

MISSION NDA MATHEMATICS

COMPLETE TOPICWISE QUESTIONS

QUADRATIC EQUATION

1. If p and q are distinct rational numbers, then the roots of equation $(p + q)^2 x^2 - 5(p^2 - q^2)x - 2(p - q)^2 = 0$ are
(a) rational and unequal (b) real and equal
(c) complex (d) none of these
2. If $x = \sqrt{7 + 4\sqrt{3}}$, then $x + \frac{1}{x}$ is equal to
(a) 2 (b) 3
(c) 4 (d) 6
3. If α and β are the roots of the equation $ax^2 + 3x + 2 = 0$ ($a < 0$), then $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ is greater than
(a) 0 (b) 1
(c) 2 (d) none of these
4. Let a, b and c be real numbers ($a \neq 0$). If α is a root of $a^2 x^2 + bx + c = 0$, β is a root of $a^2 x^2 - bx - c = 0$ and $0 < \alpha < \beta$, then the equation $a^2 x^2 + 2bx + 2c = 0$ has a root γ that always satisfies
(a) $2\gamma = \alpha + \beta$ (b) $\gamma - \alpha = \frac{\beta}{2}$
(c) $\gamma = \alpha$ (d) $\alpha < \gamma < \beta$
5. If α and β are the roots of the equation $8x^2 - 3x + 27 = 0$, then $\left(\frac{\alpha^2}{\beta}\right)^{1/3} + \left(\frac{\beta^2}{\alpha}\right)^{1/3}$ is equal to
(a) $1/4$ (b) $1/3$
(c) $7/2$ (d) $1/16$
6. If α and β are the roots of $ax^2 + bx + c = 0$ and $\alpha + \beta$, $\alpha^2 + \beta^2$ and $\alpha^3 + \beta^3$ are in G.P., then
(a) $\Delta \neq 0$ (b) $b\Delta = 0$
(c) $cb \neq 0$ (d) $c\Delta = 0$
where $\Delta = b^2 - 4ac$.
7. The values of p and q ($p \neq 0, q \neq 0$) for which p and q are the roots of the equation $x^2 + px + q = 0$ are
(a) $p = 1, q = -2$ (b) $p = 1, q = 2$
(c) $p = -1, q = 2$ (d) $p = -1, q = -2$
8. If $a(p + q)^2 + 2bpq + c = 0$ and $a(p + r)^2 + 2bpr + c = 0$, then the value of qr is
(a) $p^2 + \frac{a}{c}$ (b) $p^2 + \frac{c}{a}$
(c) $p^2 + \frac{a}{b}$ (d) $p^2 + \frac{b}{a}$



9. The set of all p for which $(p - 2)x^2 + 2(p + 1)x + p + 4 < 3$, for all real x , is given by
 (a) $(-\infty, 2)$ (b) $(-1, 2)$
 (c) $(-\infty, -1)$ (d) $(-\infty, 2)$
10. If α and β are the roots of $ax^2 + bx + c = 0$; $\alpha + h$ and $\beta + h$ are the roots of $px^2 + qx + r = 0$ and D_1 and D_2 are the respective discriminants of these equations, then $D_1 : D_2 =$
 (a) a^2/p^2 (b) b^2/q^2
 (c) c^2/r^2 (d) none of these
11. If the equation $\frac{x^2 - bx}{ax - c} = \frac{m - 1}{m + 1}$ has roots equal in magnitude but opposite in sign, then m is equal to
 (a) $\frac{a+b}{a-b}$ (b) $\frac{a-b}{a+b}$
 (c) $\frac{b-a}{b+a}$ (d) none of these
12. The values of m for which the equation $mx^2 + (2m - 1)x + m - 1 = 0$ has roots of opposite sign are given by
 (a) no values of m (b) for all values of m
 (c) $-1 < m < 0$ (d) $0 < m < 1$
13. The number of real solutions of the equation $2^{x/2} + (\sqrt{2} + 1)^x = (5 + 2\sqrt{2})^{x/2}$ is
 (a) infinite (b) 4
 (c) 2 (d) 1
14. If the equation $\frac{a}{x-a} + \frac{b}{x-b} = 1$ has two roots equal in magnitude and opposite in sign, then the value of $a + b$ is
 (a) 0 (b) 1
 (c) -1 (d) none of these
15. The values of a for which both the roots of the equation $(a - 6)x^2 = a(x - 3)$ are positive are given by
 (a) $(0, 6)$ (b) $(0, \frac{72}{11})$
 (c) $(6, \frac{72}{11})$ (d) $(\frac{72}{13}, 6)$
16. If all the real values of x obtained from the equation $4^x - (a - 3)2^x + a - 4 = 0$ are non-positive, then
 (a) $a \in (4, +\infty)$ (b) $a \in (4, 5]$
 (c) $a \in (0, 4)$ (d) none of these
17. If the sum of the roots of $ax^2 + bx + c = 0$ is equal to the sum of the squares, then
 (a) $2ac = ab + b^2$ (b) $2ab = bc + c^2$
 (c) $2bc = ac + c^2$ (d) none of these
18. The equations $kx^2 + x + k = 0$ and $kx^2 + kx + 1 = 0$ have exactly one root in common for
 (a) $k = \frac{-1}{2}, 1$ (b) $k = 1$
 (c) $k = \frac{-1}{2}$ (d) $k = \frac{1}{2}$
19. The product of the roots of $\sqrt[3]{8 + x} + \sqrt[3]{8 - x} = 1$ is
 (a) -189 (b) -5
 (c) -21 (d) -9



20. If α and β are the roots of the equation $ax^2 + bx + c = 0$, then the equation whose roots are $\frac{1}{\alpha+\beta}, \frac{1}{\alpha} + \frac{1}{\beta}$ is
- (a) $acx^2 + (a^2 + bc)x + bc = 0$ (b) $bcx^2 + (b^2 + ac)x + ab = 0$
 (c) $abx^2 + (c^2 + ab)x + ca = 0$ (d) none of these
21. Let α and β be the roots of the equation $x^2 + x + 1 = 0$. The equation whose roots are α^{19} and β^7 is
- (a) $x^2 - x - 1 = 0$ (b) $x^2 - x + 1 = 0$
 (c) $x^2 + x - 1 = 0$ (d) $x^2 + x + 1 = 0$
22. If $x^2 - x - 2$ is a factor of $x^4 - px^2 - q = 0$, then $(p + q)$ equals
- (a) 0 (b) 1
 (c) -1 (d) 9
23. If x is real, then $\frac{x^2 - 2x + 1}{x + 1}$ does not lie
- (a) between 0 and 8 (b) between -8 and 8
 (c) between -8 and 0 (d) between 16 and 16
24. If α, β and γ are the roots of the equation $x^3 + 3x - 7 = 0$, then the equation whose roots are $2\alpha + 1, 2\beta + 1$ and $2\gamma + 1$ is
- (a) $x^3 - 3x^2 + 15x - 69 = 0$ (b) $x^3 - 3x^2 + 15x + 69 = 0$
 (c) $x^3 - 7x + 3 = 0$ (d) none of these
25. If the equation $(\log_{16} x)^2 - (\log_{16} x) + \log_{16} k = 0$ has a unique solution (where k is constant), then the value of k is
- (a) 1 (b) 2
 (c) 0 (d) 4
26. The equation $(x - a)^3 + (x - b)^3 + (x - c)^3 = 0$ has
- (a) all roots real (b) one real, two complex
 (c) three real roots a, b, c (d) none of these
27. The solution set of the inequality $(x^2 - x - 2)(x^2 + 5x + 4) \geq 0$ is given by
- (a) $[-\infty, -4)$ (b) $[-4, 2)$
 (c) $[-\infty, 2) \cup [4, \infty)$ (d) none of these
28. The roots of the equation $(b - c)x^2 + (c - a)x + (a - b) = 0$ are
- (a) $\frac{c-a}{a-b}, 1$ (b) $\frac{b-c}{a-b}, 1$
 (c) $\frac{a-b}{b-c}, 1$ (d) $\frac{c-a}{b-c}, 1$
29. If one root of the equation is $ix^2 - 2(i + 1)x + (2 - i) = 0$ is $2 - i$, then the other root is
- (a) $-i$ (b) $2 + i$
 (c) i (d) $2 - i$
30. If $-3 < \frac{x^2 - ax - 2}{x^2 + x + 1} < 2$ for all $x \in \mathbb{R}$, then a satisfies
- (a) $-6 < a < 7$ (b) $-1 < a < 2$
 (c) $-2 < a < 1$ (d) $-7 < a < 6$
31. If α and β are the roots of $ax^2 + bx + c = 0$ and $p_n = \alpha^n + \beta^n$, then $ap_{n+1} + bp_n + cp_{n-1}$ is equal to
- (a) 1 (b) 0
 (c) $a + b + c$ (d) $-(a + b + c)$



32. If α and β are the roots of $ax^2 + bx + c = 0$, then those of $ax^2 + 2bx + 4c = 0$ are
 (a) $\alpha/2, \beta/2$ (b) $2\alpha, 2\beta$
 (c) $2\alpha, -2\beta$ (d) $-\alpha, -\beta$
33. $\frac{x+3}{x^2-x-2} \geq \frac{1}{x-4}$ for all x satisfying
 (a) $-2 < x < 1$ or $x > 4$ (b) $-1 < x < 2$ or $x > 4$
 (c) $x < -1$ or $2 < x < 4$ (d) none of these
34. The equation $\sqrt{x+3-4\sqrt{x-1}} + \sqrt{x+8-6\sqrt{x-1}} = 1$ has
 (a) only two solutions (b) only one solution
 (c) no solution (d) more than two solutions
35. If $(2x+1)^2 - |2x+1| - 6 < 0$, then
 (a) $-1 < x < 2$ (b) $-2 < x < 1$
 (c) $-2 < x < -1$ (d) $1 < x < 2$
36. If $\tan A$ and $\tan B$ are the roots of the equation $x^2 - px + q = 0$, then the value of $\sin^2(A+B)$ is
 (a) $\frac{p^2}{p^2+(1-q)^2}$ (b) $\frac{p^2}{p^2-(1-q)^2}$
 (c) $\frac{p^2}{p^2-(1-q)^2}$ (d) none of these
37. If $x^2 - 2x\cos\theta + 1 = 0$, then the value of $x^{2n} - 2x^n\cos n\theta + 1$ is equal to
 (a) $\cos 2n\theta$ (b) $\sin 2n\theta$
 (c) 0 (d) some real number other than 0
38. If $(x^2 - 4|x| + 4)(x^2 - 4|x| + 3) < 0$, then x lies in the interval
 (a) $(-3, -1)$ (b) $(1, 3)$
 (c) $(2, -1)$ (d) either (a) or (b) above
39. The value of x for which $\log_3(2^{1-x} + 3)$, $\log_9 4$ and $\log_{27}(2^x - 1)^3$ form an A.P. is
 (a) $11/6$ (b) $6/11$
 (c) $\log_2(11/6)$ (d) 1
40. The solution set of $\left|\frac{x}{x-1}\right| + |x| = \frac{x^2}{x-1}$ is
 (a) $[1, \infty)$ (b) $(-1, \infty)$
 (c) $(1, \infty)$ (d) none of these
41. The number of integral solutions of $\frac{x+2}{x^2+1} > \frac{1}{2}$ is
 (a) 5 (b) 3
 (c) 4 (d) none of these
42. The inequality $|2x - 3| < 1$ is valid when x lies in the interval
 (a) $(3, 4)$ (b) $(1, 2)$
 (c) $(-1, 2)$ (d) $(-4, 3)$
43. If $x^2 + y^2 + z^2 = a$, then the value of $xy + zy + zx$ lies in the interval
 (a) $[-a, a]$ (b) $\left[\frac{-a}{2}, \frac{a}{2}\right]$
 (c) $\left[\frac{-a}{2}, a\right]$ (d) $\left[-a, \frac{a}{2}\right]$
44. For the equation $\frac{1}{x+a} - \frac{1}{x+b} = \frac{1}{x+c}$, if the product of the roots is zero, then the sum of the roots is



- (a) $-\frac{2bc}{b+c}$ (b) $\frac{2bc}{b+c}$
 (c) 0 (d) $\frac{2ab}{b+c}$
45. If $a + b + c = 0$, then $x^{a^2/bc} \cdot x^{b^2/ca} \cdot x^{c^2/ab}$ is equal to
 (a) 1 (b) x
 (c) x^2 (d) x^3
46. If $a + 3b + 9c = 0$, $ac < 0$ and one root of the equation $ax^2 + bx + c = 0$ is the square of the other, then
 (a) a and b have the same sign (b) b and c have the opposite sign
 (c) both the roots are rational (d) a, b and c are irrational
47. If α and β are the roots of $x^2 + px + 1 = 0$ and γ and δ are the roots of $x^2 + qx + 1 = 0$, then the value of $(\alpha - \gamma)(\beta - \gamma)(\alpha + \delta)(\beta + \delta)$ is equal to
 (a) $q^2 - p^2$ (b) q^2
 (c) $p^2 - q^2$ (d) p^2
48. If α, β and γ are the roots of the equation $x^3 + ax + b = 0$, then $\frac{\alpha^3 + \beta^3 + \gamma^3}{\alpha^2 + \beta^2 + \gamma^2} = ?$
 (a) $3b/2a$ (b) $-3b/2a$
 (c) $3b$ (d) $2a$
49. If the roots of the equation $ax^2 + bx + c = 0$ are real and distinct, then
 (a) both the roots are greater than $-b/2a$
 (b) both the roots are less than $-b/2a$
 (c) one of the roots exceeds $-b/2a$
 (d) none of these
50. If a, b and c are real numbers such that $a^2 + b^2 + c^2 = 1$, then $ab + bc + ca$ lies in the interval
 (a) $[-1, \frac{1}{2}]$ (b) $[-\frac{1}{2}, 1]$
 (c) $[\frac{1}{2}, 2]$ (d) $[-1, 2]$
51. If $x = (\beta - \gamma)(\alpha - \delta)$, $y = (\gamma - \alpha)(\beta - \delta)$ and $z = (\alpha - \beta)(\gamma - \delta)$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is
 (a) 0 (b) $\alpha^6 + \beta^6 + \gamma^6 + \delta^6$
 (c) $\alpha^6\beta^6\gamma^6\delta^6$ (d) none of these
52. If the equation $ax^2 - 2bx + c = 0$ has real roots which are reciprocal of each other, then one has
 (a) $|b| \geq |a|$ (b) $|b| \geq |c|$
 (c) $a = c$ (d) all of these
53. If $\log_2 x + \log_x 2 = \frac{10}{3} = \log_2 y + \log_y 2$ and $x \neq y$, then $(x + y) = ?$
 (a) 2 (b) $65/8$
 (c) $37/6$ (d) none of these
54. The expression $\frac{x^2 - 2x + p^2}{x^2 + 2x + p^2}$, where $p > 1$, lies between
 (a) $\frac{p-1}{p+1}$ and 1 (b) $p^2 - 1$ and $p^2 + 1$
 (c) p and p^2 (d) $\frac{p-1}{p+1}$ and $\frac{p+1}{p-1}$



55. a, b and c are positive real numbers forming a G.P. If $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then $d/a, e/b, f/c$ are in
 (a) H.P. (b) G.P.
 (c) A.P. (d) none of these
56. If a, b and c are distinct negative numbers that are in H.P., then
 (a) the equation $ax^2 - 2bx + c = 0$ has distinct real roots
 (b) the equation $ax^2 - 2bx + c = 0$ has at least one-ve root
 (c) $ax^2 - 2bx + c < 0$ for all real x
 (d) $ax^2 - 2bx + c > 0$ for all real x
57. Suppose a and b are rational and α and β are the roots of $x^2 + 2ax + b = 0$, then the equation with rational coefficients with one root $\alpha + \beta\sqrt{a^2 + b^2}$ is
 (a) $x^2 + 4ax + 2b = 0$ (b) $x^2 + 4ax - 2b = 0$
 (c) $x^2 - 4ax + 2b = 0$ (d) $x^2 - 4ax - 2b = 0$
58. If x is real, the expression $\frac{x^2 + 34x - 71}{x^2 + 2x - 7}$ takes all values which do not lie between a and b ($a < b$), then a and b are
 (a) $a < 5, b > 9$ (b) 3, 5
 (c) 5, 9 (d) none of these
59. If the roots of the equation $x^2 + 2ax + b = 0$ are real and distinct and differ by at most $2m$, then b lies in the interval
 (a) $(a^2, a^2 + m^2)$ (b) $(a^2 - m^2, a^2)$
 (c) $[a^2 - m^2, a^2)$ (d) none of these
60. If the roots of $ax^2 + 2bx + c = 0$ ($a \neq 0$) are non-real complex and $a + c < 2b$, then
 (a) $c > 0$ (b) $c < 0$
 (c) $4a + c < 4b$ (d) $4a + c > 4b$
61. Equation $\frac{a^2}{x-a} + \frac{b^2}{x-b} + \frac{c^2}{x-c} = m - n^2x$ ($a, b, c, m, n \in \mathbb{R}$) has necessarily
 (a) all the roots real
 (b) all the roots imaginary
 (c) two real and two imaginary roots
 (d) two rational and two irrational roots

ANSWER KEY

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



10 (a) 20 (b) 30 (b) 40 (c) 50 (b) 60 (b), (c)
61 (a)

smartachievers.online

