CLASS XI – MATHEMATICS (041)

CHAPTER 9 : STRAIGHT LINES

PRACTICE PAPER – STEP-BY-STEP SOLUTIONS & MARKING SCHEME

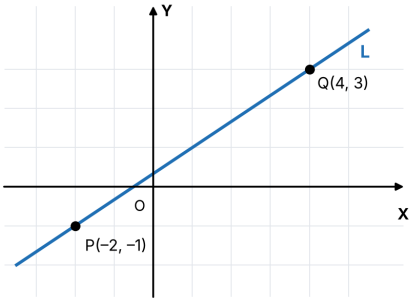
Section A – Answer Key (1 mark each)

Q1	Q2	Q3	Q4	Q5	Q6	Q7
B	C	D	A	B	C	D
Q8	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**
B	A	C	A	D	C	A

SECTION – A (14 × 1 = 14)

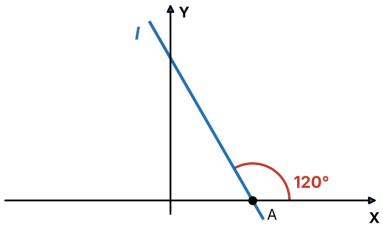
Multiple Choice and Assertion–Reason Questions

Q1. Answer: (B) **1 mark**



$m = (y_2 - y_1)/(x_2 - x_1) = (3 - (-1))/(4 - (-2)) = 4/6 = \mathbf{2/3}$.

Q2. Answer: (C) **1 mark**



$m = \tan 120° = \tan(180° - 60°) = -\tan 60° = \mathbf{-\sqrt{3}}$.

Q3. Answer: (D) **1 mark**

Slope of the joining line = (3 – (–3))/(5 – 2) = 6/3 = 2.
For perpendicular lines $m_1\, m_2 = -1$, so the required slope is **–1/2**.

Q4. Answer: (A) **1 mark**

Point-slope form: y – 4 = –3(x + 1) ⇒ y – 4 = –3x – 3.
So **3x + y – 1 = 0**.

Q5. Answer: (B) **1 mark**

Put y = 0: 3x + 12 = 0 ⇒ x = –4. Put x = 0: –4y + 12 = 0 ⇒ y = 3.
The intercepts are **–4 and 3**.

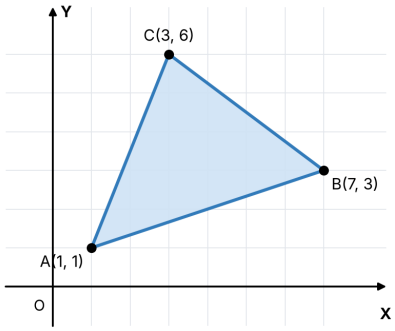
Q6. Answer: (C) **1 mark**

$d = |5(0) + 12(0) - 26| / \sqrt{(5^2 + 12^2)} = 26/\sqrt{169} = 26/13 = \mathbf{2}$.

Q7. Answer: (D) **1 mark**

Write the second line with the same x, y coefficients as the first: 3x + 4y + 10 = 0 ⇒ 6x + 8y + 20 = 0.
$d = |C_1 - C_2|/\sqrt{(A^2 + B^2)} = |-5 - 20|/\sqrt{(36 + 64)} = 25/10 = \mathbf{5/2}$.

Q8. Answer: (B) **1 mark**



Area = ½ $|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$.
= ½ |1(3 – 6) + 7(6 – 1) + 3(1 – 3)| = ½ |–3 + 35 – 6| = ½ × 26 = **13** square units.

Q9. Answer: (A) **1 mark**

Slopes: $m_1 = 2$ (from 2x – y + 1 = 0) and $m_2 = 1/3$ (from x – 3y + 5 = 0).
$\tan\theta = |(m_1 - m_2)/(1 + m_1 m_2)| = |(2 - 1/3)/(1 + 2/3)| = (5/3)/(5/3) = 1$.
So θ = **45°**.

Q10. Answer: (C) **1 mark**

Slope of kx + 3y – 7 = 0 is –k/3; slope of 2x – 6y + 1 = 0 is 1/3.
Perpendicular: (–k/3)(1/3) = –1 ⇒ k/9 = 1 ⇒ k = **9**.

Q11. Answer: (A) **1 mark**

Collinear points: slope of AB = slope of AC, where A(1, 2), B(3, 4), C(k, 8).
(4 – 2)/(3 – 1) = (8 – 2)/(k – 1) ⇒ 1 = 6/(k – 1) ⇒ k = **7**.

Q12. Answer: (D) **1 mark**

Equal intercepts a: x/a + y/a = 1 ⇒ x + y = a. It passes through (2, 3), so a = 5.
The line is **x + y – 5 = 0**.

Q13. Answer: (C) **1 mark**

Slope of 2x + 3y = 5 is –2/3; slope of 6x + 9y = 1 is –6/9 = –2/3. The slopes are equal, so the lines are parallel. Assertion is true.
Parallel lines have *equal* slopes; negative reciprocal slopes give perpendicular lines. Reason is false → option (C).

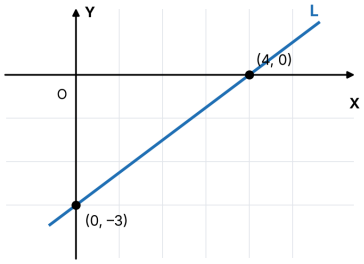
Q14. Answer: (A) **1 mark**

The Reason is the standard distance formula, so it is true.
Using it: d = |3(0) + 4(0) – 10|/√(9 + 16) = 10/5 = 2. The Assertion is true and follows from the Reason → option (A).

SECTION – B (4 × 2 = 8)

Very Short Answer Questions

Q15. 2 marks



(i) From the figure, a = 4 (x-intercept) and b = –3 (y-intercept). Intercept form: $x/4 + y/(-3) = 1$. **[½]**
Multiplying by 12: $3x - 4y = 12$, i.e. **$3x - 4y - 12 = 0$**. **[½]**
(ii) $4y = 3x - 12 \Rightarrow y = (3/4)x - 3$. The slope is **3/4**. **[1]**

Q16. 2 marks

Slope $= (-3 - 5)/(1 - (-3)) = -8/4 = -2$. **[1]**
$y - 5 = -2(x + 3) \Rightarrow y - 5 = -2x - 6 \Rightarrow$ **$2x + y + 1 = 0$**. **[1]**

Q17. 2 marks

(A) A line parallel to $2x - 5y + 1 = 0$ has the form $2x - 5y + c = 0$. **[1]**
It passes through (4, –3): $8 + 15 + c = 0 \Rightarrow c = -23$. The line is **$2x - 5y - 23 = 0$**. **[1]**
OR (B) A line perpendicular to $2x - 5y + 1 = 0$ has the form $5x + 2y + c = 0$. **[1]**
It passes through (4, –3): $20 - 6 + c = 0 \Rightarrow c = -14$. The line is **$5x + 2y - 14 = 0$**. **[1]**

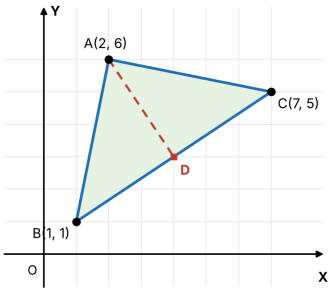
Q18. 2 marks

(A) Slope of $3x - 2y + 5 = 0$ is 3/2; slope of the line through (k, 3) and (4, 1) is $(1 - 3)/(4 - k) = -2/(4 - k)$. **[1]**
Perpendicular: $(3/2) \times (-2/(4 - k)) = -1 \Rightarrow 4 - k = 3 \Rightarrow k =$ **1**. **[1]**
OR (B) Slope $m = \tan 60° = \sqrt{3}$. **[1]**
The line passes through (0, –2): $y + 2 = \sqrt{3}(x - 0) \Rightarrow$ **$y = \sqrt{3}\,x - 2$**, i.e. $\sqrt{3}\,x - y - 2 = 0$. **[1]**

SECTION – C (3 × 3 = 9)

Short Answer Questions

Q19. 3 marks



(i) Slope of BC = (5 – 1)/(7 – 1) = 4/6 = **2/3**. Line BC: y – 1 = (2/3)(x – 1) ⇒ 3y – 3 = 2x – 2 ⇒ **2x – 3y + 1 = 0**. **[1]**

(ii) AD ⊥ BC, so the slope of AD = –3/2. Through A(2, 6): y – 6 = (–3/2)(x – 2) ⇒ 2y – 12 = –3x + 6 ⇒ **3x + 2y – 18 = 0**. **[1]**

(iii) Length of AD = distance of A(2, 6) from BC = |2(2) – 3(6) + 1|/√(4 + 9) = |–13|/√13 = 13/√13 = **√13 units**. **[1]**

Q20. 3 marks

(A) Adding 2x + y = 5 and x – y = 1: 3x = 6 ⇒ x = 2, y = 1. The point of intersection is (2, 1). **[1]**

Slope of 3x – 4y + 7 = 0 is 3/4, so the required slope is –4/3. **[1]**

y – 1 = (–4/3)(x – 2) ⇒ 3y – 3 = –4x + 8 ⇒ **4x + 3y – 11 = 0**. **[1]**

OR (B) Let the foot be F(h, k). F lies on the line: h + 2k – 10 = 0 … (1). **[1]**

PF is perpendicular to the line (slope –1/2), so slope of PF = 2: (k – 1)/(h – 3) = 2 ⇒ k = 2h – 5 … (2). **[1]**

Substituting (2) in (1): h + 4h – 10 – 10 = 0 ⇒ h = 4, k = 3. The foot is **(4, 3)**. **[1]**

Q21. 3 marks

(A) Let the y-intercept be b; then the x-intercept is 2b: x/(2b) + y/b = 1. **[1]**

Through (4, 1): 4/(2b) + 1/b = 1 ⇒ 3/b = 1 ⇒ b = 3, so the x-intercept is 6. **[1]**

The line is x/6 + y/3 = 1, i.e. **x + 2y – 6 = 0**. **[1]**

OR (B) Solve the first two lines: adding x + y = 3 and 2x – y = 0 gives 3x = 3 ⇒ x = 1, y = 2. **[1]**

For concurrency, the point (1, 2) must lie on the third line: 3(1) + k(2) – 11 = 0. **[1]**

2k = 8 ⇒ k = **4**. **[1]**

SECTION – D (1 × 5 = 5)

Long Answer Question

Q22. **5 marks**

(A) The given line $3x + y - 7 = 0$ has slope $m_1 = -3$. Let the required slope be m. **[1]**

$\tan 45° = |(m - (-3))/(1 + (-3)m)| \Rightarrow 1 = |(m + 3)/(1 - 3m)|$. **[1]**

Case 1: $(m + 3) = (1 - 3m) \Rightarrow 4m = -2 \Rightarrow m = -1/2$. **[1]**

Case 2: $(m + 3) = -(1 - 3m) \Rightarrow 4 = 2m \Rightarrow m = 2$. **[1]**

Lines through (–1, 2): $y - 2 = (-1/2)(x + 1) \Rightarrow$ **$x + 2y - 3 = 0$**, and $y - 2 = 2(x + 1) \Rightarrow$ **$2x - y + 4 = 0$**. **[1]**

OR (B)(i) Let the image be Q(h, k). The line $2x + y - 5 = 0$ has slope –2, so PQ has slope 1/2: $(k - 4)/(h - 3) = 1/2 \Rightarrow h - 2k = -5$ … (1). **[1½]**

The mid-point $((h + 3)/2, (k + 4)/2)$ lies on the line: $(h + 3) + (k + 4)/2 - 5 = 0 \Rightarrow 2h + k = 0$ … (2). **[1]**

From (1) and (2): $h = 2k - 5 \Rightarrow 4k - 10 + k = 0 \Rightarrow k = 2$, $h = -1$. The image is **(–1, 2)**. **[½]**

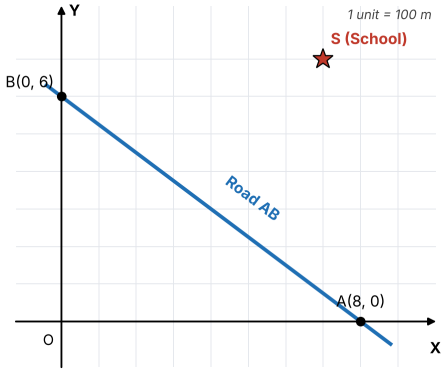
(ii) The foot of the perpendicular is the mid-point of PQ = $((3 - 1)/2, (4 + 2)/2)$ = **(1, 3)** (check: $2(1) + 3 - 5 = 0$). **[1]**

PQ = $\sqrt{((3 + 1)^2 + (4 - 2)^2)} = \sqrt{20} =$ **$2\sqrt{5}$ units**. (Also = 2 × distance of P from the line = $2 \times 5/\sqrt{5}$.) **[1]**

SECTION – E **(1 × 4 = 4)**

Case Study Based Question

Q23. **4 marks**



(i) A(8, 0) and B(0, 6), so the intercepts are 8 and 6: x/8 + y/6 = 1 ⇒ **3x + 4y – 24 = 0**. Slope = **–3/4**. **[1]**

(ii) Distance of S(7, 7): d = |3(7) + 4(7) – 24|/√(9 + 16) = 25/5 = 5 units = **500 m**. **[1]**

(iii)(a) Parallel road: 3x + 4y + c = 0 through (7, 7) ⇒ 21 + 28 + c = 0 ⇒ c = –49. Equation: **3x + 4y – 49 = 0**. **[1]**

Distance between the roads = |–24 – (–49)|/√(9 + 16) = 25/5 = 5 units = **500 m**. **[1]**

OR (b) Perpendicular road: 4x – 3y + c = 0 through (7, 7) ⇒ 28 – 21 + c = 0 ⇒ c = –7. Equation: **4x – 3y – 7 = 0**. **[1]**

Solving with 3x + 4y = 24: 12x + 16y = 96 and 12x – 9y = 21 ⇒ 25y = 75 ⇒ y = 3, x = 4. It meets AB at **(4, 3)**. **[1]**

— End of Solutions —