AMS 102 Section 7 MIDTERM II

3/29/2012

Instructions:

There is a total of **50 possible points** in this exam + an extra credit section of up to **5 points**.

PLEASE SHOW ALL WORK. Credit WILL NOT be given if a reasonable amount of work is not shown and partial credit cannot be awarded unless work is shown.

You are **ALLOWED** to use **a 1 sided 8.5x11 hand written cheat sheet** during the exam, as well as a **CALCULATOR**.

NO CELL PHONES OR COMPUTERS.

You will be given **1:30** mins to complete the exam. I will provide updates to time on the board.

Take your time, try your best. **GOOD LUCK!!!**

NAME: _____

ID: _____

(12 Points) **Matching**

Next to each description/definition below, write the letter of the most appropriate term from the list of terms in the box.

A) PDF	**H)** $\bar{x}$
B) 95.0%	**I)** Precision
C) Z-table	**J)** Normal Distribution
D) μ	**K)** 97.5%
E) Standardization	**L)** PMF
F) Normal Equations	**M)** $\hat{p}$
G) Variability	**N)** 99.5%

_____ A description of the probabilities associated with a Discrete Random Variable

_____ A method used to change the values in a dataset to a mean of 0 and a variance of 1

_____ A property of our estimator which gets higher as our sample size increases

_____ A summary of areas from negative infinity to specific values of the Standard Normal Distribution

_____ Based on the Empirical Rule, the amount of probability between 2 Standard Deviations on either side of the mean

_____ The notation we use for the estimator which represents the average value of those units in our sample

1) Consider the **Random Variable W** where **W represents the number of major snowstorms** Long Island experiences during the winter. From historical reports, you determine that Long Island experienced **0 major snowstorms 20%** of the time, **1 major snowstorm 35%** of the time, **2 major snowstorms 25%** of the time, **3 major snowstorms 15%** of the time **and 4 snowstorms the remaining times**.

   a) **Construct** a **Probability Mass Function** for the Random Variable **W**. (Recall: A table is a good format for presenting a Probability Mass Function)

   b) Calculate the **Expected Number of major Snowstorms** in a given year.

   c) Calculate the ***Variance*** **of the Number of major Snowstorms** in a given year.

2) You are in charge of a random drawing to see who wins tickets to a sold out concert. You are **giving away 4 tickets in total**. **10% of the entrants** in the drawing are **under the age of 18**. You can assume the size of the participants in the drawing is extremely large and thus the probability of selecting someone under the age of 18 doesn't change. You **randomly select the 4 individuals** who win the tickets.

    a) Your boss is concerned that the majority of winners will be under 18. Can you reassure him, by **letting him know the probability** of this happening, i.e. having **at least 3 winners who are under 18?**

    b) What is the **Average** and ***Standard Deviation*** of **winners** who are **under the age of 18**?

3) You are running a political campaign and a poll comes across your desk which claims that **only 27% of the voters support your candidate**. You claim this to be very inaccurate and want to conduct your own poll to back up your claim.

   a) You conduct a **random sample of 50** voters and find that **48% of them support your candidate**. **Under the claim of the original poll** (27% of the population support your candidate) what is the **probability of receiving at least 48% support in your sampled group**?

   b) **Verify the assumptions** required to allow you to calculate the probability as you did in part a).

   c) **In the sample distribution** you created in part a), to calculate the probability of at least 48% support in your sample, you **determined a mean and a standard deviation**.

      i. **Construct an interval** containing **all values within 3 standard deviations of the mean**. [ie: (mean – 3*std dev, mean + 3*std dev)].

      ii. The interval you have created is the minimum and maximum value for 3 standard deviations on either side of the mean. **Argue, using the empirical rule, why this implies that your observed sample (48%) is evidence that the original poll is incorrect**.

4) It is believed **that the time in between buses** at a bus stop is **normally distributed** with **a mean of 30 minutes** and a ***VARIANCE*** of **16 minutes**.

   a) What is **the probability** the next bus arrives **within 28 minutes**?

   b) What is the **cutoff point** for the **slowest 33%** of buses (i.e. Find **the 67th percentile** of this distribution)?

   c) If I took a **random sample of 11** times between buses, **what would be an approximate model** for the **average time of this sample**?

   d) **Are the assumptions** for this model **satisfied**, so that it is an accurate approximation of the average times in a sample of size 11? Why or why not?

(5 points) **EXTRA CREDIT**

You can earn at most 5 points extra credit. Each question is worth up to 4 points. Partial credit *will* be given.

1) (4 points) A course is being given in a lecture hall at Stony Brook, which has 15 rows of 20 seats per row. The last two seats in every row are designed for left-handed students. There are 278 students registered for the course. Assuming they all show up, what is the probability of a right-handed student having to sit in a left-handed seat, if the probability of any student being left handed is only 15%?

   You do not have to solve this completely, simply explain a valid method for computing this probability (formulas, models, steps you will take are all valid components of a thorough explanation).

2) (4 points) Consider a situation where I have 5 shirts I can wear during the 5-day work week, 2 Red, 2 Blue and 1 White. I want to know the number of different ways I can order the colors I wear through the week, assuming that the Reds are indistinguishable from each other and the Blues are indistinguishable from each other.

So, 2 ways I could wear them are R,R,B,B,W or R,R,B,W,B. How many overall different ways can I order them?

Hint: This is related to factorials. First, assume each shirt is unique, what would be the number of ways you can order them in this situation? That's an upper bound for the particular situation asked in the question. Now you need to adjust it since shirts of the same color cannot be distinguished from one another. A good place to start may be an easier example where you have 4 of 1 color and 1 of the other, write down all the different ways and then figure out how to write a formula for that, then extend it.