MATHS

BOOKS - MODERN PUBLICATION

LINEAR INEQUATIONS

Example

1. Solve the following inequation :

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

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2. Solve the following inequation :

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

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3. Solve the following inequation for real x:

$$\frac{5-2x}{3} \leq \frac{x}{6} - 5.$$

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

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5. Solve the following inequation :

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

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6. Solve $7x + 3 < 5x + 9$. Show the graph of the solution on the number line.

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7. Solve the following inequation :

$3x - 6 < 0$. Show the graph of the solution on the number line .

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8. Solve the following inequation :

$-3x + 9 \leq 0$. Show the graph of the solution on the number line .

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9. Solve the following inequation :

$7x + 5 > 33$. Show the graph of the solution on the number line .

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10. Solve the following inequation :

$5x - 15 \geq 0$. Show the graph of the solution on the number line .

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11. Solve the following inequation :

$4x + 3 < 6x + 7$. Show the graph of the solution on the number line .

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12. Solve the following inequation :

$5x - 1 > 3x + 7$. Show the graph of the solution on the number line .

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13. Solve the following inequation :

$\frac{3(x-2)}{5} \geq \frac{5(2-x)}{3}$. Show the graph of the solution on the number

line .

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14. Solve the following inequation :

$\frac{x}{4} < \frac{5x-2}{3} - \frac{7x-3}{5}$. Show the graph of the solution on the number line .

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15. Solve the following inequation :

$\frac{x-3}{x-5} > 0.$

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16. Solve the following inequation :

$\frac{x+3}{x-2} \leq 2.$

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17. Solve : $\frac{2x-3}{4}+8 \geq 2+\frac{4x}{3}$ and show the solution set on the number line.

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18. Solve 20x < 100, when : x is a natural number.

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19. Solve $24x < 100$, when x is an integer.

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20. Solve $5x-3 < 7$, when x is an integer.

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21. Solve $5x - 3 < 7$, when x is a real number.

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22. Solve

3x + 5 < x-7, when: x is an integer. Show the graph of the solution set on the number line .

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23. Solve

3x + 5 < x-7, when: x is an integer. Show the graph of the solution set on the number line .

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24. Solve the system of inequations : $x - 2 > 0, 3x < 18.$

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25. Solve the following system of inequalities : $3x - 7 < 5 + x$ and $11 - 5x \leq 1$ and represent the solution on number line.

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26. Solve the following system of inequalities : $3x - 7 < 5 + x$ and $11 - 5x \leq 1$ and represent the solution on number line.

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27. Solve the following system of inequations : $\frac{5x}{4} + \frac{3x}{8} > \frac{39}{8}$ and $\frac{2x-1}{12} - \frac{x-1}{3} < \frac{3x+1}{4}$.

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28. Solve the following system of inequations : $2(2x+3)-10<6(x-2)$ and $\frac{2x-3}{4}+6\geq 2+\frac{4x}{3}$.

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29. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x \succ 2.$

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30. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$y<3.$

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31. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$2x - 3 \geq 0.$

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32. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$y \leq -3.$

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33. Solve graphically : $|x| < 2.$

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34. Solve graphically : $|y| \geq 3.$

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35. Solve graphically the inequation $x + 2y - 4 < 0$.

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36. Draw the graph of the inequation $3x - 5y + 8 \geq 0$.

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37. Draw the diagram of the solution set of the linear constraints :

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

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38. Draw the diagram of the solution set of the linear constraints :

$2x + 3y \leq 6, x + 4y \leq 4, x \geq 0, y \geq 0.$

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39. Find the linear constraints for which the shaded area in the figure below is the solution set.

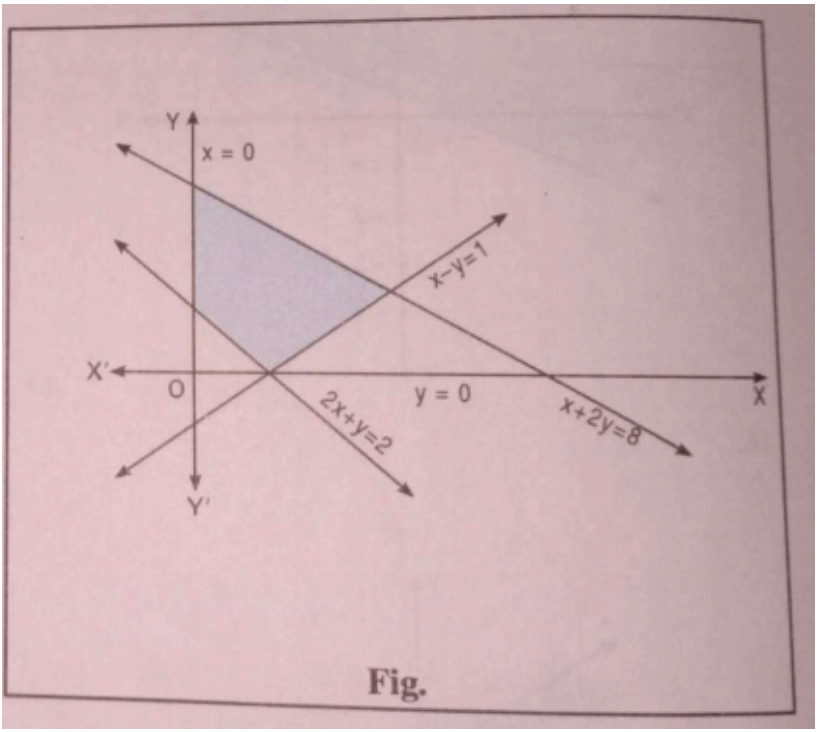

Fig.

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40. Verify that the solution set of the following is empty : $x - 2y \geq 0, 2x - y \leq -2, x \geq 0, y \geq 0$

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41. Find graphically the solution set of the following :

$2x + y \geq 4$ and $x - y + 1 = 0$.

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42. Find graphically the solution set of the following :

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

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43. Find the region enclosed by the following inequations : $x + y - 2 \leq 0, 2x + y - 3 \leq 0, x \geq 0, y \geq 0$. Also find the ordered pairs of the vertices of the regions.

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44. Ravi obtained 70 and 75 marks in first two unit test. Find the minimum marks he should get in the third test to have an average of at least 60 marks.

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45. 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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46. In the first four examinations, each of 100 marks, Hamid got 94,73,72, 84 marks if the final average is greater than or equal to 80 and less than 90 is needed to obtain a final B grade in a course, what range of marks in the fifth (last) examination will result in Hamid receiving 'B' in the course ?

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47. In an experiment, a solution of a hydrochloric acid is to be kept between 30° and 35°C. what is the range of the temperature in degree fahrenheit, if conversion formula is given by

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

Where C and F represent temperature in degree celsius and degree fahrenheit respectively.

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48. 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.

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49. A manufacture 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 $18\,\%$?

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50. By the Principle of Mathematical Induction, prove the following for all n $\in$ N :

$4^n - 3n - 1$ is divisible by 9.

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51. Prove that : $7^{2n} + \left(2^{3n-3}\right)\left(3^{n-1}\right)$ is divisible by 25 $\forall n \in N$.

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52. Given $n^4 < 10^n$ for a fixed integer $n \geq 2$. Prove that $(n+1)^4 < 10^{n+1}$.

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53. Let $U_1 = 1, U_2 = 1$ and $U_{n+2} = U_{n+1} + U_n$ for $n \geq 1$. Use Mathematical Induction to show that: $U_n = \frac{1}{\sqrt{5}}\left[\left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\frac{1-\sqrt{5}}{2}\right)^n\right]$ for all $n \geq 1$.

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54. Apply the principle of Mathematical Induction to prove that : $|\sin nx| \leq n|\sin x|$ for all n $\in$ N.

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55. Let a, b, c be positive real numbers such that $b^2 - 4ac > 0$ and let $\alpha_1 = c$. Prove by induction that $\alpha_{n+1} = \frac{a\alpha_n^2}{b^2 - 2a(\alpha_1 + \alpha_2 + \ldots + \alpha_n)}$ is well defined and $\alpha_{n+1} < \frac{\alpha_n}{2}$ for all $n = 1, 2, \ldots$. (Here, 'well defined' means that the denominator in the expression for $\alpha_{n+1}$is not zero).

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56. Solve the equation |z|+z=2+i, where z = x + iy.

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57. If z is a complex number which simultaneously satisfies the equations $3|z-12|=5|z-8i|$ and $|z-4|=|z-8|$, where $i=\sqrt{-1}$, then Im(z) can be

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58. Find all the roots of the equation : $(3z-1)^4+(z-2)^4=0$ in the simplified form of a + ib.

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59. Use De-Moivre's Theorem to solve the equation: $2\sqrt{2}x^4=\left(\sqrt{3}-1\right)+i\left(\sqrt{3}+1\right).$

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60. Given that : $(a_1 + ib_1)(a_2 + ib_2)...(a_n + ib_n) = c + id$, show that : $\tan^{-1}\left(\frac{b_1}{a_1}\right) + \tan^{-1}\left(\frac{b_2}{a_2}\right) + ... + \tan^{-1}\left(\frac{b_n}{a_n}\right) = n\pi + \tan^{-1}\left($

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61. Show that the area of the triagle on the argand plane formed by the complex numbers Z, iz and $z + iz$is $\frac{1}{2}|z|^2$, where $i = \sqrt{-1}$.

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62. let $z_{1=10+6i, z_2=4+6i, where i=\sqrt{(-1)}}$. If z is a complex number , such that the argument of $(z - z_1)/(z - z_2) is \pi/4$, then prove that $|z - 7 - 9i| = 3\sqrt{2}$.

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63. Let $\bar{b}z + b\bar{z} = c, b \neq 0$, be a line in the complex plane, where $\bar{b}$ is the complex conjugate of b. If a point z_1 is the reflection of a point z_2 through the line, then show that : $c = \bar{z}_1 b + z_2 \bar{b}$.

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64. For complex numbers z and w, prove that $|z|^2 w - |w|^2 z = z - w$ if and only if z=w or $z\overline{w} = 1$.

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65. Let the complex numbers z_1, z_2, z_3 be the vertices of an equilateral triangle. Let z_0 be the circumcentre of the triangle. Then prove that $z_1^2 + z_2^2 + z_3^2 = 3z_0^2$.

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Exercise

1. Solve the following inequation :

$3x - 9 < 0.$

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2. Solve the following inequation :

$-5x + 25 \leq 0.$

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3. Solve the following inequation :

$7x + 4 > 39.$

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4. Solve the following inequation :

$6x - 18 \geq 0.$

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5. Solve the following inequation :

$x + 10 > 4x - 5.$

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6. Solve the following inequation :

$8x - 2 > 5x.$

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7. Solve the following inequation :

$3x - 10 > 5x + 1.$

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8. Solve the following inequation :

$x + 12 < 4x - 2.$

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9. Solve the following inequation :

$4x - 7 < 3 - x.$

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10. Solve the following inequation :

$-(x - 3) + 4 > -2x + 5.$

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11. Solve the following inequation :

$3x + 17 \leq 2(1 - x).$

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12. Solve the following inequation :

$-2x + 6 \leq 5x - 4.$

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13. Solve the following inequation :

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

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14. Solve the following inequation :

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

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15. Solve the following inequation :

$$\frac{x-5}{x+2} < 0.$$

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16. Solve the following inequation :

$$\frac{6x-5}{4x+1} < 0.$$

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17. Solve the following inequation :

$$\frac{x-3}{x-5} > 0.$$

Watch Video Solution

18. Solve the following inequation :

$$\frac{x+8}{x+2} > 1.$$

Watch Video Solution

19. Solve the following inequation :

$$\frac{5x-6}{x+6} < 1.$$

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20. Solve the following inequation :

$$\frac{7x-5}{8x+3} > 4.$$

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21. Solve the following inequation :

$$\frac{x}{x-5} > \frac{1}{2}.$$

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22. Solve the following inequation :

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

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23. Solve the following inequation :

$$\frac{2(x-1)}{5} \leq \frac{3(2+x)}{7}.$$

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24. Solve the following inequation :

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

Watch Video Solution

25. Solve the following inequation :

$$\frac{x-1}{3}+4<\frac{x-5}{5}-2.$$

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26. Solve the following inequation :

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

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27. Solve the following inequation :

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

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28. Solve the following inequation :

$$\frac{x}{3} > \frac{x}{2} + 1.$$

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29. Solve the following inequation :

$$\frac{5x}{2} + \frac{3x}{4} \geq \frac{39}{4}.$$

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30. Solve the following inequation for real x:

$$\frac{5 - 2x}{3} \leq \frac{x}{6} - 5.$$

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31. Solve the following inequation :

$$\frac{4 + 2x}{3} \geq \frac{x}{2} - 3.$$

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32. Solve the following inequation :

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

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33. Solve the following inequation :

$\frac{x}{4} < \frac{5x-2}{3} - \frac{7x-3}{5}$. Show the graph of the solution on the number line .

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34. Solve the following inequation :

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

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35. Solve the following inequation :

$\frac{2x+3}{5} - 2 < \frac{3(x-2)}{5}$.

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36. Solve the following inequation :

$-8 \leq 5x - 3 < 7.$

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37. Solve the following inequation :

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

Watch Video Solution

38. Solve the following inequation :

$-3 \leq 4 - \frac{7x}{2} \leq 18.$

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39. Solve the following inequation :

$-5 \leq \frac{5 - 3x}{2} \leq 8.$

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40. Solve the following inequalities:

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

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41. Solve the following inequations :

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

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42. Solve the following inequation :

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

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43. Solve the inequalities given below and show the graph of the solution on number line:- $3x - 2 < 2x + 1$

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44. Solve the inequalities given below and show the graph of the solution on number line:- $5x - 3 \geq 3x - 5$

Watch Video Solution

45. Solve the inequalities given below and show the graph of the solution on number line:- $3(1 - x) < 2(x + 4)$

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46. Solve the inequalities given below and show the graph of the solution on number line:- $\frac{x}{2} \geq \frac{(5x - 2)}{3} - \frac{(7x - 3)}{5}$

Watch Video Solution

47. Solve the following inequalities and show the graph of the solution set on number line :

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

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48. Solve $-12x > 30$, when x is a natural number.

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49. Solve : $30x < 200$, when, (i) x is a natural number (ii) x is an integer.

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50. Solve $3x + 8 > 2$, when x is an integer.

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51. Solve : $5x - 3 < 3x + 1$, when, (i) x is an integer. (ii) x is a real number.

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52. Solve the following system of inequations : $x + 3 > 0, 2x < 14$.

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53. Solve the following system of inequations : $2x + 5 \leq 0, x - 3 \leq 0$.

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54. Solve the following system of inequations : $x + 2 > 11, 2x \leq 20$.

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55. Solve the following system of inequations : $2x - 7 < 11, 3x + 4 < -5$.

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56. Solve the following system of inequations : $3x - 1 \geq 5, x + 2 > -1$.

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57. Solve the following system of inequations : $4 - 5x > -11, 4x + 11 \leq -13$.

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58. Solve the following system of inequations : $4x - 5 < 11, -3x - 4 \geq 8$.

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59. Solve the following system of inequations : $-4x+1 \geq 0, 3-4x < 0$

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60. Solve the following system of inequations : $5x+1 > -24, 5x-1 < 24.$

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61. Solve the following system of inequations : $4x+3 \geq 2x+17, 3x-5 < -2.$

Watch Video Solution

62. Solve the following system of inequations : $x+2 \leq 5, 3x-4 > -2+x.$

Watch Video Solution

63. Solve the following system of inequations :

$4x + 5 > 3x, \ -(x + 3) + 4 \leq \ -2x + 5.$

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64. Solve the following system of inequations :

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

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65. Solve the following system of inequations :

$3x - 7 < 5 + x, 11 - 5x \leq 1.$

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66. Solve the following system of inequations : $5(2x-7)-3(2x+3) \leq 0, 2x+19 \leq 6x+47.$

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67. Solve the following system of inequations : $2(x-1) < x+5, 3(x+2) > 2-x.$

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68. Solve the following system of inequations : $5x-7 < 3(x+3), 1-\frac{3x}{2} \geq x-4.$

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69. Solve the following system of inequations : $\frac{4x}{3}-\frac{9}{4} < x+\frac{3}{4}, \frac{7x-1}{3}-\frac{7x+2}{6} > x.$

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70. Solve the following system of inequations : $-2-\frac{x}{4} \leq \frac{1+x}{3}, 3-x<4(x-3)$.

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71. Solve the following system of inequations : $7x-8<4x+7, -\frac{x}{2}>4$.

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72. Solve the following inequalities graphically in two-dimensional plane:

$x > -3$

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73. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x < -3.$

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74. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x \leq -3.$

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75. Solve the following inequalities graphically in two-dimensional plane:

$y < -2$

Watch Video Solution

76. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$y < 2.$

Watch Video Solution

77. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$y \geq 2.$

Watch Video Solution

78. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$y < 3.$

Watch Video Solution

79. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$|x| \leq 2.$

Watch Video Solution

80. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$|y| > 3.$

Watch Video Solution

81. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x + y < 5.$

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82. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$2x + y \geq 6.$

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83. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$2x - 3y > 6.$

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84. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$3x + 2y > 6.$

Watch Video Solution

85. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$3x + 4y \leq 12.$

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86. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$3y - 5x < 30.$

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87. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x - 2y + 4 \leq 0.$

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88. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x < 8 - 4y.$

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89. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x - 2y \leq -1.$

Watch Video Solution

90. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x - y \leq 2.$

Watch Video Solution

91. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$x - 2y \leq -1.$

Watch Video Solution

92. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$2x \leq 6 - 3y.$

Watch Video Solution

93. Represent the following inequations graphically in two-dimensional plane and hence solve them :

$y + 8 \geq 2x.$

Watch Video Solution

94. Represent the following inequations graphically in two-dimensional plane and hence solve them :

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

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95. Solve the following systems of inequations graphically :

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

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96. Solve the following system of inequalities graphically: $x \geq 3, y \geq 2$

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97. Solve the following systems of inequations graphically :

$y \leq 4, x \geq 1.$

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98. Solve the following system of inequalities graphically:

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

Watch Video Solution

99. Solve the following systems of inequations graphically :

$x + y \geq 5, x - y \leq 3.$

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100. Solve the following systems of inequations graphically :

$x + y > 4, 2x - y > 0.$

Watch Video Solution

101. Solve the following systems of inequations graphically :

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

Watch Video Solution

102. Solve the following systems of inequations graphically :

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

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103. Draw the graphs of the following inequations:

$2x + 3y \geq 12.$

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104. Draw the graphs of the following inequations:

$x - y \geq 0.$

Watch Video Solution

105. Draw the graphs of the following inequations:

$|x - y| \geq 2.$

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106. Draw the graphs of the following inequations:

$|y - x| \leq 1.$

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107. Draw the diagram of the solution sets of the following linear constraints :

$2x + y - 3 \geq 0, x - 2y + 1 \leq 0, x \geq 0, y \geq 0.$

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108. Draw the diagram of the solution sets of the following linear constraints :

$x + y \leq 5, 4x + y \geq 4, x + 5y \geq 5, x \leq 4, y \leq 3.$

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109. Draw the diagram of the solution sets of the following linear constraints :

$x + y \geq 1, y \leq 5, x \leq 6, 7x + 9y \leq 63, x, y \geq 0.$

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110. Verity that the solution set of the following constraints is empty :

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

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111. Verify that the solution set of the following linear constraints : $x - 2y \geq 0, 2x - y \leq -2$ is not empty and is unbounded.

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112. Find the linear constraints for which the shaded area in the following figure is the solution set :

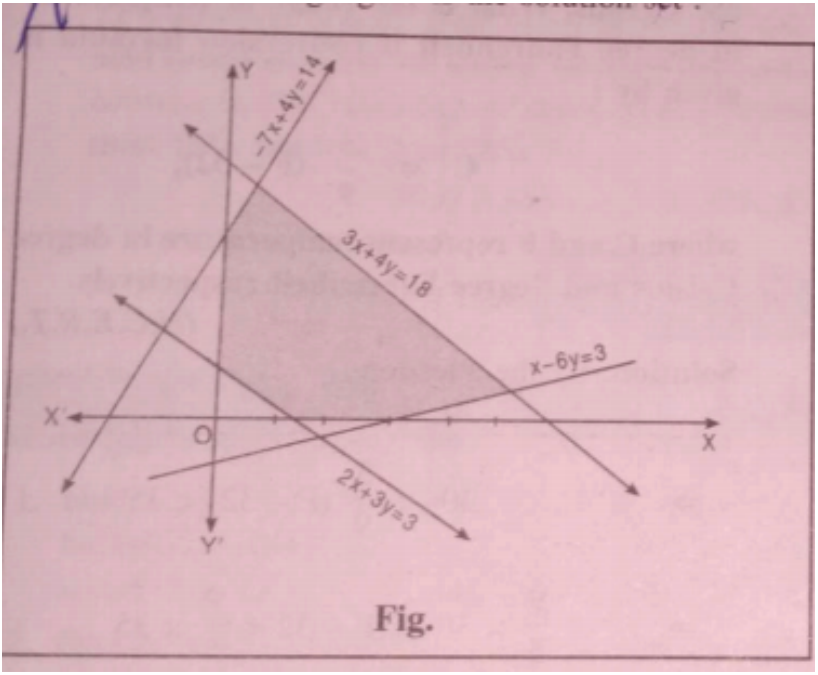

Fig.

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113. Solve the following systems of inequations graphically :

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

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114. Solve the following systems of inequations graphically :

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

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115. Solve the following systems of inequations graphically :

$5x + 4y \leq 40, x \geq 2, y \geq 3.$

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116. Solve the following systems of inequations graphically :

$3x + 2y \geq 24, 3x + y \leq 15, x \geq 4, y \geq 0.$

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117. Solve the following system of inequalities graphically:

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

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118. Solve the following systems of inequations graphically :

$2x - y - 3 \geq 0, x - 2y + 1 \leq 0, y < 3.$

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119. Solve the following systems of inequations graphically :

$8x + 3y \leq 100, x, y \geq 0.$

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120. Solve the following system of inequalities graphically:

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

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121. Solve the following system of inequalities graphically:

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

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122. Solve the following systems of inequations graphically :

$2x + y - 3 \geq 0, x - 2y + 1 \leq 0.$

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123. Solve the following system of inequalities graphically:

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

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124. Solve the following systems of inequations graphically :

$4x + 3y \geq 12, 4x - 5y \geq -20.$

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125. Solve the following systems of inequations graphically :

$x + 2y \geq 20, 3x + y \leq 15.$

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126. Solve the following systems of inequations graphically :

$x - 2y = 5, 2x - y \leq 7.$

Watch Video Solution

127. Solve the following systems of inequations graphically :

$2x + y = 3, x + 2y \leq 6.$

Watch Video Solution

128. Solve the following systems of inequations graphically :

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

Watch Video Solution

129. Solve the following systems of inequations graphically :

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

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130. Solve the following system of inequalities graphically:

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

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131. Solve the following systems of inequations graphically :

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

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132. Solve the following systems of inequations graphically :

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

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133. Solve the following systems of inequations graphically :

$x + y < 6, 7x + 4y \leq 28, x \geq 0, y > 0.$

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134. Solve the following system of inequalities graphically:

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

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135. Solve the following systems of inequations graphically :

$3x + 2y \leq 24, x + 2y \leq 16, x + y \leq 10, x \geq 0, y \geq 0.$

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136. Find the region when the following inequations : $x + y \geq 0, 2x + y \leq 4, x \geq 0$ and $y \leq 2$ hold good. Find the co-ordinates of the vertices of the region.

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137. Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40.

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

Watch Video Solution

139. 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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140. The marks obtained by a student of class XI in first terminal and second terminal are 62 and 48 respectively. Find the number of minimum

marks he should get in the annual examination to have an average of at least 60 marks.

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141. 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 course.

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142. 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.

Watch Video Solution

143. 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. What are the possible lengths of the shortest board if the third piece is to be at least 5cm longer than the second?[Hint: If x is the length of the shortest board, then x , (x + 3) and 2x are the lengths of the second and third piece, respectively. Thus, $x + (x + 3) + 2x \leq 91$ and $2x \geq (x + 3) + 5$],

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144. 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?

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

Watch Video Solution

146. The water acidity in a pool is considered normal when the average pH reading of three daily measurements is between 7.2 and 7.8. If the first two pH readings are 7.48 and 7.85, find the range of pH value for the third reading that will result in the acidity level being normal.

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147. 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?

Watch Video Solution

148. In drilling world's deepest hole, it was found that the temperature T in degree Celsius, x km below the surface of Earth, was given by : $T = 30 + 25(x - 3), 3 < x < 15$. At what depth will the temperature be between 200° C and 300° C ?

Watch Video Solution

149. A company manufactures cassettes and its cost equation for a week is C = 300 + 1.5 x and its revenue equation is R = 2x, where 'x' is the number of cassettes sold in a week. How many cassettes must be sold for the company to realize a profit ?

Watch Video Solution

150. Solve: $-2 \leq 6x - 1 < 2$.

Watch Video Solution

151. Solve the following inequations :

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

Watch Video Solution

152. Solve the following inequations :

$-3 \leq 4 - 7x < 18.$

Watch Video Solution

153. Solve the following inequations :

$-12 < 3x - 5 \leq -4.$

Watch Video Solution

154. Solve the following inequations :

$-2 < 1 - 3x < 7.$

Watch Video Solution

155. Solve the following inequations :

$-7 < 2x - 3 < 7.$

Watch Video Solution

156. Solve the following inequations :

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

Watch Video Solution

157. Solve the following inequations :

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

Watch Video Solution

158. Solve the following inequalities:

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

Watch Video Solution

159. Solve the following inequations :

$$\frac{2}{x-3} < 0.$$

Watch Video Solution

160. Solve : $|x+1| \geq 3$.

Watch Video Solution

161. Solve the following inequations :

$$|3x-2| \leq \frac{1}{2}.$$

Watch Video Solution

162. Solve the following inequations :

$$\left|x+\frac{1}{4}\right|>\frac{7}{4}.$$

Watch Video Solution

163. Solve the following inequations :

$$\left|\frac{3x-4}{2}\right|\leq\frac{5}{12}.$$

Watch Video Solution

164. Solve the following inequations :

$$|4-x|+1<3.$$

Watch Video Solution

165. A plumber can be paid under two schemes as given below : (I) : Rs. 600 and Rs. 50 per hour (II) : Rs. 170 per hour. If the job takes n hours, for what value of n does the scheme I give the plumber the better wages.

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166. Sketch the graph of the solution sets of the following system of inequations : $x + y \geq 5, 2x + 3 \geq 3y, 0 \leq x \leq 4, 0 \leq y \leq 2.$

Watch Video Solution

167. In the following, shade the region, where the following inequations hold. Also find the vertices of the region so formed : $x \geq 2, x \leq 8, y \geq -4, y \leq x + 2, 2x + y \leq 14.$

Watch Video Solution

168. Find the region when the following inequations : $x + y \leq 6, x \geq y, x \geq 0, y \geq 0$ hold good. Find the co-ordinates of the vertices of the region.

Watch Video Solution

169. i^{-35} is :

A. i

B. 1

C. 0

D. $-i$.

Answer:

Watch Video Solution

170. Solve $x^2 + 3 = 0$

A. -3

B. $-\sqrt{3}$

C. $\pm\sqrt{3}i$

D. None of these.

Answer:

Watch Video Solution

171. Solution of $x^2+2=0$ is:

A. -2

B. 2

C. $\pm\sqrt{2}$

D. $\pm\sqrt{2}i$.

Answer:

Watch Video Solution

172. Complex conjugate of 3i-4 is :

A. $3i + 4$

B. $-3i - 4$

C. $-3i + 4$

D. None of these.

Answer:

Watch Video Solution

173. Modulus of complex number 3i-4 is :

A. -1

B. 25

C. 5

D. -7.

Answer:

Watch Video Solution

174. Additive inverse of complex number 4-7i is :

A. $4+7i$

B. $-4+7i$

C. $-4-7i$

D. None of these.

Answer:

Watch Video Solution

175. The value of i^9+i^{19} is:

A. 1

B. 0

C. -1

D. 1

Answer:

Watch Video Solution

176. i^{-39} is equal to

A. $-i$

B. i

C. 1

D. -1.

Answer:

Watch Video Solution

177. Write the following in the form x + iy :

$(-i)(2i)\left(-\frac{1}{8}i\right)^3$.

A. $\frac{1}{256}i$

B. 256 i

C. $-256i$

D. None of these.

Answer:

Watch Video Solution

178. Real part of complex number 2i is :

A. Zero

B. 2

C. 3

D. None of these.

Answer:

Watch Video Solution

179. The imaginary part of $\frac{-1}{5}+\frac{i}{5}$ is :

A. Zero

B. $-\frac{1}{5}$

C. $\frac{1}{5}$

D. None of these.

Answer:

Watch Video Solution

180. The value of $i^{13}+i^{14}+i^{15}+i^{16}$ is :

A. i

B. $-i$

C. Zero

D. -1.

Answer:

Watch Video Solution

181. Complex conjugate of i is

A. i

B. $-i$

C. 0

D. 1

Answer:

Watch Video Solution

182. $\left(\frac{1+i}{1-i}\right)^2$ is equal to:

A. i

B. $-i$

C. 1

D. -1.

Answer:

Watch Video Solution

183. $i^{57} + \frac{1}{i^{125}}$ equals :

A. 0

B. 2i

C. $-2i$

D. 2

Answer:

Watch Video Solution

184. $\left(\frac{1+i}{1-i}\right)^2$ is equal to:

A. i

B. $-i$

C. 1

D. -1.

Answer:

Watch Video Solution

185. Number of non-zero integral solutions of the equation $|1-i|^x = 2^x$ is :

A. infinite

B. 1

C. 2

D. None of these.

Answer:

Watch Video Solution

186. If the imaginary part of $\frac{2z+1}{iz+1}$ is -2, then the locus of the point representing z in the complex plane is :

A. a circle

B. a st. line

C. a parabola

D. None of these.

Answer:

Watch Video Solution

187. The points representing the complex numbers z for which $|z+3|^2 - |z-3|^2 = 0$ lies on :

A. a straight line

B. a circle

C. a parabola

D. None of these.

Answer:

Watch Video Solution

188. One of the values of $(-i)^{1/3}$ is :

A. $\frac{-1+\sqrt{3}i}{2}$

B. $\frac{-1-\sqrt{3}i}{2}$

C. i

D. $\frac{-1+\sqrt{3}i}{3}$.

Answer:

Watch Video Solution

189. The complex number $z = x + iy$, which satisfies the equation $\left|\frac{z-5i}{z+5i}\right| = 1$, lies on:

A. the line y = 5

B. a circle through the origin

C. the x-axis

D. None of these.

Answer:

Watch Video Solution

190. In complex plane, the equation $|z+\bar{z}| = |z-\bar{z}|$ represents :

A. two intersecting lines

B. two parallel lines

C. four lines

D. a circle passing through the origin.

Answer:

Watch Video Solution

191. For complex numbers u, v, one always has :

A. $u^2 + v^2 = |u|^2 + |v|^2$

B. $|u| + |v| \leq |u + v|$

C. $|u - v| \leq |u| - |v|$

D. $|u + v| \leq |u| + |v|$.

Answer:

Watch Video Solution

192. If $\left(\frac{1+i}{1-i}\right)^n = 1$, then the smallest value of n is :

A. 2

B. 6

C. 8

D. 4

Answer:

Watch Video Solution

193. Which of the following is correct ?

A. $5+3i>6+4i$

B. $5+3i=6+4i$

C. $5+3i<6+4i$

D. None of these.

Answer:

Watch Video Solution

194. In the Argand diagram. if O, P and Q represent respectively the origin and the complex numbers z and z+iz, then the angle $\angle OPQ$ is :

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. $\frac{2\pi}{3}$.

Answer:

Watch Video Solution

195. The area of the triangle with vertices affixed at z, iz, z(1 +i) is:

A. $\frac{1}{4}|z|^2$

B. $\frac{1}{3}|z|^2$

C. $|z|^2$

D. $\frac{1}{2}|z|^2$.

Answer:

Watch Video Solution

196. Multiplication of a complex z by i corresponds to :

A. Clockwise rotation of the line joining z to origin in Argand diagram through an angle of $\frac{\pi}{2}$

B. Anticlockwise rotation of the line joining z to origin in Argand diagram through an angle of $\frac{\pi}{2}$

C. Rotation of the line joining z to origin in Argand diagram through an angle π

D. No rotation.

Answer:

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197. If $\frac{c+i}{c-i} = a + ib$, where a, b, c are real, then $a^2 + b^2$ equals :

A. 1

B. -1

C. c^2

D. $-c^2$.

Answer:

Watch Video Solution

198. If $i^2 = -1$, then the value of $\sum_{n=1}^{200} i^n$ is :

A. 50

B. -50

C. 0

D. 100

Answer:

Watch Video Solution

199. If the conjugate of (x + iy) (1-2i) be 1+i, then :

A. $x = \frac{3}{5}$

B. $y = \frac{3}{5}$

C. $x + iy = \frac{1 - i}{1 - 2i}$

D. $x - iy = \frac{1 - i}{1 + 2i}$.

Answer:

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200. Mathematical Induction shows that the inequality $\log(n!) > \frac{n}{2}$ holds :

A. for all positive integers n

B. for positive integers $n \geq 2$

C. for no positive integer

D. for positive integers $n \geq 3$.

Answer:

Watch Video Solution

201. The inequality $n! > 2^{n-1}$ is true:

A. for all n $\in$ N

B. for all n > 1

C. for all n > 2

D. for no n $\in$ N.

Answer:

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202. The number of solutions of the equation $z^2 + \bar{z} = 0$ is :

A. 2

B. 4

C. 6

D. 8

Answer:

Watch Video Solution

203. If α, β are the roots fo the equation $\lambda\left(x^2 - x\right) + x + 55 = 0$. If λ_1 and λ_2 are two values of λ for which the roots α, β are related by $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{4}{5}$ find the value of $\frac{\lambda_1}{\lambda_2} + \frac{\lambda_2}{\lambda_1}$

A. 4192

B. 4144

C. 4096

D. 4048

Answer:

Watch Video Solution

204. The modulus of $\frac{1-i}{3+i}+\frac{4i}{5}$ is :

A. $\sqrt{5}$ units

B. $\frac{\sqrt{11}}{5}$ units

C. $\frac{\sqrt{5}}{5}$ units

D. $\frac{\sqrt{12}}{5}$ units .

Answer:

Watch Video Solution

205. For any complex number z, the minimum value of $|z|+|z-1|$ is :

A. 0

B. 1

C. 2

D. -1.

Answer:

Watch Video Solution

206. If α, β are the roots of $x^2 - a(x-1) + b = 0$, then the value of $\frac{1}{\alpha^2 - a\alpha} + \frac{1}{\beta^2 - b\beta} + \frac{2}{a+b}$ is :

A. $\frac{4}{a+b}$

B. $\frac{1}{a+b}$

C. 0

D. -1.

Answer:

Watch Video Solution

207. The sum of all real roots of the equation $|x-2|^2 + |x-2| - 2 = 0$ is

A. 7

B. 4

C. 1

D. 5

Answer:

Watch Video Solution

208. The quadratic equation whose roots are three times the roots of $3ax^2 + 3bx + c = 0$ is:

A. $ax^2 + 3bx + 3c = 0$

B. $ax^2 + 3bx + c = 0$

C. $9ax^2 + 9bx + c = 0$

D. $ax^2 + bx + 3c = 0$

Answer:

Watch Video Solution

209. If a, b, c are real, then both the roots of the equation : $(x-b)(x-c)+(x-c)(x-a)+(x-a)(x-b)$ are always :

A. positive

B. negative

C. real

D. imaginary.

Answer:

Watch Video Solution

210. If x satisfies the inequations $2x-7<11, 3x+4<-5$, then x lies in the interval :

A. $(-\infty, 3)$

B. $(-\infty, 2)$

C. $(-\infty, -3)$

D. $(-\infty, \infty)$.

Answer:

Watch Video Solution

211. The set of all real x satisfying the inequality $\frac{3-|x|}{4-|x|} \geq 0$ is :

A. $[-3, 3] \cup (-\infty, -4) \cup (4, \infty)$

B. $(-\infty, -4) \cup (4, \infty)$

C. $(-\infty, -3) \cup (4, \infty)$

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

Answer:

Watch Video Solution

212. If the area of the triangle formed by the points `z, z+iz and iz is 50 square units, then |z| is equal to :

A. 5

B. 8

C. 10

D. $5\sqrt{2}$.

Answer:

Watch Video Solution

213. The locus of z such that : $arg[(1-2i)z-2+5i]=\frac{\pi}{4}$ is a:

A. line not passing through the origin

B. circle not passing through the origin

C. line passing through the origin

D. circle passing through the origin.

Answer:

Watch Video Solution

214. If $z = \sqrt{3} + i$, then the argument of $z^2 e^{z-i}$ is equal to :

A. $\frac{\pi}{2}$

B. $\frac{\pi}{6}$

C. $e^{\frac{\pi}{6}}$

D. $\frac{\pi}{3}$.

Answer:

Watch Video Solution

215. If $\omega \neq 1$ and $\omega^3 = 1$, then : $\frac{a\omega + b + c\omega^2}{a\omega^2 + b\omega + c} + \frac{a\omega^2 + b + c\omega}{a + b\omega + c\omega^2}$ is equal to :

A. 2

B. ω

C. 2ω

D. $2\omega^2$.

Answer:

Watch Video Solution

216. The centre of a regular hexagon is at the point z = i. If one of its vertices is at 2 + i, then the adjacent vertices of 2 + i are at the points :

A. $1 \pm 2i$

B. $i + 1 \pm \sqrt{3}$

C. $2 + i\left(1 \pm \sqrt{3}\right)$

D. $1 + i\left(1 \pm \sqrt{3}\right)$.

Answer:

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217. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}, (x \neq -p, x \neq -q, r \neq 0)$ are equal in magnitude but opposite in sign, then p + q is equal to :

A. r

B. 2r

C. r^2

D. $1/r$.

Answer:

Watch Video Solution

218. The solution of the equation : $\left(3+2\sqrt{2}\right)^{x^2-8}+\left(3+2\sqrt{2}\right)^{8-x^2}=6$ are:

A. $3 \pm 2\sqrt{2}$

B. ± 1

C. $\pm 3\sqrt{3},\ \pm 2\sqrt{2}$

D. $\pm 3,\ \pm \sqrt{7}.$

Answer:

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219. If 2 - i is a root of the equation $ax^2 + 12x + b = 0$ (where a and b are real), then the value of ab is equal to :

A. 45

B. 15

C. -15

D. -45

Answer:

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220. If one root of the equation $lx^2 + mx + n = 0$ is $\frac{9}{2}$ (l, m and n are positive integers) and $\frac{m}{4n} = \frac{l}{m}$, then l+ n is equal to :

A. 80

B. 85

C. 90

D. 95

Answer:

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221. If $x^2 + 4ax + 2 > 0$ for all values of x, then a lies in the interval:

A. (-2,4)

B. (1,2)

C. $(-\sqrt{2}, \sqrt{2})$

D. $\left(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$.

Answer:

Watch Video Solution

222. If $x + iy = \sqrt{\frac{(a+ib)}{(c+id)}}$, then $x^2 + y^2$ equals :

A. $(a^2+b^2)(c^2+d^2)$

B. $\sqrt{(a^2-b^2)(c^2-d^2)}$

C. $(a^2-b^2)(c^2-d^2)$

D. $\sqrt{\frac{a^2+b^2}{c^2+d^2}}$.

Answer:

Watch Video Solution

223. The solution of the equation |z|-z=1+2i is :

A. $\frac{3}{2} - i$

B. $\frac{3}{2} - 2i$

C. $\frac{3}{2} + 2i$

D. $\frac{3}{2} + i.$

Answer:

Watch Video Solution

224. If α and β are the roots of $x^2 + x + 1 = 0$, then $\alpha^{16} + \beta^{16}$=

A. 2

B. 0

C. 1

D. $-1.$

Answer:

Watch Video Solution

225. The complex number $\frac{1+2i}{1-i}$ lies in:

A. Fourth quadrant

B. First quadrant

C. Second quadrant

D. Third quadrant.

Answer:

Watch Video Solution

226. If P is a point in the Argand diagram corresponding to the complex number $\sqrt{3}+i$ and if OPQ is an isosceles right angled triangle, right angled at 'O', then Q represents the complex number :

A. $\sqrt{3}-i$ or $1-i\sqrt{3}$

B. $-1 \pm i\sqrt{3}$

C. $-1+i\sqrt{3}$ or $1-i\sqrt{3}$

D. $1 \pm i\sqrt{3}$.

Answer:

Watch Video Solution

227. The smallest positive integral value of 'n' such that $\left[\frac{1+\sin\frac{\pi}{8}+i\cos\frac{\pi}{8}}{1+\sin\frac{\pi}{8}-i\cos\frac{\pi}{8}}\right]^n$ is purely imaginary is n =

A. 2

B. 6

C. 4

D. 3

Answer:

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228. For $\frac{|x-1|}{x+2} < 1$, x lies in the interval :

A. $(-\infty, -2) \cup \left(-\frac{1}{2}, \infty\right)$

B. $(-\infty, 1) \cup [2, 3]$

C. $(-\infty, -4)$

D. $\left[-\frac{1}{2}, 1\right]$.

Answer:

Watch Video Solution

229. If a, b, c >0 and if abc=1, then the Value of a+b+c+ab+bc+ca lies in the interval :

A. $(-\infty, -6]$

B. (- 6,0)

C. (0, 6)

D. $[6, \infty)$.

Answer:

Watch Video Solution

230. Let z and w be two complex numbers such that $|z| \leq 1, |w| \leq 1$ and $|z - iw| = |z - i\overline{w}| = 2$, then z equals :

A. 1 or i

B. i or -i

C. 1 or -1

D. i or -1.

Answer:

Watch Video Solution

231. Find the range of $f(x) = \dfrac{x^2 + 34x - 71}{x^2 + 2x - 7}$

A. a=-1, b=1

B. a=1, b=-1

C. a=5,b=9

D. a=9,b=5.

Answer:

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232. If $ax^2 + bx + c = 0$ and $2x^2 + 3x + 4 = 0$ have a common root, where a, b, c $\in$ N (set of natural numbers), the least value of a + b +c is:

A. 13

B. 11

C. 7

D. 9

Answer:

Watch Video Solution

233. If $(3+i)(z+\bar{z})-(2+i)(z-\bar{z})+14i=0$, then $z\bar{z}$ =

A. 5

B. 8

C. 10

D. 40

Answer:

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234. $4+5\left(\frac{-1+i\sqrt{3}}{2}\right)^{2008}+3\left(\frac{-1+i\sqrt{3}}{2}\right)^{2009}$ =

A. $-i\sqrt{3}$

B. $i\sqrt{3}$

C. $1 - i\sqrt{3}$

D. $-1 + i\sqrt{3}$.

Answer:

Watch Video Solution

235. If the equation : $(a+1)x^2 - (a+2)x + (a+3) = 0$ has roots equal in magnitude but Opposite in signs, then the roots of the equation are:

A. $\pm a$

B. $\pm \frac{1}{2}a$

C. $\pm \frac{3}{2}a$

D. $\pm 2a$.

Answer:

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236. If α and β are the roots of the quadratic equation $x^2 + 4x + 3 = 0$, then the equation whose roots are $2\alpha + \beta$ are $\alpha + 2\beta$ is :

A. $x^2 - 12x + 35 = 0$

B. $x^2 + 12x - 33 = 0$

C. $x^2 - 12x - 33 = 0$

D. $x^2 + 12x + 35 = 0$.

Answer:

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237. Which one of the following is one of the roots of the equation $(b - c)x^2 + (c - a)x + (a - b) = 0$?

A. $\frac{(c - a)}{(b - c)}$

B. $\frac{(a-b)}{(b-c)}$

C. $\frac{(b-c)}{(a-b)}$

D. $\frac{(c-a)}{(a-b)}$.

Answer:

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238. What is the value of x satisfying the equation : $16\left(\frac{a-x}{a+x}\right)^3 = \frac{a+x}{a-x}$?

A. $a/2$

B. $a/3$

C. $a/4$

D. 0

Answer:

Watch Video Solution

239. If α, β are the roots of the equation : $2x^2 - 2(1+n^2)x + (1+n^2+n^4) = 0$, then what is the value of $\alpha^2 + \beta^2$?

A. $2n^2$

B. $2n^4$

C. 2

D. n^2.

Answer:

Watch Video Solution

240. The roots of $Ax^2 + Bx + C = 0$ are r and s. For the roots of $x^2 + px + q = 0$ to be r^2 and s^2, what must be the value of p ?

A. $(B^2 - 4AC) / A^2$

B. $\left(B^2 - 2AC\right) / A^2$

C. $\left(2AC - B^2\right) / A^2$

D. $B^2 - 2C$.

Answer:

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241. What is the value of $\left(\frac{-1+i\sqrt{3}}{2}\right)^{900} + \left(\frac{-1-i\sqrt{3}}{2}\right)^{301}$?

A. $\frac{-1+i\sqrt{3}}{2}$

B. $\frac{1-i\sqrt{3}}{2}$

C. $\frac{-1-i\sqrt{3}}{2}$

D. $\frac{1+i\sqrt{3}}{2}$.

Answer:

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242. If $2^x + 3^y = 17$ and $2^{x+2} - 3^{y+1} = 5$, then what is the value of x ?

A. 3

B. 2

C. 1

D. 0

Answer:

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243. What is $\frac{\left(\sqrt{3}+i\right)}{\left(1+\sqrt{3}i\right)}$ equal to ?

A. $1+i$

B. $1-i$

C. $\frac{\sqrt{3}(1-i)}{2}$

D. $\frac{\left(\sqrt{3}-i\right)}{2}$.

Answer:

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244. If z_1, z_2, z_3 are complex numbers such that $|z_1| = |z_2| = |z_3| = \left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right| = 1, |z_1 + z_2 + z_3|$ is :

A. equal to 1

B. less than 1

C. greater than 3

D. equal to 3.

Answer:

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245. For positive integers n_1, n_2, the value of the expression : $(1+i)^{n_1} + \left(1+i^3\right)^{n_1} + \left(1+i^5\right)^{n_2} + \left(1+i^7\right)^{n_2}$, where $i = \sqrt{-1}$ is a real number if and only if :

A. $n_1 = n_2 + 1$

B. $n_1 = n_2 - 1$

C. $n_1 = n_2$

D. $n_1 > 0, n_2 > 0.$

Answer:

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246. If z_1, z_2 are two complex numbers satisfying the equation $\left|\frac{z_1 + z_2}{z_1 - z_2}\right| = 1$, then $\frac{z_1}{z_2}$ is a number which is :

A. positive real

B. negative real

C. zero

D. imaginary.

Answer:

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247. The equation $z\bar{z} + a\bar{z} + \bar{a}z + b = 0, b \in R$ represents a circle if :

A. $|a|^2 = b$

B. $|a^2| > b$

C. $|a|^2 < b$

D. None of these.

Answer:

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248. If $\cos\alpha + \cos\beta + \cos\gamma = \sin\alpha + \sin\beta + \sin\gamma = 0$, then :

A. $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = 0$

B. $\sin 2\alpha + \sin 2\beta + \sin 2\gamma = 0$

C. $\cos(\beta+\gamma) + \cos(\gamma+\alpha) + \cos(\alpha+\beta) = 0$

D. $\sin(\beta+\gamma) + \sin(\gamma+\alpha) + \sin(\alpha+\beta) = 0.$

Answer:

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249. If x satisfies $|x-1| + |x-2| + |x-3| \geq 6$, then :

A. $0 \leq x \leq 4$

B. $x \leq -2$ or $x \geq 4$

C. $x \leq 0$ or $x \geq 4$

D. None of these.

Answer:

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250. If $5 \leq x \leq 8$, then :

A. $(x-5)(x-8) \geq 0$

B. $(x-5)(x-8) > 0$

C. $(x-5)(x-8) \leq 0$

D. $(x-5)(x-8) < 0.$

Answer:

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251. If $\frac{x^2-5x+6}{x^2-x+1}$ is negitive then :

A. x<2

B. 2`

C. xgt3

D. xlt2 or xgt3.

Answer:

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252. Let z_1 and z_2 be nth roots of unity, which subtend a right angle at the origin. Then n must be of the form:

A. 4k +1

B. 4k +2

C. 4k +3

D. 4k.

Answer:

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253. The complex numbers z_1, z_2 and z_3 satisfying $\frac{z_1 - z_3}{z_2 - z_3} = \frac{1 - i\sqrt{3}}{2}$ are the vertices of triangle, which is :

A. of area zero

B. right-angled isosceles

C. equilateral

D. obtuse-angled isosceles.

Answer:

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254. If $|z| = 1$ and $w = \frac{z-1}{z+1}$ (where $z \neq -1$), then $Re(w)$ is

A. $\frac{1}{|z+1|^2}$

B. $\frac{-1}{|z+1|^2}$

C. $\frac{\sqrt{2}}{|z+1|^2}$

D. 0

Answer:

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255. If z and w are two non-zero complex numbers such that $|zw| = 1$ and $Arg(z) - Arg(w) = \frac{\pi}{2}$, then $\bar{z}$ w is equal to :

A. -1

B. i

C. $-i$

D. 1

Answer:

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256. Let z and w be two non-zero complex numbers such that |z|=|w| and arg(z)+arg(w)=π, then z equals

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. $\frac{3\pi}{4}$

D. $\frac{5\pi}{4}$.

Answer:

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257. Let $z = x - iy$ and $z^{\frac{1}{3}} = p + iq$.Then $\left(\frac{x}{p} + \frac{y}{q}\right) / \left(p^2 + q^2\right)$ is equal to:

A. 1

B. -1

C. 2

D. -2.

Answer:

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258. If $\left|z^2-1\right|=|z|^2+1$, then z lies on :

A. the real axis

B. the imaginary axis

C. a circle

D. an ellipse.

Answer:

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259. If $z_1 and z_2$ are two nonzero complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$, then $arg z_1 - arg z_2$ is equal to

A. $-\pi$

B. $\frac{\pi}{2}$

C. $-\frac{\pi}{2}$

D. 0

Answer:

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260. If $w = \frac{z}{z - i\frac{1}{3}}$ and |w|=1,then z lies on:

A. a circle

B. an ellipse

C. a parabola

D. a st. line.

Answer:

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261. If a, b, c and u, v, w are complex numbers representing the vertices of two triangles such that c=(1-r)a+rb and w=(1 -r)u+rv,where r is a complex number, then the two triangles :

A. have the same area

B. are similar

C. are congruent

D. None of these.

Answer:

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262. If $z^2 + z + 1 = 0$, where z is a complex number, the value of $\left(z + \frac{1}{z}\right)^2 + \left(z^2 + \frac{1}{z^2}\right)^2 + \left(z^3 + \frac{1}{z^3}\right)^2 + \ldots + \left(z^6 + \frac{1}{z^6}\right)^2$ is

A. 18

B. 54

C. 6

D. 12

Answer:

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263. If $\omega = \alpha + i\beta$, where $\beta \neq 0, i = \sqrt{-1}$ and $z \neq 1$, satisfies the condition that $\left(\frac{\omega - \overline{\omega} z}{1 - z}\right)$ is purely real, the set of values of z is

A. $\{z : |z| = 1\}$

B. $\{z : z = \bar{z}\}$

C. $\{z : z \neq 1\}$

D. $\{z : |z| = 1, z \neq 1\}$.

Answer:

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264. If $|z + 4| \leq 3$, the maximum value of $|z + 1|$ is

A. 10

B. 6

C. 0

D. 4

Answer:

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265. If $|z| = 1$ and $z \neq 1$, then all the values of $\frac{z}{1 - z^2}$ lie on

A. a line not passing through origin

B. $|z| = \sqrt{2}$

C. the x-axis

D. the y-axis.

Answer:

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266. A man walks a distance of 3 units from the origin towards the North-East $(N45^0E)$ direction.From there, he walks a distance of 4 units towards the North-West $(N45^0W)$ direction to reach a point P. Then, the position of P in the Argand plane is

A. $3e^{\frac{i\pi}{4}} + 4i$

B. $(3 - 4i)e^{\frac{i\pi}{4}}$

C. $(4 + 3i)e^{\frac{i\pi}{4}}$

D. $(3 + 4i)e^{\frac{i\pi}{4}}$.

Answer:

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267. The conjugate of a complex number is $\frac{1}{i-1}$. Then that complex number is :

A. $\frac{1}{i-1}$

B. $\frac{-1}{i-1}$

C. $\frac{1}{i+1}$

D. $\frac{-1}{i+1}$.

Answer:

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268. How many real solutions does the equation $x^7 = 14x^5 + 16x^3 + 30x - 560 = 0$ have?

A. 5

B. 7

C. 1

D. 3

Answer:

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269. The quadratic equations $x^2 - 6x + a = 0 and x^2 - cx + 6 = 0$ have one root in common. The other roots of the first and second equations are integers in the ratio 4 : 3. Then the common root is

A. 2

B. 1

C. 4

D. 3

Answer:

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270. Let z=x+iy be a complex number, where x and y are integers and $i = \sqrt{-1}$. Then, the area of the rectangle whose vertices are the roots of the equation $z\bar{z}^3 + \bar{z}z^3 = 350$, is

A. 48

B. 32

C. 40

D. 80

Answer:

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271. If $\left|z - \frac{4}{z}\right| = 2$ then the greatest value of $|z|$ is:

A. $\sqrt{3}+1$

B. $\sqrt{5}+1$

C. 2

D. $2+\sqrt{2}$.

Answer:

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272. If the roots of the equation $bx^2+cx+a=0$ be imaginary, then for all real values of x, the expression $3b^2x^2+6bcx+2c^2$ is (1) greater than -4ab (2) less than 4ab (3) greater than $4ab$ (4) less than -$4ab$

A. greater than 4ab

B. less then 4ab

C. greater than -4ab

D. less than -4ab.

Answer:

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273. The number of complex numbersd z, such that $|z-1|=|z+1|=|z-i|$, where $i=\sqrt{-1}$ equals to

A. 0

B. 1

C. 2

D. -1.

Answer:

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274. Let z_1 and z_2 be two distinct complex numbers and $z=(1-t)z_1+tz_2$, for some real number t with $0<t<1$ and

$i = \sqrt{-1}$. If arg(w) denotes the principal argument of a non-zero complex number w, then

a. $|z - z_1| + |z - z_2| = |z_1 - z_2|$

b. $arg(z - z_1) = arg(z - z_2)$

c. $\begin{vmatrix} z - z_1 & \bar{z} - \bar{z}_1 \\ z_2 - z_1 & \bar{z}_2 - \bar{z}_1 \end{vmatrix} = 0$

d. $arg(z - z_1) = arg(z_2 - z_1)$

A. $|z - z_1| + |z - z_2| = |z_1 - z_2|$

B. $Arg|z - z_1| = Arg|z - z_2|$

C. $\begin{vmatrix} z - z_1 & \bar{z} - \bar{z}_1 \\ z_2 - z_1 & \bar{z}_2 - \bar{z}_1 \end{vmatrix} = 0$

D. $Arg(z - z_1) = Arg(z_2 - z_1)$.

Answer:

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275. Let α and β be real and z be a complex number. If $z^2 + az + \beta = 0$ has two distinct roots on the line Re(z)=1, then it is necessary that

A. $\beta \in (0, 1)$

B. $\beta \in (-1, 0)$

C. $|\beta| = 1$

D. $\beta \in (1, \infty)$.

Answer:

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276. If $\omega(\neq 1)$ is a cube root of unity and $(1+\omega)^7 = A + b\omega$, then (A,B) equals to

A. (0, 1)

B. (1, 1)

C. (1, 0)

D. (-1, 1).

Answer:

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277. By Mathematical Induction, prove that :

$n! < \left(\frac{n+1}{2}\right)^n, n > 1.$

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278. By Mathematical Induction, prove that :

$\left(1+\frac{1}{n}\right)^n \leq n$ for all $n \geq 3.$

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279. By Mathematical Induction, prove the following :

$(4^n + 15n - 1)$ is divisible by 9 .

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280. Given $n^4 < 10^n$ for a fixed integer $n \geq 2$. Prove that $(n+1)^4 < 10^{n+1}$.

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281. When P is natural number , then $P^{n+1} + (P+1)^{2n-1}$ is divisible by

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282. Using Mathematical Induction, prove that : ${}^mC_0^n C_k + {}^m C_1^n C_{k-1} + \ldots\ldots\ldots + {}^m C_k^n C_0 = {}^{m+n} C_k$, where m, n, r are positive integers and ${}^pC_q = 0$ for p < q.

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283. If x is not an integral multiple of 2π, use Mathematical Induction to prove that :

$\cos x + \cos 2x + \ldots\ldots\ldots\ldots + \cos nx = \cos \frac{n+1}{2} x \sin \frac{nx}{2} \cos ec \frac{x}{2}.$

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284. Find θ such that $\frac{3 + 2i \sin \theta}{1 - 2i \sin \theta}$ is purely real.

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285. Find all circles which are orthogonal to $|z| = 1$ and $|z - 1| = 4$.

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286. If the complex variables z_1, z_2 and origin form an equilateral triangle, prove that : $z_1^2 + z_2^2 - z_1 z_2 = 0$.

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287. Let the complex numbers z_1, z_2, z_3 be the vertices of an equilateral triangle. Let z_0 be the circumcentre of the triangle. Then prove that $z_1^2 + z_2^2 + z_3^2 = 3z_0^2$.

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288. Let A and B be two complex numbers such that $\frac{A}{B} + \frac{B}{A} = 1$. Prove that the origin and two points represented by A and B form the vertices of an equilateral triangle.

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289. Let A, B, C, D and E be points on the complex plane, which respectively represent the complex numbers z_1, z_2, z_3, z_4 and z_5. If $(z_3 - z_2)z_4 = (z_1 - z_2)z_5$, prove that the triangles ABC and DOE are similar.

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