Foundation ALGEBRA

WHICKHAM SCHOOL

Sequences

The nth term is the algebraic rule we use to describe a sequence.

To find the nth term, remember **DnO**.

Difference × **n** + **zero** term (this is the term that would come before the first term)

e.g. 4, 9, 14, 19... is given by 5n – 1

Solving Equations

To solve equations, use the inverses of the operations that have been applied to the unknown,
e.g. $4x - 7 = 11$

First add 7 to both sides:
$4x = 18$

Then divide by 4:

$x = \frac{18}{4}$ $\quad x = 4\frac{1}{2}$

If you can't work out the answer, leave it as a fraction in its simplest form.

Key Terms

Simplify – Write more simply, usually by collecting like terms, e.g. $4x + 2x - x = 5x$

Solve – Calculate the value of the letter.

Expand – Multiply out brackets.

Factorise – Put back into brackets.

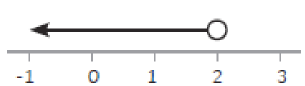
Inequalities

We deal with inequalities in the same way as equations,
e.g. Solve $5x + 2 < 12$

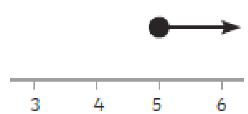
Subtract 2: $5x < 10$

Divide by 5: $x < 2$

On a number line, it looks like this:



$x \geq 5$ looks like this.
The shaded dot means more than or equal to:



Simultaneous Equations

To solve simultaneous equations:

multiply the equations if necessary;

$2x + 7y = 24 \ (\times 3)$ $\qquad 3x + 5y = 25 \ (\times 2)$

$6x + 21y = 72$ $\qquad 6x + 15y = 50$

cancel one variable by adding or subtracting the equations, and solve the resulting equation;

$$\begin{array}{r} 6x + 21y = 72 \\ - \quad 6x + 15y = 50 \\ \hline 6y = 12 \\ y = 2 \end{array}$$

and substitute this value into one of the other equations and solve for the remaining variable.

$2x + 14 = 24$

$x = 5$

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Straight Line Graphs

The general equation for a straight line graph is $y = mx + c$

m is the **gradient** (steepness) of the line and c is the **y-intercept** (where it crosses the y-axis).

Two lines are **parallel** if they have the same gradient.

Changing the Subject

Similar to solving equations, reverse the operations to get the required letter on its own.

E.g. The equation of a straight line is $y = mx + c$. Rearrange to make x the subject.

Start by subtracting c: $y - c = mx$

Divide by m: $(y - c) \div m = x$

So $x = (y - c) \div m$

Factorising Brackets

To factorise into one bracket, find the highest common factor for each term, e.g. $4x + 10 = 2(2x + 5)$

When there is no common factor and the equation is of the form $x^2 + bx + c$, you need to find two numbers that multiply to make c and add to make b, e.g. $x^2 + 7x + 12 = (x + 3)(x + 4)$

$x^2 + x - 20 = (x + 5)(x - 4)$

Expanding Brackets

To expand one bracket, make sure the term on the outside multiplies **everything** on the inside,

e.g. $4(2x - 3) = 8x - 12$

To expand two brackets, follow the F.O.I.L. method (**F**irst, **O**uter, **I**nner, **L**ast), e.g.

$(x + 3)(x + 5) = x^2 + 5x + 3x + 15$
$= x^2 + 8x + 15$

Index Laws

When multiplying, add the powers: $x^2 \times x^4 = x^6$

When dividing, subtract the powers: $\frac{b^5}{b^3} = b^2$

When you have brackets, multiply the powers: $(y^3)^5 = y^{15}$

Anything to the power of zero is 1: $a^0 = 1$