APPM 3570/STAT 3100   Exam 1   Spring 2023

NAME: _____

SECTION: 001 $\boxed{or}$ 002

Instructions:

1. Calculators are permitted.

2. Notes, your text and other books, cell phones, and other electronic devices are not permitted | except for calculators or as needed to view and upload your work.

3. Justify your answers, show all work.

4. When you have completed the exam, go to the uploading area in the room and scan your exam and upload it to Gradescope.

5.

Problem 1. (20 points.) The following ve questions pertain to permutations of the following letters: $x, y, y, z, z, z, v, v, v, v, w, w, w, w, w$. Do <u>not</u> simplify your answers.

(a) How many di erent permutations are there?

(b) How many permutations start with a *w* and end with an *x*?

(c) How many permutations keep identical letters together?

(d) How many permutations contain the sub-sequence v, z, v, z, v, z, v?

(e) How many permutations keep no two *y*'s together?

(Use the back page if additional space is needed!)

Problem 2. (24 points.) There are three unrelated parts to this question.

(a) Four events occur with probabilities $P(E) = 0.35$; $P(F) = 0.15$; $P(G) = 0.40$; $P(B) = 0.30$. If $P(E/B) = 0.20$, what's the probability that exactly one of E or B occurs? Simplify your answer!

(b) A drawer has 8 forks, 8 knives, 4 spoons and one spatula. If I draw 10 objects randomly, what's the probability that I get at least one fork and one spatula? Do <u>not</u> simplify your answer.

(c)

Problem 3. (24 points.) A manufacturer produces vehicle batteries, some of which are defec-

Problem 4. (32 points.) A biased coin is twice more likely to come up heads than tails. Let G be the number of heads minus the number of tails observed when the coin is tossed independently three times.

(a) What's the probability of flipping heads in one coin toss?

(b) Determine the probability mass function (p.m.f.) of G.

(c) Find $P(-1 \le G \le 2)$.

(d) Determine the cumulative distribution function (c.d.f.) of G.

(Use the back page if additional space is needed!)

Bonus Problem. (Recover up to 4 points marked down in problems 1-4.) Let A, B, and C be independent events. Are $(A \cup B)$ and C independent? Justify your answer with a mathematical argument or a counter-example.