Name: _____

Sec. 8.1: Apply Exponent Properties Involving Products

Consider the product $7^2 \cdot 7^3$. We could also write this as $(7 \cdot 7) \cdot (7 \cdot 7 \cdot 7)$, or simply as 7^5.

We can do the same thing using a variable as the base of a power:

$$x^2 \cdot x^3 = (x \cdot x) \cdot (x \cdot x \cdot x) = x^5$$

Notice the exponents; we can take a shortcut by simply adding the exponents when we multiply two terms that have the same base. This is called the _____ of _____:

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

If we have terms that have a variable as a base, and a coefficient other than 1, we can deal with the coefficients first and then the variable.

$$4x^3 \cdot 2x^7 = (4 \cdot 2) \cdot (x^{3+7}) = 8x^{10}$$

Now consider a term containing an exponent that is raised to a power: $(x^2)^3$

We can simplify this expression by rewriting and then applying the product of powers property:

$$(x^2)^3 = x^2 \cdot x^2 \cdot x^2 = x^{2+2+2} = x^6$$

Notice that we again could use a shortcut—multiplying the exponent inside the parentheses times the exponent outside the parentheses. This is known as the _____ of a _____.

$$(x^m)^n = x^{mn}$$

If coefficients other than 1 are present, you can work with them separately from the variable.

$$(2x^3)^4 = 2^4 \cdot x^{3 \cdot 4} = 16x^{12}$$

Examples

Simplify the expression. Write your answer using exponents.

1. $3 \cdot 3^3$

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

3. $3x \cdot -x^4$

4. $3x^2y^4z^3 \cdot 4zx^3$

5. $3jh^2k^2 \cdot 3hj^3k^2 \cdot -3h^2j^4k^2$

6. $(-3pq^3r^3)^3$

7. $2x^4 \cdot (2x^4y^2)^3$

Algebra 1 Name_____

Sec. 8.1 Practice Problems

Simplify. Your answer should contain only positive exponents.

1) $2 \cdot 2^3$

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

3) $-3m \cdot 3m^3$

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

5) $-4x^4 \cdot 4x^3$

6) $3m^4 \cdot 4m^2$

7) $3n^4 \cdot 2m^3n^2$

8) $2m^3n^3 \cdot 3m^4$

9) $-x^3y^3 \cdot -3x^3y^4 \cdot -3x^2y^3$

10) $4mn^2 \cdot 4m^3n^2$

11) $-3x^4y^3 \cdot -4x^2 \cdot x^4y^2$

12) $-3x^2y^4 \cdot 3y^2$

13) $-yx^3z^3 \cdot xy$

14) $-3j^4k^3 \cdot 3hj^4k^2$

15) $2p^3q^4r^2 \cdot 2q^3r^4$

16) $-3b \cdot ca^3b^3$

17) $(3^4)^3$

18) $((-2)^3)^2$

19) $(4^4)^2$

20) $(-2x^4)^2$

21) $(3k^3)^4$

22) $(-4v)^3$

23) $(-2x^3)^4$

24) $(3nm^2)^3$

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

26) $(2yx^3)^4$

27) $(a^3b^4c^3)^2$

28) $(-pm^4q^4)^4$

Answers to Sec. 8.1 Practice Problems

1) 2^4
2) $(-2)^6$
3) $-9m^4$
4) $6x^4$
5) $-16x^7$
6) $12m^6$
7) $6n^6m^3$
8) $6m^7n^3$
9) $-9x^8y^{10}$
10) $16m^4n^4$
11) $12x^{10}y^5$
12) $-9x^2y^6$
13) $-y^2x^4z^3$
14) $-9j^8k^5h$
15) $4p^3q^7r^6$
16) $-3b^4ca^3$
17) 3^{12}
18) $(-2)^6$
19) 4^8
20) $4x^8$
21) $81k^{12}$
22) $-64v^3$
23) $16x^{12}$
24) $27n^3m^6$
25) $16x^8y^4$
26) $16y^4x^{12}$
27) $a^6b^8c^6$
28) $p^4m^{16}q^{16}$