

Algebra I Cheat Sheet

Axioms of Equality

Reflexive axiom: $a = a$

Symmetric axiom: If $a = b$, then $b = a$

Transitive axiom: If $a = b$ and $b = c$, then $a = c$

Additive axiom: If $a = b$ and $c = d$, then $a + c = b + d$

Multiplicative axiom: If $a = b$ and $c = d$, then $ac = bd$

Solving Equations

1. Simplify if necessary.
2. Get the variable on one side of the equal sign and numbers on the other.
3. Divide by the number in front of the variable.

Solving Systems of Equations

Addition/Subtraction Method: Combine equations to eliminate one variable. The equations may need to be multiplied by a common multiple first.

Substitution Method: Solve one equation for one variable and substitute that variable into other equations.

Graphing Method: Graph each equation on the same graph. The coordinates of the intersection are the solution.

Monomials

A *monomial* is an algebraic expression that consists of only one term.

- Add or subtract monomials with like terms only: $3xy + 2xy = 5xy$.
- To multiply monomials, add the exponents of the same bases: $x^4(x^3) = x^7$.
- To divide monomials, subtract the exponent of the divisor from the exponent of the dividend of the same base: $x^8/x^3 = x^5$.

Polynomials

A *polynomial* is an algebraic expression of two or more terms, such as $x + y$. *Binomials* consist of exactly two terms. *Trinomials* consist of exactly three terms.

- To add or subtract polynomials, add or subtract like terms only.
- To multiply two polynomials, multiply each term in one polynomial by each term in the other polynomial.

The F.O.I.L. method (first, outer, inner, last) is often used when multiplying binomials.

- To divide a polynomial by a monomial, divide each term by the monomial.
- To divide a polynomial by another polynomial, make sure both are in descending order, then use long division (divide by first term, multiply, subtract, bring down).

Solving Inequalities

Solve exactly like equations, except if you multiply or divide both sides by a negative number, you must reverse the direction of the inequality sign.

Factoring

A common factor

1. Find the largest common monomial and factor of each term.
2. Divide the original polynomial to obtain the second factor.

Difference of two squares

1. Find the square root of the first term and the second term.
2. Express your answer as the product of the sum and difference of those quantities.
Example: $x^2 - 9 = (x + 3)(x - 3)$

Trinomials

1. Check to see if you can monomial factor.
2. Use double parentheses and factor the first term and place the factors in the left side of the parenthesis.
3. Factor the last term and place the factors in the right sides of the parentheses.
4. Deciding the signs of the numbers, and the numbers themselves, may take trial and error. Multiply the means and extremes; their sum must equal the middle term.
Example: $x^2 + 3x + 2 = (x + 2)(x + 1)$

Axioms of Inequality

Trichotomy axiom: $a > b$, $a = b$, or $a < b$.

Transitive axiom: If $a > b$ and $b > c$, then $a > c$.

Additive axiom: If $a > b$, then $a + c > b + c$.

Positive multiplication axiom: If $c > 0$, then $a > b$ if, and only if, $ac > bc$.

Negative multiplication axiom: If $c < 0$, then $a > b$ if, and only if, $ac < bc$.

Solving Quadratic Equations

By factoring: Put all terms on one side of the equal sign and factor. Set each factor to zero and solve.

By using the quadratic formula:

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

Plug into the formula

By completing the square: Put the equation in the form of $ax^2 + bx = -c$ (make a -1 by dividing if necessary). Add $(b/2)^2$ to both sides of the equation to form a perfect square on the left side of the equation. Find the square root of both sides of the equation. Solve the resulting equation.

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