GCSE Maths – Algebra

Generating a Sequence

Worksheet

WORKED SOLUTIONS

This worksheet will show you how to work out different types of sequence generation questions. Each section contains a worked example, a question with hints and then questions for you to work through on your own.

Section A

Worked Example

Calculate the term-to-term rule of the sequence $6, 11, 16, 21, 26$ ... and write the next three terms of the sequence.

Step 1: Calculate the difference between each term in the sequence.

The difference between 6 and 11 is $+5$. Checking the next terms, we see that the difference between the second and third term is also $+5$. The same can be checked for the other terms in the sequence.

This means that our term-to-term rule is '$+\ 5$'.

Step 2: Use the term-to-term rule to work out the next terms in the sequence.

The last term we were given is 26. We can work out the next terms by adding 5 to the terms as follows:

Term 6: $26 + 5 = \mathbf{31}$
Term 7: $31 + 5 = \mathbf{36}$
Term 8: $36 + 5 = \mathbf{41}$

Guided Example

Calculate the term-to-term rule of the sequence $1, 3, 5, 7, 9$ ... and write the next five terms of the sequence.

Step 1: Calculate the difference between each term in the sequence.

The difference between each term is 2.

So, the term-to-term rule is +2.

Step 2: Use the term-to-term rule to work out the next terms in the sequence.

Term 6 : 9 + 2 = 11
Term 7 : 11 + 2 = 13
Term 8 : 13 + 2 = 15
Term 9 : 15 + 2 = 17
Term 10 : 17 + 2 = 19

The next five terms in the sequence are :

11, 13, 15, 17, 19

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

1. Calculate the term-to-term rule and write the next three terms for the following sequences:

a) 6, 16, 26, 36, 46…

The difference between the terms in the sequence is 10.

The term-to-term rule = +10

Term 6 : 46 + 10 = 56
Term 7 : 56 + 10 = 66
Term 8 : 66 + 10 = 76

So, the next three terms in the sequence are :

56, 66, 76

b) -12, -8, -4, 0….

The difference between the terms in the sequence is 4.

The term-to-term rule = +4

Term 5 : 0 + 4 = 4
Term 6 : 4 + 4 = 8
Term 7 : 8 + 4 = 12

So, the next three terms in the sequence are :

4, 8, 12

c) 1.25, 1.5, 1.75, 2, 2.25…

The difference between the terms in the sequence is 0.25.

The term-to-term rule = + 0.25

Term 6 : 2.25 + 0.25 = 2.5
Term 7 : 2.5 + 0.25 = 2.75
Term 8 : 2.75 + 0.25 = 3

So, the next three terms in the sequence are :

2.5, 2.75, 3

Section B

Worked Example

Work out the position-to-term rule of the sequence $3, 6, 9, 12, 15$ ...and calculate the term for position 10.

Step 1: Write out the terms next to their positions and work out the relationship between the position and the term.

Position 1: 3 $(1 \times 3 = 3)$
Position 2: 6 $(2 \times 3 = 6)$
Position 3: 9 $(3 \times 3 = 9)$
Position 4: 12 $(4 \times 3 = 12)$
Position 5: 15 $(5 \times 3 = 15)$

Each position number is multiplied by 3 to get the term. Therefore, the position-to-term rule is 'multiply by 3', or '$\times 3$'.

Step 2: Use the position-to-term rule to calculate the term for the position required.

We are asked to find the term for position 10.
Using the position-to-term rule, we can calculate that the term for position 10:

$$10 \times 3 = 30$$

So, the term in position 10 has value $\mathbf{30}$.

Guided Example

Work out the position-to-term rule for the sequence $7, 8, 9, 10, 11$ ... and calculate the term for position 14.

Step 1: Write out the terms next to their positions and work out the relationship between the position and the term.

Position 1 : 7 (1 + 6 = 7)
Position 2 : 8 (2 + 6 = 8)
position 3 : 9 (3 + 6 = 9)
Position 4 : 10 (4 + 6 = 10)
Position 5 : 11 (5 + 6 = 11)

The position to term rule is add 6 (+6).

Step 2: Use the position-to-term rule to calculate the term for the position required.

Position 14 : 14 + 6 = 20

The term in position 14 has a value of 20

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

2. Calculate the position-to-term rule for the following sequences and work out the term for the position given.

a) 7, 14, 21, 28, 35… and position 7

Position 1 : 7 (1 × 7 = 7)
Position 2 : 14 (2 × 7 = 14)
Position 3 : 21 (3 × 7 = 21)
Position 4 : 28 (4 × 7 = 28)
Position 5 : 35 (5 × 7 = 35)

Position 7 : 7 × 7 = 49

The position to term rule is multiply by 7 (× 7).

The term in position 7 has a value of 49.

b) -8, -7, -6, -5, -4… and position 12

Position 1 : −8 (1 − 9 = −8)
Position 2 : −7 (2 − 9 = −7)
Position 3 : −6 (3 − 9 = −6)
Position 4 : −5 (4 − 9 = −5)
Position 5 : −4 (5 − 9 = −4)

Position 12 : 12 − 9 = 3

The position to term rule is subtract 9 (− 9).

The term in position 12 has a value of 3.

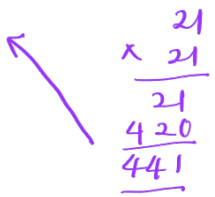
c) 1, 4, 9, 16, 25… and position 21

Position 1 : 1 (1 × 1 = 1)
Position 2 : 4 (2 × 2 = 4)
Position 3 : 9 (3 × 3 = 9)
Position 4 : 16 (4 × 4 = 16)
Position 5 : 25 (5 × 5 = 25)

Position 21 : 21 × 21 = 441

The position to term rule is the square of the number of position.

The term in position 21 has a value of 441.



21
× 21
21
420
441