CBSE Test Paper 02

CH-06 Linear Inequalities

1. What is the solution set for $\left|\frac{2x-1}{x-1}\right| > 2$?
    a. none of these
    b. $\left(\frac{3}{4}, 1\right) \cup (1, \infty)$
    c. $(\frac{1}{4}, 1) \cup (1, \infty)$
    d. $\left(-\frac{3}{4}, 1\right) \cup (1, \infty)$
2. The solution set for : $\left|\frac{2(3-x)}{5}\right| < \frac{3}{5}$
    a. $(\frac{1}{2}, \frac{3}{2})$
    b. none of these
    c. (3/2 , 9/2)
    d. $(\frac{1}{4}, \frac{3}{4})$
3. If a , b , c are real numbers such that a $> b$, $c < 0$
    a. $ac > bc$
    b. $ac < bc$
    c. $ac \geq bc$
    d. none of these
4. Identify the solution set for $\frac{7x-5}{8x+3} > 4$
    a. $(-\frac{5}{7}, -\frac{3}{8})$
    b. $(-\frac{31}{28}, -\frac{3}{8})$

c. $\left(-\frac{17}{25}, -\frac{3}{8}\right)$

d. none of these.

5. Solve the system of inequalities
$(x + 5) - 7(x - 2) \geq 4x + 9,\ 2(x - 3) - 7(x + 5) \leq 3x - 9$

a. $-9/4 \leq x \leq 1$

b. $-4 \leq x \leq 1$

c. $-1 \leq x \leq 1$

d. $-4 \leq x \leq 4$

6. Fill in the blanks:

A ________ line will divide the xy-plane in two parts, left half plane and right half plane.

7. Fill in the blanks:

The solution set for the linear inequality 4x + 2 $\geq$ 14 is ________.

8. Solve the inequalities: $-12 < 4 - \frac{3x}{-5} \leqslant 2$

9. Solve: 3x - 7 > x + 1

10. Check that the plane 5x + 2y $\leq$ 5 contains origin or not.

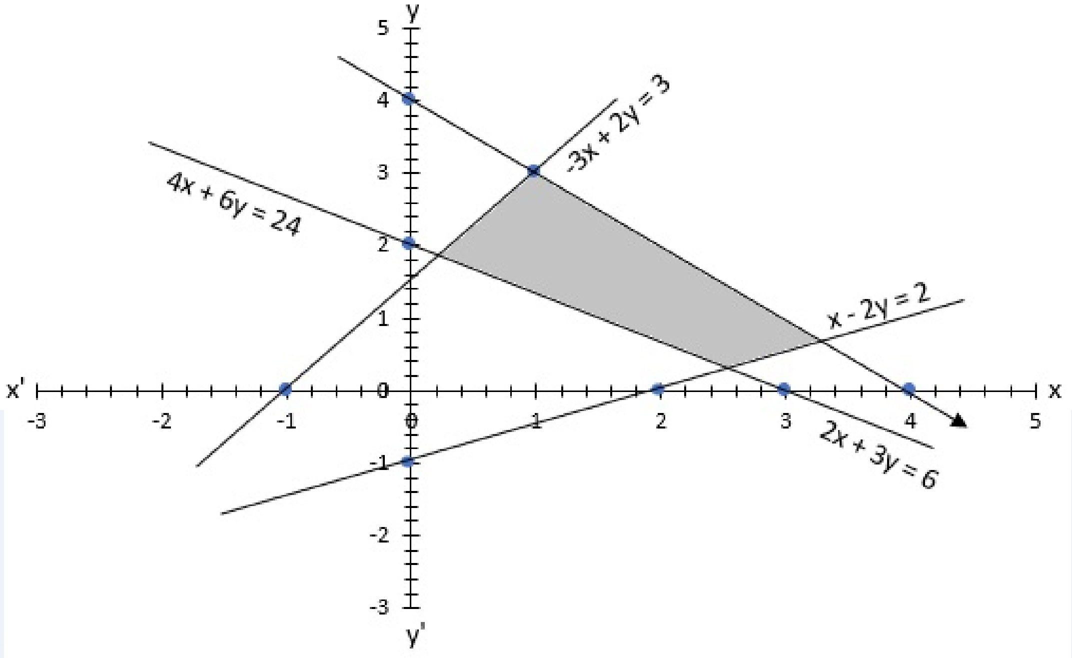
11. Find all pairs of consecutive odd natural number, both of which are larger than 10, such that their sum is less than 40.

12. In the first four examinations, each of 100 marks, Mohan got 94, 73, 72 and 84 marks. If a final average greater than or equal to 80 and less than 90 is needed to obtain a final grade B in a course, then what range of marks in the fifth (last) examination will result if Mohan receiving B in the course?

13. Solve the inequalities and show the graph of the solution in case on number line.
$\frac{x}{2} \geqslant \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

14. Find all pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11.

15. Find the linear inequations for which the shaded area in the figure is the solution set. Draw the diagram of the solution set of the linear inequations:



CBSE Test Paper 02

CH-06 Linear Inequalities

Solution

1. (b) $\left(\frac{3}{4},1\right)\cup(1,\infty)$

   Explanation:

   $\left|\frac{2x-1}{x-1}\right|>2$

   $\Rightarrow \frac{2x-1}{x-1}>2 \quad or \quad \frac{2x-1}{x-1}<-2 \qquad [\because |x|>a \Rightarrow x<-a \quad or \quad x>a]$

   First consider $\frac{2x-1}{x-1}>2$

   $\frac{2x-1}{x-1}-2>0$
   $\Rightarrow \frac{2x-1-2(x-1)}{x-1}>0$
   $\Rightarrow \frac{2x-1-2x+2}{x-1}>0$

$\Rightarrow \frac{1}{x-1} > 0$
$\Rightarrow x - 1 > 0$
$\Rightarrow x > 1$
$\Rightarrow x \epsilon (1, \infty)$

Now $\frac{2x-1}{x-1} < -2$
$\Rightarrow \frac{2x-1}{x-1} + 2 < 0$
$\Rightarrow \frac{2x-1+2(x-1)}{x-1} < 0$
$\Rightarrow \frac{4x-3}{x-1} < 0$
$\Rightarrow (4x - 3 > 0 \text{ and } x - 1 < 0) \text{ or } (4x - 3 < 0 \text{ and } x - 1 > 0)$
$\left[\because \frac{a}{b} < 0 \Rightarrow (a > 0 \text{ and } b < 0) \quad \text{or} \quad (a < 0 \text{ and } \quad b > 0)\right]$
$\Rightarrow \left(x > \frac{3}{4} \quad \text{and} \quad x < 1 \quad\right) \quad \text{or} \quad \left(x < \frac{3}{4} \quad \text{and} \quad x > 1\right)$
$\left[\text{Since} \quad x < \frac{3}{4} \quad \text{and} \quad x > 1 \text{ is} \quad \text{not} \quad \text{possible}\right]$
$\Rightarrow x \in \left(\frac{3}{4}, 1\right)$

Hence the solution set of $\frac{2x-1}{x-1} > 2 \quad or \quad \frac{2x-1}{x-1} < -2$ will be $(1, \infty) \cup \left(\frac{3}{4}, 1\right)$

2. (c) (3/2 , 9/2)

   Explanation:
   $\left|\frac{2(3-x)}{5}\right| < \frac{3}{5}$
   $\Rightarrow -\frac{3}{5} < \frac{2(3-x)}{5} < \frac{3}{5}$
   $\Rightarrow -\frac{3}{5} \cdot \frac{5}{2} < \frac{2(3-x)}{5} \cdot \frac{5}{2} < \frac{3}{5} \cdot \frac{5}{2}$
   $\Rightarrow -\frac{3}{2} < 3 - x < \frac{3}{2}$
   $\Rightarrow -\frac{3}{2} - 3 < 3 - x - 3 < \frac{3}{2} - 3$
   $\Rightarrow -\frac{9}{2} < -x < \frac{-3}{2}$
   $\Rightarrow \frac{9}{2} > x > \frac{3}{2}$
   $\Rightarrow x \in \left(\frac{3}{2}, \frac{9}{2}\right) [\because |x| < a \Leftrightarrow -a < x < a]$

3. (b) ac $<$ bc

   Explanation:

   The sign of the inequality is to be reversed $(< \quad to \quad > \quad or \quad > \quad to \quad <)$ if both sides of an inequality are multiplied by the same negative real number.

4. (c) $\left(-\frac{17}{25}, -\frac{3}{8}\right)$

Explanation:

$\frac{7x-5}{8x+3} > 4$
$\Rightarrow \frac{7x-5}{8x+3} - 4 > 0$
$\Rightarrow \frac{7x-5-4(8x+3)}{8x+3} > 0$
$\Rightarrow \frac{7x-5-32x-12}{8x+3} > 0$
$\Rightarrow \frac{-(25x+17)}{8x+3} > 0$
$\Rightarrow \frac{(25x+17)}{8x+3} < 0$
$\Rightarrow (25x+17 > 0 \text{ and } 8x+3 < 0) \quad \text{or} \quad (25x+17 < 0 \text{ and } \quad 8x+3 > 0)$
$\left[\because \frac{a}{b} < 0 \Rightarrow (a > 0 \text{ and } b < 0) \quad \text{or} \quad (a < 0 \text{ and } b > 0)\right]$
$\Rightarrow \left(x > \frac{-17}{25} \quad \text{and} \quad x < \frac{-3}{8} \quad\right) \quad \text{or} \quad \left(x < \frac{-17}{25} \quad \text{and} \quad x > \frac{-3}{8}\right)$
$\Rightarrow \frac{-17}{25} < x < \frac{-3}{8} \quad \left[\text{Since} \quad x < \frac{-17}{25} \quad \text{and} \quad x > \frac{-3}{8} is \quad \text{not} \quad \text{possible}\right]$

$\Rightarrow x\epsilon\left(-\frac{17}{25}, -\frac{3}{8}\right)$

5. (b) $-4 \leq x \leq 1$

Explanation:

$(x + 5) - 7(x - 2) \geq 4x + 9$
$\Rightarrow x+5-7x+14 \geq 4x+9$
$\Rightarrow -6x+19 \geq 4x+9$
$\Rightarrow -6x-4x \geq 9-19$
$\Rightarrow -10x \geq -10$
$\Rightarrow x \leq 1$
$\Rightarrow x\epsilon(-\infty, 1]$

$2(x - 3) - 7(x + 5) \leq 3x - 9$
$\Rightarrow 2x-6-7x-35 \leq 3x-9$
$\Rightarrow -5x-41 \leq 3x-9$
$\Rightarrow -5x-3x \leq 41-9$

$\Rightarrow -8x \leq 32$
$\Rightarrow -x \leq \frac{32}{8} = 4$
$\Rightarrow x \geq -4$
$\Rightarrow x \epsilon [-4, \infty)$
Hence the solution set is $[-4, \infty) \bigcap (-\infty, 1] = [-4, 1]$

Which means $-\ 4\ \leq\ \mathrm{x}\ \leq\ 1$

6. vertical

7. x $\in$ [3, ∞)

8. We have $-12 < 4 - \frac{3x}{-5} \leqslant 2$
$\Rightarrow -16 < \frac{-3x}{-5} \leqslant -2 \Rightarrow -16 < \frac{3x}{5} \leqslant -2 \Rightarrow -80 < 3x \leqslant -10$
$\Rightarrow \frac{-80}{3} < x \leqslant \frac{-10}{3}$

9. $\Rightarrow$ 3x - x > 1 + 7
$\Rightarrow$ 2x > 8
$\Rightarrow$ x > $\frac{8}{2}$
$\Rightarrow$ x > 4
$\therefore$ (4, ∞) is the solution set.

10. We have, 5x + 2y $\leq$ 5
On putting x = y = 0, we get 5(0) + 2(0) $\leq$ 5
$\Rightarrow$ 0 $\leq$ 5, which is true.
$\therefore$ The Given plane contains the origin.

11. Let x be the smaller of the two consecutive odd natural numbers. Then the other odd integer is x+2.
It is given that both the natural number are greater than 10 and their sum is less than 40.
$\therefore$ x > 10 and, x + x + 2 < 40
$\Rightarrow$ x > 10 and 2x < 38
$\Rightarrow$ x > 10 and x <19
$\Rightarrow$ 10 < x < 19
$\Rightarrow$ x = 11,13,15,17 [$\because$ x is an odd number]

Hence, the required pairs of odd natural number are (11,13), (13,15), (15,17) and (17,19).

12. Let x be the score obtained by Mohan in the last examination.

Then, $\frac{94+73+72+84+x}{5} \geq 80$

$\Rightarrow \quad \frac{323+x}{5} \geq 80$

$\Rightarrow \quad 323 + x \geq 400$

$\Rightarrow \quad 323 + x - 323 \geq 400 - 323$ [subtracting 323 from both sides]

$\Rightarrow \quad x \geq 77$

Therefore, Mohan should obtain more than or equal to 77 marks in the last examination. The upper limit being 90.Hence, the required range is $77 \leq x < 90$.

13. Here $\frac{x}{2} \geqslant \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

$\Rightarrow \frac{x}{2} \geqslant \frac{5x}{3} - \frac{2}{3} - \frac{7x}{5} + \frac{3}{5}$

$\Rightarrow \frac{15x-50x+42x}{30} \geqslant \frac{-10+9}{15}$

$\Rightarrow \frac{7x}{30} \geqslant \frac{-1}{15}$

Multiplying both sides by 30, we have

$7x \geqslant -2$

Dividing both sides by 7, we have

The solution set is $\left[\frac{-2}{7}, \infty\right)$

The representation of the solution set on the number line is

14. Let x and x + 2 be two consecutive odd positive integers

Then x + 2 < 10 and x + x + 2 > 11.

⇒ x < 8 and 2x + 2 > 11

⇒ x < 8 and 2x > 9

⇒ x <8 and 2x > 9

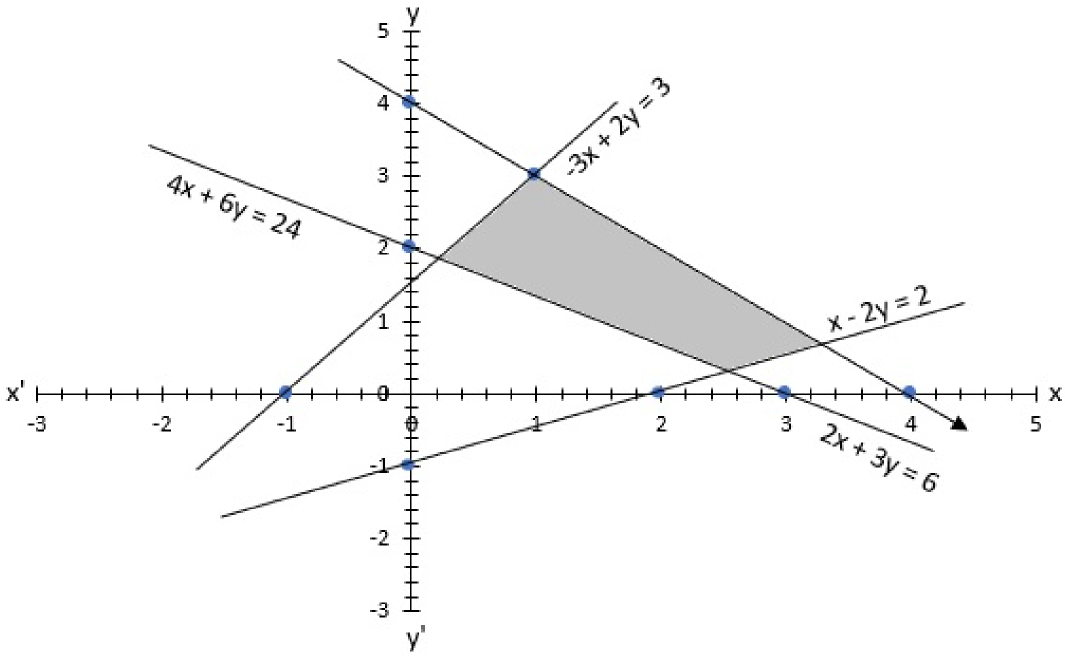
$\Rightarrow x < 8$ and $x > \frac{9}{2}$

$\Rightarrow \frac{9}{2} < x < 8$

⇒ x = 5 and 7

Thus required pairs of odd positive integers are 5,7

15.



Consider the line, 2x + 3y = 6, we observe that the shaded region and the origin are on the opposite sides of the line 2x + 3y = 6 and (0,0) does not satisfy the inequation, 2x + 3y $\geq$ 6. So, the first inequation is 2x + 3y $\geq$ 6.

Consider the line, 4x + 6y = 24, we observe that the shaded region and the origin are on the same side of the line 4x + 6y = 24 and (0,0) satisfies the linear inequation 4x + 6y $\leq$ 24. So, the second inequation is 4x + 6y $\leq$ 24.

Consider the line, -3x + 2y = 3, we observe that the shaded region and the origin are on the same side of the line -3x + 2y = 3 and (0,0) satisfies the linear equation -3x + 2y $\leq$ 3. So, the third inequation is -3x + 2y $\leq$ 3.

Finally, consider the line, x - 2y = 2, we observe that the shaded region and the origin are on the same side of the line x - 2y = 2 and (0,0) satisfies the linear inequation, x -2y $\leq$ 2. So, the fourth inequation is x - 2y $\leq$ 2.

We also notice that the shaded region is above the x-axis and is on the right side of the y-axis. So, we must have x $\geq$ 0 and y $\geq$ 0.

Thus, the linear inequations corresponding to the given solution set are:

$2x + 3y \geq 6,\ 4x + 6y \leq 24,\ -3x + 2y \leq 3,\ x - 2y \leq 2,\ x \geq 0,\ y \geq 0$