STAT 2857A – Lecture 12 Examples and Exercises

Example 12.1

According to the book "United States Water Law: An Introduction'' by John W.~Johnson, heavy rain falls at about 495 drops per second per metre square. Let X be the number of rain drops that falls in one metre square in t seconds.

a) What is the distribution of X?
b) What is the pmf of X?
c) What are the mean and variance of X?
d) How does the shape of the distribution vary with t?

Example 12.2

In lecture 4, we showed that the probability that a randomly selected person is colour blind is about .04512. Let X be the number of colour blind students in a class of 100.

a) What is the distribution of X?
b) What are the mean and variance of X?
c) What is the probability that the class contains more than 5 students who are colour blind?
d) Approximate the distribution of X by a Poisson and repeat the questions above.
e) Do you think the Poisson approximation is appropriate?

Exercise 12.1

One gram of Uranium-235 contains 2.35×10^{21} atoms. Each atom has probability 9.85×10^{-10} of decaying in one year. Let X be the number of atoms that decay in 1 year. You may assume that atoms decay independently of one another.

a) What is the distribution of X?

b) What are the mean and variance of X?
c) What is the probability that the number of decays in one year is greater than the mean?
d) Approximate the distribution of X by a Poisson and repeat the questions above.
e) Do you think the Poisson approximation is appropriate?