Linear Inequalities

DPP-01

1. When an inequation is multiplied or divided by the same negative number, inequation _____ direction.
(1) Changes
(2) Does not change
(3) Either (1) or (2)
(4) Neither (1) or (2)

2. $-6x < -18$ implies
(1) $x < 3$ (2) $x > 3$
(3) $x = 0$ (4) $x = 3$

3. In a class of boys (x) and girls (y), the maximum seating capacity is 360. This can be shown as:
(1) $x + y \le 360$
(2) $x + y \ge 360$
(3) $x + y \ne 360$
(4) None of these

4. Find the range of real of x satisfying the inequalities $3x - 2 > 7$ and $4x - 13 > 15$.
(1) $x > 3$ (2) $x > 7$
(3) $x < 7$ (4) $x < 3$

5. The solution of the inequality $8x + 6 < 12x + 14$ is
(1) $(-2, 2)$ (2) $(-2, 0)$
(3) $(2, \infty)$ (4) $(-2, \infty)$

6. A company is planning to launch a new product and decides to hire marketing executives and sales executives for the project. If the company cannot employ more than 12 executives, which of the following inequalities correctly relates the number of marketing executives (x) and sales executives (y) that the company can hire?
(1) $x + y \le 12$ (2) $2x + 3y \le 12$
(3) $3x + 2y \le 12$ (4) $4x + 4y \le 12$

7. Solve the inequality: $\frac{(3x-1)}{2} \le \frac{(x+2)}{4}$.
(1) $x \le 2$ (2) $x \le 0.8$
(3) $x \ge 1.5$ (4) $x \ge 2$

8. Solve for real 'x' if $5x - 2 \ge 2x + 1$ and $2x + 3 < 18 - 3x$
(1) $1 < x < 3$ (2) $-1 > x > -3$
(3) $1 \le x < 3$ (4) $x = 3$

9. The rules and regulations demand that the employer should employ not more than 5 experienced hands to 1 fresh one and this fact can be expressed as:
(Taking experienced person as x and fresh person as y)
(1) $5x \ge y$
(2) $5y \le x$
(3) $5y \ge x$
(4) None of these

10. A dietitian wishes to mix together two kinds of food so that the vitamin content of the mixture is at least 9 units of vitamin A, 7 units of vitamin B, 10 units of vitamin C and 12 units of vitamin D. The vitamin content per kg of each food is shown below:

	A	B	C	D
Food I :	2	1	1	2
Food II :	1	1	2	3

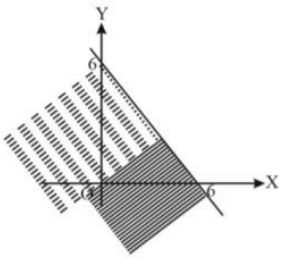
Assuming x units of food I is to be mixed with y units of food II, the situation can be expressed as
(1) $2x + y \le 9, x + y \le 7, x + 2y \le 10, 2x + 3y \le 12, x > 0, y > 0$
(2) $2x + y \ge 30, x + y \le 7, x + 2y \le 10, x + 3y \ge 12$
(3) $2x + y \ge 9, x + y \ge 7, x + y \le 10, x + 3y \ge 12$
(4) $2x + y \ge 9, x + y \ge 7, x + 2y \ge 10, 2x + 3y \ge 12, x \ge 0, y \ge 0$

Answer Key

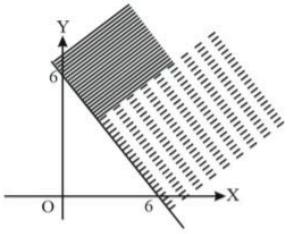
1. (1)
2. (2)
3. (1)
4. (2)
5. (4)
6. (1)
7. (2)
8. (3)
9. (3)
10. (4)

1. Which of the following graph represented the inequality $x + y \le 6$?

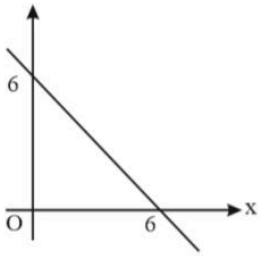
(1)



(2)



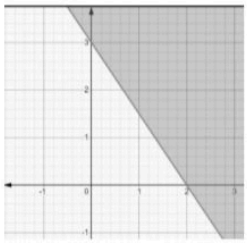
(3)



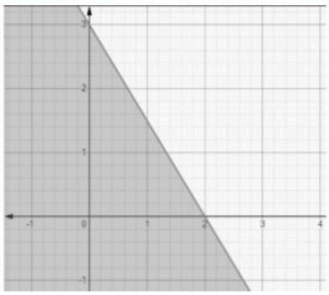
(4) None of the above

2. The graph to express the inequality $3x + 2y \le 6$ is

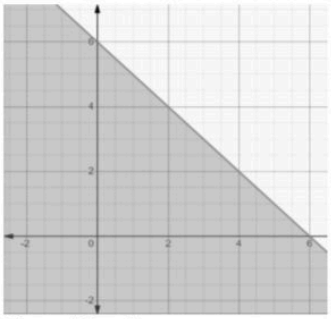
(1)



(2)



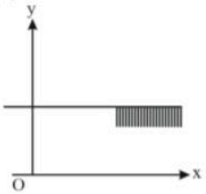
(3)



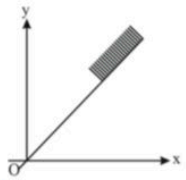
(4) None of the above

3. The graph to express the inequality $y \le \left(\frac{1}{2}\right)x$ is indicated by

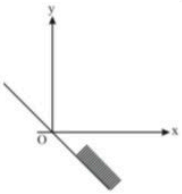
(1)



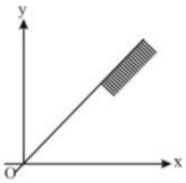
(2)



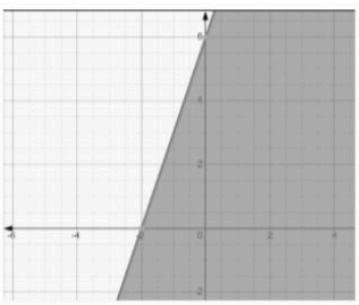
(3)



(4)

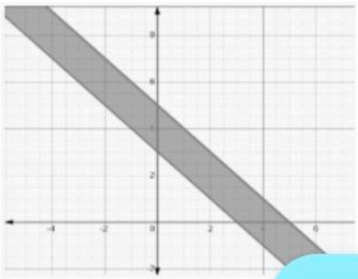


4. The graph represents which of the following inequality?



(1) $6x - 2y \ge 12$ (2) $3x - y \le 6$
(3) $x + 2y \le -12$ (4) $x + 2y \le 6$

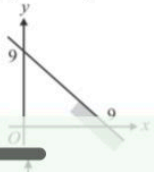
(3)



(4) None of the above

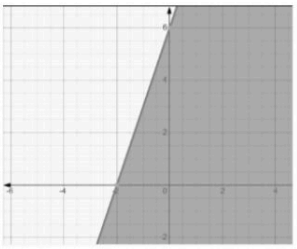
6. The graph to express the inequality

(1)



5. Which of the following graph represents the inequalities:

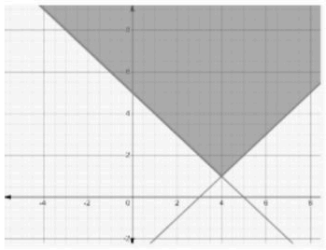
4. The graph represents which of the following inequality?



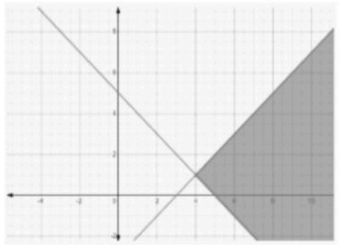
(1) $6x - 2y \geq 12$ (2) $3x - y \leq 6$
(3) $x + 2y \leq -12$ (4) $x + 2y \leq 6$

5. Which of the following graph represents the inequalities:
$x + y \geq 5$ and $x - y \leq 3$?

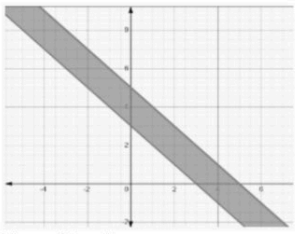
(1)



(2)



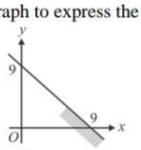
(3)



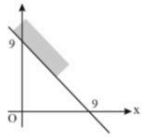
(4) None of the above

6. The graph to express the inequality $x + y \leq 9$ is

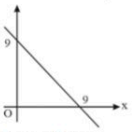
(1)



(2)



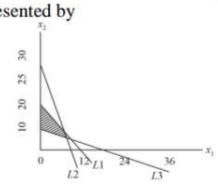
(3)



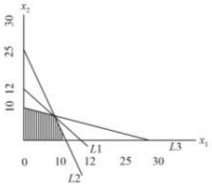
(4) None of these

7. The set of inequalities L1 : $x_1 + x_2 \leq 12$, L2 : $5x_1 + 2x_2 \leq 50$, L3 : $x_1 + 3x_2 \leq 30$, $x_1 \geq 0$ and $x_2 \geq 0$ is represented by

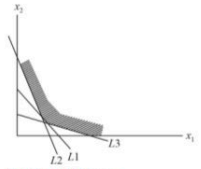
(1)



(2)



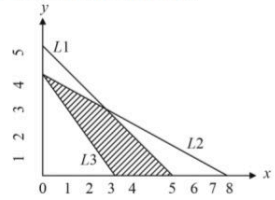
(3)



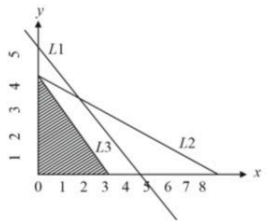
(4) None of these

8. The common region satisfying the set of inequalities $x \geq 0$, $y \geq 0$, L1: $x + y \leq 5$, L2: $x + 2y \leq 8$, L3: $4x + 3y \geq 12$ is indicated by

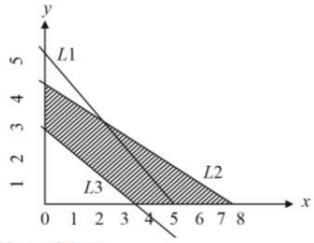
(1)



(2)



(3)



(4) None of these

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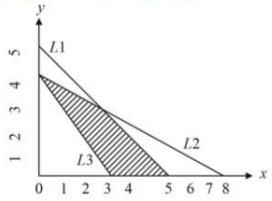
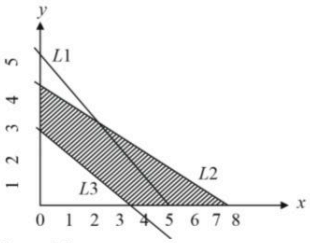
(1)



(3)



(4) None of these

Answer Key

1.	(1)
2.	(2)
3.	(4)
4.	(2)
5.	(1)
6.	(1)
7.	(2)
8.	(1)

1. Solve the inequality: $\frac{5x}{2} + \frac{3x}{4} \geq \frac{39}{4}$.

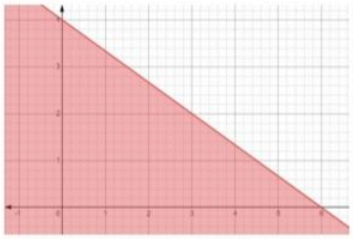
(1) $[3, \infty)$ (2) $(3, \infty)$
(3) $(-\infty, 3)$ (4) None of these

2. Solve for real 'x' if $2x + 6 \geq 0$ and $4x - 8 < 0$.
(1) $-3 \leq x \leq 2$ (2) $-6 \leq x < 8$
(3) $-3 \leq x < 2$ (4) None of these

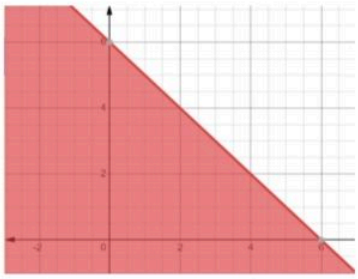
3. In a theater, the number of adults (x) and children (y) attending a show should not exceed 500. This can be shown as:
(1) $x + y \leq 500$ (2) $x + y \geq 500$
(3) $x + y \neq 500$ (4) None of these

4. Solve for real 'x' if $2x - 7 > 5 - x$ and $11 - 5x \leq 1$.
(1) $x > 2$ (2) $x > 4$
(3) $2 < x < 4$ (4) $x < 4$

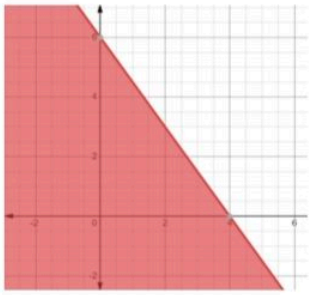
5. Which of the following graphs represents the inequality $2x + 3y \leq 12$?
(1)



(2)



(3)



(4) None of these

6. A dealer has ₹5760 to invest in fans (x) and sewing machines (y). The cost per unit of fan and sewing machine is ₹360 and ₹240 respectively. This can be shown by
(1) $360x + 240y \geq 5760$
(2) $360x + 240y \leq 5760$
(3) $360x + 240y = 5760$
(4) None of these

7. Solution set of inequalities $2x + y \leq 10$ and $x - y \leq 5$:
(i) Includes the origin.
(ii) Includes the point (4, 3).
Which one is correct ?
(1) Only (i) (2) Only (ii)
(3) Both (i) and (ii) (4) None of the above

8. A bakery produces two types of cakes: chocolate cakes and vanilla cakes. The bakery has two ovens, Oven A and Oven B. The time required for baking each type of cake in minutes and the total available baking time per day on each oven are as follows:

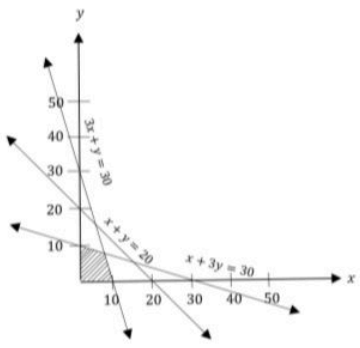
Oven	Chocolate Cake	Vanilla Cake	Available Time
A	20	30	240
B	25	35	300

Constraints can be formulated by taking x = number of chocolate cakes, y = number of vanilla cakes produced as:

(1) $20x + 30y \leq 240, 25x + 35y \leq 300$, $x \geq 0$ and $y \geq 0$
(2) $20x + 30y \geq 240, 25x + 35y \leq 300$, $x \geq 0$ and $y \geq 0$
(3) $20x + 30y = 240, 25x + 35y = 300$
(4) None of the above

9. A fertilizer company produces two types of fertilizers called grade I (x) and grade II (y). Each of these types is processed through two critical chemical plant units. Plant A has maximum of 120 hours available in a week and plant B has maximum of 180 hours available in a week. Manufacturing one bag of grade I fertilizer requires 6 hours in plant A and 4 hours in plant B. Manufacturing one bag of grade II fertilizer requires 3 hours in plant A and 10 hours in plant B. Express this using linear inequalities.
(1) $6x + 3y \leq 120, 4x + 10 = 180$
(2) $6x + 3y = 120, 4x + 10y > 180$
(3) $6x + 3y \leq 120, 4x + 10y \leq 180$
(4) $6x + 3y < 120, 4x + 10y < 180$

10. The shaded region represents:



(1) $3x - y \leq 30, x + y \leq 20, x + 3y \leq 30$, $x \geq 0$ and $y \geq 0$
(2) $3x - y \geq 30, x + y \geq 20, x + 3y \leq 30$, $x \geq 0$ and $y \geq 0$
(3) $3x - y \leq 30, x + y \leq 20, x + 3y \leq 30$,
(4) None of these

Answer Key

1.	(1)	**6.**	(2)
2.	(3)	**7.**	(1)
3.	(1)	**8.**	(1)
4.	(2)	**9.**	(3)
5.	(1)	**10.**	(1)

Hints and Solutions

1. (1)
Given: $\frac{5x}{2} + \frac{3x}{4} \geq \frac{39}{4}$

$\Rightarrow \frac{10x + 3x}{4} \geq \frac{39}{4}$

$\Rightarrow \frac{13x}{4} \geq \frac{39}{4}$

$\Rightarrow 13x \geq 39$
$\Rightarrow x \geq 3$

Therefore, the solution set is $[3, \infty)$.
Hence, the correct option is (1) i.e., $[3, \infty)$.

2. (3)
Given: $2x + 6 \geq 0$
$2x \geq -6$
$x \geq -3$ ....(i)

Also, $4x - 8 < 0$
$\Rightarrow 4x < 8$
$\Rightarrow x < 2$
Thus, $-3 \leq x < 2$

Hence, the correct option is (3) i.e., $-3 \leq x < 2$.

3. (1)
Given: Number of adults $= x$
Number of children $= y$

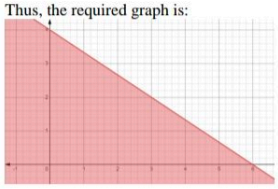
As the total attendance does not exceed the maximum capacity of 500.
This can be shown as $x + y \leq 500$

Hence, the correct option is (1) i.e., $x + y \leq 500$.

4. (2)
Given: $2x - 7 > 5 - x$
$\Rightarrow 2x + x > 7 + 5$
$\Rightarrow 3x > 12$
$\Rightarrow x > 4$ ..... (i)
Also, $11 - 5x \leq 1$
$\Rightarrow -5x \leq 1 - 11$
$\Rightarrow -5x \leq -10$
$\Rightarrow x \geq 2$ ..... (ii)
From (i) and (ii), we get
$x > 4$
Hence, the correct answer is option (2) i.e., $x > 4$.

5. (1)
Given inequality: $2x + 3y \leq 12$
For line of equation of above inequality: $2x + 3y = 12$
When $x = 0$ then $y = 4$
When $y = 0$ then $x = 6$
Thus, the coordinates satisfying the equation is (0, 4) and (6, 0).
Now, on putting $x = 0$ and $y = 0$ in the above inequality, we get
$2x + 3y = 2(0) + 3(0) = 0 \leq 12$ which is true
So, the shaded region will be towards the origin.

Thus, the required graph is:



Hence, the correct option is (1).

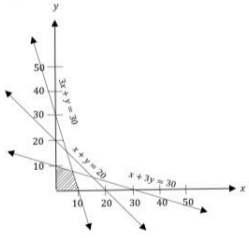
6. (2)
Given: x and y are respectively the number of fans and sewing machines bought by dealer.
Since, the cost of fan per unit is ₹360 and the cost of sewing machine per unit is ₹240.
Therefore, the total cost will be $360x + 240y$.
Also, the dealer has only ₹5760 to invest.
Thus, $360x + 240y \leq 5760$
Hence, the correct answer is option (2).

7. (1)
Given inequalities: $2x + y \leq 10$ and $x - y \leq 5$
(i) For the origin (0, 0):
$2x + y \leq 10$
$0 + 0 \leq 10$ or $0 \leq 10$, which is true
$x - y \leq 5$
$0 - 0 \leq 5$ or $0 \leq 5$, which is also true
(ii) For the point (4, 3):
$2x + y \leq 10$
$2(4) + 3 \leq 10$
$8 + 3 \leq 10$
$11 \leq 10$, which is false
Clearly, (0, 0) satisfies both the inequations.
Hence, the correct answer is option (1) i.e., Only (i).

8. (1)
Given: x = number of chocolate cakes, y = number of vanilla cakes produced
Clearly, $x \geq 0, y \geq 0$
According to the given data,
The constraints can be formulated as:
$20x + 30y \leq 240$
$25x + 35y \leq 300$
Hence, the correct answer is option (1).

9. (3)
Since, the number of bags of grade I is x and number of bags of grade II is y.
Also, for grade I fertilizer requires 6 hours in plant A, for grade II fertilizer requires 3 hours in plant A and the maximum number of hours available in a week for plant A is 120 hours.
$\Rightarrow 6x + 3y \leq 120$
Now, for grade I fertilizer requires 4 hours in plant B, for grade II fertilizer requires 10 hours in plant B and the maximum number of hours available in a week for plant B is 180 hours.
$\Rightarrow 4x + 10y \leq 180$
Hence, the correct answer is option (3).

10. (1)
Given:



Checking the options:
Option (1): $3x - y \leq 30, x + y \leq 20, x + 3y \leq 30$
At origin: $(0, 0)$
LHS: $3x - y = 3(0) - (0) = 0 \leq 30$, true
LHS: $x + y = 0 + 0 = 0 \leq 20$, true
LHS: $x + 3y = 0 + 3(0) = 0 \leq 30$, true
Only equations in option (1) are satisfying the conditions, however in other options all the equations are not satisfying it.
Also, from graph $x \geq 0$ and $y \geq 0$.

Hence, the final correct answer is option (1) i.e., $3x - y \leq 30, x + y \leq 20, x + 3y \leq 30$, $x \geq 0$ and $y \geq 0$