

Math: Algebra I

Laws of Exponents

Objectives

Students will be able to:

- State the laws of exponents.
 - Simplify expressions with exponents.
-

Warm-Up


Calculate the following:

- 3^2
 - $(4 + 1)^2$
 - 2^3
-

Lesson

- Introduction:

We know that $3^2 = 9$ and $3^3 = 27$. What is $3^3 \times 3^2$?



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knowledge engine


simplify $3^2 \cdot 3^3$

Input Interpretation:
simplify $3^2 3^3$

Result:
simplify 243

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- ◇ Suppose you know that $3^6 = 729$. To find $3^3 \times 3^3$, is there an easier way than multiplying 27 and 27?
- ◇ What about $3^3 / 3^2$?
- ◇ Or $(3^3)^2$?



computational...
knowledge engine

simplify $(3^3)^2$

Input Interpretation:
simplify $(3^3)^2$

Result:
simplify 729

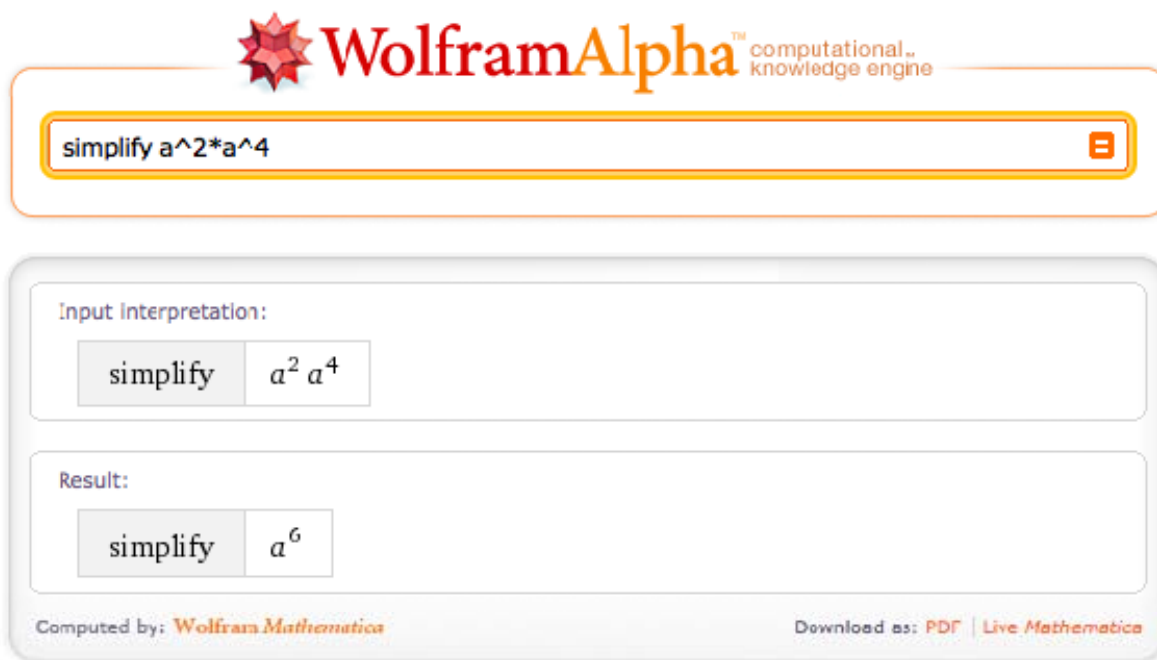
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- Student exploration: Try to write the laws of exponents by exploring this concept through Wolfram|Alpha.

Assume $a > 0$.

- ◇ What is $(a^x)(a^y)$?
- ◇ What is $(a^x)/(a^y)$?
- ◇ How about $(a^x)^y$?

Have students try different examples in Wolfram|Alpha to see if they can figure out the laws of exponents on their own.



The image shows a screenshot of the WolframAlpha website. At the top, the WolframAlpha logo is displayed with the tagline "computational knowledge engine". Below the logo is a search bar containing the text "simplify a^2*a^4". The search bar has a small orange icon on the right side. Below the search bar, the "Input Interpretation:" section shows the input "simplify" followed by "a^2 a^4". The "Result:" section shows the output "simplify" followed by "a^6". At the bottom of the page, it says "Computed by: Wolfram Mathematica" and "Download as: PDF | Live Mathematica".



simplify a^5/a^3



Input Interpretation:

simplify

$$\frac{a^5}{a^3}$$

Result:

simplify

$$a^2$$

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simplify $(x^7)^2$



Input Interpretation:

simplify

$$(x^7)^2$$

Result:

simplify

$$x^{14}$$

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• Regroup your students as a class and take volunteers for each of the above questions. Once your students have shared their ideas, solidify these concepts with the actual laws and an example of each.

$$\diamond a^x a^y = a^{x+y}$$

For example, simplify: $b^4 b^2$

$$\diamond (a^x)^y = a^{xy}$$

For example, simplify: $(7^2)^4$

$$\diamond \frac{a^x}{a^y} = a^{(x-y)}$$

For example, simplify: $\frac{z^4}{z^8}$ (assuming $z \neq 0$)

$$\diamond a^1 = a$$

$$\diamond a^0 = 1 \text{ (assuming } a \neq 0\text{)}$$

Closing

Answer the following and have the answer checked before your students leave to demonstrate understanding of the concept.

Simplify : $\frac{(2^4)^7}{2^5}$

Demonstrations

Exponents

Laws of Exponents