Question: For how many positive integer values of x is the sum $x^2 + 4x + 4$ less than 20?

Original Response

Let's break it down step by step:

- 1. We have that $x^2 + 4x + 4 < 20$.
- 2. We can factor this as $(x + 2)^2 < 16$.

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5. There are 5 positive integer values of x that satisfy this inequality. The answer is 5.

Feedback from Critique Model

Step1: We have that $x^2 + 4x + 4 < 20$.

Correctness of the step: Correct

Explanation: The given inequality is correctly stated as the problem requires finding when the expression $x^2 + 4x + 4$ is less than 20.

Step2: We can factor this as $(x + 2)^2 < 16$.

Correctness of the step: Wrong

Explanation: The quadratic expression $x^2 + 4x + 4$ correctly factors into $(x + 2)^2$, but the inequality is written incorrectly. The correct inequality should be $(x + 2)^2 < 20$. This error leads to an incorrect constraint in later steps.

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Correctness of the final answer: Wrong

Explanation: The solution mistakenly concludes that there are 5 positive integer values of x that satisfy the inequality, but the correct count is 2.

Refined Response

Let's break it down step by step:

We start with the inequality $x^2 + 4x + 4 < 20$.

Step 1: Factor the Expression. The expression $x^2 + 4x + 4$ can be factored as: $(x + 2)^2 < 20$

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Step 5: Identify Positive Integer Solutions. The positive integer solutions for x are: x = 1 and x = 2.

The positive integer values of x that satisfy the inequality $x^2 + 4x + 4 < 20$ are 1 and 2. The answer is 2.