



# Grade 8

## PATTERNING AND ALGEBRA - MODELLING

This resource may be copied in its entirety, but is **not to be used for commercial purposes** without permission from the Centre for Education in Mathematics and Computing, University of Waterloo.

Complete the **Patterns and Relations** tutorial and play **Safe Breaker** first! Click on

<http://www.learnalberta.ca/content/mec/html/index.html> the lesson and

<http://www.bbc.co.uk/schools/ks2bitesize/maths/activities/numberpatterns.shtml> for the game.

You may go to [www.wiredmath.ca](http://www.wiredmath.ca) for the link.

1. A pattern is given in each table.      a. Complete the table.  
b. Describe the pattern.  
c. Give the 20<sup>th</sup> and  $n^{\text{th}}$  term in the pattern.

i. 

$n =$	0	1	2	3	4	5	6
	0	5	10	15		25	30

      20<sup>th</sup>: \_\_\_\_\_  $n^{\text{th}}$ : \_\_\_\_\_

Description: \_\_\_\_\_

ii. 

$n =$	0	1	2	3	4	5	10
	2	3	4	5			12

      20<sup>th</sup>: \_\_\_\_\_  $n^{\text{th}}$ : \_\_\_\_\_

Description: \_\_\_\_\_

iii. 

$n =$	0	1	2	3	4	5	6
	0	1	4	9	16		36

      20<sup>th</sup>: \_\_\_\_\_  $n^{\text{th}}$ : \_\_\_\_\_

Description: \_\_\_\_\_

2. An equation can be used to describe a pattern. Complete each table, and describe the resulting pattern for  $y$ .

a.  $y = 2x - 3$ 

$x$	0	1	2	3	4
$y$					

      Description: \_\_\_\_\_

b.  $y = -4x + 5$ 

$x$	0	1	2	3	4
$y$					

      Description: \_\_\_\_\_

c.  $x + y - 5 = 0$ 

$x$	0	1	2	3	4
$y$					

      Description: \_\_\_\_\_

d.  $3x - y + 1 = 0$ 

$x$	0	1	2	3	4
$y$					

      Description: \_\_\_\_\_

What is the relationship between each equation and your description?  
(Hint: Rewrite each equation in the form  $y = mx + b$ ) \_\_\_\_\_  
\_\_\_\_\_

3. Give a description of the pattern represented by the equation, **without** calculating any terms in the pattern.

- a.  $y = -2x + 3$  \_\_\_\_\_
- b.  $y = -7x$  \_\_\_\_\_
- c.  $y = 3x + 8$  \_\_\_\_\_
- d.  $y = 8$  \_\_\_\_\_

**DID YOU KNOW?**

If you add up all the numbers in the pattern

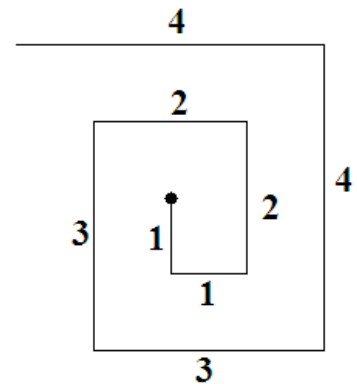
$\frac{9}{10}$  '  $\frac{9}{100}$  '  $\frac{9}{1000}$  '  $\frac{9}{10000}$  '

and so on, you get exactly 1!

4. If the time right now is 2:00 p.m., what meal might you be eating in 100 hours?
5. The first in a set of numbers is 2 and the fifth is 16. If every number is the sum of the previous two numbers (starting with the third number), then what is the sum of the first five numbers?
6. Tim is building a fence. First, he places five stakes in the ground. He then places a stake between each of those five stakes. At this point, he decides the fence is not dense enough, and once again places a stake between each of the stakes already there. Finally, for decoration, he plants a flower between each of the stakes in the finished fence. How many flowers did Tim plant?

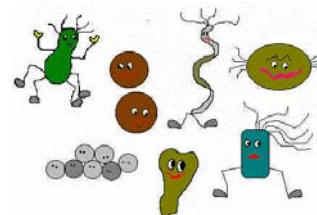


7. Kathy drew an interesting design with her pen, shown to the right. The numbers indicate the length of each line in centimeters. Kathy continued this design until her pen ran out of ink. If the total distance of all the lines she drew is 3 meters, then what is the length of the longest line she drew? In what direction was her pen moving when she drew this line?



## CHALLENGE YOURSELF!

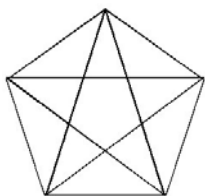
8. In an experiment, every hour 20% of the total number of bacteria die, and those remaining bacteria double. If there were originally 125 bacteria, how many are there after three hours?



9. A formula for the sum of the first  $n$  odd numbers is  $n^2$ . (For example,  $1 + 3 + 5 + 7 = 16 = 4^2$ )  
Use this formula to find the sum of  $2 + 6 + 10 + 14 + 18 + 22 + 26 + 30$ .

## EXTENSION

10. a. Complete the chart where  $d$  represents the number of diagonals of a regular polygon with  $n$  sides.



$n$	4	5	6	7	8
$d$		5			

- b. Describe the pattern (Hint: Look at  $\frac{d}{n}$ ) \_\_\_\_\_  
 \_\_\_\_\_
- c. Determine the number of diagonals that a regular polygon has with  $n$  sides. \_\_\_\_\_



Don't forget now! Go to [www.wiredmath.ca](http://www.wiredmath.ca) for the link.

**TRY THIS!**

**Number Cracker**

<http://www.funbrain.com/cgi-bin/cracker.cgi?A1=s&A2=1&submit=Start+Game>