Hello Study Global

Important things to remember and formulas used in SAT

Complex Numbers

1. Iota is the under root of -1
2. $i = \sqrt{-1}$, $i^2 = -1$, $i^3 = -i$, $i^4 = 1$
3. $z = a + bi$, here z is a complex number of which a is the real part and bi is the imaginary part.
4. Addition: we add real parts separately and imaginary parts separately.
5. Subtraction: we subtract real parts separately and imaginary parts separately.
6. Multiplication: Multiplication is performed simply like binomials, using the fact $i^2 = -1$.
7. The complex number $z_1 = a - bi$ is known as complex conjugate of $z = a + bi$.
8. Division: Whenever a complex number is in the denominator, we multiply the denominator and numerator by the conjugate of the denominator. This makes denominator a real number, and we perform multiplication for getting the numerator.
9. $z_1 \times z = a^2 + b^2$

Geometry

I. Triangles

10. Sum of all interior angles is 180°.

11. Sum of lengths of any 2 sides is always greater than the length of the third side.
12. Greater angle has greater side opposite to it.
13. Pythagorean theorem: Square of the length of the largest side=sum of the squares of the lengths of the remaining 2 sides.
    i.e. $a^2 = b^2 + c^2$
14. Area of a triangle = 1/2 x base x height
15. Area of an equilateral triangle = $\sqrt{3}/4$ x side^2
16. Acute angled triangle: square of the length of the largest side < sum of the square of the lengths of the remaining
    2 sides.
17. Obtuse angled triangle: square of the length of the largest side > sum of the square of the lengths of the remaining
    2 sides.
18. Area of $\triangle ABC$/ Area of $\triangle DEF = AB^2/DE^2 = BC^2/EF^2 = AC^2/DF^2$ (in similar triangles)

II. Quadrilateral

19. In any quadrilateral, sum of all interior angles is 360°.
20. Area of trapezium= 1/2 x (sum of parallel sides) x (distance between them).
21. Area of parallelogram= Base x height
22. Area of rhombus= 1/2 x (product of diagonals)

III. Polygon

23. Sum of all interior angles of a polygon is (n-2) x 180°.
24. Sum of all exterior angles of a polygon is 360°.
25. Number of Diagonals of a polygon = n(n-3)/2.

IV. Circle

26. Circumference of a circle = $2\pi r$

27. Area of a circle = πr^2
28. Length of the arc = $\Theta/360$ x $2\pi r$
29. Area of a sector = $\Theta/360$ x πr^2
30. Perimeter of a sector = length of the arc + length of 2 radii at the end points.

V. 3-D shapes

31. Cuboid: Volume = l x b x h, TSA= 2(lb+bh=lh)
32. Cube: Volume = a^3, TSA= $6a^2$
33. Sphere: Volume = $4/3\pi r^3$, TSA= $4\pi r^2$
34. Hemisphere: Volume = $2/3\pi r^3$, CSA= $2\pi r^2$, TSA= $3\pi r^2$
35. Cylinder: Volume = $\Pi r^2 h$, CSA= $2\pi rh$, TSA= $2\pi r(h+r)$
36. Cone: Volume = $1/3r^2 h$, CSA= πrl, TSA= $\pi r(l+r)$

Coordinate Geometry

37. Distance formula: $\sqrt{}$[difference of x-coordinates]^2 + [difference of y-coordinates]^2
38. Midpoint Formula: $x_1+x_2/2$, $y_1+y_2/2$
39. Slope: m= y_2-y_1/x_2-x_1
40. Equation of a circle: $(x-a)^2 + (y-b)^2 = r^2$
    (here, centre= (a,b) radius= r)
41. Equation of a circle with centre as origin: $x^2 + y^2 = r^2$
    (radius= r)
42. Equation of a line: y= mx + c
    (here m is slope, c is the y intercept).
43. The slope of two parallel lines are equal.
44. Perpendicular slopes are negative reciprocals of each other.

Trigonometry

Fundamental trigonometric identities:

Reciprocal Identities

$$\sin\theta = \frac{1}{\csc\theta} \qquad \cos\theta = \frac{1}{\sec\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

Quotient Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1 \qquad 1 + \tan^2\theta = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

Angles can be measured in degree and in radians,

TABLE 1 Degree/Radian Equivalencies

degrees	0°	30°	45°	60°	90°	120°	135°	150°	180°
radians	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π

Progressions

I. Arithmetic Progressions (AP)

45. n^{th} term of an AP is given by: $a_n = a + (n-1)d$

46. Sum of an AP: $S = n/2 \times (a+l)$
(here, a= first term, n= number of terms, l= last term, d= common difference)

II. Geometric Progressions (GP)

47. n^{th} term of a GP is given by: $a_n = ar^{n-1}$

48. Sum of GP: $S= a(1-r^n) / (1-r)$
(here, a= first term, n= number of terms, r= common ratio)

Percentage

49. To convert fraction to %, multiple by 100.

50. To convert % to fraction, divide by 100.

51. Percentage change= final-initial/initial x 100 %
(if % change if -ve, that means the quantity is decreases)

52. Final value (after % change) = [1+ p/100] x initial. (p= % change)

Ratio and Proportion

53. If two quantities are directly proportional then ratio is constant.

54. If two quantities are inversely proportional then product is constant.

Simple and Compound Interest

I. Simple Interest

55. Simple Interest (SI)= P x R/100 x N
(here, P= Principal amount, R= Rate of interest, N= Number of terms).

56. Total Amount (A)= Principal amount (P) + Simple Interest (SI)

II. Compound Interest

57. Total Amount $(A)= P[1+R/100]^N$
(here, P= Principal amount, R= Rate of interest, N= Number of terms).

58. Compound Interest (CI)= Total Amount (A)- Principal Amount (P)

Linear Equations

Intersection	Solution
Intersecting	Unique
Parallel	No solution
Coinciding	Infinite

Note:

- If the lines have equal slopes and different y-intercepts, the lines will be parallel.
- If the lines have equal slopes and same y-intercepts, the lines are identical.

Quadratic Equations

59. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

(If b^2-4ac is -ve then roots do not exist. i.e. given equation has no real solution.)

60. A quadratic equation when plotted on a graph forms a parabola.
The following is true for any function f(x) and any positive integer k:
- The graph of f(x) + k is the graph of f(x) shifted upward by k units.
- The graph of f(x) - k is the graph of f(x) shifted downward by k units.
- The graph of f(x + k) is the graph of f(x) shifted to the left by k units.
- The graph of f(x - k) is the graph of f(x) shifted to the right by k units.

61. Equation of a parabola: $y = a(x-h)^2 + k$ / standard form: $ax^2 + bx + c$
(h is the x coordinate, k is the y coordinate, a is the vertex)

62. Domain is a set of all inputs over which the function is defined, or produces real value.

63. Range is the set of all outputs a function can produce.

Statistics

64. Mean= Sum of terms/ Number of terms

65. If the two groups have number of terms x and y and average p and q, then the weighted average of both groups together is px + qy/x + y

66. Median= middle term (odd no. of terms) or average of middle 2 terms (even no. of terms).

67. Mode is the term with the largest frequency.

68. Mode= 3 x Median - 2 x Mean

69. Range= max value-min value

Exponents and Radians

70. $a^m \times a^n = a^{mn}$

71. $a^m/a^n = a^{m-n}$

72. $(a^m)^n = a^{mn}$

73. $a^{-n} = 1/a^n$

74. $(ab)^n = a^n b^n$

Note: $a^0 = 1$, $0^n = 0$, $1^n = 1$, $(-1)^n = 1$ (if n is even), $(-1)^n = -1$ (if n is odd)

Miscellaneous

75. $(a + b)^2 = a^2 + 2ab + b^2$

76. $(a – b)^2 = a^2 – 2ab + b^2$

77. $a^2 – b^2 = (a + b)(a – b)$

78. $(x + a)(x + b) = x^2 + (a + b)\, x + ab$

79. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

80. $(a + b)^3 = a^3 + b^3 + 3ab\,(a + b)$

81. $(a – b)^3 = a^3 – b^3 – 3ab\,(a – b)$

82. $a^3 + b^3 + c^3 – 3abc = (a + b + c)(a^2 + b^2 + c^2 – ab – bc – ca)$