SAT Math cheat sheet

ALGEBRA · LINES

- Slope: $m = (y_2 - y_1) / (x_2 - x_1)$. Rise over run, same order top and bottom
- Line: $y = mx + b$. Through a point: $y - y_1 = m(x - x_1)$
- Intercepts: set the other variable to 0. Standard $ax + by = c$ is fastest for these
- Parallel: same slope. Perpendicular: slopes multiply to -1 (negative reciprocal)
- Horizontal: $y = c$, slope 0. Vertical: $x = c$, slope undefined

ALGEBRA · SYSTEMS AND INEQUALITIES

- A variable already alone: substitute. Coefficients match: add or subtract
- Asked for $x + y$? Add the equations. Do not solve for both
- No solution: same slope, different intercept. Infinite: same line, proportional
- Inequality: flip the sign when you multiply or divide by a negative
- At least is $\geq$, at most is $\leq$. Greatest integer: the largest whole number inside the range
- Absolute value: $|u| = c$ gives $u = c$ and $u = -c$. Solve both, then check
- Two-variable inequality: graph the line, then test a point to pick the shaded side

ADVANCED MATH · QUADRATICS

- Quadratic formula: $x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$
- Discriminant $b^2 - 4ac$: positive two roots, zero one, negative none
- Standard $y = ax^2 + bx + c$: c is the y intercept, a opens up if positive
- Factored $y = a(x - r)(x - s)$: roots r and s
- Vertex $y = a(x - h)^2 + k$: vertex (h, k), signs invert
- Vertex x coordinate: $-b / 2a$. In factored form, the midpoint of the roots
- Sum of roots $-b/a$, product c/a. Complete the square to reach vertex form

GEOMETRY · ANGLES AND AREA

- Triangle angles sum to 180°. An exterior angle equals the sum of the two remote interiors
- Parallel lines cut by a transversal: corresponding and alternate angles are equal, co-interior sum to 180°
- Areas: triangle $\frac{1}{2}bh$, rectangle lw, parallelogram bh, trapezoid $\frac{1}{2}(b_1 + b_2)h$
- Similar figures: lengths $\times k$, areas $\times k^2$, volumes $\times k^3$

ADVANCED MATH · EVERYTHING ELSE

- Powers: $a^m a^n = a^{m+n}$, $a^m/a^n = a^{m-n}$, $(a^m)^n = a^{mn}$, $(ab)^n = a^n b^n$, $a^{-n} = 1/a^n$
- Roots: a^(1/n) = $\sqrt[n]{a}$ and a^(m/n) = $\sqrt[n]{(a^m)}$. $\sqrt{(a + b)}$ is not $\sqrt{a} + \sqrt{b}$
- Model $a \cdot b^t$: $b > 1$ grows, $b < 1$ decays, percent = $(b - 1) \times 100$
- Doubling every h: 2^(t/h). Halving: (1/2)^(t/h). Half-life: t over the half-life
- Common base: rewrite both sides with one base, then set exponents equal
- f(g(x)) works inside out: g first. $f^{-1}(y)$ means solve $f(x) = y$, not the reciprocal
- Domain: denominator is not zero, and the expression under a square root is at least zero
- Shifts: $f(x - 2)$ moves right 2, $f(x) + 3$ moves up 3, $-f(x)$ flips over the x axis
- Remainder when P(x) is divided by $x - a$ is P(a). If $P(a) = 0$, then $x - a$ is a factor

GEOMETRY · RIGHT TRIANGLES AND CIRCLES

- Pythagoras: $c^2 = a^2 + b^2$. Triples: 3-4-5, 5-12-13, 8-15-17, 7-24-25
- 30-60-90 is $x : x\sqrt{3} : 2x$. 45-45-90 is $x : x : x\sqrt{2}$
- SOH CAH TOA against the named angle. $\sin A = \cos(90° - A)$
- Circle: $C = 2\pi r$, $A = \pi r^2$. Arc = $(\theta/360) \cdot 2\pi r$, sector = $(\theta/360) \cdot \pi r^2$
- Radians: $360° = 2\pi$. Convert with $\theta \times \pi/180$. Arc $s = r\theta$, sector = $\frac{1}{2}r^2\theta$
- Circle equation: $(x - h)^2 + (y - k)^2 = r^2$. Expand it, then complete the square
- A tangent meets the radius at 90°. An inscribed angle is half the central angle on the same arc
- Volume: box lwh, cylinder $\pi r^2 h$, cone $\frac{1}{3}\pi r^2 h$, sphere $(4/3)\pi r^3$

ALGEBRA · WORDS INTO EQUATIONS

- per means divide, of means multiply, total means add
- more than adds, less than reverses the order: 5 less than x is $x - 5$
- Twice a number is 2x, and the word is means equals
- Fixed fee plus rate times quantity is the most common model in the section
- Two quantities and two facts: one equation for the count, one for the value
- Consecutive integers: n, n + 1, n + 2. Consecutive odd: n, n + 2, n + 4

SAT Math cheat sheet

PROBLEM SOLVING AND DATA · PERCENT AND RATE

- Multipliers: up 25% → ×1.25, down 20% → ×0.80. Changes in a row multiply
- Percent change = (new − old) / old × 100. The original is the denominator
- Find the original: divide the final value by the multiplier
- Percentage points: 45% to 50% is 5 points but about 11% change
- Rates: distance = rate × time. Convert units before multiplying
- Unit conversion: multiply by fractions that equal 1, so units cancel
- Proportion: a/b = c/d. Ratios split a total into equal parts, then scale

PROBLEM SOLVING AND DATA · PROBABILITY AND CLAIMS

- Without replacement: the second draw drops the count and the total by one
- Conditional (given that): the named group becomes the denominator
- P(A and B) = P(A) × P(B given A). Independent: P(A) × P(B)
- At least one: 1 − the probability of none
- Margin of error: result ± the margin gives a plausible interval
- Larger random sample narrows the margin; it does not fix a biased sample
- Random selection lets you generalise to that population. Only random assignment supports a cause

PROBLEM SOLVING AND DATA · STATISTICS

- Mean × count = sum, which is how a missing value is found
- Median: middle of the sorted list, average the two middles if the count is even
- Box plot: the box spans Q1 to Q3 with the median inside, whiskers reach the smallest and largest values that are not outliers
- Outliers move the mean, not the median. Weighted average: Σ(w·x) / Σw
- Spread: range is max − min, IQR is Q3 − Q1, standard deviation is a typical distance from the mean
- Add a constant to every value: center moves, spread does not. Multiply: both scale
- Scatterplot slope: the change in y per one unit of x, in context units. The intercept is the value at x = 0
- Predicted comes from the equation, actual from the dot. Residual = actual − predicted
- Outside the data range a prediction is an extrapolation, so it is a guess
- Histogram or dot plot: the bar height or the number of dots is the frequency. Add them for the count
- Skew: mean above the median means a tail to the right, below means a tail to the left
- Change one value by d: the mean moves by d divided by the number of values

WORKED IN ONE LINE

Asked for x + y

2x + 3y = 17 and x + 2y = 10. Subtract: x + y = 7.

Maximum of a parabola

$y = -2x^2 + 8x$. Vertex at x = 2, so maximum y = 8.

Two percent changes

Up 25% then down 20%: 1.25 × 0.80 = 1.00.

Two draws, no replacement

5 red, 3 blue, both red: 5/8 × 4/7 = 5/14.

TRAPS WORTH CHECKING BEFORE YOU MOVE ON

- Flipping an inequality and forgetting to reverse the sign
- Losing the second solution of an absolute value
- Keeping a root that fails when substituted back after squaring
- Adding two percent changes instead of multiplying them
- Using the grand total for a conditional probability
- Counting an overlap twice when combining two groups
- Scaling an area by the side ratio instead of its square
- Answering x when the question asked for 3x − 2

Before you answer

Read the last sentence first: it names the quantity. Substitute your answer back. Check the unit against what was asked.

Grid-ins

Short: a fraction, a decimal or a whole number. No percent signs, units, commas or mixed numbers.

Pacing

About 95 seconds a question. No route after 90 seconds, mark it and move. A blank is the only certain zero.