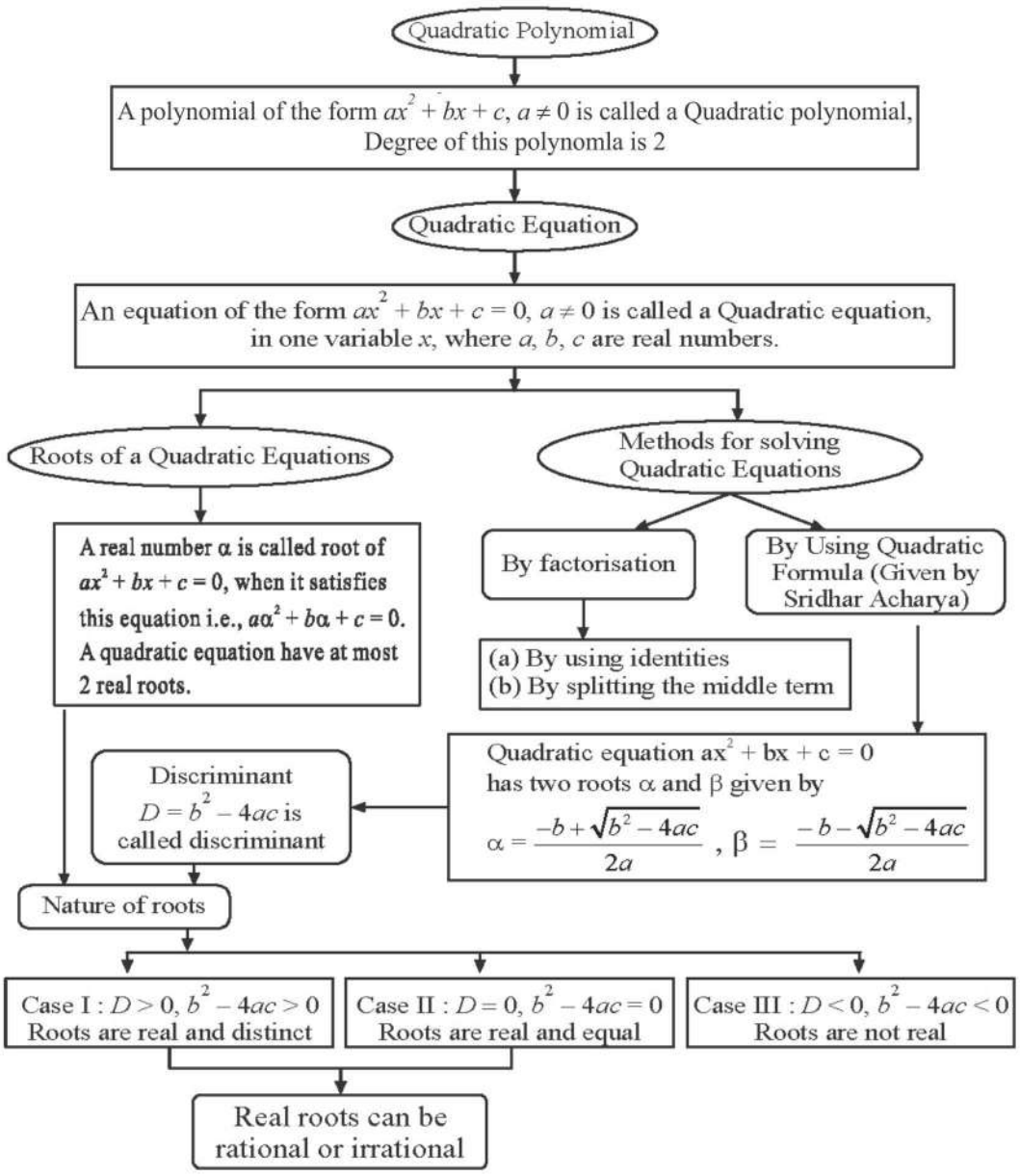
CHAPTER

4 Quadratic Equations



NOTES:

1. Real and distinct roots are $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
2. Real and equal roots are $\frac{-b}{2a}, \frac{-b}{2a}$
3. There are quadratic equation which donot have any real roots e.g. $x^2 + 1 = 0$

VERY SHORT ANSWER TYPE QUESTIONS

Multiple Choice Questions:

1. Which of the following is not a Quadratic Equation?

(*a*) $2(x - 1)^2 = 4x^2 - 2x + 1$ (*b*) $3x - x^2 = x^2 + 6$

(*c*) $\left(\sqrt{3}x + \sqrt{2}\right)^2 = 2x^2 - 5x$ (*d*) $(x^2 + 2x)^2 = x^4 + 3 + 4x^2$

2. Which of the following equation has 2 as a root

(*a*) $x^2 + 4 = 0$ (*b*) $x^2 - 4 = 0$

(*c*) $x^2 + 3x - 12 = 0$ (*d*) $3x^2 - 6x - 2 = 0$

3. If $\frac{1}{2}$ is a root of $x^2 + px - \frac{5}{4} = 0$ then value of p is

(*a*) 2 (*b*) –2

(*c*) $\frac{1}{4}$ (*d*) $\frac{1}{2}$

4. Every Quadratic Equation can have at most

(*a*) Three roots (*b*) One root

(*c*) Two roots (*d*) Any number of roots

5. Roots of Quadratic equation $x^2 - 7x = 0$ will be

(*a*) 7 (*b*) 0, –7

(*c*) 0, 5 (*d*) 0, 7

6. The value(s) of k for which the quadratic equation $2x^2 + kx + 2 = 0$ has equal roots, is

(*a*) 4 (*b*) ± 4

(*c*) – 4 (*d*) 0 **(CBSE 2020)**

7. Fill in the blanks:

(*a*) If $px^2 + qx + r = 0$ has equal roots then value of r will be _____ .

(*b*) The qaudratic equation $x^2 - 5x - 6 = 0$ if expressed as $(x + p)(x + q) = 0$ then value of p and q respectively are _____ and _____ .

(*c*) The value of k for which the roots of qaudratic equations $x^2 + 4x + k = 0$ are real is _____ .

(*d*) If roots of $4x^2 - 2x + c = 0$ are reciprocal of each other then the value of c is _____ .

(*e*) If in a quadratic equation $ax^2 + bx + c = 0$, value of a is zero then it become a _____ equation.

8. Write whether the following statements are true or false. Justify your answers.

(*a*) Every quadratic equation has atleast one real roots.

(*b*) If the coefficient of x^2 and the constant term of a quadratic equation have opposite signs, then the quadratic equation has real roots.

(*c*) 0.3 is a root of $x^2 - 0.9 = 0$.

(*d*) The graph of a quadratic polynomial is a straight line.

(*e*) The discriminant of $(x - 2)^2 = 0$ is positive.

9. Match the following :

(*i*) Roots of $3x^2 - 27 = 0$	(*a*) 169/9
(*ii*) D of $2x^2 + \frac{5}{3}x - 2 = 0$	(*b*) 0
(*iii*) Sum of roots of $8x^2 + 2x - 3 = 0$	(*c*) $x^2 - (a + b)x + ab = 0$
(*iv*) A quadratic equation with roots a and b	(*d*) $3, -3$
(*v*) The product of roots of $x^2 + 8x = 0$	(*e*) $\frac{-1}{4}$

SHORT ANSWER TYPE QUESTIONS-I

10. If the Quadratic equation $px^2 - 2\sqrt{5}px + 15 = 0$ $(p \neq 0)$ has two equal roots then find the value of p.

11. Solve for x by factorisation

(*a*) $8x^2 - 22x - 21 = 0$

(*b*) $3\sqrt{5}x^2 + 25x + 10\sqrt{5} = 0$

(*c*) $3x^2 - 2\sqrt{6}x + 2 = 0$ **(CBSE 2010)**

(*d*) $2x^2 + ax - a^2 = 0$ **(CBSE 2014)**

(*e*) $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$

(*f*) $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$

(*g*) $(x-1)^2 - 5(x-1) - 6 = 0$

12. For what vlaue of 'a' quadratic equation $3ax^2 - 6x + 1 = 0$ has no real roots? **(CBSE 2020)**

13. 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. **(CBSE 2014, 2016)**

14. If $x = \frac{2}{3}$ and $x = -3$ are roots of the quadratic equation $ax^2 + 7x + b = 0$. Find the value of a and b. **(CBSE 2016)**

15. Find value of p for which the product of roots of the quadratic equation $px^2 + 6x + 4p = 0$ is equal to the sum of the roots.

16. The sides of two squares are x cm and $(x + 4)$ cm. The sum of their areas is 656 cm^2 Find the sides of these two squares.

17. Find K if the difference of roots of the quadratic equation $x^2 - 5x + (3k - 3) = 0$ is 11.

SHORT ANSWER TYPE QUESTIONS-II

18. Find the positive value of k for which the quadratic equation $x^2 + kx + 64 = 0$ and the quadratic equation $x^2 - 8x + k = 0$ both will have real roots.

19. Solve for x

(*a*) $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$ $a + b + x \neq 0$, $a, b, x \neq 0$ **(CBSE 2005)**

(*b*) $\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$ $2a + b + 2x \neq 0$, $a, b, x \neq 0$

(*c*) $\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0, x \neq 3, \frac{-3}{2}$

(*d*) $\frac{1}{x-1} - \frac{1}{x+5} = \frac{6}{7}, x \neq 1, 5$ **(CBSE 2010)**

(*e*) $4x^2 + 4bx - (a^2 - b^2) = 0$

(*f*) $4x^2 - 2(a^2 + b^2)\,x + a^2b^2 = 0$

(*g*) $\frac{2}{x+1}+\frac{3}{2(x-2)}=\frac{23}{5x}, x \neq 0, -1, 2$

(*h*) $\left(\frac{2x}{x-5}\right)^2+\frac{10x}{(x-5)}-24=0, x \neq 5$

(*i*) $4x^2 - 4a^2x + a^4 - b^4 = 0$

(*j*) $2a^2x^2 + b(6a^2 + 1)x + 3b^2 = 0$

(*k*) $3\left(\frac{7x+1}{5x-3}\right)-4\left(\frac{5x-3}{7x+1}\right)=11, x \neq \frac{3}{5}, \frac{-1}{7}$

(*l*) $\frac{1}{x+4}-\frac{1}{x-7}=\frac{11}{30}, x \neq -4, 7$ **(NCERT)**

(*m*) $\frac{x-4}{x-5}+\frac{x-6}{x-7}=\frac{10}{3}, x \neq 5, 7$ **(CBSE 2014)**

(*n*) $\frac{1}{x+1}+\frac{2}{x+2}=\frac{4}{x+4}, \quad x \neq -1, -2, -4$

(*o*) $\frac{1}{2x-3}+\frac{1}{x-5}=1, \quad x \neq \frac{3}{2}, 5$

(*p*) $x^2 + 5\sqrt{5}x - 70 = 0$

(*q*) $\frac{16}{x}-1=\frac{15}{x+1}, x \neq 0, -1$ **(CBSE 2014)**

20. Solve by using quadratic formula $abx^2 + (b^2 - ac)\,x - bc = 0$. **(CBSE 2005)**

21. If the roots of the quadratic equation $(p + 1)x^2 - 6(p + 1)\,x + 3(p + 9) = 0$ are equal find p and then find the roots of this quadratic equation.

22. Find the nature of roots of the quadratic equation $3x^2 - 4\sqrt{3}\,x + 4 = 0$

If the roots are real, find them. **(CBSE 2020)**

23. Solve $9x^2 - 6a^2x + a^4 - b^4 = 0$ using quadratic formula. **(CBSE 2020)**

LONG ANSWER TYPE QUESTIONS

24. A train travels at a certain average speed for a distance of 54 km and then travels a distance of 63 km at an average speed of 6 km/hr more than the first speed. If it takes 3 hours to complete the total journey, what is its first speed?

25. A natural number, when increased by 12, equals 160 times its reciprocal. Find the number.

26. A thief runs with a uniform speed of 100 m/minute. After one minute a policeman runs after the thief to catch him. He goes with a speed of 100 m/minute in the first minute and increases his speed by 10 m/minute every succeeding minute. After how many minutes the policemen will catch the thief?

27. Two water taps together can fill a tank in 6 hours. The tap of larger diameter takes 9 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank. **(CBSE 2020)**

28. In the centre of a rectangular lawn of dimensions 50 m × 40 m, a rectangular pond has to be constructed, so that the area of the grass surrounding the pond would be 1184 m^2. Find the lenght and breadth of the pond.

29. A farmer wishes to grow a 100 m^2 recangular garden. Since he has only 30 m barbed wire, he fences three sides of the rectangular garden letting compound wall of this house act as the fourth side fence. Find the dimensions of his garden.

30. A peacock is sitting on the top of a pillar, which is 9 m high. From a point 27 m away from the bottom fo a pilar, a snake is coming to its hole at the base of the pillar. Seeing the snake the peacock pounces on it. If their speeds are equa, at what distance from the hole is the snake caught?

31. If the price of a book is reduced by ₹ 5, a person can buy 5 more books for ₹ 300. Find the original list price of the book.

32. ₹ 6500 were divided equally among a certain number of persons. If there been 15 more persons, each would have got ₹ 30 less. Find the original number of persons.

33. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed was reduced by 200 km/hr and the time of flight increased by 30 minutes. Find the duration of flight. **(CBSE 2020, Outside Delhi)**

34. A fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/hr less than the fast train, find the speed of the two trains.

(CBSE 2020, Outside Delhi)

35. The speed of a boat in still water is 15 km/hr. It can go 30 km upstream and return downstream to the orignal point in 4 hrs 30 minutes. Find the speed of the stream.

36. Sum of areas of two squares is 400 cm^2. If the difference of their perimeter is 16 cm. Find the side of each square.

37. The area of an isosceles triangle is 60 cm^2. The length of equal sides is 13 cm find length of its base.

38. The denominator of a fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is $2\frac{16}{21}$. Find the fraction.

39. A girl is twice as old as her sister. Four years hence, the product of their ages (in years) will be 160. Find their present ages.

40. A two digit number is such that the product of its digits is 18. When 63 is subtracted from the number, the digits interchange their places. Find the number.

(CBSE 2006)

41. Three consecutive positive integers are such that the sum of the square of the first and the product of other two is 46, find the integers. **(CBSE 2010)**

42. A piece of cloth costs ₹ 200. If the piece was 5 m longer and each metre of cloth costs ₹ 2 less, then the cost of the piece would have remained unchanged. How long is the piece and what is the original rate per metre?

43. A motor boat whose speed is 24 km/hr in still water takes 1 hour more to go 32 km upstream than to return downstream to the same spot. Find the speed of the stream

(CBSE 2016)

44. If the roots of the quadratic equation $(b - c)x^2 + (c - a)x + (a - b) = 0$ are equal, prove $2b = a + c$.

45. If the equation $(1 + m^2)n^2x^2 + 2mncx + (c^2 - a^2) = 0$ has equal roots, prove that $c^2 = a^2 (1 + m^2)$.

46. A train covers a distance of 480 km at a uniform speed. If the speed had been 8 km/hr less, then it would have taken 3 hours more to cover the same distance. Find the original speed of the train. **(CBSE 2020)**

47. A rectangular park is to be designed whose breadth is 3 m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the rectangular park and of altitude 12 m. Find the length and breadth of the park.

(CBSE 2020)

ANSWERS AND HINTS

1. **(*d*)** [$x^4 + 4x^2 + 4x^3 = x^4 + 3 + 4x^2 \Rightarrow 4x^3 = 3 \Rightarrow$ degree = 3]

2. **(*b*)** [Check by substituting $x = 2$ in the equation.]

3. **(*a*)** [Substitute $x = \frac{1}{2}$ in $x^2 + px - \frac{5}{4} = 0$.]

4. **(*c*)** [$\because$ A quadratic polynomial is of degree 2 and it has atmost two zeroes.]

5. **(*d*)** [$x(x - 7) = 0 \Rightarrow x = 0, x = 7$.]

6. **(*b*)** ± 4 ($D = 0$, $k^2 - 16 = 0$)

7. (*a*) [$r = \frac{q^2}{4p}$ ($D = 0 \Rightarrow q^2 - 4pr = 0$)]

(*b*) $p = -6, q = 1$ [$x^2 - 5x - 6 = 0 \Rightarrow (x - 6)(x + 1) = 0$]

(*c*) $K \leq 4$ [$D \geq 0 \Rightarrow 16 - 4K \geq 0 \Rightarrow 16 \geq 4K \Rightarrow 4 \geq$ K]

(*d*) $c = 4$ ($\because$ product = $1 \Rightarrow \frac{c}{a} = 1 \Rightarrow \frac{c}{4} = 1$)

(*e*) Linear equation ($x = 0 \Rightarrow ax^2 + bx + c = 0$ reduces to $bx + c = 0$)

8. (*a*) False (A quadratic equation has atmost two real root).

(*b*) True (Coefficient of $x^2 = a$, Constant $= -c$, $D = b^2 - 4ac = b^2 - 4(a)(-c) = b^2 + 4ac > 0$)

(*c*) False ($(0.3)^2 - 0.9 = 0.09 - 0.9 \neq 0$)

(*d*) False (Degree of quadratic polynomial is 2 not 1 $\because$ Not a straight line)

9. (*i*) $\rightarrow$ *d*

(*ii*) $\rightarrow$ *a*

(*iii*) $\rightarrow$ *e*

(*iv*) $\rightarrow$ *c*

(*v*) $\rightarrow$ *b*

10. $D = 0$ $\quad 20p^2 - 60p = 0, p \neq 0$

$20p(p - 3) = 0$

$p = 3$

11. (*a*) $x = \frac{7}{2}, x = -\frac{3}{4}$ $\qquad$ (*b*) $x = -\sqrt{5}, x = \frac{-2\sqrt{5}}{3}$

(*c*) $x = \sqrt{\frac{2}{3}}, x = \sqrt{\frac{2}{3}}$ (*d*) $x = \frac{a}{2}, x = -a$

(*e*) $x = -\sqrt{3}, x = \frac{-7\sqrt{3}}{3}$ (*f*) $x = -\sqrt{2}, x = \frac{-5\sqrt{2}}{2}$

(*g*) Take $(x - 1) = y$

$y^2 - 5y - 6 = 0 \Rightarrow (y + 1)(y - 6) = 0$

$y = -1, y = 6$

$x - 1 = -1, x - 1 = 6$

$x = 0, x = 7$

12. $D < 0, (-6)^2 - 4(3a)(1) < 0, 12a > 36 \Rightarrow a > 3$

13. $2(-5)^2 + p(-5) - 15 = 0 \Rightarrow p = 7$

$\therefore 7x^2 + 7x + k = 0, \quad D = 49 - 28k = 0$

$\Rightarrow k = \frac{49}{28} = \frac{7}{4}$

14. Substituting, $x = \frac{2}{3}$ we get $4a + 9b = -42$ ...(1)

Substituting, $x = -3$ we get $9a + b = 21$ ...(2)

Solve (1) and (2) to get $a = 3, b = -6$.

15. Product $= \frac{c}{a} = \frac{4p}{p} = 4,$ sum $= \frac{-b}{a} = \frac{-6}{p}$

ATQ $= \frac{-6}{p} = 4 \quad \Rightarrow \quad p = \frac{-6}{4} = \frac{-3}{2}$

16. $x^2 + (x + 4)^2 = 656$

$x^2 + 4x - 320 = 0$

$D = 1296 \quad x = \frac{-4 \pm \sqrt{1296}}{2} = \frac{-4 + 36}{2}, \frac{-4 - 36}{2}$

$x = \frac{32}{2} = 16$, (rejecting –ve value)

Sides are 16 cm, 20 cm

17. ATQ $\alpha - \beta = 11$

Solve to get $\alpha = 8, \beta = -3$

Sum of roots $\alpha + \beta = \dfrac{-b}{a} = 5$

$\alpha = 8, \beta = -3$

Product of roots $= \dfrac{c}{a}$

$-24 = 3k - 3$

$-21 = 3k \quad \Rightarrow \quad k = -7$ Ans.

18. $x^2 + kx + 64 = 0 \rightarrow D_1 = k^2 - 256 \geq 0, \quad k^2 \geq 256$

$\Rightarrow \quad k \geq 16 \quad ...(1)$

$k \leq -16$

$x^2 - 8x + k = 0 \rightarrow D_2 = 64 - 4k \geq 0, \; 64 \geq 4k$

$\Rightarrow \quad k \leq 16 \quad ...(2)$

(1) and (2) gives $k = 16$

19. (*a*) $\dfrac{1}{a+b+x} - \dfrac{1}{x} = \dfrac{1}{a} + \dfrac{1}{b}$

$\dfrac{x-a-b-x}{(a+b+x)x} = \dfrac{a+b}{ab}$

$-(a+b)\,ab = (a+b)\,(a+b+x)\,x$

$x^2 + xa + bx + ab = 0$

$(x+a)\,(x+b) = 0, \; x = -a, \; x = -b$

(*b*) $\dfrac{1}{2a+b+2x} - \dfrac{1}{2x} = \dfrac{1}{2a} + \dfrac{1}{b}$

$\dfrac{2x-2a-b-2x}{(2a+b+2x)2x} = \dfrac{2a+b}{2ab}$

$-(2a+b)2ab = (2a+b)\,(2a+b+2x)2x$

$2x^2 + 2xa + bx + ab = 0$

$(x+a)\,(2x+b) = 0, \; x = -a, \; x = -\dfrac{b}{2}$

(*c*) Take LCM to get $2x^2 + 5x + 3 = 0$, $x = -1$, $x \neq \frac{-3}{2}$. (given)

(*d*) Take LCM to get $x^2 + 4x - 12 = 0$

Ans. $x = 2, -6$

(*e*) $(4x^2 + 4bx + b^2) - a^2 = 0$

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

Ans. $x = -\frac{(a+b)}{2}, x = \frac{a-b}{2}$

(*f*) $4x^2 - 2a^2x - 2b^2x + a^2b^2 = 0$

$2x(2x - a^2) - b^2(2x - a^2) = 0 \Rightarrow (2x - b^2)(2x - a^2) = 0$

$x = \frac{b^2}{2}, \frac{a^2}{2}$

(*g*) Take LCM to get $11x^2 - 21x - 92 = 0$

$11x^2 - 44x + 23x - 92 = 0$. Solve and get

$x = 4, x = \frac{-23}{11}$

(*h*) $\left(\frac{2x}{x-5}\right)^2 + 5\left(\frac{2x}{x-5}\right) - 24 = 0$

Let $\frac{2x}{x-5} = y \quad \therefore y^2 + 5y - 24 = 0$. Solve to get $y = 3, y = -8$

Sub, $\frac{2x}{x-5} = 3, \frac{2x}{x-5} = -8$

Ans. $x = 15, x = 4$

(*i*) $4x^2 - 4a^2x + a^4 - b^4 = 0$

$(2x - a^2)^2 - (b^2)^2 = 0$

$(2x - a^2 - b^2)(2x - a^2 + b^2) = 0$

$x = \frac{a^2 + b^2}{2}, \quad x = \frac{a^2 - b^2}{2}$

(*j*) Find $D = b^2 (6a^2 - 1)^2$

Use $x = \dfrac{-B \pm \sqrt{D}}{2A}$ to get answer

Ans. $x = \dfrac{-b}{2a^2}, -3b$

(*k*) Let $\dfrac{7x+1}{5x-3} = y$

$\therefore\ 3y - \dfrac{4}{y} = 11 \Rightarrow 3y^2 - 11y - 4 = 0$. Solve to get

$y = -\dfrac{1}{3}, y = 4$

Substitute y and get $x = 0, 1$

(*l*) Take LCM to get $x^2 - 3x + 2 = 0$

Solve to get $x = 1, x = 2$

(*m*) Take LCM to get $2x^2 - 27x + 88 = 0$

$x = 8, \dfrac{11}{2}$

(*n*) Take LCM to get $x^2 - 4x - 8 = 0$ (Use quadratic formula)

Ans. $x = 2 \pm 2\sqrt{3}$

(*o*) Take LCM to get $2x^2 - 16x + 23 = 0$

Solve using Quadratic formula

Ans. $x = \dfrac{-8 \pm 3\sqrt{2}}{2}$

(*p*) $x^2 + 7\sqrt{5}x - 2\sqrt{5}x - 70 = 0$

$\left(x + 7\sqrt{5}\right)\left(x - 2\sqrt{5}\right) = 0$

$x = 2\sqrt{5}, -7\sqrt{5}$

(*q*) $\dfrac{16-x}{x} = \dfrac{15}{x+1}$

$x^2 - 16 = 0$

$x = \pm 4$

20. $abx^2 + b^2x - acx - bc = 0$

$(bx - c)(ax + b) = 0$

$x = -\frac{b}{a}, \frac{c}{b}$

21. $D = 0$

$\therefore p^2 - 2p - 3 = 0$; $p = -1, 3$

rejecting $p = -1$,

Ans. $p = 3$.

22. Find D, $D = \left(-4\sqrt{3}\right)^2 - 4(3)(4) = 0$

$\therefore$ Roots are equal and real

Roots are $\frac{-b}{2a}, \frac{-b}{2a} = \frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}$

23. $D = (-6a^2)^2 - 4(9)(a^4 - b^4)$

$= 36b^4$

$x = \frac{-(-6a^2) \pm \sqrt{36b^4}}{2 \times 9} = \frac{a^2 \pm b^2}{3}$

24. Equation $\frac{54}{x} + \frac{63}{x+6} = 3$, $x \rightarrow$ speed of train at first, $x + 6 \rightarrow$ Increased speed.

Ans. $x = 36$, $x \neq -3$.

25. Let the natural number be x.

ATQ, $x + 12 = \frac{160}{x}$ to get $x^2 + 12x - 160 = 0$

$(x + 20)(x - 8) = 0$

$x = 8, \quad x = -20$ (rejected)

26. Let time taken by thief be n minutes.

Policeman will catch the thief in $(n - 1)$ minutes.

Total distance covered by thief = $(100\ n)$ metres ...(1)

(as distance covered in 1 min = 100 min)

Distance covered by policemen

$100 + 110 + 120 + ... +$ to $(n - 1)$ 10 ...(2)

(1) and (2) $\Rightarrow 100\ n = \frac{(n-1)}{2}\ [2 \times 100 + (n-2)\ 10]$

Solve and get $n^2 - 3n - 18 = 0$

$n = 6, \quad n \neq -3$

Policeman will catch the thief in 5 minutes.

27. Time taken by top of smaller diameter = x hrs

Time taken by larger tap = $(x - 9)$ hrs

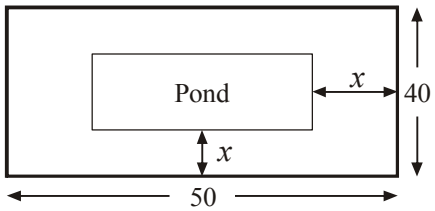
ATQ $\frac{1}{x} + \frac{1}{x-9} = \frac{1}{6}$ and get $x^2 - 21x + 54 = 0$

Ans. $x = 3, x = 18$

$x = 3$ rejeced as $x - 9 = -6 < 0$

$\therefore x = 18$ hrs $x - 9 = 18 - 9 = 9$ hrs

28.



Length of rectangular lawn = 50 m

Breadth of rectangular lawn = 40 m

Length of pond = $50 - 2x$

Breadth of pond = $40 - 2x$

Area of lawn – Area of pond = area of grass

$50 \times 40 - (50 - 2x)\ (40 - 2x) = 1184$

get $x^2 - 45x + 296 = 0$

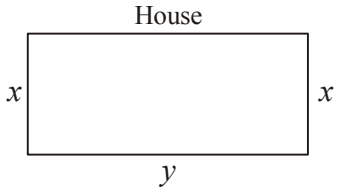
$x = 37, x = 8$

$x = 37$ rejected $\because\ 40 - 2x = 40 - 2(37) < 0$

Ans. Length of pond = 34 m

Breadth of pond = 24 m

29. $x + y + x = 30$, $xy = 100$

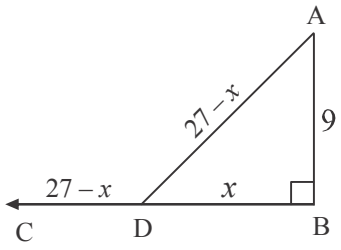


Solve x = 5m, 10 m,

y = 20 m, 10 m

$\therefore$ dim. are 5 m × 20 m or 10 m × 10 m

30.



In ΔABD, pythagoras theorem $9^2 + x^2 = (27 - x)^2$. Solve it to get x = 12 m.

31. Let original list price = ₹ x

ATQ $\frac{300}{x-5} - \frac{300}{x} = 5$

Solve and get $x = 20$, $x = -15 \rightarrow$ rejected

Ans. ₹ 20

32. Let original number of persons be x

ATQ $\frac{6500}{x} - \frac{6500}{x+15} = 30$

Solve and get $x = 50$, $x = -65$ (rejected).

33. ATQ $\frac{600}{x-200} - \frac{600}{x} = \frac{1}{2}$ [Speed of aircraft = x km/hr]

Solve to get $x = 600$, $x \neq -400$

Duration of flight $\frac{600}{600}$ = 1hr.

34. ATQ $\frac{600}{x}-\frac{600}{x+10}=3$ (Speed of slow train x km/hr)

Solve to get $x = 40$, $x = -50$ (rejected).

Ans. 40 km/hr, 50 km/hr.

35. ATQ $\frac{30}{15-x}+\frac{30}{15+x}=\frac{9}{2}$ (Speed of stream x km/hr)

Solve to get x = 5, $x = -5$ (rejected)

Ans. 5 km/hr

36. $x^2 + y^2 = 400$ ...(1)

$4x - 4y = 16 \Rightarrow x - y = 4$ ...(2)

$y - x = 4$ ...(3)

Solve (1) and (2) to get $x = 16$, $x = -12$ (rejected)

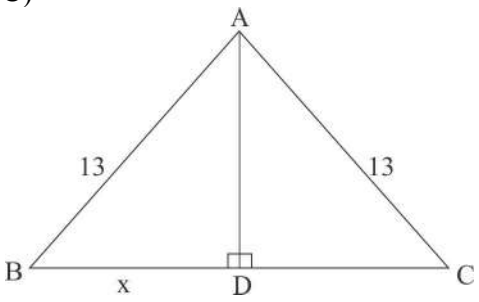
Solve (1) and (3) to get $x = 12$, $x = -16$ (rejected)

Ans. $x = 16$ m, $y = 12$ m from (1) and (2)

$x = 12$ m, $y = 16$ m from (1) and (3)

37. BC = 2x, BD = x (Draw a $\perp$ from A on BC)

Use pythagoreas to get



AD = $\sqrt{169-x^2}=60$

A = $\frac{1}{2}\times 2x\times\sqrt{169-x^2}=60$

Solve to get $x^2 = 144$, $x^2 = 25$

$x = 12$ or x = 5

$x = -12, -5$ (rejected)

base $2x = 24$ cm or 10 cm

38. Fraction is $\frac{x}{2x+1}$

ATQ $\frac{x}{2x+1}+\frac{2x+1}{x}=2\frac{16}{21}=\frac{58}{21}$

Solve to get $x = 3$, $x = \frac{-7}{11}$ (rejected)

Ans. Fraction = $\frac{3}{7}$.

39. Age of sister = x years

Age of girl = $2x$

ATQ $(x + 4)(2x + 4) = 160$

Solve to get $x^2 + 6x - 72 = 0$

Ans. $x = 6$ years, $x = -12$ (rejected)

$2x = 12$ years

40. Let tens place digit = x, then units digits = $\frac{18}{x}$.

No, $10x + \frac{18}{x}$

ATQ $\left(10x + \frac{18}{x}\right) - \left(\frac{10 \times 18}{x} + x\right) = 63$

Solve to get $x = 9$, $x \neq -2$ (rejected).

Ans. Number is 92

41. Let no. be x, $x + 1$, $x + 2$ (rejected).

ATQ $(x)^2 + (x + 1)(x + 2) = 46$

To get $2x^2 + 3x - 44 = 0$

Use quadratic formula to get $x = 4$, $x = -\frac{11}{2}$ (rejected)

$\therefore$ Numbers are 4, 5, 6.

42. Let length of piece be x metre.

ATQ $\frac{200}{x} - \frac{200}{x+5} = 2$

Solve to get $x^2 + 5x - 500 = 0$

Solve to get $x = 20$, $x = -25$ (rejected)

Rate per meter = $\frac{200}{x} = \frac{200}{20} = ₹\ 10$

43. Let speed of boat = x

ATQ $\frac{32}{24 - x} - \frac{32}{24 + x} = 1$

$x^2 + 64x - 576 = 0$

$(x + 72)(x - 8) = 0$

$x = 8$ km/hr

$x = -72$ km/hr (rejected)

44. Find D and let $D = 0$

$(c - a)^2 - 4(b - c)(a - b) = 0$

Solve to get $(a + c - 2b)^2 = 0$

$\therefore\ a + c = 2b$

45. $D = 0$

$(2\ mnc)^2 - 4(1 + m^2)\, n^2 (c^2 - a^2) = 0$

to get $4n^2c^2 = 4n^2a^2 (1 + m^2)$

$\therefore\ c^2 = a^2 (1 + m^2)$

46. Let the speed of the train = x km/hr

ATQ, $\frac{480}{x-8} - \frac{480}{x} = 3$

$x^2 - 8x - 1280 = 0$

$x = 40, -32$ (rejected)

$x = 40$ km/hr

47. Let Lm be the length of the rectangular park

Breadth = (L – 3) m

Altitude of the isosceles triangle = 12 m

ATQ $L(L - 3) = \frac{1}{2}(12)(L - 3) + 4$

$L^2 - 9L + 14 = 0$

$(L - 7)(L - 2) = 0$

$\Rightarrow\ L = 7, 2$

So, L = 7m (L = 2 rejected $\because$ L – 3 = –1)

$\because$ Length = 7 m, Breadth = 4 m

Practice Test

Quadratic Equations

Time: 1 Hour **M.M : 20**

SECTION-A

1. The value of k is ..... if $x = 3$ is one root of $x^2 - 2kx - 6 = 0$. **1**
2. If the discriminant of $3x^2 + 2x + \alpha = 0$ is double the discriminant of $x^2 - 4x + 2 = 0$ then value of α is **1**
3. If discriminant of $6x^2 - bx + 2 = 0$ is 1 then value of b is **1**
4. $(x - 1)^3 = x^3 + 1$ is quadratic equation. (T/F) **1**

SECTION-B

5. If roots of $x^2 + kx + 12 = 0$ are in the ratio 1 : 3 find k. **2**
6. Solve for x : $21x^2 - 2x + \frac{1}{21} = 0$ **2**
7. Find k if the quadratic equation has equal roots : $kx(x - 2) + 6 = 0$. **2**

SECTION-C

8. Solve using quadratic formula **3**

$$4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$$

9. For what value of k, $(4 - k)x^2 + (2k + 4)x + (8k + 1) = 0$ is a perfect square. **3**

SECTION-C

10. Two water taps together can fill a tank in $1\frac{7}{8}$ hours. The tap with longer diameter takes 2 hours less than the tap with smaller one to fill the tank separately. Find the time in which each tap can fill the tank separately. **(CBSE 2018)** **4**