Student Learning Centre

Key Algebraic concepts Summary Sheet

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Key Terms

BEDMAS	Order of operations acronym First Brackets, then the Exponents, Division, Multiplication, Addition & Subtraction.
Absolute Value	The absolute value of *x*, denoted | *x* | is the distance of *x* from zero, and gives the size or magnitude of a value but not its sign.
Expanding Brackets (FOIL)	This is another acronym that relates to removing brackets from an algebraic expression by First terms, Outer terms, Inside Terms and Last Terms.
Inequality	Tells you the size of two values relative to each other, whether they are > (greater) or < (less) than the other.
Radical	An exponent is expressed as a fraction.
Exponent	Indicates how many times a value is multiplied by itself.
Polynomial	An algebraic expression that comprises constants (numbers), variables (x & y), and exponents (x^2, x^3 etc).
Logarithms	A way of writing any number as a power of 10 or e.
Linear equation	An equation in the form y = mx + c where m = slope of the line and c = *y*-intercept of the line *x* & *y* refer to *x* & *y* coordinates on the line.
Irrational Numbers	Numbers that cannot be written as $\frac{a}{b}$ where a and b are integers and b is not zero.
Rearranging Equations	Remember to do the same thing to both sides of the equation to preserve equality and balance between each side.
Like Terms	Like terms are those where both the variable and the power on the variable are identical.
Variable	Shorthand way of describing changing values.
Factorising	Opposite to expanding; try to find greatest common factor and take outside the brackets in the first instance.

Key Formulas

Absolute Values

$|a| = a \; for \; a \geq 0; \; = -a \; for \; a \leq 0$

If $|m| < b$ then $-b < m < b$

If $|m| > b$ then $m > b \; or \; m < -b$

Factorising

$$a(b+c) = ab + ac$$

$$(x-a)(x+a) = x^2 - a^2$$

$$(x+a)^2 = x^2 + 2ax + a^2$$

$$(x-a)2 = x^2 - 2ax + a^2$$

Properties of logs

$y = logx \quad x = 10^y$

$Lnx = log_e x$

$Log10 = 1$

$Lne = 1$

$Log1 = 0$

$Log10^x = x$

$Log(m.n) = logm + logn$

$Log(\frac{m}{n}) = logm - logn$

$Log(m)^r = rlogm$

Exponents

$x^0 = 1$

$(xn)^m = x^{nm}$

$x^m . x^n = x^{m+n}$

$x - {}^m = \frac{1}{x^m}$

$\frac{x^m}{x^n} = xm^{-n}$

$(xy)^n = x^n . y^n$

Quadratic Equation

If $\boldsymbol{a}x^2 + \boldsymbol{b}x + \boldsymbol{c} = 0$ then $x = -b \mp \frac{\sqrt{b^2-4ac}}{2a}$

Radicals

$\sqrt[a]{x} = x^{1/a}$

$\sqrt[n]{a^n} = a$

$\sqrt[n]{ab} = \sqrt[n]{a} . \sqrt[n]{b}$

$x^{\frac{m}{n}} = \sqrt[n]{x^m} = (\sqrt[n]{x})^m$

Mathematical Symbols

Symbol	Meaning	Example
$<$	less than	$1 < 1000$
$>$	greater than	$1000 > 1$
$[\,(\,)\,]$	multiple brackets - calculate inside first	$[(1+2)*(1+5)] = 18$
$\sqrt{a}$	square root	$\sqrt{9} = \pm 3$
$x!$	factorial	$4! = 1*2*3*4 = 24$
$\lvert x \rvert$	absolute value	$\lvert -5 \rvert = 5$
Δ	Delta means a change	$\Delta t = t_1 - t_0$
a^b	exponent	$2^3 = 8$
e	a constant value $e = 2.7182 \ldots$	$Ln(ex) = x$

Graphing Linear Equations

How do you work out the equation of a straight line?

Let's use an example: What is the equation of the line going through (2.5, 20) and (5, 30)?

Step 1: Work out the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{30-20}{5-2.5}$$

$$= \frac{10}{2.5}$$

$$= 4$$

Step 2: Work out the y - intercept, by substituting a coordinate back into the equation.

From Step 1 we know $m = 4$.
So using the $y = mx + c$ formula, the equation becomes $\boldsymbol{y = 4x + c}$ **.**

We know that (5,30) is a point on the line. So, we can substitute $\boldsymbol{x = 5}$ and $\boldsymbol{y = 30}$ into $\boldsymbol{y = 4x + c}$ to work out c.

(However, you could substitute either coordinate)

Step 3: Write down the equation.

We have found that $m = 4$ and $c = 10$, so the equation of the line is:

$$y = 4x + c$$
$$30 = 4 \times 5 + c$$
$$30 = 0 + c$$
$$30 - 20 = 20 + c - 20$$
$$10 = c$$

$$\boldsymbol{y = 4x + 10}$$