

# SAT & PSAT Must-Know Math Formulas

## LOTLOUISCHO STEM CLUB

### 1. Algebra – Linear Equations and Functions

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad (\text{Slope formula})$$

$$y = mx + b \quad (\text{Slope-intercept form})$$

$$y - y_1 = m(x - x_1) \quad (\text{Point-slope form})$$

$$y_1 = m_1x + b_1$$

$$y_2 = m_2x + b_2$$

$m_1 = m_2$  for parallel lines,  $m_1 \cdot m_2 = -1$  for perpendicular lines.

Average rate of change between  $(a, f(a))$  and  $(b, f(b))$ :  $\frac{f(b) - f(a)}{b - a}$

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### 2. Quadratics and Polynomials

$$y = ax^2 + bx + c \quad (\text{Standard form})$$

$$y = a(x - h)^2 + k \quad (\text{Vertex form, vertex} = (h, k))$$

$$y = a(x - r_1)(x - r_2) \quad (\text{Factored form, roots } r_1, r_2)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (\text{Quadratic formula})$$

$$a^2 \pm 2ab + b^2 = (a \pm b)^2, \quad a^2 - b^2 = (a - b)(a + b)$$

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### 3. Exponential and Radical Functions

$$y = a(1 \pm r)^t \quad (\text{Growth/decay model})$$

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \quad (\text{Compound interest})$$

$$A = Pe^{rt} \quad (\text{Continuous growth/decay})$$

$$a^m \cdot a^n = a^{m+n}, \quad \frac{a^m}{a^n} = a^{m-n}, \quad a^{1/n} = \sqrt[n]{a}, \quad a^{m/n} = \sqrt[n]{a^m}$$

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### 4. Geometry – Plane Figures

$$A_{\triangle} = \frac{1}{2}bh, \quad A_{\text{circle}} = \pi r^2, \quad C = 2\pi r$$

$$A_{\text{rect}} = bh, \quad A_{\text{trap}} = \frac{1}{2}(b_1 + b_2)h$$

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

$$a^2 + b^2 = c^2 \quad (\text{Pythagorean theorem})$$

$$45\text{-}45\text{-}90 \text{ triangle: } x, x, x\sqrt{2}; \quad 30\text{-}60\text{-}90: x, x\sqrt{3}, 2x$$

$$s = \frac{\theta}{360}(2\pi r), \quad A_{\text{sector}} = \frac{\theta}{360}(\pi r^2)$$

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### 5. Solid Geometry

$$V_{\text{rect prism}} = lwh, \quad V_{\text{cyl}} = \pi r^2 h$$

$$V_{\text{cone}} = \frac{1}{3}\pi r^2 h, \quad V_{\text{sphere}} = \frac{4}{3}\pi r^3$$

$$A_{\text{sphere}} = 4\pi r^2$$

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## 6. Statistics and Data

$$\bar{x} = \frac{\text{sum of data}}{\text{number of data points}} \quad (\text{Mean})$$

Median = middle value, Mode = most frequent value, Range = Max - Min

$$\text{Line of best fit: } y = mx + b, \quad \text{Percent change: } \frac{\text{new} - \text{old}}{\text{old}} \times 100\%$$

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## 7. Probability and Counting

$$P = \frac{\text{favorable outcomes}}{\text{total outcomes}}$$

$$P(A \cap B) = P(A)P(B) \text{ (independent), } \quad P(A \cup B) = P(A) + P(B) \text{ (mutually exclusive)}$$

$${}_nC_r = \frac{n!}{r!(n-r)!}, \quad {}_nP_r = \frac{n!}{(n-r)!}$$

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## 8. Conversions and Constants

$$1 \text{ in} = 2.54 \text{ cm}, \quad 1 \text{ ft} = 12 \text{ in}, \quad 1 \text{ yd} = 3 \text{ ft}$$

$$\pi \approx 3.1416, \quad e \approx 2.718$$

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## Bonus: Quick Test Tips

- Memorize special right triangle ratios.
- Know how to use the built-in Desmos calculator efficiently.
- Check units for geometry problems.
- For variables, plug in easy numbers.
- Estimate magnitude to spot unreasonable answers.