

0.6.20

L.C. Can I generate and describe number sequences? (i.e. can I find the nth term?)

Challenge 1: Here is an equation.

$$k = 100 - 4n$$

Find the value of  $k$  when  $n = 20$

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Challenge 2: The formula for the **number of circles (c)**

in **shape number (n)** is  $c = 3n - 1$

Use the formula to work out the **shape number**  
which has **104 circles**.

What patterns can you see in these numbers?

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We describe them as number sequences.

Could you continue the sequences indefinitely?

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>		<b>n</b>
4	8	12	16	20	24	28	32	36	40		
5	9	13	17	21	25	29	33	37	41		

# What is the 4<sup>th</sup> term in the 4 × table sequence?

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We can write an expression to show the general term – or the general rule.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		nth
4	8	12	16	20	24	28	32	36	40		
5	9	13	17	21	25	29	33	37	41		

The rule for the middle row is  $4n$  or 4 lots of the term. Once we know which term we want to work out, we replace the  $n$  for that number.

What is the general term for the bottom row?

$$4n + 1$$

# This is how you work out the formula.

Term:	1	2	3	4	5	6	7	8	9
Sequence 1:	3	5	7	9	11	13	15	17	19
Sequence 2:	-1	4	9	14	19	24	28	32	36

Let's look at sequence 1.

- 1) Ask yourself what is the sequence going up in? Here, it's going up in twos.
- 2) Write the number it is going up in next to 'n'. (N stands for whatever term we want to work out).
- 3) Finally, work out what you need to adjust by. This will always be a + or -.

# This is how you work out the formula.

Term:	1	2	3	4	5	6	7	8	9
Sequence 1:	3	5	7	9	11	13	15	17	19
Sequence 2:	-1	4	9	14	19	24	28	32	36

Let's look at sequence 1.

- 1) Ask yourself what is the sequence going up or down in? Here, it's twos.
- 2) Write the number it is going up in next to 'n'. (N stands for whatever term we want to work out).  **$2n$  (this means 2 lots of 'n')**
- 3) Finally, work out what you need to adjust by. This will always be a + or -.

**So, look at term 1.  $2 \text{ lots of } 1 = 2$ . What do we need to add or subtract to get to 3? We need to add 1. So the complete formula is  $2n + 1$ .**

**Let's use this formula to check some of the other terms. What would the 20<sup>th</sup> term be, for example.**

If you finish, try and work out the formula for sequence 2.

# What are the formulae for these sequences?

Term:	1	2	3	4	5	6	7	8	9
Sequence 1:	4	7	10	13	16	19	22	25	28
Sequence 2:	-5	0	5	10	15	20	25	30	35

- 1) Ask yourself what is the sequence going up in?
- 1) Write the number it is going up in next to 'n'. (N stands for whatever term we want to work out).
- 2) Finally, work out what you need to adjust by. This will always be a + or -.

# Can you describe the $n^{\text{th}}$ term for these sequences?

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		nth
4	8	12	16	20	24	28	32	36	40		
2	6	10	14	18	22	26	30	34	38		
9	13	17	21	25	29	33	37	41	45		

$$4n$$

$$4n - 2$$

$$4n + 5$$

- 1) Ask yourself what is the sequence going up in?
- 1) Write the number it is going up in next to 'n'. (N stands for whatever term we want to work out).
- 2) Finally, work out what you need to adjust by. This will always be a + or -.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		nth
6	13	20	27	34	41	48	55	62	69		
7	14	21	28	35	42	49	56	63	70		
17	24	31	38	45	52	59	66	73	80		

What is the formula to describe the first row?

- 1) Ask yourself what is the sequence going up in?

What about the second?

- 1) Write the number it is going up in next to 'n'. (N stands for whatever term we want to work out).

.....and the third?

- 2) Finally, work out what you need to adjust by. This will always be a + or -.



## Steps to Success:

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- 1) Ask yourself what is the sequence going up in?
- 1) Write the number it is going up in next to 'n'. (N stands for whatever term we want to work out).
- 2) Finally, work out what you need to adjust by. This will always be a + or -.

**RED**

**Three star sheet**

**YELLOW**

**Two star sheet**

**BLUE  
AND  
GREEN**

**One star sheet**

### Reach for the stars:

There are three boxes, one contains only apples, one contains only oranges, and one contains both apples and oranges. The boxes have been incorrectly labeled such that no label identifies the actual contents of the box it labels. Opening just one box, and without looking inside the box, you take out one piece of fruit. By looking at the fruit, how can you immediately label all of the boxes correctly?

# Reach for the stars.

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Open the box that is labelled "Apples and Oranges". You know that as none of the labels are correct, the box must either contain only apples, or only oranges.

Suppose that you remove an apple from that box. Therefore, that box must be the "Apples Only" box.

One of the two remaining boxes must be the "Oranges Only" box. However, one is labelled "Apples Only", and the other is labelled "Oranges Only". Therefore, the one labelled "Apples Only" is the box that contains only oranges, and the box labelled "Oranges Only" is the box that contains both kinds of fruit.

Simple!