

## Warm Up Questions

$$1. \frac{7^5 \times 7^3 \times 7^4}{7^8 \times 7^4 \div 7^4}$$

$$2. \frac{8^{14} \div 8^3 \div 8^5}{8^2 \times 8^3 \times 8}$$

$$3. \frac{2^4(4^3 \div 2^2) - 4^0}{3(3^4 + 2^2)}$$

$$1. \frac{7^5 \times 7^3 \times 7^4}{7^8 \times 7^4 \div 7^4}$$

$$\begin{aligned} & \frac{7^{12}}{7^{12} \div 7^4} \\ &= \frac{7^{12}}{7^8} \\ &= 7^4 \end{aligned}$$

$$2. \frac{8^{14} \div 8^3 \div 8^5}{8^2 \times 8^3 \times 8^1}$$

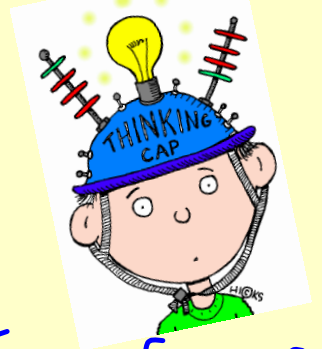
$$\begin{array}{r} 14 - 3 - 5 \\ 11 - 5 \\ = 6 \end{array}$$

$$\frac{8^6}{8^6}$$

$$\begin{aligned} &= 8^0 \\ &= 1 \end{aligned}$$

$$3. \frac{2^4(4^3 \div 2^2) - 4^0}{3(3^4 + 2^2)}$$

Evaluate



1)

$$\begin{aligned} & \underbrace{(-2)^7 \div (-2)^3} - \underbrace{(-2)^5 \div (-2)^2} & \underbrace{(-4)^9 \div (-4)^5} + \underbrace{(-4)^5 \div (-4)^2} \\ & (-2)^4 - (-2)^5 \div (-2)^2 & (-4)^4 + (-4)^5 \div (-4)^2 \\ & (-2)^4 - (-2)^3 & (-4)^4 + (-4)^3 \\ & +16 + (+8) & 256 + (-64) \\ & = 24 & = 192 \end{aligned}$$

# Section 2.5

## Exponent Laws II



Fill in the following chart

Power	As Repeated Multiplication	As a Product of Factors	As a power
$(3^2)^5$	$3^2 \times 3^2 \times 3^2 \times 3^2 \times 3^2$		$3^{10}$
$(4^2)^3$	$4^2 \times 4^2 \times 4^2$		$4^6$
$(-2^4)^3$	$(-2)^4 \times (-2)^4 \times (-2)^4$		$(-2)^{12}$



## Exponent Law for a Power of a Power

To raise a power to a power, multiply the exponents.

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

$$(5^3)^5 = 5^{15}$$

**Who is being held captive???????**  
**and by who?????**

$$(-5)^3 = \text{—}$$



$$(-6)^2 = \text{+}$$



$$-(7)^5 = \text{—}$$





## Try this



Express the following as a single power

1)  $(5^7)^8$

$$5^{56}$$

2)  $(10^2)^3$

$$10^6$$

3)  $[(-2)^4]^3$

$$(-2)^{12}$$

## Evaluate

1)  $(2^3)^2$

$$= 2^6$$

$$= 64$$

2)  $(5^2)^3$

$$= 5^6$$

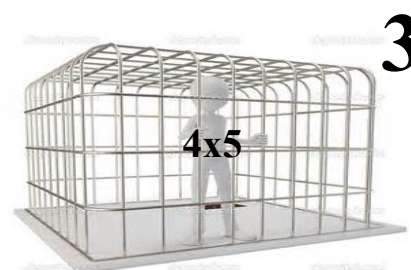
$$= 15625$$

3)  $[(-3)^2]^4$

$$(-3)^8$$

$$= +6561$$

Write the expression as a Product of Powers



$$(4 \times 5)^3$$

$$\begin{aligned} & (4 \times 5)(4 \times 5)(4 \times 5) \\ = & \textcircled{4} \times \textcircled{5} \times \textcircled{4} \times \textcircled{5} \times \textcircled{4} \times \textcircled{5} \\ & 4^3 \times 5^3 \end{aligned}$$

Write the expression as a Product of Powers



$$\begin{aligned} & (6^2 \times 3^3)^3 \\ &= 6^6 \times 3^9 \end{aligned}$$

Fill in the following chart

Power	As Repeated Multiplication	As a Product of Factors	As a Product of Powers
$(6 \times 3)^5$			
$(7 \times 2)^3$			
$((-3) \times 5)^2$			

## Exponent Law for a Power of a Product



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

The variables "a" and "b" are any integer, except 0.

The variable "m" is any whole numbers.

# Try this



Write as a power then Evaluate

$$1) [(-5)^3]^7$$

$$(-5)^{21}$$

= -

$$2) -(3^5)^4$$

$$= -3^{20}$$

$$= -3486784401$$

$$3) (4^8)^2$$

$$4^{16}$$

$$= 4294967296$$

# What about a power of a quotient?



What did you discover?

Write the expression as a Power of a Quotient

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

$$\frac{3}{2} \times \frac{3}{2}$$

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

$$\left(\frac{5^1}{3^3}\right)^4$$

$$\frac{5^4}{3^{12}}$$

$$\left(\frac{4^2}{7^3}\right)^3$$

∴

$$\frac{4^6}{7^9}$$



## Exponent Law for a Power of a Quotient



$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

BUT  $b \neq 0$



The variables "a" and "b" are any integer, except 0.

The variable "m" is any whole numbers.

# Evaluating Powers of Product and Quotients

$$[(-6) \times 4]^2$$

## Method 1

Use the exponent law for a power of a product

$$\begin{aligned} [(-6) \times 4]^2 & \\ &= (-6)^2 \times 4^2 \\ &= 36 \times 16 \\ &= 576 \end{aligned}$$

## Method 2

Use the order of operations

$$\begin{aligned} [(-6) \times 4]^2 & \\ &= [-24]^2 \\ &= 576 \end{aligned}$$

You Decide

Try some more (use which ever method you want)

2)  $-(5 \times 2)^3$

3)  $\left(\frac{21}{-3}\right)^3$

# Applying Exponent Laws and Order of Operations

$$\begin{aligned} & (5 \times 2)^3 + (2^8 \div 2^5)^4 \\ & (10)^3 + (2^3)^4 \\ & (10)^3 + 2^{12} \\ & 1000 + 4096 \\ & = 5096 \end{aligned}$$

# Class/Homework

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