Log Problem

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1 Introduction

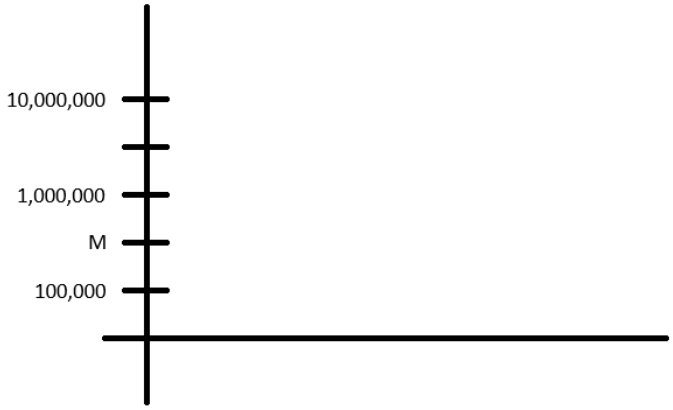
This is a thought about estimation in engineering. Suppose I asked you how many cats I have at home? If you guess 3, and I said 2, then you were pretty close. In engineering there is a difference. You may estimate a value in engineering to be 700, and if the real value is 100, we would say that you are very close. This is called being within an order of magnitude. Because numbers in science can vary on very large scales, for example, we may be searching for a number that we are not sure is in the range from 1 billion to 100 100 quadrillion, or 1×10^9 to 1×10^{19}. If the actual number happened to be 1×10^{12} and we guess 11×10^{12} that may be a very good guess.

2 The Kit Kat Problem

In March 2026 a two ton truck of Kit Kats was stolen in Europe. I don't remember the exact number of Kit Kat's on the truck, but let's suppose that I guess that there were 100,000 candies on the truck and that you guess that there were 1,000,000 candies on the truck. Suppose the actual number of candies on the truck was right in the middle, 550,000 candies (450,000 more that 100,000 and 450,000 less that 1,000,000). In the sense of a logarithmic measurement, can we say that my guess or your guess is better? I don't know for sure but here is a note about the problem. (See possible solution on next page).

3 Possible Solution

Consider following log scale where M is in the middle of 100,000 and 1,000,000.



For example the scale goes 100,000 then $10 \times 100,000 = 1,000,000$ then $10 \times 1,000,000 = 10,000,000$.

So we can also consider the mid point between 100,000 and 1,000,000.

In the same way, $100,000 \times c = M$ then $M \times c = 1,000,000$.

Substituting the first equation into the place of M in the second equation we see that

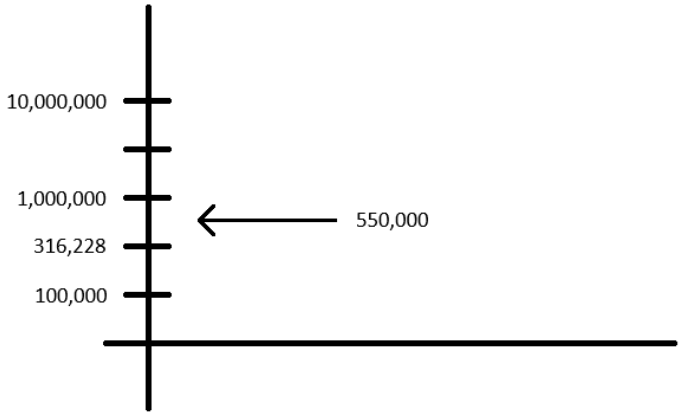
$(100,000 \times c) \times c = 1,000,000$

$100,000 \times c^2 = 1,000,000$

$c^2 = 10$

$c = \sqrt{10} = 3.16$

Therefore a possible solution is shown below, where we say that your guess of 1,000,000 was closer to the actual number of candies on the Kit Kat truck.


10,000,000
1,000,000
550,000
316,228
100,000