ABHINAV ACADEMY

UDUPI

CET25M12 LINEAR PROGRAMMING

Class 12 - Mathematics

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 56**

1. In an LPP, if the objective function z = ax + by has the same maximum value on two corner points of the feasible region, then the number of points at which z_{max} occurs is: **[1]**

   a) finite b) 0

   c) infinite d) 2

2. The corner points of the feasible region determined by the system of linear inequalities are (0, 0), (4, 0), (2, 4), and (0, 5). If the maximum value of z = ax + by, where a, b > 0 occurs at both (2, 4) and (4, 0), then: **[1]**

   a) 3a = b b) 2a = b

   c) a = 2b d) a = b

3. The corner points of the feasible region determined by the system of linear constraints are (0, 10), (5, 5), (15, 15), (0, 20). Let Z = px + qy, where p, q > 0. Condition on p and q so that the maximum of Z occurs at both the points (15, 15) and (0, 20) is **[1]**

   a) q = 3p b) q = 2p

   c) p = q d) p = 2q

4. The position of origin (0, 0) w.r.t. feasible region represented by x + y $\geq$ 1 is **[1]**

   a) on the line x + y = 0 b) on the line x - y = 0

   c) not in the region d) in the region

5. Which of the following statements is correct? **[1]**

   a. Every LPP admits an optimal selection.
   b. A LPP admits unique optimal solution.
   c. If a LPP admits two optimal solutions it has an infinite solution.
   d. The set of all feasible solutions of a LPP is not a convex set.

   a) Option (d) b) Option (a)

   c) Option (b) d) Option (c)

6. Which of the following is not a convex set? **[1]**

   a) [(x, y) : 2x + 5Y < 7] b) $\{(x, y) : x^2 + y^2 \leq 4\}$

   c) {X: |X| = 5} d) {(x, y) : $3x^2 + 2y^2 \leq 6$)

7. The solution set of the inequation 2x + y > 5 is **[1]**

   a) full plane that contains the origin b) open half plane not containing the origin

c) half plane that contains the origin

d) whole xy-plane except the points lying on the line 2x + y = 5

8. The optimal valuie of the objective function is attained at the points **[1]**

a) given by corner points of the feasible region

b) given by intersection of inequations with the axes only

c) given by intersection of inequations with y-axis only

d) given by intersection of inequations with x-axis only

9. Maximize Z = – x + 2y, subject to the constraints: x ≥ 3, x + y ≥ 5, x + 2y ≥ 6, y ≥ 0. **[1]**

a) Z has no maximum value

b) Maximum Z = 14 at (2, 6)

c) Maximum Z = 12 at (2, 6)

d) Maximum Z = 10 at (2, 6)

10. Corner points of the feasible region determined by the system of linear constraints are (0, 3), (1, 1) and (3, 0). Let Z = px+qy, where p, q > 0. Condition on p and q so that the minimum of Z occurs at (3, 0) and (1, 1) is **[1]**

a) p = 3q

b) p = 2q

c) p = q

d) $p = \frac{q}{2}$

11. Minimize Z = 50x+60y , subject to constraints x +2 y ≤ 50 , x + y ≥ 30, x, y ≥ 0. **[1]**

a) 1800

b) 1550

c) 1700

d) 1200

12. The corner points of the feasible region determined by the following system of linear inequalities: 2x + y $\leq$ 10, x + 3y $\leq$ 15, x, y $\geq$ 0 are (0, 0), (5, 0), (3, 4) and (0, 5). Let Z = px + qy, where p, q $\geq$ 0. Condition on p and q so that the maximum of Z occurs at both (3, 4) and (0, 5) is **[1]**

a) p = 3q

b) q = 3p

c) p = q

d) p = 2q

13. A Linear Programming Problem is as follows: **[1]**

Maximize/Minimize objective function Z = 2x - y + 5

Subject to the constraints

3x + 4y $\leq$ 60

x + 3y $\leq$ 30

x $\leq$ 0, y $\geq$ 0

In the corner points of the feasible region are A(0, 10), B(12, 6), C(20, 0) and O(0,0), then which of the following is true?

a) Minimum value of Z is -5

b) At two corner points, value of Z are equal

c) Maximum value of Z is 40

d) Difference of maximum and minimum values of Z is 35

14. Let X_1 and X_2 are optimal solutions of a LPP, then **[1]**

a) $X = \lambda X_1 + (1-\lambda)X_2, \lambda \in R$ is also an optimal solution

b) $X = \lambda X_1 + (1+\lambda)X_2, \lambda \in R$ gives an optimal solution

c) $X = \lambda X_1 + (1-\lambda)X_2, 0 \leq \lambda \leq 1$ gives

d) $X = \lambda X_1 + (1+\lambda)X_2, 0 \leq \lambda \leq 1$ give an optimal solution an optimal solution

15. The region represented by the inequation system x, y $\geq$ 0, y $\leq$ 6, x + y $\leq$ 3 is **[1]**

a) unbounded in first and second quadrants
b) bounded in first quadrant
c) bounded in second quadrant
d) unbounded in first quadrant

16. The linear programming problem minimize Z = 3x + 2y subject to constraints x + y $\geq$ 8, 3x + 5y $\leq$15, x $\geq$ 0 and y $\geq$ 0, has **[1]**

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

17. If the constraints in a linear programming problem are changed **[1]**

a) he change in constraints is ignored
b) the problem is to be re-evaluated
c) the objective function has to be modified
d) solution is not defined

18. Which of the following is a convex set? **[1]**

a) $\left\{(x, y): y^2 \geq x\right\}$
b) $\{(x, y): x^2+y^2 \geq 1\}$
c) $\{(x, y): x \geq 2, y \leq 4\}$
d) $\left\{x, y): 3 x^2+4 y^2 \geq 5\right\}$

19. Minimize Z = 5x + 10 y subject to x + 2y ≤ 120, x + y ≥ 60, x – 2y ≥ 0, x, y ≥ 0 **[1]**

a) Minimum Z = 310 at (60, 0)
b) Minimum Z = 320 at (60, 0)
c) Minimum Z = 330 at (60, 0)
d) Minimum Z = 300 at (60, 0)

20. A feasible region of a system of linear inequalities is said to be ..., if it can be enclosed within a circle. **[1]**

a) unbounded
b) In squared form
c) bounded
d) in circled form

21. The maximum value of Z = 4x + 3y subject to constraint x + y $\leq$ 10, xy $\geq$ 0 is **[1]**

a) 40
b) 36
c) 20
d) 10

22. A point out of following points lie in plane represented by 2x + 3y $\leq$ 12 is **[1]**

a) (4, 3)
b) (0, 3)
c) (0, 5)
d) (3, 3)

23. Maximise the function Z = 11x + 7y, subject to the constraints: x ≤ 3, y ≤ 2,x ≥ 0, y ≥ 0. **[1]**

a) 50
b) 48
c) 49
d) 47

24. Determine the maximum value of Z = 11x + 7y subject to the constraints :2x + y ≤ 6, x ≤ 2, x ≥ 0, y ≥ 0. **[1]**

a) 47
b) 43
c) 42
d) 45

25. Maximize Z = 3x + 4y, subject to the constraints : x + y ≤ 1, x ≥ 0, y ≥ 0. **[1]**

a) 4
b) 5
c) 6
d) 3

26. Maximize $Z = 100x + 120y$, subject to constraints $2x + 3y \le 30$, $3x + y \le 17$, $x \ge 0$, $y \ge 0$. **[1]**

a) 1260
b) 1280
c) 1300
d) 1200

27. Solution of LPP maximize $Z = 2x - y$ subject to $x + y \leq 2$, $x, y \geq 0$ **[1]**

a) 0
b) 1
c) 4
d) 2

28. The point at which the maximum value of $x + y$, subject to the constraints $x + 2y \leq 70$, $2x + y \leq 95$, $x, y \geq 0$ is obtained, is **[1]**

a) (20, 35)
b) (30, 25)
c) (35, 20)
d) (40,15)

29. Maximize $Z = 50x + 60y$, subject to constraints $x + 2y \le 50$, $x + y \ge 30$, $x, y \ge 0$. **[1]**

a) 1600
b) 1547
c) 2500
d) 1525

30. Objective function of an LPP is **[1]**

a) a function to be optimized
b) a function between the variables
c) a constraint
d) a relation between the variables

31. The point which does not lie in the half plane $2x + 3y - 12 \leq 0$ is **[1]**

a) (2,1)
b) (-3, 2)
c) (1, 2)
d) (2, 3)

32. A Linear Programming Problem is as follows: **[1]**
Minimize $Z = 2x + y$
Subject to the constraints $x \geq 3$, $x \leq 9$, $y \geq 0$
$x - y \geq 0$, $x + y \leq 14$
The feasible region has

a) 5 corner points including (0, 0) and (9, 5)
b) 5 corner points including (7, 7) and (3, 3)
c) 5 corner points including (3, 6) and (9, 5)
d) 5 corner points including (14, 0) and (9, 0)

33. Corner points of the feasible region for an LPP are (0, 2), (3, 0), (6, 0), (6, 8) and (0, 5). Let $F = 4x + 6y$ be the objective function. Maximum of F – Minimum of F = **[1]**

a) 48
b) 60
c) 42
d) 18

34. The value of objective function is maximum under linear constraints **[1]**

a) at (0, 0)
b) at any vertex of feasible region
c) the vertex which is maximum distance from (0, 0)
d) at the centre of feasible region

35. By graphical method, the solution of linear programming problem **[1]**
Maximize $Z = 3x_1 + 5x_2$

Subject to $3x_1 + 2x_2 \leq 18$

$x_1 \leq 4$

$x_2 \leq 6$

$x_1 \geq 0, x_2 \geq 0$, is

a) $x_1 = 2, x_2 = 0, Z = 6$

b) $x_1 = 4, x_2 = 6, Z = 42$

c) $x_1 = 2, x_2 = 6, Z = 36$

d) $x_1 = 4, x_2 = 3, Z = 27$

36. The feasible region for an LPP is always a **[1]**

a) convex polygon

b) Straight line

c) concave polygon

d) type of polygon

37. Maximize $Z = 5x+3y$, subject to constraints $x + y \leq 300$, $2x + y \leq 360$, $x \geq 0$, $y \geq 0$. **[1]**

a) 1020

b) 1050

c) 1040

d) 1030

38. By graphical method solution of LLP maximize $Z = x + y$ subject to $x + y \leq 2x$; $y \geq 0$ obtained at **[1]**

a) at infinite number of points

b) only two points

c) only one point

d) at definite number of points

39. The corner points of the feasible region for a Linear Programming problem are P(0, 5), Q(1, 5), R(4, 2) and S(12, 0). The minimum value of the objective function $Z = 2x + 5y$ is at the point. **[1]**

a) Q

b) S

c) R

d) P

40. The solution set of the inequality $3x + 5y < 4$ is **[1]**

a) an open half-plane not containing the origin.

b) an open half-plane containing the origin.

c) a closed half plane containing the origin.

d) the whole XY-plane not containing the line $3x + 5y = 4$.

41. The value of objective function $Z = 2x + 3y$ at comer point (3, 2) is **[1]**

a) 9

b) 5

c) 15

d) 12

42. In a LPP, the linear inequalities or restrictions on the variables are called **[1]**

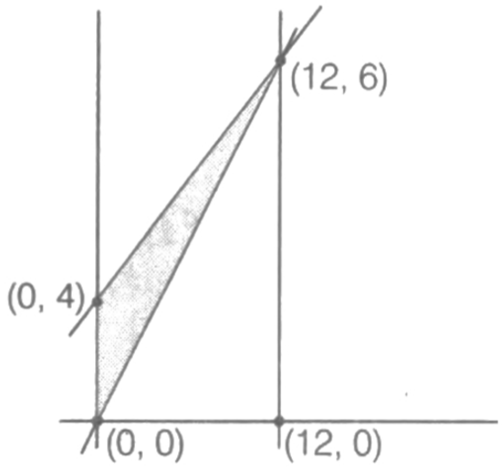
a) Limits

b) Inequalities

c) Linear constraints

d) Constraints

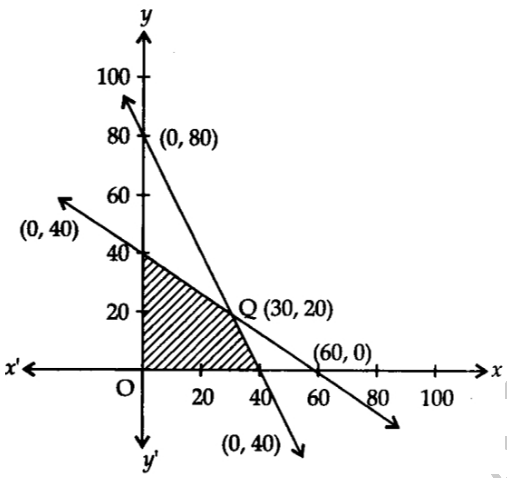
43. The feasible region for an LPP is shown in the following figure. **[1]**



Let F = 3x - 4y be the objective function. Maximum value of F is

a) 12
b) 0
c) -18
d) 8

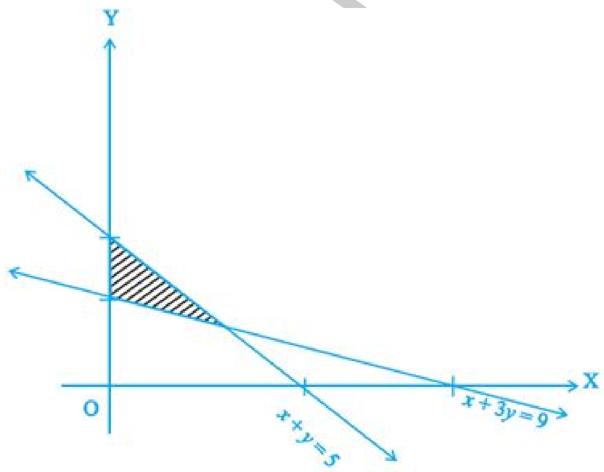
44. For an L.P.P. the objective function is Z = 4x + 3y, and the feasible region determined by a set of constraints (linear in equations) is shown in the graph. **[1]**



Which one of the following statements is true?

a) Value of Z at Q is less than the value at R.
b) Maximum value of Z is at Q.
c) Value of Z at R is less than the value at P.
d) Maximum value of Z is at R

45. The feasible region for a LPP is shown in Figure. Find the maximum value of Z = 11x + 7y. **[1]**



a) 49
b) 48
c) 50
d) 47

46. The feasible solution for a LPP is shown in Figure. Let Z = 3x – 4y be the objective function. (Maximum value of Z + Minimum value of Z) is equal to **[1]**

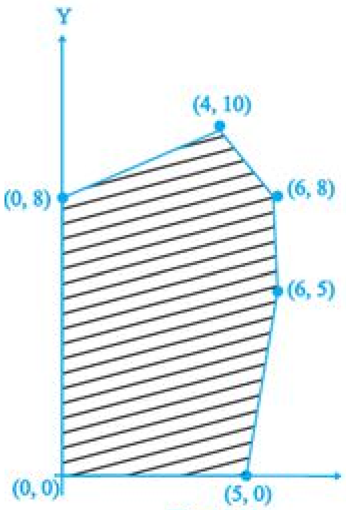


Fig. 12.12

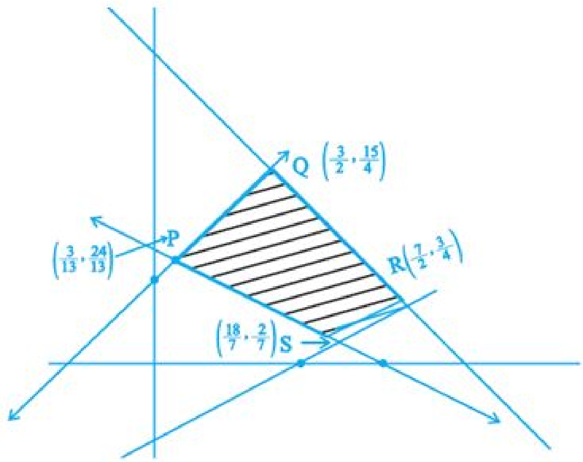
a) 13

b) - 17

c) 1

d) – 13

47. In Figure, the feasible region (shaded) for a LPP is shown. Determine the maximum and minimum value of Z = x + 2y **[1]**



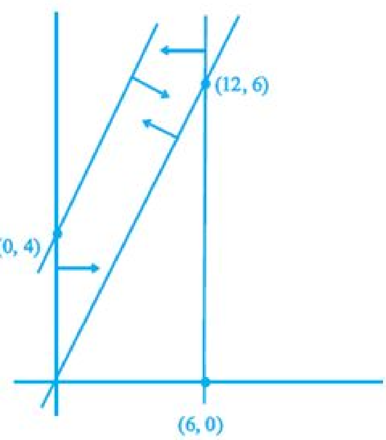
a) Maximum = 10, minimum = $3\frac{1}{4}$

b) Maximum = 8, minimum = $3\frac{1}{6}$

c) Maximum = 7, minimum = $3\frac{1}{9}$

d) Maximum = 9, minimum = $3\frac{1}{7}$

48. The feasible region for an LPP is shown in the Figure. Let F = 3x - 4y be the objective function. Maximum value of F is. **[1]**



a) - 18 b) 0

c) 8 d) 12

49. The feasible solution for an LPP is shown in Figure. Let Z = 3x – 4y be the objective function. Maximum value of Z occurs at **[1]**

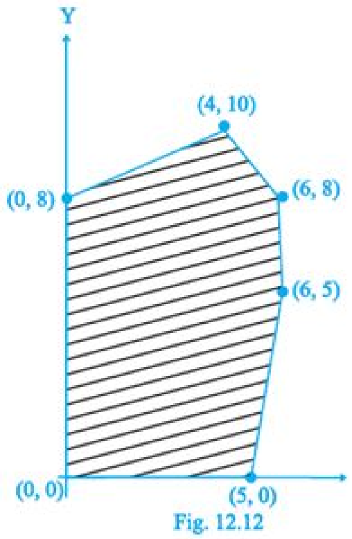
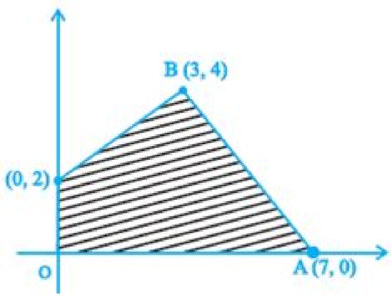


Fig. 12.12

a) (6, 8) b) (6, 5)

c) (4, 10) d) (5, 0)

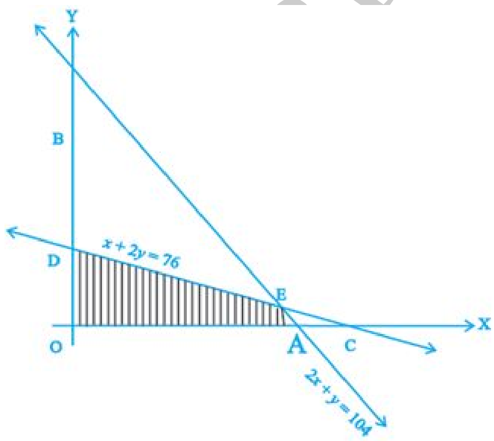
50. Feasible region (shaded) for a LPP is shown in Figure. Maximize Z = 5x + 7y. **[1]**



a) 45 b) 49

c) 47 d) 43

51. Determine the minimum value of Z = 3x + 4y if the feasible region (shaded) for a LPP is shown in Figure above. **[1]**

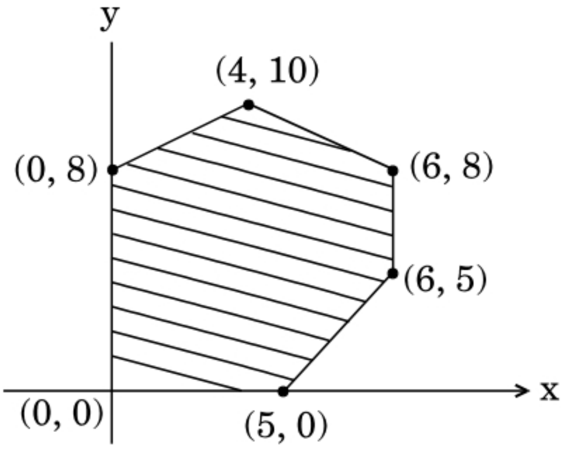


a) 154 b) 196

c) 112 d) 152

52. The feasible region for an LPP is shown below: **[1]**

Let z = 3x - 4y be the objective function. Minimum of z occurs at



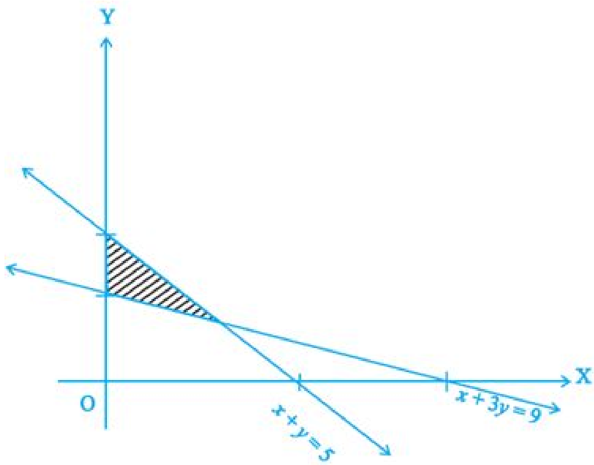
a) (0, 8)

b) (0, 0)

c) (5, 0)

d) (4, 10)

53. The feasible region for a LPP is shown in Figure. Find the minimum value of Z = 11x + 7y. **[1]**



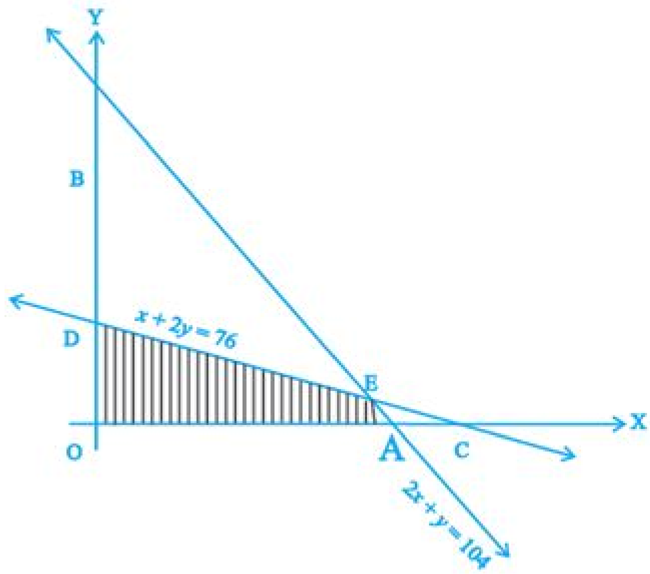
a) 22

b) 21

c) 19

d) 20

54. Determine the maximum value of Z = 3x + 4y if the feasible region (shaded) for a LPP is shown in Figure above. **[1]**

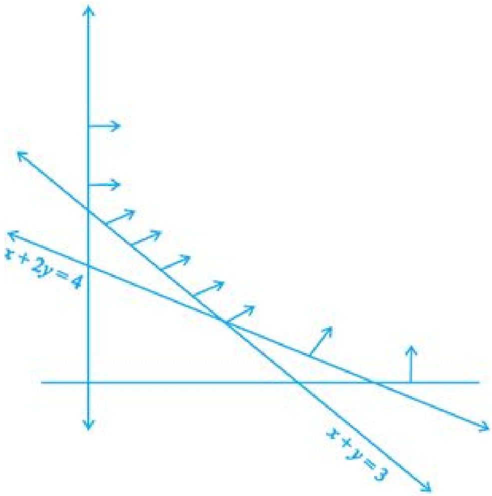


a) 226

b) 196

c) 216 d) 206

55. The feasible region for a LPP is shown in Figure. Evaluate Z = 4x + y at each of the corner points of this region. Find the minimum value of Z, if it exists **[1]**



a) Minimum value = 2

b) Minimum value = 5

c) Minimum value = 4

d) Minimum value = 3

56. A fruit grower can use two types of fertilizer in his garden, brand P and brand Q. The amounts (in kg) of nitrogen, phosphoric acid, potash, and chlorine in a bag of each brand are given in the table. Tests indicate that the garden needs at least 240 kg of phosphoric acid, at least 270 kg of potash and at most 310 kg of chlorine. **[1]**

Kg per bag		
	Brand P	Brand Q
Nitrogen	3	3.5
Phosphoric acid	1	2
Potash	3	1.5
Chlorine	1.5	2

If the grower wants to maximise the amount of nitrogen added to the garden, how many bags of each brand should be added? What is the maximum amount of nitrogen added?

a) 150 bags of brand P and 50 bags of brand Q; Maximum amount of nitrogen = 625 kg

b) 140 bags of brand P and 50 bags of brand Q; Maximum amount of nitrogen = 595 kg

c) 160 bags of brand P and 52 bags of brand Q; Maximum amount of nitrogen = 635 kg

d) 145 bags of brand P and 55 bags of brand Q; Maximum amount of nitrogen = 555 kg