**EECS 461 Probability and Statistics**
Fall Semester 2022
Assignment **#9** Due **25 October 2022**

Reading: Sections 5.1 - 5.6 in Yates/Goodman

Do all of the Quizzes in the Reading assignment but do *not* hand them in. Answers to the Quizzes are on the book's website (search Yates Goodman Wiley)

For all problems from the book, you should use the method(s) from the corresponding section to solve the problem.

1. Problem 5.2.4, p. 207. Consider the problem as stated to be part (a), and add part (b): Find the marginal PMFs for $X$ and $Y$.
2. Consider two successive traffic lights. Assume the first light is equally likely to be red or green when a random driver approaches it (we are simplifying by assuming there is no amber light). Then assume that, as the driver approaches the second light, the probability that the second light is the same color as the first one was when the driver approached it is 0.8, due to timing coordination. For this pair of lights, let $X$ be the number of green lights that a random driver will encounter when approaching each light. Then let $Y$ be the number of green lights that a random driver will encounter as approaching each light before encountering the first red light.
    a. Find the joint PMF of $X$ and $Y$. Express your answer both as a table and as points (with PMF values) on an $X, Y$ plane. Hint: use a probability tree with outcomes being either a red or green color for each light.
    b. Express the probability that the second light is green as a driver approaches in terms of $X$ and $Y$, then find that probability.
    c. Express the probability that at least one light is red as a driver approaches in terms of $X$ and $Y$, then find that probability.
3. Problem 5.3.4, p. 208. You may initially want to use a table to express the marginal PMFs, but your final answer should be a complete mathematical expression for each marginal PMF. Then use those mathematical expressions to find the means.
4. Problem 5.4.2, parts (a) and (b) only, p. 209.
5. The joint PDF of $G$ and $H$ is:

    $$f_{G,H}(g,h) = 3 \cdot g \quad \text{for } 0 < g \leq 1 \text{ and } 0 < h \leq g$$

    and 0 otherwise.
    a. Find $\mathrm{P}[G > 0.5, H > 0.2]$.
    b. Find the marginal distribution of $G$. Express it as a complete mathematical expression.
    c. Find the marginal distribution of $H$. Express it as a complete mathematical expression.

  

d. Verify that each marginal is valid (integrates to 1).

e. Determine whether or not $G$ and $H$ are independent.

6. Problem 5.6.4 part (a) only, p. 209. HOWEVER, instead of a fair coin, let the probability of a head be $p$.

7. Two independent RVs $G$ and $H$ have the following PDFs:

$f_G(g) = 1/5$ for $5 < g \leq 10$ and 0 otherwise.

$f_H(h) = k \cdot h^2$ for $2 < h \leq 4$ for some constant $k$ and 0 otherwise.

a. Determine the value of $k$.

b. Find the joint PDF of $G$ and $H$. Be sure to give a complete description of this joint PDF.

c. Verify that the joint PDF is valid (integrates to 1).

  