Welcome Back MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 2/5 Topic: Rational Indices	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 the following expression.

$$x^{\frac{1}{3}}x^{5}$$

Describe in words why the Index Law below is true.

$$x^{a}x^{b} = x^{a+b}$$

Warm-up: Simplify.

$x^{\frac{1}{3}}x^{5} = X^{\frac{1}{3}} \cdot X^{\frac{15}{3}} = X^{\frac{16}{3}}$

Describe in words why the Index Law below is true.

$$x^{a}x^{b} = x^{a+b}$$

① $x^{a} = x \cdot x \cdot x \cdot x \cdot \cdots x$ (x multiplied by itself a-times)

② $x^{b} = x \cdot x \cdot x \cdot \cdots x$ (x multiplied b-times)

Hence $x^{a} \cdot x^{b} = x^{a+b}$ (x multiplied (a+b)-times).

Class Plan:

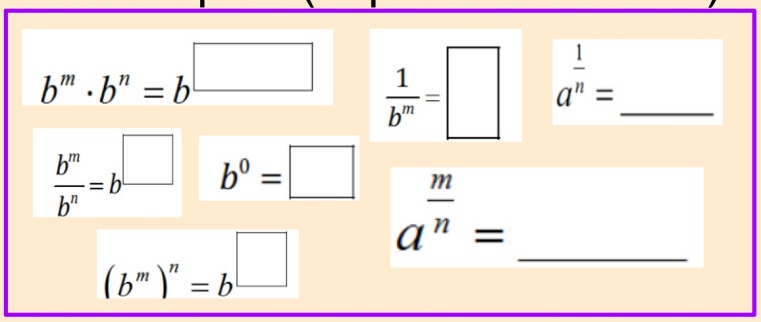
1. Warm-up
2. Homework Questions?
3. Criterion C: Create a study guide to communicate Index Laws

2B Index Laws

(Properties of Exponents)

DO: Create your own study guide.

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



***Use Investigations to help you!

Due: End of the hour Wednesday 2-7

***Self-assess, defend your score.

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

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

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

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

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

$b^0 = \square$

$a^{\frac{1}{n}} = \_\_\_\_\_$

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

B Chapter 2 INDEX LAWS

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.

D Chapter 2 **RATIONAL INDICES**

$a^{\frac{1}{2}} = \sqrt{a}$ and $a^{\frac{1}{3}} = \sqrt[3]{a}$

$a^{\frac{1}{n}} = \sqrt[n]{a}$ where $\sqrt[n]{a}$ is called the **nth root of** a.

Rational Exponents

For any real number a and integers m and $n > 1$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

Study guide, Criterion C: Communication Rubric

3 4	The student is able to: • Use some appropriate mathematical language • Use appropriate forms of mathematical representation to present information adequately. • Communicate through lines of reasoning that are complete. • Adequately organize information using logical structure.			• A Study guide includes multiple examples that are created to correctly demonstrate each property of exponents, ***with some error***. (*Multiplying and dividing the same base, power-to-a-power, zero exponent, rational exponents and negative exponents*). • Each example has a word description, use of symbols, and steps showing the simplification. • The piece of work is ***somewhat*** organized and neat. **Complete:** All necessary pieces are a part of the final work.

Study guide, Criterion C: Communication Rubric

5 6	The student is able to: • Usually use appropriate mathematical language. • 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.			• A Study guide includes multiple examples that are created to correctly demonstrate each property of exponents, ***with little error***. (*Multiplying and dividing the same base, power-to-a-power, zero exponent, rational exponents and negative exponents*). • 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. **Complete:** All necessary pieces are a part of the final work. **Coherent:** The work is understood using the language developed in the unit.

Study guide, Criterion C: Communication Rubric

7 8	The student is able to: • 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.			• A Study guide includes multiple examples that are created to correctly demonstrate each property of exponents. (*Multiplying and dividing the same base, power-to-a-power, zero exponent, and negative exponents*). • 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. **Complete:** All necessary pieces are a part of the final work. **Coherent:** The work is understood using the language developed in the unit. **Concise:** The work does not include unnecessary pieces of information.

Exercises...
Finish Study Guide

Due: End of the hour Wednesday 2-7
***Self-assess, defend your score.

- simplifies repeated multiplication
- tells how many times to multiply the #

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:

$$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^8$$

* 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.

$$(\ldots a \cdot a \cdot a \ldots)(\ldots a \cdot a \cdot a \ldots)$$

"m" times "n" times

$$= (\ldots a \cdot a \cdot a \ldots)$$

"m+n" times

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:

$$(3^2)^3 = 3^{2\cdot 3} = 3^6$$

$\underbrace{(a\cdot a\cdot a\ldots)(a\cdot a\cdot a\ldots)\ldots}_{\text{"n" times}}$

"m" 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

$a \neq 0$

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

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

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

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

example:

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

solving by expansion

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

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

(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

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

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

5) Negative Exponent

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

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

THUS $(m-n) < 0$. AS $\frac{a}{a} = 1$, THE EXPANDED FORM SHOWS RESULTING $\frac{1}{\underbrace{\ldots a \cdot a \cdot a \ldots}_{|m-n| \text{ times}}}$

example: *USING DIVISION PROPERTY

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

SOLVING BY EXPANSION

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

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

⑥ RATIONAL EXPONENTS

$a^{\frac{1}{n}} = \sqrt[n]{a}$ $\quad$ $a^{\frac{m}{n}} = \sqrt[n]{a^m}$

example:

$8^{\frac{1}{3}} = \sqrt[3]{8} = 2$

$2^{\frac{3}{3}} = \sqrt[3]{2^3} = 2$

solving by expansion

$(2 \cdot 2 \cdot 2)^{\frac{1}{3}} = 2^{\frac{1}{3}} \cdot 2^{\frac{1}{3}} \cdot 2^{\frac{1}{3}} = 2^{\frac{1}{3}+\frac{1}{3}+\frac{1}{3}} = 2^1 = 2$

$\sqrt[3]{2 \cdot 2 \cdot 2} = 2$

example:

$\sqrt{4^3} = \sqrt{64} = 8$

$\sqrt{4^3} = 4^{\frac{3}{2}} = 8$