SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

QUADRATIC EQUATIONS

Class 10 - Mathematics

Time Allowed: 2 hours and 55 minutes **Maximum Marks: 172**

Section A

1. If the equation x^2 - kx + 1 = 0 has no real roots then **[1]**

a) -2 < k < 2
b) k > - 2
c) k < -2
d) k > 2

2. ________ is called the Discriminant of the quadratic equation ax^2 + bx + c = 0. **[1]**

a) c^2 - 4ab
b) a^2 + 2bc
c) b^2 - 4ac
d) a^2 - 4bc

3. Which of the following has no real root? **[1]**

a) $x^2 - 5x + 3\sqrt{2} = 0$
b) $x^2 + 4x - 3\sqrt{2} = 0$
c) $x^2 - 4x - 3\sqrt{2} = 0$
d) $x^2 - 4x + 3\sqrt{2} = 0$

4. The roots of the equation $3\sqrt{x} + 5(x)^{-\frac{1}{2}} = \sqrt{2}$ can be found by solving ________. **[1]**

a) $16x^2$ + 22x - 30 = 0
b) $9x^2$ + 28x -25 = 0
c) $9x^2$ + 30x + 25 = 0
d) $9x^2$ + 28x + 25 = 0

5. The quadratic equation ax^2 + 2x + a = 0 has two distinct roots, if **[1]**

a) a = $\pm$ 1
b) a = 0
c) a = 0, 1
d) 0 = - 1, 0

6. Which of the following is a quadratic equation? **[1]**

a) $x^3 - x^2 = (x-1)^3$
b) $x^2 + 2x + 1 = (4-x)^2 + 3$
c) $-2x^2 = (5-x)\left(2x - \frac{2}{5}\right)$
d) $(k+1)x^2 + \frac{3}{2}x - 5 = 0$, where k = – 1

7. The perimeter of a right triangle is 70cm and its hypotenuse is 29cm. The area of the triangle is **[1]**

a) 210 sq.cm
b) 200 sq.cm
c) 180 sq.cm
d) 250 sq.cm

8. If $\frac{1}{2}$ is a root of the equation x^2 + kx – $\frac{5}{4}$ = 0, then the value of k is **[1]**

a) $\frac{1}{2}$
b) -2
c) $\frac{1}{4}$
d) 2

9. Which of the following quadratic equations has -1 as a root? **[1]**

a) $x^2 - 4x - 5 = 0$

b) $-x^2 - 4x + 5 = 0$

c) $x^2 + 3x + 4 = 0$

d) $x^2 - 5x + 6 = 0$

10. A train travels 360km at a uniform speed. If the speed had been 5 km/hr more, it would have taken 1 hour less for the same journey, then the actual speed of the train is **[1]**

a) 48 km/hr

b) 36 km /hr

c) 40 km/hr

d) 45 km/hr

11. For what values of k, the equation $kx^2 - 6x - 2 = 0$ has real roots? **[1]**

a) $k \geq \frac{-9}{2}$

b) $k \leq -5$

c) $k \leq -2$

d) $k \leq \frac{-9}{2}$

12. If one root of the equation $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ is 1, then the other root is ________. **[1]**

a) $\frac{a(b-c)}{c(a-b)}$

b) $\frac{c(a-b)}{a(b-c)}$

c) $\frac{b(c-a)}{a(b-c)}$

d) $\frac{a(b-c)}{b(c-a)}$

13. The value of k for which the quadratic equation $2x^2 - 10x + k = 0$ has real and equal roots, is: **[1]**

a) $\frac{25}{2}$

b) $-\frac{5}{2}$

c) $\frac{1}{5}$

d) $\frac{1}{2}$

14. The sum of two numbers is 17 and the sum of their reciprocals is $\frac{17}{62}$. The quadratic representation of the above situation is **[1]**

a) $\frac{1}{x} + \frac{1}{x+17} = \frac{17}{62}$

b) $\frac{1}{x(17-x)} = \frac{17}{62}$

c) $\frac{1}{x} + \frac{1}{17-x} = \frac{17}{62}$

d) $\frac{1}{x} - \frac{1}{17-x} = \frac{17}{62}$

15. A quadratic equation whose roots are $(3 - \sqrt{2})$ and $(3 + \sqrt{2})$ is: **[1]**

a) $x^2 - 7 = 0$

b) $x^2 - 6x + 7 = 0$

c) $9x^2 - 2 = 0$

d) $x^2 + 6x + 7 = 0$

16. The perimeter of a rectangle is 82 m and its area is 400 m^2. The breadth of the rectangle is **[1]**

a) 25 m

b) 9 m

c) 16 m

d) 20 m

17. The roots of a quadratic equation $x^2 - 4px + 4p^2 - q^2 = 0$ are **[1]**

a) 2p + q, 2p - q

b) p + 2q, p - 2q

c) 2p + q, 2p + q

d) 2p - q, 2p - q

18. The sum S of first n even natural numbers is given by the relation S = n(n +1). If the sum is 420, then the value of n is **[1]**

a) 20

b) 21

c) 24

d) 22

19. A quadratic equation $ax^2 + bx + c = 0$, has coincident roots, if **[1]**

a) b^2 - ac = 0
b) b^2 - 4ac < 0
c) b^2 - 4ac > 0
d) b^2 - 4ac = 0

20. The values of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is **[1]**

a) 0 only
b) 8 only
c) 0, 8
d) 4

21. **Assertion (A):** Sum and product of roots of $2x^2 - 3x + 5 = 0$ are $\frac{3}{2}$ and $\frac{5}{2}$ respectively. **[1]**

Reason (R): If α and β are the roots of $ax^2 + bx + c = 0$, $a \neq 0$, then sum of roots = $\alpha + \beta = -\frac{b}{a}$ and product of roots = $\alpha\beta = \frac{c}{a}$

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

22. **Assertion (A):** If roots of the equation $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c = 1$ **[1]**

Reason (R): If a, b, c are odd integer then the roots of the equation $4abc\, x^2 + (b^2 - 4ac)\, x - b = 0$ are real and distinct.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

23. **Assertion (A):** The equation $x^2 + 3x + 1 = (x - 2)^2$ is a quadratic equation. **[1]**

Reason (R): Any equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$, is called a quadratic equation.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

24. **Assertion (A):** The equation $9x^2 + 3kx + 4 = 0$ has equal roots for k = ± 4 **[1]**

Reason (R): If discriminant D of a quadratic equation is equal to zero then the roots of the equation are real and equal.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

25. **Assertion (A):** If one root of the quadratic equation $4x^2 - 10x + (k - 4) = 0$ is reciprocal of the other, then value of k is 8. **[1]**

Reason (R): Roots of the quadratic equation $x^2 - x + 1 = 0$ are real.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

26. **Assertion (A):** $4x^2 - 12x + 9 = 0$ has repeated roots. **[1]**

Reason (R): The quadratic equation $ax^2 + bx + c = 0$ have repeated roots if discriminant D > 0.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

27. **Assertion (A):** If 5 + $\sqrt{7}$ is a root of a quadratic equation with rational co-efficients, then its other root is 5 - $\sqrt{7}$. **[1]**

Reason (R): Surd roots of a quadratic equation with rational co-efficients occur in conjugate pairs.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

28. **Assertion (A):** The value of k = 2, if one root of the quadratic equation $6x^2$ - x - k = 0 is $\frac{2}{3}$ **[1]**

Reason (R): The quadratic equation $ax^2 + bx + c = 0$, $a \leq 0$ has two roots.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

29. **Assertion (A):** $(2x - 1)^2 - 4x^2 + 5 = 0$ is not a quadratic equation. **[1]**

Reason (R): x = 0, 3 are the roots of the equation $2x^2 - 6x = 0$

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

30. **Assertion (A):** The equation $8x^2 + 3kx + 2 = 0$ has equal roots then the value of k is $\pm\frac{8}{3}$ **[1]**

Reason (R): The equation $ax^2 + bx + c = 0$ has equal roots if D = $b^2 - 4ac = 0$

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

31. A two-digit number is four times the sum of its digits and twice the product of its digits. Find the number. **[2]**

32. If the sum of first n even natural numbers is 420, find the value of n. **[2]**

33. Find non-zero value of k, for which the quadratic equation $kx^2 + 1 - 2(k - 1)x + x^2 = 0$ has equal roots. **[2]**

34. If the sum of n successive odd natural numbers starting from 3 is 48, find the value of n. **[2]**

35. Find k so that the quadratic equation $(k + 1)x^2 + 2(k + 1)x + 1= 0$ has equal roots. **[2]**

36. Find the value of k for the quadratic equation $kx(x - 2) + 6 = 0$, so that they have two equal roots. **[2]**

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

38. Ram takes 6 days less than Bhagat to finish a piece of work. If both of them together can finish the work in 4 days, in how many days Bhagat alone can finish the work? **[2]**

39. If a man walks 1 km/hr faster than his usual speed then he covers a distance of 3 km in 15 minutes less time. Find his usual speed. (In km/hr) **[2]**

40. Solve: $2x^2 + ax - a^2 = 0$ **[2]**

[2]

41. Using quadratic formula, find the real roots of the equation $2x^2 + 2x + 9 = 0$, if they exist.

42. Solve the equation $\frac{16}{x} - 1 = \frac{15}{x+1}, x \neq 0, -1$ **[2]**

43. Find the values of k for which the equation has real and equal roots: $x^2 + k(2x + k - 1) + 2 = 0$. **[2]**

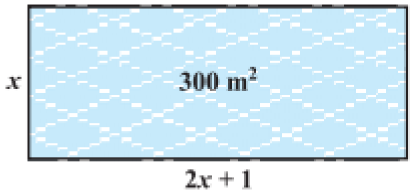
44. If an integer is added to its square, the sum is 90. Find the integer with the help of quadratic equation. **[2]**

45. A car covers a distance of 2592 km with a uniform speed. The number of hours taken for the journey is one half the number representing the speed in km/ hour. Find the time taken to cover the distances. **[2]**

46. Find the roots of the given quadratic equation $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$ by factorization. **[2]**

47. Two water taps together can fill a tank in $3\frac{1}{3}$ hours. The tap of larger diameter takes 5 hours less than the smaller one to fill the tank separately. Find the time in which each tap can fill the tank separately. **[2]**

48. Find the dimensions of the prayer hall given in the below figure. **[2]**



49. A two-digit number is four times the sum of its digits and twice the product of its digits. Find the number. **[2]**

Section C

50. Find the values of p for which the quadratic equation $(2p + 1)x^2 - (7p + 2)x + (7p - 3) = 0$ has real and equal roots. **[3]**

51. Is there any real value of 'a' for which the equation $x^2 + 2x + (a^2 + 1) = 0$ has real roots? **[3]**

52. A two-digit number is 5 times the sum of its digits and is also equal to 5 more than twice the product of its digits. Find the number. **[3]**

53. Determine, if 3 is a root of the equation given below: **[3]**
$\sqrt{x^2 - 4x + 3} + \sqrt{x^2 - 9} = \sqrt{4x^2 - 14x + 16}$

54. Solve: $3^{(x+2)} + 3^{-x} = 10$ **[3]**

55. Determine whether the given quadratic equation have real roots and if so, find the roots **[3]**
$16x^2 = 24x + 1$

56. A rectangular field is 16 m long and 10 m wide. There is a path of uniform width all around it, having an area of 120 m^2. Find the width of the path. **[3]**

57. The numerator of a fraction is one less than its denominator. If three is added to each of the numerator and denominator, the fraction is increased by $\frac{3}{28}$. Find the fraction. **[3]**

58. A two-digit number is such that the product of its digits is 8. When 18 is subtracted from the number, the digits interchange their places. Find the number. **[3]**

59. Solve: $\frac{x+3}{x-2} - \frac{1-x}{x} = 4\frac{1}{4}, x \neq 2, 0$ **[3]**

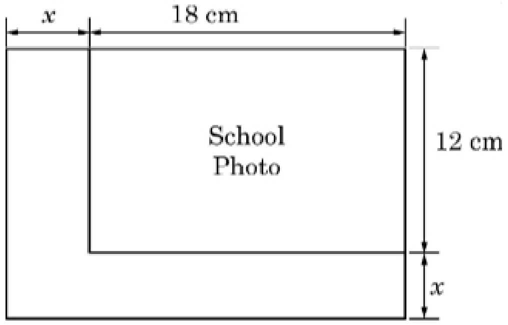
Section D

60. **Read the following text carefully and answer the questions that follow:** **[4]**

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.

i. Write an algebraic equation depicting the above information. (1)
ii. Write the corresponding quadratic equation in standard form. (1)

iii. What should be the new dimensions of the enlarged photo? (2)



OR

Can any rational value of x make the new area equal to 220 cm^2? (2)

61. **Read the following text carefully and answer the questions that follow:** **[4]**

The tradition of pottery making in India is very old. In fact, it is older than Indus Valley Civilization. The shaping and baking of clay articles has continued through the ages. The picture of a potter is shown below:

A potter makes a certain number of pottery articles in a day. It was observed on a particular day the cost of production of each article(in ₹) was one more than twice the number of articles produced on that day. The total cost of production on that day was ₹ 210.

i. Taking number of articles produced on that day as x, form a quadratic equation in x. (1)

ii. Find the number of articles produced and the cost of each article. (1)

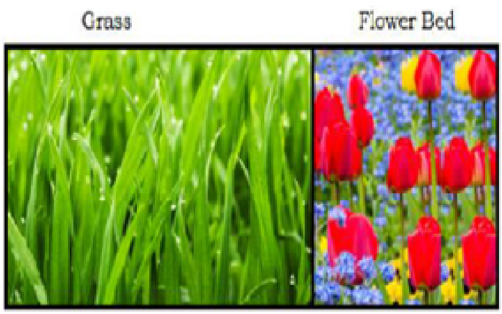
iii. Find the cost of production of 15 articles. (2)

OR

Find the number of articles made by Potter in a day if the total cost of production is ₹ 1575. (2)

62. **Read the following text carefully and answer the questions that follow:** **[4]**

Shreya has a field with a flowerbed and grassland. The grassland is in the shape of rectangle while flowerbed is in the shape of square. The length of the grassland is found to be 3 m more than twice the length of the flowerbed. Total area of the whole land is 1260 m^2.



i. If the length of the square is x m then find the total length of the field. (1)

ii. What will be the perimeter of the whole figure in terms of x? (1)

iii. Find the value of x if the area of total field is 1260 m^2. (2)

OR

Find area of grassland and the flowerbed separately. (2)

63. **Read the following text carefully and answer the questions that follow:** **[4]**

The angry Arjun carried some arrows for fighting with Bheeshm. With the half of the arrows, he cut down the arrows thrown by Bheeshm on him and with six other arrows, he killed the charioteer of Bheeshm. With one arrow each, he knocked down respectively the chariot, flag and the bow of Bheeshma. Finally, with one more than four times the square root of arrows, he laid Bheeshm unconscious on an arrow bed.

i. If Arjun had x arrows then by how many arrows he cut down arrows thrown by Bheeshm? (1)
ii. If Arjun had x arrows then by how many arrows he laid Bheeshm unconscious on arrow bed? (1)
iii. Find the total number of arrows Arjun had. (2)

OR

From a quadratic equation by the no of arrows used by Arjuna? (2)

64. **Read the following text carefully and answer the questions that follow:** **[4]**

A rectangular floor area can be completely tiled with 200 square tiles. If the side length of each tile is increased by 1 unit, it would take only 128 tiles to cover the floor.

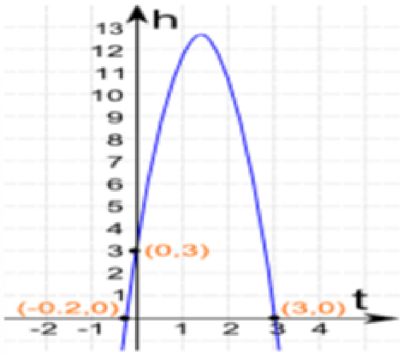
i. Assuming the original length of each side of a tile be x units, make a quadratic equation from the above information. **(1)**
ii. Write the corresponding quadratic equation in standard form. **(1)**
iii. a. Find the value of x, the length of side of a tile by factorisation. **(2)**

OR

b. Solve the quadratic equation for x, using quadratic formula. **(2)**

65. **Read the following text carefully and answer the questions that follow:** **[4]**

Michael throws a ball with a speed of 14 m/s which follows the curve = $-5t^2 + 14t + 3$ where **h** represents height in meters and time **t** in seconds.



i. Find the possible values of **t** when the ball touches the ground. (1)
ii. Find the maximum height attained by the ball. (1)
iii. What is the vertical component of velocity at h_{max}? (2)

OR

Find the position of ball at t = 18. (2)

Section E

66. 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. **[5]**

67. 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 **[5]**

68. Find the values of k for which the equation $(3k+1)x^2+2(k+1)x+1$,has equal roots. Also find the roots. **[5]**

69. Find all the values of k for which the quadratic equation $2x^2 + kx + 8 = 0$ has equal roots. Also, find the roots. **[5]**

70. The difference of the squares of two numbers is 45. The square of the smaller number is 4 times the larger number. Determine the numbers. **[5]**

71. 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(l + 3k) + 7(3 + 2k) = 0 has equal roots. **[5]**

72. If the price of a book is reduced by ₹ 5, a person can buy 4 more books for ₹ 600. Find the original price of the book. **[5]**

73. The side of a square exceeds the side of another square by 4 cm and the sum of the areas of the two squares is 400 cm^2. Find the sides of the squares. **[5]**

74. 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) **[5]**

75. The sum of the ages of a boy and his sister (in years) is 25 and product of their ages is 150. Find their present ages. **[5]**