

# SAT Math Formula Sheet

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## ALGEBRA & LINEAR EQUATIONS

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<b>Slope</b>	$m = (y_2 - y_1) / (x_2 - x_1)$	<i>Rise over run</i>
<b>Slope-Intercept</b>	$y = mx + b$	<i>m=slope, b=y-intercept</i>
<b>Point-Slope</b>	$y - y_1 = m(x - x_1)$	<i>Use when you have a point + slope</i>
<b>Standard Form</b>	$Ax + By = C$	<i>A,B,C are integers</i>
<b>Parallel Lines</b>	Same slope ( $m_1 = m_2$ )	<i>Different y-intercepts</i>
<b>Perpendicular Lines</b>	$m_1 * m_2 = -1$	<i>Slopes are negative reciprocals</i>
<b>Midpoint</b>	$((x_1+x_2)/2, (y_1+y_2)/2)$	<i>Average of coordinates</i>
<b>Distance</b>	$d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$	<i>Pythagorean theorem applied</i>

## QUADRATIC EQUATIONS

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<b>Standard Form</b>	$y = ax^2 + bx + c$	<i>a determines direction</i>
<b>Quadratic Formula</b>	$x = (-b \pm \sqrt{b^2-4ac}) / 2a$	<i>Memorize this!</i>
<b>Discriminant</b>	$D = b^2 - 4ac$	<i>D&gt;0: 2 real, D=0: 1 real, D&lt;0: none</i>
<b>Vertex Form</b>	$y = a(x - h)^2 + k$	<i>(h,k) is the vertex</i>
<b>Vertex from Std</b>	$h = -b/(2a), k = f(h)$	<i>Plug h back into equation</i>
<b>Factored Form</b>	$y = a(x - r_1)(x - r_2)$	<i>r1, r2 are the roots/zeros</i>
<b>Sum of Roots</b>	$r_1 + r_2 = -b/a$	<i>Vieta's formula</i>
<b>Product of Roots</b>	$r_1 * r_2 = c/a$	<i>Vieta's formula</i>

## EXPONENTS & RADICALS

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<b>Product Rule</b>	$a^m * a^n = a^{(m+n)}$	<i>Same base: add exponents</i>
<b>Quotient Rule</b>	$a^m / a^n = a^{(m-n)}$	<i>Same base: subtract exponents</i>
<b>Power Rule</b>	$(a^m)^n = a^{(mn)}$	<i>Multiply exponents</i>
<b>Zero Exponent</b>	$a^0 = 1$	<i>Any nonzero base</i>
<b>Negative Exponent</b>	$a^{-n} = 1/a^n$	<i>Flip to denominator</i>
<b>Fractional Exponent</b>	$a^{(m/n)} = n\text{-th root of } a^m$	<i>Denominator = root index</i>
<b>Radical Product</b>	$\sqrt{ab} = \sqrt{a} * \sqrt{b}$	<i>Split under the radical</i>

## GEOMETRY — AREAS & PERIMETERS

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<b>Rectangle Area</b>	$A = l * w$	<i>length x width</i>
<b>Rectangle Perimeter</b>	$P = 2l + 2w$	
<b>Triangle Area</b>	$A = (1/2) * b * h$	<i>base x height / 2</i>
<b>Circle Area</b>	$A = \pi * r^2$	<i><math>\pi \approx 3.14159</math></i>
<b>Circle Circumference</b>	$C = 2 * \pi * r$ or $\pi * d$	<i>d = diameter = 2r</i>
<b>Trapezoid Area</b>	$A = (1/2)(b_1 + b_2) * h$	<i>Average of parallel sides x height</i>
<b>Parallelogram</b>	$A = b * h$	<i>NOT side lengths</i>

# SAT Math Formula Sheet (continued)

## GEOMETRY — VOLUMES & 3D SHAPES

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Rectangular Prism	$V = l * w * h$	$SA = 2(lw + lh + wh)$
Cylinder	$V = \pi * r^2 * h$	$SA = 2*\pi*r*h + 2*\pi*r^2$
Cone	$V = (1/3) * \pi * r^2 * h$	
Sphere	$V = (4/3) * \pi * r^3$	$SA = 4*\pi*r^2$
Pyramid	$V = (1/3) * B * h$	$B = \text{area of base}$

## TRIANGLES & TRIGONOMETRY

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Pythagorean Theorem	$a^2 + b^2 = c^2$	$c = \text{hypotenuse (longest side)}$
Common Triples	3-4-5, 5-12-13, 8-15-17, 7-24-25	Memorize these!
30-60-90 Triangle	$x, x*\sqrt{3}, 2x$	Short, long, hypotenuse
45-45-90 Triangle	$x, x, x*\sqrt{2}$	Two equal legs
sin(A)	$\sin = \text{opposite} / \text{hypotenuse}$	SOH
cos(A)	$\cos = \text{adjacent} / \text{hypotenuse}$	CAH
tan(A)	$\tan = \text{opposite} / \text{adjacent}$	TOA
Triangle Inequality	$a + b > c$	Any two sides > third side
Angle Sum	$A + B + C = 180 \text{ degrees}$	Interior angles of any triangle
Exterior Angle	$\text{ext} = \text{sum of remote interior}$	

## STATISTICS & PROBABILITY

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Mean (Average)	$\text{mean} = \text{sum} / \text{count}$	Add all values, divide by n
Median	Middle value when sorted	Average of 2 middle if even count
Mode	Most frequent value	Can have 0, 1, or multiple modes
Range	$\text{max} - \text{min}$	
Standard Deviation	Low = clustered, High = spread	SAT won't ask you to calculate
Probability	$P = \text{favorable} / \text{total}$	$0 \leq P \leq 1$
Combined Prob (AND)	$P(A \text{ and } B) = P(A) * P(B)$	If independent events
Combined Prob (OR)	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$	
Percent Change	$((\text{new} - \text{old}) / \text{old}) * 100$	Positive = increase

## RATIOS, PROPORTIONS & PERCENTS

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Proportion	$a/b = c/d \Rightarrow ad = bc$	Cross multiply
Percent	$\text{part}/\text{whole} = \text{percent}/100$	is/of = %/100
Percent Increase	$((\text{new}-\text{old})/\text{old}) * 100$	
Percent Decrease	$((\text{old}-\text{new})/\text{old}) * 100$	
Simple Interest	$I = P * r * t$	$P=\text{principal}, r=\text{rate}, t=\text{time}$
Compound Interest	$A = P(1 + r/n)^{nt}$	$n=\text{compounds/year}$
Rate * Time = Dist	$d = r * t$	Speed formula
Average Speed	Total dist / Total time	NOT average of speeds

## FUNCTIONS & GRAPHS

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Function Notation	$f(x) = \text{expression}$	$f(3)$ means plug in $x=3$
Domain	All valid x inputs	No dividing by 0, no neg sqrt
Range	All possible y outputs	
Composition	$(f \circ g)(x) = f(g(x))$	Plug g into f
Absolute Value	$ x  = x \text{ if } x \geq 0, -x \text{ if } x < 0$	Distance from zero
Circle Equation	$(x-h)^2 + (y-k)^2 = r^2$	Center (h,k), radius r

## KEY SAT MATH TIPS

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1. The SAT provides a reference sheet with basic geometry formulas, but knowing them by heart saves time.
2. Plug in answer choices (backsolve) when algebra gets messy. Start with choice C.
3. Draw diagrams for geometry problems. Label everything. Mark right angles.
4. On "which could be true" questions, you only need ONE valid example.
5. Calculator section: use Desmos (built-in) to graph and solve visually.