Revision – Inequalities

* Straight Objective Type

(1)
$$-5 \leq \frac{2-3x}{4} \leq 9$$

$$-20 \leq 2-3x \leq 36$$

$$-20-2 \leq 2-3x-2 \leq 36-2$$

$$-22 \leq -3x \leq 34$$

$$\frac{-22}{-3} \geq \frac{-3x}{-3} \geq \frac{34}{-3}$$

$$\boxed{-\frac{34}{3} \leq x \leq \frac{22}{3}}$$ (option A)

(2)
$$3x-4 \geq -2x+6$$

$$3x+2x \geq 6+4$$

$$5x \geq 10$$

$$x \geq \frac{10}{5}$$

$$\boxed{x \geq 2}$$ (option B)

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

$$x = 5, \quad x = -2$$

$$\xleftarrow{\quad + \quad \underset{-2}{\overset{}{\ominus}} \quad - \quad \underset{5}{\overset{}{\ominus}} \quad + \quad}\longrightarrow$$
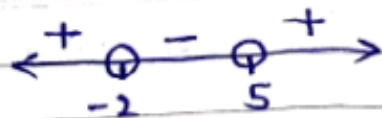
$$\therefore \quad x \in (-2, 5)$$

or $\boxed{-2 < x < 5}$ (option c)

④ $\dfrac{4-3x}{5} < \dfrac{2x-5}{4}$

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

$$16 - 12x < 10x - 25$$

$$10x + 12x > 16 + 25$$

$$22x > 41$$

$$\boxed{x > \dfrac{41}{22}} \quad \text{(option A)}$$

⑤ $\dfrac{2x-3}{4} + 8 > 2 + \dfrac{4x}{3}$

$$\dfrac{4x}{3} - \dfrac{2x-3}{4} < 8-2$$

$$\dfrac{16x - 6x + 9}{12} < 6$$

$$10x + 9 < 72$$
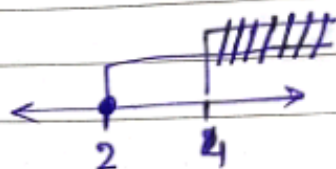
$$10x < 72 - 9$$

$$10x < 63$$

$$x < \frac{63}{10}$$

$$\boxed{x < 6.3}$$

⑥

$$2x - 7 > 5 - x$$

$$2x + x > 5 + 7$$

$$3x > 12$$

$$x > 4$$

$$11 - 5x \leq 1$$

$$11 - 1 \leq 5x$$

$$5x \geq 10$$

$$x \geq 2$$

∴ $\boxed{x > 4}$ (option c)

⑦

$$5x - 7 < 3(x + 3)$$

$$5x - 7 < 3x + 9$$

$$5x - 3x < 9 + 7$$

$$2x < 16$$

$$x < 8$$
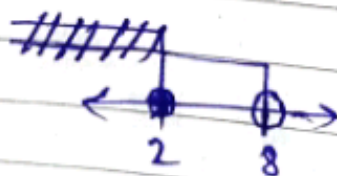
$$1 - \frac{3x}{2} \geq x - 4$$

$$2 - 3x \geq 2(x - 4)$$

$$2 - 3x \geq 2x - 8$$

$$2 + 8 \geq 5x$$

$$x \leq 2$$

∴ $\boxed{x \leq 2}$ (option A)

⑧

$$-3 \leq \frac{4-7x}{2} \leq 18$$

$$-6 \leq 4-7x \leq 36$$

$$-6-4 \leq 4-7x-4 \leq 36-4$$

$$-10 \leq -7x \leq 32$$

$$\frac{-10}{-7} \geq \frac{-7x}{-7} \geq \frac{32}{-7}$$

$$\boxed{\frac{-32}{2} \leq x \leq \frac{10}{7}}$$ (option c)

⑨

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

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

$$\frac{3x - 8 - 4x}{6} \leq 3$$

$$-x - 8 \leq 18$$

$$\boxed{x \geq -26}$$ (option c)

(10)
$$\frac{x}{4} < \frac{5x-2}{3} - \frac{7x-3}{5}$$

$$\frac{x}{4} < \frac{25x - 10 - 21x + 9}{15}$$

$$15x < 2(4x - 1)$$

$$15x < 16x - 4$$

$$16x - 15x > 4$$

$$\boxed{x > 4} \quad (\text{Option A})$$

* Multiple correct Answer Type

(11)

$x + 2 \leq 5$	$3x - 4 > -2 + x$
$x \leq 5 - 2$	$3x - x > -2 + 4$
$x \leq 3$	$2x > 2$
	$x > 1$

$\therefore (1, 3]$ are solutions of this ineq.

So option (B) and (C) are correct

(12) $2(x+1) < x+5$ $3(x+2) > 2-x$

$2x+2 < x+5$ $3x+6 > 2-x$

$2x-x < 5-2$ $3x+x > 2-6$

$x < 3$ $x > -1$

-1 0 1 2 3

$\therefore (-1, 3)$ are solutions of ineq.

So, option (A) and (B) are
correct

(13) $\dfrac{x-2}{x+2} \geqslant 3$ $2x-7 \leqslant 5$

$2x \leqslant 5+7$

$\dfrac{x-2}{x+2} - 3 \geqslant 0$ $2x \leqslant 12$

$\dfrac{x-2-3x-6}{x+2} \geqslant 0$ $x \leqslant \dfrac{12}{2}$

$\boxed{x \leqslant 6}$

$\dfrac{2x+8}{x+2} \leqslant 0$

$\dfrac{x+4}{x+2} \leqslant 0$ $-4 \quad -2$
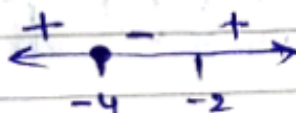
$\therefore x \in [-4, -2)$
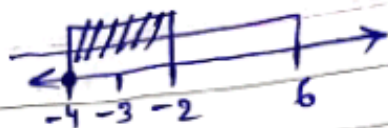
∴ solution of ineq. are $[-4, -2)$

So, option (B) and (D) are correct

(14) $\dfrac{x+7}{x-4} > 2$

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

$\dfrac{x+7}{x-4} - 2 > 0$

$\dfrac{2x+1}{x-2} - 3 > 0$
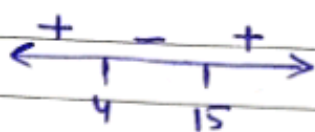
$\dfrac{x+7-2x+8}{x-4} > 0$

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

$\dfrac{-x+15}{x-4} > 0$
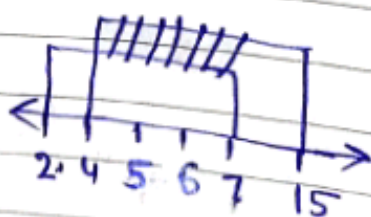
$\dfrac{-x+7}{x-2} > 0$

$\dfrac{x-15}{x-4} < 0$

$\dfrac{x-7}{x-2} < 0$

$x \in (4,15)$

$x \in (2,7)$

∴ solution of ineq. are 5, 6

so, option (A) and (B) are correct

⑮ (A) $3x + 17 \leqslant 2(1-x)$

$3x + 17 \leqslant 2 - 2x$

$5x \leqslant 2 - 17$

$5x \leqslant -15$

$x \leqslant -3 \longrightarrow$ (s)

(B) $37 - (3x+5) \geqslant 9x - 8(x-3)$

$37 - 3x - 5 \geqslant 9x - 8x + 24$

$9x - 8x + 3x \leqslant 37 - 5 - 24$

$4x \leqslant 8$

$x \leqslant 2 \longrightarrow$ (r)

(C) $\dfrac{4x}{3} - \dfrac{9}{4} < x + \dfrac{3}{4}$, $\dfrac{7x-1}{3} - \dfrac{7x+2}{6} > x$

$\dfrac{4x}{3} - x < \dfrac{3}{4} + \dfrac{9}{4}$, $\dfrac{14x - 2 - 7x - 2}{6} > x$

$\dfrac{x}{3} < 3$ $\dfrac{7x-4}{6} > x$

$x < 9$

$7x - 6x > 4$

$x > 4$

$\therefore \ 4 < x < 9 \longrightarrow$ (q)

(D) $\quad -2 - \dfrac{x}{4} \leqslant \dfrac{1+x}{3}$, $\qquad 3-x < 4(x-3)$

$$\dfrac{1+x}{3} + \dfrac{x}{4} \geqslant -2 \qquad\qquad 3-x < 4x-12$$

$$\qquad\qquad\qquad\qquad\qquad 3+12 < 4x+x$$

$$\dfrac{4+4x+3x}{12} \geqslant -2 \qquad\qquad 5x > 15$$

$$\qquad\qquad\qquad\qquad\qquad x > 3$$

$$7x + 4 \geqslant -24$$

$$7x \geqslant -28$$

$$x \geqslant -4 \qquad\qquad\qquad -4 \qquad 3$$

$$\therefore \quad x > 3 \longrightarrow (P)$$

⑯ (A) $\quad 3x - 7 < 1$

$$3x < 1 + 7$$

$$x < \dfrac{8}{3} \longrightarrow (s)$$

(B) $\quad 2x - 5 < 3$

$$2x < 3 + 5$$

$$x < \dfrac{8}{2}$$

$$x < 4 \longrightarrow (T)$$

(C) $2 < 3x + 5$

$3x > 2 - 5$

$3x > -3$

$x > -1 \longrightarrow$ (q)

(D) $7x - 3 \leq 11$

$7x \leq 11 + 3$

$7x \leq 14$

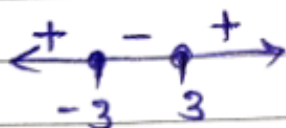$x \leq 2 \longrightarrow$ (P)

* Integer Answers Types

(17) $x^2 - 1 \leq 8$

Here, $x \in [k_1, k_2]$

$x^2 - 1 - 8 \leq 0$

$x^2 - 9 \leq 0$

$x^2 - 3^2 \leq 0$

$(x-3)(x+3) \leq 0$

$\therefore x \in [-3, 3]$, Here $k_1 = -3$, $k_2 = 3$
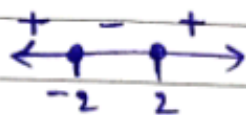
$\therefore k_1 + k_2 = -3 + 3$

$\boxed{k_1 + k_2 = 0}$ Ans

⑲ $x^2 - 1 \leqslant 3$

$x^2 - 4 \leqslant 0$

$(x-2)(x+2) \leqslant 0$

$$\overset{+}{\underset{-2}{\longleftarrow}} \quad \overset{-}{\underset{2}{\bullet}} \quad \overset{+}{\longrightarrow}$$

$x \in [-2, 2]$

we have given $x \in [k_1, k_2]$

$\therefore$ $\boxed{k_2 = 2}$ Ans

⑳

$|x-2| \leqslant 5$

C-I $x - 2 \leqslant 5$ C-II $x - 2 \geqslant -5$

$x \leqslant 7$ $x \geqslant -3$

$$\overset{}{\underset{-3}{\bullet}} \rule{1cm}{0.4pt} \overset{}{\underset{7}{\bullet}} \longrightarrow$$

$\therefore$ $x \in [-3, 7]$

So, maximum value of x is 7   Ans

㉑ $|x-3| \geqslant 6$

C-I $x - 3 \geqslant 6$ C-II $x - 3 \leqslant -6$

$x \geqslant 9$ $x \leqslant -3$

$$\therefore \quad x \in (-\infty, -3] \cup [9, \infty)$$

So, minimum +ve value of x is 9 Ans

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* Comprehension Type

$$|x-2| \leq 4$$

C-I $x-2 \leq 4$ C-II $x-2 \geq -4$

        $x \leq 6$ $x \geq -2$

$$\therefore \quad x \in [-2, 6]$$

(22)   Minimum value of $x \doteq -2$

(23)   Max^m value of x is 6

(24) $x \in [-2, 6]$