California Institute of Technology
Department of Electrical Engineering

EE 162
Random Processes for Communication and Signal Processing

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2. Some Comments on *In Dire Need of Some Brains*

As we have seen just now in class, the probability of A winning is 0.545454 ..., and the average number of trigger pulls before somebody wins is 6. Since this is an average, however, then some duels will be shorter (perhaps just one trigger pull) and others will be much longer. To study the magnitude of the variation in the durations of many duels we can use a computer simulation. The Matlab program `fools1.m` simulates 10,000 duels and keeps track of who wins and how long each duel lasts. The heart of the simulation is Matlab's internal random number generator named `rand`. As with every high-level scientific programming language, the generator returns a number from a distribution that is uniformly distributed from 0 to 1 each time `rand` is called. So to simulate the firing of a six-shot revolver with just one bullet in the cylinder simply call `rand` and see if the returned number is between 0 and 1/6 (gun fires) or greater than 1/6 (gun does not fire). The cylinder spin before each trigger pull makes the probability that the gun fires with each trigger pull 1/6, and is also independent of all previous trigger pulls.

When I ran `fools1.m` five times, for example, here is what was produced:

Run	$P(A)$	Average Number of Trigger Pulls
1	0.5517	6.0089
2	0.5508	5.9424
3	0.5496	6.0970
4	0.5492	5.9170
5	0.5513	5.9285

The results are in fairly good agreement with the theoretical answers, although the estimates for $P(A)$ are a bit on the high side. It is interesting to note from Figure 2.1 that a significant number of duels lasted longer than ten trigger pulls, and a few were longer than twenty trigger pulls.