Appendix

Lesson 6.1: Graphs of Relations

Practice – I

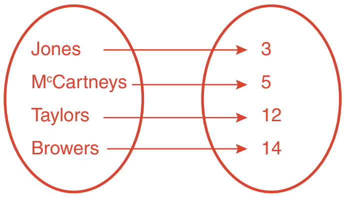
1. The following families spent time camping in Kananaskis over the summer months:

Family	Days
The Jones	3
The McCartneys	5
The Taylors	12
The Browers	14

a. Describe the relation in words.

The relation shows the number of days each family spent camping over the summer months.

b. Represent the relation using a mapping diagram.



2. Consider the relation represented by the set of ordered pairs shown.

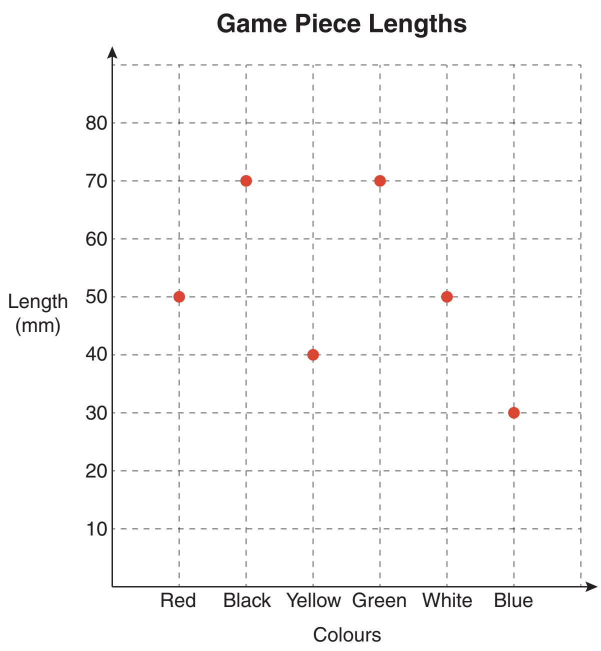
$\{(6,36),(7,42),(8,48),(9,54),(10,60)\}$

Describe the relation in words.

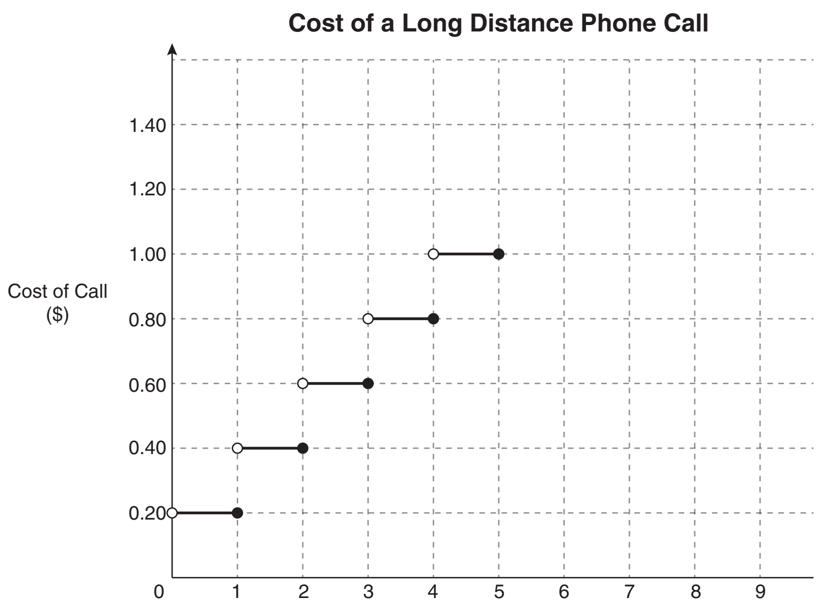
The relation shows as the x-value increases by 1 with a starting value of 6, the y-value increases by 6 with a starting value of 36.

3. Game pieces of various lengths are colour-coded. The length of each colour, in millimetres, is given in the table. Graphically represent the relation.

Colour	Measurement (mm)
Red	50
Black	70
Yellow	40
Green	70
White	50
Blue	30



4. The following graph shows how a cell phone company bills for air time on long distance calls.



The graph shows that the cell phone company charges $0.20 per minute or portion thereof. For instance, a 30 second phone call and a 45 second phone call will each get billed the $0.20 cost of a one minute call. The line segments on the graph are not connected because as each minute elapses there is an automatic cost increase to the call of $0.20.

The open dot on the left side of each line segment indicates the exclusion of that value, while the closed dot on the right side of each line segment indicates the inclusion of that value.

For example, the open dot at $x = 1$ and $y = \$0.40$ means that any phone call that it is **more than** one minute, but less than and **including** two minutes is $0.40.

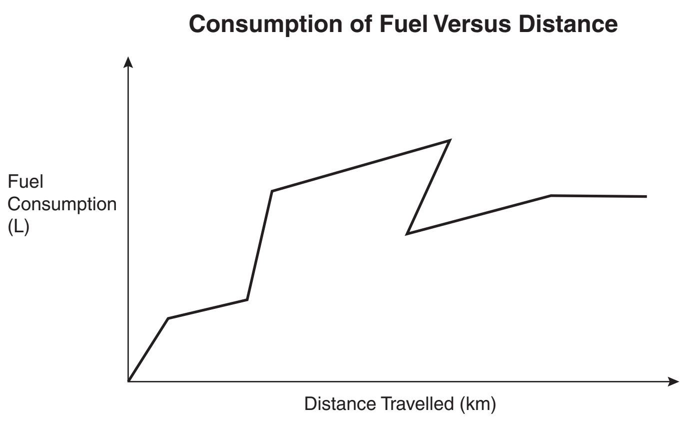
a. How much would it cost for a 4.25 minute long distance call?

It would cost $1.00 for a 4.25 minute call.

b. How much would it cost for a 9.5 minute long distance call?

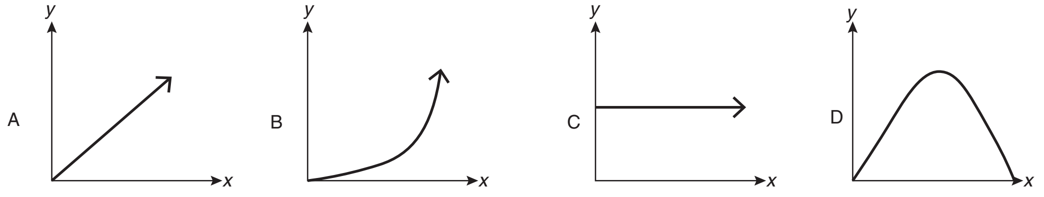
It would cost $2.00 for a 9.5 minute call.

5. Explain why the graph below represents an impossible situation.



Several points on the graph (an entire segment) suggest that the distance travelled can be reversed, while the fuel consumption is simultaneously decreasing – this is impossible.

6. Match the graphs with the scenario statements below. Place the letter of the graph beside the most suitable description. Scenarios can match more than once.



__A__ The distance a car travels at a constant speed.

__B__ The number of bacteria if the colony's population doubles every two hours.

__D__ The height of a ball when thrown into the air.

__A__ One variable is changing at a constant rate in relation to the other variable.

__C__ One variable is not changing.

__C__ The distance travelled while stuck in a snow bank.

Please complete *Lesson 6.1 Explore Your Understanding Assignment* located in *Workbook 6.1* before proceeding to *Lesson 6.2*.

Lesson 6.2: Domain and Range

Practice – II

1. Determine the domain and range of the following relations as sets in list form.

a. {(3,6), (6,7), (10,11), (13,17), (14,20)}

Domain: $\{3, 6, 10, 13, 14\}$

Range: $\{6, 7, 11, 17, 20\}$

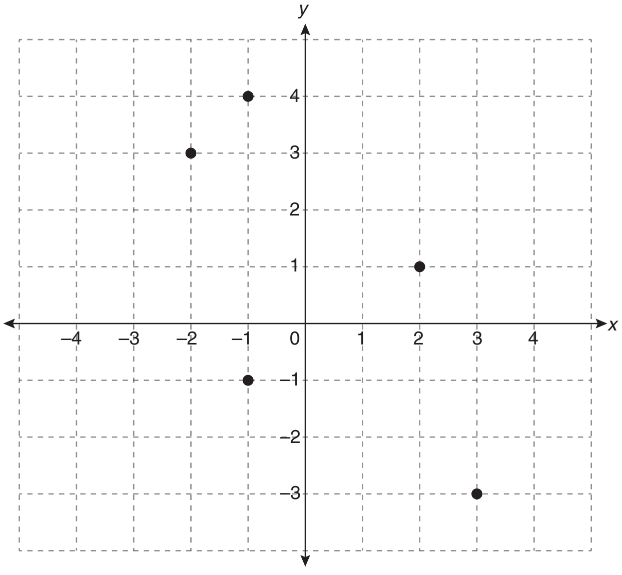
b.

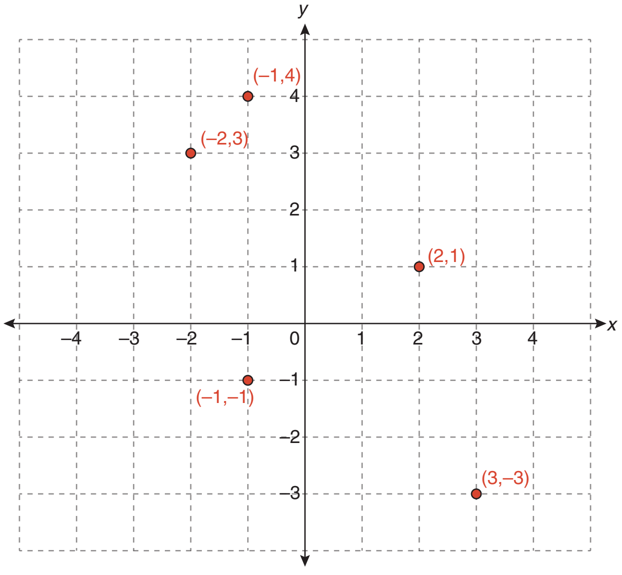
x	y
–2	–3
–5	5
–8	11

Domain: $\{-2, -5, -8\}$

Range: $\{-3, 5, 11\}$

c.

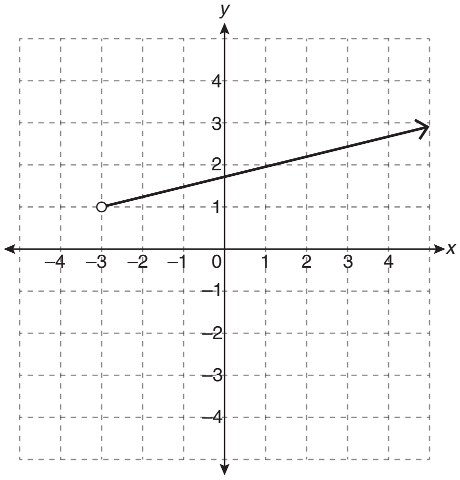




Domain: $\{-2, -1, 2, 3\}$

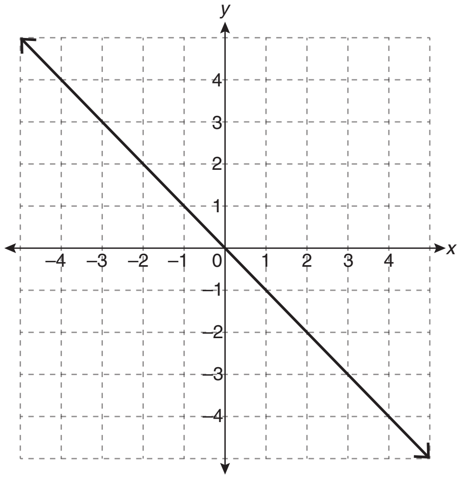
Range: $\{-3, -1, 1, 3, 4\}$

2. State the domain and range of the following relations using set-builder notation and interval notation.



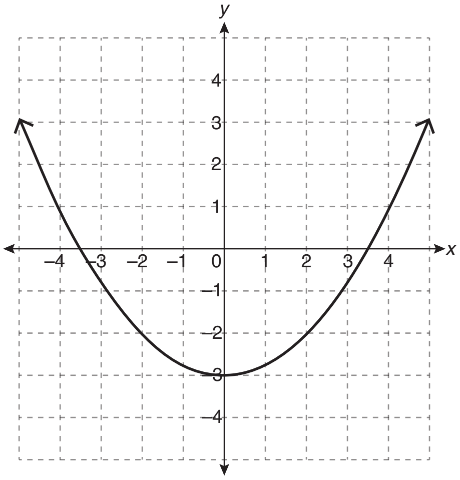
D: $\{x \mid x > -3, x \in R\}$ D: $(-3, +\infty)$

R: $\{y \mid y > 1, y \in R\}$ R: $(1, +\infty)$



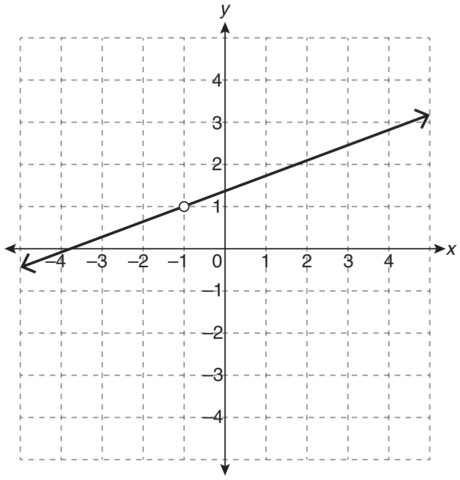
D: $\{x \mid x \in R\}$ D: $(-\infty, +\infty)$

R: $\{y \mid y \in R\}$ R: $(-\infty, +\infty)$



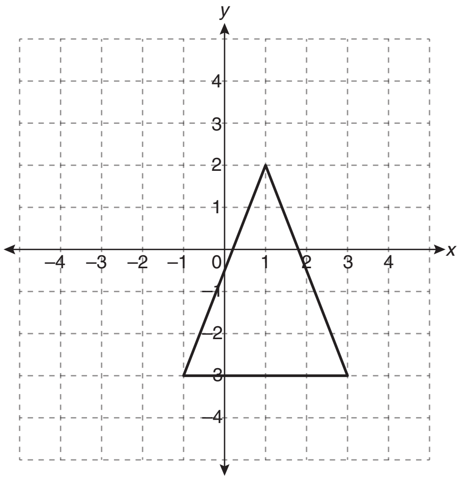
D: $\{x \mid x \in R\}$ D: $(-\infty, +\infty)$

R: $\{y \mid y \geq -3, y \in R\}$ R: $[-3, +\infty)$



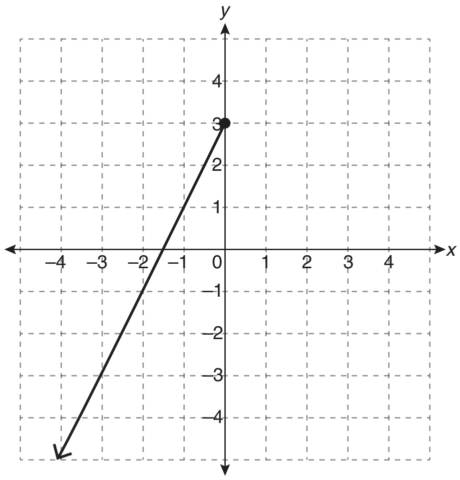
D: $\{x \mid x \neq -1, x \in R\}$ D: $(-\infty, -1) \& (-1, +\infty)$

R: $\{y \mid y \neq 1, y \in R\}$ R: $(-\infty, 1) \& (1, +\infty)$



D: $\{x \mid -1 \leq x \leq 3, x \in R\}$ D: $[-1, 3]$

R: $\{y \mid -3 \leq y \leq 2, y \in R\}$ R: $[-3, 2]$



D: $\{x \mid x \leq 0, x \in R\}$ D: $(-\infty, 0]$

R: $\{y \mid y \leq 3, y \in R\}$ R: $(-\infty, 3]$

3. Pop cans can be returned to the bottle depot in exchange for a refunded deposit. Complete the following table.

Number of Pop Cans, *n*	**Refund, *r* ($)**
1	0.10
2	0.20
5	0.50
10	1.00
12	1.20
15	1.50
43	4.30

a. State the independent and dependent variables for the relation.

The independent variable is the number of pop cans.

The dependent variable is the refund amount.

b. Explain the relationship between the variables.

The amount of the refund depends on the number of pop cans returned.

c. Explain why there cannot be negative values for this type of relation.

A negative number of cans cannot be returned and a refund cannot be a negative dollar value.

d. Is the data represented in this situation discrete or continuous? Explain.

The data is discrete because only whole numbers of pop cans can be returned for a refund in increments of 10 cents.

e. Extrapolate how much money would be refunded when 367 pop cans returned.

A total of $367 \times \$0.10 = \$36.70$ would be refunded.

f. Determine the domain and range specific to the table of values above.

Domain: $\{1, 2, 5, 10, 12, 15, 43\}$

Range: $\{0.10, 0.20, 0.50, 1.00, 1.20, 1.50, 4.30\}$

Please complete *Lesson 6.2 Explore Your Understanding Assignment* located in *Workbook 6.2* before proceeding to *Lesson 6.3*.

Lesson 6.3: Linear Relations

Practice – III

1. a. Given the following tables of values, determine the pattern in the values for each variable.

Table 1	
x	y
3	5
5	10
7	15
9	20

Table 2	
a	b
1	1
2	5
3	9
4	16

Table 1
Difference between the adjacent x-values $5 - 3 = 2$ $7 - 5 = 2$ $9 - 7 = 2$
Difference between the adjacent y-values $10 - 5 = 5$ $15 - 10 = 5$ $20 - 15 = 5$

Table 2
Difference between the adjacent x-values $2 - 1 = 1$ $3 - 2 = 1$ $4 - 3 = 1$
Difference between the adjacent y-values $5 - 1 = 4$ $9 - 5 = 4$ $16 - 9 = 7$

Or

- In Table 1, the x-values increase by 2 every time and the y-values increase by 5 every time.
- In Table 2, the x-values increase by 1 every time and the y-values increase by 4 for the first two differences and the increase is by 7.

Or

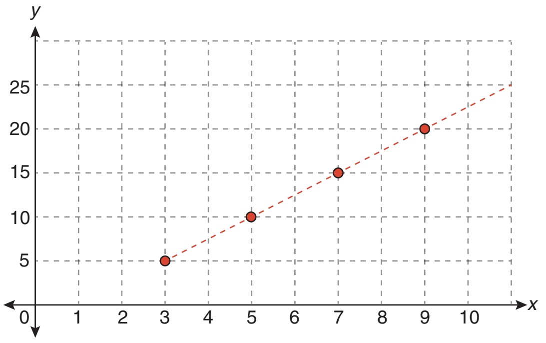
Compare the ratios of the vertical change to the horizontal change, from point to point, for each table.

The ratio for Table 1 is 5:2 for all pairs of points.

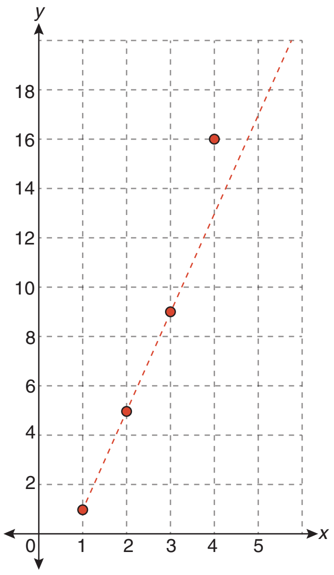
The ratio for Table 2 is 4:1 for the first two pairs of points, and 7:1 for the last pair of points.

b. Graph the relation represented in each table of values.

Relation 1



Relation 2



c. Explain whether the relations are linear.

- The relation represented in Table 1 is a linear relation because its points form a straight line. Both the adjacent x-values and the adjacent y-values have a common difference.
- The relation represented in Table 2 is not a linear relation because its points do not form a straight line. Adjacent x-values have a common difference, but adjacent y-values do not have a common difference.

2. a. Determine the slope of the line that passes through the points.

i. $B(4,-4)$ and $C(-3,10)$

$$m = \frac{\text{rise}}{\text{run}}$$

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

$$m = \frac{10 - (-4)}{-3 - 4}$$

$$m = \frac{14}{-7}$$

$$m = -2$$

ii. $D(5,-6)$ and $E(5,3)$

$$m = \frac{\text{rise}}{\text{run}}$$
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$m = \frac{3-(-6)}{5-5}$$
$$m = \frac{9}{0}$$
$$m = \text{undefined}$$

iii. $G(2,-4)$ and $H(-3,-4)$

$$m = \frac{\text{rise}}{\text{run}}$$
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$m = \frac{-4-(-4)}{-3-2}$$
$$m = \frac{0}{-5}$$
$$m = 0$$

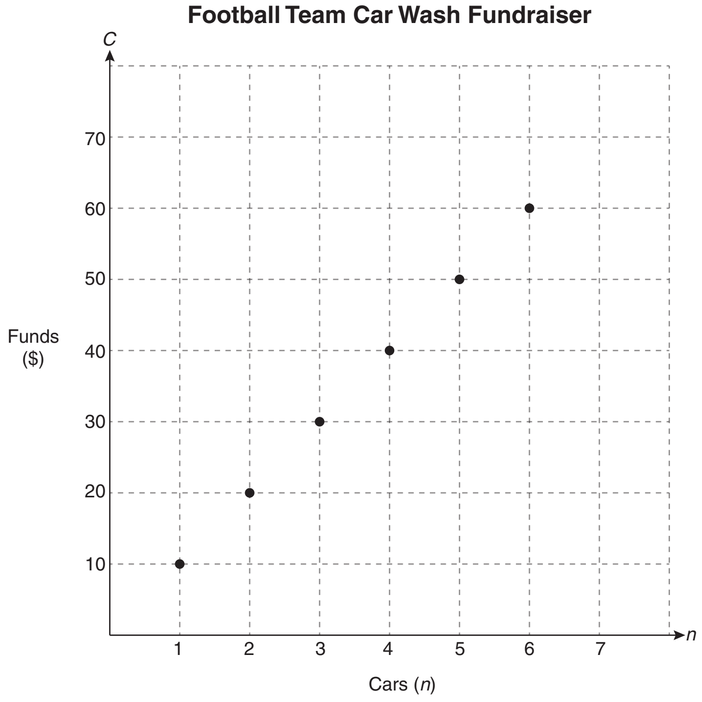
b. Describe what each line will look like when graphed.

i. The line will consistently fall 2 units downward and run 1 unit to the right, passing through points $B(4,-4)$ and $C(-3,10)$. The line is decreasing to the right.

ii. The line will be vertical, passing through points $D(5,-6)$ and $E(5,3)$.

ii. The line will be horizontal, passing through points $G(2,-4)$ and $H(-3,-4)$.

3. The graph shows the amount of money a high school football team made while hosting a car wash fundraiser.



a. Describe the pattern that indicates the graph represents a linear relation.

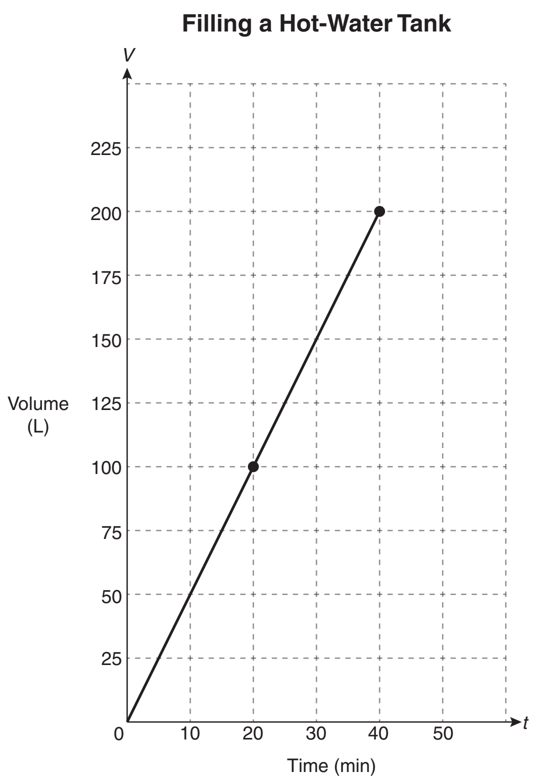
For every car washed, there is an increase in earning of \$10.00. So, two cars raise \$20 and three cars raise \$30, etc.

b. If the team earned \$250, how many cars did they wash?

$$\frac{250}{10} = 25$$

The team washed 25 cars.

4. The relation representing a 200 L hot-water tank being filled at a constant rate is shown in the graph below. Determine the rate of change of the relation.



Every 20 minutes 100 L of hot water is added to the tank.

$$\frac{100\text{ L}}{20\text{ min}} = 5\text{ L/min}$$

The rate of change of the relation is 5 L/min.

Please complete *Lesson 6.3 Explore Your Understanding Assignment* located in *Workbook 6.3* before proceeding to *Lesson 6.4*.

Lesson 6.4: Linear Functions

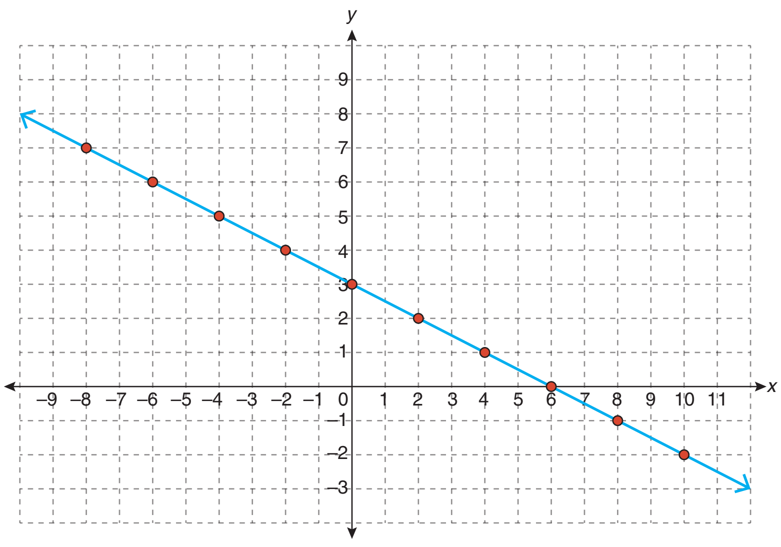
Practice – IV

1. Sketch the graph of $y = -\frac{1}{2}x + 3$.

Points used will vary. Select x-values and determine the corresponding y-values.

Plot the points and draw a line through them.

x	y
–8	7
–6	6
–4	5
–2	4
0	3
2	2
4	1
6	0
8	–1
10	–2



2. Which set of ordered pairs does not represent a function? Explain.

a. $\{(3,6),(4,9),(5,12),(3,0)\}$

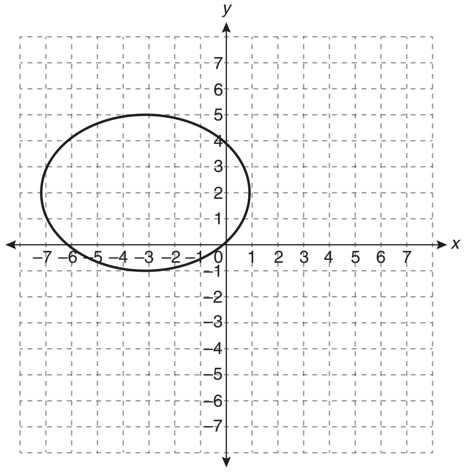
b. $\{(5,-6),(6,8),(8,10),(9,-10)\}$

c. $\{(-3,-5),(-4,-8),(-5,-9),(-6,0)\}$

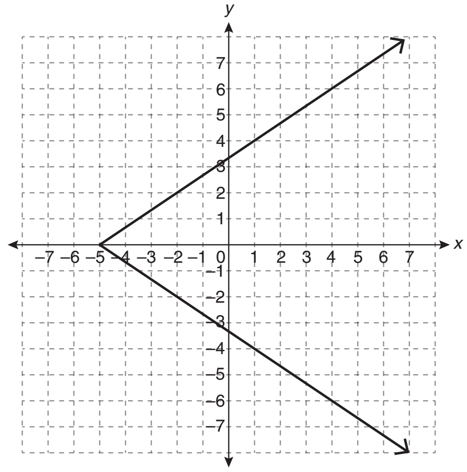
d. $\{(7,0),(4,-1),(-6,1),(-3,0)\}$

The set $\{(3,6),(4,9),(5,12),(3,0)\}$ is not a function because there are two values of y for one value of x.

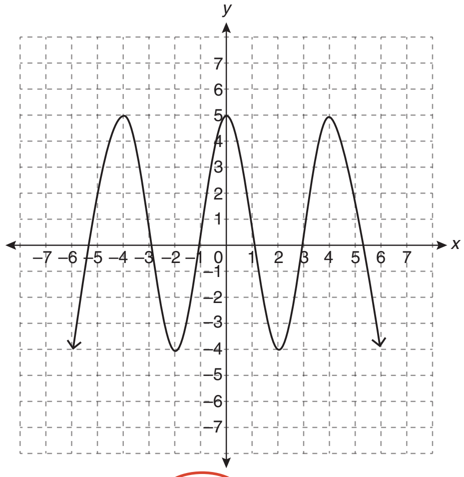
3. Circle YES if the graph of the relation represents a function or NO if it does not represent a function.



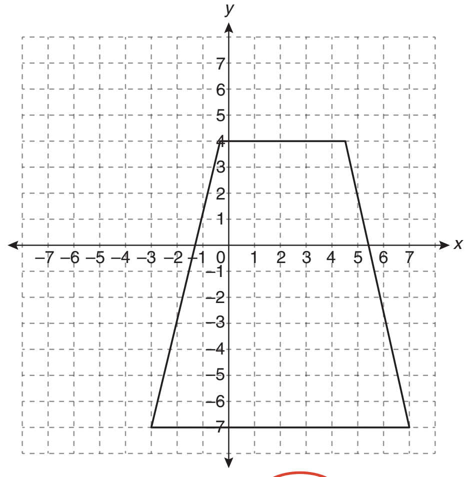
YES NO



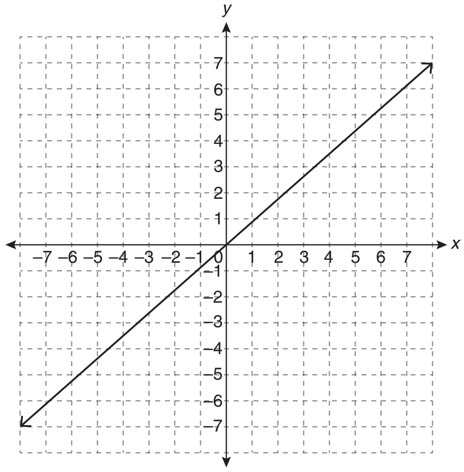
YES NO



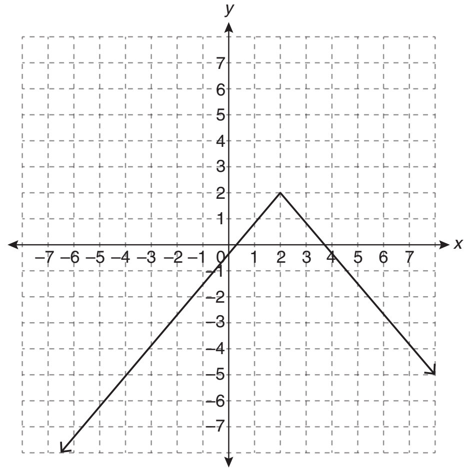
YES NO



YES NO



YES NO



YES NO

4. Given $g(x) = 5x - 10$,

   a. make a table of values for the domain $\{-1, 0, 1, 2, 3\}$.

x	0	1	2	3
$g(x)$	-10	-5	0	5

$g(0)$
$g(0) = 5(0) - 10$
$g(0) = -10$

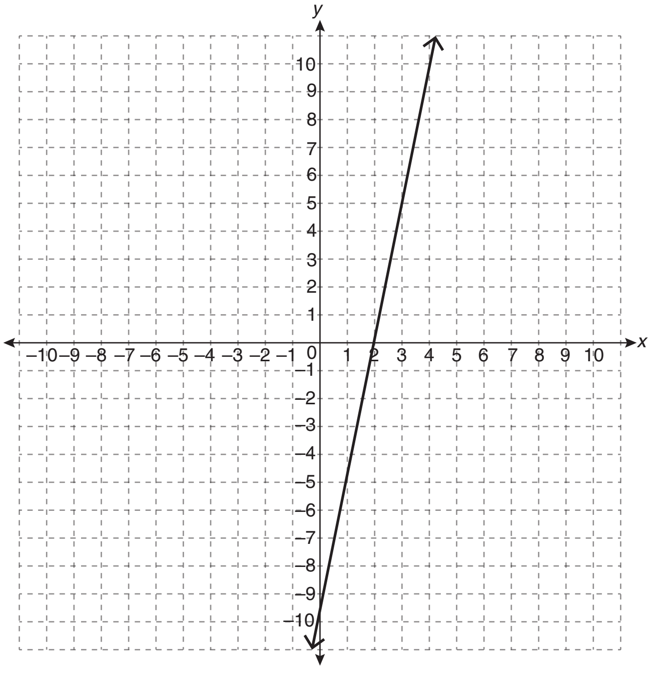
$g(1)$
$g(1) = 5(1) - 10$
$g(1) = -5$

$g(2)$
$g(2) = 5(2) - 10$
$g(2) = 0$

$g(3)$
$g(3) = 5(3) - 10$
$g(3) = 5$

   b. graph the function $g(x) = 5x - 10$.

$\{(0, -10), (1, -5), (2, 0), (3, 5)\}$



Please complete *Lesson 6.4 Explore Your Understanding Assignment*, located in *Workbook 6.4*.