GENERAL

# math formulas for the act

Published: September 3, 2026 | Index ID: #-

## Introduction

Preparing for the ACT can feel like navigating a labyrinth of equations and concepts, especially when you're trying to master the math portion. While the test covers a wide range of topics—from basic algebra to advanced trigonometry—having a solid grasp of the **math formulas for the ACT**can dramatically improve your speed and confidence. This article offers a comprehensive, step by step guide that not only lists the essential formulas but also explains how to apply them effectively during the exam. Whether you're a freshman planning ahead or a senior fine tuning your skills, the strategies and resources below will help you turn those intimidating symbols into tools for success.

## Key Math Topics Covered by the ACT

The ACT math section is divided into four main categories, each with its own set of concepts and corresponding formulas:

- Algebra – linear equations, quadratic equations, systems of equations, functions, and inequalities.
- Geometry – properties of shapes, area, volume, and the Pythagorean theorem.
- Trigonometry – right triangle ratios, unit circle relationships, and basic identities.
- Advanced Topics – logarithms, exponents, and a few probability questions.

Understanding the formulas in each area is the first step toward mastering the test. Below, we break down the most frequently encountered equations and show you how to remember them.

## Essential Algebra Formulas

### 1. Solving Linear Equations

Linear equations usually appear in the form ax + b = c. The basic formula to isolate x is:

**Formula:** x = (c - b) / a

Remember to keep the signs straight: subtract b from both sides and then divide by a.

### 2. Quadratic Equations

Quadratics are expressed as ax² + bx + c = 0. The most common method on the ACT is the quadratic formula:

**Formula:** x = [-b ± " (b² - 4ac)] / (2a)

Key tips:

- Always compute the discriminant b² - 4ac first.
- If the discriminant is negative, there are no real solutions—often a trick question.
- Use the "±" symbol to remember that two solutions exist unless the discriminant is zero.

### 3. Systems of Equations

When you have two equations in two variables, you can solve them by substitution or elimination. The elimination method often uses the following formula:

**Formula:** m •x + n •y = p • and m ,x + n ,y = p , !’ solve for y or x by adding or subtracting multiples.

In practice, you’ll usually multiply one equation so the coefficients of one variable match, then add or subtract to eliminate that variable.

### 4. Functions and Exponents

For exponential growth or decay, the ACT often uses:

**Formula:** y = a·b • where a is the initial value, b is the base, and n is the exponent.

To solve for n, take the logarithm of both sides:

**Formula:** n = log_b (y / a)

### 5. Inequalities

When dealing with inequalities, remember that multiplying or dividing by a negative number flips the inequality sign. For example:

**Formula:** If -2x > 6, divide by -2 and flip the sign to get x .

## Geometry Formulas You’ll Need

### 1. Area and Perimeter

- Rectangle: Area = l × w; Perimeter = 2(l + w)
- Triangle: Area = (base × height) / 2; Perimeter = a + b + c
- Circle: Area = < +#° Circumference = 2<
- Parallelogram: Area = base × height

### 2. The Pythagorean Theorem

For right  angled triangles, the relationship between the sides is:

**Formula:** a² + b² = c², where c is the hypotenuse.

On the ACT, you’ll often solve for the missing side or verify a right triangle.

### 3. Volume

- Cylinder: Volume = < +&€
- Sphere: Volume = (4/3)< +0
- Rectangular Prism: Volume = l × w × h

### 4. Coordinate Geometry

Distance between two points (x •, y •) and (x ,, y ,):

**Formula:** " [(x , - x •)² + (y , - y •)²]

Midpoint between the same points:

**Formula:** [(x • + x ,)/2, (y • + y ,)/2]

## Trigonometry Basics for the ACT

### 1. Right  Triangle Ratios

The three core trigonometric ratios are:

- Sine (sin): opposite / hypotenuse
- Cosine (cos): adjacent / hypotenuse
- Tangent (tan): opposite / adjacent

### 2. Unit Circle Values

For common angles (0°, 30°, 45°, 60°, 90°), memorize the sine, cosine, and tangent values:

- 0°: sin = 0, cos = 1, tan = 0
- 30°: sin = 1/2, cos = " 3/2, tan = 1/" 3
- 45°: sin = " 2/2, cos = " 2/2, tan = 1
- 60°: sin = " 3/2, cos = 1/2, tan = " 3
- 90°: sin = 1, cos = 0, tan = undefined

### 3. Basic Trigonometric Identities

These identities help simplify expressions:

- Pythagorean Identity: sin²;, ² 6÷;#¸ = 1
- Double Angle: sin 2;, Ò " 6–ã¸ cos;,Â 6÷2 #¸ = cos²;, b 6–ë#¸

## Advanced Topics: Logarithms and Exponents

### 1. Logarithm Rules

On the ACT, you might see questions involving logs. Remember the core rules:

- Product Rule: log_b (xy) = log_b x + log_b y
- Quotient Rule: log_b (x/y) = log_b x – log_b y
- Power Rule: log_b (x •) = n·log_b x
- Change of Base: log_b x = ln x / ln b

### 2. Exponential Growth and Decay

When dealing with exponential functions, use the base e (Euler's number). The general formula is:

**Formula:** y = a·e^(kt), where k is the growth (positive) or decay (negative) constant.

## Probability and Statistics on the ACT

The math section occasionally includes basic probability questions. Use these quick formulas:

- Probability of an Event: P(A) = favorable outcomes / total outcomes
- Complementary Probability: P(not A) = 1 – P(A)
- Joint Probability: P(A and B) = P(A) × P(B) (if independent)

## Strategies for Using Formulas Under Time Pressure

1. Flashcards: Create a set of flashcards with each formula on one side and an example on the other. Review them daily.
2. Mnemonics: Use memory aids. For example, "Silly Old Cat" for sin = opposite / hypotenuse, cos = adjacent / hypotenuse, tan = opposite / adjacent.
3. Practice with Real Problems: Apply each formula to a variety of practice questions. The ACT test bank is a great resource.
4. Time Management: Allocate a fixed amount of time per question (e.g., 45 seconds). If a problem seems too complex, move on and return if time permits.

5. Check Units: Always verify that your answer's units match the question's requirements.

## Common Mistakes to Avoid

- Sign Errors: Forgetting to flip the inequality sign when multiplying/dividing by a negative number.
- Misreading Trigonometric Ratios: Confusing sine, cosine, and tangent when working with right triangles.
- Ignoring the Discriminant: Skipping the calculation of $b^2 - 4ac$ in quadratic equations can lead to wrong answers.
- Unit Confusion: Mixing up centimeters with meters or inches with feet.


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