

YEAR 8 - ALGEBRAIC TECHNIQUES...

Sequences

@whisto_maths

What do I need to be able to do?

By the end of this unit you should be able to:

- Generate a sequence from term to term or position to term rules
- Recognise arithmetic sequences and find the n th term
- Recognise geometric sequences and other sequences that arise

Keywords

Sequence: items or numbers put in a pre-decided order

Term: a single number or variable

Position: the place something is located

Linear: the difference between terms increases or decreases (+ or -) by a constant value each time

Non-linear: the difference between terms increases or decreases in different amounts, or by x or \div

Difference: the gap between two terms

Arithmetic: a sequence where the difference between the terms is constant

Geometric: a sequence where each term is found by multiplying the previous one by a fixed non zero number

Linear and Non Linear Sequences

Linear Sequences – increase by addition or subtraction and the same amount each time

Non-linear Sequences – do not increase by a constant amount – quadratic, geometric and Fibonacci

- Do not plot as straight lines when modelled graphically
- The differences between terms can be found by addition, subtraction, multiplication or division

Fibonacci Sequence – look out for this type of sequence

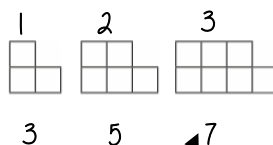
0 1 1 2 3 5 8 ...

Each term is the sum of the previous two terms



Sequence in a table and graphically

Position: the place in the sequence



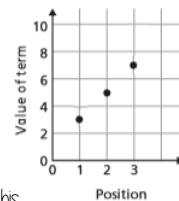
Term: the number or variable (the number of squares in each image)

In a table

Position	1	2	3
Term	3	5	7

+2 +2

Graphically



Because the terms increase by the same addition each time this is **linear** – as seen in the graph

Sequences from algebraic rules

This is substitution!

$3n + 7$

$3n^2 + 7$

This will be linear - note the single power of n . The values increase at a constant rate

This is not linear as there is a power for n

$2n - 5$

Substitute the number of the term you are looking for in place of 'n'

- eg
- 1st term = $2(1) - 5 = -3$
 - 2nd term = $2(2) - 5 = -1$
 - 100th term = $2(100) - 5 = 195$

Checking for a term in a sequence

Form an equation

Is 201 in the sequence $3n - 4$?

Algebraic rule

$3n - 4 = 201$

Term to check

Solving this will find the position of the term in the sequence. ONLY an integer solution can be in the sequence.

Complex algebraic rules

Misconceptions and comparisons

$2n^2$

$(2n)^2$

2 times whatever n squared is

2 times n then square the answer

- eg
- 1st term = $2 \times 1^2 = 2$
 - 2nd term = $2 \times 2^2 = 8$
 - 100th term = $2 \times 100^2 = 2000$

- eg
- 1st term = $(2 \times 1)^2 = 4$
 - 2nd term = $(2 \times 2)^2 = 16$
 - 100th term = $(2 \times 100)^2 = 40000$

$n(n + 5)$

- eg
- 1st term = $1(1 + 5) = 6$
 - 2nd term = $2(2 + 5) = 14$
 - 100th term = $100(100 + 5) = 10500$

You don't need to expand the expression

Finding the algebraic rule

This is the 4 times table \rightarrow 4, 8, 12, 16, 20....

$4n$

7, 11, 15, 19, 22

This has the same constant difference – but is 3 more than the original sequence

$4n + 3$

This is the constant difference between the terms in the sequence

This is the comparison (difference) between the original and new sequence

YEAR 8 - DEVELOPING NUMBER... Fractions & Percentages

@whisto_maths

What do I need to be able to do?

By the end of this unit you should be able to:

- Convert between FDP less than and more than 100.
- Increase or decrease using multipliers.
- Express an amount as a percentage.
- Find percentage change.

Keywords

- Percent:** parts per 100 – written using the % symbol
- Decimal:** a number in our base 10 number system. Numbers to the right of the decimal place are called decimals.
- Fraction:** a fraction represents how many parts of a whole value you have.
- Equivalent:** of equal value.
- Reduce:** to make smaller in value.
- Growth:** to increase/ to grow.
- Integer:** whole number, can be positive, negative or zero.
- Invest:** use money with the goal of it increasing in value over time (usually in a bank).

Convert FDP



70/100 → This also means 70 out of 100 squares → 70 hundredths = 70 "hundredths" = 7 "tenths" = 0.7 → 70 hundredths = 70%

Using a calculator → → $\frac{70}{100}$ → S-D → Convert to a decimal → × 100 converts to a percentage

This will give you the answer in the simplest form

Be careful of recurring decimals

eg $\frac{1}{3} = 0.333333$

$\frac{3}{5} = 0.\dot{6}$

The dot above the 3

Fraction/ Percentage of amount



Find $\frac{3}{5}$ of £60

£60 → $\frac{3}{5}$ → £36

Remember $\frac{3}{5} = 60\% = 0.6$

10% of £60 = £6
50% of £60 = £30
60% of £60 = £36

Remember $\frac{3}{5} = 60\% = 0.6$
60% of £60 = 0.6 × 60 = £36

Convert FDP < and > 100%

100 hundredths = 100%
10 tenths = 100%

40 hundredths = 40%
4 tenths = 40%

140 hundredths = 140%
14 tenths = 140%

100% + 40%
1 + 0.40
= 1.40

Percentage decrease: Multipliers

100% → Decrease by 58% → 42%

100% - 58% = 42%

100 - 0.58 = 0.42

Multiplier Less than 1

Percentage increase: Multipliers

100% → Increase by 12% → 112%

100% + 12% = 112%

100 + 0.12 = 1.12

Multiplier More than 1

Express as a % - Non-calculator

7 per every 10 are orange → $\frac{7}{10}$ → This means that 70 per every 100 are orange → $\frac{70}{100}$ → 70%

27 per every 50 shaded → $\frac{27}{50}$ → 54 per every 100 shaded → $\frac{54}{100}$ → 54%

Denominator 100 Equivalent fractions

Express as a % - Calculator

Rosie $\frac{13}{30}$ → $\frac{13}{30}$ → × 100 → 43.333...% → 43%

Can't use equivalence easily to find 'per hundred'

This is the same as 13 ÷ 30

Decimal percentages are still a percentage.

Percentage change

I bought a phone for £200. A year later sold it for £125.

100% → £200 → £125

All values of change compare to the ORIGINAL value

Percentage loss $\frac{75}{200} \times 100 = 37.5\%$

$\frac{\text{Difference in value}}{\text{Original value}} \times 100$

I bought a house for £180,000, I later sold it for £216,000.

100% → £180,000 → £216,000

Percentage profit $\frac{36000}{180000} \times 100 = 20\%$

Money made (profit value)

Choose appropriate method

The language and wording of the question is the key

Have you represented the question in a bar model?
Can you use a calculator?