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

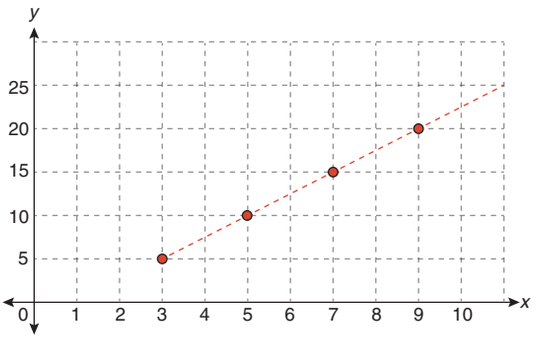
Compare the ratios of the vertical change to the horizontal change, from point to point, for each table.

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

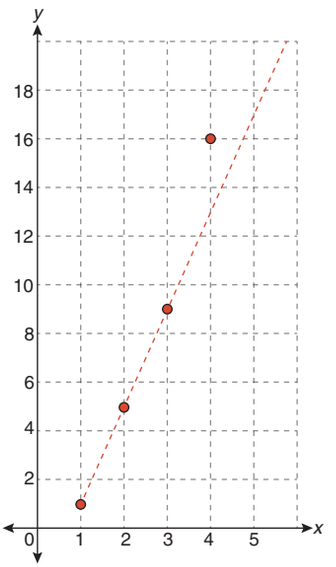
The ratio for Table 2 is 4:1 for the first two pairs of points, and 7:1 for the last pair of points.

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 $H(-3,-4)$

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

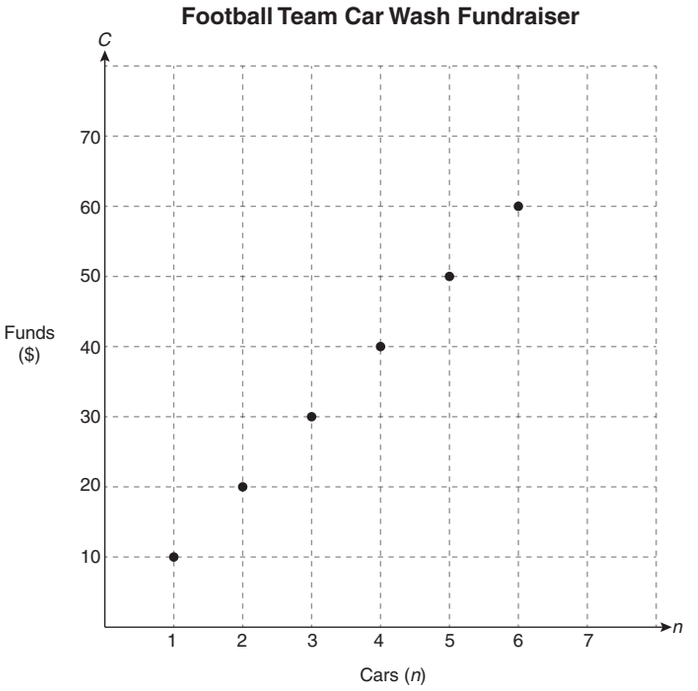
b. Describe what each line will look like when graphed.

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.

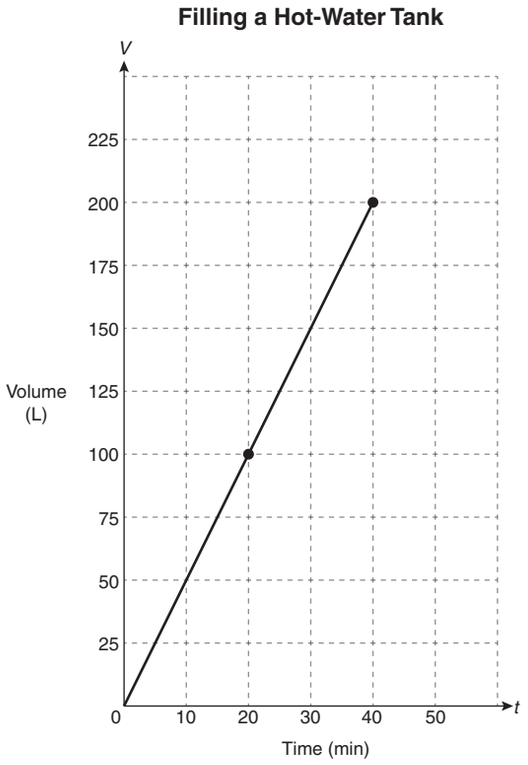
For every car washed, there is an increase in earning of $10.00. So, two cars raise $20 and three cars raise $30, etc.

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*.