Name_____ Date _____

4.2 Adding, Subtracting, and Multiplying Polynomials

For use with Exploration 4.2

Essential Question How can you cube a binomial?

1 EXPLORATION: Cubing Binomials

Work with a partner. Find each product. Show your steps.

a. $(x + 1)^3 = (x + 1)(x + 1)^2$ Rewrite as a product of first and second powers.

$= (x + 1)$ _____ Multiply second power.

$=$ _____ Multiply binomial and trinomial.

$=$ _____ Write in standard form, $ax^3 + bx^2 + cx + d$.

b. $(a + b)^3 = (a + b)(a + b)^2$ Rewrite as a product of first and second powers.

$= (a + b)$ _____ Multiply second power.

$=$ _____ Multiply binomial and trinomial.

$=$ _____ Write in standard form.

c. $(x - 1)^3 = (x - 1)(x - 1)^2$ Rewrite as a product of first and second powers.

$= (x - 1)$ _____ Multiply second power.

$=$ _____ Multiply binomial and trinomial.

$=$ _____ Write in standard form.

d. $(a - b)^3 = (a - b)(a - b)^2$ Rewrite as a product of first and second powers.

$= (a - b)$ _____ Multiply second power.

$=$ _____ Multiply binomial and trinomial.

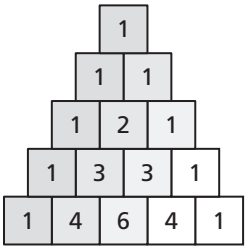
$=$ _____ Write in standard form.

Name _____ Date _____

2 EXPLORATION: Generalizing Patterns for Cubing a Binomial

Work with a partner.

a. Use the results of Exploration 1 to describe a pattern for the coefficients of the terms when you expand the cube of a binomial. How is your pattern related to Pascal's Triangle, shown at the right?



b. Use the results of Exploration 1 to describe a pattern for the exponents of the terms in the expansion of a cube of a binomial.

c. Explain how you can use the patterns you described in parts (a) and (b) to find the product $(2x - 3)^3$. Then find this product.

Communicate Your Answer

3. How can you cube a binomial?

4. Find each product.

a. $(x + 2)^3$ **b.** $(x - 2)^3$ **c.** $(2x - 3)^3$

d. $(x - 3)^3$ **e.** $(-2x + 3)^3$ **f.** $(3x - 5)^3$

Name_____ Date _____

4.2 Notetaking with Vocabulary

For use after Lesson 4.2

In your own words, write the meaning of each vocabulary term.

Pascal's Triangle

Core Concepts

Special Product Patterns

Sum and Difference	Example
$(a + b)(a - b) = a^2 - b^2$	$(x + 3)(x - 3) = x^2 - 9$

Square of a Binomial	Example
$(a + b)^2 = a^2 + 2ab + b^2$	$(y + 4)^2 = y^2 + 8y + 16$
$(a - b)^2 = a^2 - 2ab + b^2$	$(2t - 5)^2 = 4t^2 - 20t + 25$

Cube of a Binomial	Example
$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$	$(z + 3)^3 = z^3 + 9z^2 + 27z + 27$
$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$	$(m - 2)^3 = m^3 - 6m^2 + 12m - 8$

Notes:

Name _____ Date _____

4.2 Notetaking with Vocabulary (continued)

Pascal's Triangle

In Pascal's Triangle, the first and last numbers in each row are 1. Every number other than 1 is the sum of the closest two numbers in the row directly above it. The numbers in Pascal's Triangle are the same numbers that are the coefficients of binomial expansions, as shown in the first six rows.

	n	$(a + b)^n$	Binomial Expansion	Pascal's Triangle
0th row	0	$(a + b)^0 =$	1	1
1st row	1	$(a + b)^1 =$	$1a + 1b$	1 1
2nd row	2	$(a + b)^2 =$	$1a^2 + 2ab + 1b^2$	1 2 1
3rd row	3	$(a + b)^3 =$	$1a^3 + 3a^2b + 3ab^2 + 1b^3$	1 3 3 1
4th row	4	$(a + b)^4 =$	$1a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + 1b^4$	1 4 6 4 1
5th row	5	$(a + b)^5 =$	$1a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + 1b^5$	1 5 10 10 5 1

Notes:

Name_____ Date _____

4.2 Notetaking with Vocabulary (continued)

Extra Practice

In Exercises 1–3, find the sum or difference.

1. $(-4x^2 - 6x + 18) + (-x^2 + 7x + 8)$

2. $(6x^2 - 12x + 48) - (-x^2 + 24x - 63)$

3. $(-11x^4 - x^3 - 3x^2 + 10x - 2) - (-11x^4 + 5x^2 - 7x + 13)$

In Exercises 4–9, find the product.

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

5. $(x^4 - 10x^2 + 25)(3x^2 - 6x - 1)$

6. $(x + 1)(x - 2)(x + 6)$

7. $(2x - 3)(6 - x)(4 - 5x)$

8. $(3y - 8)(3y + 8)$

9. $(2v - 1)^3$

In Exercises 10 and 11, use Pascal's Triangle to expand the binomial.

10. $(4t - 2)^4$

11. $(g + 6)^5$