# MTH202: Assignment 4, Additional Exercises

### January 30, 2019

1. A player has a fair coin, and a fair 4-sided dice and a fair 6-sided dice (all are independent). The player flips the coin, if it shows head, then the 4-sided dice is rolled and its value noted; else if the coin shows tail then the 6-sided dice is rolled and it value noted. Suppose $X$ denote the result obtained. Is $X$ a random variable? What is the p.m.f of $X$?

2. A standard (6-sided) fair die is rolled two times (each role being independent). Let $X_i$ denote the value obtained on the $i$-th roll. Is this a random variable? What about $S = X_1 - X_2$, the difference of the values rolled? Determine the p.m.f of $S$.

3. In an experiment, we can observe whether the solution is acidic (event $A$) and whether the solution is coloured (event $B$). Assume that $P(B) > 0$. We now carry out the experiment repeatedly (each trial being independent) until $B$ is observed. What is the probability that $A$ is observed at the same time as $B$?

4. Suppose $k$ pipes of length 1 meter are attached in a series. Probability that $i$-th pipe is blocked is $p_i$ (independent of the others). What is the probability that water will flow from one end to another?

5. A system consists of $n$ machines in parallel (so it works as long as one of the machines is working). $k$-th machine works with probability $p_k$, independently of the other machines. What is the probability that system functions?

6. Let $X$ be a random variable taking values in $\mathbb{N} \cup \{0\}$ such that $P(X = i) = e^{-s}\frac{s^i}{i!}$ for a fixed $s > 0$. Does this define a p.m.f? Explain why.