

ACT Math Formulas You Should Know

About The ACT Math

The ACT Math tests students on high school math that should be learned between grades 9-11. Unlike the SAT, the ACT Math section does not provide a list of formulas that can be used on the test. Understanding and memorizing the majority of these formulas we've provided in this PDF are vital for success. Print this out for easy studying!

ACT Math Details

- 60 multiple choice questions
- 60 minutes
- Calculator usage is permissible

Content Breakdown

Pre-Algebra (20-25%)

decimals, fractions, integers, place value, square roots, exponents, scientific notation, factors, ratios, proportions, percents, linear equations, statistical charts and graphs

Elementary Algebra (15-20%)

exponents, square roots, algebraic expressions through substitution, using variables to express functional relationships, algebraic operations, quadratic equations by factoring

Intermediate Algebra (15-20%)

quadratic formula, rational and radical expressions, absolute value equations and inequalities, sequences and patterns, functions and modeling, matrices, roots and polynomials, complex numbers, systems of equations, quadratic inequalities

Coordinate Geometry (15-20%)

distance, midpoints, conics, evaluating points and lines on a graph, graphing inequalities, parallel and perpendicular lines

Plane Geometry (20-25%)

properties of circles, triangles, rectangles, parallelograms, and trapezoids, properties and relations of plane figures - angles and parallel lines, transformations, volume, area, three-dimensional geometry

Trigonometry (5-10%)

trig relations in right triangles, values and properties of trig functions, graphing, using identities, and solving trig equations

10 Must-Know ACT Math Formulas

Set up a percentage fraction

$$\frac{\text{part}}{\text{whole}} = \frac{x}{100}$$

This is more of a key concept because it can be applied to a variety of questions. Just rearrange the formula to solve for whatever "x" is.

Standard linear equation

$y = mx + b$. Where m is the slope and b is the y intercept.

This formula will *certainly* be on the test. It may not always be written in this standard form, so just be sure that you understand how to rearrange the equation to make it look like this.

Slope

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

aka

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

This formula is so important we have an entire article dedicated to it! You are going to see this on the test and likely in a variety of ways.

Perimeter of rectangle

$$P = 2l + 2w$$

Area of rectangle

$$A = l \times w$$

Volume of cuboid

$$V = l \times w \times h$$

Circumference of circle

$$C = 2\pi r$$

Area of circle

$$A = \pi r^2$$

Pythagorean theorem

$$a^2 + b^2 = c^2$$

This is one of the *most, most, most* important formulas to know! It's sure to make any appearance on the test, and knowing this will allow you to solve a variety of questions (see distance of a line segment above).

SOHCAHTOA

$$\sin = \frac{\text{length of opposite}}{\text{length of hypotenuse}} \quad \cos = \frac{\text{length of adjacent}}{\text{length of hypotenuse}}$$

$$\tan = \frac{\text{length of opposite}}{\text{length of adjacent}}$$

9 Good-to-Know ACT Math Formulas

Mean (average)

$$\text{Mean} = \frac{\text{sum of all numbers}}{\text{number of numbers}}$$

These questions will appear on the test, and this is a relatively easy formula to memorize.

Probability

$$P = \frac{\text{number of desired outcomes}}{\text{total number of outcomes}}$$

Try to think in terms of percent fraction to help you remember this one.

Factorials

! = multiply number by each smaller whole number down to one.

Sometimes (but not always!) they remind you in the question what a factorial is.

Mid point

$$\text{Mid Point} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

You will probably see a question dealing with the midpoint of a line. This is listed under "good to know" rather than "need to know" because if you think about it, you are basically taking the average of the x and y coordinates, so thinking about this intuitively might be better than pure memorization.

Length of a line segment

$$L = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

This is good to know, but if you are crunched for time studying you can skip memorizing this and simply graph the coordinates; set up a right triangle and solve for the hypotenuse to get the answer. The downside with this method, however, is that it will take longer to answer this type of question come test time!

Area of a triangle

$$A = \frac{1}{2}bh$$

Surface area of cuboid

$$\text{TSA} = 2(lw + wh + hl)$$

Volume of a sphere

$$V = \frac{4}{3} \pi r^3$$

Special triangles

- 3/4/5

A triangle with sides of 3, 4, and 5 will always be a right triangle, even if the problem does not explicitly state it.

- 45°/45°/90°

In these triangles, the ratio of sides will be $1:1:\sqrt{2}$ always be with $\sqrt{2}$ corresponding to the hypotenuse.

- 30°/60°/90°

In these triangles, the ratio of sides will be $1:2:\sqrt{3}$ always be, with "2" corresponding to the hypotenuse.

* Knowing these shortcuts will help you save time on the test!

Some Other Formulas to Keep in Mind

Geometric and arithmetic sequences

Arithmetic: $a_n = a_1 + d(n-1)$. Where a_n is the n^{th} term of the series, a_1 is the first number of the series, and d is the difference between the numbers.

Geometric: $a_n = a_1 \times r^{n-1}$. Where a_n is the n^{th} term of the series, a_1 is the first term in the series, and r is the factor that you multiply by in order to progress from one term to the next.

If you are aiming to get every point possible, more difficult series questions will appear toward the end of the test that would benefit from these formulas.

Permutations and combinations

Permutations: $\frac{n!}{(n-r)!}$

Combinations: $\frac{n!}{r!(n-r)!}$

Again, like the series formulas, questions requiring these formulas will only account for a point or two on the test.

Quadratic equation

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

This is of lower priority than other formulas because most of the time you can factor the quadratic. However, if a question asks about imaginary numbers with quadratics, then knowing this equation is essential to solving the problem.

Equation of a circle

$(x - h)^2 + (y - k)^2 = r^2$. Where (h, k) are the center coordinates of the circle.

Usually there is only one question on the test that requires this formula.

Area of a trapezoid/parallelogram

$$A = \frac{a+b}{2}h$$

A trick here is to make triangles and solve the "pieces" of the trapezoid.

Volumes cones and cylinders

Cone: $Volume = \pi r^2 \frac{h}{3}$

Cylinder: $Volume = \pi r^2 h$

Length of chord

$$\text{chord length} = 2r \sin\left(\frac{1}{2}\theta\right)$$

Area of sector

$$A = \pi r^2 \times \frac{\theta}{2\pi}$$

Law of cos and sine

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

If you see a trigonometry question that can't be answered knowing SOHCAHTOA, then you will probably need to know these formulas, but they don't come up often.

