FMCS1: Coursework 3 (Probability)

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Handin deadline: 16:00, 16 March 2007

1. What is the probability of winning the National Lottery?
    We can describe the situation as follows:
    - A single play involves choosing 6 different number between 1–49
    - The draw chooses 6 numbered balls out of 49
    - The order in which the numbers are chosen does not matter in either case

    (a) How many possible outcomes of the draw are there?
    (b) What is the probability of winning the jackpot? (i.e. your 6 chosen numbers match the 6 balls that are drawn.)
    (c) What is the probability of matching at least 5 of the 6 winning balls? (Forget the bonus ball for now.)
    (d) Now consider the bonus ball (which is a seventh ball that is drawn). What is the probability of matching the bonus ball and 5 of the 6 winning balls?
    (e) To help their readers become millionaires, several newspapers used to publish a "guide" to the lottery listing the numbers that have come up in previous draws, so that people can bet on those numbers that have come up less frequently in the past. Comment on this strategy for choosing lottery numbers.

2. There is a box with three drawers, each containing 2 coins (gold or silver). The contents of the drawers are:
    D1 2 Gold (GG)
    D2 1 Gold, 1 Silver (GS)
    D3 2 Silver (SS)
    You pick a drawer at random, and choose a coin at random from that drawer. The coin is gold. What is the probability that the other coin in the drawer is gold?

3. There are two identical boxes. Box A contains 600 blue balls and 400 red balls; box B contains 400 blue balls and 600 red balls. You randomly choose a box (by flipping a fair coin) and draw out 13 balls, replacing the ball after each draw. You obtain 9 blue and 4 red balls. What is the probability that you chose box A?