Important Concepts . . .

Preview Review

Mathematics   Grade 8   TEACHER KEY
W2 - Lesson 3:   Graphing and Analyzing
Linear Equations

Important Concepts of Grade 8 Mathematics

Materials Required

Protractor
Ruler
Calculator

No Textbook Required

This is a stand-alone course.

Alberta Distance Learning Centre has an Internet site that you may find useful. The address is as follows: **http://www.adlc.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Preview/Review Concepts
for
Grade Eight Mathematics

Teacher Key

OBJECTIVES

By the end of this lesson, you will be able to:

- Determine the missing value in an ordered pair

- Create a table of values

- Construct a graph for discrete data

- Describe the relationship between the variables of a given graph

GLOSSARY

Discrete Data – data that contains a set of values that is distinct and separate from one another. Data located in between these values is meaningless.

Linear Relation – relationships between two variables (usually x and y) that form a straight non-vertical and non-horizontal line when graphed.

Ordered Pair – a related pair of values that correspond to a point on a graph; an ordered pair is written in the form (x, y).

W2 – Lesson 3: Graphing and Analyzing Linear Equations

Materials required:

- Paper, and Pencil

Part 1: Creating a Table of Values

A linear relation is a relationship between two variables (usually x and y) that form a straight non-vertical and non-horizontal line when it is graphed.

A linear relation looks like y = 3x + 1, where x is the input value and y is the output value.

Before you can graph a linear relation, you determine the ordered pairs that correspond to the given linear relation. Ordered pairs can be calculated by substituting a given value of x into the linear relation and evaluating the value of y.

Example 1

Evaluate the linear relation y = 3x + 1 when x = 0, 1, 2, 3, and 4.

$$y = 3x + 1$$
$$= 3(0) + 1$$
$$= 0 + 1$$
$$= 1$$

$$y = 3x + 1$$
$$= 3(1) + 1$$
$$= 1 + 1$$
$$= 2$$

$$y = 3x + 1$$
$$= 3(2) + 1$$
$$= 6 + 1$$
$$= 7$$

$$y = 3x + 1$$
$$= 3(3) + 1$$
$$= 9 + 1$$
$$= 10$$

$$y = 3x + 1$$
$$= 3(4) + 1$$
$$= 12 + 1$$
$$= 13$$

The ordered pair is (0,1)

The ordered pair is (1,2)

The ordered pair is (2,7)

The ordered pair is (3,10)

The ordered pair is (4,13)
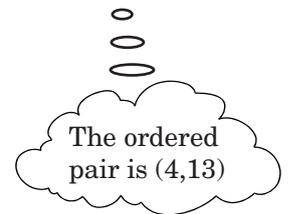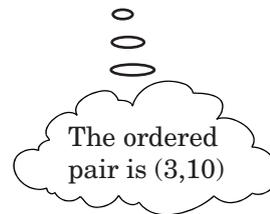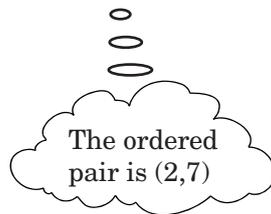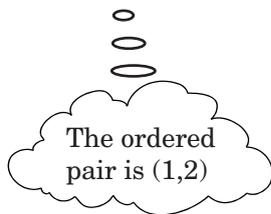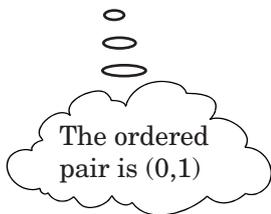
These relations can be organized neatly in a table of values. A table of values has two columns. The first column lists the x-values (input) the seconds column lists the corresponding y-values (output).

x	y
0	1
1	4
2	7
3	10
4	13

Practice Questions

1. Determine the missing values in the ordered pairs given the following linear relations.

   a. $y = -5x - 1$

   $(2, \underline{\quad})$

   $(\underline{\quad}, -26)$

   To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

   $y = -5x - 1$

   $y = -5(2) - 1$

   $y = -10 - 1$

   $y = -11$

   The ordered pair is (2, -11).

   To determine the x-value, substitute the given y-value into the linear relation and evaluate for x.

   $y = -5x - 1$

   $-26 = -5x - 1$

   $-26 + 1 = -5x - 1 + 1$

   $-25 = -5x$

   $\dfrac{-25}{-5} = \dfrac{-5x}{-5}$

   $5 = x$

   The ordered pair is (5, -26).

b. $y = 2x + 7$

$$(\_\_\_, 25)$$

$$(6, \_\_\_)$$

To determine the x-value, substitute the given y-value into the linear relation and evaluate for x.

$$y = 2x + 7$$
$$25 = 2x + 7$$
$$25 - 7 = 2x + 7 - 7$$
$$18 = 2x$$
$$\frac{18}{2} = \frac{2x}{2}$$
$$9 = x$$

The ordered pair is (9, 25).

To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

$$y = 2x + 7$$
$$y = 2(6) + 7$$
$$y = 12 + 7$$
$$y = 19$$

The ordered pair is (6, 19) .

2.   Create a table of values for the following linear relations. Use x = 0, 1, 2, 3, and 4.

a. $y = -2x + 3$

To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

x	y
0	3
1	1
2	-1
3	-3
4	-5

b. $y = 4x - 5$

To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

x	y
0	-5
1	-1
2	3
3	7
4	11

c. $y = -6x - 8$

To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

x	y
0	-8
1	-14
2	-20
3	-26
4	-32

Part 2: Graphing and Analyzing a Linear Relation

In a linear relation, the value of y depends upon the input value of x. This makes x the independent variable and the y-variables the dependant variables.

To graph a linear relation plot the set of x-values (independent variables) along the horizontal axis (the x-axis) and plot the set of y-values (dependant variables) along the vertical axis (the y-axis).

Remember the following points:

- Label the axis with a name including the units

- Label the origin with a 0 and plot the increments along the x-axis using a consistent scale. Do the same for the y-axis.

- Give the graph a title.

- Do not connect the points because the data is discrete. That means that no meaningful values exist between the numbers plotted along the x-axis.

Example 1

Dawson mows lawns for $12.00 a lawn. Graph this relation on the following graph.
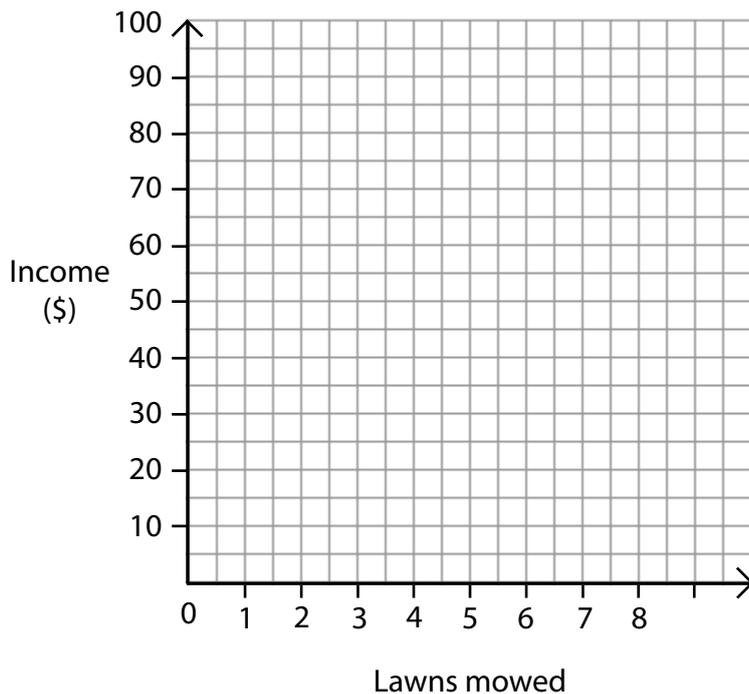
The linear relation that represents Dawson's part-time income is I = 12m, where I represents his income and m represents the number of lawns he mows.
First create a table of values to determine the ordered pairs.

m		I
0	12(0)	0
1	12(1)	12
2	12(2)	24
3	12(3)	36
4	12(4)	48

The first number in the ordered pair represents the x-coordinate.
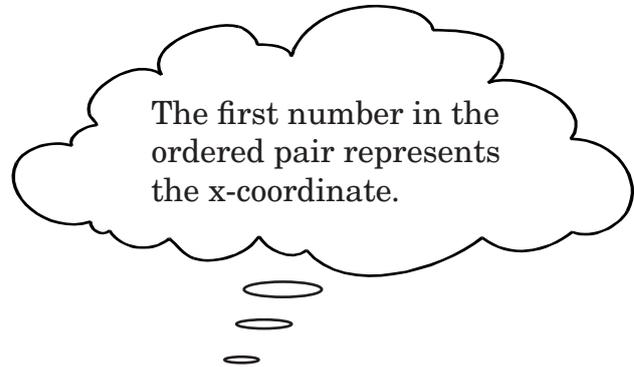
The ordered pairs that correspond to the linear relation are: (0, 0), (1, 12), (2, 24), (3, 36), (4, 48).

The second number in the ordered pair represents the y-coordinate.
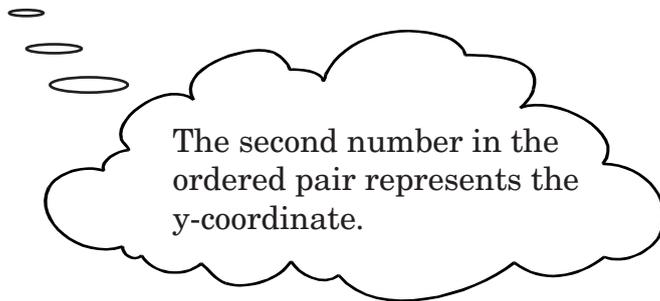
Now you can graph the linear relation using the ordered pairs as points.

Dawson's income vs number of lawns mowed

Lawns mowed
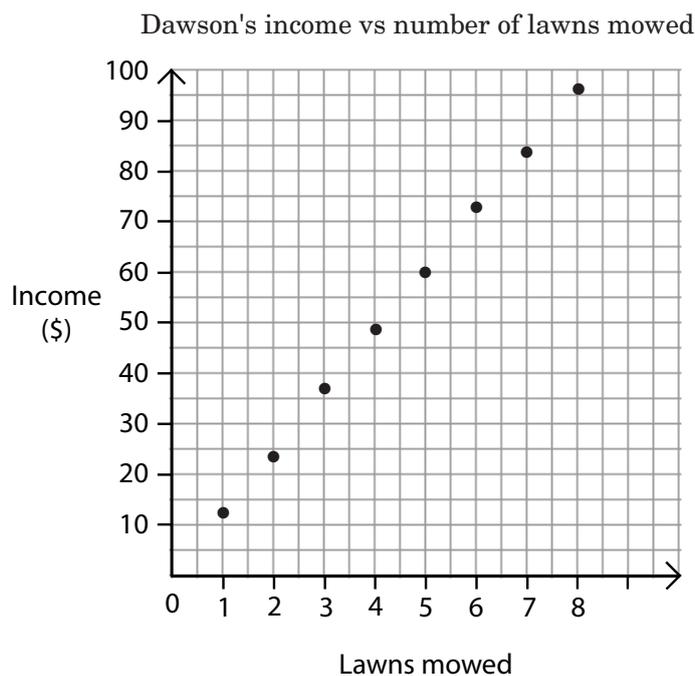
When a linear relation is graphed, a relationship between the variables can be seen. In this case, it looks like the more lawns Dawson mow, the more money he will make.
As the number of lawns increased by 1, Dawson's income increases by 12 dollars.

Example 2

The temperature on a cool summer day is illustrated on the given graph. The linear relation that represent this relationship is T = -2t + 20, where T represents the temperature and t represent the time.

Temperature vs Time

Temperature (°C)

Time (hours)
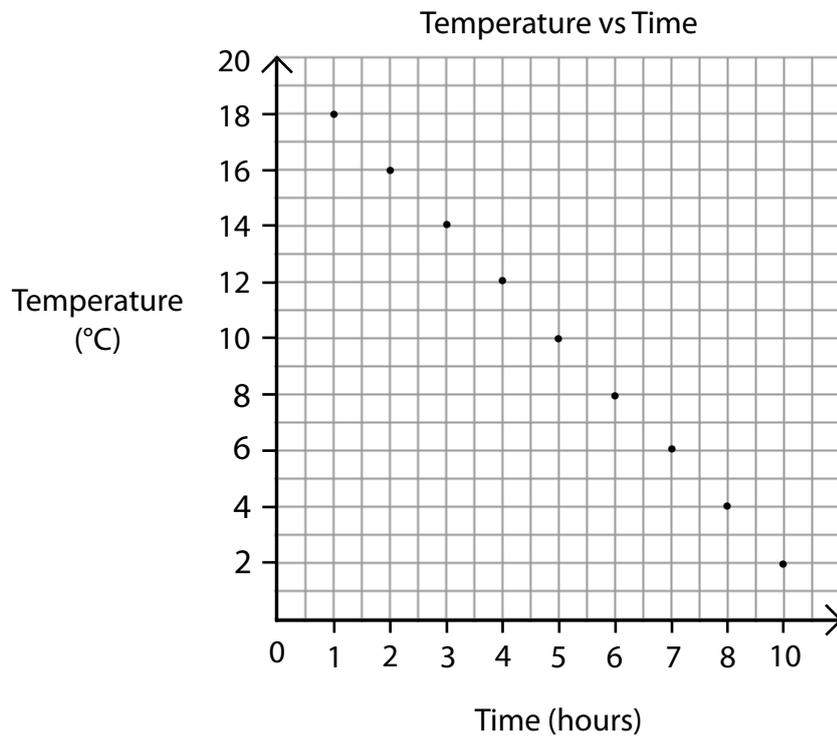
What is the relationship between the two variables?
It looks like as time increases, the temperature decreases. For every hour the times goes up, the temperature decreases by 2°C.

Practice Questions

1. Graph the following linear relations.

    a. $y = -3x + 4$
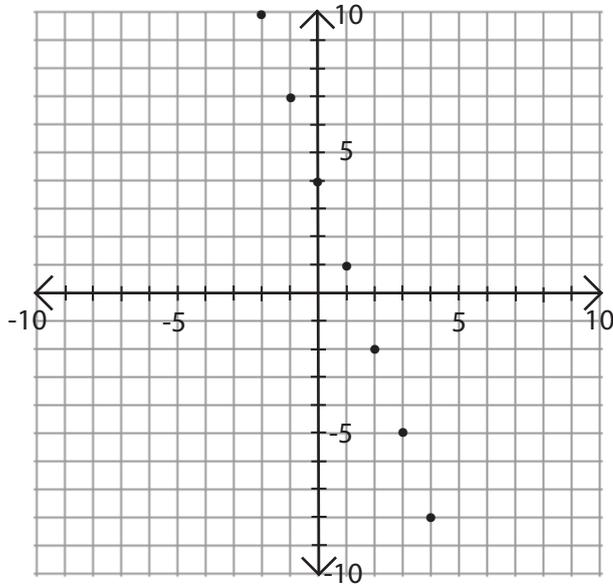
    b. $y = 5x - 10$
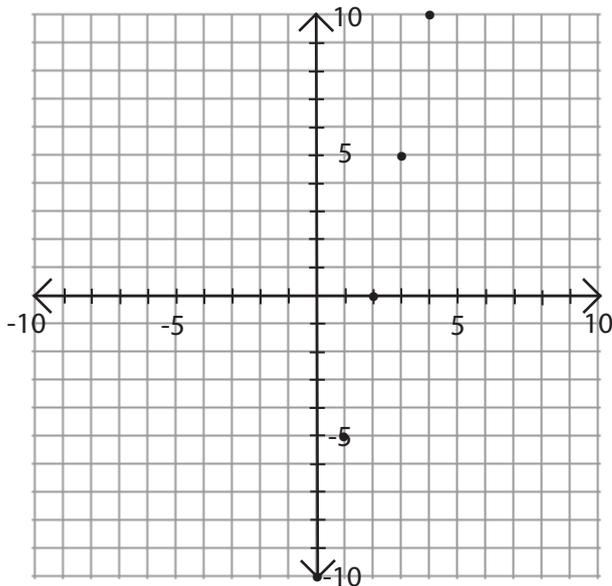
2. Determine the relationship between the two variables in the given graphs.

a.

Number of watermelons sold per day

Day
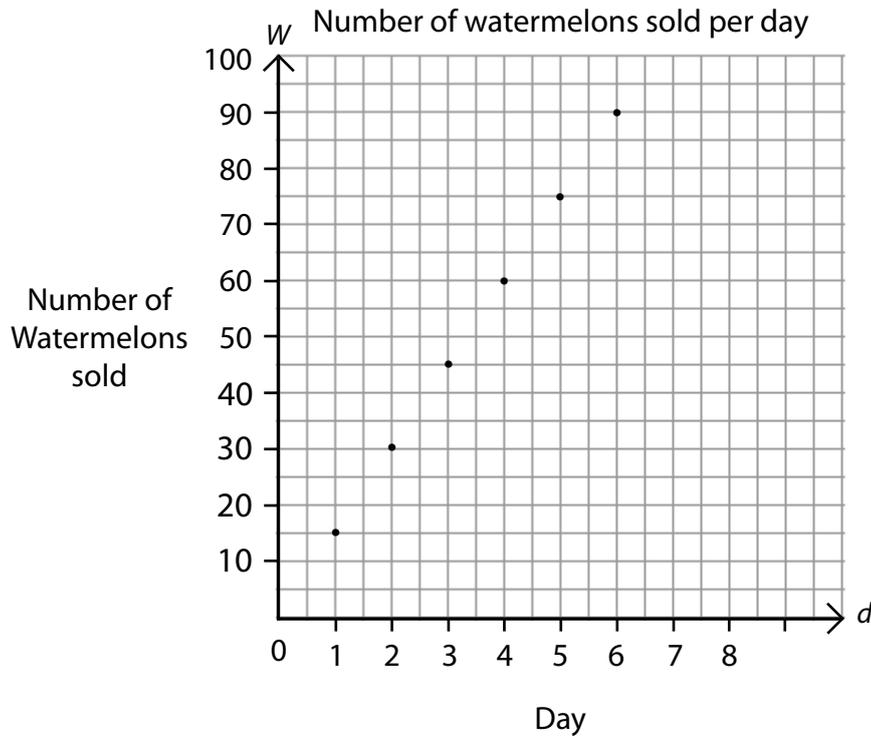
The independent variable is the day, d, and the dependant variable is the

number of watermelons, W.

For every day that goes by, 15 watermelons are sold.

b.

Temperature vs Time

Temperature of coffee (°C)

Time (hours)
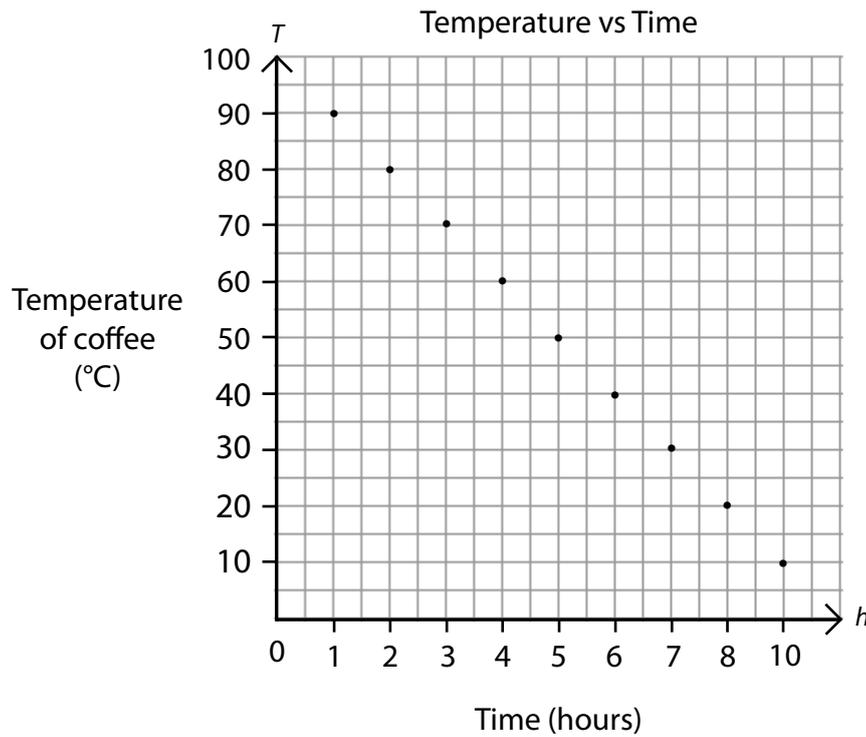
The independent variable is the hours, h, and the dependant variable is the temperature of the coffee, T.

For every hour that goes by the temperature of the coffee decreases by 10°C.

Lesson 8: Assignment

Determine the missing value in the ordered pair for the given linear relations.

1. $y = -6x$

$(3, \underline{\quad})$

$(\underline{\quad}, -24)$

To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

$y = -6x$

$y = -6(3)$

$y = -18$

The ordered pair is (3, -18).

To determine the x-value, substitute the given y-value into the linear relation and evaluate for x.

$y = -6x$

$-24 = -6x$

$\dfrac{-24}{-6} = \dfrac{-6x}{-6}$

$4 = x$

The ordered pair is (4, -24).

2. $y = 7x + 8$

$(2, \underline{\quad})$

$(\underline{\quad}, 29)$

To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

$y = 7x + 8$

$y = 7(2) + 8$

$y = 14 + 8$

$y = 22$

The ordered pair is (2, 22).

To determine the x-value, substitute the given y-value into the linear relation and evaluate for x.

$y = 7x + 8$

$29 = 7x + 8$

$29 - 8 = 7x + 8 - 8$

$21 = 7x$

$\dfrac{21}{7} = \dfrac{7x}{7}$

$3 = x$

The ordered pair is (3, 29).

Create a table of values for the following linear relations. Use x = 0, 1, 2, 3, and 4.

3. $y = 50 - x$

To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

x	y
0	50
1	49
2	48
3	47
4	46

4. $y = 16x - 4$

To determine the y-value, substitute the given x-value into the linear relation and evaluate for y.

x	y
0	-4
1	12
2	28
3	44
4	60

Graph the following linear relations and determine the relationship between the two variables.

5.   The cost of renting a banquet hall for a fundraiser is represented by the following linear relation $C = 20n + 150$, where C represents the cost of the banquet hall and n represents the number of people who attend the fundraiser. Tickets for the fundraiser are sold in packages of 15.
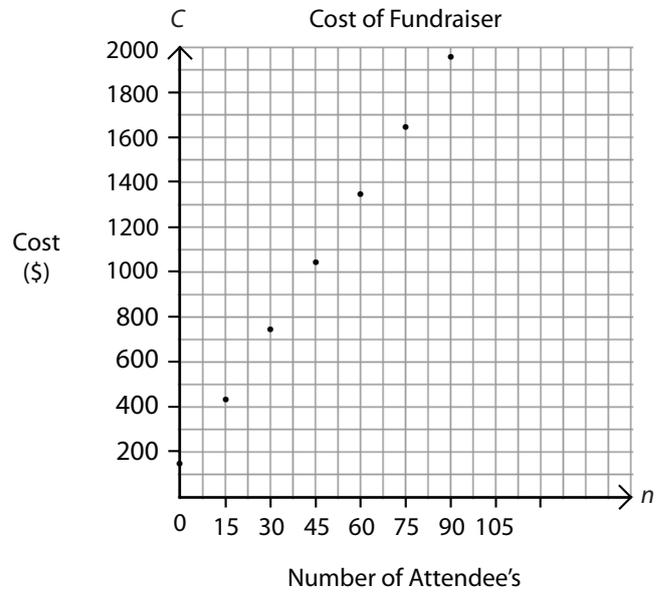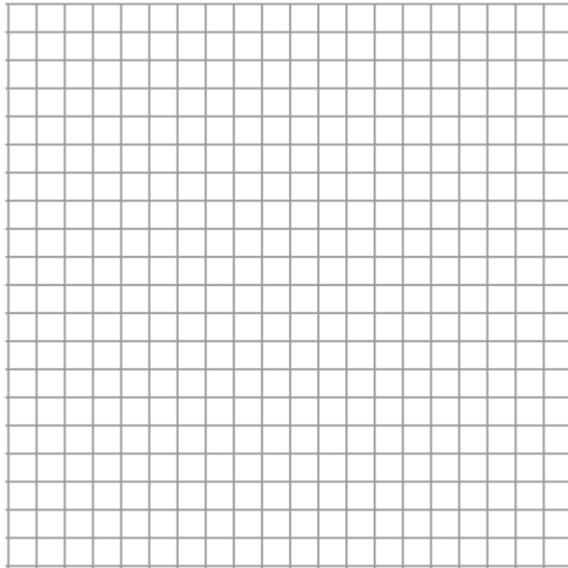
n	C
15	450
30	750
45	1050
60	1350
75	1650

Cost, C, is the dependant variable and the number of attendee's, n, is the dependant variable. As the number of attendee's increases, the cost of renting the banquet hall also increases.

6. The cost of having a cell phone is represented by the following linear relation, $C = 0.15m + 40$, where C represents the cost of the cell phone plan, and m represents the minutes spent talking on the cell phone. The number of minutes must be pre-bought in 100 minute packages.
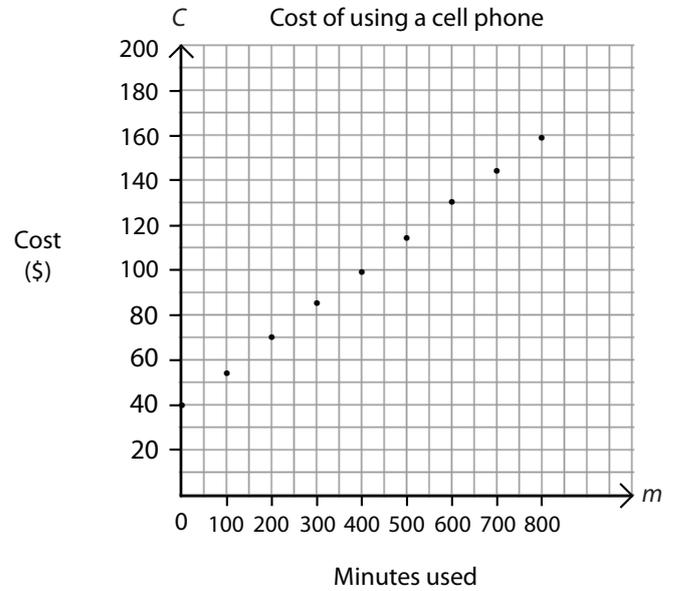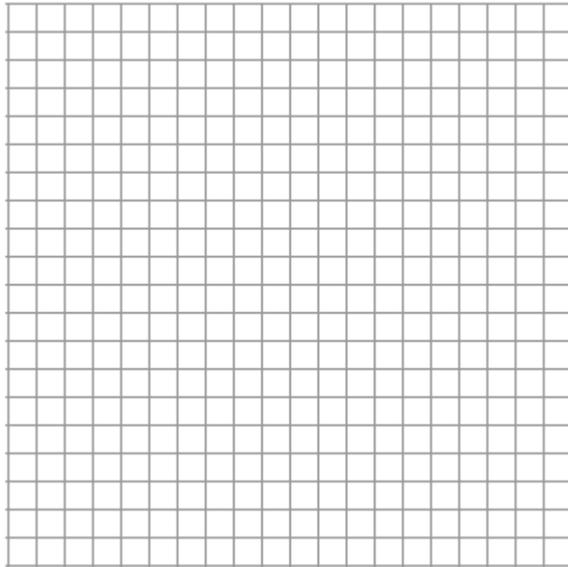
m	C
100	55
200	70
300	85
400	100
500	115

Cost, C, is the dependant variable and the number of minutes used, m, is the dependant variable. As the number of minutes used increases, the cost of the cell phone also increases.

LEARNING ANYTIME ANYWHERE