

Straight Lines — CBSE Pattern Test 2

Class 11 Mathematics · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

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General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.
 (2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.
 (3) For MCQ questions choose the single correct option; for VSA answers write a single line.
 (4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

1. The slope of a line making an angle of 45° with the positive direction of the x-axis is
 - (A) 1
 - (B) -1
 - (C) 0
 - (D) $\sqrt{2}$
2. The point-slope form of the equation of a line with slope m through (x_1, y_1) is
 - (A) $y - y_1 = m(x - x_1)$
 - (B) $y = m(x + x_1) + y_1$
 - (C) $y - y_1 = m/x$
 - (D) $x - x_1 = m(y - y_1)$
3. The two lines $2x + 3y = 1$ and $4x + 6y = 5$ are
 - (A) parallel
 - (B) perpendicular
 - (C) coincident
 - (D) intersecting at 45°
4. The perpendicular distance between the parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$ is
 - (A) $2/5$
 - (B) 2
 - (C) $12/5$
 - (D) $1/3$
5. A line with x-intercept 2 and y-intercept 3 has the equation
 - (A) $x/2 + y/3 = 1$
 - (B) $2x + 3y = 1$
 - (C) $x + y = 6$
 - (D) $3x + 2y = 1$
6. The slope of the x-axis is
 - (A) 0
 - (B) 1
 - (C) -1
 - (D) undefined
7. Write the equation of the y-axis.
8. Define the x-intercept of a line.

9. Find the area of the triangle with vertices (1, 0), (0, 1) and (0, 0).
10. What is the condition for three points A, B, C to be collinear, in terms of the area of triangle ABC?

Section B — Short Answer I (4 × 2 = 8 marks)

11. Reduce $3x + 2y - 12 = 0$ into intercept form and find the intercepts it cuts off on the axes.
12. Find the slope and y-intercept of the line $6x + 3y - 5 = 0$.
13. Find the distance of the point (-1, 1) from the line $12(x + 6) = 5(y - 2)$.
14. Find the equation of the straight line passing through the origin and perpendicular to the line joining the points (5, 4) and (2, -3).

Section C — Short Answer II (4 × 3 = 12 marks)

15. Find the equation of the perpendicular bisector of the line segment joining the points (3, 4) and (-1, 2).
16. Find the coordinates of the foot of the perpendicular from the point (-1, 3) to the line $3x - 4y - 16 = 0$.
17. Find the equations of the lines passing through the point (3, 2) which make an angle of 45° with the line $x - 2y = 3$.
18. Using the concept of the equation of a line, prove that the points (3, 0), (-2, -2) and (8, 2) are collinear.

Section D — Long Answers (2 × 5 = 10 marks)

19. (a) In triangle ABC with A(2, 3), B(4, -1) and C(1, 2), find the equation of the median from A to the side BC. (b) Find the image of the point (3, 8) with respect to the line $x + 3y = 7$.
20. (a) Derive the equation of a line in intercept form, $x/a + y/b = 1$, and state the special cases. (b) A line passes through the point (1, 2) and makes an angle of 60° with the positive direction of the x-axis. Find its equation and its perpendicular distance from the origin.

Answer Key (Marking Scheme)

- Q1 — (A) 1 ($\tan 45^\circ$). Q2 — (A) $y - y_1 = m(x - x_1)$. Q3 — (A) parallel ($2/4 = 3/6 \neq 1/5$). Q4 — (A) $2/5$ ($|7 - 5|/5$).
- Q5 — (A) $x/2 + y/3 = 1$. Q6 — (A) 0. Q7 — y-axis: $x = 0$.
- Q8 — The x-coordinate of the point where the line meets the x-axis ($y = 0$). Q9 — Area = $1/2$ sq units ($1/2|1(1-0) + 0(0-0) + 0(0-1)| = 1/2 \cdot 1$). Q10 — The area of triangle ABC must be zero.
- Q11 — $3x + 2y = 12$ Q12 — $x/4 + y/6 = 1$: intercepts 4 and 6. Q12 — $y = -2x + 5/3$: slope -2, y-intercept $5/3$.
- Q13 — Line is $12x - 5y + 82 = 0$; $d = |12(-1) - 5(1) + 82|/13 = 65/13 = 5$ units. Q14 — Slope of the joining line = $(-3-4)/(2-5) = 7/3$ Perpendicular slope $-3/7$; through origin: $3x + 7y = 0$.
- Q15 — Mid-point (1, 3); slope of segment = $(2-4)/(-1-3) = 1/2$ Perpendicular slope -2 Q16 — $y - 3 = -2(x - 1)$ Q17 — $x + y - 5 = 0$. Q16 — $L = 3(-1) - 4(3) - 16 = -31$; foot = $(-1 - 3(-31)/25, 3 + 4(-31)/25) = (68/25, -49/25)$.
- Q17 — $x - 2y = 3$ has slope $1/2$; required slopes $m = (1/2 \pm 1)/(1 - 1/2) = 3$ or $-1/3$ Q18 — Slope of (3,0):(-2,-2) = $2/5$; slope of (-2,-2):(8,2) = $4/10 = 2/5$; equal slopes through the common point (-2,-2) Q19 — (a) Mid-point of BC = $(5/2, 1/2)$; slope of median = $(3 - 1/2)/(2 - 5/2) = (5/2)/(-1/2) = -5$ Q20 — (a) Intercepts (a, 0) and (0, b): two-point form gives $x/a + y/b = 1$; special cases: $a = 0$ (y-axis) and $b = 0$ (x-axis) are not representable. (b) $m = \tan 60^\circ = \sqrt{3}$ Q21 — $y - 2 = \sqrt{3}(x - 1)$ Q22 — $3x - y + (2 - \sqrt{3}) = 0$; distance from origin = $|2 - \sqrt{3}|/\sqrt{3 + 1} = (2 - \sqrt{3})/2$.