MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

LINE

Exercise 1 Topical Problems Linear Programming Problem And Its General From

1. In case of a linear programming problem, feasible region is always

A. a convex set

B. a concave set

C. a bounded convex set

D. a bounded concave set

Answer: A

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2. In linear programming problem, the linear function Z subject to certain conditions determined by a set of linear inequalities with variables as non-negative, is

A. maximised only

B. minimised only

C. Both (a) and (b

D. None of these

Answer: C

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3. A problem which seeks to maximise or minimise a linear function (say, of two variables x and y) subject to certain constraints as determined by a set of linear inequalities is called a/an

A. optimisation problem

B. functional problem

C. numerical problem

D. computer problem

Answer: A

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4. The linear inequalities or equations or restrictions on the variables of a linear programming problem are called A)linear relations B) constraints C) functions D) objective functions

A. linear relations

B. constraints

C. functions

D. objective functions

Answer: B

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5. Consider the following statements

The term linear implies that all mathematical relations used in the problem are linear relations. II. The term programming refers to the method of determining a particular programme. Choose the correct option.

A. Only I is true

B. Only II is true-

C. Both I and II are true

D. Neither I nor II is true

Answer: C

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6. A furniture deals in only two items -tables and chairs, He has 50000 to invest and has storage space of atmost 60 pieces. A table costs t 2500 and a chair t 500. Then, the constraints of the above problem are (where, x is number of tables and y is number of chairs)

A. $x \geq , 0y \geq 0$

B. $5x + y \leq 100$

C. $x + y \leq 60$

D. All of these

Answer: D

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7. If a furniture dealer estimate that from the sale of one table he can make a profit of ₹ 250 and from the sale of one chair of a profit of ₹ 75 and if x is the sale of chairs and y us the number of tables , then its linear objectives function is

A. $Z = 75x + 250y$

B. $Z = 75x + 25Y$

C. $Z = 250 + 75y$

D. $Z = 25x + 75y$

Answer: A

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8. A linear programming problem is one that is conerned with finding the ....A.... Of a linear function called ....B... function of serval variables (say x and Y) , subject to the condiations that the variables are ....C.... And satisfy set of linear inequalities called linear constriants .

Here, A,B C are respectively

A. objective ,optimal value, negative

B. optimal value, objective ,negative

C. optimal value , objective ,non- negative

D. objective ,optimal value, non- negative

Answer: C

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9. The conditions $x \geq 0, y \geq 0$ are called

A. restrictions only

B. negative restirctions

C. non-negative resitricions

D. None of these

Answer: C

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10. Which of the following is a linear objective ? A) $z = ax + by$ B) $z \leq ax + by$ C) $z > ax + by$ D)$z \neq ax + by$

A. Z= ax + by

B. $Z \leq ax + by$

C. $Z > ax + by$

D. $Z \neq ax + by$

Answer: A

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11. The variables x and y in a linear programming problem are called A) decision variables B) linear variables C) optimal variables D) None of these

A. decision variables

B. linear variables

C. optimal variables

D. None of these

Answer: A

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12. Which of the following statements is false? A) The feasible region is always a concave region B) The maximum (or minimum) solution of the objective function occurs at the vertex of the feasible region C) If two corner points produce the same maximum (or minimum) value of the objective function, then every point on the line segment joining these points will also give the same maximum (or minimum) two. values D) All of the above

A. The feasible region is always a concave region

B. The maximum (or minimum) solution of the objective function occurs at the vertex of the feasible region

C. If two corner points produce the same maximum (or minimum) value of the objective function, then every point on the line segment joining these points will also give the same maximum (or minimum) two. values

D. All of the above

Answer: A

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13. The optimal value of the objective function is attained at the points A)given by intersection of inequations with axes only B) given by intersection of inequations with X-axis only C) given by corner points of the feasible region D) none of teh above

A. given by intersection of inequations with axes only

B. given by intersection of inequations with X-axis only

C. given by corner points of the feasible region

D. None of the above

Answer: C

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14. Variables of the objective function of the linear programming problem are A) zero B) zero or positive C) negative D) zero or negative

A. zero

B. zero or positive

C. negative

D. zero or negative

Answer: B

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15. A furniture deals in only two items -tables and chairs, He has 50000 to invest and has storage space of atmost 60 pieces. A table costs t 2500 and a chair t 500. Then, the constraints of the above problem are (where, x is number of tables and y is number of chairs)

A. 2

B. 3

C. 4

D. 1

Answer: C

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16. A faniture dealer deals in only two itmes - tables and chairs. He has 'Rs. 50000 invest and has storage place of at most 60 pieces. A table costs Rs. 2500 and chair Rs. 500. He estimates that from the sale of one table, he can make a perfect Rs. 250 and that from the sale of one chair a profit of Rs. 75. How many table and chair he should buy from the available money so as to maximise his total profit assuming that he can sell all the items which he buys.

A. maximies Z=250 x + 75 Y

Subject to the constraints

$5x + y \leq 100$

$x + Y \leq 60$

$x, y \geq 0$

B. minimise Z= 250x + 75 y

Subject to the constrainsts

$5xY \leq 100$

$x + y \leq 100$

$x, y \geq 0$

C. minimise Z = 250 x + 75 y

Subject to the constrains

$5x + y \geq 100$

$x + y \geq 60$

$x, y \geq 60$

$x, y \geq 0$

D. maximise Z= 250 x + 75 y

Subject to the constraints

$5x + y \leq 100$

$x + y \geq 60$

$x, y \geq 0$

Answer: A

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17. The objective function of an LPP is A) a constraint B)a function to be optimised C) a relation between the variables D) none of these

A. a constraint

B. a function to be optimised

C. a relation between the variables

D. None of the above

Answer: B

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18. Which of the following sets are not convex? A) $\{(x, y) : 8x^2 + 6y^2 \leq 24\}$ B) $\{(x, y) : 6 \leq x^2 + y^2 \leq 36\}$ C) $\{(x, y) : y \geq 3, y \geq 30\}$ D) $\{(x, y) : x^2 \leq y\}$

A. $\{x, y) : 8x^2 + 6y^2 \leq 24\}$

B. $\{(x, y) : 6 \leq x^2 + y^2 \leq 36\}$

C. $\{(x, y) : y \geq 3, y \geq 30\}$

D. $\{(x, y) : x^2 \leq y\}$

Answer: B

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19. One of the important class of optimisation problem is A) functional programming problem B)linear programming problem C)numerical programming problem D) none of these

A. functional programming problem

B. linear programming problem

C. numerical programming problem

D. None of the above

Answer: B

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20. The problems which seek to maximise (or minimise) profit (o r cost) from a general class of problems called A) optimization problems B)customization problems C)Both A and B D) none of these

A. optimisation problems

B. customisation problems

C. Both (a) and (b)

D. None of these

Answer: A

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21. The wide applicability of linear programming problem is in a A) industry B) commerce C) management science D) all of these

A. industry

B. commerce

C. management science

D. All of these

Answer: A

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22. An optimisation problem may involve finding A) maximizing profit B) minimum cost C) minimum use of resources D) All of the above

A. maximum profit

B. minimum cost

C. minimum use of resources

D. All of the above

Answer: A

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23. If a young man rides his motorcycle at 25 km/hr, he has to spend 2 per kilometer on petrol if per he rides it at a faster speed of 40 km/hr the petrol cost increases to 5 per kilometer.He has 100 to spend on petrol and wishes to find the maximum distance he can travel within one hours. Express this as a linear programming problem and then solve it.

A. $2x + 5y \leq 100, \frac{x}{25} + \frac{y}{40} \geq 1, \geq 0, y \geq 0$

B. $2x + 5y \geq 100, \frac{x}{25} + \frac{y}{40} \geq 1, x \geq 0, y \geq 0$

C. $2x + 5y \leq 100, \frac{x}{25} + \frac{y}{40} \leq 1, x \geq 0y \leq 0$

D. $2x + 5y \leq 100, 25x + 40y \leq 1, x \geq 0, y \geq 0$

Answer: C

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24. Priya has to stitch table clothes and curtains for a living. She has to put in 1 hour of work for a table cloth and 3 hours for a curtain. She gets ₹ 50 for· every table cloths and ₹ 250 for every curtain. She has to earn a least ₹ 500 per day. Minimize the no of hours of work she has to put in every day.

A. Miniimize z= x+ 3y subject to $250x + 50y \leq 500, x \geq 0, y \geq 0$

B. Minimize z= x + 3y subject to $50x + 250y \geq 500, x \geq 0, y \geq 0$

C. Minimize $z = x + 3y$ subject to $250x + 250 \leq 500, x \geq , 0y \geq 0$

D. Minimize z= x + 3 y subject to $250x + 250 \leq 500x \geq 0$

Answer: B

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25. A factory owner purchases two types of machines, A and B for his factory. The requirements and the limitations for the machines are as follows: Machine Area occupied Labour force Daily output (in units) A $1000\,m^2$ $12\,men$ 60 B $1200\,m^2$ $8\,men$ 40 He has maximum area of $9000\,m^2$ available, and 72 skilled labourers who can operate both the machines. How many machines of each type should he buy to maximise the daily output?

A. Maximize z = 50x + 40y subject to constraints:

$$x \geq 0, y \geq 0, 1000x + 12000y \leq 760012x + 8y \leq 72$$

B. Maximiize z = 50x + 40y subject to constraints:

$$x \geq 0, y \geq 0, 1000x + 12000y \geq 7600, 12x + 8y \leq 72$$

C. Maximize z = 50x + 40y subject to constraints

$$x \geq 0, y \geq 0, 1000x + 1200y \leq 7600, 12x + 8y \geq 72$$

D. Maximize z = 50x + 40 y subject to constraints:

$$X2 \geq 0, y2 \geq 0, 1000x + 1200y2 \geq 7600, 12x + 8y2 \geq 72.$$

Answer: A

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26. Let p and q be the statements $p: 4x + 5y \geq 20, q: 3x^2 + 2y^2 \leq 6$ Can p an q both be constraints for an LPP?

A. both p and q can be constraints of LPP

B. p but not q is a constraint of LPP

C. q but not pis a constraint of LPP

D. neither p not q is a constraint of LPP

Answer: B

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27. Which of the following cannot be considered as the objective function of a linear programming problem? A)Maximize $z = 3x + 2y$ B) Minimize $z = 6x + 7y + 92$ C) Maximize $z = 2x$ D)Minimize $z = x^2xy + y^2$

A. Maximizez = 3x + 2y

B. Minimize z = 6x + 7Y + 92

C. Maximizez = 2x

D. Minimize z = $x^2 + 2xy + y^2$

Answer: D

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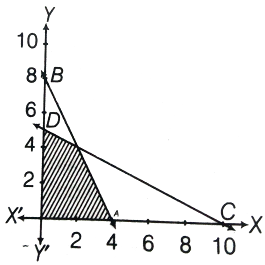
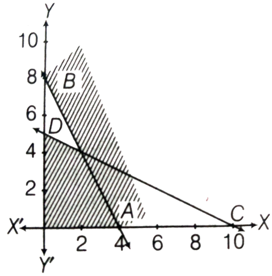
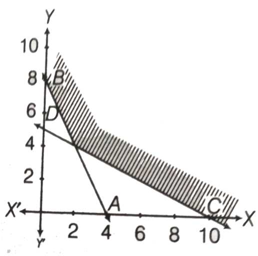
28. The solution set of the linear inequalities $2x + y \geq 8$ and $x + 2y \geq 10$ is

A. 

B. 

C. 

D. None of these

Answer: C

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29. A printing company prints two types of magazines _A and 8. The company earns '10 and '15 on each magazine A and 8 respectively. These are processed on three machines I, II and Ill and total time in hours available per week on each machine is as follows.

Magazine → ↓ Machine	A (x)	B (y)	Time available
I	2	3	36
II	5	2	50
III	2	6	60

The number of constraints is

A. 3

B. 4

C. 5

D. 6

Answer: C

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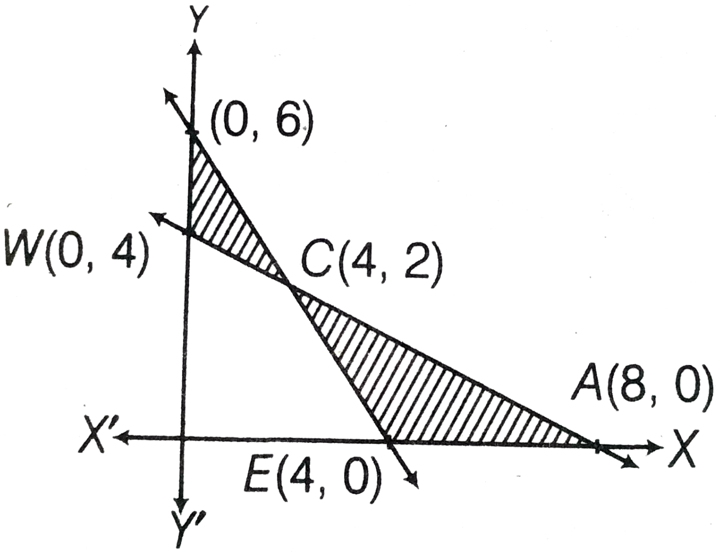
30. The region shaded horziontally is represented by the inequations



A. $y \geq 0, 3x + 2y \geq 12, x + 2y \leq 8$

B. $y \leq 0, 3x + 2y \leq 12, x + 2y \leq 8$

C. $y \geq 0, 3x + 2y \geq 12, x + 2y \geq 8$

D. $y \geq 0, 3x + 2y \leq 12, x + 2y \geq 8$

Answer: A

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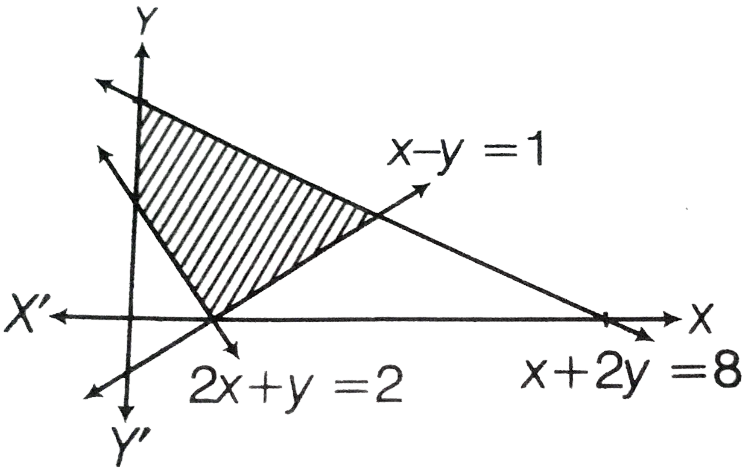
31. Find the linear inequations for which the shaded area in following figure is the solution set:



A. $x + y \leq 1, 2x + y \geq 2, x - 2 \geq 8, x \leq 0, y \geq 0$

B. $x - y \geq 1, 2x + y \geq 2, x \geq 0, y \geq 0$

C. $x - y \geq 1, 2x + y \leq 2, x + 2y \geq 8, x \geq 0, y \geq 0$

D. $x + y \geq 1, 2x + y \leq 2, x + 2y \geq 8, x \geq 0, y \geq 0$

Answer: C

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32. The minimum value of Z= 4x+5y subject to the constraints $x \leq 30, y \leq 40$ and $x \geq 0, y \geq 0$ is

A. 320

B. 200

C. 120

D. 0

Answer: D

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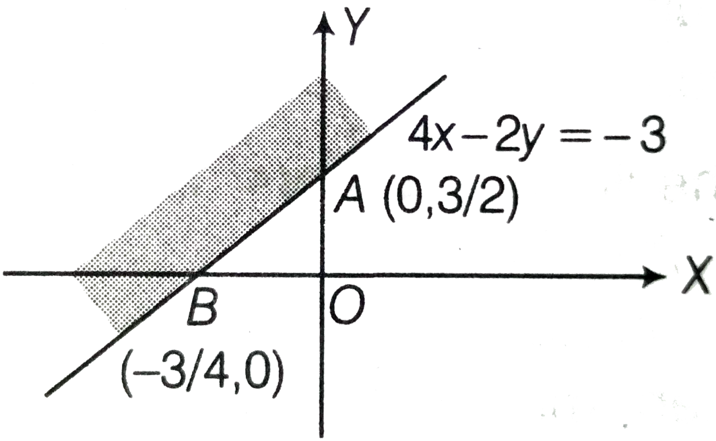
33. Shaded region is repersented by



A. $4x - 2y \leq 3$

B. $4x - 2y \leq -3$

C. $4x - 2y \geq 3$

D. $4x - 2y \geq -3$

Answer: B

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34. The shaded region for the inequality $x + 5y \leq 6$ is

A. to the non-origin side of x + 5y =6

B. to the either side of $x+5y=6$

C. to the origin side of $x+5y=6$

D. to the neither side of $x+5y=6$

Answer: C

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35. The feasible region for the following constraints $L_1 \leq 0, L_2 \geq 0, L_3 = 0, x \geq 0, y \geq 0$ in the diagram shown is

A. area DHF

B. area AHC

C. line segment EG

D. line segment GI

Answer: C

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36. $3x + 4y \leq 18, 2x + 3y \geq 3 \text{ and } x, y \geq 0$ is

A. (0,2)

B. (4,8,0)

C. (0,3)

D. None of these

Answer: D

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37. The corner point method for bounded feasible region comprises of the following steps I.

When the feasible region is bounded, M and m are the maximum and minimum values of Z.

II. Find the feasible region of the linear programming problem and determine its corner points.

III. Evaluate the objective function Z = ax + by at each corner point. Let M and m respectively be the largest and smallest values of these points. The correct order of these above steps is

A. III,I,II

B. II,III,I

C. II,I,III

D. I,III,II

Answer: B

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Exercise 1 Topical Problems Solution Of Lpp Graphical Method

1. Maximum value of Z = 12x + 3y subject to constraints $x \geq 0, y \geq 0, x + y \leq 5$ and $3x + y \leq 9$ is

A. 15

B. 36

C. 60

D. 40

Answer: B

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2. The coordinate of the point at which minimum value of Z = 7x - 8y, subject to the conditions constraints $x + y - 20 \leq 0, y \geq 5, \ \leq \ -5$ is

A. (20,0)

B. (15,5)

C. (0,5)

D. (0,20)

Answer: D

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3. The minimum value of the objective function Z=2x+10y for linear constraints $x \geq 0, y \geq 0, x - y \geq 0, x - 5y \leq -5$ is

A. 10

B. 15

C. 12

D. 8

Answer: B

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4. The minimum value of Z = 5x - 4y subject to constraints $x + y \leq 10, y \leq 4, x, y > 0$ will be at the point

A. (10,4)

B. (-10,4)

C. (6,4)

D. (0,4)

Answer: D

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5. The maximum value of z = 10x + 6y subject to constraints $x \geq 0, y \geq 0, x + y \leq 12, 2x + y \leq 20$ is

A. 72

B. 80

C. 104

D. 110

Answer: C

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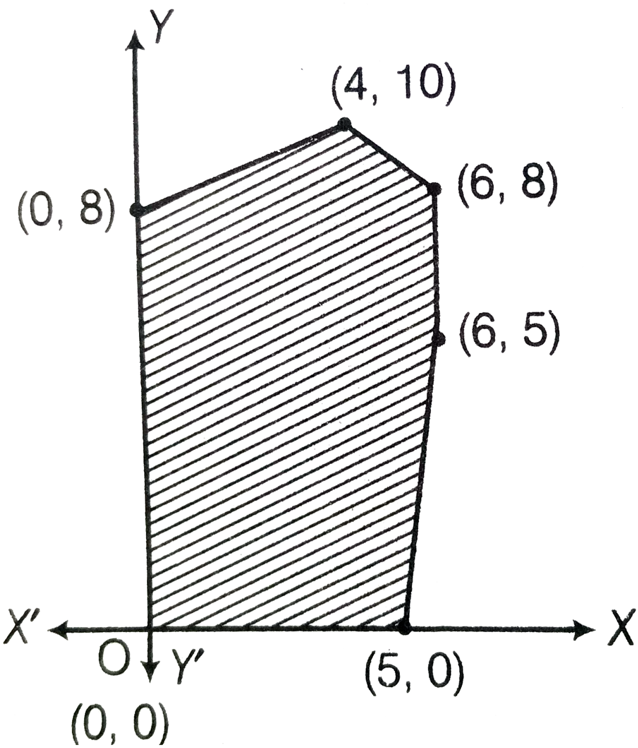
6. The feasible solution for a LPP is hown as below,



Let Z =3x -4y be the objective function . Then,

Maximum of Z occurs at

A. (5,0)

B. (6,5)

C. (6,8)

D. (4,10)

Answer: A

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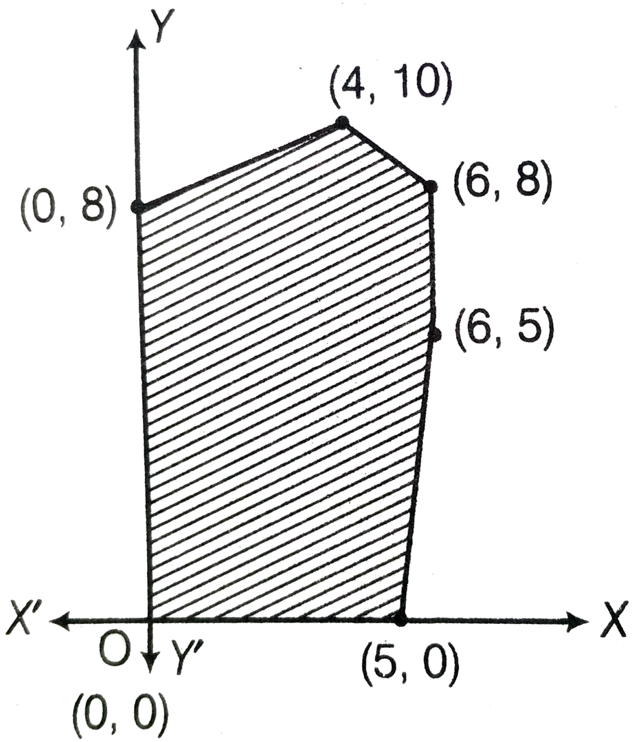
7. The feasible solution for a LPP is hown as below,



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

A. (0,0)

B. (0,8)

C. (5,0)

D. (4,10)

Answer: B

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8. The feasible solution for a LPP is hown as below,

Let Z =3x -4y be the objective function . Then, (Maximum value of Z + Minimum vlaue of Z) is equal to

A. 13

B. 1

C. -13

D. -17

Answer: D

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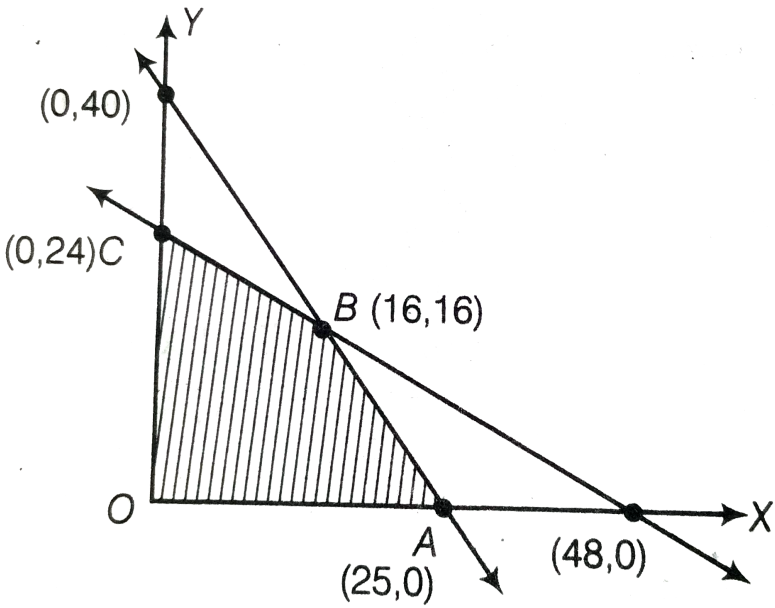
9. The maximum value of Z = 4x + 3y, if the feasible region for an LPP is shown in following figure, is



A. 112

B. 100

C. 72

D. 110

Answer: A

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10. The maximum value of Z =x +3y such that $2x+y \leq 20, x+2y \leq 20, x \geq 0, y \geq 0$ is

A. 10

B. 60

C. 30

D. None of these

Answer: C

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11. The area of the feasible region for the following constraints $3y+x \geq 3, x \geq 0, y \geq 0$ will be

A. bounded

B. unbounded

C. convex

D. concave

Answer: B

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12. The iinear programming problem Maximise $Z = x_1 + x_2$

Subject to constraints

$x_1 + 2x_2 \leq \ \leq 2000$

$x_1 + x_2 \leq 15000$

$x_2 \leq 600$

$x_1 \geq has$

A. no feasible solution

B. unique optimal solution

C. a finite number of optimal solutions

D. infinite number of optimal solutions

Answer: D

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13. Consider the linear programming problem Maximise Z = 4x + y.

Subject to constraints $x+y \leq 50, x+y \geq 100$ and $x, y \geq 0$ Then, maximum vlaue of Z is

A. 0

B. 50

C. 100

D. does not exist

Answer: D

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14. The maximum and minimum values of the objective function Z = 3x - 4 y subject to the constraints

$x - 2y \leq 0, \ -3x + y \leq 4$

$x - y \leq 6, x, y \geq 0$

are respectively

A. 12,10

B. 10,12

C. 12,-16

D. 5,12

Answer: C

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15. The maximum value of Z = 4x + 2y subject to the constraints $2x + 3y \leq 18, x + y \geq 10, x, y \geq 0$ is

A. 20

B. 36

C. 40

D. None of these

Answer: D

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Exercise 2 Miscellaneous Problems

1. The point which provides the solution of the linear programming problem, maximise Z = 45x + 55y. Subject to constraints Subject to constraints $x, y \geq 0, 6x + 4y \leq 120$ and $3x + 10y \leq 180$ is

A. (15, 10)

B. (10, 15)

C. (0,18)

D. (20,0)

Answer: B

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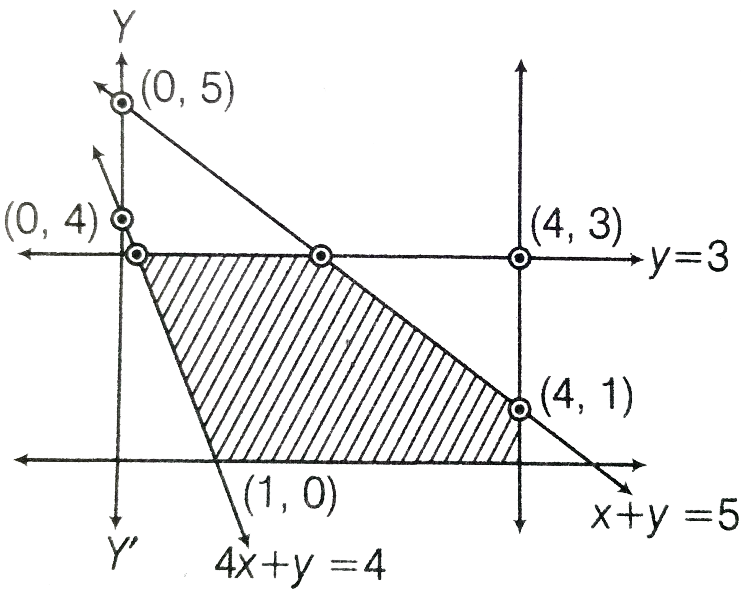
2. Determine the system of linear equation for which the solution set is the shaded region in the following figure



A. If $x + y, 4 \leq 3, x + y \leq 5, 4x + y \geq 4, y \geq 0, x \geq 0$

B. $x \leq 4, y \leq 3, x + y \geq 5, 4x + y \leq 4, y \geq 0, x \geq 0$

C. $x \geq 4, y \geq 3, x+y \leq 5, 4x+y \geq 4, y \geq 0, x \geq 0$

D. $x \geq 4, y \geq 3, x+y \geq 5, 4x+y \leq 4, y \geq 0,$

Answer: A

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3. if $x+y \leq 2, x \geq 0$ then point at which maximum value of 3x + 2y attained will be

A. (0,2)

B. (0,0)

C. (2,0)

D. $\left(\frac{1}{2}, \frac{1}{2}\right)$

Answer: C

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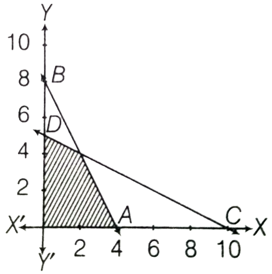
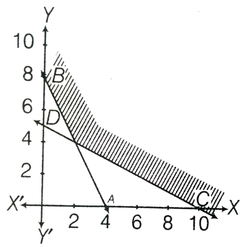
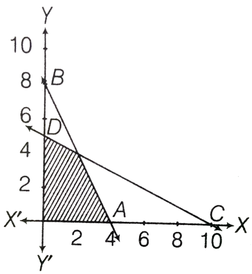
4. The solution set of the linear inequalities $2x + 2y \geq 10$ and $x + 2y \geq 10$



A.



B.



C.

D. None of these

Answer: B

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5. Solve the linear programming problem. Maximise Z = x + 2y

Subject to constraints $x - y \leq 10, 2x + 3y \leq 20$ and $x \geq 0, y \geq 0$

A. Z=10

B. Z=30

C. Z=40

D. None of these

Answer: D

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6. For an LPP, minimise Z = 2x + y subject to constraint $5x + 10y \leq 50, x + y \geq 1, y \leq 4$ and $x, y \geq 0$ then Z is equal to

A. 0

B. 1

C. 2

D. 12

Answer: B

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7. Consider the inequalities $x_1 + x_2 \leq 3, 2x_1 + 5x_2 \geq 10x_1, x_2 \geq 0$ then feasible region is

A. (2,2)

B. (1,2)

C. (2,1)

D. (4,2)

Answer: B

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8. $Z = 4x + 2y, 4x + 2y \geq 46, x + 3y \leq 24$ and x and y are greater than or equal to Zero, then the maximum value of Z is

A. 46

B. 96

C. 52

D. None of these

Answer: B

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9. The minimum vlaue $Z = 2x_1 + 3x_2$ subject to the conditions $2x_1 + 7x_2 \geq 22, x_1 + x_2 \geq 6, 5x_1 + x_2 \geq 10$ and $x_1, x_2 \geq 0$ is

A. 14

B. 20

C. 10

D. 16

Answer: A

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10. The maximum value $P = 3x + 4y$ subjected to the constraints $x + y \leq 40, x + 2y \leq 60, x \geq 0$ and $y \geq 0$ is

A. 130

B. 140

C. 40

D. 120

Answer: B

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11. Consider the inequalities $5x_1 + 4x_2 \geq 9, x_1 + x_2 \leq 3, x_1 \geq 0, x_2 \geq 0$ Which of the following point lies inside the solution set ?

A. (1,3)

B. (1,2)

C. (1,4)

D. (2,2)

Answer: B

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12. The minimum and maximum values problem, of Z for the minimise and maximise Z = 3x + 9 y subject to the constraints

$x + 3y \leq 60, x + y \geq 10, x \leq y,$

are respectively

A. 60 and 180

B. 180 and 60

C. 50 and 190

D. 190 and 50

Answer: A

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13. The linear programming problem minimiseZ=3x+2y subject to the constraints

$x + y \geq 8$

$3x + 5y \leq 15$

$x \geq 0, y \geq 0$ has

A. one solution

B. no feasible solution

C. two solutions

D. infinitely many solution

Answer: B

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14. The maximum and minimum values of the objective function Z = x + 2y subject to the constraints

$x + 2y \geq 100, 2x - y \leq 0, 2x + y \leq 200$ occurs respectively at

A. one point and three points

B. two points and one point

C. one point and infinitely points

D. one point and one point

Answer: C

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15. The maximum value of the objective function

Z=3x+4y

subject to the constraints $x+y \leq 4, x \geq 0, y \leq o$ is

A. 16

B. 18

C. 20

D. 25

Answer: A

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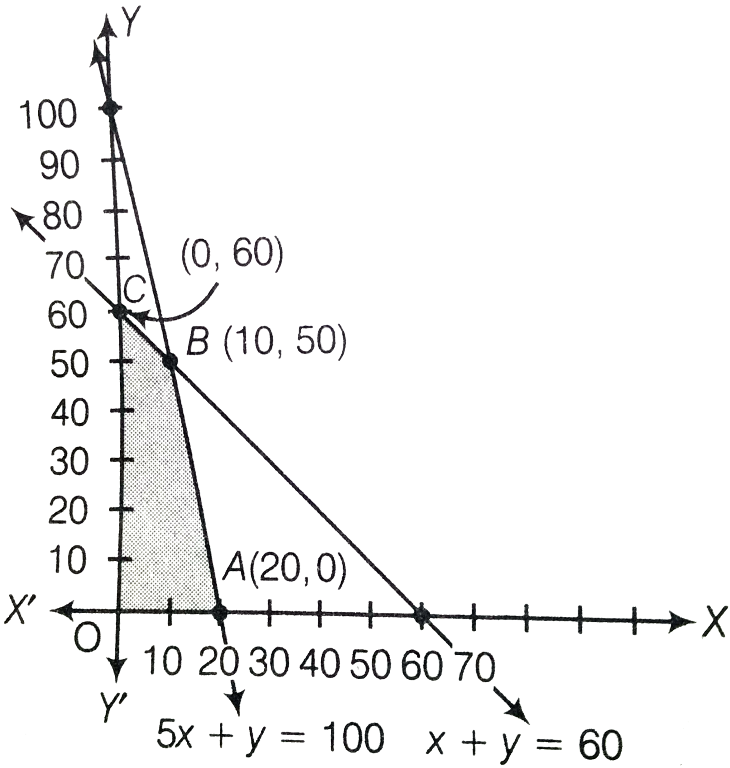
16. Let x and y are the number of tables and chairs respectively, on which a furniture dealer wants to make profit for the constraints Maximise Z = 250x + 75 y

$5x+y \leq 100, x+y \leq 60x \geq 0y \geq 0$

consider the following graph



Then, the maximum profit to the dealer results from buying

A. 10 tables and 50 chairs

B. 50 tables and 10 chairs

C. 0 table and 60 chairs

D. 20 tables and 40 chairs

Answer: A

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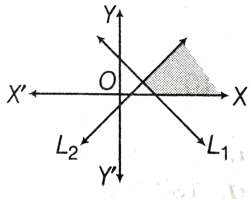
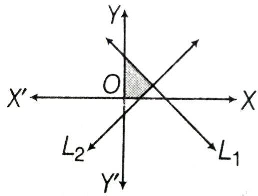
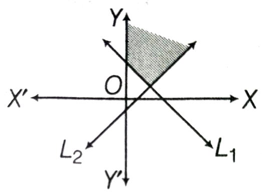
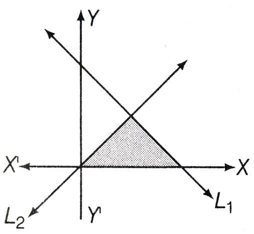
17. The graphical solution of linear inequalities $x + y \geq 5$ and $x - y \leq 3$,

A. 

B. 

C. 

D. 

Answer: C

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18. By graphical method, the solutions of linear programming problem maximum $Z = 3x_1 + 5x_2$ subject to constraints $3x_1 + 2x_2 \leq 18$

$x_1 \leq 4, x_2 \leq 6, x_1 \geq 0, x_2 \geq 0$

A. $x_1 = 2, x_2 = 6, Z = 36$

B. $x_1 = 2, x_2 = 6, Z = 36$

C. $x_1 = 4, x_2 = 3, Z = 27$

D. $x_1 = 4, x_2 = 6, Z = 42$

Answer: B

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19. A toy company manufactures two types of doll; a basic version doll; a basic version doll A and a deluxe version doll B. Each doll of type B takes twice as long to produce as one of type. A and the company would have time to ,make a maximum of 2, 000 per day if it produces only the basic version. The supply of plastic is sufficient to produce 1500 dolls per day (both A and B combined). The deluxe version requires a fancy dress of which there are only 600 per day available. If the company makes profit Rs. 3 and Rs. 5 per doll respectively o doll A and doll B; how many of each should be produced per day in order to maximize profit?

A. 800500

B. 500600

C. 450450

D. $1000, 500$

Answer: D

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20. The minimum value of Z = 10x + By subject to $4x + y \geq 4, x + 3y \geq 6, x + y \geq 3, x \geq 0, y \geq 0$ is

A. 60

B. 27

C. $\frac{74}{3}$

D. 32

Answer: C

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21. The point which provides the solution of the solution to the linear programming problem . Maximum (2x+3y) subject to constraints .

$4x + y \geq 4, x + 3y \geq 6, x + y \geq 3, x \geq 0, y \geq 0$ is

A. (3,2.5)

B. (2.3.5)

C. (2,3.5)

D. -1.35

Answer: D

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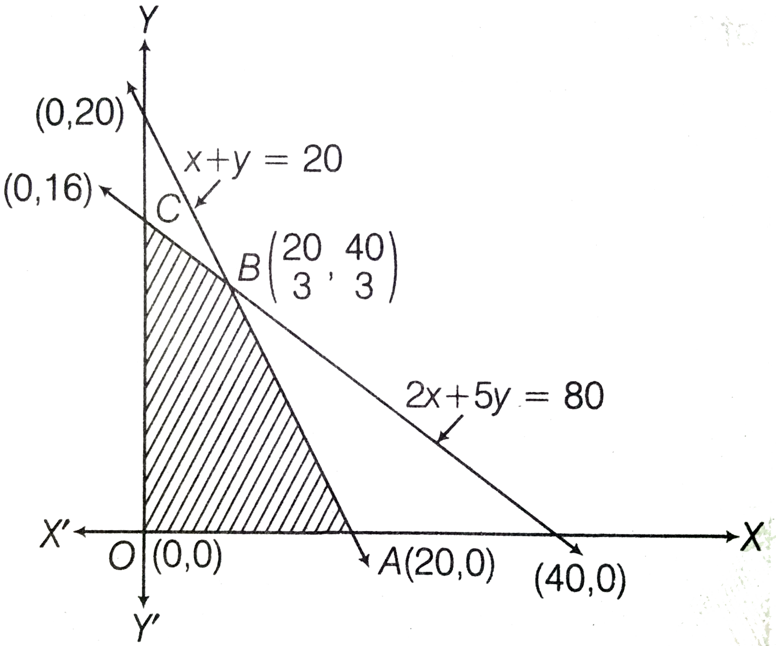
22. Shaded region is represented by , the constraints



A. $2x + 5y \geq 80, x + y \leq 20, x \geq 0, y \leq 0$

B. $2x + 5y \geq 80, x + y \geq 20, x \geq 0, y \geq 0$

C. $2x + 5y \geq 80, x + y \geq 20, x \geq 0, y \geq 0$

D. $2x + 5y \leq 80, x + y \leq 20, x \leq 0$

Answer: C

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23. Let R be the feasible region (convex polygon) for a linear programming problem and Z = ax + by be the objective function. Then, which of the following statements is false? A) When Z has an optimal value, where the variables x and y are subject to constraints described by linear inequalities, this optimal value must occur at a corner point (vertex) of the feasible region . B)If R is bounded, then the objective function Z has both a maximum and a minimum value on Rand each of these occurs at a corner point of R . C) If R is unbounded, then a maximum or a minimum value of the objective function may not exist D) If R is unbounded and a maximum or a minimum value of the objective function z exists, it must occur at corner point of R

A. When Z has an optimal value, where the variables x and y are subject to constraints described by linear inequalities, this optimal value must occur at a corner point (vertex) of the feasible region .

B. If R is bounded, then the objective function Z has both a maximum and a minimum value on Rand each of these occurs at a corner point of R .

C. If R is unbounded, then a maximum or a minimum value of the objective function may not exist

D. If R is unbounded and a maxil'TUJm or a minimum value of the objective function z exists, it must occur at corner point of R

Answer: D

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24. The minimum value of the objective function Z=x+2y

Subject to the constraints,

$2x + y \geq 3, x + 2y \geq 6, x, y \geq 0$ occurs

A. at every point on the line x + 2y = 6

B. at every point on the line 2x + y = 3

C. at every point on the line x + 2y = 3 d

D. at every point on the line 2x + y = 6

Answer: A

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25. Let the feasible region of the linear programming problem with the objective function Z = ax + by is unbounded and let M and m be the maximum and minimum value of Z, respectively. Now, consider the following statements

I. M is the maximum value of Z, if the open half plane determined by ax + by gt M has no point in common with the feasible region. Otherwise, Z has no maximum value.

II. mis the minimum value of Z, if the open half plane determined by ax +

by lt m has no point in common with the feasible region. Otherwise, Z has no minimum value. Choose the correct option.

A. Only I is true .

B. Only II is true

C. Both I and II are true

D. Neither I nor II is true

Answer: C

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26. The minimum and maximum values of the objective function, Z = 5x + 10y subject to the constraints $x + 2y \leq 120, x + y \geq 60, x - 2y \geq 0, x, y \leq 0$ are respectively

A. 300 and 500

B. 600 and 700

C. 600 and 700

D. 300 and 400

Answer: B

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27. Consider the following statements

I. If the feasible region of an LPP is undbounded then maximum or minimum value of the obJective function Z = ax + by may or may not exist .

II. Maximum value of the objective function Z = ax + by in an LPP always occurs at only one corner point of the feasible region.

III. In an LPP, the minimum value of the objective function Z = ax + by is always 0, if origin is one of the corner point of the feasible region.

IV. In an LPP, the maximum value of the objective function Z = ax + by is always finite.

Which of the following statements are true?

A. I and IV

B. II and III

C. I and III

D. II and IV

Answer: A

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28. 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 $p, q > 0$. Then, the condition on p and q so that the maximum of Z occurs at both the points (15, 15) and (0, 20), is

A. p=q

B. p=2q

C. q=2p

D. q=3p

Answer: D

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29. (Allocation problem) A cooperative society of farmers has 50 hectare of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as Rs 10,500 and Rs 9,000 respectively. To control weeds, a liquid herbicide has to be

A. 20 hec for crop X and 30 hec for crop Y

B. 20 hec each for both crop X and crop Y

C. 30 hec for crop X and 20 hec for crop Y

D. 30 hec each for both crop X and crop Y 30

Answer: C

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30. Anil wants to invest at the most Rs.12000 in bonds. A and B. According to rules, he has to invest at least Rs.2000 in Bond A is 8% per annum and on Bond B, it is 10% per annum, how should he invest his money for maximum interest ? Solve the problem graphically.

A. ₹ 10000 and ₹ 2000

B. ₹ 2000 and ₹ 10000

C. ₹ 6000 and ₹ 6000

D. None of these

Answer: B

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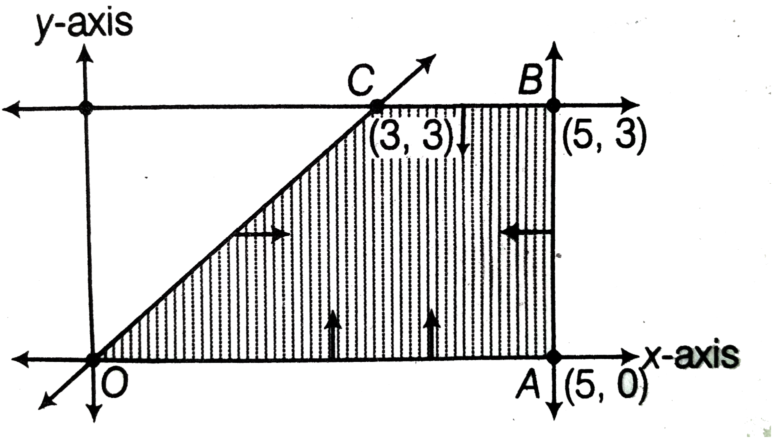
1. The shaded part of given figure indicates infeasible region



then the constsriants are

A. $x, y \geq 0, x+y \geq 0, x \geq 5, y \leq 3$

B. $x, y \geq 0, x-y \geq 0, x \leq 5, y \leq 3$

C. $x, y \geq 0, x-y \geq 0, x \leq 5, y \geq 3$

D. $x, y \geq 0, x-y \leq 0, x \leq 5, y \leq 3$

Answer: B

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2. The objective function $Z = x_1 + x_2$ subject to the constraints: $x_1 + x_2 \leq 10, \ -2x_1 + 3x_2 \leq 15, x_1 \leq 6, x_1, x_2 \geq 0$ has maximum value _____________ of the feasible region .

A. at only two points

B. at only two points

C. at every point of the segment joining two points

D. at every point of the line joining two points

Answer: C

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3. The constraints $-x_1 + x_2 \leq 1, \ -x_1 + 3x_2 \leq 9, x_1, x_2 > 0$ defines

A. bounded feasible space

B. unbounded feasible space

C. both bounded and unbounded feasible space

D. None of the above

Answer: B

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4. The maximum value of Z = 3x + 2y for linear $x + y \leq 7, 2x + 3y \leq 16, x \geq 0, y \geq 0$ is the objective function constraints

A. 16

B. 21

C. 25

D. 28

Answer: B

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5. The maximum vlaue of $Z = 9x + 13y$ subject to constraints $2x + 3y \leq 18, 2x + y \leq 10, x \geq 0, y \geq 0$ is

A. 130

B. 81

C. 79

D. 28

Answer: C

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6. For the LPP, Min $Z = x_1 + x_2$ such that inequalities $5x_1 + 10x_2 \geq 0, \ + x_2 \leq 1, x_2 \leq 4 \text{ and } x_1, x_2 \geq 0$

A. There is a bounded solution

B. There is no solution

C. There are infinite solutions

D. None of the above

Answer: A

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7. The region rprsented by the inequation system $x, y \geq 0, y \leq 6, x + y \leq 3,$ is

A. unbounded in first quadrant

B. unbounded in first and second quadrants

C. bounded in first quadrant

D. None of the above

Answer: C

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8. A wholesale merchant wants to start the business of cereal with ₹ 24000. Wheat is ₹ 400 per quintal and rice is ₹ 600 per quintal. He has capacity to store 200 quintal cereal. He earns the profit ₹ 25 per quintal on wheat and 40 per quintal on nee. If he stores x quintal rice and y quintal wheat, then for maximum profit the objective function is

A. $25x + 40y$

B. $40x = 25y$

C. $400x + 600y$

D. $\frac{400}{40}x + \frac{600}{25}y$

Answer: B

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9. Which of the term is not used in a linear programming problem? A) optimal solution B)Feasible solution C)concave region D)objective functions

A. Optimal solution

B. Feasible solution

C. Concave region

D. objective functions

Answer: C

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10. If given constraints are $5x + 4y \geq 2, x \leq 6, y \leq 7,$ then the maximum value of the function $z = x + 2y$ is

A. 13

B. 14

C. 15

D. 20

Answer: D

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11. $Z = 30x + 20y$, $x + y \leq 8$, $x + 2y \geq 4$, $6x + 4 \geq 12$, $x \geq 0$, $y \geq 0$

A. unique solution

B. infinitely many solution

C. minimum at (4, 0)

D. minimum 60 at point (0, 3)

Answer: B

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12. Minimize Z= 3x+y, subject to constriants

$2x + 3y \leq 6$, $x + y \geq 1$, $x \geq 0$, $y \geq 0$ Then

A. x = 1, y = 1

B. x = 0, y = 1

C. x = 1, y = 0

D. x = - 1, y = - 1

Answer: B

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13. The shaded region for the inequality $x + 5y \leq 6$ is

A. to the non-origin side of $x + 5y = 6$

B. to the either side of $x + 5y = 6$

C. to the origin side of $x + 5y = 6$

D. to the neither side of $x + 5y = 6$

Answer: C

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14. Direction cosines of the line $\frac{x+2}{2} = \frac{2y-5}{3}, z = -1$ are

A. $\frac{4}{5}, \frac{3}{5}, 0$

B. $\frac{3}{5}, \frac{4}{5}, \frac{1}{5}$

C. $-\frac{3}{5}, \frac{4}{5}, 0$

D. $\frac{4}{5}, -\frac{2}{5}, \frac{1}{5}$

Answer: A

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15. The line $\frac{x+1}{-10} = \frac{y+3}{-1} = \frac{z-4}{1}$ and $\frac{x+10}{-1} = \frac{y+1}{-3} = \frac{z-1}{4}$ interest at the point.

A. (11,-4,5)

B. (-11,-4,5)

C. (11,4,-5)

D. (-11,-4,-5)

Answer: B

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16. The symmetric equation of lines 3x+2z-5=0 and x+y-2z-3=0 is

A. $\frac{x-1}{5}=\frac{y-4}{7}=\frac{z-0}{1}$

B. $\frac{x+1}{5}=\frac{y+4}{7}=\frac{z-0}{1}$

C. $\frac{x+1}{-5}=\frac{y+4}{7}=\frac{z-0}{1}$

D. $\frac{x-1}{-5}=\frac{y-4}{7}=\frac{z-0}{1}$

Answer: C

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Exercise 1 Optical Problems

1. Find the direciton ratio of the line $\frac{3-x}{1}=\frac{y-2}{5}=\frac{2z-3}{1}$

A. $\left(1, 5, \frac{1}{2}\right)$

B. (-5,5,1)

C. $\left(-1, 5, \frac{1}{2}\right)$

D. (1,5,1)

Answer: C

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2. Equation of a line passing through the points (3,1,2) and (-1,2,1) is

A. $\frac{x+3}{-4}=\frac{y-1}{1}=\frac{z-2}{1}$

B. $\frac{x-3}{-4}=\frac{y-1}{1}=\frac{z-2}{1}$

C. $\frac{x-3}{-4}=\frac{y-1}{1}=\frac{z-2}{-1}$

D. $\frac{x-3}{-4}=\frac{y-1}{1}=\frac{z-2}{1}$

Answer: C

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3. Equation of the line passing through the point (0,1,2) and equally inclined to the coordintate axes, are

A. x=y-1=z-2

B. x=y+1=z+2

C. $\frac{x}{0}=\frac{y}{3}=\frac{z}{2}$

D. None of these

Answer: A

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4. A line L_1 passes through the point $3\hat{i}$ and is parallel to the vector $-\hat{i}+\hat{j}+\hat{k}$ and another line L_2 passes through $\hat{i}+\hat{j}$ and is parallel to the vector $\hat{i} + \hat{k}$, then point of intersection of the lines iss

A. $\hat{i} + 2\hat{j} + \hat{k}$

B. $2\hat{i} + \hat{j} + \hat{k}$

C. $\hat{i} - 2\hat{j} - \hat{k}$

D. $\hat{i} - 2\hat{j} + \hat{k}$

Answer: B

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5. The line $\frac{x+1}{1} = \frac{y-1}{2} = \frac{z-2}{-1}, \frac{x-1}{2} = \frac{y}{1} = \frac{z+1}{4}$ are

A. parallel lines

B. intersecting lines

C. perpendicular

D. None of these

Answer: C

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6. The vector equation of the line passing through the points (1,-2,5) and (-2,1,3) is

A. $r = -2\hat{i} + \hat{j} + 3\hat{k} + \lambda\left(3\hat{i} - 3\hat{j} + 2\hat{k}\right)$

B. $r = -2\hat{i} - \hat{j} + 3\hat{k} + \lambda\left(\hat{i} + 3\hat{j} - 5\hat{k}\right)$

C. $r = -\hat{i} - 2\hat{j} + 5\hat{k} + \lambda\left(-2\hat{i} - \hat{j} + 3\hat{k}\right)$

D. $r = -2\hat{i} + \hat{j} + 3\hat{k} + \lambda\left(\hat{i} - 2\hat{j} + 5\hat{k}\right)$

Answer: A

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7. The vector equationm of the line $\dfrac{x-5}{3} = \dfrac{y+4}{7} = \dfrac{z-6}{2}$ is

A. $r = 3\hat{i} - 7\hat{j} - 2\hat{k} + \lambda\left(5\hat{i} - 4\hat{j} + 6\hat{k}\right)$

B. $r = 5\hat{i} + 4\hat{j} + 6\hat{k} + \lambda\left(3\hat{i} - 7\hat{j} + 2\hat{k}\right)$

C. $r = 3\hat{i} + 7\hat{j} + 2\hat{k} + \lambda\left(5\hat{i} - 4\hat{j} + 6\hat{k}\right)$

D. $r = 5\hat{i} - 4\hat{j} + 6\hat{k} + \lambda\left(3\hat{i} + 7\hat{j} + 2\hat{k}\right)$

Answer: D

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8. The vector equation of the line $\frac{x+2}{3} = \frac{1-y}{-2} = \frac{z-5}{7}$ is

A. $r = \left(3\hat{i} - 2\hat{j} + 7\hat{k}\right) + \lambda\left(-2\hat{i} + \hat{j} + 5\hat{k}\right)$

B. $r = \left(-2\hat{i} + \hat{j} + 5\hat{k}\right) + \lambda\left(3\hat{i} - 2\hat{j} + 7\hat{k}\right)$

C. $r = \left(3\hat{i} - 2\hat{j} + 7\hat{k}\right) + \lambda\left(2\hat{i} + \hat{j} - 5\hat{k}\right)$

D. $r = \left(2\hat{i} + \hat{j} + 5\hat{k}\right) + \lambda\left(3\hat{i} + 2\hat{j} + 7\hat{k}\right)$

Answer: B

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9. The vector equation of the line passing through a point with position vector $2\hat{i}-\hat{j}+\hat{k}$ and parallel to the line joining the points with position vectors $-\hat{i}+4\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}+2\hat{k}$ is $r=\left(2\hat{i}-\hat{j}+\hat{k}\right)+\lambda\left(x\hat{i}-2\hat{j}+\hat{k}\right)$ where x is equal to

A. 0

B. 1

C. 2

D. 4

Answer: C

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10. The vector equation of the line $\frac{x-2}{2}=\frac{2y-5}{-3}, z=-1$ is $r=\left(2\hat{i}+\frac{5}{2}\hat{j}-\hat{k}\right)+\lambda\left(2\hat{i}-\frac{3}{2}\hat{j}+x\hat{k}\right)$ where x is equal to

A. 0

B. 1

C. 2

D. 3

Answer: A

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11. The equation $r = \lambda \hat{i}$ represents

A. the X-axis

B. the yoz-plane

C. the y-axis

D. the Z-axis

Answer: A

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12. The vector equation of the straight line $\frac{1-x}{3}=\frac{y+1}{-2}=\frac{3-z}{-1}$ is

A. $r=\left(\hat{i}-\hat{j}+3\hat{k}\right)+\lambda\left(3\hat{i}+2\hat{j}-\hat{k}\right)$

B. $r=\left(\hat{i}-\hat{j}+3\hat{k}\right)+\lambda\left(3\hat{i}-2\hat{j}-\hat{k}\right)$

C. $r=\left(3\hat{i}-2\hat{j}-\hat{k}\right)+\lambda\left(\hat{i}-\hat{j}+3\hat{k}\right)$

D. $r=\left(3\hat{i}+2\hat{j}-\hat{k}\right)+\lambda\left(\hat{i}-\hat{j}+3\hat{k}\right)$

Answer: A

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13. The direction ratio's of the line $x-y+z-5=0=x-3y-6$ are

A. (3,1,-2)

B. (2,-4,1)

C. $\left(\frac{3}{\sqrt{14}},\frac{1}{\sqrt{14}},\frac{-2}{\sqrt{14}}\right)$

D. $\left(\frac{2}{\sqrt{41}},\frac{-4}{\sqrt{14}},\frac{1}{\sqrt{41}}\right)$

Answer: A

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14. If the lines $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-1}{1}=\frac{z-6}{-5}$ are perpendicular, find the value of k.

A. $\frac{-10}{7}$

B. $\frac{10}{7}$

C. $\frac{-10}{11}$

D. $\frac{10}{11}$

Answer: A

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15. The equation to the straight line passing through the points (4,-5,2) and (-1,5,3) is

A. $\frac{x-4}{1}=\frac{y+5}{-2}=\frac{z+2}{-1}$

B. $\frac{x+1}{1}=\frac{y-5}{2}=\frac{z-3}{-1}$

C. $\frac{x}{(-1)}=\frac{y}{5}=\frac{z}{3}$

D. $\frac{x}{4}=\frac{y}{-5}=\frac{z}{-2}$

Answer: A

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16. Show that the line $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4} and \frac{x-4}{5}=\frac{y-1}{2}$ intersect. Find their point of intersection.

A. (0,0,0)

B. (1,1,1)

C. (-1,-,1,-1)

D. (1,2,3)

Answer: C

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17. If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4} and \frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then find the value of k.

A. $\frac{3}{2}$

B. $\frac{9}{2}$

C. $-\frac{2}{9}$

D. $-\frac{3}{2}$

Answer: B

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18. The lines $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ and $\frac{x-1}{-2}=\frac{y-2}{-4}=\frac{z-3}{6} are$

A. intersecting

B. coincident

C. parallel

D. None of these

Answer: B

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19. Lines whose equation are $\frac{x-3}{2}=\frac{y-2}{3}=\frac{z-1}{\lambda}$ and $\frac{x-2}{3}=\frac{y-3}{2}=\frac{z-2}{3}$ lie in same plane, then.

The value of $\sin^{-1}\sin\lambda$ is equal to

A. 3

B. $\pi-3$

C. 4

D. $\pi-4$

Answer: D

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20. If the lines $\frac{x-1}{2}=\frac{y+2}{a}=\frac{z-3}{10}$ and $\frac{x-2}{3}=\frac{y+3}{-6}=\frac{z+4}{6}$ are parallel to each other, then

A. a-2,b=5

B. a=4,b=5

C. a=-4,b=15

D. a=4,b=15

Answer: C

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21. Find the acute angle between the two straight lines whose direction cosines are given by $l+m+n=0$ and $l^2+m^2-n^2=0$

A. $\frac{\pi}{3}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. $\pi - 2$

Answer: A

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22. A line makes an angle θ both with x-axis and y-axis. A possible range of θ is

A. $\left[0, \frac{\pi}{4}\right]$

B. $\left[0, \frac{\pi}{2}\right]$

C. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

D. $\left[\frac{\pi}{3}, \frac{\pi}{6}\right]$

Answer: C

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23. The angle between the line $x = 1 = y = 2 = \frac{z}{1}$ and $\frac{x}{1} = y = -1 = z = 0$ is

A. 30°

B. 60°

C. 90°

D. 0°

Answer: C

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24. The angle between the lines $\frac{x+4}{1} = \frac{y-3}{2} = \frac{z+2}{3}$ and $\frac{x}{3} = \frac{y-1}{-2} = \frac{z}{1}$ is

A. $\sin^{-1}\left(\frac{1}{7}\right)$

B. $\cos^{-1}\left(\frac{2}{7}\right)$

C. $\cos^{-1}\left(\frac{1}{7}\right)$

D. None of these

Answer: C

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25. The acute angle between the line joining the points (2,1,-3) and (-3,1,7)and a line parallel to $\frac{x-1}{3}=\frac{y}{4}=\frac{z+3}{5}$ through the point (-1,0,4) is

A. $\cos^{-1}\left(\frac{1}{\sqrt{10}}\right)$

B. $\cos^{-1}\left(\frac{1}{5\sqrt{10}}\right)$

C. $\cos^{-1}\left(\frac{7}{5\sqrt{10}}\right)$

D. $\cos^{-1}\left(\frac{3}{5\sqrt{10}}\right)$

Answer: C

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26. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is (A) 0^0 (B) 90^0 (C) 45^0 (D) 30^0

A. 30°

B. 45°

C. 90°

D. 0°

Answer: C

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27. The angle betweeen the lines $\frac{x}{1} = \frac{y}{0} = \frac{z}{-1}$ and $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$ is equal to

A. $\pi - \cos^{-1}\left(\frac{1}{5}\right)$

B. $\cos^{-1}\left(\frac{1}{3}\right)$

C. $\cos^{-1}\left(\frac{1}{2}\right)$

D. $\cos^{-1}\left(\frac{1}{4}\right)$

Answer: A

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28. The angle between the straight line

$r = (2-3t)\hat{i} + (1+2t)\hat{j} + (2+6t)\hat{k}$ and $r = 1(1+4s)\hat{i} + (2-s)\hat{j} + ($

A. $\cos^{-1}\left(\frac{\sqrt{41}}{34}\right)$

B. $\cos^{-1}\left(\frac{21}{34}\right)$

C. $\cos^{-1}\left(\frac{34}{63}\right)$

D. None of these

Answer: C

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29. Fid the condition if lines $x = ay + b, z = cy + dandx = a'y + b', z = c'y + d'$ are perpendicular.

A. $aa' + cc' = 1$

B. $\frac{a}{a}' + \frac{c}{c}' = -1$

C. $\frac{a}{a'} + \frac{c}{c'} = 1$

D. aa'+cc'=-1

Answer: D

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30. For the lines $L_1; \vec{a} + t\left(\vec{b} + \vec{c}\right)$ and $L_2; \vec{r} = \vec{b} + s\left(\vec{c} + \vec{a}\right)$ then L_1 and L_2 1ntersect at

A. a

B. b

C. a b+c

D. a 2b

Answer: C

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31. The distance between two parallel lines can be taken out by the formula

A. $d = \left|\frac{b.\ (a_2 - a_1)}{|b|}\right|$

B. $d = \left|\frac{b.\ (a_2 - a_1)}{|a_2 - a_1|}\right|$

C. $d = \left|\frac{b.\ (a_2 - a_1)}{|a_2 - a_1|}\right|$

D. $d = \left|\frac{b \times (a_2 - a_1)}{|b|}\right|$

Answer: D

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32. The shortest distance between the skew lines $\bar{r} = \overline{a_1} + \lambda \overline{b_1} \text{and} \bar{r} = \overline{a_2} + \mu \overline{b_2}$ is

A. $d = \left|\frac{(b_1 - b_2).(a_1 \times a_2)}{a_1 \times a_2}\right|$

B. $d = \left|\frac{(b_1.b_2).(a_1 - a_2)}{|b_1||b_2|}\right|$

C. $d = \left|\frac{(b_1 \times b_2).(a_2 - a_1)}{|b_1| \times |b_2|}\right|$

D. $d = \left|\frac{(b_1 \times b_2).(a_2 \times a_1)}{|b_1 \times b_2| \mid a_1 \times b_2}\right|$

Answer: C

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33. The shortest distance between the lines $\frac{x - x_1}{a_1} = \frac{y - y_1}{b_1} = \frac{z - z_1}{c_1}$ and $\frac{x - x_2}{a_2} = \frac{y - y_2}{b_2} = \frac{z - z_2}{c_2}$ is $\begin{vmatrix} x_1 - x_1 & y_2 - y_1 & z_2 - z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$ /A Here, A refers to

A. $(b_1c_2 - b_2c_1)^2 - (c_1a_2 - c_2a_1)^2 + (a_1b_2 - a_2b_1)^2$

B. $(b_1c_2 - b_2c_1)^2 + (c_1a_2 - c_2a_1)^2 + (a_1b_2 - a_2b_1)^2$

C. $\sqrt{(a_1b_2 - a_2b_1)^2 + (b_1c_2 - b_2c_1)^2 + (c_1a_2 - c_2a_1)^2}$

D. None of these

Answer: C

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34. The shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1} and \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$ is a. $\sqrt{30}$ b. $2\sqrt{30}$ c. $5\sqrt{30}$ d. $3\sqrt{30}$

A. $\sqrt{30}$

B. $2\sqrt{30}$

C. $5\sqrt{30}$

D. $-3\sqrt{30}$

Answer: D

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35. Find the cartesian equation of the line which passes through the point $(-2, 4, -5)$ and parallel and line are $(3, 5, 6)$. So, the equation of line is,

$$\frac{x-(-2)}{3} = \frac{y-4}{5} = \frac{z-(-5)}{6}.$$

A. $\sqrt{\frac{37}{10}}$

B. $\frac{37}{\sqrt{10}}$

C. $\frac{\sqrt{37}}{10}$

D. None of these

Answer: A

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36. Find the coordinates of a point on the $\frac{x-1}{2} = \frac{y+1}{-3} = z$ atg a distance $4\sqrt{14}$ from the point $(1, -1, 0)\cdot$

A. (9,-13,4)

B. $(8\sqrt{14}, -12, -1)$

C. $(-8\sqrt{14}, 12, 1)$

D. $(-7, 11, -4)$

Answer: D

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37. The point of the line $\frac{x-2}{1} = \frac{y+3}{-2} = \frac{z+5}{-2}$ at a distance of 6 from the point (2,-3,-5) is

A. (3,-5,-3)

B. (4,-7,-9)

C. (0,2,-1)

D. (-3,5,3)

Answer: B

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38. The shortest distance between the lines $x + a = 2y = -12z$ and $x = y + 2a = 6z - 6a$ is

A. a

B. 2a

C. 4a

D. 6a

Answer: B

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39. The length of the perpendicular from P(1,0,2) on the line $\dfrac{x+1}{3} = \dfrac{y-2}{-2} = \dfrac{z+1}{-1}$ is

A. $\dfrac{3\sqrt{6}}{2}$

B. $\dfrac{6\sqrt{3}}{5}$

C. $3\sqrt{2}$

D. $2\sqrt{3}$

Answer: A

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40. The distance of the point P(1,2,3) from the line which passes through the point (4,2,2) and parallel to the vector $2\hat{i} + 3\hat{j} + 6\hat{k}$ is

A. $\sqrt{10}$

B. $\sqrt{7}$

C. $\sqrt{5}$

D. 1

Answer: A

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41. The shortest distance between the straight lines

$$\frac{x-6}{1}=\frac{2-y}{2}=\frac{z-2}{2} \text{ and } \frac{x+4}{3}=\frac{y}{-2}=\frac{1-z}{2} \text{ is}$$

A. 9

B. $\frac{25}{3}$

C. $\frac{16}{3}$

D. 4

Answer: B

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42. The shortest distance between the line 1+x=2y=-12z and x=y+2=6z-6 is

A. 1

B. 2

C. 3

D. 4

Answer: B

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43. The foot of the perpendicular from (2,4,-1) to the line $\frac{x+5}{1}=\frac{y+3}{4}=\frac{z-6}{-9}$ is

A. (-4,1,-3)

B. (4,-1,-3)

C. (-4,-1,3)

D. (-4,-1,-3)

Answer: A

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44. The length of the shortest distance between the two lines $\overrightarrow{r}=\left(-3\hat{i}+6\hat{j}\right)+s\left(-4\hat{i}+3\hat{j}+2\hat{k}\right)$ and $\overrightarrow{r}=\left(-2\hat{i}+7\hat{k}\right)=t\left(-\right.$

is (A) 7units (B) 13units (C) 8units (D) 9units

A. 7 units

B. 13 units

C. 8 units

D. 9 units

Answer: D

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45. The shortest distance between the straighat lines through the point $A_1 = (6, 2, 2)$ and $A_2 = (-4, 0, -1)$ in the directions 1,-2,2 and 3,-2,-2 is (A) 6 (B) 8 (C) 12 (D) 9

A. 6 units

B. 8 units

C. 12 units

D. 9 units

Answer: D

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46. The length of the perpendicular from P(1,6,3) to the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3} is$

A. 3

B. $\sqrt{11}$

C. $\sqrt{13}$

D. 5

Answer: C

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47. The shortest distance between the lines $\frac{x-2}{3}=\frac{y+3}{4}=\frac{z-1}{5}$ and $\frac{x-5}{1}=\frac{y-1}{2}=\frac{z-6}{3}$, is

A. 3

B. 2

C. 1

D. 0

Answer: D

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48. the distance of the point $(2, 3, 4)$ from the line $(1-x)=\frac{y}{2}=\frac{1}{3}(1+z)$

A. $\frac{1}{7}\sqrt{35}$

B. $\frac{4}{7}\sqrt{35}$

C. $\frac{2}{7}\sqrt{35}$

D. $\frac{3}{7}\sqrt{35}$

Answer: D

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49. Shortest distance between line $2x+3y+4z-4=0=x+y+2z-3$ and z-axis is -

A. 1

B. 2

C. 4

D. 3

Answer: B

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50. If l_1, m_1, n_1 and l_2, m_2, n_2 are the direction cosines of two mutually perpendicular lines, show that the direction cosines of the line perpendicular to both of these are $m_1n_2 - m_2n_1, n_1l_2 - n_2l_1, l_1m_2 - l_2m_1$.

A. $m_1n_2 + m_2n_1. n_1l_2 + n_2l_1. l_1m_2 + l_2m_1$

B. $m_1n_2 - m_2n_1. n_1l_2 - n_2l_1, l_1m_2 - l_2m_1$

C. $m_1m_2 - n_1n_2. n_1n_2 - l_1l_2, l_1l_2 - m_1m_2$

D. $m_1m_2 + n_1n_2. n_1n_2 - l_1l_2, l_1l_2 - m_1m_2$

Answer: B

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Exercise 2 Miscellaneous Problems

1. The dr's of two lines are given by $a + b + c = 0, 2ab + 2ac - bc = 0.$ Then the angle between the lines is

A. π

B. $\frac{2\pi}{3}$

C. $\frac{\pi}{2}$

D. $\frac{\pi}{3}$

Answer: B

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2. The point of intersection of the lines $\frac{x-5}{3} = \frac{y-7}{-1} = \frac{z+2}{1} and = \frac{x+3}{-36} = \frac{y-3}{2} = \frac{z-6}{4}$ is a. $\left(21, \frac{5}{3}, \frac{10}{3}\right)$ b. $(2, 10, 4)$ c. $(-3, 3, 6)$ d. $(5, 7, -2)$

A. $(2, 10, -4)$

B. $\left(21, \frac{5}{3}, \frac{10}{3}\right)$

C. $(5, 7, -2)$

D. $(-3, 3, 6)$

Answer: B

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3. बिंदुओं $(-1, 0, 2)$ और $(3, 4, 6)$ से होकर जाने वाली रेखा का सदिश समीकरण ज्ञात कीजिए |

A. $-\hat{i}+2\hat{k}+\lambda\left(4\hat{i}+4\hat{j}+4\hat{k}\right)$

B. $2\hat{i}-\hat{k}+\lambda\left(4\hat{i}+4\hat{j}+4\hat{k}\right)$

C. $-\hat{i}+2\hat{k}+\lambda\left(-\hat{i}+4\hat{j}+2\hat{k}\right)$

D. $-\hat{i}+2\hat{k}+\lambda\left(3\hat{i}+4\hat{j}+6\hat{k}\right)$

Answer: A

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4. The point of intersection of the lines $\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7}$ and $\frac{x-2}{1}=\frac{y-4}{3}=\frac{z-6}{5}$ is

A. $\left(\frac{1}{2}, \frac{1}{2}, -\frac{3}{2}\right)$

B. $\left(-\frac{1}{2}, -\frac{1}{2}, \frac{3}{2}\right)$

C. $\left(\frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}\right)$

D. $\left(-\frac{1}{2}, \frac{1}{2}, \frac{3}{2}\right)$

Answer: C

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5. Find the equation of the line (vector and Cartesian both) which is parallel to the vector $2\hat{i} - \hat{j} + 3\hat{k}$ and which passes through the point (5,-2,4)

A.

$$r = \left(3\hat{i} + 2\hat{j} - 8\hat{k}\right) + \lambda\left(5\hat{i} + 2\hat{j} - 4\hat{k}\right), \frac{x-3}{5} = \frac{y-2}{2} = \frac{z+8}{-4}$$

B.

$$r = \left(5\hat{i} + 2\hat{j} - 4\hat{k}\right) + \lambda\left(3\hat{i} + 2\hat{j} - 8\hat{k}\right), \frac{x-3}{5} = \frac{y-2}{2} = \frac{z+8}{-1}$$

C.

$$r = \left(5\hat{i} + 2\hat{j} - 4\hat{k}\right) + \lambda\left(3\hat{i} + 2\hat{j} - 8\hat{k}\right), \frac{x-5}{3} = \frac{y-2}{2} = \frac{z+4}{-8}$$

D.

$$r = \left(3\hat{i} + 2\hat{j} - 8\hat{k}\right) + \lambda\left(5\hat{i} + 2\hat{j} - 4\hat{k}\right), \frac{x-5}{3} = \frac{y-2}{2} = \frac{z-4}{-8}$$

Answer: C

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6. Find the equation of the perpendicular drawn from (2,4,-1) to the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{3}$.

A. $\frac{x-2}{6} = \frac{y-4}{3} = \frac{z+1}{2}, (-4, 1, -3)$

B. $\frac{x-3}{2} = \frac{y-4}{6} = (z+1)(2), (-1, 4, 3)$

C. $\frac{x+3}{6} = \frac{y-4}{3} = \frac{z-2}{2}, (3, 4, 1)$

D. $\frac{x-2}{3} = \frac{y+4}{6} = \frac{z+1}{2}, (4, 1, 3)$

Answer: A

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7. बिंदु $(1, 2, -4)$ से जाने वाली और दोनों रेखाओ $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ और $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$ पर लंब रेखा का सदिश समीकरण ज्ञात कीजिए।

A. $r = \left(\hat{i} + 2\hat{j} - 4\hat{k}\right) + \lambda\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)$

B. $r = \left(2\hat{i} + 3\hat{j} - 6\hat{k}\right) + \lambda\left(\hat{i} + 2\hat{j} - 4\hat{k}\right)$

C. $r = \left(\hat{i} + 2\hat{j} - 4\hat{k}\right) + \lambda\left(3\hat{i} + 8\hat{j} - 5\hat{k}\right)$

D. $r = \left(\hat{i} + 2\hat{j} - 4\hat{k}\right) + \lambda\left(3\hat{i} - 16\hat{j} - 7\hat{k}\right)$

Answer: A

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8. The shortest distance between the lines

$r = \left(-\hat{i} - \hat{j} - \hat{k}\right) + \lambda\left(7\hat{i} - 6\hat{j} + \hat{k}\right)$ and $r = \left(3\hat{i} + 5\hat{j} + 7\hat{k}\right) + \mu\left(\hat{i} -\right.$

A. $\sqrt{29}$ units

B. 29 units

C. $\frac{29}{2}$ units

D. $2\sqrt{29}$ units

Answer: D

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9. Find the vector and the cartesian equations of the line that passes through the points$(3, 2, 5), (3, 2, 6)$.

A. $r = 3\hat{i} - 2\hat{j} - 5\hat{k}, x - 3 = y + 2 = \frac{z+5}{11}$

B. $r = 3\hat{i} - 2\hat{j} - 5\hat{k}, \frac{x-3}{0} = \frac{y+2}{0} = \frac{z+5}{11}$

C. $r = 3\hat{i} - 2\hat{j} - 5\hat{k} + \lambda\left(11\hat{k}\right), x - 3 = y + 2 = \frac{z+5}{11}$

D. $r = 3\hat{i} - 2\hat{j} - 5\hat{k} + \lambda\left(11\hat{k}\right), \frac{x-3}{0} = \frac{y+2}{0} = \frac{z+5}{0}$

Answer: D

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10. Find the equation of the perpendicular drawn from (2,4,-1) to the line $\frac{x+5}{1}=\frac{y+3}{4}=\frac{z-6}{3}$.

A. $\frac{x-2}{6}=\frac{y-4}{3}=\frac{z+1}{2}$

B. $\frac{x+2}{6}=\frac{y-4}{3}=\frac{z+1}{2}$

C. $\frac{x+2}{-6}=\frac{y-4}{3}=\frac{z+1}{2}$

D. $\frac{x+2}{6}=\frac{y+4}{3}=\frac{z+1}{2}$

Answer: A

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11. The length of the perpendicular from P(1,6,3) to the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3} is$

A. 3

B. $\sqrt{11}$

C. $\sqrt{13}$

D. 5

Answer: C

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12. The equation of a line which passes through the point $(1, 2, 3)$ and is parallel to the vector $3\hat{i} + 2\hat{j} - 2\hat{k}$, is

A. $r = \left(3\hat{i} + 2\hat{j} - 2\hat{k}\right) + \lambda\left(\hat{i} + 2\hat{j} + 3\hat{k}\right)$

B. $r = \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) + \lambda\left(3\hat{i} + 2\hat{j} - 2\hat{k}\right)$

C. $r = \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) + \lambda\left(2\hat{i} - 5\hat{k}\right)$

D. $r = \left(\hat{i} + 2\hat{j} + 3\hat{k}\right) + \lambda\left(4\hat{i} + 4\hat{j} + \hat{k}\right)$

Answer: B

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13. P is a point on the line segment joining the points $(3, 2, -1)$ and $(6, 2, -2)$. If x - coordinate of P is 5, then its y - coordinate is

A. 2

B. 1

C. -1

D. -2

Answer: A

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14. The equaton of the line in vector and cartesian from that passes through the point with position vector $2\hat{i} - \hat{j} + 4\hat{k}$ and is in the direction $\hat{i} + 2\hat{j} - \hat{k}$ are

A. $r = \left(2\hat{i} - \hat{j} + 4\hat{k}\right) + \lambda\left(\hat{i} + 2\hat{j} - \hat{k}\right), \dfrac{x-1}{2} = \dfrac{y-2}{-1} = \dfrac{z+1}{-4}$

B. $r = \left(\hat{i} + 2\hat{j} - \hat{k}\right) + \lambda\left(2\hat{i} - \hat{j} + 4\hat{k}\right), \frac{x-1}{2} = \frac{y-2}{-1} = \frac{z+1}{4}$

C. $r = \left(2\hat{i} - \hat{j} + 4\hat{k}\right) + \lambda\left(\hat{i} + 2\hat{j} - \hat{k}\right), \frac{x-2}{1} = \frac{y+1}{2} = \frac{z-4}{-1}$

D.

Answer: D

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15. Find the vector and the cartesian equations of the lines that passes through the origin and $(5, 2, 3)$.

A. $r = 5\hat{i} - 2\hat{j} + 3\hat{k}, 5x = -2y = 3z$

B. $r = \lambda\left(5\hat{i} - 2\hat{j} + 3\hat{k}\right), 5x = -2y = 3z$

C. $r = \lambda\left(5\hat{i} - 2\hat{j} + 3\hat{k}\right), (x)\frac{)}{5} = \frac{y}{-2} = \frac{z}{3}$

D. None of the above

Answer: C

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16. The equation of a line $4x - 4y - z + 11 = 0 = x + 2y - z - 1$ can be put as $\frac{x}{2} = \frac{y-2}{1} = \frac{z-3}{4}$ (b) $\frac{x-2}{2} = \frac{y-2}{1} = \frac{z}{4}$ $\frac{x-2}{2} = \frac{y}{1} = \frac{z-3}{4}$ (d) None of these

A. $\frac{x}{2} = \frac{y-2}{1} = \frac{z-3}{4}$

B. $\frac{x-4}{-2} = \frac{y-4}{2} = \frac{z+11}{2}$

C. $\frac{x-2}{2} = \frac{y}{1} = \frac{z-3}{4}$

D. $\frac{x-2}{2} = \frac{y-2}{1} = \frac{z}{4}$

Answer: A

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17. The line $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{1}$ intersects the curve $xy = c^{I2}, z = 0$ if c is equal to a. ± 1 b. $\pm 1/3$ c. $\pm \sqrt{5}$ d. none of these

A. ± 1

B. $\pm\frac{1}{3}$

C. $\pm\sqrt{5}$

D. None of these

Answer: C

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18. the lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-k}$ and $\frac{x-1}{k}=\frac{y-4}{1}=\frac{z-5}{1}$ are coplanar if k=?

A. any value

B. exactly one value

C. exactly two values

D. exactly three values

Answer: C

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19. Find the equation of the perpendicular from point $(3, -1, 11)$ to line $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$. Also, find the coordinates of foot of perpendicular and the length of perpendicular.

A. $\sqrt{66}$

B. $\sqrt{29}$

C. $\sqrt{33}$

D. $\sqrt{53}$

Answer: D

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20. The line passing through the points $(5, 1, a)$ and $(3, b, 1)$ crosses the yz-plane at the point $\left(0, \frac{17}{2}, \frac{-13}{2}\right)$.Then

A. $a = 8, b = 2$

B. $a = 2, b = 8$

C. $a = 4, b = 6$

D. $a = 6, b = 4$

Answer: D

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21. If the straight lines $\frac{x-1}{k} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x-2}{3} = \frac{y-3}{k} = \frac{z-1}{2}$ intersect at a point, then the integer k is equal to (1) -5 (2) 5 (3) 2 (4) -2

A. -2

B. -5

C. 5

D. 2

Answer: B

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22. Consider the line L 1 : x 1 y 2 z 1 312 +++ ==, L2 : x2y2z3 123

A. 0

B. $17 / \sqrt{3}$

C. $41 / 5\sqrt{3}$

D. $17 / 5\sqrt{2}$

Answer: D

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23. Match the following columns.

	Column I		Column II
A.	$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-1}{3}=\frac{y-3}{4}=\frac{z-5}{5}$ are	p.	coincident
B.	$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-3}{2}=\frac{y-5}{3}=\frac{z-7}{4}$ are	q.	parallel and different
C.	$\frac{x-2}{5}=\frac{y+3}{4}=\frac{5-z}{2}$ and $\frac{x-7}{5}=\frac{y-1}{4}=\frac{z-2}{-2}$ are	r.	skew
D.	$\frac{x-3}{2}=\frac{y+2}{3}=\frac{z-4}{5}$ and $\frac{x-3}{3}=\frac{y-2}{2}=\frac{z-7}{5}$ are	s.	intersecting at a point

A. $\begin{matrix} A & B & C & D \\ q & r & s & p \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ s & p & q & r \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ p & q & r & s \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ r & p & s & q \end{matrix}$

Answer: B

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24. Find the equation of a line passing through $(1, -1, 0)$ and parallel to the line $\frac{x-2}{3}=\frac{2y+1}{2}=\frac{5-z}{1}$

A. $\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-0}{-1}$

B. $\frac{x-1}{3}=\frac{y+1}{1}=\frac{z-0}{-1}$

C. $\frac{x-1}{3}=\frac{y+1}{1}=\frac{z-0}{1}$

D. $\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-0}{1}$

Answer: C

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25. The direction cosines of the line $x-y+2z=5, 3x+y+z=6$ are

A. $\frac{-3}{5\sqrt{2}}, \frac{5}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}$

B. $\frac{3}{5\sqrt{2}}, \frac{-5}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}$

C. $\frac{3}{5\sqrt{2}}, \frac{5}{5\sqrt{2}}, \frac{4}{5\sqrt{2}}$

D. None of these

Answer: A

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26. The length of the perpendicular drawn from $(1, 2, 3)$ to the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$ is a. 4 b. 5 c. 6 d. 7

A. 5 units

B. 7 units

C. 4 units

D. None of these

Answer: B

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27. The straight line $\frac{x-3}{3} = \frac{y-2}{1} = \frac{z-1}{0}$ is Parallel to x-axis Parallel to the y-axis Parallel to the z-axis Perpendicular to the z-axis

A. parallel to X - axis

B. parallel to Y - axis

C. parallel to Z- axis

D. perpendicular to Z- axis

Answer: D

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28. If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then k is equal to (1) -1 (2) $\frac{2}{9}$ (3) $\frac{9}{2}$ (4) 0

A. -1

B. $\frac{2}{9}$

C. $\frac{9}{2}$

D. 0

Answer: C

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29. If the lines $x = 1 + s, y = -3 - \lambda s, z = 1 + \lambda s$ and $x = \frac{t}{s}, y = 1 + t, z = 2 - t$ are coplanar, then λ is equal to

A. -2

B. -1

C. $-\frac{1}{2}$

D. 0

Answer: A

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30. Consider the lines $L_1 : \frac{x-1}{3} = \frac{y+2}{1} = \frac{z+1}{2}$ $L_2 : \frac{x-2}{1} = \frac{y+2}{2} = \frac{z-3}{3}$ The unit vector perpendicular to both L_1 and L_2 is

A. $\dfrac{1}{\sqrt{99}}\left(-\hat{i}+7\hat{j}+7\hat{k}\right)$

B. $\dfrac{1}{5\sqrt{3}}\left(-\hat{i}-7\hat{j}+5\hat{k}\right)$

C. $\dfrac{1}{5\sqrt{3}}\left(-\hat{i}+7\hat{j}+5\hat{k}\right)$

D. $\dfrac{1}{\sqrt{99}}\left(7\hat{i}-7\hat{j}-\hat{k}\right)$

Answer: B

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