

	NAME:				
	Gr 9		Date:		Time 2 ½ hrs
CAPS Reference	2-1 Numeric and Geometric Patterns				
Topic	2-1-1 Physical and diagrammatic patterns				



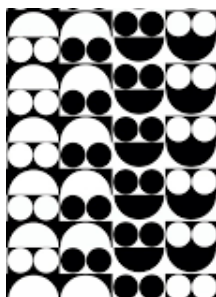
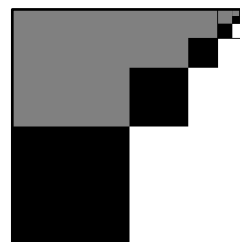
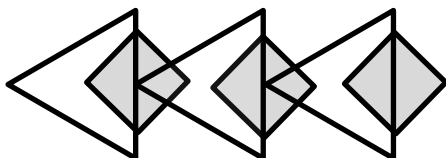
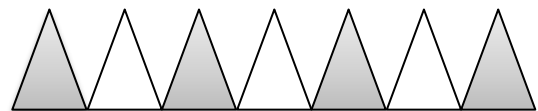
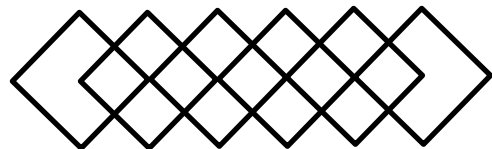
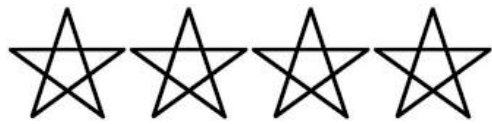
1. Think First! [10 mins]

Patterns are part of our lives.

We see them on clothes, blankets, towels, quilts, sweet papers, boxes and painted on houses.

They may be made with objects like bricks or be painted or sewn.

Look at the following patterns and see what Mathematics you can see in them.





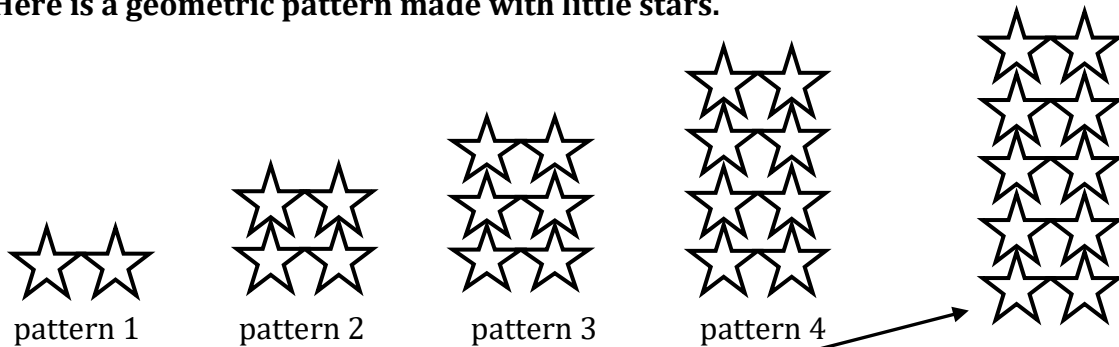
2. Got it? [20 mins]

Patterns made with objects, pictures or shapes are called geometric patterns.

Sometimes we make the pattern sometimes we draw a diagram.

Example:

Here is a geometric pattern made with little stars.



2.1 Pattern 5 will look like this:

2.2 Work out how many stars there are in pattern 6, 7 and 8.

2.3 We show the number values of the geometric pattern in a table.

Here is the table for the pattern up to the 8th one.

Pattern number	1	2	3	4	5	6	7	8
Number of stars	2	4	6	8	10	12	14	16

2.4 We would describe this pattern by saying:

The number of stars in the pattern equals two times the pattern number.

2.5 We can write this mathematically as:

Number of stars = $2 \times$ pattern number

2.6 Using symbols: $t = 2 \times p$

2.7.1 How many stars will be in the:

2.7.1 25th pattern number?

2.7.2 120th pattern number

2.8 Which pattern number will have:

2.8.1 76 stars?

2.8.2 584 stars?



3. Go ahead! [15 mins]

XX
X

pattern 1

XXXXX
XXX

pattern 2

XXXXXXXXX
XXXXXX

pattern 3

XXXXXXXXXXXXX
XXXXXXXXXX

pattern 4

3.1 Use the **X** pattern above to answer these questions.

3.1.1 Draw pattern 5 and pattern 6.

3.1.2 How many **X**'s are in patterns 5 and 6.

3.1.3 How many **X**'s will be in:

3.1.3.1 Pattern 10

2.1.3.2 Pattern 22

3.1.4 In your own words, describe how the pattern above is formed.

3.1.5 Write this pattern as a number sentence using n .

3.1.6 Give the values missing from the table in the blocks numbered (a) to (e).

pattern number (n)	1	2	3	4	5	6	10	(d)	22	n
number of X 's	3	7	11	15	(a)	(b)	(c)	59	(e)	

3.1.7 Draw a flow diagram using the numbers 7, 9, 11, 13, 15, 20 as the input numbers.



4. Check your work! [5 mins]

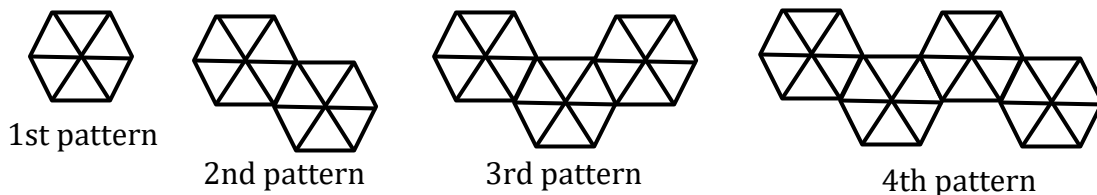


5. Go ahead! [30 mins]

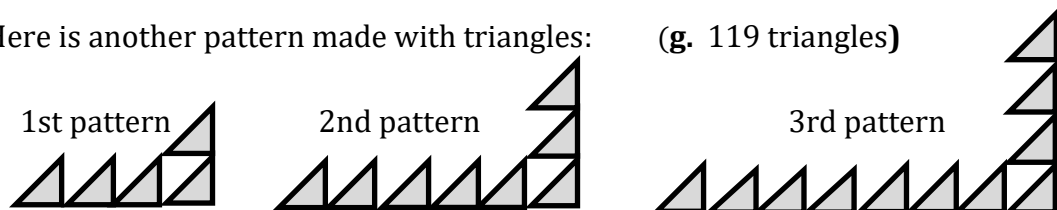
For each of the following geometric patterns:

- Draw the next 2 patterns.
- In your own words, describe how the pattern is formed.
- Write this as a number sentence using n .
- Draw a table of values for the first 6 natural numbers.
- Draw a flow diagram using the first 6 odd numbers.
- How many pattern objects will there be in patterns 11, 25 and 70?
- Which pattern number will have the given number of items?

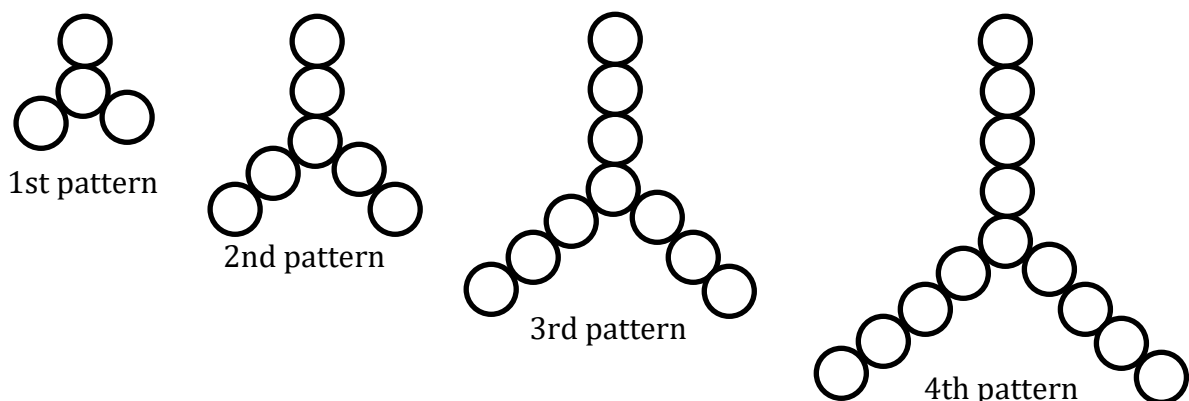
5.1 This pattern is made using triangles grouped together. (**g.** 114 triangles)



5.2 Here is another pattern made with triangles: (**g.** 119 triangles)



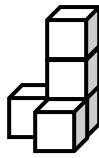
5.3 A circle pattern. (**g.** 115 circles)



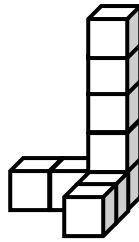
5.4 This pattern is made using cubes. (g. 113 cubes)



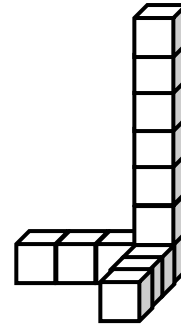
pattern 1



pattern 2



pattern 3



pattern 4



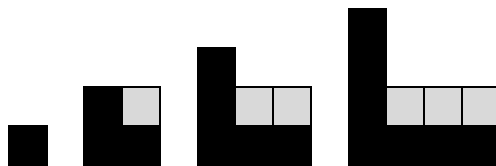
6. Check your work! [10 mins]



7. Got it? [20 mins]

Multi patterns.

Here is a geometric pattern made with grey and black squares.



Pattern 1 Pattern 2 Patterns 3 Pattern 4

The pattern can be viewed in three ways:

7.1 The number of grey squares.

7.2 The number of black squares.

7.3 The number of squares altogether.

Pattern number	1	2	3	4	5	6	10	n
Number of grey squares	0	1	2	3	4	5	6	$n - 1$
Number of black squares	1	3	5	7	9	11	13	$2n - 1$
Total number of squares	1	4	7	10	13	16	19	$3n - 2$

7.4 We would describe these patterns by saying:

The number of grey squares equals the pattern number subtract one.

The number of black squares equals two times the pattern number subtract one.

The total number of squares is three times the pattern number subtract one.

7.5 We can write the patterns or rules as:

Grey squares = $n - 1$

Black squares = two times the pattern number subtract one.

Total number of squares = $3n - 2$ $[(n - 1) + (2n - 1)]$

7.6. How many grey, black and total squares will be in the:

7.6.1 25th pattern number? $[24, 49, 73]$

7.6.2 120th pattern number $[119, 239, 358]$

7.7 Which pattern number will have:

7.7.1 54 grey squares? $[55]$ 7.7.2 87 black squares $[88]$

7.7.3 76 squares in total? $[n^2 - 2n + 4 = 124 \quad n^2 - 2n - 120 = 0$
 $(n + 10)(n - 12) = 0 \quad n = 12 \text{ or } -10 \text{ (can't have - number of squares)}]$

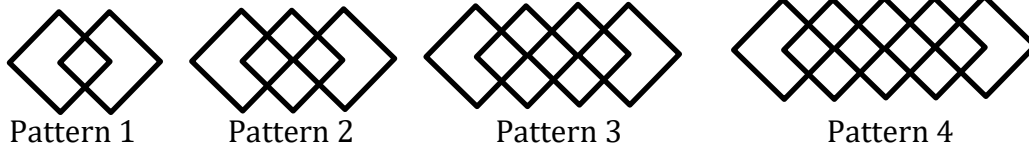


8. Go ahead! [30 mins]

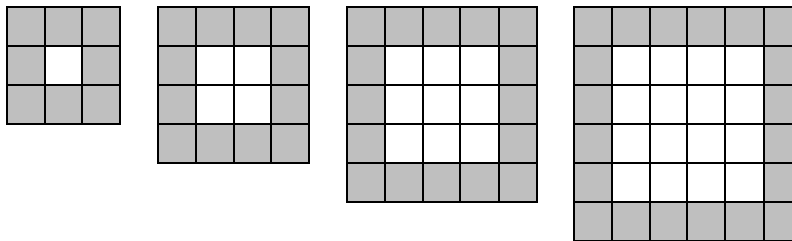
For each of the following geometric patterns:

- Draw the next 2 patterns.
- In your own words, describe how the pattern is formed.
- Write this as a number sentence using n .
- Draw a table of values for the first 6 natural numbers.
- How many pattern objects will there be in patterns 11, 25 and 70?
- Which pattern number will have the given number of items?

8.1 This pattern is made of 2 different sized squares.



8.2 This pattern is made of grey and white squares.



Pattern 1 Pattern 2 Pattern 3 Pattern 4 $g = 900$



9. Check your work! [5 mins]



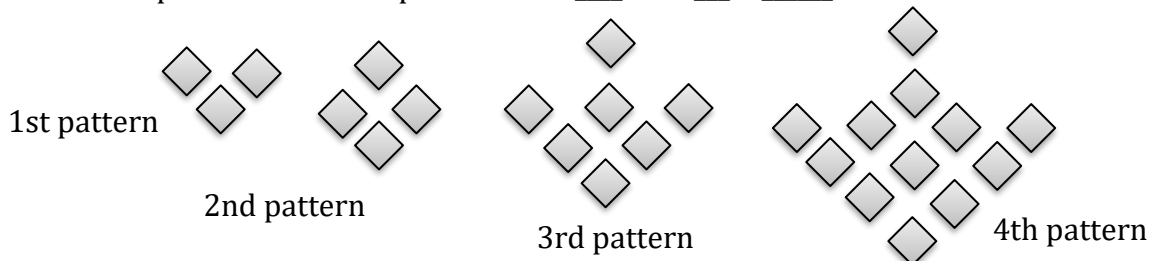
10. Going further! [own time]

10.1 Create a geometric pattern of your own with 5 pattern numbers.

10.2 Analyse the pattern as in the questions above.

10.3 This pattern is made of squares – it is a different type of pattern! (g . 124 squares)

- Draw the next 2 patterns.
- The pattern is formed in the following way:
(pattern number)² – (two times the pattern number) add four.
- Complete to write the pattern rule: $___ n^2 - ___ n ______$



- Draw a table of values for the first 6 natural numbers.
- Draw a flow diagram using the first 6 odd numbers.
- How many pattern objects will there be in patterns 11, 25 and 70?
- Which pattern number will have the given number of items?



11. Check your work! [5 mins]