Get Ready

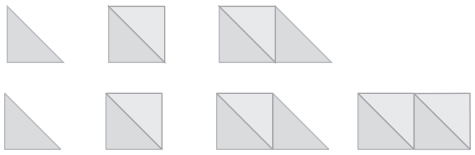
Name: _____ Date: _____

Explore Patterns

Patterns come in the form of shapes, pictures, colours, numbers, letters, and so on.

In this pattern, you add one dark triangle, then one light triangle, then one dark triangle, and so on.

Once you determine a pattern, you can predict what comes next.



1. Continue each pattern for three more items.

a) 

b) 

2. Continue each number pattern for three more items.

a) 1, 3, 5, 7, …

b) 50, 45, 40, 35, …

c) 3, 6, 9, 12, …

d) 6000, 5000, 4000, 3000, …

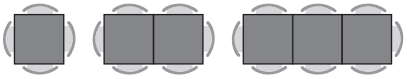
Describe Patterns

You can use a table to show a pattern.

Figure 1 Figure 2 Figure 3 Figure 4

Figure	Number of Rectangles
1	1
2	3
3	5
4	7

3. The following shows a pattern in the number of chairs arranged around tables. Fill in the blanks in the chart.



1 table 2 tables 3 tables

Number of Tables	1	2	3	4
Number of Chairs				

4. Study the pattern of squares.

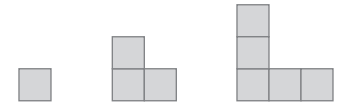


Figure 1 Figure 2 Figure 3

a) Draw Figure 4 in the pattern.

b) Make a table showing the number of squares in each of the first five figures.

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Determine Pattern Rules

You can make a rule that describes a pattern.
Here is a rule for the pattern shown:
The number of triangles is one more than the figure number.


Figure 1 Figure 2 Figure 3

You can use the rule to make predictions:
There would be 11 triangles in Figure 10 because $10 + 1 = 11$.

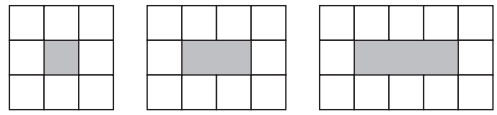
5. The following shows a number pattern: 1, 5, 9, 13, 17, …

a) What number comes next in the pattern?

b) Describe in words a pattern rule for the numbers.

c) Explain what you did to determine the pattern.

6. A swimming pool deck increases in size by the following pattern.


Deck 1 Deck 2 Deck 3

a) What is a pattern rule for the number of white squares?

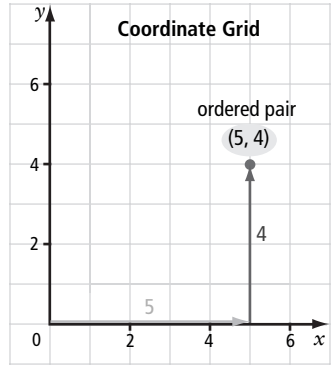
b) What is the number of white squares around the pool in Deck 20?

Use Graphing Skills

Graphs show relationships between two things.

To make a graph, you plot ordered pairs on a coordinate grid.

To plot the ordered pair (5, 4),
- start at (0, 0)
- move 5 units right
- then, move 4 units up
- mark a dot



7. For each ordered pair, copy and complete this statement: Move ■ units to the right. Then, move ■ units up.

a) (5, 2)

b) (7, 3)

c) (4, 6)

8. a) On centimetre grid paper, draw a coordinate grid with numbers from 0 to 8 on each axis.

b) Plot these ordered pairs on your coordinate grid:
A(5, 8), B(8, 5), C(8, 1), D(2, 1), E(2, 5)

c) Join the points in alphabetical order. Join E to A. What is the shape?

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10.1 Describe Patterns

***MathLinks 7*, pages 350–357**

Key Ideas Review

Choose from the terms below to complete the following statements.

fractions next number predict repeating shape

1. Patterns come in many forms. Name the two forms of patterns show below.

a) 3, 5, 7, 9, 11 _____

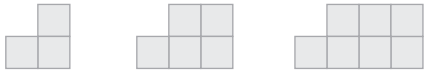
b) 

Figure 1 Figure 2 Figure 3 _____

2. You can use a pattern to _____ what comes _____. For example, the next number in #1a) is _____ .

3. $\frac{1}{9} = 0.\overline{1}$, $\frac{2}{9} = 0.\overline{2}$, $\frac{3}{9} = 0.\overline{3}$

This number pattern uses _____ and _____ decimals.

Practise and Apply

4. a) Describe the pattern of circles.

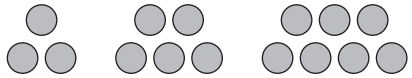


Figure 1 Figure 2 Figure 3

b) Draw Figure 4.

c) How many circles will be in Figure 5?

5. a) Describe the pattern of triangles.

Figure 1 Figure 2 Figure 3

b) Draw Figure 5.

c) How many triangles will be in Figure 6?

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6. The table shows fractions in fifths and their decimal equivalents.

Fraction	Decimal
$\frac{1}{5}$	0.2
$\frac{2}{5}$	0.4
$\frac{3}{5}$	0.6

a) Describe the pattern.

b) What fraction comes next in the table? Write the fraction's decimal equivalent.

Fraction: _____

Decimal equivalent: _____

c) Predict what happens to the pattern after $\frac{5}{5}$. Use your prediction to show the next number in the pattern.

7. Greg and Dawn are trying to figure out what decimal equivalent comes next in the pattern shown in the table.

Fraction	Decimal
$\frac{1}{8}$	0.125
$\frac{2}{8}$	0.250
$\frac{3}{8}$	0.375
$\frac{4}{8}$	0.500

a) Predict the decimal equivalent for $\frac{5}{8}$.

b) Without using your calculator, predict the decimal equivalent for $\frac{11}{8}$. Explain how you know.

8. Thea wants to put a border around her walkway.

Figure 1 Figure 2

a) Complete the table. Round the decimals to the nearest hundredth.

Figure	Black Tiles / Total # Tiles	Decimal
1	$\frac{2}{3}$	0.67
2	$\frac{3}{5}$	0.60
3		
4		
5		

b) For Figures 3 to 5, describe the pattern, for both the fractions and decimal equivalents.

Black Tiles:

Total # Tiles:

Decimal:

Name: _____ Date: _____

10.2 Variables and Expressions

***MathLinks 7*, pages 358–364**

Key Ideas Review

Choose from the terms below to complete #1 to #3.

constant	letter	numerical coefficient	variable	variables

1. Fill in the blanks on the diagram.

a) _____ _____ b) _____ c) _____

2. Any _____ can be used as a _____ to represent a number or amount.

3. **a)** You want to write an expression for the following pattern. Show the order in which you would perform the steps.

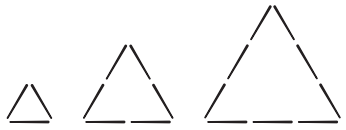

Figure 1 Figure 2 Figure 3

_____ Describe the pattern using the variable, numbers, and operations.

_____ Choose a variable and tell what it represents.

b) Write an expression for the pattern.

Practise and Apply

4. Carlos plays the copycat game, where players repeat and increase the pattern with each turn. If you make a mistake, you miss a turn.

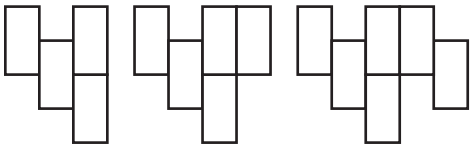

Figure 1 Figure 2 Figure 3

a) Make a table that shows the figure number and the total number of rectangles for the first five figures.

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b) Describe the pattern for #4 in words.

c) What is an expression for the figure number in terms of the total number of rectangles?

5. Vy uses toothpicks to make hexagon designs.

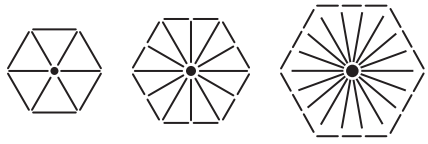

Figure 1 Figure 2 Figure 3

a) Make a table that shows the number of toothpicks used for the perimeter and the total number of toothpicks in each figure for the first five figures.

b) Describe the pattern in words.

c) What is an expression for the total number of toothpicks in each figure compared to the number in the perimeter of each figure?

d) If Figure 6 has a total of 72 toothpicks, how many are in its perimeter? Show your thinking.

6. Identify the variable and write an expression for each of the following statements.

a) triple the height increased by 5 cm

b) the perimeter decreased by 2 m

c) 10 years older than Cynthia

d) juice boxes shared equally among 3 students

7. a) Describe a pattern that could be represented by the expression $r + 5$.

b) What does your variable represent?

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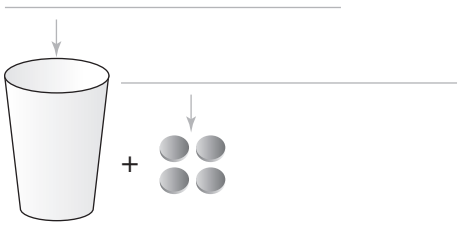
10.3 Evaluate Expressions

***MathLinks 7*, pages 365–371**

Key Ideas Review

1. Identify the variable and the constant in the following model of $c + 4$.



Use arrows to join the beginning of the sentence in column A with the correct ending in column B.

A	B
2. You can model an expression	**a)** for an expression.
3. Evaluate an expression	**b)** using cups and counters.
4. You can make a table of values	**c)** by substituting a number for the variable in the expression.

Practise and Apply

5. Use cups and counters to model each expression. Draw your model.

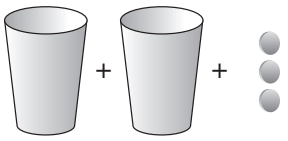
a) $3y$

b) $x + 5$

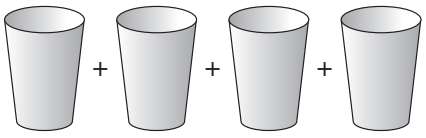
c) $2x + 4$

6. Write an expression to represent each model.

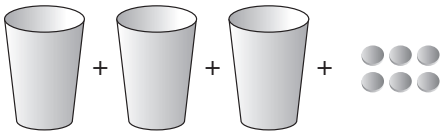
a)



b)



c)



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7. Evaluate each expression.

a) $x + 6$ when $x = 4$

b) $2y - 3$ when $y = 5$

c) $\frac{n}{2} + 5$ when $n = 8$

8. The expression $4t$ represents the number of toothpicks in each figure.

Figure 1 Figure 2 Figure 3

a) Make a table of values for the first six figures in the pattern.

b) What would be the number of toothpicks in Figure 14? Show your thinking.

9. Chen is making designs with his checkerboard pieces.

Figure 1 Figure 2 Figure 3

a) Complete the table of values.

Figure	Number of Game Pieces
1	
2	
3	
4	
5	
6	
7	

b) What is an expression for the number of game pieces in any figure? Show your thinking.

c) What does your variable represent?

d) How many game pieces would be in Figure 20? Show your thinking.

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10.4 Graph Linear Relations

***MathLinks 7*, pages 372–381**

Key Ideas Review

Choose from the following terms to complete #1.

graph relationships table of values

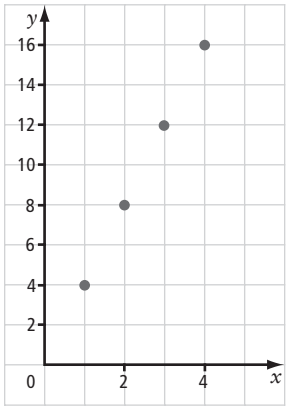
1. Identify the ways in which the following patterns are shown.

a)

Branch	1	2	3	4
Total Number of Plums	4	8	12	16

_____

b)



_____

2. Patterns can be described in several ways. Match the pattern descriptions below with the way each describes the pattern. Write the correct letter beside the sentence to show the way the pattern is being described.

W = words D = horizontal and vertical distances R = relationships

_____ **a)** The points increase by 2 units to the right, then 2 units up, starting at (0, 0).

_____ **b)** The relationship between f and p is linear and can be expressed as $(p, 3p)$ or $f = 3p$.

_____ **c)** The pattern forms a straight line, starting at (0, 0). Each y-coordinate is twice the x-coordinate.

_____ **d)** The coordinates of the points are (x, y). The relationship is linear.

Name: _____ Date: _____

Practise and Apply

3. The figures show a pattern of white and black triangles.

Figure 1 Figure 2 Figure 3

a) Complete the table of values showing the number of black triangles compared to the number of white triangles for the first four figures.

	Figure 1	Figure 2	Figure 3	Figure 4
Black Triangles				
White Triangles				

b) Draw a graph using the ordered pairs in your table of values.

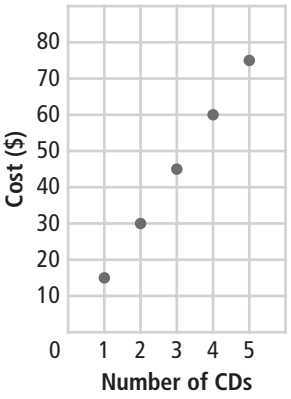
c) Describe the pattern on your graph in the following ways.

Words:

Horizontal and Vertical Distances:

Relationship:

4. The following graph shows how much CDs cost.



a) Make a table of values for the first five values of x, starting at $x = 1$.

b) Describe the pattern.

5. For a year-end field trip, there must be one adult for every eight students attending.

a) Create a table of values to show the relationship between the number of students and number of adults needed.

b) How many adults would you need if you had 107 grade 7 students going on the field trip? Show your thinking.

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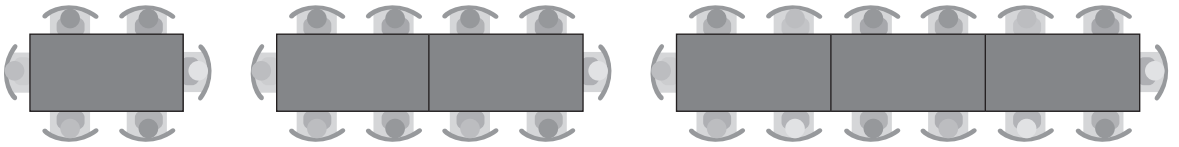
Link It Together

1. You are planning a dinner party. You need to set up the tables at the restaurant so everyone can be seated together. The restaurant manager gives you the following chart.



1 table 2 tables 3 tables

a) Draw the next diagram in the pattern.

b) Create a table of values comparing the number of guests that can be seated at 2, 4, 6, and 8 tables.

c) Draw a graph comparing the number of tables to the number of guests.

d) Write an expression to show how many guests can be seated if you know the number of tables.

e) If there are 15 tables, how many guests can be seated? Show your thinking.

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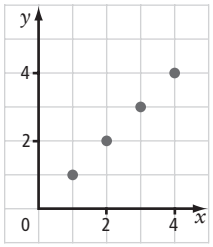
Vocabulary Link

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

1. This is one example:



2. If $y = 2$, this would be 5 for the expression $y + 3$.

3. $9 \div a$ is one example.

4. This is one example:

Number of Pups, *p*	Number of Fish, *f*	Ordered Pair, (*p*, *f*)
1	3	(1, 3)
2	6	(2, 6)
3	9	(3, 9)

5. One example is 1, 3, 7, 11, ...

6. In the expression $b + 4$, this would be 4.

7. In the expression $x - 5$, x is one of these.

8. In the expression $6m$, 6 would be the numerical one of these.

9. If there were three fish for each pup, this would be $f = 3p$.

B

a) coefficient

b) constant

c) expression

d) linear relation

e) pattern

f) relationship

g) table of values

h) value

i) variable

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