

### 2.5 – Exponent Laws (Part 2)

INVESTIGATE

1. Complete the following table:

Power of a Power	As Repeated Multiplication	As a Product of Factors	As a Single Power
$(4^3)^2$	$4^3 \times 4^3$	$4 \times 4 \times 4 \times 4 \times 4 \times 4$	$4^6$
$(3^2)^4$	$3^2 \times 3^2 \times 3^2 \times 3^2$	$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$	$3^8$
$[(-5)^2]^3$	$(-5)^2 \times (-5)^2 \times (-5)^2$	$(-5) \times (-5) \times (-5) \times (-5) \times (-5) \times (-5)$	$(5)^6$

2. What rule can you create to reduce a power of a power?

Keep the base, multiply the exponents

**Exponent Laws (Part 2)**

~~★~~ Power of a Power:  $(a^m)^n = a^{mn}$

Power of a Product:  $(ab)^m = a^m b^m$

Power of a Quotient:  $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

Where  $a$  and  $b$  are rational bases, except 0;  $m$  and  $n$  are rational exponents

Ex. 1: Write as a power.

(a)  $(6^2)^7$   
 $= 6^{2 \times 7}$   
 $= 6^{14}$

(b)  $[(-7)^3]^2$   
 $= (-7)^{3 \times 2}$   
 $= (-7)^6$

(c)  $-(2^4)^5$   
 $= -2^{4 \times 5}$   
 $= -2^{20}$

Ex. 2: Evaluate in two different ways:

1 - using the exponent laws

$$\begin{aligned} \text{(a)} \quad & (2 \times 5)^2 \\ & = 2^2 \times 5^2 \\ & = 4 \times 25 \\ & = 100 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & \left(\frac{4}{-2}\right)^2 \\ & = \frac{4^2}{(-2)^2} \\ & = \frac{16}{4} \\ & = 4 \end{aligned}$$

2 - using the order of operations

$$\begin{aligned} & = 10^2 \\ & = 100 \end{aligned}$$

$$\begin{aligned} & = (-2)^2 \\ & = 4 \end{aligned}$$

Ex. 3: Simplify, then evaluate each expression.

$$\begin{aligned} \text{(a)} \quad & [(-2)^2]^2 \times (-2)^2 \\ & = (-2)^4 \times (-2)^2 \\ & = (-2)^6 \\ & = 64 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad & [(-4)^4 \div (-4)^2]^2 \\ & = [(-4)^2]^2 \\ & = (-4)^4 \\ & = 256 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & (3^2 \times 3^3)^2 \\ & = (3^5)^2 \\ & = 3^{10} \\ & = \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad & -\left(\frac{3^8}{3^6}\right)^2 \\ & = -(3^2)^2 \\ & = -3^4 \\ & = -81 \end{aligned}$$

Assignment: 2.5 Blue sheet

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