ALGEBRA

Topics

- Finding and using the nth term
- Special Sequences
- Linear and geometric sequences

What do I need to be able to do?

- Continue a sequence by finding the next term.
- Explain the rule of a sequence verbally and as a written explanation.
- Draw the next diagram in a sequence.
- Find the nth term of a sequence.
- Generate a sequence from the nth term.
- Recognise non-linear sequences.

Summer term

Sequences

Key Vocabulary

Sequence	A list of numbers or objects in a special order
Linear	The same amount each time
Geometric	Different amounts each time
Pattern	Things arranged following a rule or rules
Nth Term	A formula that enables us to find any term in a sequence
Term	In Algebra a term is either a single number or variable, or numbers and variables multiplied together
Fibonacci	Each number equals the sum of the two numbers before it

Finding the nth term

The nth term is the general rule for a sequence. We can use the nth term to then calculate any term in the sequence.

Here is a sequence: 5, 8, 11, 14, …

Find the difference between the numbers.

This means that the nth term starts with 3n and we need to look at the 3 times table.

$$5, 8, 11, 14$$

+3 +3 +3 = 3n

Remember to calculate how we get from the times table to the original sequence.

3, 6, 9, 12, … + 2

5, 8, 11, 14, …

The nth term is $3n + 2$.

Career Links

Being able to confidently work with algebra is a great skill to have and has lots of links with a number of careers such as:

- Cryptologist
- Carpenter
- Astronomer
- Electrician
- Architect

Finding the next term - numbers

When you need to find the next term in the sequence you need to work out what the general rule for the sequence is.

The rule is add 4 because the difference between each number is 4.

1, 5, 9, 13, …. 17

+4 +4 +4

17 is the next number because 13 + 4 = 17.

The rule is subtract 7 because the difference between each number is 7.
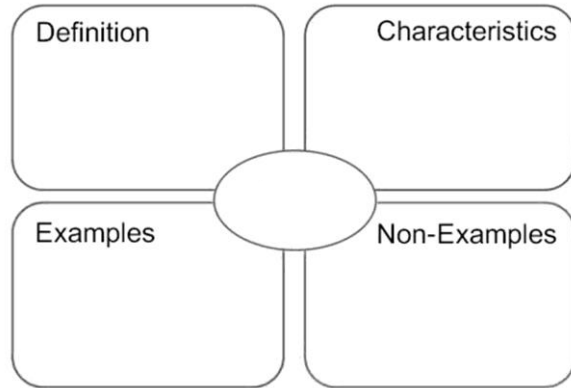
14, 7, 0, -7, …. -14

-7 -7 -7

-14 is the next number because -7 – 7 = -14.

The rule is multiply by 2 because the numbers are doubling.

5, 10, 20, 40, …. 80

x2 x2 x2

80 is the next number because 40 x 2 = 80.

[Concept map]

Definition	Characteristics
Examples	Non-Examples

Special sequences

Sometimes sequences do not increase or decrease by a consistent number. These can be quadratic sequences which include an n^2 term or they can be other special sequences some of which are shown below,

Triangular numbers

1, 3, 6, 10, 15, 21, 28, 36, 45, 55…

To get from one term to the next you can see that the difference increases by 1 more each time so 2, 3, 4, 5 etc.

These are the square numbers written as a sequence so 1x1, 2x2, 3x3 etc..

Square numbers

$1^2=1$ $2^2=4$ $3^2=9$ $4^2=16$ $5^2=25$ $6^2=36$
$7^2=49$
$8^2=64$
$9^2=81$
$10=^2100$…

Cube numbers

$1^3=1$ $2^3=8$ $3^3=27$ $4^3=64$
$5^1=125$
$6^3=216$
$7^3=343$…

These are the cube numbers written as a sequence so 1x1x1, 2x2x2, 3x3x3 etc..

**The Fibonacci Sequence**

1,1,2,3,5,8,13,21,34,55,89,144,233,377…

The Fibonacci sequence is when we add the second number in the sum to the answer to get the next term.

1+1=2	13+21=34
1+2=3	21+34=55
2+3=5	34+55=89
3+5=8	55+89=144
5+8=13	89+144=233
8+13=21	144+233=377

Generating a sequence

nth term = 3n - 1

Substitute 1, 2 & 3 where n is in the nth term to get the first 3 numbers in the sequence.

n	3n - 1
1	3 x 1 – 1 = 2
2	3 x 2 – 1 = 5
3	3 x 3 – 1 = 8

To get the 10th term:
3 x 10 – 1 = 29.

Sequence = 2, 5, 8, ….

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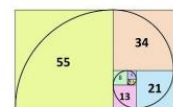
NUMBER

Topics

- Ratio notation
- Simplify ratio
- Share in a ratio
- Ratio and fractions

What do I need to be able to do?

- Use ratio notation
- Write ratios in the form 1:n and n:1
- Simplify ratios fully
- Share in 2 part ratios (3-part challenge)
- Relate ratios to fractions

Key Vocabulary

Ratio	Relationship between two or more numbers
Part	This is the numeric value '1' of, would be equivalent to
Share	Splitting into equal parts or groups
Simplify	Divide all parts of a ratio by the same number
Equivalent	Equal in value
Convert	Change from one form to another

Ratio: The is the relationship between two or more numbers and each number is separate by a colon.

The ratio of footballs to rugby balls: 1:4

Football is mentioned first so that is why the 1 comes before 4.

The ratio of rugby balls to footballs: 4:1

Rugby is mentioned first so that is why the 4 comes before 1.

Career Links

Being able to confidently work with number is a great skill to have and has lots of links with a number of careers such as:

- Banking
- Carpenter
- Accounting
- Electrician
- Architect

Write 2: 5 in the form 1 : n

2 : 5

÷ 2   ÷ 2

1 : 2.5

Write 2: 5 in the form n : 1

2 : 5

÷ 5   ÷5

0.4 : 1

You must end up with a 1 in the correct place - read the question carefully!

Simplify   12 : 20   ÷ 4

= 3 : 5

This could have been done in two steps by dividing by 2 and then by 2 again.

Simplify   60 : 40 : 100   ÷ 10

= 6 : 4 : 10   ÷ 2

= 3 : 2 : 5

This could have been done in one step by dividing by 20.

Definition | Characteristics

Examples | Non-Examples
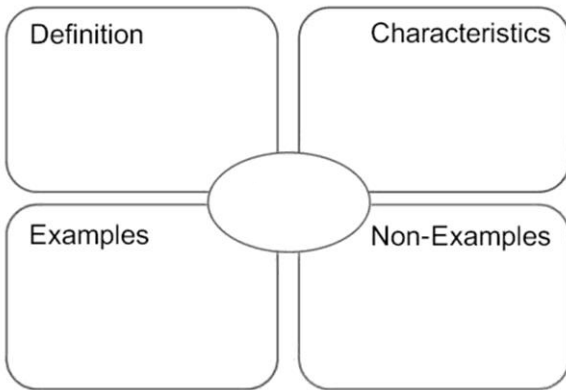
Sharing in a ratio: To share in a ratio we can use bar modelling to visualise the steps.

Share £45 in the ratio 2:7.

Add the parts of the ratio together.

2 + 7 = 9 parts

Divide the total by the number of parts.

45 ÷ 9 = 5

2 : 7   x

Multiply each part of the ratio by the value of one part,

= £10:£35

2 : 7

5	5
5	5
=10	5
	5
	5
	5
	5
	=35

Sharing ratio when given one part:

Joy and Martin share money in the ratio 2:5. Martin gets £18 more than Joy. How much do they each get?

5 -2 = 3 parts difference

18 ÷ 3 = 6

2 : 5   x

Find how many parts difference there are and then divide.

= £12: £30

2 : 5

6	6
6	6
	6
	6
	6
=12	=30

As fractions: If we wanted to represent the ratio as fractions then:

1 : 4

$= \frac{1}{5} : \frac{4}{5}$

The denominator comes from adding the two parts of the ratio together.

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