

Quadratic Equations

Printable teaching and practice sheet

Chapter 3 | Module 12 | Student Book pages 115-131 | Suggested time: 50 minutes | 20 marks



Name: _____ Class: _____ Date: _____

Learning goals

- Explain and apply quadratic formula with valid conditions and clear reasoning.
- Explain and apply roots and coefficients with valid conditions and clear reasoning.
- Explain and apply signs of roots with valid conditions and clear reasoning.

Quick reference

Quadratic formula	For $ax^2+bx+c=0$ with $a \neq 0$, $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$.
Roots and coefficients	For $ax^2+bx+c=0$, $\alpha + \beta = -b/a$ and $\alpha\beta = c/a$.
Signs of roots	The signs of real roots can be inferred from their product, sum, and discriminant.

Worked example

To solve $2x^2+x-3=0$: $D=25$, so the quadratic formula gives $x = \frac{-1 \pm 5}{4}$; hence $x=1$ or $x=-3/2$.

Graduated practice

Answer without viewing the key. Show complete working for short-response questions.

1. What is the solution set of $x^2-5x+6=0$? [1 marks]

- A) {2, 3} B) {-2, -3}
C) {1, 6} D) {5, 6}

2. What is the nature of the roots of $2x^2+4x+5=0$ over the real numbers? [1 marks]

- A) Two equal real roots B) Two distinct real roots
C) No real roots D) One real root equal to -1

3. If α and β are the roots of $3x^2-7x-6=0$, find $\alpha+\beta$ and $\alpha\beta$. [1 marks]

- A) $\alpha+\beta=-7/3$, $\alpha\beta=-2$ B) $\alpha+\beta=7/3$, $\alpha\beta=2$
C) $\alpha+\beta=7/3$, $\alpha\beta=-2$ D) $\alpha+\beta=-7/3$, $\alpha\beta=2$

4. Which monic equation has roots -2 and 5? [1 marks]

- A) $x^2+3x-10=0$ B) $x^2-3x-10=0$
C) $x^2-7x+10=0$ D) $x^2+7x-10=0$

5. If the roots of $x^2+5x+6=0$ are real, what are their signs? [1 marks]

- A) Both positive B) Both negative
C) Opposite signs D) One is zero

6. Which is the correct factorisation of $2x^2-x-6$? [1 marks]

- A) $(2x-3)(x+2)$ B) $(2x+3)(x-2)$
C) $(2x-1)(x+6)$ D) $(x-3)(2x+2)$

7. True or false: if the discriminant of a quadratic equation is zero, it has two equal real roots. [1 marks]

☐ True ☐ False

8. True or false: if the product of the roots of a quadratic is positive, both roots must be positive. [1 marks]

☐ True ☐ False

9. Solve $2x^2+x-3=0$ using the quadratic formula, giving both roots in simplest form. [3 marks]

10. If α and β are the roots of $x^2-4x-1=0$, find $\alpha^2+\beta^2$ without solving the equation. [3 marks]

11. Form a quadratic equation with integer coefficients whose roots are $\frac{1}{2}$ and $-\frac{1}{3}$. [3 marks]

12. Find the values of m for which the roots of $x^2+(m-2)x-3m=0$ are real and have opposite signs. [3 marks]

Challenge and review

1. Derive the quadratic formula for $ax^2+bx+c=0$, where a is nonzero, by completing the square.

2. If α and β are the roots of $2x^2-5x-3=0$, form an equation whose roots are $\alpha+1$ and $\beta+1$ without first finding α and β .

3. Error analysis: a student claims $D>0$ proves that both roots are positive. Explain what the discriminant actually proves and what additional information determines the signs.

Follow-up plan

Below 14/20: revisit the quadratic formula, discriminant, root relations and signs, then retry Questions 2-6 and 9-12. At 14 or above: continue to the online module challenge.