

# Puzzle: Baffling Raffling

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A good (a professional soft-serve ice cream maker, as it turns out) is being raffled off by an auctioneer. Bidders can buy tickets in the raffle for \$1 apiece and at the end of the raffle the good is assigned to one of the bidders. The probability of assigning the good to a given bidder is proportional to the number of tickets he or she bought. Five bidders are participating in the raffle. They value the good at \$480.50 (Max), \$336.35 (Nora), \$240.25 (Ozgür), \$210.65 (Paolo) and \$190.20 (Qiao), and these values are common knowledge.

If they were participating in a standard (English) auction, the good would go to the highest bidder for a price equal to the second highest bid (or bid plus epsilon, depending on the implementation). In this case, Max would win the good at Nora's price of \$336.35 and would bring in a profit of  $\$480.50 - \$336.35 = \$144.15$ . None of the other bidders make a profit and the auctioneer brings in \$336.35.

In the raffle, how many tickets should each of the participants buy, assuming their goals are to maximize profit knowing that the others are trying to do the same? Who, of the auctioneer, Max, Nora, Ozgür, Paolo, and Qiao, gained the most expected profit by the auctioneer's choice of using a raffle instead of an English auction?<sup>1</sup>

Send solutions to the editor at [dreeves@umich.edu](mailto:dreeves@umich.edu) with subject: SIGecom Exchanges Puzzle. The author(s) of the most elegant solution (as judged by the editor) will be allowed to publish it in the next issue of the Exchanges (ties broken in favor of earlier submissions). To make the solutions accessible to a wide audience, please try to minimize technical jargon. Until the winner is chosen the editor will not give any hints or feedback.

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