Get Ready

Name: _____ **Date:** _____

Describe Patterns in Words

Patterns can be described using words. When you describe a pattern, tell what it is, where it starts, and how it changes.

- The pattern of letters *a*, *c*, *e*, … can be described as letters of the alphabet beginning with *a*, and skipping one letter each time or increasing by two letters.
- The number pattern 6, 9, 12, … can be described as whole numbers that begin with 6, and increase by 3 or are multiples of 3.

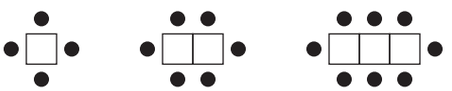
1. Describe each pattern in words.

a) *b, e, h,* …

b) 9, 4, –1, …

Show Patterns in a Table

A café has small tables that seat four people. Small tables can be moved together to seat larger groups as shown.



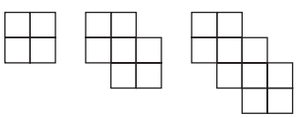
The information from this pattern can be shown in a table.

Number of Tables	1	2	3
Number of Chairs	4	6	8

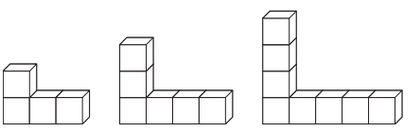
You can describe the pattern as "the number of chairs begins at 4 and increases by 2 each time you add a table."

2. For each pattern, make a table of values and then describe the pattern.

a)



b)



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Describe Patterns Using an Expression

There are three algae eaters and some guppies in a fish tank. If the number of guppies is represented by the **variable** *g,* the total number of fish in the tank can be expressed as $g + 3$.

3. Write an expression for each scenario. Tell what your variable represents.

a) Shay has five boxes of pencils. Each box has the same number of pencils. How many pencils does he have in total?

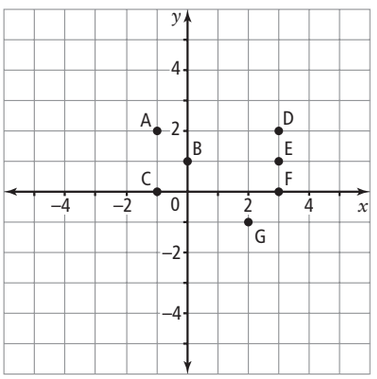
b) A Winnipeg warehouse has 12 shipping cartons of DVDs. Each carton has the same number of DVDs. The cartons will be sent to four different cities. How many DVDs will go to each city?

Use a Coordinate Grid

Points on a coordinate grid are described using **ordered pairs** written as (x, y).

Point E can be described using the ordered pair (3, 1).

- The first coordinate, or ***x*-coordinate**, is the horizontal distance of point E from the y-axis.
- The second coordinate, or ***y*-coordinate**, is the vertical distance of point E from the x-axis. You can locate points by counting from the origin (0, 0).



4. Enter each point from the above coordinate grid in the table below.

Point	E						
x	3	−1	2	3			
y	1	0	−1	2			

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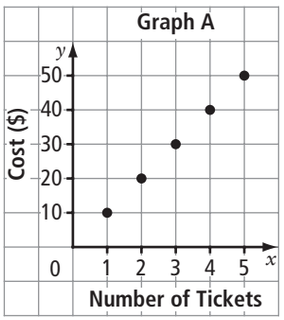
9.1 Analysing Graphs of Linear Relations

***MathLinks 8*, pages 332–341**

Key Ideas Review

Use the graph at right to answer questions #1 to #4.



1. Complete a table of values for the graph.

2. Circle the three factors that should be included to describe the pattern on a graph.

a) where it starts **b)** how it changes **c)** slope of the line

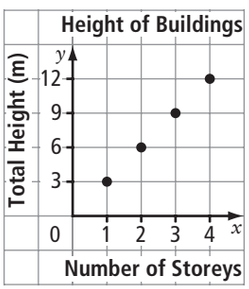
d) *x*-axis and *y*-axis titles **e)** what it relates to

3. Does the graph above show a linear relation? How do you know?

4. Does it make sense to have values between those on the graph? Explain.

Practise and Apply

5. Complete the sentences to describe the graph below.



a) The height of a one-storey building is _____ m, a _____-storey building is 6 m high, a three-storey building is _____ m, …

b) The points appear to lie in a _____. The line shows a _____ relation.

c) The graph shows that to move from one point to the next, you go _____ unit horizontally, and _____ units vertically.

d) Complete the table of values for this graph.

	1	2	3	4		10
	3				15	

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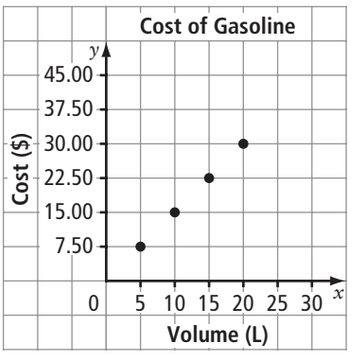
6. The graph shows the cost of gasoline based on the volume of gas.



a) Does the graph show a linear relation? Explain.

_____

_____

_____

b) The graph shows that for every five units horizontally, you go

_____ units vertically.

c) Complete the table of values from the graph.

Volume (L)	Cost ($)
5	7.50

d) Would it be reasonable to include a point for 7 L? Explain.

_____

_____

_____

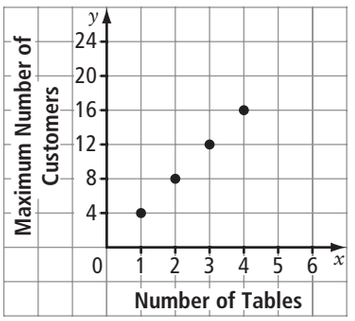
e) What is the cost of gasoline per litre?

f) If the graph continued, what would be the cost of

25 L?

30 L?

7. The graph shows the maximum number of customers based on the number of tables in the restaurant.



a) Title the graph.

b) Describe the patterns on the graph. Does the graph show a linear relation?

_____

_____

_____

c) Complete the table of values for the graph.

	1			4	5	6
	4	8				

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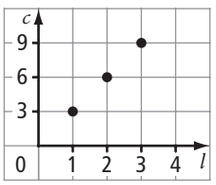
9.2 Patterns in a Table of Values

***MathLinks 8*, pages 342–351**

Key Ideas Review

Match the terms in column B to a representation of a linear relation in column A.

A	B
1. (l, $3l$)	**a)** table of values
2. The cost in dollars is $3l$, where l is the length in metres.	**b)** graph
3. <table><tr><td>***l***</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>***c***</td><td>0</td><td>3</td><td>6</td><td>9</td></tr></table>	**c)** words
4. The cost in dollars is three times the length in metres.	**d)** ordered pair
5. 	**e)** expression

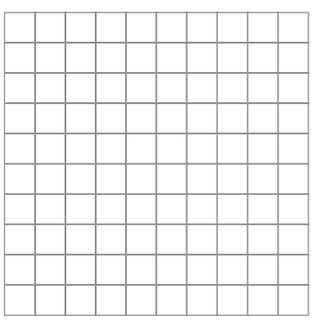
6. Circle the words that correctly complete each statement.
You can tell that the relationship in #3 is linear because

- Each consecutive value for c changes by (the same/a different) amount.
- Each consecutive value for l changes by (the same/a different) amount.

Practise and Apply

7. Graph the ordered pairs in the table of values.

l	***m***
2	7
4	9
6	11
8	13



8. Circle the table(s) of values that show a linear relation. Explain your answer.

a)

l	***m***
2	7
4	9
6	11
8	13

b)

a	***b***
3	8
6	12
9	15
12	19

_____

_____

_____

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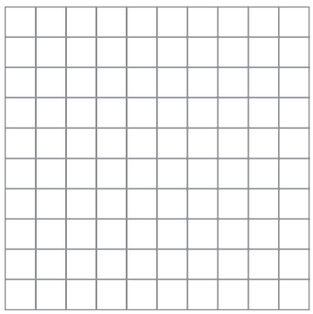
9. The table of values represents a linear relation.

x	0	1	2	3	4	5
d	0	3	6	9	12	15

a) Graph the ordered pairs.



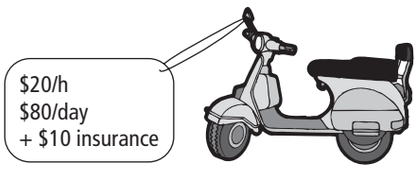
b) What is the difference in value for consecutive x-values?

c) What is the difference in value for consecutive d-values?

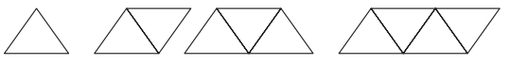
d) The d-value is _____ times the x-value.

e) Write an expression for d in terms of x.

10. For what number of hours is it cheaper to rent by the day rather than by the hour? Show your work.



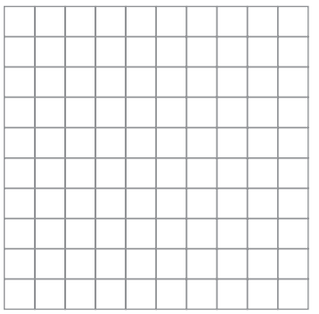
11. The following pattern of triangles continues. The side of each triangle is 2 cm.



a) Complete the table of values to show the relationship between the number of triangles and the perimeter of each figure.

Number of Triangles	1	2	3	4
Perimeter (cm)	6	8		

b) Draw a graph from the table of values.



c) Describe the relationship shown on the graph.

_____

_____

_____

d) What is an expression for the perimeter in terms of the number of triangles? Explain what the variables mean.

e) If the pattern continues, what is the perimeter when there are 30 triangles? Show your thinking.

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9.3 Linear Relationships

***MathLinks 8*, pages 352–359**

Key Ideas Review

For #1 and #2, unscramble the letters to form a word that correctly completes the statement.

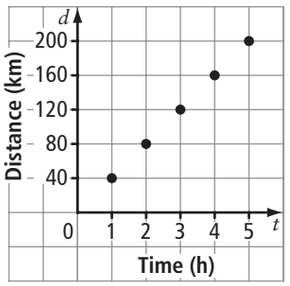
1. a) You can graph a linear _____ (AEILNORT) represented by a(n) _____ (AFLMORU) or a(n) _____ (AEIUNOQT).

b) First, make a table of _____ (AELUVS).
Check that the values in the table are _____ (AABEELNORS).

c) Then, graph using the _____ (EEDDORR) pairs in the table.

t	*d*
0	0
1	40
2	80
3	120
4	160
5	200

2. Whenever possible, choose variables that are meaningful. For example, *d* for _____ (AECDISTN) and *t* for _____ (EITM).



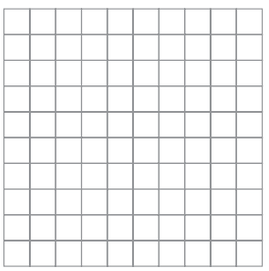
Practise and Apply

3. The amount of water used by a garden hose can be represented as $V = 20t$, where V is the volume of water in litres, and t is the time in minutes.

a) Complete the table of values.

t	*V*
0	0
1	20
3	
4	
5	

b) Graph the ordered pairs.



c) Is it reasonable to have points between the ones on the graph? Explain.

_____

_____

_____

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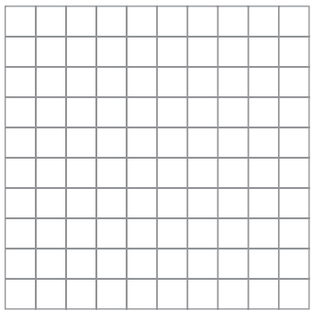
4. The use of computers is free in most libraries, but most libraries charge for using the printer. The cost of printing can be represented by $C = 15p$, where C is the cost in cents, and p is the number of pages printed.

a) Complete the table of values.

p	0	1	2	3	4	5
C						

b) Graph the ordered pairs.



c) Is it reasonable to have points between the ones on the graph? Explain.

5. Evaluate each equation using the given value. Show your thinking.

a) $y = 3x - 1$ when $x = 5$

b) $y = 4x + 1$ when $x = -3$

c) $y = -x$ when $x = -4$

6. Complete the table of values for each equation using $x = -2, -1, 0, 1, 2$.

a) $y = 4x + 1$

x						
y						

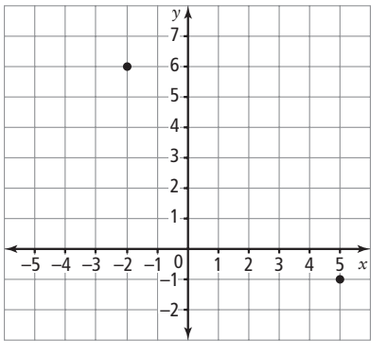
b) $y = -5x$

x						
y						

c) $y = 3 - x$

x						
y						

7. This graph represents part of the linear relation $y = -x + 4$.



a) What are the coordinates for the point that lies on the y-axis?

b) What is the y-coordinate when $x = 3$?

c) For the point $(-10, y)$, what is the value of y?

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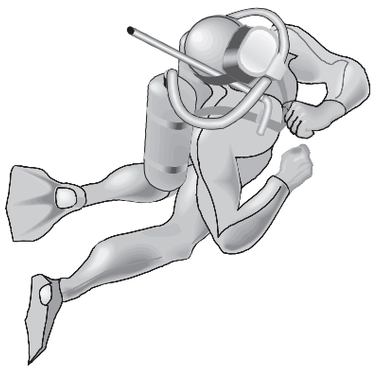
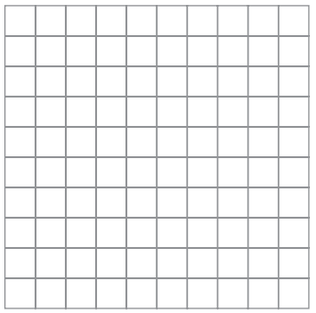
Link It Together

A scuba diver is 60 metres underwater and rises at a rate of 20 metres every minute.



1. Make a table of values to show the diver's rise to the surface.

2. a) Plot the ordered pairs on the graph.



b) Title the graph.

c) Describe the pattern on the graph.

3. a) What is the difference between consecutive values in the chart?

b) Write an expression for this relationship. Explain what each part of the expression means.

4. Is it reasonable to extend the graph above 0 metres? Explain.

5. Does the graph show a linear relationship? Explain.

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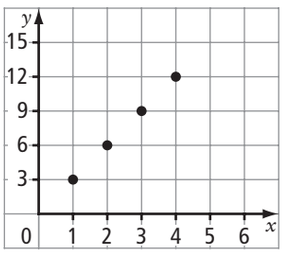
Vocabulary Link

Draw a line from the example in column A to the correct term in column B. Then, find each term in the word search.

A	B
1. $C = \pi d$, where C is the circumference and d is the diameter of a circle.	**a)** equation
2.	**b)** expression
3. A pattern formed by two sets of numbers.	**c)** formula
4. 	**d)** linear relation
5. $y = 4x$	**e)** relationship
6. $6c - 2$	**f)** table of values
7. An unknown number, c.	**g)** variable

Hieght (m)	0	150	300	450	600	750
Temperature (°C)	20					

N	I	V	B	V	M	J	H	A	G	V	Y	U	U	R	A	T	E	V	G
T	R	S	N	W	L	U	L	Z	Y	X	R	K	Z	G	E	E	I	O	Z
E	A	U	E	V	H	U	T	E	C	F	S	F	O	F	Z	Q	R	Z	G
I	L	B	Q	R	M	D	X	L	U	C	F	S	N	N	L	U	S	P	T
Z	Y	P	L	R	O	U	E	E	R	Q	L	W	U	Z	Q	A	O	I	U
E	Q	D	O	E	G	M	L	T	K	N	F	C	E	V	W	T	D	L	M
X	V	F	U	T	O	B	P	B	W	M	K	Q	I	T	F	I	L	U	S
P	M	Y	I	C	A	F	B	J	S	U	Z	L	E	N	Y	O	V	U	V
R	M	G	Z	I	W	E	V	Y	H	O	W	F	J	B	D	N	L	H	C
E	A	L	R	E	B	H	K	A	T	V	K	S	O	C	V	E	K	G	Z
S	F	A	T	Q	X	K	J	P	L	Y	R	M	A	U	A	F	F	K	U
S	V	Z	O	C	W	K	F	C	S	U	C	V	E	J	P	G	N	L	V
I	A	D	N	E	I	L	Q	D	I	X	E	S	N	E	N	X	U	G	W
O	S	E	V	L	E	R	N	U	W	X	B	S	D	D	S	G	B	S	B
N	J	L	I	N	E	A	R	R	E	L	A	T	I	O	N	K	C	R	E
W	T	J	R	E	L	A	T	I	O	N	S	H	I	P	Z	F	P	O	E
M	T	J	K	M	N	G	L	Y	P	S	H	Q	M	K	S	O	T	X	J
A	N	T	N	P	G	W	W	U	N	L	T	M	N	S	W	R	Z	E	D