

## Negative Exponents

What is our rule for dividing powers with the same base?

Use this rule to try the following problem...

$$\frac{3^2}{3^4}$$

You notice that the exponent ends up being negative. Let's use the table below to investigate how to deal with negative exponents...

Problem	Expressed with a Negative Exponent	Factors	Reduced Expression
$\frac{3^2}{3^4}$			
$\frac{5^3}{5^4}$			
$\frac{2^1}{2^5}$			
$\frac{4^2}{4^7}$			
$\frac{3^{100}}{3^{300}}$			

1. What patterns or short cuts do you notice about this process?

2. What would  $(10^m)^n$  equal?

### General Rule:

Try These...

1.  $4^{-6}$

2.  $2^{-3}$

3.  $4^{-2}$

4.  $5^{-3}$

Zero as an Exponent???

What happens when you divide two powers and you get zero as an exponent? For example...

$$\frac{3^4}{3^4} =$$

Problem	Fraction without Powers	Simplify	Quotient
$\frac{3^4}{3^4}$			
$\frac{2^5}{2^5}$			
$\frac{9^3}{9^3}$			
$\frac{3^2}{3^2}$			
$\frac{4^{50}}{4^{50}}$			

1. What patterns or short cuts do you notice about this process?

2. What would  $a^0$  always equal?

General Rule:

Simplify each of the following...

1.  $36^0$

2.  $\frac{3^4 \cdot x^3}{3 \cdot x^3}$

3.  $\frac{a^6 \cdot b^7}{a^6 \cdot b^4}$

4.  $7x^0$

## Practice 4-8 Exponents and Division

Complete each equation.

1.  $\frac{8^n}{8^7} = 8^2$ ,  $n =$  \_\_\_\_\_

2.  $\frac{12x^5}{4x} = 3x^n$ ,  $n =$  \_\_\_\_\_

3.  $\frac{1}{h^5} = h^n$ ,  $n =$  \_\_\_\_\_

4.  $\frac{p^n}{p^8} = p^{-6}$ ,  $n =$  \_\_\_\_\_

5.  $\frac{1}{81} = 3^n$ ,  $n =$  \_\_\_\_\_

6.  $\frac{12^4}{12^n} = 1$ ,  $n =$  \_\_\_\_\_

Simplify each expression.

7.  $\frac{a^3}{a^7}$  \_\_\_\_\_

8.  $\frac{j^5}{j^6}$  \_\_\_\_\_

9.  $\frac{x^7}{x^7}$  \_\_\_\_\_

10.  $\frac{k^5}{k^9}$  \_\_\_\_\_

11.  $\frac{9x^8}{12x^5}$  \_\_\_\_\_

12.  $\frac{2f^{10}}{f^5}$  \_\_\_\_\_

13.  $\frac{3y^4}{6y^{-4}}$  \_\_\_\_\_

14.  $n^{-5}$  \_\_\_\_\_

15.  $\frac{3xy^4}{9xy}$  \_\_\_\_\_

16.  $(-15)^0$  \_\_\_\_\_

17.  $\frac{15h^6k^3}{5hk^2}$  \_\_\_\_\_

18.  $4b^{-6}$  \_\_\_\_\_

Write each expression without a fraction bar.

19.  $\frac{a^7}{a^{10}}$  \_\_\_\_\_

20.  $\frac{4x^2y}{2x^3}$  \_\_\_\_\_

21.  $\frac{x^3y^4}{x^9y^2}$  \_\_\_\_\_

22.  $\frac{12mn}{12m^3n^5}$  \_\_\_\_\_

23.  $\frac{16s^2t^4}{8s^5t^3}$  \_\_\_\_\_

24.  $\frac{21e^4f^2}{7e^2}$  \_\_\_\_\_

25. Write three different quotients that equal  $4^{-5}$ .

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