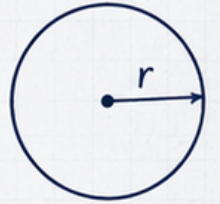
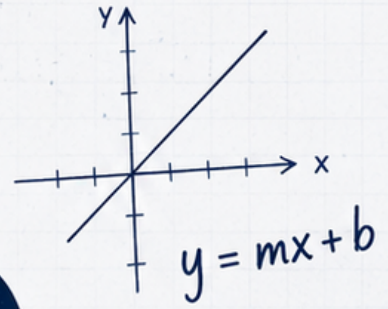




SUCCESS
STARTS
WITH
PREPARATION



Your Formulas.
Your Success.



$$A = \pi r^2$$

%

GEOMETRY
ALGEBRA
DATA ANALYSIS
& MORE!

GED MATH

FORMULA REVIEW



ESSENTIAL
FORMULAS



COVER ALL
TOPICS



QUICK
REFERENCE



PASS
WITH CONFIDENCE

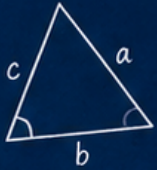
Review. Remember. Succeed.

CLEAR.
CONCISE.
COMPLETE.



$$A = lw$$

$$C = 2\pi r$$



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

$$y = mx + b$$

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



$$\bar{x} = \frac{\sum x}{n}$$

- ✓ Numbers & Operations
- ✓ Algebra
- ✓ Geometry
- ✓ Measurement
- ✓ Data Analysis
- ✓ Problem Solving



GED MATH

Formula Review Guide

GED Math foundations plus the Algebra 1 formulas students need for GED Mathematical Reasoning: equations, graphs, geometry, data, and word problems.

Formula Snapshot

GEOMETRY

$$A_{\Delta} = \frac{1}{2}bh, \quad a^2 + b^2 = c^2$$

area and right triangles

ALGEBRA

$$y = mx + b, \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

lines and quadratics

DATA

$$\text{mean} = \frac{\text{sum}}{\text{count}}$$

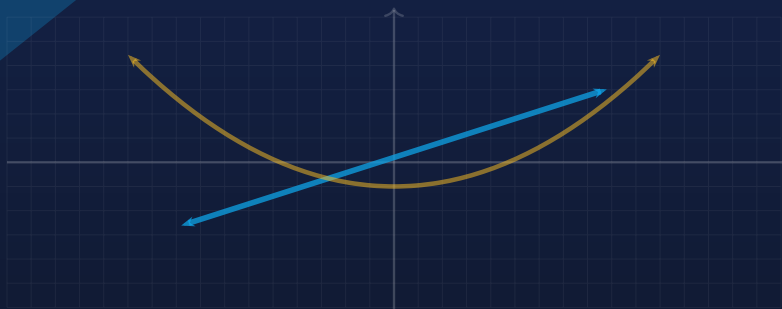
summaries and probability

GED Test Focus

Official Sheet + Must-Know Extra

Word-Problem Ready

Basic Math • Geometry • Algebra • Graphs & Functions • Data • Probability



Welcome to the GED Math Formula Review

GED Math starts with strong Pre-Algebra: number sense, fractions, decimals, percents, ratios, integers, units, geometry, and data. This guide keeps that full base and then adds the Algebra 1 formulas GED students need for equations, graphs, functions, polynomials, quadratics, and word problems.

USE FIRST Formula

Read the rule before starting practice.

WATCH FOR Restrictions

Denominators, signs, units, and the correct whole matter.

THEN TRY Example

Check one worked example before doing ten problems.

FINISH WITH Practice

Scan the hub when a topic needs another pass.



HOW TO STUDY

Use this guide in loops: review the base formula, study the GED algebra add-on, then try a mixed GED-style problem. When a formula is given on the test, your job is still to recognize it, label the quantities, match units, substitute carefully, and check whether the answer makes sense.

How to read every section Each topic uses the same color-coded blocks.

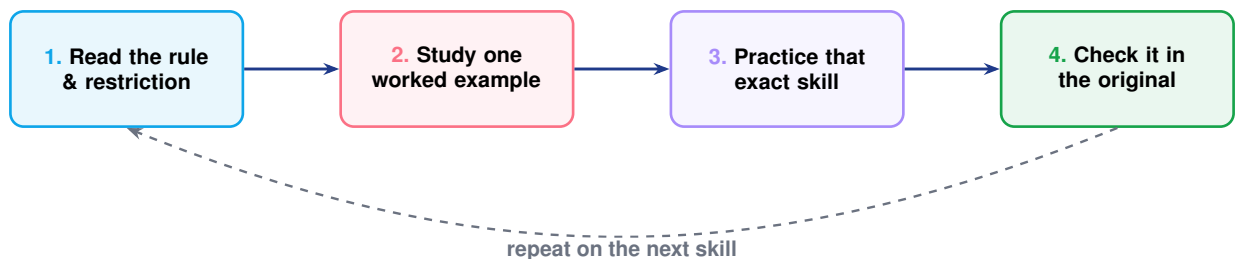
Formula table
the rules

Tutor's Note
plain English

Example
worked problem

Visual
see the idea

The study loop Run this cycle on each skill until it feels automatic.



What's Inside

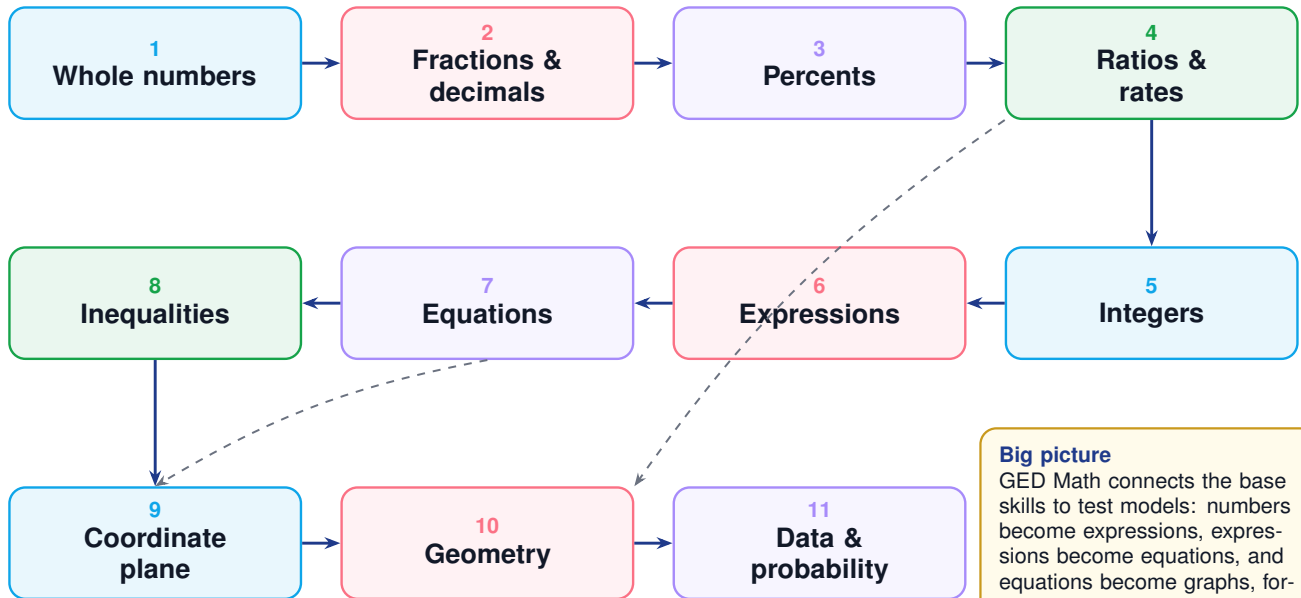
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Each section pairs the **formula** with a plain-English **Tutor's Note**, a worked example, and quick watch-outs.



GED Math Formula Roadmap

GED Math starts with Pre-Algebra fluency, then adds the Algebra 1 formulas that appear in GED Mathematical Reasoning. Move from number sense into equations, graphs, geometry, data, and word-problem models.



Big picture
 GED Math connects the base skills to test models: numbers become expressions, expressions become equations, and equations become graphs, formulas, and word-problem decisions.



If an algebra step feels hard, check the earlier skill: signs, fractions, order of operations, or choosing the correct whole in a percent problem.

Every number lives on the number line Whole numbers, integers, fractions, and decimals are all points on one line — negatives to the left of 0, positives to the right.



1 Whole Numbers, Properties & Order

Number rules

Place value

A digit's value depends on its position: ones, tens, hundreds, tenths, hundredths, and so on.

Order of operations

Parentheses, exponents, multiply or divide left to right, then add or subtract left to right.

Commutative property

$$a + b = b + a \text{ and } ab = ba.$$

Associative property

$$(a + b) + c = a + (b + c) \text{ and } (ab)c = a(bc).$$

Distributive property

$$a(b + c) = ab + ac.$$

Identity properties

$$a + 0 = a \text{ and } a \cdot 1 = a.$$

Inverse properties

$$a + (-a) = 0 \text{ and } a \cdot \frac{1}{a} = 1 \text{ when } a \neq 0.$$

Tutor's Note

Order of operations keeps everyone evaluating expressions the same way. Multiplication and division are a team: do whichever appears first from left to right. Addition and subtraction work the same way.

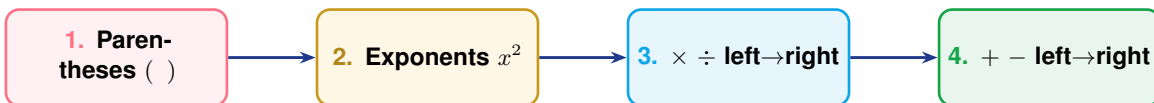
Example: $18 - 3(2 + 4)^2 \div 6$. Parentheses: 6. Exponent: 36. Multiply/divide: $3 \cdot 36 \div 6 = 18$. Then $18 - 18 = 0$.



PEMDAS

PEMDAS does not mean all multiplication before all division. Work multiplication and division left to right.

Order of operations (PEMDAS) Work top to bottom, but multiply/divide share a step (left to right) and so do add/subtract.



2 Factors, Multiples & Number Types

Factors and number sense

Factor	A whole number that divides another whole number evenly.
Multiple	A result of multiplying a number by a whole number.
Prime number	A whole number greater than 1 with exactly two factors: 1 and itself.
Composite number	A whole number greater than 1 with more than two factors.
GCF	Greatest common factor: the largest factor shared by numbers.
LCM	Least common multiple: the smallest positive multiple shared by numbers.
GCF-LCM connection	For positive integers a, b : $\text{gcd}(a, b) \cdot \text{lcm}(a, b) = ab$.
Divisibility: 2, 5, 10	By 2 if even; by 5 if ending in 0 or 5; by 10 if ending in 0.
Divisibility: 3, 4, 6, 9	By 3 or 9 if the digit sum is divisible by 3 or 9; by 4 if the last two digits form a multiple of 4; by 6 if divisible by 2 and 3.

Tutor's Note

GCF helps you simplify and factor. LCM helps you build common denominators. Prime factorization is the cleanest way to find both.

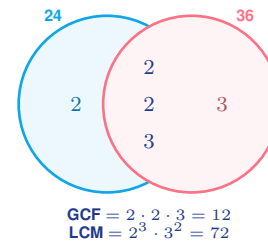
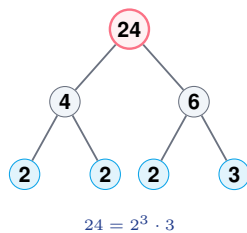
$24 = 2^3 \cdot 3$ and $36 = 2^2 \cdot 3^2$. $\text{GCF} = 2^2 \cdot 3 = 12$ and $\text{LCM} = 2^3 \cdot 3^2 = 72$.

Example



Zero is a multiple of every nonzero whole number, but it is not used as the least positive common multiple.

Prime factor trees & the GCF/LCM Venn Break each number into primes, then share them: the overlap is the GCF and the whole picture is the LCM.



3 Fractions & Mixed Numbers

Fraction operations

Equivalent fractions	$\frac{a}{b} = \frac{ak}{bk}$ when $b \neq 0$ and $k \neq 0$.
Simplify	$\frac{a}{b}$ is simplified by dividing numerator and denominator by their GCF, with $b \neq 0$.
Add/subtract	$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$, with $b, d \neq 0$.
Multiply	$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$, with $b, d \neq 0$.
Divide	$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$, with $b, c, d \neq 0$.
Reciprocal	The reciprocal of $\frac{a}{b}$ is $\frac{b}{a}$, with $a, b \neq 0$.
Mixed to improper	$a\frac{b}{c} = \frac{ac + b}{c}$ for positive mixed numbers; keep a negative sign outside until the end.
Part of a whole	A fraction $\frac{a}{b}$ means a parts out of b equal parts.

Tutor's Note

To add or subtract fractions, the denominators must name the same size pieces. To multiply, go straight across. To divide, keep the first fraction, change division to multiplication, and flip the second fraction.

$$\frac{2}{3} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6} = \frac{9}{6} = \frac{3}{2} = 1\frac{1}{2}.$$

Example

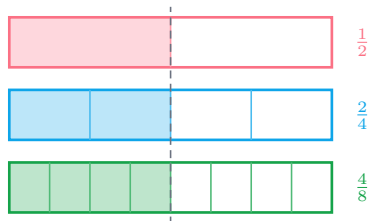


DENOMINATORS

A denominator can never be 0. Division by zero is undefined.

Fraction models: equivalent fractions

The same amount can be cut into more, smaller pieces. Each bar below is shaded *half*, so $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$.

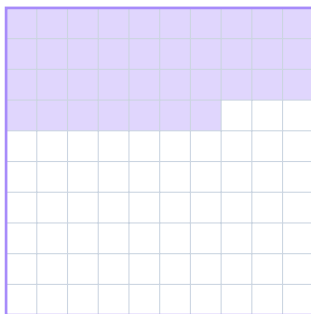


4 Decimals, Percents & Money Math

Decimal and percent formulas

Add/subtract decimals	Line up the decimal points, then add or subtract as usual.
Multiply decimals	Multiply as whole numbers, then place the point so the answer has the total number of decimal places.
Divide decimals	Move both decimals right until the divisor is whole, then divide.
Decimal to percent	Move the decimal two places right: $0.37 = 37\%$.
Percent to decimal	Move the decimal two places left: $85\% = 0.85$.
Percent to fraction	$p\% = \frac{p}{100}$, then simplify if possible.
Percent equation	part = percent · whole, using percent as a decimal.
Percent change	$\frac{\text{new} - \text{old}}{\text{old}} \cdot 100\%$, where $\text{old} \neq 0$.
Simple interest	$I = Prt$ and $A = P + I = P(1 + rt)$.
Tax / tip / markup	Total = original amount $\times (1 + r)$, where r is the rate as a decimal.
Discount / markdown	Sale price = original price $\times (1 - r)$, where r is the discount rate.

Percent means “out of 100” Shade a 10×10 grid: each little square is 1%. The same value is a fraction over 100 and a decimal.



$$37\% = 0.37 = \frac{37}{100}$$

Percent bar: part = percent \times whole



$$0.25 \times 80 = 20$$

Tutor's Note

The most common percent mistake is choosing the wrong whole. The whole is the original or total amount that the percent is based on.



A jacket costs \$80 and is discounted 25%. Discount = $0.25(80) = 20$, so the sale price is \$60. **Example**



MONEY

Round money to the nearest cent only at the end unless the problem tells you to round earlier.

5 Ratios, Rates & Proportions

Proportion tools

Ratio	$a : b$, a to b , and $\frac{a}{b}$ all compare two quantities.
Rate	A ratio with different units, such as miles per hour.
Unit rate	A rate with denominator 1.
Proportion	$\frac{a}{b} = \frac{c}{d}$ means $ad = bc$, with $b, d \neq 0$.
Scale factor	scale factor = $\frac{\text{new length}}{\text{original length}}$.
Similar figures	Corresponding side lengths are proportional and corresponding angles match. $y = kx$, where $k = \frac{y}{x}$ when $x \neq 0$.
Constant of proportionality	A proportional relationship graphs as a straight line through $(0, 0)$.
Proportional graph	
Unit price	unit price = $\frac{\text{total cost}}{\text{number of units}}$.
Distance, rate, time	$d = rt$; so $r = \frac{d}{t}$ and $t = \frac{d}{r}$.
Percent proportion	$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$, with whole $\neq 0$.

Tutor's Note

A proportion is two equal ratios. Cross-multiplication works because multiplying both sides by the denominators clears the fractions.

If 3 notebooks cost \$7.50, the unit rate is $7.50 \div 3 = \$2.50$ per notebook. **Example**

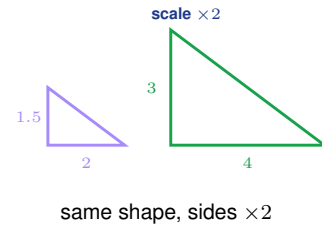
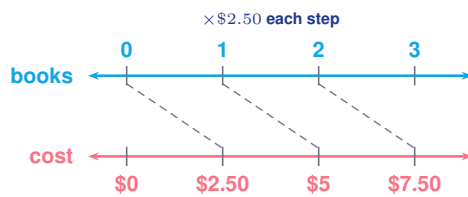


UNITS

Ratios compare. Rates compare with units. Keep units attached until the answer makes sense.



Ratio tables & similar figures Scale both quantities by the same number and the ratio stays the same.



6 Integers & Absolute Value

Signed number rules

Add same signs

Add absolute values and keep the common sign.

Add different signs

Subtract absolute values and keep the sign of the number farther from 0.

Subtract

$$a - b = a + (-b).$$

Multiply/divide signs

Same signs give positive; different signs give negative.

Zero pairs

$$a + (-a) = 0; \text{ opposites cancel in addition.}$$

Absolute value

$|a|$ is the distance from 0, so $|a| \geq 0$.

Opposites

a and $-a$ are the same distance from 0 in opposite directions.

Coordinate distance on a line

Distance between a and b is $|a - b|$.

Tutor's Note

For multiplying or dividing, count negatives: an even number of negative signs gives a positive result; an odd number gives a negative result.

$-7 + 12 = 5$ because the signs are different, so subtract $12 - 7$ and keep the sign of 12.

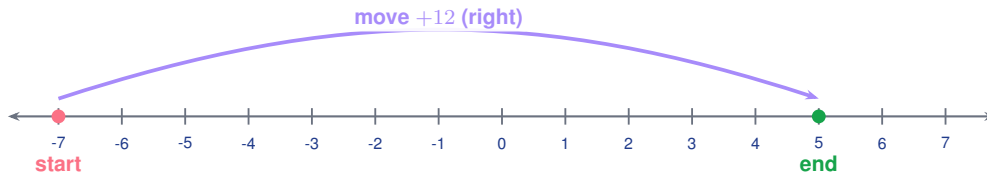
Example



Do not treat subtraction like multiplication. For $5 - (-3)$, add the opposite:
 $5 + 3 = 8$.



Adding integers on a number line Start at the first number, then *move*: right to add a positive, left to add a negative.



$-7 + 12 = 5$. The two points are $|-7 - 5| = 12$ apart.

7 Expressions, Equations & Inequalities

Algebra basics

Expression

Numbers, variables, and operations without an equals sign.

Equation

A statement that two expressions are equal.

Evaluate

Substitute a number for a variable and simplify.

Substitution

Replace a variable with a given value, then use order of operations.

Combine like terms

Add/subtract coefficients of terms with the same variable part.

Distribute

$$a(b + c) = ab + ac.$$

One-step equation

$$x + a = b \Rightarrow x = b - a \text{ and } ax = b \Rightarrow x = \frac{b}{a} \text{ when } a \neq 0.$$

Two-step equation

For $ax + b = c$, subtract b first, then divide by a when $a \neq 0$.

Inequality rule

If multiplying or dividing by a negative number, flip the inequality symbol.

Tutor's Note

Solving means keeping the equation balanced while isolating the variable. Whatever you do to one side, do to the other side.

Solve $3x + 5 = 20$. Subtract 5: $3x = 15$. Divide by 3: $x = 5$.

Example

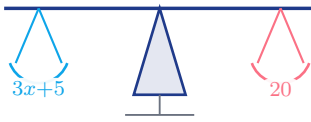


CHECK

A solution should make the original equation true. For inequalities, test a number in the solution region if you are unsure.



An equation is a balance scale Whatever you do to one side, do to the other, and the scale stays level until x is alone.



Solve $3x + 5 = 20$:

1. Subtract 5 from *both* sides: $3x = 15$.
2. Divide *both* sides by 3: $x = 5$.
3. Check: $3(5) + 5 = 20$. ✓

8 Exponents, Roots & Scientific Notation

Powers and roots

Exponent meaning

a^n means multiply a by itself n times for positive integer n .

Product of powers

$$a^m \cdot a^n = a^{m+n}$$

Power of a power

$$(a^m)^n = a^{mn}$$

Power of a product

$$(ab)^n = a^n b^n$$

Power of a quotient

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n} \text{ when } b \neq 0.$$

Quotient of powers

$$\frac{a^m}{a^n} = a^{m-n} \text{ when } a \neq 0.$$

Zero exponent

$$a^0 = 1 \text{ when } a \neq 0.$$

Negative exponent

$$a^{-n} = \frac{1}{a^n} \text{ when } a \neq 0.$$

Square root

$$\sqrt{x} = a \text{ means } a^2 = x \text{ and } a \geq 0.$$

Cube root

$$\sqrt[3]{x} = a \text{ means } a^3 = x.$$

Perfect squares

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, ... are squares of whole numbers.

Perfect cubes

1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, ... are cubes of whole numbers.

Scientific notation

$a \times 10^n$, where $1 \leq a < 10$ and n is an integer.

Powers of ten

Multiplying by 10^n moves the decimal n places right if $n > 0$ and left if $n < 0$.



Tutor's Note

Scientific notation keeps very large and very small numbers readable. The exponent on 10 tells how many places the decimal moved.

$0.00042 = 4.2 \times 10^{-4}$ because the decimal moves 4 places right to make 4.2.

Example



ROOTS

The square root symbol means the principal, nonnegative square root. So $\sqrt{49} = 7$, not ± 7 .

Exponents & scientific notation The exponent counts how many times the base is multiplied. Scientific notation moves the decimal so one nonzero digit sits in front.

base → 2 3 — exponent

$$= 2 \cdot 2 \cdot 2 = 8$$

$$4200 = 4.2 \times 10^3$$

3 places left

$$0.0042 = 4.2 \times 10^{-3}$$

3 places right

Power checkpoint Before graphing, make exponents automatic.

Same base

$2^3 \cdot 2^4 = 2^7 = 128$. Add exponents when multiplying.

Square roots

$\sqrt{64} = 8$ because $8^2 = 64$. Use the principal root.

Power of a power

$(x^2)^5 = x^{10}$. Multiply the exponents.

Perfect squares

Know 1^2 through 15^2 ; they make roots and geometry faster.

Scientific form

$0.0063 = 6.3 \times 10^{-3}$. Small decimals use negative powers.

Fast check

If the answer gets huge, the exponent should usually be positive. If it gets tiny, negative.



9 Coordinate Plane & Linear Patterns

Graphing basics

Ordered pair

(x, y) gives horizontal movement first, vertical movement second.

Quadrants

I: (+, +), II: (-, +), III: (-, -), IV: (+, -).

Slope

$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}, \text{ with } x_2 \neq x_1.$$

Rate of change

Another name for slope: how much y changes for each 1 unit of x .

y -intercept

The point where a graph crosses the y -axis.

x -intercept

The point where a graph crosses the x -axis.

Linear pattern

$y = mx + b$, where m is slope and b is the y -intercept.

Direct variation

$y = kx$ is a proportional linear pattern through the origin.

Horizontal line

$y = c$ has slope 0.

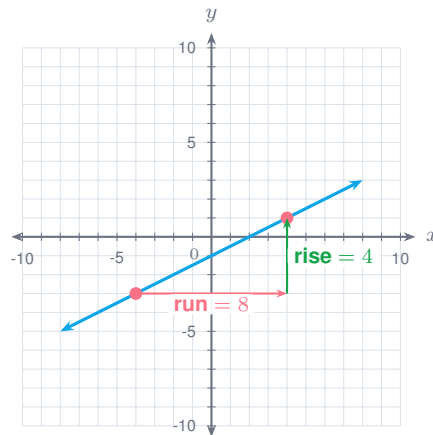
Vertical line

$x = c$ has undefined slope.

Tutor's Note

The coordinate plane is a map. The x -axis moves left and right; the y -axis moves down and up. Slope tells how much y changes for each 1 step in x .

Visual: slope is rise over run





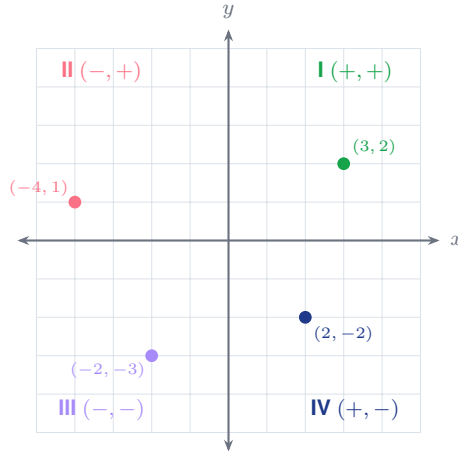
GRAPH

A vertical line fails the function test because one input has many outputs.

The coordinate plane: quadrants & plotting

An ordered pair (x, y) moves right/left first, then up/down.

The signs tell you the quadrant.



GED graph formula route

Match the representation before calculating.

Two points

Use slope first, then find the intercept.

Table

Check whether the change in y is constant for equal changes in x .

Equation

Identify m and b , or set one variable to 0 for intercepts.

Word problem

Treat slope as a unit rate and the intercept as the starting amount.

Mini-formulas GED students use on graphs

Slope from points

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

If the run is negative, keep the sign in the denominator.

Line from a graph

Find m from two clear grid points, then read where the line crosses the y -axis.

Intercepts

For an x -intercept, set $y = 0$. For a y -intercept, set $x = 0$.

Prediction

Substitute the given x or y value, then check whether the answer fits the graph scale.



Common GED graph traps Fix these before selecting an answer.

Scale

Count by the axis labels, not just by grid boxes.

Sign

A line that falls left to right has a negative slope.

Units

Slope often means per hour, per mile, or per item.

Answer type

Decide whether the question asks for a point, rate, intercept, or estimate.

Final GED check: mark the input, output, rate, and units before choosing an answer.



Graphing checkpoint Read the plane like a map: horizontal first, vertical second.

Ordered pair

$(-4, 3)$ means left 4, then up 3. The x -move comes first.

Quadrant signs

I (+, +), II (-, +), III (-, -), IV (+, -).

Slope

$m = \frac{\text{rise}}{\text{run}}$. Up/right is positive; down/right is negative.

Intercepts

y -intercept: where the graph crosses the y -axis. x -intercept: where it crosses the x -axis.

Line patterns

$y = mx + b$ shows slope m and starting value b .

Fast check

A vertical line has undefined slope because its run is 0.

Table pattern

Equal x -steps with equal y -changes show a linear pattern.

Rate meaning

Slope units come from the axis labels, such as dollars per hour.

GED answer check

Estimate from the graph before choosing an answer.

Use this order on GED graph questions:

Read the labels

Decide what x , y , slope, and intercept mean in the problem.

Check the scale

Axes may count by 2, 5, 10, 100, or decimals.

Find anchor points

Use clear grid points before estimating slope or intercepts.

Connect to algebra

A line, table, equation, and word model can all describe the same relationship.

GED graph formula mini-review:

Slope from points

$m = \frac{y_2 - y_1}{x_2 - x_1}$; subtract in the same order.

Intercepts

In $Ax + By = C$, set $x = 0$ for the y -intercept and $y = 0$ for the x -intercept.

Table example

If x goes 0, 2, 4 and y goes 3, 7, 11, then $m = 2$ and $y = 2x + 3$.

Function value

$f(5)$ means use $x = 5$ in the rule or read the output when input is 5.

Common GED graph traps:

Wrong scale

Count the grid marks before reading a point.

Wrong direction

A negative slope falls from left to right, even if both points are positive.

Wrong variable

The horizontal axis usually gives the input, time, or quantity chosen.

Wrong answer type

A graph may ask for a rate, an intercept, a coordinate, or a prediction.

30-second GED graph workout:

From a table

Use two clean rows to find slope, then check every row.

From a line

Pick two grid points, count rise and run, then simplify the slope.

From $y = mx + b$

Name the starting value b and rate m before substituting.

From words

Decide whether the graph is about cost, time, distance, score, or quantity.

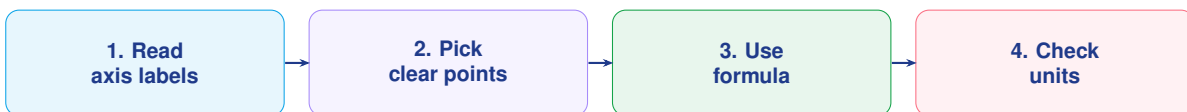
Prediction

Substitute the new input or extend the constant rate.

Reasonableness

The answer should match the graph direction and the axis units.

Mini mixed example: A gym charges \$18 to join and \$7 per visit, so $C = 7v + 18$. The graph starts at 18, rises by 7 each visit, and the point $(4, 46)$ means 4 visits cost \$46.

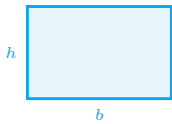


10 Geometry & Measurement

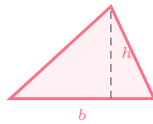
Plane geometry

Rectangle perimeter	$P = 2l + 2w.$
Rectangle area	$A = lw.$
Square perimeter / area	$P = 4s$ and $A = s^2.$
Triangle area	$A = \frac{1}{2}bh.$
Parallelogram area	$A = bh.$
Trapezoid area	$A = \frac{1}{2}(b_1 + b_2)h.$
Circle circumference	$C = 2\pi r = \pi d.$
Circle area	$A = \pi r^2.$
Pythagorean theorem	$a^2 + b^2 = c^2$ for right triangles, where c is the hypotenuse.

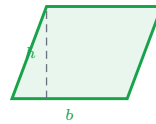
Area formulas you can see Area is the flat space inside a figure; the height is always perpendicular to the base.



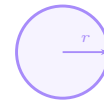
Rectangle
 $A = bh$



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



Parallelogram
 $A = bh$



Circle
 $A = \pi r^2$

Geometry checkpoint Name the measurement before choosing a formula.

Perimeter

Add side lengths around the outside. Units stay linear.

Circles

$C = 2\pi r = \pi d$ and $A = \pi r^2$. Diameter is twice the radius.

Area

Covering a flat region uses square units. Rectangle: $A = lw$.

Pythagorean check

Use $a^2 + b^2 = c^2$ only for right triangles; c is the hypotenuse.

Triangle area

$A = \frac{1}{2}bh$. The height must be perpendicular to the base.

Fast check

Area and volume answers should include square or cubic units.



Solid geometry: volume & surface area

Rectangular prism

$$V = lwh; \text{ surface area } SA = 2lw + 2lh + 2wh.$$

Cube

$$V = s^3; \text{ surface area } SA = 6s^2.$$

Cylinder

$$V = \pi r^2 h; \text{ surface area } SA = 2\pi r^2 + 2\pi rh.$$

Triangular prism

$$V = \left(\frac{1}{2}bh\right)L; \text{ SA} = \text{two triangle ends} + \text{three rectangle faces.}$$

Cone

$$V = \frac{1}{3}\pi r^2 h.$$

Pyramid

$$V = \frac{1}{3}(\text{base area})h.$$

Sphere

$$V = \frac{4}{3}\pi r^3; \text{ surface area } SA = 4\pi r^2.$$

Surface area idea

Add the areas of every outside face or curved surface; nets help organize the faces.

Tutor's Note

Area is measured in square units because it covers a flat region. Volume is measured in cubic units because it fills space. Make sure all measurements use the same unit before using a formula.

Example

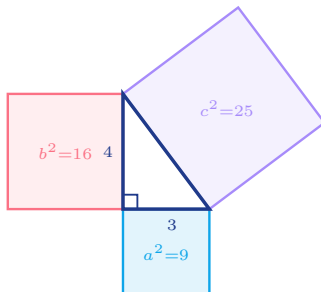
A triangle with base 10 cm and height 7 cm has area $A = \frac{1}{2}(10)(7) = 35$ square centimeters.



GEOMETRY

For the Pythagorean theorem, c is always the longest side, across from the right angle.

The Pythagorean theorem: $a^2 + b^2 = c^2$ For a right triangle, the square built on the hypotenuse equals the two squares on the legs added together.



The legs are $a = 3$ and $b = 4$, so $c^2 = a^2 + b^2 = 9 + 16 = 25$, which gives $c = \sqrt{25} = 5$.

The hypotenuse c is always the longest side, opposite the right angle.



11 Measurement & Unit Conversions

Customary (U.S.) units

Length

12 in = 1 ft; 3 ft = 1 yd; 5280 ft = 1 mi.

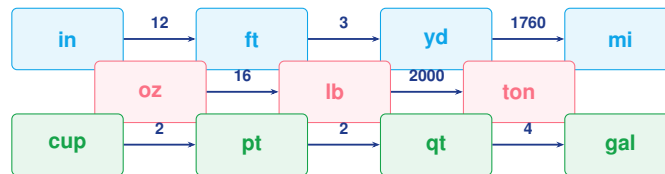
Weight

16 oz = 1 lb; 2000 lb = 1 ton.

Capacity

8 fl oz = 1 cup; 2 cups = 1 pt; 2 pt = 1 qt; 4 qt = 1 gal.

Unit conversion checkpoint Write the unit you want to cancel on the bottom.



Length path

1 yd = 3 ft and 1 ft = 12 in, so
2 yd = 72 in.

Fraction setup

$5 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}}$: feet cancel.

Weight path

1 lb = 16 oz; multiply pounds by 16 to
get ounces.

Reasonableness

Smaller units make larger numbers;
larger units make smaller numbers.

Capacity path

1 gal = 4 qt = 8 pt = 16 cups.

Fast check

Keep units attached until the final
answer. They show whether the setup
is right.

Try it 4 ft = 48 in 3 lb = 48 oz 2 gal = 8 qt = 32 cups Smaller units make the number larger.



Metric units & time

Metric length

10 mm = 1 cm; 100 cm = 1 m; 1000 m = 1 km.

Metric mass

1000 mg = 1 g; 1000 g = 1 kg.

Metric capacity

1000 mL = 1 L.

Metric prefixes

kilo = 1000, hecto = 100, deca = 10, deci = $\frac{1}{10}$, centi = $\frac{1}{100}$, milli = $\frac{1}{1000}$.

Time

60 s = 1 min; 60 min = 1 hr; 24 hr = 1 day; 7 days = 1 wk.

Temperature

$F = \frac{9}{5}C + 32$ and $C = \frac{5}{9}(F - 32)$.

Converting units: multiply by a fraction equal to 1 Write the conversion so the *old* unit cancels and the *new* unit is left.

$$5 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} \Rightarrow 60 \text{ in}$$

the "ft" units cancel, leaving inches

Tutor's Note

To convert, multiply by a fraction that equals 1 (the same amount written two ways). Put the unit you want to cancel on the bottom and the unit you want to keep on top.

Example

Convert 3 yards to inches: $3 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 108 \text{ in}$.

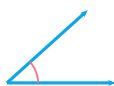


UNITS

Metric prefixes move the decimal by powers of 10: from km to m multiply by 1000; from m to cm multiply by 100.

12 Angles, Lines & Polygons

Types of angles Angles are measured in degrees. A right angle is exactly 90° ; a straight angle is 180° .



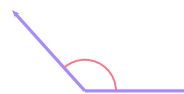
Acute

less than 90°



Right

exactly 90°



Obtuse

between 90° and 180°



Straight

exactly 180°



Angle & figure facts

Right / straight angle

A right angle is 90° ; a straight angle is 180° ; a full turn is 360° .

Complementary angles

Two angles whose measures add to 90° .

Supplementary angles

Two angles whose measures add to 180° (a straight line).

Vertical angles

When two lines cross, opposite angles are equal.

Triangle angle sum

The three interior angles of a triangle add to 180° .

Quadrilateral angle sum

The four interior angles of a quadrilateral add to 360° .

Polygon angle sum

For n sides, interior angles add to $(n - 2) \cdot 180^\circ$.

Regular polygon angle

Each interior angle is $\frac{(n-2)180^\circ}{n}$.

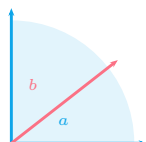
Exterior angles

One exterior angle at each vertex adds to 360° ; regular exterior angle is $\frac{360^\circ}{n}$.

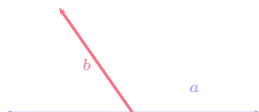
Parallel lines

Lines in a plane that never meet; a crossing line makes equal matching angles.

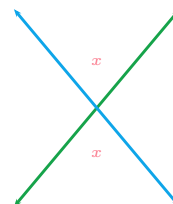
Angle pairs Complementary angles add to 90° , supplementary angles add to 180° , and vertical angles (across an X) are equal.



Complementary
 $a + b = 90^\circ$



Supplementary
 $a + b = 180^\circ$



Vertical
opposite angles equal

Tutor's Note

Most angle problems are just addition. If two angles form a right angle, they are complementary; if they form a straight line, they are supplementary. Set the known sum equal to the parts and solve.

If one angle of a complementary pair is 35° , the other is $90^\circ - 35^\circ = 55^\circ$.

Example

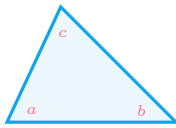


ANGLES

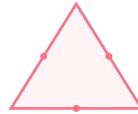
The angles of a triangle always total 180° , so two angles determine the third:
 $c = 180^\circ - a - b$.



Triangle angle sum & figure types The three angles of any triangle add to 180° ; the four angles of any quadrilateral add to 360° .



$a + b + c = 180^\circ$



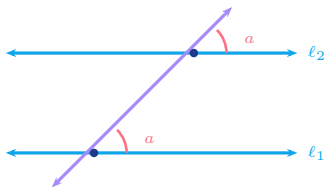
equilateral: all sides =



rectangle

4 right angles

Parallel lines cut by a transversal A line crossing two parallel lines makes equal matching angles.



Corresponding angles (same position at each crossing) are **equal**.

Alternate interior angles (opposite sides, between the lines) are **equal**.

Co-interior angles (same side, between the lines) are **supplementary** — they add to 180° .

Interior angle sums: $(n - 2) \times 180^\circ$ Every extra side adds another 180° to the total.



Triangle

3 sides = 180°



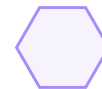
Quadrilateral

4 sides = 360°



Pentagon

5 sides = 540°



Hexagon

6 sides = 720°

Angle checkpoint Most angle questions are sum facts plus simple equations.

Pairs

$a + b = 90^\circ$ for complementary;
 $a + b = 180^\circ$ for supplementary.

Triangles

$a + b + c = 180^\circ$. Two angles determine the third.

Quadrilaterals

Four interior angles add to 360° .

Polygons

Interior sum = $(n - 2)180^\circ$. Divide by n only for regular polygons.

Parallel lines

Corresponding and alternate interior angles match; same-side interior angles add to 180° .

Fast check

A straight line is 180° and a full turn is 360° .

GED setup

Draw a line through the known angle pair, then write the sum fact.

Equation habit

For angles with variables, combine like terms before solving.

Estimate

An obtuse angle must be more than 90° ; an acute angle must be less.



13 Data, Statistics & Probability

Statistics formulas

Mean	$\bar{x} = \frac{\text{sum of values}}{\text{number of values}}$
Median	The middle value after the data are ordered.
Mode	The value or values that occur most often.
Range	Maximum minus minimum.
Quartiles	Q_1 , median, Q_3 split ordered data into four equal parts.
Interquartile range	$IQR = Q_3 - Q_1$, the spread of the middle half.
Mean absolute deviation	$MAD = \frac{\sum x - \bar{x} }{n}$, the average distance from the mean.
Probability	$P(\text{event}) = \frac{\text{favorable outcomes}}{\text{total equally likely outcomes}}$
Experimental probability	$\frac{\text{times event occurs}}{\text{number of trials}}$
Complement	$P(\text{not } A) = 1 - P(A)$.
Simple counting principle	If one choice has m options and another has n options, together there are mn outcomes.

Tutor's Note

Statistics summarize data. Probability predicts chance. Both depend on reading the question carefully: are the outcomes equally likely, and what exactly counts as a success?

For data 4, 5, 6, 9, the mean is $\frac{4+5+6+9}{4} = 6$ and the range is $9 - 4 = 5$.

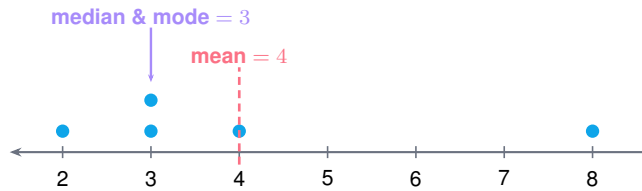
Example



Outliers can pull the mean more than the median. If one value is far away from the rest, compare both measures.

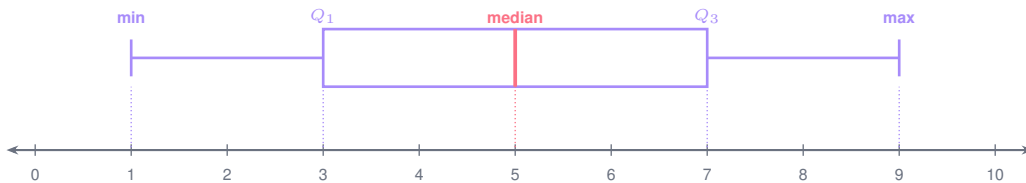


Mean, median & mode on a dot plot Stack a dot for each value, then read the center three ways. The mean balances the data; the median is the middle; the mode is the most common.



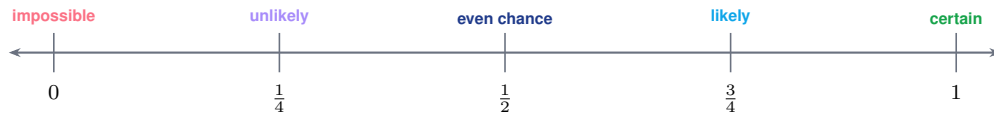
Data 2, 3, 3, 4, 8: mean $\frac{20}{5} = 4$, median 3, mode 3, range $8 - 2 = 6$.

The five-number summary & box plot Order the data, then mark the minimum, first quartile Q_1 , median, third quartile Q_3 , and maximum.



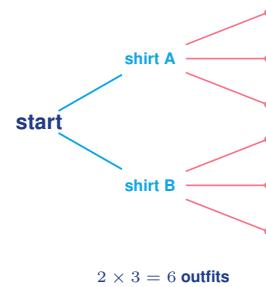
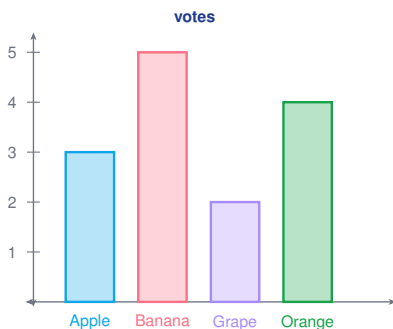
The box holds the middle half of the data; its width ($Q_3 - Q_1$) is the interquartile range (IQR).

The probability scale Every probability is a number from 0 (impossible) to 1 (certain). Half-way is an even chance.



0% to 100% — e.g. one head on a fair coin flip is $\frac{1}{2} = 50\%$.

Reading data & counting outcomes A bar graph compares categories; the counting principle multiplies the choices at each stage.



GED Algebra 1 Add-On

Add these to the Pre-Algebra base

GED Math is built on Pre-Algebra fluency, but the test also expects students to recognize Algebra 1 structures: linear equations, inequalities, systems, functions, polynomials, factoring, quadratics, and formulas from graphs. Keep the full base review above, then add these formulas when practicing GED-style algebra and word problems.

KEEP THE BASE

Pre-Algebra first

Fractions, percents, ratios, integers, units, geometry, and data stay in the guide.

USE WITH WORDS

Formula choice

Read the question type before choosing an equation.

ADD ALGEBRA

GED-ready layer

Linear models, systems, functions, polynomials, and quadratics.

CHECK UNITS

Answer sense

Slope, rate, area, volume, and cost all carry units.

Linear equations, inequalities, and systems

One-step equation

$$x + a = b \Rightarrow x = b - a, \quad ax = b \Rightarrow x = \frac{b}{a} \text{ for } a \neq 0.$$

Two-step equation

$$ax + b = c \Rightarrow ax = c - b \Rightarrow x = \frac{c-b}{a}.$$

Multi-step equation

Distribute, combine like terms, move variable terms to one side, then isolate.

Literal equation

To solve a formula for one letter, use inverse operations until that letter is alone.

Inequality rule

Reverse $<$, $>$, \leq , \geq when multiplying or dividing by a negative number.

Compound inequality

$$a < x < b \text{ means } x > a \text{ and } x < b \text{ at the same time.}$$

Absolute value equation

$$|x - a| = b \text{ means } x - a = b \text{ or } x - a = -b \text{ when } b \geq 0.$$

System solution

The ordered pair that makes both equations true; use substitution, elimination, or graphing.

Elimination setup

Add or subtract equations after multiplying if needed so one variable cancels.

Tutor's Note

Algebra on GED Math is often a word problem in disguise. Define the variable first, write one equation, and only then solve. If a problem gives two conditions, a system is usually cleaner than guessing.



If $3x + 4 = 19$, then $3x = 15$ and $x = 5$. If $-2x \leq 10$, divide by -2 and reverse: $x \geq -5$.

Example



ALGEBRA CHECK

After solving, substitute the answer back into the original equation or inequality. This catches sign mistakes quickly.

Lines, graphs, and functions

Slope

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$; horizontal slope is 0, vertical slope is undefined.

Slope-intercept form

$y = mx + b$, where m is slope and b is the y -intercept.

Point-slope form

$y - y_1 = m(x - x_1)$ when a point and slope are known.

Standard form

$Ax + By = C$; intercepts come from setting the other variable equal to 0.

Parallel lines

Same slope, different intercepts.

Perpendicular lines

Slopes are negative reciprocals: $m_1 m_2 = -1$ for nonvertical lines.

Distance formula

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

Midpoint formula

$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$.

Function notation

$f(a)$ means replace x with a in the rule for $f(x)$.

Average rate of change

$\frac{f(b) - f(a)}{b - a}$, the slope between two input-output points.

Tutor's Note

For graphs, ask what the axes measure. Slope is not just a number; it is a rate such as dollars per ticket, miles per hour, points per question, or gallons per minute.

Through $(2, 5)$ and $(6, 13)$, slope is $m = \frac{13 - 5}{6 - 2} = 2$. The line is $y = 2x + 1$ because $5 = 2(2) + b$ gives $b = 1$.

Example



GRAPH HABIT

Intercepts are starting values or break-even points. Always read the axis labels before interpreting them.



Exponents, radicals, polynomials, and factoring

Product of powers

$$a^m \cdot a^n = a^{m+n}.$$

Quotient of powers

$$\frac{a^m}{a^n} = a^{m-n} \text{ for } a \neq 0.$$

Power of a power

$$(a^m)^n = a^{mn}.$$

Zero and negative exponents

$$a^0 = 1 \text{ and } a^{-n} = \frac{1}{a^n} \text{ for } a \neq 0.$$

Scientific notation

$$a \times 10^n, \text{ where } 1 \leq a < 10.$$

Simplify radicals

$$\text{Factor out perfect squares: } \sqrt{72} = 6\sqrt{2}.$$

Add polynomials

Combine like terms only.

Multiply monomials

Multiply coefficients and add exponents on matching variables.

Distribute / FOIL

$$(a + b)(c + d) = ac + ad + bc + bd.$$

GCF factoring

$$ab + ac = a(b + c).$$

Difference of squares

$$a^2 - b^2 = (a - b)(a + b).$$

Trinomial pattern

$$x^2 + bx + c = (x + m)(x + n) \text{ when } m + n = b \text{ and } mn = c.$$

Tutor's Note

GED polynomial questions are usually about structure. Look first for a common factor, then for a difference of squares, then for two numbers that multiply and add correctly.

$$6x^2 + 9x = 3x(2x + 3). \text{ Also, } x^2 - 25 = (x - 5)(x + 5).$$

Example



FACTORIZING

Factoring is reverse distributing. Multiply your factors back together to check the answer.



Quadratics and nonlinear patterns

Standard quadratic form

$$y = ax^2 + bx + c, \text{ with } a \neq 0.$$

Quadratic equation form

$ax^2 + bx + c = 0$ before solving by factoring or formula.

Quadratic formula

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

Discriminant

$b^2 - 4ac$ tells how many real solutions: positive two, zero one, negative none.

Axis of symmetry

$$x = -\frac{b}{2a}.$$

Vertex from standard form

Find $x = -\frac{b}{2a}$, then substitute to find y .

Factored form

$y = a(x - r_1)(x - r_2)$ shows zeros r_1 and r_2 .

Exponential pattern

$y = a \cdot b^x$ multiplies by the same factor each step.

Direct variation

$y = kx$; the constant of proportionality is $k = \frac{y}{x}$.

Inverse variation

$xy = k$ or $y = \frac{k}{x}$ for $x \neq 0$.

Tutor's Note

GED Math does not usually need advanced quadratic theory, but students should know the quadratic formula, standard form, factoring, and what a graph's zeros/intercepts mean.

For $x^2 - 5x + 6 = 0$, factor to $(x - 2)(x - 3) = 0$, so $x = 2$ or $x = 3$.

Example



QUADRATIC SETUP

Move everything to one side before factoring or using the quadratic formula.

GED quadratic decision check

Easy factors

Use factoring and the zero-product property.

Graph or table

Look for zeros, vertex, intercepts, and increasing/decreasing behavior.

Messy numbers

Use the quadratic formula and estimate before choosing an answer.

Word problem

Define what x represents and reject answers that do not fit the situation.



GED word-problem formulas that connect algebra to the base

Percent of a whole	part = percent · whole, with percent as a decimal.
Percent change	$\frac{\text{new} - \text{old}}{\text{old}} \times 100\%$.
Simple interest	$I = Prt$ and $A = P + I = P(1 + rt)$.
Distance/rate/time	$d = rt, r = \frac{d}{t}, t = \frac{d}{r}$.
Total cost	total = (number of units)(price per unit), then add tax/tip or subtract discount.
Scale factor	$\frac{\text{new length}}{\text{old length}}$; area scale factor is squared, volume scale factor is cubed.
Probability	$P(A) = \frac{\text{favorable outcomes}}{\text{total outcomes}}$ and $P(\text{not } A) = 1 - P(A)$.
Counting principle	Multiply the number of choices at each stage.

Tutor's Note

These formulas turn the Pre-Algebra base into GED test work. The formula is only useful after the quantities are labeled and the units match.

Example

A price rises from \$80 to \$92. Percent change is $\frac{92-80}{80} \times 100\% = 15\%$.



GED WORD PROBLEMS

Underline what the question asks for, circle the numbers with units, choose the formula family, then calculate.

GED Formula Sheet and Test-Specific Review Preserved from the GED draft

This section keeps the GED-specific formulas from the first draft and places them after the full Pre-Algebra base and Algebra 1 add-on, so no GED formula coverage is lost. Use it as a final test-focused pass before downloading or printing.

14 GED Focus: Basic Number Operations

Order of operations

NO-CALCULATOR READY MUST-KNOW SKILL

Parentheses → Exponents → \times, \div left to right → $+, -$ left to right.



Fraction operations

NO-CALCULATOR READY MUST-KNOW SKILL

$$\frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd}, \quad \frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}, \quad \frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}.$$

Denominators cannot be zero. Convert mixed numbers to improper fractions before multiplying or dividing.

Decimal and percent conversions

NO-CALCULATOR READY MUST-KNOW SKILL

$p\% = \frac{p}{100} = 0.p$ when p is a whole percent. Move the decimal two places left to change percent to decimal; move two places right to change decimal to percent.

Integer signs and absolute value

NO-CALCULATOR READY MUST-KNOW SKILL

$|a|$ is distance from 0. Same signs multiply/divide to positive; different signs multiply/divide to negative. For addition, same signs add; different signs subtract absolute values and keep the sign of the larger absolute value.

GED-style setup

Order $0.07, \frac{1}{8}, \frac{1}{2}, 0.6, \frac{4}{5}$ from least to greatest. Convert to decimals: $0.07, 0.125, 0.5, 0.6, 0.8$. So the order is $0.07, \frac{1}{8}, \frac{1}{2}, 0.6, \frac{4}{5}$.



WATCH THE FIRST PART

The no-calculator questions reward clean number sense: fractions, decimals, signs, ordering, and simple substitutions.

15 GED Focus: Ratios, Percents, Rates, and Real-Life Formulas**Ratio and proportion**

MUST-KNOW SKILL

A ratio compares quantities: $a : b = \frac{a}{b}$. A proportion is two equal ratios: $\frac{a}{b} = \frac{c}{d}$. Cross products match: $ad = bc$.

Percent equation

MUST-KNOW SKILL

part = percent \times whole, using the percent as a decimal. For percent change: percent change = $\frac{\text{new} - \text{old}}{\text{old}} \times 100\%$.

Simple interest

OFFICIAL SHEET

$I = Prt$, where I is interest, P is principal, r is the annual rate as a decimal, and t is time in years. Total balance for simple interest: $A = P + I = P(1 + rt)$.

Distance, rate, and time

OFFICIAL SHEET

$d = rt$. Rearrange as $r = \frac{d}{t}$ and $t = \frac{d}{r}$ when needed.



Total cost

OFFICIAL SHEET

total cost = (number of units)(price per unit). Add tax, fees, or tips after finding the base cost.

A 15% tip on a \$48 bill is $0.15(48) = 7.20$. Total cost is $48 + 7.20 = \$55.20$.

GED-style setup



UNIT CHECK

Rates carry units: miles per hour, dollars per ticket, gallons per minute. If the units do not match, convert before using the formula.

16 GED Focus: Algebra Foundations**Evaluate an expression**

MUST-KNOW SKILL

Substitute each value, then use order of operations. If $3x - 2y$ with $x = 4, y = -1$, then $3(4) - 2(-1) = 14$.

Distributive property and like terms

MUST-KNOW SKILL

$a(b + c) = ab + ac$. Like terms have the same variable part, such as $4x$ and $-7x$. Combine coefficients only:
 $4x - 7x = -3x$.

Linear equations

MUST-KNOW SKILL

Use inverse operations to isolate the variable. Whatever is done to one side must be done to the other. For $ax + b = c$, subtract b , then divide by a .

Inequalities

MUST-KNOW SKILL

Solve like equations, but reverse the inequality when multiplying or dividing by a negative number: if $-2x < 8$, then $x > -4$.

Systems of equations

MUST-KNOW SKILL

A solution to a system is the ordered pair that makes both equations true. Use substitution, elimination, or graphing.

Solve $3(x - 4) = 2x + 7$. Distribute: $3x - 12 = 2x + 7$. Subtract $2x$: $x - 12 = 7$. Add 12: $x = 19$.

GED-style setup



ALGEBRA HABIT

Do not skip the sign. Most GED algebra misses come from losing a negative while distributing or moving terms.



17 GED Focus: Lines, Graphs, and Functions

Slope of a line

OFFICIAL SHEET

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$. Horizontal lines have slope 0; vertical lines have undefined slope.

Slope-intercept form

OFFICIAL SHEET

$y = mx + b$, where m is slope and b is the y -intercept.

Point-slope form

OFFICIAL SHEET

$y - y_1 = m(x - x_1)$. Use it when a point and slope are given.

Distance and midpoint

MUST-KNOW SKILL

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

Function notation

MUST-KNOW SKILL

$f(x)$ means the output when the input is x . To evaluate $f(3)$, replace every x in the rule with 3.

If $f(x) = 2x^2 - 5$, then $f(3) = 2(3)^2 - 5 = 18 - 5 = 13$.

GED-style setup



GRAPH CHECK

For a line, two points are enough. For a function question, ask: input, output, rate of change, or intercept?

18 GED Focus: Exponents, Radicals, Polynomials, and Quadratics

Exponent laws

MUST-KNOW SKILL

$a^m \cdot a^n = a^{m+n}$, $\frac{a^m}{a^n} = a^{m-n}$, $(a^m)^n = a^{mn}$, $a^0 = 1$ for $a \neq 0$, $a^{-n} = \frac{1}{a^n}$.

Radicals and square roots

MUST-KNOW SKILL

$\sqrt{a^2} = |a|$. Simplify perfect squares first: $\sqrt{72} = \sqrt{36 \cdot 2} = 6\sqrt{2}$.

Scientific notation

MUST-KNOW SKILL

$a \times 10^n$ where $1 \leq a < 10$. Positive n means a large number; negative n means a small decimal.



Polynomial operations

MUST-KNOW SKILL

Add/subtract like terms. Multiply monomials by multiplying coefficients and adding exponents on matching variables. FOIL is distributive property for binomials.

Quadratic forms and formula

OFFICIAL SHEET

Standard form: $y = ax^2 + bx + c$. Quadratic formula:

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

Use it when factoring is not easy or when the problem asks for exact solutions.

Factoring patterns

MUST-KNOW SKILL

$a^2 - b^2 = (a - b)(a + b)$, $x^2 + bx + c = (x + m)(x + n)$ when $m + n = b$ and $mn = c$.

Factor $x^2 + 7x + 12$. Find two numbers that add to 7 and multiply to 12: 3 and 4. So $x^2 + 7x + 12 = (x + 3)(x + 4)$. **GED-style setup**



QUADRATIC CHECK

If an equation has x^2 , move everything to one side before factoring or using the quadratic formula.

19 GED Focus: Geometry and Measurement

Area formulas

OFFICIAL SHEET

Square: $A = s^2$. Rectangle: $A = lw$. Parallelogram: $A = bh$. Triangle: $A = \frac{1}{2}bh$. Trapezoid: $A = \frac{1}{2}h(b_1 + b_2)$. Circle: $A = \pi r^2$.

Perimeter and circumference

OFFICIAL SHEET

Square: $P = 4s$. Rectangle: $P = 2l + 2w$. Triangle: $P = s_1 + s_2 + s_3$. Circle: $C = 2\pi r = \pi d$.

Pythagorean theorem

OFFICIAL SHEET

$a^2 + b^2 = c^2$ for right triangles, where c is the hypotenuse.

Angles

MUST-KNOW SKILL

Complementary angles sum to 90° . Supplementary angles sum to 180° . Triangle angles sum to 180° . A straight line is 180° .



Prisms and cylinders

OFFICIAL SHEET

Rectangular prism: $SA = 2lw + 2lh + 2wh$, $V = lwh$.Right prism: $SA = ph + 2B$, $V = Bh$.Cylinder: $SA = 2\pi rh + 2\pi r^2$, $V = \pi r^2 h$.**Pyramids, cones, and spheres**

OFFICIAL SHEET

Pyramid: $SA = \frac{1}{2}ps + B$, $V = \frac{1}{3}Bh$.Cone: $SA = \pi rs + \pi r^2$, $V = \frac{1}{3}\pi r^2 h$.Sphere: $SA = 4\pi r^2$, $V = \frac{4}{3}\pi r^3$.

GED-style setup

A cylinder has radius 3 and height 10. Its volume is $V = \pi r^2 h = \pi(3)^2(10) = 90\pi \approx 282.6$ cubic units.

GEOMETRY HABIT

If the answer choices have square units, use area or surface area. If they have cubic units, use volume.

20 GED Focus: Data, Statistics, and Probability**Mean and median**

OFFICIAL SHEET

Mean = $\frac{\text{sum of values}}{\text{number of values}}$. Median is the middle value after ordering, or the mean of the two middle values when there are an even number of values.**Mode, range, and outliers**

MUST-KNOW SKILL

Mode is the most frequent value. Range = maximum – minimum. An outlier is far from most values and can pull the mean more than the median.

Probability

MUST-KNOW SKILL

 $P(\text{event}) = \frac{\text{favorable outcomes}}{\text{total outcomes}}$. The complement rule is $P(\text{not } A) = 1 - P(A)$.**Counting principle**

MUST-KNOW SKILL

If one choice has m options and another has n options, together they have mn outcomes. Use this before listing possibilities.**Permutations and combinations**

MUST-KNOW SKILL

Permutation order matters: $P(n, r) = \frac{n!}{(n-r)!}$. Combination order does not matter: $C(n, r) = \frac{n!}{r!(n-r)!}$.

A bag has 5 red, 3 blue, and 2 green marbles. The probability of not drawing blue is $1 - \frac{3}{10} = \frac{7}{10}$. **GED-style setup**

**DATA CHECK**

For charts and tables, read the labels before calculating. Many GED data questions are really unit and label questions.

21 GED Focus: Word-Problem Translation

Operation clues

total, sum, increased by → add
 difference, less than, decreased by → subtract
 of, product, times, each → multiply
 per, quotient, split equally → divide

Equation clues

is, equals, gives, results in → =
 at least → ≥
 at most → ≤
 fewer than → <
 more than → >

Percent word problems

MUST-KNOW SKILL

Identify the whole first. “30% of 80” means $0.30(80)$. “24 is 30% of what number?” means $24 = 0.30x$.

Mixture of formulas

MUST-KNOW SKILL

GED word problems often combine steps: total cost plus tax, distance plus time, area plus unit price, or slope plus interpretation. Write one line per step.

Reasonableness check

MUST-KNOW SKILL

A discount should lower the price. Tax/tip should raise it. A probability must be between 0 and 1. Area must be positive. A square root length cannot be negative.

Tile costs \$2.40 per square foot. A rectangular floor is 12 ft by 9 ft. Area = $12(9) = 108$ sq ft. Cost = $108(2.40) = \$259.20$. **GED-style setup**

**TRANSLATION LOOP**

Underline the quantity being asked for, circle the numbers with units, choose the formula, then substitute.



22 GED Focus: Official Sheet vs. Must-Know Extras

Formulas GED gives on the official formula sheet

Area	square, rectangle, parallelogram, triangle, trapezoid, circle
Perimeter/Circumference	square, rectangle, triangle, circle
Solids	surface area and volume for rectangular prism, right prism, cylinder, pyramid, cone, sphere
Data	mean and median descriptions
Algebra	slope, slope-intercept form, point-slope form, quadratic standard form, quadratic formula
Applications	Pythagorean theorem, simple interest, distance formula $d = rt$, total cost

Formulas and facts students should still know

Arithmetic	fraction operations, percent conversions, integer signs, order of operations
Proportions	ratios, unit rates, cross products, scale factor, percent change
Algebra	distributive property, like terms, equation steps, inequality sign reversal, systems
Graphs	distance formula, midpoint formula, function notation, intercept meaning
Exponents	exponent laws, radicals, scientific notation, factoring patterns
Data	mode, range, probability, complement rule, counting principle



WHY THIS MATTERS

The formula sheet reduces memorization, but it does not solve the problem. The score comes from recognizing which formula fits the situation.

GED formula sheet action plan

Find the formula family	Geometry, algebra, data, rate, cost, or percent.
Label every quantity	Write units beside numbers before substituting.
Use the given sheet wisely	The sheet gives formulas, but the problem gives the meaning.
Check the answer type	Linear units, square units, cubic units, dollars, percent, or probability.



23 GED Focus: Symbols and Vocabulary

Symbols

=	equals
≠	not equal
<, >	less than, greater than
≤, ≥	at most, at least
%	percent, per hundred
x	absolute value
\sqrt{x}	square root
(x, y)	ordered pair
m	slope
b	y-intercept

Vocabulary

coefficient	number multiplying a variable
constant	number that does not change
expression	no equals sign
equation	has an equals sign
solution	value that makes a statement true
unit rate	rate per one unit
scale factor	multiplier from one size to another
outlier	data value far from the rest
hypotenuse	longest side of a right triangle

Vocabulary habit: Translate the command word: evaluate means plug in, simplify means clean up, solve means find the value, and graph means show the relationship.

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Final GED formula checklist

Number sense

Can I order fractions/decimals and handle negative signs without rushing?

Percent/rate

Did I identify the whole, the rate, and the unit before multiplying?

Algebra

Did I distribute correctly and keep both sides balanced?

Lines/functions

Do I know whether the question asks for slope, intercept, input, or output?

Geometry

Did I choose perimeter, area, surface area, or volume and use the right units?

Data/probability

Did I order the data, read chart labels, and keep probability between 0 and 1?

Last pass before practice Read the question first, not the answer choices. Estimate the size of the answer, write one clean setup line, and only then calculate. If a formula is given on the GED sheet, spend your energy choosing it correctly and substituting the right values.

High-frequency GED formula triggers

“How much altogether?”

total cost, tax, tip, discount, or simple interest

“How steep?”

slope $m = \frac{\text{rise}}{\text{run}}$ or rate of change

“How much space?”

area for flat regions; volume for solids

“Around the outside?”

perimeter or circumference

“Middle or average?”

median after ordering; mean after adding

“What value works?”

equation, inequality, system, or function evaluation



Quick Reference Tables

Memorize these to speed up everything

Fraction = Decimal = Percent

Fraction	Decimal	Percent
$\frac{1}{2}$	0.5	50%
$\frac{1}{3}$	$0.\bar{3}$	$33\frac{1}{3}\%$
$\frac{2}{3}$	$0.\bar{6}$	$66\frac{2}{3}\%$
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{5}$	0.2	20%
$\frac{2}{5}$	0.4	40%
$\frac{1}{6}$	$0.1\bar{6}$	$16\frac{2}{3}\%$
$\frac{1}{8}$	0.125	12.5%
$\frac{1}{9}$	$0.\bar{1}$	$11\frac{1}{9}\%$
$\frac{1}{10}$	0.1	10%
$\frac{1}{20}$	0.05	5%
$\frac{1}{100}$	0.01	1%

Perfect squares

n	n^2	n	n^2
1	1	9	81
2	4	10	100
3	9	11	121
4	16	12	144
5	25	13	169
6	36	14	196
7	49	15	225
8	64	20	400

Divisibility rules

- By** The number is divisible if...
- 2 it is even (ends in 0, 2, 4, 6, 8).
 - 3 the digit sum is divisible by 3.
 - 4 the last two digits form a multiple of 4.
 - 5 it ends in 0 or 5.
 - 6 it is divisible by both 2 and 3.
 - 9 the digit sum is divisible by 9.
 - 10 it ends in 0.

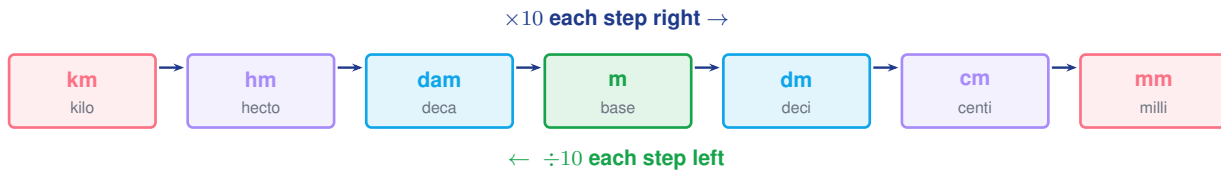
Perfect cubes

n	n^3	n	n^3
1	1	6	216
2	8	7	343
3	27	8	512
4	64	9	729
5	125	10	1000

Powers of ten

Power	Value
$10^0, 10^1, 10^2, 10^3$	1, 10, 100, 1000
$10^4, 10^5, 10^6$	10,000, 100,000, 1,000,000
$10^{-1}, 10^{-2}, 10^{-3}$	0.1, 0.01, 0.001

The metric staircase Each step is a power of 10. Moving *right* to a smaller unit multiplies by 10 (decimal moves right); moving *left* divides by 10.



GED Math Symbols Cheat Sheet

Symbol • Meaning • Example

Operations & Comparisons

Symbol	Meaning	Example
=	equals	$x = 5$
\neq	not equal	$x \neq 0$
<	less than	$x < 7$
>	greater than	$x > 2$
\leq	at most	$x \leq 10$
\geq	at least	$x \geq 0$
+	add / positive	$3 + 4 = 7$
-	subtract / negative	$5 - 8 = -3$
\times, \cdot	multiply	$4 \cdot x = 4x$
$\div, /$	divide	$12 \div 3 = 4$

Graphs & Geometry

Symbol	Meaning	Example
(x, y)	ordered pair	$(3, -2)$
x-axis	horizontal axis	left/right
y-axis	vertical axis	up/down
m	slope	rise/run
b	y-intercept	$y = mx + b$
k	constant of proportionality	$y = kx$
P	perimeter	distance around
A	area	square units
V	volume	cubic units
r, d	radius, diameter	$d = 2r$

Fractions, Powers & Roots

Symbol	Meaning	Example
$\frac{a}{b}$	fraction / quotient	$\frac{3}{4}$
%	percent	$25\% = 0.25$
:	ratio	$2 : 3$
$\frac{b}{a}$	reciprocal of $\frac{a}{b}$	divide fractions
x^2	square	$6^2 = 36$
x^3	cube	$2^3 = 8$
\sqrt{x}	square root	$\sqrt{49} = 7$
$\sqrt[3]{x}$	cube root	$\sqrt[3]{8} = 2$
$ x $	absolute value	$ -5 = 5$
π	circle constant	$C = 2\pi r$

Data & Probability

Symbol	Meaning	Example
\bar{x}	mean	$\bar{x} = 6$
n	number of values	$n = 12$
$P(A)$	probability	$P(A) = \frac{1}{4}$
A'	not event A	complement
\approx	approximately	$\pi \approx 3.14$
∞	continues without end	repeating decimal
\Rightarrow	leads to	$x + 2 = 5 \Rightarrow x = 3$
\therefore	therefore	final conclusion

Symbol check Equation symbols compare values; operation symbols change values; graph symbols name location and slope; data symbols summarize a set. Always read the symbol in context before substituting numbers.



GED Math Vocabulary Bank

Numbers & Operations

Digit — one symbol in a number, such as 0 through 9.
Place value — the value of a digit based on its position.
Factor — a number that divides another number evenly.
Multiple — a product of a number and a whole number.
Prime — a whole number greater than 1 with exactly two factors.
Composite — a whole number greater than 1 with more than two factors.
GCF — the greatest common factor.
LCM — the least common multiple.
Rational number — a number that can be written as $\frac{a}{b}$, with $b \neq 0$.
Absolute value — distance from zero on a number line.

Fractions, Decimals & Percents

Numerator — the top number in a fraction.
Denominator — the bottom number in a fraction; it cannot be zero.
Equivalent fractions — fractions with the same value.
Mixed number — a whole number plus a fraction.
Improper fraction — a fraction with numerator at least as large as denominator.
Reciprocal — a fraction flipped upside down; used to divide fractions.
Percent — per hundred.
Unit rate — a rate per one unit.
Proportion — two equal ratios.
Proportional relationship — a relationship that can be written as $y = kx$.
Scale factor — the multiplier from one size to another.

Algebra Readiness

Variable — a letter that represents a number.
Constant — a number that does not change.
Coefficient — a number multiplying a variable.
Expression — numbers, variables, and operations without an equals sign.
Equation — a statement that two expressions are equal.
Solution — a value that makes an equation or inequality true.
Like terms — terms with the same variable part.
Distribute — multiply a factor by each term inside parentheses.
Inequality — a comparison using $<$, $>$, \leq , or \geq .
Scientific notation — a number written as $a \times 10^n$, where $1 \leq a < 10$.
Unit conversion — rewriting a measurement with an equivalent unit.

Graphs, Geometry & Data

Coordinate plane — a grid formed by the x -axis and y -axis.
Ordered pair — a point written as (x, y) .
Slope — change in y divided by change in x .
Perimeter — distance around a figure.
Area — space inside a flat figure.
Volume — space inside a solid figure.
Mean — the average of a data set.
Median — the middle value after ordering.
Outlier — a data value far from most of the data.
IQR — interquartile range; the spread of the middle half.
Probability — a number that describes how likely an event is.



VOCAB

Translate the action word first: evaluate plugs in a number, simplify cleans an expression, solve finds a value, and graph shows the relationship visually.

Vocabulary check Say the word, name the action, then write a tiny example. If a definition includes a restriction such as $b \neq 0$ or $a \geq 0$, keep that restriction with the formula.



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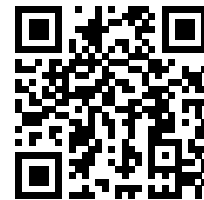
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TOOLS

Quick references

Use formula sheets and topic pages when memory needs support.