

5-1 Monomials

Objective: Multiply and Divide Monomials
Use expressions written in scientific form.

Monomials:

5b, -w, 23, x^2 , $1/3x^3y^3$

Not Monomials:

$1/n^4$, $\sqrt[3]{x}$, $x+8$, a^{-1}

- no variables in denominator
- no variables w/ negative exponent
- no variables under radicals

5x²y⁴

Coefficient:

5

Degree(sum of exp. variables):

$2 + 4 = 6$

Rules

1. Negative Exponents

$a^{-n} = 1/a^n$ $1/a^{-n} = a^n$

Ex: $2^{-3} = 1/2^3 = 1/8$

$1/b^{-8} = b^{+8}$

3. Quotient of Powers

$a^m/a^n = a^{m-n}$

$7^6/7^2 = 7^4$

Note: $5^0 = 1$, $6^0 = 1$, etc.

2. Product of Powers

$a^m \cdot a^n = a^{m+n}$

$4^2 \cdot 4^6 = 4^8$

4. Properties of Powers

Power of a power: $(a^m)^n = a^{mn}$

$(7^2)^5 = 7^{10}$

Power of a product: $(ab)^n = a^n b^n$

$(5a)^2 = 25a^2$

Power of a quotient: $(a/b)^n = a^n/b^n$

$(x/y)^6 = x^6/y^6$

$(a/b)^{-n} = (b/a)^n = b^n/a^n$

$(x/y)^{-3} = y^3/x^3$

$(\frac{a}{b})^{-1} = \frac{a^{-1}}{b^{-1}} = \frac{1/a}{1/b} = \frac{1/a \cdot b}{1/b \cdot a} = \frac{b}{a}$

$\frac{x^3}{y^3} = \frac{y^3}{x^3}$

Simplify **No Answers with negative exponents!*

Ex1: $(-2a^3b)(-5ab^4)$
 $= \frac{-2 \cdot 5 \cdot a^3 \cdot a^1 \cdot b^1 \cdot b^4}{1} = \frac{10a^4b^5}{1}$

Ex2: s^2/s^{10}
 $\frac{s^2}{s^{10}} = s^{2-10} = s^{-8} = \frac{1}{s^8}$

Ex3: $(b^2)^4$
 $b^2 \cdot b^2 \cdot b^2 \cdot b^2 = b^8$

Note: $b^a \cdot b^4 = b^{a+4} = b^6$

Ex4: $(-3c^2d^5)^3$
 $(-3)^3 \cdot (c^2)^3 \cdot (d^5)^3 = -27 \cdot c^6 \cdot d^{15}$

Ex5: $\left(\frac{-2a}{b^2}\right)^5 = \frac{(-2)^5 \cdot a^5}{(b^2)^5} = \frac{-32a^5}{b^{10}}$

Ex6: $\left(\frac{x}{3}\right)^{-4} = \frac{x^{-4}}{3^{-4}} = \frac{1}{x^4} \cdot \frac{81}{1} = \frac{81}{x^4}$

Ex7: $\left(\frac{-3a^{5y}}{a^6y^4}\right)^5 = \left(\frac{-3}{a^y b^4}\right)^5 = \frac{(-3)^5}{(a^y)^5 \cdot (b^4)^5} = \frac{-243}{a^{5y} \cdot b^{20}}$

$a^{5y-6y} = a^{-y} = \frac{1}{a^y}$

Scientific Notation: used to express very large or very small numbers

$a \times 10^n$ where $1 \leq a < 10$, n--any integer

Ex 8: Express in Scientific Notation.

A) 4,560,000 4.56×10^6

B) 0.000092 9.2×10^{-5}

Ex 9: Evaluate. Express each in Scientific Notation.

A) $(5 \times 10^3)(7 \times 10^8) = 35 \times 10^{11} = 3.5 \times 10^{12}$

B) $(1.8 \times 10^{-4})(4 \times 10^7) = 7.2 \times 10^3$

Ex 10: There are about 5×10^6 red blood cells in one ml of blood. A certain blood sample contains 8.32×10^6 red blood cells. About how many ml of blood are in the sample?

$\frac{8.32 \times 10^6}{5 \times 10^6} = \frac{8.32}{5} = 1.664 \text{ ml}$