

MATH AUCTION

March 7, 2012

Rules:

- 1) We divide into teams and work for a fixed amount of time to solve the problems below.
- 2) Each team is given \$500 to start.
- 3) The best solution to a problem is worth \$200.
- 4) The problems are put up for auction in the order given. The team with the highest bid is allowed to present its solution.
- 5) The problem is then put up for bid again (and again), but each time the solution must be better than the previous solution.
- 6) When no other team wants to buy the problem, the team with the best solution collects the value of the problem. Every team that “bought” the problem pays for its bid, even if it did not have the winning solution.
- 7) If a team can show that it has found the best solution (by showing that no better solution is possible), then that team gets an additional \$50 prize money for the problem.

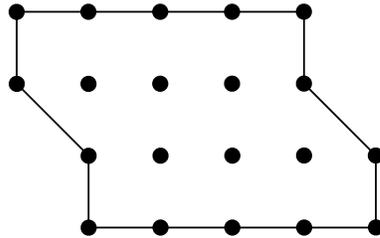
PROBLEMS

- 1) Make the minimum possible number of marks on a wooden plank so that every integer number of inches from 1 through 15 can be measured using this plank; that is, this length can be represented as the distance between some pair of the marks.

- 2) Suppose we have a balance (i.e. a scale with two arms, which can only tell us whether the items place on one arm weigh less than or more than the items place on the other arm). We are given 16 coins, one of which is counterfeit and weighs more than its real counterparts. Present an algorithm to find the counterfeit coin in the fewest number of weighings as possible in the worst case.

- 3) Six children sit around a circular table with 6 seats. How many ways can you rearrange the children so that no child moves more than one seat to the right or to the left of his or her original position?

- 4) Find as many different ways as possible to cut this figure into four pieces of the same size and shape, using straight line segments that begin and end at grid points.



- 5) Forty matches are arranged in the pattern below, forming many squares, including squares of size 1×1 , 2×2 , 3×3 , and 4×4 . Remove the fewest number of matches possible so that none of these squares remain.

