

# Math 9 Exponent Laws (part 2)

Name \_\_\_\_\_

Day \_\_\_ Period \_\_\_ Date \_\_\_\_\_

## Warm-up:

When multiplying the same bases together you can just add the exponents.

When dividing the same bases you can just subtract the exponents.

What is  $2^6 \div 2^2$ ?  $= 2^{6-2}$   
 $= 2^4$   
 $= 16$

What is  $(-5)^3(-5)^4(-5)^{-2}$ ?  
 $= (-5)^{3+4+(-2)} = (-5)^5$

## Activity 1:

In your group, discuss what  $(4^2)^3$  means.

It means  $4^2$  multiplied by itself 4 times.

Try writing  $(4^2)^3$  in expanded form.

$(4^2) \times (4^2) \times (4^2) = (4 \times 4) \times (4 \times 4) \times (4 \times 4)$

Now count up the number of 4s you have and rewrite  $(4^2)^3$  in exponential form. You should only have ONE exponent this time.  $4^6$

## Activity 2: Fill in the table below. The first row has been done for you.

A power raised to an exponent	Partly expanded	Fully expanded	Exponential form
$(2^5)^3$	$2^5 \times 2^5 \times 2^5$	$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$ $2 \times 2 \times 2 \times 2 \times 2 \times 2$	$2^{15}$
$(3^2)^4$	$3^2 \times 3^2 \times 3^2 \times 3^2$	$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$	$3^8$
$(-5^5)^2$	$(-5^5) \times (-5^5)$	$-(5 \times 5 \times 5 \times 5 \times 5) \times -(5 \times 5 \times 5 \times 5 \times 5)$	$5^{10}$

Look at your table. Is there a faster way to go from the first column to the last column? Write it down.

Multiply the exponents!

**Activity 3: Raising a quotient to an exponent. Raising a product to an exponent.**

Write  $\left(\frac{3}{4}\right)^2$  in simplified exponential form.

$$\frac{3^2}{4^2} = \frac{9}{16}$$

Write  $\left(\left(\frac{2}{5}\right)^2\right)^3$  in simplified exponential form.

$$\left(\frac{2}{5}\right)^{2 \times 3} = \left(\frac{2}{5}\right)^6 = \frac{2^6}{5^6} = \frac{64}{3125}$$

Write  $[2x]^4$  in simplified exponential form.

$$2^4 \times x^4 = 16x^4$$

Write  $\left(\frac{1}{3}\right)^1 \left(\frac{1}{3}\right)^2 \left(\frac{1}{3}\right)^3 \left(\frac{1}{3}\right)^4 \left(\frac{1}{3}\right)^5$  as a quotient of two powers.

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

Write  $(9 \times 4)^1 (9 \times 4)^2$  as a product of two powers.

$$= (9 \times 4)^{1+2} = 9^2 \times 4^2$$

**EXPONENT LAW 4** <sup>Power of a power</sup> To raise a power to a power, multiply exponents.  
 $(a^m)^n = a^{m \cdot n}$  ex.  $(a^2)^5 = a^{10}$

**EXPONENT LAW 5** Power of a product  
 $(ab)^n = a^n b^n$  ex.  $(4 \cdot 3)^4 = (4^4 \cdot 3^4)$

**EXPONENT LAW 6** Power of a Quotient  
 $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$  ex.  $\left(\frac{5}{2}\right)^5 = \frac{5^5}{2^5}$

**Activity 4-** Check your understanding Based on your understanding of the 6 Laws...

Based on your understanding of the 6 Laws... Which of the following can/cannot be done. Circle either can or cannot.

a)  $a^2 + a^3 = a^{2+3} = a^5$  can/cannot

b)  $a^2 \times ab^4 = (ab)^{2+4}$  can/cannot

c)  $ab^5 \times (ab)^4 = a^5 b^9$  can/cannot

d)  $3^2 \times 3^4 = 9^6$  can/cannot

e)  $(2^3)^2 = (2^2)^3$  can/cannot

f)  $(a^3)^4 = a^{3+4}$  can/cannot