SOFTWARE & TECH

Math Formulas To Know For Gre

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Mastering the GRE Quantitative Section: Essential Math Formulas To Know For GRE Success

The Graduate Record Examination (GRE) can feel like a daunting hurdle on your path to graduate school. While the verbal and analytical writing sections test your vocabulary and reasoning, the Quantitative Reasoning section often stirs the most anxiety. How do you solve complex problems quickly without a calculator for most of the section? The answer lies in preparation and recall. Knowing the right **math formulas to know for GRE**success is not just about memorization; it is about building a toolkit that allows you to approach any problem with speed and confidence. This guide breaks down the essential formulas, organized by topic, to help you achieve a high quant score.

The GRE Quantitative section tests basic math skills, your understanding of elementary mathematical concepts, and your ability to reason quantitatively. It does not test advanced calculus or trigonometry. However, it demands fluency in arithmetic, algebra, geometry, and data analysis. By internalizing the core formulas, you free up cognitive resources to focus on strategy and logic, which are often the deciding factors between a good score and a great one. Let's dive into the specific formula categories you need to master.

Arithmetic and Number Properties

These are the foundational building blocks. Many problems on the GRE test your ability to manipulate numbers and understand their relationships.

Before any formula, you must master the order of operations. The GRE loves to test whether you can correctly simplify an expression. Remember **Parentheses, Exponents, Multiplication and Division (from left to right), Addition and Subtraction (from left to right)**. A common trick is a problem like $3 + 5 \times 2$. The correct answer is 13 (multiplication first), not 16.

Knowing the difference between odd and even numbers, positive and negative integers, and prime numbers is crucial.

- Even + Even = Even; Odd + Odd = Even; Even + Odd = Odd.
- Even × Even = Even; Odd × Odd = Odd; Even × Odd = Even.
- Prime Numbers: A number greater than 1 that has no positive divisors other than 1 and itself. The first few primes (2, 3, 5, 7, 11) are essential. Remember that 2 is the only even prime number and 1 is not prime.
- Divisibility Rules: A number is divisible by 3 if the sum of its digits is divisible by 3. A number is divisible by 9 if the sum of its digits is divisible by 9. A number is divisible by 5 if it ends in 0 or 5.

These are the bread and butter of the GRE. You must be able to convert between them effortlessly.

- Percent to Decimal: Move the decimal point two places to the left. (e.g., 35% = 0.35)
- Decimal to Percent: Move the decimal point two places to the right. (e.g., 0.08 = 8%)
- Percent Change: This is a critical formula. It is (New Value - Original Value) / Original Value × 100%. A positive result indicates a percent increase, while a negative result indicates a percent decrease.
- Simple Interest: Interest = Principal × Rate × Time. This is a straightforward formula, but make sure the rate and time are in the same units (e.g., annual rate for years).

Algebra and Equation Solving

Algebra on the GRE is not about abstract theory; it is about setting up and solving equations quickly.

The most basic form is **y = mx + b**, where *m* is the slope and *b* is the y-intercept. The slope is calculated as **m = (y , - y •) / (x , - x •)**. Understanding how to find the equation of a line given two points or given a point and a slope is a must.

The general form is **ax² + bx + c = 0**. You will often need to factor these or use the quadratic formula.

- Factoring: Find two numbers that multiply to c and add to b. For example, $x^2 + 5x + 6 = (x + 2)(x + 3)$.
- Quadratic Formula: For equations that are hard to factor, use x = [-b ± " (b² - 4ac)] / 2a.
- Difference of Squares: This pattern appears constantly: $a^2 - b^2 = (a + b)(a - b)$. Memorize this.
- Perfect Square Trinomials: $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$.

You will encounter problems with two equations and two variables. The key methods are **substitution** (solving for one variable and plugging into the other equation) and **elimination**(adding or subtracting the equations to cancel one variable). The GRE often presents these in the context of word problems involving ages, money, or mixtures.

Solid fluency with exponent rules is non-negotiable.

- Product Rule: x C × x G = x } C z G ~
- Quotient Rule: x C / x G = x } C { G ~
- Power Rule: (x C) G = x } C G ~
- Negative Exponents: x { C = 1 / x C
- Fractional Exponents: x } C/ G ~ = G" x C
- Simplifying Radicals: " (ab) = " a × " b and " (a/b) = " a / " b.

Geometry Formulas

Geometry on the GRE is mostly about shapes, lines, and angles. You will not need to write formal proofs, but you will need to calculate lengths, areas, and volumes.

A straight line measures 180 degrees. When two parallel lines are cut by a transversal, specific angle relationships are created (corresponding angles are equal, alternate interior angles are equal). A right angle measures 90 degrees.

Triangles are the most important shape on the GRE.

- Area of a Triangle: Area = ½ × base × height. The height must be perpendicular to the base.
- Sum of Interior Angles: A + B + C = 180°.
- Pythagorean Theorem: For a right triangle, $a^2 + b^2 = c^2$ where c is the hypotenuse (the side opposite the right angle).
- Special Right Triangles: These appear frequently to save you time.

  30-60-90 Triangle: Sides are in the ratio x : x" 3 : 2x.
- 45-45-90 Triangle: Sides are in the ratio x : x : x" 2.

- Area of a Square: side²
- Area of a Rectangle: length × width
- Area of a Parallelogram: base × height
- Area of a Trapezoid: ½ × (base • + base ,) × height

- Area of a Circle: < +
- Circumference of a Circle: 2< " ÷" Àd (diameter)

- Arc Length: (Central Angle / 360°) × 2<
- Area of a Sector: (Central Angle / 360°) × < +

In addition to the line equation above, you need to understand the **midpoint formula**: **[(x • + x ,)/2, (y • + y ,)/2]**. The **distance formula**: **" [(x , - x •)² + (y ,. - y •)²]**. The distance formula is essentially the Pythagorean theorem in disguise.

While less common, you should know these formulas.

- Volume of a Rectangular Solid: length × width × height
- Volume of a Cylinder: < +&€
- Surface Area of a Rectangular Solid: 2lw + 2lh + 2wh
- Surface Area of a Cylinder: 2< +" ² #Àrh

Data Analysis and Statistics

These formulas help you interpret data from charts, tables, and graphs, which make up a significant portion of the quant section.

- Mean (Arithmetic Average): Sum of terms / Number of terms. This is the most common average tested.
- Median: The middle value when the numbers are arranged in order. If there is an even number of terms, it is the average of the two middle terms.
- Mode: The number that appears most frequently in a set.
- Range: The largest value minus the smallest value.
- Weighted Average: Used when different groups have different sizes. Formula: (Sum of all weighted values) / (Total number of items).

You do not need to calculate the standard deviation by hand, but you must understand what it represents. It measures the spread of data points from the mean. A low standard deviation means the data is clustered close to the mean. A high standard deviation means the data is spread out. The GRE often tests this conceptually, asking you to compare the standard deviation of two different data sets.

Probability is the chance of an event occurring.

- Basic Probability: P(event) = Number of favorable outcomes / Total number of possible outcomes. The result is always between 0 and 1.
- Probability of NOT an Event: P(not A) = 1 - P(A).
- Probability of A and B (Independent Events): P(A and B) = P(A) × P(B). This applies when the outcome of one event does not affect the other.
- Probability of A or B (Mutually Exclusive Events): P(A or B) = P(A) + P(B). If the events can overlap, use P(A or B) = P(A) + P(B) - P(A and B).

These formulas are used to determine the number of ways something can occur.

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