Homework 8 – Intro to Probability and Statistics

Your name here

Instructions:

Due: 06/04 at 11:59PM.

What am I expecting? An R Markdown with the answers. Note: this one can be done in paper and pencil. If you want to do so, do the problem and take pictures of it. Put the pictures in a PDF and send it.

Have fun!

Question 1

A factory produce valves, with 20% chance of a given valve be broken. The valves are sold in boxes, containing ten valves in each box. If no broken valve is found, then they sell the box for $10.00. With one broken valve, the box costs $8.00. With two or three, the box is sold for $6.00. More than three valves broken, they sell the box for $2.00. What is the mean sales price for the boxes?

Question 2

If a random variable X has distribution:

x	-2	-1	0	1	2
f(x)	1/2	1/10	1/5	1/10	1/10
F(x)	1/2	3/5	4/5	9/10	1

Compute the mean, the variance, and the standard deviation of X.

- X^2?
- $3X$?

Question 3

If a random variable X has distribution (note: it is the same as in the previous problem):

x	-2	-1	0	1	2
f(x)	1/2	1/10	1/5	1/10	1/10
F(x)	1/2	3/5	4/5	9/10	1

Compute the distribution of the following transformations:

- X^2?
- $3X$?

Question 4

Prove the following statements:

- Let two constants, $a \in \mathbb{R}$ and $b \in \mathbb{R}$, and a discrete random variable X. Prove that $\mathbb{E}(aX+b) = a\mathbb{E}(X)+b$.
- Let two constants, $a \in \mathbb{R}$ and $b \in \mathbb{R}$, and a discrete random variable X. Prove that $\mathbb{V}(aX+b) = a^2\mathbb{V}(X)$.
- Let $a \in \mathbb{R}$ a constant. Prove that $\mathbb{E}(a) = a$ and that $\mathbb{V}(a) = 0$.