

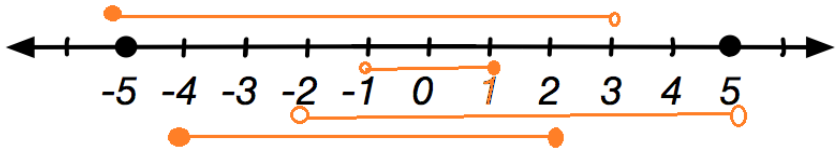

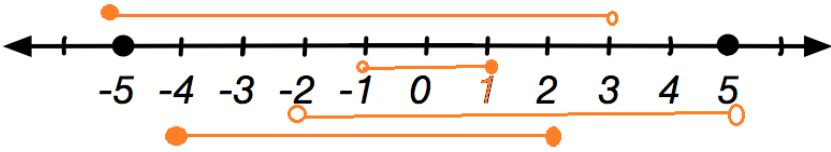


CHAPTER-6
LINEAR INEQUALITIES
05 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	<p>In drilling world's deepest hole it was found that the temperature T in degree Celsius, x km below the earth's surface was given by $T = 30 + 25(x-3)$, $3 \leq x \leq 15$.</p>  <p>At what depth will the temperature be between 155°C and 205°C.</p>	5
2.	<p>Suppose we have been given 200 litres of 10% concentrated H_2SO_4 acid. How many litres of 30% conc. H_2SO_4 acid should be added so that the concentration of the resulting acid should be more than 15% but less than 20%?</p> 	5
3.	<p>In an experiment a thermometer only Fahrenheit measurements are shown . Using it a solution of hydrochloric acid is measured which is to be kept between 30° and 35° Celsius. What is the range of temperature in degree Fahrenheit if conversion formula is Given by $C = \frac{5}{9}(F - 32)$, Where C and F represent and degree Celsius and degree Fahrenheit respectively</p>	5
4.	<p>The given real number line is marked with different inequalities regarding a problem. Find all the inequalities and the solution</p> 	5
5.	<p>A company produced cassettes; one cassette costs the company `30 and also an additional fixed cost of `26000 per week. The company sold each cassette at `43. Let x be the number of cassettes produced and sold by the company in a week. From the above information, answer the following questions.</p> <ol style="list-style-type: none"> (i) Find the cost function of the company. (ii) Find the revenue function of the company. (iii) Find the profit function of the company. (iv) How many cassettes must be produced by the company in a week to realize some profit? <p>If company incurred an additional cost of `3 on each cassette per week, then how many cassettes must be produced by the company in a week so that there is no profit no loss?</p>	5

6.	Solve $\frac{1}{x} - \frac{1}{x+2} \geq 1, x \neq -2, 0$ where x is real number	5
7.	<p>Salman is a taxi driver and he has a taxi. Salman has to spend Rs 16 per km on diesel if he rides his taxi at 30 km per hour and the cost on diesel rises to Rs 20 per km if his taxi at 45 km per hour.</p>  <p>He has Rs 200 to spend on diesel and desires to travel maximum distance within 2 hours. Formulate the given data in the form of inequations and show graphically the region representing the solution of the inequations.</p>	5
8.	A manufacture has 460 litres of a 9% acid solution. How many litres of a 3% acid solution must be added to it so that the acid content in the resulting mixture be more than 5% but less than 7% ?	5
9.	<p>Solve the system of inequations:</p> $6x/4x-1 < 1/2, x/2x+1 \geq 1/4.$	5
10.	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.	5
11.	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 the acid content in the resulting mixture will be more than 15% but less than 18%?	5

ANSWERS:

Q. NO	ANSWER	MARKS
1.	$T = 30 + 25(x-3), 3 \leq x \leq 15$ $155 < T < 205$ $\Rightarrow 155 < 30 + 25(x-3) < 205$ $\Rightarrow 8 < x < 10$ Hence, at the depth 8 to 10 km temperature lies between 155° C and 205°C.	5
2.	Let x litres of 30% conc. H ₂ SO ₄ acid solution is required to be added. Then Total mixture = (x + 200) litres. Therefore 30% x + 10% of 200 > 15% of (x + 200) and $30\% x + 10\% \text{ of } 200 < 20\% \text{ of } (x + 200)$ $15 < \frac{(20 + \frac{30}{100}x)100}{200+x} < 20$ or $15 < \frac{2000+30x}{200+x} < 20$ or $3000+15x < 2000+30x < 4000+ 20x$ or $3000+15x < 2000+30x$ and $2000+30x < 4000+ 20x$ or $\frac{200}{3} < x$ and $x < 200$ or $\frac{200}{3} < x < 200$	5
3.	$30 < \frac{5}{9}(F - 32) < 35$ $54 < F-32 < 63$ $86 < F < 95$	5
4.	 <p style="margin-left: 40px;"> $-5 \leq x \leq 3$ $-1 < x \leq 1$ $-2 < x < 5$ $-4 \leq x \leq 2$ </p> <p style="margin-left: 40px;">Solution region $-1 < x \leq 1$</p>	5
5.	(i) $C(x)=26000+30x$ (ii) $R(x)=43x$ (iii) $P(x)=13x-26000$ (iv) $x > 2000$ (v) $x=2600$	5
6.	$\frac{1}{x} - \frac{1}{x+2} \geq 1$ $\Rightarrow \frac{x+2-x}{x(x+2)} \geq 1$	5

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

$$\Rightarrow \frac{2-x(x+2)}{x(x+2)} \geq 0$$

$$\Rightarrow \frac{2-x^2-2x}{x(x+2)} \geq 0$$

$$\Rightarrow \frac{x^2+2x-2}{x(x+2)} \leq 0$$

$$\Rightarrow \frac{x^2+2x+1-3}{x(x+2)} \leq 0$$

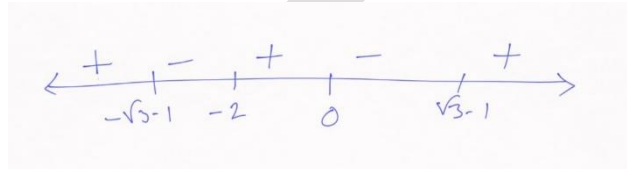
$$\Rightarrow \frac{(x+1)^2-3}{x(x+2)} \leq 0$$

$$\Rightarrow \frac{(x+1)^2-(\sqrt{3})^2}{x(x+2)} \leq 0$$

$$\Rightarrow \frac{(x+\sqrt{3}+1)(x-\sqrt{3}+1)}{x(x+2)} \leq 0$$

$$\Rightarrow \frac{\{x-(-\sqrt{3}-1)\}\{x-(\sqrt{3}-1)\}}{x(x+2)} \leq 0$$

$$\Rightarrow x \in [-\sqrt{3}-1, -2) \cup (0, \sqrt{3}-1]$$



7. Let x km and y km be the distances travelled with speed 30 km/hr and 45 km/hr respectively.

Cost for travelled x km = $16x$

Cost for travelled y km = $20y$

Because he has 200 rupees

$$\therefore 16x + 20y \leq 200$$

$$\Rightarrow 4x + 5y \leq 50$$

Time taken to cover x km = $x/30$ hours

Time taken to cover y km = $y/45$ hours

He has reach within 2 hours,

$$\therefore \frac{x}{30} + \frac{y}{45} \leq 2$$

$$\Rightarrow 3x + 2y \leq 180$$

Distance can not be negative

$$\therefore x \geq 0 \text{ and } y \geq 0$$

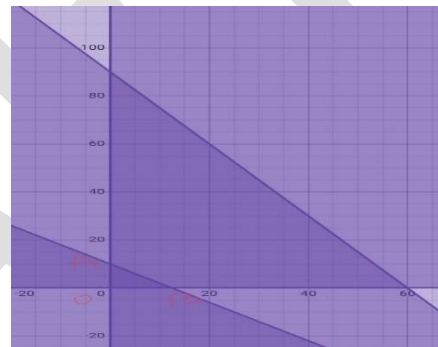
Hence

$$4x + 5y \leq 50$$

$$3x + 2y \leq 180$$

$$x \geq 0, y \geq 0$$

solution region is triangle OAB.



5

8. Let x litres of a 3% acid solution be added to 460 litres of 9% acid solution. Then,

total quantity of mixture = $(460 + x)$ litres

Total acid content in $(460 + x)$ litres of mixture = $\{(460 * 9/100) + (x * 3/100)\} * \text{litres} = (207/5 + (3x)/100) * \text{litres} .$

Now, the acid content in the resulting mixture must be more than 5% and less than 7%.

$$5\% * \text{oof}(460 + x) < (207/5 + (3x)/100) < 7\% * \text{oof}(460 + x) \quad 5/100 * (460 + x) <$$

	<p> $(4140 + 3x)/100 < 7/100 * (460 + x)$ $5(460 + x) < 4140 + 3x < 7(460 + x)$ $2300 + 5x < 4140 + 3x < 3220 + 7x$ $2300 + 5x < 4140 + 3x$ and $4140 + 3x < 3220 + 7x$ $5x - 3x < 4140 - 2300$ and $4140 - 3220 < 7x - 3x$ $2x < 1840$ and $920 < 4x$ $x < 920$ and $* 230 < x$ $230 < x < 920$ Hence, the required quantity of 3% acid solution to be added must be more than 230 litres and less than 920 litres. </p>	
<p>9.</p>	<p> The first inequation of the given system is $(6x)/(4x - 1) < 1/2$ $(6x)/(4x - 1) - 1/2 < 0$ $(12x - 4x + 1)/(2(4x - 1)) < 0$ $(8x + 1)/(2(4x - 1)) < 0$ Right arrow $8x+1 < 0$ and $4x-1 > 0$. $(8x + 1 > 0$ and $4x - 1 < 0)$ or $(8x + 1 < 0$ and $4x - 1 > 0$ $(8x > -1$ and $4x < 1)$ or $(8x < -1$ and $4x > 1)$ $(x > -1/8$ and $x < 1/4)$ or $(x < -1/8$ and $x > 1/4)$ $-1/8 < x < 1/4$ x in $(-1/8, 1/4)$ $x < -1/8$ and $x > 1/4$ is not possible and second inequation of the given system is $x/(2x + 1) \geq 1/4$ $x/(2x + 1) - 1/4 \geq 0$ $(4x - 2x - 1)/(4(2x + 1)) \geq 0$ Right arrow $2x-1 \geq 0$ and $2x+1 > 0$ $(2x - 1 \leq 0$ and $2x + 1 < 0)$ or $(2x - 1 \geq 0$ and $2x + 1 > 0)$ $(2x \leq 1$ and $2x < -1)$ or $(2x \geq 1$ and $2x > -1)$ $(x \leq 1/2)$ and $x < -1/2)$ or $(x \geq 1/2)$ and $x > -1/2)$ $(x < -1/2)$ * or $(x \geq 1/2)$ </p>	

	<p>$x \text{ in } (-\infty, -1/2) \text{ or } x \text{ in } [1/2, \infty)$</p> <p>$x \text{ in } (-\infty, -1/2) \cup [1/2, \infty)$</p> <p>Solution set = $(-1/8, 1/4) \cap (-\infty, -1/2) \cup [1/2, \infty) = \phi$</p> <p>e, the given system of inequations has no solution.</p>	
10.	<p>Solution:</p> <p>Let x cm be the length of the shortest side of the triangle.</p> <p>\therefore According to the question, length of the longest side = $3x$ cm</p> <p>Length of the third side = $(3x - 2)$ cm</p> <p>The least perimeter of the triangle = 61 cm (given)</p> <p>Thus, $x + 3x + (3x - 2)$ cm ≥ 61 cm</p> $= 7x - 2 \geq 61$ $= 7x \geq 63$ <p>Dividing by 7 on both sides, we get;</p> $= 7x/7 \geq 63/7$ $= x \geq 9$ <p>Hence, the minimum length of the shortest side will be 9 cm.</p>	5
11.	<p>Solution:</p> <p>Let x litres of 30% acid solution be required to be added.</p> <p>Total mixture = $(x + 600)$ litres</p> <p>Thus, $30\% x + 12\% \text{ of } 600 > 15\% \text{ of } (x + 600)$</p> <p>and</p> $30\% x + 12\% \text{ of } 600 < 18\% \text{ of } (x + 600)$ $\Rightarrow (30x/100) + (12/100) \times (600) > (15/100) (x + 600)$ <p>And</p>	5

$$(30x/100) + (12/100) \times (600) < (18/100) (x + 600)$$

$$\Rightarrow 30x + 7200 > 15x + 9000 \text{ and } 30x + 7200 < 18x + 10800$$

$$\Rightarrow 15x > 1800 \text{ and } 12x < 3600$$

$$\Rightarrow x > 120 \text{ and } x < 300,$$

$$\text{i.e., } 120 < x < 300$$

Hence, the number of litres of the 30% acid solution will have to be more than 120 litres but less than 300 litres.

DRAFT