Quadratic Equations

**Formula Sheet**

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| **Name** | **Definition** | **Formula** |
| Order of Operations | You need to know the order of operations to solve equations. To remember the order of operations, use the acronym PEMDAS. | |  |  | | --- | --- | | **P** | **P**arentheses | | **E** | **E**xponents | | **MD** | **M**ultiplication and **D**ivision (left-to-right) | | **AS** | **A**ddition and **S**ubtraction (left-to-right) |   Within each level, evaluate left to right. |
| Quadratic Equation | Any equation containing one term in which the unknown variable is squared and no term in which it is raised to a higher power. | Standard Form: , where  Vertex Form:  Factored Form: a form in which a quadratic equation is expressed as a product of two algebraic expressions    * Other forms of factors are , , and * where and are constants |
| Perfect Squares | A number obtained from squaring an integer (multiplying a number by itself). | |  |  | | --- | --- | |  |  | | 0 | 0 | | 1 | 1 | | 2 | 4 | | 3 | 9 | | 4 | 16 | | 5 | 25 | | 6 | 36 | | 7 | 49 | | 8 | 64 | | 9 | 81 | | 10 | 100 | | 11 | 121 | | 12 | 144 | |
| Zero Product Property | A property stating that if the product of two expressions or quantities is equal to zero, then at least one of the expressions or quantities is equal to zero. | If then , , or both and ar zero. |
| Solutions of Quadratic Equations | Quadratic equations contain a variable that is squared. The result of having a squared variable is that every quadratic equation has either zero, one, or two solutions. | Once you have rewritten the quadratic equation into a form in which one side is only a squared variable and the other side is only a numeric expression then:   * If the numeric expression is less than zero, there are no solutions. * If the numeric expression is equal to zero, there is one solution. * If the numeric expression is greater than zero, there are two solutions. |
| Perfect Square Trinomial | A trinomial that follows a specific pattern and can be written as a square of a binomial. | * The first and last terms of the trinomial are positive perfect squares. * The middle term ( or ) is twice the product of and . |
| Difference of Two Squares | If there are only two terms that are perfect squares, and they are separated by a minus sign, it can be written as a difference of two squares. |  |
| Completing the Square | Completing the square is a method of factoring. The process makes an expression into a perfect square trinomial and can be used to solve a quadratic equation. | Starting from the standard form of a quadratic equation, , follow these steps:   1. Move the constant term, , to the right side of equation: 2. Divide the coefficient of the middle term, , by 2, then square the quotient: 3. Add the number to both sides of the equation: 4. Simplify and factor. |
| Quadratic Formula | A formula that gives the solutions of any quadratic equation in standard form. | where , , and are from the standard form of a quadratic equation: |
| Discriminant of a Parabola | In the quadratic formula, is known as the discriminant of a parabola. The discriminant is used to determine what type of solutions a quadratic equation has. | * If is positive, then there are two solutions * If is zero, then there is one solution * If is negative, then there are no solutions |
| Key Features of a Parabola | When you pot points using a quadratic equation, the graph is a parabola. It is shaped like an upward or downward U.  There are four key parts of a parabola: the axis of symmetry, the vertex, the zero(s), and the *y*-intercept. |  |
| Vertex Form of a Quadratic Equation | When a quadratic equation is in vertex form, the axis of symmetry and vertex are easily identifiable. | * Axis of Symmetry: * Vertex: |