Unit 2: Algebra

Basic Algebra

Algebraic Indices

Simplify

$$8qr^2 \times 3qr = 24q^2r^3$$

You must use the rules of indices when simplifying with algebra

Solving Equations

Solve $3(x + 5) = 21$

Expand first

$3x + 15 = 21$

Solve for x

$3x = 6$

$x = 2$

Substitution

When we substitute values into a formula we take out the variables and put in the numbers.

Example: 2a + 4b

Where a = -3 and b = 5

You do 2 x –3 = -6

And 4 x 5 = 20

Then add them together:

-6 + 20 = 14

Expanding

Expanding Single Brackets

Expand $3(x + 4 + y)$

Multiply in grid method

x	x	4	y
3	$3x$	12	$3y$

$3(x + 4 + y) = 3x + 12 + 3y$

Expanding double brackets

Expand $(x + y)(x + y)$

Multiply in grid method

x	x	y
x	x^2	xy
y	xy	y^2

$= x^2 + xy + xy + y^2 = x^2 + 2xy + y^2$

Expanding double brackets that look like single brackets

Expand $(x + 1)^2 = (x + 1)(x + 1)$

Multiply in grid method

x	x	1
x	x^2	x
1	x	1

$= x^2 + x + x + 1 = x^2 + 2x + 1$

When expanding brackets it is easier to use grid method.

Make sure you simplify at the end

Factorising

Factorising Single Brackets (Numbers)

Factorise $10x + 15$.

Find the **HCF** of the numbers. → **HCF** = 5

$10x + 15 = 5(2x + 3)$

Divide each term by the **HCF** and **close the bracket.**

Factorising into a single bracket

Variables and numbers

Factorise $2ab + 4b$.

Find the **HCF** of the **variables.** → **HCF** = b

HCF = 2

$2ab + 4b = 2b(a + 2)$

Divide each term by the **HCFs** and **close the bracket.**

Only **'open the brackets'** once **all HCFs are found.**

Factorising Double Brackets

1. Factorise the following quadratic expression into double brackets.

$x^2 + 9x + 18 = (x + 6)(x + 3)$

Factors of 18: 1, 18 / 2, 9 / 3, 6

Write a **list** of **factor pairs** of the **constant term.**

Choose the pair that **add to make "+9".**

You can **put these in either bracket!**

Why must the factor pair be... ? positive × positive, negative × negative

Sequences

Linear Sequence

Find the nth term of the following sequence:

14, 12, 10, 8, 6 ….

-2 -2 -2 -2 = -2n

To find the constant we find the term before The 1st term which is 16

The nth term is = -2n + 16

Quadratic Sequence

Example: Find the formula for the nth term of the sequence:

2, 5, 10, 17

Find the differences: 2 → 5 → 10 → 17; +3, +5, +7

Not constant so find second differences

This is constant: +2, +2

The second difference is **CONSTANT** so the formula for the nth term must contain a n^2. The number in front of n^2 is **half** the constant difference.

n^2

Term number	1	2	3	4
Sequence	2	5	10	17
	+ 1	+1	+1	+1
n^2	1	4	9	16

This is constant so now we can work out the nth term

$n^2 + 1$