

CLASS 10

MATHS

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NCERT Solutions for Class 10 Maths Chapter 4: Quadratic Equations – Free PDF Download

Chapter 4 — Quadratic Equations is one of the most exam-heavy algebra chapters in the current 2026-27 CBSE Class 10 Maths syllabus. Below are complete, step-by-step solutions for all three rationalised exercises (4.1, 4.2 and 4.3), covering how to identify a quadratic equation, solve by factorisation, and determin...

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Chapter 4 — Quadratic Equations is one of the most exam-heavy algebra chapters in the current 2026-27 CBSE Class 10 Maths syllabus. Below are complete, step-by-step solutions for all three rationalised exercises (4.1, 4.2 and 4.3), covering how to identify a quadratic equation, solve by factorisation, and determine the nature of roots using the discriminant. These Class 10 Mathematics Chapter 4 solutions are also useful as quick revision notes before exams.

NCERT Solutions for Class 10 Maths Chapter 4: Quadratic Equations

Exercise 4.1

Q1. Check whether the following are quadratic equations:

(i) $(x + 1)^2 = 2(x - 3)$

Expanding: $x^2 + 2x + 1 = 2x - 6$, so $x^2 + 2x + 1 - 2x + 6 = 0$, giving $x^2 + 7 = 0$. This is of the form $ax^2 + bx + c = 0$.

Yes, it is a quadratic equation.

(ii) $x^2 - 2x = (-2)(3 - x)$

RHS = $-6 + 2x$. So $x^2 - 2x - 2x + 6 = 0$, giving $x^2 - 4x + 6 = 0$.

Yes, it is a quadratic equation.

(iii) $(x - 2)(x + 1) = (x - 1)(x + 3)$

LHS = $x^2 - x - 2$. RHS = $x^2 + 2x - 3$. Subtracting: $-x - 2 - 2x + 3 = 0$, giving $-3x + 1 = 0$, a linear equation (x^2 terms cancel).

No, it is not a quadratic equation.

(iv) $(x - 3)(2x + 1) = x(x + 5)$

LHS = $2x^2 - 5x - 3$. RHS = $x^2 + 5x$. Subtracting: $x^2 - 10x - 3 = 0$.

Yes, it is a quadratic equation.

(v) $(2x - 1)(x - 3) = (x + 5)(x - 1)$

LHS = $2x^2 - 7x + 3$. RHS = $x^2 + 4x - 5$. Subtracting: $x^2 - 11x + 8 = 0$.

Yes, it is a quadratic equation.

(vi) $x^2 + 3x + 1 = (x - 2)^2$

RHS = $x^2 - 4x + 4$. Subtracting: $7x - 3 = 0$, a linear equation.

No, it is not a quadratic equation.

(vii) $(x + 2)^3 = 2x(x^2 - 1)$

LHS = $x^3 + 6x^2 + 12x + 8$. RHS = $2x^3 - 2x$. Subtracting: $-x^3 + 6x^2 + 14x + 8 = 0$, i.e. $x^3 - 6x^2 - 14x - 8 = 0$, a cubic equation.

No, it is not a quadratic equation.

(viii) $x^3 - 4x^2 - x + 1 = (x - 2)^3$

RHS = $x^3 - 6x^2 + 12x - 8$. Subtracting: $2x^2 - 13x + 9 = 0$, the cubic terms cancel.

Yes, it is a quadratic equation.

Q2. Represent the following situations in the form of quadratic equations:

(i) The area of a rectangular plot is 528 m^2 . The length of the plot (in metres) is one more than twice its breadth. Find the length and breadth.

Let breadth = x m, so length = $(2x + 1)$ m. Area = length $\times$ breadth: $x(2x + 1) = 528$.
 $2x^2 + x - 528 = 0$.

(ii) The product of two consecutive positive integers is 306. We need to find the integers.

Let the integers be x and $x + 1$. $x(x + 1) = 306$.

$$x^2 + x - 306 = 0.$$

(iii) Rohan's mother is 26 years older than him. The product of their ages 3 years from now will be 360. We would like to find Rohan's present age.

Let Rohan's present age = x years, so his mother's age = $(x + 26)$ years. Three years later: $(x+3)$ and $(x+29)$. $(x+3)(x+29) = 360$.

$$x^2 + 32x - 273 = 0.$$

(iv) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, it would have taken 3 hours more to cover the same distance. Find the speed of the train.

Let the speed = x km/h. Time taken = $480/x$ hours. At speed $(x-8)$, time = $480/(x-8) = 480/x + 3$.

$$480/(x-8) - 480/x = 3 \Rightarrow 480[x - (x-8)] / [x(x-8)] = 3 \Rightarrow 3840 = 3x(x-8).$$

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

Exercise 4.2

Q1. Find the roots of the following quadratic equations by factorisation:

(i) $x^2 - 3x - 10 = 0$

$$x^2 - 5x + 2x - 10 = 0 \Rightarrow x(x-5) + 2(x-5) = 0 \Rightarrow (x-5)(x+2) = 0.$$

$$x = 5 \text{ or } x = -2.$$

(ii) $2x^2 + x - 6 = 0$

$$2x^2 + 4x - 3x - 6 = 0 \Rightarrow 2x(x+2) - 3(x+2) = 0 \Rightarrow (2x-3)(x+2) = 0.$$

$$x = 3/2 \text{ or } x = -2.$$

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

$$\sqrt{2}x^2 + 5x + 2x + 5\sqrt{2} = 0 \Rightarrow x(\sqrt{2}x + 5) + \sqrt{2}(\sqrt{2}x + 5) = 0 \Rightarrow (\sqrt{2}x + 5)(x + \sqrt{2}) = 0.$$

$$x = -5/\sqrt{2} \text{ or } x = -\sqrt{2}.$$

(iv) $2x^2 - x + 1/8 = 0$

$$\text{Multiplying throughout by 8: } 16x^2 - 8x + 1 = 0 \Rightarrow (4x - 1)^2 = 0.$$

$$x = 1/4, 1/4 \text{ (equal roots)}.$$

(v) $100x^2 - 20x + 1 = 0$

$$(10x - 1)^2 = 0.$$

$$x = 1/10, 1/10 \text{ (equal roots)}.$$

Q2(a). John and Jivanti together have 45 marbles. Both of them lost 5 marbles each, and the product of the number of marbles they now have is 124. Find how many marbles they had to start with.

Let John have x marbles, so Jivanti has $(45-x)$. After losing 5 each: $(x-5)(40-x) = 124 \Rightarrow -x^2 + 45x - 200 = 124 \Rightarrow x^2 - 45x + 324 = 0 \Rightarrow (x-36)(x-9) = 0$.

John and Jivanti had 36 and 9 marbles, or 9 and 36 marbles, respectively.

Q2(b). A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in ₹) was found to be 55 minus the number of toys produced in a day. On a particular

day, the total cost of production was ₹750. Find the number of toys produced that day.

Let x = number of toys. Cost per toy = $(55-x)$. Total cost: $x(55-x) = 750 \Rightarrow x^2 - 55x + 750 = 0 \Rightarrow (x-25)(x-30) = 0$.

25 or 30 toys were produced that day.

Q3. The sum of two numbers is 27 and their product is 182. Find the numbers.

Let the numbers be x and $(27-x)$. $x(27-x) = 182 \Rightarrow x^2 - 27x + 182 = 0$. Discriminant = $729 - 728 = 1$. $x = (27 \pm 1)/2$.

The numbers are 13 and 14.

Q4. Find two consecutive positive integers, sum of whose squares is 365.

Let the integers be x and $x+1$. $x^2 + (x+1)^2 = 365 \Rightarrow 2x^2 + 2x - 364 = 0 \Rightarrow x^2 + x - 182 = 0 \Rightarrow (x-13)(x+14) = 0$. Rejecting the negative root:

The integers are 13 and 14.

Q5. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.

Let base = x cm, altitude = $(x-7)$ cm. By Pythagoras: $x^2 + (x-7)^2 = 13^2 \Rightarrow 2x^2 - 14x - 120 = 0 \Rightarrow x^2 - 7x - 60 = 0 \Rightarrow (x-12)(x+5) = 0$. Rejecting the negative root, $x = 12$.

Base = 12 cm, altitude = 5 cm.

Q6. A cottage industry produces a certain number of articles in a day. It was observed that on a particular day, the number of articles produced was 2 more than twice the number of workers. The cost of production of each article (in ₹) was 3 more than twice the number of articles produced that day. If the total cost of production that day was ₹90, find the number of workers and the number of articles produced.

Let workers = x . Articles = $(2x+2)$. Cost per article = $2(2x+2)+3 = (4x+7)$. Total cost: $(2x+2)(4x+7) = 90 \Rightarrow 8x^2 + 22x + 14 = 90 \Rightarrow 4x^2 + 11x - 38 = 0$. Discriminant = $121 + 608 = 729 = 27^2$. $x = (-11 \pm 27)/8$. Rejecting the negative root, $x = 2$.

Number of workers = 2, number of articles produced = 6 (at ₹15 each).

Exercise 4.3 (Nature of Roots)

Q1. Find the nature of the roots of the following quadratic equations. If real roots exist, find them.

(i) $2x^2 - 3x + 5 = 0$

$D = (-3)^2 - 4(2)(5) = 9 - 40 = -31 < 0$.

No real roots.

(ii) $3x^2 - 4\sqrt{3}x + 4 = 0$

$D = 48 - 48 = 0$.

Real and equal roots: $x = 4\sqrt{3}/6 = 2/\sqrt{3}$ (both roots).

(iii) $2x^2 - 6x + 3 = 0$

$D = 36 - 24 = 12 > 0$.

Real and distinct roots: $x = (3 \pm \sqrt{3})/2$.

Q2. Find the value(s) of k for each of the following quadratic equations so that they have two equal roots:

(i) $2x^2 + kx + 3 = 0$

$$D = k^2 - 24 = 0 \Rightarrow k^2 = 24.$$

$$k = \pm 2\sqrt{6}.$$

$$(ii) kx(x-2) + 6 = 0$$

Rewriting: $kx^2 - 2kx + 6 = 0$ ($k \neq 0$). $D = 4k^2 - 24k = 0 \Rightarrow 4k(k-6) = 0$. Since $k \neq 0$:

$$k = 6.$$

Q3. Is it possible to design a rectangular mango grove whose length is twice its breadth and area is 800 m²? If so, find its length and breadth.

Let breadth = x , length = $2x$. Area: $2x^2 = 800 \Rightarrow x^2 = 400 \Rightarrow D = 0 - 4(1)(-400) = 1600 > 0$, real distinct roots $x = \pm 20$. Rejecting the negative root:

Yes, it is possible. Breadth = 20 m, length = 40 m.

Q4. Is the following situation possible? The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years was 48.

Let one friend's present age = x , the other = $(20-x)$. Four years ago: $(x-4)(16-x) = 48 \Rightarrow -x^2 + 20x - 64 = 48 \Rightarrow x^2 - 20x + 112 = 0$. $D = 400 - 448 = -48 < 0$.

No, this situation is not possible (no real solution exists).

Q5. Is it possible to design a rectangular park of perimeter 80 m and area 400 m²? If so, find its length and breadth.

Let length = x , so breadth = $(40-x)$ (since length+breadth=40). Area: $x(40-x) = 400 \Rightarrow x^2 - 40x + 400 = 0$. $D = 1600 - 1600 = 0$, equal roots, $x = 20$.

Yes, it is possible — but only as a square park with length = breadth = 20 m.

Why This Chapter Matters

Quadratic Equations is a cornerstone algebra chapter in the CBSE Class 10 board exam — it typically contributes 6–8 marks through a mix of direct factorisation questions, discriminant/nature-of-roots reasoning, and word problems (ages, speed, area, cost), and the discriminant concept and quadratic formula introduced here are used repeatedly in Class 11 and 12 algebra, coordinate geometry, and calculus.

CBSE Exam Weightage

This chapter falls under **Unit II: Algebra** in the CBSE Class 10 Maths board exam syllabus. This unit typically carries around **20 marks (25%)** of the 80-mark theory paper, based on CBSE's published unit-wise weightage (Question Paper Design). CBSE sets weightage at the unit level rather than chapter-by-chapter, so the exact share from this specific chapter can vary a little between years and sample papers.

How to Use These Solutions

Work through each question on paper before checking the answer here — pay special attention to rejecting negative/invalid roots in word problems (ages, lengths, speeds must be positive), since that step is where marks are most often lost. You can download the full chapter directly from our [Class 10 Maths NCERT book page](#), or browse every Class 10 subject on our [Class 10 hub](#).

Class 10 Mathematics Chapter 4 – Notes and Extra Questions

Along with these NCERT Solutions, students can also use the [Class 10 Mathematics Chapter 4 Extra Questions](#) and [Class 10 Mathematics Chapter 4 Revision Notes](#) for quick revision and extra practice.

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