Let X be the number that comes up on a fair 6-sided die. What is E[X] and Var(X) ? Let I be a random variable which takes value 1 when the die value is greater than 3 and I equals 0 otherwise. What is E[I] and Var(I) ? Now suppose we throw 10 dice. Let X_i be the result for i^{th} die. What is $E[X_1+X_2+\ldots+X_{10}]$?

A computer program crashes at the end of each hour with probability *p*, if has not done so already. What is the expected time until the program crashes ? Express in terms of *p*. Useful fact[1]: $\sum_{i=1}^{\infty} ix^{i-1} = \frac{1}{(1-x)^2}$. Write a Matlab simulation and compare its estimate with your calculation.

The time to run a cloud computing task is X = 1/N + Y, where N is the number of servers allocated to the task and Y is a random variable with E[Y]=0. Suppose n=2 servers are allocated, what is E[X|N=2] ? Suppose the number of available servers has PMF: P(N=1)=0.5, P(N=2)=0.2, P(N=3)=0.2, P(N=4)=0.1. What is E[X] ?

Suppose the number of people using a mobile app in a day is a random variable N with PMF $P(N=n) = \frac{e^{-n}}{1-1/e}$. On average each person pays €1 per day to use the service. What is the expected revenue for this app ? Useful fact: $\sum_{i=0}^{\infty} ix^i = \frac{x}{(1-x)^2}$

A tout is buying tickets for a concert. The price of the tickets is €50 and the tout sells them for €100, making a profit of €50. However, if he can't sell a ticket then he makes nothing from it (so it costs him €50). Let random variable N be the number of people who will buy tickets from the tout. N has PMF $P(N=n) = (1 - e^{-0.5})e^{-0.5n}$. Suppose the tout buys m=10 tickets, what is his expected profit or loss ? Express in terms of m, n and constants. Using Matlab plot the expected profit vs m. What value of m maximizes profit ?

[1] E.g. see https://en.wikipedia.org/wiki/Arithmetico-geometric_sequence