Department of Mathematics and Computer Science
Probability and Statistics Challenge Problems 5 - Solution

Coin Toss

1. Suppose that you have a chessboard that measures 80cm by 80cm. The board is divided into 64 squares, half of which are black and the other half of which are white. A coin, having diameter 2cm, is dropped randomly on the chessboard. What is the probability that the coin lands entirely within a white square? That is to say that no part of the coin is in contact with a black square.

   It is easiest to focus on the centre of the coin. Suppose that the centre of the coin lands on a white square. This happens with probability 1/2. In order for the coin to be entirely on the white square, the centre of the coin must be at least 1cm from the edge of the square. That means that the centre of the coin must land within an 8cm by 8cm square within the larger 10cm by 10cm square. That is to say that the centre of the coin must land in a 64 sq cm region within a region totalling 100 sq. cm. The probability of this happening is 64/100, or 64%. Therefore, the probability that the coin lands entirely within the white square is (1/2)(64/100)=32/100 or 32%.

Problem posted at http://www.cs.uleth.ca/~sheriff/statistics/challenge.htm.

Problems are open to all University of Lethbridge students. Solutions may be submitted to Dennis Connolly (C566) or John Sheriff (D510). If no one is in the office, just put the solution under the door. Please include your name and student number. Students with correct solutions will be acknowledged and prizes will be awarded at the end of the semester based upon performance during the semester.

If you like problem solving you should consider trying
Math Problem of the Week (see Kerri Webb in C572).

You may also be interested in the following competitions
ACM Programming Contest (see Howard Cheng in C570)
Putnam Exam (see Sean Legge in C518)