BAAP OF ALL FORMULA LISTS

FOR IIT JEE

STRAIGHT LINE

SL#	FORMULA
1	**Distance Between Two Points** $d = AB = \|x_2 - x_1\| = \|x_1 - x_2\|$
2	**Dividing a Line Segment in the Ratio** $\lambda x_0 = \frac{x_1 + \lambda x_2}{1 + \lambda}, \lambda \frac{AC}{CB}, \lambda \neq -1.$
3	**Midpoint of a Line Segment** $x_0 = \frac{x_1 + x_2}{2}, \lambda = 1.$
4	**Distance Between Two Points** $d = AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
5	**Distance Between Two Points in Polar Coordinates** $d = AB = \sqrt{r_1^2 + r_2^2 - 2r_1 r_2 \cos(\phi_2 - \phi_1)}$
6	**Converting Rectangular Coordinates to Polar Coordinates** $x = r\cos\phi, y = r\sin\psi.$
7	**Converting Polar Coordinates to Rectangular Coordinates** $r = \sqrt{x^2 + y^2}, \tan\phi = \frac{y}{x}.$
8	**General Equation of a straight Line** $Ax + By + C = 0$
9	**Normal Vector to a Straight Line The Vector** $\overrightarrow{A, B}$ is noramal to the line $Ax + By + C = 0$

10	**Explicit Equation of a straight Line (Slope -Intercept Form)** $y = kx + b$.
11	**Gradient of a Line** $k = \tan\alpha = \frac{y_2 - y_1}{x_2 - x_1}$
12	**Equation of a line given a point and the Gradient** $y = y_0 + k(x - x_0)$, **where k is the gradient,** $P(x_0, y_0)$ **is a point on the line.**
13	**Equation of a Line That Passes Through Two Points** $\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$ or $\begin{vmatrix} x & y & 1 \\ x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \end{vmatrix} = 0$
14	**Intercept Form** $\frac{x}{a} + \frac{y}{b} = 1$
15	**Normal Form** $x\cos\beta + y\sin\beta - p = 0$
16	**Point Direction Form** $\frac{x - x_1}{X} = \frac{y - y_1}{Y}$, **where** (X, Y) **is the direction of the ine and** $P_1(x_1, y_1)$ **lies on the line.**
17	**Vertical Line** $x = a$
18	**Horizontal Line** $y = b$
19	**Vector equation of a Straight Line** $\vec{r} = \vec{a} + t\,\vec{b}$, **where O is the origin of the coordinates,** **X is any variable point on the line,** $\vec{a}$ **is the position vector of a known point A on the line,** $\vec{b}$ **is a known vector of direction, parallel to the line, t is a parameter,** $\vec{r} = \overrightarrow{OX}$ **is the position vector of any pont X on the line.**
20	**Straight Line in Parametric Form** $\begin{cases} x = a_1 + tb_1 \\ y = a_2 + tb_2 \end{cases}$ **where** (x, y) **are the coordinates of any unknown point on the line,**

	(a_1, a_2) are the coordinates of a known point on the line, (b_1, b_2) are the coordinates of a vector parallel to the line, t is a parameter.
21	**Distance From a Point To a Line** The distance from the point $P(a, b)$ to line $Ax + By + C = 0$ is $d = \frac{\lvert Aa + Bb + c \rvert}{\sqrt{A^2 + B^2}}$
22	**Parallel Lines Two lines** $y = k_1 x + b_1 \text{ and } y = k_2 x + b_2$ are parallel if $k_1 = k_2$. Two lines $A_1 x + B_1 y + C_1 = 0 \text{ and } A_2 x + B_2 y + C_2 = 0$ are parallel if $\frac{A_1}{A_2} = \frac{B_1}{B_2}$.
23	**Perpendicular Lines** **Two Lines** $y = k_1 x + b_1 \text{ and } y = k_2 x + b_2$ are perpendicular if $k_2 = -\frac{1}{k_1}$ or, equivalently, $k_1 k_2 = -1$. Two lines $A_1 x + B_1 y + C_1 = 0 \text{ and } A_2 x + B_2 y + C_2 = 0$ perpendicular if $A_1 A_2 + B_1 B_2 = 0$
24	**Angle Between Two Lines** $\tan\phi = \frac{k_2 - k_1}{1 + k_1 k_2}, \cos\phi = \frac{A_1 A_2 + B_1 B_2}{\sqrt{A_1^2 + B_1^2}.\sqrt{A_2^2 + B_2^2}}$
25	**Intersection of Two Lines** If two lines $A_1 x + B_1 y + C_1 = 0 \text{ and } A_2 x + B_2 y + C_2 = 0$ intersect, the intersection point has coordinates $x_0 = \frac{-C_1 B_2 + C_2 B_1}{A_1 B_2 - A_2 B_1}$, $y_0 = \frac{-A_1 C_2 + A_2 C_1}{A_1 B_2 - A_2 B_1}$