

Laws of Exponents

Name: _____

Date: _____

Score: _____ / 17

Think of the **laws of exponents** as cheat codes for simplifying—they let you combine or reduce powers without writing out every single factor! The *Product of Powers* rule says add the exponents when you multiply like bases; the *Quotient of Powers* rule says subtract when you divide; and the *Power of a Power* rule says multiply the exponents when one power is raised to another. You will also meet rules for the power of a product, the power of a quotient, the zero exponent, and negative exponents. Learn these shortcuts now and you will breeze through algebra, scientific notation, and any problem where exponents pop up!

Key Concepts & Quick Review

Law	Rule	Example
Product of Powers	$a^m \cdot a^n = a^{m+n}$	$3^2 \cdot 3^4 = 3^6$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}$	$\frac{5^7}{5^3} = 5^4$
Power of a Power	$(a^m)^n = a^{mn}$	$(2^3)^2 = 2^6$
Power of a Product	$(ab)^n = a^n \cdot b^n$	$(4 \cdot 3)^2 = 4^2 \cdot 3^2$
Power of a Quotient	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	$\left(\frac{2}{5}\right)^3 = \frac{8}{125}$
Zero Exponent	$a^0 = 1$ ($a \neq 0$)	$7^0 = 1$
Negative Exponent	$a^{-n} = \frac{1}{a^n}$	$2^{-3} = \frac{1}{8}$

Examples

① Simplify $\frac{4^5 \cdot 4^2}{4^3}$.

Think It Through: First use the Product of Powers in the numerator: $4^5 \cdot 4^2 = 4^7$. Then use the Quotient of Powers: $\frac{4^7}{4^3} = 4^{7-3} = 4^4 = 256$.

Answer: $4^4 = 256$

② Simplify $(3^2)^3 \cdot 3^{-4}$.

Think It Through: Power of a Power: $(3^2)^3 = 3^6$. Product of Powers: $3^6 \cdot 3^{-4} = 3^{6+(-4)} = 3^2 = 9$.

Answer: $3^2 = 9$



 **Practice Problems**

Simplify each expression using the laws of exponents.

- | | | | |
|-----------------------------------|-------|--------------------------|-------|
| 1. $2^3 \cdot 2^4 =$ | _____ | 9. $\frac{6^8}{6^5} =$ | _____ |
| 2. $5^6 \div 5^2 =$ | _____ | 10. $(4^3)^2 =$ | _____ |
| 3. $(3^2)^3 =$ | _____ | 11. $2^{-4} =$ | _____ |
| 4. $(2 \cdot 5)^3 =$ | _____ | 12. $(3 \cdot 2)^4 =$ | _____ |
| 5. $\left(\frac{3}{4}\right)^2 =$ | _____ | 13. $\frac{9^4}{9^4} =$ | _____ |
| 6. $7^0 =$ | _____ | 14. $5^3 \cdot 5^{-1} =$ | _____ |
| 7. $4^{-2} =$ | _____ | 15. $(10^2)^3 =$ | _____ |
| 8. $10^5 \cdot 10^{-3} =$ | _____ | | |

Study Tips

-  The bases must be the **same** before you can add or subtract exponents. $2^3 \cdot 3^2$ cannot be combined with the Product of Powers rule.
-  A **negative exponent** flips the base to a fraction — it does NOT make the answer negative.
-  When in doubt, expand the expression to verify your shortcut: $2^3 \cdot 2^2 = (2 \cdot 2 \cdot 2)(2 \cdot 2) = 2^5$.

 **Word Problems**

16. A computer stores data in bits. A kilobyte is 2^{10} bytes and a megabyte is 2^{20} bytes. How many kilobytes are in one megabyte? Express your answer as a power of 2. _____
17. A savings programme triples its value every year. After 2 years the value is 3^2 times the original. After another 4 years, the total is $3^2 \cdot 3^4$ times the original. Use the laws of exponents to write this as a single power and evaluate it. _____



Answer Keys

1) $2^7 = 128$

2) $5^4 = 625$

3) $3^6 = 729$

4) 1,000

5) $\frac{9}{16}$

6) 1

7) $\frac{1}{16}$

8) $10^2 = 100$

9) $6^3 = 216$

10) $4^6 = 4096$

11) $\frac{1}{16}$

12) 1,296

13) 1

14) 25

15) 1,000,000

16) 1,024 kilobytes

17) 729 times the original value

Step-by-Step Explanations

Tutoring notes not found for this topic.



Want Even More Practice?

Check Out Our Other Iowa ISASP Test Books!



Iowa ISASP Grade 7 Math Preparation Bundle

18 full-length practice tests across three books (5 + 6 + 7)

No repeated questions—maximum practice value!



18 Tests!
3 Books
One Bundle

Important: All our test books contain **unique, completely different tests** from each other! Each book offers fresh practice questions—no repeats!

5 Practice Tests

- ✓ 5 complete practice tests with detailed explanations
- ✓ Perfect foundation for ISASP test preparation
- ✓ Builds confidence and test-taking skills
- ✓ High-quality questions aligned with state standards

Start your practice journey!

6 Practice Tests

- ✓ 6 complete practice tests with detailed explanations
- ✓ **Unique tests**—different from the 5 tests book
- ✓ Perfect for more practice after mastering 5 tests
- ✓ Builds even more confidence and test-taking skills
- ✓ Same high-quality questions aligned with standards

Take your practice to the next level!

7 Practice Tests

- ✓ 7 complete practice tests for maximum preparation
- ✓ **Unique tests**—different from 5 and 6 tests books
- ✓ The most comprehensive practice for Grade 7
- ✓ Ideal for students aiming for top scores
- ✓ Extensive practice builds mastery and confidence

Go all the way with comprehensive practice!