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Class: 11
Subject: Mathematics
Topic: QP Linear Inequalities
No. of Questions: 20
Duration: 60 Min
Maximum Marks: 60

1. The solution of $\frac{5x}{2}+\frac{3x}{4}\leq\frac{39}{4}$ is

(1) $x\geq 4$
(2) $x\geq 2$
(3) $x\geq 3$
(4) $x\geq 0$

Ans. C

Solution:- $\frac{5x}{2}+\frac{3x}{4}\geq\frac{39}{4}$
Multiply by 4,
$\Rightarrow 10x+3x\geq 39$
$\Rightarrow 13x\geq 39$
$x\geq 3$
$\therefore$ (3) $x\geq 3$ is correct.

2. If $\frac{5x+8}{4-x}<2$, then $x\in$

(a) (0,4)
(b) (b) $(-\infty,0)$
(c) (c) $(4,\infty)$
(d) (d) $(-\infty,0)\cup(4,\infty)$

Ans. D

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Solution: $\frac{5x+8}{4-x}<2$

$\Rightarrow \frac{5x+8}{4-x}-2<0$

$\Rightarrow \frac{5x+8-8+2x}{4-x}<0$

$\Rightarrow \frac{7x}{4-x}<0$

$\Rightarrow \frac{7x}{x-4}<0$

$x \in (-\infty, 0) \cup (4, \infty)$

$\therefore$ (4) is correct.

3. If $x+5>2(x+1)$ and $2-x<3(x+2)$, then $x \in$

(a) x - 1
(b) x ∈(-1,3)
(c) x> -1
(d) x<-6

Ans. B

Solution: - $x+5>2(x+1) \Rightarrow -x>-3 \quad \Rightarrow x<3$

$2-x<3(x+2) \Rightarrow -4x<4 \quad \Rightarrow \quad x>-1$

$\therefore -1<x<3$

$\therefore x \in (-1,3)$

$\therefore$ (2) is correct.

4. If $a > b$ and $c < d$, then

(a) $a + c < b + d$

(b) $a + c > b + d$

(c) $a - d < b - c$

(d) $a - d < b - c$

Ans. D

Solution:- $a. > \text{and} - c > -d$
$\Rightarrow a - c > b - d$

$\therefore$ is correct.

5. The solution set of $\left|\frac{2}{x-6}\right| \geq 1, x \neq 6$ is

(a) $[4,6)\text{U}(6,8]$

(b) $(-\infty, 4)$

(c) $(6,8)$

(d) $(6,\infty)$

Ans. A

Solution:

$$2 \geq [x-6]$$
$$-2 \leq x-6 \leq 2$$
$$-2+6 \leq x \leq 2+6$$
$$4 \leq x \leq 8$$

$\therefore$ Solution is $[4,6)\text{U}(6,8]$

$\therefore$ (1) is correct.

6. (6) C $(x) = 60\frac{5}{2}x$ and R(x) =4x are respectively, the cost and Revenue function of a cassette company where x is the number of cassettes produced. The number of cassetts to be produced and sold so as to realize a profit is

(a) $x \leq 300$
(b) (b)$x > 400$
(c) (c)$x \leq 400$
(d) (d)$x \geq 275$

Ans. B

Solution:-Profit $Px = R(x) - c(x)$

$= 4x - 600 - \frac{5}{2}x = \frac{3}{2}x - 600$

$\frac{3}{2}x - 600 > 0$

$x > 400$

$\therefore$ (2) is correct.

7. If $x^2 + 4ax + 4 > 0\ \forall x$, then

(a)$0 < a < 1$

(b)$-1 < a < 1$

(c)$-1 < a < 0$

(d)$-4 < a < 4$

Ans. B

Solution:-$x^2 + 4ax + 4 = x^2 + 4ax + 4a^2 + 4 - 4a^2$

$= (X + 2a)^2 + (4 - 4a^2) > 0$

$\Rightarrow 4 - 4a^2 > 0$

$4 > 4a^2$ $a^2 < 1$

$|a| < 1$

$\therefore$ (2) is correct.

8. If $y = 8 + 10 \cos 2x$, then

(a) -1 <cos
(b) -10>-cos2x
(c) $-2 \leq y \leq 18$
(d) 10cos2x

Ans. C

Solution:-

W.K.T. $-1 \leq \cos 2x \leq 10$

$-10 \geq 10\cos 2x \leq 10 + 8$

$-2 \leq y \leq 18$

$\therefore$ (3) is correct.

9. If $y = \sin^{-1} 2x$ then $x \in$

(a) ≤ 1
(b) $x \in [-\frac{1}{2}, \frac{1}{2}]$
(c) $-\frac{1}{2} \leq$
(d) $2x \leq 1$

Ans. B

Solution:-

If $y = \sin^{-1} 2x$ is defined only when

$-1 \le 2x \le 1$

$-\frac{1}{2} \le x \le \frac{1}{2}$/

$\therefore x \in [-\frac{1}{2}, \frac{1}{2}]$

$\therefore$ (2) is correct.

10. If $y = \sin^{-1}[2x]$,where [x] is the greatest integer function, then x $\in$

(a) $[\frac{1}{2}, \frac{1}{2}]$

(b) $[-\frac{1}{2}, 1]$

(c) $[-\frac{1}{2}, 0]$

(d)$[-\frac{1}{2}, 1]$

Ans. D

Solution:-The problem is different from the previous problem because we have [2x] and $[2x] = 2$ when $x = 1$ when $x < 1$, $[2x] = 1$ only

$\therefore$ We have $-\frac{1}{2} \le x < 1$

$\therefore x \in [-\frac{1}{2}, 1]$

$\therefore$ (4) is correct.

11. If $0 < \propto < \frac{\pi}{2}$ and $x = \cos\propto - \cos^2 \propto + \cos^3 \propto - \ldots$ to ∞, then,

(a) $0 < x < 1$

(b) $0 \leq x \leq 1$

(c) $-1 \leq x \leq 1$

(d) $1 \leq x \leq 2$

Ans. A

Solution:-

$x = \frac{\cos\propto}{1+\cos\propto}$ $\quad (S_\infty = \frac{a}{1-r})$

$\cos\propto > 0 \therefore 1 + \cos\propto > \cos\propto$

$\Rightarrow 1 > \frac{\cos\propto}{1+\cos\propto}$ $\quad \Rightarrow \frac{\cos\propto}{1+\cos\propto} < 1$

$\therefore 0 < x < 1$

$\therefore$ (1) is correct.

12. If $x = p$ and $x = q$ are the points of maxima and minima of $f(x) = x^3 - 12a^2x + 36ax^2 - 4, (a > 0)$then

(a) $p > q$
(b) $p < q$
(c) $p = q$
(d) $2p > q$

Ans. B

Solution:-$f(x) = x^3 - 12ax^2 + 36a^2x - 4, (a > 0)$

$f'(x) = 3x^2 - 24ax + 36a^2$

$f''(x) = 6x - 24a$

$f''(x) = 6(x - 4a)$

$f''(p) < 0 \quad \Rightarrow \quad p - 4a < 0 \quad \Rightarrow p < 4a$

$f''(q) < 0 \quad \Rightarrow q - 4a < 0 \quad \Rightarrow q > 4a$

$p < 4a < q \quad \therefore p < q$

$\therefore$ (2) is correct.

13. If (0,0), (30,0), (20,30) and (0,50) are the vertices of the feasible region of the LPP .Maximize $z = 60x + 50y$ Subject to $x + y \leq 50, 3x + y \leq 90$ and $x, y \geq 0$, then $Z_{max} =$

(a) 2500
(b) 3000
(c) 2700
(d) 1800

Ans. C

Solution:-$z = 60x + 50y$

at (0,0) $\quad z = 0$

at (30,0) $\quad z = 60 \times 30 + 0 = 0 = 1800$

at (20,30) $\quad z = 60 \times 20 + 50 \times 30 = 2700$

at (0<50) $\quad z = 0 + 50 \times 50 = 2500$

$\therefore Z_{max} = 2700$

$\therefore$ (3) is correct.

14. The point which does notbelongs to the feasible region of the LPP : Minimize : $Z = 60x + 10y$ Subject to $3x + y \geq 8$ $2x + 2y \geq 12$ $x + 2y \geq 10$ $x, y \geq 0$

(a) 3x +y
(b) $14 \geq 8$
(c) x + 2y10

(d) $x, y \geq 0$

Ans. B

Solution:-We test whether the inequalities are satisfied or not.

$(0,8),\ \ 3(0) + 8 \geq 8 \qquad\qquad 8 \geq 8$

$2(0) + 2(8) = 16 \geq 12$ is true.

$0 + 2(8) = 16 \geq 12$ is true.

$\therefore$ (0,8) is in the feasible region.

$(4,2), 3\ (4) + 2 = 14 \geq 8$

$(4 + 2)$ is not a point in the feasible region

$\therefore$ (2) is correct.

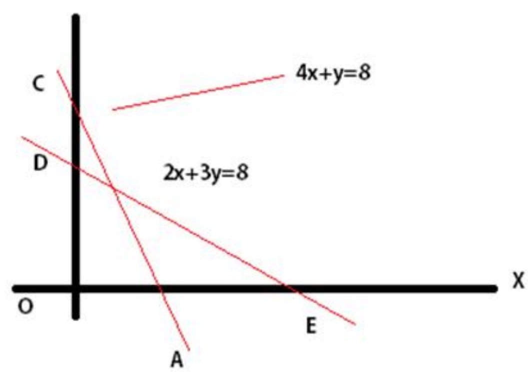
15. The solution set for the inequalities $4x + y \geq 8, 2x + 3y \leq 12, x \geq 0$ and $y \geq 0$ from the following figure.

(a)AEBA

(b)OABD

(c)BCDB

(d)YCBEX



$4x = y = 8$ is the region

Ans. A

Solution: $-4x + y \geq 8$ is satisfied above the line ABC. $2x + 3y \leq 12$ is satisfied below the line EBD.

$\therefore$ The feasible region is the region AEBA.

$\therefore$ (1) is correct.

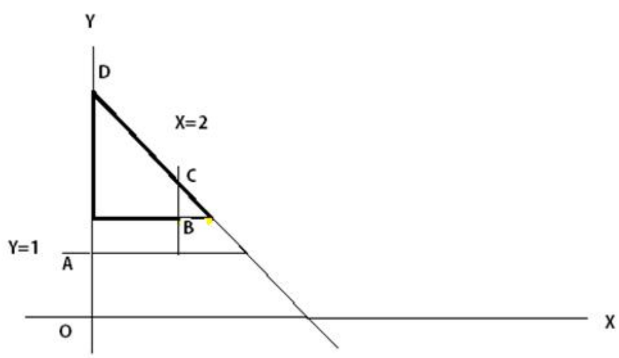
16. In the following figure the shaded region ABCDA represents the solution set of the linear In equations $x \geq 0, y \geq 0$ and

(a) $3x + 4y \leq 12$, $x \geq 2$, $y \leq 1$
(b) $3x + 4y \leq 12$, $x \geq 2$, $y \geq 1$
(c) $3x + 4y \geq 12$, $x \leq 2$, $y \geq 1$
(d) $3x + 4y \leq 12$ $x \leq 2$, $y \geq 1$

Ans. D

Solution:-The shaded region represents $x - y \geq 0$ $x + y \geq 0$

$\therefore$ (3) is correct.



17. The shaded region in the following figure represents the solution set of

(a) $x - y \geq 0, x = y \leq 0$
(b) $x - y \leq 0, x + y \leq 0$
(c) $x - y \geq 0, x + y \geq 0$
(d) $x - y \leq 0, x + y \geq 0$.

Ans. C

Solution:-The shades region represents $x - y \geq 0$ $x + y \geq 0$

$\therefore$ (3) is correct.

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18. If $\left[\frac{2x}{15}+\frac{y}{5}\right]=1$ Where [x] is the greatest integer function, then

(a)$15 < 2x + 3y \leq 30$

(b)$15 < 2x + 3y \leq 30$

(c) $15 < 2 + 3y \leq 30$

(d)$15 \leq 2x + 3y < 30$

Ans. D

Solution:- Solution:-$\frac{2x}{15}+\frac{y}{5}\frac{2x+3y}{15}$

$\left[\frac{2x+3y}{15}\right]=1$ when $2x + 3y \geq 15$

Further when$2x + 3y = 30$,

$\left[\frac{2x+3y}{15}\right]=2 \therefore 2x + 3y \geq 15, 2x3y < 30.$

$\therefore 15 \leq 2x + 3y < 30, \therefore$ (4) is correct

19. $f(x) = 2x^3 - 9x^2 + 12 + 4$ is decreasing when

(a)$-\infty < x < 1$ and $2 < \infty < \infty$

(b)$-1 < x < 2$

(c) $1, x < 2$

(d)$0 < x < 2$

Ans. C

Solution:- $f'(x) = 6x^2 - 15x + 12$

$= 6(x^2 - 3x + 2$

$= 6(x - 1)(x - 2)$

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$f'(x) < 0$ when x lies between 1 and 2

$\therefore 1 < x < 2$

$\therefore$ (3) is correct.

20. Log $\left\{\frac{\sqrt{16-x^2}}{3-x}\right\}$ is real only when,

(a) $-4 < x < 3$ (b) $-4 < x < 4$

(c) $-4 < x < 0$ (d) $3 < x < 4$

Ans. A

Solution:-

$\sqrt{16-x^2}$ is real when $16 - x^2 > 0$ $x^2 < 16$ $-4 < x < 4$

Log N is real only when $N > 0$

$\therefore 3 - x > 0$ $x < 3$ $\therefore$ Both are satisfied only when $-4 < x < 3$ $\therefore$ (1) is correct.