

### 3.3 Exponent Laws Investigation

SOLUTIONS

MPM1D  
Jensen

**Product Rule:** Complete the following table

Product	Expanded Form	Single Power
$3^2 \cdot 3^4$	$(3 \times 3) \times (3 \times 3 \times 3 \times 3)$ $= 3 \times 3 \times 3 \times 3 \times 3 \times 3$	$3^6$
$4^3 \cdot 4^3$	$(4 \times 4 \times 4) \times (4 \times 4 \times 4)$ $= 4 \times 4 \times 4 \times 4 \times 4 \times 4$	$4^6$
$2^3 \cdot 2^4 \cdot 2^2$	$(2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2) \times (2 \times 2)$ $= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$	$2^9$
$k^3 \cdot k^5$	$(k \times k \times k) \times (k \times k \times k \times k \times k)$ $= k \times k \times k \times k \times k \times k \times k \times k$	$k^8$
create your own example		

Describe any trends you see: when multiplying powers with the same base, keep the same base and add the exponents.

**Quotient Rule:** Complete the following table

Quotient	Expanded Form	Single Power
$5^5 \div 5^3$	$\frac{5 \times 5 \times 5 \times 5 \times 5}{5 \times 5 \times 5}$	$5^2$
$7^4 \div 7^1$	$\frac{7 \times 7 \times 7 \times 7}{7}$	$7^3$
$10^6 \div 10^4$	$\frac{10 \times 10 \times 10 \times 10 \times 10 \times 10}{10 \times 10 \times 10 \times 10}$	$10^2$
$x^8 \div x^5$	$\frac{x(x)(x)(x)(x)(x)(x)(x)}{x(x)(x)(x)(x)}$	$x^3$
create your own example		

Describe any trends you see: when dividing powers with the same base, keep the same base and subtract the exponents

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**Power of a Power Rule:** Complete the following table

Power of a Power	Expanded Form	Single Power
$(2^2)^3$	$(2^2) \times (2^2) \times (2^2)$ $= (2 \times 2) \times (2 \times 2) \times (2 \times 2)$ $= 2 \times 2 \times 2 \times 2 \times 2 \times 2$	$2^6$
$(5^3)^4$	$= (5^3) \times (5^3) \times (5^3) \times (5^3)$ $= (5 \times 5 \times 5) \times (5 \times 5 \times 5) \times (5 \times 5 \times 5) \times (5 \times 5 \times 5)$ $= 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$	$5^{12}$
$(10^4)^2$	$= (10^4) \times (10^4)$ $= (10 \times 10 \times 10 \times 10) \times (10 \times 10 \times 10 \times 10)$ $= 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$	$10^8$
Create your own example		

Describe any trends you see:

A power of a power can be written as a single power by multiplying the exponents.

**Exponent Laws:**

Product Rule	$x^a \cdot x^b = x^{a+b}$
Quotient Rule	$x^a \div x^b = x^{a-b}$
Power of a Power Rule	$(x^a)^b = x^{a \times b}$
Zero Exponent Rule	$x^0 = 1$