

Objective 1.01 Multiplication Properties of Exponents:

I. Multiplying Powers with the same base

$a^m \cdot a^n = a^{m+n}$ When multiplying and the bases are the same, ADD the exponents.

Example 1:

a. Simplify: $x^2 \cdot x^5$ $x^{2+5} = x^7$

b. Simplify: $y^2 \cdot y^4 \cdot z$ $y^{2+4} z = y^6 z$

Try these:

1. $3^6 \cdot 3^9$

2. $b^4 \cdot b^{10}$

3. $j^{12} \cdot j^{20}$

Answers: 1) 3^{15} 2) b^{14} 3) j^{32}

Example 2:

a. Simplify: $2y^3 \cdot 8y^9$

$2 \cdot 8 = 16$ $y^{3+9} = y^{12}$

Final answer is $16y^{12}$

b. Simplify $4h^2 \cdot -3h \cdot 5h^2 \cdot y^2$

Multiply coefficients: -60 , $h^{2+1+2} = h^5$ (if there isn't an exponent there, then it has an exponent of 1)

There is nothing you can do with the y^2 so it goes at the end.

Final answer: $-60h^5y^2$

You try:

1. $2x^3 \cdot 5x^2 \cdot -3y^2 \cdot 4y$

2. $8p^6 \cdot 10p^4 \cdot c$

3. $7w \cdot 7w \cdot w$

Answers: 1) $-120x^5y^3$ 2) $80cp^{10}$ (It is proper for answers to be in alphabetical order) 3) $49w^3$

Multiplication properties of exponents continued:

II. Raising a Power to a Power

$(a^m)^n = a^{m \cdot n}$ If you have a power raised to a power, you MULTIPLY the exponents.

Examples:

a. $(x^3)^4 = x^{3 \cdot 4} = x^{12}$

b. $(y^5)^7 = y^{5 \cdot 7} = y^{35}$

Try these:

1. $(w^8)^7$

2. $(c^4)^4$

3. $(k^3)^9$

Answers: 1) w^{56} 2) c^{16} 3) k^{27}

III. Raising a Product to a Power:

$$(ab)^m = a^m \cdot b^m$$

Whenever you have a product raised to a power, you raise everything inside the parentheses to the power.

Examples:

a. $(2xy)^3 = 2^3 \cdot x^3 \cdot y^3 = 8x^3y^3$

b. $(-3p^2r^4s^6)^4 =$ *be careful with the -3* $(-3)^4 \cdot p^{2 \cdot 4} \cdot r^{4 \cdot 4} \cdot s^{6 \cdot 4} = 81p^8r^{16}s^{24}$

c. $(-2x^3yz^5)^3 = (-2)^3 x^{3 \cdot 3} \cdot y^3 \cdot z^{5 \cdot 3} = -8x^9y^3z^{15}$

You try...

1. $(5gh)^2$

2. $(4p^2q^6)^4$

3. $(-2x^5y^9z)^5$

Answers: 1) $25g^2h^2$ 2) $256p^8q^{24}$ 3) $-32x^{25}y^{45}z^5$