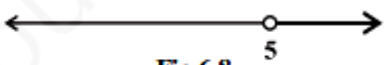
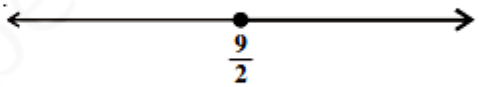
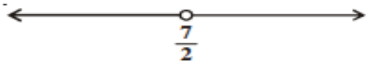
CHAPTER-6

LINEAR INEQUALITIES

03 MARK TYPE QUESTIONS

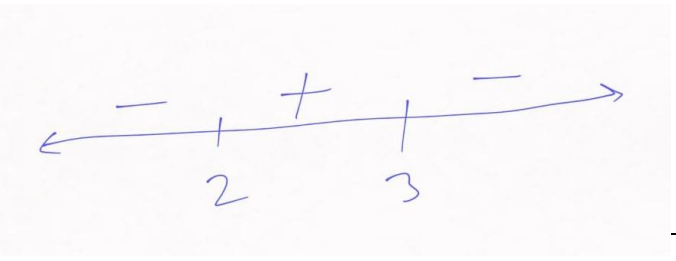
Q. NO	QUESTION	MARK
1.	A man wants to cut three lengths from a single piece of board of length 91 cm. The second length is to be 3 cm longer than the shortest and third length is to be twice as long as the shortest.  What are the possible lengths of the shortest board if the third piece is to be at least 5 cm longer than the second?	3
2.	A solution is to be kept between 68° F and 77° F. what is the range in temperature in degree Celsius (°C) if the Celsius/ Fahrenheit (F)conversion formula is given by F = (9/5) C + 32?	3
3.	The longest side of a triangle is 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm, find the minimum length of the shortest side.	3
4.	Rishi is aiming for a seat in prestigious institution which admits students scoring above 90% in class XII. Class XII marks are calculated in weightage system where each PA carry 10% weightage , half yearly marks carry 20% weightage and remaining weightage is that of final exam. Rishi got 46/50, 49/50 and 40/50 in three PA s and 96/100 in half yearly. How many minimum marks should he get out of 100 in his final exam to get admission in the institute.	3
5.	A sugar cane is 91 cm long. Three brothers shared it by cutting it into 3 pieces of different size. The second brother got 3 cm more cane than the smallest cane and the third cane is as twice as long as the shortest. What are the possible lengths of sugar cane if the third brother's piece us to be at least 5 cm longer than the second brother's piece.	3
6.	Arun a class XI student made tea for the first time. He added 50 grams of sugar in 1 litre of tea he made. Ideally one adds 4 grams to 6 grams for 200 ml. How much water should he add more so that the sweetness of his tea come to normal levels.	3
7.	 IQ of a person is given by the formula IQ = $\frac{MA}{CA} \times 100$, where MA is mental age and CA is chronological age. If $80 \leq IQ \leq 140$ for a group of 12 years old children find the range of their mental age.	3

8.	Solution of a linear inequality in variable x is represented on number line in the given parts 1 to 3 . Choose the correct answer from the given four options in each of the exercises (M.C.Q.). (A) $x \in (-\infty, 5)$ (B) $x \in (-\infty, 5]$ (C) $x \in [5, \infty,)$ (D) $x \in (5, \infty)$  Fig 6.8 (i) (ii) (A) $x \in (\frac{9}{2}, \infty)$ (B) $x \in [\frac{9}{2}, \infty)$ (D) $x \in [-\infty, \frac{9}{2})$ (D) $x \in (-\infty, \frac{9}{2}]$  Fig 6.9 (iii)  (A) $x \in (-\infty, \frac{7}{2})$ (B) $x \in (-\infty, \frac{7}{2}]$ (C) $x \in [\frac{7}{2}, -\infty)$ (D) $x \in (\frac{7}{2}, \infty)$	3
9.	 A man wants to cut three lengths from a single piece of board of length 91cm. The second length is to be 3cm longer than the shortest and the third length is to be twice as long as the shortest. (i) if x is the length of shortest piece .write the perimeter as inequality form. (ii) Use **part (i)** find the length of shortest piece as inequality form. (ii) What are the possible lengths of the shortest board if the third piece is to be at least 5cm longer than the second?	3
10.	Find the range of the values of $2+4\sin^2 x - \cos 2x$	3
11.	Find all possible integer values of x for $$\frac{1}{3-|x|} > 1$$	3
12.	Solve the system of inequalities graphically $$x + y \geq 4, x + y \leq 6, x \geq 0, y \geq 0$$ Write also name of the solution region.	3
13.		3

	The water acidity in a pool is consider normal when the average pH reading of three daily measurements is between 7.2 and 7.8.If the first two pH reading are 7.48 and 7.85,find the range of pH value for the third language reading that will result in the acidity being normal.	
14.	Solve $\|3x-2\| \leq 1/2$, $x \in R$?	**3**
15.	Solve $\|3 - 4x\| \geq 9$, $x \in R$?	**3**
16.	Solve $2\|x-3\|>5, x \epsilon R$?	**3**
17.	**Solve $-8 \leq 5x - 3 < 7$**	3
18.	**Solve for x:** **$3(x - 1) \leq 2(x - 3)$**	3
19.	**Solve: $(x - 2)/(x + 5) > 2$**	3

ANSWERS:

Q. NO	ANSWER	MARKS
1.	Let the length of the shortest piece of board be x cm. then the lengths of the second and third pieces are (x+3) and 2x cm respectively. $x + (x+3) + 2x \leq 91$ and $2x \geq (x+3) + 5$ or, $4x + 3 \leq 91$ and $x \geq 8$ Hence the shortest piece is greater than or equal to 8 but less than or equal to 22.	3
2.	Given F = (9/5) C + 32 68 < F 77 or 68 < F = (9/5) C + 32 < 77s or 36 < 9/5 C <45 or 20 < C < 25 The range of temperature in degree Celsius lies between 20^o C and 25^o C.	3
3.	Let the shortest side be x cm. According to question, Longest side is 3x cm and third side is (3x – 2) cm Perimeter of triangle ≥ 61 or $x + 3x + 3x – 2 \geq 61$ or $7x \geq 63$ or $x \geq 9$ Therefore, minimum length of the shortest side is 9 cm.	3
4.	Let the minimum marks in final exam be 'x'. PA marks weightage $\frac{46}{50}X10 + \frac{49}{50}\ X\ 10 + \frac{40}{50}X\ 10 = 27$ Half yearly weightage $\frac{96}{100}x20 = 19.2$ Remaining weightage 100-(10+10+10+20) = 50 Final exam weightage $\frac{x}{100}X\ 50$ Required percentage ≥90 $$27 + 19.2 + \frac{50x}{100} \geq 90$$ x> 87.36	3
5.	A sugar cane is 91 cm long. Three brothers shared it by cutting it into 3 pieces of different size. The second brother got 3 cm more cane than the smallest cane and the third cane is at least as twice as long as the shortest. What are the possible lengths of sugar cane if the third brother's piece us to be at least 5 cm longer than the second brother's piece.	3

	Let the smallest cane be x cm long . Second brother share =3+x Third cane ≥ 2x 2x ≥5 cm => x≥2.5 Total length = x+3+x+2x = 4x+3 4x+3≤91 => x ≤ 22 Solution shortest cane 2.5 ≤ x ≤ 22	
6.	Ideal sugar limit percentage per litre : 2% < y < 3% (per litre) Let us assume Arun needs to add 'x' litre of water (1+ x) 2 % < 5 % of 1 litre < (1+x) 3% X < 1.5 and x> 2/3 so 1.5<x<1.6	3
7.	$9.6 \leq MA \leq 16.8$	3
8.	(i) (A) and (D) Both (ii) (B) and (D) Both (iii) (A) and (D) Both	3
9.	(i) $4x+3 \leq 91$ (ii) $X \leq 22$ (iii) $8 \leq x \leq 22$	3
10.	$2+4\sin^2 x - \cos 2x$ $= 2 + 2(1 - \cos 2x) - \cos 2x$ $= 2 + 2 - 2\cos 2x - \cos 2x$ $= 4 - 3\cos 2x$ Now, $-1 \leq cos2x \leq 1 \; for \; all \; x \in \boldsymbol{R}$ $\Rightarrow -3 \leq -3cos2x \leq 3$ $\Rightarrow 4 - 3 \leq 4 - 3cos2x \leq 3 + 4$ $\Rightarrow 1 \leq -3cos2x \leq 7$ ∴ range is [1,7]	3
11.	$\frac{1}{3-\lvert x\rvert} > 1$ $\Rightarrow \frac{1}{3-\lvert x\rvert} - 1 > 0$ $\Rightarrow \frac{-2+\lvert x\rvert}{3-\lvert x\rvert} > 0$ Let y = |x| $\Rightarrow \frac{-2+y}{3-y} > 0$ $\Rightarrow y \in (2,3)$ $\Rightarrow 2<y<3$ 	3

	$\Rightarrow 2<\|x\|<3$ $\Rightarrow 2<x<3$ (if $x\geq 0$) or $2<-x<3$ (if $x \leq 0$) $\Rightarrow x\in (2,3)\ or\ x \in (-2,-3)$ $\Rightarrow x\in (-2,-3)U(2,3)$ Therefore, x has no integer solution	
12.	For $x+y\geq 4$ X +y= 4 $\Rightarrow \frac{x}{4}+\frac{y}{4}=1$ For $x+y\leq 6$ x + y = 6 $\Rightarrow \frac{x}{6}+\frac{y}{6}=1$ $x\geq 0\ and\ y\geq 0$ represents first quadrant. Name of the solution region ABCD is isosceles trapezium.  	3
13.	Between 6.27 and 8.07	3
14.	We have, |x| <= a - a <= x <= a |3x-2|<= 1 2 Left right arrow - 1/2 <= 3x - 2 <= 1/2 - 1/2 <= 3x - 2 and 3x - 2 <= 1/2 Right arrow 1/2 + 2 <= 3xand * 3x <= 1/2 + 2 3/2 <= 3x and 3x <= 5/2 1 1/2 <= x and x <= 5/6 1/2 <= x <= 5/6 solution set = \ x in R : (1/2) <= x <= 5/6 \ =[1 2 , 5 6]..	
15.	We have, |x| >= a x <= - a or x >= a |3 - 4x| >= 9 3 - 4x <= - 9 or 3 - 4x >= 9 - 4x <= - 9 - 3 or - 4x >= 9 - 3 - 4x <= - 12 or - 4x >= 6 → x >= 3 or x <= - 3/2 → x <= - 3/2 or x >= 3	

	x in $(-\infty, -3/2)$ or x in $[3, \infty)$ solution set= $(-\infty, -3/2)$ ([3,00),	
16.	Clearly, x -3 ne0 and therefore, x ne3 We have. $2/\|x - 3\| > 5$ Since $\|x - 3\|$ is positive, we may multiply both sides of (1) by $\|x - 3\|$ This gives $2 > 5\|x - 3\|$ $2/5 > \|x - 3\|$ < $\|x - 3\|$ < 2/5 - 2/5 < x - 3 < 2/5 [Ix| <a-a<x<a	
17.	**Solution:** Given, $-8 \leq 5x - 3$ and $5x - 3 < 7$ Let us solve these two inequalities simultaneously. $-8 \leq 5x - 3$ and $5x - 3 < 7$ can be written as: $-8 \leq 5x - 3 < 7$ Adding 3, we get $-8 + 3 \leq 5x - 3 + 3 < 7 + 3$ $-5 \leq 5x < 10$ Dividing by 5, we get $-1 \leq x < 2$	3
18.	**Solution:** Given, $3(x - 1) \leq 2(x - 3)$ The above inequality can be written as,	3

	$3x - 3 \leq 2x - 6$ Adding 3 to both the sides, we get; $3x - 3 + 3 \leq 2x - 6 + 3$ $3x \leq 2x - 3$ Subtracting 2x from both the sides, $3x - 2x \leq 2x - 3 - 2x$ $x \leq -3$ Therefore, the solutions to the given inequality are defined by all the real numbers less than or equal to -3. Hence, the required solution set for x is $(-\infty, -3]$.	
19.	**Solution:** $(x - 2)/(x + 5) > 2$ Subtracting 2 from both sides, we get; $(x - 2)/(x + 5) - 2 > 0$ $[(x - 2) - 2(x + 5)]/ (x + 5) > 0$ $(x - 2 - 2x - 10)/(x + 5) > 0$ $-(x + 12)/(x + 5) > 0$ Multiplying -1 on both sides, we get; $(x + 12)/(x + 5) < 0$ $\Rightarrow x + 12 < 0$ and $x + 5 > 0$ (or) $x + 12 > 0$ and $x + 5 < 0$ $\Rightarrow x < -12$ and $x > -5$ (or) $x > -12$ and $x < -5$ $\Rightarrow -12 < x < -5$ Therefore, $x \in (-12, -5)$.	3