MA 5230 Test 1: Review

1 Statistics

1. Use this table for the question. We tested two different drugs on both male and female patients. Below we list the count successes and failures for each drug treatment.

	Drug A		Drug B	
	Success	Failure	Success	Failure
male	25	100	20	85
female	35	55	111	206

   (a) What is the probability that male we see success using Drug A? What is the probability that male will see success using Drug B? Which drug is better for a male?

   (b) What is the probability that a person (combining males and females) using drug A is successful?

   (c) What is the probability that a person (combining males and females) using drug B is successful? So which drug treatment is more successful for people overall

   (d) What is the probability that female will see success using Drug A? What is the probability that female will see success using Drug B? Which drug is better for a female?

   (e) Reconcile your answers.

2. Use the list of numbers below

$$1, 3, 3, 3, 4, 5, 5, 5, 6, 6, 6, 6$$

   (a) What is the five number summary?

   (b) Compute the IQR amd make a box and whisker plot using 1.5*IQR.

   (c) Are there any outliers?

   (d) Compute $\bar{x}$ dn s for the list.

2 Probability

3. I have a pair of fair dice. We roll the two dice and add the numbers on the faces.

   (a) What is the probability that the sum is a 7?

   (b) What is the probability that the sum is a 5?

   (c) What is the probability that the first roll is a 4?

   (d) What is the probability that at least one of the rolls is 4?

   (e) What is the probability that the sum is a 7 given that that the sum is an even number?

(f) What is the probability that the sum is a 7 given that that the first roll is a 4?

(g) Is the sum is a 7 independent of sum is an even number?

(h) Is the sum is a 7 independent of the first roll is a 4?

(i) Is the sum is a 5 independent of the first roll is a 4?

4. I have some funny dice with six sides.

   - Die A has sides 2, 2, 4, 4, 9, 9.
   - Die B has sides 1, 1, 6, 6, 8, 8.
   - Die C has sides 3, 3, 5, 5, 7, 7.

   (a) We roll die A what is the probability of rolling a 2? a 4? a 9?

   (b) We roll die A and die B. What is the probability of A having a higher roll?

5. Three trains come to the station train A, train B and train C. The probability that one takes train A is 25%, train B is 30% and train C is 45%. The trains are late at rates 5%, 10%, 15% respectively.

   (a) What is the probability that I take train A and I am late?

   (b) What is the probability that I am late?

   (c) What is the probability that I am late given that I took train A?

   (d) What is the probability that I took train A given that I am late?

6. An urn has three red balls, five green balls and seven purple balls.

   (a) If we draw three balls from the urn (with replacement), what is the probability of drawing three green balls?

   (b) If we draw three balls from the urn (with replacement), what is the probability of drawing exactly two green balls?

7. An urn has three red balls, five green balls and seven purple balls.

   (a) If we draw three balls from the urn (without replacement), what is the probability of drawing three green balls?

   (b) If we draw three balls from the urn (without replacement), what is the probability of drawing exactly two green balls?

3 Random Variables

8. An urn has three red balls, five green balls and seven purple balls. We draw three balls (without replacement). Let X be the count of green balls and Y be the count of red balls.

   (a) Write the p(x) table.

   (b) Write the F(x) table. Graph.

   (c) Compute $P(X < 2)$, $P(Y < 2)$ and the $P(X < 2|Y = 1)$.

9. Let the pdf be defined as $f(n) = cn^2$ for where $n \in \{1, 2, 3, 4\}$.
   (a) Is this random variable discrete or continuous?
   (b) Compute c
   (c) Write the $F(n)$ table. Graph.
   (d) Compute $P(N < 2)$ and $P(N \leq 2)$.
   (e) Compute $P(N < 2|x \leq 2)$.
10. Let the life span of a light bulb be given by the pdf $f(x) = ce^{-x/7}$ where $x > 0$.
   (a) Is this random variable discrete or continuous? why?
   (b) Compute c
   (c) Compute $P(X < 2)$ and $P(X \leq 2)$.
   (d) Compute $P(X < 2|x \leq 2)$.

4 Some Proofs

11. Prove: If $P(A) > P(A|B)$ then $P(B) > P(B|A)$.
12. Prove: If A is independent of B then $P(A \cap B) = P(A)P(B)$.