

## The Nineteenth Annual Green Chicken Contest

October 5, 1996

1. Suppose a rectangle is entirely covered (i.e., concealed) by an appropriate arrangement of 25 disks of unit radius. Can the same rectangle be covered by 100 disks of  $1/2$  unit radius?
2. What is the least possible integral period of the sum of functions of periods 3 and 6?
3. You have an ink stamp which is so amazingly precise that, when inked and pressed down on the plane, it makes every circle of irrational radius (centered at the center of the stamp) black. Question: Can one use the stamp three times and make every point in the plane black? (Assume the plane was white to begin with and ignore the fact that no such stamp is physically possible).
4. Four bugs are placed at the corners of a square with side  $a$ . Each bug walks always directly toward the next bug in the clockwise direction. How far do the bugs walk before they meet?
5. You have ten boxes, each containing nine balls. The balls in one box weigh 0.9 kg; the rest weigh 1 kg. You have one weighing on an accurate scale to find the box containing the light balls. How do you do it?
6. A hallway of width  $a$  turns through 90 degrees into a hallway of width  $b$ . A ladder is to be passed around the corner. If the movement is within the horizontal plane, what is the maximum length of the ladder?