Class 10 Mathematics: Quadratic Equations

Source: CBSE Previous Year Questions (PYQs) | Total Questions: 34

Section A: Multiple Choice & Statement Type Questions (1 Mark Each)

1. Which of the following equations has no real roots?
   a. $x^2 - 4x + 3\sqrt{2} = 0$
   b. $x^2 + 4x - 3\sqrt{2} = 0$
   c. $x^2 - 4x - 3\sqrt{2} = 0$
   d. $3x^2 + 4\sqrt{3}x + 4 = 0$ (CBSE 2020)

2. Values of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is:
   a. 0 only
   b. 4
   c. 8 only
   d. 0, 8 (CBSE 2021)

3. Statement Type: Which of the following statements is TRUE regarding the equation $(x^2 + 1)^2 - x^2 = 0$?
   a. It has four real roots.
   b. It has two real roots.
   c. It has no real roots.
   d. (d) It has one real root. (NCERT Exemplar / PYQ Concept)

4. If one root of the equation $ax^2 + bx + c = 0$ is the reciprocal of the other, then:
   a. $a = b$
   b. $b = c$
   c. $a = c$
   d. $b = 0$ (CBSE 2020)

5. Assertion-Reasoning:
   Assertion (A): The equation $x^2 + 3x + 1 = (x - 2)^2$ is not a quadratic equation.
   Reason (R) : Any equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$ is 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.

Section B: Short Answer Type Questions (2-3 Marks Each)

6. Solve for x: $9x^2 - 6b^2x - (a^4 - b^4) = 0$ (CBSE 2015)

7. 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. Hence, find the roots. (CBSE 2015)

8. Solve for x: $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, x \neq -4, 7$ (CBSE 2020)

9. 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 2016)

10. Find the nature of the roots of the quadratic equation: $2x^2 - 6x + 3 = 0$ (CBSE 2019)

11. The sum of the squares of two consecutive natural numbers is 421. Find the numbers. (CBSE 2012)

Section C: Long Answer Type (Word Problems) (4-5 Marks Each)

12. (Time & Work) Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank. (CBSE 2019)

13. (Speed & Distance) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. Find the usual speed of the train. (CBSE 2020/2021)

14. (Upstream/Downstream) 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. (CBSE 2018)

15. (Flight/Time) A plane left 30 minutes later than the scheduled time and in order to reach its destination 1500 km away in time, it has to increase its speed by 250 km/h from its usual speed. Find its usual speed. (CBSE 2018)

16. (Geometry/Area) The sum of the areas of two squares is 468 m². If the difference of their perimeters is 24 m, find the sides of the two squares. (CBSE 2011/NCERT)

17. (Profit/Cost) A shopkeeper buys some books for ₹80. If he had bought 4 more books for the same amount, each book would have cost ₹1 less. Find the number of books he bought. (CBSE 2012)

18. (Unit Test Marks) In a class test, the sum of Shefali's marks in Mathematics and English is 30. Had she got 2 marks more in Mathematics and 3 marks less in English, the product of their marks would have been 210. Find her marks in the two subjects. (CBSE 2019)

Section D: Case-Based Questions

19. Case Study 1: The Ball Throw The height h (in feet) of a ball thrown by a child is given by $h(t) = -14t^2 + 21t + 7$ where t is time in seconds. (CBSE Case Study Bank)

   i. Find the height of the ball at $t = 1$ second.

   ii. Form a quadratic equation to find the time when the ball hits the ground ($h = 0$).

   iii. What is the discriminant of the quadratic equation formed in part (2)?

20. Case Study 2: The Flock of Swans Out of a group of swans, $\frac{7}{2}$ times the square root of the number of swans are playing on the shore of a tank. The two remaining ones are playing with amorous fight in the water. (CBSE 2016 - Classical Problem)

     (i).   Assume the total number of swans is x. Represent the above situation as a quadratic equation. (Hint: Let number of swans be y^2).

     (ii).   Find the total number of swans.

Answer Key (Brief)

1. (a)
2. (d)
3. (c) (Simplifies to $x^4 + x^2 + 1 = 0$, let $y = x^2$, $y^2 + y + 1 = 0$ has no real roots)
4. (c)
5. (a)
6. $x = \frac{b^2+a^2}{3}, \frac{b^2-a^2}{3}$
7. $p = 3$; Roots are equal ($x = 3$)
8. $x = 1,2$
9. $k = 7/4$
10. Real and distinct ($D > 0$)
11. 14 and 15
12. Smaller tap: 25 hrs, Larger tap: 15 hrs
13. $40 \frac{km}{h}$
14. $\frac{6 \text{ km}}{h}$
15. $\frac{750 \text{ km}}{h}$
16. 18 m and 12 m
17. 16 books
18. (Maths: 13, Eng: 17) or (Maths: 12, Eng: 18)
19. (1) 14ft (2) $14t^2 - 21t - 7 = 0$ (3) $D = 833$
20. Total Swans = 16 (Equation: $x - \frac{7}{2}\sqrt{x} - 2 = 0$)