

1. A  $4 \times 8$  rectangular billiards table has corners at  $(0, 0)$ ,  $(4, 0)$ ,  $(4, 8)$ , and  $(0, 8)$ . The cue ball is at  $(1, 3)$  and the target ball is at  $(2, 6)$ .
  - (a) You wish to hit the target ball by banking off the right bunker. Where should you aim along that wall?
  - (b) How about for a double bank off the bottom and right bunkers?
  - (c) How about for a double bank off the left, bottom and right bunkers?
2. A  $12 \times 12$  grid of dots is 3 colored, so that each of the dots gets colored one of three colors. Prove that there are 4 dots which form an axis-parallel rectangle which are all colored the same color.
3. One hundred people have tickets for the 100 seats on an airplane. The first passenger to board the plane pays no attention to the seat assignments, but just chooses a seat at random. As the other 99 passengers enter the plane single file, each sits in her assigned seat if that is available, and chooses a vacant seat at random if the assigned seat is occupied.

What is the probability that the last passenger to board the plane will be able to sit in the assigned seat?
4. Cut an equilateral triangle into pieces, and assemble the pieces into a square having the same area as the original triangle.