



Year 7 higher topic 10

Sequences and graphs

What careers would use these skills?

Economist, building surveyor, Biologist, conservationist, air traffic controller, meteorologist

Term-to-term rule

Numbers in a **sequence** are called **terms**. Numbers *increase* in **ascending** sequences and numbers *decrease* in **descending** sequences. A **finite** sequence has a fixed number of terms (a beginning and end.) An **infinite** sequence goes on forever. You can describe a sequence by giving the **first term** and the **term-to-term rule**. The term-to-term rule tells you how you get from one term to the next.

Arithmetic sequences

An **arithmetic sequence** goes up or down in equal steps. This step is called the **common difference**.

Increasing Arithmetic Sequence	Decreasing Arithmetic Sequence
* Common difference is positive!	* Common difference is negative!
$5, 9, 13, 17, \dots$ $+4 \quad +4 \quad +4$	$20, 17, 14, 11, \dots$ $-3 \quad -3 \quad -3$

Recognise geometric sequences

In a **geometric sequence**, the term-to-term rule is 'multiply by \square '. You can find each term by multiplying the previous term in the sequence by a constant value.

N^{th} term

n is the term number.

1st 2nd 3rd 4th...

n is always a positive integer.

You can describe a sequence by giving the **general term** (or n^{th} term.) the general term relates the term number (n) to terms.

Linear Sequence
A linear sequence is a list of numbers that increases or decreases by the same amount each time.

Find the n^{th} term of the linear sequence: 8, 11, 14, 17, ...

n^{th} term = $3n + 5$

Find the n^{th} term of the linear sequence: 0.5, -1, -2.5, -4, ...

n^{th} term = $-1.5n + 2$

Generating sequences

Sequences can be generated by considering the terms that are known and calculating the **term-to-term rule** in order to predict the rest of the sequence.

Generate the first five terms of a sequence using the following formulae:

a)

Position Number (n)	1	2	3	4	5
Sequence = $6n + 2$					

b)

Position Number (n)	1	2	3	4	5
Sequence = $3n - 4$					

c)

Position Number (n)	1	2	3	4	5
Sequence = $8 - 3n$					

(i)

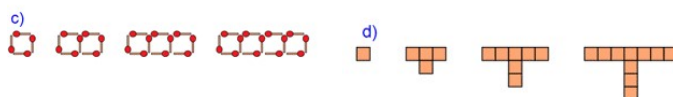
1, 4, 9, 16, 25, ...

Square Numbers

(ii)

1, 3, 6, 10, 15, ...

Triangular Numbers



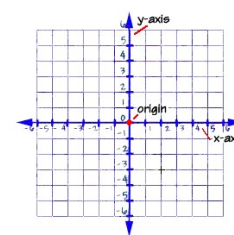
Fibonacci sequence

The Fibonacci sequence is named after the Italian mathematician Leonardo Fibonacci. In this sequence, you find each term by adding the previous two terms together: 1, 1, 2, 3, 5, 8, 13... It is an **infinite** sequence.



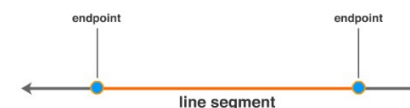
Positive and negative coordinates

The 'x' and 'y' axis extend below 0 so you can plot with negative 'x' and 'y' co-ordinates. The point (0,0) is called the **origin**.



Line segment

A line segment is part of a line defined by two end points.



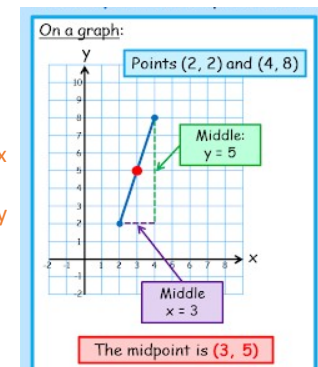
Midpoint of a line segment

The midpoint is **halfway** between the two end points:

Its **x value** is halfway between the two x values
Its **y value** is halfway between the two y values

To calculate it:

Add both "x" coordinates, divide by 2
Add both "y" coordinates, divide by 2



Straight line graphs

A line on a coordinate grid is called a **graph**. You can describe it by giving the **equation of the line**.

On the grid, draw the graph of $x + y = 6$.

(a) Complete the table of values for the graph $x + y = 6$

x	0	1	2	3	4
y	6	5	4	3	2

