



## Binomial Expressions

Suggested time: 75 minutes

**What's important in this lesson:**

In this lesson you will learn how to expand and simplify binomial expressions.

**Complete these steps:**

1. Read through the lesson portion of the package independently.
2. Complete any of the examples in the lesson.
3. Check your lesson answer with the lesson key your teacher has.
4. Seek assistance from the teacher as needed. If you have any questions about the examples.

**Hand-in the following to your teacher:**

1. The 'Student Handout'.

**Questions for the teacher:**

**Review of Vocabulary**

Monomial	Binomial	Trinomial	Polynomial
One term	Two terms	Three terms	Any number of terms
$3x^2$	$3x^2+6x$	$x^2 - 7x + 4$	- a term is a coefficient and one or more variables multiplied together
$xyz$	$5x-7$	$2m^3 + 4m^2 - 9m$	
$7$	$x^2 - 8$	$3x^2 - 7y^2 + 7$	

Recall the distributive property from Lesson 1.

$$2(x + 7) = 2x + 14$$

$$3k(2k - 8) = 6k^2 - 24k$$

$$5(x^2 + 3x - 12) = 5x^2 + 15x - 60$$

**Practice:** Expand each of the following.

a)  $5(x+7)$

b)  $-3(x-8)$

c)  $4x(x+5)$

d)  $-5x(x-2)$

**Multiplying a Binomial by a Binomial**

Use the acronym **FOIL** to help you remember the four parts you need to multiply.

<b>F</b>	- multiply the <b>FIRST</b> term in each bracket
<b>O</b>	- multiply the <b>OUTSIDE</b> term in each bracket
<b>I</b>	- multiply the <b>INSIDE</b> term in each bracket
<b>L</b>	- multiply the <b>LAST</b> term in each bracket

$$\begin{array}{l}
 \text{OUTSIDE } F \quad \quad \quad I \\
 \text{FIRST} \quad \quad \quad (x)(x) \quad \quad \quad (4)(x) \\
 \downarrow \quad \quad \quad \downarrow \\
 (x+4)(x-7) = x^2 - 7x + 4x - 28 = x^2 - 3x - 28 \\
 \text{INSIDE} \quad \quad \quad \uparrow \quad \quad \quad \uparrow \\
 \text{LAST} \quad \quad \quad (x)(-7) \quad \quad \quad (4)(-7) \\
 \quad \quad \quad \quad \quad O \quad \quad \quad L \\
 \text{collect } -7x + 4x \downarrow
 \end{array}$$

**Examples:**

$$\begin{aligned}
 (x+2)(x+8) \\
 = x^2 + 8x + 2x + 16 \\
 = x^2 + 10x + 16
 \end{aligned}$$

$$\begin{aligned}
 (2x+7)(x-5) \\
 = 2x^2 + 7x - 10x - 35 \\
 = 2x^2 - 3x - 35
 \end{aligned}$$

$$\begin{aligned}
 (x+8)(x-8) \\
 = x^2 + 8x - 8x - 64 \\
 = x^2 - 64
 \end{aligned}$$

**Practice:** Expand and simplify. Remember **FOIL !!!**

a)  $(x + 4)(x + 9)$

b)  $(x + 11)(x - 3)$

c)  $(x - 7)(x + 7)$

d)  $(x - 7)(x + 6)$

e)  $(x - 2)(x - 10)$

f)  $(2m + 3)(2m - 3)$

### Squaring a Binomial

For a question like  $(x + 7)^2$  the first step is to rewrite the expression and then use FOIL.

$$\begin{aligned}(x + 7)^2 &= (x + 7)(x + 7) \\ &= x^2 + 7x + 7x + 49 \\ &= x^2 + 14x + 49\end{aligned}$$

$$\begin{aligned}(x - 5)^2 &= (x - 5)(x - 5) \\ &= x^2 - 5x - 5x + 25 \\ &= x^2 - 10x + 25\end{aligned}$$

**Practice:** Expand and simplify

a)  $(x + 8)^2$

b)  $(x - 6)^2$

**Putting it all Together:** Expand and collect like terms

$$\begin{aligned}2(x + 3)^2 - 8 & \\ &= 2(x + 3)(x + 3) - 8 && \text{* write the brackets out twice} \\ &= 2(x^2 + 3x + 3x + 9) - 8 && \text{* use FOIL to expand, keep the parts inside brackets because of the 2} \\ &= 2(x^2 + 6x + 9) - 8 && \text{* collect like terms} \\ &= 2x^2 + 12x + 18 - 8 && \text{* multiply each term inside the brackets by 2} \\ &= 2x^2 + 12x + 10 && \text{* collect like terms}\end{aligned}$$

**Practice:** Expand and simplify

a)  $3(x - 4)^2 + 5$

**Practice:** Expand and simplify

a)  $x(x + 5)$

b)  $-4(x - 4)$

c)  $(x + 1)(x + 3)$

d)  $(x - 5)(x + 5)$

e)  $(3x + 1)(x - 5)$

f)  $(x + 6)^2$

g)  $(x - 9)^2$

h)  $-2(x + 3)(x - 2)$

i)  $6(x + 8)^2 - 5$

j)  $(x - 2)(x + 2) + (x + 5)(x + 6)$

Assessment and Evaluation: Unit 1 Lesson 2

Expand and simplify.

$\frac{1}{3}$

1.  $(x-1)(x+2)$

$\frac{1}{3}$

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

$\frac{1}{3}$

3.  $(3x+5)(x+2)$

$\frac{1}{3}$

4.  $(t-3)^2$

$\frac{1}{4}$

5.  $(3x+1)(3x-1) + x(2x-1)$

$\frac{1}{5}$

6.  $(x-2)(x-3) + (x-4)(x+5)$