Exponent Rules Review Worksheet

NOTE: Anything to the zero power equals 1!

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

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

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

Example 3: $(x^2y^3)^4 = x^{2\bullet 4}\, y^{3\bullet 4} = x^8y^{12}$ Example 4: $(2x^3yz^2)^3 = 2^3\, x^{3\bullet 3}\, y^3\, z^{2\bullet 3} = 8x^9y^3z^6$

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. Copy the problem. Work on your own paper.

1) $a \cdot a^2 \cdot a^3$ a^6

2) $(2a^2b)(4ab^2)$ $8a^3b^3$

3) $(6x^2)(-3x^5)$ $-18x^7$

4) $b^3 \cdot b^4 \cdot b^7 \cdot b$ b^{15}

5) $(3x^3)(3x^4)(-3x^2)$ $-27x^9$

6) $(2x^2y^3)^2$ $4x^4y^6$

7) $(5x^2y^4)^3$ $125x^6y^{12}$

8) $(6x^4y^6)^3$ $216x^{12}y^{18}$

9) $(4x^3y^3)^3$ $64x^9y^9$

10) $(7xy)^2$ $49x^2y^2$

11) $\frac{x^3}{x}$ x^2

12) $\frac{18c^3}{-3c^2}$ $-6c$

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

14) $\frac{-48c^2d^4}{-8cd}$ $6cd^3$

15) $\frac{22y^6z^8}{2yz^{-7}}$ $11y^5z^{15}$

16) $x^2 \cdot x^7$ x^9

17) $\left(x^2\right)^7$ x^{14}

18) $\left(-2x^4\right)^5$ $-32x^{20}$

19) $2x^3 + 7x^3$ $9x^3$

20) 7^0 1

21) $8x^0$ $8(1)=8$

22) -3^4 -81

23) $(-3)^4$ 81

24) $6x^0y^8 - \left(2y^2\right)^4$ $6y^8 - 16y^8$ $-10y^8$

25) $(x+2y)(x-2y)$ x^2-4y

26) $\frac{2x^3}{-8x^4}$ $-\frac{1}{4x}$ or $-\frac{1}{4}x^{-1}$

27) $\frac{xy^7}{x^3y^4}$ $x^{-2}y^3$ or $\frac{y^3}{x^2}$

28) $6x^5 \cdot 3x^5 \cdot x^0$ $18x^{10}$

29) $\left(3st^{12}\right)^3$ $27s^3t^{36}$

30) $\left(\frac{3m^2n^7}{m}\right)^5$ $243m^5n^{35}$

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19) $2x^3+7x^3$ $9x^3$

20) 7^0 1

21) $8x^0$ 1

22) -3^4 ← negative not in bracket -81

23) $(-3)^4$ 81

24) $6x^0y^8-\left(2y^2\right)^4$ y^8-16y^8 $-15y^8$

25) $(x+2y)(x-2y)$ diff of sq x^2-4y^2

26) $\frac{2x^3}{-8x^4}$ $\frac{1}{-4x}$ or $\frac{x^{-1}}{-4}$

27) $\frac{xy^7}{x^3y^4}$ $x^{-2}y^3$ NC $\frac{y^3}{x^2}$

28) $6x^5\cdot 3x^5\cdot x^0$ $18x^{10}$ $x^0 = 1$

29) $\left(3st^{12}\right)^3$ $27t^{36}$

30) $\left(\frac{3m^2n^7}{m}\right)^5$ $\frac{243m^{10}n^{35}}{m^5} = 243m^5n^{35}$