SAT Math and SAT Math IIC Formula Sheet

Algebra

Given $f(x) = ax^2 + bx + c$

Sum of roots: $\frac{-b}{a}$

Product of roots: $\frac{c}{a}$

Quadratic formula: $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Even functions: $f(x) = f(-x)$. The right side of the graph has the same y-values as the left side

Odd functions: $f(x) = -f(-x)$. The right and left sides of the graph have opposite y-values, like 5 and -5

Solving a system of linear equations with a TI-83 or higher:

Line up your variables. Example

Equation 1: $5x + 2y = 13$

Equation 2: $7y - 4x = 27$

Should be

$5x + 2y = 13$

$-4x + 7y = 27$

Create a matrix and type in the coefficients. Create a second matrix and type in the solutions – in this case, 13 and then 27. Invert (hit the $^{-1}$ button on your calculator) the first matrix and multiply it by the second matrix. This method can work with more than two variables.

Geometry

Regular polygon: a polygon where the sides all have the same length

Distance between two points (x_1, y_1) and (x_2, y_2): $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

*Distance from a point (x_1, y_1) to a line $ax + by + c = 0$: $\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

Sum of interior angles in an n-sided regular polygon: $180(n-2)$

Areas:

- Square: s^2
- Circle: πr^2
- Triangle: $\frac{bh}{2}$ or $\frac{ab\sin C}{2}$
- Rhombus: $\frac{d_1 d_2}{2}$
- Trapezoid: $\frac{(b_1 + b_2)h}{2}$
- Regular Hexagon: $\frac{3s^2\sqrt{3}}{2}$

Special area formulas:

- Regular triangle: $\frac{s^2\sqrt{3}}{4}$
- Heron's formula for scalene triangles: $\sqrt{s(s-a)(s-b)(s-c)}$, where s is one-half of the perimeter

Volumes; Lateral Surface Areas:

- Sphere: $\frac{4\pi r^3}{3}$; $4\pi r^2$
- Cylinder: $\pi r^2 h$; $2\pi rh$
- Cube: s^3 ; $6s^2$
- Rectangular Prism: lwh ; $2(lw) + 2(wh) + 2(lh)$
- Right Cone: $\frac{\pi r^2 h}{3}$; $\pi r\sqrt{r^2 + h^2}$

*Angle between two lines: $\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$, where m_2 is the slope of one of the lines and m_1 is the slope of the other line

*Law of sines: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

*Law of cosines: $c^2 = a^2 + b^2 - 2ab\cos C$

Number of diagonals in an n-sided polygon: $d = n(n-3)/2$

Common Pythagorean triples: (3,4,5), (5,12,13), (7,24,25), (8,15,17)

Items marked with a * are for the Math IIC Test and are unlikely to show up on the SAT I

Written by Jeffrey Wong
July 2006

Probability and Statistics

Factorial: $n! = 1 * 2 * 3 ... * n$

Permutation: a grouping where order matters – (1,2) is a different group than (2,1). The amount of groupings of r objects from n objects is: $${}_nP_r = \frac{n!}{(n-r)!}$$

Combination: a combination where order does not matter – (1,2) would be considered the same as (2,1). The amount of combinations of r objects chosen from n objects is: $${}_nC_r = \frac{n!}{r!(n-r)!}$$

*Circular Permutations: if n objects are arranged in a circle, there are $(n-1)!$ possible arrangements

Probability of event E occurring: $$P(E) = \frac{successes}{total}$$

Probability of events A and B both occurring: $P(A \cap B) = P(A) * P(B)$ if A and B are independent events

*Probability of event A or event B occurring: $$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Measures of central tendency: your calculator can do all of them.

Enter the numbers in a list on your calculator. Then hit the STAT button and go to the CALC tab. The 1 variable statistics will give you the results, including standard deviation, which will be listed as σ

*Least Squares Regression: your calculator can do this too.

Make two lists on your calculator: one list for the x-coordinates of the points and one list for the y-coordinates. Hit the STAT button and go to the CALC tab. LinReg will give you the modeling equation $y = ax + b$

Sequences and Series

Term: a number in a sequence

Arithmetic sequence: list of numbers where you add a certain number to the previous term to get the next term. The number that you add is the common difference

Geometric sequence: list of numbers where you multiply a certain number to the previous term to get the next term. The number that you multiply by is the common ratio

n^{th} term of an arithmetic sequence: $a_n = a_1 + (n-1)d$. Of a geometric sequence: $g_n = g_1 * r^{n-1}$

Sum of an arithmetic sequence: $\frac{(a_1 + a_n)n}{2}$. This is the average of the first and last terms of the sequence multiplied by the amount of terms in the sequence.

Sum of a geometric sequence: $\frac{g_1(1-r^n)}{1-r}$

Sum of an infinite geometric sequence: $\frac{g_1}{1-r}$ if $-1 < r < 1$

*Special series:

- Sum of the first n odd numbers = n^2
- Sum of the first n perfect squares = $\frac{n(n+1)(2n+1)}{6}$
- Sum of the first n perfect cubes = $\frac{(1+n)^2 n^2}{4}$

Miscellaneous

*Slope with parametric equations – given: $y(t) = at + b$ and $x(t) = ct + d$

Slope = $\frac{a}{c}$

Number of divisors of x:
Prime factorize x. Add 1 to each of the exponents, then multiply the new exponents

Items marked with a * are for the Math IIC Test and are unlikely to show up on the SAT I

Written by Jeffrey Wong
July 2006