

Juniors

(Grades up to 10)

International Mathematics TOURNAMENT OF THE TOWNS

O-Level Paper

Spring 2003.

- 1 [4] 2003 dollars are placed into N purses, and the purses are placed into M pockets. It is known that N is greater than the number of dollars in any pocket. Is it true that there is a purse with less than M dollars in it?
- 2 [4] Two players in turns colour the sides of an n -gon. The first player colours any side that has 0 or 2 common vertices with already coloured sides. The second player colours any side that has exactly 1 common vertex with already coloured sides. The player who cannot move, loses. For which n the second player has a winning strategy?
- 3 [5] Points K and L are chosen on the sides AB and BC of the isosceles $\triangle ABC$ ($AB = BC$) so that $AK + LC = KL$. A line parallel to BC is drawn through midpoint M of the segment KL , intersecting side AC at point N . Find the value of $\angle KNL$.
- 4 [5] Each term of a sequence of natural numbers is obtained from the previous term by adding to it its largest digit. What is the maximal number of successive odd terms in such a sequence?
- 5 [5] Is it possible to tile 2003×2003 board by 1×2 dominoes placed horizontally and 1×3 rectangles placed vertically?