LESSON MAKER PRO

Binomial Power Play

Expand powers into equivalent polynomials.

HIGH SCHOOL · MA.912.AR.1.11

MA.912.AR.1.11 "Apply the Binomial Theorem to create equivalent polynomial expressions."

NAME _____ DATE _____

EXPAND A BINOMIAL

To expand $(a+b)^n$, use the binomial coefficients for that power and multiply each coefficient by powers of both terms. Start with the first term at its highest power and decrease its exponent by 1 each time. If the binomial has subtraction, treat the second term as negative.

WORKED EXAMPLE

Expand $(6x+5)^3$.

1. Use coefficients 1, 3, 3, 1: $(6x+5)^3 = (6x)^3 + 3(6x)^2(5) + 3(6x)(5)^2 + 5^3$.
2. Evaluate each term: $216x^3 + 540x^2 + 450x + 125$.

Answer: $216x^3 + 540x^2 + 450x + 125$

PRACTICE 6 problems

1 Expand $(x+7)^2$.

ANSWER _____

2 Expand $(2x-1)^4$.

ANSWER _____

3 Expand $(4x-8)^2$.

ANSWER _____

4 Expand $(x+9)^4$.

ANSWER _____

5 Expand $(7x+1)^2$.

ANSWER _____

6 Expand $(2x^2-1)^4$.

ANSWER _____

APPLY IT Show your work

1 A game designer creates a square arena with side length (2x+1) meters. Write an expanded polynomial for the area of the arena.

WORK SPACE

ANSWER _____

2 A robotics club designs a cube-shaped protective case with edge length (x-7) centimeters. Write an expanded polynomial for the volume of the case.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Expand $(4x^2+7)^4$ and write the result in descending powers of x.

WORK SPACE AND ANSWER

ANSWER KEY

Binomial Power Play

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Expand $(x+7)^2$.	$\mathbf{x^2 + 14x + 49}$
2	Expand $(2x-1)^4$.	$\mathbf{16x^4 - 32x^3 + 24x^2 - 8x + 1}$
3	Expand $(4x-8)^2$.	$\mathbf{16x^2 - 64x + 64}$
4	Expand $(x+9)^4$.	$\mathbf{x^4 + 36x^3 + 486x^2 + 2916x + 6561}$
5	Expand $(7x+1)^2$.	$\mathbf{49x^2 + 14x + 1}$
6	Expand $(2x^2-1)^4$.	$\mathbf{16x^8 - 32x^6 + 24x^4 - 8x^2 + 1}$

PART 2 · APPLY IT

1. **$4x^2 + 4x + 1$** The area of a square is side squared, so use $(2x+1)^2$. Expand with coefficients 1, 2, 1.
2. **$x^3 - 21x^2 + 147x - 343$** The volume of a cube is edge cubed, so use $(x-7)^3$. The negative second term causes the signs to alternate.

CHALLENGE

$256x^8 + 1792x^6 + 4704x^4 + 5488x^2 + 2401$

Accept equivalent expanded polynomials with terms in any order, although descending powers are preferred. Check that students use the correct binomial coefficients and signs.