Highsted Knowledge Organiser
Maths
Year 8 Expressions and Formulae 1

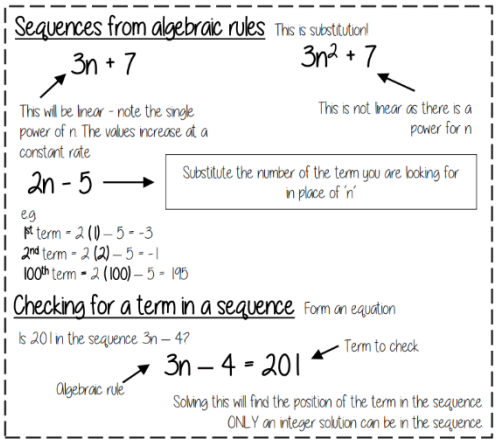
What I need to know

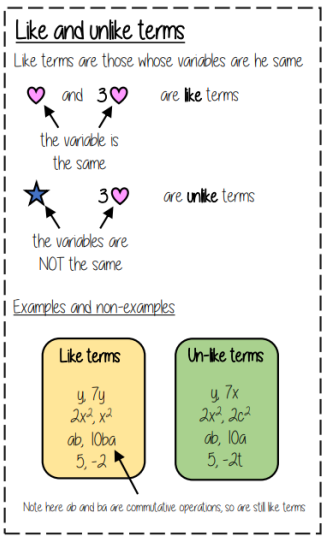
- Understand the difference between an expression, a formula and an equation
- Simplify algebraic expressions using the rules of indices
- Simplify algebraic expressions by collecting like terms
- Simplify algebraic expressions by expanding brackets and collecting like terms
- Factorise algebraic expressions by finding the highest common factor
- Substitute positive and negative numbers into expressions and formulae
- Understand a formula can be used to generate a sequence
- Find a formula for the nth term
- Multiply out brackets of the form (a + b) (c + d)

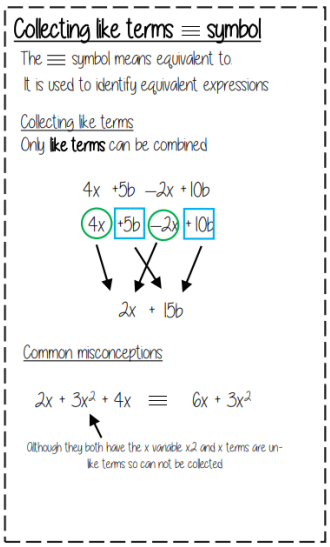
Key Vocabulary

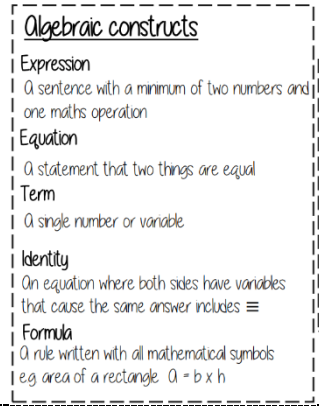
Expressions, formula, equation, rules of indices, collecting like terms, expanding, factorising, highest common factor, substitute, sequence, nth term

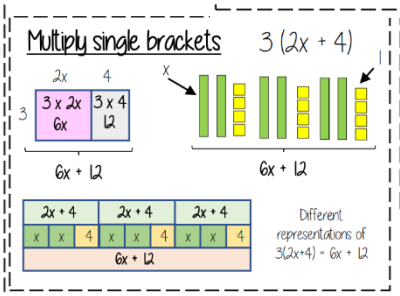
Student reference point

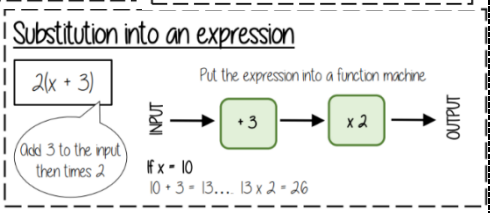












Challenge question

Luis writes down eight consecutive positive integers. The sum of the three smallest numbers is 33. What is the sum of the three largest numbers?

Suggested reading

https://youtu.be/zxJNJMDj2Ec (Corbettmaths Collecting Like terms)
https://youtu.be/ZJA1qz4XovY (Corbettmaths Expanding Brackets)
https://youtu.be/UrOJrsRv9iI (Corbettmaths Factorisation)
https://youtu.be/ZkC2FX5TOJ8 (Corbettmaths Substitution into Expressions)
https://youtu.be/qnVVTBAfNu4 (Corbettmaths nth term

Highsted Knowledge Organiser
Maths
Year 8 Indices and Standard Form

What I need to know

- Understand and use index notation for positive and negative integer powers
- Know and use the rules of indices
- Use the rules of indices to simplify and calculate the value of numerical expressions involving multiplication and division of positive and negative powers
- Use the rules of indices to multiply and divide algebraic expressions with positive and negative integer powers
- Understand and express numbers as powers of 10
- Express and interpret numbers written in standard form

Key Vocabulary

Index notation, rules of indices, multiplication, division, brackets, simplify, standard form

Student reference point

Addition/ Subtraction laws for indices

$3^5 \times 3^2 = (3 \times 3 \times 3 \times 3 \times 3) \times (3 \times 3) \rightarrow 3^7$

The base number is all the same so the terms can be simplified

Addition law for indices

$a^m \times a^n = a^{m+n}$

$3^5 \div 3^2 \rightarrow 3^3$

$\frac{3 \times 3 \times 3 \times \cancel{3} \times \cancel{3}}{\cancel{3} \times \cancel{3}} \rightarrow \frac{3^3}{3^0} \rightarrow \frac{3^3}{1}$

Subtraction law for indices

$a^m \div a^n = a^{m-n}$

Positive powers of 10

1 billion – 1 000 000 000

$10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^9$

Addition rule for indices $10^a \times 10^b = 10^{a+b}$

Subtraction rule for indices $10^a \div 10^b = 10^{a-b}$

Numbers between 0 and 1

$0.054 = 5.4 \times 10^{-2}$

1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
10^0	10^{-1}	10^{-2}	10^{-3}
0	0	5	4

A negative power does not mean a negative answer – it means a number closer to 0

Order numbers in standard form

10^2	10^1	10^0	10^{-1}	10^{-2}	10^{-3}	10^{-4}

6.4×10^{-2}	2.4×10^2	3.3×10^0	1.3×10^{-1}	Look at the power first will the number be = > or < than 1
0.064	240	1	0.13	Use a place value grid to compare the numbers for ordering

Standard form with numbers > 1

Any number between 1 and less than 10 × 10^n Any integer

Example

3.2×10^4
$= 3.2 \times 10 \times 10 \times 10 \times 10$
$= 32000$

Non-example

0.8×10^4

$5.3 \times 10^{0.7}$

Mental calculations

$6.4 \times 10^2 \times 1000$ Not in Standard Form
$= 6.4 \times 10^2 \times 10^3$ Use addition for indices rule
$= 6.4 \times 10^5$

$(2 \times 10^3) \times 4$ Divide the values
$= (2 \times 4) \times 10^3$
$= 0.5 \times 10^3$

$3 \times 10^5 \times 3$
$= 24 \times 10^5$ Not in Standard Form
$= 2.4 \times 10^1 \times 10^5$ Use addition for indices rule
$= 2.4 \times 10^6$

Remember the layout for standard form

Any number between 1 and less than 10 × 10^n Any integer

Using a calculator

$14 \times 10^5 \times 3.9 \times 10^3$

Use a calculator to work out this question to a suitable degree of accuracy

Input 14 and press ×10^x Then press 5 (for the power)
Press ×
Input 3.9 and press ×10^x Then press 3 (for the power)
Press =

This gives you the solution

Click calculator for video tutorial

To put into standard form and a suitable degree of accuracy
Press SHIFT SETUP and then press 7 for sci mode.
Choose a degree of accuracy so in most cases press 2.

Answer: 5.5×10^8

Challenge question

What is the digit **x** in this cross-number?

Across
1. A cube
3. A cube

Down
1. One less than a cube
2. A number

1	2
3	x

Suggested reading

https://youtu.be/To04tERCUPs (Corbettmaths Indices Numerical)
https://youtu.be/ozuXy8_NZcg (Corbettmaths Laws of Indices)
https://youtu.be/cxGyZ3Yx9ow (Corbettmaths Standard form)

Highsted Knowledge Organiser
Maths
Year 8 Angles

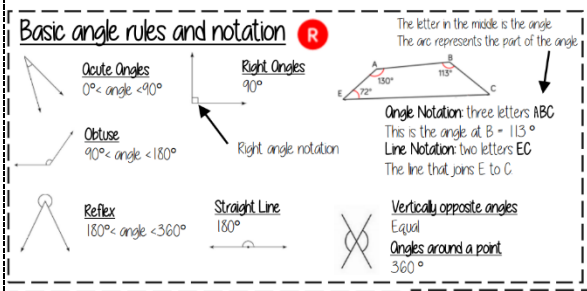
What I need to know

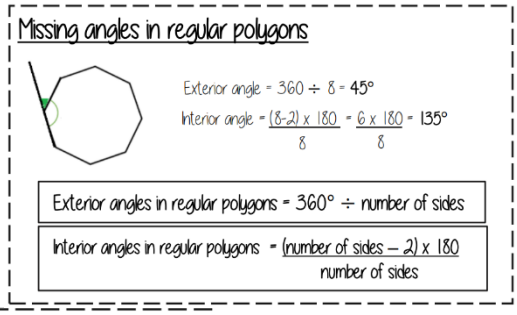
- Review angles on parallel lines: alternate, corresponding, vertically opposite, supplementary & interior
- Review sum of angles in a triangle and identify scalene, isosceles and equilateral triangles
- Continue to use the conventions for labelling lines, angles and shapes
- Know the names of polygons up to 10 sides
- Know that the exterior angles of any polygon add to 360°
- Find the sum of the interior angles of any polygon by splitting the shape into triangles and multiplying by 180
- Understand how to use angle facts to find unknown angles in various diagrams involving polygons.
- Prove simple facts geometrically

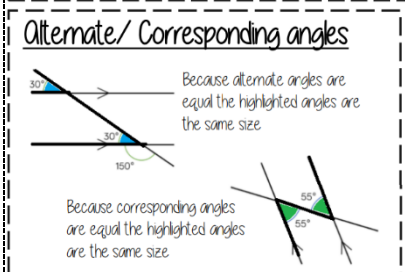
Key Vocabulary

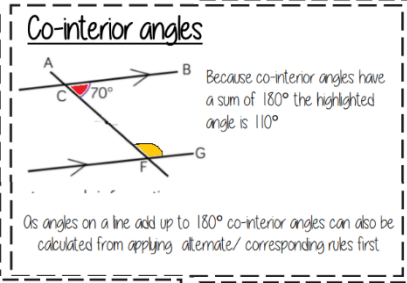
Parallel, alternate, corresponding, vertically opposite, supplementary, interior, sum, scalene isosceles, equilateral, polygon, exterior, hexagon, pentagon, heptagon, octagon, nonagon, decagon

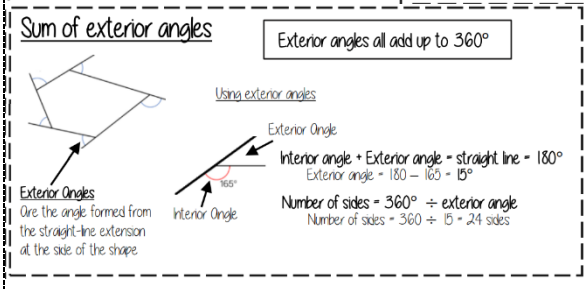
Student reference point

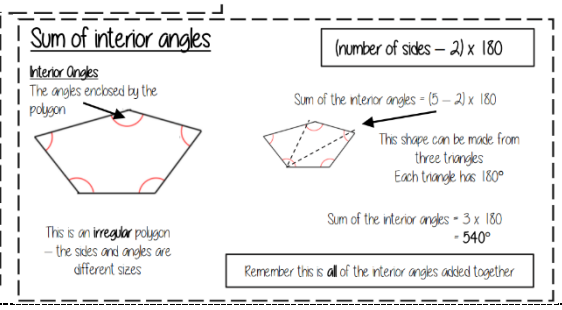












Challenge question

A square is labelled anticlockwise ABCD. The point *E* is outside the square so that *CDE* is an equilateral triangle. Find angle *BED*.

Suggested reading

https://youtu.be/7k1raqv-9yk (Corbettmaths Shape names)
https://youtu.be/QEsjIeSnEHU (Corbettmaths Angles in a triangle)
https://youtu.be/mM-PU6hmkrg (Corbettmaths Angles in Parallel Lines)
https://youtu.be/gVo8ZrtlSp0 (Corbettmaths Angles in Polygons)

Highsted Knowledge Organiser
Maths
Year 8 Averages & Statistical Diagrams

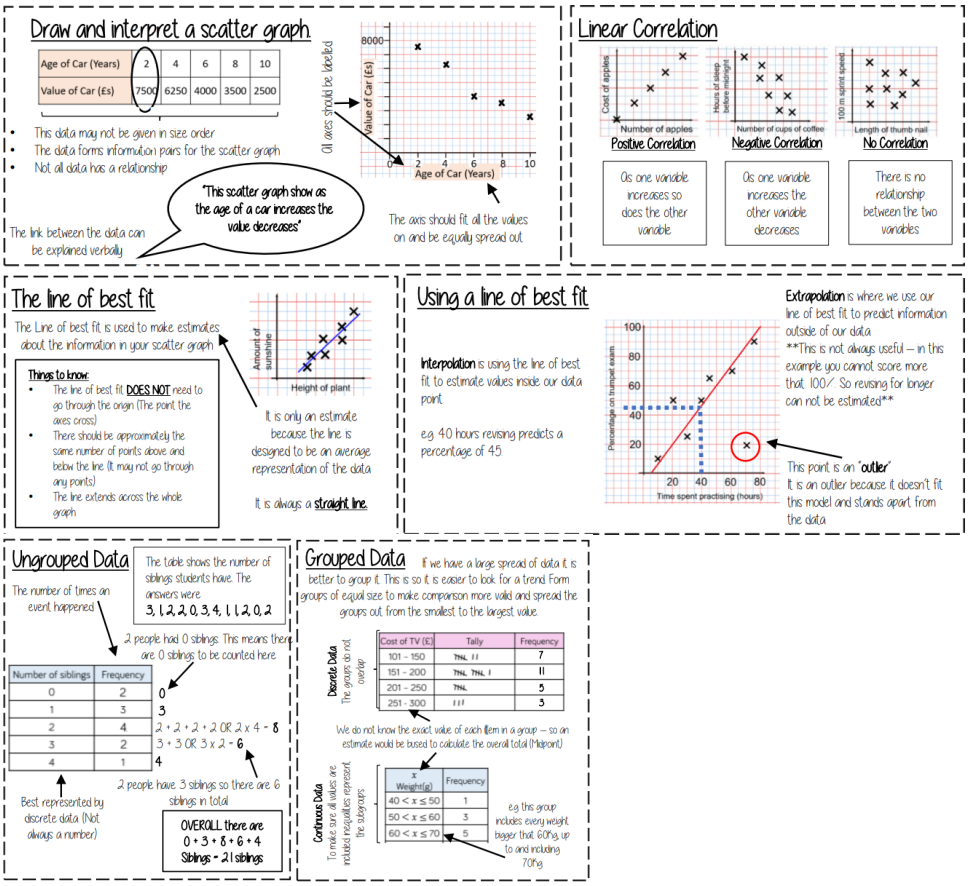
What I need to know

- Calculate the mean, mode, median and range
- Find the mean from a frequency table
- Construct and use stem and leaf diagrams
- Compare 2 sets of data using the mean, mode or median and range
- Represent bivariate data on a scatter graph and understand this represents the relationship between 2 variables
- Describe the relationship between 2 variables using correlation
- Interpret graphs and tables
- Understand that graphs can be misleading and explain why
- Calculate an estimate of the mean from a grouped frequency table
- Find the modal class and the interval in which the median lies for grouped data

Key Vocabulary

Mean, median, mode, averages, range, frequency table, stem and leaf, compare, bivariate, scatter graph, correlation, misleading, grouped frequency, modal class

Student reference point



Challenge Question

There are four unknown numbers.
The mean of the first two numbers is 4.
The mean of the first three numbers is 9.
The mean of all four numbers is 15.
If one of the four numbers is 2, what are the others?

Suggested reading

https://youtu.be/VUaOCgJTPjI (Corbettmaths Scatter Graphs)
https://youtu.be/hIGrp8X3XyY (Corbettmaths Scatter Graphs Correlation)
https://youtu.be/zGbCFis_XpI (Corbettmaths Mean from a Frequency Table)
https://youtu.be/2_sdgFJxb_U (Corbettmaths Meidan from a Frequency Table)

Highsted Knowledge Organiser
Maths
Year 8 Formulae and Equations

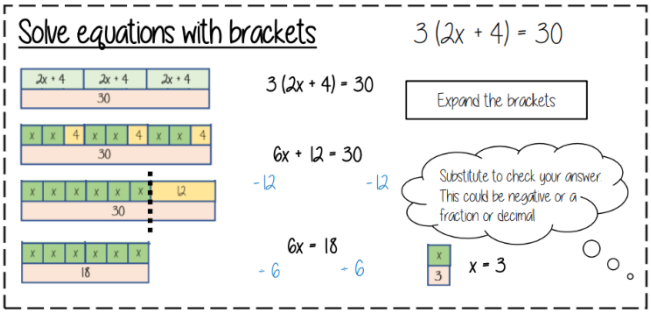
What I need to know

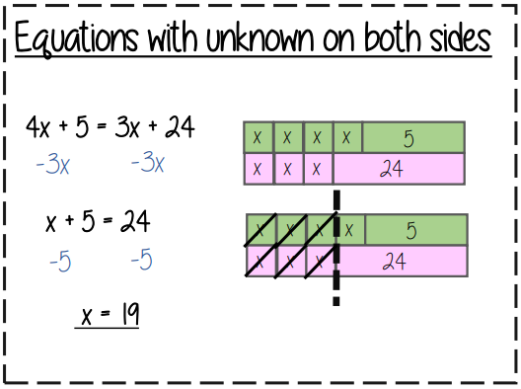
- Understand the meaning of an inverse operation
- Solve linear equations including those with brackets with positive and negative numbers
- Solve linear equations with an unknown on both sides
- Construct and solve equations
- Change the subject of the formula in simple cases by using function machines and transforming both sides

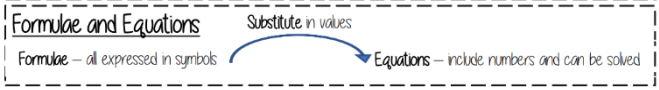
Key Vocabulary

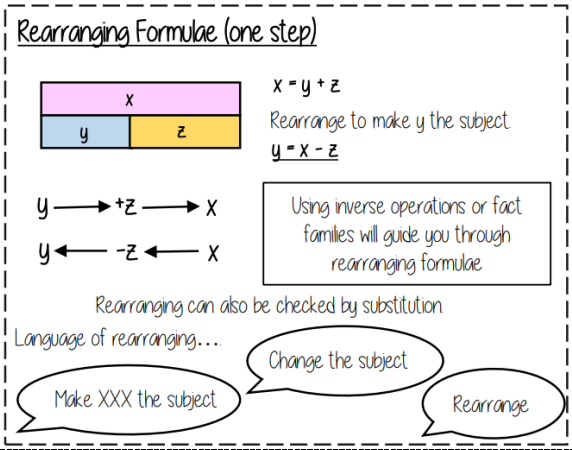
Inverse, operation, unknown, equation, construct, solve, formula, subject

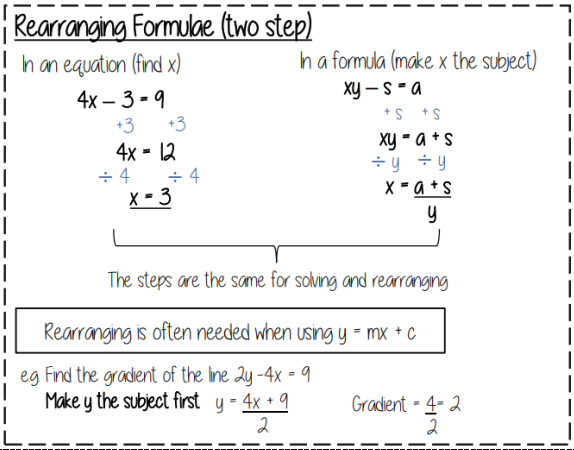
Student reference point











Challenge question

An athlete covers three consecutive miles by walking the first mile, running the second mile and cycling the third. He runs twice as fast as he walks, and he cycles one and a half times as fast as he runs. He takes ten minutes longer than he would do if he cycled the three miles. How long does he take by walking, running and cycling?

Suggested reading

https://youtu.be/7k1raqv-9yk (Corbettmaths Shape names)
https://youtu.be/QEsjIeSnEHU (Corbettmaths Angles in a triangle)
https://youtu.be/mM-PU6hmkrg (Corbettmaths Angles in Parallel Lines)
https://youtu.be/gVo8ZrtlSp0 (Corbettmaths Angles in Polygons)