

Question: Given $n=7^3 \times 11^2 \times 13^4$, find the number of integers that are divisors of n .

Show-o & Emu3 & Janus Pro 7B



**Show-o, Emu3 and Janus Pro 7B
do not support this task.**

MMaDA

<think>

Okay, so I need to find the number of divisors of the number n which is given as 7 cubed times 11 cubed times 13 to the fourth power. Hmm, let's see I remember that there's a formula for finding the number of divisors when you have the prime factorization of a number. Let me try to recall how that works.

First off, if a number is expressed as a product of primes raised to exponents various exponents, like $n = p_1^a \times p_2^b \times p_3^c \dots$ then the total number of divisors is $(a+1)(b+1)(c+1)\dots$ and so on for each prime factor. Is that right? I think I think so. Because for each prime factor, the exponent can range from 0 up to the exponent in the original number. So, for each prime, you have (ponent + 1) choices. Then you multiply them all together because they're independent choices.

Let me verify that with a simple example. Suppose n is $2^2 \times 3^1$. Then the divisors are 1, 2, 3, 4, 6, 12. That's 6 divisors. Using the formula, $(2+1)(1+1) = 3 \times 2 = 6$. Yeah, that checks out. Another example: if n is $2^1 \times 5^1$. Then the divisors are 1, 2, 5. The formula is $(2+1) = 3$, which is correct. So I think the formula is solid.

Alright, so applying this to the given n . The prime factors are 7, 11, and 13, each to exponents are 3, 2, and 4 respectively. Therefore, the number of divisors should be $(3+1)(2+1)(4+1)$. Let's compute that.

First, calculate each exponent one by one. For the 7: $3+1=4$. Then the 11 is 2, so $2+1=3$. Then 13 is 4, so $4+1=5$. Now multiplying those together: 4×3 is 12. 12 times 5 is 60. So the number of divisors is 60? That seems straightforward.

Wait, but, just to make sure I didn't make a mistake in the exponents. Let me check the original problem again. The given n is $7^3 \times 11^2 \times 13^4$. So, exponents are 3, 2, 4. Therefore, adding 1 to each exponent gives 4, 3, 5. Multiplying those together gives $4 \times 3 = 12$, $12 \times 5 = 60$. Yep, that's correct.

So I guess there's not much more to it. It's a straightforward application of the number of divisors formula when the number is already in its prime factorized form. Since the problem is already in that form, it's just matter of applying the formula directly without having to factorize the number first. So that's easier. If the number wasn't already factorized, we would have to factorize it first, but here, it's already done.

Let me just think if there's any way this could go wrong. Maybe if the exponents were read? For example, if someone thought 7^3 is just 7×3 instead of 7 cubed, but the problem uses the caret notation, so 7^3 is 7 cubed. Same with the others. So 11^2 is 11^2 , and 13^4 is 13^4 . So the exponents are 3, 2, 4. So, that part seems okay. Alternatively, could there be a miscalculation? Let's compute $4 \times 3 \times 5$. Yes, 4×3 is 12, and 12×5 is 60. Seems solid.

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60