Section 2.5 Exponent Laws II
Power of a Power Investigation

Power of a Power	Repeated Multiplication	Product of Factors	Power Form
$(2^4)^3$	$2^4 \times 2^4 \times 2^4$	$(2 \times 2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2)$	2^{12}
$(3^2)^4$	$3^2 \times 3^2 \times 3^2 \times 3^2$	$(3 \times 3) \times (3 \times 3) \times (3 \times 3) \times (3 \times 3)$	3^8
$(4^2)^3$	$4^2 \times 4^2 \times 4^2$	$(4 \times 4) \times (4 \times 4) \times (4 \times 4)$	4^6
$(5^3)^3$	$5^3 \times 5^3 \times 5^3$	$(5 \times 5 \times 5) \times (5 \times 5 \times 5) \times (5 \times 5 \times 5)$	5^9
$[(-4)^3]^2$	$(-4)^3 \times (-4)^3$	$(-4 \times -4 \times -4) \times (-4 \times -4 \times -4)$	$(-4)^6$
$[(-5)^3]^5$	$(-5)^3 \times (-5)^3 \times (-5)^3 \times (-5)^3 \times (-5)^3$	$(-5 \times -5 \times -5) \times (-5 \times -5 \times -5) \times (-5 \times -5 \times -5) \times (-5 \times -5 \times -5) \times (-5 \times -5 \times -5)$	$(-5)^{15}$

Create 3 more examples of your own.

Power of a Power	Repeated Multiplication	Product of Factors	Power Form

State a rule for when you have two exponents (power of a power)

When you have a power to a power, the base stays the same and multiply the exponents.

$(a^m)^n = a^{m \times n}$

where $a \neq 0$ and m and n are whole numbers

Examples

1:   Write as a power

A) $(3^2)^4$
    $= 3^{2 \times 4}$
    $= 3^8$

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

C) $-(2^2)^4$
    $= -(2^{2 \times 4})$
    $= -2^8$

D) $(3^0)^2$
    $= 3^{0 \times 2}$
    $= 3^0$

E) $(42^3)^2 \times (42^4)^4$
    $= 42^{3 \times 2} \times 42^{4 \times 4}$
    $= 42^6 \times 42^{16}$
    $= 42^{6 + 16}$
    $= 42^{22}$

This problem uses two exponent rules!

2.　Simplify first, then evaluate.

A)　$(2^3)^2 \times (3^2)^2$

　　$= 2^{3 \times 2} \times 3^{2 \times 2}$

　　$= 2^6 \times 3^4$

　　$= 64 \times 81$

　　$= 5184$

B)　$(-3^2)^3 \times (-3^0)^9$

　　$= (-3^{2 \times 3}) \times (-3^{0 \times 9})$

　　$= (-3^6) \times (-3^0)$

　　$= -729 \times -1$

　　$= 729$

Complete Page 84 # 6, 7, 9, 12

Power of a Product Investigation

Power	Repeated Multiplcation	Product of Factors	Product of Powers
$(2 \times 5)^3$	$(2 \times 5) \times (2 \times 5) \times (2 \times 5)$	$2 \times 2 \times 2 \times 5 \times 5 \times 5$	$2^3 \times 5^3$
$(3 \times 4)^2$	$(3 \times 4) \times (3 \times 4)$	$3 \times 3 \times 4 \times 4$	$3^2 \times 4^2$
$(4 \times 2)^5$	$(4 \times 2) \times (4 \times 2) \times (4 \times 2) \times (4 \times 2) \times (4 \times 2)$	$4 \times 4 \times 4 \times 4 \times 4 \times 2 \times 2 \times 2 \times 2 \times 2$	$4^5 \times 2^5$
$(5 \times 3)^4$	$(5 \times 3) \times (5 \times 3) \times (5 \times 3) \times (5 \times 3)$	$5 \times 5 \times 5 \times 5 \times 3 \times 3 \times 3 \times 3$	$5^4 \times 3^4$
$(5 \times 6)^2$	$(5 \times 6) \times (5 \times 6)$	$5 \times 5 \times 6 \times 6$	$5^2 \times 6^2$
$(7 \times 2)^3$	$(7 \times 2) \times (7 \times 2) \times (7 \times 2)$	$7 \times 7 \times 7 \times 2 \times 2 \times 2$	$7^3 \times 2^3$

Create 3 more examples of your own.

Power	Repeated Multiplication	Product of Factors	Product of Powers

State a rule for when you have a power of a product.

When you have a power of a product, the exponent outside the bracket is applied to the exponents on each of the factors on the inside of the brackets.

$(ab)^m = a^m b^m$
    where $a \neq 0$ and $b \neq 0$ and m is a whole number

1. Evaluate each question two ways. Use power of a product and BEDMAS.

A) $[(-7) \times 5]^2$ B) $- (3 \times 2)^2$

Method 1

$= (-7)^2 \times 5^2$ $= -(3^2 \times 2^2)$

$= 49 \times 25$ $= -(9 \times 4)$

$= 1225$ $= - 36$

Method 2

$= [-35]^2$ $= -(6)^2$

$= (-35) \times (-35)$ $= - (6 \times 6)$

$= 1225$ $= -36$

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2. Evaluate, using any method of your choice.

A) $(3 \times 4)^3$ B) $[(-2)^2 \times (-2)^1]^3$

$= 12^3$ $= [(-2)^{2+1}]^3$

$= 1728$ $= [(-2)^3]^3$

                                   $= (-2)^{3 \times 3}$

                                   $= (-2)^9$

                                   $= -512$

Complete Page 84 #'s 4 and 14

Power of a Quotient Investigation

Power	Repeated Multiplication	Product of Factors	Product of Quotients
$\left(\dfrac{5}{6}\right)^3$	$\dfrac{5}{6} \times \dfrac{5}{6} \times \dfrac{5}{6}$	$\dfrac{5 \times 5 \times 5}{6 \times 6 \times 6}$	$\dfrac{5^3}{6^3}$
$\left(\dfrac{2}{3}\right)^4$	$\dfrac{2}{3} \times \dfrac{2}{3} \times \dfrac{2}{3} \times \dfrac{2}{3}$	$\dfrac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3}$	$\dfrac{2^4}{3^4}$
$\left(\dfrac{1}{5}\right)^5$	$\dfrac{1}{5} \times \dfrac{1}{5} \times \dfrac{1}{5} \times \dfrac{1}{5} \times \dfrac{1}{5}$	$\dfrac{1 \times 1 \times 1 \times 1 \times 1}{5 \times 5 \times 5 \times 5 \times 5}$	$\dfrac{1^5}{5^5}$
$\left(\dfrac{3}{10}\right)^2$	$\dfrac{3}{10} \times \dfrac{3}{10}$	$\dfrac{3 \times 3}{10 \times 10}$	$\dfrac{3^2}{10^2}$
$\left(\dfrac{-4}{7}\right)^3$	$\dfrac{-4}{7} \times \dfrac{-4}{7} \times \dfrac{-4}{7}$	$\dfrac{-4 \times -4 \times -4}{7 \times 7 \times 7}$	$\dfrac{(-4)^3}{7^3}$
$\left(\dfrac{-4}{-5}\right)^6$	$\dfrac{-4}{-5} \times \dfrac{-4}{-5} \times \dfrac{-4}{-5} \times \dfrac{-4}{-5} \times \dfrac{-4}{-5} \times \dfrac{-4}{-5}$	$\dfrac{-4 \times -4 \times -4 \times -4 \times -4 \times -4}{-5 \times -5 \times -5 \times -5 \times -5 \times -5}$	$\dfrac{(-4)^6}{(-5)^6}$

Create 3 more examples of your own.

Power	Repeated Multiplication	Product of Factors	Product of Quotients

State a rule for when you have a power of a quotient.

When you have a power of a quotient, the exponent outside of the bracket is applied to the exponents on the numerator and denominator of the fraction inside of the brackets.

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

where a ≠ 0 and b ≠ 0 and m is a whole number

Evaluate each question two ways. Use power of a quotient and BEDMAS.

A) $[(-24) \div 6]^4$ B) $\left(\frac{52}{13}\right)^3$

Method 1

= $(-24)^4 \div 6^4$ $\qquad\qquad = \frac{(52)^3}{(13)^3}$

= 331 776 ÷ 1296 $\qquad\qquad = \frac{140608}{2197}$

= 256 $\qquad\qquad\qquad\qquad = 64$

Method 2

= $[-4]^4$ $\qquad\qquad\qquad = (4)^3$

= 256 $\qquad\qquad\qquad\quad = 64$

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Complete Pages 84-85
#'s 5, 8, 10, 15, 16 and 19