

## The marriage agency

A marriage agency has in its files 25 men and 25 women and aims at acquainting the men with the women by organising dinner evenings, each one involving 12 tables, seating 2 men and 2 women. (Consequently, at each dinner evening, 1 man and 1 woman have a day off.) The question is how many of such dinner evenings the marriage agency can schedule without some man and woman sharing a table twice.

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Frans van der Sommen raised this problem at the end of the ETAC session of 8 August 1995. Rutger M. Dijkstra, who happened to attend that session, immediately showed how to schedule 12 dinner evenings: partition the men into a singleton and 12 pairs numbered  $[0..12)$ , do the same with the women, and let on the  $n$ th evening the men of pair  $i$  share a table with the women of pair  $(i+n) \bmod 12$ .

The demonstration that 12 is indeed the maximum took a little bit longer. Consider a sequence of 13 dinner evenings. Then at

most 13 men have had an evening off, and therefore at least  $12 (= 25 - 13)$  men dined all 13 evenings. Such a man enjoyed  $26 (= 2 \times 13)$  times the company of a woman; the number of women being 25, there is - pigeon-hole principle - at least one woman whose company he enjoyed at least twice.

[As said, this took a little bit longer. We first tried too a crude a counting argument in terms of man-woman combinations. Their total number is  $625 (= 25 \times 25)$ , each evening  $48 (= 4 \times 12)$  combinations are getting acquainted. Since  $625/48 = 13\frac{1}{48}$ , this rules out a schedule of 14 or more evenings, but the feasibility of a schedule of 13 dinner evenings it leaves open.]

This is actually a sequel to EWD1212: feasibility is shown by means of a witness, infeasibility by a counting argument.

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prof. dr. Edsger W. Dijkstra  
 Department of Computer Sciences  
 The University of Texas at Austin  
 Austin, TX 78712-1188  
 USA