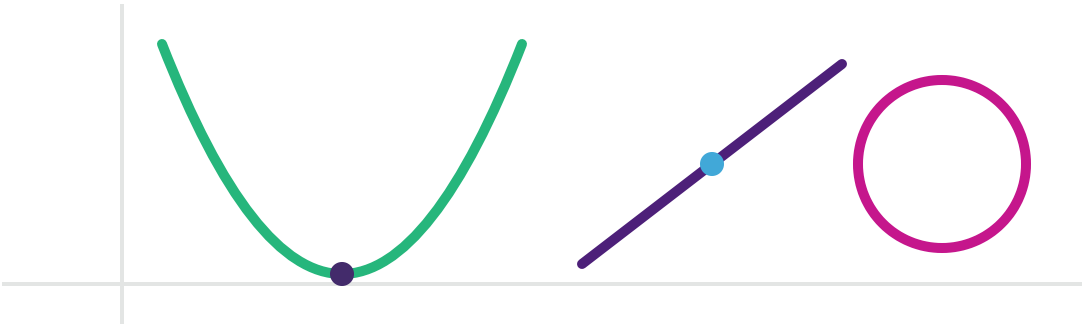
SAT Math Formulas

Every formula and math term you need · Fully updated for the Digital SAT



Magoosh

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CHAPTER 1

Introduction

How to Use This PDF

This PDF collects every formula, definition, and math term you need for the Digital SAT in one place — and nothing you don't. If a concept is tested on today's SAT, you'll find it here with a quick note on how it actually shows up in questions. If a concept disappeared when the SAT went digital, we cut it, so you never spend a minute studying something that can't earn you points.

Use it two ways: read a chapter straight through when you're first reviewing a topic, or jump around from the Table of Contents (every entry is clickable) when you need to look something up mid-practice.

Digital SAT Math at a Glance

44	70	2	100%
QUESTIONS	MINUTES	MODULES	CALCULATOR ALLOWED

- Two 35-minute modules of 22 questions each. How you do on the first module determines whether your second module is the easier or harder version — so start strong.
- About 75% of questions are multiple choice; the rest are student-produced responses, where you type your own answer. There is **no penalty for guessing** on either type — never leave a question blank.
- The **Desmos graphing calculator is built into the testing app** and available on every question. Many questions that look like algebra can be solved faster by graphing.
- A **reference sheet of geometry formulas** is one click away on every question (see Chapter 6 for exactly what's on it).

The questions come from four content domains, and the split is worth knowing when you decide where to spend study time:

DOMAIN	SHARE OF THE TEST	COVERED IN
Algebra	~35% (13–15 questions)	Chapter 3
Advanced Math	~35% (13–15 questions)	Chapter 4
Problem-Solving & Data Analysis	~15% (5–7 questions)	Chapter 5
Geometry & Trigonometry	~15% (5–7 questions)	Chapter 6

What You Get vs. What You Memorize

Good news: the SAT hands you every essential *geometry* formula on the built-in reference sheet — areas, volumes, the Pythagorean theorem, and the special right triangles. You do not need to memorize those; you need to recognize *when to use them*.

Everything else — slope, the quadratic formula, exponent rules, percent change, exponential growth — is on you. That's what Chapters 3–5 are for, and it's a shorter list than you might fear.

Formulas: How to (Not) Use Them

Here's the thing about formula lists: memorizing one is the *start* of preparation, not the end. The SAT rarely asks "What is the formula?" It asks questions where the right formula, applied to a slightly disguised setup, gets you to the answer in under a minute. Understanding how and why a formula works beats rote memorization every time.

Take the distance formula. It looks ugly written out — but it's really just the Pythagorean theorem: any two points on a graph define a right triangle, and the distance between them is its hypotenuse. If you understand that, you don't have to memorize anything new, and you can't mis-remember it under pressure.

So as you work through these chapters, don't just copy formulas onto flashcards. For each one, work a practice problem with it, and ask what each piece of the formula *means*. That's the difference between recognizing a formula and being able to score with it.

Materials & Resources

This PDF pairs best with real practice. Before you dive into the formulas, here is everything Magoosh offers to put them to work, plus the official resources worth your time.

START HERE — FREE PRACTICE TEST

Not sure where you stand? Take Magoosh's **free SAT practice test** at magoosh.com/sat/sat-practice-test. It's the fastest way to find your baseline score and see which chapters of this PDF deserve your study time.

Magoosh SAT Prep

That's us! Magoosh SAT Prep includes video lessons across every SAT topic, practice questions with video explanations, full-length practice tests, and study schedules that tell you exactly what to do each week — in a digital format that mimics what you'll see on test day. Not ready to commit? Grab a free 1-week trial.

The Magoosh SAT App

Prefer studying on your phone? The SAT Test Prep App makes studying on the go easy for both iPhone and Android users.

Official Digital SAT Practice

Take full-length adaptive practice tests in Bluebook, the College Board's testing app — the same software you'll use on test day, and the best way to get comfortable with the built-in Desmos calculator and reference sheet before they count. The tests are free.

Khan Academy Official SAT Practice

The College Board's partnership with Khan Academy offers free lessons and practice covering the content tested on the Digital SAT.

The Magoosh High School Blog

Free articles on strategy, study plans, and every SAT math topic in this PDF, at magoosh.com/hs.

CHAPTER 2

Essential SAT Math Vocabulary

Plenty of missed SAT math questions have nothing to do with math ability — the question said *integer* or *at most* or *zero of the function*, and that one word changed everything. This chapter is every term the SAT expects you to know cold, organized so you can review it in one sitting and revisit it the week before your test.

Number Words

TERM	WHAT IT MEANS ON THE SAT
Integer	A whole number, its negative, or zero: ... −2, −1, 0, 1, 2 ... No fractions, no decimals. If a question says "x is an integer," that restriction is usually the whole point of the problem.
Positive / negative	Positive means greater than zero; negative means less than zero. **Zero is neither.** "Non-negative" means positive or zero.
Even / odd	Evens are divisible by 2 (...−4, −2, 0, 2, 4...). Zero is even. Only integers are even or odd.
Consecutive integers	Integers that follow in order: $n, n + 1, n + 2, \ldots$ Consecutive even (or odd) integers step by two: $n, n + 2, n + 4, \ldots$
Factor (divisor)	A number that divides evenly into another. The factors of 12 are 1, 2, 3, 4, 6, 12.
Multiple	The result of multiplying a number by an integer. Multiples of 12: 12, 24, 36, ... (Factors are small, multiples are big.)
Prime number	An integer greater than 1 whose only factors are 1 and itself: 2, 3, 5, 7, 11, 13, ... **1 is not prime; 2 is the only even prime.**
Digit	One of the symbols 0–9. In 358, the digit 5 is in the tens place.
Rational / irrational	Rational numbers can be written as a fraction of integers; irrational numbers (like $\sqrt{2}$ and π) cannot.
Absolute value	$\lvert x \rvert$ is the distance from x to zero, so it's never negative: $\lvert -7 \rvert = 7$.
Reciprocal	Flip the fraction: the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$. A number times its reciprocal equals 1.

Operations & Expressions

TERM	WHAT IT MEANS ON THE SAT
Sum / difference	The result of adding / subtracting.
Product / quotient	The result of multiplying / dividing.
Expression	A mathematical phrase with no equals sign: $3x + 5$. You can't "solve" an expression — only simplify or rewrite it.
Equation	Two expressions set equal: $3x + 5 = 20$. Equations get solved.
Term	A piece of an expression separated by + or −. In $3x^2 - 5x + 2$, the terms are $3x^2$, $-5x$, and 2.
Coefficient	The number multiplying a variable. In $3x^2$, the coefficient is 3. SAT questions often say "where *a* and *b* are constants — find the coefficient."
Constant	A fixed number (no variable attached). In $y = 2x + 7$, the constant 7 is often the "starting value" in word problems.
Variable	A letter standing for an unknown or changing quantity.
Like terms	Terms with identical variable parts: $3x^2$ and $-5x^2$ combine; $3x^2$ and $3x$ don't.
Equivalent	Two expressions that are equal for *every* value of the variable. "Which expression is equivalent to…" means rewrite — factor, expand, or simplify — not solve.

Equations & Solutions

THE SYNONYM CLUSTER TO KNOW

For a function *f*, these four phrases all point to the same numbers: a **solution** of $f(x) = 0$, a **root**, a **zero** of the function, and an **x-intercept** of its graph. The SAT rotates freely among them. If you know one, you know all four.

TERM	WHAT IT MEANS ON THE SAT
Solution	A value that makes an equation true — it "satisfies" the equation. A solution to a *system* must satisfy every equation at once.
Satisfies	"$x = 4$ satisfies the equation" = plugging in 4 makes both sides equal.

TERM	WHAT IT MEANS ON THE SAT
No solution	No value works. For linear equations this happens when the variables cancel and you're left with something false, like 5 = 3.
Infinitely many solutions	Every value works — the two sides are the same expression in disguise. Variables cancel and leave something true, like 5 = 5.
Extraneous solution	A value produced by valid algebra that fails in the *original* equation. Shows up with radical and rational equations — always plug answers back in (Chapter 4).
In terms of	"Solve for *y* in terms of *x*" = isolate *y*; the answer will still contain *x*.
Undefined	Division by zero. A rational expression is undefined where its denominator equals 0 — a favorite SAT question all by itself.
Discriminant	The $b^2 - 4ac$ inside the quadratic formula; its sign tells you how many real solutions a quadratic has (Chapter 4).

Word-Problem Translation

Word problems are translation exercises. These are the standard dictionary entries:

ENGLISH	MATH
is / was / will be / equals	=
of (with a fraction or percent)	multiply — "40% of x" = 0.40x
per / each / for every	a rate — usually the slope or the number multiplying the variable. "$3 per ride" = 3r
at least	≥ ("at least 10" includes 10)
at most / no more than	≤
more than / exceeds	> , or addition: "6 more than x" = x + 6
fewer than / less than	< , or subtraction — **order flips**: "6 less than x" = x − 6, not 6 − x
twice / double / triple	2x / 2x / 3x
(directly) proportional to	y = kx for some constant k — doubling one doubles the other
initial value / starting amount	the constant term — the y-intercept, or the value when t = 0
rate of change	the slope — how much y changes per one unit of x

Functions & Graphs

TERM	WHAT IT MEANS ON THE SAT
Function	A rule that turns each input into exactly one output. $f(x) = 2x + 1$ means "the output for input x."
f(3)	The output when the input is 3 — substitute 3 everywhere you see x. $f(3) = 7$ also means the graph passes through the point (3, 7).
x-intercept	Where a graph crosses the x-axis; the point has y = 0. Same as a root or zero.
y-intercept	Where a graph crosses the y-axis; the point has x = 0. In models, it's the starting value.
Slope	Steepness: rise over run, the change in y for each 1-unit increase in x (Chapter 3).
Vertex	The turning point of a parabola — its maximum or minimum (Chapter 4).
Axis of symmetry	The vertical line through the vertex; a parabola mirrors across it.
Maximum / minimum	The greatest / least output value. For a parabola, it's the y-coordinate of the vertex.
Increasing / decreasing	Rising / falling as you read the graph left to right.
Intersection	A point where two graphs cross — the solution of the system of their equations. This link is the key to many Desmos shortcuts.
Linear vs. exponential	Linear = changes by the same *amount* each step; exponential = changes by the same *percent* each step (Chapter 4).

Data & Statistics

TERM	WHAT IT MEANS ON THE SAT
Mean (average)	Sum of the values divided by how many there are.
Median	The middle value when the data are in order (average the two middle values if the count is even). Resistant to outliers.
Mode	The most frequent value.
Range	Maximum minus minimum.

TERM	WHAT IT MEANS ON THE SAT
Outlier	A value far from the rest. Outliers drag the **mean** and stretch the **range**, but barely move the **median** — a tested distinction.
Standard deviation	A measure of spread: how far values sit from the mean, typically. Tightly clustered data = small; spread-out data = large. The SAT asks you to compare, never to compute.
Frequency	How many times a value appears; a frequency table lists values with their counts.
At random	Every item has an equal chance of being picked — the setup phrase for probability questions.
Scatterplot / line of best fit	A cloud of data points and the trend line through it (Chapter 5).
Positive / negative association	As x increases, y tends to increase / decrease.
Margin of error	The "plus or minus" on a survey estimate. Larger random samples give smaller margins of error (Chapter 5).

Geometry Words

TERM	WHAT IT MEANS ON THE SAT
Congruent	Exactly the same size and shape. Congruent angles have equal measures; congruent sides have equal lengths.
Similar	Same shape, possibly different size: equal angles, and sides in proportion. The engine behind many triangle questions.
Parallel / perpendicular	Never meeting / meeting at 90°. On graphs: equal slopes / negative-reciprocal slopes.
Complementary / supplementary	Two angles summing to 90° / 180°.
Equilateral / isosceles / scalene	Triangle with 3 equal sides (all angles 60°) / at least 2 equal sides / no equal sides. Equal sides face equal angles.
Hypotenuse / legs	In a right triangle: the side opposite the right angle (always longest) / the two sides forming the right angle.
Radius / diameter	Center to edge / edge to edge through the center. d = 2r.
Chord / tangent	A segment connecting two points on a circle / a line touching the circle at exactly one point — and always perpendicular to the radius at that point.

TERM	WHAT IT MEANS ON THE SAT
Arc / sector	A piece of a circle's edge / a pizza-slice piece of its area (Chapter 6).
Perimeter / area / volume	Distance around a flat shape / space inside a flat shape / space inside a 3-D solid.

CHAPTER 3 · ~35% OF THE TEST

Algebra

Algebra is the biggest domain on the Digital SAT, and it's dominated by one object: the line. Master slope, the forms of a linear equation, and systems, and you've covered roughly a third of the test.

Solving Linear Equations

Whatever you do to one side, do to the other. The standard sequence: distribute to clear parentheses, combine like terms, gather the variable on one side, then divide.

WATCH OUT

When the variables all cancel, the equation is telling you something. Left with a false statement (5 = 3)? **No solution.** Left with a true one (5 = 5)? **Infinitely many.** The SAT loves asking for the constant that makes a system behave this way — match the coefficients, then check the constants.

Slope

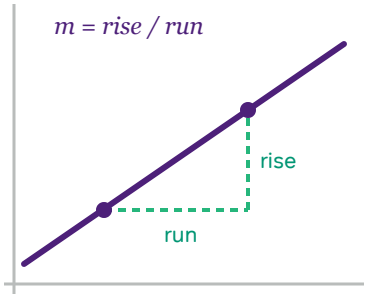
$$m = (y_2 - y_1) / (x_2 - x_1)$$

Rise over run: the change in y for each 1-unit increase in x.

Slope is the single most-tested idea in SAT algebra, and the test cares less about computing it than *interpreting* it. In any real-world model $y = mx + b$:

- **m** is the rate: the cost *per* item, the growth *per* year — the "per" number.
- **b** is the starting value: what y equals when x = 0.

Uphill left-to-right = positive slope; downhill = negative; horizontal = 0; vertical = undefined.



Slope: how much you climb for each step right.

The Three Forms of a Line

FORM	EQUATION	BEST WHEN…
Slope-intercept	$y = mx + b$	you know (or want) the slope m and y-intercept b — the default for word-problem models.
Point-slope	$y - y_1 = m(x - x_1)$	you know the slope and any one point (x_1, y_1).
Standard	$Ax + By = C$	the question gives this form. Slope = −A/B; x-intercept = C/A; y-intercept = C/B.

STRATEGIC MOVE

"Which equation defines the line…?" questions rarely require re-deriving anything. Check the slope first — that usually eliminates two choices — then plug the given point into what's left. Or type the choices into Desmos and see which graph passes through the points.

Parallel & Perpendicular Lines

Parallel: $m_1 = m_2$ Perpendicular: $m_1 \cdot m_2 = -1$

Perpendicular slopes are negative reciprocals: a slope of ¾ pairs with −4/3.

Systems of Equations

A system's solution is where the graphs intersect. Two ways to find it by hand:

- **Substitution:** solve one equation for a variable, plug into the other. Best when a variable is already isolated (or nearly).
- **Elimination:** multiply the equations so one variable's coefficients match, then add or subtract to cancel it. Best when everything is in Ax + By = C form.

Count solutions without solving by comparing the lines:

THE TWO LINES…	SOLUTIONS	HOW TO SPOT IT
Cross	Exactly one	Different slopes.
Are parallel	None	Same slope, different y-intercepts.
Are identical	Infinitely many	One equation is a multiple of the other.

STRATEGIC MOVE

On the Digital SAT, the fastest way to solve most systems is to type both equations into Desmos and click the intersection point. Save the algebra for questions that ask about a coefficient rather than the solution itself.

Inequalities

Solve inequalities exactly like equations, with one exception:

> Multiply or divide both sides by a negative $\implies$ flip the inequality sign.
>
> $-2x < 10$ becomes $x > -5$.

For systems of inequalities on a graph, the solution set is the region where the shadings overlap. To check whether a point is a solution, just plug it into every inequality — it must satisfy all of them.

Absolute Value

$|x| = a \implies x = a \text{ or } x = -a$

$|x| < a \implies -a < x < a \qquad |x| > a \implies x < -a \text{ or } x > a$

Think distance: $|x - 3| < 5$ means "x is within 5 of 3."

Function Notation

$f(x)$ is not multiplication — it's "the output of f at input x." Two skills cover nearly every function-notation question:

- **Evaluate:** $f(5)$ means substitute 5 for every x in the rule.
- **Translate points:** $f(2) = 9$ means the graph passes through (2, 9) — and a table of values is just a list of such points.

For composite values like $g(f(2))$, work inside-out: find f(2) first, then feed the result to g.

CHAPTER 4 · ~35% OF THE TEST

Advanced Math

"Advanced Math" is the SAT's name for nonlinear algebra: exponents, quadratics, exponential functions, and polynomials. It's tied with Algebra as the biggest domain, and quadratics are its center of gravity.

Exponent Rules

RULE	FORMULA	EXAMPLE
Product	$x^a \cdot x^b = x^{a+b}$	$x^2 \cdot x^3 = x^5$
Quotient	$x^a / x^b = x^{a-b}$	$x^7 / x^3 = x^4$
Power of a power	$(x^a)^b = x^{ab}$	$(x^2)^3 = x^6$
Power of a product	$(xy)^a = x^a y^a$	$(2x)^3 = 8x^3$
Negative exponent	$x^{-a} = 1 / x^a$	$2^{-3} = 1/8$
Zero exponent	$x^0 = 1$ $(x \neq 0)$	$17^0 = 1$

WATCH OUT

These rules need the **same base**. To simplify $4^x \cdot 8^x$, rewrite both as powers of 2 first. And the classic trap: $x^2 \cdot x^3$ is x^5, not x^6 — multiply the bases' exponents only when raising a power to a power.

Roots & Rational Exponents

$\sqrt{(ab)} = \sqrt{a} \cdot \sqrt{b}$ $\quad \sqrt{(a/b)} = \sqrt{a} / \sqrt{b}$ $\quad x^{(m/n)} = \sqrt[n]{(x^m)}$

$\sqrt{48} = \sqrt{16} \cdot \sqrt{3} = 4\sqrt{3}$. $x^{(3/2)} = \sqrt{(x^3)}$. But $\sqrt{(a + b)} \neq \sqrt{a} + \sqrt{b}$ — roots don't split over addition.

A fractional exponent is just a root in disguise: the denominator is the root, the numerator is the power. The SAT tests this translation directly, in both directions.

Quadratics

A quadratic is $y = ax^2 + bx + c$ with $a \neq 0$, and its graph is a parabola. Three factoring patterns are worth knowing on sight:

$$(a + b)^2 = a^2 + 2ab + b^2$$

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

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

The difference of squares is the most-tested pattern on the SAT — spot it fast in both directions.

When a quadratic factors, set each factor to zero: if $(x - 3)(x + 5) = 0$, then $x = 3$ or $x = -5$. When it doesn't factor nicely, use the quadratic formula:

$$x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$$

For $ax^2 + bx + c = 0$. Works on every quadratic, every time.

The expression under the root, the **discriminant**, answers the SAT's favorite quadratic question — "how many real solutions?" — without solving:

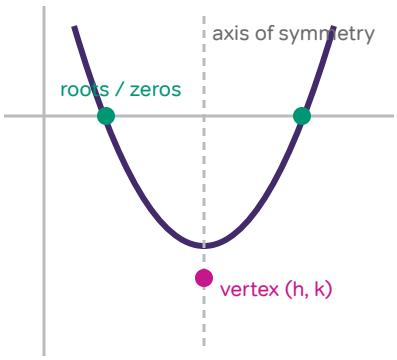
DISCRIMINANT $B^2 - 4AC$	REAL SOLUTIONS	GRAPH
Positive	Two	Parabola crosses the x-axis twice
Zero	Exactly one	Vertex sits on the x-axis
Negative	None	Parabola misses the x-axis entirely

Anatomy of a Parabola

Vertex form: $y = a(x - h)^2 + k$

Vertex at (h, k). Watch the sign: $y = (x + 3)^2 - 2$ has vertex $(-3, -2)$.

- The vertex's x-coordinate is $x = -b / 2a$; it's also the midpoint of the two x-intercepts.
- $a > 0$ opens upward (vertex = minimum); $a < 0$ opens downward (vertex = maximum).
- The y-intercept is c — plug in $x = 0$.
- "Which form displays the vertex / the intercepts as constants?" = pick vertex form / factored form. No algebra needed.



One parabola, all the vocabulary.

Exponential Growth & Decay

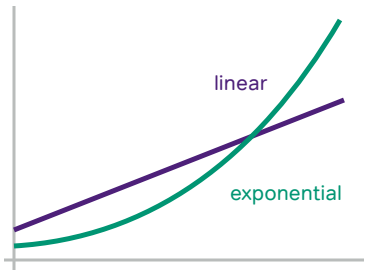
$y = a \cdot b^x$ growth: $b = 1 + r$ decay: $b = 1 - r$

a = initial amount, b = growth factor, r = percent rate as a decimal. 3% yearly growth: $y = a(1.03)^t$. 20% decay: $y = a(0.80)^t$.

The SAT's favorite move is making you choose between linear and exponential models:

- "Increases by 12 **each** year" — same amount per step — is **linear**.
- "Increases by 12% each year" — same percent per step — is **exponential**.

Also read the exponent's clock carefully: in $y = 400(1.05)^{(t/3)}$, the quantity grows 5% every *three* units of t, not every one.



Same start — very different futures.

Polynomials, Zeros & Factors

$(x - k)$ is a factor of $p(x) \iff p(k) = 0 \iff$ the graph crosses at $x = k$

Factors, zeros, roots, and x-intercepts are one idea wearing four outfits.

Given a graph, read the zeros straight off the x-axis and rebuild the factors. Given a table, look for the input where the output is 0. A related fact the SAT tests: dividing p(x) by (x − k) leaves remainder p(k) — so a remainder of 0 means (x − k) divides evenly.

Rational & Radical Equations

- **Rational equations** (variable in a denominator): multiply both sides by the denominator to clear it. A rational *expression* is undefined where its denominator is 0.
- **Radical equations** (variable under a root): isolate the radical, then square both sides.

WATCH OUT

Squaring both sides can create **extraneous solutions** — answers the algebra produces that fail in the original equation. Whenever you square or clear denominators, plug every solution back into the original. Answer choices like "I and II only" on radical-equation questions are testing exactly this.

CHAPTER 5 · ~15% OF THE TEST

Problem-Solving & Data Analysis

This domain is proportional reasoning and data literacy: percents, rates, statistics, and reading charts. The math is rarely hard — the points are lost to misread questions, so the vocabulary in Chapter 2 does heavy lifting here.

Percentages

$$p\% \text{ of } x = (p/100) \cdot x$$

$$\text{percent change} = (\text{new} - \text{old}) / \text{old} \times 100\%$$

The “old” value — the original — always goes in the denominator.

For percent increase and decrease, multiply instead of adding: a 30% increase is ×1.30, a 30% decrease is ×0.70. This makes chained changes painless:

WATCH OUT

Successive percent changes don’t add. Up 20% then down 20% is ×1.20 × 0.80 = ×0.96 — a net 4% *decrease*, not back to even. And “40% greater than x” means 1.4x, while “40% of x” means 0.4x — one word, very different numbers.

Ratios, Rates & Proportions

$$a/b = c/d \implies ad = bc$$

Set up two equal ratios, cross-multiply, solve. Keep the same units in the same position (top or bottom) on both sides.

Unit conversions are just multiplication by rates: to convert 5 hours to minutes, multiply by 60 minutes per hour. Chain rates so the units you don’t want cancel — writing the units into your work is the single best defense against conversion traps.

Mean, Median, Mode & Range

$$\text{mean} = \text{sum of values} / \text{number of values} \implies \text{sum} = \text{mean} \times \text{count}$$

The rearranged version solves most SAT average questions: work with sums, not averages.

Example of the sum trick: a team of 5 has mean height 70 inches (sum 350). Add a 76-inch player and the new mean is 426 ÷ 6 = 71.

- **Median:** order the data first; middle value (or average of the middle two). In a frequency table, count from the ends toward the middle.
- **Comparing mean vs. median:** a long tail of high values (or a high outlier) pulls the mean above the median; the reverse pulls it below. The SAT asks this conceptually — no computation.

Standard Deviation

You will never calculate a standard deviation on the SAT. You only need the concept: it measures how spread out the data are around the mean. Data bunched tightly together = small standard deviation; data scattered widely = large. Given two dot plots, the one with values piled near the center has the smaller standard deviation — that comparison is the entire question.

Scatterplots & Lines of Best Fit

- The **line of best fit** summarizes the trend; its slope is the predicted change in y per unit of x, and its y-intercept is the predicted starting value.
- A common question: the difference between an actual data point and the line's **prediction** at that x — read the vertical gap between the point and the line.
- Positive association: points rise left to right. Negative: they fall. No association: a shapeless cloud.

Probability & Two-Way Tables

> P(event) = favorable outcomes / total possible outcomes
>
> Always a number between 0 and 1.

On the Digital SAT, probability almost always arrives as a **two-way table**. The skill being tested is picking the right denominator:

> **STRATEGIC MOVE**
>
> The phrase after **"given that"** (or "of the students who…") names your denominator. "Given that a selected student is a junior" = restrict to the junior *row*, and use that row's total — not the whole table's.

Samples, Surveys & Margin of Error

- **Random sampling** lets you generalize results to the whole population the sample was drawn from — and only that population.
- **Margin of error** is the uncertainty around an estimate. Larger random samples → smaller margin of error. That's the only relationship the SAT tests.

- **Random assignment** to treatment groups is what allows a cause-and-effect conclusion. No random assignment, no causal claim — association only.

CHAPTER 6 · ~15% OF THE TEST

Geometry & Trigonometry

Your Built-In Reference Sheet

Every geometry formula below is **given to you** on the reference sheet, one click away on every question. Don't memorize these — get familiar with the sheet before test day so you know exactly what's on it and can find things fast.

ON YOUR REFERENCE SHEET

$A = \pi r^2$ · $C = 2\pi r$ · $A = lw$ · $A = \frac{1}{2}bh$ · $c^2 = a^2 + b^2$

$V = lwh$ · $V = \pi r^2 h$ · $V = (4/3)\pi r^3$ · $V = (1/3)\pi r^2 h$ · $V = (1/3)lwh$

Both special right triangles (below) · a circle has 360° or 2π radians · a triangle's angles sum to 180°.

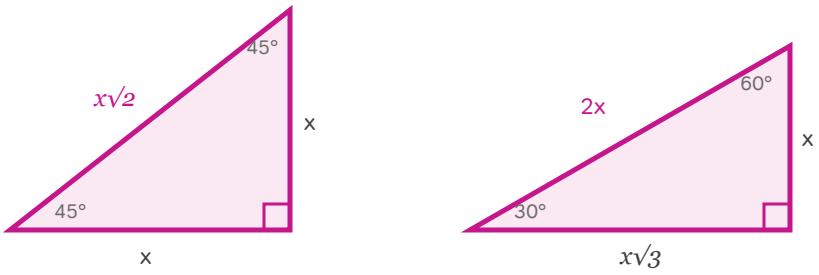
Angles & Lines

- **Vertical angles** (the X made by two crossing lines) are equal; angles on a straight line sum to 180°.
- A line crossing two **parallel lines** creates only two angle measures — every angle is either a or 180° − a. Matching corners match.
- A triangle's angles sum to 180°; an **exterior angle** equals the sum of the two remote interior angles.

Triangles

Area and the Pythagorean theorem are on the reference sheet. The working knowledge that turns them into answers:

- **Pythagorean triples** save time: 3-4-5 and 5-12-13 (and their multiples, like 6-8-10) appear constantly.
- **Similar triangles** have equal angles and proportional sides. When a question says "similar," set up the ratio of corresponding sides immediately. Two pairs of equal angles is enough to prove similarity.
- Equal sides face equal angles (isosceles); the largest side faces the largest angle.



The special right triangles — both are printed on your reference sheet.

Two reads worth practicing: in the 45-45-90, the hypotenuse is a leg times √2 (and a leg is the hypotenuse divided by √2). In the 30-60-90, the short side is always opposite the 30° angle, and the hypotenuse is twice that short side.

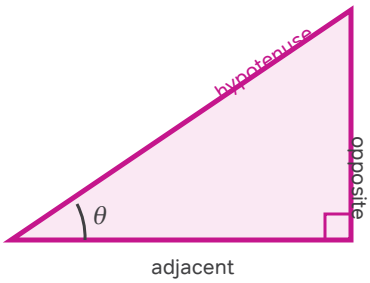
Right-Triangle Trigonometry

SOH-CAH-TOA

$\sin\theta = \text{opp/hyp} \quad \cos\theta = \text{adj/hyp}$

$\tan\theta = \text{opp/adj}$

"Opposite" and "adjacent" are relative to the angle you're standing at — relabel before you write the ratio.



Label from the angle in question, then write the ratio.

$\sin\theta = \cos(90° - \theta)$

The complementary-angle identity — a Digital SAT favorite. If sin 32° = 0.53, then cos 58° = 0.53, no calculator needed.

Because similar triangles have proportional sides, **equal angles mean equal trig ratios** — if two right triangles are similar, the cosine of matching angles is identical regardless of size.

Circles

Circumference and area are on the reference sheet. Arcs and sectors are just fractions of them:

$$\text{arc length} = (\text{central angle} / 360^\circ) \cdot 2\pi r \qquad \text{sector area} = (\text{central angle} / 360^\circ) \cdot \pi r^2$$

A 90° slice is a quarter of the circumference and a quarter of the area.

In the coordinate plane:

$$(x - h)^2 + (y - k)^2 = r^2$$

Center (h, k), radius r. Signs flip: $(x + 3)^2 + (y - 1)^2 = 25$ has center (−3, 1) and radius 5.

If a circle equation arrives expanded (with $x^2 + 6x$–style terms), complete the square to restore this form — or paste the equation into Desmos and read the center and radius off the graph.

Radians, when they appear, are one conversion: $180^\circ = \pi$ radians.

Volume

Every volume formula you need — box, cylinder, sphere, cone, pyramid — is on the reference sheet. The test's twist is rarely the formula itself; it's the setup: solving backward for a radius or height, doubling one dimension (doubling r quadruples a cylinder's volume — r is squared), or converting units before you compute. Slow down on the setup, then let the sheet supply the formula.

ONE LAST STRATEGIC MOVE

Don't study formulas the night before the test. Study the *reference sheet* and your calculator instead — knowing where everything lives in Bluebook is worth more on test morning than one more formula.