# EXERCISE-I

## Solution of quadratic equations and Nature of roots

**1.** If $x^2 + y^2 = 25, xy = 12$, then $x =$

(A) {3, 4} (B) {3, –3}

(C) {3, 4, –3, –4} (D) {–3, –3}

**2.** The solution set of the equation $x^{\log_x (1-x)^2} = 9$ is

(A) {– 2, 4} (B) {4}

(C) {0, – 2, 4} (D) None of these

**3.** Let one root of $ax^2 + bx + c = 0$ where $a, b, c$ are integers be $3+\sqrt{5}$, then the other root is

(A) $3-\sqrt{5}$ (B) 3

(C) $\sqrt{5}$ (D) None of these

**4.** The number of real solutions of the equation $|x|^2 - 3|x| + 2 = 0$ are

(A) 1 (B) 2

(C) 3 (D) 4

**5.** The number of real roots of the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ are

(A) 1 (B) 2

(C) Infinite (D) None

**6.** The number of real solutions of the equation $|x^2 + 4x + 3| + 2x + 5 = 0$ are

(A) 1 (B) 2

(C) 3 (D) 4

**7.** The roots of the given equation $(p-q)x^2 + (q-r)x + (r-p) = 0$ are

(A) $\frac{p-q}{r-p}, 1$ (B) $\frac{q-r}{p-q}, 1$

(C) $\frac{r-p}{p-q}, 1$ (D) $1, \frac{q-r}{p-q}$

**8.** If a root of the equation $x^2 + px + 12 = 0$ is 4, while the roots of the equation $x^2 + px + q = 0$ are same, then the value of q will be

(A) 4 (B) 4/49

(C) 49/4 (D) None of these

**9.** How many roots the equation $x - \frac{2}{x-1} = 1 - \frac{2}{x-1}$ have

(A) One (B) Two

(C) Infinite (D) None

**10.** The solution of the equation $x + \frac{1}{x} = 2$ will be

(A) 2, –1 (B) 0, –1, $-\frac{1}{5}$

(C) $-1, -\frac{1}{5}$ (D) None of these

**11.** 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

**12.** The value of $x = \sqrt{2+\sqrt{2+\sqrt{2+.....}}}$ is

(A) –1 (B) 1

(C) 2 (D) 3

**13.** The value of $x$ in the given equation $4^x - 3^{x-\frac{1}{2}} = 3^{x+\frac{1}{2}} - 2^{2x-1}$ is

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

(C) $\frac{2}{1}$ (D) $\frac{5}{3}$

**14.** The equation $e^x - x - 1 = 0$ has
(A) Only one real root $x = 0$
(B) At least two real roots
(C) Exactly two real roots
(D) Infinitely many real roots

**15.** The equation $\sqrt{(x+1)} - \sqrt{(x-1)} = \sqrt{(4x-1)}$ has
(A) No solution
(B) One solution
(C) Two solutions
(D) More than two solutions

**16.** The equation $\log_e x + \log_e(1+x) = 0$ can be written as
(A) $x^2 + x - e = 0$ (B) $x^2 + x - 1 = 0$
(C) $x^2 + x + 1 = 0$ (D) $x^2 + xe - e = 0$

**17.** If $x = \sqrt{6 + \sqrt{6 + \sqrt{6 + ....\text{to } \infty}}}$, then
(A) $x$ is an irrational number
(B) $2 < x < 3$
(C) $x = 3$
(D) None of these

**18.** The real roots of the equation $x^2 + 5|x| + 4 = 0$ are
(A) $-1, 4$ (B) $1, 4$
(C) $-4, 4$ (D) None of these

**19.** A real root of the equation $\log_4\{\log_2(\sqrt{x+8} - \sqrt{x})\} = 0$ is
(A) 1 (B) 2
(C) 3 (D) 4

**20.** $\{x \in R : |x-2| = x^2\} =$
(A) $\{-1, 2\}$ (B) $\{1, 2\}$
(C) $\{-1, -2\}$ (D) $\{1, -2\}$

**21.** The roots of the given equation $2(a^2 + b^2)x^2 + 2(a+b)x + 1 = 0$ are
(A) Rational (B) Irrational
(C) Real (D) Imaginary

**22.** If the roots of the equations $px^2 + 2qx + r = 0$ and $qx^2 - 2\sqrt{pr}x + q = 0$ be real, then
(A) $p = q$ (B) $q^2 = pr$
(C) $p^2 = qr$ (D) $r^2 = pq$

**23.** If the roots of the equation $ax^2 + x + b = 0$ be real, then the roots of the equation $x^2 - 4\sqrt{ab}x + 1 = 0$ will be
(A) Rational (B) Irrational
(C) Real (D) Imaginary

**24.** If one of the roots of the equation $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ is coincident, then the numerical value of $(a+b)$ is
(A) 0 (B) – 1
(C) 2 (D) 5

**25.** The equation $x^{(3/4)(\log_2 x)^2 + (\log_2 x) - 5/4} = \sqrt{2}$ has
(A) At least one real solution
(B) Exactly three real solutions
(C) Exactly one irrational solution
(D) All the above

**26.** If $a > 0, b > 0, c > 0$ then both the roots of the equation $ax^2 + bx + c = 0$
(A) Are real and negative
(B) Have negative real parts
(C) Are rational numbers
(D) None of these

**27.** The value of k for which $2x^2 - kx + x + 8 = 0$ has equal and real roots are
(A) –9 and –7 (B) 9 and 7
(C) –9 and 7 (D) 9 and –7

**28.** The roots of the quadratic equation $2x^2 + 3x + 1 = 0$, are
(A) Irrational (B) Rational
(C) Imaginary (D) None of these

**29.** If $l, m, n$ are real and $l \neq m$, then the roots of the equation $(l-m)x^2 - 5(l+m)x - 2(l-m) = 0$ are

(A) Complex

(B) Real and distinct

(C) Real and equal

(D) None of these

**30.** If the roots of the equation $x^2 - 8x + (a^2 - 6a) = 0$ are real, then

(A) $-2 < a < 8$ (B) $2 < a < 8$

(C) $-2 \leq a \leq 8$ (D) $2 \leq a \leq 8$

**31.** The condition for the roots of the equation, $(c^2 - ab)x^2 - 2(a^2 - bc)x + (b^2 - ac) = 0$ to be equal is

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

(C) $c = 0$ (D) None of these

**32.** If $b_1 b_2 = 2(c_1 + c_2)$, then at least one of the equations $x^2 + b_1 x + c_1 = 0$ and $x^2 + b_2 x + c_2 = 0$ has

(A) Real roots

(B) Purely imaginary roots

(C) Imaginary roots

(D) None of these

**33.** The value of $k$ for which the quadratic equation, $kx^2 + 1 = kx + 3x - 11x^2$ has real and equal roots are

(A) $-11, -3$ (B) $5, 7$

(C) $5, -7$ (D) None of these

**34.** The expression $y = ax^2 + bx + c$ has always the same sign as $c$ if

(A) $4ac < b^2$ (B) $4ac > b^2$

(C) $ac < b^2$ (D) $ac > b^2$

**35.** The value of $m$ for which the equation

$$\frac{a}{x + a + m} + \frac{b}{x + b + m} = 1$$

has roots equal in magnitude but opposite in sign is

(A) $\frac{a+b}{a-b}$ (B) 0

(C) $\frac{a-b}{a+b}$ (D) $\frac{2(a-b)}{a+b}$

**36.** The roots of the equation $(a^2 + b^2)t^2 - 2(ac + bd)t + (c^2 + d^2) = 0$ are equal, then

(A) $ab = dc$ (B) $ac = bd$

(C) $ad + bc = 0$ (D) $\frac{a}{b} = \frac{c}{d}$

**37.** For what values of $k$ will the equation $x^2 - 2(1 + 3k)x + 7(3 + 2k) = 0$ have equal roots

(A) $1, -\frac{10}{9}$ (B) $2, -\frac{10}{9}$

(C) $3, -\frac{10}{9}$ (D) $4, -\frac{10}{9}$

**38.** If the roots of equation $x^2 + a^2 = 8x + 6a$ are real, then

(A) $a \in [2, 8]$ (B) $a \in [-2, 8]$

(C) $a \in (2, 8)$ (D) $a \in (-2, 8)$

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

(A) 15 (B) 9

(C) 7 (D) 8

**40.** For what value of $k$ will the equation $x^2 - (3k - 1)x + 2k^2 + 2k$ have equal roots

(A) 5 (B) 9

(C) Both (A) and (B) (D) 0

## Relation between roots and coefficients

**41.** If $\alpha$ and $\beta$ are the roots of the equation $2x^2 - 3x + 4 = 0$, then the equation whose roots are $\alpha^2$ and $\beta^2$ is

(A) $4x^2 + 7x + 16 = 0$

(B) $4x^2 + 7x + 6 = 0$

(C) $4x^2 + 7x + 1 = 0$

(D) $4x^2 - 7x + 16 = 0$

**42.** If $\alpha$ and $\beta$ are the roots of the equation $x^2 - a(x+1) - b = 0$ then $(\alpha+1)(\beta+1) =$

(A) $b$ (B) $-b$

(C) $1-b$ (D) $b-1$

**43.** If $\alpha, \beta$ be the roots of the equation $2x^2 - 2(m^2+1)x + m^4 + m^2 + 1 = 0$, then $\alpha^2 + \beta^2 =$

(A) 0 (B) 1

(C) $m$ (D) $m^2$

**44.** If the ratio of the roots of the equation $ax^2 + bx + c = 0$ be $p : q$, then

(A) $pqb^2 + (p+q)^2 ac = 0$

(B) $pqb^2 - (p+q)^2 ac = 0$

(C) $pqa^2 - (p+q)^2 bc = 0$

(D) None of these

**45.** If $\alpha, \beta$ are the roots of the equation $ax^2 + bx + c = 0$, then $\frac{\alpha}{a\beta + b} + \frac{\beta}{a\alpha + b} =$

(A) $\frac{2}{a}$ (B) $\frac{2}{b}$

(C) $\frac{2}{c}$ (D) $-\frac{2}{a}$

**46.** If the sum of the roots of the equation $ax^2 + bx + c = 0$ be equal to the sum of their squares, then

(A) $a(a+b) = 2bc$ (B) $c(a+c) = 2ab$

(C) $b(a+b) = 2ac$ (D) $b(a+b) = ac$

**47.** If the roots of the equation $\frac{\alpha}{x-\alpha} + \frac{\beta}{x-\beta} = 1$ be equal in magnitude but opposite in sign, then $\alpha + \beta =$

(A) 0 (B) 1

(C) 2 (D) None of these

**48.** If $\alpha, \beta$ be the roots of the equation $x^2 - 2x + 3 = 0$, then the equation whose roots are $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$ is

(A) $x^2 + 2x + 1 = 0$ (B) $9x^2 + 2x + 1 = 0$

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

**49.** If $\alpha, \beta$ are the roots of $x^2 + px + 1 = 0$ and $\gamma, \delta$ are the roots of $x^2 + qx + 1 = 0$, then $q^2 - p^2 =$

(A) $(\alpha-\gamma)(\beta-\gamma)(\alpha+\delta)(\beta+\delta)$

(B) $(\alpha+\gamma)(\beta+\gamma)(\alpha-\delta)(\beta+\delta)$

(C) $(\alpha+\gamma)(\beta+\gamma)(\alpha+\delta)(\beta+\delta)$

(D) None of these

**50.** If $\alpha, \beta$ be the roots of $x^2 - px + q = 0$ and $\alpha', \beta'$ be the roots of $x^2 - p'x + q' = 0$, then the value of $(\alpha - \alpha')^2 + (\beta - \alpha')^2 + (a - \beta')^2 + (\beta - \beta')^2$ is

(A) $2\{p^2 - 2q + p'^2 - 2q' - pp'\}$

(B) $2\{p^2 - 2q + p'^2 - 2q' - qq'\}$

(C) $2\{p^2 - 2q - p'^2 - 2q' - pp'\}$

(D) $2\{p^2 - 2q - p'^2 - 2q' - qq'\}$

**51.** If the roots of the equation $Ax^2 + Bx + C = 0$ are $\alpha, \beta$ and the roots of the equation $x^2 + px + q = 0$ are $\alpha^2, \beta^2$, then value of $p$ will be

(A) $\frac{B^2 - 2AC}{A^2}$ (B) $\frac{2AC - B^2}{A^2}$

(C) $\frac{B^2 - 4AC}{A^2}$ (D) None of these

**52.** The quadratic equation whose one root is $\frac{1}{2+\sqrt{5}}$ will be

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

(B) $x^2+4x+1=0$

(C) $x^2-4x-1=0$

(D) $\sqrt{2}x^2-4x+1=0$

**53.** If the roots of the equation $x^2+x+1=0$ are $\alpha,\beta$ and the roots of the equation $x^2+px+q=0$ are $\frac{\alpha}{\beta},\frac{\beta}{\alpha}$ then p is equal to

(A) –2 (B) –1

(C) 1 (D) 2

**54.** If $\alpha,\beta$ are the roots of the equation $x^2+ax+b=0$ then the value of $\alpha^3+\beta^3$ is equal to

(A) $-(a^3+3ab)$ (B) $a^3+3ab$

(C) $-a^3+3ab$ (D) $a^3-3ab$

**55.** If the sum of the roots of the equation $x^2+px+q=0$ is three times their difference, then which one of the following is true

(A) $9p^2=2q$ (B) $2q^2=9p$

(C) $2p^2=9q$ (D) $9q^2=2p$

**56.** If the roots of the equation $x^2+2mx+m^2-2m+6=0$ are same, then the value of *m* will be

(A) 3 (B) 0

(C) 2 (D) –1

**57.** If the roots of the given equation

$(2k+1)x^2-(7k+3)x+k+2=0$

are reciprocal to each other, then the value of *k* will be

(A) 0 (B) 1

(C) 2 (D) 3

**58.** If the roots of the equation $ax^2+bx+c=0$ are 1 and 2l, then

(A) $b^2=9ac$ (B) $2b^2=9ac$

(C) $b^2=-4ac$ (D) $a^2=c^2$

**59.** The sum of the roots of a equation is 2 and sum of their cubes is 98, then the equation is

(A) $x^2+2x+15=0$ (B) $x^2+15x+2=0$

(C) $2x^2-2x+15=0$ (D) $x^2-2x-15=0$

**60.** If the roots of the equation $ax^2+bx+c=0$ are $\alpha,\beta$, then the value of $\alpha\beta^2+\alpha^2\beta+\alpha\beta$ will be

(A) $\frac{c(a-b)}{a^2}$ (B) 0

(C) $-\frac{bc}{a^2}$ (D) None of these

**61.** If the roots of the equation $ax^2+bx+c=0$ are real and of the form $\frac{\alpha}{\alpha-1}$ and $\frac{\alpha+1}{\alpha}$, then the value of $(a+b+c)^2$ is

(A) $b^2-4ac$ (B) $b^2-2ac$

(C) $2b^2-ac$ (D) None of these

**62.** If the ratio of the roots of $ax^2+2bx+c=0$ is same as the ratio of the roots of $px^2+2qx+r=0$, then

(A) $\frac{b}{ac}=\frac{q}{pr}$ (B) $\frac{b^2}{ac}=\frac{q^2}{pr}$

(C) $\frac{2b}{ac}=\frac{q^2}{pr}$ (D) None of these

**63.** Roots of the equation $x^2+bx-c=0(b,c>0)$ are

(A) Both positive (B) Both negative

(C) Of opposite sign (D) None of these

**64.** If $p$ and $q$ are the roots of the equation $x^2 + pq = (p+1)x$, then $q=$

(A) $-1$ (B) 1

(C) 2 (D) None of these

**65.** If the roots of $ax^2 + bx + c = 0$ are $\alpha, \beta$ and the roots of $Ax^2 + Bx + C = 0$ are $\alpha - k, \beta - k$, then $\dfrac{B^2 - 4AC}{b^2 - 4ac}$ is equal to

(A) 0 (B) 1

(C) $\left(\dfrac{A}{a}\right)^2$ (d) $\left(\dfrac{a}{A}\right)^2$

**66.** If $p$ and $q$ are the roots of $x^2 + px + q = 0$, then

(A) $p = 1, q = -2$ (B) $p = -2, q = 1$

(C) $p = 1, q = 0$ (D) $p = -2, q = 0$

**67.** If one root of the quadratic equation, $ix^2 - 2(i+1)x + (2-i) = 0$ is $2 - i$, then the other root is

(A) $-i$ (B) $i$

(C) $2 + i$ (D) $2 - i$

**68.** If the roots of equation $5x^2 - 7x + k = 0$ are reciprocal to each other, then value of $k$ is

(A) 5 (B) 2

(C) 1/5 (D) 1

**69.** If roots of $x^2 - 7x + 6 = 0$ are $\alpha, \beta$, then $\dfrac{1}{\alpha} + \dfrac{1}{\beta} =$

(A) 6/7 (B) 7/6

(C) 7/10 (D) 8/9

**70.** If $\alpha, \beta$ are the roots of $x^2 - 2x + 4 = 0$, then $\alpha^5 + \beta^5$ is equal to

(A) 16 (B) 32

(C) 64 (D) None of these

**71.** The harmonic mean of the roots of the equation $(5+\sqrt{2})x^2 - (4+\sqrt{5})x + 8 + 2\sqrt{5} = 0$ is

(A) 2 (B) 4

(C) 6 (D) 8

**72.** If the roots of $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c$ is

(A) 1 (B) 2

(C) 3 (D) 4

**73.** If $\alpha$ and $\beta$ are roots of the equation $Ax^2 + Bx + C = 0$, then value of $\alpha^3 + \beta^3$ is

(A) $\dfrac{3ABC - B^3}{A^3}$ (B) $\dfrac{3ABC + B^3}{A^3}$

(C) $\dfrac{B^3 - 3ABC}{A^3}$ (D) $\dfrac{B^3 - 3ABC}{B^3}$

**74.** If $\alpha, \beta$ are the roots of the equation $x^2 - (1+n^2)x + \dfrac{1}{2}(1+n^2+n^4) = 0$ then the value of $\alpha^2 + \beta^2$ is

(A) $2n$ (B) $n^3$

(C) $n^2$ (D) $2n^2$

**75.** The value of $p$ for which one root of the equation $x^2 - 30x + p = 0$ is the square of the other, are

(A) 125 only (B) 125 and $-216$

(C) 125 and 215 (D) 216 only

**76.** What is the sum of the squares of roots of $x^2 - 3x + 1 = 0$

(A) 5 (B) 7

(C) 9 (D) 10

**77.** Sum of roots is $-1$ and sum of their reciprocals is $\dfrac{1}{6}$, then equation is

(A) $x^2 + x - 6 = 0$ (B) $x^2 - x + 6 = 0$

(C) $6x^2 + x + 1 = 0$ (D) $x^2 - 6x + 1 = 0$

**78.** If the sum of the roots of the equation $x^2 + px + q = 0$ is equal to the sum of their squares, then

(A) $p^2 - q^2 = 0$ (B) $p^2 + q^2 = 2q$

(C) $p^2 + p = 2q$ (D) None of these

**79.** If $\alpha, \beta$ are roots of $x^2 - 3x + 1 = 0$, then the equation whose roots are $\frac{1}{\alpha - 2}, \frac{1}{\beta - 2}$ is

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

(C) $x^2 - x - 1 = 0$ (D) None of these

**80.** The equation formed by decreasing each root of $ax^2 + bx + c = 0$ by 1 is $2x^2 + 8x + 2 = 0$, then

(A) $a = -b$ (B) $b = -c$

(C) $c = -a$ (D) $b = a + c$

**81.** If $\alpha \neq \beta$ but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$, then the equation whose roots are $\alpha/\beta$ and $\beta/\alpha$ is

(A) $3x^2 - 25x + 3 = 0$

(B) $x^2 + 5x - 3 = 0$

(C) $x^2 - 5x + 3 = 0$

(D) $3x^2 - 19x + 3 = 0$

**82.** Difference between the corresponding roots of $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ is same and $a \neq b$, then

(A) $a + b + 4 = 0$ (B) $a + b - 4 = 0$

(C) $a - b - 4 = 0$ (D) $a - b + 4 = 0$

**83.** Product of real roots of the equation $t^2x^2 + |x| + 9 = 0$

(A) Is always positive

(B) Is always negative

(C) Does not exist

(D) None of these

**84.** If the roots of the equation $12x^2 - mx + 5 = 0$ are in the ratio 2 : 3, then $m$ =

(A) $5\sqrt{10}$ (B) $3\sqrt{10}$

(C) $2\sqrt{10}$ (D) None of these

**85.** If one root of the equation $x^2 + px + q = 0$ is $2 + \sqrt{3}$, then values of $p$ and $q$ are

(A) – 4, 1 (B) 4, – 1

(C) 2, $\sqrt{3}$ (D) –2, $-\sqrt{3}$

**86.** The condition that one root of the equation $ax^2 + bx + c = 0$ is three times the other is

(A) $b^2 = 8ac$ (B) $3b^2 + 16ac = 0$

(C) $3b^2 = 16ac$ (D) $b^2 + 3ac = 0$

**87.** The equation whose roots are reciprocal of the roots of the equation $3x^2 - 20x + 17 = 0$ is

(A) $3x^2 + 20x - 17 = 0$

(B) $17x^2 - 20x + 3 = 0$

(C) $17x^2 + 20x + 3 = 0$

(D) None of these

**88.** If $\alpha$, $\beta$ are the roots of the equation $x^2 + 2x + 4 = 0$, then $\frac{1}{\alpha^3} + \frac{1}{\beta^3}$ is equal to

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

(C) 32 (D) $\frac{1}{4}$

**89.** The equation of the smallest degree with real coefficients having $1 + i$ as one of the root is

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

(C) $x^2 + 2x + 2 = 0$ (D) $x^2 + 2x - 2 = 0$

**90.** Let two numbers have arithmetic mean 9 and geometric mean 4. Then these numbers are the roots of the quadratic equation

(A) $x^2 - 18x - 16 = 0$

(B) $x^2 - 18x + 16 = 0$

(C) $x^2 + 18x - 16 = 0$

(D) $x^2 + 18x + 16 = 0$

## Condition for common roots, Quadratic expressions and Position of roots

**91.** If x be real, then the minimum value of $x^2 - 8x + 17$ is

(A) –1 (B) 0

(C) 1 (D) 2

**92.** If $x$ is real, then the maximum and minimum values of expression $\frac{x^2 + 14x + 9}{x^2 + 2x + 3}$ will be

(A) 4, – 5 (B) 5, – 4

(C) – 4, 5 (D) – 4, – 5

**93.** If $x$ is real, the expression $\frac{x + 2}{2x^2 + 3x + 6}$ takes all value in the interval

(A) $\left(\frac{1}{13}, \frac{1}{3}\right)$ (B) $\left[-\frac{1}{13}, \frac{1}{3}\right]$

(C) $\left(-\frac{1}{3}, \frac{1}{13}\right)$ (D) None of these

**94.** 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

**95.** If x, y, z are real and distinct, then $u = x^2 + 4y^2 + 9z^2 - 6yz - 3zx - zxy$ is always

(A) Non-negative (B) Non-positive

(C) Zero (D) None of these

**96.** If x be real, then the maximum value of $5 + 4x - 4x^2$ will be equal to

(A) 5 (B) 6

(C) 1 (D) 2

**97.** If $x$ is real, the function $\frac{(x - a)(x - b)}{(x - c)}$ will assume all real values, provided

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

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

**98.** If x is real, then the maximum and minimum values of the expression $\frac{x^2 - 3x + 4}{x^2 + 3x + 4}$ will be

(A) 2, 1 (B) $5, \frac{1}{5}$

(C) $7, \frac{1}{7}$ (D) None of these

**99.** If x is real, then the value of $\frac{x^2 + 34x - 71}{x^2 + 2x - 7}$ does not lie between

(A) –9 and –5 (B) –5 and 9

(C) 0 and 9 (D) 5 and 9

**100.** If $x$ is real, then the value of $x^2 - 6x + 13$ will not be less than

(A) 4 (B) 6

(C) 7 (D) 8

**101.** The smallest value of $x^2 - 3x + 3$ in the interval $(-3, 3/2)$ is

(A) 3/4 (B) 5

(C) –15 (D) –20

**102.** If the roots of $x^2 + x + a = 0$ exceed $a$, then

(A) $2 < a < 3$ (B) $a > 3$

(C) $-3 < a < 3$ (D) $a < -2$

**103.** If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3, then

(A) $a < 2$ (B) $2 \le a \le 3$

(C) $3 < a \le 4$ (D) $a > 4$

**104.** If $x$ be real, the least value of $x^2 - 6x + 10$ is

(A) 1 (B) 2

(C) 3 (D) 10

**105.** Let $\alpha, \beta$ be the roots of $x^2 + (3 - \lambda)x - \lambda = 0$. The value of $\lambda$ for which $\alpha^2 + \beta^2$ is minimum, is

(A) 0 (B) 1

(C) 2 (D) 3

## Solution of quadratic inequations and Miscellaneous equations

**106.** If $x^2 + 2ax + 10 - 3a > 0$ for all $x \in R$, then

(A) $-5 < a < 2$ (B) $a < -5$

(C) $a > 5$ (D) $2 < a < 5$

**107.** The roots of the equation $x^4 - 4x^3 + 6x^2 - 4x + 1 = 0$ are

(A) 1, 1, 1, 1 (B) 2, 2, 2, 2

(C) 3, 1, 3, 1 (D) 1, 2, 1, 2

**108.** If the roots of the equation $8x^3 - 14x^2 + 7x - 1 = 0$ are in G.P., then the roots are

(A) $1, \frac{1}{2}, \frac{1}{4}$ (B) 2, 4, 8

(C) 3, 6, 12 (D) None of these

**109.** If the sum of the two roots of the equation $4x^3 + 16x^2 - 9x - 36 = 0$ is zero, then the roots are

(A) 1, 2 –2 (B) $-2, \frac{2}{3}, -\frac{2}{3}$

(C) $-3, \frac{3}{2}, -\frac{3}{2}$ (D) $-4, \frac{3}{2}, -\frac{3}{2}$

**110.** One root of the following given equation $2x^5 - 14x^4 + 31x^3 - 64x^2 + 19x + 130 = 0$ is

(A) 1 (B) 3

(C) 5 (D) 7

**111.** If two roots of the equation $x^3 - 3x + 2 = 0$ are same, then the roots will be

(A) 2, 2, 3 (B) 1, 1, –2

(C) – 2, 3, 3 (D) –2, –2, 1

**112.** If $a, b, c$ are real and $x^3 - 3b^2x + 2c^3$ is divisible by $x - a$ and $x - b$, then

(A) $a = -b = -c$

(B) $a = 2b = 2c$

(C) $a = b = c, a = -2b = -2c$

(D) None of these

**113.** If $\alpha$, $\beta$ and $\gamma$ are the roots of $x^3 + 8 = 0$, then the equation whose roots are $\alpha^2, \beta^2$ and $\gamma^2$ is

(A) $x^3 - 8 = 0$ (B) $x^3 - 16 = 0$

(C) $x^3 + 64 = 0$ (D) $x^3 - 64 = 0$.

**114.** If $\alpha, \beta, \gamma$ are the roots of the equation $x^3 + 4x + 1 = 0$,

then $(\alpha + \beta)^{-1} + (\beta + \gamma)^{-1} + (\gamma + \alpha)^{-1} =$

(A) 2 (B) 3

(C) 4 (D) 5

**115.** If the sum of two of the roots of $x^3 + px^2 + qx + r = 0$ is zero, then $pq =$

(A) $-r$ (B) $r$

(C) $2r$ (D) $-2r$