PRACTICE PAPER

ICSE CLASS 10 – MATHEMATICS

Chapter 14 : Equation of a Line

STEP-BY-STEP SOLUTIONS & MARKING SCHEME · Maximum Marks: 40

Formulae used

Slope $m = \tan\theta = \frac{y_2 - y_1}{x_2 - x_1}$ | Parallel lines: $m_1 = m_2$ | Perpendicular lines: $m_1 \times m_2 = -1$ | Collinear points: slope AB = slope BC.

$y = mx + c$ (slope–intercept) | $y - y_1 = m(x - x_1)$ (point–slope) | A line $y = mx + c$: slope m, y-intercept c. Line $ax + by + c = 0$ has slope $-a/b$.

Mid-point $= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ | Distance $= \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$ | A point on the x-axis has $y = 0$; on the y-axis $x = 0$.

SECTION A (20 Marks)

Question 1 [8 × 1 = 8]

Part	Ans.	Working
(i)	**(b)**	$m = (-9 - 3)/(4 - (-2)) = -12/6 = -2$.
(ii)	**(c)**	$y = mx + c$ with $m = 3$, $c = -4$ gives $y = 3x - 4$.
(iii)	**(a)**	$4x - 6y + 5 = 0 \Rightarrow y = (2/3)x + 5/6$, so the slope is 2/3.
(iv)	**(b)**	Slopes: $-k/3$ and 3/2. Product $= -1 \Rightarrow (-k/3)(3/2) = -1 \Rightarrow k = 2$.
(v)	**(d)**	Put $y = 0$: $3x + 12 = 0 \Rightarrow x = -4$.
(vi)	**(c)**	A line parallel to the x-axis has the form $y =$ constant; through $(-3, 5)$: $y = 5$.
(vii)	**(a)**	Slopes $-3/4$ and 4/3: product $= -1$, so (A) is true. (R) is false: the product must be -1, not 1.
(viii)	**(c)**	$3(2) - 2(3) = 0$ ✓, so (A) is true; (R) states exactly why, so it explains (A).

Question 2 [4 + 4 + 4 = 12]

(i)

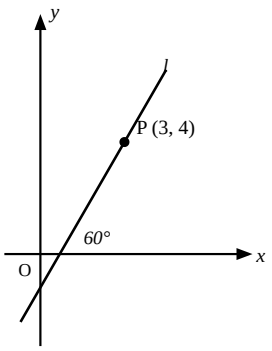
Slope $m = \frac{-1 - 3}{4 - (-2)} = \frac{-4}{6} = -\frac{2}{3}$ [1]

Using A(−2, 3): $y - 3 = -\frac{2}{3}(x + 2)$ [1]

$3y - 9 = -2x - 4$ [1]

$2x + 3y = 5$ (check with B: $8 - 3 = 5$ ✓) [1]

(ii)



Slope of l = tan 60° = $\sqrt{3}$ [1]

$y - 4 = \sqrt{3}(x - 3)$ [1]

$\mathbf{y = \sqrt{3}\,x + 4 - 3\sqrt{3}}$ [1]

Slope of the perpendicular = $-\frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$ [1]

(iii)

Slope of AB = $(5 - 2)/(2 + 1) = 1$ [1]

Slope of BC = $(k - 5)/(4 - 2) = (k - 5)/2$ [1]

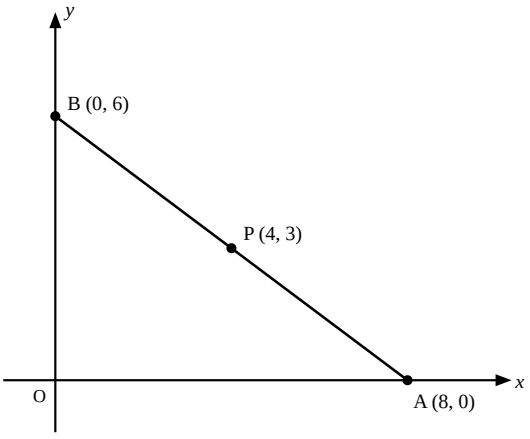
Collinear ⇒ $(k - 5)/2 = 1$ ⇒ $\mathbf{k = 7}$ [1]

Line: slope 1 through A(−1, 2): $y - 2 = x + 1$ ⇒ $\mathbf{y = x + 3}$ (check C(4, 7): $7 = 4 + 3$ ✓) [1]

SECTION B (20 Marks) — any two questions

Question 3 [3 + 3 + 4 = 10]

(i)



A lies on the x-axis and B on the y-axis: let A = (a, 0) and B = (0, b) [1]

Mid-point: $\frac{a + 0}{2} = 4$ ⇒ $\mathbf{a = 8}$, so A = (8, 0) [1]

$\frac{0 + b}{2} = 3$ ⇒ $\mathbf{b = 6}$, so B = (0, 6) [1]

(ii)

Slope of AB = $\frac{6 - 0}{0 - 8} = -\frac{\mathbf{3}}{\mathbf{4}}$ [1]

y-intercept = 6, so $y = -\frac{3}{4}x + 6$ [1]

$4y = -3x + 24 \Rightarrow \mathbf{3x + 4y = 24}$ [1]

(iii)

The perpendicular bisector passes through P(4, 3) with slope $= -1 \div (-¾) = \frac{4}{3}$ [1]

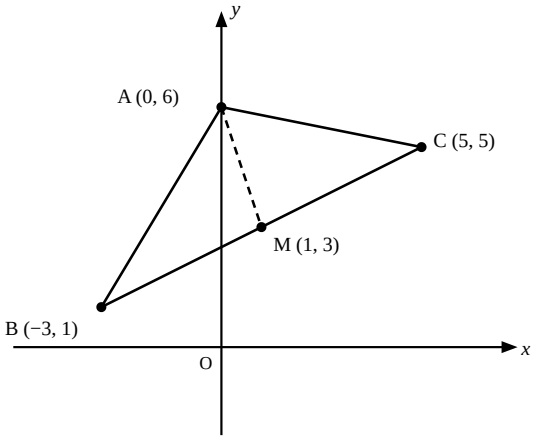
$y - 3 = \frac{4}{3}(x - 4)$ [1]

$3y - 9 = 4x - 16 \Rightarrow \mathbf{4x - 3y = 7}$ [1]

$AB = \sqrt{(8^2 + 6^2)} = \sqrt{100} = \mathbf{10\ units}$ [1]

Question 4 [3 + 3 + 4 = 10]

(i)



Slope of $BC = \frac{5 - 1}{5 - (-3)} = \frac{4}{8} = \frac{1}{2}$ [1]

Using B(−3, 1): $y - 1 = \frac{1}{2}(x + 3)$ [1]

$2y - 2 = x + 3 \Rightarrow \mathbf{x - 2y + 5 = 0}$ [1]

(ii)

The altitude from A is perpendicular to BC: slope $= -1 \div ½ = -2$ [1]

$y - 6 = -2(x - 0)$ [1]

$\mathbf{2x + y = 6}$ [1]

(iii)

Mid-point of BC: $M = ((-3 + 5)/2, (1 + 5)/2) = (1, 3)$ [1]

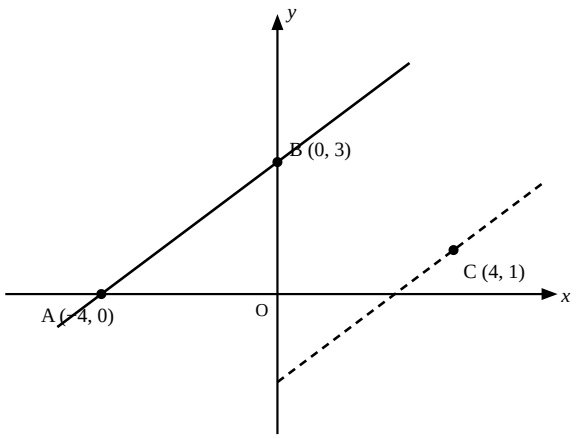
Slope of $AM = (3 - 6)/(1 - 0) = -3$ [1]

$y - 6 = -3x \Rightarrow \mathbf{3x + y = 6}$ [1]

Slope of $AC = \frac{5 - 6}{5 - 0} = -\frac{1}{5}$. A line through B parallel to AC has slope $\mathbf{-\frac{1}{5}}$ [1]

Question 5 [3 + 3 + 4 = 10]

(i)



Slope of AB = $\frac{3-0}{0-(-4)} = \mathbf{\frac{3}{4}}$ [1]

y-intercept = 3, so $y = \frac{3}{4}x + 3$ [1]

$4y = 3x + 12 \Rightarrow \mathbf{3x - 4y + 12 = 0}$ [1]

(ii)

Parallel to AB ⇒ slope = $\frac{3}{4}$ [1]

Through C(4, 1): $y - 1 = \frac{3}{4}(x - 4)$ [1]

$4y - 4 = 3x - 12 \Rightarrow \mathbf{3x - 4y - 8 = 0}$ (shown dashed) [1]

(iii)

$(k + 1)x + 3y = 8$ has slope $-\frac{k+1}{3}$. Perpendicular to AB: $\frac{3}{4} \times (-\frac{k+1}{3}) = -1$ [1]

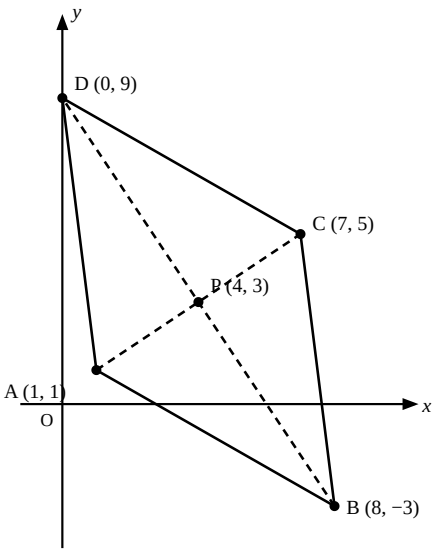
$(k + 1)/4 = 1 \Rightarrow \mathbf{k = 3}$ [1]

$6x - (m - 2)y = 5$ has slope $\frac{6}{m-2}$. Parallel to AB: $\frac{6}{m-2} = \frac{3}{4}$ [1]

$m - 2 = 8 \Rightarrow \mathbf{m = 10}$ [1]

Question 6 [3 + 3 + 4 = 10]

(i)



The diagonals of a rhombus bisect each other: P = mid-point of AC = ((1 + 7)/2, (1 + 5)/2) = **(4, 3)** [1]

Slope of AC = $\frac{5-1}{7-1} = \mathbf{\frac{2}{3}}$ [1]

The diagonals are perpendicular: slope of BD = $-\frac{3}{2}$ [1]

(ii)

BD passes through P(4, 3) with slope $-\frac{3}{2}$: $y - 3 = -\frac{3}{2}(x - 4)$ [1]

$2y - 6 = -3x + 12$ [1]

$3x + 2y = 18$ [1]

(iii)

D lies on the y-axis (x = 0): $2y = 18 \Rightarrow y = 9$. **D = (0, 9)** [1]

P is the mid-point of BD: B = (2 × 4 − 0, 2 × 3 − 9) [1]

B = (8, −3) (check: 3 × 8 + 2 × (−3) = 18 ✓) [1]

AC = $\sqrt{(6^2 + 4^2)} = \sqrt{52}$; BD = $\sqrt{(8^2 + 12^2)} = \sqrt{208} = 2\sqrt{52}$. Area = $\frac{1}{2} \times AC \times BD = \frac{1}{2} \times \sqrt{52} \times 2\sqrt{52} =$ **52 sq. units** [1]

— End of Solutions —