

STAT 225 - SUMMER 2011 - EXAM 2 - 7/19/2011

NAME:

INSTRUCTOR:

CLASS TIME (CIRCLE ONE):

8:40-9:40am 9:50-10:50am 11:00am-12:00pm 1:00-2:00pm

- Show work for full credit. Unsupported work will NOT receive full credit.
- All answers should be in decimal form: no fractions, permutations, combinations, or exponential forms. Round all answers to at least 2 decimal places.
- You are responsible for upholding the Honor Code of Purdue University. This includes protecting your work from other students.
- You are allowed pages 8.5"x11" handwritten cheat sheets and a scientific calculator.
- Instructors will not interpret questions, tell you if you're on the right track, or check any answers for you. Only legitimate questions will be answered.
- You must turn in your Cheat Sheet at the end of the exam and may be asked to show your student ID.
- Turn off your cell phone before the exam begins.

Question	Points Possible	Points Received
1	12	
2	13	
3	14	
4	15	
5	17	
6	14	
7	14	
Cheat Sheet	1	
Total	100	

1

(12 Points) Hal (a man) goes to the Wabash Landing Movie Theatre to catch a flick with 5 of his friends, 3 guys and 2 girls. For each of the following scenarios, state the distribution and parameter(s). If an approximation is appropriate, state the exact and approximate distributions for full credit. (3 points each)

1.1

It takes Hal anywhere from 10 to 15 minutes to get to the theatre with equal chance. Let T be the time it takes Hal to get to the theatre.

1.2

The theatre serves tickets to 5 customers every 2 minutes. Let C be the number of customers served in an hour.

1.3

The concession stand serves 10 customers a minute. Hal is the 40th customer in line. Let S be the amount of time it takes to serve Hal in minutes.

1.4

Hal's group finds a row of seats for his party, so that they can all sit together. Let G be the number of girls sitting on the outside seats.

2

Facebook (FB) periodically sends out a simple poll question through FB randomly to 500 of its users asking if they are satisfied with FB or not. From past surveys, the proportion that are satisfied with FB is 90%. Let S represent the number that are satisfied in the next poll. (13 Points)

2.1

Determine the distribution and its parameter(s) that define S . (2 Points)

2.2

Is there a valid approximating distribution to the distribution that define S above? If yes, determine the distribution, S^* , and its parameter(s) that approximate S . If no, explain what characteristics the distribution that define S above fail to meet to be approximated. (3 Points)

2.3

What are the chances (approximation valid if indicated above) that more than 440 and fewer than 460 FB users are satisfied in the next poll? (3 Points)

2.4

Let P represent the proportion that are satisfied in the next poll. Determine the distribution and its parameter(s) that define P . (2 Points)

2.5

What are the chances the proportion of FB users in the next survey that are satisfied with FB is between 0.88 and 0.92? (3 Points)

3

Hans and Franz lift weights for long periods of time. On any given day, Hans will lift between 2 and 5 hours with equal chance and Franz will lift between 2.5 and 4 hours with equal chance. Let H denote the duration of time in hours Hans lifts in a day and F denote the duration of time in hours Franz lifts in a day. (14 Points)

3.1

Determine the distribution and its parameter(s) that define H . (2 Points)

3.2

20% of the time Franz lifts longer than what amount of time? (3 Points)

3.3

What are the chances either Hans or Franz lift more than 3.5 hours in any given day? (4 Points)

3.4

What are the approximate chances that Hans works out between 100 and 120 hours in the month of July? (5 Points)

4

(15 points) Let X be a continuous Random Variable (RV) with Probability Density Function (PDF): (3 Points Each)

$$f_X(x) = \begin{cases} C(1-x) & 0 < x < 1 \\ 0 & \text{Else} \end{cases}, \text{ where } C \text{ is a constant}$$

4.1

Find the value of C such that $f_X(x)$ is a valid PDF.

4.2

What is the Cumulative Distribution Function (CDF) of X ?

4.3

Find the 75th percentile of X .

4.4

Find $P(0.5 < X < 0.75 | 0.6 < X < 0.8)$.

4.5

Find $E[2X + 1]$.

5

Your friend Pete, being juvenile, decides to drop pennies from the observation deck of the Sears tower. The tower is 1,353 feet or 412 meters above the side walk. Thus, without taking into account air resistance, it should take 6.5 seconds for a penny to reach the ground. Pete experimented on a roll of 50 pennies and found the average descent time to be 7 seconds with a variance of 0.04 seconds squared for each penny. Let T be the time in seconds it takes the 51st penny to reach the ground. (17 Points)

5.1

Determine the distribution and its parameter(s) that define T . (2 Points)

5.2

What are the chances the 51st penny will have a descent time within 0.25 seconds of 7 seconds provided the laws of Physics dictate it will take more than 6.5 seconds? (4 Points)

5.3

25% of pennies will exceed what descent time? (3 Points)

5.4

Due to the result of the experiment, with 98% confidence, the 51st penny will land between what times? (4 Points)

5.5

Pete repeats the same experiment assuming the average descent time to be 7 seconds with a variance of 0.04 seconds squared from above. How many pennies will Pete need to drop to be 99% confident that the average descent time of the experiment is within 0.01 seconds of the average descent time of 7 seconds from the previous experiment? (4 Points)

6

A United States (U.S.) jury is composed of 12 of your peers. This selection is made from a larger summons group of 250 peers. To assure they are your peers, a summons group consists of 30 African-Americans, 130 Caucasians (Whites), 60 Hispanics/Latinos, and 30 Asians. Within each sub population half are men and half are women. Indiana creates 200 juries a year. Let WW be the number of white women on a jury and let WWT be the number of white women on juries this year in Indiana. (14 Points)

6.1

Determine the distribution and its parameter(s) that define WW . (2 Points)

6.2

Is there a valid approximating distribution to the distribution that define WW above? If yes, determine the distribution, WW^* , and its parameter(s) that approximate WW . If no, explain what characteristics the distribution that define WW above fail to meet to be approximated. (3 Points)

6.3

Determine the distribution and its parameter for WWT^* , the approximate distribution of WWT . (2 Points)

6.4

Determine the 99% Confidence Interval (CI) for WWT^* ? (3 Points)

6.5

What are the approximate chances that between 550 and 700, inclusive, white women serve on juries in Indiana this year? (4 Points)

7

Bryan typically receives 20 e-mails every 3 hours during business hours. Let T represent the time in minutes until Bryan receives his next e-mail. (14 Points)

7.1

Determine the distribution and its parameter(s) that define T . (2 Points)

7.2

What is Bryan's median wait time until he receives his next e-mail? (3 Points)

7.3

What are the chances Bryan will wait between 15 and 20 minutes total for his next e-mail being that he has already waited 10 minutes? (4 Points)

7.4

What is the approximate probability Bryan will receive his next 36 e-mails sometime between 5 and 7 hours from now? (5 Points)