

# Sum and Product

Summer 2009

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## 1 Puzzle

There are a number of versions of this puzzle going around, this is probably my favourite.

Two positive integers  $x$  and  $y$  are chosen such that  $x + y \leq 100$ . Their sum and product are calculated, the sum is told to one mathematician (or 'wizard') for some reason in the original phrasing and the product to another. For convenience the mathematicians are also renamed Mr. Sum and Mrs. Product. After some time to crunch numbers the following exchange takes place:

Mrs. Product: I do not know what the two numbers are.

Mr. Sum: I knew you did not, and I also don't know what the two numbers are.

Mrs. Product: Now I know the two numbers.

Mr. Sum: Now I also know the two numbers.

What are the two numbers?

## 2 Discussion

A few ground rules. Firstly, again, this is a maths puzzle - there's no mucking around with hidden messages, neither of them signals the other, or passes him a note or anything. Also, they are assumed to be perfect mathematicians/logicians - when they say they can't work out the numbers, that means it is impossible to do so from the information they have, and when they solve it equally they definitely know what the numbers are.

This is another puzzle, like the Blue Eyes one, in which people revealing their ignorance is actually useful to the other mathematicians. When Mr. Sum and Mrs. Product make their opening statements they are eliminating some possibilities from the possibilities for  $x$  and  $y$  - and enough so that the other person can then come to the right conclusion.

### **3 Solution**

To come on 28<sup>th</sup> September