

Exponent Rules Review Worksheet

Key

Product Rule: When multiplying monomials that have the same base, add the exponents.

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

Example 1: $x \cdot x^3 \cdot x^4 = x^{1+3+4} = x^8$

Example 2: $(2x^2y)(-3x^3y^4) = 2 \cdot (-3) \cdot x^2 \cdot x^3 \cdot y \cdot y^4 = -6x^5y^5$

Power Rule: When raising monomials to powers, multiply the exponents.

$$(x^m)^n = x^{m \cdot n}$$

Example 3: $(x^2y^3)^4 = x^{2 \cdot 4} y^{3 \cdot 4} = x^8y^{12}$

Example 4: $(2x^3yz^2)^3 = 2^3 x^{3 \cdot 3} y^3 z^{2 \cdot 3} = 8x^9y^3z^6$

Quotient Rule: When dividing monomials that have the same base, subtract the exponents.

$$\frac{x^m}{x^n} = x^{m-n}$$

Example 5: $\frac{x^3}{x^{-2}} = x^{3-(-2)} = x^5$

Example 6: $\frac{5^6}{5^2} = 5^{6-2} = 5^4$

Example 7: $\frac{36m^3n^5}{-9mn^4} = \frac{36}{-9} \cdot \frac{m^3}{m} \cdot \frac{n^5}{n^4} = -4m^2n$

Simplify each of the following.

1) $a \cdot a^2 \cdot a^3$

a^{1+2+3}

a^6

2) $(2a^2b)(4ab^2)$

$2 \cdot a^2 \cdot b^1 \cdot 4 \cdot a^1 \cdot b^2$

$8a^{2+1}b^{1+2}$

$8a^3b^3$

3) $(6x^2)(-3x^5)$

$6 \cdot x^2 \cdot (-3) \cdot x^5$

$-18x^{2+5}$

$-18x^7$

4) $b^3 \cdot b^4 \cdot b^7 \cdot b^1$

$b^{3+4+7+1}$

b^{15}

5) $(3x^3)(3x^4)(-3x^2)$

$3 \cdot x^3 \cdot 3 \cdot x^4 \cdot (-3) \cdot x^2$

$-27x^{3+4+2}$

$-27x^9$

6) $(2x^2y^3)^2$

$2^2 \cdot (x^2)^2 \cdot (y^3)^2$

$4x^4y^6$

7) $(5x^2y^4)^3$

$5^3 \cdot (x^2)^3 \cdot (y^4)^3$

$125x^6y^{12}$

8) $(6x^4y^6)^3$

$6^3 \cdot (x^4)^3 \cdot (y^6)^3$

$216x^{12}y^{18}$

9) $(4x^3y^3)^3$

$4^3 \cdot (x^3)^3 \cdot (y^3)^3$

$64x^9y^9$

10) $(7xy)^2$

$7^2 \cdot x^2 \cdot y^2$

$49x^2y^2$

11) $\frac{x^3}{x^1}$

x^{3-1}

x^2

12) $\frac{18c^3}{-3c^2}$

$\frac{18}{-3} \cdot c^{3-2}$

$-6c^1$

13) $\frac{9a^3b^5}{-3ab^2}$

$\frac{9}{-3} \cdot a^{3-1} \cdot b^{5-2}$

$-3a^2b^3$

14) $\frac{-48c^2d^4}{-8cd}$

$\frac{-48}{-8} \cdot c^{2-1} \cdot d^{4-1}$

$6c^1d^3$

15) $\frac{22y^6z^8}{2yz^{-7}}$

$\frac{22}{2} \cdot y^{6-1} \cdot z^{8-(-7)}$

$11y^5z^{15}$

16) $x^2 \cdot x^7$

x^{2+7}

x^9

17) $(x^2)^7$

x^{14}

18) $(-2x^4)^5$

$(-1)^5 \cdot 2^5 \cdot (x^4)^5$

$-1 \cdot 32 \cdot x^{20}$

$-32x^{20}$

19) $7^0 = 1$

20) $8x^0$

$8 \cdot 1$

8

21) $\frac{2x^3}{-8x^4}$

$\frac{2}{-8} \cdot \frac{x^3}{x^4}$

\downarrow
 $-\frac{1}{4} \cdot x^{3-4}$

\downarrow
 $-\frac{1}{4} \cdot x^{-1}$

$-\frac{1}{4x^1}$

22) $\frac{xy^7}{x^3y^4}$

$x^{1-3} \cdot y^{7-4}$

$x^{-2} \cdot y^3$

$\frac{y^3}{x^2}$

23) $6x^5 \cdot 3x^5 \cdot x$

$6 \cdot x^5 \cdot 3 \cdot x^5$

$18x^{5+5}$

$18x^{10}$

24) $(3st^{12})^3$

$3^3 \cdot s^3 \cdot t^{36}$

$27s^3t^{36}$

25) $\left(\frac{3m^2n^7}{m}\right)^5$

$\frac{3^5 \cdot m^{10} \cdot n^{35}}{m^5}$

$243m^{10-5}n^{35}$

$243m^5n^{35}$