## Random Walk Algorithms: Homework 6

You can answer the following questions either analytically, or by writing and running code.

1. Consider a game A which consists of flipping a coin with probability $1 / 2$ of landing head up, in which case you win $\$ 1$; if it lands tail up you lose $\$ 1$. Thus, if $W_{t}$ is your wealth after playing $t$ times, $\left\{W_{t}\right\}$ is a random walk on $\mathbb{Z}$. If $W_{0}=0$, what is $\mathrm{E}\left[W_{100}\right]$ ?
2. Now consider a game B which has two coins, $B_{1}$ and $B_{2}$. The probability of $B_{1}$ landing head up is $1 / 10$ and the probability of $B_{2}$ landing head up is $3 / 4$. On play $t$, if $W_{t-1} \equiv 0$ $(\bmod 3)$ you must flip $B_{1}$; otherwise you must flip $B_{2}$. Again you win $\$ 1$ if the coin you flip lands head up; otherwise you lose $\$ 1$. In this case, $\left\{W_{t}\right\}$ is an inhomogeneous random walk on $\mathbb{Z}$. If $W_{0}=0$, what is $\mathrm{E}\left[W_{100}\right]$ ?
3. Finally, suppose you play these games in the order AABB . If $W_{0}=0$, what is $\mathrm{E}\left[W_{100}\right]$ ? Compare your result with those in problems 1 and 2.
