Exercise 7.3

Q1) Solve the following inequalities.

(i) $3x+1<5x-4$

Solution: $3x+1<5x-4$

$3x<5x-4-1$

$3x-5x<-5$

$-2x<-5$

Case-I When negative is eliminated from both sides of inequality the symbol will be change.

Case-II When negative is transferred from variable to constant side, symbol will also change.

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

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

Solution Set $=\left\{x \mid x>\frac{5}{2}\right\}$

(ii) $4x-10.3\le 21x-1.8$

Solution: $4x-10.3\le 21x-1.8$

$4x-21x\le -8.5+10.3$

$-17x\le 8.5$

When negative value is shifted to other side its symbol changes.

$$x\ge\frac{8.5}{-17}$$

$$x\ge-\frac{8.5}{17}$$

$x\ge -0.5$

Solution Set $=\{x \mid x\ge -0.5\}$

(iii) $4-\frac{1}{2}x\ge -7+\frac{1}{4}x$

Solution: $4-\frac{1}{2}x\ge -7+\frac{1}{4}x$

$$-\frac{1}{2}x-\frac{1}{4}\ge -7-4$$

$$\frac{-2x-x}{4}\ge -11$$

$-3x\ge -44$

When negative value is shifted the symbol changes

$$x\le\frac{-44}{-3}$$

$$x\le\frac{44}{3}$$

Solution Set $=\{x \mid x\le\frac{44}{3}\}$

(iv) $x-2(5-2x)\ge 6x-3\frac{1}{2}$

Solution: $x-2(5-2x)\ge 6x-3\frac{1}{2}$

$$x-10+4x\ge 6x-\frac{7}{2}$$

$$5x-6x\ge -\frac{7}{2}+10$$

$$-1x\ge\frac{-7+20}{2}$$

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

When negative is shifted other side symbol changes

$$x\le\frac{13}{-1\times 2}$$

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

$x\le -6.5$

Solution Set $=\{x \mid x\le -6.5\}$

(v) $\frac{3x+2}{9}-\frac{2x+1}{3}>-1$

Solution: $\frac{3x+2}{9}-\frac{2x+1}{3}>-1$

$$\frac{3x+2-3(2x+1)}{9}>-1$$

$3x+2-6x-3>-9$

$-3x>-9+1$

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$3x > -8$

Negative value is shifted to other side its symbols changes

$$x < \frac{-8}{-3}$$

$$x < \frac{8}{3}$$

Solution Set $= \left\{ x \mid x < \frac{8}{3} \right\}$

(vi) $3(2x+1) - 2(2x+5) < 5(3x-2)$

Solution: $3(2x+1) - 2(2x+5) < 5(3x-2)$

$6x + 3 - 4x - 10 < 15x - 10$

$2x - 7 - 15x < -10$

$-13x < -10 + 7$

$-13x < -3$

The value is negative when shifted to other side it changes its symbols

$$x > \frac{-3}{-13}$$

$$x > \frac{3}{13}$$

Solution Set $= \left\{ x \mid x > \frac{3}{13} \right\}$

(vii) $3(x-1) - (x-2) > -2(x+4)$

Solution: $3(x-1) - (x-2) > -2(x+4)$

$3x - 3 - x + 2 > -2x - 8$

$2x - 1 > -2x - 8$

$2x + 2x > -8 + 1$

$4x > -7$

$$x > \frac{-7}{4}$$

Solution Set $= \left\{ x \mid x > \frac{-7}{4} \right\}$

(viii) $2\frac{2}{3}x + \frac{2}{3}(5x-4) > -\frac{1}{3}(8x+7)$

Solution: $2\frac{2}{3}x + \frac{2}{3}(5x-4) > -\frac{1}{3}(8x+7)$

$$\frac{8}{3}x + \frac{10x-8}{3} > -\frac{(8x+7)}{3}$$

$$\frac{8x+10x-8}{3} > -\frac{8x+7}{3}$$

Multiplying both side by 3

$$\cancel{3} \times \frac{18x-8}{\cancel{3}} > -\cancel{3} \times \frac{8x+7}{\cancel{3}}$$

$18x - 8 > -(8x+7)$

$18x - 8 > -8x - 7$

$18x + 8x > -7 + 8$

$26x > 1$

$$x > \frac{1}{26}$$

Solution Set $= \left\{ x \mid x > \frac{1}{26} \right\}$

Q2) Solve the following inequalities

(i) $-4 < 3x + 5 < 8$

Solution: $-4 < 3x + 5 < 8$

$-4 < 3x + 5$	and	$3x + 5 < 8$
$-4 - 5 < 3x$		$3x < 8 - 5$
$-9 < 3x$		$3x < 3$
$\frac{-9}{3} < x$		$x < \frac{3}{3}$
$-3 < x$		$x < 1$

$-3 < x < 1$

Solution Set $= \{ x \mid -3 < x < 1 \}$

(ii) $-5 \le \frac{4-3x}{2} < 1$

Solution: $-5 \le \frac{4-3x}{2} < 1$

$-5 \le \frac{4-3x}{2}$	and	$\frac{4-3x}{2} < 1$
$-10 \le 4 - 3x$		$4 - 3x < 2$
$3x - 10 \le 4$		$-3x < 2 - 4$
$3x \le 4 + 10$		$-3x < -2$
$3x \le 14$		$x > \frac{-2}{-3}$
$x \le \frac{14}{3}$		$x > \frac{2}{3}$
$\frac{2}{3} < x$		

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$$\frac{2}{3} < x \le \frac{14}{3}$$

Solution Set $= \{x \mid \frac{2}{3} < x \le \frac{14}{3}\}$

(iii) $-6 < \frac{x-2}{4} < 6$

Solution: $-6 < \frac{x-2}{4} < 6$

$-6 < \frac{x-2}{4}$

$-24 < x - 2$

$-24 + 2 < x$

$-22 < x$

and

$\frac{x-2}{4} < 6$

$x - 2 < 24$

$x < 24 + 2$

$x < 26$

$-22 < x < 26$

Solution Set $= \{x \mid -22 < x < 26\}$

(iv) $3 \ge \frac{7-x}{2} \ge 1$

Solution: $3 \ge \frac{7-x}{2} \ge 1$

$3 \ge \frac{7-x}{2}$

$6 \ge 7 - x$

$6 - 7 \ge -x$

$-1 \ge -x$

Negative sign change the symbols

$1 \le x$

and

$\frac{7-x}{2} \ge 1$

$7 - x \ge 2$

$-x \ge 2 - 7$

$-x \ge -5$

$x \le 5$

$1 \le x \le 5$

Solution Set $= \{x \mid 1 \le x \le 5\}$

(v) $3x - 10 \le 5 < x + 3$

Solution $3x - 10 \le 5 < x + 3$

$3x - 10 \le 5$	and	$5 < x + 3$
$3x \le 5 + 10$		$5 - 3 < x$
$3x \le 15$		$2 < x$
$\frac{3x}{3} \le \frac{15}{3}$		
$x \le 5$		

$2 < x \le 5$

Solution Set $= \{x \mid 2 < x \le 5\}$

(vi) $-3 \le \frac{x-4}{-5} < 4$

Solution $-3 \le \frac{x-4}{-5} < 4$

$-3 \le \frac{x-4}{-5}$	and	$\frac{x-4}{-5} < 4$
$-3 \times -5 \ge x - 4$		
$x - 4 > 4(-5)$		
$15 \ge x - 4$		$x > -20 + 4$
$15 + 4 \ge x$		$x > -16$
$19 \ge x$		$-16 < x$
$x \le 19$		

$-16 < x \le 19$

Solution Set $= \{x \mid -16 < x \le 19\}$

(vii) $1 - 2x < 5 - x \le 25 - 6x$

Solution: $1 - 2x < 5 - x \le 25 - 6x$

$1 - 2x < 5 - x$ and $5 - x \le 25 - 6x$

$-x + 6x \le 25 - 5$	$6x - x \le 20$
$1 - 2x + x < 5$	$5x \le 20$
$-x < 5 - 1$	$x \le \frac{20}{5}$
$-x < 4$	$x \le 4$

Due negative sign

Symbol change

$-4 < x$

$-4 < x \le 4$

Solution Set $= \{x \mid -4 < x \le 4\}$

(viii) $3x - 2 < 2x + 1 < 4x + 17$

Solution: $3x - 2 < 2x + 1 < 4x + 17$

$3x - 2 < 2x + 1$	$2x + 1 < 4x + 17$
$3x - 2x - 2 < +1$	$2x - 4x < 17 - 1$
$x < 1 + 2$	$-2x < 16$
$x < 3$	

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$$x > \frac{16}{-2}$$

$$x > -8$$

$$-8 < x$$

$$-8 < x < 3$$

Solution Set $= \{x | -8 < x < 3|\}$

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