GRADE X

Question Bank (MATHEMATICS)

Chapter-4 Quadratic Equation

1 marks:

1. The quadratic equation $(x^2+1)^2 - x^2 = 0$ has
   a) Four real roots
   b) No real roots
   c) two real roots
   d) one real root

2. The quadratic equation $2x^2 - \sqrt{5}x + 1 = 0$ has
   a) Two distinct real roots
   b) No real roots
   c) two equal real roots
   d) more than 2 real roots

3. The quadratic equation $2x^2 - 3\sqrt{2}x + \frac{9}{4} = 0$ has
   a) Two distinct real roots
   b) No real roots
   c) two equal real roots
   d) more than 2 real roots

4. The quadratic equation $x^2 + 3x + 2\sqrt{2} = 0$ has
   a) Two distinct real roots
   b) No real roots
   c) two equal real roots
   d) more than 2 real roots

5. The quadratic equation $5x^2 - 3x + 1 = 0$ has **[BOARD 2024]**
   a) Two distinct real roots
   b) No real roots
   c) two equal real roots
   d) more than 2 real roots

6. Nature of roots of quadratic equations $2x^2 - 4x + 3 = 0$ is
   a) Real b) equal c) not real d) none of them

7. The roots of the quadratic equation $x^2 - 0.04 = 0$ are **[BOARD 2023]**
   a) ± 0.2 b) ± 0.02 c) 0.4 d) 2

8. What is the positive real root of $64x^2 - 1 = 0$?
   a) $1/8$ b) $1/4$ c) $1/2$ d) $1/6$

9. The real roots of the equation $x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 = 0$ are
   a) 1, 8 b) -1, -8 c) -1, 8 d) 1, -8

10. If ½ is a root of the equation $x^2 + kx - \frac{5}{4} = 0$, then the value of k is **[BOARD 2024]**
    a) 2 b) -2 c) ¼ d) ½

11. If $r = 3$ is a root of quadratic equation $kr^2 - kr - 3 = 0$ then the value of k is
    a) $1/2$ b) 3 c) $1/3$ d) $1/4$

12. If $x = 0.3$ is a root of the equation $x^2 - 0.9k = 0$ then k is **[BOARD 2023]**
    a) 1 b) 10 c) 0.1 d) 100

13. If p is the root of the equation $x^2 - (p+q)x + k = 0$ then the value of k is
    a) p b) q c) p+q d) pq

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14. If the roots of the equation $ax^2 + bx + c = 0, a \neq 0$ are real and equal then which of the following relation is true? **[BOARD 2024]**

a) $a = \frac{b^2}{c}$ b) $b^2 = ac$ c) $ac = \frac{b^2}{4}$ d) $c = \frac{b^2}{a}$

15. If the quadratic equation $x^2 + 4x + k = 0$ has real and equal roots, then

a) $k < 4$ b) $k > 4$ c) $k = 4$ d) $k \geq 4$

16. Value(s) of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is/are

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

17. Find the value of k for which the equation $x^2 + k(2x + k - 1) + 2 = 0$ has real and equal roots. **[BOARD 2023]**

a) 2 b) 3 c) 4 d) 5

18. If $x^2 + k(4x + k - 1) + 2 = 0$ has equal roots, then k is

a) $-\frac{2}{3}, 1$ b) $\frac{2}{3}, -1$ c) $\frac{3}{2}, \frac{1}{3}$ d) $\frac{3}{2}, -\frac{1}{3}$

19. If the quadratic equation $ax^2 + bx + c = 0$ has two real and equal roots then c is **[BOARD 2023 & BOARD 2024]**

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

20. The quadratic equations $x^2 - 4x + k = 0$ has distinct real roots if

a) $k = 4$ b) $k > 4$ c) $k = 16$ d) $k < 4$

21. The least positive value of k for which the quadratic equation $2x^2 + kx - 4 = 0$ has rational roots, is **[BOARD 2023]**

a) $\pm 2\sqrt{2}$ b) 2 c) ± 2 d) $\sqrt{2}$

22. Let p be a prime number. The quadratic equation having its roots as factors of p is

a) $x^2 - px + p = 0$ c) $x^2 - (p + 1)x + p = 0$

b) $x^2 + (p + 1)x + p = 0$ d) $x^2 - px + p + 1 = 0$

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

a) $x^2 - 4x + 5 = 0$ c) $x^2 + 3x - 12 = 0$

b) $2x^2 - 7x + 6 = 0$ d) $3x^2 - 6x - 2 = 0$

24. Which of the following equations has the sum of its roots as 4? **[BOARD 2023]**

a) $2x^2 - 4x + 8 = 0$ c) $-x^2 + 4x + 4 = 0$

b) $\sqrt{2}x^2 - \frac{4}{\sqrt{2}}x + 1 = 0$ d) $4x^2 - 4x + 4 = 0$

25. A quadratic equation whose roots are $2 + \sqrt{3}$ *and* $2 - \sqrt{3}$ is **[BOARD 2023]**

a) $x^2 - 4x + 1 = 0$ c) $x^2 + 4x + 1 = 0$

b) $4x^2 - 3 = 0$ d) $x^2 - 1 = 0$

26. Each root $x^2 - bx + c = 0$ is decreased by 2. The resulting equation is $x^2 - 2x + 1 = 0$ then

a) $b = 6, c = 9$ b) $b = 3, c = 5$ c) $b = 2, c = -1$ d) $b = -4, c = 3$

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27. If one root of the equation $ax^2 + bx + c = 0$ is the reciprocal of the other, then
    a) $b = c$ b) $a = b$ c) $ac = 1$ d) $a = c$

28. If one root of the equation $(k-1)x^2 - 10x + 3 = 0$ is the reciprocal of the other then the value of k is
    a) 2 b) 3 c) 4 d) 5

29. The linear factors of the quadratic equation $x^2 + kx + 1 = 0$ are
    a) $k \geq 2$ b) $k \leq 2$ c) $k \geq -2$ d) $2 \leq k \leq -2$

30. The condition for one root of the quadratic equation $ax^2 + bx + c = 0$ to be twice the other, is
    a) $b^2 = 4ac$ b) $2b^2 = 9ac$ c) $c^2 = 4a + b^2$ d) $c^2 = 9a - b^2$

31. The equation $2x^2 + 2(p+1)x + p = 0$ where p is real, always has roots that are
    a) Equal c) equal in magnitude but opposite in sign
    b) Irrational d) real

32. If α *and* β are roots of $ax^2 - bx + c = 0 (a \neq 0)$ then value of $\alpha + \beta$ is
    a) $\frac{b}{a}$ b) $\frac{a}{b}$ c) $\frac{2a}{b}$ d) $\frac{a}{2b}$

33. If the discriminant of the quadratic equation $3x^2 - 2x + c = 0$ is 16, then the value of c is **[BOARD 2024]**
    a) 1 b) 0 c) -1 d) $\sqrt{2}$

34. The ratio of the sum and product of the roots of the quadratic equation $5x^2 - 6x + 21 = 0$ is **[BOARD 2024]**
    a) 5:21 b) 2:7 c) 21:5 d) 7:2

Options for Assertion and Reasoning Questions:

a) Both assertion(A) and reason(R) are true and reason(R) is the correct explanation of assertion(A)

a) Both assertion(A) and reason(R) are true but reason(R) is not the correct explanation of assertion(A)

b) Assertion (A) is true but reason (R) is false

c) Assertion (A) is false but reason (R) is true

35. ***Assertion (A):*** $4x^2 - 12x + 9 = 0$ has repeated roots.
    Reason (R): The quadratic equation has repeated roots if discriminant $D > 0$.

36. ***Assertion (A):*** The equation $x^2 + 3x + 1 = (x-2)^2$ has repeated roots.
    Reason (R): Any equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$, is called a quadratic equation.

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37. ***Assertion (A):*** The value of x are $\frac{-a}{2}$, a for a quadratic equation $2x^2 + ax - a^2 = 0$.

Reason (R): For quadratic equation $ax^2 + bx + c = 0$ where $\neq 0$ $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$.

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

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

39. ***Assertion (A):*** The roots of the quadratic equation $x^2 + 2x + 2 = 0$ are imaginary.

Reason (R): If discriminant $D = b^2 - 4ac < 0$ then the roots of the quadratic equation $ax^2 + bx + c = 0$ are imaginary.

40. ***Assertion (A):*** If $5 + \sqrt{7}$ is a root of a quadratic equation with rational co-efficient then its other root is $5 - \sqrt{7}$.

Reason (R): Surd roots of the quadratic equation with rational coefficient occur in conjugate pairs. **[BOARD 2023]**

2 marks:

1. Find the sum and product of the roots of the quadratic equation $2x^2 - 9x + 4 = 0$. **[BOARD 2023]**
2. Find the discriminant of the quadratic equation $4x^2 - 5 = 0$ and hence comment on the nature of roots of the equation. **[BOARD 2023]**
3. A natural number when increased by 12 equals 160 times the reciprocal. Find the number. **[BOARD 2023]**
4. If one root of the quadratic equation $x^2 + 12x - k = 0$ is thrice the other root, then find the value of k. **[BOARD 2023]**

3 marks:

1. Solve: $\frac{1}{x} - \frac{1}{x-2} = 3, x \neq 0, 2.$
2. Solve: $\frac{1}{x} + \frac{2}{2x-3} = \frac{1}{x-2}, x \neq 0, \frac{2}{3}, 2.$
3. Solve: $\frac{1}{x+4} - \frac{1}{x+7} = \frac{11}{30}, x \neq -4, -7.$
4. Solve: $\frac{x+1}{x-1} + \frac{x-2}{x+2} = 4 - \frac{2x+3}{x-2}, x \neq 1, -2, 2.$
5. Solve: $\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0, x \neq 3, \frac{-3}{2}.$
6. Solve: $x^2 + \left(\frac{a}{a+b} + \frac{a+b}{a}\right)x + 1 = 0.$
7. Solve: $\frac{1}{(x-1)(x-2)} + \frac{1}{(x-2)(x-3)} = \frac{2}{3}, x \neq 1, 2, 3.$
8. Find the value of p for which the quadratic equation $px(x-2) + 6 = 0$ has two equal real roots. **[BOARD 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.

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10. The sum of two numbers is 15. If the sum of their reciprocals is $\frac{3}{10}$ find the two numbers. **[BOARD 2023]**
11. If $\alpha \, and \, \beta$ are roots of the quadratic equation $x^2 - 7x + 10 = 0$ find the quadratic equation whose roots are $\alpha^2 \, and \, \beta^2$. **[BOARD 2023]**
12. In a 2-digit number, the digit at the unit's place is 5 less than the digit at the ten's place. The product of the digits is 36. Find the number. **[BOARD 2024]**
13. Three consecutive integers are such that sum of the square of second and product of other two is 161. Find the three integers. **[BOARD 2024]**
14. A dealer sells an article for Rs 75 and gains as much percent as the cost price of the article. Find the cost price of the article. **[BOARD 2024]**

5 marks:

1. Solve: $\left(\frac{2x}{x-5}\right)^2 + \left(\frac{2x}{x-5}\right) - 24 = 0, x \neq 5.$
2. Solve: $\frac{x+3}{x-2} - \frac{1-x}{x} = \frac{17}{4}, x \neq 0, 2.$
3. Solve: $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}, x \neq -1, -2, -4.$
4. Solve: $4x^2 + 4bx - (a^2 - b^2) = 0.$
5. Find x in terms of a, b and c: $\frac{a}{x-a} + \frac{b}{x-b} = \frac{2c}{x-c}, x \neq a, \; b, c.$
6. Solve: $\frac{x-1}{2x+1} + \frac{2x+1}{x-1} = 2$ where $x \neq \frac{-1}{2}, 1.$
7. Solve: $\frac{1}{x-2} + \frac{2}{x-1} = \frac{6}{x}, x \neq 0, 1, 2.$
8. Solve: $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$
9. If $x = -2$ is a root of the equation $3x^2 + 7x + p = 0$ find the value of k so that the roots of the equation $x^2 + k(4x + k - 1) + p = 0$ are equal.
10. 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. **[BOARD 2024]**
11. Find the 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. **[BOARD 2024]**
12. Find the positive values of k for which the quadratic equations $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ both will have the real roots.
13. Write all values of p for which the quadratic equation $x^2 + px + 16 = 0$ has equal roots. Find the roots of the equation so obtained.
14. If the roots of the quadratic equation $(x - a)(x - b) + (x - b)(x - c) + (x - c)(x - a) = 0$ are equal. Then show that $a = b = c$.
15. A two digit number is such that product of its digits is 14. If 45 is added to the number, the digits interchange their places. Find the number. **[BOARD 2024]**
16. An express train takes 1 hour less than a passenger train to travel 132 km between Mysore and Bangalore (without taking into consideration the time they stop at intermediate stations). If the average speed of the express train is 11 km/hr more than that of the passenger train, find the average speed of the two trains.

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17. A fast train takes 3 hours less than a slow train for a journey of 60 km. If the speed of the slow train is 10 km/hr less than that of the fast train, find the speed of each train.
18. A train travels at a certain average speed for a distance of 54 km and then travels at a distance of 63 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? **[BOARD 2023]**
19. A train travels a distance of 90 km at a constant speed. Had the speed been 15 km/hr more, it would have taken 30 minutes less for the journey. Find the original speed of the train. **[BOARD 2024]**
20. A motor boat whose speed is 18 km/hr 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.
21. A motor boat whose speed in still water is 9 km/hr, goes 15 km downstream and comes back to the same spot, in a total time of 3 hours 45 minutes. Find the speed of the stream.
22. A motor boat whose speed is 15 km/hr in still water goes 30 km downstream and comes back in 4 hours 30 minutes. Find the speed of the stream.
23. To fill a swimming pool two pipes are used. If the pipe of larger diameter used for 4 hours and the pipe of smaller diameter for 9 hours, only half of 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?
24. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/hr from its usual speed and the time of the flight increased by 30 minutes. Find the scheduled duration of the flight. **[BOARD 2024]**
25. A person on tour has Rs.4200 for his expenses. If he extends his tour for 3 days, he has to cut down his daily expenses by Rs70. Find the original duration of tour.
26. A person on tour has Rs.360 for his expenses. If he extends his tour for 4 days, he has to cut down his daily expenses by Rs.3. Find the original duration of the tour.
27. If the price of the book is reduced by Rs. 5, a person can buy 4 more books for Rs. 600. Find the original price of the book.
28. Two water taps together can fill a tank in $\frac{15}{8}$ hours. The tap of larger diameter takes 2 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank. **[BOARD 2023]**
29. Two pipes running together can fill a cistern in $3\frac{1}{13}$ hours. If one pipe takes 3 hours more than the other to fill it, find the time in which each pipe would fill the cistern.
30. A rectangular park is to be designed whose breadth is 3 m less than its length. Its area is to be 4 square meters 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 its length and breadth.

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31. Some students planned a picnic. The total budget for food was Rs. 2,000. But 5 students failed to attend the picnic and thus the cost of food for each member increased by Rs. 20. How many students attended the picnic and how much did each student pay for the food?
32. If Zeba was younger by 5 years than what she really is, then the square of her age (in years) would have been 11 more than five times her actual age. What is her age now?
33. The age of a man is twice the square of the age of his son. Eight years hence, the age of the man will be 4 years more than three time the age of his son. Find their present ages. **[BOARD 2024]**
34. Rs.6500 were divided equally among a certain number of persons. Had there been 15 more persons, each would have got Rs. 30 less. Find the original number of persons.
35. A takes 6 days less than the time taken by B to finish a piece of work. If both A and B together can finish it in 4 days, find the time taken by B to finish the work.
36. 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. **[BOARD 2024]**
37. 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. **[BOARD 2024]**

Case Based Questions:

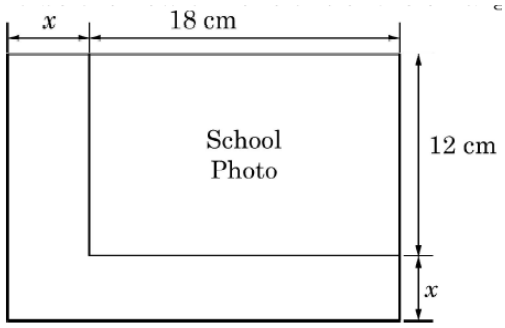
1. While designing the school year book, a teacher asked the student that the length and width of a particular photo is increased by x units each to double the area of the photo. The original photo is 18 cm long and 12 cm wide. **[BOARD 2023]**

   Based on the above information, answer the following questions:

   (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 220cm^2? **2**

2. In an auditorium, seats are arranged in rows and columns. The number of rows are equal to the number of seats in each row. When the number of rows are doubled and the number of seats in each row is reduced by 10, the total number of seats increases by 300.

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Based on the above information answer the following:

(i) If x is taken as number of row in original arrangement, write the quadratic equation that describes the situation? **1**

(ii) How many number of rows are there in the original arrangement? **1**

(iii) How many number of seats are there in the auditorium in original arrangement ? How many number of seats are there in the auditorium after re-arrangement. **2**

OR

How many number of columns are there in the auditorium after re-arrangement? **2**

3. 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. **[BOARD 2024]**

(i) Assuming the original length of each side of a tile be x units, makes a quadratic equation from the above information. **1**

(ii) Write the corresponding quadratic equation in standard form. **1**

(iii) Find the values of x, the length of side of a tile by factorization. **2**

OR

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