Linear Programming Class 12 Important Questions

10 questions · 27 marks · no calculator · step-marked answers

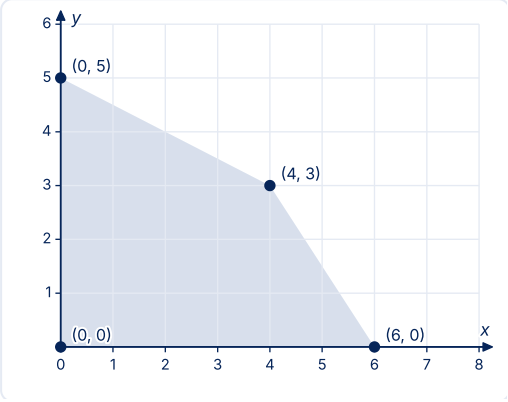
Name _____ Date _____ Score / 27

- Original questions in the board paper's question types, from 1-mark MCQs to a case study. Try every question before you look at the answers.
- No calculator: as in the CBSE board exam, everything works by hand.
- Worked answers with step marks for 5 questions start after the questions. The other 5 open free on the chapter page with a free account (no card): the link is next to each one.
- Online, with more practice: cbsemathrevision.com/class-12/linear-programming

Section A · Multiple choice and assertion–reason (1 mark each)

1. **1 mark · Graphical solution**

A bounded feasible region has corner points $(0, 0)$, $(6, 0)$, $(4, 3)$ and $(0, 5)$. What is the greatest value of $Z = 2x + 3y$ on it?



Feasible region with corners (0, 0), (6, 0), (4, 3), (0, 5)

(a) 15

(b) 17

(c) 12

(d) 18

2. **1 mark · Feasible region and corner points**

Which point lies in the region given by $x + y \leq 4$, $2x + y \leq 6$, $x \geq 0$, $y \geq 0$?

(a) $(3, 2)$

(b) $(2, 3)$

(c) $(1, 2)$

(d) $(4, 1)$

3. **1 mark · Feasible region and corner points**

In the following question, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

Assertion (A): The point $(2, 3)$ lies in the feasible region of the constraints $x + y \leq 4$, $x \geq 0$, $y \geq 0$.

Reason (R): A point is in the feasible region only if it satisfies every constraint.

(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).

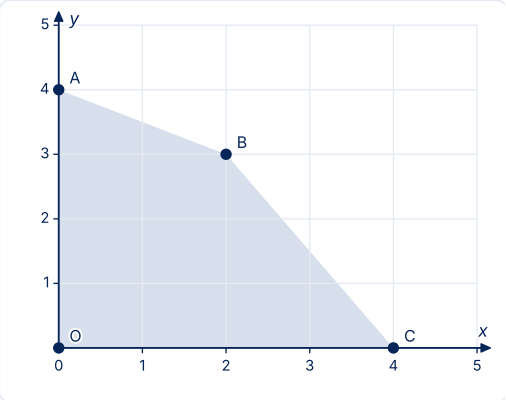
(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

Section B · Short answer (2 marks each)

4. **2 marks · Graphical solution**

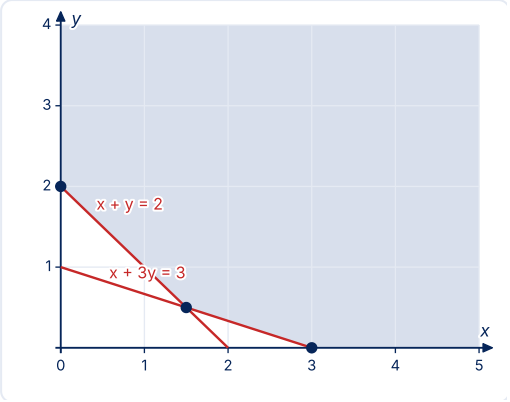
The corner points of a bounded feasible region are $O(0, 0)$, $A(0, 4)$, $B(2, 3)$ and $C(4, 0)$. Find the maximum and minimum values of $Z = 4x + 6y$.



Feasible region OABC

5. **2 marks · Graphical solution**

The feasible region for $x + y \geq 2$, $x + 3y \geq 3$, $x \geq 0$, $y \geq 0$ is unbounded, with corner points $(0, 2)$, $\left(\frac{3}{2}, \frac{1}{2}\right)$ and $(3, 0)$. Find the minimum of $Z = 3x + 5y$.

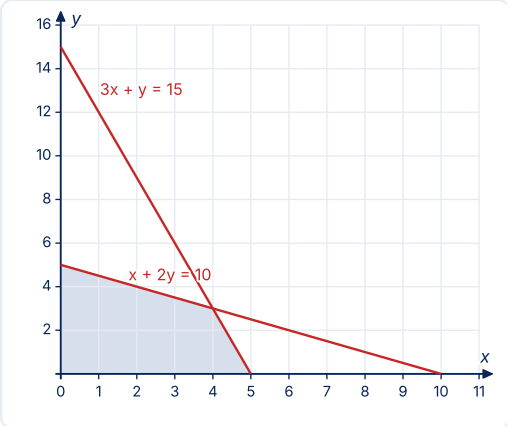


Unbounded region for x + y ≥ 2, x + 3y ≥ 3

Section C · Short answer (3 marks each)

6. **3 marks · Graphical solution**

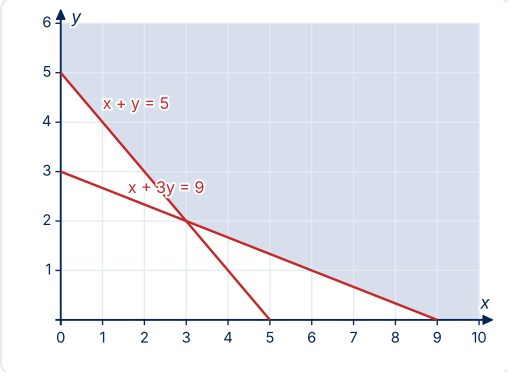
Use the corner-point method to find the maximum of $Z = 5x + 3y$, given $x + 2y \le 10$, $3x + y \le 15$ and $x, y \ge 0$.



Feasible region for x + 2y ≤ 10, 3x + y ≤ 15

7. **3 marks · Graphical solution**

Minimise $Z = 2x + 3y$ subject to $x + y \ge 5$, $x + 3y \ge 9$, $x \ge 0$, $y \ge 0$.

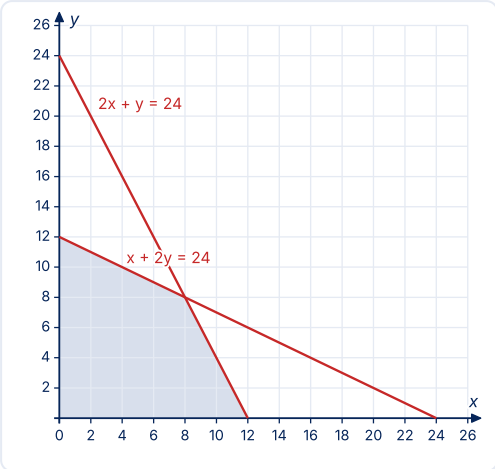


Unbounded region for x + y ≥ 5, x + 3y ≥ 9

Section D · Long answer (5 marks each)

8. **5 marks · Formulating LPPs**

A workshop makes two kinds of lamp, A and B. Each lamp A needs 2 hours of machine time and 1 hour of finishing; each lamp B needs 1 hour of machine time and 2 hours of finishing. There are at most 24 machine hours and 24 finishing hours a week. The profit is ₹40 on each lamp A and ₹50 on each lamp B. How many of each should be made for the greatest profit?



Feasible region for 2x + y ≤ 24, x + 2y ≤ 24

9. **5 marks · Formulating LPPs**

A diet must contain at least 18 units of vitamin A and at least 10 units of iron. Food P gives 3 units of vitamin A and 1 unit of iron per kg and costs ₹6 per kg; food Q gives 2 units of vitamin A and 2 units of iron per kg and costs ₹10 per kg. Find the cheapest mix and its cost.

Section E · Case study (4 marks)

10. **4 marks · Formulating LPPs**

Bakery plan. A bakery makes x cakes and y trays of pastries a day. A cake needs 200 g of flour and a tray 100 g; 5 kg of flour is available. The oven holds at most 30 items (cakes and trays together) a day. The profit is ₹30 a cake and ₹20 a tray.

i. Write the constraints. *[1 mark]*

ii. Find the corner points of the feasible region. *[1 mark]*

iii. Find the plan that gives the greatest profit. *[2 marks]*

Answers and worked solutions

Question 1 — 1 mark

Z at the corners: 0, 12, 17, 15; the greatest is 17 at $(4, 3)$ **A1**

Correct option: (b) 17

Question 2 — 1 mark

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/linear-programming#iq-2

Question 3 — 1 mark

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/linear-programming#iq-3

Question 4 — 2 marks

Answer: Max 26, min 0

$Z(O) = 0$, $Z(A) = 24$, $Z(B) = 8 + 18 = 26$, $Z(C) = 16$ **M1**

Maximum 26 at $B(2, 3)$; minimum 0 at $O(0, 0)$ **A1**

Question 5 — 2 marks

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/linear-programming#iq-5

Question 6 — 3 marks

Answer: 29 at $(4, 3)$

Corner points: $(0, 0)$, $(5, 0)$, $(0, 5)$ and the intersection of $x + 2y = 10$ and $3x + y = 15$, which is $(4, 3)$ **M1**

Z: 0, 25, 15, $20 + 9 = 29$ **A1**

Maximum $Z = 29$ at $x = 4$, $y = 3$ **A1**

Question 7 — 3 marks

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/linear-programming#iq-7

Question 8 — 5 marks

Answer: 8 of each; ₹720

Let x lamps A and y lamps B. Maximise $Z = 40x + 50y$ **M1**

subject to $2x + y \le 24$, $x + 2y \le 24$, $x \ge 0$, $y \ge 0$ **A1**

Corners: $(0, 0)$, $(12, 0)$, $(0, 12)$ and $(8, 8)$ (where $2x + y = 24$ meets $x + 2y = 24$) **A1**

Z: 0, 480, 600, $320 + 400 = 720$ **M1**

Make 8 of each; greatest profit ₹720 **A1**

Question 9 — 5 marks

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/linear-programming#iq-9

Question 10 — 4 marks

i. $2x + y \le 50$ (flour, in $100\ g$ units), $x + y \le 30$, $x \ge 0$, $y \ge 0$ **A1**

ii. $(0, 0)$, $(25, 0)$, $(0, 30)$ and $(20, 10)$ **A1**

iii. $Z = 30x + 20y$: 0, 750, 600, $600 + 200 = 800$ **M1**

20 cakes and 10 trays: ₹800 **A1**

More on this chapter, free: revision notes, a Route to 95 and practice with instant feedback at cbsemathrevision.com/class-12/linear-programming

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