Mathematics Question Bank

Fundamentals of Mathematics

Exercise-1

Marked Questions may have for Revision Questions.

PART - I : OBJECTIVE QUESTIONS

1. Number of integers satisfying $x^2 \le 4$ and $x \ge -4$
(1) 3 (2) 5 (3) 0 (4) 2

2. Number of positive integers satisfying $\frac{x^2-4x+3}{2x+1} < 3$ is
(1) 10 (2) 9 (3) 8 (4) 7

3. Number of integers satisfying the relation $\frac{14x}{x+1} - \frac{9x-30}{x-4} < 0$
(1) 6 (2) 4 (3) 2 (4)3

4. Number of positive integers satisfying. $\frac{7}{(x-2)(x-3)} + \frac{9}{(x-3)} + 1 < 0$
(1) 3 (2) 0 (3) 4 (4) 5

5. Number of integer values of x satisfying $-5 \le x < 10$ and $0 \le x \le 15$ is
(1) 10 (2) 11 (3) 12 (4) 13

6. The number of positive integers satisfying the inequality $\frac{x^2-1}{2x+5} < 3$ is
(1) 10 (2) 9 (3) 8 (4) 7

7. The complete set of values of 'x' which satisfy the inequations : $5x + 2 < 3x + 8$ and $\frac{x+2}{x-1} < 4$ is
(1) $(-\infty, 1)$ (2) $(2, 3)$ (3) $(-\infty, 3)$ (4) $(-\infty, 1) \cup (2, 3)$

8. The number of the integral solutions of $x^2 + 9 < (x + 3)^2 < 8x + 25$ is :
(1) 1 (2) 2 (3) 3 (4) 5

9. The complete solution set of the inequality $\frac{x^4-3x^3+2x^2}{x^2-x-30} \ge 0$ is:
(1) $(-\infty, -5) \cup (1, 2) \cup (6, \infty) \cup \{0\}$ (2) $(-\infty, -5) \cup [1, 2] \cup (6, \infty) \cup \{0\}$
(3) $(-\infty, -5] \cup [1, 2] \cup [6, \infty) \cup \{0\}$ (4) $(-\infty, -5) \cup (1, 2) \cup (6, \infty) \cup \{0\}$

10. Number of positive integral values of x satisfying the inequality

$\frac{(x-4)^{2013}.(x+8)^{2014}(x+1)}{x^{2016}(x-2)^3.(x+3)^5.(x-6)(x+9)^{2012}} \le 0$ is

(1) 0 (2) 1 (3) 2 (4) 3

11. Number of non-negative integral values of x satisfying the inequality $\frac{2}{x^2-x+1}-\frac{1}{x+1}-\frac{2x-1}{x^3+1} \ge 0$ is
(1) 0 (2) 1 (3) 2 (4) 3

12. If $a^4 \cdot b^5 = 1$ then the value of $\log_a (a^5b^4)$ equals
(1) 9/5 (2) 4 (3) 5 (4) 8/5

13. $\frac{1}{1+\log_b a+\log_b c}+\frac{1}{1+\log_c a+\log_c b}+\frac{1}{1+\log_a b+\log_a c}$ has the value equal to
(1) abc (2) $\frac{1}{abc}$ (3) 0 (4) 1

14. $\frac{1}{\log_{\sqrt{bc}} abc}+\frac{1}{\log_{\sqrt{ca}} abc}+\frac{1}{\log_{\sqrt{ab}} abc}$ has the value equal to :
(1) 1/2 (2) 1 (3) 2 (4) 4

15. $(\log_2 10) . (\log_2 80) - (\log_2 5) . (\log_2 160)$ is equal to :
(1) $\log_2 5$ (2) $\log_2 20$ (3) $\log_2 10$ (4) $\log_2 16$

16. The ratio $\frac{2^{\log_{2^{1/4}} a}-3^{\log_{27}(a^2+1)^3}-2a}{7^{4\log_{49} a}-a-1}$ simplifies to :
(1) $a^2 - a - 1$ (2) $a^2 + a - 1$ (3) $a^2 - a + 1$ (4) $a^2 + a + 1$

17. Let $x = 2^{\log 3}$ and $y = 3^{\log 2}$ where base of the logarithm is 10, then which one of the following holds good ?
(1) 2x < y (2) 2y < x (3) 3x = 2y (4) y = x

18. If $\log_a (ab) = x$, then $\log_b (ab)$ is equal to
(1) $\frac{1}{x}$ (2) $\frac{x}{1+x}$ (3) $\frac{x}{1-x}$ (4) $\frac{x}{x-1}$

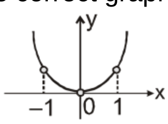
19. Which one of the following is the smallest ?
(1) $\log_{10}\pi$ (2) $\sqrt{\log_{10}\pi^2}$ (3) $\left(\frac{1}{\log_{10}\pi}\right)^3$ (4) $\left(\frac{1}{\log_{10}\sqrt{\pi}}\right)$

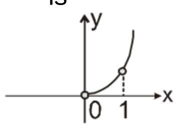
20. The expression $\log_p \underbrace{\sqrt[p]{\sqrt[p]{\sqrt[p]{\cdots\cdots\cdots\sqrt[p]{p}}}}}_{\text{n radical sign}}$, where $p \ge 2$, $p \in N$; $n \in N$ when simplified is
(1) independent of p (2) independent of p and of n
(3) dependent on both p and n (4) positive

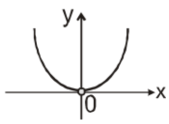
21. $\log_{10}(\log_2 3) + \log_{10}(\log_3 4) + \log_{10}(\log_4 5) + ... + \log_{10}(\log_{1023} 1024)$ simplifies to
(1) a composite (2) a prime number

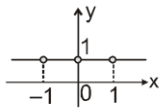
(3) rational which is not an integer (4) an integer

22. The correct graph of $y = x^{\log_x x^2}$ is

(1) 

(2) 

(3) 

(4) 

23. Number of positive integer(s) which do not satisfy $\frac{1-\log_4 x}{1+\log_2 x} \le \frac{1}{2}$.

(1) 2 (2) 3 (3) 1 (4) 4

24. $10^{\log_p(\log_q(\log_r x))}$ = 1 and $\log_q\left(\log_r(\log_p x)\right)$ = 0 then 'p' equals

(1) $r_{q/r}$ (2) rq (3) 1 (4)$r_{r/q}$

25. The sum of all the solutions to the equation $2\log_{10} x - \log_{10}(2x - 75) = 2$

(1) 30 (2) 350 (3) 75 (4) 200

26. If $\log_x \log_{18}\left(\sqrt{2}+\sqrt{8}\right) = \frac{1}{3}$. Then the value of 1000 x is equal to

(1) 8 (2) 1/8 (3) 1/125 (4) 125

27. If $3^{2\log_3 x} - 2x - 3 = 0$, then the number of values of 'x' satisfying the equation is

(1) zero (2) 1 (3) 2 (4) more than 2

28. Number of real solutions of the equation $\sqrt{\log_{10}(-x)} = \log_{10}\sqrt{x^2}$ is :

(1) zero (2) exactly 1 (3) exactly 2 (4) 4

29. The solution set of the inequality $\log_{\sin\left(\frac{\pi}{3}\right)}(x^2 - 3x + 2) \ge 2$ is

(1) $\left(\frac{1}{2}, 2\right)$ (2) $\left(1, \frac{5}{2}\right)$

(3) $\left[\frac{1}{2}, 1\right) \cup \left(2, \frac{5}{2}\right]$ (4) $\left(\frac{1}{2}, 1\right) \cup \left(2, \frac{5}{2}\right)$

30. If $\log_{0.3}(x - 1) < \log_{0.09}(x - 1)$, then x lies in the interval

(1) $(2, \infty)$ (2) $(1, 2)$ (3) $(-2, -1)$ (4) $(-\infty, -1)$

31. Solution set of the inequality $2 - \log_2(x_2 + 3x) \ge 0$ is :

(1) $[-4, 1]$ (2) $[-4, -3) \cup (0, 1]$

(3) $(-\infty, -3) \cup (1, \infty)$ (4) $(-\infty, -4) \cup [1, \infty)$

32. If $\log_{0.5}\log_5(x_2 - 4) > \log_{0.5}1$, then ‘x’ lies in the interval

(1) $(-3, -\sqrt{5}) \cup (\sqrt{5}, 3)$ (2) $(-3, -\sqrt{5}) \cup (, 3\sqrt{5})$

(3) $(\sqrt{5}, 3\sqrt{5})$ (4) φ

Fundamental of Mathematics

33. The set of all solutions of the inequality $(1/2)^{x^2-2x} < 1/4$ contains the set
(1) $(-\infty, 0)$ (2) $(-\infty, 1)$ (3) $(1, \infty)$ (4) $(3, \infty)$

34. Solution of the equation $|x^2 - 4x + 3| + x = 7$ is
(1) $-1, 4$ (2) $1, 4$ (3) $-1, -4$ (4) $1, -4$

35. Solution of the equation $|x - 2| + ||x| - 3| = 7x + 1$ is
(1) $\frac{9}{4}$ (2) $\frac{4}{9}$ (3) $-\frac{4}{9}$ (4) $-\frac{9}{4}$

36. Sum of solution of the equation $|x|^3 - 15x^2 - 8|x| - 11 = 0$ is
(1) 15 (2) 30 (3) 0 (4) –15

37. Number of real roots of the equation $|x-1|^2 - 3|x-1| + 2 = 0$ is :
(1) 1 (2) 2 (3) 3 (4) 4

38. Minimum value of $f(x) = |x| + |x-1| + |x-2|$ is equal to
(1) 3 (2) 4 (3) 5 (4) 2

39. If $||x-4| - 4| = 1$ then sum of values of x is
(1) 16 (2) 24 (3) 0 (4) 3

40. If $|x^3 - 9x^2 + 26x - 24|$ is a prime number then number of possible integral value of x is
(1) 1 (2) 2 (3) 0 (4) 3

41. $|x-2| + |x+1| \geq 3$, then complets solution set of this inequation is :
(1) $[1, \infty)$ (2) $(-\infty, -2]$ (3) R (4) $[-2, 1]$

42. The complete solution set of $||x-2| - 1| \leq 1$ is
(1) $[0, 2)$ (2) $[0, 4]$ (3) $[-1, 3]$ (4) $[1, 3]$

43. The complete solution set of $|2x-3| + |x-5| \leq |x-8|$ is
(1) $\left[-5, \frac{3}{2}\right]$ (2) $(-\infty, -5]$ (3) $\left[\frac{3}{2}, \infty\right]$ (4) $(-\infty, -5] \cup \left[\frac{3}{2}, \infty\right)$

44. If $|x^2 - 4x - 5| + |x^2 - x - 2| = 3|x + 1|$ then set of all real values of x is
(1) $[2, 5]$ (2) $[2, 5] \cup \{-1\}$ (3) $[-2, 1] \cup (4, \infty]$ (4) $(-\infty, -2] \cup [1, 4]$

45. The complete solution set of $2|\log_2 x| + \log_2 x \geq 2$
(1) $x \geq 2^{\frac{2}{3}}$ (2) $x \leq \frac{1}{4}$ (3) Both A and B (4) $\left[2^{\frac{2}{3}}, \infty\right) \cup \left(0, \frac{1}{4}\right]$

46. Solution of inequality $\frac{(x^2-1)(e^x-1)}{(x-1)} \leq 0$ is
(1) $[0,1)$ (2) $[0,2)$ (3) $[-1,0]$ (4) $(-\infty,1]$

47. If $\frac{6x^2-5x-3}{x^2-2x+6} \leq 4$, then the least and the highest values of $4x_2$ are:
(1) 0 & 81 (2) 9 & 81 (3) 36 & 81 (4) 0 & 9

Fundamental of Mathematics

48. If $\frac{4\alpha}{\alpha^2+1} \geq 1$ and $\alpha + \frac{1}{\alpha}$ is an odd integer then number of possible values of α is
(1) 1 (2) 2 (3) 3 (4) 4

49. The value of $\left|\log_2 \log_9 \sqrt{6+\sqrt{6+\sqrt{6+\ldots\infty}}}\right|$ is
(1) 1 (2) 2 (3) 3 (4) 4

50. How many positive integers 'a' have the property that $\log_a 625$ is a positive integer
(1) 4 (2) 3 (3) 2 (4) More than 4

51. Let the equation $\frac{1}{x} - \frac{1}{y} = \frac{2}{15}$ and $\log_3 x + \log_3 y = 1 + \log_3 5$ then $x^2 + y^2$ is
(1) 31 (2) 32 (3) 33 (4) 34

52. If $\log_a b = 2$; $\log_b c = 2$ and $\log_3 c = 3 + \log_3 a$ then (a + b + c) equals
(1) 90 (2) 93 (3) 102 (4) 243

53. If a, b, c are positive real numbers such that $a^{\log_3 7} = 27$; $b^{\log_7 11} = 49$ and $c^{\log_{11} 25} = \sqrt{11}$. The value of $\left(a^{(\log_3 7)^2} + b^{(\log_7 11)^2} + c^{(\log_{11} 25)^2}\right)$ equals
(1) 489 (2) 469 (3) 464 (4) 400

54. The solution set of the inequality $\frac{\ell n(x+2)}{x^2-3x-4} \leq 0$ is
(1) $(-\infty, 0] \cup (4, \infty)$ (2) $(-2, 0] \cup (4, \infty)$ (3) $(-1, 0] \cup (4, \infty)$ (4) $(-2, -1) \cup (-1, 4)$

55. Solve $\log_{0.04}(x-1) \geq \log_{0.2}(x-1)$
(1) $x \leq 1$ or $x \geq 2$ (2) $x = 1$; $x \geq 2$ (3) $x \geq 2$ (4) $x \in R$

56. If $\log_{\log_9 10}\left(\log_2\left(\frac{x-1}{x+2}\right)\right) > 0$ then number of integers satisfying above inequation is
(1) 3 (2) 2 (3) 1 (4) 0

57. If the equation $||x+3| - 2| = p$ where p is a constant integer has exactly three distinct solutions, then the number of integral values of p is
(1) 0 (2) 1 (3) 2 (4) 4

58. Number of integers satisfying the equation $|x^2 + 5x| + |x - x^2| = |6x|$ is
(1) 3 (2) 5 (3) 7 (4) 9

59. Maximum value of $f(x) = |x + 1| - 2|x - 1|$ is
(1) 3 (2) 2 (3) 1 (4) 0

60. If $|x + 1| + y = 5$ and $x - |y| = 2$, find x + y
(1) 3 (2) 4 (3) 2 (4) 1

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

DIRECTIONS :

Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.

(1) Both the statements are true.

(2) Statement-I is true, but Statement-II is false.
(3) Statement-I is false, but Statement-II is true.
(4) Both the statements are false.

A-1 **Statement-I :** $\log_{10}(\sqrt{13}-\sqrt{12}) < \log_{0.1}(\sqrt{14}-\sqrt{13})$
Statement-II : (i) If $a > 1$, then $x > 1 \Rightarrow \log_a x > 0$ and $0 < x < 1 \Rightarrow \log_a x < 0$
(ii) If $0 < a < 1$, then $x > 1 \Rightarrow \log_a x < 0$ and $0 < x < 1 \Rightarrow \log_a x > 0$

A-2 **Statement-I :** Maximum value of $\log_{1/3}(x_2 - 4x + 5)$ is '0'.
Statement-II : $\log_a x \le 0$ for $x \ge 1$ and $0 < a < 1$.

A-3. **Statement-I :** If $|x - 2| + |x - 7| = |2x - 9|$, then $x \le 2$ or $x \ge 7$
Statement-II : $|x - a| + |x - b| = b - a$ has infinitely many solution, for $a < b$.

Section (B) : MATCH THE COLUMN

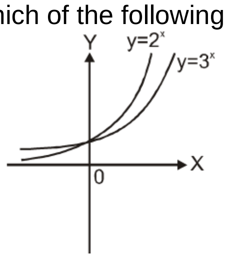
B-1. Let $f(x) = \dfrac{x^2-5x+4}{x^2-5x+6}$

Column – I		**Column – II**	
(A)	$f(x) > 0$	(p)	$(-\infty,1) \cup (2,3) \cup (4,\infty)$
(B)	$f(x) < 1$	(q)	$(1,2) \cup (3,4)$
(C)	$f(x) > 1$	(r)	$(2,3)$
(D)	$f(x) < 0$	(s)	$(-\infty,2) \cup (3,\infty)$

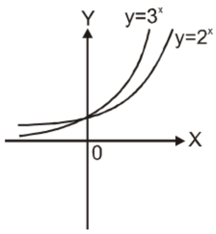
Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

C-1. Let $N = \dfrac{\log_3 135}{\log_{15} 3} - \dfrac{\log_3 5}{\log_{405} 3}$. Then N is :
(1) a natural number
(2) a prime number
(3) a rational number
(4) an integer

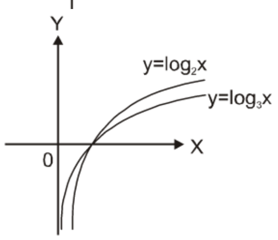
C-2. Which of the following is correct :



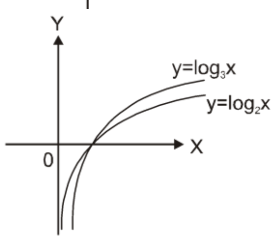
(1)



(2)



(3)



(4)

Fundamental of Mathematics

C-3. Consider f(x) = ||x –1| – |x + 2|| = P.
(1) If P = 0 then f(x) has exactly one solution
(2) If P =1 then f(x) has exactly 2 solution
(3) If P = 3 then f(x) has infinite solution
(4) If P = 4 then f(x) has no solution

C-4. What values of 'x' satisfying $\frac{x^2(2x+3)(\sin x+3)}{(e^x-3)(x^2-x+2)} \geq 0$
(1) e
(2) π
(3) e^2
(4) $\ell n6$

Answers

PART - I

1.	(2)	**2.**	(2)	**3.**	(3)	**4.**	(2)	**5.**	(1)	**6.**	(4)	**7.**	(4)
8.	(4)	**9.**	(2)	**10.**	(4)	**11.**	(4)	**12.**	(1)	**13.**	(4)	**14.**	(2)
15.	(4)	**16.**	(4)	**17.**	(4)	**18.**	(4)	**19.**	(1)	**20.**	(1)	**21.**	(4)
22.	(2)	**23.**	(3)	**24.**	(1)	**25.**	(4)	**26.**	(4)	**27.**	(2)	**28.**	(3)
29.	(3)	**30.**	(1)	**31.**	(2)	**32.**	(1)	**33.**	(4)	**34.**	(1)	**35.**	(2)
36.	(3)	**37.**	(4)	**38.**	(4)	**39.**	(1)	**40.**	(3)	**41.**	(3)	**42.**	(2)
43.	(1)	**44.**	(2)	**45.**	(4)	**46.**	(3)	**47.**	(1)	**48.**	(2)	**49.**	(1)
50.	(2)	**51.**	(4)	**52.**	(2)	**53.**	(2)	**54.**	(4)	**55.**	(3)	**56.**	(2)
57.	(2)	**58.**	(3)	**59.**	(2)	**60.**	(2)						

PART - II

Section (A) :

A-1 (1) **A-2** (1) **A-3.** (1)

Section (B) :

B-1. (A) → (p), (B) → (s), (C) → (r), (D) → (q)

Section (C) :

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C-1.	(1,2,3,4)	**C-2.**	(2,3)	**C-3.**	(1,2,3,4)	**C-4.**	(1,3,4)