Home Assignment 9

Discrete Mathematics – CSC/MAT A67, Winter 2024

PROBABILITY: ABSTRACT PROPERTIES

1. Let (Ω,p) be a probability space and let X be a random variable. Let c be a real number, and let Y be a random variable such that Y(ω) = c · X(ω) for all ω ∈ Ω. Prove that E[Y]=c*E[X].

   By definition, $E[Y] = \sum_{\omega \in \Omega} Y(\omega) = \sum_{\omega \in \Omega} c \cdot X(\omega) = c \cdot \sum_{x \in \Omega} X(\omega) = c \cdot E[X]$.

2. Let (Ω,p) be a probability space and let X and Y be random variables. Prove that E[X - Y] = E[X] - E[Y]. (Hint: Define a random variable Z that takes value -Y(ω) on each ω ∈ Ω, and use Q1 & linearity of expectation.)

   We define a random variable Z such that Z(ω) = -Y(ω) for every ω ∈ Ω.