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Linear Programming — CBSE Class 12 Mathematics Chapter Test

FREE CHAPTER TEST · CLASS XII · MATHEMATICS (041) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	40	19 (A 10 · B 3 · C 2 · D 2 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 19 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. In Section A, Questions 1 to 8 are multiple choice questions (MCQs) and Questions 9 and 10 are assertion-reason based questions of 1 mark each.
4. In Section B, Q11–13 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Q14–15 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Q16–17 are long answer (LA) type questions, carrying 5 marks each.
7. In Section E, Q18–19 are case study based questions, carrying 4 marks each, with sub-parts of the values of 1, 1 and 2 marks.
8. There is no overall choice. However, an internal choice has been provided in 1 question of Section B, 1 question of Section C, 1 question of Section D and in the 2-mark sub-part of each question of Section E.
9. Use of calculators is not allowed. log x denotes the natural logarithm of x.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class XII Mathematics (041) Sample Question Paper 2026-27, released on 21 September 2026 at cbseacademic.nic.in, at half the length of the 80-mark board paper: 40 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Linear Programming · **Topics:** Terminology: constraints, objective function · Feasible and infeasible regions · Corner points · Bounded regions · Unbounded regions · Multiple optimal solutions

SECTION A

This section comprises 10 questions of 1 mark each: 8 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. The maximum value of $Z = 2x + 5y$ subject to $x + y \le 5$, $x \ge 0$, $y \ge 0$ is 1

(A) 10 (B) 25

(C) 5 (D) 20

2. The corner points of the bounded feasible region of an LPP are (0, 0), (5, 0), (3, 4) and (0, 5). The maximum value of $Z = 2x + 3y$ is 1

(A) 15 (B) 10

(C) 18 (D) 25

3. The feasible region of the constraints $x + y \ge 2$, $x \ge 0$, $y \ge 0$ is 1

(A) unbounded (B) bounded

(C) empty (D) a single point

4. The corner points of the feasible region of an LPP are (0, 3), (2, 0), (5, 0), (5, 6) and (0, 6). The minimum of $Z = 3x + 2y$ occurs at 1

(A) (0, 3) only (B) (2, 0) only

(C) (5, 6) (D) every point of the line segment joining (0, 3) and (2, 0)

5. Which of the following points lies in the feasible region of $2x + y \le 6$, $x + 2y \le 6$, $x \ge 0$, $y \ge 0$? 1

(A) (3, 1) (B) (1, 3)

(C) (2, 1) (D) (0, 4)

6. In a linear programming problem, the objective function is 1

(A) a constraint (B) a linear function to be maximised or minimised

(C) a quadratic function (D) a set of inequalities

7. The maximum value of $Z = x + y$ subject to $2x + y \le 10$, $x + 3y \le 15$, $x \ge 0$, $y \ge 0$ is 1

(A) 7 (B) 5

(C) 6 (D) 10

8. The feasible region of the constraints $x + y \ge 5$, $x + y \le 3$, $x \ge 0$, $y \ge 0$ is 1

(A) bounded (B) unbounded

(C) a line segment (D) empty

9. **Assertion (A):** The maximum value of $Z = x + y$ on the bounded feasible region with corner points (0, 0), (4, 0), (2, 3) and (0, 4) is 5. 1

Reason (R): The maximum of a linear objective function on a bounded feasible region occurs at a corner point of the region.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

10. **Assertion (A):** Every linear programming problem has an optimal solution. 1

Reason (R): A linear programming problem whose feasible region is empty has no feasible solution.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

SECTION B

This section comprises 3 very short answer (VSA) type questions of 2 marks each.

11. Find the corner points of the feasible region determined by $x + y \le 6$, $x \le 4$, $x \ge 0$, $y \ge 0$. 2

12. (a) Minimise $Z = 2x + 3y$ subject to $x + y \ge 2$, $2x + y \ge 3$, $x \ge 0$, $y \ge 0$. 2

OR

(b) Maximise $Z = 4x + 3y$ subject to $x + 2y \le 8$, $2x + y \le 10$, $x \ge 0$, $y \ge 0$.

13. The corner points of the feasible region of an LPP are (0, 0), (6, 0), (4, 4) and (0, 5). Let $Z = px + qy$, where $p, q > 0$. Find the condition on p and q so that the maximum of Z occurs at both (6, 0) and (4, 4). 2

SECTION C

This section comprises 2 short answer (SA) type questions of 3 marks each.

14. (a) Solve graphically: maximise $Z = 3x + 6y$ subject to $x + 2y \le 24$, $x + y \ge 6$, $x \le y$, $x \ge 0$, $y \ge 0$. 3

OR

(b) Solve graphically: minimise $Z = 2x + 3y$ subject to $x + 2y \ge 4$, $x + y \ge 3$, $x \ge 0$, $y \ge 0$.

15. Solve graphically: maximise $Z = 3x + y$ subject to $x + y \le 40$, $2x + y \le 60$, $x \ge 0$, $y \ge 0$. 3

SECTION D

This section comprises 2 long answer (LA) type questions of 5 marks each.

16. (a) Solve graphically: minimise and maximise $Z = x + 3y$ subject to $x + 3y \geq 30$, $3x - y \leq 0$, $x + y \leq 80$, $x \geq 0$, $y \geq 0$. 5

OR

(b) Solve graphically: minimise $Z = -2x + 3y$ subject to $x + 3y \leq 9$, $2x + y \leq 8$, $x \geq 0$, $y \geq 0$.

17. Solve graphically: maximise $Z = 150x + 60y$ subject to $4x + y \leq 80$, $x + y \leq 50$, $x \geq 0$, $y \geq 0$. 5

SECTION E

This section comprises 2 case study based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.

18. A workshop makes x chairs and y tables a day. Its weekly plan is the LPP: maximise profit $Z = 50x + 40y$ (in rupees) subject to $x + y \leq 10$, $x + 2y \leq 16$, $x \geq 0$, $y \geq 0$.

(i) Is (5, 5) a feasible solution? Give a reason. [1]

(ii) Find the corner point where the lines $x + y = 10$ and $x + 2y = 16$ meet. [1]

(iii) Find the maximum profit and where it occurs. [2]

OR

(iii) If the profit were instead $Z = 40x + 50y$, find the maximum profit and where it occurs. [2]

19. A diet is planned from x units of food P and y units of food Q. The LPP is: minimise cost $Z = 6x + 10y$ (in rupees) subject to $x + 2y \geq 8$, $3x + y \geq 9$, $x \geq 0$, $y \geq 0$.

(i) Is the feasible region bounded or unbounded? [1]

(ii) Write the corner points of the feasible region. [1]

(iii) Find the minimum cost, justifying that it is the minimum. [2]

OR

(iii) If the cost were instead $Z = 6x + 2y$, find the minimum cost and where it occurs. [2]

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
(B)	(C)	(A)	(D)	(C)	(B)	(A)	(D)	(A)	(D)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (B). Corner points (0, 0), (5, 0), (0, 5) give Z = 0, 10, 25; the maximum is 25.

Q2. Answer (C). Z = 0, 10, 18, 15 at the four corners; the maximum is 18 at (3, 4).

Q3. Answer (A). It contains every point beyond the line $x + y = 2$ in the first quadrant, so it is unbounded.

Q4. Answer (D). Z = 6, 6, 15, 27, 12: the minimum 6 occurs at both (0, 3) and (2, 0), and so at every point of the segment joining them.

Q5. Answer (C). (2, 1): $2(2) + 1 = 5 \le 6$ and $2 + 2 = 4 \le 6$. Each of the others breaks a constraint.

Q6. Answer (B). The objective function is the linear function Z = ax + by whose maximum or minimum is wanted.

Q7. Answer (A). Corner points (0, 0), (5, 0), (3, 4), (0, 5) give Z = 0, 5, 7, 5; the maximum is 7 at (3, 4).

Q8. Answer (D). No point can have $x + y \ge 5$ and $x + y \le 3$ together: there is no feasible region.

Q9. Answer (A). By R it is enough to compare Z at the corners: 0, 4, 5, 4, so the maximum is 5 and A is true. Answer (A).

Q10. Answer (D). R is true, and such a problem (or one with an unbounded region where Z keeps increasing) has no optimal solution, so A is false. Answer (D).

Q11. (2 marks) Answer: (0, 0), (4, 0), (4, 2), (0, 6).
The boundary lines are $x + y = 6$, $x = 4$ and the axes; $x + y = 6$ meets $x = 4$ at (4, 2). [1]
Corner points: (0, 0), (4, 0), (4, 2), (0, 6). [1]

Q12. (2 marks) Answer: (a) 4 at (2, 0); (b) 22 at (4, 2).
(a) The region is unbounded with corner points (0, 3), (1, 1), (2, 0), where Z = 9, 5, 4. [1] The half-plane $2x + 3y < 4$ has no point in common with the region (there $2x + 3y = 2(x + y) + y \ge 4$), so the minimum is 4 at (2, 0). [1]
OR (b) $x + 2y = 8$ and $2x + y = 10$ meet at (4, 2); corner points (0, 0), (5, 0), (4, 2), (0, 4) give Z = 0, 20, 22, 12. [1]
Maximum Z = 22 at (4, 2). [1]

Q13. (2 marks) Answer: p = 2q.
Z(6, 0) = 6p and Z(4, 4) = 4p + 4q must be equal: $6p = 4p + 4q$, so p = 2q. [1]
Then Z = 12q at both, which exceeds Z(0, 5) = 5q and Z(0, 0) = 0, so it is the maximum: the condition is p = 2q. [1]

Q14. (3 marks) Answer: (a) 72 at every point of the segment joining (8, 8) and (0, 12); (b) 7 at (2, 1).
(a) The feasible region is bounded, with corner points (0, 6), (3, 3), (8, 8), (0, 12). [1½] Z = 36, 27, 72, 72. [1] The maximum 72 occurs at (8, 8) and (0, 12), and so at every point of the segment joining them. [½]
OR (b) The region is unbounded with corner points (4, 0), (2, 1), (0, 3), where Z = 8, 7, 9. [1½] In the region $2x + 3y = (x + 2y) + (x + y) \ge 4 + 3 = 7$, so the half-plane $2x + 3y < 7$ has no point in common with it [1]: the minimum is 7 at (2, 1). [½]

Q15. (3 marks) Answer: 90 at (30, 0).
$x + y = 40$ and $2x + y = 60$ meet at (20, 20). [1]
Corner points (0, 0), (30, 0), (20, 20), (0, 40) give Z = 0, 90, 80, 40. [1]
Maximum Z = 90 at (30, 0). [1]

Q16. (5 marks) Answer: (a) min 30 on the segment joining (0, 10) and (3, 9), max 240 at (0, 80); (b) −8 at (4, 0).
(a) The feasible region is bounded. [1] Its corner points are (0, 10), (3, 9), (20, 60), (0, 80). [2] Z = 30, 30, 200, 240. [1] Minimum 30 at every point of the segment joining (0, 10) and (3, 9); maximum 240 at (0, 80). [1]
OR (b) The feasible region is bounded with corner points (0, 0), (4, 0), (3, 2), (0, 3). [2] Z = 0, −8, 0, 9. [2] Minimum Z = −8 at (4, 0). [1]

Q17. (5 marks) Answer: 3900 at (10, 40).
Draw $4x + y = 80$ (through (20, 0) and (0, 80)) and $x + y = 50$ (through (50, 0) and (0, 50)). [1]
They meet where $3x = 30$: (10, 40). [1]
Corner points (0, 0), (20, 0), (10, 40), (0, 50). [1]
Z = 0, 3000, 3900, 3000. [1]
Maximum Z = 3900 at (10, 40). [1]

Q18. (4 marks) Answer: (i) yes; (ii) (4, 6); (iii) ₹ 500 at (10, 0), or ₹ 460 at (4, 6).
(i) Yes: $5 + 5 = 10 \le 10$ and $5 + 10 = 15 \le 16$. [1]
(ii) Subtracting, $y = 6$, $x = 4$: (4, 6). [1]
(iii)(a) Corner points (0, 0), (10, 0), (4, 6), (0, 8): Z = 0, 500, 440, 320. [1] Maximum ₹ 500 at (10, 0). [1]
OR (iii)(b) Z = 0, 400, 460, 400 at the same corners. [1] Maximum ₹ 460 at (4, 6). [1]

Q19. (4 marks) Answer: (i) unbounded; (ii) (0, 9), (2, 3), (8, 0); (iii) ₹ 42 at (2, 3), or ₹ 18 on the segment joining (0, 9) and (2, 3).
(i) Unbounded. [1]
(ii) (0, 9), (2, 3), (8, 0). [1]
(iii)(a) Z = 90, 42, 48 at the corners. [1] The half-plane $6x + 10y < 42$ has no point in common with the region, so the minimum cost is ₹ 42 at (2, 3). [1]
OR (iii)(b) Z = 18, 18, 48; since $6x + 2y = 2(3x + y) \ge 18$ everywhere in the region [1], the minimum ₹ 18 occurs at every point of the segment joining (0, 9) and (2, 3). [1]

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Every answer in this paper was checked independently by computer: corner points exactly by intersecting the boundary lines, and every optimum by a brute-force search over a fine grid of feasible points.