RD Sharma Solutions Class 11 Maths Chapter 15 Ex 15.1

Linear Inequations Ex 15.1 Q1

Now, $12x < 50$

$$\Rightarrow x < \frac{50}{12} = \frac{25}{6}$$

(i)

Since $x \in R$, $x \in \left(-\infty, \frac{25}{6}\right)$

(ii)

Since $x \in Z, x \in \{\ldots,-3,-2,-1,0,1,2,3,4\}$

(iii)

Since $x \in N, x \in \{1,2,3,4\}$

Linear Inequations Ex 15.1 Q2

Now, $-4x > 30$

$\Rightarrow x < \frac{-30}{4} = \frac{-15}{2}$

(i)

If $x \in R$, then $x < \frac{-15}{2} \Rightarrow x \in \left(-\infty, -\frac{15}{2}\right)$

(ii)

If $x \in Z$, then $x < -\frac{15}{2} \Rightarrow x \in \{\ldots, -10, -9 - 8\}$

(iii)

$-4x > 30$

$\Rightarrow -x > \frac{30}{4}$

$\Rightarrow x < -\frac{30}{4}$

As $x \in N$, so x can not be less than 1.

$\therefore$ The solution set of the inequality $-4x > 30$ is null set ϕ.

Linear Inequations Ex 15.1 Q3

Now,

$4x - 2 < 8$

$\Rightarrow 4x < 8 + 2$

$\Rightarrow 4x < 10$

$\Rightarrow x < \frac{10}{4} = \frac{5}{2}$

(i) If $x \in R$, then $x < \frac{5}{2} \Rightarrow x \in \left(-\infty, \frac{5}{2}\right)$

(ii) If $x \in Z$ then $x < \frac{5}{2} \Rightarrow x \in \{\ldots, -2, -1, 0, 1, 2\}$

(iii) If $x \in N$ then $x < \frac{5}{2} \Rightarrow x \in \{1, 2\}$

Linear Inequations Ex 15.1 Q4

$3x - 7 > x + 1$

$\Rightarrow \quad 3x - x > 1 + 7$

$\Rightarrow \quad 2x > 8$

$\Rightarrow \quad x > \frac{8}{2} = 4$

$\Rightarrow \quad x > 4$

$\therefore (4, \infty)$ is the solution set.

Linear Inequations Ex 15.1 Q5

$x + 5 > 4x - 10$

$\Rightarrow \quad x - 4x > -10 - 5$

$\Rightarrow \quad -3x > -15$

$\Rightarrow \quad 3x < 15$

$\Rightarrow \quad x < \frac{15}{3} = 5$

$\Rightarrow \quad x < 5$

$\therefore \quad (-\infty, 5)$ is the solution set

Linear Inequations Ex 15.1 Q6

$3x + 9 \geq -x + 19$

$\Rightarrow \quad 3x + x \geq 19 - 9$

$\Rightarrow \quad 4x \geq 10$

$\Rightarrow \quad x \geq \frac{10}{4} = \frac{5}{2}$

$\therefore \quad \left[\frac{5}{2}, \infty\right)$ is the solution set

Linear Inequations Ex 15.1 Q7

$2(3 - x) \geq \frac{x}{5} + 4$

$\Rightarrow \quad 6 - 2x \geq \frac{x}{5} + 4$

$\Rightarrow \quad -2x - \frac{x}{5} \geq 4 - 6$

$\Rightarrow \quad \frac{-11x}{5} \geq -2$

$\Rightarrow \quad \frac{11x}{5} \leq 2$

$\Rightarrow \quad x \leq \frac{10}{11}$

$\left(-\infty, \frac{10}{11}\right]$ is the solution set

Linear Inequations Ex 15.1 Q8

$\frac{3x - 2}{5} \leq \frac{4x - 3}{2}$

$\Rightarrow \quad \frac{3x}{5} - \frac{2}{5} \leq \frac{4x}{2} - \frac{3}{2}$

$\Rightarrow \quad \frac{3x}{5} - \frac{4x}{2} \leq \frac{-3}{2} + \frac{2}{5}$

$\Rightarrow \quad \frac{6x - 20x}{10} \leq \frac{-15 + 4}{10}$

$\Rightarrow \quad -14x \leq -11$

$\Rightarrow \quad 14x \geq 11$

$\Rightarrow \quad x \geq \frac{11}{14}$

$\left[\frac{11}{14}, \infty\right)$ is the solution set

Linear Inequations Ex 15.1 Q9

$$-(x-3)+4<5-2x$$

$$\Rightarrow \quad -x+3+4<5-2x$$

$$\Rightarrow \quad -x+7<5-2x$$

$$\Rightarrow \quad -x+2x<5-7$$

$$\Rightarrow \quad x<-2$$

$(-\infty,-2)$ is the solution set

Linear Inequations Ex 15.1 Q10

$$\frac{x}{5}<\frac{3x-2}{4}-\frac{5x-3}{5}$$

$$\Rightarrow \quad \frac{x}{5}<\frac{3x-2}{4}-\frac{(5x-3)}{5}$$

$$\Rightarrow \quad \frac{x}{5}<\frac{5(3x-2)-4(5x-3)}{20}$$

$$\Rightarrow \quad x<\frac{15x-10-20x+12}{4}$$

$$\Rightarrow \quad 4x<-5x+2$$

$$\Rightarrow \quad 4x+5x<2$$

$$\Rightarrow \quad 9x<2$$

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

$\therefore$ The solution set is $\left(-\infty,\frac{2}{9}\right)$

Linear Inequations Ex 15.1 Q11

$$\frac{2(x-1)}{5}\leq\frac{3(2+x)}{7}$$

$$\Rightarrow \quad 7(2(x-1))\leq 5(3(2+x))$$

$$\Rightarrow \quad 14(x-1)\leq 15(2+x)$$

$$\Rightarrow \quad 14x-14\leq 30+15x$$

$$\Rightarrow \quad 14x-15x\leq 30+14$$

$$\Rightarrow \quad -x\leq 44$$

$$\Rightarrow \quad x\geq -44$$

$\therefore$ The solution set is $[-44,\infty)$

Linear Inequations Ex 15.1 Q12

$$\frac{5x}{2}+\frac{3x}{4}\geq\frac{39}{4}$$

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

$$\Rightarrow \quad 13x\geq 39$$

$$\Rightarrow \quad x\geq\frac{39}{13}=3$$

$$\Rightarrow \quad x\geq 3$$

$\therefore$ The solution set is $[3,\infty)$

Linear Inequations Ex 15.1 Q13

$$\frac{x-1}{3}+4<\frac{x-5}{5}-2$$

$$\frac{x-1+12}{3}<\frac{x-5-10}{5}$$

$$5(x-1+12)<3(x-5-10)$$

$$5(x+11)<3(x-15)$$

$$5x+55<3x-45$$

$$5x-3x<-45-55$$

$$2x<-100$$

$$x<-50$$

$\therefore$ The solution set is $(-\infty,-50)$

Linear Inequations Ex 15.1 Q14

$$\frac{2x+3}{4}-3<\frac{x-4}{3}-2$$

$$\frac{2x+3-12}{4}<\frac{x-4-6}{3}$$

$$3(2x+3-12)<4(x-4-6)$$

$$3(2x-9)<4(x-10)$$

$$6x-27<4x-40$$

$$6x-4x<-40+27$$

$$2x<-13$$

$$x<-\frac{13}{2}$$

$\therefore$ The solution set is $\left(-\infty,-\frac{13}{2}\right)$

Linear Inequations Ex 15.1 Q15

$$\frac{5-2x}{3}<\frac{x}{6}-5$$

$$\frac{5-2x}{3}<\frac{x-30}{6}$$

$$6(5-2x)<3(x-30)$$

$$30-12x<3x-90$$

$$-12x-3x<-90-30$$

$$-15x<-120$$

$$15x>120$$

$$x>\frac{120}{15}=8$$

$\therefore$ The solution set is $(8,\infty)$

Linear Inequations Ex 15.1 Q16

$$\frac{4+2x}{3} \geq \frac{x}{2} - 3$$
$$\frac{4+2x}{3} \geq \frac{x-6}{2}$$
$$2(4+2x) \geq 3(x-6)$$
$$8+4x \geq 3x-18$$
$$4x-3x \geq -18-8$$
$$x \geq -26$$

$\therefore$ The solution set is $[-26, \infty)$

Linear Inequations Ex 15.1 Q17

$$\frac{2x+3}{5} - 2 < \frac{3(x-2)}{5}$$
$$\frac{2x+3-10}{5} < \frac{3x-6}{5}$$
$$2x-7 < 3x-6$$
$$2x-3x < -6+7$$
$$-x < 1$$
$$x > -1$$

$\therefore$ The solution set is $(-1, \infty)$

Linear Inequations Ex 15.1 Q18

$$x-2 \leq \frac{5x+8}{3}$$
$$3(x-2) \leq 5x+8$$
$$3x-6 \leq 5x+8$$
$$3x-5x \leq 8+6$$
$$-2x \leq 14$$
$$2x \geq -14$$
$$x \geq -7$$

$\therefore$ The solution set is $[-7, \infty)$

Linear Inequations Ex 15.1 Q19

$$\frac{6x-5}{4x+1} < 0$$

Case 1: $6x-5>0$ *and* $4x+1<0$

$\Rightarrow x > \frac{5}{6}$ *and* $x < \frac{-1}{4}$

This is not possible.

Case 2: $6x-5<0$ *and* $4x+1>0$

$\Rightarrow x < \frac{5}{6}$ *and* $x > \frac{-1}{4}$

$\therefore$ Solution set is $\left(-\frac{1}{4}, \frac{5}{6}\right)$

Linear Inequations Ex 15.1 Q20

$$\frac{2x-3}{3x-7} > 0$$

Case 1: $2x-3>0$ *and* $3x-7>0$

$\Rightarrow x > \frac{3}{2}$ *and* $x > \frac{7}{3}$

$\Rightarrow x > \frac{7}{3}$

Case 2: $2x-3<0$ *and* $3x-7<0$

$\Rightarrow x < \frac{3}{2}$ *and* $x < \frac{7}{3}$

$\Rightarrow x < \frac{3}{2}$

$\therefore \left(-\infty, \frac{3}{2}\right) \cup \left(\frac{7}{3}, \infty\right)$ is the solution set

Linear Inequations Ex 15.1 Q21

$$\frac{3}{x-2} < 1$$
$$\frac{3}{x-2} - 1 < 0$$
$$\frac{3-(x-2)}{x-2} < 0$$
$$\frac{3-x+2}{x-2} < 0$$
$$\frac{5-x}{x-2} < 0$$
$$\frac{x-5}{x-2} > 0$$

Case 1: $x-5>0$ *and* $x-2>0$

$\Rightarrow x > 5$ *and* $x > 2$

$\Rightarrow x > 5$

Case 2: $x-5<0$ *and* $x-2<0$

$\Rightarrow x < 5$ *and* $x < 2$

$\Rightarrow x < 2$

$\therefore$ solution set is $(-\infty, 2) \cup (5, \infty)$

Linear Inequations Ex 15.1 Q22

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

$$\frac{1}{x-1} - 2 \le 0$$

$$\frac{1-2(x-1)}{x-1} \le 0$$

$$\frac{1-2x+2}{x-1} \le 0$$

$$\frac{3-2x}{x-1} \le 0$$

Case 1: $3-2x \ge 0$ *and* $x-1<0$

$\Rightarrow x \le \frac{3}{2}$ *and* $x<1$

$\Rightarrow x<1$

Case 2: $3-2x \le 0$ *and* $x-1>0$

$\Rightarrow x \ge \frac{3}{2}$ *and* $x>1$

$\Rightarrow x \ge \frac{3}{2}$

Hence the solution set is $(-\infty, 1) \cup \left[\frac{3}{2}, \infty\right)$

Linear Inequations Ex 15.1 Q23

$$\frac{4x+3}{2x-5} < 6$$

$$\frac{4x+3}{2x-5} - 6 < 0$$

$$\frac{4x+3-6(2x-5)}{2x-5} < 0$$

$$\frac{4x+3-12x+30}{2x-5} < 0$$

$$\frac{-8x+33}{2x-5} < 0$$

$$\frac{8x-33}{2x-5} > 0$$

Case 1: $8x-33>0 \quad and \quad 2x-5>0$

$\Rightarrow x > \frac{33}{8} \quad and \quad x > \frac{5}{2}$

$\Rightarrow x > \frac{33}{8}$

Case 2: $8x-33<0 \quad and \quad 2x-5<0$

$\Rightarrow x < \frac{33}{8} \quad and \quad x < \frac{5}{2}$

$\Rightarrow x < \frac{5}{2}$

Hence the solution set is $\left(-\infty, \frac{5}{2}\right) \cup \left(\frac{33}{8}, \infty\right)$

Linear Inequations Ex 15.1 Q24

$$\frac{5x-6}{x+6}<1$$

$$\frac{5x-6}{x+6}-1<0$$

$$\frac{5x-6-(x+6)}{x+6}<0$$

$$\frac{5x-6-x-6}{x+6}<0$$

$$\frac{4x-12}{x+6}<0$$

Case 1: $4x-12>0$ *and* $x+6<0$
$\Rightarrow x>3$ *and* $x<-6$

This is not possible.

Case 2: $4x-12<0$ *and* $x+6>0$
$\Rightarrow x<3$ *and* $x>-6$

Hence the solution set is $(-6,3)$

Linear Inequations Ex 15.1 Q25

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

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

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

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

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

Case 1: $7x>0$ *and* $4-x<0$
$\Rightarrow x>0$ *and* $4<x$

$\Rightarrow 4<x$

Case 2: $7x<0$ *and* $4-x>0$
$\Rightarrow x<0$ *and* $4>x$
$\Rightarrow x<0$

Hence solution set is $(-\infty,0)\cup(4,\infty)$

Linear Inequations Ex 15.1 Q26

$$\frac{x-1}{x+3} > 2$$

$$\frac{x-1}{x+3} - 2 > 0$$

$$\frac{x-1-2(x+3)}{x+3} > 0$$

$$\frac{x-1-2x-6}{x+3} > 0$$

$$\frac{-x-7}{x+3} > 0$$

$$\frac{x+7}{x+3} < 0$$

Case 1: $x+7>0$ *and* $x+3<0$

$\Rightarrow x > -7$ *and* $x < -3$

Case 2: $x+7<0$ *and* $x+3>0$

$\Rightarrow x < -7$ *and* $x > -3$

This is not possible.

$\therefore$ The solution set is $(-7,-3)$

Linear Inequations Ex 15.1 Q27

$$\frac{7x-5}{8x+3} > 4$$

$$\frac{7x-5}{8x+3} - 4 > 0$$

$$\frac{7x-5-4(8x+3)}{8x+3} > 0$$

$$\frac{7x-5-32x-12}{8x+3} > 0$$

$$\frac{-25x-17}{8x+3} > 0$$

$$\frac{25x+17}{8x+3} < 0$$

Case 1: $25x+17>0$ *and* $8x+3<0$

$\Rightarrow x > \frac{-17}{25}$ *and* $x < \frac{-3}{8}$

Case 2: $25x+17<0$ *and* $8x+3>0$

$\Rightarrow x < \frac{-17}{25}$ *and* $x > \frac{-3}{8}$

This is not possible

$\therefore$ Hence the solution set is $\left(\frac{-17}{25}, \frac{-3}{8}\right)$

Linear Inequations Ex 15.1 Q28

$$\frac{x}{x-5} > \frac{1}{2}$$

$$\frac{x}{x-5} - \frac{1}{2} > 0$$

$$\frac{2x-(x-5)}{2(x-5)} > 0$$

$$\frac{2x-x+5}{2x-10} > 0$$

$$\frac{x+5}{2x-10} > 0$$

Case 1: $x+5>0$ *and* $2x-10>0$

$\Rightarrow x > -5$ *and* $x > 5$

$\Rightarrow$ $x > 5$

Case 2: $x+5<0$ *and* $2x-10<0$

$\Rightarrow x < -5$ *and* $x < 5$

$\Rightarrow$ $x < -5$

Hence the solution set is $(-\infty, -5) \cup (5, \infty)$