$1 = 2$

Here is a bizarre proof of $1 = 2$.

And here is how it goes:

Let there be two positive unknown numbers a and b. And let these numbers be equal.	$a = b$
Now we will apply a sequence of operations to this equation: First, we will multiply both sides by a.	$a \cdot a = a \cdot b$ $a^2 = ab$
Next, we will subtract b^2 from both sides.	$a^2 - b^2 = ab - b^2$
Factor the left side using the formula $a^2 - b^2 = (a+b)(a-b)$. Factor the right side by factoring out b.	$(a+b)(a-b) = b(a-b)$
Since both sides contain $(a-b)$, divide both sides of the equation by $(a-b)$.	$\frac{(a+b)\cancel{(a-b)}}{\cancel{(a-b)}} = \frac{b\cancel{(a-b)}}{\cancel{(a-b)}}$
Because the initial problem states that $a = b$, we can replace a with b.	$a + b = b$ $b + b = b$
Combine the like terms on the left side.	$2b = b$
Now, divide both sides by b, and cancel b.	$\frac{2\cancel{b}}{\cancel{b}} = \frac{\cancel{b}}{\cancel{b}}$
After canceling b, we get that $2 = 1$.	$2 = 1$

Now, we all know that 2 is not equal to 1. So, what happened in the process that gave us this bizarre answer?
It is the step where we divided both sides by $(a - b)$:

$$\frac{(a+b)\cancel{(a-b)}}{\cancel{(a-b)}} = \frac{b\cancel{(a-b)}}{\cancel{(a-b)}}$$

In the beginning, we stated that $a = b$. So, if we subtract $a - b$, the answer will be equal to zero. And we know that division by zero is undefined (can't divide by zero). So, this step is invalid:

$$\frac{(a+b)\cancel{(a-b)}}{\cancel{(a-b)}} = \frac{b\cancel{(a-b)}}{\cancel{(a-b)}}$$

Therefore, we happily conclude that $1 \neq 2$.