* **Choose the right answer from the given options. [1 Marks Each]** [40]

1. Ordered pair that satisfy the equation x + y + 1 < 0 is:

    (A) (0, -1)　　　　　(B) (-2,0)　　　　　(C) (2, -4)　　　　　(D) Both (B) and (C)

2. If the cube roots of unity are $1, \omega$ and ω^2, then the roots of the equation $(x-1)3+8=0,$ are:

    (A) $-1, 1+2\omega, 1+2\omega^2$

    (B) $-1, 1+2\omega, 1-2\omega^2$

    (C) $-1, -1, -1$

    (D) $-1, -1+2\omega-1-2\omega^2$

3. If α and β are the roots of the equation $x^2 - x + 1 = 0,$ then a $2009 + \beta^{2009}$ is equal to:

    (A) -2　　　　　(B) -1　　　　　(C) 1　　　　　(D) 2

4. The value of x for which $|x+1| + \sqrt{(x-1)} = 0$

    (A) 0　　　　　(B) 1　　　　　(C) -1　　　　　(D) No value of x

5. The longest side of a triangle is 2 times the shortest side and the third side is 4cm shorter than the longest side.If the perimeter of the triangle is at least 61cm, find the minimum length of the shortest side.

    (A) 7　　　　　(B) 9　　　　　(C) 11　　　　　(D) 13

6. If (1 – p) is a root of quadratic equation x^2 + px + (1-p) = 0, then its roots are:

    (A) 0, 1　　　　　(B) – 1, 1　　　　　(C) 0, -1　　　　　(D) – 1, 2

7. The solution of the inequality $\frac{3(x-2)}{5} \geq \frac{5(2-x)}{3}$ is:

    (A) $x \in (2,\infty)$　　(B) $x \in \left[-2,\infty\right)$　　(C) $x \in \left[\infty,2\right)$　　(D) $x \in \left[2,\infty\right)$

8. If $|x+3| \geq 10$, then:

    (A) $x \in \left(-13,7\right]$

    (B) $x \in \left(-13,7\right)$

    (C) $x \in \left(-\infty,-13\right] \cup \left[7,\infty\right)$

    (D) $x \in \left(-\infty,-13\right) \cup \left[7,\infty\right)$

9. If x is a natural number and $20x \leq 100$ then find solution set of x.

    (A) {0, 1, 2, 3, 4, 5}　　(B) {1, 2, 3, 4, 5}　　(C) {1, 2, 3, 4}　　(D) {0, 1, 2, 3, 4}

10. If |x–1| x - 1 > 5, then:

    (A) $x \in (-4,6)$

    (B) $x \in [-4,6]$

    (C) $x \in (-\infty,-4) \cup (6,\infty)$

    (D) $x \in (-\infty,-4) \cup [6,\infty)$

11. If $4x+3 < 6x+7$, then $x \in$

    (A) $(2,\infty)$　　(B) $(-2,\infty)$　　(C) $(-\infty,2)$　　(D) $(-\infty,\infty)$

12. A solution is to be kept between $77°$ F and $86°$ F. What is the range in temperature in degree Celsius (C) if the $\frac{\text{Celsius}}{\text{Fahrenheit}}$ (F) conversion formula is given by $F = \frac{9}{5c} + 32°$

(A) $[15°, 20°]$ (B) $[20°, 25°]$ (C) $[25°, 30°]$ (D) $[30°, 35°]$

13. Solution of $|3x + 2| < 1$ is:

(A) $\left[-1, \frac{-1}{3}\right]$ (B) $\left(\frac{-1}{3}, -1\right)$ (C) $\left(-1, \frac{-1}{3}\right)$ (D) None of these

14. 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

15. If x is a whole number and $10x \leq 50$ then find solution set of x.

(A) {0,1, 2, 3, 4, 5}   (B) {1, 2, 3, 4, 5}   (C) {1, 2, 3, 4}   (D) {0, 1, 2, 3, 4}

16. The length of a rectangle is three times the breadth. If the minimum perimeter of the rectangle is 160cm, then:

(A) breadth > 20cm   (B) length < 20cm   (C) breadth x ≥ 20cm   (D) length ≤ 20cm

17. Write the solution of inequality $\frac{1}{5}\left(\frac{3x}{5} + 4\right) \geq \frac{1}{3}(x - 6)$.

(A) $x \leq \frac{105}{8}$ (B) $x \geq \frac{105}{8}$ (C) $x \geq 120$ (D) $x \leq 120$

18. The cost and revenue functions of a product are given by C(x) = 20x + 4000 and R(x) = 60x + 2000, respectively, where x is the number of items produced and sold. How many items must be sold to realise some profit?

(A) Less than 40   (B) More than 50   (C) Less than 50   (D) Exactly 50

19. The sum of four numbers in AP is 20. The numbers are such that the ratio of the product of first and fourth is to the product of second and third as 2 : 3. The greatest number is:

(A) 8   (B) 7   (C) 14   (D) 4

20. Rahul obtained 20 and 25 marks in first two tests. Find the minimum marks he should get in the third test to have an average of at least 30 marks.

(A) 60   (B) 35   (C) 180   (D) 45

21. If $7x + 3 < 5x + 9$ then $x \in$

(A) $(-\infty, 3]$ (B) $(-\infty, \infty)$ (C) $(-\infty, 3)$ (D) $[3, \infty)$

22. If Ram has x rupees and he pay 40 rupees to shopkeeper then find range of x if amount of money left with Ram is at least 10 rupees is given by inequation, ___?

(A) x ≥ 10   (B) x ≤ 10   (C) x ≤ 50   (D) x ≥ 50

23. A pack of coffee powder contains a mixture of x gms of coffee and y gms of choco. The amount of coffee powder is greater than that of chocolate and each pack weights at least 10g. Which of the followinginequalities describe the given condition?

(A) $x < y$ (B) $x + y \geq 10$ (C) $x + y \leq 10$ (D) $x > y$

24. The value of a for which one root of the quadratic equation $(a^2 - 5a + 3)x^2 + 3a - 1)x + 2$ is twice as large as the other, is:

(A) $\frac{2}{3}$ (B) $\frac{-2}{3}$ (C) $\frac{1}{3}$ (D) $\frac{-1}{3}$

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

(A) (11, 13), (13, 15), (15, 17), (17, 19)   (B) (11, 13), (13, 15), (15, 17)

(C) (21, 23), (23, 25), (25, 27), (27, 29)   (D) (15, 17), (17, 19), (19, 21), (21, 23)

26. The number of pairs (a, b) of positive real numbers satisfying $a^4 + b^4 < 1$ and $a^2 + b^2 > 1$ is

(A) 0 (B) 1 (C) 2 (D) More than 2

27. In a cinema hall, the charge per person is ₹200. On the first day, only 60% of the seats were filled. The owner decided to reduce the price by 20% and there was an increase of 50% in the number of spectators on the next day. The percentage increase in the revenue on the second day was

(A) 50 (B) 40 (C) 30 (D) 20

28. There are three kinds of liquids X, Y, Z. Three jars J_1, J_2, J_3 contains $100 ml$ of liquids X, Y, Z respectively. By an operation we mean three steps in the following order

- stir the liquid in J_1 and transfer $10\,ml$ from J_1 into J_2
- stir the liquid in J_2 and transfer $10\,ml$ from J_2 into J_3
- stir the liquid in J_3 and transfer $10\,ml$ from J_3 into J_1.

After performing the operation four times, let x, y, z be the amounts of X, Y, Z respectively, in J_1. Then,

(A) $x > y > z$ (B) $x > z > y$ (C) $y > x > z$ (D) $z > x > y$

29. Suppose the height of a pyramid with a square base is decreased by $p\%$ and the lengths of the sides of its square base are increased by $p\%$ (where, $p > 0$). If the volume remains the same, then

(A) $50 < p < 55$ (B) $55 < p < 60$ (C) $60 < p < 65$ (D) $65 < p < 70$

30. The solution set of $|x - 1| \leq -1$ is...

(A) $(0, 2)$ (B) $[0, 2]$ (C) $(-\infty, -1] \cup [1, \infty)$ (D) $\emptyset$

31. The number of ordered pairs (x, y) of integers satisfying $x^3 + y^3 = 65$ is

(A) 0   (B) 2   (C) 4   (D) 6

32. $\frac{|x-1|}{x-1} \leq 0$ then $x \in$

(A) $(-\infty, 1)$ (B) $(1, \infty)$ (C) $(-1, 1)$ (D) ϕ

33. If $|x-2| \geq |x-4|$ then $x \in \ldots$

(A) $[2, 4]$ (B) $[3, \infty)$ (C) $[3, 6]$ (D) $[-4, -2]$

34. $\left|x + \frac{1}{x}\right| \geq 2$ then $x \in$

(A) $R - \{0\}$ (B) $R - \{\pm 1\}$ (C) R (D) 0

35. The solution set of $x < 5$ and $x \geq 2$ is...

(A) $(2, 5)$ (B) $[2, 5)$ (C) $(2, 5]$ (D) $[2, 5]$

36. The solution set of $\frac{x^2}{x^2+1} < 0$ is

(A) 0 (B) $(-1, 1)$ (C) ϕ (D) R

37. If $|x-2| \geq 8$ then $x \in$

(A) $(-6, 10)$ (B) $(-\infty, -6) \cup (10, \infty)$

(C) $(-\infty, -6) \cup (10, \infty)$ (D) $(-\infty, -6] \cup [10, \infty)$

38. The solution set of $x^2 \leq 9$ is

(A) $[-3, 3]$ (B) $(-3, 3)$

(C) $(-\infty, -3) \cup (3, \infty)$ (D) ϕ

39. The solution set of $x^2 \leq 4$ is......

(A) $[-2, 2]$ (B) $(-2, 2)$ (C) $(-\infty, -2] \cup [2, \infty)$ (D) $\emptyset$

40. The number of ordered pairs (a, b) of positive integers such that $\frac{2a-1}{b}$ and $\frac{2b-1}{a}$ are both integers is

(A) 1 (B) 2 (C) 3 (D) more than 3

* Given section consists of questions of 2 marks each.   [6]

41. Solve the inequality $\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$ for real x.

42. The marks obtained by a student of Class XI in first and second terminal examinations are 62 and 48, respectively. Find the minimum marks he should get in the annual examination to have an average of at least 60 marks.

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

* Given section consists of questions of 3 marks each.   [36]

44. A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting

mixture will be more than 15% but less than 18%?

45. Solve the inequality and show the graph for the solution on number line: 5x – 3 $\geq$ 3x – 5

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

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

48. 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.

49. 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.

50. 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].

51. Solve the inequality and represent the solution graphically on number line: 5 (2x – 7) – 3 (2x + 3) $\leq$ 0 , 2x + 19 $\leq$ 6x + 47.

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

53. In an experiment, a solution of hydrochloric acid is to be kept between 30° and 35° Celsius. What is the range of temperature in degree Fahrenheit if conversion formula is given by C = $\frac{5}{9}$ (F – 32), where C and F represent a temperature in degree Celsius and degree Fahrenheit, respectively.

54. A company manufactures cassettes and its cost and revenue functions for a week are $C = 300 + \frac{3}{2}x$ R = 2x respectively, where x is the number of cassettes produced and sold in a week. How many cassettes must be sold for the company to realize a profit?

55. A solution is to be kept between 86° and 95°F. What is the range of temperature in degree Celsius, if the Celsius (C)/ Fahrenheit (F) conversion formula is given by $F = \frac{9}{5}C + 32$.

* Given section consists of questions of 5 marks each.

56. 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?

57. 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?

58. A solution of 9% acid is to be diluted by adding 3% acid solution to it. The resulting mixture is to be more than 5% but less than 7% acid. If there is 460 litres of the 9% solution, how many litres of 3% solution will have to be added?

59. The water acidity in a pool is considerd normal when the average pH reading of three daily measurements is between 8.2 and 8.5. If the first two pH readings are 8.48 and 8.35, find the range of pH value for the third reading that will result in the acidity level being normal.

* Case study based questions [8]

60. Shweta was teaching "method to solve a linear inequality in one variable" to her daughter.
    Step I Collect all terms involving the variable (x) on one side and constant terms on other side with the help of above rules and then reduce it in the form $ax < b$ or $ax \leq b$ or $ax > b$ or $ax \geq b$.
    Step II Divide this inequality by the coefficient of variable (x). This gives the solution set of given inequality.
    Step III Write the solution set.

    Based on above information, answer the following questions.

    (i) The solution set of $24x < 100$, when x is a natural number is
       (a) $\{1,2,3,4\}$ (b) $(1,4)$ (c) $[1,4]$ (d) None of these

    (ii) The solution set of $24100x <$, when x is an integer is
       (a) $\{\ldots\ldots -4, -3, -2, -1, 0, 1, 2, 3, 4\}$ (b) $(-\infty, 4]$ (c) $[4, \infty]$ (d) None of the above

    (iii) The solution set of $-5x + 25 > 0$ is
       (a) $[5, \infty)$ (b) $(-\infty, 5]$ (c) $(5, \infty)$ (d) $(-\infty, 5)$

    (iv) The solution set of $3x - 5 < x + 7$ is
       (a) $(6, \infty)$ (b) $[6, \infty)$ (c) $(-\infty, 6)$ (d) $(-\infty, 6]$

(v) The solution set of $x + \frac{x}{2} + \frac{x}{3} < 11$ is
   (a) $(-\infty, 6]$ (b) $(-\infty, 6)$ (c) $[6, \infty)$ (d) None of these

61. A manufacturing company produces certain goods. The company manager used to make a data record on daily basis about the cost and revenue of these goods separately. The cost and revenue function of a product are given by $C(x) = 20x + 4000$ and $R(x) = 60x + 2000$, respectively, where x is the number of goods produced and sold.

Based on above information, answer the following questions.

(i) How many goods must be sold to realise some profit?
(a) $x < 50$
(b) $x > 50$
(c) $x \geq 50$
(d) $x \leq 50$

(ii) If the cost and revenue functions of a product are given by $C(x) = 3x + 400$ and $R(x) = 5x + 20$ respectively, where x is the number of items produced by the manufacturer, then how many items must be sold to realise some profit?
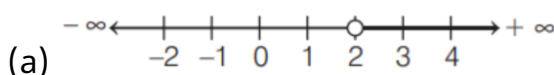(a) $x \leq 190$
(b) $x \geq 190$
(c) $x < 190$
(d) $x > 190$

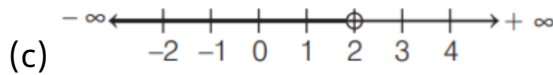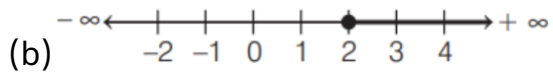(iii) Let x and b are real numbers. If $b > 0$ and $x < b$, then
(a) x is always positive
(b) X is always negative
(c) x is real number
(d) None of these

(iv) The solution set of $3 - 5 < x + 7$, when x is a whole number is given by
(a) $\{0,1,2,3,4,5\}$
(b) $(-\infty, 6)$
(c) $[0,5]$
(d) None of these

(v) Graph of inequality $x > 2$ on the number line is represented by

(a)

(b)

(c)

(d) None of the above

----- "If you are working on something that you really care about, you don't have to be pushed. The vision pulls you. -----