

MA 2621 – TERM- A - 2017

HW #2 (Problems 1-8)

Due W 9/06

#1. Let X be a random variable that takes values from 0 to 9 with equal probability $1/10$.

- a) Find the probability distribution of the random variable $Y = X \bmod (4)$.
- b) Find the probability distribution of the random variable $Y = 6 \bmod (X + 1)$.

Note: $x \bmod y$ = remainder when x is divided by y .

#2. Consider the random variable X with probability distribution,

$$P(x) = \begin{cases} \frac{x^2}{a} & : -2, -1, 0, 1, 2. \\ 0 & : \text{otherwise} \end{cases}$$

- a) Find a and $E[X]$
- b) What is the probability distribution of random variable $Z = (X - E[X])^2$?
- c) Using part b), compute the variance of X .
- d) Compute the variance of X using the formula given in the class note.

#3. Suppose an individual plays a gambling game where it is possible to lose \$1.00, break even, win \$3.00, or win \$10.00 each time she plays. The probability distribution for each outcome is provided by the following table:

Outcome	-\$1.00	\$0.00	\$3.00	\$10.00
Probability	0.30	0.40	0.20	0.10

- a) Find the mean and the variance of the outcome for this game.
- b) Suppose the casino decides to adjust the payout levels by subtracting \$1.00 from each prize. Find the mean and the variance of the outcome using the result in part a).
- c) Suppose that the casino decides that the game does not have an impressive enough top prize with the lower payouts, and decides to double all of the prizes in part b). Find the mean and the variance of the outcome.

- #4. You are visiting a rainforest, but unfortunately your insect repellent has run out. As a result, at each second, a mosquito lands on your neck with probability 0.5. If a mosquito lands, it will bite you with probability 0.2, and it will never bother you with probability 0.8, independently of other mosquitoes. What is the expected time between successive bites?
- #5. Suppose we roll three tetrahedral dice that have 1, 2, 3, and 4 on their four sides. Find the probability distribution for the sum of the three sides.
- #6. A lottery has one \$100 price, two \$25 prices and five \$10 prices. What should you be willing to pay for a ticket if 100 tickets are sold?
- #7. In a group of five items, two are defective. Find the distribution of N , the number of draws we need to find the first defective item. Find the mean and the variance of N .
- #8. Suppose $P(X \in \{1,2,3\}) = 1$ and $E(X) = 2.5$. What is the smallest and largest possible values for the variance?

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Suggested Problems

Pg: 29-31 : 38, 40, 41, 43, 48, 50, 51, 55.