CHAPTER : LINEAR INEQUALITIES

← CLASS XIO=2 →

Ans. 1 Solve

(1) $-15 \leq \dfrac{3(x-2)}{5} < 6$ and show soln on number line.

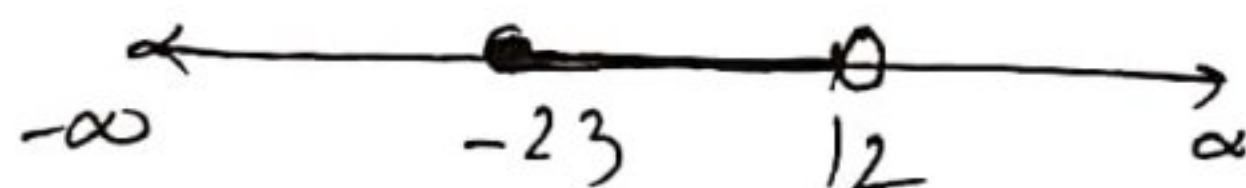(2) $2 < \dfrac{2-3x}{2} \leq 4$

Sol. (i) $-15 \leq \dfrac{3(x-2)}{5} < 6$

⇒ $-75 \leq 3(x-2) < 30$ --- (multiply by 5)

⇒ $-25 \leq x-2 < 10$ --- (divide by 3)

⇒ $-23 \leq x < 12$ --- (adding 2)

$x \in [-23, 12)$

(2) $2 < \dfrac{2-3x}{2} \leq 4$

⇒ $4 < 2-3x \leq 8$

⇒ $2 < -3x \leq 6$

⇒ $-\dfrac{2}{3} > x \geq -2$ (Sign change : Inp)

∴ $x \in [-2, -\dfrac{2}{3})$
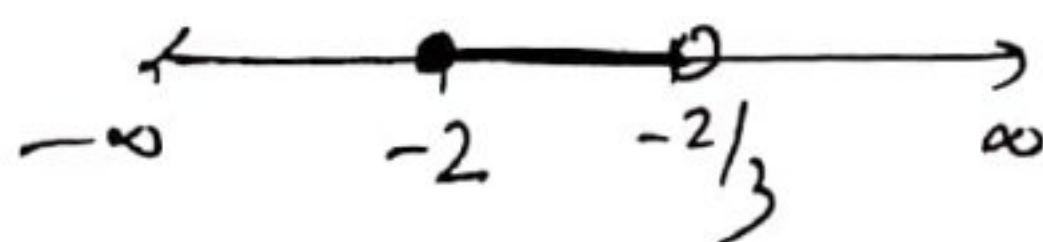
Qns 2 → Solve the inequalities and represent the solution on the number line.

$$5(2x-7) -3(2x+3) \leq 0 \quad ; \quad 2x+19 \leq 6x+47$$

Sol Consider

$$10x-35 -6x -9 \leq 0$$
$$4x -44 \leq 0$$
$$4x \leq 44$$
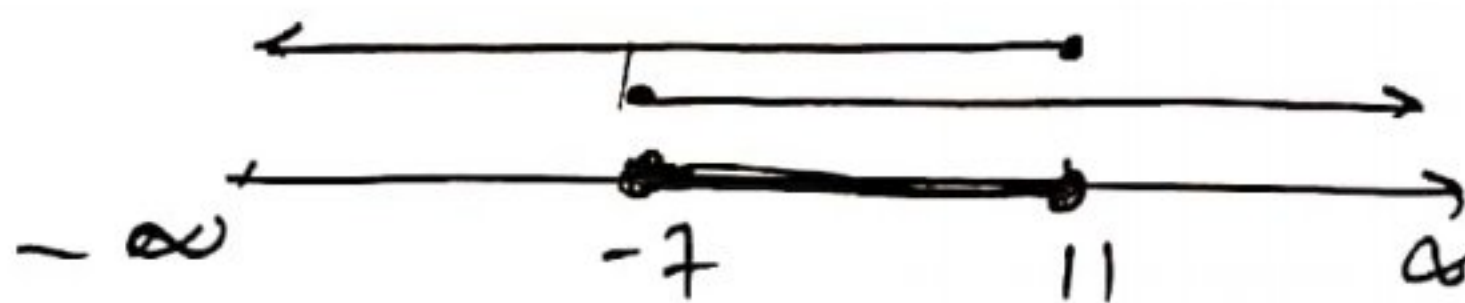$$x \leq 11 \quad \cdots ①$$
$$x \in (-\infty, 11]$$

Consider

$$2x+19 \leq 6x+47$$
$$\quad -4x \leq 28$$
$$\Rightarrow \quad x \geq -7 \quad \cdots ②$$
$$x \in [-7, \infty)$$

$$\therefore \quad x \in [-7, 11] \quad \underline{Ans}$$

WORD PROBLEMS →

Qn. 3 → find all pairs of Consecutive odd positive Integers both of which are smaller than 10, Such that their sum is more than 11

Soln let the nos are x & $(x+2)$

A.T.q $x < 10$ and $x+2 < 10$
            $x < 10$ and $x < 8$
        Consider $\boxed{x < 8}$ $\cdots (1)$

also

$$x + (x+2) > 11$$

$$2x > 9$$

$$x > \frac{9}{2} \quad \text{--②}$$

from (1) & (2)

$$\frac{9}{2} < x < 8$$

pairs $(5, 7), (7, 9)$ **Ans**

Qn. 4 → A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

Soln
=

600 l 12%	+	x l 30%	=	Resulting mixture (600+x) l 15% < Acid < 18%

Consider
=

$$\frac{12}{100} \times 600 + \frac{30}{100} \times x > \frac{15}{100}(600+x)$$

$$\Rightarrow 7200 + 30x > 9000 + 15x$$

$$\Rightarrow 15x > 1800$$

$$\Rightarrow \boxed{x > 120} \quad \text{--①}$$

again
=

$$\frac{12}{100} \times 600 + \frac{30}{100} \times x < \frac{18}{100} \times (600+x)$$

$$\Rightarrow 7200 + 30x < 10800 + 18x$$

$$\Rightarrow 12x < 3600$$

$$\Rightarrow \boxed{x < 300} \quad \text{--②}$$

from (1)(2)

$$120 < x < 300$$

∴ 30% acid solution must be more than 120 litры & less than 300 litrы **Ans**

Qn. 5 : A solution is to be kept between 68°F and 77°F. what is the range of temperature in degree celcius (c) if the celcius/fahrenheit (F) conversion formula is given by $F = \frac{9}{5}C + 32$?

Soln we have

$$68 < F < 77$$

$$\Rightarrow 68 < \frac{9}{5}C + 32 < 77$$

$$\Rightarrow 36 < \frac{9}{5}C < 45 \quad \cdots \left(\text{subtract } 32\right)$$

$$\Rightarrow 180 < 9C < 225 \quad \cdots \left(\text{multiply by } 5\right)$$

$$\Rightarrow 20 < C < 25 \quad \cdots \left(\text{divide by } 9\right)$$

∴ range of temp in Celcius is between 20°C and 25°C

Qn. 6 : A man wants to cut three lengths from a single piece of board of length 91 cm. The second length is to be 3cm longer than the shortest and the third length is to be twice as long as the shortest. what are the possible lengths of the shortest board if the third piece is to be at least 5cm longer than the second ?

Soln

let the shortest length = x cm

2nd length = $(x+3)$ cm

third length = $(2x)$ cm

$$x + (x+3) + (2x) \leq 91$$

$$\Rightarrow \quad 4x \leq 88$$

$$\Rightarrow \boxed{x \leq 22} - ①$$

ATQ

$$2x \geq (x+3) + 5$$

$$\Rightarrow \boxed{x \geq 8} - ②$$

from (1) & (2)

$$8 \leq x \leq 22$$

∴ Shortest length should be made than equal to 8 cm and less than equal to 22 cm **Ans**

Que 7 ✴ Solve $24x < 100$ when

(1) x is a natural number

(2) x is an integer

(3) x is a real number

Soln

$$24x < 100$$

$$x < \frac{100}{24}$$

$$x < \frac{25}{6}$$

(i) $x \in \{1, 2, 3, 4\}$

(2) $x \in \{\ldots -3, -2, -1, 0, 1, 2, 3, 4\}$

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

Ans 8 → Solve the inequalities and find common solution

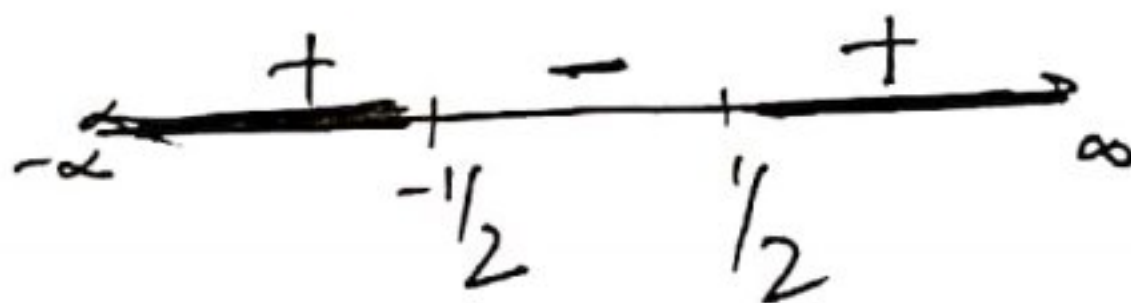$$\frac{x}{2x+1} \geq \frac{1}{4} \quad ; \quad \frac{6x}{4x-1} < \frac{1}{2}$$

Sol = ① $\dfrac{x}{2x+1} \geq \dfrac{1}{4}$

$\Rightarrow \dfrac{x}{2x+1} - \dfrac{1}{4} \geq 0$

$\Rightarrow \dfrac{4x - 2x - 1}{4(2x+1)} \geq 0$

$\Rightarrow \dfrac{2x-1}{2x+1} \geq 0$

$\boxed{2x+1 \neq 0 \\ x \neq -1/2}$

$x \in \left(-\infty, -\frac{1}{2}\right) \cup \left[\frac{1}{2}, \infty\right)$ ①

② $\dfrac{6x}{4x-1} < \dfrac{1}{2}$

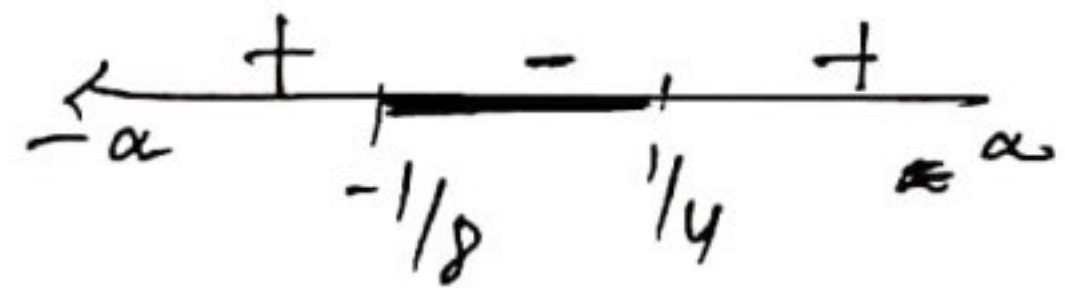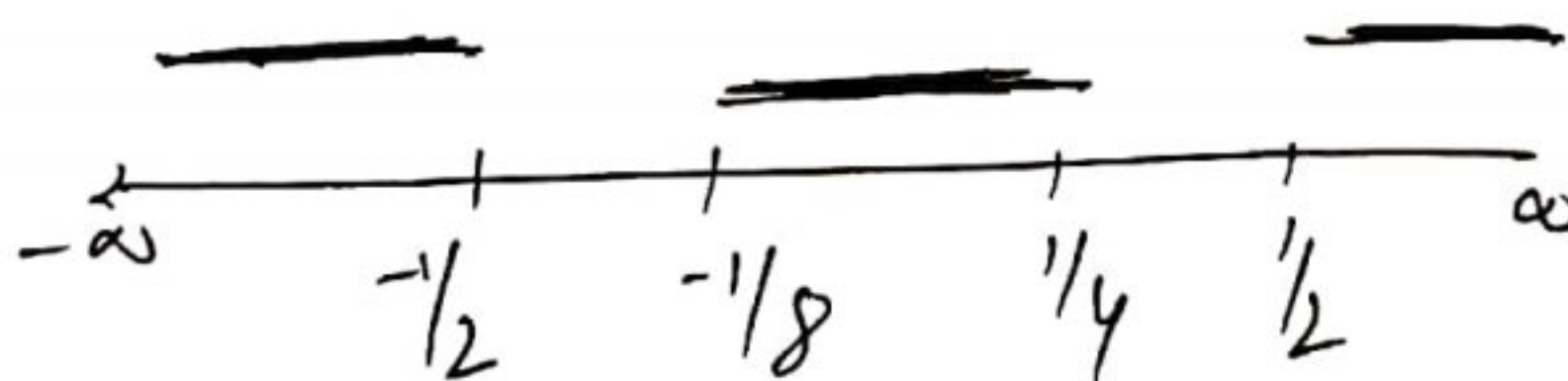$\Rightarrow \dfrac{6x}{4x-1} - \dfrac{1}{2} < 0$

$\Rightarrow \dfrac{12x - 4x + 1}{2(4x-1)} < 0$

$\Rightarrow \dfrac{8x+1}{4x-1} < 0$

$\boxed{4x-1 \neq 0 \\ x \neq 1/4}$

$x \in \left(-\frac{1}{8}, \frac{1}{4}\right)$ ②

∴ Clearly there is no common solution

∴ $x \in \phi$

QN. 1 → find all pairs of consecutive even positive integers, both of which are larger than 5 such that and their sum is less than 23

ANS $(6,8)$ $(8,10)$, $(10,12)$

QNS 2 → The longest side of a triangle is 3 times the shortest side and the third side is 2cm shorter than the longest side. If the perimeter of the triangle is atleast 61 cm. Find the minimum length of the shortest side. **AND.** 9cm

QNS 3 → Ravi obtained 70 and 75 marks in first two unit test. Find the minimum marks in 3rd test to have an average of atleast 60 marks.

Ans more than or equal to 35

QN 4 → In an experiment, a solution of hydrochloric acid is to be kept between 30° and 35° celcius. what is the range of temperature in degree Fahrenheit if conversion formula is given by $C = \frac{5}{9}(F - 32)$

ANS between 86°F and 95°F

QNS 5 → A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to more than

4% but less than 6% boric acid.

If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added?

Ans   more than 320 litres and less than 1280 litres

Qns 6 → How many litres of water will have to be added to 1125 litres of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content?

Ans   more than 562.5 litres and less than 900 litres

HINT   In water there is 0% acid

Qn. 7 → Solve $\dfrac{x-2}{x+5} > 2$ Ans (-12, -5)

Qns 8 → Solve $\dfrac{4}{x+3} \le 3 \le \dfrac{6}{x+1}$ Ans $\dfrac{1}{3} \le x \le 1$

HINT Consider seperately and then common solution

Qn. 9 → find the common solution of the inequalities

$2(2x+3) -10 < 6(x-2)$ and

$\dfrac{2x-3}{4} +6 \ge 2+\dfrac{4x}{3}$ Ans   No common solution

Qn 10 → Solve and find common solution

$\dfrac{5x+8}{4-x} < 2$ and $\dfrac{x-1}{x+3} > 2$ Ans $x \in (-7, -3)$

Qn 11 → Solve $5x-3 < 10$ when

(1) x is a natural no

(2) x is an Integer

(3) x is a real number

—✗—