



# MATHS

# BOOKS - CHHAYA PUBLICATION MATHS (BENGALI ENGLISH)

# LINEAR INEQUATIONS



**1.** Sove:  $3x-7\leq 5$ , when

 $x \in N$ 

In each case represent the solution set on real numbers

line.





**2.** Sove:  $3x-7\leq 5$ , when

 $x \in Z$ 

In each case represent the solution set on real numbers

line.

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**3.** Sove:  $3x - 7 \leq 5$ , when

 $x \in R$ 

In each case represent the solution set on real numbers

line.

4. Solve and show the solution set on the real number

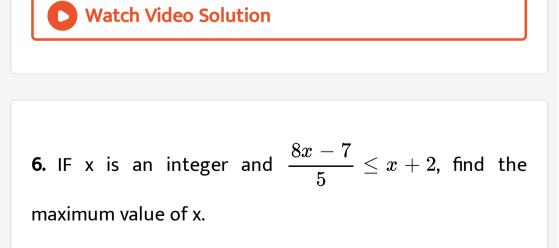
line:

 $3(3x+2)-12 \leq 11x-2$ 

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5. Solve the inequations  $3(x-5) < 5x-7 \leq 3(x+1)$ 

and show their graphical presentation.





7. IF  $\{x \in R : x > 0\}$ , find the solution set of the inequation  $\frac{7}{2x} - \frac{5}{7} > \frac{5}{3x} - \frac{2}{3}$ . Also represent the

solution set on the real number line.

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8. Solve the inequation 
$$rac{5x}{2}-5 \geq rac{19-3x}{4}$$
. Also

represent solution set of the inequation on real number

line.



**9.** Solve the inequation  $10+rac{11}{4}x\leq 5x+1$  when

 $x \in N$ 

In each case, represent the solution set on real number

line.

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10. Solve the inequation  $10 + rac{11}{4}x \leq 5x + 1$  when

 $x \in Z$ 

In each case, represent the solution set on real number

line.

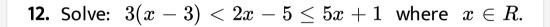
11. Solve the inequation  $10+rac{11}{4}x\leq 5x+1$  when

 $x \in R$ 

In each case, represent the solution set on real number

line.

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Also represent the solution set on real number line.



13. Solve: 
$$3x+2>x-rac{5-x}{2}>2$$
 where  $x\in R.$ 

14. Solve: 
$$rac{x-4}{x+3}>0$$
 (Where  $x\in R$  and  $x
eq 5$ ) and

represent the solution set on real number line.

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15. Solve: 
$$\displaystyle rac{x+2}{x-5} < 0$$
 ( Where  $x \in R$  and  $x 
eq 5$ ) and

represent the solution set on real number line.

16. Solve: 
$$\displaystyle rac{4}{x-3}>2$$
 ( where  $x\in R$  and  $x
eq 3$ ), represent the solution set on real number line.

17. Solve the following system of inequation :

$$rac{2x-1}{5x+2}\geq rac{1}{3}$$
and  $rac{x}{4x+1}\leq rac{1}{2}$ , where  $x\in R$  and  $x
eq rac{2}{5}, x
eq -rac{1}{4}$ 

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**18.** Represent the solution set of the following system of inequation on real number line and hence find their common solution set.

$$3(3x-2)>2(x+2)$$
and  $x-rac{x-4}{3}>3$  when  $x\in R.$ 

19. Show that the solution set of the following system of

inequations is the interval (2,4).

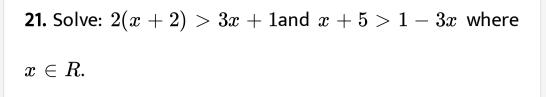
x-5 < 7-2xand  $3-4x \leq x-7$  where  $x \in R$ .

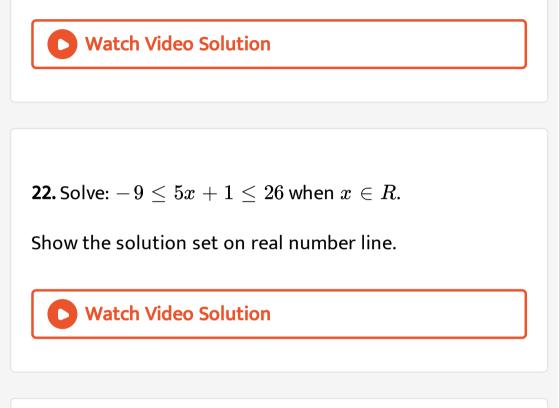
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20. Prove that the following system of inequations has no

solution .

$$rac{x}{2}-rac{15}{4}\geq x-rac{21-x}{3}$$
 and  $3x+4>2x+9$  where  $x\in R.$ 





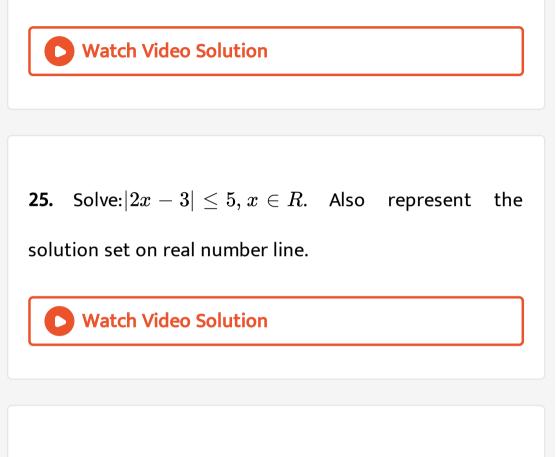
**23.** Solve:  $|x| \leq 3$  and represent the solution set on real

number line.



**24.** Solve: $|x| \ge 3$  and represent the solution set on real

number line.



**26.** Solve: $|x+2|\geq 3$  where  $x\in R$  . Also represent the

solution set on real number line.

27. Solve: 
$$\frac{3}{|x+1|} > 4$$
 where  $x \in R$  and  $x \neq -1$ .  
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28. Solve:  $1 \le |x+2| \le 4$  where  $x \in R$ .  
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29. Solve: 
$$rac{|x|-2}{|x|-3} \geq 0 \ x \in R$$
 and  $x 
eq 3.$ 

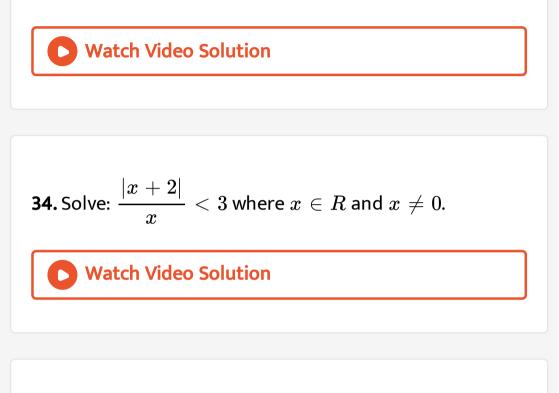
**30.** Solve the following system of inequations:

$$|x| \geq 3$$
and  $|x-2| \leq 6$ 

**31.** Solve: 
$$rac{2}{|x|-3} \leq rac{1}{2}$$
 where  $x \in R$  and  $x 
eq \pm 3$ .

**32.** Solve: 
$$rac{|x+1|+2x+3}{x+3} > 2, x \in R$$
 and  $x 
eq -3.$ 

33. Solve: 
$$|x-1|+|x-2|+|x-3|\geq 6$$
 where  $x\in R.$ 



**35.** Let x and x+2 be two consecutive even positive integers, such that x > 12 and the sum of the integers is less than 39. Find all possible pairs of such integers.

**36.** Find all possible pairs of consecutive odd natural numbers such that each of them is smaller than 20 and their sum is greater than 32.



**37.** The formula of IQ of a person is given below:

$$IQ = rac{m}{c} imes 100$$

where m is mental age and c is chronological age. If  $80 \le IQ \le 140$  for a group of 12-year children, find the range of their mental age.

**38.** A manufacture's cost function C(x) and revenue function R(x) of x units of a product are respectively given by

C(x)=3x+250andR(x)=8x+30

Find the number of products the manufacture must sell to earn some profit.

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**39.** To obtain grade  $A^+$  is an examination a student must score an average of 90 marks or moe in five papers each of 100 marks. IF his marks in first four papers be 87, 89, 95,90, then find the minimum marks the should score in fifth paper is he wants to achieve grade  $A^+$ .



**40.** The temperation of a valuable medicine solution is to be kept between  $77^{\circ}$ F and  $104^{\circ}$ F. Find the range of temperature in degree Celcius, given that the conversion formula of Celcius (C )and Fahrenheit (F) is

$$\frac{C}{5} = \frac{F - 32}{9}$$



**41.** 1050 litres of an acid solution 40% acid. Find the range of water in litres to be added with this acid solution of water in litres so that the resulting mixure will have more than 25% but less than 35% acid.



**42.** Suppose that sum divided among three boys does not exceed Rs.87. The second boy gets Rs.7 more than the first and the third boy receives twice the sum received by the first. If the third boy receives at least Rs.8 more than the second boy , then find the possible amount received by the first boy.



**43.** Solve the following inequations graphically in xy-plane:

 $2x-5\geq 0$ 





45. Solve the following inequations graphically in xyplane: 4x + 8 > 0

**46.** Solve the following inequations graphically in xy-plane:

 $2y+7\leq 0$ 

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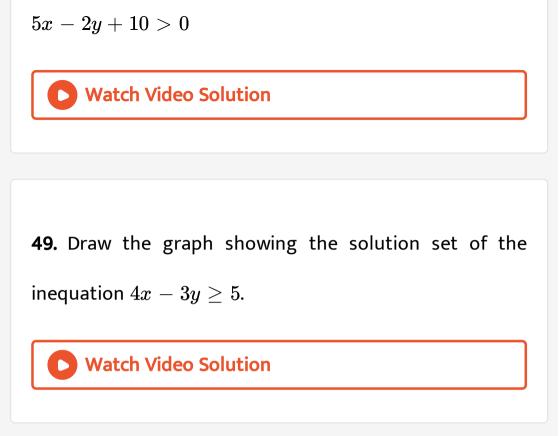
**47.** Draw the graphs of solutions sets of the following inequations:

 $x+2y-3\leq 0$ 



48. Draw the graphs of solutions sets of the following

inequations:



**50.** Exhibit graphically the solution set of the following system of inequations:

 $6x+5y\leq 30, x\geq 1$  and  $y\leq 2$ 

51. Find graphically the solution set of the following

linear inequations:

$$2x+5y\leq 40, x+y\leq 11, x\geq 0, y\geq 0$$



52. Exhibit graphically the solution set of the following

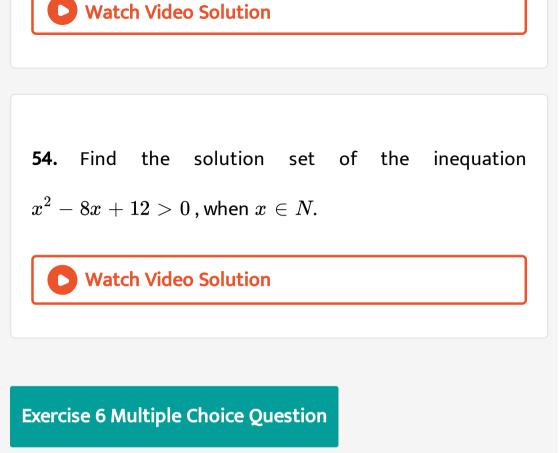
system of linear inequations:

 $x-2y\leq 2, x+y\geq 3, \ -2x+y\leq 4, x\geq 0, y\geq 0$ 

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**53.** IF x and y are positive integers or zero, find the solution set of the inequation  $3x + 4y \le 6$ .





1. IF  $x \in N$  and -5 < 2x - 7 < 1, then the values of x

is-

A. 
$$2 \leq x \leq 4$$

 $\mathsf{B.2} \leq x < 4$ 

 $\mathsf{C.}\, 2 < x \, \leq 4$ 

D. 2 and 3

Answer: D

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2. IF x is an integer which is a perfect square and  $7 \leq 2x - 3 < 17$ , then x is-

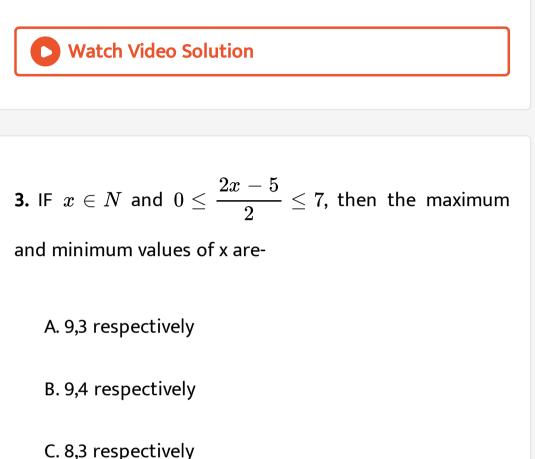
A. 9

B.4

C. 16

D. 25

#### Answer: A



D. none of these

Answer: A



**4.** IF x is an integer, then the solution set of the inequation  $-x^2 + 7x - 6 > 0$  is-

A. {2,4}

B. {3,5}

C. {2,3,4,5}

D. {4,5}

Answer: C



5. Solution set of the inequation  $\frac{2x+5}{7} > \frac{x+3}{4}$  (where x < 5 is an integer) is-

A. {2,3,4}

B. {1,3,4}

C. {1,2,3}

D. {1,2,3,4}

Answer: A



**6.** Solution set of the inequation  $-2 \leq rac{3x-1}{2} \leq 1$  (

where  $x \in Z$ ) is-

A. {1,2,-1}

B. {1,0,-3}

C. {-1,0,1}

D. {1,-1,0}

Answer: C

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7. If x-y=3 and  $x+y \geq 9$  then the minimum value of x is-

A. 2

B. 4

C. 5

D. 6

#### Answer: D

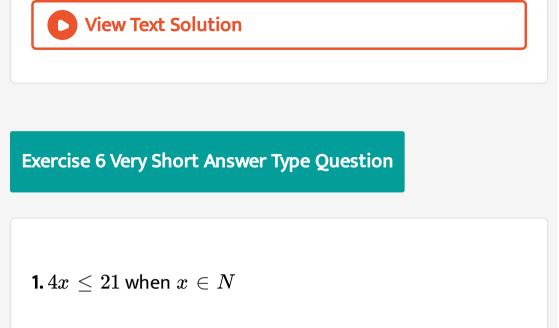


8. If x and y are positive integers, the the solution sets of

the inequations  $x \leq 3, y \leq 2$  and  $5x + 6y \leq 21$  are-



Answer: B



**2.** 
$$4x \leq 21$$
 when  $x \in Z$ 

3. 
$$rac{5}{6}x+9\leq 2(x+1)$$
when  $x\in N$ 



4. 
$$rac{5}{6}x+9\leq 2(x+1)$$
when  $x\in R$ 

5. 
$$\displaystyle rac{2x+3}{4}+2\leq rac{1}{4}+rac{4x}{3}, x\in R$$

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$$\mathbf{6.}\,rac{x}{4}+rac{2-5x}{3}<rac{3-7x}{5},x\in R$$

7. 
$$2x+3\leq 4(x-2), x\in R$$

$$\mathbf{8.}\,rac{3}{2x}+rac{1}{3}\geqrac{2}{3x}+rac{1}{2}(x>0),x\in R$$

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9. 
$$rac{1}{3}(8x-5) \leq rac{1}{2}(5x-2), x \in R$$

10. 
$$rac{3x}{4}-rac{4x-3}{5}>1, x\in R$$



11. 
$$0<rac{2x-5}{2}<7, x\in R$$

12. 
$$5(x-1) \leq 7x+1 < 8, x \in R$$

C

0

13. 
$$7-rac{x}{4}\geq 2(x+2), x\in R$$

14. 
$$rac{x-2}{3} \leq rac{x+1}{4}, x \in R$$

15. 
$$rac{1}{x+2} \leq 0$$

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16. 
$$\displaystylerac{1}{2x-1}>0, x\in R$$

17. 
$$rac{x+3}{x+4} > 1, x \in R$$



18. 
$$rac{x-1}{x-4} > 0 (x 
eq 4), x \in R$$

19. 
$$rac{x-1}{x+4} \geq 3, x 
eq -4$$
 and  $x \in R$ 

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20. 
$$rac{3x+5}{x+2} \geq 4, x 
eq -2$$
and  $x \in R$ 

21. 
$$\displaystyle rac{5}{x-1} > 2, x 
eq 1$$
 and  $x \in R$ 

22. 
$$rac{2x-3}{3x-2}>0, x
eq rac{2}{3}$$
and  $x\in R$ 

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23. 
$$rac{4(x+3)}{4-x} \leq 3, x 
eq 4$$
and  $x \in R$ 

24. 
$$rac{x}{x-4} > rac{1}{3}, x 
eq 4$$
 and  $x \in R$ 



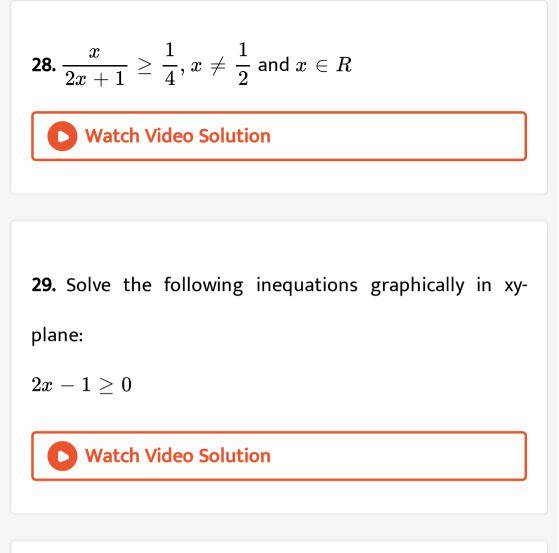
25. 
$$rac{x+3}{x-1} \leq rac{1}{2}, x 
eq 1$$
 and  $x \in R$ 

26. 
$$rac{x+1}{3} \leq rac{2x-1}{4}, x \in R$$

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27. 
$$rac{2x+5}{x+3} \geq 1, x 
eq -3$$
 and  $x \in R$ 

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**30.** Solve the following inequations graphically in xyplane:

 $2y+1\geq 0$ 



**31.** Solve the following inequations graphically in xy-plane:

x+4>0



**32.** Solve the following inequations graphically in xy-plane:

y-3>0

**33.** Solve the following inequations graphically in xy-plane:

 $x-2\leq 0$ 

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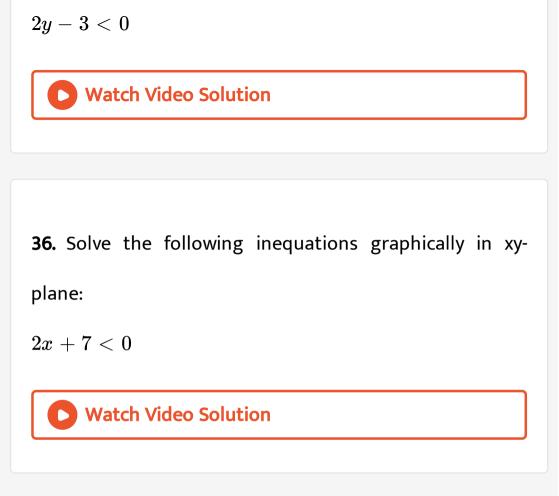
**34.** Solve the following inequations graphically in xy-plane:

 $y+2\leq 0$ 



35. Solve the following inequations graphically in xy-

plane:



37. In each of the following problems find the solution set

of the given system of inequations:

$$3(1-2x)>7x+29$$
 and  $rac{12-5x}{6}<rac{78-x}{12}, x\in R$ 

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38. In each of the following problems find the solution set

of the given system of inequations:

 $rac{3x+36}{10} \geq rac{50-x}{7}$  and  $3(2x+5) \leq 5x+18, x \in R$ 

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**39.** In each of the following problems find the solution set

of the given system of inequations:

$$rac{10x}{9} - rac{4x-1}{7} > rac{3x-2}{5}$$
 and  $rac{2(x-1)}{5} - 4x > rac{1-3x}{2} - 24, x \in R$ 

40. In each of the following problems find the solution

set of the given system of inequations:

$$rac{x-1}{2}>x-4$$
 and  $rac{x+1}{2}>rac{x+3}{5}, x\in R$ 

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**41.** In each of the following problems find the solution set

of the given system of inequations:

$$5(7x+5) < 163 + 6(5x+2)$$
 and

 $9x-5>2(x+6), x\in R$ 

**42.** In each of the following problems find the solution set of the given system of inequations:

$$-10\leq 3x-4\leq x+2, x\in R$$

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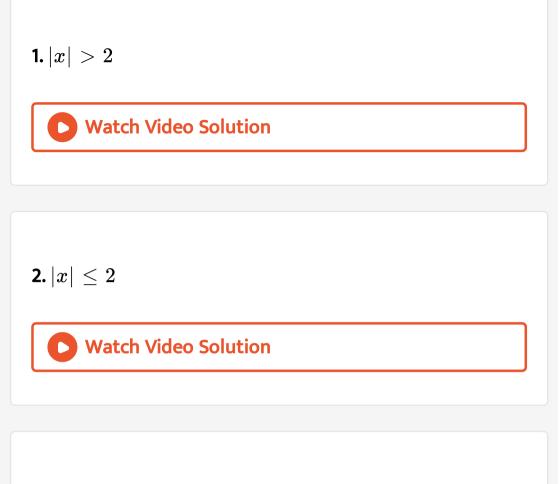
43. In each of the following problems find the solution set

of the given system of inequations:

$$-8\leq 4(x+1)\leq 7, x\in R$$

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**Exercise 6 Short Answer Type Question** 



3. 
$$|2x-3|\leq 1$$

4. 
$$|2x+5| > 7$$





5. 
$$rac{3}{|x+1|}>2$$

6. 
$$|2-3x|\leq 5$$

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7. 
$$|5-2x|\geq 3$$

8.
$$|2(4-x)| < 7$$

9. 
$$\left|rac{3}{x-3}
ight|>4, x
eq 3$$

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10. 
$$rac{|x+4|+2x}{x+1}>2$$

11. 
$$|x-1|+|x-2|\geq 4$$

12. 
$$rac{1}{2-|x|} \geq 1 (x 
eq \pm 2)$$

13. 
$$rac{|x-3|}{x-3} > 0 (x 
eq 3)$$

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14. 
$$rac{|x|-5}{|x|-3} > 0 (x 
eq \pm 3)$$

15. 
$$rac{|2x-3|}{|x-1|} > 3(x 
eq 1)$$

16. 
$$rac{|x-1|}{x+2} < (x 
eq -2)$$

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17. 
$$\left|x+rac{1}{x}
ight|>2$$



18. 
$$|x-2|\geq |x-4|$$



**19.** Find graphically the solution region of the following inequations:

 $2x + 3y \ge 6$ 



20. Find graphically the solution region of the following

inequations:

 $3x + 4y \le 12$ 

21. Find graphically the solution region of the following

inequations:

 $x-5y+4\geq 0$ 

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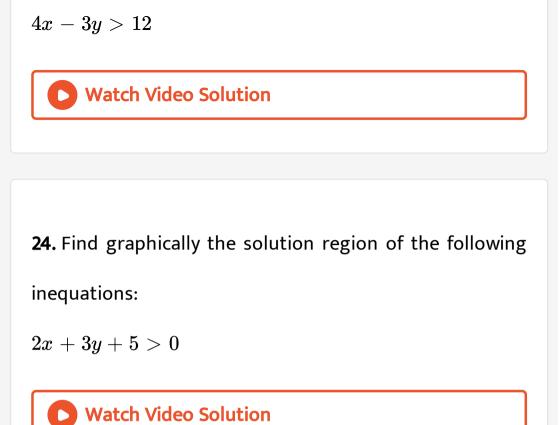
**22.** Find graphically the solution region of the following inequations:

5x - 3y < 10



23. Find graphically the solution region of the following

inequations:



25. Exhibit graphically the solution set of each of the

following system of linear inequations:

$$x\geq 0, y\geq 0, 3x+4y\leq 12$$

**26.** Exhibit graphically the solution set of each of the following system of linear inequations:

$$x \geq 1, y \geq 0, x+y \leq 10$$

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**27.** Exhibit graphically the solution set of each of the following system of linear inequations:

 $-3 \leq x \leq 5, \ -5 \leq y \leq 5$ 



28. Exhibit graphically the solution set of each of the

following system of linear inequations:

 $3x-2y\geq 12, 2x-y+6\leq 0$ 

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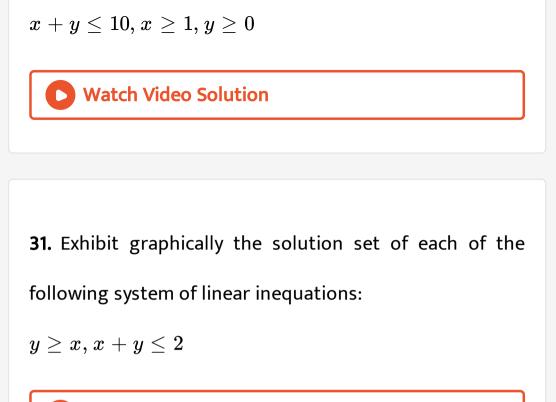
**29.** Exhibit graphically the solution set of each of the following system of linear inequations:

 $x\leq 1,y\leq 2,x-4y\leq 12$ 



30. Exhibit graphically the solution set of each of the

following system of linear inequations:



32. Exhibit graphically the solution set of each of the

following system of linear inequations:

$$x+y\leq 5, 2x-3y\geq 6, x\geq 2$$

**33.** Exhibit graphically the solution set of each of the following system of linear inequations:

 $6x+5y-30\leq 0, x\geq 1y\leq 2$ 



**34.** Exhibit graphically the solution set of each of the following system of linear inequations:

 $2x+5y\geq 10, x\geq 8, y\leq 2$ 



35. Exhibit graphically the solution set of each of the

following system of linear inequations:

 $0\leq x\leq 2, 0\leq y\leq 3, 2x+y\leq 4$ 

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**36.** Exhibit graphically the solution set of each of the following system of linear inequations:

 $3x + 4y \geq 48, 2x + y \leq 20, x > 0$ 



**37.** Exhibit graphically the solution set of each of the

following system of linear inequations:

$$x + 2y \le 3, 3x + 4y \ge 12, x \ge 0, y \ge 0$$

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38. Exhibit graphically the solution set of each of the following system of linear inequations:  

$$0 \le x \le 6, 0 \le y \le 5, x + y \ge 1, 7x + 9y \le 63$$

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**39.** Show that the solution region represented by the following inequations is a null set:

$$x\geq 0, y\geq 0, 2x-y+2\leq 0, x-2y\geq 0$$

**40.** Solve graphically the following system of linear inequations:

$$x-y\leq 1, x+2y\leq 8, 2x+y\geq 2, x\geq 0, y\geq 0$$

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**41.** The formula of IQ of a student is given below:

$$IQ = rac{m}{c} imes 100$$

Where m is mental age and c is chronological age. IF

 $10.2 \leq m \leq 16.2$  for a group of 15-year students, find

the range of their IQ.



**42.** The temperature of a solution is to be kept between  $35^{\circ}C$  and  $45^{\circ}C$ . Find the range of temperature in degree Fahrenheit, given that the conversion formula of Fahrenheit (F) and Celcius (C) is  $\frac{C}{5} = \frac{F-32}{9}$ 



**43.** The temperature of solution is to be kept between  $104^{\circ}F$  and  $113^{\circ}F$ . Find the range of temperature in degree Celcius, given that the conversion formula of Celcius © and Fahrenheit (F) is

5F=9C+160



**44.** A firm produces x units of a product. The cost function C(x) and revenue function R(x) of x unit are given by C(x)=4(x+200) and R(x)=8(x+55). Find the minimum number of product the firm must produce the firm must produce to run as a profitable concern.



# **45.** Let x and x+2 be two consecutive odd natural numbers such that x < 26 and their sum is greater than

42. Find all possible pairs of such odd natural numbers.



**46.** Find all possible pairs of consecutive even positive integers such that each of them is greater than 15 and their sum is less than 49.

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**47.** Find all possible pairs of consecutive even natural numbers, both of which are less than 12 and their sum is greater than 17.



48. The marks scored by a student in Physics, Chemistry

and Mathematics are 87,80 and 89 respectively. Find the

minimum marks he should score in computer science to

have an average of at least 86 marks.



**49.** To obtain grade A is an examination a student must score an average of 90 marks or more in five papers each of 100 marks. If his marks in first four papers are 82,92,94 and 88, then find the minumum marks he should score in fifth paper if he wants to get grade A in the examination.



**50.** The water acidity in a pool is considered normal when the average pH reading of three daily measurements is

between 7.1 and 7.8 . IF the first two pH readings are 7.45 and 7.75, find the range of ph value for the third reading that will result in the acidity level being normal.



**51.** 2250 litres of an acid solution contain 35% acid. Find the range of water in litres to be added with this acid solution so that the resulting mixture will have more than 15% but less than 25% acid.



**52.** The lengths of three sides of a traingle are x cm, (2x+1) cm and (2x-2) cm .If the perimeter of the traingle is

at least 54 cm, find the minimum value of x.

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**53.** Suppose the sum divided among three men does not exceed Rs.439. The second man receives Rs.39 more than the first and the thrid man gets twice the sum received by the first man. If third man receives at least Rs.36 more than the second man, then find the maximum sum received by the first man.



**54.** The temperature  $(t^{\,\circ} C)$  at a depth x km below the

surface of the earth is given by

t=32+25(x-3) where  $3\leq x\leq 15$ .

Find the range of depth when temperature is between  $207^{\circ}C$  and  $282^{\circ}C$ .



55. The temperature  $(T \circ C)$  at a depth x km below the surface of the earth is given by

t=30+25(x-3) where $4\leq x\leq 16.$ 

If the depth below the surface of earth is between 9.8 km

and 13.8km , find the range of temperature.



56. How many litres of a 35% acid solution must be added to 500 litres of a 16% acid solution so that acid content in the resulting mixture may be more than 25%but less than 30%?

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#### Exercise 6 Long Answer Type Question

**1.** A manufacturer produces two types of articles A and B. The production cost of an article A is Rs.250 and that of B is Rs.300. His total investment does not exceed Rs.20000 and he can store at most 100 articles. Formulate tha given data in the form of inequations and show graphically the region representing the solution of these

inequations.



2. A man has to spend Rs.16 per km on petrol if he rides his motor-car at 30 km per hour and the cost on petrol rises to Rs.20 per km if he rides his car at 45 km per hour. He has Rs.200 to spend on petrol 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.



3. solve 
$$rac{dy}{dx} = (x+y)^{rac{1}{3}}$$



**4.** A manufacture produces nuts and bolts for industrial machinery. It takes 1 hour of work on machine A and 3 hours on machine B to produce a package of nuts while it takes 3 hours on machine A and 1 hour on machine B to produce a package of bolts. If he operates his machines for at most 12 hours then formulate the given data in the form of inequations and show graphically the region representing the solution of these inequations.



5. A diet is to contain at least 400 units of carbohydrate, 500 units of fat and 300 units of protein. Foods  $F_1$ contains 10 units of carbohydrate, 20 units of fat and 15 units of protein and food  $F_2$  contains 25 units of carbohydrate,10 units of fat and 20 units of protein. Formulate the given data in the form of inequations and show graphically the region representing the solution of these inequations.



**6.** A person requires at least 10,12 and 12 units of chemicals A ,B and C respectively for his garden. A liquid product contains 5,2 and 1 units of A,B and C respectively

per jar. A dry product contains 1,2 and 4 units of A,B and C per carton. Formulate the given data in the form of inequations and show graphically the region representing the solution of these inequations.

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Sample Question For Competitive Exams Multiple Correct Answer Type

1. The set of values of x which satisfy the inequation  $rac{5x+8}{4-x} < 2$ , are-A.  $(-\infty,0)$ B.  $(0,-\infty)$ 



D.  $(-\infty,4)$ 

#### Answer: A::C

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2. Find the graph of linear inequation in xy plane  $2y+1\leq 0$ 

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**3.** The region bounded by the inequation  $|y-x| \leq 3$  are

lying in the quadrant-

A. 1st

B. 2nd

C. 3rd

D. 4th

Answer: A::B::C::D

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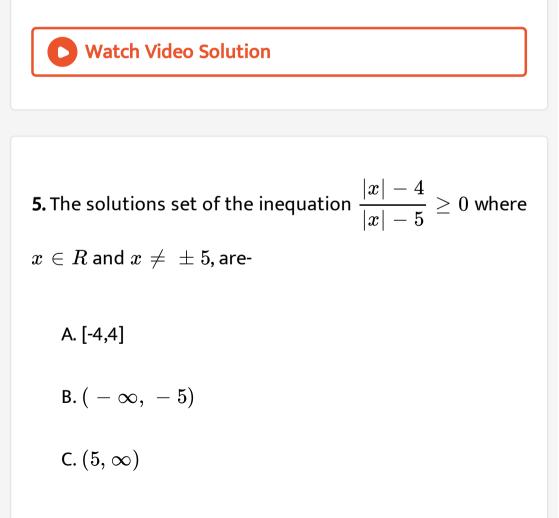
**4.** Two consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40, then the numbers are-

B. 15,13

C. 17,19

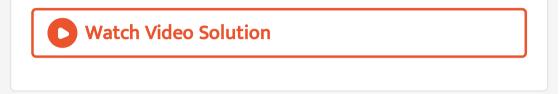
D. 17.15

Answer: A::C

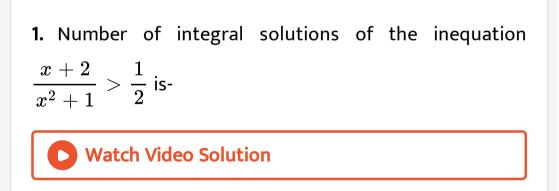


D. none of these

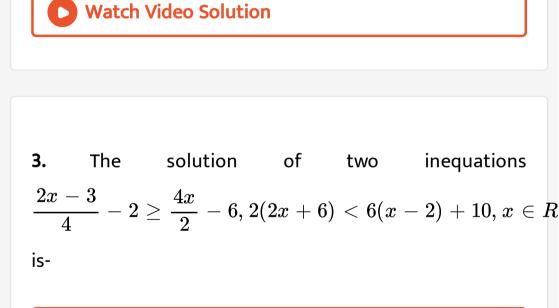
Answer: A::B::C



Sample Question For Competitive Exams Integer Answer Type

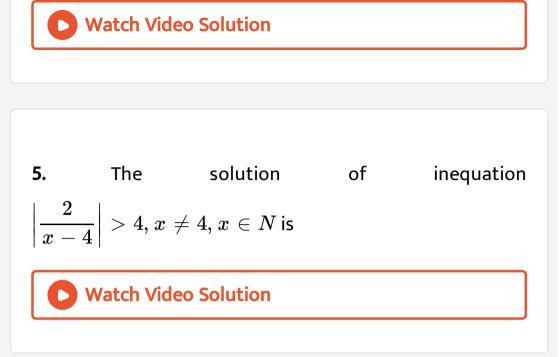


2. The longest side of a traingle is three times the shortest side and the third side is 2 cm shorter than the longest side. If perimeter of the traingle is at least 61 cm, then the minimum length of the shortest side will be-



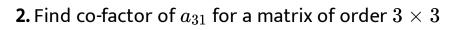
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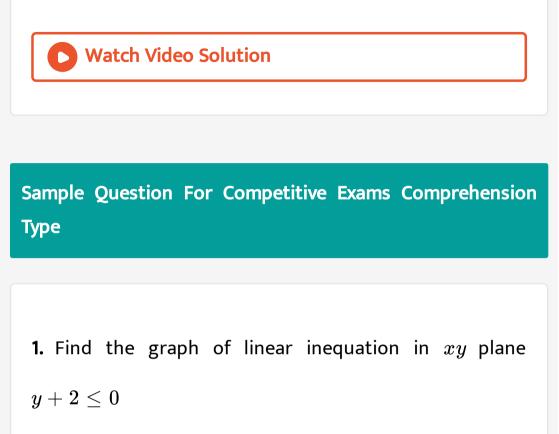
**4.** The solution of the inequation  $-4x > 30, x \in N$  is-



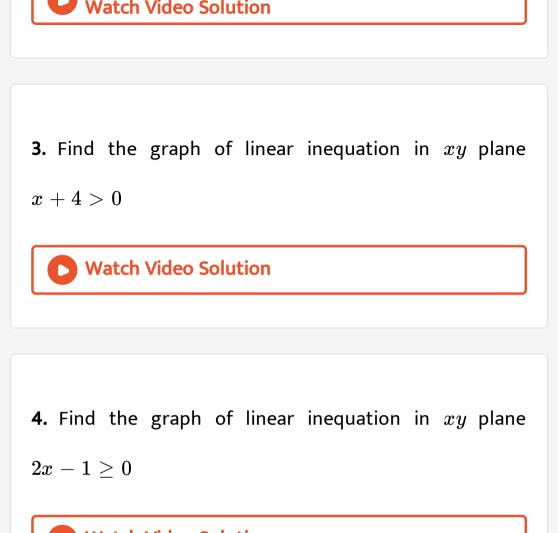
# Sample Question For Competitive Exams Matrix Match Type

1. construct 2 imes 2 matrix if  $A=\left[a_{ij}
ight]$  whose elements  $a_{ij}$  are given by :  $rac{\left(i-j
ight)^2}{2}$ 





2. Find the graph of linear inequation in xy plane $x-2\leq 0$ 



5. Consider the inequality  $9^x - a \cdot 3^x - a + 3 \le 0$  where

'a' is a real parameter.

The given inequality has at least one negative solution for 'a' lying in-

A.  $(-\infty,2)$ B.  $(3,\infty)$ C.  $(-2,\infty)$ 

D. (2,3)

Answer: D

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**6.** Find the graph of linear inequation in xy plane  $2y+7\leq 0$ 

7. Find the graph of linear inequation in xy plane 4x + 8 > 0

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Sample Question For Competitive Exams Assertion Reason Type

1. Find the graph of linear inequation in xy plane y-3 < 0

2. Find the graph of linear inequation in xy plane 2x-5>0

