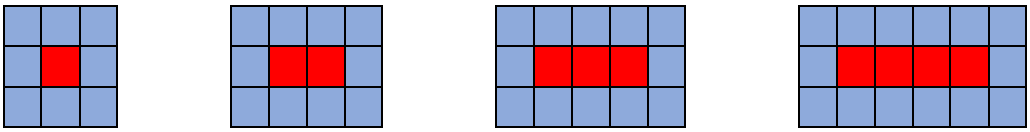
Formulae and Sequences

In today's revision session we revise how to find a formula from a pattern and how to use the formula. After that we will recall how we can use a formula to find the next term of a sequence and finally we will revise how to find the formula for the next term of sequence.

Finding a formula

Have a look at these patterns:-



One red tile	Two red tiles	Three red tiles	Four red tiles
Eight blue tiles	Ten blue tiles	Twelve blue tiles	Fourteen blue tiles

It is helpful to put the results in a table: -

Number of red tiles (R)	1	2	3	4
Number of blue tiles (B)	8	10	12	14

+2 +2 +2

Notice that this pattern "goes up in 2s". That means it is based on the 2× table. However, it is not just the two times table, it is the two times table plus six.

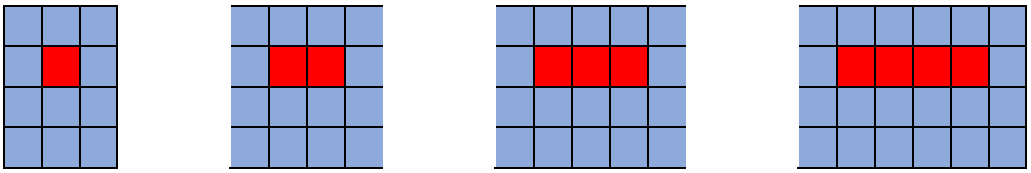
Number of red tiles (R)	1	2	3	4
Number of blue tiles (B)	2 × 1 + 6 = 8	2 × 2 + 6 = 10	2 × 3 + 6 = 12	2 × 4 + 6 = 14

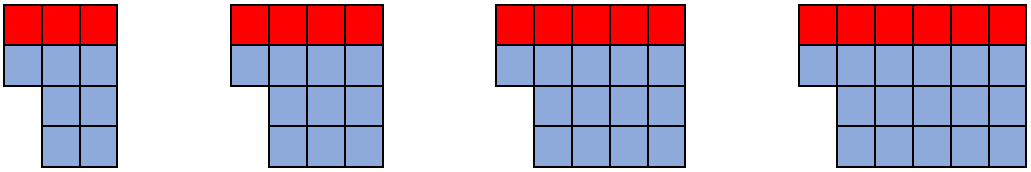
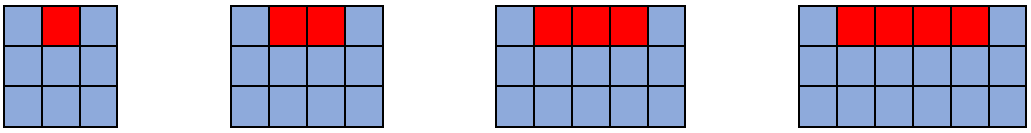
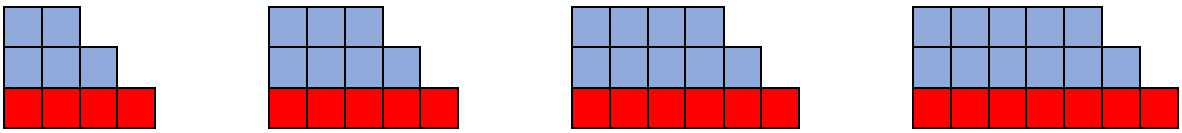
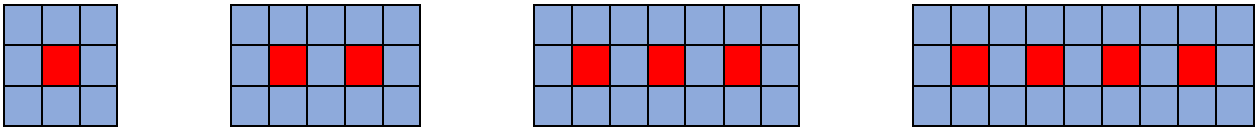
The formula for the number of blue tiles is: -

$$B = 2R + 6$$

For each of these patterns make a table like the one above and write down the formula for B, the number of blue tiles: -

1)



2)	
3)	
4)	
5)	

Using a formula

Look at this example: -

If P = 4Q – 5: -

a) Find P = 15, find Q

P = 4Q – 5
15 = 4Q – 5 (swap round to solve)
4Q – 5 = 15
4Q = 20
Q = 5

b) Find Q = 15, find P

P = 4Q – 5
P = 4 × 15 – 5
P = 60 – 5
P = 55

Notice:-

1) The questions look very similar

2) The working and the answers are very different

How to we avoid getting confused?

It is important to write the formula down each time and then make sure you put the number from the question in the under the correct letter in the formula. If you get that simple step correct the rest should follow.

Now try these examples: -

1) $A = 3B + 4$

a) Find A if B = 34.

b) Find B if A = 34.

2) $C = 5D - 6$

a) Find D if C = 34.

b) Find C if D = 34.

3) $E = 2F + 10$

a) Find E if F = 50.

b) Find F if E = 50.

4) $G = 6H - 3$

a) Find H if G = 27.

b) Find G if H = 27.

5) $K = 7L + 5$

a) Find K if L = 40.

b) Find L if K = 40.

Continued below ↓

Using formula to find the nth term

When we first started working with sequences we asked you to work out the next term. However, this means that if we want to find out the 100th term of a sequence we need to know all 99 terms before it!

Instead we can use a formula to find the nth term. For example: -

The formula for the nth term of a formula is n^{th} term = 5n + 6. Find the 100th term.

$$\begin{aligned} n^{th} \text{ term} &= 5n + 6 \\ &= 5 \times 100 + 6 \\ &= 506 \end{aligned}$$

Notice that if we are trying to find the 100th term we make n = 100. If we were finding the 45th term n would be 45.

Now try to these examples: -

1) The formula for the nth term of a formula is n^{th} term = 3n – 4. Find the 20th term.

2) The formula for the nth term of a formula is n^{th} term = 7n + 10. Find the 30th term.

3) The formula for the nth term of a formula is n^{th} term = 5n – 6. Find the 40th term.

4) The formula for the nth term of a formula is n^{th} term = $n^2 + n$. Find the 9th term.

5) The formula for the nth term of a formula is n^{th} term = $n^3 - 6$. Find the 10th term.

Continued below ↓

Finding a formula for the nth term

Have a look at these examples: -

a) Find a formula for the nth term of this sequence: -

10, 14, 18, 22, 26, 30, 34……..

The sequence "goes up in 4s" so it is based on the 4× table. However, each number is more than the corresponding one in the 4× table so something has been added.

n^{th} term = 4n + 6

b) Find a formula for the nth term of this sequence: -

2, 12, 22, 32, 42, 52, 62, 72……..

The sequence "goes up in 10s" so it is based on the 10× table. However, each number is less than the corresponding one in the 10× table so something has been subtracted.

n^{th} term = 10n – 8

Now try find a formula for the nth term of these sequence : -

1) 9, 13, 17, 21, 25, 29……

2) 1, 6, 11, 16, 21, 26, 31……

3) 8, 15, 22, 29, 36, 43……

4) 20, 31, 42, 53, 64, 75……..

5) 4, 24, 34, 44, 54, 64, 74……