



Agenda:

1) Bell Ringer: page 48 - *due at 12:55*

2) Lesson 3: Numbers in Exponential Form
Raised to a Power

EQ: What is the rule for an exponent raised to a power?

notes/ examples start on p. 40

3) Homework: pgs 46-47

4) Exit Ticket

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p. 42

EXAMPLE	WRITE IN EXPANDED FORM	REWRITE USING EXPONENTS
$(2^3)^2$	$(2^3)(2^3) = (2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2)$	2^6
$(3^2)^4$	$3^2 \cdot 3^2 \cdot 3^2 \cdot 3^2$	3^8
$(5^4)^3$	$5^4 \cdot 5^4 \cdot 5^4$	5^{12}
$(7^2)^2$	$7^2 \cdot 7^2$	7^4
$\left[\left(\frac{1}{2}\right)^2\right]^5$	$\left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^2$	$\left(\frac{1}{2}\right)^{10}$
$(x^m)^n$		x^{mn}

1) What patterns did you notice as you filled in the chart?

Keep Base, multiply exponents

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Lesson 3: Numbers in Exponential Form Raised to a Power p. 27

Classwork

For any number x and any positive integers m and n ,

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

because

$$(x^m)^n = \underbrace{(x \cdot x \cdots x)}_{m \text{ times}}^n$$

$$= \underbrace{(x \cdot x \cdots x)}_{m \text{ times}} \times \cdots \times \underbrace{(x \cdot x \cdots x)}_{m \text{ times}} \quad n \text{ times}$$

$$= x^{mn}$$

$$(2^3)^4 = 2^{12}$$

$$2^3 \cdot 2^3 \cdot 2^3 \cdot 2^3$$

$$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$$

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Exercise 1

$$(15^3)^9 = 15^{3 \cdot 9} = 15^{27}$$

Exercise 3

$$(3 \cdot 4^{17})^4 = 3 \cdot 4^{17 \cdot 4} = 3 \cdot 4^{68}$$

Exercise 2

$$((-2)^5)^8 = (-2)^{5 \cdot 8} = (-2)^{40}$$

Exercise 4

Let s be a number.

$$(s^{17})^4 = s^{17 \cdot 4} = s^{68}$$

Exercise 5

Sarah wrote $(3^5)^7 = 3^{12}$. Correct her mistake. Write an exponential expression using a base of 3 and exponents of 5, 7, and 12 that would make her answer correct.

correct

$$(3^5)^7 = 3^{5 \cdot 7} = 3^{35}$$

Power Rule

$$3^5 \cdot 3^7 = 3^{12}$$

product Rule

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For any numbers x and y , and positive integer n ,

$$(xy)^n = x^n y^n$$

because

$$\begin{aligned}(xy)^n &= \underbrace{(xy) \cdots (xy)}_{n \text{ times}} \\ &= \underbrace{(x \cdot x \cdots x)}_{n \text{ times}} \cdot \underbrace{(y \cdot y \cdots y)}_{n \text{ times}} \\ &= x^n y^n.\end{aligned}$$

Ex) $(3x^2)^4$
 $3x^2 \cdot 3x^2 \cdot 3x^2 \cdot 3x^2$
 $3 \cdot 3 \cdot 3 \cdot 3 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x^2$
 $3^4 x^8$

Ex) $(2x)^3 = 2x \cdot 2x \cdot 2x$
 $= 2^3 x^3$

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Exercise 7

$(11 \times 4)^9 = 11^9 \times 4^9$
 44^9 OR

Exercise 8

$(3^2 \times 7^4)^5 = (3^2)^5 \times (7^4)^5$
 $3^{10} \times 7^{20}$

Exercise 9

Let a , b , and c be numbers.
 $(3^2 a^4)^5 = (3^2)^5 (a^4)^5$
 $3^{10} a^{20}$

Exercise 13

Let x and y be numbers, $y \neq 0$, and let n be a positive integer. How is $\left(\frac{x}{y}\right)^n$ related to x^n and y^n ?

$$\left(\frac{1}{2}\right)^3 = \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1^3}{2^3}$$

$$\left(\frac{4}{5}\right)^2 = \left(\frac{4}{5}\right)\left(\frac{4}{5}\right) = \frac{4^2}{5^2}$$

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Exercise 10

Let x be a number.
 $(5x)^7 = 5^7 x^7$

Exercise 11

Let x and y be numbers.
 $(5xy^2)^7 = 5^7 x^7 (y^2)^7$
 $5^7 x^7 y^{14}$

Exercise 12

Let a , b , and c be numbers.
 $(a^2 bc^3)^4 = (a^2)^4 b^4 (c^3)^4$
 $a^8 b^4 c^{12}$

Homework

Write each answer as a base raised to a power or as the product of bases raised to powers that is equivalent to the given one.

1. $(9^3)^6 =$

2. $(113^2 \times 37 \times 51^4)^3 =$

3. Let x, y, z be numbers. $(x^2 y z^4)^3 =$

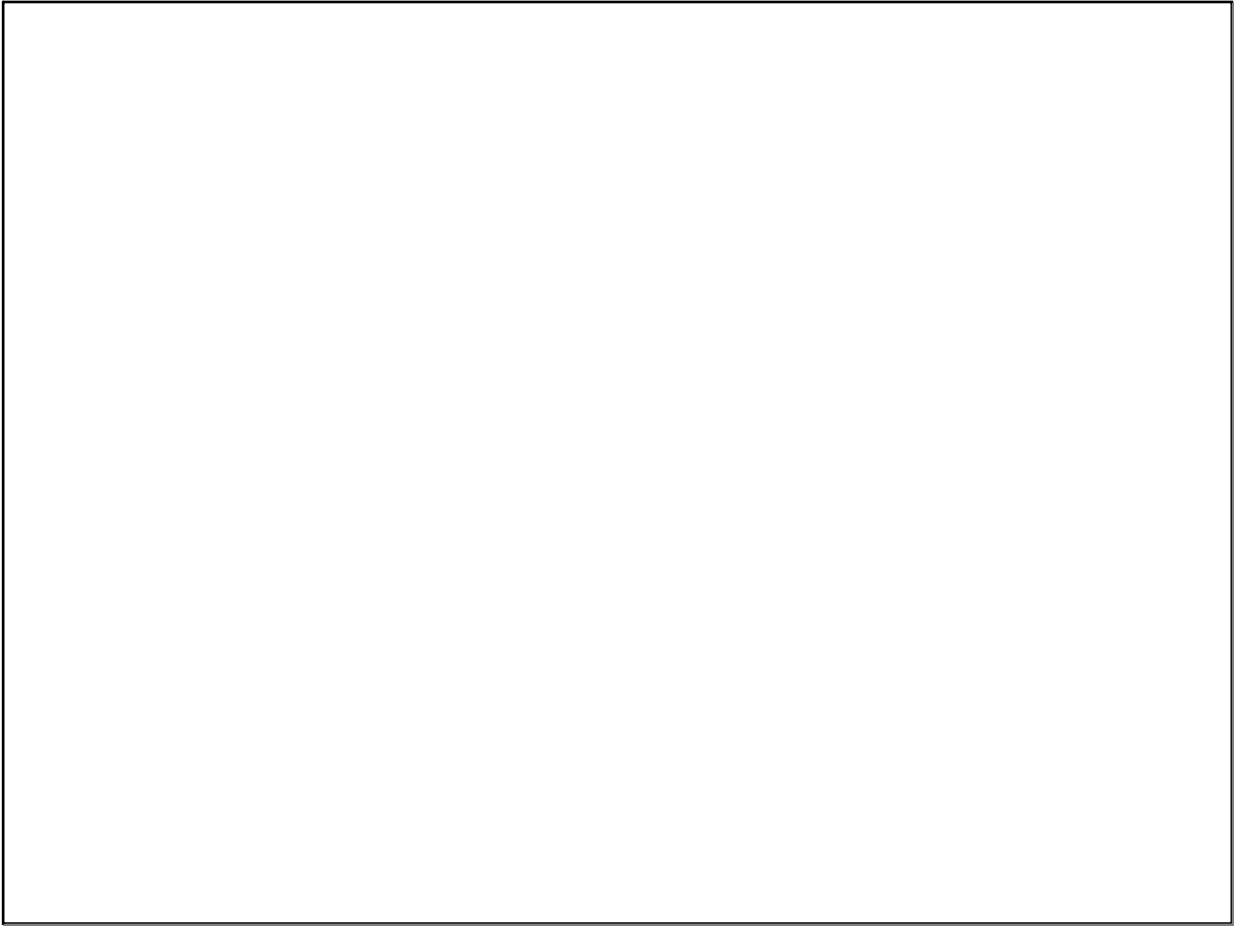
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4. Let x, y, z be numbers and let m, n, p, q be positive integers. $(x^m y^n z^p)^q =$

5. $\frac{4^8}{5^8} =$

6. Show (prove) in detail why $(2 \cdot 3 \cdot 7)^4 = 2^4 3^4 7^4$.

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