

Exercise. 7.3 (Solution)

9th Class

1. Solve the following inequalities.

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

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

$$3x - 5x < -4 - 1$$

$$-2x < -5$$

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

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

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

ii) $4x - 10.3 \leq 21x - 1.8$

(Solution): $4x - 10.3 \leq 21x - 1.8$

$$4x - 21x \leq -1.8 + 10.3$$

$$-17x \leq 8.5$$

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

$$x \geq -0.5$$

$$\textbf{Solution Set} = \{x \geq -0.5\}$$

$$\text{iii) } 4 - \frac{1}{2}x \geq -7 + \frac{1}{4}x$$

$$\text{(Solution): } 4 - \frac{1}{2}x \geq -7 + \frac{1}{4}x$$

Multiply by 4 on both sides

$$4 \times 4 - 4 \times \frac{1}{2}x \geq 4 \times -7 + 4 \times \frac{1}{4}x$$

$$16 - 2x \geq -28 + x$$

$$-2x - x \geq -28 - 16$$

$$-3x \geq -44$$

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

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

$$\textbf{Solution Set} = \left\{x \leq \frac{44}{3}\right\}$$

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

$$\text{(Solution): } x - 2(5 - 2x) \geq 6x - \frac{7}{2}$$

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

Multiply both sides by 2

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

$$2x - 20 + 8x \geq 12x - 7$$

$$10x - 12x \geq -7 + 20$$

$$-2x \geq 13$$

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

$$x \leq -6.5$$

Solution Set = {x ≤ -6.5}

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

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

Multiply both sides by 9

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

$$3x + 2 - 3(2x + 1) > -9$$

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

$$-3x - 1 > -9$$

$$-3x > -9 + 1$$

$$-3x > -8$$

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

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

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

$$\textbf{vi) } 3(2x + 1) - 2(2x + 5) < 5(3x - 2)$$

$$\text{(Solution): } 3(2x + 1) - 2(2x + 5) < 5(3x - 2)$$

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

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

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

$$-13x < -3$$

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

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

$$\textbf{Solution Set} = \left\{ \frac{3}{13} \right\}$$

$$\textbf{vii) } 3(x - 1) - (x - 2) > -2(x + 4)$$

$$\text{(Solution): } 3(x - 1) - (x - 2) > -2(x + 4)$$

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

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

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

$$4x > -7$$

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

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

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

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

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

$$\frac{8}{3}x + \frac{10}{3}x - \frac{8}{3} > -\frac{1}{3}(8x + 7)$$

Multiply both sides by 3

$$3 \times \frac{8}{3}x + 3 \times \frac{10}{3}x - 3 \times \frac{8}{3} > -3 \times \frac{1}{3}(8x + 7)$$

$$8x + 10x - 8 > -8x - 7$$

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

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

$$26x > 1$$

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

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

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

2: Solve the following inequalities.

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

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

Subtract 5 in the inequalities

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

$$-9 < 3x < 3$$

$$\frac{-9}{3} < \frac{3x}{3} < \frac{3}{3}$$

$$-3 < x < 1$$

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

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

(Solution): $-5 \leq \frac{4-3x}{2} < 1$

Multiply by in the inequalities

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

$$-10 \leq 4 - 3x < 2$$

Subtract 4 both sides in the inequalities

$$-10 - 4 \leq 4 - 3x - 4 < 2 - 4$$

$$-14 \leq -3x < -2$$

$$\frac{-14}{-3} \leq \frac{-3x}{-3} < \frac{-2}{-3}$$

$$\frac{14}{3} \geq x > \frac{2}{3}$$

$$\text{Solution Set} = \left\{ \frac{14}{3} \geq x > \frac{2}{3} \right\}$$

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

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

Multiply both sides by 4

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

$$-24 < x - 2 < 24$$

Add 2 in the inequalities

$$-24 + 2 < x - 2 + 2 < 24 + 2$$

$$-22 < x < 26$$

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

$$\text{iv) } 3 \geq \frac{7-x}{2} \geq 1$$

$$\text{(Solution): } 3 \geq \frac{7-x}{2} \geq 1$$

Multiply by 2 in the inequalities

$$2 \times 3 \geq 2 \times \frac{7-x}{2} \geq 2 \times 1$$

$$6 \geq 7 - x \geq 2$$

There are two possibilities to write the inequalities

$$6 \geq 7 - x$$

$$7 - x \geq 2$$

$$6 - 7 \geq 7 - x - 7$$

$$7 - 7 - x \geq 2 - 7$$

$$-1 \geq -x$$

$$-x \geq -5$$

$$1 \leq x$$

$$x \leq 5$$

$$\text{Solution Set} = \{1 \leq x \leq 5\}$$

$$\text{v) } 3x - 10 \leq 5 < x + 3$$

$$\text{(Solution): } 3x - 10 \leq 5 < x + 3$$

Write the inequalities in two possibilities

$$3x - 10 \leq 5$$

$$5 < x + 3$$

$$3x - 10 + 10 \leq 5 + 10$$

$$5 - 3 < x + 3 - 3$$

$$3x \leq 15$$

$$2 < x$$

$$x \leq 5$$

$$\text{Solution Set} = \{2 < x \leq 5\}$$

$$\text{vi) } -3 \leq \frac{x-4}{-5} < 4$$

$$\text{(Solution): } -3 \leq \frac{x-4}{-5} < 4$$

Write the inequalities in two possibilities

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

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

$$(-5)(-3) \leq (-5) \frac{x-4}{-5} \quad (-5) \times \frac{x-4}{-5} < (-5) \times 4$$

$$15 \geq x - 4$$

$$x - 4 > -20$$

$$x \leq 15 + 4$$

$$x > -20 + 4$$

$$x \leq 19$$

$$x > -16$$

$$\text{Solution Set} = \{-16 < x \leq 19\}$$

$$\text{vii) } 1 - 2x < 5 - x \leq 25 - 6x$$

$$\text{(Solution): } 1 - 2x < 5 - x \leq 25 - 6x$$

Write the inequalities in two possibilities

$$\begin{array}{rcl}
1 - 2x < 5 - x & & 5 - x \leq 25 - 6x \\
1 - 2x + x < 5 - x + x & & \\
1 - x < 5 & & 5 - x + x \\
1 - x - 1 < 5 - 1 & & \leq 25 - 6x + x \\
-x < 4 & & 5 \leq 25 - 5x \\
x > -4 & & 5 - 25 \leq 25 - 5x - 25 \\
& & -20 \leq -5x \\
& & \frac{-20}{-5} \leq \frac{-5x}{-5} \\
& & x \leq 4
\end{array}$$

$$\text{Solution Set} = \{-4 < x \leq 4\}$$

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

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

Write the inequalities in two possibilities

$$\begin{array}{rcl}
3x - 2 < 2x + 1 & & 2x + 1 < 4x + 17 \\
3x - 2x < 1 + 2 & & 2x - 4x < 17 - 1 \\
x < 3 & & -2x < 16 \\
& & \frac{-2x}{-2} < \frac{16}{-2} \\
& & x > -8
\end{array}$$

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

Do good, have good.