# 21-301 Combinatorics
# Homework 5
# Due: Wednesday, October 11

1. A box has $m$ drawers; Drawer i contains $g_i$ gold coins and $s_i$ silver coins, for $i = 1, 2, \ldots, m$. Assume that one drawer is selected randomly and that a randomly selected coin from that drawer turns out to be gold. What is the probability that the chosen drawer is drawer 1?

2. A bag contains $n$ balls, each of a different color. In a round, a person picks a random ball from the bag, makes a note of its color and then puts it back. What is the expected number of rounds required for the person to have pulled out a ball of each color at least once?

3. A particle sits at the left hand end of a line $0 - 1 - 2 - \cdots - L$. When at 0 it moves to 1. When at $i \in [1, L-1]$ it makes a move to $i-1$ with probability $1/4$ and a move to $i+1$ with probability $3/4$. When at $L$ it stops.

   Let $E_k$ denote the expected number of visits to 0 if we started the walk at $k$.

   (a) Find a set of equations satisfied by the $E_k$.

   (b) Given that $E_k = \frac{A}{3^k} + B$ is a solution to your equations for some $A, B$, determine $A, B$ and hence find $E_0$.