

# Step by step guide: Multiplying Two Binomials

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## 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)

### 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?