

SECTION-A

This section comprises multiple choice questions (MCQs) of 1 mark each.

1. If $-2x + 1 \geq x + 1$, then $x \in$

(a) $(-\infty, 0)$ (b) $(-\infty, 0]$
(c) $[0, \infty)$ (d) $[0, \infty]$

2. The domain of the function f given by $f(x) = \frac{x-4}{x^2-16}$ is :

(a) $\mathbb{R} - \{4\}$ (b) $\mathbb{R} - \{-4\}$
(c) $\mathbb{R}$ (d) $\mathbb{R} - \{4, -4\}$

3. If $f(x) = x - \frac{1}{x}, x \neq 0$ then $f(x) + f\left(\frac{1}{x}\right)$ is equal to :

(a) x (b) $\frac{1}{x}$
(c) $2x$ (d) 0

4. If $\frac{1}{x} > 1$, then $x \in$

(a) $(1, \infty)$ (b) $(0, 1)$
(c) $(-\infty, 0) \cup (1, \infty)$ (d) $(-\infty, 0)$

5. Let $n(A) = 7, n(B) = 3$, then maximum value of $n(A \cap B)$ will be :

(a) 3 (b) 7
(c) 10 (d) 0

6. If $a + ib = c + id$ then :

(a) $a^2 + c^2 = 0$ (b) $b^2 + c^2 = 0$
(c) $a^2 + b^2 = c^2 + d^2$ (d) $b^2 + d^2 = 0$

7. If $([x] - 3)([x] - 4) = 0$, where $[.]$ represents greatest integer function, then $x \in$:

(a) $(3, 5)$ (b) $[3, 5)$
(c) $(3, 5]$ (d) $[3, 5]$

8. If $(x - y, y + x) = (0, 2)$ then $2x + 3y =$

(a) 0

(b) 2

(c) 3

☒ (d) 5

9. If $A = (2, 3, 4, 5)$, $B = \{3, 5, 7, 9\}$, then $(A \cup B) - (B - A) =$

(a) $\{2, 3\}$

$$(2, 3, 4, 5, 7, 9) - (7, 9) = (2, 3, 4, 5)$$

(b) $\{2, 3, 4, 5\}$

(c) $\{2, 3, 4, 5, 7, 9\}$

☒ (d) $\{2, 4, 7, 9\}$

10. If $|x - 2| \geq -3$, then $x \in$:

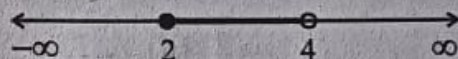
(a) $\{\}$

(b) $(-\infty, \infty)$

☒ (c) $[-1, 5]$ only

(d) $(-1, 5)$ only

11. Solution of a linear inequality in variable x is represented on the number line as ,



then $x \in$:

(a) $(2, 4)$

☒ (b) $[2, 4)$

(c) $(2, 4]$

(d) $[2, 4]$

12. If $A = \{x : x \in \mathbb{N}, x < 2\}$, $B = \{x : x \in \mathbb{N}, 1 < x < 5\}$, $C = \{3, 5\}$ then $A \times (B \cap C) =$

(a) $\{(1, 3)\}$

(b) $\{(1, 5)\}$

☒ (c) $\{(1, 3), (1, 5)\}$

(d) $\{\}$

13. For all sets A and B , $(A - B) \cup (A \cap B) =$

(a) A

(b) B

(c) $B - A$

☒ (d) $A \cup B$

14. If $A = \{2, 4, 6, 8, \dots, 20\}$, $B = (8, 10, 12, \dots, 22)$, then $n(A - B) =$

(a) 1

☒ (b) 2

☒ (c) 3

(d) 4

15. If x is a natural number and $5 - x > 2$, then $x \in$:

(a) $\{3, 4, 5, \dots\}$

(b) $\{4, 2, 3\}$

☒ (c) $\{3\}$

(d) $\{1, 2\}$



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XI-M

16. If $(1+i)^4 = x + iy$, then $x^2 + y^2 =$

(a) 2

(b) 4

(c) 8

(d) 16

17. If $x = (2\cos^2 15^\circ - 1)$ and $y = \frac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$ then $(x + y) =$

(a) 0

(b) $\sqrt{3}$

(c) $2\sqrt{3}$

(d) $\frac{\sqrt{3}}{2}$

18. If $\theta = 135^\circ = \frac{a\pi}{b}$ (in Radian), where a and b are coprime numbers, then $a + b =$

(a) 4

(b) 5

(c) 6

(d) 7

Question number 19 and 20 are Assertion and Reason based question carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the codes (a), (b), (c) and (d) as given below:

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of the Assertion (A)

(c) Assertion (A) is true, but Reason (R) is false

(d) Assertion (A) is false, but Reason (R) is true

19. Assertion (A): If the letters H, I, C, P are arranged in a row in all possible ways and the words (with or without meaning) so formed are written as in dictionary, then word CHIP occurs in 1st position.

Reason (R): The number of ways of arranging four distinct objects all at time is 4C_4



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20. Assertion (A): The range of function $f(x) = \sin x + \cos x$ is $(-\sqrt{2}, \sqrt{2})$

Reason (R): for all $\theta \in \mathbb{R}$, $-1 \leq \sin \theta \leq 1$

1

SECTION-B

This section comprises very short answer (VSA) type questions of 2 marks each.

21. Find the multiplicative inverse of the complex number $(-3 + 4i)$.

2

22. If R is a relation given by $R = \{(x, y) : y = x + \frac{2023}{x}, \text{ where } x, y \in \mathbb{N}\}$ then find the range of R .

2

23. Solve :

2

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

OR

✓ Solve :

$$|7x - 3| \leq 4$$

24. Write set A in set-builder form :

2

$$A = \{0.5, 0.9, 1.3, 1.7, \dots, 4.5\}$$

OR

$$\checkmark A = \left\{ \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \dots, \frac{2023}{2024} \right\}$$

25. Write set $A = \{x : x^3 = x, x \in \mathbb{R}\}$ in Roaster form.

2

SECTION-C

This section comprises short answer (SA) type questions of 3 marks each.

26. Define and sketch the graph of signum function. Write its domain and range.

3

27. If $x + iy(u + iv)^{1/3}$ then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$ $(x + iy)^3 = u + iv$

28. If $z_1 = 2 - i, z_2 = 1 + i$, then find the value $\left| \frac{z_1 + z_2 + 1}{z_1 - z_2 + 1} \right|$.

3

29. 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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OR

Solve

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

30. List all subsets of the set $\{\phi, \{\phi\}, \{\{\phi\}\}\}$.

3

OR

If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$, $B = \{2, 3, 5, 7\}$ then verify that :

(i) $(A \cup B)' = A' \cap B'$

(ii) $(A \cap B)' = A' \cup B'$

31. Prove that : $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4 \sin^2 \left(\frac{x-y}{2} \right)$

3

OR

Find the value of $\tan \frac{\pi}{8}$.

$\frac{180}{8} = 22.5^\circ$
 $\tan 10^\circ = \frac{20-43}{90-43}$
 $\frac{20-43}{90-43} = \frac{20-43}{90-43}$
 $\frac{20-43}{90-43} = \frac{20-43}{90-43}$

SECTION-D

This section comprises long type answer (LA) type questions of 5 marks each.

32. Find the domain and range of the following functions :

5

(a) $f(x) = \frac{1}{1-2\cos x}$

(b) $f(x) = \sqrt{9-x^2}$

33. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$ and ${}^nC_{r+1} = 126$, then find nC_2

5



OR

Five boys and five girls form a line. Find the number of ways of making the seating arrangement under the following conditions:

- (i) All girls sit together
- (ii) All girls never sit together
- (iii) No two girls sit together
- (iv) Boys and girls sits alternate

$$1+2+1+1$$



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34. Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$, if $\tan x = -\frac{4}{3}$, x lies in II quadrant.

5

OR

Prove that :

$$\left(1 - \cos \frac{\pi}{8}\right) \left(1 - \cos \frac{3\pi}{8}\right) \left(1 - \cos \frac{5\pi}{8}\right) \left(1 - \cos \frac{7\pi}{8}\right) = \frac{1}{8}$$

35. Prove that $\tan 5x - \tan 4x - \tan x = \tan x \cdot \tan 4x \cdot \tan 5x$ and hence use this result to find the value of $\frac{\tan 50^\circ}{2 \tan 10^\circ + \tan 40^\circ}$.

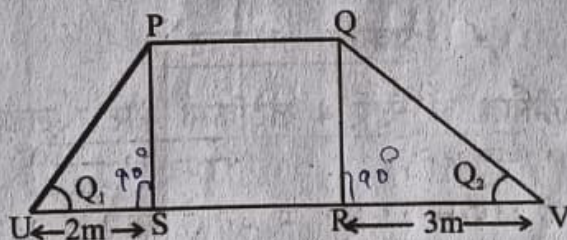
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SECTION-E

This section comprises 3 case based questions of 4 marks each.

Case Study-I

36. PQRS is equal of side 1 m.



Two stones U and V are on opposite side of the square at a distance of 2 m and 3 m respectively (as shown in the figure)

$$US = 2\text{m}, RV = 3\text{m}.$$

On the basis of above information, answer the following questions :

(i) Find the value of $\tan \theta_1 + \tan \theta_2$

1

(ii) Find the value of $\tan \theta_1 \cdot \tan \theta_2$

1

(iii) Find the value of $\tan (\theta_1 + \theta_2)$

2

OR

Find the Radian measure of $(\theta_1 + \theta_2)$

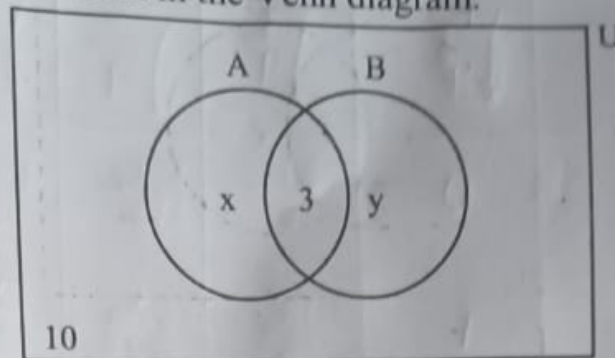


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Case Study-2

37. A and B are two sets as shown in the Venn diagram.



Let $n(A) = m$ and $n(B) = p$

If the total number of subsets of the set A is 112 less than total number of subsets of the set B, then on the basis of this information, answer the following questions :

- (i) Find the value of m and p .

OR

Find the value of x and y .

- (ii) Find the value of $n(U)$

- (iii) What will be the value of $n(A \cap B)'$

Case Study-3

38. From a group of 4 girls and 7 boys, a team of 5 students is to be formed for a zonal level competition.



On the basis of above information find in how many ways team can be selected under following conditions :

- (i) atleast one boy and one girl must be included.
(ii) atleast 3 girls must be selected.



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$$\begin{array}{r} 1 \times 1 \times 10 \times 9 \times 8 \\ 1 \times 1 \times 10 \times 9 \times 8 \\ 2 \times 0 \end{array}$$