Name _____ Date _____ Class _____

LESSON 7-7

Reteach

Multiplying Polynomials

To multiply monomials, multiply the constants, then multiply variables with the same base.

Multiply $(3a^2b)(4ab^3)$.

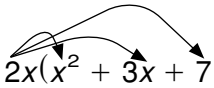
$(3a^2b)(4ab^3)$

$(3 \cdot 4)(a^2 \cdot a)(b \cdot b^3)$ *Rearrange so that the constants and the variables with the same bases are together.*

$12a^3b^4$ *Multiply.*

To multiply a polynomial by a monomial, distribute the monomial to each term in the polynomial.

Multiply $2x(x^2 + 3x + 7)$.



$2x(x^2 + 3x + 7)$

$(2x)x^2 + (2x)3x + (2x)7$ *Distribute.*

$2x^3 + 6x^2 + 14x$ *Multiply.*

Multiply.

1. $(-5x^2y^3)(2xy)$

2. $(2xyz)(-4x^2yz)$

3. $(3x)(x^2y^3)$

Fill in the blanks below. Then finish multiplying.

4. $4(x - 5)$

$(\square)x - (\square)5$

5. $3x(x + 8)$

$(\square)x + (\square)8$

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

$(\square)x^2 - (\square)6x + (\square)3$

Multiply.

7. $5(x + 9)$

8. $-4x(x^2 + 8)$

9. $3x^2(2x^2 + 5x + 4)$

10. $-3(5 - x^2 + 2)$

11. $(5a^3b)(2ab)$

12. $5y(-y^2 + 7y - 2)$

Name _____ Date _____ Class _____

LESSON 7-7

Reteach

Multiplying Polynomials (continued)

Use the Distributive Property to multiply binomials and polynomials.

Multiply $(x + 3)(x - 7)$.

$(x + 3)(x - 7)$

$x(x - 7) + 3(x - 7)$ — *Distribute each term of the first binomial.*

$(x)x - (x)7 + (3)x - (3)7$

$x^2 - 7x + 3x - 21$ — *Multiply.*

$x^2 - 4x - 21$ — *Combine like terms.*

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

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

$x(x^2 + 3x + 4) + 5(x^2 + 3x + 4)$ — *Distribute each term of the first binomial.*

$(x)x^2 + (x)3x + (x)4 + (5)x^2 + (5)3x + (5)4$ — *Distribute again.*

$x^3 + 3x^2 + 4x + 5x^2 + 15x + 20$ — *Multiply.*

$x^3 + 8x^2 + 19x + 20$ — *Combine like terms.*

Fill in the blanks below. Then finish multiplying.

13. $(x + 4)(x - 5)$

$\square(x - 5) + \square(x - 5)$

_____

14. $(x - 2)(x + 8)$

$\square(x + 8) - \square(x + 8)$

_____

15. $(x - 3)(x - 6)$

$\square(x - 6) - \square(x - 6)$

_____

Multiply.

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

_____

17. $(x - 7)(x + 7)$

_____

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

_____

Fill in the blanks below. Then finish multiplying.

19. $(x + 3)(2x^2 + 4x + 8)$

$\square(2x^2 + 4x + 8) + \square(2x^2 + 4x + 8)$

_____

20. $(x + 2)(6x^2 + 4x + 5)$

$\square(6x^2 + 4x + 5) + \square(6x^2 + 4x + 5)$

_____

LESSON 7-1

Practice A

Multiplying Polynomials

Multiply.

1. $(4x)(5x)$ — $20x^2$
2. $(3x^2)(5x)$ — $15x^3$
3. $(6y^2)(3y^3)$ — $18y^5$
4. $3(5x + 7)$ — $15x + 21$
5. $4x(2x^2 + 7x + 3)$ — $8x^3 + 28x^2 + 12x$

Fill in the blanks by multiplying the First, Inner, Outer, and Last terms. Then simplify.

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

x^2	$2x$	$5x$	10
F	O	I	L

Simplify: $x^2 + 7x + 10$

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

x^2	$-3x$	$4x$	-12
F	O	I	L

Simplify: $x^2 + x - 12$

Fill in the blanks below. Then simplify.

8. $(x + 3)(x^2 + 4x + 7) = x(x^2 + 4x + 7) + 3(x^2 + 4x + 7)$

Distribute: $x^3 \ 4x^2 \ 7x + 3x^2 \ 12x \ 21$

Simplify: $x^3 + 7x^2 + 19x + 21$

9. $(2x - 1)(4x^3 - 3x^2 + 5) = 2x(4x^3 - 3x^2 + 5) + -1(4x^3 - 3x^2 + 5)$

Distribute: $8x^4 \ -6x^3 \ 10x + -4x^3 \ 3x^2 \ -5$

Simplify: $8x^4 - 10x^3 + 3x^2 + 10x - 5$

10. **The length of a rectangle is 5 inches greater than the width.**
   - **a.** Write an expression for the width of the rectangle. — w
   - **b.** Write an expression for the length of the rectangle. — $w + 5$
   - **c.** Write a simplified expression for the area of the rectangle. (Area = length × width) — $w^2 + 5w$
   - **d.** Find the area of the rectangle when the width is 3 inches. — $24\ \text{in}^2$
   - **e.** Find the area of the rectangle when the length is 9 inches. — $36\ \text{in}^2$

LESSON 7-1

Practice B

Multiplying Polynomials

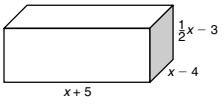
Multiply.

1. $(6m^4)(8m^2)$ — $48m^6$
2. $(5x^3)(4xy^2)$ — $20x^4y^2$
3. $(10s^5t)(7st^4)$ — $70s^6t^5$
4. $4(x^2 + 5x + 6)$ — $4x^2 + 20x + 24$
5. $2x(3x - 4)$ — $6x^2 - 8x$
6. $7xy(3x^2 + 4y + 2)$ — $21x^3y + 28xy^2 + 14xy$
7. $(x + 3)(x + 4)$ — $x^2 + 7x + 12$
8. $(x - 6)(x - 6)$ — $x^2 - 12x + 36$
9. $(x - 2)(x - 5)$ — $x^2 - 7x + 10$
10. $(2x + 5)(x + 6)$ — $2x^2 + 17x + 30$
11. $(m^2 + 3)(5m + n)$ — $5m^3 + m^2n + 15m + 3n$
12. $(a^2 + b^2)(a + b)$ — $a^3 + a^2b + ab^2 + b^3$
13. $(x + 4)(x^2 + 3x + 5)$ — $x^3 + 7x^2 + 17x + 20$
14. $(3m + 4)(m^2 - 3m + 5)$ — $3m^3 - 5m^2 + 3m + 20$
15. $(2x - 5)(4x^2 - 3x + 1)$ — $8x^3 - 26x^2 + 17x - 5$

16. **The length of a rectangle is 3 inches greater than the width.**
   - **a.** Write a polynomial that represents the area of the rectangle. — $w^2 + 3w$
   - **b.** Find the area of the rectangle when the width is 4 inches. — $28\ \text{in}^2$

17. **The length of a rectangle is 8 centimeters less than 3 times the width.**
   - **a.** Write a polynomial that represents the area of the rectangle. — $3w^2 - 8w$
   - **b.** Find the area of the rectangle when the width is 10 centimeters. — $220\ \text{cm}^2$

18. Write a polynomial to represent the volume of the rectangular prism.



$\frac{1}{2}x^3 - \frac{5}{2}x^2 - 13x + 60$

LESSON 7-1

Practice C

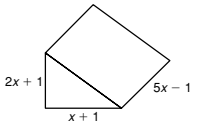
Multiplying Polynomials

Multiply.

1. $\left(\frac{1}{2}m^3\right)(6m)(2m^2)$ — $6m^6$
2. $(-3x^4)(2x)(0.75x^4)$ — $-4.5x^9$
3. $\left(\frac{1}{4}x^3y^2\right)(xy)\left(\frac{1}{4}x\right)$ — $\frac{1}{16}x^5y^3$
4. $\frac{1}{2}x(6x^2 + 10x + 5)$ — $3x^3 + 5x^2 + \frac{5}{2}x$
5. $x^2y(3xy - 2x^2y)$ — $3x^3y^2 - 2x^4y^2$
6. $0.4x(0.6x - 8y)$ — $0.24x^2 - 3.2xy$
7. $(2x + 1)(x + 2)$ — $2x^2 + 5x + 2$
8. $(3x - 4)(2x - 5)$ — $6x^2 - 23x + 20$
9. $(x^2 + 3)(x - 4)$ — $x^3 - 4x^2 + 3x - 12$
10. $(x^2 + y^2)(x^2 + y^2)$ — $x^4 + 2x^2y^2 + y^4$
11. $\left(x + \frac{1}{2}\right)\left(x + \frac{1}{4}\right)$ — $x^2 + \frac{3}{4}x + \frac{1}{8}$
12. $(3x^2 - 1)(x - 1)$ — $3x^3 - 3x^2 - x + 1$
13. $(x^2 + 1)(x^2 + 4x + 3)$ — $x^4 + 4x^3 + 4x^2 + 4x + 3$
14. $(5x + y)(x^2 + xy + y^2)$ — $5x^3 + 6x^2y + 6xy^2 + y^3$
15. $(a + b + c)(a + b + c)$ — $a^2 + 2ab + 2ac + b^2 + 2bc + c^2$

16. **The length of a rectangle is 2 inches more than 3 times the width.**
   - **a.** Write a polynomial that represents the area of the rectangle. — $3w^2 + 2w$
   - **b.** Find the area of the rectangle when the width is 2.5 inches. — $23.75\ \text{in}^2$

17. Write a polynomial to represent the volume of the triangular prism. (The volume of a prism is equal to the area of its base times its height.) — $5x^3 + \frac{13}{2}x^2 + x - \frac{1}{2}$



18. If $x = 3$, what are the dimensions of the triangular prism? — $7 \times 4 \times 14$

What is the volume? — 196

LESSON 7-1

Reteach

Multiplying Polynomials

To multiply monomials, multiply the constants, then multiply variables with the same base.

Multiply $(3a^2b)(4ab^3)$.

$(3a^2b)(4ab^3)$

$(3 \cdot 4)(a^2 \cdot a)(b \cdot b^3)$ — *Rearrange so that the constants and the variables with the same bases are together.*

$12a^3b^4$ — *Multiply.*

To multiply a polynomial by a monomial, distribute the monomial to each term in the polynomial.

Multiply $2x(x^2 + 3x + 7)$.

$2x(x^2 + 3x + 7)$

$(2x)x^2 + (2x)3x + (2x)7$ — *Distribute.*

$2x^3 + 6x^2 + 14x$ — *Multiply.*

Multiply.

1. $(-5x^2y^3)(2xy)$ — $-10x^3y^4$
2. $(2xyz)(-4x^2yz)$ — $-8x^3y^2z^2$
3. $(3x)(x^2y^3)$ — $3x^3y^3$

Fill in the blanks below. Then finish multiplying.

4. $4(x - 5)$

$(\boxed{4})_x - (\boxed{4})_5$

$4x - 20$

5. $3x(x + 8)$

$(\boxed{3x})_x + (\boxed{3x})_8$

$3x^2 + 24x$

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

$(\boxed{2x})_{x^2} - (\boxed{2x})_{6x} + (\boxed{2x})_3$

$2x^3 - 12x^2 + 6x$

Multiply.

7. $5(x + 9)$ — $5x + 45$
8. $-4x(x^2 + 8)$ — $-4x^3 - 32x$
9. $3x^2(2x^2 + 5x + 4)$ — $6x^4 + 15x^3 + 12x^2$
10. $-3(5 - x^2 + 2)$ — $3x^2 - 21$
11. $(5a^3b)(2ab)$ — $10a^4b^2$
12. $5y(-y^2 + 7y - 2)$ — $-5y^3 + 35y^2 - 10y$

LESSON 7-7

Reteach

Multiplying Polynomials (continued)

Use the Distributive Property to multiply binomials and polynomials.

Multiply $(x + 3)(x - 7)$.

$(x + 3)(x - 7)$

$x(x - 7) + 3(x - 7)$ — *Distribute each term of the first binomial.*

$(x)x - (x)7 + (3)x - (3)7$

$x^2 - 7x + 3x - 21$ — *Multiply.*

$x^2 - 4x - 21$ — *Combine like terms.*

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

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

$x(x^2 + 3x + 4) + 5(x^2 + 3x + 4)$ — *Distribute each term of the first binomial.*

$(x)x^2 + (x)3x + (x)4 + (5)x^2 + (5)3x + (5)4$ — *Distribute again.*

$x^3 + 3x^2 + 4x + 5x^2 + 15x + 20$ — *Multiply.*

$x^3 + 8x^2 + 19x + 20$ — *Combine like terms.*

Fill in the blanks below. Then finish multiplying.

13. $(x + 4)(x - 5)$

$\boxed{x}(x - 5) + \boxed{4}(x - 5)$

$x^2 - x - 20$

14. $(x - 2)(x + 8)$

$\boxed{x}(x + 8) - \boxed{2}(x + 8)$

$x^2 + 6x - 16$

15. $(x - 3)(x - 6)$

$\boxed{x}(x - 6) - \boxed{3}(x - 6)$

$x^2 - 9x + 18$

Multiply.

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

$x^2 - 5x + 6$

17. $(x - 7)(x + 7)$

$x^2 - 49$

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

$x^2 + 3x + 2$

Fill in the blanks below. Then finish multiplying.

19. $(x + 3)(2x^2 + 4x + 8)$

$\boxed{x}(2x^2 + 4x + 8) + \boxed{3}(2x^2 + 4x + 8)$

$2x^3 + 10x^2 + 20x + 24$

20. $(x + 2)(6x^2 + 4x + 5)$

$\boxed{x}(6x^2 + 4x + 5) + \boxed{2}(6x^2 + 4x + 5)$

$6x^3 + 16x^2 + 13x + 10$

LESSON 7-7

Challenge

The Missing Binomial

Determine the missing binomial. Choose from the table below. Each binomial is used once.

$x + 4$	$x + 3$	$x - 3$
$x + 1$	$x + 6$	$x - 4$
$x + 2$	$x - 2$	$x - 6$

1. $(x + 4)(x + 2) = x^2 + 2x + 4x + 8 = x^2 + 6x + 8$

2. $(x + 1)(x + 5) = x^2 + 5x + x + 5 + = x^2 + 6x + 5$

3. $(x + 2)(x - 3) = x^2 - 3x + 2x - 6 = x^2 - x - 6$

4. $(x + 3)(x - 5) = x^2 - 2x - 15$

5. $(x + 6)(x + 1) = x^2 + 7x + 6$

6. $(x - 2)(x + 4) = x^2 + 2x - 8$

7. $(x - 3)(x + 6) = x^2 + 3x - 18$

8. $(x - 4)(x + 2) = x^2 - 2x - 8$

9. $(x - 6)(x - 5) = x^2 - 11x + 30$

The binomials missing from the following equations are not all listed in the table. Determine the missing binomials.

10. $(x + 2)(x + 7) = x^2 + 9x + 14$

11. $(x + 3)(x + 4) = x^2 + 7x + 12$

12. $(x - 6)(x - 2) = x^2 - 8x + 12$

13. $(x - 4)(x - 10) = x^2 - 14x + 40$

14. $(x + 6)(x + 3) = x^2 + 9x + 18$

15. $(x + 1)(x - 4) = x^2 - 3x - 4$

16. $(x - 2)(x - 2) = x^2 - 4x + 4$

17. $(3x - 1)(x + 2) = 3x^2 + 5x - 2$

18. $(x - 7)(2x + 3) = 2x^2 - 11x - 21$

19. $(2x - 3)(3x + 4) = 6x^2 - x - 12$

LESSON 7-7

Problem Solving

Multiplying Polynomials

Write the correct answer.

1. A bedroom has a length of $x + 3$ feet and a width of $x - 1$ feet. Write a polynomial to express the area of the bedroom. Then calculate the area if $x = 10$.

$x^2 + 2x - 3$;

117 square feet

2. The length of a classroom is 4 feet longer than its width. Write a polynomial to express the area of the classroom. Then calculate the area if the width is 22 feet.

$w^2 + 4w$;

572 square feet

3. Nicholas is determining if he can afford to buy a car. He multiplies the number of months m by $i + p + 30f$ where i represents the monthly cost of insurance, p represents the monthly car payment, and f represents the number of times he fills the gas tank each month. Write the polynomial that Nicholas can use to determine how much it will cost him to own a car both for one month and for one year.

$i + p + 30f$; $12i + 12p + 360f$

4. A seat cushion is shaped like a trapezoid. The shorter base of the cushion is 3 inches greater than the height. The longer base is 2 inches shorter than twice the height. Write the polynomial that can be used to find the area of the cushion. (The area of a trapezoid is represented by $\frac{1}{2}h(b_1 + b_2)$.)

$\frac{3}{2}h^2 + \frac{1}{2}h$

The volume of a pyramid can be found by using $\frac{1}{3}Bh$ where B is the area of the base and h is the height of the pyramid. The Great Pyramid of Giza has a square base, and each side is about 300 feet longer than the height of the pyramid. Select the best answer.

5. Which polynomial represents the approximate area of the base of the Great Pyramid?

A $h^2 + 90{,}000$
B $2h + 90{,}000$
C $h^2 + 600h + 90{,}000$
D $2h^2 + 600h + 90{,}000$

6. Which polynomial represents the approximate volume of the Great Pyramid?

F $\frac{1}{3}h^3 + 200h^2 + 30{,}000h$
G $\frac{1}{3}h^2 + 200h + 30{,}000$
H $h^3 + 600h^2 + 90{,}000h$
J $3h^3 + 600h^2 + 90{,}000h$

7. The original height of the Great Pyramid was 485 feet. Due to erosion, it is now about 450 feet. Find the approximate volume of the Great Pyramid today.

A 562,500 ft^3
B 616,225 ft^3
C 84,375,000 ft^3
D 99,623,042 ft^3

LESSON 7-7

Reading Strategies

Follow a Procedure

There are several methods that can be used to multiply polynomials, depending on the number of terms. There is one procedure that can always be used, no matter how many terms there are. It is shown in the example below.

Multiply $(5x - 4)(3x^2 + x - 8)$.

$(5x - 4)(3x^2 + x - 8)$

$5x(3x^2 + x - 8) - 4(3x^2 + x - 8)$

$15x^3 + 5x^2 - 40x - 12x^2 - 4x + 32$

1 — Use the Distributive Proverty.

$15x^3 + 5x^2 - 40x - 12x^2 - 4x + 32$

$15x^3 + (5x^2 - 12x^2) + (-40x - 4x) + 32$

2 — Collect like terms.

$15x^3 + (5x^2 - 12x^2) + (-40x - 4x) + 32$

$15x^3 - 7x^2 - 44x + 32$

3 — Simplify by combining like terms.

Use the procedure shown above to answer each of the following.

1. Multiplication was used six times in step 1. How many times would it be used if two binomials were being multiplied?

4

2. In step 2, how do you know that $5x^2$ and $-12x^2$ are like terms?

They have the same exponent on the same variable.

3. In step 3, how do you know the expression is completely simplified?

There are no like terms.

Multiply the polynomials.

4. $-3x^3(2x^2 - 4x + 1)$

$-6x^5 + 12x^4 - 3x^3$

5. $(2x + 5)(9x^2 + 6x)$

$18x^3 + 57x^2 + 30x$

6. $(7x + 2)(x - 3)$

$7x^2 - 19x - 6$

7. $(2x^3 + 6x + 8)(x^2 - 5x + 1)$

$2x^5 - 10x^4 + 8x^3 - 22x^2 - 34x + 8$