Chapter Nine

Inequalities:

(Q1) Find the solution set of x + 3 > 19 – 3x, where x is a real number, and illustrate your answer on a number line.

Soln:

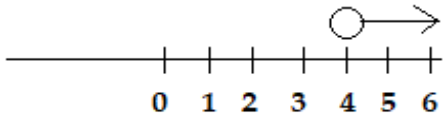
x + 3 > 19 – 3x

=> x + 3x > 19 – 3,

=> 4x > 16.

Dividing through using 4

$=> \frac{4x}{4} > \frac{16}{4}, => x > 4.$



(Q2) Solve 5 – 2x > x + 2, where x is a real number, and illustrate your answer on a number line.

Soln:

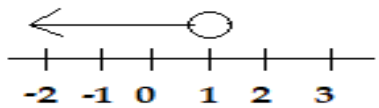
5 – 2x > x + 2

=> 5 – 2 > x + 2x,

=> 3 > 3x, and dividing through by 3

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

=> 1 > x => x < 1.



(Q3) Find the truth set of $2x - 6 \leq 5(3 - x)$.

Soln:

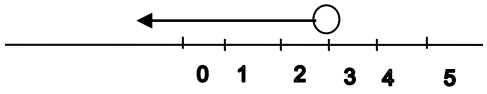
$2x - 6 \leq 5(3 - x)$

$\Rightarrow 2x - 6 \leq 15 - 5x,$

$\Rightarrow 2x + 5x \leq 15 + 6,$

$\Rightarrow 7x \leq 21$, and dividing through by 7

$\Rightarrow \frac{7x}{7} < \frac{21}{7}, \Rightarrow x < 3.$



(Q4) Solve $5x - 3(x - 1) \geq 39$, and illustrate your answer on a number line.

Soln:

$5x - 3(x - 1) \geq 39$

$\Rightarrow 5x - 3x + 3 \geq 39,$

$\Rightarrow 2x + 3 \geq 39,$

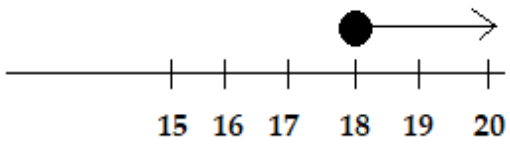
$\Rightarrow 2x \geq 39 - 3,$

$\Rightarrow 2x \geq 36.$

Dividing through using 2

$\Rightarrow \frac{2x}{2} \geq \frac{36}{2},$

$\Rightarrow x \geq 18.$



(Q5) Solve $3x - 9 \geq 12(x - 3)$, and illustrate your answer on a number line.

Soln:

$3x - 9 \geq 12\ (x - 3)$

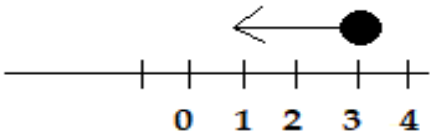
$=>3x - 9 \geq\ 12x - 36,$

$=> 3x - 12\ x \geq\ -36 + 9,$

$=> -12x + 3x \geq\ -27,$

$=> -\ 9x \geq\ -27,$ and dividing through using $-\ 9$

$=> \frac{-\ 9x}{-\ 9}\ \geq\ \frac{-\ 27}{-\ 9}, => x\ \leq 3.$



N/B: When an inequality is divided or multiplied through by a negative number, the inequality sign is reversed

(Q6) Solve the inequality $\frac{3}{4}(x + 1) + 1\ \leq \frac{1}{2}(x - 2) + 5.$

Soln:

Multiply through by 4

$=> 4\ x\ \frac{3}{4}(x + 1) + 4\ x\ 1 \leq 4\ x\ \frac{1}{2}(x - 2) + 4\ x\ 5,$

$=> 3(x + 1) + 4 \leq 2(x - 2) + 20,$

$=> 3x + 3 + 4 \leq 2x - 4 + 20,$

$=> 3x + 7 \leq 2x - 4 + 20,$

$=> 3x - 2x < -\ 4 + 20 - 7,$

$=> x < 20 - 7 - 4,$

=> x < 13 – 4,

=> x < 9.

(Q7) Solve $2x - 1\frac{1}{2} \geq 5x - 6$.

Soln:

$2x - 1\frac{1}{2} \geq 5x - 6$

=> $2x - \frac{3}{2} \geq 5x - 6$, and multiplying through by 2

=>$2 \times 2x - 2 \times \frac{3}{2} \geq 2 \times 5x - 2 \times 6$,

=> $4x - 3 \geq 10x - 12$,

=> $4x - 10x \geq -12 + 3$,

=> $-6x \geq -9$

=> $\frac{-6x}{-6x} \geq \frac{-9}{-6}$

=> $x \leq 1\frac{1}{2}$.

(Q8) Solve $\frac{2x-1}{4} - \frac{x-2}{3} > 1$.

Soln:

$\frac{2x-1}{4} - \frac{x-2}{3} > 1$.

$=> \frac{1}{4}(2x-1) - \frac{1}{3}(x-2) > 1$.

Multiply through using 12.

=>$12 \times \frac{1}{4}(2x-1) - 12 \times \frac{1}{3}(x-2) > 12 \times 1$,

=> $3(2x - 1) - 4(x - 2) > 12$,

=> $6x - 3 - 4x + 8 > 12$,

=> $6x - 4x > 12 - 8 + 3$,

=> 2x > 7.

Dividing through using 2 $=> \frac{2x}{2} > \frac{7}{2} => x > 3\frac{1}{2}$.