**STAT 351- Midterm Exam (30 points)**

**Instruction:**

**Save the final document with answers as a PDF before submitting to D2L.**

**If you scan and upload your work, please make sure it is readable before submitting.**

**Ground Rules for Exam**

1. **Academic dishonesty policies are strictly in force.** No collaboration, discussion or communication of any kind about the exam is permitted until you turn the exam in.
2. **All work is to be your own.** Absolutely **NO discussion** of this exam **or any STAT 351 related topic, with fellow STAT 351 students, or with ANYONE else other than your instructor, is permitted.**
3. **Violation of (2) will result – at a minimum – in a grade of 0 on this exam.** Be advised that academic honesty violations are violations of ethical conduct standards for students – **they *can* result in expulsion from the university. A few points on an exam is not worth putting your future career in jeopardy.**
4. **If you have a question – you know my e-mail address (**[**nadeej2@pdx.edu**](mailto:nadeej2@pdx.edu)**). ASK!!!!!!!!!!**
5. **However, please look at all the completed lecture notes and homework before asking me anything.**
6. **Since this is an exam, if any one of the problems (or their different versions) from this exam was posted on any webpage, then everyone in the class will get zero for that question and the instructor has right to take legal actions against it.**

* **You MUST show main steps of your work before the final answer to get points.**
* **If you don’t know how to type MATH equations, then please write your work on a paper and submit a scanned copy of photo of those.**
* **No work gives zero points. More than one answer gives zero points.**
* **If your final answer is a single number, you MUST circle, underline or highlight it to get points.**
* **If you are using MATLAB for any computation, you MUST provide the MATLAB command lines along with the values you used for the complete work. Otherwise, zero points will be given.**

**Problem 1:**

A student who was interested in finding whether majority of adults believe in ghosts or not collected data from a random sample of people.

The student collected their age in addition to asking whether they believe in ghosts or not. The data are summarized in the following table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **Age** | | | |
|  |  | **20-29** | **30-39** | **40-49** | **50-59** |
| **Believe in ghosts?** | **Yes** | 9 | 5 | 4 | 8 |
| **No** | 5 | 2 | 3 | 6 |

Based on this information, compute the following probabilities. **If you report the final answer as a value between 0 and 1, then keep all the decimal places or 4 or more decimal places.**

1. **(1 point)** What is the probability that a randomly selected adult believes in ghosts?
2. **(1.4 points)** What is the probability that a randomly selected adult believes in ghosts, if the person is 30-39 years old?
3. **(1.4 points)** What is the probability that a randomly selected adult believes in ghosts or the person is 30-39 years old?

**Problem 2:**

At a coffee shop, 62% of customers purchase a coffee.

Of those, 33% purchase a pastry.

1. **(1.4 points)** What is the probability that a selected customer purchases a coffee and a pastry? **If you report the final answer as a value between 0 and 1, then keep all the decimal places or 4 or more decimal places.**
2. **(1.4 points)** If 67% customers do not purchase a pastry, then explain whether purchasing a coffee is statistically independent from purchasing a pastry. Provide numerical evidence.

**Problem 3:**

An Engineering Statistics class has 25 students.

16 are electrical engineering majors.

19 are juniors or electrical engineering majors.

Compute the following and **if you report the final answer as a value between 0 and 1, then keep all the decimal places or 4 or more decimal places.**

1. **(1.4 points)** What is the probability that a randomly selected student in this class is not a junior and not an electrical engineering major?
2. **(1.4 points)** What is the probability that a randomly selected student in this class is a junior and not an electrical engineering major?
3. **(1.4 points)** If two students are randomly selected one after the other without replacement, what is the probability that both students are electrical engineering majors?

**Problem 4:** **(2 points)**

As shown below, a system is composed of 5 components, each one of which is operational independent of the other components.

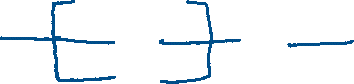


**C2**

**C1**

**C5**

**C3**



**C4**

The reliability of each component is given below.

|  |  |
| --- | --- |
| Component | Reliability |
| 1 | 0.8 |
| 2 | 0.6 |
| 3 | 0.7 |
| 4 | 0.75 |
| 5 | 0.9 |

Compute the reliability this system. Your answer has to be a number. **If you report the final answer as a value between 0 and 1, then keep all the decimal places or 4 or more decimal places.**

**Problem 5:**

The following table shows the probability distribution of number items sold per transaction at a store.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P(x) | 0.24 | 0.29 | 0.23 | 0.13 | 0.03 | 0.03 | 0.05 |

Based on this, compute the following and **if you report the final answer as a value between 0 and 1, then keep all the decimal places or 4 or more decimal places.**

1. **(1.4 points)** Compute the probability that a randomly selected transaction has less than 4 items.
2. **(1.5 points)** Compute the expected number of items per transaction.
3. **(1.75 points)** Compute the standard deviation of items per transaction.

**Problem 6:**

Based on a large survey of Oregonians, it was found that there is a 66% chance a randomly selected person in Oregonian never brings an umbrella with them when they expect rain.

Compute the following and **if you report the final answer as a value between 0 and 1, then keep all the decimal places or 4 or more decimal places.**

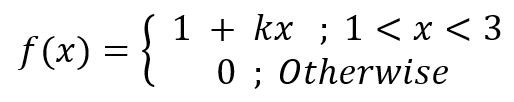
1. **(1.4 points)** What is the probability that randomly selected two people in Oregon never bring an umbrella with them when they expect rain?
2. **(1.4 points)** What is the probability that more than 5 of 25 randomly selected people in Oregon never bring an umbrella with them when they expect rain?
3. **(1.4 points)** What is the probability that we have to select 10 people in Oregon so that we find the first person who never bring an umbrella with them when they expect rain?

**Problem 7: (1.4 points)**

If the number of occurrences per 100m has a Poisson distribution with mean of 5, then compute the probability that there will be less than 3 occurrences in 25m. **Your final answer must be a number. If you report the final answer as a value between 0 and 1, then keep 4 or more decimal places.**

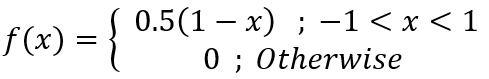
**Problem 8: (1.5 points)**

Find the value of *k* such that the following function is a pdf.



**Problem 8:**

The following function shows the probability function of random variable X.



1. **(1.25 points)** Find the probability that X is negative.
2. **(1.4 points)** Compute the variance of X.

**Problem 9:**

The age of members of an online forum has a normal distribution with mean of 49 years and a standard deviation of 12 years.

Compute the following and **if you report the final answer as a value between 0 and 1, then keep all the decimal places or 4 or more decimal places.**

1. **(1.4 points)** What is the probability that a randomly selected member of this online forum is between 40 and 55 years? **Keep 4 or more decimal places in your answer.**
2. **(1.4 points)** What is the minimum age for the 8% oldest members of this forum? **Keep 2 or more decimal places in your answer.**