

Knowledge Organiser: Year 8 Maths; Linear equations and inequalities



Add directed numbers

$2 + -4 = -2$

 $8 + -3 = 5$

Partitioning
 $8 + -3 = 5$
 $5 + 3 + -3 = 5$
 Partition the value to create a zero pair calculation
 Generalisation: $+ - = -$

Subtract directed numbers

$2 - -1 = 3$

 "Subtract" - means take away or remove
 $2 - -3 = 5$

 Start with the representation of 2
 Take away one
 Generalisation: $- - = +$

Multiply/Divide directed numbers

$2 \times -3 = -6$

 Two representations of the same calculation
Negative, Negative calculation
 -2×-3

 This is the negative of 2×-3
 $-2 \times -3 = 6$
 The act of making counters into their negative is turning them over
 Divisions are the inverse operations

Evaluate algebraic expressions

$a = 5$ $b = -4$
 $a^2 = 5^2$
 $a^2 = 25$
 $b^2 = (-4)^2$
 $b^2 = 16$
 With negative numbers the brackets are important so that it performs -4×-4 .
 Brackets around negative substitutions helps remove calculation errors
 $2a - b = 2 \times 5 - (-4) = 10 + 4 = 14$
 $3b - 2a = 3(-4) - 2(5) = -12 - 10 = -22$

Directed numbers

$++ \rightarrow +$
 $-- \rightarrow +$
 $+- \rightarrow -$
 $-+ \rightarrow -$
 e.g. $a = -5$ and $b = 2$
 $a^2 = a \times a = -5 \times -5 = 25$
 $b + a = 2 + -5 = -3$

Multiply single brackets

$3(2x + 4)$

 $6x + 12$

 Different representations of $3(2x + 4) = 6x + 12$

Algebraic constructs

Expression
 A sentence with a minimum of two numbers and one maths operation
Equation
 A statement that two things are equal
Term
 A single number or variable
Identity
 An equation where both sides have variables that cause the same answer includes \equiv
Formula
 A rule written with all mathematical symbols e.g. area of a rectangle $A = b \times h$

Simple Inequalities

$<$ less than \leq Less than or equal to
 $>$ More than \geq More than or equal to
 Note:
 $x < 10$
 Say this out loud "x is a value less than 10"
 $10 > x$
 Say this out loud "10 is more than the value"
 Note:
 $x < 10$ and $10 > x$ represent the same values
 $x + 2 \leq 20$
 "my value + 2 is less than or equal to 20"
 $x \leq 18$
 The biggest the value can be is 18

Solve one step equations (+/-)

There is more to this than just spotting the answer

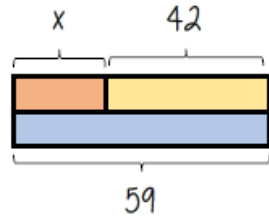
$$x + 42 = 59$$

$$x + 42 = 59$$

$$42 + x = 59$$

$$59 - x = 42$$

$$59 - 42 = x$$



Don't forget you know how to use function machines



Equations with unknown on both sides

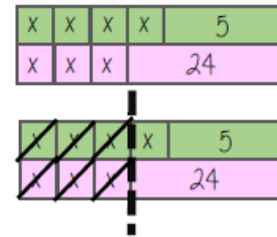
$$4x + 5 = 3x + 24$$

$$-3x \quad -3x$$

$$x + 5 = 24$$

$$-5 \quad -5$$

$$x = 19$$



Keywords

Simplify: grouping and combining similar terms
Substitute: replace a variable with a numerical value
Equivalent: something of equal value
Coefficient: a number used to multiply a variable
Product: multiply terms
Highest Common Factor (HCF): the biggest factor (or number that multiplies to give a term)
Inequality: an inequality compares who values showing if one is greater than, less than or equal to another

Form expressions

For unknown variables, a letter is normally used in its place

More than – ADD

Less than/ difference – SUBTRACT

eg 4 more than $t \longrightarrow t + 4$
 8 less than $k \longrightarrow k - 8$

Only similar terms can be grouped together

eg Find the perimeter of this shape
 (Perimeter = length around outside of shape)
 t
 $t + 2t + 1 + t + 2t + 1 \longrightarrow 6t + 2$

Solve equations with brackets

$$3(2x + 4) = 30$$

Expand the brackets

$$3(2x + 4) = 30$$

$$6x + 12 = 30$$

$$-12 \quad -12$$

$$6x = 18$$

$$-6 \quad -6$$

Substitute to check your answer.
 This could be negative or a fraction or decimal

$$\frac{x}{3} \quad x = 3$$

Formulae and Equations

Substitute in values

Formulae – all expressed in symbols

Equations – include numbers and can be solved

Like and unlike terms

Like terms are those whose variables are the same

and 3 are like terms
 the variable is the same

are unlike terms
 the variables are NOT the same

Like terms

$y, 7y$
 $2x^2, x^2$
 $ab, 10ba$
 $5, -2$

Un-like terms

$y, 7x$
 $2x^2, 2c^2$
 $ab, 10a$
 $5, -2t$

Collecting like terms \equiv symbol

The \equiv symbol means equivalent to.
 It is used to identify equivalent expressions

Collecting like terms

Only like terms can be combined

$$4x + 5b - 2x + 10b$$

$$2x + 15b$$



How do we use Knowledge Organisers in Mathematics?

How can you use knowledge organisers at home to help us?

- **Retrieval Practice:** Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.

I will also use these at home to complete my own independent learning and revision of these key topics.