MTH 245, Exam #1, Spring 2023 Name _____

Instructions: Show all work to receive full credit. You should note any formulas used or calculator functions used, their inputs and outputs, or attach a spreadsheet with your calculations. I cannot grade work if I don't know where an answer came from. Be sure complete all parts of each questions, including requests for interpretation and explanations. Be as thorough as possible.

This exam will be submitted in 2 parts. Part 1 are numerical or multiple-choice responses that will be submitted separately and graded by the computer. The second part will consist of explanatory responses, working with graphs and other questions that will be submitted as scanned documents and graded by hand.

Part 1: Answer these questions using your calculator or Excel. Show your work on this page or in Excel and submit along with part 2. Then submit your answers to these questions in the Exam #1 Part 1 submission tool in Canvas.

1. For each of the following variables, determine i) is the variable qualitative or quantitative? ii) the level of measurement: nominal, ordinal, interval, or ratio? iii) if the variable is quantitative, is it discrete or continuous? (6 points each)
   a. Car value (in dollars)

   b. Book category (eg. on Amazon)

   c. Credit card number

   d. Number of times a patient has gotten COVID-19

2. For the Salary data on Sheet 1 of the data file **245exam1data.xlsx**, find the following statistics:
   a. The mean, median and mode (6 points)

   b. The standard deviation and range (4 points)

c. Calculate the five-number summary for this data. (5 points)

d. Based on this information, what percentile (approximately) is a salary of $69,500? (3 points)

3. A jar contains 7 black marbles, 10 clear marbles, 5 red marbles, 16 blue marbles, 8 green marbles and 9 silver marbles.
    a. What is the probability of selecting a black marble? (3 points)

    b. What is the probability of selecting a red or yellow marble?(4 points)

    c. What is the probability of not selecting a green marble? (3 points)

    d. What is the probability of selecting a clear marble, followed by a silver marble? (5 points)

4. Use the following table to calculate the probabilities requested. (4 points each)

Smoking Level/Drinking Level	Heavy Drinking	No Drinking	Occasional Drinking	Grand Total
Heavy Smoking	733	163	552	1448
No Smoking	733	2118	2061	4912
Occasional Smoking	899	435	1067	2401
Grand Total	2365	2716	3680	8761

a. What is the probability of a randomly selected person from this study is a heavy drinker?

b. What is the probability of a randomly selected person from this study being a heavy drinker and an occasional smoker?

c. What is the probability of a randomly selected person from this study being a heavy drinker or being an occasional smoker?

d. What is the probability of being a heavy drinker given that the person is an occasional smoker?

e. Are the variables smoking and drinking independent? Why or why not? Show calculations to justify your answer.

5. For the discrete probability distribution below, answer the following questions. (3 points each)

X	0	1	2	3	4
P(x)		0.24	0.31	0.25	0.09

a. What conditions are required to be satisfied for the table of values to represent a probability distribution?

b. Fill in the missing value in the table, i.e., what is P(X=0)?

c. What is the probability that $x \geq 2$, i.e.,$P(X \geq 2)$?

d. What is the probability x is less than 0, i.e., $P(X < 0)$?

e. What is the probability that x is not 3?

Part 2: Answer these questions in this file, using Excel (copy and paste solutions into this document), show work, etc. Don't make me hunt through Excel looking for answers to these questions! Submit your work for Part 1, work and solutions for Part 2, and any Excel file(s) you used to get your answers in the Exam #1 Part 2 submission folder.

6. A researcher is interested in finding out about the eating habits of the American public. She decides to conduct a survey of 150 shoppers at a local mall and asks them how often they eat out at a restaurant. (3 points each)
   a. What is the population of interest in this study?

   b. What is the sample used in this study?

   c. What is the parameter being studied?

   d. What statistic is the researcher likely to use to estimate the parameter?

7. A researcher notes a relationship in a study high rates of diabetes in a community and high crime rates. What is an example of a possible confounding variable the researcher would want to control for? Why? (4 points)

8. Why does a convenience sample tend to introduce bias into the results of a study? (4 points)

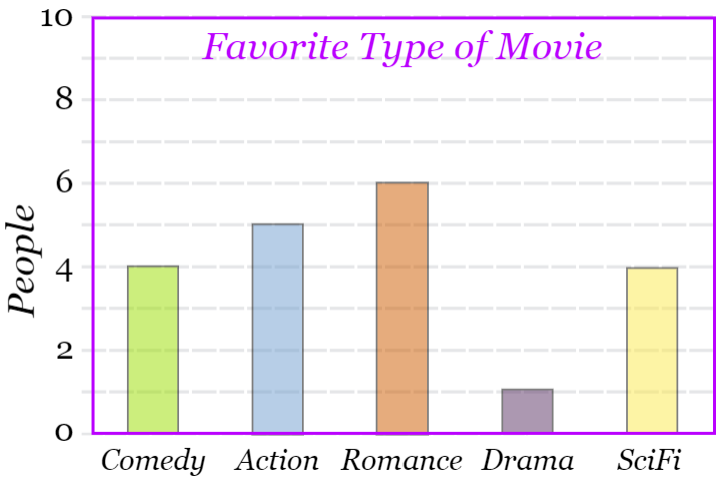
9. What is a double-blind study and why are studies conducted this way? (4 points)

10. Using the data on Sheet 2 of the data file **245exam1data.xlsx**, construct a frequency table of search egines. Display the frequencies as both counts, and percentages. Use the data to construct a bar graph and a pie chart. (Paste your graphs and table(s) here.) (16 points)

11. The data on Sheet 3 of the data file 245exam1data.xlsx, construct a line graph of the data. Paste the graph here, and then describe the graph. Are there any trends? (8 points)

12. For the Salary data on Sheet 1 of the data file **245exam1data.xlsx**, construct a histogram and a boxplot of the data. Paste your graphs here. Describe the general shape of the distribution (symmetric, normal, right- or left-skewed, etc.) (10 points)

13. Below is a bar chart of the type of movie people prefer. In the space next to the graph, or using Excel, convert this graph to a Pareto chart. (8 points)



14. Use the data in the table below answer the questions that follow.

Family Size/Homeownership	No	Yes	Grand Total
1	41	49	90
2	43	71	114
3	61	72	133
4	40	45	85
5	22	30	52
6	4	11	15
7+	7	4	11
Grand Total	218	282	500

a. Use this information to compare the family sizes of those who own their own home and those who don't. (3 points)

b. Explain why breaking up the numerical categories in this fashion could be considered misleading, especially when making a graph. (3 points)