Year 8 – Brackets, Inequalities, Sequences and Indices

Essential knowledge

Know what a linear sequence is.
Know how to use an inequality sign.
Know inverse operations.
Know correct algebraic notation.
Know how to multiply and divide algebraic terms.

Key Vocabulary

Sequence: items or numbers put in a pre-decided order
Term: a single number or variable
Rule: instructions that relate two variables
Linear: the difference between terms increases or decreases by the same value each time
Inverse: the operation that undoes what was done by the previous operation. (The opposite operation).
Expression: a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)

Prior learning links

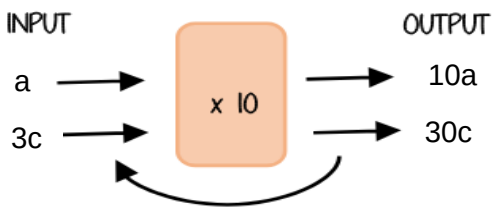
Recognising patterns
Number facts such as multiplications.
Function Machines, Bar Modelling
Inverse Operations

Inequality Signs

< "less than" > "more than"
≤ "less than or equal to"
≥ "more than or equal to"

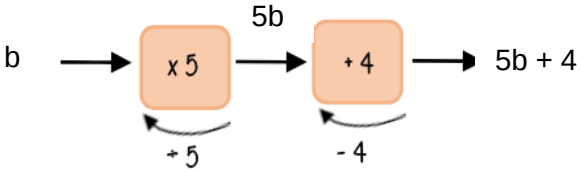
$x \leq 10$ is the same as $10 \geq x$
"x is a value less than or equal to 10"

Function machines with Algebra (Finding inputs and Outputs).



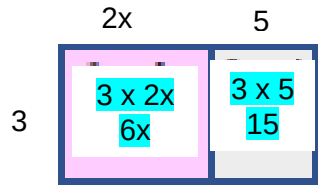
÷ 10 is inverse to find input

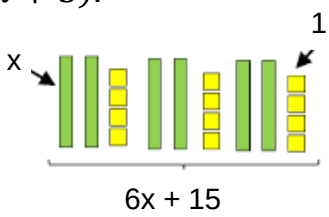
The inverse of adding is subtracting. Subtracting is adding. The inverse of multiplying is dividing and dividing is multiplying. If you have an output and do the inverse you will find the input.



Expanding Brackets

$3(2x + 5)$ is equivalent to 3 multiplied by $(2x + 5)$ or "3 lots of $(2x + 5)$.





Algebraic notation

5 + 5 + 5 3 x 5 5 x 3	y + y + y + y y x 4 4 x y 4y	20 ÷ h $\frac{20}{h}$

In Algebra we do not write the multiplication sign or the division sign. If a number is next to a letter it has been multiplied e.g. 5a means 5 multiplied by a. Divides are written as fractions.

Substitution into expressions.

When we substitute into expressions we replace a letter with a number.

4y means 4 lots of 'y'
If y = 7 this means the expression is asking for 4 'lots of' 7
4 x 7 OR 7 + 7 + 7 +7 OR 7 x 4 = 28
e.g. : y – 2 = 7 – 2 = 5
This can also be done with a function machine.

2(x + 3)

If x = 10 10 + 3 = 13..... 13 x 2 = 26

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Key Vocabulary

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
Base: The number that gets multiplied by a power
Power: The exponent –or the number that tells you how many times to use the number in multiplication
Indices: The power or the exponent.
Coefficient: The number used to multiply a variable

Prior learning links

Recognising patterns
Number facts such as multiplications.
Function Machines, Bar Modelling
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Power Law

3^4

Power
This tells us how many times we need to multiply the base by itself

Base
This tells us the number we are multiplying

This means $3^4 = 3 \times 3 \times 3 \times 3 = 81$

Dividing with Indices

$$\frac{18}{24} = \frac{\cancel{2} \times \cancel{3} \times 3}{\cancel{2} \times 2 \times 2 \times \cancel{3}} = \frac{3}{4}$$

We cancel common factors, therefore:

$$\frac{5a^3b^2}{15ab^5} =$$

$$\frac{\cancel{5} \times \cancel{a} \times a \times a \times \cancel{b} \times \cancel{b}}{\cancel{5} \times 3 \times \cancel{a} \times \cancel{b} \times \cancel{b} \times b \times b \times b}$$

$$= \frac{a^2}{3b^3}$$

Linear Sequences- Increase or decrease by the same amount each time

Linear Sequences 7, 11, 15, 19…
How do I know this is a linear sequence? It increases by adding 4 to each term.
How many terms do I need to make this conclusion? At least 4 terms – two terms only shows one difference not if this difference is constant. (a common difference).
How do I continue the sequence? You continue to repeat difference for each term

Sequences from Algebraic Rules

$3n + 4$ – this will be a linear sequence because it is a single power of "n" and will increase by **3** each time.

To generate the sequence we substitute the number we are looking for in place of "n".
e.g.
1st term = 3 x 1 + 4 = 7
2nd term = 3 x 2 + 4 = 11
3rd term = 3 x 3 + 4 = 15
So the sequence would start 7, 11, 15…

Multiplying with Indices

$$3t \times 5t =$$
$$3 \times t \times 5 \times t =$$
$$3 \times 5 \times t \times t =$$
$$15t^2$$

$$4a \times 3b =$$
$$4 \times a \times 3 \times b =$$
$$4 \times 3 \times a \times b =$$
$$12ab$$

By writing out terms individually, we can simplify:

$$2b^4 \times 7b^3 =$$
$$2 \times b \times b \times b \times b \times 7 \times b \times b \times b =$$
$$2 \times 7 \times b \times b \times b \times b \times b \times b \times b =$$
$$14b^7$$

Year 8- Brackets, Inequalities, sequences and indices

Prior learning links

Which of these sequences is linear:

1, 1, 2, 3, 5, 8, 13…
1, 4, 7, 10, 13…
1, 2, 4, 8, 16, 32…

Solve the following equations:
a + 11 = 14

b – 6 = 9

3c = 12

$\frac{d}{2} = 4$

Key Vocabulary

Define the following key words:
Substitute:

Factor:

Sequence:

Inverse:

Expanding Brackets:

Expand the following brackets:

$3\ (x + 2)$

$4\ (x\ - 7)$

$2\ (3x\ - 5)$

$x\ (x + 9)$

Inequalities:

Write the following inequalities in words:
$x < 3$

$x \geq 6$

List the first 5 integers that satisfy the inequality:
$x \leq -2$

Substitution

If a = 5 b = 2 and c = -3 find the value of the following expressions.

a) a+b b) 2b c) ac d) ab + c e) c - a

Indices

Simplify the following:

3a x 2b

6c x 7c

$5d^3 \times 10d^5$

$8a^2b \times 4a^5b^3$

Simplify the following fractions:
$\frac{5x^3y}{20x^2}$

$\frac{12a^5b}{20a^3b^4}$

Sequences from Algebraic Rules

Describe in words the term-to-term rule for the following algebraic sequences:
3n
5n + 1
2n - 5

Write the first 5 terms of the sequences generated by the following algebraic rules:

3n + 1

4n – 3

2n + 7