Learning Intention:

- I can recognize and extend a pattern using a drawing, a table of values (TOV), words, and by writing an equation.

Math is all about patterns. Today, we will want to connect the idea of patterns with equations.

Example 1: Take a look at the following pictures.

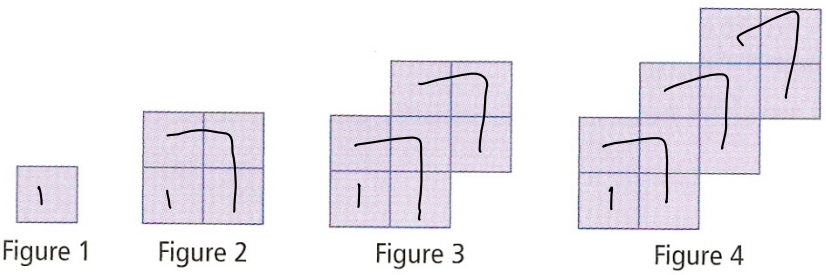


Figure 1 Figure 2 Figure 3 Figure 4

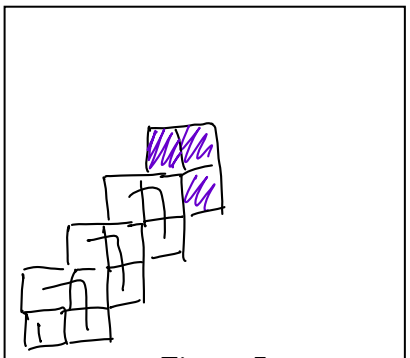


Figure 5

a) Draw Figure 5 in the blank space to the right.

b) Describe the pattern you see by completing the blanks below.

As the figure number ***increases by*** 1 *, the number of squares* increases by 3 .

c) Create a table of values to represent the relationship between the number of squares and the figure number for the first 4 figures.

Figure Number "n"	Number of Squares, "s"
1	1
2	4
3	7
4	10

1 + 1 + 1 + 1

+3 +3 +3

* Repeated addition of 3 is the same as multiplying by 3.

d) .Write an equation to represent this pattern.

Note: Any pattern that continues by increasing or decreasing by the same value is called linear pattern.

In this example, the pattern increase by 3. Linear patterns are found by multiplying by the increasing/decreasing value by a variable, and then either adding or subtracting a value to ensure that we can get the proper number.

Figure Number "n"	Number of Squares, "s"
1	1
2	4
3	7
4	10
"n"	$s = 3n - 2$

1. Identify Linear Pattern
2. Write pattern as Equation
   $S = 3n + C$
3. Fill in values for S and N
   ↓ solve
   $(1) = 3(1) + C$
   $1 = 3 + C$
   $-2 = C$

e) Now that you have the equation…you can use it to answer some questions.

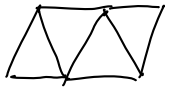
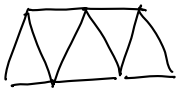
i. How many squares are in figure #12?

$S = 3n - 2$ $S = 3(12) - 2 = 36 - 2 = 34$

ii. Which figure contains 109 squares?

$S = 3n - 2$ $109 = 3n - 2$ (+2, +2) $\frac{111}{3} = \frac{3n}{3}$ $n = 37$

Exercise: Look at the pattern shown below and answer the following questions.

Figure	1	2	3	4	5
					
Number of toothpicks	3	5	7	9	11

a) How many toothpicks will there be in the 4th and 5th pattern? Draw it out.

9, 11

b) Describe the pattern in words.

Starts with 3. Adds 2 toothpicks for every additional figure.

c) Complete the table and create an equation that relates the figure number to the amount of toothpicks.

Figure Number "n"	**Number of Toothpicks, "t"**
1 (+1)	3 (+2)
2 (+1)	5 (+2)
3 (+1)	7 (+2)
4 (+1)	9 (+2)
5	11
"n"	$t = 2n + 1$

$\boxed{t = 2n + C}$

$3 = 2(1) + C$

$-2 \quad -2$

$3 = 2 + C$

$1 = C$

d) How many toothpicks can be found in the 200th figure? $t = 2(200) + 1 = 400 + 1$ $t = 401$

e) Which figure number has 143 toothpicks?

$143 = 2(n) + 1$ (−1, −1)

Choose Your Own Adventure: pg 159 # 4,7,8, or pg 160 # 11,14

$\frac{142}{2} = \frac{2n}{2}$ $n = 71$