

2.6: Powers of Monomials

To determine powers of monomials:

METHOD 1:

- 1) Rewrite the power in expanded form (change to repeated multiplication).
- 2) Multiply the monomials using the rules listed above.

Ex.) Simplify.

$$\begin{aligned} \text{a) } (4x^3)^2 &= (4x^3)(4x^3) \\ &= 4^2 x^6 \\ &= 16x^6 \end{aligned}$$

$$\begin{aligned} \text{b) } (2y^8)^3 &= (2y^8)(2y^8)(2y^8) \\ &= 4y^{16} \end{aligned}$$

$$\begin{aligned} \text{c) } (a^4b^5)^2 &= (a^4b^5)(a^4b^5) \\ &= a^8b^{10} \end{aligned}$$

$$\begin{aligned} \text{d) } (-5x^2y^4)^3 &= (-5x^2y^4)(-5x^2y^4)(-5x^2y^4) \\ &= -125x^6y^{12} \end{aligned}$$

$$\begin{aligned} \text{e) } (-3a^3b)^2 &= (-3a^3b^2)(-3a^3b^2) \\ &= 9a^6b^4 \end{aligned}$$

$$\begin{aligned} \text{f) } (2x^2y^5)^2(xy^4) &= (2x^2y^5)(2x^2y^5)(xy^4) \\ &= 4x^5y^{14} \end{aligned}$$

$$\begin{aligned} \text{g) } (-3a^5b^4)^3(5a^4b)^2 &= (-3a^5b^4)(-3a^5b^4)(-3a^5b^4)(5a^4b)(5a^4b) \\ &= (-27)(25)a^{23}b^{14} \end{aligned}$$

METHOD 2:

- 1) Raise the numerical coefficient to the appropriate exponent, and then evaluate.
- 2) Apply the power of a power rule to the variables (multiply the exponents together). Repeat for each different variable in the question.

Ex.) Simplify.

$$\begin{aligned} \text{a) } (8x^5)^2 &= 8^2 x^{10} \\ &= 64x^{10} \end{aligned}$$

$$\begin{aligned} \text{b) } (-2y^9)^3 &= -8y^{27} \end{aligned}$$

$$\begin{aligned} \text{c) } (4a^2b^4)^3 &= 64a^6b^{12} \end{aligned}$$

$$\begin{aligned} \text{d) } & (-3a^3b)^2 \\ & = 9a^6b^2 \end{aligned}$$

$$\begin{aligned} \text{e) } & (-2x^2y^5)^5(3xy^6)^2 \\ & = (-32) \times 10 y^{25} \cdot (9x^2y^{12}) \\ & = -298 x^{12} y^{37} \end{aligned}$$

Challenge Questions:

Simplify.

$$\text{a) } (3x^4y^2)(-3xy^2)^2$$

$$\begin{aligned} & = (3x^4y^2)(9x^2y^4) \\ & = 27x^6y^6 \end{aligned}$$

$$\text{b) } \frac{(2m^2n)^3}{(3mn)^2}$$

$$= \frac{8m^6n^3}{9m^2n^2}$$

$$\text{c) } \frac{4x^5y^3(2xy)^2}{-8xy^2}$$

$$= \frac{4x^5y^3(4x^2y^2)}{-8xy^2}$$

$$= \frac{16x^7y^5}{-8xy^2}$$

$$= -2x^6y^3$$

$$= \frac{8}{9} m^4 n$$