

MATH-57091 Probability and Statistics for High-School
Teachers.

Home Work 3, due on Wednesday SEPTEMBER 21,
Instructor: Prof. Artem Zvavitch

Problem 1. (25 points) Suppose that X is a random variable that takes on one of the values $-1, 0, 1$ and 2 . If

$$\mathbb{P}(X = -1) = .2, \mathbb{P}(X = 0) = .3 \text{ and } \mathbb{P}(X = 1) = .4,$$

Find

- $\mathbb{P}(X = 2)$.
- $\mathbb{P}(X \leq 1)$.
- $\mathbb{P}(X > 0)$.
- $\mathbb{P}(-\frac{1}{2} \leq X < 2)$.
- $\mathbb{E}X$.
- *Distribution (Probability Mass function) of X^2 . (Probability mass function is a function that gives the probability that a discrete random variable is exactly equal to some value. For example: $\mathbb{P}(X = -1) = .2, \mathbb{P}(X = 0) = .3$ and $\mathbb{P}(X = 1) = .4$. If now we consider a new random variable $Y = X + 3$ we would get $\mathbb{P}(Y = 2) = .2, \mathbb{P}(Y = 3) = .3$ and $\mathbb{P}(Y = 4) = .4$. The question is to find the Probability mass function for X^2).*
- $\mathbb{E}X^2$.
- $\mathbb{E}2^X$.

Also let Y be a random variable that takes on one of the values $-2, 0, 3$. If

$$\mathbb{P}(Y = -2) = .2, \mathbb{P}(Y = 0) = .3 \text{ and } \mathbb{P}(Y = 3) = .5,$$

find

- $\mathbb{E}Y$,
- $\mathbb{E}(X + Y)$. (Hint: try to do it directly, but after see Lecture 3.2)

Problem 2. (10 points) An insurance agent has two clients each of whom has a life insurance policy that pays 100000 dollars upon death. Their probabilities of dying this year are .05 and .1. Let X denote the total amount of money that will be paid this year to the clients beneficiaries. Assuming that the event that client 1 dies is independent of the event that client 2 dies, determine the probability distribution (probability mass function) of X also $\mathbb{E}X$.

Problem 3. (10 points) Let $\mathbb{E}X = \mathbb{E}Y = 0$ is it true that then $\mathbb{E}XY = 0$.

Problem 4. (10 points) Let Y be a Geometric Random Variable with parameter p , find $\mathbb{E}Y$.