



STUDENT \_\_\_\_\_

GROUP \_\_\_\_\_

INSTRUCTOR \_\_\_\_\_

DATE \_\_\_\_\_

## Math Lab Lesson #5 Classwork:

### Exponent Laws

#### WHAT TO DO:

- Watch the video and take notes on this Classwork sheet
- Pause and repeat any parts of the video that you want to review again. It's not a race!
- Answer any questions embedded in the video
- After watching the video, complete the Practice Problems.
- Create one or two flashcards that relate to what you learned from the video and the Practice Problems.
- Then, go to the next video and repeat!

★ Video: Exponent Laws: Where do they come from?

| <u>FIVE EXPONENT LAWS</u> |                             |
|---------------------------|-----------------------------|
| #1:                       | $(x^a)^b = x^{ab}$          |
| #2:                       | $x^a \cdot x^b = x^{a+b}$   |
| #3:                       | $\frac{x^a}{x^b} = x^{a-b}$ |
| #4:                       | $x^0 = 1$                   |
| #5:                       | $x^{-a} = \frac{1}{x^a}$    |



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★ Example (Law #1):  $(x^5)^2$

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★ Example (Law #2):  $x^5 \cdot x^2$

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★ Example (Law #3):  $\frac{x^5}{x^2}$

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★ Example (Law #4):  $\frac{x^2}{x^2}$

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★ Example (Law #5):  $\frac{x^2}{x^5}$



★ Example (Using the Laws Together): Simplify  $\frac{x^{10} \cdot (x^3)^{-2}}{x^4}$

\*Use the same idea to simplify  $\frac{7^{10} \cdot (7^3)^{-2}}{7^4}$

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➔ **Practice Problems: Exponent Laws: Where do they come from?**

1. Simplify the expressions below.

a)  $(m^3)^4$

b)  $(8^3)^4$

c)  $m^{12} \cdot m^8$

d)  $\frac{9^{20}}{9^6}$

e)  $5^0$

f)  $5^{-2}$



2. Simplify the expressions below:

a)  $(m^3)^4 \cdot m^8$

b)  $\frac{(m^3)^4 \cdot m^8}{m^6}$

c)  $\frac{(5^{14})^2}{5^{27}}$

d)  $(x^6)^{-2}$

e)  $\frac{x^6}{x^2}$

f)  $\frac{x^6}{x^{-2}}$

g)  $\frac{x^6 \cdot x^{-4}}{x^2}$



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3. Shaianne thinks that  $(x^3)^4$  is equal to  $(x^4)^3$ . Is Shaianne right? Explain.

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4. Assetou thinks that  $x^7 \cdot x^4$  is equal to  $x^4 \cdot x^7$ . Is Assetou right? Explain.

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5. Fabian thinks that  $\frac{x^7}{x^4}$  is equal to  $\frac{x^4}{x^7}$ . Is Fabian right? Explain.

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6. We know that  $x^{-4} = \frac{1}{x^4}$ . How do you think we could simplify  $\frac{1}{x^{-4}}$ ?

**STOP: DID YOU MAKE YOUR FLASHCARDS?**





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★ Video: Comparing Expressions with Different Bases

**BIG IDEA: WE CAN ONLY USE EXPONENT LAWS IF THE BASES ARE THE SAME!**

|   |  |
|---|--|
| <p><b>YES!</b> ✓</p> $2^6 \cdot 2^5 = 2^{11}$ | <p><b>NO!</b> ✗</p> $2^6 \cdot 4^5 = 8^{11}$ |
|---|--|

★ Example: Simplify:  $2^6 \cdot 4^5$

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★ Example: If  $3^{10} = 9^x$ , then what is the value of  $x$ ?



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➔ **Practice Problems: Comparing Expressions with Different Bases**

1. Rewrite the following numbers using base 2. The first one is done for you:

a)  $4 = 2^2$

b)  $8 =$

c)  $16 =$

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2. Rewrite the following numbers using base 3.

a)  $9 =$

b)  $27 =$

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3. Rewrite the following numbers using base 4.

a)  $16 =$

b)  $64 =$

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4. Rewrite the following numbers using base 5.

a)  $25 =$

b)  $125 =$



**\*For the problems below, start by rewriting the expression on the left so that it has the same base as the expression on the right. feel free to check your work on your calculator!**

5. Solve for  $x$  :  $4^5 = 2^x$

6. Solve for  $x$  :  $8^3 = 2^x$

7. Solve for  $x$  :  $16^x = 4^6$

8. Solve for  $x$  :  $125^7 = 5^x$

9. Solve for  $x$  :  $8^x = 2^{33}$





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10. If  $2^c = 16$ , then what is the value of  $c$  ?

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11. If  $2^c = \frac{1}{16}$ , then what is the value of  $c$  ?

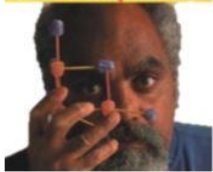
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12. **SAT-TYPE QUESTION:** If  $2x - 3 = 1$ , then what is the value of  $\frac{25^x}{5^3}$  ?

Hint: First use all of your exponent laws, and then look at the equation!

**STOP: DID YOU MAKE YOUR FLASHCARDS?**



**BOSS LEVEL**

Look at this equation:

$$a^b = b^a$$

In the entire universe, there is **only one pair of numbers**  $a$  and  $b$  that make this equation true.

What are they?