

SAT Math Formula Sheet: what the test gives you, and what you must know

Given on every SAT math module (the reference sheet)

- Area of a circle $A = \pi r^2$, circumference $C = 2\pi r$
- Area of a rectangle $A = lw$; triangle $A = \frac{1}{2}bh$
- Pythagorean theorem $c^2 = a^2 + b^2$
- Special right triangles: 30-60-90 sides $x, x\sqrt{3}, 2x$; 45-45-90 sides $s, s, s\sqrt{2}$
- Volumes: box lwh , cylinder $\pi r^2 h$, sphere $(\frac{4}{3})\pi r^3$, cone $(\frac{1}{3})\pi r^2 h$, pyramid $(\frac{1}{3})lwh$
- A circle has 360° or 2π radians; the angles of a triangle sum to 180°

Not given: algebra (the largest share of the test)

- Slope $m = (y_2 - y_1)/(x_2 - x_1)$; slope-intercept $y = mx + b$; point-slope $y - y_1 = m(x - x_1)$
- Parallel lines: equal slopes; perpendicular: slopes multiply to -1
- Systems: no solution when slopes equal and intercepts differ; infinite when the equations are the same line
- Quadratic: standard $ax^2 + bx + c$, vertex $a(x - h)^2 + k$ with vertex (h, k) , factored $a(x - p)(x - q)$ with roots p, q
- Vertex $x = -b/2a$; quadratic formula $x = [-b \pm \sqrt{b^2 - 4ac}]/2a$; discriminant $b^2 - 4ac$ tells the number of real solutions
- Sum of roots $-b/a$, product c/a
- Exponents: $x^a \cdot x^b = x^{(a+b)}$, $(x^a)^b = x^{(ab)}$, $x^{(-a)} = 1/x^a$, $x^{(1/n)} = \text{nth root of } x$
- Exponential growth/decay $y = a(1 + r)^t$ (r negative for decay); compound interest $A = P(1 + r/n)^{(nt)}$
- Absolute value $|x| = a$ means $x = a$ or $x = -a$
- Function shifts: $f(x) + k$ up, $f(x - h)$ right, $-f(x)$ reflects over the x -axis, $f(-x)$ over the y -axis

Not given: problem solving and data

- Percent change = $(\text{new} - \text{old})/\text{old} \times 100$; percent of a number = $(p/100) \times n$
- Average = $\text{sum} / \text{count}$; a missing value = $(\text{average} \times \text{count}) - \text{sum of the rest}$
- Ratio $a:b$ means $a/(a + b)$ of the whole is a
- Unit conversion: multiply by $(\text{new unit} / \text{old unit})$ fractions until the old unit cancels
- Median: middle value (or mean of the two middle); mode: most frequent; range: $\text{max} - \text{min}$
- Standard deviation: larger when values are spread out; the SAT never asks you to compute it
- Probability = $\text{favourable} / \text{total}$; conditional probability from a two-way table = $\text{cell} / \text{row (or column) total}$
- Line of best fit: read slope as "per unit of x " and the y -intercept as the value at $x = 0$

Not given: geometry and trigonometry

- Distance $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$; midpoint $((x_1 + x_2)/2, (y_1 + y_2)/2)$
- Circle: $(x - h)^2 + (y - k)^2 = r^2$ with centre (h, k) ; complete the square to find it
- Arc length = $(\theta/360) \times 2\pi r$; sector area = $(\theta/360) \times \pi r^2$; radians = $\text{degrees} \times \pi/180$
- Interior angles of an n -gon sum to $180(n - 2)$; each exterior angle of a regular n -gon is $360/n$
- Similar triangles: corresponding sides in proportion; areas scale by the square of the ratio
- SOH CAH TOA; $\sin^2\theta + \cos^2\theta = 1$; $\sin x = \cos(90^\circ - x)$
- Complex numbers: $i^2 = -1$; multiply like binomials
- Density = $\text{mass} / \text{volume}$ (appears in word problems)

How to use it: cover the sheet and write it from memory once a week until you can. Then practise from the real released tests, timed. 1-on-1 SAT math preparation: sciencewithshobha.com/subjects/sat/