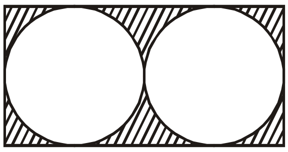
LEVEL-I

[SINGLE CORRECT CHOICE TYPE]

1. The ratio of total area of the rectangle to the total shaded area



(A) $\frac{2}{\pi}$ (B) $\frac{4}{4-\pi}$ (C) $\frac{4-\pi}{\pi}$ (D) $\frac{\pi}{4}$

2. Which one of the following does not reduce to sinx for every x, wherever defined, is

(A) $\frac{\tan x}{\sec x}$ (B) $\frac{\sin x}{\sec^2 x - \tan^2 x}$ (C) $\frac{\sin^2 x \sec x}{\tan x}$ (D) All reduce to sinx

3. What is the area of an equilateral triangle inscribed in a circle of radius 4 cm ?

(A) 12 cm^2 (B) $9\sqrt{3}$ cm^2 (C) $8\sqrt{3}$ cm^2 (D) $12\sqrt{3}$ cm^2

4. The equation $\frac{2x^2}{x-1} - \frac{2x+7}{3} + \frac{4-6x}{x-1} + 1 = 0$ has the roots

(A) 4 and 1 (B) only 1 (C) only 4 (D) Neither 4 nor 1

5. An equilateral triangle and a regular hexagon have the same perimeter, then the ratio of their areas is

(A) 1 : 2 (B) 2 : 3 (C) 1 : 3 (D) 2 : 5

6. 116 people participated in a knockout tennis tournament. The players are paired up in the first round, the winners of the first round are paired up in the second round, and so on till the final is played between two players. If after any round, there is odd number of players, one player is given a bye, i.e. he skips that round and plays the next round with the winners. The total number of matches played in the tournament is

(A) 115 (B) 53 (C) 232 (D) 116

7. The circumference of a circle circumscribing an equilateral triangle is 24π units. Then the area of the circle inscribed in the equilateral triangle, is

(A) 12π (B) 24π (C) 36π (D) 48π

8. If $\frac{1}{x} - \frac{1}{y} = 4$, then the value of $\frac{2x+4xy-2y}{y-x+2xy}$ is equal to

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

LEVEL-II

[SINGLE CORRECT CHOICE TYPE]

9. If $a \in I$ & $a^4 + a^2 + 1$ is prime. The number of possible values of a is

(A) 0 (B) 1 (C) 2 (D) 3

10. Suppose that $w = 2^{1/2}$, $x = 3^{1/3}$, $y = 6^{1/6}$ and $z = 8^{1/8}$. From among these number list, the biggest, second biggest numbers are

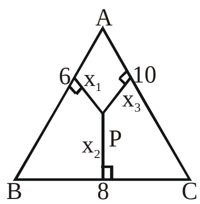
(A) w, x (B) x, w (C) y, z (D) x, z

11. Given $3x^2 + x = 1$, then the value of $6x^3 - x^2 - 3x$ is equal to

(A) –1 (B) 0 (C) 1 (D) 2

[SUBJECTIVE TYPE]

12. The sides of a ΔABC are as shown in the figure. Let P be any internal point of this triangle and x_1, x_2 & x_3 denote the distance between P and sides of triangle. The value of $\left(\frac{3x_1 + 4x_2 + 5x_3}{6}\right)$ is



13. Find all the integral solutions of the equation $xy = 2x - y$

14. If $n + 20$ and $n - 21$ are both perfect square of natural numbers, where n is a natural number, Find n.

15. Is there exist any natural numbers, m & n such that $m^2 = n^2 + 2010$.

LEVEL-I

[SINGLE CORRECT CHOICE TYPE]

1. The ratio of (2x – y) to (x + y) is $\frac{2}{3}$. Then $\frac{x}{y}$ is

(A) $\frac{2}{3}$ (B) $\frac{3}{4}$ (C) $\frac{5}{4}$ (D) 5

2. If x + y = a and $x^2 + y^2 = b$, then the value of $(x^3 + y^3)$, is

(A) ab (B) $a^2 + b$ (C) $a + b^2$ (D) $\frac{3ab - a^3}{2}$

3. If $x = 3 - \sqrt{8}$, then $x^2 + \frac{1}{x^2}$ is equal to

(A) 6 (B) 34 (C) 102 (D) 110

4. If $(a^2 + b^2)^3 = (a^3 + b^3)^2$ and $ab \neq 0$ then the numerical value of $\frac{a}{b} + \frac{b}{a}$ is equal to

(A) $\frac{3}{2}$ (B) $\frac{2}{3}$ (C) 1 (D) $\frac{4}{9}$

5. Solution set of the equation $3^{2x^2} - 2.3^{x^2+x+6} + 3^{2(x+6)} = 0$ is

(A) {–3, 2} (B) {6, –1} (C) {–2, 3} (D) {1, – 6}

6. The expression $\sqrt{(28+10\sqrt{3})} + \sqrt{(28-10\sqrt{3})}$ simplifies to

(A) 10 (B) 12 (C) $2\sqrt{3}$ (D) 5

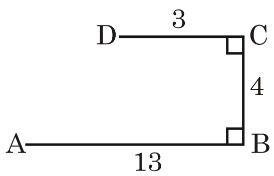
7. Unit digit of $3^8 + 7^8 + 5^8$ is

(A) 1 (B) 7 (C) 6 (D) 0

8. If $4x^4 - (a-1)x^3 + ax^2 - 6x + 1$ is divisible by (2x – 1), then 'a' is equal to

(A) 13 (B) –13 (C) 11 (D) –11

9. In the figure the sum of distance AD and BD is



(A) between 10 and 11 (B) 12

(C) between 15 and 16 (D) between 16 and 17

10. If $x = \frac{4}{(\sqrt{5}+1)(\sqrt[4]{5}+1)(\sqrt[8]{5}+1)}$. Then the value of $(1 + x)^{24}$ is

(A) 5 (B) 25 (C) 125 (D) 625

LEVEL-II

[SINGLE CORRECT CHOICE TYPE]

11. If $5^{10x} = 4900$, $2^{\sqrt{y}} = 25$ then the value of $\dfrac{\left(5^{(x-1)}\right)^5}{4^{-\sqrt{y}}}$ is

(A) $\dfrac{14}{5}$ (B) 5 (C) $\dfrac{28}{5}$ (D) 14

12. Let p, q be real numbers satisfying $p^2 - q^2 = 4$ and $2pq = 3$ then $(p^2 + q^2)$ is equal to

(A) 1 (B) 9 (C) 16 (D) 5

13. If $\dfrac{l}{\sqrt{10}+\sqrt{14}+\sqrt{15}+\sqrt{21}} = \dfrac{\sqrt{10}-\sqrt{14}-\sqrt{15}+\sqrt{21}}{k}$, then

(A) $k = \ell/2$ (B) $\ell = k/2$ (C) $\ell = 2/k$ (D) None of these

14. Let $x = \sqrt{3-\sqrt{5}}$ and $y = \sqrt{3+\sqrt{5}}$. If the value of the expression $x - y + 2x^2y + 2xy^2 - x^4y + xy^4$ can be expressed in the form $\sqrt{p} + \sqrt{q}$ where $p, q \in N$, then $(p + q)$ has the value equal

(A) 410 (B) 610 (C) 510 (D) 540

[MATRIX TYPE]

Q.15 Has **four** statements (A,B,C and D) given in **Column-I** and **five** statements (P, Q, R, S and T) given in **Column-II**. Any given statement in **Column-I** can have correct matching with one or more statement(s) given in **Column-II.**

15.

Column-I	Column-II
(A) A rectangular box has volume 48, and the sum of the length of the twelve edges (all integers) of the box is 48. The largest integer that could be the length of an edge of the box, is	(P) 1
(B) The number of zeroes at the end in the product of first 20 prime numbers, is	(Q) 2
(C) The number of solutions of $2^{2x} - 3^{2y} = 55$, in which x and y are integers, is	(R) 3
	(S) 4
(D) The number $\left(7+5\sqrt{2}\right)^{1/3} + \left(7-5\sqrt{2}\right)^{1/3}$, is equal to	(T) 6

Solve the following inequality for x :

1. $\dfrac{x^2+2x-3}{x^2+1}<0$

2. $x^4 - 2x^2 - 63 \le 0$

3. $\dfrac{x^2-7x+12}{2x^2+4x+5}>0$

4. $\dfrac{x^4+x^2+1}{x^2-4x-5}<0$

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

6. $\dfrac{x^2-5x+12}{x^2-4x+5}>3$

7. $\dfrac{(2-x^2)(x-3)^3}{(x+1)(x^2-3x-4)}\ge 0$

8. $\dfrac{(x+2)(x^2-2x+1)}{4+3x-x^2}\ge 0$

9. $\dfrac{2x}{x^2-9}\le\dfrac{1}{x+2}$

10. $\dfrac{20}{(x-3)(x-4)}+\dfrac{10}{x-4}+1>0$

11. $(x^2-2x)(2x-2)-\dfrac{9(2x-2)}{x^2-2x}\le 0$

12. $(x + 5)(2x-3)^5 (7 - x)^3 (3x + 8)^2 < 0$

13. $\dfrac{(x-1)(x+2)^2}{-1-x}<0$

14. $\dfrac{x+1}{(x-1)^2}<1$

15. $\dfrac{x^2+6x-7}{x^2+1}\le 2$

16. $\dfrac{x+7}{x-5}+\dfrac{3x+1}{2}\ge 0$

17. $\dfrac{14x}{x+1}-\dfrac{9x-30}{x-4}<0$

18. $\dfrac{x^2+2}{x^2-1}<-2$

19. $\dfrac{5-4x}{3x^2-x-4}<4$

20. $\dfrac{x^4-3x^3+2x^2}{x^2-x-30}>0$

21. $\dfrac{1}{x-2}+\dfrac{1}{x-1}>\dfrac{1}{x}$

22. $\dfrac{(x-2)(x-4)(x-7)}{(x+2)(x+4)(x+7)}>1$

23. $\dfrac{1}{x-1}-\dfrac{4}{x-2}+\dfrac{4}{x-3}-\dfrac{1}{x-4}<\dfrac{1}{30}$

24. $x^3 - 3x^2 - x + 3 > 0$

25. $(x^2 - x - 1)(x^2 - x - 7) < -5$

26. $\dfrac{x+1}{x-1} \geq \dfrac{x+5}{x+1}$

27. $\dfrac{1}{x-2} - \dfrac{1}{x} \leq \dfrac{2}{x+2}$

28. $\dfrac{(x-4)(2x-5)^{27}(x^2-9)^{10}(x+4)^{93}}{(x^2-25)(x+3)^{91}(x^2+10)^5} > 0$

29. $\dfrac{(x^2-9)^{101}(x^2+6)(x^2-4)^{100}}{(x^2-5x+6)^{13}(x^2-16)^{16}} > 0$

30. $\dfrac{(2x-5)^{100}(x+3)(2x+1)^{101}}{(x^2-4)^{151}(3x-4)^{197}} < 0$

31. $\dfrac{(2x+3)^9(x-4)^{24}(x-6)^{56}(x^2-9)^{31}}{(x+4)^{32}(x^2-4)^9(x+6)^5(x-8)^{94}} \geq 0$

32. $\dfrac{(x-4)^{30}(x^2-9)^9(x^2-3x+2)^{17}(3x^2+10)^{10}}{(x^2-5x+6)^{52}(x^2-25)^{60}(x^2+10)^{11}} \leq 0$

LEVEL-I

[SINGLE CORRECT CHOICE TYPE]

1. The value of 'x' satisfying the equation $|x + 2| = 2(3 - x)$ is in the form of $\frac{a}{b}$ where a and b are co-prime numbers, then the values of (a + b) is equal to

(A) 7 (B) 1 (C) 9 (d) 8

2. Number of solutions of equation $|x - 3| + 2|x + 1| = 4$ is

(A) 0 (B) 1 (C) 2 (D) 3

3. If solution of the equation $(x + 3)|x + 2| + |2x + 3| + 1 = 0$ is in the form of $\frac{a-\sqrt{b}}{2}$, then the values of (a – b) is

(A) –24 (B) –10 (C) 24 (D) 10

4. The number of real solutions of the equation $|x^2 - 1| = x + 3$, is

(A) 4 (B) 1 (C) 0 (D) 2

5. The least integral values of x which satisfy the equation $|x - 3| + 2|x + 1| = 4$, is

(A) –1 (B) 1 (C) 0 (D) –2

6. The complete and exhaustive range of values of 'x' satisfying the inequality $|2x + 1| > x$, is

(A) $\left(-\infty,-\frac{1}{2}\right)\cup\left(-\frac{1}{3},\infty\right)$ (B) $\left(-\infty,-\frac{1}{2}\right)$ (C) $\left(-\frac{1}{3},\infty\right)$ (D) $(-\infty,\infty)$

7. The number of integral solution of $x^2 + 2|x + 3| - 10 \le 0$, is

(A) 3 (B) 5 (C) 4 (D) 2

8. The number of positive integral solution of inequality $|2x - 4| < x - 1$, is

(A) 0 (B) 1 (C) 2 (D) 3

9. The number of integers not satisfying the inequality $|x| + |x - 3| \ge 5$ is

(A) 2 (B) 3 (C) 4 (D) 5

10. The complete solution set of $|2x + 1| - |5x - 2| \ge 1$, is

(A) $x \in \left(-\infty,\frac{2}{7}\right)\cup\left(\frac{2}{3},\infty\right)$ (B) $x \in \left[\frac{2}{7},\frac{2}{3}\right]$

(C) $x \in R$ (D) $x \in \phi$

LEVEL-II

[SINGLE CORRECT CHOICE TYPE]

11. The values of 'x' satisfying the equation $|x| - 2|x + 1| + 3|x + 2| = 0$, lies in

(A) (–5,–2) (B) [–5,–2) (C) [–5,–2] (D) (0, 3)

12. The product of all solutions of the equation $|x - 3| + |x + 2| - |x - 4| = 3$, is

(A) 12 (B) 6 (C) –12 (D) –6

13. The number of real solutions of the equation $\sqrt{x-1+2\sqrt{x-2}}-\sqrt{x-1-2\sqrt{x-2}}=1$, is

(A) 0 (B) 1 (C) 2 (D) 3

14. Which of the following does not hold true for the expression E = $\sqrt{x^2-2x+1}-\sqrt{x^2+2x+1}$?

(A) E = 2 if $x \le -1$ (B) E = –2x if –1 < x < 1

(C) E = –2 if $x \ge 1$ (D) E = –2 for all x

15. The number of real solution of the equation $|x^2 + x + 3| = x + 3$, is

(A) 2 (B) 0 (C) 1 (D) 3

16. The sum of all possible values of x satisfying the equation $|x - |4 - x|| = 4 + 2x$ is

(A) –1 (B) 0 (C) 1 (D) 3

17. The number of integral solution of $|x + 1| + |x - 3| > 2\,|x - 1|$, is

(A) 5 (B) 6 (C) 3 (D) 2

[SUBJECTIVE TYPE]

Solve the following for x :

18. $|x^2 - 1| + |2 - x^2| = 1$

19. $|x^4 - x^2 - 12| = |x^4 - 9| - |x^2 + 3|$

20. $|x + 2| + |x^2 - 5x + 1| \le |x^2 - 4x + 3|$

LEVEL-I

[SINGLE CORRECT CHOICE TYPE]

1. The value of $\log_{0.01} 1000 + \log_{0.1} 0.0001$ is

(A) – 2 (B) – 10 (C) – 5/2 (D) 5/2

2. $\log_8 128 - \log_9 (\cot\frac{\pi}{3})$ is

(A) $\frac{31}{12}$ (B) $\frac{19}{12}$ (C) $\frac{13}{4}$ (D) $\frac{3}{2}$

3. If $\log_2(\log_3(\log_4(x))) = 0$, $\log_3(\log_4(\log_2(y))) = 0$ and $\log_4(\log_2(\log_3(z))) = 0$ then the sum of x, y and z is

(A) 89 (B) 58 (C) 105 (D) 50

4. $ln\left(\frac{3}{\sqrt{3}}\right) - ln\left(2+\sqrt{3}\right)$ equals (where $ln x = \log_e x$)

(A) $ln\sqrt{3} + ln\left(2-\sqrt{3}\right)$ (B) $ln 3 - ln\left(2-\sqrt{3}\right)$

(C) $ln 3 - ln\left(2-\sqrt{3}\right)$ (D) $ln\sqrt{3} + ln\left(2+\sqrt{3}\right)$

5. If $\log_2\left(4+\log_3(x)\right) = 3$, then sum of digits of x is-

(A) 3 (B) 6 (C) 9 (D) 18

[MULTIPLE CORRECT CHOICE TYPE]

6. If p, q $\in$ N satisfy the equation $x^{\sqrt{x}} = \left(\sqrt{x}\right)^x$ then p & q are

(A) relatively prime (B) twin prime

(C) coprime (D) If $\log_q p$ is defined then $\log_p q$ is not defined & vice versa

7. If 'a' and 'b' are two distinct prime numbers lying between 1 and 10, which of the following can be the sum of 'a' and 'b'?

(A) 5 (B) 6 (C) 7 (D) 8

8. Let λ satisfies the equation $\log_{(1-x)}3 - \log_{(1-x)}2 = \frac{1}{2}$, then

(A) $\lambda < 1$ (B) $\lambda > -2$

(C) $\lambda^2 > 1$ (D) $-3 < \lambda < 4$

9. The expression, $\log_p \log_p \underbrace{\sqrt[p]{\sqrt[p]{\sqrt[p]{\ldots\ldots\sqrt[p]{p}}}}}_{\text{n radical sign}}$ where $p \geq 2$, $p \in N$, when simplified is

(A) independent of p, but dependent on n (B) independent of n, but dependent on p

(C) dependent on both p & n (D) negative.

[MATRIX TYPE]

Q.10 has **four** statements (A,B,C and D) given in **Column-I** and **five** statements (P, Q, R, S and T) given in **Column-II**. Any given statement in **Column-I** can have correct matching with one or more statement(s) given in **Column-II.**

10. **Column-I** | **Column-II**

Column-I	Column-II
(A) $\dfrac{\log_2 32}{\log_3 \sqrt{243}}$	(P) positive integer
(B) $\dfrac{2\log 6}{\log 12 + \log 3}$	(Q) negative integer
(C) $\log_{1/4}\left(\dfrac{1}{16}\right)^{-2}$	(R) rational but not integer
(D) $\dfrac{\log_5 16 - \log_5 4}{\log_5 128}$	(S) prime

[SUBJECTIVE TYPE]

11. The value of $\log_3 (\log_2 (\log_{\sqrt{3}} 81))$

12. $\log_3\left[\log_2^2\left(\dfrac{1}{2}\right) + 6\log_2\sqrt{2} + 5\right]$

13. $\left[\log_{\frac{1}{2}}\sqrt{\dfrac{1}{4}} + 6\log_{\frac{1}{4}}\left(\dfrac{1}{2}\right) - 2\log_{\frac{1}{16}}\left(\dfrac{1}{4}\right)\right] \div \log_{\sqrt{2}} \sqrt[5]{8}$

14. $\log_2 \log_2 \sqrt{2\sqrt{2\sqrt{2}}}$

15. $\log_{\sqrt{2}} \sqrt{\sqrt{2}\sqrt{\sqrt{2}}} + \log_{\sqrt{\sqrt{2}}} \sqrt[4]{\sqrt{2\sqrt{2}}}$

16. $\sqrt{\log_{\sqrt{3}} \sqrt[4]{\dfrac{(\sqrt{3})^{\frac{1}{2}}}{\sqrt{3}}} + \log_{\sqrt[4]{2}} \sqrt[4]{\sqrt{\dfrac{2}{\sqrt{2}}}}}$

17. $\left(\log_{\sqrt{5}} 125 \div \log_5^2 25\right).\left(\log_{\frac{1}{5}} \sqrt{5} \div \log_{0.2} \sqrt[3]{25}\right)$

18. Prove that $\log\dfrac{75}{16} - 2\log\dfrac{5}{9} + \log\dfrac{32}{243} = \log 2$

19. Simplify $x^{\ln y - \ln z} y^{\ln z - \ln x} z^{\ln x - \ln y}$

20. $\log_2\left(\dfrac{1}{4\sqrt{4}}\right) + \log_3\left(\dfrac{\sqrt[3]{3\sqrt{3}}}{27}\right) + \log_4\left(\dfrac{\sqrt[3]{8}}{128\sqrt{2}}\right)$

LEVEL- I

[SINGLE CORRECT CHOICE TYPE]

1. How many distinct real numbers belong to the following collection

$$\left\{ln\left(4-\sqrt{15}\right);\, ln\left(4+\sqrt{15}\right);\, -ln\left(4-\sqrt{15}\right);\, -ln\left(4+\sqrt{15}\right);\, ln\left(\frac{4+\sqrt{15}}{4-\sqrt{15}}\right);\, ln\left(31+8\sqrt{15}\right)\right\}$$

(A) 2 (B) 3 (C) 4 (D) 5

2. If $\log x + \log 5 = \log x^2 - \log 14$, then x equal to (where base of the logarithm is 10)

(A) 2^{70} (B) 70 (C) either 0 or 70 (D) 70^2

3. $\log_{10}(\log_2 3) + \log_{10}(\log_3 4) + \log_{10}(\log_4 5) + ... + \log_{10}(\log_{1023} 1024)$ simplifies to

(A) a composite (B) a prime number

(C) rational which is not an integer (D) an integer

4. The value of 'a' for which $\frac{\log_a 7}{\log_6 7} = \log_\pi 36$ holds good, is

(A) $1/\pi$ (B) π^2 (C) $\sqrt{\pi}$ (D) 2

5. Given that log (2) = 0.3010....., number of digits in the number 2000^{2000} is

(A) 6601 (B) 6602 (C) 6603 (D) 6604

6. Let N be the number of digits in the number 64^{64} then the value of N, is - (use $\log_{10} 2 = 0.3010$)

(A) 78 (B) 84 (C) 144 (D) 116

LEVEL-II

7. If $a^4 \cdot b^5 = 1$ then the value of $\log_a(a^5b^4)$ equals

(A) 9/5 (B) 4 (C) 5 (D) 8/5

8. If $\log_{ab} a = 4$ and the value of $\log_{ab}\left(\frac{\sqrt[3]{a}}{\sqrt{b}}\right) = \frac{p}{q}$, where p & q are coprimes, then value of $|p - q|$ is equal to

(A)5 (B) 6 (C) 11 (D) 17

9. Given $\log_{10}2 = a$ and $\log_{10}3 = b$. if $3^{x+2} = 45$. The value of x in terms of a and b is

(A) $\frac{a-1}{b}$ (B) $\frac{1-a}{b}$ (C) $\frac{1+a}{b}$ (D) $\frac{b}{1-a}$

10. If $\log_y x + \log_x y = 7$, then the value of $(\log_y x)^2 + (\log_x y)^2$, is

(A) 43 (B) 45 (C) 47 (D) 49

11. Which one of the following is the smallest ?

(A) $\log_{10}\pi$ (B) $\sqrt{\log_{10}\pi^2}$ (C) $\left(\frac{1}{\log_{10}\pi}\right)^3$ (D) $\left(\frac{1}{\log_{10}\sqrt{\pi}}\right)$

12. Number of digits in 4^{16}. 5^{25} is (use $\log_{10}2 = 0.3010$)

(A) 27 (B) 28 (C) 29 (D) 30

[MULTIPLE CORRECT CHOICE TYPE]

13. Which of the following when simplified, reduces to unity ?

(A) $\log_{10}5.\log_{10}20+\log^2_{10}2$

(B) $\dfrac{2\log 2+\log 3}{\log 48-\log 4}$

(C) $-\log_5\log_3\sqrt{\sqrt[5]{9}}$

(D) $\dfrac{1}{6}\log_{\frac{\sqrt{3}}{2}}\left(\dfrac{64}{27}\right)$

14. If $\log_4 5 = x$ and $\log_5 6 = y$, then

(A) $\log_4 6 = xy$ (B) $\log_6 4 = xy$ (C) $\log_3 2 = \dfrac{1}{2xy-1}$ (D) $\log_2 3 = \dfrac{1}{2xy-1}$

15. If $x = (\text{antilog}_2 3)(\text{antilog}_3 4)$, $y = \text{antilog}_6 2$ and $\dfrac{x}{y}=\dfrac{p}{q}$ in lowest form (where $p,q \in N$), then $(p + q)$ is less than or equal to

(A) 20 (B) 19 (C) 18 (D) 17

[MATRIX TYPE]

Q.16 has **four** statements (A,B,C and D) given in **Column-I** and **four** statements (P, Q, R and S) given in **Column-II**. Any given statement in **Column-I** can have correct matching with one or more statement(s) given in **Column-II.**

16.

Column-I	**Column-II**
(A) Anti logarithm of $(0.\overline{6})$ to the base 27 has the value equal to	(P) 5
(B) Characteristic of the logarithm of 2008 to the base 2 is	(Q) 7
(C) The value of b satisfying the equation $\log_e 2 \,.\, \log_b 625 = \log_{10}16 \,.\, \log_e 10$ is	(R) 9
(D) Number of naughts after decimal before a significant figure comes in the number $\left(\dfrac{5}{6}\right)^{100}$, is	(S) 10

[SUBJECTIVE TYPE]

17. Simplify $\dfrac{1}{1+\log_b a+\log_b c}+\dfrac{1}{1+\log_c a+\log_c b}+\dfrac{1}{1+\log_a b+\log_a c}$ is (in terms of abc)

18. $\left(\log_8 27-\log_{0.5}\dfrac{1}{3}\right).\left(\dfrac{\log_3 12}{\log_{36}3}-\dfrac{\log_3 4}{\log_{108}3}\right)$

19. $\log_{\sqrt{6}}3.\log_3 36+\log_{\sqrt{3}}8.\log_4 81$

20. Evaluate $\dfrac{\left((64)^{\frac{1}{\log_5 8}}+2^{\frac{2}{\log_{\sqrt{5}}2}}\right)\left(\left(\sqrt{11}\right)^{\frac{2}{\log_{25}11}}-(64)^{\log_8\sqrt{5}}\right)}{300}$

LEVEL-I

[SINGLE CORRECT CHOICE TYPE]

1. Consider the equation $\log_{10}(x + \pi) = \log_{10}(x) + \log_{10}(\pi)$, where x is a positive real number. This equation has -

(A) no solutions
(B) exactly 1 solution
(C) exactly 2 solutions
(D) more than 2, but infinitely many solutions

2. The sum of all the solutions to the equation $2 \log x - \log(2x - 75) = 2$ is

(A) 30 (B) 350 (C) 75 (D) 200

3. The number of solution of $\log(2x) = 2 \log (4x - 15)$ is -

(A) 1 (B) 2 (C) 3 (D) infinite

4. Solution set of the equation $\log(8 - 10x - 12x^2) = 3\log (2x - 1)$ is -

(A) $\{1\}$ (B) $\{3, 2\}$ (C) $\{5\}$ (D) ϕ

5. 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 ?

(A) $2x < y$ (B) $2y < x$ (C) $3x = 2y$ (D) $y = x$

LEVEL-II

6. The product of all values of x which make the following statement true $(\log_3 x)(\log_5 9) - \log_x 25 + \log_3 2 = \log_3 54$, is

(A) $\sqrt{5}$ (B) 5 (C) $5\sqrt{5}$ (D) 25

7. Suppose that, $\log_{10}(x - 2) + \log_{10}y = 0$ and $\sqrt{x} + \sqrt{y-2} = \sqrt{x+y}$

Then the value of $(x + y)$, is

(A) 2 (B) $2\sqrt{2}$ (C) $2 + 2\sqrt{2}$ (D) $4 + 2\sqrt{2}$

8. The real value of x for which the statement $\log_6 9 - \log_9 27 + \log_8 x = \log_{64} x - \log_6 4$ holds true, is

(A) 1/2 (B) 1/4 (C) 1/8 (D) 1/16

9. The real x and y satisfy simultaneously $\log_8 x + \log_4 y^2 = 5$ and $\log_8 y + \log_4 x^2 = 7$ then the value of xy is equal to

(A) 2^9 (B) 2^{12} (C) 2^{18} (D) 2^{24}

[MULTIPLE CORRECT CHOICE TYPE]

10. The equation $\dfrac{\log_8(8/x^2)}{(\log_8 x)^2} = 3$ has

(A) no integral solution
(B) one natural solution
(C) two real solutions
(D) one irrational solution

11. In which of the following case(s) the real number 'm' is greater than the real number 'n' ?

(A) $m = (\log_2 5)^2$ and $n = \log_2 20$
(B) $m = \log_{10} 2$ and $n = \log_{10} \sqrt[3]{10}$
(C) $m = \log_{10}5.\log_{10}20 + (\log_{10}2)^2$ and $n = 1$
(D) $m = \log_{1/2}\left(\frac{1}{3}\right)$ and $n = \log_{1/3}\left(\frac{1}{2}\right)$

12. Select the correct statement.

(A) $\log_3 19 \cdot \log_{1/7} 3 \cdot \log_4 \left(\frac{1}{7}\right) < 2$

(B) The equation $\log_{1/3}(x^2 + 8) = -2$ has two real solutions.

(C) Let $N = \log_2 15 \cdot \log_{1/6} 2 \cdot \log_3 \left(\frac{1}{6}\right)$. The greatest integer which is less than or equal to N is 3.

(D) The equation $\log_4 x + \log_4(x + 2) = \log_4(3x)$ has no prime solution.

13. For the equation $\log_{3\sqrt{x}} x + \log_{3x} \sqrt{x} = 0$, which of the following do not hold good?

(A) no real solution

(B) one prime solution

(C) one integral solution

(D) no irrational solution

[SUBJECTIVE TYPE]

14. If $\log_{\sqrt{2}} \sqrt{x} + \log_2 x + \log_4(x^2) + \log_8(x^3) + \log_{16}(x^4) = 40$ then x is equal to

15. If $4^{\log_9 3} + 9^{\log_2 4} = 10^{\log_x 83}$, $(x \in R)$, then x is

[SINGLE CORRECT CHOICE TYPE]

1. Let B, C, P and L be positive real numbers such that

$\log(B \cdot L) + \log(B \cdot P) = 2$; $\log(P \cdot L) + \log(P \cdot C) = 3$; $\log(C \cdot B) + \log(C \cdot L) = 4$

The value of the product (BCPL) equals (base of the log is 10)

(A) 10^2 (B) 10^3 (C) 10^4 (D) 10^9

2. If $\log_3(x) = p$ and $\log_7(x) = q$, which of the following yields $\log_{21}(x)$?

(A) pq (B) $\frac{1}{p+q}$ (C) $\frac{1}{p^{-1}+q^{-1}}$ (D) $\frac{pq}{p^{-1}+q^{-1}}$

3. $\sum_{n=1}^{1023} \log_2\left(1+\frac{1}{n}\right)$ is equal to -

(A) 8 (B) 9 (C) 10 (D) 12

4. Let $u = (\log_2 x)^2 - 6\log_2 x + 12$ where x is a real number. Then the equation $x^u = 256$ has

(A) no solution for x (B) exactly one solution for x

(C) exactly two distinct solutions for x (D) exactly three distinct solutions for x

5. If $(49)^{3\log_{\sqrt{343}}\sqrt{x}} - 2x - 3 = 0$, then x is equal to

(A) –1 (B) 3 (C) –1, 3 (D) 2, 3

[MATRIX TYPE]

Q.6 & Q.7 has **four** statements (A,B,C and D) given in **Column-I** and **five** statements (P, Q, R and S) given in **Column-II**. Any given statement in **Column-I** can have correct matching with one or more statement(s) given in **Column-II.**

6.

Column-I	**Column-II**
(A) When the repeating decimal 0.363636............ is written as a rational fraction in the simplest form, the sum of the numerator and denominator is	(P) 8
(B) If $\log_8 a + \log_8 b = (\log_8 a)(\log_8 b)$ and $\log_a b = 3$, then the value of 'a' is	(Q) 15
(C) Let $N = (2 + 1)(2^2 + 1)(2^4 + 1) \ldots\ldots\ldots (2^{32} + 1) + 1$ then $\log_{256} N$ equals	(R) 16

7.

Column-I	**Column-II**
(A) If x_1 and x_2 satisfy the equation $x^{\log_{10} x} = 100x$ then the value of x_1x_2 equals	(P) irrational
(B) Sum of the squares of the roots of the equation $\log_2(9 - 2^x) = 3 - x$ is	(Q) rational
(C) If $\log_{1/8}\left(\log_{1/4}\left(\log_{1/2} x\right)\right) = \frac{1}{3}$ then x is	(R) prime
(D) Let $\log_b a = 3$, $\log_b c = -4$. If the value of x satisfying the equation $a^{3x} = c^{x-1}$ is expressed in the form p/q, where p and q are relatively prime then p + q is	(S) composite

[SUBJECTIVE TYPE]

8. $\log_2 (x^2 - 5x + 6) > 1$

9. $\log_{\frac{1}{2}}(x^2 - 1) \geq \log_{\frac{1}{2}}(3x)$

10. $\log_2 (2x + 3) > \log_2 (x - 2)$

11. $\log_3 |3 - 4x| > 2$

12. $\log_2 |x - 2| > \log_2 |x + 4|$

13. Find x for $\dfrac{(\ell nx)^2 - 3\ell nx + 3}{\ell nx - 1} < 1$.

14. If $(21.4)^a = (0.00214)^b = 100$, then the value of $\dfrac{1}{a} - \dfrac{1}{b}$ is

15. Number of integers satisfying the inequality $\log_{1/2} |x - 3| > -1$ is

[SINGLE CORRECT CHOICE TYPE]

1. Which of the following conditions imply that the real number x is rational ?

I $x^{1/2}$ is rational **II** x^2 and x^5 are rational **III** x^2 and x^4 are rational

(A) I and II only (B) I and III only (C) II and III only (D) I, II and III

2. Let $n=\sqrt{6+\sqrt{11}}+\sqrt{6-\sqrt{11}}-\sqrt{22}$, then

(A) $n \geq 1$ (B) $0 < n < 1$ (C) $n = 0$ (D) $-1 < n < 0$

3. Number of real distinct x satisfying the equation $|x-2| + |x-3| = |x-1|$ is

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

4. The sum of the solutions of the equation $9^x - 6 \cdot 3^x + 8 = 0$ is

(A) $\log_3 2$ (B) $\log_3 6$ (C) $\log_3 8$ (D) $\log_3 4$

5. If $x=\left(2^{\sqrt{5}}\right)\left(5^{\sqrt{2}}\right)$, then $\log_{10} x=\left(\sqrt{A}-\sqrt{B}\right)(\log_{10} 2)+\sqrt{B}$. The value of (A + B) equals

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

6. a = log12, b = log21, c = log11 and d = log22 then $\log\left(\frac{1}{7}\right)$ can be expressed in this form

P(a – b) + Q(c – d) where P and Q are integers then the value of (7P – Q) equals

(A) 5 (B) 9 (C) 13 (D) 15

7. Given $\log_2 a = p$, $\log_4 b = p^2$ and $\log_{c^2}(8)=\frac{2}{p^3+1}$. If $\log_2\left(\frac{c^8}{ab^2}\right) = (\alpha p^3 - \beta p^2 - \gamma p + \delta)$ where $\alpha,\beta,\gamma,\delta,\in N$, then find the value of $(\alpha + \beta + \gamma + \delta)$.

(A) 17 (B) 12 (C) 15 (D) 96

8. Let $\log_M N = \alpha + \beta$, where α is an integer and β is non negative fraction. If M and α are prime and $\alpha + M = 7$ then $N \in [a,b)$, Then the sum of all possible value(s) of $|b - 5a|$ is

(A) 0 (B) 24 (C) 48 (D) 96

[MATRIX TYPE]

Q.9 & Q.10 has **four** statements (A,B,C and D) given in **Column-I** and **four** statements (P, Q, R and S) given in **Column-II**. Any given statement in **Column-I** can have correct matching with one or more statement(s) given in **Column-II.**

9.

Column-I	**Column-II**
(A) The expression $x=\log_2\log_9\sqrt{6+\sqrt{6+\sqrt{6+\ldots\infty}}}$ simplifies to	(P) an integer
(B) The number $N=2^{(\log_2 3.\log_3 4.\log_4 5\ldots\log_{99}100)}$ simplifies to	(Q) a prime
(C) The expression $\frac{1}{\log_5 3}+\frac{1}{\log_6 3}-\frac{1}{\log_{10} 3}$ simplifies to	(R) a natural
(D) The number $N=\sqrt{2+\sqrt{5}-\sqrt{6-3\sqrt{5}+\sqrt{14-6\sqrt{5}}}}$ simplifies to	(S) a composite

10. **Column-I** and **column-II** contains **four** entries each. Entry of column-I are to be uniquely matched with only one entry of column-II.

Column-I	**Column-II**
(A) $\frac{1}{\sqrt{2}+1}+\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{\sqrt{4}+\sqrt{3}}+........+\frac{1}{\sqrt{49}+\sqrt{48}}$	(P) 3
(B) Let $A = \log_{\sqrt{3}} 8\cdot\log_4 81$; $B = \log_{\sqrt{6}} 3\cdot\log_3 36$ Then the value of (A – B) equals	(Q) 6
(C) Let $A = \log^2_{\sqrt{2}}\left(\frac{1}{4}\right)$; $B = \log^3_{2\sqrt{2}}(8)$; $C = -\log_5 \log_3 \sqrt{\sqrt[5]{9}}$. Then the value of $\left(\frac{A}{B}+C\right)$ equals	(R) 7
(D) $\left(\sqrt[3]{4}-\sqrt[3]{10}+\sqrt[3]{25}\right)\left(\sqrt[3]{2}+\sqrt[3]{5}\right)$	(S) 8

[COMPREHENSION TYPE]

Paragraph for question nos. 11 to 13

Let A denotes the sum of the roots of the equation $\frac{1}{5-4\log_4 x}+\frac{4}{1+\log_4 x}=3$.

B denotes the value of the product of m and n, if $2^m = 3$ and $3^n = 4$.

C denotes the product of the integral roots of the equation $\log_{3x}\left(\frac{3}{x}\right)+(\log_3 x)^2=1$.

11. The value of A + B equals

(A) 10 (B) 6 (C) 8 (D) 4

12. The value of B + C equals

(A) 6 (B) 2 (C) 4 (D) 5

13. The value of A ÷ C + B equals

(A) 4 (B) 8 (C) 7 (D) 5

[SUBJECTIVE TYPE]

14. Find all integral solution of the equation, $4\log_{x/2}\left(\sqrt{x}\right)+2\log_{4x}\left(x^2\right)=3\log_{2x}\left(x^3\right)$

15. **(i)** Prove that if $x = \log_c b + \log_b c$, $y = \log_a c + \log_c a$, $z = \log_b a + \log_a b$ then $xyz = x^2 + y^2 + z^2 - 4$.

(ii) $y = a^{\frac{1}{(1-\log_a x)}}$ and $z = a^{\frac{1}{(1-\log_a y)}}$, prove that $x = a^{\frac{1}{(1-\log_a z)}}$

[SINGLE CORRECT CHOICE TYPE]

1. If A and B are two given sets, then $A \cap (A \cap B)^C$ is equal to

(A) A (B) B (C) ϕ (D) $A \cap B^C$

2. Let $A = [x : x \in R, |x| < 1]$; $B = [x : x \in R, |x-1| \geq 1]$ and $A \cup B = R - D$, then the set *D* is

(A) $[x : 1 < x \leq 2]$ (B) $[x : 1 \leq x < 2]$ (C) $[x : 1 \leq x \leq 2]$ (D) None of these

3. If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9(n-1) : n \in N\}$, then $X \cup Y$ is equal to

(A) X (B) Y (C) N (D) None of these

4. Let $n(U) = 700, n(A) = 200, n(B) = 300$ and $n(A \cap B) = 100$, then $n(A^C \cap B^C) =$

(A) 400 (B) 600 (C) 300 (D) 200

5. In a town of 10,000 families, it was found that 40% family buy newspaper *A*, 20% buy newspaper *B* and 10% families buy newspaper *C*, 5% families buy *A* and *B*, 3% buy *B* and *C* and 4% buy *A* and *C*. If 2% families buy all the three newspapers, then number of families which buy *A* only is

(A) 3100 (B) 3300 (C) 2900 (D) 1400

6. If $A = \{a, b\}, B = \{c, d\}, C = \{d, e\}$, then $\{(a,c),(a,d),(a,e),(b,c),(b,d),(b,e)\}$ is equal to

(A) $A \cap (B \cup C)$ (B) $A \cup (B \cap C)$ (C) $A \times (B \cup C)$ (D) $A \times (B \cap C)$

7. If P, Q and R are subsets of a set A, then $R \times (P^c \cup Q^c)^c =$

(A) $(R \times P) \cap (R \times Q)$ (B) $(R \times Q) \cap (R \times P)$ (C) $(R \times P) \cup (R \times Q)$ (D) None of these

8. Out of 800 boys in a school, 224 played cricket, 240 played hockey and 336 played basketball. Of the total, 64 played both basketball and hockey; 80 played cricket and basketball and 40 played cricket and hockey; 24 played all the three games. The number of boys who did not play any game is

(A) 128 (B) 216 (C) 240 (D) 160

9. If A = {1, 2, 3} and B = {3, 8}, then $(A \cup B) \times (A \cap B)$ is

(A) {(3, 1), (3, 2), (3, 3), (3, 8)} (B) {(1, 3), (2, 3), (3, 3), (8, 3)}

(C) {(1, 2), (2, 2), (3, 3), (8, 8)} (D) {(8, 3), (8, 2), (8, 1), (8, 8)}

10. If $n(A) = 3$ and $n(B) = 6$ and $A \subseteq B$. Then the number of elements in $A \cap B$ is equal to

(A) 3 (B) 6 (C) 9 (D) None of these

11. In a certain town 25% families own a phone and 15% own a car, 65% families own neither a phone nor a car. 2000 families own both a car and a phone. Consider the following statements in this regard:

1. 10% families own both a car and a phone
2. 35% families own either a car or a phone
3. 40,000 families live in the town

Which of the above statements are correct

(A) 1 and 2 (B) 1 and 3 (C) 2 and 3 (D) 1, 2 and 3

12. If $X = \{8^n - 7n - 1 : n \in N\}$ and $Y = \{49(n-1) : n \in N\}$, then

(A) $X \subseteq Y$ (B) $Y \subseteq X$ (C) $X = Y$ (D) None of these

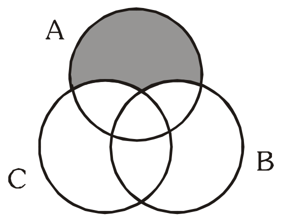
13. If $N_a = \{an : n \in N\}$, then $N_3 \cap N_4 =$

(A) N_7 (B) N_{12} (C) N_3 (D) N_4

14. If A = [x : x is a multiple of 3] and B = [x : x is a multiple of 5], then $A - B$ is ($\bar{A}$ means complement of A)

(A) $\bar{A} \cap B$ (B) $A \cap \bar{B}$ (C) $\bar{A} \cap \bar{B}$ (D) $\overline{A \cap B}$

15. The shaded region in the given figure is



(A) A ∩ (B ∪ C) (B) A ∪ (B ∩ C) (C) A ∩ (B – C) (D) A – (B ∪ C)

16. Let A and B be two sets then (A ∪ B)' ∪ (A' ∩ B) is equal to

(A) A' (B) A (C) B (D) B'

17. In a class of 100 students, 55 students have passed in Mathematics and 67 students have passed in Physics. Then the number of students who have passed in Physics only is (each student is pass in atleast one subject).

(A) 45 (B) 50 (C) 40 (D) NOT

[SUBJECTIVE TYPE]

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18. Write the following sets in roster form :

(i) A = { x : x is an integer and $-3 \leq x < 7$}

(ii) B = {x : x is a natural number less than 6}

(iii) C = {x :x is a two digit natural number such that the sum of its digits is 8}

(iv) D = {x : x is a prime number which is divisor of 60}

(v) E = The set of all letters in the word TRIGONOMETRY

(vi) F = The set of all letters in the word BETTER

19. Write the following sets in the set builder form :

(i) {3,6,9,12} (ii) {2,4,8,16,32} (iii) {5 , 25, 125, 625} (iv) {2,4,6,...}

(v) {1,4,9,16.... 100}

20. If X={a,b,c,d} and Y = {f,b,d,g}, find

(i) X – Y (ii) Y – X (iii) $X \cap Y$

ANSWER KEY

RACE-01

1. (B)	**2.** (D)	**3.** (D)	**4.** (C)	**5.** (B)	**6.** (A)	**7.** (C)	**8.** (B)	**9.** (C)

10. (B) **11.** (A) **12.** (4) **13.** (0, 0), (–2, 4), (1, 1), (–3, 3) **14.** (421) **15.** NO

RACE-02

1. (C)	**2.** (D)	**3.** (B)	**4.** (B)	**5.** (C)	**6.** (A)	**7.** (B)	**8.** (A)	**9.** (C)

10. (C) **11.** (D) **12.** (D) **13.** (C) **14.** (B) **15.** A-T, B-P, C-P, D-Q

RACE-03

1. $(-3, 1)$ **2.** $[-3, 3]$ **3.** $(-\infty, 3) \cup (4, +\infty)$ **4.** $(-1, 5)$

5. $(-9/2, -2) \cup (3, +\infty)$ **6.** $(1/2, 3)$ **7.** $[-\sqrt{2}, -1) \cup (-1, \sqrt{2}] \cup [3, 4)$

8. $(-\infty, -2] \cup (-1, 4)$ **9.** $(-\infty, -3) \cup (-2, 3)$ **10.** $(-\infty, -2) \cup (-1, 3) \cup (4, +\infty)$

11. $(-\infty, -1] \cup (0, 1] \cup (2, 3]$ **12.** $x \in \left(-5, -\frac{8}{3}\right) \cup \left(\frac{-8}{3}, \frac{3}{2}\right) \cup (7, \infty)$ **13.** $(-\infty, -2) \cup (-2, -1) \cup (1, +\infty)$

14. $(-\infty, 0) \cup (3, +\infty)$ **15.** $(-\infty, +\infty)$ **16.** $[1, 3] \cup (5, +\infty)$

17. $(-1, 1) \cup (4, 6)$ **18.** $(-1, 0) \cup (0, 1)$ **19.** $\left(-\infty, -\sqrt{7}/2\right) \cup \left(-1, \sqrt{7}/2\right) \cup (4/3, +\infty)$

20. $(-\infty, -5) \cup (1, 2) \cup (6, +\infty)$ **21.** $\left(-\sqrt{2}, 0\right) \cup \left(1, \sqrt{2}\right) \cup (2, +\infty)$ **22.** $(-\infty, -7) \cup (-4, -2)$

23. $x \in (-\infty, -2) \cup (-1, 1) \cup (2, 3) \cup (4, 6) \cup (7, \infty)$ **24.** $x \in (-1, 1) \cup (3, \infty)$

25. $x \in (-2, -1) \cup (2, 3)$ **26.** $x \in (-\infty, -1) \cup (1, 3]$

27. $\left(-2, \frac{(3-\sqrt{17})}{2}\right] \cup (0, 2) \cup \left[\frac{(3+\sqrt{17})}{2}, +\infty\right)$

28. $(-\infty, -5) \cup (-4, -3) \cup \left(\frac{5}{2}, 3\right) \cup (3, 4) \cup (5, \infty)$ **29.** $(-\infty, -3) \cup (2, \infty) - \{\pm 4, 3\}$

30. $(-\infty, -3) \cup \left(-2, -\frac{1}{2}\right) \cup \left(\frac{4}{3}, 2\right)$ **31.** $(-\infty, -6) \cup [-3, -2) \cup \left[\frac{-3}{2}, 2\right) \cup [3, 8) \cup (8, \infty)$

32. $[-3, 1] \cup (2, 3)$

RACE-04

1. (A)	**2.** (B)	**3.** (A)	**4.** (D)	**5.** (A)	**6.** (D)	**7.** (B)	**8.** (B)	**9.** (C)
10. (B)	**11.** (C)	**12.** (C)	**13.** (B)	**14.** (D)	**15.** (C)	**16.** (B)	**17.** (C)	

18. $x \in [-\sqrt{2}, -1] \cup [1, \sqrt{2}]$ **19.** $x \in (-\infty, -2] \cup [2, \infty)$ **20.** $x \in \left[-2, \frac{5-\sqrt{21}}{2}\right] \cup \left[\frac{5+\sqrt{21}}{2}, \infty\right)$

RACE-05

1. (D) **2.** (A) **3.** (A) **4.** (A) **5.** (C) **6.** (ACD) **7.** (ACD) **8.** (ABCD)

9. (AD) **10.** A-PS, B-P, C-Q, D-R **11.** 1 **12.** 2 **13.** $\frac{5}{2}$

14. $\log_2 7 - 3$ **15.** 1.5 **16.** $\sqrt{\frac{1}{8}}$ **17.** $\frac{9}{8}$ **19.** 1 **20.** –35/4

RACE-06

1. (B) **2.** (B) **3.** (D) **4.** (C) **5.** (C) **6.** (D) **7.** (A) **8.** (C) **9.** (B)

10. (C) **11.** (A) **12.** (B) **13.** (ABC) **14.** (AC) **15.** (AB) **16.** A-R ; B-S ; C-P ; D-Q

17. 1 **18.** 0 **19.** 16 **20.** 2

RACE-07

1. (B) **2.** (D) **3.** (B) **4.** (D) **5.** (D) **6.** (C) **7.** (C) **8.** (C) **9.** (A)

10. (BC) **11.** (AD) **12.** (BD) **13.** (ABD) **14.** 256 **15.** 10

RACE-08

1. (B) **2.** (C) **3.** (C) **4.** (B) **5.** (B) **6.** A-Q; B-R ; C-P

7. A-Q,S ; B-QS ; C-P ; D-QR **8.** $x \in (-\infty, 1)\ (4, \infty)$ **9.** $x \in \left(1, \dfrac{3+\sqrt{13}}{2}\right]$

10. $x > 2$ **11.** $x \in \left(-\infty, -\dfrac{3}{2}\right) \cup (3, \infty) - \left\{\dfrac{3}{4}\right\}$ **12.** $x \in (-\infty, -1) - \{-4\}$

13. $x \in (0, e)$ **14.** 2 **15.** **2**

RACE-09

1. (A) **2.** (C) **3.** (B) **4.** (C) **5.** (A) **6.** (A) **7.** (A) **8.** (D)

9. A-P ; B-PRS ; C-PR ; D-PQR **10.** A-Q, B-S, C-P, D-R **11.** (C) **12.** (D) **13.** (A) **14.** 1 ,4

RACE-10

1. (D) **2.** (B) **3.** (B) **4.** (C) **5.** (B) **6.** (C) **7.** (A) **8.** (D) **9.** (B)

10. (A) **11.** (C) **12.** (A) **13.** (B) **14.** (B) **15.** (D) **16.** (A) **17.** (A)

18. (i) $A=\{-3,-2,-1,0,1,2,3,4,5,6\}$ (ii) $B = \{1,2,3,4,5\}$ (iii) $C = \{17,26,35,44,53,62,71,80\}$
(iv) $D = \{2,3,5\}$ (v) $E = \{T,R,I,G,O,N,M,E,Y\}$ (vi) $F = \{B,E,T,R\}$

19. (i) $\{x : x = 3n,\ n \in N \text{ and } 1 \le n \le 4\}$ (ii) $\{x : x = 2^n,\ n \in N \text{ and } 1 \le n \le 5\}$
(iii) $\{x : x = 5^n,\ n \in N \text{ and } 1 \le n \le 4\}$ (iv) $\{x : x \text{ is an even natural number }\}$
(v) $\{x : x = n^2,\ n \in N \text{ and } 1 \le n \le 10\}$

20. (i) $\{a, c\}$ (ii) $\{f, g\}$ (iii) $\{b, d\}$