

Find The Value Of Each Of The Following:

Exponents7) 5, 4 To The Power8) 13, 2 To The Power9) (1.2) 2

Find The Value Of Each Of The Following: Exponents7) 5, 4 To The Power8) 13, 2 To The Power9) (1.2) 2

Understanding exponents is fundamental in mathematics, especially when dealing with large numbers or complex calculations. Exponents, also known as powers, represent the repeated multiplication of a number by itself. In this article, we will explore how to find the values of various exponential expressions, specifically focusing on the following examples:

- 5^7
- 4^8
- 13^2
- 2^9
- $(1.2)^2$

By the end of this guide, you'll have a clear understanding of how to evaluate these types of expressions, with detailed explanations and step-by-step calculations.

What Are Exponents?

Before diving into calculations, let's review what exponents are.

Definition of Exponents

An exponent indicates how many times a base number is multiplied by itself. For example:

- $5^3 = 5 \times 5 \times 5 = 125$

- $2^4 = 2 \times 2 \times 2 \times 2 = 16$

In the expression a^n :

- 'a' is the base
- 'n' is the exponent or power

Key Concepts in Exponentiation

- Positive integer exponents: Indicate repeated multiplication.
- Zero exponent rule: $a^0 = 1$ (for any $a \neq 0$)
- Negative exponents: $a^{-n} = 1 / a^n$
- Fractional exponents: $a^{(m/n)} = n$ -th root of a^m

In our current examples, we're dealing with positive integers and simple fractional exponents.

Calculating Each Exponential Expression

Let's now evaluate each of the given expressions step by step.

1. Calculating 5^7

Step 1: Understanding 5^7

This means multiplying 5 by itself 7 times:

$$5^7 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$$

Step 2: Breakdown of calculation

Calculating large powers directly can be cumbersome, so it's helpful to break it down:

- $5^1 = 5$
- $5^2 = 25$
- $5^3 = 125$
- $5^4 = 625$
- $5^5 = 3,125$
- $5^6 = 15,625$
- $5^7 = 78,125$

Final answer: $5^7 = 78,125$

2. Calculating 4^8

Step 1: Recognize the pattern

We can compute stepwise:

- $4^1 = 4$
- $4^2 = 16$
- $4^3 = 64$
- $4^4 = 256$
- $4^5 = 1,024$
- $4^6 = 4,096$
- $4^7 = 16,384$
- $4^8 = 65,536$

Final answer: $4^8 = 65,536$

Alternatively, knowing that $4^8 = (2^2)^8 = 2^{2 \times 8} = 2^{16} = 65,536$, confirms our calculation.

3. Calculating 13^2

Step 1: Recognize that squaring a number is multiplying it by itself

$$13^2 = 13 \times 13$$

Step 2: Calculate

$$13 \times 13 = 169$$

Final answer: $13^2 = 169$

4. Calculating 2^9

Step 1: Repeated multiplication

$$- 2^1 = 2$$

$$- 2^2 = 4$$

$$- 2^3 = 8$$

$$- 2^4 = 16$$

$$- 2^5 = 32$$

$$- 2^6 = 64$$

$$- 2^7 = 128$$

$$- 2^8 = 256$$

$$- 2^9 = 512$$

Final answer: $2^9 = 512$

5. Calculating $(1.2)^2$

Step 1: Recognize this as squaring

$$(1.2)^2 = 1.2 \times 1.2$$

Step 2: Calculate

$$1.2 \times 1.2 = 1.44$$

Final answer: $(1.2)^2 = 1.44$

Additional Tips for Calculating Exponents

While manual calculations work well for small exponents, larger powers may require efficient methods or tools. Here are some tips:

1. **Use Repeated Multiplication:** Break down the exponent into smaller parts. For example, $4^8 = (4^4)^2$.
2. **Leverage Powers of Known Numbers:** For example, $2^{10} = 1024$, which is a common reference point.
3. **Use Calculators or Computational Tools:** For very large exponents, calculators or software like WolframAlpha can provide instant results.

4. **Understand Exponent Rules:** Master rules such as $a^m \times a^n = a^{m+n}$ and $(a^m)^n = a^{m \times n}$ to simplify calculations.

Understanding the Importance of Exponent Calculations

Calculating exponents accurately is crucial in various fields such as engineering, computer science, finance, and scientific research. For example:

- Computing compound interest involves powers.
- Algorithms used in encryption rely on exponentiation.
- Scientific notation expresses very large or small numbers efficiently.
- Population modeling and exponential growth calculations depend on powers.

Practical Applications of Exponent Calculations

Knowing how to compute exponents helps in real-world scenarios:

- **Financial Calculations:** Determining compound interest over time.
- **Engineering:** Calculating signal attenuation or amplification.
- **Data Science:** Working with algorithms involving powers, like polynomial regression.
- **Physics:** Calculating energy levels or decay rates that follow exponential patterns.

Conclusion

In summary, evaluating exponential expressions involves understanding the base and exponent, applying multiplication systematically, and sometimes leveraging mathematical rules for simplification.

For the specific examples provided:

- $5^7 = 78,125$

- $4^8 = 65,536$

- $13^2 = 169$

- $2^9 = 512$

- $(1.2)^2 = 1.44$

Mastering these calculations enhances your mathematical proficiency and prepares you for more complex problems involving exponents. Whether you're a student, educator, or professional, the ability to evaluate powers confidently is an essential skill in the quantitative world.

Remember: Always double-check calculations, especially with larger exponents, and utilize technological tools when necessary to ensure accuracy.

Frequently Asked Questions

What is 5 raised to the power of 4?

5 raised to the power of 4 is $5^4 = 625$.

How do you calculate 13 to the power of 2?

13 to the power of 2 is $13^2 = 169$.

What is the value of 2 to the power of 9?

2 to the power of 9 is $2^9 = 512$.

How do you evaluate $(1.2)^2$?

Calculating $(1.2)^2$ gives $1.2 \times 1.2 = 1.44$.

What is the result of 7 raised to the power of 5?

$7^5 = 7 \times 7 \times 7 \times 7 \times 7 = 16,807$.

Calculate 4 to the power of 8.

$4^8 = 65,536$.

What is the approximate value of $(1.2)^2$?

Approximately 1.44.

How do you compute 2^9 ?

$2^9 = 512$.

Additional Resources

Exponents: Unlocking the Power of Mathematical Operations

Understanding exponents is fundamental in mathematics, serving as the backbone for various concepts in algebra, calculus, physics, engineering, and computer science. They allow us to express large numbers succinctly, analyze growth patterns, and perform complex calculations efficiently. Today, we'll explore how to find the value of specific exponent expressions, dissecting each problem with precision and clarity. Whether you're a student, educator, or math enthusiast, this comprehensive

review aims to deepen your appreciation for the power and elegance of exponents.

Introduction to Exponents and Their Significance

What Are Exponents?

An exponent indicates how many times a number, called the base, is multiplied by itself. For example, in (5^4) , the base is 5, and the exponent is 4, which means:

$$5^4 = 5 \times 5 \times 5 \times 5$$

Why Are Exponents Important?

- Simplify large calculations
- Express exponential growth or decay (e.g., population growth, radioactive decay)
- Solve equations involving powers
- Model real-world phenomena in science and engineering

Breaking Down Each Problem

Let's analyze each problem individually, understanding the principles involved, performing calculations step-by-step, and discussing potential applications.

Problem 1: Find (5^4)

Understanding the Expression

The expression (5^4) asks for 5 multiplied by itself 4 times:

$$5^4 = 5 \times 5 \times 5 \times 5$$

Calculation

Step-by-step:

- $5 \times 5 = 25$
- $25 \times 5 = 125$
- $125 \times 5 = 625$

Result:

$$\boxed{5^4 = 625}$$

Applications

- Computing areas in geometric problems
- Calculating compound interest over multiple periods where the growth factor is 5

Problem 2: Find (13^2)

Understanding the Expression

The expression (13^2) involves squaring 13:

$$\backslash[13^2 = 13 \times 13 \backslash]$$

Calculation

Calculating directly:

$$\backslash[13 \times 13 = 169 \backslash]$$

Result:

$$\backslash[\boxed{13^2 = 169}\backslash]$$

Applications

- Calculating the area of a square with side length 13 units
- Analyzing quadratic relationships in algebra

Problem 3: Find $\backslash(2^9 \backslash)$

Understanding the Expression

The expression $\backslash(2^9 \backslash)$ signifies multiplying 2 by itself 9 times:

$$\backslash[2^9 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \backslash]$$

Calculation

Instead of multiplying sequentially, leverage powers of 2:

- $\backslash(2^1 = 2 \backslash)$
- $\backslash(2^2 = 4 \backslash)$

- $(2^3 = 8)$
- $(2^4 = 16)$
- $(2^5 = 32)$
- $(2^6 = 64)$
- $(2^7 = 128)$
- $(2^8 = 256)$
- $(2^9 = 512)$

Alternatively, recognize that:

$$2^9 = (2^3)^3 = 8^3 = 512$$

Result:

$$\boxed{2^9 = 512}$$

Applications

- Data storage calculations (e.g., kilobytes, megabytes)
- Understanding binary systems in computing
- Modeling exponential growth in populations or resource consumption

Problem 4: Find $(1.2)^2$

Understanding the Expression

Here, $(1.2)^2$ involves squaring 1.2:

$$(1.2)^2 = 1.2 \times 1.2$$

Calculation

Multiplying:

$$1.2 \times 1.2 = 1.44$$

Result:

$$\boxed{(1.2)^2 = 1.44}$$

Applications

- Calculating compound interest with small growth factors
- Analyzing percentage increases in economics or finance
- Modeling incremental changes in scientific measurements

Advanced Concepts and Techniques in Exponentiation

While the above calculations are straightforward, understanding some advanced techniques can help you handle more complex problems.

Properties of Exponents

- Product of Powers: $a^m \times a^n = a^{m+n}$
- Quotient of Powers: $\frac{a^m}{a^n} = a^{m-n}$ (for $a \neq 0$)
- Power of a Power: $(a^m)^n = a^{m \times n}$
- Zero Exponent: $a^0 = 1$ (for $a \neq 0$)
- Negative Exponent: $a^{-n} = \frac{1}{a^n}$

Applying these rules simplifies calculations significantly, especially for larger exponents.

Using Logarithms to Find Exponents

In cases where you know the result and want to find the exponent, logarithms are invaluable:

$$\text{If } a^x = y, \text{ then } x = \log_a y$$

For example, to find x in $2^x = 512$:

$$x = \log_2 512$$

Since $2^9 = 512$, it follows:

$$x = 9$$

This approach is essential in fields requiring reverse calculations of exponential functions.

Practical Tips for Calculating Exponents

- Use prime factorization for large numbers to simplify calculations.
- Recognize common exponents (e.g., powers of 2, 10, 5) to speed up computations.
- Leverage calculator functions for arbitrary powers, but understand the underlying principles.
- When dealing with fractional exponents (e.g., $a^{1/n}$), remember they correspond to roots:

$$a^{1/n} = \sqrt[n]{a}$$

Conclusion: The Power of Exponents in Mathematics and Beyond

The exploration of exponents reveals their fundamental role in simplifying complex calculations and understanding growth processes. From basic calculations like (5^4) to more nuanced operations involving fractional exponents, mastering these concepts opens doors to advanced mathematical reasoning and real-world problem-solving.

Key Takeaways:

- Exponents condense repeated multiplication into a compact notation.
- Basic rules and properties streamline calculations and enable problem-solving efficiency.
- Recognizing patterns, such as powers of 2, enhances mental math skills.
- Logarithms serve as powerful tools for reversing exponential functions.

By embracing the principles illustrated through these example problems, you equip yourself with a vital mathematical toolkit. Whether working on academic assignments, professional projects, or everyday calculations, understanding and applying exponents can significantly enhance your mathematical proficiency and confidence.

Remember: Practice makes perfect—try calculating various exponents and applying properties to deepen your comprehension. The more familiar you become with these operations, the more intuitive and powerful your mathematical thinking will be.

[Find The Value Of Each Of The Following Exponents7 5 4 To](#)

The Power8 13 2 To The Power9 1 2 2

Find The Value Of Each Of The Following Exponents7 5 4 To The Power8 13 2 To The Power9 1 2 2

Related Articles

- [Create A Properly Formatted Works Cited Page For A Research Paper About The Dangers Of Cell Phone Use](#)
- [ExampleThe Product Of 4 And \(3 + X\) Is Equal To 36. What Is The Value Of X?The Equation \$4\(3 + X\) = 36\$](#)
- [FILL IN THE BLANK. A Mutation At A Single Locus Causes A Change In Many Different Characters. This An](#)

[Back to Home](#)