



MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

LINEAR INEQUALITIES

Example

1. Solve the inequation $3x - 8 < -2$ and represent the solution on the number line when

(i) $x \in R$ (ii) $x \in Z$

(iii) $x \in N$.



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2. solve $2(2x + 3) - 10 < 6(x - 2)$ and represent this solution on real line.



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3. Solve the inequation $\frac{3(x - 2)}{5} \leq \frac{5(2 - x)}{3}$

and represent this solution on number line.



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4. solve the inequation $\frac{2x - 3}{4} + 9 \geq 3 + \frac{4x}{3}$

and represent this solution on number line .

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5. solve the inequation $\frac{x + 1}{x + 3} > 1$

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6. solve the inequation $\frac{x - 2}{x + 5} > 2$.

A. $x \in (-12, -5)$

B. $x \in (-12, 5)$

C. $x \in (5, 12)$

D. None of these

Answer: A



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7. solve the inequation $\frac{2x + 4}{x - 1} \geq 5$ and represent this solution on the number line.



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8. solve : $-\frac{1}{3} \leq \frac{x}{2} - \frac{4}{3} < \frac{1}{6}$

A. [2,3)

B. (2,3)

C. (2,3]

D. [2,3]

Answer: A



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9. solve : $|3x - 2| \leq 1$



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10. Solve : $\frac{2}{|x - 3|} > 1, x \neq 3$



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11. Solve: $\frac{-1}{|x| - 2} \geq 1, \text{ where } x \in R, x \neq \pm 2.$



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12. solve: $|x - 2| + |x - 4| \geq 8$

A. $x \in (-\infty, -1] \cup [7, \infty)$

B. $x \in (-\infty, 3] \cup [7, \infty)$

C. $x \in (-7, -1] \cup [7, \infty)$

D. $x \in [7, \infty)$

Answer: A



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13. solve: $\frac{|x - 1|}{x + 1} < 1$



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14. Find all pairs of consecutive even numbers which are greater than 8 and their sum is smaller than 27.

A. (-10, 12) and (12, 14)

B. (10, 12) and (12, -14)

C. (10, 24) and (12, 14)

D. (10, 12) and (12, 14)

Answer: D



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15. A student scores 65, 62 70 marks in 3 subjects. Find the minimum marks scored by him in 4th subject to get an average of 64 minimum.



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16. The largest side of a triangle is twice the smallest side. Its largest side is 3 cm more than the third side. Find the minimum length of the

smallest side if the minimum perimeter of the triangle is 62 cm.



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17. IQ of a person is given by the formula

$$IQ = \frac{MA}{CA} \times 100 \text{ where } MA = \text{mental age and}$$

$CA = \text{chronological age. If IQ for a group of 10 years children is given by the inequation}$

$70 \leq IQ \leq 140$, find the range of their mental age.



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18. A solution is to be kept between $59^{\circ}F$ and $77^{\circ}F$. What is the range of temperature in degree celcius (C) if the Celcius-fahrenheit conversion formula is:

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



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19. A manufacturer has 600 liters of 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%?



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20. Solve the following inequation graphically:

$$2x + 3y \leq 6$$



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21. solve the inequation $2x - y \geq 3$ by graphical method.





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22. Solve the inequation $x + y < 5$ by graphical method.



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23. solve the following system of inequation by graphical method:

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



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24. solve the following system of inequation by graphical method : $5x + 4y \leq 40$, $x \geq 2$, $y \geq 3$



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Exercise

1. Solve the inequation $3x - 2 < 5$ If (i) $x \in \mathbb{N}$
(ii) $x \in \mathbb{R}$ and represent the solution on the number line



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2. Solve the inequation $12x < 50$ If (i) $x \in \mathbb{Z}$ (ii) $x \in \mathbb{R}$ and represent the solution on the number line



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3. Solve the inequation $3x + 8 > 2$ If (i) $x \in \mathbb{N}$ (ii) $x \in \mathbb{R}$ and represent the solution on the number line



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4. Solve the inequation $6x - 5 \leq 7$ If (i) $x \in \mathbb{I}$
(ii) $x \in \mathbb{R}$ and represent the solution on the
number line



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5. Solve the inequation $30x < 200$ If (i) $x \in \mathbb{Z}$
(ii) $x \in \mathbb{N}$ and represent the solution on the
number line



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6. Solve the inequation $5x - 5 \leq -5$ If (i) $x \in \mathbb{Z}$ (ii) $x \in \mathbb{R}$ and represent the solution on the number line



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7. Solve the inequation $3x - 7 < 5x - 3$ If $x \in \mathbb{R}$ and represent the solution on the number line



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8. Solve the inequation $3(x - 1) \leq 2(x - 3)$ If $x \in \mathbb{R}$ and represent the solution on the number line



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9. Solve the inequation $5x - 2 \geq 3x - 1$ If $x \in \mathbb{R}$ and represent the solution on the number line



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10. Solve the inequation $2x + 5 > -5x + 12$ if $x \in \mathbb{R}$ and represent the solution on the number line



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11. Solve : $\frac{5 - 2x}{3} + 5 \leq \frac{x}{6}$



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12. solve : $\frac{3x - 4}{2} + 1 \geq \frac{x + 1}{4}$

A. $[1, \infty)$

B. $[2, \infty)$

C. $[3, \infty)$

D. $[4, \infty)$

Answer: A



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13. Solve : $3\left(\frac{3x}{5} + 4\right) \geq 2(x - 6)$

A. $(-\infty, 120]$

B. $(-\infty, -120]$

C. $(-\infty, 12]$

D. None of these

Answer: A



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14. Solve the inequalities for real x :

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



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15. Solve : $\frac{x}{2} \geq \frac{5x - 8}{3} - \frac{7x - 13}{5}$



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16. Solve : $\frac{x}{6} \geq \frac{8 - 3x}{2} + 4$



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17. Solve : $x + \frac{x}{2} + \frac{x}{3} > 11$

A. $x > 4$

B. $x > 5$

C. $x > 6$

D. $x > 7$

Answer: C



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18. Solve : $\frac{3x}{5} - \frac{2(x - 2)}{3} \leq 1$



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19. Solve : $2(5x - 7) \geq 3(4x - 5)$

A. $\left(-\infty, \frac{1}{3} \right]$

B. $\left(-\infty, \frac{1}{2} \right]$

C. $\left(-\infty, \frac{5}{2} \right]$

D. None of these

Answer: B



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20. Solve : $\frac{5x}{4} - 1 \leq \frac{4x - 1}{3}$



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21. Solve : $\frac{5x - 2}{3} < \frac{4x - 7}{2}$



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22. Solve : $\frac{x}{4} - 1 < \frac{x}{5} + 2$



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23. Solve : $\frac{1}{x - 3} < 0$



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24. Solve : $\frac{x - 1}{x - 2} > 1$



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25. Solve : $\frac{2}{x + 3} \geq 0$

A. (2,3)

B. (5, ∞)

C. (3, ∞)

D. (- 3, ∞)

Answer: D



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26. Solve : $\frac{x + 2}{x + 1} < 0$

A. $(-\infty, -2) \cup (-1, \infty)$

B. $(-2, -1)$

C. R

D. None of these

Answer: B



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27. Solve : $\frac{2x - 1}{x + 2} \leq 3$



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28. Solve : $x + 2 \geq 0$ and $2x - 5 \leq 0$



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29. Solve : $5 - 2x < 11$ and $4x - 3 \geq 9$



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30.

Solve

:

$$\frac{5x}{4} > \frac{4x - 1}{3} \text{ and } 4x + 3 < \frac{2x + 1}{3}$$



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31. Solve : $\frac{2x - 1}{2} \leq 2x + \frac{1}{2} \leq \frac{11}{2} + x$



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32. Solve : $6 \leq -3(2x - 4) < 12$



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33. Solve : $-12 \leq 4 + \frac{3x}{5} \leq 2$



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34. Solve : $|x - 3| \leq 1$

A.

B.

C.

D.

Answer: N/a



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35. Solve : $|x + 2| < 3$



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36. Solve : $|2x - 1| > 2$



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37. Solve : $\left| \frac{1}{2x - 1} \right| \leq 3, x \neq 1/2$



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38. Solve : $\left| \frac{2}{x-3} \right| > 1, x \neq 3$

A. $[1, 5] \cup (-1, \infty)$

B. $(1, 5) \cup [-1, \infty)$

C. $(1, 5] \cup (-1, \infty)$

D. $(1, 5) \cup (-1, \infty)$

Answer: D



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39. Solve : $\frac{|x| - 1}{|x| - 2} \geq 0, x \neq \pm 2$



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40. Solve : $\frac{|x + 4| + x}{x + 1} > 1, x \neq -1$

A. $(-5, -3) \cup (-1, \infty)$

B. $(-5, -3) \cup [-1, \infty)$

C. $(-5, -3] \cup (-1, \infty)$

D. $(-5, -3) \cup (1, \infty)$

Answer: A



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41. Solve : $|x - 1| + |x - 2| \geq 3$



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42. Solve : $|x - 1| + |x - 2| + |x - 3| > 6$



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43. Solve : $|x - 3| + |x - 5| > 9$





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44. Find all pairs of consecutive odd integers both of which are smaller than 12 and their sum is more than 11.



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45. Find all pairs of consecutive even integers both of which are greater than 7 and their sum is less than 25.



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46. Find all pairs of consecutive even integers both of which are greater than 6 and their sum is less than 27.



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47. A student obtained 60, 62, 64 and 66 marks in 4 subjects in an examination. Find the minimum marks he should get in 5th subject to have an average of at least 65 marks.

A. 75

B. 73

C. 72

D. 74

Answer: *B*



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48. A student obtained 62 and 48 marks in the first and second examinations of class XI. Find the minimum marks he should get in annual

examination to have an average of at least 60 marks.



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49. The water acidity in a pond is considered normal when the average pH reading of three daily measurement is between 7.1 and 7.8. If the first two pH readings are 7.25 and 7.8, find the range of pH of the water of the pond for the 3rd reading that will result in the acidity level being normal.



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50. The longest side of a triangle is three times the shortest side and the third side is 2 cm shorter than the longest side if the perimeter of the triangles at least 61 cm, find the minimum length of the shortest side.



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51. 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 the third length is to be twice as long as the shortest. What are the possible lengths of the shortest board?



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52. A solution is to be kept between $50^{\circ} F$ and $68^{\circ} F$. What is the range of temperature in degree celcius if Celcius-fahrenheit conversion formual is :

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



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53. A solution is to be kept between $40^{\circ}C$ and $60^{\circ}C$. What is the range of temperature in farhenheit if Celcius-farhenheit conversion formual is : $F = \frac{9}{5}C + 32$



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54. 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?

A. $x > 562.5$ and $x < 900$

B. $x > 565.5$ and $x < 800$

C. $x > 600$ and $x < 900$

D. $x > 562.5$ and $x < 700$

Answer: *A*



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55. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be 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?

A. (320, 1270)

B. (340, 1260)

C. (320, 1280)

D. (300, 600)

Answer: C



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56. If the cost and revenue function of a product are respectively $C(x) = 5x + 700$ and $R(x) = 15x + 100$, where 'x' is the number of products then what will be the value of 'x' to get profit ?

A. 50

B. 60

C. 70

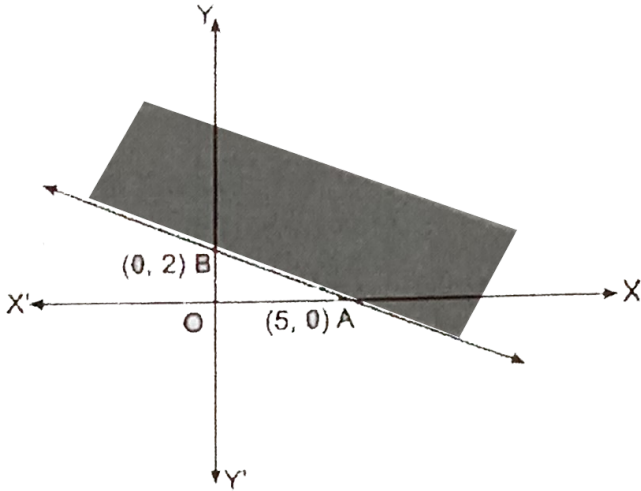
D. 80

Answer: B

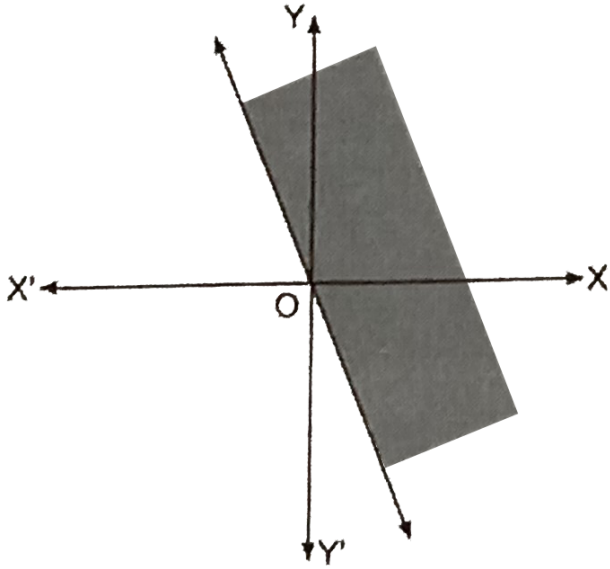


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$$57. 2x + 5y \geq 10$$

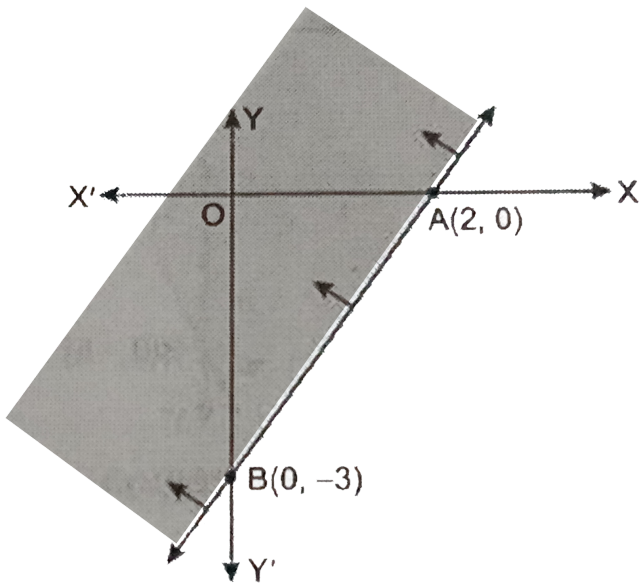


A.



B.

C.



D. None of these

Answer: A



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58. $x - 2y \leq 4$



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59. $x + 4y > 8$



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$$60. 3y - 5x < 15$$



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$$61. 2x + y \geq 0$$



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$$62. 2x + y \leq 6, x + 2y \leq 8, x \geq 0, y \geq 0$$



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63. Solve the following system of inequations graphically

$$x + y \leq 10, x + 3y \leq 15, x \geq 0, y \geq 0$$



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64.

$$x + y \leq 10, 4x + 3y \leq 24, x \geq 0, y \geq 0$$



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65. $x + 2y \leq 40, 2x + y \leq 40, x \geq 0, y \geq 0$



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66. $2x + y \geq 6, x + 2y \geq 8, x \geq 0, y \geq 0$



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67. $x + 2y \leq 3, 3x + 4y \geq 12, x \geq 0, y \geq 1$



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68.

$$x + 2y \leq 10, x + y \geq 1, x - y \leq 0, x \geq 0, y \geq 0$$



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69. $3x + 4y \leq 60, x \geq 2y, x \geq 1, y \geq 0$



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70. $3x + 2y \leq 6, x \geq 1, y \geq 2$



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71. The solution set of

$$x + y \leq 9, x > y, x \geq 0$$



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



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



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$$74. 2x - y > 1, 2y - x > 1$$



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$$75. x + y \geq 24, 2x + y \geq 32, x \geq 0, y \geq 0$$



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76.

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



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Ncert Question

1. Solve $24x < 100$, when (i) x is a natural number. (ii) x is an integer.



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2. Solve $12x > 30$, when (i) x is a natural number. (ii) x is an integer



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3. Solve $5x - 3 < 7$, when (i) x is integer. (ii) x is a real number.



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4. Solve $3x + 8 > 2$, when (i) x is an integer. (ii) x is a real number.



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5. solve the inequalities for real x

$$4x + 3 < 5x + 7$$



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6. solve the inequalities for real x

$$3x - 7 > 5x - 1$$



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7. solve the inequalities for real x

$$3(x - 1) \leq 2(x - 3)$$



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8. solve the inequalities for real x

$$3(2 - x) \geq 2(1 - x)$$



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9. solve the inequalities for real x

$$x + \frac{x}{2} + \frac{x}{3} < 11$$

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10. solve the inequalities for real x $\frac{x}{3} > \frac{x}{2} + 1$

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11. solve the inequalities for real x

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

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12. solve the inequalities for real x

$$\frac{1}{2} \left(\frac{3x}{5} + 4 \right) \geq \frac{1}{3} (x - 6)$$



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13. solve the inequalities for real x

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



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14. $37 - (3x + 5) \geq 9x - 8(x - 3)$





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$$15. \frac{x}{4} < \frac{(5x - 2)}{3} - \frac{(7x - 3)}{5}$$



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$$16. \frac{(2x - 1)}{3} \geq \frac{(3x - 2)}{4} - \frac{(2 - x)}{5}$$



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$$17. 3x - 2 < 2x + 1$$



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$$18. 5x - 3 \geq 3x - 5$$



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$$19. 3(1 - x) < 2(x + 4)$$



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$$20. \frac{x}{2} \geq \frac{(5x - 2)}{3} - \frac{(7x - 3)}{5}$$



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21. Find the minimum marks he should get in the third test to have an average of at least 60 marks .



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22. To receive Grade 'A' in a course, one must obtain an average of 90 marks or more in five examinations (each of 100 marks). If Sunita's marks in first four examinations are 87, 92, 94 and

95, find minimum marks that Sunita must obtain in fifth examination to get grade 'A' in the cours.



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23. Find all pairs of consecutive add positive integers both of which are smaller than 10 such that their sum is more than 11,



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24. Find all pairs of consecutive even positive integers, both of which are larger than 5 such that their sum is less than 23.



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25. 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 least 61 cm, find the minimum length of the shortest side.



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26. 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 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 5 cm longer than the second?

[Hint : If x is length of the shortest board, then x , $(x+3)$ and $2x$ are the lengths of the second and third piece, respectively. Thus ,

$$x + (x + 3) + 3x \leq 91 \text{ and } 2x \geq (x + 3) + 5]$$

.



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$$27. x + y < 5$$



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$$28. 2x + y \geq 6$$



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29. $3x + 4y \leq 12$



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30. $y + 8 \geq 2x$



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31. $x - y \leq 2$



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$$32. 2x - 3y > 6$$



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$$33. -3x + 2y \geq -6$$



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$$34. 3y - 5x < 30$$



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35. $y < -2$



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36. $x > -3$



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37. $x \geq 3, y \geq 2$



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38. $3x + 2y \leq 12, x \geq 1, y \geq 2$



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39. $2x + y \geq 6, 3x + 4y \leq 12$



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40. $x + y \geq 4, 2x - y < 0$



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41. $2x - y > 1, x - 2y < 1$



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42. $x + y \leq 6, x + y \leq 4$



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43. $2x + y \geq 8, x + 2y \geq 10$



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44. $x + y \leq 9, x > y, x \geq 0$



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45. $5x + 4y \leq 20, x \geq 1, y \geq 2$



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46. $3x + 4y \leq 60, x + 3y \leq 30, x \geq 0, y \geq 0$



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$$47. 2x + y \geq 4, x + y \leq 3, 2x - 3y \leq 6$$



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$$48. x + 2y \leq 3, 3x + 4y \geq 12, x \geq 0, y \geq 1$$



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$$49. 4x + 3y \leq 60, y \geq 2x, x \geq 3, x, y \geq 0$$



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50.

$$3x + 2y \leq 150, x + 4y \leq 80, x \leq 15, y \geq 0, x \geq 0$$



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51.

$$x + 2y \leq 10, x + y \geq 1, x - y \leq 0, x \geq 0, y \geq 0$$



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Miscellaneous Exercise

$$1. 2 \leq 3x - 4 \leq 5$$



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$$2. 6 \leq -3(2x - 4) < 12$$



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$$3. -3 \leq 4 - \frac{7x}{2} \leq 10$$



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$$4. -15 < \frac{3(x - 2)}{5} \leq 0$$



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$$5. -12 < 4 - \frac{3x}{-5} \leq 2$$



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$$6. 7 \leq \frac{(3x + 11)}{2} \leq 11$$



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$$7. 5x + 1 > -24, 5x - 1 < 24$$



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$$8. 2(X - 1) < X + 5, 3(X + 2) > 2 - X$$



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$$9. 3x - 7 > 2(x - 6), 6 - x > 11 - 2x$$



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10.

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



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11. A solution is to be kept between $68^{\circ}F$ and $77^{\circ}F$. What is the range in temperature in degree Celsius (C) if the Celsius / Fahrenheit (F) conversion formula is given by $F = \frac{9}{5}C + 32$?



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12. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be 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



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13. 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?



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14. IQ of a person is given by 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 year children, find the range of their mental age.



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