Class 10 Mathematics · Chapter 3: Pair of Linear Equations in Two Variables

Answer key and marking scheme · 20 marks · about 40 minutes · based on NCERT

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1. In solving $2x + y = 7$ and $3x - 4y = 5$ by substitution, $y = 7 - 2x$ is put into the second equation. The value of x obtained is [1]

(a) -3 (b) 1
(c) $\frac{33}{5}$ (d) 3

Answer: (d) $3x - 4(7 - 2x) = 5$ gives $3x - 28 + 8x = 5$, so $11x = 33$ and $x = 3$ (then $y = 1$).

2. The pair of equations $3x + 5y - 7 = 0$ and $4x - 2y + 1 = 0$ has [1]

(a) no solution (b) exactly one solution
(c) infinitely many solutions (d) exactly two solutions

Answer: (b) $a_1/a_2 = 3/4$ and $b_1/b_2 = 5/(-2) = -5/2$. Since $3/4 \neq -5/2$, the lines intersect, so there is exactly one solution.

3. The number of common solutions of a pair of linear equations in two variables can NOT be [1]

(a) 0 (b) 1
(c) 2 (d) infinitely many

Answer: (c) Two lines either meet in one point, never meet, or coincide. So a pair has one solution, none, or infinitely many; exactly two is impossible.

4. Which equation, taken with $3x - 4y + 6 = 0$, gives a pair of coincident lines? [1]

(a) $6x - 8y + 6 = 0$ (b) $6x - 8y + 12 = 0$
(c) $4x - 3y + 6 = 0$ (d) $-3x + 4y + 6 = 0$

Answer: (b) $6x - 8y + 12 = 0$ is $2(3x - 4y + 6) = 0$: $a_1/a_2 = b_1/b_2 = c_1/c_2 = 1/2$. Option (a) and option (d) have the x and y ratios equal but a different constant ratio (parallel); (c) has $3/4 \neq -4/-3$ (intersecting).

5. Adding the equations $4x + 3y = 18$ and $5x - 3y = 9$ gives x equal to [1]

(a) 3 (b) 27
(c) 9 (d) 2

Answer: (a) The y-coefficients are 3 and -3, opposite in sign, so adding removes y: $9x = 27$, $x = 3$.

6. For what values of k does the pair $x + 2y = 3$ and $5x + ky = 7$ have a unique solution? [2]

Unique solution needs $a_1/a_2 \neq b_1/b_2$: $1/5 \neq 2/k$, i.e. $k \neq 10$. So every real k except 10.

- uses the condition $a_1/a_2 \neq b_1/b_2$ (1)
- $k \neq 10$ (1)

7. Solve $0.3x + 0.5y = 1.9$ and $0.7x - 0.2y = 1.7$. [2]

Multiply both by 10: $3x + 5y = 19$ and $7x - 2y = 17$. Multiply by 2 and 5: $6x + 10y = 38$, $35x - 10y = 85$. Add: $41x = 123$, $x = 3$. Then $5y = 19 - 9$, $y = 2$.

- clears decimals to $3x + 5y = 19$ and $7x - 2y = 17$ (1)
- $x = 3$, $y = 2$ (1)

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8. Solve by substitution: $x + 3y = 10$ and $2x - y = 6$. [2]

From the first, $x = 10 - 3y$. Into the second: $2(10 - 3y) - y = 6$, so $20 - 7y = 6$, $y = 2$. Then $x = 10 - 6 = 4$. Solution $x = 4$, $y = 2$.

- writes $x = 10 - 3y$ and substitutes into the other equation, getting $y = 2$ (1)
- $x = 4$ (1)

9. A cycle-hire stand in Mysuru charges a fixed amount, which covers the first hour, and a rate for every hour after that. Ramesh paid ₹110 for 4 hours and Asha paid ₹170 for 7 hours. Find the fixed charge and the rate per extra hour. [3]

Let the fixed charge be ₹x and the rate ₹y. Only hours after the first are charged: $x + 3y = 110$, $x + 6y = 170$. Subtract: $3y = 60$, $y = 20$; $x = 50$. Fixed charge ₹50, ₹20 per extra hour. Check: $50 + 60 = 110$, $50 + 120 = 170$.

- counts charged hours: $x + 3y = 110$ and $x + 6y = 170$ (1)
- solves $y = 20$ (1)
- $x = 50$, and verifies against both bills (1)

10. A two-digit number is 7 times the sum of its digits, and its digits differ by 3. Find the number. [3]

Let the number be $10x + y$. $10x + y = 7(x + y)$ gives $3x = 6y$, $x = 2y$. Case $x - y = 3$: $y = 3$, $x = 6$, number 63. Case $y - x = 3$: $y - 2y = 3$, $y = -3$, not a digit. So the number is 63 ($7 \times 9 = 63$).

- forms $10x + y = 7(x + y)$, so $x = 2y$ (1)
- takes both cases $x - y = 3$ and $y - x = 3$ (1)
- rejects the negative digit; number 63 (1)

11. The present ages of a father and his daughter add to 50 years. Five years ago the father was 7 times as old as his daughter. Find their present ages. [3]

$f + d = 50$ and $f - 5 = 7(d - 5)$, i.e. $f = 7d - 30$. Then $8d - 30 = 50$, $d = 10$, $f = 40$. Check: five years ago 35 and 5, and $35 = 7 \times 5$.

- both equations, subtracting 5 from both ages (1)
- solves $d = 10$ (1)
- father 40 years, daughter 10 years (1)