

Objectives

- Multiply polynomials
- Use binomial expansion to expand binomial expressions that are raised to a positive integer powers.

Example 1 Multiplying a Monomial and a Polynomial

Find each product.

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

b) $ab(a^3 + 3ab^2 - b^3)$

Try it! a) $3cd^2(4c^2d - 6cd + 14cd^2)$

b) $x^2y(6y^3 + y^2 - 28y + 30)$

Example 2 Multiply Polynomials

Find each product.

a) $(x - 2)(1 + 3x - x^2)$

Horizontally

Vertically

Try it!

Find each product.

a) $(x^2 + 3x - 5)(x^2 - x + 1)$

Horizontally

Vertically

Example 3 Expanding a Power of a Binomial

Find each product.

a) $(x + y)^3$

Try it!

Find each product.

a) $(x + 4)^4$

b) $(2x - 1)^3$

Binomial Expansion		Pascal's Triangle Coefficients
$(a+b)^0 =$	1	1
$(a+b)^1 =$	$a+b$	1 1
$(a+b)^2 =$	$a^2 + 2ab + b^2$	1 2 1
$(a+b)^3 =$	$a^3 + 3a^2b + 3ab^2 + b^3$	1 3 3 1
$(a+b)^4 =$	$a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$	1 4 6 4 1
$(a+b)^5 =$	$a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$	1 5 10 10 5 1

Use a chart to expand binomials. Here is the binomial $(x+2)^4$ as an example.

- 1) Write the coefficients from Pascal's Triangle in the top row
- 2) Write the decreasing powers in the second row.
- 3) Then shift one column to the right and write increasing powers in the third row
- 4) Finally, multiply vertically to get $x^4 + 8x^3 + 24x^2 + 32x + 16$

1	4	6	4	1
x^4	x^3	x^2	x	
	2	4	8	16

Example 4 Using Pascal's Triangle to Expand Binomial Expressions

a) $(y-3)^4$
 $[1(y)^4(-3)^0] + [4(y)^3(-3)^1] + [6(y)^2(-3)^2] + [4(y)^1(-3)^3] + [1(y)^0(-3)^4]$
 $y^4 - 12y^3 + 54y^2 - 108y + 81$

Or

1	4	6	4	1
x^4	x^3	x^2	x	
	3	9	27	81

Try it! Using Pascal's Triangle to Expand Binomial Expressions

a) $(x+2)^3$