

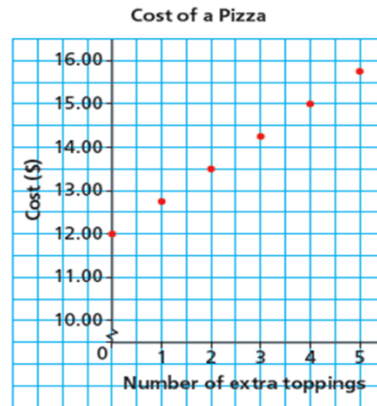
5.6: Properties of Linear Relations

Lesson Focus: Identify and Represent Linear Relations in Different Ways

Make Connections

The table of values and graph show the cost of a pizza with up to 5 extra toppings.

Number of Extra Toppings	Cost (\$)
0	12.00
1	12.75
2	13.50
3	14.25
4	15.00
5	15.75



What patterns do you see in the table? In the graph?

Write a rule for the pattern that relates the cost of the pizza to the number of extra toppings.

How can you tell that that this relation is linear?

Example A:

A cost for a car rental is \$60 plus \$20 for every 100 km driven.

The **INDEPENDENT VARIABLE** is the _____.

The **DEPENDENT VARIABLE** is the _____.

We can identify that this is a linear relation in a number of ways:

- A table of values:

Distance driven (km)	Total Cost (\$)
0	
100	
200	
300	
400	

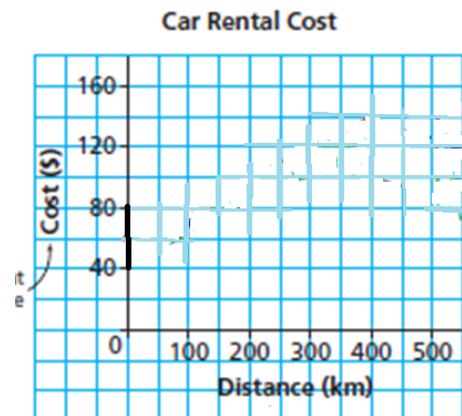
For a linear relations, a constant change in the independent variable leads to a constant change in the depending variable

- A set of ordered pairs:

{{ (), (), (), (), () }}

- A graph

The graph of a linear relation is a **straight line**.



We can use each representation to determine **RATE OF CHANGE**

We can express **RATE OF CHANGE** as a fraction:

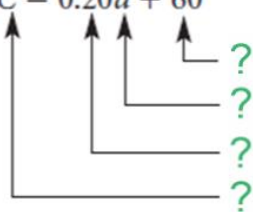
$$\frac{\text{change in dependent variable}}{\text{change in independent variable}} = \text{-----}$$

The rate of change is \$0.20/km; that is, for each additional 1 km driven, the rental cost increases by 20¢. The rate of change is constant for a linear relation.

We can determine the rate of change from the equation that represents the linear function.

Let the cost be C dollars and the distance driven be d kilometres.

An equation for this linear function is:

$$C = 0.20d + 60$$


Example 1**Determining whether a Table of Values Represents a Linear Relation**

Which table of values represents a linear relation? Justify the answer.

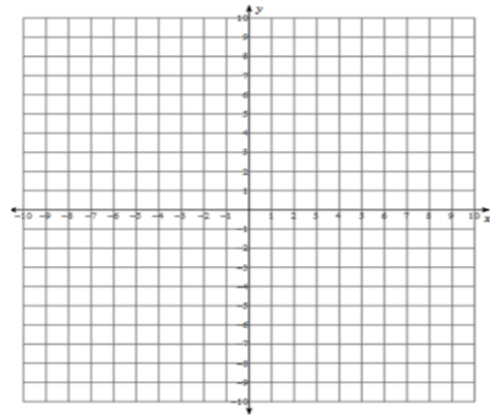
- a) The relation between temperature in degrees Celsius, C , and temperature in degrees Fahrenheit, F
- b) The relation between the current, I amps, and power, P watts, in an electrical circuit

C	F
0	32
5	41
10	50
15	59

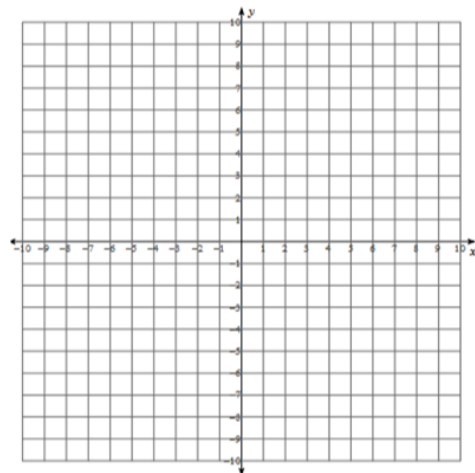
I	P
0	0
5	75
10	300
15	675

Graph each of the following:

a) $y = -2x + 3$



b) $y = x^2 - 1$



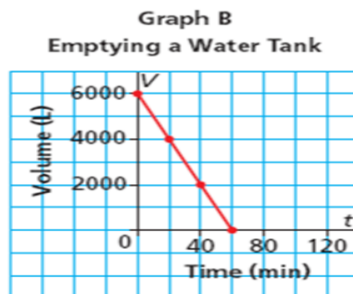
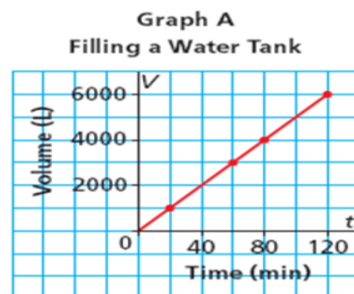
Example 3 Identifying a Linear Relation

Which relation is linear? Justify the answer.

- A new car is purchased for \$24 000. Every year, the value of the car decreases by 15%. The value is related to time.
- For a service call, an electrician charges a \$75 flat rate, plus \$50 for each hour he works. The total cost for service is related to time.

Example 4 Determining the Rate of Change of a Linear Relation from Its Graph

A water tank on a farm near Swift Current, Saskatchewan, holds 6000 L. Graph A represents the tank being filled at a constant rate. Graph B represents the tank being emptied at a constant rate.



- Identify the independent and dependent variables.
- Determine the rate of change of each relation, then describe what it represents.