

## I. Lesson Overview

<b>Lesson Title:</b>	Quadratic Expressions
<b>Strand:</b>	Numbers and Algebra
<b>Sub-Strand:</b>	Quadratic Expressions and Equations 1
<b>Grade Level:</b>	10
<b>Estimated Duration:</b>	40 minutes

### Key Inquiry Question

*How do we apply the concept of quadratic equations?*

## II. Learning Objectives & Standards

### Learning Objectives

Upon completion of this lesson, students will be able to:

1. **Know (Conceptual Understanding):** Understand the structure of a quadratic expression ( $ax^2 + bx + c$ ), including the quadratic term, linear term, and constant term.
2. **Do (Procedural Skill):** Form quadratic expressions by multiplying monomials and binomials using the distributive property and collecting like terms.
3. **Apply (Application/Problem-Solving):** Apply algebraic manipulation to simplify expressions and form quadratic expressions from different situations.

### Curriculum Alignment

<b>Strand:</b>	Numbers and Algebra
<b>Sub-Strand:</b>	Quadratic Expressions and Equations 1
<b>Specific Learning Outcome:</b>	Form quadratic expressions from different situations.

## III. Materials & Resources

<b>Textbooks:</b>	<a href="#">CBC Grade 10 Mathematics Learner's Book</a> <a href="#">CBC Grade 10 Mathematics Teacher's Book</a>
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## IV. Lesson Procedure

### Phase 1: Problem-Solving and Discovery / Engage & Explore (15 minutes)

**Objective:** To activate prior knowledge about algebraic expressions and explore the structure of quadratic expressions.

#### Anchor Activity: Exploring Quadratic Expressions

Work in Groups:

- Identify and label the terms of the quadratic expression: quadratic term, linear term, and constant term.
- Discuss whether the expression is in standard form and, if not, try to convert it.
- Identify the coefficients (a, b) and constant (c).
- Discuss the properties of the expression: whether it can be factored, whether it has real solutions, etc.
- Present your findings to the class.

#### Examples of Quadratic Expressions for Groups:

- Group 1:  $2x^2 + 5x - 3$
- Group 2:  $3x^2 - 4x + 1$
- Group 3:  $x^2 + 6x + 9$
- Group 4:  $4x^2 - 9$

**Teacher's Role:** The teacher circulates among the groups, asking probing questions (e.g., "Which term has  $x^2$ ?", "What is the coefficient of  $x$ ?", "What happens if  $a = 0$ ?"). The teacher uses student discoveries to bridge to formal instruction on forming quadratic expressions.

### Phase 2: Structured Instruction / Explain (10 minutes)

**Objective:** To formalize the definition and structure of quadratic expressions and methods to form them.

#### Key Takeaways:

##### Definition of a Quadratic Expression:

A quadratic expression is an expression of the form:

$$ax^2 + bx + c$$

Where:

- a, b, and c are constants (real numbers)
- x is a variable

- $a \neq 0$  (if  $a = 0$ , it would not be a quadratic expression)

**Parts of a Quadratic Expression:**

Term	Example ( $2x^2 + 5x - 3$ )	Description
Quadratic Term	$2x^2$	The term with $x^2$ (coefficient $a = 2$ )
Linear Term	$5x$	The term with $x$ (coefficient $b = 5$ )
Constant Term	$-3$	The term without $x$ ( $c = -3$ )

**Types of Algebraic Expressions:**

- Monomial: An expression with one term (e.g.,  $3x$ ,  $y^2$ ,  $5$ )
- Binomial: An expression with two terms (e.g.,  $(a + b)$ ,  $(x - 3)$ )

**Forming Quadratic Expressions:**

Quadratic expressions can be formed by:

1. Multiplying a monomial by a binomial (using distributive property)
2. Multiplying two binomials

**The Distributive Property:**

When multiplying a monomial by a binomial, multiply the monomial by each term in the binomial, then combine like terms.

Example:  $a(b + c) = ab + ac$

**Addressing Misconceptions:** "Remember: When distributing a negative sign, it changes the sign of each term inside the bracket. Also, always collect like terms at the end to simplify your expression."

**Phase 3: Practice and Application / Elaborate (15 minutes)**

**Objective:** To apply the distributive property and form quadratic expressions by simplifying algebraic expressions.

**Worked Example:**

Simplify:  $2a(a - 1) - 3(a^2 - 1)$

Solution:

Step 1: Open the brackets using distributive property

$$2a(a - 1) - 3(a^2 - 1)$$

$$= 2a(a) + 2a(-1) + (-3)(a^2) + (-3)(-1)$$

$$= 2a^2 - 2a - 3a^2 + 3$$

Step 2: Collect like terms

$$= 2a^2 - 3a^2 - 2a + 3$$

$$= -a^2 - 2a + 3$$

**Note:** In this example,  $(2a)$  and  $(-3)$  are monomial expressions, while  $(a - 1)$  and  $(a^2 - 1)$  are binomial expressions.

**Teacher's Role:** The teacher monitors students, emphasizing careful sign handling when distributing negative terms.

#### Phase 4: Assessment / Evaluate (Exit Ticket)

**Objective:** To formatively assess individual student understanding.

#### Exit Ticket Questions:

Form a quadratic expression by simplifying:

1.  $3x(x + 2) - 4(x^2 - 1)$
2.  $8n(n + 5) - 3(n^2 - 6)$
3.  $4p(p - 1) - 5(p^2 + 2)$
4.  $7a(a + 3) - 2(a^2 - 2)$

#### Answer Key:

1.  $3x(x + 2) - 4(x^2 - 1)$   
 $= 3x^2 + 6x - 4x^2 + 4$   
 $= -x^2 + 6x + 4$
2.  $8n(n + 5) - 3(n^2 - 6)$   
 $= 8n^2 + 40n - 3n^2 + 18$   
 $= 5n^2 + 40n + 18$
3.  $4p(p - 1) - 5(p^2 + 2)$   
 $= 4p^2 - 4p - 5p^2 - 10$

$$= -p^2 - 4p - 10$$

$$4. 7a(a + 3) - 2(a^2 - 2)$$

$$= 7a^2 + 21a - 2a^2 + 4$$

$$= 5a^2 + 21a + 4$$

## V. Differentiation

Student Group	Strategy & Activity
<b>Struggling Learners (Support)</b>	Scaffolding: Provide step-by-step templates showing the distribution process. Start with simpler expressions (one monomial $\times$ one binomial). Use color coding to track terms. Allow peer support during practice.
<b>On-Level Learners (Core)</b>	The core lesson activities as described above.
<b>Advanced Learners (Challenge)</b>	Extension Activity: Simplify more complex expressions such as: a) $2m - 2(m - 1)^2$ b) $(x + 2)(x - 3) + x(x + 1)$ c) Create a real-world problem that results in a quadratic expression.

### Extension Activity Solutions:

$$a) 2m - 2(m - 1)^2$$

$$= 2m - 2(m^2 - 2m + 1)$$

$$= 2m - 2m^2 + 4m - 2$$

$$= -2m^2 + 6m - 2$$

$$b) (x + 2)(x - 3) + x(x + 1)$$

$$= x^2 - 3x + 2x - 6 + x^2 + x$$

$$= 2x^2 + 0x - 6$$

$$= 2x^2 - 6$$

## VI. Assessment

Type	Method	Purpose
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<b>Formative (During Lesson)</b>	- Observation during group work - Questioning during presentations - Exit Ticket	To monitor progress and adjust instruction.
<b>Summative (After Lesson)</b>	- Homework assignment - Future quiz/test questions	To evaluate mastery of learning objectives.

**Teacher's Role:** Collect and review the exit tickets to gauge student understanding and identify any common misconceptions that need to be addressed in the next lesson.

## VII. Teacher Reflection

*To be completed after the lesson.*

1. What went well?
2. What would I change?
3. Student Understanding: What did the exit tickets reveal?
4. Next Steps: Based on assessment data, what is the plan for the next lesson?