Class 10 Mathematics Quadratic Equations Notes

Unit 2 focus / Learn the method

Learn to recognise a quadratic equation, solve it by factorisation or the quadratic formula, and check the roots by substitution.

Start with standard form

A quadratic equation can be written as **$ax^2 + bx + c = 0$**, where a, b and c are constants and **$a \neq 0$**. Its highest power of x is 2. Move every term to one side before identifying the coefficients.

For $3x^2 + 7 = 8x$, standard form is $3x^2 - 8x + 7 = 0$. Therefore a = 3, b = -8 and c = 7. The minus sign is part of b.

Two reliable methods

Method	How to use it
Factorisation	Write the expression as a product. If AB = 0, then A = 0 or B = 0. Set each factor equal to zero.
Quadratic formula	$x = (-b \pm \sqrt{(b^2 - 4ac)}) / (2a)$. Keep brackets around the whole numerator and denominator.

What the discriminant tells you

The discriminant is **$D = b^2 - 4ac$**. For real coefficients, $D > 0$ gives two distinct real roots; $D = 0$ gives one repeated real root; $D < 0$ gives no real roots (the roots form a complex conjugate pair).

Worked example 1 Factorisation

Solve $x^2 - 5x + 6 = 0$.
Find two numbers with product 6 and sum -5: -2 and -3.
$(x - 2)(x - 3) = 0$
$x - 2 = 0$ or $x - 3 = 0$
x = 2 or x = 3.

Check x = 2: 4 - 10 + 6 = 0. Check x = 3: 9 - 15 + 6 = 0. Both roots satisfy the original equation.

Worked examples and practice

Try the questions before turning to the answer key

Worked example 2 A coefficient before x squared

Solve $2x^2 + x - 6 = 0$.
$2x^2 + 4x - 3x - 6 = 0$
$2x(x + 2) - 3(x + 2) = 0$
$(2x - 3)(x + 2) = 0$
$x = 3/2$ or $x = -2$.

Worked example 3 Use the formula

Solve $x^2 - 4x + 1 = 0$. Here $a = 1$, $b = -4$, $c = 1$.
$D = (-4)^2 - 4(1)(1) = 12$
$x = (4 \pm \sqrt{12}) / 2 = (4 \pm 2\sqrt{3}) / 2$
$x = 2 + \sqrt{3}$ or $x = 2 - \sqrt{3}$. Keep the exact surd form unless decimals are requested.

Independent practice

1. Write $4x^2 + 9 = 12x$ in standard form and identify a, b and c.

2. Solve $x^2 - 7x + 12 = 0$.

3. Solve $3x^2 - x - 2 = 0$.

4. Solve $2x^2 - 8 = 0$.

5. Use the quadratic formula to solve $x^2 + 2x - 2 = 0$.

6. Find the discriminant and state the nature of the roots of $x^2 + 6x + 9 = 0$.

7. Does $x^2 + x + 1 = 0$ have real roots? Give a reason.

8. A student divides $x^2 - 4x = 0$ by x and writes only $x = 4$. Explain the missing solution.

Working checklist: write standard form, keep coefficient signs, show the method, give all roots and substitute to check.

Answers and common mistakes

Use the explanations to correct your working

1. $4x^2 - 12x + 9 = 0$, so $a = 4$, $b = -12$ and $c = 9$.

2. $(x - 3)(x - 4) = 0$, so $x = 3$ or $x = 4$.

3. $3x^2 + 2x - 3x - 2 = 0$. Thus $(3x + 2)(x - 1) = 0$ and $x = -2/3$ or $x = 1$.

4. $2x^2 = 8$, so $x^2 = 4$ and $x = \pm 2$. Both 2 and -2 square to 4.

5. $a = 1$, $b = 2$, $c = -2$. $D = 4 + 8 = 12$. Therefore $x = (-2 \pm \sqrt{12})/2 = -1 \pm \sqrt{3}$.

6. $D = 6^2 - 4(1)(9) = 0$. There is one repeated real root, $x = -3$.

7. $D = 1 - 4 = -3$. The equation has no real roots because the square root of a negative number is not real.

8. Factor first: $x(x - 4) = 0$. The solutions are $x = 0$ and $x = 4$. Dividing by x assumes $x \neq 0$ and loses the root $x = 0$.

Mistakes to catch before you finish

Do not read b as positive when its term is negative. In the formula, square b using brackets. Divide the entire numerator by 2a. Keep both branches of ±. Avoid dividing by an expression that might be zero without checking that case.

Five minute revision

Without looking back, write standard form and the quadratic formula. Then solve $x^2 - 9 = 0$ and explain why there are two roots. Answer: $(x - 3)(x + 3) = 0$, giving $x = 3$ and $x = -3$.

Scope and reference

Focus: algebraic solution of quadratic equations within Unit 2. Graphical solution, quadratic inequalities and real-world application exercises are outside this pack.

Curriculum reference: PECTAA Grade 10 ALP, session 2026-27 / exam 2027, dated 14 November 2026. Checked 15 November 2026. See the official Curriculum and Compliance page and Grade 10 notification.

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