

Linear Inequalities

- $\frac{4}{x+1} \leq 3 \leq \frac{6}{x+1}, (x > 0)$
- $\frac{|x-2|-1}{|x-2|-2} \leq 0$
- $\frac{1}{|x|-3} \leq \frac{1}{2}$
- $|x-1| \leq 5, |x| \geq 2$
- $-5 \leq \frac{2-3x}{4} \leq 9$
- $4x + 3 \geq 2x + 17, 3x - 5 < -2.$
- A company manufactures cassettes. Its cost and revenue functions are $C(x) = 26,000 + 30x$ and $R(x) = 43x$, respectively, where x is the number of cassettes produced and sold in a week. How many cassettes must be sold by the company to realise some profit?
- The water acidity in a pool is considered normal when the average pH reading of three daily measurements is between 8.2 and 8.5. If the first two pH readings are 8.48 and 8.35, find the range of pH value for the third reading that will result in the acidity level being normal.
- A solution of 9% acid is to be diluted by adding 3% acid solution to it. The resulting mixture is to be more than 5% but less than 7% acid. If there is 460 litres of the 9% solution, how many litres of 3% solution will have to be added?
- A solution is to be kept between 40°C and 45°C . What is the range of temperature in degree fahrenheit, if the conversion formula is $F = \frac{9}{5}C + 32$?
- The longest side of a triangle is twice the shortest side and the third side is 2 cm longer than the shortest side. If the perimeter of the triangle is more than 166 cm then find the minimum length of the shortest side.
- In drilling world's deepest hole it was found that the temperature T in degree celcius, x km below the earth's surface was given by $T = 30 + 25(x - 3)$, $3 \leq x \leq 15$. At what depth will the temperature be between 155°C and 205°C ?

13. Solve the following system of inequalities $\frac{2x+1}{7x-1} > 5$, $\frac{x+7}{x-8} > 2$

14. Find the linear inequalities for which the shaded region in the given figure is the solution set.

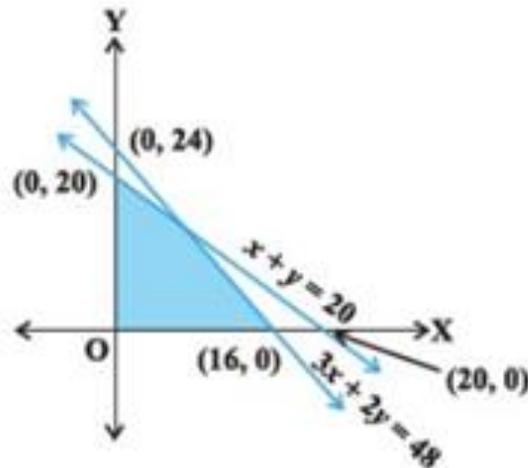


Fig 6.5

15. Find the linear inequalities for which the shaded region in the given figure is the solution set.

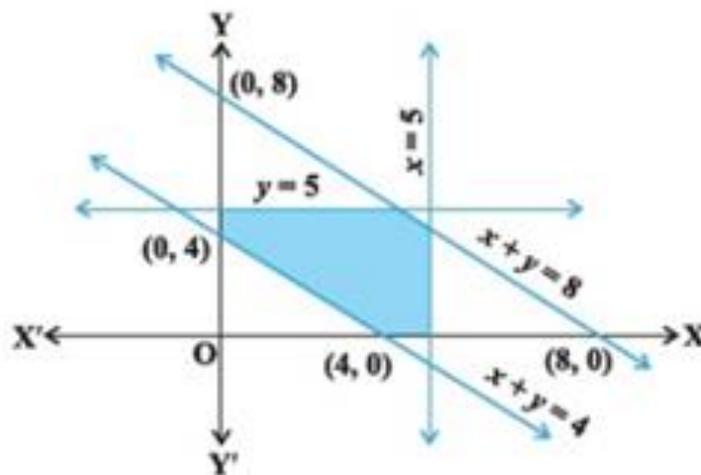


Fig 6.6

16. Show that the following system of linear inequalities has no solution $x+2y \leq 3$, $3x+4y \geq 12$, $x \geq 0$, $y \geq 1$

17. Solve the following system of linear inequalities:

$$3x + 2y \geq 24, 3x + y \leq 15, x \geq 4$$

18. Show that the solution set of the following system of linear inequalities is an unbounded region

$$2x + y \geq 8, x + 2y \geq 10, x \geq 0, y \geq 0$$

Choose the correct answer from the given four options in each of the Exercises 19 to 26 (M.C.Q.).

19. If $x < 5$, then

(A) $-x < -5$

(B) $-x \leq -5$

(C) $-x > -5$

(D) $-x \geq -5$

20. Given that x, y and b are real numbers and $x < y, b < 0$, then

(A) $\frac{x}{b} < \frac{y}{b}$

(B) $\frac{x}{b} \leq \frac{y}{b}$

(C) $\frac{x}{b} > \frac{y}{b}$

(D) $\frac{x}{b} \geq \frac{y}{b}$

21. If $-3x + 17 < -13$, then

(A) $x \in (10, \infty)$

(B) $x \in [10, \infty)$

(C) $x \in (-\infty, 10]$

(D) $x \in [-10, 10]$

22. If x is a real number and $|x| < 3$, then

(A) $x \geq 3$

(B) $-3 < x < 3$

(C) $x \leq -3$

(D) $-3 \leq x \leq 3$

23. x and b are real numbers. If $b > 0$ and $|x| > b$, then

(A) $x \in (-b, \infty)$

(B) $x \in [-\infty, b)$

(C) $x \in (-b, b)$

(D) $x \in (-\infty, -b) \cup (b, \infty)$

24. If $|x-1| > 5$, then

(A) $x \in (-4, 6)$

(B) $x \in [-4, 6]$

(C) $x \in [-\infty, -4) \cup (6, \infty)$

(D) $x \in [-\infty, -4) \cup [6, \infty)$

25. If $|x + 2| \leq 9$, then

(A) $x \in (-7, 11)$

(B) $x \in [-11, 7]$

(C) $x \in (-\infty, -7) \cup (11, \infty)$

(D) $x \in (-\infty, -7) \cup [11, \infty)$

26. The inequality representing the following graph is:

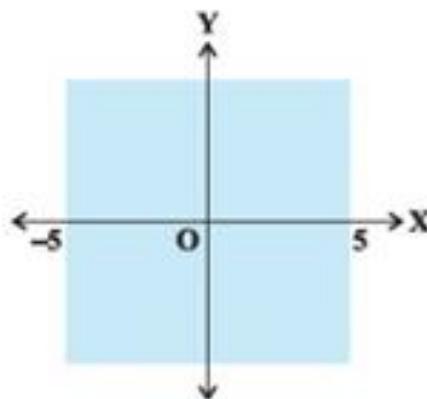


Fig 6.7

(A) $|x| < 5$

(B) $|x| \leq 5$

(C) $|x| > 5$

(D) $|x| \geq 5$

Solution of a linear inequality in variable x is represented on number line in Exercises 27 to 30. Choose the correct answer from the given four options in each of the exercises (M.C.Q.).

27. (A) $x \in (-\infty, 5)$ (B) $x \in (-\infty, 5]$

(C) $x \in [5, \infty)$ (D) $x \in (5, \infty)$



Fig 6.8

28. (A) $x \in (\frac{9}{2}, \infty)$

(B) $x \in [\frac{9}{2}, \infty)$

(C) $x \in [-\infty, \frac{9}{2})$

(D) $x \in (-\infty, \frac{9}{2}]$

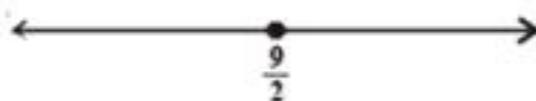


Fig 6.9

29. (A) $x \in (-\infty, \frac{7}{2})$ (B) $x \in (-\infty, \frac{7}{2}]$

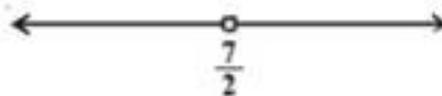


Fig 6.10

(C) $x \in [\frac{7}{2}, -\infty)$ (D) $x \in (\frac{7}{2}, \infty)$

30. (A) $x \in (-\infty, -2)$
(B) $x \in (-\infty, -2]$
(C) $x \in (-2, \infty)$
(D) $x \in [-2, \infty)$



Fig 6.11

True or False Type Questions

31. State which of the following statements is True or False

- (i) If $x < y$ and $b < 0$, then $\frac{x}{b} < \frac{y}{b}$.
(ii) If $xy > 0$, then $x > 0$ and $y < 0$
(iii) If $xy > 0$, then $x < 0$ and $y < 0$
(iv) If $xy < 0$, then $x < 0$ and $y < 0$
(v) If $x < -5$ and $x < -2$, then $x \in (-\infty, -5)$
(vi) If $x < -5$ and $x > 2$, then $x \in (-5, 2)$
(vii) If $x > -2$ and $x < 9$, then $x \in (-2, 9)$
(viii) If $|x| > 5$, then $x \in (-\infty, -5) \cup [5, \infty)$
(ix) If $|x| \leq 4$, then $x \in [-4, 4]$
(x) Graph of $x < 3$ is

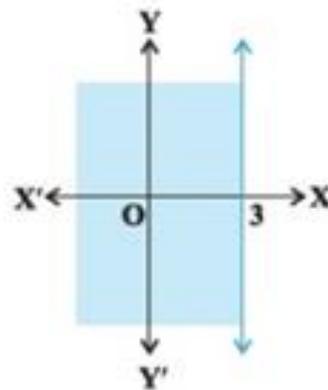


Fig 6.12

- (xi) Graph of $x \geq 0$ is

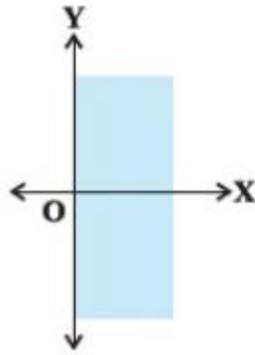


Fig 6.13

(xii) Graph of $y \leq 0$ is

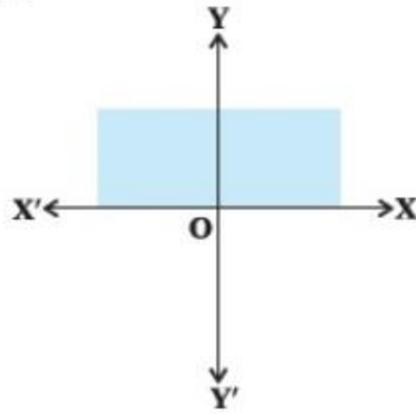


Fig 6.14

(xiii) Solution set of $x \geq 0$ and $y \leq 0$ is

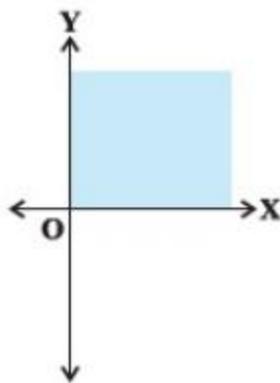


Fig 6.15

(xiv) Solution set of $x \geq 0$ and $y \leq 1$ is

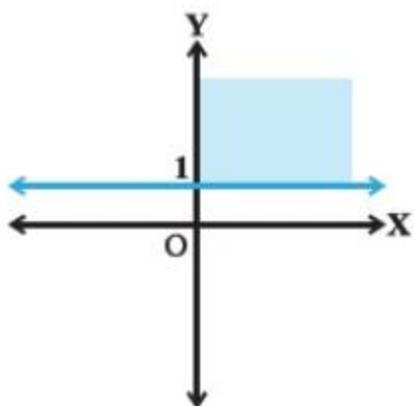


Fig 6.16

(xv) Solution set of $x + y \geq 0$ is

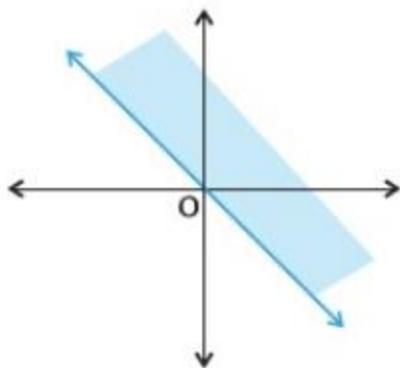


Fig 6.17

Fill in the Blanks Type Questions

32. Fill in the blanks of the following:

(i) If $-4x \geq 12$, then $x \dots -3$.

(ii) If $\frac{-3}{4}x \leq -3$, then $x \dots 4$.

(iii) If $\frac{2}{x+2} > 0$, then $x \dots -2$.

- (iii) If $\frac{2}{x+2} > 0$, then $x \dots -2$.
- (iv) If $x > -5$, then $4x \dots -20$.
- (v) If $x > y$ and $z < 0$, then $-xz \dots -yz$.
- (vi) If $p > 0$ and $q < 0$, then $p - q \dots p$.
- (vii) If $|x+2| > 5$, then $x \dots -7$ or $x \dots 3$.
- (viii) If $-2x + 1 \geq 9$, then $x \dots -4$.