

4.6 Polynomial Expansion

SWBAT expand and simplify polynomials using Pascal's Triangle.

Example 1: Rewrite each of the problems in expanded form and then simplify the polynomial.

a) $f(x) = x + 1$

b) $f(x) = (x + 1)^2$

c) $f(x) = (x + 1)^3$

$$(x+1)(x+1)$$

$$x^2 + 2x + 1$$

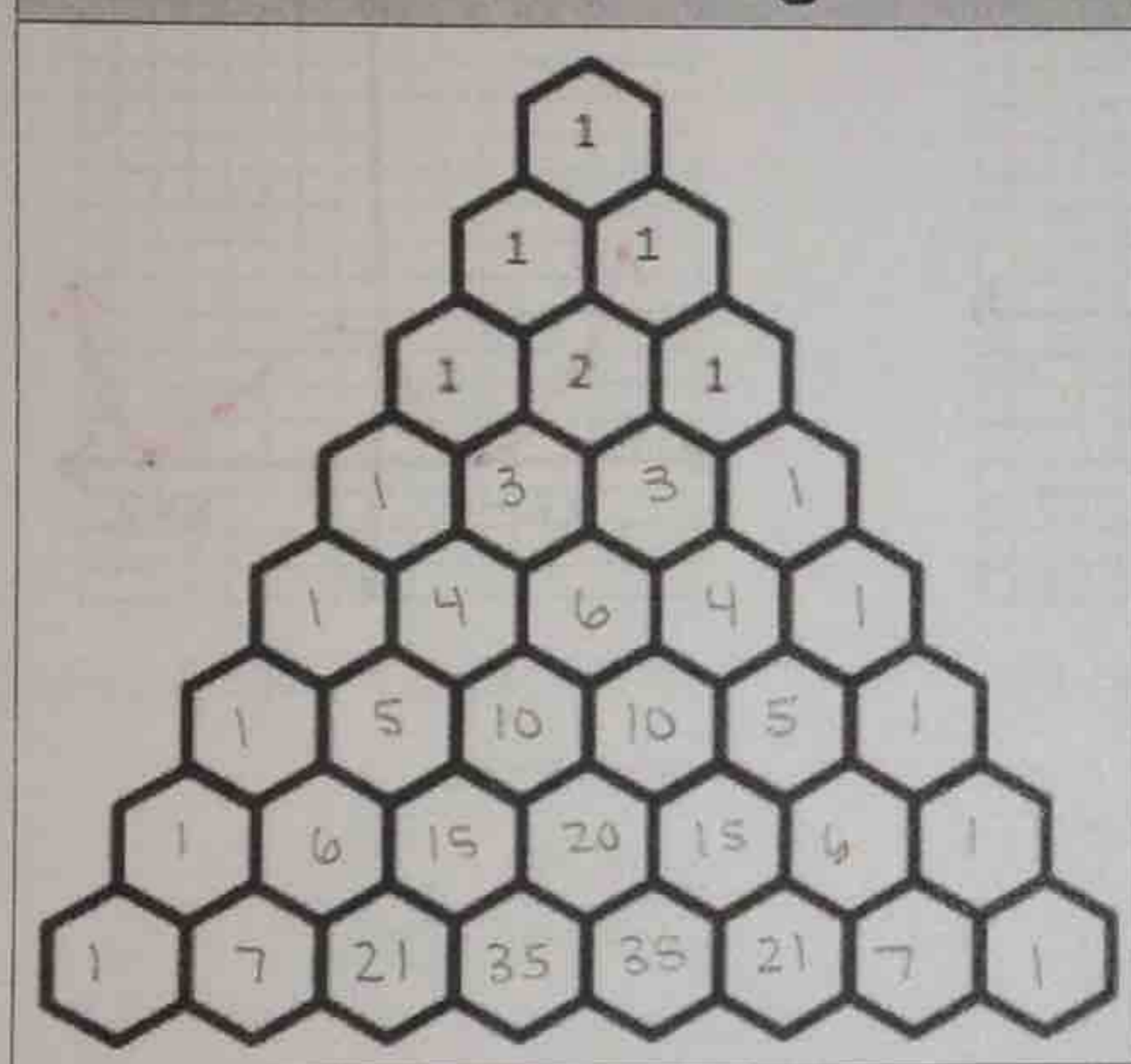
$$(x+1)(x+1)(x+1)$$

$$(x+1)(x^2 + 2x + 1)$$

$$x^3 + 2x^2 + x + x^2 + 2x + 1$$

$$x^3 + 3x^2 + 3x + 1$$

Pascal's Triangle



Expanding polynomials might seem easy, but imagine if you had a polynomial raised to the 10th degree, or the 100th. Pascal's Triangle is a way of expanding polynomials without having to foil a bunch of times.

Example 1: Expand and simplify: $(x + y)^5$

$$1x^5y^0 + 5x^4y^1 + 10x^3y^2 + 10x^2y^3 + 5xy^4 + 1x^0y^5$$

$$x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + y^5$$

Example 2: Expand and simplify: $(2x - y)^3$

$$1(2x)^3(-y)^0 + 3(2x)^2(-y)^1 + 3(2x)(-y)^2 + 1(2x)^0(-y)^3$$

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

$$8x^3 - 12x^2y + 6xy^2 - y^3$$

Example 3: Expand and simplify: $(2m - 1)^4$

$$1(2m)^4(-1)^0 + 4(2m)^3(-1)^1 + 6(2m)^2(-1)^2 + 4(2m)(-1)^3 + 1(2m)^0(-1)^4$$

$$1(16m^4) + 4(8m^3)(-1) + 6(4m^2)(1) + 4(2m)(-1) + 1(1)$$

$$16m^4 - 32m^3 + 24m^2 - 8m + 1$$

Example 4: Expand and simplify: $(x - 3y)^5$

$$1x^5(-3y)^0 + 5x^4(-3y)^1 + 10x^3(-3y)^2 + 10x^2(-3y)^3 + 5x(-3y)^4 + 1x^0(-3y)^5$$

$$1x^5 + 5x^4(-3y) + 10x^3(9y^2) + 10x^2(-27y^3) + 5x(81y^4) + 1(-243y^5)$$

$$x^5 - 15x^4y + 90x^3y^2 - 270x^2y^3 + 405xy^4 - 243y^5$$