad \overset{-2x}{}$

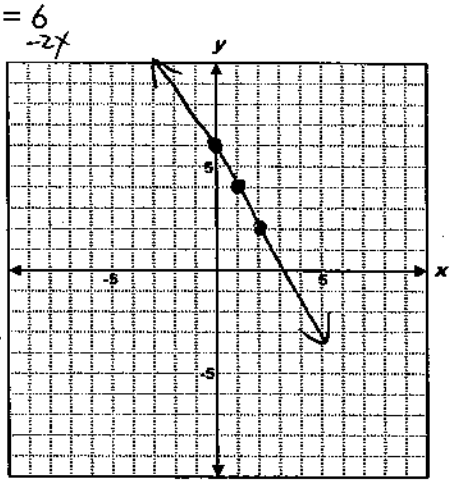
$y = 6 - 2x$

or

$y = -2x + 6$

$\frac{\text{rise}}{\text{run}}$ y-int

$-2 = \frac{-2}{1}$



LEARNING OUTCOME: 4C: I can understand that in a linear relation, a constant change in "x" produces a constant change in "y".

4. For the relation $y = 2x + 5$, when the "x-value" increases by 1, it produces what type of change in the "y-value"? Hint: You may want to make a table of values.

x	y
0	5
1	7
2	9

y-value increases by 2.

5. For the relation $y = -3x + 9$, when the "y-value" decreases by 6, it produces what type of change in the "x-value"? Hint: You may want to make a table of values.

x	y
0	9
1	6
2	3
3	0

-6

x-value decreases by 6.

LEARNING OUTCOME: 4D: I can understand the concepts behind horizontal and vertical lines

6. Which table of values represents a vertical line?

a.

x	y
0	4
1	3
2	2
4	0

b.

x	y
3	2
3	4
3	6
3	12

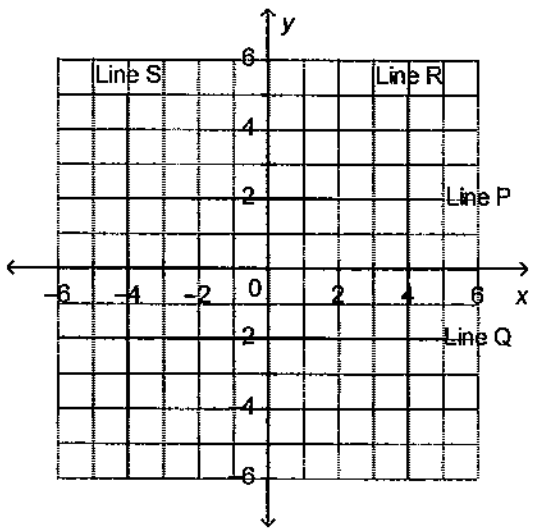
c.

x	y
1	4
2	4
3	4
4	4

d.

x	y
0	0
2	2
4	4
6	6

7. Which line is the graph of $x = 4$?



A) Line S

B) Line P

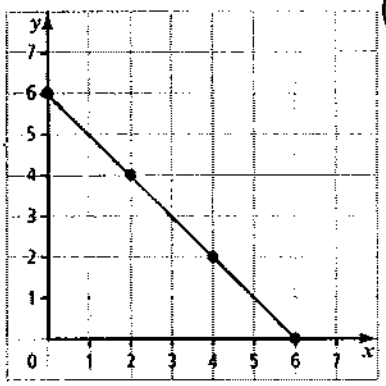
C) Line Q

D) Line R

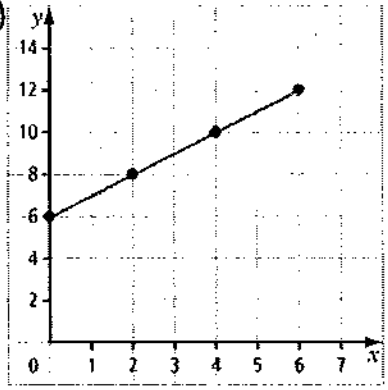
LEARNING OUTCOME: 4E: I can match equations to their graphs and vice versa.

8. Which graph represents the linear relation $y = x + 6$?

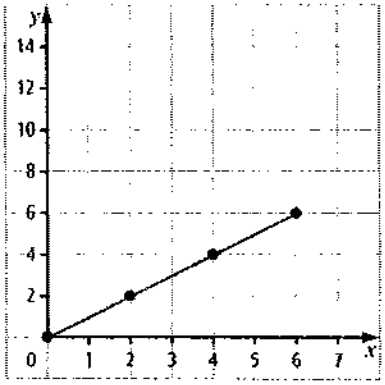
a.



b.



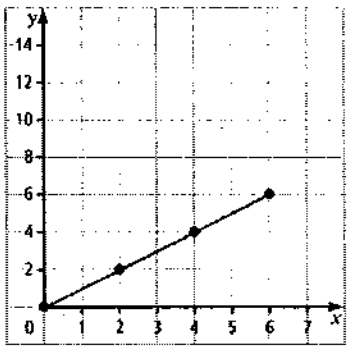
c.



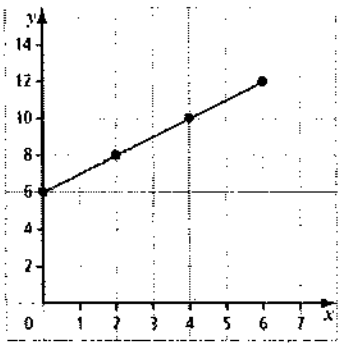
9. Which graph represents the following table of values?

x	y
6	0
4	2
2	4
0	6

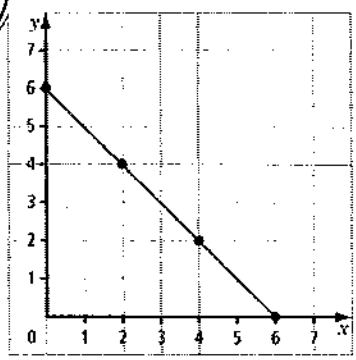
a.



b.



c.

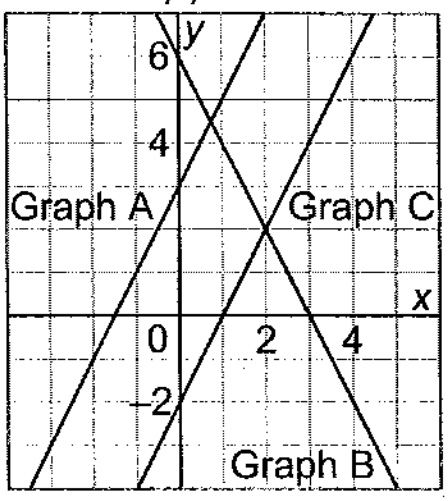


10. Match each equation with a graph on the grid below. Justify your answers.

B **a)** $2x + y = 6$ $\rightarrow$ $y = 6 - 2x$ or $y = -2x + 6$.

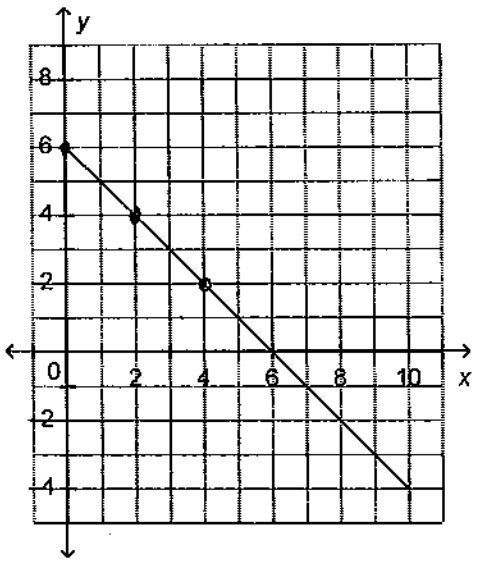
C **b)** $2x - y = 2$ $\rightarrow$ $-y = -2x + 2$ $\rightarrow$ $y = 2x - 2$.

A **c)** $y = 2x + 3$



LEARNING OUTCOME: 4F: I can understand how to interpolate and extrapolate data from linear relations.

11. This graph represents a linear relation. Determine the value of y when:



(a) x = 4

Y=2

(b) x = 2

Y=4

(c) x = 0

Y=6

12. This graph represents a linear relation. Determine the value of x when

a. y = 4

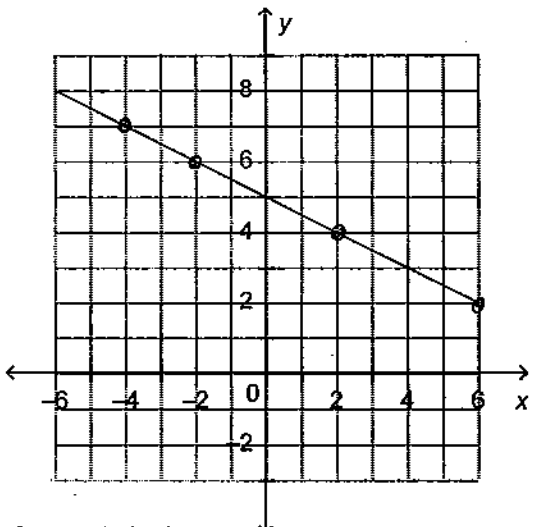
X=2

b. y = 2

X=6

c. y = 7

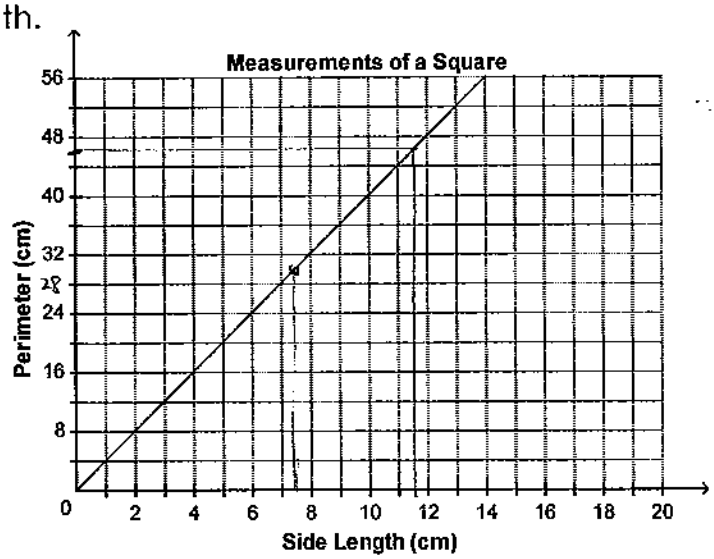
X=-4



d. Which part did you use INTERPOLATION? Explain how you know.

All of them used interpolation because they are all within the graph.

13. This graph shows the relationship between the perimeter of a square and its side length.



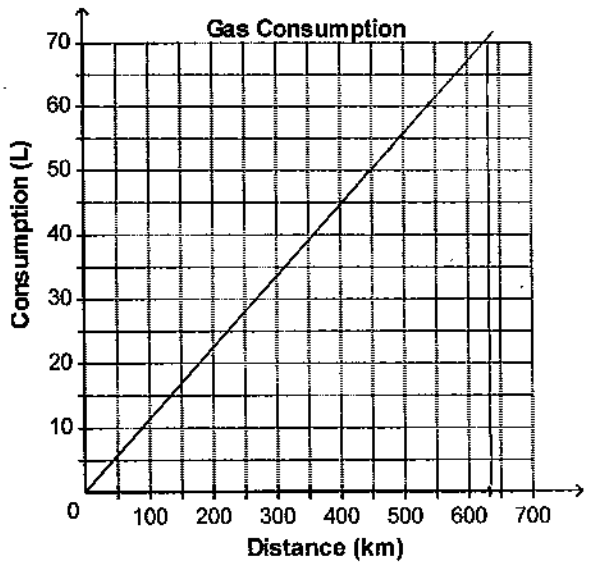
a) Determine the perimeter of a square with side length 7.5 cm.

30 cm.

b) Determine the side length of a square with perimeter 46 cm.

11.5 cm.

14. This graph shows the gas consumption rate of a car.



a) Estimate the volume of gas required to travel 630 km.

70L.

b) Estimate the distance the car can travel on 60 L of gas.

540km.

CURRICULAR COMPETENCY QUESTIONS:

15. James is a basketball player and is wanting to play for the Toronto Raptors. He has been offered a $500,000 signing bonus, plus $900,000 per season.

    a. Write an equation relating James' total earnings to the number of seasons played.

$Y = 900{,}000X + 500{,}000$.

X	Y	
0	500,000	
1	1,400,000	+900,000
2	2,300,000	+900,000

    b. How long will it take for James to earn at least $4,000,000?

$4{,}000{,}000 = 900{,}000X + 500{,}000$

$-500{,}000 \quad -500{,}000$

$3{,}500{,}000 = 900{,}000X$

$\frac{3{,}500{,}000}{900{,}000} = \frac{900{,}000}{900{,}000}X$

$X = 3.8\overline{8}$ $\therefore$ 4 seasons.

    c. What assumptions do you need to make for your answer in part 'b' to be valid?

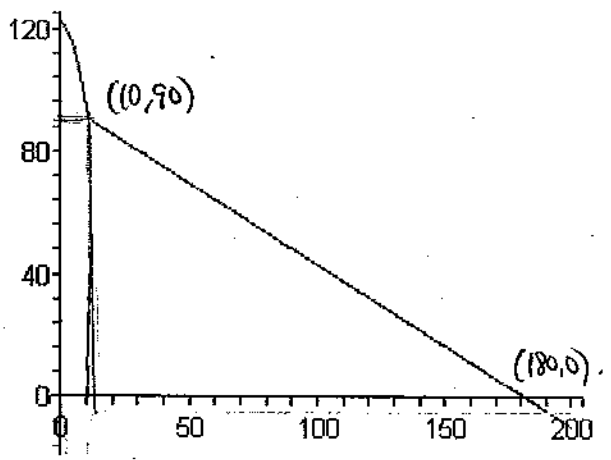
His annual salary remains constant throughout the career.

16. The graph below shows the height of a parachutist after jumping from an airplane. The height is measured in hundreds of feet (e.g. 80 = 8000 feet) and time is measured in seconds.

    a. When does her parachute open? How do you know?

10 seconds after he jumped, the speed at which her height is changing has decreased after 10 seconds.

    b. At approximately what rate is the parachutist falling once her chute opens?



$\text{rate} = \text{slope} = \frac{\text{rise}}{\text{run}} = m$.

$m = \frac{-90}{170} = \boxed{\frac{-9}{17}\ \text{ft/s}}$

17. The monthly cost, in dollars, for a cellphone plan is given by the equation C = 0.15t + 30, where "t" is the time, in minutes, spent calling long distance.

a. Describe this plan with a table of values for the first 4 minutes.

t	C
1	30.15
2	30.3
3	30.45
4	30.6

b. How would the graph change if the cost of long distance calling is now $0.20 per minute? The graph of the line becomes steeper.

c. How would the graph change if the cost of the basic cell phone plan be reduced to $25? The entire line shifted downwards by $5.

18. The relation f = 0.04x + 0.20 provides the multiplication factor for converting an adult dosage of medicine to a child's dosage, where "x" is the age of the child. Determine the appropriate dosage of medicine if the adult dosage is 250 mg and child's age is 12 years old.

$f = 0.04(12) + 0.2$

$= 0.48 + 0.2$

$= 0.68.$

250×0.68

$= 170\ mg.$

19. Drew can type 30 words per minute. He has to type a 2500-word essay.

a) Create a table that shows the number of words that ***remain*** after Drew has typed for up to 5 min.

x	y	
1	2470	↓ -30
2	2440	↓ -30
3	2410	
4	2380	
5	2350.	

(+1, +1)

b) Write an equation that relates the number of words remaining, *W*, to the number of minutes, *n*, that Drew has typed.

$y = mx + b$

$m = \frac{rise}{run} = \frac{-30}{1} = -30.$

$y = -30x + b.$

$2470 = -30(1) + b.$

$2470 = -30 + b$

$2470 = -30 + b$

$+30 \quad +30$

$b = 2500$

$\therefore y = -30x + 2500$

c) Drew types for 40 min. How many words does Drew have left to type?

$y = -30(40) + 2500 = -1200 + 2500 = 1300$ words

d) Drew has 640 words left to type. For how long has he been typing?

$640 = -30x + 2500$

$-2500 \quad -2500$

$\frac{-1860}{-30} = \frac{-30x}{-30}$

$x = 62$ minutes