



SAT Math Formula Sheet

Essential Formulas with Examples

Geometry Formulas

Area Formulas

Shape	Formula	Example
Rectangle	$A = lw$	Rectangle with length 8 and width 5: $A = 8 \times 5 = 40$
Triangle	$A = \frac{1}{2}bh$	Triangle with base 6 and height 4: $A = \frac{1}{2} \times 6 \times 4 = 12$
Circle	$A = \pi r^2$	Circle with radius 3: $A = \pi(3)^2 = 9\pi$
Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$	Trapezoid with bases 8, 12 and height 5: $A = \frac{1}{2}(8 + 12) \times 5 = 50$

Perimeter & Circumference

Shape	Formula	Example
Rectangle	$P = 2l + 2w$	Rectangle 8 $\times$ 5: $P = 2(8) + 2(5) = 26$
Triangle	$P = a + b + c$	Triangle with sides 3, 4, 5: $P = 3 + 4 + 5 = 12$
Circle	$C = 2\pi r$ or $C = \pi d$	Circle with radius 4: $C = 2\pi(4) = 8\pi$

Volume & Surface Area

Shape	Volume	Surface Area
Rectangular Prism	$V = lwh$	$SA = 2(lw + lh + wh)$
Cube	$V = s^3$	$SA = 6s^2$
Cylinder	$V = \pi r^2 h$	$SA = 2\pi r^2 + 2\pi rh$
Sphere	$V = \frac{4}{3}\pi r^3$	$SA = 4\pi r^2$

Example: Cylinder with radius 3 and height 8

- Volume: $V = \pi(3)^2(8) = 72\pi$
- Surface Area: $SA = 2\pi(3)^2 + 2\pi(3)(8) = 18\pi + 48\pi = 66\pi$



Coordinate Geometry



Essential Coordinate Formulas

Concept	Formula	Example
Distance	$d = \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$	Distance from (1,2) to (4,6): $d = \sqrt{[(4-1)^2 + (6-2)^2]} = \sqrt{[9 + 16]} = 5$
Midpoint	$M = ((x_1 + x_2)/2, (y_1 + y_2)/2)$	Midpoint of (2,3) and (8,7): $M = ((2+8)/2, (3+7)/2) = (5,5)$
Slope	$m = (y_2 - y_1)/(x_2 - x_1)$	Slope through (1,3) and (5,11): $m = (11-3)/(5-1) = 8/4 = 2$

Line Equations

Form	Equation	When to Use
Slope-Intercept	$y = mx + b$	When you know slope and y-intercept
Point-Slope	$y - y_1 = m(x - x_1)$	When you know slope and one point
Standard	$Ax + By = C$	When dealing with intercepts

Example: Line with slope 3 passing through (2,5)

- Point-slope: $y - 5 = 3(x - 2)$
- Slope-intercept: $y = 3x - 1$



Right Triangle & Trigonometry

Pythagorean Theorem

$a^2 + b^2 = c^2$ (where c is the hypotenuse)

Example: Right triangle with legs 5 and 12

- $c^2 = 5^2 + 12^2 = 25 + 144 = 169$
- $c = \sqrt{169} = 13$

Special Right Triangles

Triangle Sides Ratio Example

45-45-90 1 : 1 : $\sqrt{2}$ If legs = 4, hypotenuse = $4\sqrt{2}$

30-60-90 1 : $\sqrt{3}$: 2 If short leg = 3, long leg = $3\sqrt{3}$, hypotenuse = 6

Basic Trigonometry



Function Definition	Example
$\sin \theta$	opposite/hypotenuse In 3-4-5 triangle: $\sin \theta = 3/5$
$\cos \theta$	adjacent/hypotenuse In 3-4-5 triangle: $\cos \theta = 4/5$
$\tan \theta$	opposite/adjacent In 3-4-5 triangle: $\tan \theta = 3/4$



Algebra Essentials

Quadratic Formulas

Concept	Formula	Example
Standard Form	$y = ax^2 + bx + c$	$y = 2x^2 - 5x + 3$
Vertex Form	$y = a(x - h)^2 + k$	$y = 2(x - 1)^2 + 4$ (vertex at (1,4))
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	For $x^2 - 5x + 6 = 0$: $x = \frac{5 \pm \sqrt{(25-24)}}{2} = \frac{5 \pm 1}{2}$

Factoring Patterns

Pattern	Formula	Example
Difference of Squares	$a^2 - b^2 = (a+b)(a-b)$	$x^2 - 9 = (x+3)(x-3)$
Perfect Square	$a^2 \pm 2ab + b^2 = (a \pm b)^2$	$x^2 + 6x + 9 = (x+3)^2$
Common Factor	$ax + ay = a(x + y)$	$3x + 6 = 3(x + 2)$



Exponential & Logarithmic

Exponent Rules

Rule	Formula	Example
Product	$a^m \times a^n = a^{(m+n)}$	$x^3 \times x^5 = x^8$
Quotient	$a^m \div a^n = a^{(m-n)}$	$x^7 \div x^3 = x^4$
Power	$(a^m)^n = a^{(mn)}$	$(x^2)^3 = x^6$
Negative	$a^{(-n)} = 1/a^n$	$x^{(-2)} = 1/x^2$



Growth & Decay

Type	Formula	Example
Exponential Growth	$y = a(1 + r)^t$	\$1000 at 5% for 3 years: $y = 1000(1.05)^3$
Exponential Decay	$y = a(1 - r)^t$	500 grams, 10% decay for 4 periods: $y = 500(0.9)^4$



Circle Equations

Circle Formulas

Form	Equation	Information Given
Standard	$(x - h)^2 + (y - k)^2 = r^2$	Center (h,k), radius r
General	$x^2 + y^2 + Dx + Ey + F = 0$	Need to complete the square
Example: Circle with center (3, -2) and radius 5		
	• Equation: $(x - 3)^2 + (y + 2)^2 = 25$	

Circle Properties

Concept	Formula	Example
Sector Area	$A = (\theta/360^\circ) \times \pi r^2$	60° sector of circle with r = 6: $A = (60/360) \times \pi(36) = 6\pi$
Arc Length	$L = (\theta/360^\circ) \times 2\pi r$	90° arc of circle with r = 4: $L = (90/360) \times 2\pi(4) = 2\pi$



Statistics & Data Analysis

Central Tendency

Measure	Definition	Example
Mean	Sum of values ÷ number of values	Data: 2,4,6,8,10. Mean = $30 \div 5 = 6$
Median	Middle value when ordered	Data: 2,4,6,8,10. Median = 6
Mode	Most frequently occurring value	Data: 2,3,3,4,5. Mode = 3

Probability



Concept	Formula	Example
Basic Probability	$P(\text{event}) = \text{favorable outcomes} / \text{total outcomes}$	Rolling a 3 on a die: $P = 1/6$
Compound Events	$P(A \text{ and } B) = P(A) \times P(B)$	Two coin flips both heads: $P = 1/2 \times 1/2 = 1/4$



Quick Reference: Common Values

Perfect Squares

$1^2 = 1$,
 $2^2 = 4$
 $3^2 = 9$
 $4^2 = 16$
 $5^2 = 25$
 $6^2 = 36$
 $7^2 = 49$
 $8^2 = 64$
 $9^2 = 81$
 $10^2 = 100$
 $11^2 = 121$
 $12^2 = 144$
 $13^2 = 169$
 $14^2 = 196$
 $15^2 = 225$

Common Radicals

$\sqrt{2} \approx 1.41$
 $\sqrt{3} \approx 1.73$
 $\sqrt{5} \approx 2.24$
 $\sqrt{6} \approx 2.45$
 $\sqrt{7} \approx 2.65$
 $\sqrt{8} = 2\sqrt{2} \approx 2.83$

Angle Conversions



- $30^\circ = \pi/6$ radians
- $45^\circ = \pi/4$ radians
- $60^\circ = \pi/3$ radians
- $90^\circ = \pi/2$ radians
- $180^\circ = \pi$ radians



Test-Taking Formula Tips

Time-Saving Strategies

1. **Memorize these formulas** - they're not provided on the test
2. **Use the calculator wisely** - for complex arithmetic, not simple calculations
3. **Estimate first** - eliminate obviously wrong answers
4. **Work backwards** - plug answer choices into equations when stuck

Formula Sheet Usage

- ✓ **Do memorize:** Basic area, Pythagorean theorem, quadratic formula
- ✓ **Reference sheet provides:** Volume formulas, some geometry formulas
- ✓ **Practice with:** Your calculator's functions and memory features

Common Formula Mistakes

- ✗ **Don't confuse:** Area vs. perimeter formulas
- ✗ **Watch out for:** Radius vs. diameter in circle problems
- ✗ **Be careful with:** Order of operations in complex formulas
- ✗ **Remember:** Units in your final answer



Practice Problems

Geometry

1. A rectangle has length 12 and width 5. What is the length of its diagonal?
Answer: $\sqrt{12^2 + 5^2} = \sqrt{144 + 25} = \sqrt{169} = 13$
2. What is the area of a circle with diameter 10?



Answer: $r = 5$, so $A = \pi(5)^2 = 25\pi$

Algebra

3. Solve for x : $2x^2 - 8x + 6 = 0$

Answer: $x = [8 \pm \sqrt{(64-48)}] / 4 = [8 \pm 4] / 4$, so $x = 3$ or $x = 1$

4. What is the slope of a line passing through (2,3) and (6,11)?

Answer: $m = (11-3)/(6-2) = 8/4 = 2$



 **Pro Tip:** Print this formula sheet and use it during practice tests, then gradually try to solve problems without it to build memorization.

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Need help applying these formulas? Contact us for personalized SAT Math coaching and strategy sessions.