Warm Up

Simplify:

$$\left(\frac{5x^3y^4}{35x^{13}y^7}\right)^2$$

$$\left(\frac{1}{7x^{10}y^3}\right)^2$$

$$\frac{1}{49x^{20}y^6}$$

Name K

Homework Questions?

Division of Monomials Raised to a Power

Simplify each monomial. Show your work/thinking; all final answers must have positive exponents.

1. $\left(\frac{2x^4y^{12}}{y^{10}}\right)^3$

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

$8x^{12}y^6$

2. $\left(\frac{4x^7y^{20}}{xy^{18}}\right)^3$

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

$64x^{18}y^6$

3. $\left(\frac{10x^7y^{20}}{5x^{10}y^{18}}\right)^3$

$\left(\frac{2y^2}{x^3}\right)^3$

$\frac{8y^6}{x^9}$

4. $\left(\frac{18x^{13}y^{17}}{12x^{12}y^{12}}\right)^3$

$\left(\frac{3xy^5}{2}\right)^3$

$\frac{27x^3y^{15}}{8}$

5. $\left(\frac{7x^{11}y^5}{14x^{11}y^{25}}\right)^3$

$\left(\frac{1}{2y^{20}}\right)^3$

$\frac{1}{8y^{60}}$

6. $\left(\frac{-7x^{22}y}{6x^{30}y^5}\right)^3$

$\left(\frac{-1}{3x^8y^4}\right)^3$

$\frac{-1}{27x^{24}y^{12}}$

7. $\left(\frac{44x^{23}y^{84}}{66x^{20}y^{87}}\right)^3$

$\left(\frac{2x^3}{3y^3}\right)^3$

$\frac{8x^9}{27y^9}$

8. $\left(\frac{420x^{108}y^{15}z^3}{840x^{112}y^4z^6}\right)^5$

$\left(\frac{y^{11}}{2x^4z^3}\right)^5$

$\frac{y^{55}}{32x^{20}z^{15}}$

9. $\left(\frac{x^{47}y^{20}}{-2x^{45}y^{20}}\right)^4$

$\left(\frac{x^2}{-2}\right)^4$

$\frac{x^8}{16}$

10. $\left(\frac{-25x^{118}y^{112}}{5x^{114}y^{115}}\right)^2$

$\left(\frac{-5x^4}{y^3}\right)^2$

$\frac{25x^8}{y^6}$

11. $\left[\left(\frac{24y^{18}z^5}{18x^2y^{20}}\right)\cdot\left(\frac{15x^{10}y^4}{20z^2}\right)\right]^3$

$(x^8y^2z^3)^3$

$x^{24}y^6z^9$

12. $\left[\left(\frac{18x^{32}y^{58}}{5x^{37}y^{32}}\right)\cdot\left(\frac{-25x^4}{9y^{10}}\right)\right]^4$

$\left(\frac{-10y^{16}}{x}\right)^4$

$\frac{10{,}000y^{64}}{x^4}$

What does an exponent mean?

It tells us ... how many times a term is multiplied

Reminder, what is a term:

$x \quad y \quad -40 \quad 2x^2$

All of these are terms

Definition of Term: Any component of an expression that is separated by a + or − sign.

What does a negative exponent mean?

$y = 2^x$

x	y
-3	$\frac{1}{8}$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8
4	16

÷2 ÷2 ÷2 ÷2

x2 x2 x2

$\frac{1}{8} = \frac{1}{2^3}$ $\frac{1}{4} = \frac{1}{2^2}$ $\frac{1}{2} = \frac{1}{2^1}$

$2^0 = 1$

Anything to the zero power equals 1

What do we notice?

When we have a term to a negative power, we are actually dividing by that term to the positive power.

multiply 3 times

2^3

$2 \cdot 2 \cdot 2 = 8$

opposite

2^{-3}

$\frac{1}{2 \cdot 2 \cdot 2} = \frac{1}{8}$

12 divided by 4 = $\frac{12}{4}$ ← Division Bar

The division bar:

$\frac{6}{3} = 2$

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

we will be seeing some division

$y^{-8} = \frac{1}{y^8}$

$3^{-2} = \frac{1}{3 \cdot 3} = \frac{1}{3^2} = \frac{1}{9}$

$5m^{-3} = 5\left(\frac{1}{m^3}\right) = \frac{5}{m^3}$

$(a^{-2})(b^3) = \frac{1}{a^2} \cdot \frac{b^3}{1} = \frac{b^3}{a^2}$

$x^3 \cdot x^{-1} = \frac{x \cdot x \cdot x}{x} = x^2$

If there is a negative exponent, start your simplifying by drawing a division bar.

$-6x^{-4}y^6 = \frac{-6y^6}{x^4}$

$\frac{3^4}{3^{-2}} = \frac{3^4 \cdot 3^2}{1} = 3^4 \cdot 3^2 = 3^6$

dividing by 3^2 → other side of division bar

$\frac{k^{-3}}{k^5} = \frac{1}{k^3 \cdot k^5} = \frac{1}{k^8}$

$\frac{12x^5}{4x^{-2}} = \frac{12x^5 \cdot x^2}{4} = 3x^7$

flip

Start with ODD Numbers

8-3 Practice

NAME _____ DATE _____ PERIOD _____

Student Edition
Pages 347–351

Negative Exponents

Write each expression using positive exponents. Then evaluate the expression.

1. 2^{-6}
2. 5^{-1}
3. 8^{-2}
4. 10^{-3}

Simplify each expression.

5. g^{-6}
6. s^{-1}
7. q^{0}
8. $a^{-2}b^{2}$
9. $\frac{m^5n^{-1}}{1} = \frac{m^5}{n^1}$
10. $p^{-1}q^{-6}r^{3}$
11. $x^{-3}y^{2}z^{-4}$
12. $a^{-2}b^{0}c^{-1}$
13. $12m^{-6}n^{4}$
14. $7xy^{-8}z$
15. $x^{-3}(x^{2})$
16. $b^{3}(b^{-5})$
17. $\frac{b^3}{b^6}$
18. $\frac{y^3}{y^{-2}}$
19. $\frac{m^5n^3}{m^6n^2}$
20. $\frac{xy^2}{xy^3}$
21. $\frac{a^7b^4}{a^9b^2}$
22. $\frac{rs^{-3}}{r^2s^4}$
23. $\frac{16c^8}{4c^{10}}$
24. $\frac{9x^{-5}y^5}{36x^4y^3}$
25. $\frac{7p^2q^6}{21p^{-3}q^7}$
26. $\frac{-6m^5n^2q^{-1}}{36m^{-2}n^4q^{-1}}$
27. $\frac{4a^3b^2c^2}{6a^5b^3c}$
28. $\frac{28x^5y^{-3}z}{-4x^4yz^3}$

Homework

Finish classwork,
and complete EVEN numbers