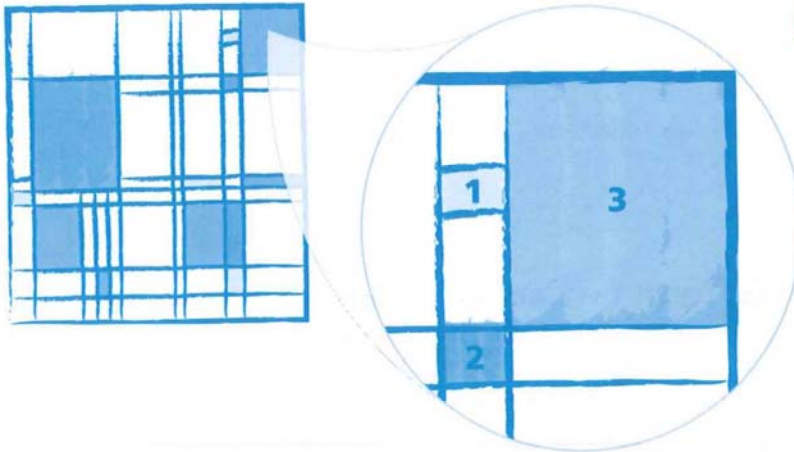


7-2

Multiplying Polynomials

MODEL & DISCUSS

Samantha makes the abstract painting shown using vertical and horizontal lines and four colors.



A. How can you use mathematics to describe the areas of Rectangle 1 and Rectangle 2?

From 7.1, **add/subt** "like-terms":
 ex) $3+5 = 8$
 ex) $3x+5x = 8x$
 etc...

- Same variables
- coefficients...

B. **Look for Relationships** How can you use mathematics to describe the area of Rectangle 3? **MP.7**

Properties of Exponents

$$a^m \cdot a^n = a^{m+n}$$

Same
 ex) $x \cdot x = x^2$

Same
 $\frac{a^m}{a^n} = a^{m-n}$

$x \cdot x \neq 2x$
 $x+x$

HABITS OF MIND

Communicate Precisely What information would you need to find the percentage of the painting that is red? Explain. **MP.6**

Finding areas of rectangles

EXAMPLE 1 Try It! Multiply a Monomial and a Trinomial

$2(3+4) \rightarrow 2(7) \rightarrow 14$

1. Find each product.
- a. $-2x^2(x^2 + 3x + 4)$
- b. $-4x(2x^2 - 3x + 5)$

mono tri distrib property

$-2x^2$

$1x^2$	$3x$	4
$-2x^4$	$-6x^3$	$-8x^2$

$-4x$

$2x^2$	$-3x$	$+5$
$-8x^3$	$+12x^2$	$-20x$

EXAMPLE 2 Try It! Use a Table to Find the Product of Polynomials

2. Find the area of each green rectangle.

a.

$2x$	4	
$5x$	$10x^2 + 20x$	$20x$
2	$4x$	$+8$

Combine Like Terms

$10x^2 + 24x + 8$

b.

$7x$	2	
$2x$	$14x^2$	$4x$
1	$7x$	2

$14x^2 + 11x + 2$

EXAMPLE 3 Try It! Multiply Binomials

3. Find each product.

a. $(5x - 4)(2x + 1)$

$5x(2x) + 5x(1) - 4(2x) - 4(1)$

$\rightarrow 10x^2 + 5x - 8x - 4$

$\rightarrow 10x^2 - 3x - 4$

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

$3x$

$2x + 4$	
$6x^2$	$12x$
-5	$-10x - 20$

$\rightarrow 6x^2 + 2x - 20$

distributive property

FOIL
First
Outer
Inner
Last

	$2x$	$+1$	$-3x$
$5x$	$10x^2$	$+5x$	
-4	$-8x$	-4	

$\rightarrow 10x^2 - 3x - 4$

HABITS OF MIND

Reason Could you use an area model to find the product of polynomials that have subtracted terms? Explain. MP.2

EXAMPLE 4 Try It! Multiply a Trinomial and a Binomial

4. Find each product.

a. $(2x - 5)(-3x^2 + 4x - 7)$

	$-3x^2$	$4x$	-7
$2x$	$-6x^3$	$8x^2$	$-14x$
-5	$15x^2$	$-20x$	$+35$

$-6x^3 + 23x^2 - 34x + 35$

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

	$2x^2$	$+3x$	-4
$-3x^2$	$-6x^4$	$-9x^3$	$+12x^2$
$+1$	$2x^2$	$+3x$	-4

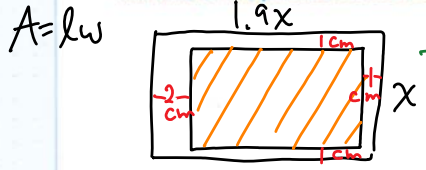
$-6x^4 - 9x^3 + 14x^2 + 3x - 4$

EXAMPLE 5 Try It! Closure and Multiplication

5. Why is it important that the product of two polynomials have only whole number exponents?

EXAMPLE 6 Try It! Apply Multiplication of Binomials

6. Suppose the height of the phone in Example 6 were 1.9 times the width but all of the other conditions were the same. What expression would represent the area of the phone's surface not occupied by the screen?



Let x equal

→ area of frame ...

→ big rect area - little rect area.

$1.9x(x) - (1.9x - 3)(x - 2)$

$(1.9x - 3)(x - 2)$

HABITS OF MIND

Generalize Does closure of polynomial multiplication depend on closure of polynomial addition and subtraction? Explain. © MP.8

Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How does multiplying polynomials compare to multiplying integers?

2. **Use Appropriate Tools** When multiplying two variables, how is using the Distributive Property similar to using a table? **MP.5**

3. **Error Analysis** Mercedes states that when multiplying $4x^3(x^3 + 2x^2 - 3)$ the product is $4x^9 + 8x^6 - 12x^3$. What was Mercedes's error? **MP.3**

4. **Use Structure** When multiplying, why is the degree of the product different from the degree of the factors? **MP.7**

Do You KNOW HOW?

Find each product.

5. $-2x^3(3x^2 - 4x + 7)$

$$-2x^3 \begin{array}{|c|c|c|} \hline 3x^2 & -4x & +7 \\ \hline \end{array}$$

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

	$2x$	5	
x	$2x^2$	$-8x$	
-4	$6x$	-24	

$2x^2 - 2x - 24$

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

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

$$\rightarrow 3x^2 + 4x - 6x - 8$$

$$\rightarrow 3x^2 - 2x - 8$$

8. $(5y - 2)(4y^2 + 3y - 1)$

	$4y^2$	$3y$	-1
$5y$	$20y^3$	$15y^2$	$-5y$
-2	$-8y^2$	$-6y$	$+2$

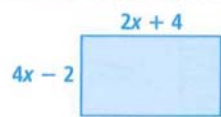
$$\rightarrow 20y^3 + 7y^2 - 11y + 2$$

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

	$2x$	-3
$3x^2$	$6x^3$	$-9x^2$
$2x$	$4x^2$	$-6x$
-5	$-10x$	$+15$

$6x^3 - 5x^2 - 16x + 15$

10. Find the area of the rectangle



$$(2x + 4)(4x - 2)$$

$$8x^2 - 4x + 16x - 8$$

$$8x^2 + 12x - 8$$