

Mathematics 1550H – Introduction to probability

TRENT UNIVERSITY, Winter 2015

Assignment #2

Fair and biased

Due on Thursday, 12 February, 2015.

1. Suppose all you have is a biased coin that when tossed comes up heads 60% of the time and tails 40% of the time. How can you use it to simulate a fair coin, *i.e.* one that comes up heads 50% of the time and tails 40% of the time? Explain why your method works. [3]
2. Suppose all you have is a fair coin. How can you use it to simulate a biased coin such as the one in problem 1 that comes up heads 60% of the time and tails 40% of the time? Explain why your method works. [4]
3. Suppose all you have is a fair coin. How can you use it to – completely accurately! – simulate a biased coin that has $P(H) = \frac{1}{\sqrt{2}}$ and $P(T) = 1 - \frac{1}{\sqrt{2}}$? Explain why your method works, or explain why there can be no such method. [3]

Note: Keep in mind that $\frac{1}{\sqrt{2}}$ is irrational (because $\sqrt{2}$ is), and so cannot be written as a ratio of integers. That makes this problem rather harder than **2** ...