Lesson 7-4 More Multiplication Properties of Exponents

Raising a Power to a Power – To raise a power to a power multiply the exponents.

$(a^m)^n = a^{mn}$ example: $(5^4)^2 = 5^{4\cdot2} = 5^8$ $(m^3)^5 = m^{3\cdot5} = m^{15}$

Raising a Product to a Power – To raise a product to a power, raise each factor to the power and multiply

$(ab)^n = a^n b^n$ example: $(3x)^4 = 5^4x^4 = 81x^4$

Study the examples on the left, then try the problems on the right.

A. $(z^5)^3$ $z^{5\cdot3} = z^{15}$

B. $(x^7)^{-2}$ $\frac{1}{(x^7)^2} = \frac{1}{x^{14}}$

C. $(m^2)^7n^5$ $m^{2\cdot7}n^5 = m^{14}n^5$

D. $(6a)^4$ $6^4a^4 = 1296a^4$

E. $(6j^{-2})^{-3}$ $6^{-3}\cdot j^{(-2)(-3)} = \frac{j^6}{6^3} = \frac{j^6}{216}$

F. $(4a^3)^2a^5 = 4^2a^{3\cdot2}a^5 = 16a^6a^5 = 16a^{11}$

G. $(7t^{-3})^3(s^5t^4)^2$ $7^3r^{-9}s^{10}t^8$ $= \frac{7^3s^{10}t^8}{r^9} = \frac{343s^{10}t^8}{r^9}$

1. $(v^7)^2$ $v^{7\cdot2} = v^{14}$

2. $b(b^{-8})^{-3}$ $b(b^{24}) = b^{25}$

3. $(g^5)^{-5}(g^0)^{-2}$ $g^{-25}\cdot g^{-12} = g^{-37} = \frac{1}{g^{37}}$

4. $(9z^4)^{-4}$ $\frac{1}{(9z^4)} = \frac{1}{9^4z^4} = \frac{1}{6561z^4}$

5. $(gh)^0$ $= 1$

6. $(xy^2)(xy^2)^{-1}$ $\frac{xy^2}{xy^2} = 1$

7. $(3b^{-4}c^{-2})^6c^3$ $3^6b^{-24}c^{-12}c^3 = \frac{729}{b^{24}c^9}$

Simplify. Write each answer in scientific notation.

H. $(5\times10^7)^2$ $5^2\cdot10^{14} = 25\cdot10^{14} = 2.5\cdot10^{15}$

I. $(3.6\times10^5)^2 = 3.6^2\cdot10^{10} = 12.96\cdot10^{10} = 1.296\cdot10^{11}$

J. $2^3(2m)^2 = 8\cdot2^2m^2 = 32m^2$

K $(-7p)^3 + 7p^3$ $-243p^3 + 7p^3 = -236p^3$

L. $4a(0^8)b^4(-b)^{-7} = 0$

8. $(9\times10^{-12})^2 = 81\cdot10^{-24} = 8.1\times10^{-23}$

9. $(1.7\times10^{-8})^3 = 4.913\times10^{-24}$

10 $(68.68)^8(68.68)^{-8} = (68.68)^0 = 1$

11. $(d^2)^{-5}d^3$ $= d^{-10}\cdot d^3 = d^{-7} = \frac{1}{d^7}$

12. $(10^{-5})^3(9.9\times10^{-12})^2$ $= 9.801\times10^{-38}$