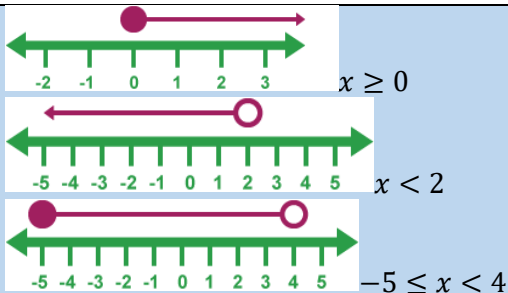


Topic: Algebra

Topic/Skill	Definition/Tips	Example
Term	Either a single number or variable, or numbers and variables multiplied together	$4x$ or 7
Variable	A symbol , usually a letter , which represents a number which is usually unknown.	In the equation $x + 2 = 5$, x is the variable.
Expression	A mathematical statement written using symbols, numbers or letters	$3x + 2$ or $5y^2$
Equation	A statement showing that two expressions are equal	$2y - 17 = 15$
Identity	An equation that is true for all values of the variables An identity uses the symbol: $\equiv$	$2x \equiv x+x$
Formula	Shows the relationship between two or more variables	Area of a rectangle = length x width $A = L \times W$
Function	A special relationship where each input has a single output . It is often written as " f(x) " where x is the input value.	$f(x) = \frac{x}{2}$ ("f of x equals x divided by 2")
Simplifying Expressions	Collect 'like terms'. Be careful with negatives. x^2 and x are not like terms. x times x The answer is x^2 not $2x$. $p \times p \times p$ The answer is p^3 not $3p$ $p + p + p$ The answer is $3p$ not p^3	$2x + 3y + 4x - 5y + 3 = 6x - 2y + 3$ $3x + 4 - x^2 + 2x - 1 = 5x - x^2 + 3$ Squaring is multiplying by itself, not by 2. If $p=2$, then $p^3=2 \times 2 \times 2=8$, not $2 \times 3=6$ If $p=2$, then $2+2+2=6$, not $2^3 = 8$
Expand	To expand a bracket, multiply each term in the bracket by the expression outside the bracket.	$3(m + 7) = 3m + 21$
Factorise	The reverse of expanding . Factorising is writing an expression as a product of terms by ' taking out ' a common factor .	$6x - 15 = 3(2x - 5)$, where 3 is the common factor.
Solve	To find the answer /value of something Use inverse operations on both sides of the equation (balancing method) until you find the value for the letter.	Solve $2x - 3 = 7$ Add 3 on both sides $2x = 10$ Divide by 2 on both sides $x = 5$
Inverse	Opposite	The inverse of addition is subtraction. The inverse of multiplication is division.
Substitution	Replace letters with numbers. Be careful of $5x^2$. You need to square first, then multiply by 5.	$a = 3, b = 2$ and $c = 5$. Find: 1. $2a = 2 \times 3 = 6$ 2. $3a - 2b = 3 \times 3 - 2 \times 2 = 5$ 3. $7b^2 - 5 = 7 \times 2^2 - 5 = 23$

Writing Formulae	Substitute letters for words in the question.	Bob charges £3 per window and a £5 call out charge. $C = 3N + 5$ Where N=number of windows and C=cost
Change the subject of an equation	Use inverse operations on both sides of the formula (balancing method) until you find the expression for the letter.	Make x the subject of $y = \frac{2x-1}{z}$ Multiply both sides by z $yz = 2x - 1$ Add 1 to both sides $yz + 1 = 2x$ Divide by 2 on both sides $\frac{yz + 1}{2} = x$ We now have x as the subject.
Simultaneous Equations	A set of two or more equations , each involving two or more variables (letters). The solutions to simultaneous equations satisfy both/all of the equations .	$2x + y = 7$ $3x - y = 8$ $x = 3$ $y = 1$
Coefficient	A number used to multiply a variable . It is the number that comes before/in front of a letter.	6z 6 is the coefficient z is the variable
Solving Simultaneous Equations (by Elimination)	1. Balance the coefficients of one of the variables. 2. Eliminate this variable by adding or subtracting the equations (Same Sign Subtract, Different Sign Add) 3. Solve the linear equation you get using the other variable. 4. Substitute the value you found back into one of the previous equations. 5. Solve the equation you get. 6. Check that the two values you get satisfy both of the original equations.	$5x + 2y = 9$ $10x + 3y = 16$ Multiply the first equation by 2. $10x + 4y = 18$ $10x + 3y = 16$ Same Sign Subtract (+10x on both) $y = 2$ Substitute $y = 2$ in to equation. $5x + 2 \times 2 = 9$ $5x + 4 = 9$ $5x = 5$ $x = 1$ Solution: $x = 1, y = 2$
Inequality	An inequality says that two values are not equal . $a \neq b$ means that a is not equal to b.	$7 \neq 3$ $x \neq 0$
Inequality symbols	$x > 2$ means x is greater than 2 $x < 3$ means x is less than 3 $x \geq 1$ means x is greater than or equal to 1 $x \leq 6$ means x is less than or equal to 6	State the integers that satisfy $-2 < x \leq 4$. -1, 0, 1, 2, 3, 4

Inequalities on a Number Line	Inequalities can be shown on a number line. Open circles are used for numbers that are less than or greater than ($<$ or $>$) Closed circles are used for numbers that are less than or equal or greater than or equal ($\leq$ or $\geq$)	
Quadratic	A quadratic expression is of the form $ax^2 + bx + c$ where a, b and c are numbers, $a \neq 0$	Examples of quadratic expressions: x^2 $8x^2 - 3x + 7$ Examples of non-quadratic expressions: $2x^3 - 5x^2$ $9x - 1$
Product of two linear expressions	When multiplying two linear expressions , every term in the first expression has to be multiplied by every term in the second expression.	$(y + 2)(y + 3)$ F: $y \times y = y^2$ O: $y \times 3 = 3y$ I: $2 \times y = 2y$ L: $2 \times 3 = 6$ $y^2 + 3y + 2y + 6 = y^2 + 5y + 6$
Factorising Quadratics	When a quadratic expression is in the form $x^2 + bx + c$ find the two numbers that add to give b and multiply to give c .	$x^2 + 7x + 10 = (x + 5)(x + 2)$ (because 5 and 2 add to give 7 and multiply to give 10) $x^2 + 2x - 8 = (x + 4)(x - 2)$ (because +4 and -2 add to give +2 and multiply to give -8)
Difference of Two Squares	An expression of the form $a^2 - b^2$ can be factorised to give $(a + b)(a - b)$	$x^2 - 25 = (x + 5)(x - 5)$ $16x^2 - 81 = (4x + 9)(4x - 9)$
Solving Quadratics ($ax^2 + bx = 0$)	Factorise and then solve = 0 .	$x^2 - 3x = 0$ $x(x - 3) = 0$ $x = 0$ or $x = 3$
Solving Quadratics by Factorising ($a = 1$)	Factorise the quadratic in the usual way. Solve = 0 Make sure the equation = 0 before factorising.	Solve $x^2 + 3x - 10 = 0$ Factorise: $(x + 5)(x - 2) = 0$ $x = -5$ or $x = 2$

Factorising Quadratics when $a \neq 1$	When a quadratic is in the form $ax^2 + bx + c$ 1. Multiply a by c = ac 2. Find two numbers that add to give b and multiply to give ac. 3. Re-write the quadratic, replacing bx with the two numbers you found. 4. Factorise in pairs – you should get the same bracket twice 5. Write your two brackets – one will be the repeated bracket, the other will be made of the factors outside each of the two brackets.	Factorise $6x^2 + 5x - 4$ 1. $6 \times -4 = -24$ 2. Two numbers that add to give +5 and multiply to give -24 are +8 and -3 3. $6x^2 + 8x - 3x - 4$ 4. Factorise in pairs: $2x(3x + 4) - 1(3x + 4)$ 5. Answer = $(3x + 4)(2x - 1)$
Where else is the Algebra topic used: Graphs Angles Measures Transformations		Links to other subjects: