



© 1997–2004, Millennium Mathematics Project, University of Cambridge.

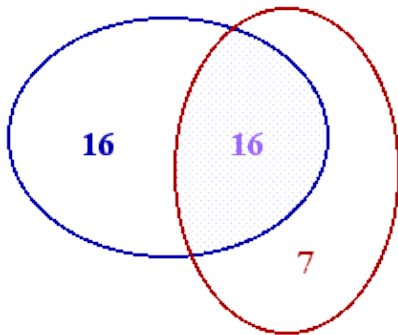
Permission is granted to print and copy this page on paper for non-commercial use. For other uses, including electronic redistribution, please contact us.

November 2003

Regulars



## Independence Day: solution



Let's suppose the two examiners found  $A$  and  $B$  errors respectively and that they found  $C$  of them in common. Now assume that  $A$  has a probability  $a$  of detecting a mistake, while  $B$  has a probability  $b$  of detecting a mistake. If the total number of typographical errors in the thesis was  $T$ , then  $A=aT$  and  $B=bT$ .

But if the two examiners are proof-reading *independently* then we know that  $C=abT$ . So  $AB=abT^2=CT$  and so the total number of mistakes is  $AB/C$ , irrespective of the values of  $a$  and  $b$ .

Since the total number of mistakes that the examiners found (noting that we mustn't double count the  $C$  mistakes that they both found) was  $A+B-C$ , this means that the total number that they didn't spot is just  $T-(A+B-C)$  and this is  $(A-C)(B-C)/C$ . In words, it's the product of the number that each found that the other didn't divided by the number they both found.

This makes good sense. If both found lots of errors but none in common then they are not very good proof-readers and there are likely to be many more that neither of them found.

In my example  $A=32$ ,  $B=23$ ,  $C=16$  and so the number of unfound errors is expected to be  $(16 \times 7)/16=7$ .

[Back to Outer space: Independence Day](#)

## Plus Magazine



*Plus* is part of the family of activities in the Millennium Mathematics Project, which also includes the NRICH and MOTIVATE sites.