

Step by step guide: Multiplying Two Binomials

Grade 10 Mathematics | 40-Minute Lesson

Before Class Begins

Preparation Checklist:

- Prepare exploration tables for each group (5 binomial pairs)
- Write the FOIL acronym on the board (covered until Phase 2)
- Prepare exit tickets for distribution
- Set timer for phase transitions
- Have special product formulas ready to reveal

PHASE 1: Problem-Solving and Discovery (15 Minutes)

Opening (2 minutes)

[SAY]:

"Good morning/afternoon, class! Last lesson we learned about quadratic expressions. Today, we're going to learn how to CREATE quadratic expressions by multiplying two binomials together!"

[SAY]:

"Here's our key question: How do we apply the concept of quadratic equations? Let's discover the patterns together."

Anchor Activity Introduction (2 minutes)

[DISTRIBUTE exploration tables to groups]:

[SAY]:

"Each group has a table with pairs of binomials. Your task is to multiply them and find the expanded form. For example, if you have $(x + 2)(x + 3)$, you need to find what that equals when expanded."

Group Work Instructions (1 minute)

[SAY - Read slowly and clearly]:

"In your groups of 3:

1. Complete the table by multiplying each pair of binomials
2. Look for patterns in your results
3. Discuss: How do the signs affect the final answer?
4. Try creating your own binomial multiplication

You have 8 minutes. Begin!"

Circulation and Probing (6 minutes)

[DO]: Walk around the room, observing how students multiply the binomials.

[ASK probing questions as you circulate]:

- "How did you multiply the first terms together?"
- "What do you get when you multiply the outer terms?"
- "What about the inner terms?"
- "What pattern do you see with the middle terms?"
- "What happens when both signs are negative?"
- "What happens when one is positive and one is negative?"

[TIME CHECK]: At 6 minutes, announce: "Two more minutes!"

Class Discussion (4 minutes)

[SAY]:

"Let's share what you discovered. What is $(x + 2)(x + 3)$?"

[Expected answer]: " $x^2 + 5x + 6$ "

[ASK]:

"What about $(x + 3)(x - 3)$? What did you notice?"

[Expected answer]: " $x^2 - 9$. The middle terms cancelled!"

[TRANSITION]:

"Excellent observations! Let me show you the formal method and some special patterns."

PHASE 2: Structured Instruction (10 Minutes)

The FOIL Method (4 minutes)

[REVEAL FOIL on board]:

[SAY]:

"FOIL is a method to remember how to multiply two binomials:

F = First terms

O = Outer terms

I = Inner terms

L = Last terms"

[DEMONSTRATE with $(x + 2)(x + 3)$]:

" F : $x \times x = x^2$

O : $x \times 3 = 3x$

I : $2 \times x = 2x$

L : $2 \times 3 = 6$

Combined: $x^2 + 3x + 2x + 6 = x^2 + 5x + 6$ "

Special Product 1: Square of a Binomial (3 minutes)

[WRITE on board]:

$$(a + b)^2 = a^2 + 2ab + b^2$$

[SAY]:

"When you square a binomial, you get:

- The first term squared
- PLUS twice the product of both terms
- PLUS the second term squared

Similarly: $(a - b)^2 = a^2 - 2ab + b^2$ "

Special Product 2: Difference of Squares (2 minutes)

[WRITE on board]:

$$(a + b)(a - b) = a^2 - b^2$$

[SAY]:

"This is called the DIFFERENCE OF SQUARES. When you multiply $(a + b)$ by $(a - b)$, the middle terms cancel out!"

$$(a + b)(a - b) = a^2 - ab + ab - b^2 = a^2 - b^2"$$

Addressing Misconceptions (1 minute)

[SAY - IMPORTANT]:

"COMMON MISTAKE: $(a + b)^2$ is NOT equal to $a^2 + b^2$!"

You MUST include the middle term $2ab$!

$$(x + 3)^2 = x^2 + 6x + 9, \text{ NOT } x^2 + 9"$$

[TRANSITION]:

"Now let's practice with some problems!"

PHASE 3: Practice and Application (15 Minutes)

Worked Example (4 minutes)

[SAY]:

"Let's expand $(8x + 5)^2$ together."

[WRITE while explaining]:

"Method 1: Using FOIL

$$(8x + 5)^2 = (8x + 5)(8x + 5)$$

$$F: 8x \times 8x = 64x^2$$

$$O: 8x \times 5 = 40x$$

$$I: 5 \times 8x = 40x$$

$$L: 5 \times 5 = 25$$

$$= 64x^2 + 40x + 40x + 25$$

$$= 64x^2 + 80x + 25"$$

"Method 2: Using the formula $(a + b)^2 = a^2 + 2ab + b^2$

$$a = 8x, b = 5$$

$$= (8x)^2 + 2(8x)(5) + (5)^2$$

$$= 64x^2 + 80x + 25"$$

Guided Practice (5 minutes)

[SAY]:

"Try these with your partner:

- a) $(x - 1)(x - 6)$
- b) $(2x + 3)(x + 4)"$

[GIVE 4 minutes, then review]:

$$"a) (x - 1)(x - 6)$$

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

$$= x^2 - 7x + 6$$

$$b) (2x + 3)(x + 4)$$

$$= 2x^2 + 8x + 3x + 12$$

$$= 2x^2 + 11x + 12"$$

Independent Practice (6 minutes)

[SAY]:

"Now try these on your own:

- a) $2y(y + 4)$
- b) $(3y - 5)(2y + 7)$
- c) $(s + 6)^2"$

[GIVE 5 minutes, then quickly check]:

$$"a) 2y^2 + 8y$$

$$b) 6y^2 + 11y - 35$$

$$c) s^2 + 12s + 36"$$

[TRANSITION]:

"Now I want to see what each of you has learned."

PHASE 4: Assessment / Checkpoint (8 Minutes)

Checkpoint exploration (5 minutes)

[DO] Project the digital textbook on the screen. Navigate to the "Checkpoint" section.

[SAY] "This is our digital mathematics textbook. It has something special called checkpoints. Watch what happens when I click this button..."

[DO] Click "Show new example question" on Checkpoint

[SAY] "See? A new number appeared! And if I click again..."

[DO] Click the button again to show randomization

[SAY] "A different number! This means you can practice with hundreds of different examples. The computer never runs out of problems to give you."

[SAY] "Now it's your turn. With your partner, open the digital textbook and find the checkpoint.

[SAY] Click "Show new example question" to load the problem

[SAY] Solve the displayed question

[SAY] Click "submit" to check your answer

[SAY] If incorrect, carefully read the feedback and analyse the error before trying a new question. The immediate feedback from checkpoint submissions allows students to identify and correct errors in real-time.

[SAY] Complete at least 5 questions

[DO] Circulate among pairs. Ask probing questions, for example, what patterns do you notice?

Independent Work (5 minutes)

[DISPLAY questions]:

"Form quadratic expressions:

1. $-4y(3y - 2)$

2. $(x - 2)(x - 3)$ "

[SAY]:

"You have 5 minutes. Begin."

Collection and Closure (2 minutes)

[SAY]:

"Time's up. Please pass your exit tickets forward."

[COLLECT all tickets]

[SAY]:

"Today you learned:

- The FOIL method for multiplying binomials
- $(a + b)^2 = a^2 + 2ab + b^2$ (square of a binomial)
- $(a + b)(a - b) = a^2 - b^2$ (difference of squares)
- Always collect like terms at the end!"

[SAY]:

"Great work today! For homework, complete the remaining problems from the assessment sheet."

Differentiation Notes

For Struggling Learners:

- Provide FOIL templates with labeled boxes
- Use color coding for First, Outer, Inner, Last terms
- Start with simple binomials with positive terms only
- Allow peer support during practice

For Advanced Learners:

[GIVE these extensions]:

- Expand $(2x + 3y)^2$
- Find $(3a - 2b)(3a + 2b)$
- Find the product $(x + 1)(x + 2)(x + 3)$

Answer Key

Exit Ticket Answers:

1. $-4y(3y - 2): -12y^2 + 8y$

2. $(x - 2)(x - 3): x^2 - 5x + 6$

Additional Assessment Answers:

$$2y(y + 4) = 2y^2 + 8y$$

$$3x(2x + 5) = 6x^2 + 15x$$

$$-3x(4x + 7) = -12x^2 - 21x$$

$$(x - 1)(x - 6) = x^2 - 7x + 6$$

$$(2x + 3)(x + 4) = 2x^2 + 11x + 12$$

$$(3y - 5)(2y + 7) = 6y^2 + 11y - 35$$

$$(s + 6)^2 = s^2 + 12s + 36$$

Post-Lesson Reflection Prompts

- 1. What went well?** Did students discover the patterns in the exploration?
- 2. What would I change?** Was the FOIL method clear enough?
- 3. Student Understanding:** Did students remember to include the middle term in squares?
- 4. Next Steps:** Which students need more practice with sign handling?