FREE NOTES · NCERT + JEE LEVEL

Straight Lines

Line ka slope, parallel aur perpendicular lines, lines ke beech angle, collinearity, line ki equation ke saare forms, general form, point se line ki doori aur parallel lines ke beech doori.

01 Class 10 ke basics
02 Slope (gradient)
03 Parallel, perpendicular & lines ke beech angle
04 Line ki equation ke forms
05 General equation Ax + By + C = 0
06 Distance formulas
07 Formula sheet
08 JEE Extra + Tricks
09 Solved examples
10 Common mistakes
11 Practice questions
12 Quick revision: exam se 5 minute pehle

01 Class 10 ke basics

Doori PQ $= \sqrt{((x_2 - x_1)^2 + (y_2 - y_1)^2)}$

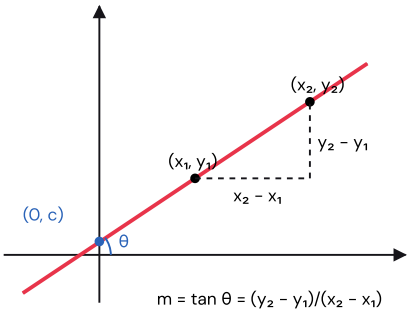
Section (m:n andar se) $= ((mx_2 + nx_1)/(m + n), (my_2 + ny_1)/(m + n))$

Midpoint $= ((x_1 + x_2)/2, (y_1 + y_2)/2)$; centroid $= ((x_1+x_2+x_3)/3, (y_1+y_2+y_3)/3)$

Triangle ka area $= ½ \,|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$

02 Slope (gradient)

- m = tan θ, θ = positive x-axis ke saath inclination (0 ≤ θ < π).
- Do points se: m = $(y_2 - y_1)/(x_2 - x_1)$.
- Horizontal line: m = 0. Vertical line: slope defined nahi.
- m > 0: line right me upar jaati; m < 0: neeche.



Do points se slope; y-intercept c

03 Parallel, perpendicular & lines ke beech angle

Parallel: $m_1 = m_2$

Perpendicular: $m_1\, m_2 = -1$

$$\tan\theta = |(m_2 - m_1)/(1 + m_1 m_2)|$$

Acute angle deta. Teen points A, B, C **collinear** agar slope AB = slope BC.

04 Line ki equation ke forms

Form	Equation
Horizontal / vertical	$y = a;\ x = b$
Point-slope	$y - y_1 = m(x - x_1)$
Two-point	$y - y_1 = [(y_2 - y_1)/(x_2 - x_1)](x - x_1)$
Slope-intercept	$y = mx + c$ (c = y-intercept)
Intercept	$x/a + y/b = 1$
Normal	$x\cos\omega + y\sin\omega = p$

Normal form: p = origin se perpendicular doori, ω = perpendicular ka x-axis se angle.

05 General equation Ax + By + C = 0

Slope $= -A/B$, x-intercept $= -C/A$, y-intercept $= -C/B$

Normal form: $\pm\sqrt{(A^2 + B^2)}$ se bhaag do taaki $p > 0$ rahe

Ax + By + C = 0 ke parallel line: Ax + By + k = 0. Perpendicular: Bx − Ay + k = 0.

06 Distance formulas

$$d = |Ax_1 + By_1 + C| \,/\, \sqrt{(A^2 + B^2)}$$

(x_1, y_1) ki Ax + By + C = 0 se doori.

$$d = |C_1 - C_2| \,/\, \sqrt{(A^2 + B^2)}$$

Parallel lines Ax + By + C_1 = 0 aur Ax + By + C_2 = 0 ke beech doori (A, B same hone chahiye!).

07 Formula sheet

Slope	$(y_2 - y_1)/(x_2 - x_1) = \tan\theta$
Angle	$\tan\theta = \lvert(m_2 - m_1)/(1 + m_1m_2)\rvert$
Perpendicular	$m_1m_2 = -1$
Point-slope	$y - y_1 = m(x - x_1)$
Intercept	$x/a + y/b = 1$
Point–line doori	$\lvert Ax_1 + By_1 + C\rvert/\sqrt{(A^2 + B^2)}$

08 JEE Extra + Tricks

JEE LEVEL

- Parallel lines $ax + by + c_1 = 0$ aur $ax + by + c_2 = 0$ ki doori: $|c_1 - c_2|/\sqrt{(a^2 + b^2)}$.
- Angle bisectors: $(a_1x + b_1y + c_1)/\sqrt{(a_1^2 + b_1^2)} = \pm(a_2x + b_2y + c_2)/\sqrt{(a_2^2 + b_2^2)}$.
- Intersection se guzarne wali lines: $L_1 + \lambda L_2 = 0$.
- (x_1, y_1) ka $ax + by + c = 0$ me foot/image: $(x - x_1)/a = (y - y_1)/b = -k(ax_1 + by_1 + c)/(a^2 + b^2)$, $k = 1$ foot, $k = 2$ image.
- Centroid, incentre $(ax_1 + bx_2 + cx_3)/(a + b + c)$, circumcentre, orthocentre: centroid orthocentre–circumcentre ko 2 : 1 me baant-ta.
- Triangle ka area determinant se $\frac{1}{2}|x_1(y_2 - y_3) + \ldots|$; zero $\Rightarrow$ collinear.

09 Solved examples

Q1. Slopes 2 aur 3 wali lines ke beech acute angle.

$\tan\theta = |(3 - 2)/(1 + 6)| = 1/7 \Rightarrow \theta = \tan^{-1}(1/7)$.

Q2. (−2, 3) se slope −4 wali line ki equation.

$y - 3 = -4(x + 2) \Rightarrow$ **$4x + y + 5 = 0$**.

Q3. (1, 2) se $x - 2y + 3 = 0$ ke perpendicular line.

Di gayi line ka slope ½ ⇒ chahiye −2 ⇒ $y - 2 = -2(x - 1) \Rightarrow$ **$2x + y - 4 = 0$**.

Q4. (3, −5) ki $3x - 4y - 26 = 0$ se doori.

$|9 + 20 - 26|/5 =$ **3/5**.

Q5. $3x - 4y + 7 = 0$ aur $6x - 8y + 4 = 0$ ke beech doori.

A, B barabar karo: $6x - 8y + 4 = 0 \Rightarrow 3x - 4y + 2 = 0 \Rightarrow d = |7 - 2|/5 =$ **1**.

10 Common mistakes

- Parallel lines ki doori me pehle A aur B barabar na karna.
- Vertical line ka slope 0 kehna (defined nahi hota).
- Angle formula me modulus bhool jaana (obtuse/negative aata).
- $Ax + By + C = 0$ ka slope A/B likhna (−A/B hai).

11 Practice questions

1. (3, −2) aur (−1, 4) se guzarne wali line ka slope?
2. Kya (1, 5), (2, 3), (−2, 11) collinear hain?
3. Intercepts 3 aur −2 wali line ki equation.
4. $kx + 3y = 2$, $2x - y = 5$ ke perpendicular ho to k?

ANSWERS

1) −3/2 · 2) Haan (dono slopes −2) · 3) $2x - 3y = 6$ · 4) k = 3/2

12 Quick revision: exam se 5 minute pehle

SLOPE

- $m = \tan\theta$.
- Parallel barabar; $\perp$ guna -1.

FORMS

- $y = mx + c$.
- $x/a + y/b = 1$.
- $x\cos\omega + y\sin\omega = p$.

GENERAL

- Slope $-A/B$.
- Parallel: same A, B.

DOORI

- $|Ax_1+By_1+C|/\sqrt{(A^2+B^2)}$.
- $|C_1 - C_2|/\sqrt{(A^2+B^2)}$.

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.