

Welcome Back MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: <u>2/5</u> Topic: <u>2B: Zero and Negative exponents</u>	0 1 2	
Tuesday Date: _____ Topic: _____	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	

Warm-up: Simplify.

$$\underline{2x^4(x^5)^3} = 2x^4 \cdot x^{15} = 2x^{19}$$

How can we describe in words
how to solve the warm-up?

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Warm-up: Simplify.

$$2x^4(x^5)^3 = 2x^4 \cdot x^{15} = 2x^{19}$$

How can we describe in words how to solve the warm-up?

- ① Multiply $5 + 3$ since x^5 is raised to a power of 3.
- ② Add exponents 4 and 15 because they have the same base and are being multiplied.

Class Plan:

1. Warm-up

2. Homework Questions?

3. Criterion C: Create a study guide to communicate Index Laws

Example Posted...



Standard: Index Property Study Guide, with example (2-5)

[Download File](#)



Extended: Index Property Study Guide, with example (2-5)

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2B Index Laws

(Properties of Exponents)

DO: Create your own study guide.

1. Explain properties (use words & symbols).
2. Show examples (expansion & rules)

$$b^m \cdot b^n = b^{\boxed{}}$$
$$\frac{b^m}{b^n} = b^{\boxed{}}$$
$$(b^m)^n = b^{\boxed{}}$$
$$b^0 = \boxed{}$$
$$\frac{1}{b^m} = \boxed{}$$

***Use Investigations to help you!

Due: Beginning of class, Friday 2-9

***Self-assess, defend your score.

3. Provide a detailed explanation of each property using words (& symbols!)

$$b^m \cdot b^n = b^{\boxed{}}$$

$$(b^m)^n = b^{\boxed{}}$$

$$\frac{b^m}{b^n} = b^{\boxed{}}$$

$$b^0 = \boxed{}$$

$$\frac{1}{b^m} = \boxed{}$$

Index Laws

(Properties of Exponents)

Multiplication, Power, Division, Zero, and Negative Exponent Properties

Property #1: **Multiplication Rule**

Description of how it works:

$$b^m \cdot b^n = b^{\boxed{}}$$

Examples:

(For each example, show using properties and expansion)

Property #2: **Power Rule**

Description of how it works:

$$(b^m)^n = b^{\square}$$

Examples:

(For each example, show using properties and expansion)

Property #3: **Division Rule**

Description of how it works:

$$\frac{b^m}{b^n} = b^{\square}$$

Examples:

(For each example, show using properties and expansion)

Property #4: **Zero Rule**

Description of how it works:

$$b^0 = \boxed{}$$

Examples:

(For each example, show using properties and expansion)

Property #5: Negative Rule

Description of how it works:

$$\frac{1}{b^m} = \boxed{\phantom{b^{-m}}}$$

Examples:

(For each example, show using properties and expansion)

Product Property of Exponents

$$a^m \cdot a^n = a^{m+n}$$

Quotient Property of Exponents

$$\frac{a^m}{a^n} = a^{m-n}$$

Definition of Negative Exponents

$$a^{-n} = \frac{1}{a^n} \quad \text{or} \quad \left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$$

Zero Exponents

$$a^0 = 1$$

Power of a Power Property

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

Power of a Product Property

$$(ab)^m = a^m b^m$$

Power of a Quotient Property

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

*****Important:**

Recognize how connected the properties are.

UNIT: Exponentials and Logarithms

Key Concept: Form

Related Concept(s): Model, Simplification

Global Context: Identities and Relationships

Statement of Inquiry: Different models can allow us to simplify complex relationships.

Task Title: Property of Exponents Study Guide

Task Description: Students will create their own study guide that showcases the properties of exponents.

Task: Create a study guide with examples of each property of exponents. Your guide will include:

- 1) Examples of each property of exponents.
- 2) Detailed work showing how to simplify the examples.
- 3) A description or explanation of the properties in words.

- 1) Create your own study guide.
- 2) Self-assess, defend your score.

Due: Beginning of class, Friday 2-9

Study guide, Criterion C: Communication Rubric

3	The student is able to: <ul style="list-style-type: none">• Use some appropriate mathematical language		
4	<ul style="list-style-type: none">• Use appropriate forms of mathematical representation to present information adequately.• Communicate through lines of reasoning that are complete.• Adequately organize information using logical structure.		<ul style="list-style-type: none">• A Study guide includes multiple examples that are created to correctly demonstrate each property of exponents, with some error. (<i>Multiplying and dividing the same base, power-to-a-power, zero exponent, and negative exponents</i>).• Each example has a word description, use of symbols, and steps showing the simplification.• The piece of work is somewhat organized and neat. <p>Complete: All necessary pieces are a part of the final work.</p>

Study guide, Criterion C: Communication Rubric

5	<p>The student is able to:</p> <ul style="list-style-type: none"> • Usually use appropriate mathematical language. 	<ul style="list-style-type: none"> • A Study guide includes multiple examples that are created to correctly demonstrate each property of exponents, with little error. (<i>Multiplying and dividing the same base, power-to-a-power, zero exponent, and negative exponents</i>). • Each example has a word description, correct use of symbols, and detailed steps showing the simplification, with little error. • The piece of work is mostly organized and neat. <p>Complete: All necessary pieces are a part of the final work.</p> <p>Coherent: The work is understood using the language developed in the unit.</p>
6	<ul style="list-style-type: none"> • Usually use appropriate forms of mathematical representation to present information correctly. • Usually move between different forms of mathematical representation. • Communicate through lines of reasoning that are complete and coherent. • Present work that is usually organized using a logical structure. 	

Study guide, Criterion C: Communication Rubric

7	<p>The student is able to:</p> <ul style="list-style-type: none"> • Consistently use appropriate mathematical language • Use appropriate forms of mathematical representation to consistently present information correctly. • Move effectively between different forms of mathematical representation. • Communicate through lines of reasoning that are complete, coherent, and concise. • Present work that is consistently organized using a logical structure. 	<ul style="list-style-type: none"> • A Study guide includes multiple examples that are created to correctly demonstrate each property of exponents. <i>(Multiplying and dividing the same base, power-to-a-power, zero exponent, and negative exponents).</i> • Each example has a word description, correct use of symbols, and detailed steps showing the simplification. • The piece of work is organized and neat. • (8) Examples include multiple properties. <p><u>Complete:</u> All necessary pieces are a part of the final work.</p> <p><u>Coherent:</u> The work is understood using the language developed in the unit.</p> <p><u>Concise:</u> The work does not include unnecessary pieces of information.</p>
8		

Exercises...

Finish Study Guide

Due: Beginning of class, Friday 2-9

- Simplifies repeated multiplication
- Tells how many times to multiply the #

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PROPERTIES OF EXPONENTS

(LAWS OF INDICES) - CH. 2 MYP 4

* STUDY GUIDE

① PRODUCT OF POWERS

$$a^m \cdot a^n = a^{m+n}$$

EXAMPLE:

$$2^3 \cdot 2^5 = 2^{3+5} = 2^8$$

SOLVING BY EXPANSION:

$$\underbrace{2 \cdot 2 \cdot 2}_{2^3} \cdot \underbrace{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}_{2^5} = 2^8$$

* EXPANDING THE EXPRESSIONS
ALLOWS FOR UNDERSTANDING
OF THE PROPERTIES/LAWS.

* AN EXPONENT SAYS HOW MANY TIMES
TO MULTIPLY THE BASE BY ITSELF.
IF BASE "a" IS MULTIPLIED "m"
TIMES, AND THEN ANOTHER "n"
TIMES, "a" IS MULTIPLIED A TOTAL OF "m+n"
TIMES.

$$\begin{aligned} & (\underbrace{\dots a \cdot a \cdot a \dots}_{\text{"m" times}}) (\underbrace{\dots a \cdot a \cdot a \dots}_{\text{"n" times}}) \\ & = (\underbrace{\dots a \cdot a \cdot a \dots}_{\text{"m+n" times}}) \end{aligned}$$

② POWER OF A POWER

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

IF base "a" is multiplied "m" times, AND THAT IS ALL REPEATED "n" TIMES, "a" IS MULTIPLIED "m·n" TIMES.

example:

$$(3^2)^3 = 3^{2 \cdot 3} = 3^6 \dots \underbrace{(a \cdot a \cdot a \dots)_{\text{"m" times}}}_{\text{"n" times}}$$

solving by expansion

$$(3^2)(3^2)(3^2) = 3^{2+2+2} = 3^6$$

$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^6$$

③ QUOTIENT OF POWERS

$$\frac{a^m}{a^n} = a^{m-n}$$

$a \neq 0$ Base "a" is multiplied "m" times divided "a" multiplied "n" times. Given $\frac{a}{a} = 1$

$$\frac{a \cdot a \cdot a \dots}{a \cdot a \cdot a \dots} = 1 \cdot 1 \cdot 1 \cdot a^{m-n}$$

example:

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

$$= 4^{4-2} = 4^2$$

until "a" is multiplied a remaining "m-n" times.

Solving by expansion

$$\frac{4 \cdot 4 \cdot 4 \cdot 4}{4 \cdot 4} = 4^2$$

$$4 \cdot 4$$

$$\frac{256}{16} = 16$$

$$16$$

④

ZERO EXPONENT

$$a^0 = 1 \quad a \neq 0$$

USING QUOTIENT RULE,
 a^m DIVIDED BY a^m
EQUALS $a^{m-m} = a^0$,
 $\frac{a^m}{a^m} = 1$, THUS $a^0 = 1$

EXAMPLE:

* USING DIVISION
PROPERTY

$$\frac{5^2}{5^2} = 5^{2-2} = 5^0 = 1$$

SOLVING BY EXPANSION

$$\frac{5 \cdot 5}{5 \cdot 5} = 1$$

$$\frac{5 \cdot 5}{5 \cdot 5}$$

$$\frac{25}{25} = 1$$

$$\frac{25}{25}$$

5) NEGATIVE EXPONENT

A NEG EXPONENT IS A RESULT OF $\frac{a^m}{a^n}$ AS $m < n$

$$a^{-m} = \frac{1}{a^m}$$

THUS $(m-n) < 0$. AS $\frac{a}{a} = 1$, THE EXPANDED FORM SHOWS RESULTING

EXAMPLE: USING DIVISION PROPERTY

... $\underbrace{a \cdot a \cdot a \dots}_{|m-n| \text{ times}}$

$$\frac{2^2}{2^3} = 2^{2-3} = 2^{-1} = \frac{1}{2^1} = \frac{1}{2}$$

SOLVING BY EXPANSION

$$\frac{2 \cdot 2}{2 \cdot 2 \cdot 2} = \frac{1}{2}$$

$$\frac{4 \div 4}{8 \div 4} = \frac{1}{2}$$