chapter - 4

Quadratic Equations

Previous Years Questions

4.2 Quadratic Equations

VSA (1 mark)

1. If the sum of the roots of the quadratic equation $ky^2 - 11y + (k - 23) = 0$ is $\frac{13}{21}$ more than the product of the roots, then find the value of k.

   (Term II, 2021-22)

2. Write the quadratic equation in x whose roots are 2 and -5.

   (2021 C)

3. If one root of the quadratic equation $2x^2 + 2x + k = 0$ is $-\frac{1}{3}$, then find the value of k.

   (2019 C)

4. Find the value of k for which the roots of the equation $3x^2 - 10x + k = 0$ are reciprocal of each other.

   (Delhi 2019)

5. Find the value of k for which $x = 2$ is a solution of the equation $kx^2 + 2x - 3 = 0$.

   (Al 2019)

6. If $x = 3$ is one root of the quadratic equation

   $x^2 - 2kx - 6 = 0$, then find the value of k.

   (2018)

7. If $x = -\frac{1}{2}$, is a solution of the quadratic equation $3x^2 + 2kx - 3 = 0$, find the value of k.

   (Delhi 2015)

SA I (2 marks)

8. Find the sum and product of the roots of the quadratic equation $2x^2 - 9x + 4 = 0$.

   (2023)

9. Find the value of p, for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other.

(Al 2017)

10. If $x = 2/3$ and $x = -3$ are roots of the quadratic equation $ax^2 + 7x + b = 0$, find the values of a and b.

    (Delhi 2016)

SA II (3 marks)

11. Find the value of ' p ' for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other.

    (2023)

12. One root of the quadratic equation $2x^2 - 8x - k = 0$ is $\frac{5}{2}$. Find the value of k. Also, find the other root.

    (2021 C)

4.3 Solution of a Quadratic Equation by Factorisation

MCQ

13. The roots of the equation $x^2 + 3x - 10 = 0$ are
    (a) $2, -5$
    (b) $-2,5$
    (c) $2,5$
    (d) $-2, -5$

    (2023)

SA I (2 marks)

14. Solve the quadratic equation for x :

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

    (Term II, 2021-22, AI 2015)

15. Solve for x :

    $\frac{x+1}{x-1} + \frac{x-2}{x+2} = 4 - \frac{2x+3}{x-2}; x \neq 1, -2,2$

    (Delhi 2016)

16. Solve for x: $\sqrt{2x+9} + x = 13$

    (Al 2016)

17. Solve for x: $\sqrt{6x+7}-(2x-7)=0$

    (AI 2016)

18. A two digit number is four times the sum of the digits. It is also equal to 3 times the product of digits. Find the number.

    (Foreign 2016)

19. Solve for x: $\frac{1}{x-3}-\frac{1}{x+5}=\frac{1}{6}, x \neq 3, -5$

    (Foreign 2016)

20. Solve for x (in terms of a and b) :

    $\frac{a}{x-b}+\frac{b}{x-a}=2, x \neq a, b$ (Foreign 2016) Ev

21. Solve the following quadratic equation for x :

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

    (Delhi 2015)

22. Solve the following quadratic equation for x :

    $9x^2-6b^2x-(a^4-b^4)=0$

    (Delhi 2015)

23. Solve the following quadratic equation for x :

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

    (Al 2015)

24. Solve for x :

    $x^2-(\sqrt{3}+1)x+\sqrt{3}=0$

    (Foreign 2015)

25. Solve the quadratic equation $2x^2+ax-a^2=0$ for x.

    (Delhi 2014)

SA II (3 marks)

26. Sum of the areas of two squares is 157 m^2. If the sum of their perimeters is 68 m, find the sides of the two squares.

    (2019)

27. A plane left 30 minutes later than its scheduled time and in order to reach the destination 1500 km away in time, it had to increase its speed by 100 km/h from the usual speed. Find its usual speed.

(2018)

28. Solve for x :

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

(Delhi 2016)

29. Solve the following quadratic equation for x :

$$x^2+\left(\frac{a}{a+b}+\frac{a+b}{a}\right)x+1=0$$

(Delhi 2016)

30. Solve for x :

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

(Al 2016)

31. Three consecutive natural numbers are such that the square of the middle number exceeds the difference of the squares of the other two by 60. Find the numbers.

(AI 2016)

32. Solve for x: $\frac{1}{x}+\frac{2}{2x-3}=\frac{1}{x-2}, x \neq 0, \frac{3}{2}, 2.$

(Foreign 2016) Ev

33. Solve for x :

$$2x^2+6\sqrt{3}x-60=0$$

34. Solve for x :

$$x^2+5x-(a^2+a-6)=0$$

(Foreign 2015)

35. Solve the equation

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

(Delhi 2014)

36. Solve the equation $\frac{3}{x+1} - \frac{1}{2} = \frac{2}{3x-1}; x \neq -1, x \neq \frac{1}{3}$, for x.

(Delhi 2014)

37. Solve the equation

$$\frac{14}{x+3} - 1 = \frac{5}{x+1}; x \neq -3, -1, \text{ for } x$$

(Delhi 2014)

38. Solve for x :

$$\frac{16}{x} - 1 = \frac{15}{x+1}; x \neq 0, -1$$

LA (4/5/6 marks)

39. In the picture given below, one can see a rectangular in-ground swimming pool installed by a family in their backyard. There is a concrete sidewalk around the pool of width x m. The outside edges of the sidewalk measure 7 m and 12 m. The area of the pool is 36 sq. m.

Based on the information given above, form a quadratic equation in terms of x.

Find the width of the sidewalk around the pool.

(Term II, 2021-22) Ap

40. The sum of two numbers is 34. If 3 is subtracted from one number and 2 is added to another, the product of these two numbers becomes 260. Find the numbers.

(Term II, 2021-22)

41. The hypotenuse (in cm) of a right angled triangle is 6 cm more than twice the length of the shortest side. If the length of third side is 6 cm less than thrice the length of shortest side, then find the dimensions of the triangle.

(Term II, 2021-22)

42. A 2-digit number is such that the product of its digits is 24. If 18 is subtracted from the number, the digits interchange their places. Find the number.

    (Term II, 2021-22)

43. Sum of the areas of two squares is $544\ m^2$. If the difference of their perimeters is $32\ m$, find the sides of the two squares.

    (2020)

44. A motorboat 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. Find the speed of the stream.

    (NCERT, 2020, 2018, Al 2014)

45. Solve the following equation for x :

    $$\frac{1}{x+1}+\frac{2}{x+2}=\frac{7}{x+5}, x \neq -1,-2,-5$$

    (2019 C)

46. 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.

    (Delhi 2019)

47. A train travels $360\ km$ at a uniform speed. If the speed had been $5\ km/hr$ more, it would have taken $1hr$ less for the same journey. Find the speed of the train.

    (NCERT, Al 2019)

48. Solve for x :

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

    (Al 2019)

49. A train travels at a certain average speed for a distance of $63\ km$ and then travels a distance of $72\ km$ at an average speed of $6\ km/hr$ more than its original speed. If it takes 3 hours to complete total journey, what is the original average speed?

    (2018)

50. Speed of a boat in still water is $15\ km/h$. It goes $30\ km$ upstream and returns back at the same point in 4 hours 30 minutes. Find the speed of the stream.

    (Delhi 2017)

51. Solve for x :

$$\frac{1}{x+1}+\frac{3}{5x+1}=\frac{5}{x+4}, x \neq -1, -\frac{1}{5}, -4$$

(Al 2017)

52. Two taps running together can fill a tank in $3\frac{1}{13}$ hours. If one tap takes 3 hours more than the other to fill the tank, then how much time will each tap take to fill the tank?

(Al 2017)

53. A passenger, while boarding the plane, slipped from the stairs and got hurt. The pilot took the passenger in the emergency clinic at the airport for treatment. Due to this, the plane got delayed by half an hour. To reach the destination 1500 km away in time, so that the passengers could catch the connecting flight, the speed of the plane was increased by 250 km/hour than the usual speed. Find the usual speed of the plane. What value is depicted in this question?

(Delhi 2016)

54. Find x in terms of a, b and c :

$$\frac{a}{x-a}+\frac{b}{x-b}=\frac{2c}{x-c}, x \neq a, b, c$$

(Delhi 2016)

55. The time taken by a person to cover 150 km was $2\frac{1}{2}$ hours more than the time taken in the return journey. If he returned at a speed of 10 km/hour more than the speed while going, find the speed per hour in each direction.

(Delhi 2016)

56. A motor boat whose speed is 24 km/h 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.

(Al 2016)

57. 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 rectangular park.

(NCERT, Al 2016)

58. Two water taps together can fill a tank in 9 hours 36 minutes. The tap of larger diameter takes 8 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

(Foreign 2016)

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

(Foreign 2016)

60. The numerator of a fraction is 3 less than its denominator. If 2 is added to both the numerator and the denominator, then the sum of the new fraction and original fraction is $\frac{29}{20}$. Find the original fraction.

(Delhi 2015)

61. To fill a swimming pool two pipes are to be used. If the pipe of larger diameter is used for 4 hours and the pipe of smaller diameter for 9 hours, only half the pool can be filled. Find how long it would take for each pipe to fill the pool separately, if the pipe of smaller diameter takes 10 hours more than the pipe of larger diameter to fill the pool.

(Delhi 2015)

62. Solve for x :

$$\frac{3}{x+1}+\frac{4}{x-1}=\frac{29}{4x-1}; x \neq 1,-1,\frac{1}{4}$$

(Delhi 2015) Ev

63. The diagonal of a rectangular field is 16 metres more than the shorter side. If the longer side is 14 metres more than the shorter side, then find the lengths of the sides of the field.

(Al 2015)

64. 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/h more than the first speed. If it takes 3 hours to complete the total journey, what is its first speed?

(AI 2015)

65. A bus travels at a certain average speed for a distance of 75 km and then travels a distance of 90 km at an average speed of 10 km/h more than the first speed. If it takes 3 hours to complete the total journey, find its first speed.

(AI 2015)

66. A truck covers a distance of 150 km at a certain average speed and then covers another 200 km at an average speed which is 20 km per hour more than the first speed. If the truck covers the total distance in 5 hours, find the first speed of the truck. (AI 2015) Ap

67. The total cost of a certain length of a piece of cloth is ₹200. If the piece was 5 m longer and each metre of cloth cost ₹ 2 less, the cost of the piece would have remained unchanged. How long is the piece and what is its original rate per metre?

(Foreign 2015)

68. The difference of two natural numbers is 5 and the difference of their reciprocals is $\frac{1}{10}$. Find the numbers.

(Delhi 2014)

69. The difference of two natural numbers is 3 and the difference of their reciprocals is $\frac{3}{28}$. Find the numbers.

(Delhi 2014)

70. The difference of two natural numbers is 5 and the difference of their reciprocals is $\frac{5}{14}$. Find the numbers.

(Delhi 2014)

71. Solve for x: $\frac{x-2}{x-3}+\frac{x-4}{x-5}=\frac{10}{3}; x \neq 3,5$

72. Solve for x: $2\left(\frac{2x-1}{x+3}\right)-3\left(\frac{x+3}{2x-1}\right)=5; x \neq -3, \frac{1}{2}$

(Foreign 2014)

73. The sum of the squares of two consecutive even numbers is 340. Find the numbers. (Foreign 2014)

74. Solve for x: $3\left(\frac{3x-1}{2x+3}\right)-2\left(\frac{2x+3}{3x-1}\right)=5; x \neq \frac{1}{3}, -\frac{3}{2}$.

(Foreign 2014)

75. The sum of the squares of two consecutive multiples of 7 is 637. Find the multiples.

(Foreign 2014)

76. Solve for x: $3\left(\frac{7x+1}{5x-3}\right)-4\left(\frac{5x-3}{7x+1}\right)=11; x \neq \frac{3}{5}, -\frac{1}{7}$.

(Foreign 2014)

Solution of a Quadratic Equation by Quadratic Formula

MCQ

77. The discriminant of the quadratic equation

$3\sqrt{3}x^2+10x+\sqrt{3}=0$ is

(a) \pm 8

(b) 8

(c) $100-4\sqrt{3}$

(d) 64

(2020 C)

VSA (1 marks)

78. Write the discriminant of the quadratic equation $(x + 5)^2 = 2(5x - 3)$.
(2019)

SA I (2 marks)

79. Solve the quadratic equation for x :
$x^2 - 2ax - (4b^2 - a^2) = 0$
(Term II, 2021-22)

80. Solve for x: $2x^2 - 2\sqrt{2}x + 1 = 0$
(Term II, 2021-22 C)

81. Solve for y: $y^2 + \frac{3\sqrt{5}}{2}y - 5 = 0$
(Term II, 2021-22C)

82. Solve the quadratic equation:
$x^2 - 2ax + (a^2 - b^2) = 0$ for x.
(Term II, 2021-22)

83. Solve the quadratic equation $x^2 + 2\sqrt{2}x - 6 = 0$ for x.
(NCERT Exemplar, Term II, 2021-22)

84. Find the roots of the quadratic equation
$$\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$$
(Delhi 2017)

85. Solve for x: $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$
(Foreign 2016, AI 2015, 2014)

SA II (3 marks)

86. Using quadratic formula, solve the following equation for x :
$abx^2 + (b^2 - ac)x - bc = 0$
(2021 C)

87. Solve for x :

$x^2 - (2b - 1)x + (b^2 - b - 20) = 0$

(Foreign 2015)

88. Solve for x :

$x^2 + 6x - (a^2 + 2a - 8) = 0$

(Foreign 2015)

LA (4/5 / 6 marks)

89. The difference of the squares of two numbers is 180. The square of the smaller number is 8 times the greater number. Find the two numbers.

(Term II, 2021-22)

90. Solve for x :

$\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}, x \neq -1, -2, -4$

(AI 2016)

91. Two pipes running together can fill a tank in $11\frac{1}{9}$ minutes. If one pipe takes 5 minutes more than the other to fill the tank separately, find the time in which each pipe would fill the tank separately.

92. Solve for x :

(Al 2016)

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

(Delhi 2015)

93. Solve for x: $\frac{x-3}{x-4} + \frac{x-5}{x-6} = \frac{10}{3}; x \neq 4, 6$

(Al 2014)

94. Solve for x: $\frac{x-4}{x-5} + \frac{x-6}{x-7} = \frac{10}{3}; x \neq 5, 7$

(AI 2014)

4.4 Nature of Roots

MCQ

95. The least positive value of k, for which the quadratic equation $2x^2 + kx - 4 = 0$ has rational roots, is
(a) $\pm 2\sqrt{2}$
(b) 2
(c) \pm 2
(d) $\sqrt{2}$

(2023)

96. The value(s) of k for which the quadratic equation $2x^2 + kx + 2 = 0$ has equal roots, is
(a) 4
(b) \pm 4
(c) -4
(d) 0

(2020)

VSA (1 mark)

97. Find the nature of roots of the quadratic equation $2x^2 - 4x + 3 = 0$

(2019)

98. For what values of ' a ' the quadratic equation

$9x^2 - 3ax + 1 = 0$ has equal roots?

(2019 C)

99. For what values of k, the roots of the equation $x^2 + 4x + k = 0$ are real?

(Delhi 2019)

100. Find the value of k for which the quadratic equation $3x^2 + kx + 3 = 0$ has real and equal roots. (AI 2019)

101. If the quadratic equation $px^2 - 2\sqrt{5}px + 15 = 0$ has two equal roots, then find the value of p.

(AI 2015)

SA I (2 marks)

102. Find the discriminant of the quadratic equation $4x^2 - 5 = 0$ and hence comment on the nature of roots of the equation.

(2023)

103. Find the value of m for which the quadratic equation $(m-1)x^2 + 2(m-1)x + 1 = 0$ has two real and equal roots.

(Term II, 2021-22)

104. If the quadratic equation

$(1 + a^2)x^2 + 2abx + (b^2 - c^2) = 0$

has equal and real roots, then prove that

$b^2 = c^2(1 + a^2)$.

(Term II, 2021-22)

105. Find the nature of roots of the quadratic equation $3x^2 - 4\sqrt{3}x + 4 = 0$. If the roots are real, find them.

(2020C)

106. Find the value of k for which the equation $x^2 + k(2x + k - 1) + 2 = 0$ has real and equal roots.

(Delhi 2017)

107. Find the values of p for which the quadratic equation $4x^2 + px + 3 = 0$ has equal roots.

(AI 2014)

108. Find the values of k for which the quadratic equation $9x^2 - 3kx + k = 0$ has equal roots.

(Al 2014)

109. Find the value of p so that the quadratic equation $px(x - 3) + 9 = 0$ has equal roots.

(AI 2014)

SA II (3 marks)

110. Find the value of ' p ' for which the quadratic equation $px(x - 2) + 6 = 0$ has two equal real roots.

(2023)

111. Write all the values of p for which the quadratic equation $x^2 + px + 16 = 0$ has equal roots. Find the roots of the equation so obtained.

(2019)

112. If the roots of the quadratic equation in x: $(a^2 + b^2)\ x^2 - 2(ac + bd)x + (c^2 + d^2) = 0$ are equal, prove that $ad = bc$.

(2019 C)

113. If the equation $(1 + m^2)x^2 + 2mcx + c^2 - a^2 = 0$ has equal roots then show that $c^2 = a^2(1 + m^2)$.

(Delhi 2017)

114. If $ad \neq bc$, then prove that the equation

$(a^2 + b^2)x^2 + 2(ac + bd)x + (c^2 + d^2) = 0$ has no real roots.

(Al 2017)

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

(AI 2016)

116. Find that non-zero value of k, for which the quadratic equation $kx^2 + 1 - 2(k - 1)x + x^2 = 0$ has equal roots. Hence, find the roots of the equation.

(Delhi 2015)

117. Find that value of p for which the quadratic equation $(p + 1)x^2 - 6(p + 1)x + 3(p + 9) = 0, p \neq -1$ has equal roots. Hence, find the roots of the equation.

(Delhi 2015)

118. If 2 is a root of the quadratic equation $3x^2 + px - 8 = 0$ and the quadratic equation $4x^2 - 2px + k = 0$ has equal roots, find the value of k.

(Foreign 2014)

119. If 1 is a root of the quadratic equation $3x^2 + ax - 2 = 0$ and the quadratic equation $a(x^2 + 6x) - b = 0$ has equal roots, find the value of b.

(Foreign 2014)

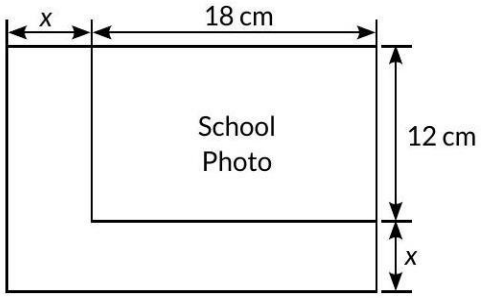
LA (4/5/6 marks)

120. Case Study: While designing the school year book, a teacher asked the student that the length and width of a particular photo is increased by x units each to double the area of the photo. The original photo is 18 cm long and 12 cm wide.

Based on the above information, answer the following questions:

(i) Write an algebraic equation depicting the above information.

(ii) Write the corresponding quadratic equation in standard form. (iii) What should be the new dimensions of the enlarged photo?



OR

Can any rational value of x make the new area equal to $220\ \text{cm}^2$?

(2023)

121. Find the positive values (s) of k for which quadratic equations $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ both will have real roots.

(Foreign 2016)

122. If roots of quadratic equation $x^2 + 2px + mn = 0$ are real and equal, show that the roots of the quadratic equation $x^2 - 2(m+n)x + (m^2 + n^2 + 2p^2) = 0$ are also equal.

(Foreign 2016)

123. If $x = -2$ is a root of the equation $3x^2 + 7x + p = 0$, find the values of k so that the roots of the equation $x^2 + k(4x + k - 1) + p = 0$ are equal.

(Foreign 2015)

124. If $x = 3$ is root of the equation $x^2 - x + k = 0$, find the value of p so that the roots of the equation $x^2 + k(2x + k + 2) + p = 0$ are equal.

(Foreign 2015)

125. If $x = -4$ is a root of the equation $x^2 + 2x + 4p = 0$, find the values of k for which the equation $x^2 + px(1 + 3k) + 7(3 + 2k) = 0$ has equal roots.

(Foreign 2015)

126. Find the values of k for which the quadratic equation $(k+4)x^2 + (k+1)x + 1 = 0$ has equal roots. Also find these roots.

(Delhi 2014)

127. Find the values of k for which the quadratic equation $(3k+1)x^2 + 2(k+1)x + 1 = 0$ has equal roots. Also find the roots.

(Delhi 2014)

128. Find the value of p for which the quadratic equation $(2p + 1)x^2 - (7p + 2)x + (7p - 3) = 0$ has equal roots. Also find these roots.

(Delhi 2014)