EECS 461 Probability and Statistics
Fall Semester 2022
Assignment **#12** Due **15 November 2022**

Reading: Sections 6.1 - 6.5 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 6.1.4, p. 236, Yates/Goodman. PMF of sum of discrete RVs.
2. Problem 6.2.8, p. 237. Transforming a continuous uniform(0,1) RV.
3. Let C denote the temperature in degrees Celsius to which a laptop computer will be subjected in the field. Assume that C is continuously distributed uniformly over the interval [15,21]. Let F denote the field temperature in degrees Fahrenheit so that $F = (9/5)C + 32$. Find the PDF for F. Be sure to provide a *complete* PDF (include range information in the PDF).
4. Problem 6.3.4, p. 237. Output of a limiter (clipper). Be sure to provide a *complete* PDF (include range information in the PDF).
5. Let G be a continuous RV uniformly distributed over [0,4], and let $J = m(G) = (G - 3)^2$. Find the PDF of J. Be sure to provide a *complete* PDF (include range information in the PDF).
6. Problem 6.4.4, p. 239. PDF of maximum of 2 continuous RVs. Be sure to provide a *complete* PDF (include range information in the PDF).
7. Let G and H be independent continuous RVs, each uniformly distributed over [0,1] and [0,2], respectively. Let K and L be defined as $K = 2G + H$ and $L = G + 3H$. Find the joint PDF of K and L. Be sure to provide a *complete* PDF (include range information in the PDF).
8. Let G and H be continuous RVs with joint PDF $f_{G,H}(g, h)$. Let $K = G/H$. Find the PDF of K in terms of $f_{G,H}(g, h)$. Hint: Let $L = H$, find the joint PDF of K and L, then integrate to find the PDF of K. Simplify your expression as much as you can.
9. Let X and Y be independent, continuous RVs. Let X be exponential(2) and let Y be uniform(-1,1). Find the PDF of $K = X + Y$. Be sure to provide a *complete* PDF (include range information in the PDF).

EECS 461 PROBABILITY & STATISTICS

ASSIGNMENT 12 — CHAPTER 6 PROBABILITY MODELS OF DERIVED RANDOM VARIABLES

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1. PROBLEM 6.1.4 — PMF OF SUM OF DISCRETE RVs

LET X & Y BE DISCRETE RANDOM VARIABLES WITH JOINT PMF $P_{X,Y}(x,y)$ THAT IS ZERO EXCEPT WHEN x & y ARE $\mathbb{Z}$. LET $W = X + Y$ & SHOW THAT THE PMF OF W SATISFIES

$$P_W(w) = \sum_{x=-\infty}^{\infty} P_{X,Y}(x, w-x)$$

LET PMF OF X BE, $P_X(X=x)$, $x \in I$ & $I = \{\mathbb{Z}_s\}$

LET PMF OF Y BE, $P_Y(Y=y)$, $y \in I$ & $I = \{\mathbb{Z}_s\}$

LET PMF OF W BE, $P_W(W=w)$, $w \in I$ & $I = \{\mathbb{Z}\}$

LET $W = X + Y$

$\Rightarrow$ $Y = W - X$

$\Rightarrow$ MUST ASSUME ALL POSSIBLE COMBINATIONS OF X

$$\therefore P_W(W=w) = \sum_{X=-\infty}^{\infty} P_W(X=x, Y=w-x) = \underline{\sum_{X=-\infty}^{\infty} P_X(X=x)\, P_Y(Y=w-x)}$$

$$P_W(w) = \sum_{X=-\infty}^{\infty} P_{X,Y}(x, w-x) =$$

SATISFIES

2. PROBLEM 6.2.8 TRANSFORMING A CONTINUOUS UNIFORM (0,1) RV