Multiplying Monomials and Polynomials

Zaher is making stained-glass box with square base. He wants the box height to be 2 inches less than the side length of the base. The volume of the box is found by multiplying a polyomial by a monomial.

Remember that when you multiply two powers with the same bases, you add the exponents. To multiply two polynomials, multiply the coefficients and add the exponents of the variables that are the same base.

$(5m^2n^3)(6m^3n^6)$
$= 5 \bullet 6 \bullet m^{2+3} \bullet n^{3+6}$
$= 30\, m^5\, n^9$

Example 1: **Multiply**

A. $(3r^2s^3)(5r^4s^5)$
$= 15r^6s^8$ Multiply coefficients and add exponents.

B. $(7x^2y)(-3x^4yz^8)$
$= -21x^6y^2z^8$ Multiply coefficients and add exponents.

To multiply a polynomial by a monomial, use the Distributive Property.

Dividing by a Monomial: To divide a polynomial by a monomial, divide each term in the polynomial by the monomial, and then use the quotient of powers property.

Understand the Problem

If the side length of the base is ***s***, then the height is $s - 2$. The volume is $s \bullet s \bullet (s - 2) = s^2(s - 2)$. The answer will be a value of ***s*** that makes the volume of the box equal to 32 in^3.

Make a Plan

You can make a table of values for the polynomial to try to find the value of s. Use the Distributive Property to write the expression $s^2(s - 2)$ another way. Use substitution to complete the table.

Solve the Problem

$s^2(s - 2) = s^3 - 2s^2$ Distributive property

s	1	2	3	4
$s^3 - 2s^2$	$1^3 - 2(1)^2$ $= -1$	$2^3 - 2(2)^2$ $= 0$	$3^3 - 2(3)^2$ $= 9$	$4^3 - 2(4)^2$ $= 32$

The side length of the base should be 4 inches.

Look Back

If the side length of the base were 4 inches, and the height was 2 inches less, or 2 inches, then the volume would be $4 \bullet 4 \bullet 2 = 32$ inches. The answer is reasonable.