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Module 11 Simplifying Algebraic Expressions
with Polynomials**Lesson 4** Multiplying Monomials and Binomials**guided
notes****Lesson Objectives**

- Find the product of two monomials.
- Find the product of a monomial and a binomial.
- Find the product of two binomials using the Distributive Property twice.
- Find the product of two binomials using the FOIL method.

To multiply monomials, use the _____ and
_____ Properties to rearrange the terms.

Then use the _____ rule for _____ to
simplify the expression.

1 Simplify: $x^3y \cdot 6xy^2$

2 Simplify: $2x(x + 2)$

3 Simplify: $-4ab(8a - 3b^3)$

To multiply binomials either use the _____ Property twice or
use the _____ Method.

FOIL stands for F _____, O _____,

I _____, L _____

4 Simplify: $(2p - 5)(p - 4)$

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**guided
practice**

Set 1

1. Simplify: $3v^4 \cdot (-5v^2)$

2. Simplify: $(-2x^2y^5)(-4x^3)$

3. Simplify: $(2r^3)(-3r^2s^2)(2s^2)$

Set 2

1. Simplify: $5d(3d^2 - 6d)$

2. Simplify: $bc^3(9c^3 - 4b^2)$

Set 3

1. Simplify: $(m + 2)(m + 3)$

2. Simplify: $(2r - 7)(3r + 5)$

3. Simplify: $(p - 8)(p + 8)$

Manipulatives Set

1. $2k(3k - 1)$

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

3. $(x - 2)(x - 4)$



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**independent
practice**

Find the product.

1. $4h \cdot 2h$

2. $(-2t^3)(-5t^2)$

3. $\frac{2}{3}w \cdot (-9w^3)$

4. $3x^2y \cdot 2xy^3$

5. $(4m^2n^3)(-5m^3)$

6. $5b(b^3 - 6b)$

7. $-4g^3h^2(4gh^2 - g^2h^3)$

8. $(x + 4)(x + 6)$

9. $(w - 8)(w + 3)$

10. $(r - 11)(r + 11)$

11. $(g + 7)^2$

12. $(b - 6)^2$

Journal

- A friend missed class today and wants to know how to multiply two monomials. Explain in words how to find the product $(-4x^2)(-6x^4)$.
- What is the product $(x + a)^2$? Write a rule for finding the square of a binomial that contains an addition symbol and use the rule to find the product $(x + 3)^2$.
- What is the product $(x - a)^2$? Write a rule for finding the square of a binomial that contains a subtraction symbol and use the rule to find the product $(x - 6)^2$.
- A student claimed the simplified product of any two binomials is a trinomial. Is the student correct? Give an example to support this answer.
- Find the product $(x + 5)(x + 4)$, showing each step. How are the constants 5 and 4 in the binomial factors related to the coefficient of the middle term in the product? How are the constants 5 and 4 in the binomial factors related to the last term in the product? If $(x + a)(x + b) = x^2 + cx + d$, how are a , b , and c related? How are a , b , and d related?

Cumulative Review

Simplify.

1. $3x^2 - 5x^2$

2. $4 - 9b + 3$

3. $5m + 2m^2 - m$

4. $3(x - 4) + 1$

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

6. $w^3 \cdot w^5 \cdot w$

7. $6x - 4(x + 3)$

8. $3(b + 1) + 4(2 - b)$

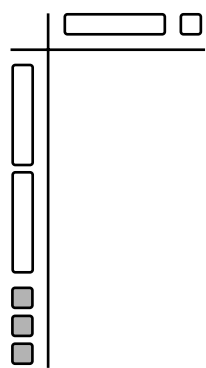
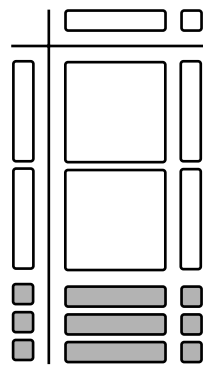
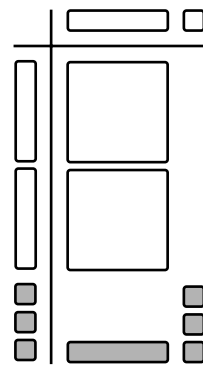
9. $3h - 4h^2 + h^3 - 7h + 5h^2$

10. $8x^2y - 3xy + 2x^2y - 4xy^2 - 2xy$

Manipulatives

Use algebra tiles to represent the product $(2x - 3)(x + 1)$.

1. Represent the factor $2x - 3$ to the left of the vertical gridline and represent the factor $x + 1$ above the horizontal gridline. See Figure 1. Solid figures represent negatives and hollow figures represent positives. A small square represents the number one, a rectangle represents x , and a large square represents x^2 .
2. The factor $2x - 3$ is represented by two x -rectangles and three small negative one-squares. The factor $x + 1$ is represented by one x -rectangle and one small one-square.
3. The product is represented below and to the right of the gridlines. An x -rectangle times an x -rectangle is a large x^2 -square. An x -rectangle times a small negative one-square equals a $-x$ -rectangle. A small one-square times an x -rectangle equals an x -rectangle. A small one-square times a small negative one-square equals a small negative one-square. See Figure 2.
4. Combine small squares with small squares, rectangles with rectangles, and large squares with large squares (combine like terms). There are two x^2 -squares: $x^2 + x^2 = 2x^2$. There are two x -rectangles and three $-x$ -rectangles. Pair a positive rectangle with a negative rectangle (this is called a zero pair because their sum is zero) and remove that pair of tiles. Then, remove another positive rectangle and negative rectangle (another zero pair). The only remaining rectangle is one $-x$ -rectangle: $2x - 3x = -x$. There are three small negative one-squares: $-1 - 1 - 1 = -3$. After combining all like terms, you have the simplified product: $2x^2 - x - 3$. See Figure 3.

Figure 1**Figure 2****Figure 3**

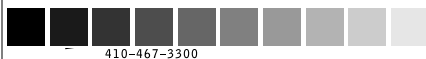
Use algebra tiles to find the following products.

1. $3x(x + 3)$

3. $(x + 1)(x + 4)$

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

4. $5(2x^2 + 3x)$



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Module 11 Simplifying Algebraic Expressions
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practice**

Find the product of each expression and simplify.

1. $(3m^2)(-6m^4)$

2. $2a \cdot a^3$

3. $(-\frac{2}{5}x^3)(-10x)$

4. $(-5st^3)(-6s^3t)$

5. $ab \cdot a^3b$

6. $x(x - 1)$

7. $2w(3w - 6)$

8. $-5b^5(2b^2 - 3b)$

9. $x^2y(3xy - 4x^3y^2)$

10. $-6m^3n^2(3mn^3 + 2m^2n^2)$

11. $4x^2y^2(6xy - 2x)$

12. $-\frac{3}{4}s^2t^4(12 - 8st)$

13. $(b - 7)(b + 3)$

14. $(t + 10)(t - 5)$

15. $(q - 7)(q + 2)$

16. $(x - 6)(x + 10)$

17. $(x - 5)(x + 5)$

18. $(r + 2)(r - 2)$

19. $(k + 6)^2$

20. $(r + 4)^2$

21. $(w - 8)^2$

22. $(b - 12)^2$

