QUADRATIC EQUATIONS

SELECT THE CORRECT ALTERNATIVE (ONLY ONE CORRECT ANSWER)

1. The roots of the quadratic equation $(a + b - 2c)\,x^2 - (2a - b - c)\,x + (a - 2b + c) = 0$ are -

(A) $a + b + c$ & $a - b + c$ (B) $1/2$ & $a - 2b + c$

(C) $a - 2b + c$ & $1/(a + b - 2c)$ (D) none of these

2. If the A.M. of the roots of a quadratic equation is $\frac{8}{5}$ and A.M. of their reciprocals is $\frac{8}{7}$, then the quadratic equation is -

(A) $5x^2 - 8x + 7 = 0$ (B) $5x^2 - 16x + 7 = 0$ (C) $7x^2 - 16x + 5 = 0$ (D) $7x^2 + 16x + 5 = 0$

3. If $\sin\alpha$ & $\cos\alpha$ are the roots of the equation $ax^2 + bx + c = 0$ then -

(A) $a^2 - b^2 + 2ac = 0$ (B) $a^2 + b^2 + 2ac = 0$

(C) $a^2 - b^2 - 2ac = 0$ (D) $a^2 + b^2 - 2ac = 0$

4. If one root of the quadratic equation $px^2 + qx + r = 0$ $(p \neq 0)$ is a surd $\frac{\sqrt{a}}{\sqrt{a}+\sqrt{a-b}}$, where p, q, r; a, b are all rationals then the other root is -

(A) $\frac{\sqrt{b}}{\sqrt{a}-\sqrt{a-b}}$ (B) $a + \frac{\sqrt{a(a-b)}}{b}$

(C) $\frac{a+\sqrt{a(a-b)}}{b}$ (D) $\frac{\sqrt{a}-\sqrt{a-b}}{\sqrt{b}}$

5. A quadratic equation with rational coefficients one of whose roots is $\tan\left(\frac{\pi}{12}\right)$ is -

(A) $x^2 - 2x + 1 = 0$ (B) $x^2 - 2x + 4 = 0$ (C) $x^2 - 4x + 1 = 0$ (D) $x^2 - 4x - 1 = 0$

6. $ax^2 + bx + c = 0$ has real and distinct roots α and $\beta(\beta > \alpha)$. Further $a > 0$, $b < 0$ and $c < 0$, then -

(A) $0 < \beta < |\alpha|$ (B) $0 < |\alpha| < \beta$ (C) $\alpha + \beta < 0$ (D) $|\alpha| + |\beta| = \left|\frac{b}{a}\right|$

7. If the roots of $(a^2 + b^2)\,x^2 - 2b\,(a + c)\,x + (b^2 + c^2) = 0$ are equal then a, b, c are in

(A) A.P. (B) G.P. (C) H.P. (D) none of these

8. If $a\,(b - c)\,x^2 + b\,(c - a)\,x + c\,(a - b) = 0$ has equal root, then a, b, c are in

(A) A.P. (B) G.P. (C) H.P. (D) none of these

9. Let $p, q \in \{1, 2, 3, 4\}$. Then number of equation of the form $px^2 + qx + 1 = 0$, having real roots, is

(A) 15 (B) 9 (C) 7 (D) 8

10. If the roots of the quadratic equation $ax^2 + bx + c = 0$ are imaginary then for all values of a, b, c and $x \in R$, the expression $a^2x^2 + abx + ac$ is -

(A) positive (B) non-negative

(C) negative (D) may be positive, zero or negative

11. If x, y are rational number such that $x + y + (x - 2y)\sqrt{2} = 2x - y + (x - y - 1)\sqrt{6}$, then

(A) x and y connot be determined (B) $x = 2, y = 1$

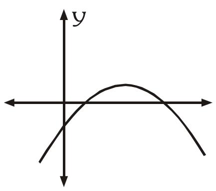
(C) $x = 5, \ y = 1$ (D) none of these

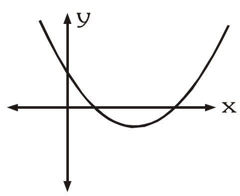
12. Graph of the function $f(x) = Ax^2 - BX + C$, where

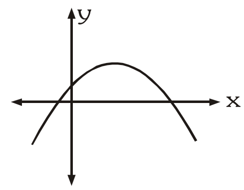
$A = (\sec\theta - \cos\theta)(\text{cosec}\theta - \sin\theta)(\tan\theta + \cot\theta)$,

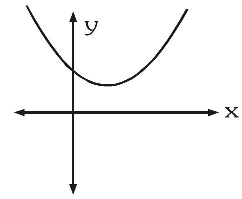
$B = (\sin\theta + \text{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 - (\tan^2\theta + \cot^2\theta)$ &

$C = 12$, is represented by

(A) 

(B) 

(C) 

(D) 

13. The equation whose roots are the squares of the roots of the equation $ax^2 + bx + c = 0$ is -

(A) $a^2x^2 + b^2x + c^2 = 0$ (B) $a^2x^2 - (b^2 - 4ac)x + c^2 = 0$

(C) $a^2x^2 - (b^2 - 2ac)x + c^2 = 0$ (D) $a^2x^2 + (b^2 - ac)x + c^2 = 0$

14. If $\alpha \neq \beta$, $\alpha^2 = 5\alpha - 3$, $\beta^2 = 5\beta - 3$, then the equation whose roots are α/β & β/α, is

(A) $x^2 + 5x - 3 = 0$ (B) $3x^2 + 12x + 3 = 0$ (C) $3x^2 - 19x + 3 = 0$ (D) none of these

15. If α, β are the roots of the equation $x^2 - 3x + 1 = 0$, then the equation with roots $\frac{1}{\alpha - 2}, \frac{1}{\beta - 2}$ will be

(A) $x^2 - x - 1 = 0$ (B) $x^2 + x - 1 = 0$ (C) $x^2 + x + 2 = 0$ (D) none of these

16. If $x^2 - 11x + a$ and $x^2 - 14x + 2a$ have a common factor then 'a' is equal to

(A) 24 (B) 1 (C) 2 (D) 12

17. The smallest integer x for which the inequality $\frac{x-5}{x^2 + 5x - 14} > 0$ is satisfied is given by -

(A) – 7 (B) – 5 (C) – 4 (D) – 6

18. The number of positive integral solutions of the inequation $\frac{x^2(3x-4)^3\ (x-2)^4}{(x-5)^5\ (2x-7)^6} \leq 0$ is -

(A) 2 (B) 0 (C) 3 (D) 4

19. The value of 'a' for which the sum of the squares of the roots of $2x^2 - 2(a - 2)x - a - 1 = 0$ is least is -

(A) 1 (B) 3/2 (C) 2 (D) – 1

20. If the roots of the quadratic equation $x^2 + 6x + b = 0$ are real and distinct and they differ by atmost 4 then the least value of b is -

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

21. The expression $\frac{x^2 + 2x + 1}{x^2 + 2x + 7}$ lies in the interval ; $(x \in R)$ -

(A) $[0, -1]$ (B) $(-\infty, 0] \cup [1, \infty)$ (C) $[0, 1)$ (D) none of these

22. If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real & less than 3 then -

(A) $a < 2$ (B) $2 \leq a \leq 3$ (C) $3 < a \leq 4$ (D) $a > 4$

23. The number of integral values of m, for which the roots of $x^2 - 2mx + m^2 - 1 = 0$ will lie between – 2 and 4 is -

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

24. If the roots of the equation, $x^3 + Px^2 + Qx - 19 = 0$ are each one more than the roots of the equation, $x^3 - Ax^2 + Bx - C = 0$, where A, B, C, P & Q are constants then the value of A + B + C =

(A) 18 (B) 19 (C) 20 (D) none

25. If α, β, γ, δ are roots of $x^4 - 100x^3 + 2x^2 + 4x + 10 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma} + \frac{1}{\delta}$ is equal to -

(A) $\frac{2}{5}$ (B) $\frac{1}{10}$ (C) 4 (D) $-\frac{2}{5}$

26. Number of real solutions of the equation $x^4 + 8x^2 + 16 = 4x^2 - 12x + 9$ is equal to -

(A) 1 (B) 2 (C) 3 (D) 4

27. The complete solution set of the inequation $\sqrt{x+18} < 2-x$ is -

(A) $[-18, -2]$ (B) $(-\infty, -2) \cup (7, \infty)$ (C) $(-18, 2) \cup (7, \infty)$ (D) $[-18, -2)$

28. If $\log_{1/3} \frac{3x-1}{x+2}$ is less than unity then x must lie in the interval -

(A) $(-\infty, -2) \cup (5/8, \infty)$ (B) $(-2, 5/8)$

(C) $(-\infty, -2) \cup (1/3, 5/8)$ (D) $(-2, 1/3)$

29. Exhaustive set of value of x satisfying $\log_{|x|}(x^2 + x + 1) \ge 0$ is -

(A) $(-1, 0)$ (B) $(-\infty, 1) \cup (1, \infty)$

(C) $(-\infty, \infty) - \{-1, 0, 1\}$ (D) $(-\infty, -1) \cup (-1, 0) \cup (1, \infty)$

30. Solution set of the inequality, $2 - \log_2(x^2 + 3x) \ge 0$ is -

(A) $[-4, 1]$ (B) $[-4, -3) \cup (0, 1]$ (C) $(-\infty, -3) \cup (1, \infty)$ (D) $(-\infty, -4) \cup [1, \infty)$

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THAN ONE CORRECT ANSWERS)

31. If α is a root of the equation $2x(2x + 1) = 1$, then the other root is -

(A) $3\alpha^3 - 4\alpha$ (B) $-2\alpha(\alpha + 1)$ (C) $4\alpha^3 - 3\alpha$ (D) none of these

32. If $b^2 \ge 4ac$ for the equation $ax^4 + bx^2 + c = 0$, then all roots of the equation will be real if -

(A) $b > 0, a < 0, c > 0$ (B) $b < 0, a > 0, c > 0$

(C) $b > 0, a > 0, c > 0$ (D) $b > 0, a < 0, c < 0$

33. Let α, β be the roots of $x^2 - ax + b = 0$, where a & $b \in R$. If $\alpha + 3\beta = 0$, then -

(A) $3a^2 + 4b = 0$ (B) $3b^2 + 4a = 0$ (C) $b < 0$ (D) $a < 0$

34. For $x \in [1, 5]$, $y = x^2 - 5x + 3$ has -

(A) least value = -1.5 (B) greatest value = 3

(C) least value = -3.25 (D) greatest value = $\frac{5+\sqrt{13}}{2}$

35. Integral real values of x satisfying $\log_{1/2}(x^2 - 6x + 12) \ge -2$ is -

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

36. If $\frac{1}{2} \le \log_{0.1} x \le 2$, then -

(A) the maximum value of x is $\frac{1}{\sqrt{10}}$ (B) x lies between $\frac{1}{100}$ and $\frac{1}{\sqrt{10}}$

(C) x does not lie between $\frac{1}{100}$ and $\frac{1}{\sqrt{10}}$ (D) the minimum value of x is $\frac{1}{100}$

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	B	A	C	C	B	B	C	C	A
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	B	B	C	C	A	A	D	C	B	A
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	C	A	C	A	D	A	D	A	D	B
Que.	31	32	33	34	35	36				
Ans.	B,C	B,D	A,C	B,C	A,B,C	A,B,D				

EXTRA PRACTICE QUESTIONS ON QUADRATIC EQUATIONS

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THAN ONE CORRECT ANSWERS)

1. The equation whose roots are $\sec^2\alpha$ & $\operatorname{cosec}^2\alpha$ can be -

(A) $2x^2 - x - 1 = 0$ (B) $x^2 - 3x + 3 = 0$ (C) $x^2 - 9x + 9 = 0$ (D) $x^2 + 3x + 3 = 0$

2. If $\cos\alpha$ is a root of the equation $25x^2 + 5x - 12 = 0$, $-1 < x < 0$, then the value of $\sin 2\alpha$ is -

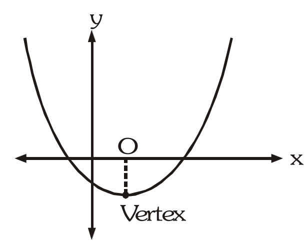
(A) $12/25$ (B) $-12/25$ (C) $-24/25$ (D) $24/25$

3. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}$ are equal in magnitude and opposite in sign, then -

(A) $p + q = r$ (B) $p + q = 2r$

(C) product of roots = $-\frac{1}{2}(p^2+q^2)$ (D) sum of roots = 1

4. Graph of $y = ax^2 + bx + c = 0$ is given adjacently. What conclusions can be drawn from this graph -



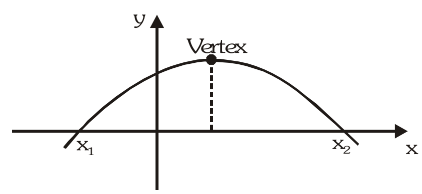
(A) $a > 0$ (B) $b < 0$

(C) $c < 0$ (D) $b^2 - 4ac > 0$

5. If a, b, c are real distinct numbers satisfying the condition $a + b + c = 0$ then the roots of the quadratic equation $3ax^2 + 5bx + 7c = 0$ are -

(A) positive (B) negative (C) real and distinct (D) imaginary

6. The adjoining figure shows the graph of $y = ax^2 + bx + c$. Then -



(A) $a > 0$ (B) $b > 0$

(C) $c > 0$ (D) $b^2 < 4ac$

7. If $x^2 + Px + 1$ is a factor of the expression $ax^3 + bx + c$ then -

(A) $a^2 + c^2 = -ab$ (B) $a^2 - c^2 = -ab$ (C) $a^2 - c^2 = ab$ (D) none of these

8. The set of values of 'a' for which the inequality $(x - 3a)(x - a - 3) < 0$ is satisfied for all x in the interval $1 \le x \le 3$

(A) $(1/3, 3)$ (B) $(0, 1/3)$ (C) $(-2, 0)$ (D) $(-2, 3)$

9. Let p(x) be the cubic polynomial $7x^3 - 4x^2 + K$. Suppose the three roots of p(x) form an arithmetic progression. Then the value of K, is -

(A) $\frac{4}{21}$ (B) $\frac{16}{147}$ (C) $\frac{16}{441}$ (D) $\frac{128}{1323}$

10. If the quadratic equation $ax^2 + bx + 6 = 0$ does not have two distinct real roots, then the least value of $2a + b$ is -

(A) 2 (B) -3 (C) -6 (D) 1

11. If p & q are distinct reals, then $2\{(x - p)(x - q) + (p - x)(p - q) + (q - x)(q - p)\} = (p - q)^2 + (x - p)^2 + (x - q)^2$ is satisfied by -

(A) no value of x (B) exactly one value of x (C) exactly two values of x (D) infinite values of x

12. The value of 'a' for which the expression $y = x^2 + 2a\sqrt{a^2-3}\,x + 4$ is perfect square, is -

(A) 4 (B) $\pm\sqrt{3}$

(C) ± 2 (D) $a \in (-\infty, -\sqrt{3}\,] \cup [\,\sqrt{3}, \infty)$

13. Set of values of 'K' for which roots of the quadratic $x^2 - (2K - 1)x + K(K - 1) = 0$ are -

(A) both less than 2 is $K \in (2, \infty)$
(B) of opposite sign is $K \in (-\infty, 0) \cup (1, \infty)$
(C) of same sign is $K \in (-\infty, 0) \cup (1, \infty)$
(D) both greater than 2 is $K \in (2, \infty)$

14. The correct statement is / are -

(A) If x_1 & x_2 are roots of the equation $2x^2 - 6x - b = 0$ $(b > 0)$, then $\frac{x_1}{x_2} + \frac{x_2}{x_1} < -2$

(B) Equation $ax^2 + bx + c = 0$ has real roots if $a < 0$, $c > 0$ and $b \in R$

(C) If $P(x) = ax^2 + bx + c$ and $Q(x) = -ax^2 + bx + c$, where $ac \neq 0$ and $a, b, c \in R$, then $P(x).Q(x)$ has at least two real roots.

(D) If both the roots of the equation $(3a + 1)x^2 - (2a + 3b)x + 3 = 0$ are infinite then $a = 0$ & $b \in R$

15. If $\alpha_1 < \alpha_2 < \alpha_3 < \alpha_4 < \alpha_5 < \alpha_6$, then the equation $(x - \alpha_1)(x - \alpha_3)(x - \alpha_5) + 3(x - \alpha_2)(x - \alpha_4)(x - \alpha_6) = 0$ has -

(A) three real roots
(B) no real root in $(-\infty, \alpha_1)$
(C) one real root in (α_1, α_2)
(D) no real root in (α_5, α_6)

16. Equation $2x^2 - 2(2a + 1)x + a(a + 1) = 0$ has one root less than 'a' and other root greater than 'a', if

(A) $0 < a < 1$ (B) $-1 < a < 0$ (C) $a > 0$ (D) $a < -1$

17. The value(s) of 'b' for which the equation, $2\log_{1/25}(bx + 28) = -\log_5(12 - 4x - x^2)$ has coincident roots, is/are -

(A) $b = -12$ (B) $b = 4$ (C) $b = 4$ or $b = -12$ (D) $b = -4$ or $b = 12$

18. For every $x \in R$, the polynomial $x^8 - x^5 + x^2 - x + 1$ is -

(A) positive
(B) never positive
(C) positive as well as negative
(D) negative

19. If α, β are the roots of the quadratic equation $(p^2 + p + 1)x^2 + (p - 1)x + p^2 = 0$ such that unity lies between the roots then the set of values of p is -

(A) ϕ (B) $p \in (-\infty, -1) \cup (0, \infty)$ (C) $p \in (-1, 0)$ (D) $(-1, 1)$

20. Three roots of the equation, $x^4 - px^3 + qx^2 - rx + s = 0$ are tanA, tanB & tanC where A, B, C are the angles of a triangle. The fourth root of the biquadratic is -

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

21. If $\log_{\left(\frac{x^2-12x+30}{10}\right)}\left(\log_2 \frac{2x}{5}\right) > 0$ then x belongs to interval -

(A) $(\frac{5}{2}, 6 + \sqrt{6})$ (B) $(\frac{5}{2}, 6 - \sqrt{6})$ (C) $(6, 6 + \sqrt{6})$ (D) $(10, \infty)$

ANSWER KEY										
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	C,D	B,C	A,B,C,D	C	B,C	C	B	D	B
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	C	C	A,B,C	A,B,C	A,C,D	B	A	C	A
Que.	21									
Ans.	B,D									