

Algebra – Key Topics for a C/B Grade

Indices

Use powers (as in the number section) and index laws.

Negative and fractional powers e.g. $5^{-3} = \frac{1}{5^3} = \frac{1}{125}$, $64^{\frac{1}{3}} = \sqrt[3]{64} = 4$

Index laws apply to these as usual.

Simplifying

Remember that + or – signs belong to the term that comes after them.

$$5x + 4y - 2x + 6y = 3x + 10y$$

$$x^2 + x^2 + x^2 = 3x^2$$

$$5(3y - 7) = 15y - 35$$

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

$$(x + 4)(x + 7) = x^2 + 4x + 7x + 28 = x^2 + 11x + 28$$

Factorising

Factorising means putting brackets in. If the expression has 2 terms, look for common factors. If it has 3 terms, you need 2 brackets with x at start and 2 numbers (add to make x bit, multiply to make number).

$$24x^2 + 16x = 8x(3x + 2)$$

$$x^2 - 7x + 12 = (x - 3)(x - 4)$$

Algebra Fractions

To simplify an algebra fraction, factorise top and bottom and try to cancel common factors. To add, subtract multiply or divide, use the same methods as for numbers. Don't worry if you can't finish a question, you can still pick up some marks.

Formulae

Substitute numbers into formulae. Remember to show your working and take particular care with negative numbers. Remember some formulae you need are on the formula sheet.

Rearrange formulae in the same way you solve equations. "Make x the subject" means rearrange until you get x on its own.

You may also need to use word formulae, or turn words into algebra.

Linear Equations

Solve by collecting x on one side, numbers on the other. Remember to do the opposite when you take something across the = sign.

$$5x + 3 = 2x - 8$$

$$5x - 2x = -8 - 3$$

$$3x = -11$$

$$x = \frac{-11}{3} = -3\frac{2}{3}$$

You may be asked to form an equation from a word problem.

Simultaneous Equations

Multiply one or both equations to get the y coefficient the same.

Subtract the equations (if both +) or add (if one + and one -) to *eliminate* one variable.

Solve to find x, and then substitute back to find x.

$$2x + 3y = 17 \quad (\times 5) \quad 10x + 15y = 85$$

$$3x - 5y = 35 \quad (\times 3) \quad 9x - 15y = 105$$

$$19x = 190$$

$$x = 190 \div 19 = 10$$

$$2 \times 10 + 3y = 17$$

$$20 + 3y = 17$$

$$3y = -3$$

$$y = -1$$

Remember that the solution to these equations is the intersection point of the straight lines given by the original equation.

Quadratic Equations

Quadratic equations have an x^2 in them. They can be solved in two ways: factorising or using the formula.

To *factorise*, put into two brackets

$$x^2 + 6x - 7 = 0$$

$$(x + 7)(x - 1) = 0$$

$$x + 7 = 0, \text{ so } x = -7$$

$$x - 1 = 0, \text{ so } x = 1$$

$$x = 7 \text{ or } 1$$

For harder equations *use the formula*

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Watch out for a, b or c being negative, and remember to put negatives in brackets if squaring.

Give your answer to 3 s.f. if it is not a whole number.

Inequalities

Inequalities can be solved in the same way as equations – but don't divide by a negative number. Remember that your answer will be an inequality, not a single number.

$$2x + 6 \leq 14$$

$$2x \leq 14 - 6$$

$$2x \leq 8$$

$$x \leq \frac{8}{2}$$

$$x \leq 4$$

Inequalities can be shown on number lines.

Use a white circle for $<$ or $>$, and a black circle for \leq or \geq .

Simple inequalities can be shown on graphs. To show $-3 \leq x \leq 5, -1 \leq y \leq 4$, shade out anything whose x and y coordinates are not in the given ranges.