Worcester Polytechnic Institute   Summer 2019 – E1 Term
Department of Mathematical Sciences
Professor: Stephan Sturm
Online Success Coach: Patchara Santawisook

MA 2631

Probability Theory

Section E161

Assignment 7

due on Tuesday, May 11

1. Let Z be a geometric distributed random variable with success probability p. Calculate $\mathbb{V}ar[Z]$.

2. Let Y be a binomial distributed random variable with n trials of success probability p. Show that
$$\mathbb{V}ar[Y] = np(1-p).$$

3. Assume that X is a random variable taking values on the non-negative integers that satisfies
$$\mathbb{P}[X \geq n+i \mid X \geq n] = \mathbb{P}[X \geq i].$$
   Show that X is a geometric distributed random variable. What is the parameter p?

4. Assume that X is a Poisson distributed random variable with parameter $\lambda > 0$. Prove that $\mathbb{V}ar(X) = \lambda$ and calculate $\mathbb{E}[X^3]$.

6 points per problems

Additional practice problems (purely voluntary - no points, no credit, no grading):

Standard Carlton and Devore, Section 2.4: Exercises 50, 54, 59, 61, 66; Section 2.6: 98