

Exponent Laws Part 2

Investigation 3:

$$[(-7)^3]^2$$

First Expand:

$$(-7)^3 \times (-7)^3$$

Then simplify using Law 1:

$$(-7)^6$$

Exponent Law 3: Power of a Power

To raise a power to a power, you must Multiply the exponents to simplify. $(a^m)^n = a^{m \times n}$

Power	Repeated Form	Simplified
$(3^4)^2$	$3^4 \times 3^4 \Rightarrow (3 \times 3 \times 3 \times 3) \times (3 \times 3 \times 3 \times 3)$	3^8
$(2^2)^3$	$2^2 \times 2^2 \times 2^2 \Rightarrow (2 \times 2) \times (2 \times 2) \times (2 \times 2)$	2^6
$[(-3)^2]^4$	$(-3)^2 \times (-3)^2 \times (-3)^2 \times (-3)^2$	$(-3)^8$
$(10^5)^4$	$10^5 \times 10^5 \times 10^5 \times 10^5$	10^{20}

Investigation 4:

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

First Expand:

$$(3 \times 4) \times (3 \times 4) \times (3 \times 4)$$

OR

$$3 \times 3 \times 3 \times 4 \times 4 \times 4$$

Then simplify using Law 1:

$$3^3 \times 4^3$$

Exponent Law 4: Power of a Product

When the product of two powers with different bases is raised to an exponent, you can distribute (share) that exponent with each power. $(ab)^m = a^m b^m$

Multiply outside exponent with both inside exponents

Power	Repeated Form	Simplified
$(2 \times 3)^4$	$(2 \times 3) \times (2 \times 3) \times (2 \times 3) \times (2 \times 3)$ $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$	$2^4 \times 3^4$
$(5 \times 6)^2$	$(5 \times 6) \times (5 \times 6)$ $5 \times 5 \times 6 \times 6$	$5^2 \times 6^2$
$(2^3 \times 5^2)^2$	$(2^3 \times 5^2) \times (2^3 \times 5^2)$ $2 \times 2 \times 2 \times 5 \times 5 \times 2 \times 2 \times 2 \times 5 \times 5$ $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5$	$2^6 \times 5^4$
$(4^3 \times 6^5)^3$	$(4^3 \times 6^5) \times (4^3 \times 6^5) \times (4^3 \times 6^5)$ 	$4^9 \times 6^{15}$

Investigation 5:

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

First Expand:

$$\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4}$$

Then simplify using Law 1:

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

Exponent Law 5: Power of a Quotient

When the quotient of two powers with different bases is raised to an exponent, you can distribute (share) that exponent with each

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

Multiply outside exponent with both inside exponents

Power	Repeated Form	Simplified
$\left(\frac{4}{2}\right)^2$	$\frac{4}{2} \times \frac{4}{2}$	$\frac{4^2}{2^2}$
$\left(\frac{5}{6}\right)^3$	$\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6}$	$\frac{5^3}{6^3}$
$\left(\frac{3^2}{9^1}\right)^2$	$\frac{3^2}{9^1} \times \frac{3^2}{9^1} = \frac{3 \times 3 \times 3 \times 3}{9 \times 9}$	$\frac{3^4}{9^2}$
$\left(\frac{3}{1}\right)^3$	$\frac{3}{1} \times \frac{3}{1} \times \frac{3}{1}$	$\frac{3^3}{1^3}$

Practice Assignment:

Practice the Basics: Pgs 84-85 #4(a-c), 5(a-c), 6, 8, 14a-d, 15ab

Medium Difficulty: Pgs 84-85 # 6, 8, 12, 14, 15, 16abe

Most Challenging: Pgs 84-85 # 12, 14, 15, 16, 19aef, 20a