QUESTION BANK

EXERCISE - 1

Q.1 A polynomial function of the 2nd degree has what form?

Q.2 A quadratic equation has what form?

Q.3 What do we mean by a root of a quadratic?

Q.4 A quadratic always has how many roots?

Q.5 The graph of a quadratic is always the form called ?

Q.6 What are the three methods for solving a quadratic equation, that is, for finding the roots?

Q.7 If a product of factors is 0 if ab = 0 then what can you conclude about the factors a, b ?

Q.8 If α & β ($\alpha > \beta$) are the roots of equation $3x^2 - 2x - 1 = 0$, find the value of $3\alpha + 2\beta$

Q.9 Show that the roots of $(a-b)x^2 - 3(a+b)x - 2(a-b) = 0$ $(a \neq b)$ are always real and unequal

Q.10 If the root of the equation $(b-c)x^2 + (c-a)x + (a-b) = 0$ are equal, prove that $2b = a + c$

Q.11 If $x^2 + 4x - p = 0$ has equal roots and $x = -2$ is a root of $px^2 + kx + 2 = 0$, find the value of k.

Q.12 If one root of the equation $ax^2 + bx + c = 0$ is three times the other root, show that $3b^2 = 16a$

Q.13 Form a quadratic equation whose roots α & β satisfy the system of equations $2\alpha - 3\beta = 7$ & $3\alpha - 2\beta = 8$

Q.14 If one root of the equation $x^2 - bx + a = 0$ is the square of the other, show that $b(b^2 - 2a) = a(1 + a + b)$

Q.15 If α & β are the roots of the equation $x^2 - 3x + p = 0$, find p such that $\alpha = 2\beta$

Q.16 If the sum of the roots of the equation is 2 & sum of their cubes is 98, then the equation is

Q.17 Of 56 days a certain number were dull, square of four more than that number were wet and four were fine. How many wet days were there.

Q.18 A teacher on attempting to arrange the student for mass drill in the form of a solid square found that 24 students were left over. When he increased the size of the square by one student he found that he was short of 25 students. Find the number of students.

Q.19 A businessman bought some items for Rs. 600, keeping 10 items for himself, he sold the remaining item at a profit of Rs.5 per item. From the amount received in this deal he could buy 15 more items. Find the original price of each item.

Q.20 If the root of the equation $\ell x^2 + nx + n = 0$, be in the ratio p : q, then $\sqrt{(p/q)} + \sqrt{(q/p)} + \sqrt{(n/l)} = ?$

Q.21 Solve for x : $\sqrt{(3^{x+1} + 6)} - \sqrt{(3^x + 3)} = 1$

Q.22 An express train makes a run of 240 km at a certain speed. Another train whose speed is 12 km/h less takes an hour longer to cover the same distance. Find the speed of the express train in km/h ?

Q.23 The angry Arjun carried some arrows for fighting with Bheeshem. With half the arrows, he cut down the arrow thrown by Bheeshem on him and with six other arrows he killed the rath driver of Bheeshem. With one arrow each he knocked down respectively the rath, flag and the bow of Bheesehem. Finally, with one more than four times the square root of arrows he laid Bheeshem unconscious on an arrow bed. Find the total number of arrows Arjun had.

Q.24 If I had walked 1 km/h faster, I would have taken 10 min less to walk 2 km. Find the rate of my walking.

Q.25 Solve : $9^{x+2} - 6 \cdot 3^{x+1} + 1 = 0$

Q.26 Solve : $x^4 + 2x^3 - 13x^2 + 2x + 1 = 0$

Q.27 If α, β are the roots of the equation $2x^2 - 3x - 5 = 0$, form an equation whose roots are $\alpha/(\alpha^2 + \beta^2)$, $\beta/(\alpha^2 + \beta^2)$

Q.28 A fox and an eagle lived at the top of a cliff of height 'h' whose base was at a distance 'mh' from the neighboring farm. The fox descends the cliff and went straight to the farm, the eagle flew up to a height x, and then flew in a straight line to the farm. The distance traversed by each being the same, find x.

Q.29 If q, r > 0 then find the sign of the roots of the equation $x^2 + qx - r = 0$.

Q.30 One root of $x^2 + kx - 8 = 0$ is square of the other. Then, find the value of k.

Q.31 If $(\cos 30^\circ + \sin 30^\circ)$ is a root of the quadratic equation then, find the quadratic equation.

Q.32 Solve the following equations for factorisation.

(a) $-2x^2 + 3x + 2 = 0$, $p, q \in R$ (b) $8x^2 - 22x - 21 = 0$

Q.33 Find the discriminants of the equation : $(x - 1)(2x - 1) = 0$

Q.34 Check if the equations have real roots $(x - 1)(2x - 5) = 0$

Q.35 For what value of p will the equations have real roots ?

$px^2 + 3x - 4 = 0$

Q.36 Find the real roots of the equation, if possible (by using quadriatic formula)

$2x^2 - 5\sqrt{3}x + 6 = 0$

Q.37 Without solving, find the sum and the product of the roots of the equations : $4x^2 - 3x + 5 = 0$

Q.38 Evaluate $\sqrt{6 + \sqrt{6 + \sqrt{6 + ...\infty}}}$

Q.39 Form the quadratic equations for the roots given $\frac{3+\sqrt{5}}{4}, \frac{3-\sqrt{5}}{4}$

Q.40 Construct the quadratic equations for roots having sum (S) and product (P) =

Q.41 Find the roots of the equation by the method of completing the square : $25x^2 - 30x - 10 = 0$

Q.42 Construct the quadratic whose roots are 2 and 3.

Q.43 Construct the quadratic whose roots are $2 + \sqrt{3}, 2 - \sqrt{3}$

Q.44 Construct the quadratic whose roots are $3 + \sqrt{3}, 3 - \sqrt{3}$

Q.45 Determine p if the equations have equal roots : $2px^2 - 8x + p = 0$

Q.46 Solve $x + \frac{5}{x} - 6 = 0$

Q.47 Solve $\sqrt{2x - 9} + x = 13$

Q.48 Solve : $\frac{1}{x+5} + \frac{1}{x+4} = \frac{1}{x+2} + \frac{1}{x+7}$

Q.49 Solve : $3^{x+2} + 3^{-x} = 10$

Q.50 The sides of a right-angled triangle (in cm) are x – 1, x and x + 1. Find the sides.

Q.51 Determine the condition for the roots of the equation $ax^2 + bx + c = 0$ to be in the ratio p : q.

Q.52 Determine three successive odd numbers whose squares have the sum 83.

Q.53 A group of girls planned a picnic. The budget for food was Rs. 2400. Due to illness, 10 girls could not go to the picnic and cost of food for each girl increased by Rs. 8. How many girls had planned the picnic ?

Q.54 A plane left 40 minutes late due to bad weather and in order to reach the destination 1600 km. away in time, it had to increase its speed by 400 km/hour from its usual speed.

Q.55 The sum of S of n successive odd natural numbers starting from 3 is given by $S = n(n + 2)$. Determine n if the sum is 168.

Q.56 The sum of the ages of a father and his son is 45 years. Fiver years ago, the product of their age (in years) was 124. Dtermine their present ages.

Q.57 Determine the value of k for which the quadratic equation $4x^2 - 3kx + 1 = 0$ has equal roots.

Q.58 Find the value of c for which the quadratic equation $4x^2 - 2(c + 1)x + (c + 4) = 0$ has equal roots.

Q.59 Find the value of α such that the quadratic equation $(\alpha - 12)\, x^2 + 2\,(\alpha - 12)\, x + 2 = 0$ has equal roots.

Q.60 A shopkeeper buys a number of books for Rs. 80. If he had bought 4 more books for the same amount, each book would have cost him Re. 1 less. How many books did he buy ?

Q.61 If α and β are the roots of the quadratic equation $2x^2 + 5x + k = 0$, find the value of k for which $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$

Q.62 Some students planned to go for a picnic. The budget for food was Rs. 240. As four students failed to go, the cost of food for each student increased by Rs. 10. How many students had gone for the picnic ?

Q.63 A takes 12 days less than B to finish a piece of work. If A and B together can finish the work in 8 days, find the time taken by B to finish the work.

Q.64 Two trains leave New Delhi station at the same time. The first train travels due west and the second, due north. The speed of the second train is 5 km/hr. greater than that of the first train. If, after two hours, they are 50 km apart, find the average speed of each train.

EXERCISE - 2

Fill in the Blanks :

Q.1 A quadratic equation in the variable x is of the form $ax^2 + bx + c = 0$, where a, b, c are real numbers and a .....

Q.2 A quadratic equation $ax^2 + bx + c = 0$ has two distinct real roots, if $b^2 - 4ac$ .....

Q.3 $x^2 - 2x = (-2)\,(3 - x)$ is a ..... equation.

Q.4 Roots of the quadratic equation $3x^2 - 2\sqrt{6}x + 2 = 0$ are .....

Q.5 Two numbers whose sum is 27 and product is 182 are .....

Q.6 Two consecutive positive integers, sum of whose squares is 365 are .....

Q.7 The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, the other two sides are .....

Q.8 A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. The speed of the stream .....

Q.9 The vertex of the quadratic polynomial $y = 4x^2 - 12x + C$ will be a point on the x-axis, if the value of C is equal to .....

Q.10 The number of real roots of the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ are .....

True-False statements –

Q.11 A real number a is said to be a root of the quadratic equation $ax^2 + bx + c = 0$, if $a\alpha^2 + b\alpha + c = 0$. The zeroes of the quadratic polynomial $ax^2 + bx + c$ and the roots of the quadratic equation $ax^2 + bx + c = 0$ are the same.

Q.12 A quadratic equation cannot be solved by the method of completing the square.

Q.13 If we can factorise $ax^2 + bx + c$, $a \neq 0$, into a product of two linear factors, then the roots of the quadratic equation $ax^2 + bx + c = 0$ can be found by equating each factor to zero.

Q.14 $(x - 2)\,(x + 1) = (x - 1)\,(x + 3)$ is a quadratic equation.

Q.15 $(x^2 + 3x + 1) = (x - 2)^2$ is not a quadratic equation.

Q.16 $x^2 + x - 306 = 0$ represent quadratic equation for product of two consecutive positive integer is 306.

Q.17 If α, β are the roots of $x^2 - ax + b = 0$ and if $\alpha^n + \beta^n = V_n$, then $V_{n+1} = aV_n + bV_{n-1}$?

EXERCISE - 3

Q.1 The roots of the equation $(x-3)^2 = 3$ are :

(A) $3 \pm \sqrt{3}$ (B) $-3 \pm \sqrt{3}$ (C) 0 (D) 6

Q.2 Solutions of the equation $(x+4)(x-4) = 9$ are :

(A) 4, –4 (B) ± 5 (C) $\pm \sqrt{7}$ (D) $\pm 1/5$

Q.3 Zero of the polynomial $P(x) = x^2 - 5x + 6$ is :

(A) 1 (B) –1 (C) 3 (D) 4

Q.4 The equation $ax^2 + bx + c = 0$, $a \neq 0$ has no real roots, if

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

Q.5 If sum of the roots is 2 and product is 5 then the quadratic equation is

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

Q.6 The nature of roots of equation $x^2 + 2x\sqrt{3} + 3 = 0$ is as follows

(A) Real and equal (B) Rational and equal (C) Rational and unequal (D) Irrational and unequal

Q.7 The difference of roots of $x^2 - 7x - 9 = 0$ is equal to

(A) $\sqrt{85}$ (B) $\frac{\sqrt{85}}{2}$ (C) $2\sqrt{85}$ (D) $\sqrt{\frac{85}{2}}$

Q.8 The roots of the equation $ax^2 + bx + c = 0$ will be reciprocal of each other if

(A) $a = b$ (B) $b = c$ (C) $c = a$ (D) none of the above

Q.9 The values of k for which the equation $2x^2 + kx + x + 8 = 0$ will have real and equal roots are

(A) 7 and –9 (B) –7 and 9 (C) 7 and 9 (D) –7 and –9

Q.10 The value of x satisfying the equation $x^2 + p^2 = (q-x)^2$ is

(A) $\frac{q^2 - p^2}{2}$ (B) $\frac{p^2 - q^2}{2p}$ (C) $\frac{q^2 - p^2}{2q}$ (D) $\frac{p^2 - q^2}{2}$

Q.11 Two roots of the equation $b(c-a)x^2 + a(b-c)x + c(a-b) = 0$ are 1 and

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

Q.12 Two numbers whose sum is 8 and the absolute value of whose difference is 10 are roots of the equation

(A) $x^2 - 8x + 9 = 0$ (B) $x^2 - 8x - 9 = 0$ (C) $x^2 + 8x - 9 = 0$ (D) $x^2 + 8x + 9 = 0$

Q.13 Sum of the reciprocals of the roots of the equation $x^2 + px + q = 0$ is

(A) 1/p (B) p/q (C) –p/q (D) q/p

Q.14 If α, β are roots of the equation $ax^2 + bx + c = 0$, then the quadratic equation whose roots are $a\alpha + b$ and $a\beta + b$ is

(A) $x^2 - bx - ac = 0$ (B) $bx^2 - ax + ca = 0$ (C) $abx^2 - bx + c = 0$ (D) $x^2 - bx + ca = 0$

Q.15 If r, s are roots of $ax^2 + bx + c = 0$, then $\frac{1}{r^2} + \frac{1}{s^2}$ is

(A) $b^2 - 4ac$ (B) $\frac{b^2 - 4ac}{2a}$ (C) $\frac{b^2 - 2ac}{c^2}$ (D) $\frac{b^2 - 4ac}{c^2}$

Q.16 If the roots of a quadratic equation $ax^2 + bx + c = 0$ are doubled, then the quadratic equation is

(A) $ax^2 + 2bx + 2c = 0$ (B) $ax^2 + 4bx + 4c = 0$

(C) $ax^2 + 4bx + 2c = 0$ (D) $ax^2 + 2bx + 4c = 0$

Q.17 If α is one of the roots of a quadratic equation $x^2 - 2px + p = 0$, then the other root is

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

Q.18 The quadratic equation whose roots are the reciprocal of the roots of the equation $2x^2 - 5x + 2 = 0$ are

(A) $2x^2 - \frac{1}{5}x + 2 = 0$ (B) $2x^2 + 5x + 2 = 0$ (C) $2x^2 - 5x + 2 = 0$ (D) $2x^2 - 5x - 2 = 0$

Q.19 The quadratic equation whose roots are the sum and difference of the squares of roots of the equation $x^2 - 3x + 2 = 0$ is

(A) $x^2 - 8x + 15 = 0$ (B) $x^2 + 8x + 15 = 0$ (C) $x^2 - 8x - 15 = 0$ (D) $x^2 + 8x - 15 = 0$

Q.20 In solving a problem on quadratic equation, one student makes a mistake in the constant term of the equation and gets –5 and –2 for the roots. Another student makes a mistake in the coefficient of first degree term and finds –6 and –2 for the roots. The correct equation was

(A) $x^2 + 7x + 10 = 0$ (B) $x^2 + 7x + 12 = 0$ (C) $x^2 + 8x + 10 = 0$ (D) $x^2 - 8x + 12 = 0$

Q.21 If $\sqrt{1 - x + \sqrt{1 + x}} = \sqrt{1 + x}$, then x is equal to

(A) $\pm \frac{\sqrt{17}}{8}$ (B) $\pm \frac{\sqrt{15}}{8}$ (C) $\frac{1 \pm \sqrt{17}}{8}$ (D) $\frac{1 \pm \sqrt{15}}{8}$

Q.22 The length of a rectangular plot is 8m more than its width. If the length is reduced by 4m and width increased by 3m, the area remains the same. The dimensions of the plot in metres are

(A) 16, 8 (B) 20, 12 (C) 24, 16 (D) 30, 22

Q.23 If a, b, $c \in R$, roots of the equation $(x - a)(x - b) + (x - b)(x - c) + (x - c)(x - a) = 0$ are equal if and only if–

(A) $a = b = c$ (B) $a = 0, b = 1, c = 1$ (C) $a = 1, b = 0, c = 1$ (D) $a \neq 1, b = 1, c = 0$

Q.24 If α, β be the roots of $x^2 + 3ax + 2a^2 = 0$ and $\alpha^2 + \beta^2 = 5$, the value of a is

(A) 2 (B) 3 (C) ± 1 (D) $\pm 1/2$

Q.25 If α, β be the roots of $ax^2 + bx + c = 0$, $\alpha^2 - \beta^2$ is equal to

(A) $\pm \frac{b^2}{a^2}\sqrt{b^2 - 4ac}$ (B) $\pm \frac{b}{a^2}\sqrt{b^2 - 4ac}$ (C) $\pm \frac{a}{b}\sqrt{b^2 - 4ac}$ (D) $\pm \frac{a^2}{b^2}\sqrt{b^2 - 4ac}$

Q.26 The condition for equation $x^2 - bx + c = 0$ to have two consecutive integers as its roots is

(A) $b^2 - c^2 = 1$ (B) $b^2 - 4c = 1$ (C) $c^2 - 4b^2 = 1$ (D) $b = c$

Q.27 If α, β be the roots of $3x^2 - 4x + 1 = 0$, the equation whose roots are $\alpha/\beta, \beta/\alpha$ is

(A) $2x^2 - 5x + 2 = 0$ (B) $2x^2 + 5x + 2 = 0$ (C) $x^2 + 3x + 1 = 0$ (D) $x^2 + 3x - 1 = 0$

Q.28 If one root of the equation $x^2 - 6kx + 5 = 0$ is 5, the value of k is

(A) 2 (B) 1 (C) –1 (D) –1/2

Q.29 Find k if one root of the equation $x^2 - 12x + 3k = 0$ is the square of the other.

(A) 3 (B) 6 (C) 9 (D) 12

Q.30 The condition for the roots of equation $x^2 - \ell x + m = 0$ to differ by one is

(A) $\ell^2 + m^2 = 1$ (B) $m^2 = 4\ell + 1$ (C) $\ell^2 = 4m + 1$ (D) $\ell = m + 1$

Q.31 If roots of the equation of $ax^2 + 2bx + c = 0$ are real and distinct, then the roots of $(b + c)(ax^2 + 2b + c) = (b^2 - ac)(x^2 + 1)$ are

(A) real and distinct (B) real and equal

(C) not real (D) not related to $ax^2 + 2bx + c = 0$

Q.32 If sum of the roots of $px^2 + qx + r = 0$ is equal to their product, which one is true ?

(A) $p + q = 0$ (B) $q + r = 0$ (C) $p + r = 0$ (D) $p + q + r = 0$

Q.33 The roots of the equation $\sqrt{\frac{x}{1-x}}+\sqrt{\frac{1-x}{x}}=\frac{13}{6}$ are

(A) 3/13 . 2/13 (B) 9/13, 4/13 (C) 13/6, 11/6 (D) none of these

Q.34 The sum of a number and its reciprocal is 125/22. The number is

(A) 1/11 (B) 3/11 (C) 4/11 (D) none of these

Q.35 If one root of the quadratic equation is $\sqrt{3}+1$, the equation is

(A) $x^2-2\sqrt{3}\,x+2=0$ (B) $x^2-2x-2=0$ (C) $x^2-2x-\sqrt{3}=0$ (D) $x^2+2\sqrt{3}\,x+23=0$

Q.36 If α, β be the roots of $x^2+px+7=0$ and $\alpha^2+\beta^2=35$, the values of p are

(A) ± 1 (B) ± 6 (C) ± 7 (D) ± 8

Q.37 A total of 28 handshakes was exchanged at the conclusion of a party. Assuming that each participant was equally polite towards all the others, the number of people present was

(A) 14 (B) 7 (C) 56 (D) 8

Q.38 At the midpoint of line segment AB which is p units long, a perpendicular MR is erected with length q units. An arc is described from R with a radius equal to 1/2 AB, meeting AB at T. Then AT & TB are the roots of

(A) $x^2+px+q^2=0$ (B) $x^2-px+q^2=0$ (C) $x^2+px-q^2=0$ (D) $x^2-px-q^2=0$

Q.39 If $x+y=1$, then the largest value of xy is

(A) 1 (B) 0.5 (C) 0 (D) 0.25

Q.40 If $(x-a)/(b+c)+(x-b)/(c+a)+(x-c)/(a+b)=3$, then x is

(A) 0 (B) 1 (C) a + b + c (D) abc

Q.41 Find k if one root of the equation $x^2-12x+3k=0$ is the square of the other.

(A) 3 (B) 9 (C) 6 (D) 12

Q.42 What is the condition for the roots of $ax^2+bx+c=0$ to be in the ratio of p : q ?

(A) $a^2c^2(p+q)=p^2q^2b$ (B) $ac(p+q)^2=pqb^2$

(C) $pq(a+c)^2=acb^2$ (D) $p^2q^2(a+c)=a^2c^2b$

Q.43 If the ratio between the roots of the equation, $\ell x^2+nx+n=0$ is p : q then the value of $\sqrt{(p/q)}+\sqrt{(q/p)}+\sqrt{(n/\ell)}$ is –

(A) 1 (B) 3 (C) 0 (D) –1

Q.44 If α is one of the roots of a quadratic equation $x^2-2px+p=0$, then the other root is

(A) $\alpha/(2\alpha-1)$ (B) $(2\alpha-1)/\alpha$ (C) $\alpha/(2\alpha+1)$ (D) $(2\alpha+1)/\alpha$

Q.45 The graph of $y=x^2-12x+40$ will intersect the x-axis at

(A) 1 point (B) 2 point (C) 3 point (D) does not intersect

Q.46 A length of 60 cm is divided into equal parts. What is the number of these parts if, when this number is increased by unity, the length of each part is decreased by 1 mm ?

(A) 24 (B) 25 (C) 28 (D) None

Q.47 If $\tan\theta$ & $\sec\theta$ are the roots of the quadratic equation $ax^2+bx+c=0$ then

(A) $a^4=b^2(b^2-4ac)$ (B) $b^4=a^2(b^2-4ac)$ (C) $a^4=b^2(b^2+4ac)$ (D) $b^4=a^2(b^2+4ac)$

Q.48 If x_1 & x_2 are the roots of the quadratic equation $ax^2-5x+6=0$ such that $x_1/x_2=2/3$ then the value of 'a' is

(A) –1 (B) 6 (C) 1 (D) 4

Q.49 If α, β are the roots of the equation $ax^2+bx+c=0$, then the equation whose roots are $\alpha+(1/\beta)$ & $\beta+1/\alpha$, is

(A) $acx^2+(a+c)bx+(a+c)^2=0$ (B) $abx^2+(a+c)bx+(a+c)^2=0$

(C) $acx^2+(a+b)cx+(a+c)^2=0$ (D) None of these

Q.50 Both the roots of the given equation $(x-a)(x-b)+(x-b)(x-c)+(x-c)(x-a)=0$ are always –

(A) Positive (B) Negative (C) Real (D) Imaginary

Q.51 If $x = 2 + 2^{2/3} + 2^{1/3}$, then $x^3 - 6x^2 + 6x =$

(A) 3 (B) 2 (C) 1 (D) None

Q.52 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) $(a - c)^2 = b^2 + c^2$ (C) $a^2 + b^2 - 2ac = 0$ (D) $a^2 + b^2 + 2ac = 0$

Q.53 The quadratic equation whose one roots is $1/(2 + \sqrt{5})$ will be

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

Q.54 If α & β are the roots of the equation $x^2 - 4x + 1 = 0$, the value of $\alpha^3 + \beta^3$ is

(A) 76 (B) 52 (C) –52 (D) –76

Q.55 If α, β are the roots of the equation $ax^2 + 3x + 2 = 0$ $(a < 0)$ then the value of $(\alpha^2 / \beta) + (\beta^2 / \alpha)$ is.

(A) greater than 0 (B) greater than 1 (C) less than 1 (D) less than 0

Q.56 If the equation $4x^2 + x(p + 1) + 1 = 0$ has exactly two equal roots, Then one of the values p is

(A) 5 (B) –3 (C) 0 (D) 3

Q.57 The solution of $(2x + 3) / (2x - 1) = (3x - 1) / (3x + 1)$

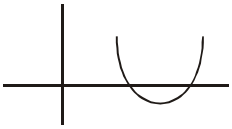
(A) 1/8 (B) –1/8 (C) 8/3 (D) –8/3

Q.58 Find the quadratic equation whose roots are square the roots of equation $x^2 - 16x + 1 = 0$

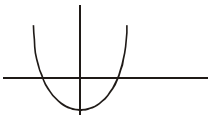
(A) $x^2 - 254x + 1 = 0$ (B) $x^2 + 254x + 1 = 0$ (C) $x^2 - 24x - 1 = 0$ (D) $x^2 + 24x + 1 = 0$

Direction (Q.59–Q.61) :

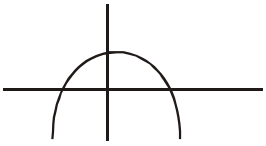
Comment upon the values of a, b, c, D for the standard Q.E as $y = ax^2 + bx + c$ and find the correct statement.

Q.59 Figure 

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

Q.60 Figure 

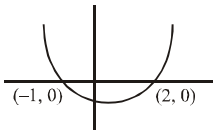
(A) $a < 0$ (B) $D < 0$ (C) $b > 0$ (D) $c > 0$

Q.61 Figure : 

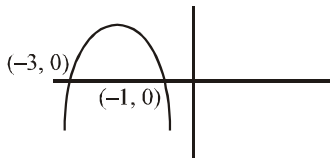
(A) $a > 0$ (B) $D < 0$ (C) $b > 0$ (D) $c < 0$

Direction (Q.62–Q.63) :

Find the inter-relationship in variables for the standard Q.E as $y = ax^2 + bx + c$

Q.62 Figure : 

(A) $a + b + c = 0$ (B) $a - b + c = 0$ (C) $2a + b + c = 0$ (D) $4a - 2b + c = 0$

Q.63 Figure : 

(A) $9a - 3b + c = 0$ (B) $9a + 3b + c = 0$ (C) $a + b + c = 0$ (D) None

Q.64 If $f(x) = x^2 + 3x - 2$ then find $f(-2)$

(A) 2 (B) –2 (C) – 4 (D) 4

Q.65 Find k if the roots of the equation $3kx^2 + 4(kx - 1)$ are real and equal.

(A) k = 0, 3 (B) k = 1, 3 (C) k = 2, 3 (D) k = 0, 1

Q.66 If one root of the quadratic equation $ax^2 + bx + c = 0$ is double the other, what is the right relation

(A) $2b^2 = 9ac$ (B) $b^2 = 9ac$ (C) $2a^2 = 9bc$ (D) $a^2 = 9bc$

Q.67 The sum of the roots of a quadratic equation is 4 and the sum of their squares is 14. Find the equation.

(A) $x^2 - 4x + 1 = 0$ (B) $x^2 - 2x - 1 = 0$ (C) $x^2 - 3x - 1 = 0$ (D) $x^2 + 3x + 1 = 0$

Q.68 The number which exceeds its positive square root by 12 is

(A) 9 (B) 16 (C) 25 (D) None

Q.69 The number of real solutions of the equation $|x|^2 - 3|x| + 2 = 0$ are–

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

Q.70 The roots of the equation $x^2 + Ax + B = 0$ are 5 and 4. The roots of $x^2 + Cx + D = 0$ are 2 and 9. Which of the following is a root of $x^2 + Ax + D = 0$?

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

Q.71 One of the two students, while solving a quadratic equation in x, copied the constant term incorrectly and got the roots 3 and 2. The other copied the constant term and coefficient of x^2 correctly as –6 and 1 respectively. The corrects roots are –

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

Q.72 What is the condition for one root of the quadratic equation $ax^2 + bx + c = 0$ to be twice the other –

(A) $b^2 = 4ac$ (B) $2b^2 = 9ac$ (C) $c^2 = 4a + b^2$ (D) $c^2 = 9a - b^2$

Q.73 If the sum of the roots of the equation $\lambda x^2 + 2x + 3\lambda = 0$ be equal to their product, then λ =

(A) 4 (B) – 4 (C) 6 (D) None of these

Q.74 If α, β are the roots of the equation $ax^2 + bx + c = 0$, then $\frac{\alpha}{\alpha\beta + b} + \frac{\beta}{a\alpha + b} =$

(A) 2/a (B) 2/b (C) 2/c (D) –2/a

Q.75 If $x^2 + 2x - 3 \geq 0$ and $x^2 - 2x - 3 \geq 0$ then –

(A) $x \geq 3$ (B) $x \leq 3$ (C) both (A) and (B) (D) None of these

Q.76 If α, β are the roots of $x^2 + px + q = 0$ and also $x^{2n} + p^n x^n + q^n = 0$, $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ are the roots of $(x + 1)^n + x^n + 1 = 0$, then n is –

(A) an odd integer (B) an even integer (C) a fraction (D) an irrational number

Q.77 If a and b are the non-zero distinct roots of $x^2 + ax + b = 0$, then the least value of $x^2 + ax + b$ is –

(A) 1 (B) –9/4 (C) 9/4 (D) 2/3

Q.78 If α, β are the roots of the equation $x^2 - 7x + 12 = 0$, then $\alpha^2 + \beta^2$ equals –

(A) 14 (B) 19 (C) 24 (D) 25

Q.79 If α, β are the roots of the equation $x^2 + bx + c = 0$, then the roots of the equation $cx^2 + (b^2 - 2c)x + c = 0$ are–

(A) α^2, β^2 (B) $\frac{1}{\alpha}, \frac{1}{\beta}$ (C) $\frac{\alpha}{\beta}, \frac{\beta}{\alpha}$ (D) $2\alpha, 2\beta$

Q.80 If one root of $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is–

(A) 49/4 (B) 4/49 (C) 4 (D) 1/4

Q.81 If $\left(x - \frac{1}{2}\right)^2 - \left(x - \frac{3}{2}\right)^2 = x + 2$, then x = ?

(A) 3 (B) 2 (C) 4 (D) None of these

Q.82 For what value of 'a' will the sum of the squares of the roots of the equation $x^2 - (a-2)x - a - 1 = 0$ have the least–

(A) 0 (B) 1 (C) 2.5 (D) 6.4

Q.83 The roots of the equation $x^2 - 2\sqrt{2}x + 1 = 0$ are

(A) Real and different (B) Imaginary and different

(C) Real and equal (D) Rational and different

Q.84 If α, β, γ are the roots of the equation $2x^3 - 3x^2 + 6x + 1 = 0$, then $\alpha^2 + \beta^2 + \gamma^2$ is equal to –

(A) –15/4 (B) 15/4 (C) 9/4 (D) 4

Q.85 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

Q.86 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

Q.87 If the equation $2x^2 + x + k = 0$ and $x^2 + x/2 - 1 = 0$ have 2 common roots then the value of k is

(A) 1 (B) 3 (C) – 1 (D) – 2

Q.88 The roots of the equation $\sqrt{3x+1} + 1 = \sqrt{x}$ are –

(A) 0 (B) 1 (C) 0, 1 (D) None

Q.89 If $x^2 + y^2 = 25$, $xy = 12$, then x =

(A) {3, 4} (B) {3, –3} (C) {3, 4, –3, – 4} (D) {–3, –3}

Q.90 The number of real solutions of the equation $|x|^2 - 3|x| + 2 = 0$ are –

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

Q.91 If $x = \sqrt{7 + 4\sqrt{3}}$, then $x + \frac{1}{x} =$

(A) 4 (B) 6 (C) 3 (D) 2

Q.92 The solution of equation $\frac{p+q-x}{r} + \frac{q+r-x}{p} + \frac{r+p-x}{q} + \frac{4x}{p+q+r} = 0$ is –

(A) x = p + q + r (B) x = p – q + r (C) $x = \frac{p+q}{q+r}$ (D) $x = \frac{p}{q} + r$

Q.93 If the roots of the given equation $2x^2 + 3(\lambda - 2)x + \lambda + 4 = 0$ be equal in magnitude but opposite in sign, then λ =

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

Q.94 If the roots of the equation $px^2 + 2qx + r = 0$ and $qx^2 - 2\sqrt{pr}x + q = 0$ be real, then –

(A) p = q (B) $q^2 = pr$ (C) $p^2 = qr$ (D) $r^2 = pq$

Q.95 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) $\frac{2(a-b)}{a+b}$

Q.96 The value of k for which the equation $(k-2)x^2+8x+k+4=0$ has both real, distinct and negative is –

(A) 0 (B) 2 (C) 3 (D) – 4

Q.97 If α, β are the roots of the equation $ax^2+bx+c=0$ then the equation whose roots are $\alpha+\frac{1}{\beta}$ and $\beta+\frac{1}{\alpha}$ is

(A) $acx^2+(a+c)bx+(a+c)^2=0$ (B) $abx^2+(a+c)bx+(a+c)^2=0$

(C) $acx^2+(a+b)cx+(a+c)^2=0$ (D) None of these

Q.98 The quadratic equation whose one root is $2-\sqrt{3}$ will be–

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

Q.99 The equation $2x^2+2(p+1)x+p=0$, where p is real, always has roots that are

(A) Equal (B) Equal in magnitude but opposite in sign

(C) Irrational (D) Real

Q.100 Find two numbers, one of which is 3/5th of the other, such that the difference of their squares is equal to 16.

(A) 5, 9 (B) 5, 3 (C) 10, 6 (D) 1, 4

Q.101 In the Maths Olympiad of 2000 at Animal Planet, two representatives from the donkey's side, while solving a quadratic equation, committed the following mistakes :

(i) One of them made a mistake in the constant term and got the roots as 5 and 9.

(ii) Another one committed an error in the coefficient of x and he got the roots as 12 and 4.

But in the meantime, they realised that they are wrong and they managed to get it right jointly. Find the quadratic equation-

(A) $x^2+4x+14=0$ (B) $2x^2+7x-24=0$ (C) $x^2-14x+48=0$ (D) $3x^2-17x+52=0$

Q.102 If $p=2^{2/3}+2^{1/3}$, then which of the following is true ?

(A) $p^3-6p-6=0$ (B) $p^3-6p+6=0$ (C) $p^3+6p-6=0$ (D) $p^3+6p+6=0$

Q.103 The value of Y from the equations $X^2+X=Y^2+Y$ and $aX+bY=1$ will be-

(A) $(1+b)/(a-b)$ (B) $(a+1)/(b-a)$ (C) $(a+1)/(a-b)$ (D) None of these

Q.104 If the ratio of the roots of the equation $x^2+bx+c=0$ is the same as that of $x^2+qx+r=0$, then

(A) $r^2b=qc^2$ (B) $r^2c=qb^2$ (C) $c^2r=q^2b$ (D) $b^2r=q^2c$

Q.105 If $a+b+c=0$ and a, b, c are rational, then the roots of the equation $(b+c-a)x^2+(c+a-b)x+(a+b-c)=0$ are –

(A) rational (B) irrational (C) imaginary (D) equal

Q.106 If α is a root of $4x^2+2x-1=0$, then the other root is –

(A) $3\alpha^3-4\alpha$ (B) $4\alpha^3-3\alpha$ (C) $3\alpha^3+4\alpha$ (D) $4\alpha^3+3\alpha$

Q.107 If r tbe the ratio of the roots of the equation $ax^2+bx+c=0$, then $\frac{(r+1)^2}{r}=$

(A) a^2/bc (B) b^2/ca (C) c^2/ab (D) None of these

Q.108 The ratio of the roots of $bx^2+nx+n=0$ is p : q, then –

(A) $\sqrt{\frac{q}{p}}+\sqrt{\frac{p}{q}}+\sqrt{\frac{\ell}{n}}=0$ (B) $\sqrt{\frac{p}{q}}+\sqrt{\frac{q}{p}}+\sqrt{\frac{n}{\ell}}=0$ (C) $\sqrt{\frac{q}{p}}+\sqrt{\frac{p}{q}}+\sqrt{\frac{\ell}{n}}=0$ (D) $\sqrt{\frac{p}{q}}+\sqrt{\frac{q}{p}}+\sqrt{\frac{n}{\ell}}=0$

Q.109 The value of k so that the equations $x^2 - x - 12 = 0$ and $kx^2 + 10x + 3 = 0$ may have one root in common, is–

(A) $\frac{43}{16}$ (B) 3 (C) –3 (D) $-\frac{43}{16}$

Q.110 If α, β are roots of the equation $A(x^2 + m^2) + Amx + cm^2x^2 = 0$, then $A(\alpha^2 + \beta^2) + A\alpha\beta + c\alpha^2\beta^2 =$

(A) 0 (B) 1 (C) –1 (D) None of these

Q.111 In copying a quadratic equation of the form $x^2 + px + q = 0$, a student wrote the coefficient of x incorrectly and the roots were found to be 3 and 10, another student wrote the same equation but he wrote the constant term iscorrectly and thus he found the roots to be 4 and 7. The roots of the correct equation are –

(A) 5, 6 (B) 4, 6 (C) 4, 5 (D) None of these

Q.112 If α, β are the roots of $x^2 - 2px + q = 0$ and γ, δ are roots of $x^2 - 2rx + s = 0$ and $\alpha, \beta, \gamma, \delta$ are in A.P. then –

(A) $p - q = r^2 - s^2$ (B) $s - q = r^2 - p^2$ C) $r - s = p^2 - q^2$ (D) None of these

Q.113 If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, the value of q is–

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

Q.114 The real roots of the equation $x^{2/3} + x^{1/3} - 2 = 0$ are –

(A) 1, 8 (B) –1, –8 (C) –1, 8 (D) 1, –8

Q.115 Solution of the equation $\sqrt{x-2} + \sqrt{4-x} = \sqrt{6-x}$ is –

(A) $x = 4 - \frac{4}{\sqrt{5}}$ (B) $x = 4 + \frac{4}{\sqrt{5}}$ (C) $x = 4 - \frac{2}{\sqrt{5}}$ (D) $x = 4 + \frac{2}{\sqrt{5}}$

Q.116 The value of m so that the equation $3x^2 - 2mx - 4 = 0$ and $x(x - 4m) + 2 = 0$ may have a common root is –

(A) $1/\sqrt{2}$ (B) $-1/\sqrt{2}$ (C) 1/2 (D) – 1/2

Q.117 Let α and β be the roots of the equation $x^2 + x + 1 = 0$. The equation whose root are $\alpha^{19}.\beta^7$ is –

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

Q.118 The expression $x^2 + 2(a + b + c)x + 3(bc + ca + ab)$ will be a perfect square if –

(A) $a + b + c = 0$ (B) $ac + bc + ab = 0$ (C) $a = b = c$ (D) None of these

EXERCISE - 4

MATCH THE COLUMN

Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in **column I** have to be matched with statements (p, q, r, s) in **column II**.

Q.1 Column II give roots of quadration equations given in column I, match them correctly.

Column I	**Column II**
(A) $6x^2 + x - 12 = 0$	(p) (–6, 4)
(B) $8x^2 + 16x + 10 = 202$	(q) (9, 36)
(C) $x^2 - 45x + 324 = 0$	(r) (3, –1/2)
(D) $2x^2 - 5x - 3 = 0$	(s) (–3/2, 4/3)

Q.2 Match the column

Column I	**Column II**
(A) $(x - 3)(x + 4) + 1 = 0$	(p) Forth degree polynomial
(B) $(x + 2)^3 = 2x(x^2 - 1)$	(q) Quadratic equation
(C) $(2x - 2)^2 = 4x^2$	(r) Non-quadratic equation
(D) $(2x^2 - 2)^2 = 3$	(s) linear equation

Q.3 Column II give pair of two number for solution to problems given in column I, match them correctly.

Column I	**Column II**
(A) The sum of the squares of two positive integers is 208. If the square of the larger number is 18 times the smaller.	(p) (7, 49)
(B) A year ago, the father was eight times as old as his son.Now his age is the square of his son's age.	(q) (5, 29)
(C) The age of father is equal to the sqare of the age of his son.The sum of the age of father and five times the age of the son is 66 years.	(r) (36, 6)
(D) Two years ago, Jacob's age was three times the square of John's age. In three years' time. John's age will be one-fourth of Jacob's age	(s) (8, 12)

EXERCISE - 5

PREVIOUS YEARS COMPETITION PROBLEMS

Q.1 If one root of $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is–
(A) 49/4 (B) 4/49 (C) 4 (D) 1/4

Q.2 One root of $x^2 + kx - 8 = 0$ is square of the other, then the value of k is –
(A) 2 (B) 8 (C) –8 (D) –2

Q.3 Given the quadratic equation $x^2 - (A-3)x - (A-2)$, for what vlaue of A will the sum of the squares of the roots be zero –
(A) –2 (B) 3 (C) 6 (D) None of these

Q.4 If the roots, x_1 and x_2 of the quadratic equation $x^2 - 2x + c = 0$ also satisfy the equation $7x_2 - 4x_1 = 47$, then which of the following is true –
(A) $c = -15$ (B) $x_1 = -5, x_2 = 3$ (C) $x_1 = 4.5, x_2 = -2.5$ (D) None of these

Q.5 Let p and q be the roots of the quadratic equation $x^2 - (\alpha - 2)x - \alpha - 1 = 0$. What is the minimum possible value of $p^2 + q^2$
(A) 0 (B) 3 (C) 4 (D) 5

Q.6 If α and β are the roots of the equation $(ax^2 + bx + c = 0)$, then what is the value of $(\alpha^2 + \beta^2)$ –

I. $\alpha + \beta = -\left(\frac{b}{a}\right)$ II. $2\alpha\beta = \left(\frac{c}{a}\right)$

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

Q.7 The roots of the quadratic equation $2x^2 + 3x + 1 = 0$ are –
(A) Irrational (B) Rational (C) Imaginary (D) None of these

Q.8 If roots of the given equation $(\cos p - 1)x^2 + (\cos p)x + \sin p = 0$ are real, then –
(A) $p \in (-\pi, 0)$ (B) $p \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (C) $p \in (0, \pi)$ (D) $p \in (0, 2\pi)$

Q.9 The expression $x^2 + 2bx + c$ has the positive value if –
(A) $b^2 - 4c > 0$ (B) $b^2 - 4c < 0$ (C) $c^2 < b$ (D) $b^2 < c$

Q.10 If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then c/a, a/b, b/c are in –
(A) A.P. (B) G.P. (C) H.P. (D) None of these

Q.11 If the roots of the equation $\frac{1}{x+p} + \frac{1}{x+q} = \frac{1}{r}$ are equal in magnitude but opposite in sign, then the product of the roots will be–
(A) $\frac{p^2+q^2}{2}$ (B) $-\frac{(p^2+q^2)}{2}$ (C) $\frac{p^2-q^2}{2}$ (D) $-\frac{(p^2-q^2)}{2}$

Q.12 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

Q.13 If $\alpha \neq \beta$ but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$, then the equation whose roots are α/β and β/α is –
(A) $3x^2 - 25x + 3 = 0$ (B) $x^2 + 5x - 3 = 0$ (C) $x^2 - 5x + 3 = 0$ (D) $3x^2 - 19x + 3 = 0$

Q.14 If a root of the equations $x^2 + px + q = 0$ and $x^2 + \alpha x + \beta = 0$ is common, then its value will be (where $p \neq \alpha$ and $q \neq \beta$)
(A) $\frac{q-\beta}{\alpha-p}$ (B) $\frac{p\beta-\alpha q}{q-\beta}$ (C) $\frac{q-\beta}{\alpha-p}$ or $\frac{p\beta-\alpha q}{q-\beta}$ (D) None of these

Q.15 If one root of the quadratic equation $ax^2 + bx + c = 0$ is equal to the n^{th} power of the other root, then the value of $(ac^n)^{\frac{1}{n+1}} + (a^n c)^{\frac{1}{n+1}} =$
(A) b (B) – b (C) $b^{\frac{1}{n+1}}$ (D) $-b^{\frac{1}{n+1}}$

Q.16 The value of 'a' for which one root of the quadratic equation $(a^2 - 5a + 3)x^2 + (3a - 1)x + 2 = 0$ is twice as large as the other, is–
(A) 2/3 (B) –2/3 (C) 1/3 (D) –1/3

Q.17 Let a, b, c be real numbers $a \neq 0$. If α is a root $a^2x^2 + bx + c = 0$, β is a root of $a^2x^2 - bx - c = 0$ and $0 < \alpha < \beta$, then the equation $a^2x^2 + 2bx + 2c = 0$ has a root γ that always satisfies –
(A) $\gamma = \frac{\alpha+\beta}{2}$ (B) $\gamma = \alpha + \frac{\beta}{2}$ (C) $\gamma = \alpha$ (D) $\alpha < \gamma < \beta$

EXERCISE - 6

PREVIOUS YEARS BOARD QUESTIONS

Q.1 For what value of k, does the quadratic equation $9x^2 + 8kx + 16 = 0$ have equal roots ?
Q.2 Find the value of c such that equation $4x^2 - 2(c + l)x + (c + 4) = 0$ has real and equal roots.
Q.3 Find the value of k for which the quadratic equation $(k + 4)r + (k + 1)x + 1 = 0$ has equal roots.
Q.4 If one root of the equation $3x^2 - kx - 2 = 0$ is 2, find the value of k. Also find the other root.
Q.5 If –5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k.
Q.6 If one root of the quadratic equation $2x^2 + kx - 6 = 0$ is 2, find the value of k. Also find the other root.
Q.7 For what value of k, given equation has real and equal roots : $(k + 1)x^2 - 2(k - 1)x + 1 = 0$.
Q.8 Find the values of k so that $(x - 1)$ is a factor of $k^2x^2 - 2kx - 3$.
Q.9 Solve for x : $4x^2 - 2(a^2 + b^2)x + a^2b^2 = 0$
Q.10 Solve for x : $4x^2 - 4a^2x + (a^4 - b^4) = 0$
Q.11 Solve for x: $9x^2 - 9(a+b)x + [2a^2 + 5ab + 2b^2] = 0$.
Q.12 Using quadratic formula, solve the following quadratic equation for x : $p^2x^2 + (p^2 - q^2)x - q^2 = 0$
Q.13 Using quadratic formula, solve the following quadratic equation for x : $x^2 - 2ax + (a^2 - b^2) = 0$
Q.14 Using quadratic formula, solve the following quadratic equation for x : $x^2 - 4ax + 4a^2 - b^2 = 0$.
Q.15 Solve for x : $36x^2 - 12ax + (a^2 - b^2) = 0$
Q.16 Solve for x : $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$, $a \neq 0, b \neq 0, x \neq 0$ **Q.17** Solve for x : $a^2b^2x^2 + b^2x - a^2x - 1 = 0$
Q.18 Solve for x : $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$ **Q.19** Using quadratic formula, solve for x : $9x^2 - 3(a + b)x + ab = 0$
Q.20 Using quadratic formula, solve the following for x : $9x^2 - 3(a^2 + b^2)x + a^2b^2 = 0$
Q.21 Solve for x: $12abx^2 - (9a^2 - 8b^2)x - 6ab = 0$
Q.22 Using the quadratic formula, solve the equation : $a^2b^2x^2 - (4b^4 - 3a^4)x - 12a^2b^2 = 0$
Q.23 Solve for x : $(a + b)^2x^2 + 8(a^2 - b^2)x + 16(a - b)^2 = 0$
Q.24 Rewrite the following as a quadratic equation in x and then solve for x.

$$\frac{4}{x} - 3 = \frac{5}{2x+3}, x \neq 0, -\frac{3}{2}$$