PLEASE HELPPPPPWhich Of The Following Are Square Roots To The Number Below? Check All That Apply. 144

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Understanding square roots is a fundamental concept in mathematics that often confuses students and learners alike. When asked, "Which of the following are square roots of 144? Check all that apply," it's essential to understand what a square root is and how to identify the correct values. In this article, we will explore the concept of square roots, specifically focusing on the number 144, and help you determine all the numbers that are square roots of 144. By the end, you will have a clear understanding of how to identify square roots and be able to confidently select all applicable options.

What Is a Square Root?

Definition of a Square Root

A square root of a number is a value that, when multiplied by itself, gives the original number. Mathematically, if x is a square root of n, then:

$$ x^2 = n $$

For example, 3 is a square root of 9 because:

$$ 3^2 = 9 $$

Similarly, -3 is also a square root of 9 because:

$$ (-3)^2 = 9 $$

It's important to note that every positive real number has two square roots: a positive and a negative one.

Principal Square Root

The principal square root is the non-negative root of a number. When referring to "the square root" without any qualifiers, mathematicians typically mean the principal (positive) root. For 144, this is 12 because:

$$ 12^2 = 144 $$

However, when the question asks for all square roots, both positive and negative roots should be considered.

Square Roots of 144

Calculating the Square Roots of 144

To find the square roots of 144, ask: "What number, when multiplied by itself, results in 144?"

Let’s examine some options:

- 12:

$$ 12 \times 12 = 144 $$

- -12:

$$ -12 \times -12 = 144 $$

- Other possibilities?

Since 144 is a perfect square, its square roots are limited to the positive and negative roots of 12.

List of All Square Roots of 144

Based on the definition, the square roots of 144 are:

- Positive root: 12
- Negative root: -12

Hence, the numbers that are square roots of 144 are 12 and -12.

Checking Multiple-Choice Options

Suppose you are given multiple options and asked to select all the numbers that are square roots of 144. The options might be:

- 12
- -12
- 144
- -144
- 6
- -6

Let’s analyze each:

1. 12:

$$ 12^2 = 144 \quad \checkmark $$

2. -12:

$$ (-12)^2 = 144 \quad \checkmark $$

3. 144:

$$ 144^2 = 20,736 \neq 144 \quad \text{No} $$

4. -144:

$$ (-144)^2 = 20,736 \neq 144 \quad \text{No} $$

5. 6:

$$ 6^2 = 36 \neq 144 \quad \text{No} $$

6. -6:

$$ (-6)^2 = 36 \neq 144 \quad \text{No} $$

Correct options are 12 and -12.

Understanding Perfect Squares and Their Roots

What Is a Perfect Square?

A perfect square is a number that is the square of an integer. Since 144 is a perfect square (because 12×12 = 144), it has integer square roots.

Why Are Only 12 and -12 Roots of 144?

Because:

$$ 12 \times 12 = 144 $$
$$ (-12) \times (-12) = 144 $$

No other integers, when squared, produce 144, making these the only roots.

How to Find Square Roots of a Number

Step-by-Step Method

1. Factor the number: Find prime factorization if needed.
2. Identify perfect squares: Check if the number is a perfect square.
3. Find the positive root: Take the square root of the number.
4. Determine the negative root: Add the negative counterpart.
5. Verify: Multiply the potential roots by themselves to check if they produce the original number.

Example: Square Roots of 144

- Prime factorization:

$$ 144 = 2^4 \times 3^2 $$

- Square root:

$$ \sqrt{144} = \sqrt{2^4 \times 3^2} = 2^{2} \times 3^{1} = 4 \times 3 = 12 $$

- Roots are 12 and -12.

Common Mistakes to Avoid

- Confusing square roots with square: Remember, squaring a number multiplies it by itself, while taking a square root finds the original number that, when squared, produces the given number.
- Forgetting the negative root: Both positive and negative roots are valid unless specified otherwise.
- Assuming non-perfect squares have integer roots: Many numbers, like 50 or 200, do not have integer square roots.

Summary: Which Numbers Are Square Roots of 144?

In conclusion, the square roots of 144 are:

- 12 (positive root)
- -12 (negative root)

Any options other than these are not square roots of 144.

Additional Practice Questions

- Question 1: Is 144 a perfect square?
Answer: Yes, because 12×12 = 144.

- Question 2: What are the square roots of 81?
Answer: 9 and -9.

- Question 3: Find all square roots of 225.
Answer: 15 and -15.

Final Tips for Mastering Square Roots

- Always verify if the number is a perfect square before attempting to find square roots.
- Remember to consider both positive and negative roots unless specified.
- Use prime factorization for larger or more complex numbers to simplify finding roots.
- Practice with different numbers to build confidence in identifying square roots quickly.

By understanding the concept of square roots and practicing with various numbers, you'll become proficient at solving these types of questions. For the specific case of 144, the key takeaway is that the square roots are 12 and -12.

Frequently Asked Questions

Which of the following are square roots of 144?

12 and -12 are square roots of 144.

Is 144 a perfect square?

Yes, 144 is a perfect square because its square roots are 12 and -12.

What are the positive and negative square roots of 144?

The positive square root is 12, and the negative square root is -12.

Can 144 have other square roots besides 12 and -12?

No, only 12 and -12 are the square roots of 144.

How do you verify that 12 is a square root of 144?

Multiply 12 by itself: 12 × 12 = 144, confirming it is a square root.

Is -12 a square root of 144?

Yes, because (-12) × (-12) = 144.

Additional Resources

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Understanding the concept of square roots is fundamental in mathematics, especially in algebra and geometry. When asked, "Which of the following are square roots of 144?", it's essential to have a clear grasp of what square roots represent. In this guide, we will explore the meaning of square roots, how to identify them, and provide a detailed step-by-step approach to solving this specific problem. Whether you're a student working through homework or someone brushing up on basic math concepts, this comprehensive breakdown will help clarify the process and ensure you're equipped to determine all square roots of 144 accurately.

What Is a Square Root?

Before diving into the specifics of 144, let’s review what a square root actually is.

Definition

A square root of a number is a value that, when multiplied by itself, gives the original number. In notation, the square root of a number x is denoted as √x.

Example:

- √9 = 3 because 3 × 3 = 9
- √16 = 4 because 4 × 4 = 16

Principal Square Root vs. All Square Roots

- The principal square root is the non-negative root, typically represented simply as √x.
- However, every positive real number actually has two real square roots: one positive and one negative. For example, both 3 and -3 are square roots of 9, since:

- 3 × 3 = 9
- (-3) × (-3) = 9

When a question asks to check all that apply for square roots, it often means both positive and negative roots are considered unless specified otherwise.

How to Find Square Roots of 144

Let's focus on the specific number, 144, and determine its square roots.

Step 1: Recognize Perfect Squares

144 is a perfect square, meaning it is the square of an integer. Recognizing perfect squares can often be done by:

- Memorizing common perfect squares (e.g., 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, etc.)
- Using prime factorization or estimation methods

Since 144 appears in the list of common perfect squares, it’s straightforward to identify its roots.

Step 2: Prime Factorization (Optional but Helpful)

Prime factorization of 144:

- 144 ÷ 12 = 12
- 12 ÷ 2 = 6
- 6 ÷ 2 = 3
- 3 is prime

So, 144 = 12 × 12 = (2^4) × (3^2)

This confirms that 144 is a perfect square, as its prime factorization contains pairs of prime factors.

Step 3: Find the Square Roots

Since 144 is a perfect square:

- Positive square root: √144 = 12
- Negative square root: -√144 = -12

Step 4: Verify Options

Suppose the options include numbers like 12, -12, 144, -144, etc. The correct square roots are 12 and -12.

Common Mistakes to Avoid

- Confusing square roots with factors: Remember, square roots are specific values that, when squared, give the original number.
- Ignoring the negative root: Both positive and negative roots are valid solutions unless specified otherwise.
- Assuming only one root: For perfect squares, always consider both positive and negative roots.

Practice: Checking Multiple Choice Options

Imagine you are given multiple options such as:

- A) 12
- B) -12
- C) 144
- D) -144

Which are square roots of 144?

Correct answers: A) 12 and B) -12

Incorrect answers: C) 144 and D) -144 because:

- $144 \times 144 \neq 144$
- $(-144) \times (-144) \neq 144$; actually, $(-144) \times (-144) = 20736$, which is not 144.

Summary: How to Approach Such Problems

To systematically determine all square roots of a given number like 144, follow these steps:

1. Identify if the number is a perfect square: Recognize common perfect squares or use prime factorization.
2. Find the positive root: Use mental math, a calculator, or prime factorization.
3. Determine the negative root: Remember, if x is a root, then -x is also a root (for positive numbers).
4. Check all options: Verify which options correspond to these roots.

Additional Tips for Students

- Memorize perfect squares up to at least 15^2 (225). This speeds up recognition.
- Understand that square roots of negative numbers involve complex numbers, but for positive real numbers like 144, only real roots are relevant.
- Use a calculator wisely: Many scientific calculators have a square root button to verify your work.

Final Thoughts

Determining which numbers are square roots of a given number is a fundamental skill in math. For 144, the key takeaway is that its square roots are 12 and -12 because:

- $12 \times 12 = 144$
- $(-12) \times (-12) = 144$

Always remember to check both positive and negative roots unless the problem explicitly asks for only the principal root. Mastering this process not only helps with homework but also builds a solid foundation for understanding more advanced mathematical concepts.

In conclusion, the correct answers to "Which of the following are square roots of 144?" are 12 and -12. Use this approach as a template for solving similar problems involving perfect squares and their roots, and you'll find that recognizing perfect squares becomes an intuitive part of your math toolkit.

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