MATH 154, Final Exam, Part I, Spring 2021 Name KEY

Instructions: This portion of the exam is based on the questions below using the Excel file **154final_data.xlsx** and the questions below. The answers to these questions will be entered into the Canvas Exam #1 Part 1 as numerical, true/false, multiple choice or multiple answer type questions. This portion of the exam must be submitted electronically in Canvas and the computer will autograde the solutions.

After completing this exam, also submit you work and answers for Part 2 in the Part 2 submission folder. The second portion of the exam will be for written questions and submitted other types of Excel-related work such as graphs. The second part of the exam will be graded by hand. Both parts of the exam must be completed.

1. Using the data on Sheet 9, complete the following: (b-f: 4 points each)
   Make a scatterplot of the midterm and final exam score data with midterms on the horizontal axis and final exams on the vertical axis. Add a descriptive title and axis labels. Be sure to adjust the axes to eliminate as much unnecessary white space as possible. Add a linear trendline, find the regression equation and R^2.

   a. **Report the regression equation.**

   $y = .8648x + 11.413$

   b. **Report the correlation value and the coefficient of determination.**

   $r = 0.744$ $r^2 = 0.5536$

   c. **Is the correlation positive or negative?**

   positive

   d. **Is the correlation strong, moderate or weak?**

   moderately strong

   e. **Does the relationship in the scatterplot appear to be linear or nonlinear?**

   linear

2. Using the data on Sheet 10, Calculate a complete set of descriptive statistics for years of education. Report the following below.
   a. **Mean and standard deviation.** (6 points)

   mean = 5.63
   St. dev = 3.466

b. **Five-number summary**. (6 points)

min = 0 Q1 = 3 Median = 5.5 Q3 = 8 Max = 15

c. **Range and mode**. (4 points)

range = 15 mode = 6

3. Using the same data on Sheet 10, make a histogram of education. Label your graph appropriately with axis labels and a descriptive title. **Describe the shape of the graph: is it symmetric, left skewed, right skewed or some other shape?** (5 points)

right skewed

4. The standard deviation of the speed of 68 vehicles on a certain highway is 10.3 mph. **Find the standard error if** $SE = \frac{SD}{\sqrt{n}}$. (5 points)

1.249

5. The formula for the standard score is $Z = \frac{x-\mu}{\sigma}$. The mean height of women is 64" with a standard deviation of 3.1", and the mean height of men is 70" with a standard deviation of 3.5". Richard is 6'4" and Pamela is 5'10". **Which of them is taller for their gender? Explain.** (8 points)

Pamela, her z score is higher

6. Using the data on Sheet 10, **find the 20th percentile of education from the data**. (5 points)

2

7. Using an amortization table or a built-in financial formula in Excel, **find the amount in a savings account** if it collects 1.75% interest, compounded daily, for 18 years, if a $20 deposit is made every week. (6 points)

$22,007.07

8. Using the data on Sheet 11, make a summary table of the smoking data and make a pie graph of it, and label it appropriately. **What percent of the sample consider themselves smokers?** (6 points)

43.9%

9. Employees are surveyed and a scatterplot of the relationship between total experience (work experience plus education) is plotted against salary. A linear regression line is found, and the equation and coefficient of determination is on the graph. Use this graph to answer the questions that follow.

a. State the slope of the regression line. (5 points)

817.43

b. State the y-intercept. (5 points)

23479

c. If a new employee has a total of 7 years of experience credits (three years on the job plus a 4-year degree), what kind of salary can they expect according to the regression equation? (5 points)

29,201.01

d. What is the R^2 value? (5 points)

.6043

10. What values are used to create a boxplot? (4 points)

5 # summary - min, max, median, Q1, Q3

11. A table of unit conversions is shown below. Use it to perform the following unit conversions. (4 points each)

Length

SI unit : meter (m)

1 km = 0.62137 mi
1 mi = 5280 ft
= 1.6093 km
1 m = 1.0936 yd
1 in = 2.54 cm (exactly)
1 cm = 0.3937 in

Temperature

SI unit : kelvin (K)

0 K = -273.15°C
= -459.67°F
K = °C + 273.15

$$°C = \frac{5}{9}(°F - 32°)$$

$$°F = \frac{9}{5}°C + 32°$$

a. Convert 729 kilometers to miles

729 * 0.62137 = 452.98

b. Convert $-4°F$ to degrees Celsius

$-20°C$

12. Shown below is a pivot table of Gender, and whether or not the person lives alone. Use the table to answer the questions that follow. (5 points each)

	Column Labels		
Row Labels	**No**	**Yes**	**Grand Total**
Female	332	66	398
Male	379	79	458
Grand Total	**711**	**145**	**856**

a. If a person is randomly selected from the data, what is the probability that the person is male?

458/856

b. What is the probability that the person does not live alone?

711/856

c. What is the probability that the person does not live alone and is a man?

379/856

d. What is the probability that the person does not live alone or is a man?

$$\frac{711 + 458 - 379}{856} = \frac{790}{856}$$

e. What is the probability that the person does not live alone given that they are male?

379/458

13. Using the screenshot of an Excel sheet below to write a formula that will evaluate the expression $\frac{A+C^2}{D-\sqrt{B}}$ using the cell references where the values are in the sheet. **What is the value you obtain?** (8 points)

	A	B	C	D	Formula
4		13	16	13	8

45.5

MATH 154, Final Exam, Part II, Spring 2021 Name KEY

Instructions: For this portion of the exam, answer the questions in words or by creating graphs or tables in Excel. You will be asked to submit your work (scan this portion of the exam or compile photo images of the pages in a single document), and you will be asked to submit your Excel work file. You will only be able to submit two files to the Canvas Final Exam Part 2.

If you need data for the exam, use the same file as you used for Part 1: **154final_data.xlsx.**

Academic Integrity Statement

I affirm that, I, _____ (student name), do attest that I alone am completing the problems on this test without receiving unauthorized assistance. I understand that violations of academic integrity may result in sanctions, up to and including expulsion from the college.

_____(Student Signature)

_____(Student ID number)

Attach a copy of your photo ID to the online submission (there is a question drop box for it). The ID must be a photo ID. A Driver's license, School ID (NOVA or otherwise), or a work ID are acceptable as long as it contains your full name and photo.

1. Using the same data on Sheet 10, make a histogram of education. Label your graph appropriately with axis labels and a descriptive title.

2. Using the same data on Sheet 10, make a boxplot. **Does the boxplot support your description of the skew or symmetry above? Explain why or why not.** (5 points)

Yes. Though the skew is not as strong on the box plot

3. On Sheet 11, make a pivot table of the data of drinking and smoking levels. Note that the coding is N=non, O=occasional, H=high, S=smoking, D=drinking. **Copy the table below.** (6 points)

	HD	ND	OD	
HS	733	163	552	1448
NS	733	2118	2061	4912
OS	899	435	1067	2401
	2365	2716	3680	8761

4. Using the data on Sheet 11, make a summary table of drinking data, and make a bar graph of it. Label it appropriately and **write a sentence that summarizes what it tells you.** (6 points)

more people in sample are occasional drinkers than in other categories

5. Employees are surveyed and a scatterplot of the relationship between total experience (work experience plus education) is plotted against salary. A linear regression line is found, and the equation and coefficient of determination is on the graph. Use this graph to answer the questions that follow.

a. State the slope of the regression line and **interpret it in the context of the problem**. (5 points)

For every extra year of experience, salary would increase by $817.43 on average

b. State the y-intercept and **interpret it in the context of the problem**. (5 points)

The base salary for someone w/ no experience has an average of $23,479

c. What is the proportion of the variability in salary that can be explained by total experience? (5 points)

60.43%

6. A screenshot below shows a small dataset, sample size 10. Based on the information shown, write the Excel formulas you'd need to calculate the requested values. (5 points each)

	AF	AG	AH	AI	AJ	AK
1		20				
2		22				
3		26				
4		23				
5		24				
6		18				
7		32				
8		24				
9		31				
10		28				
11						

a. What formula would be needed to find the median of the data?

=MEDIAN(AG1:AG10) or
=QUARTILE(AG1:AG10,2)

b. What formula would be needed to find the 75th percentile?

=QUARTILE(AG1:AG10, 3) or
=PERCENTILE(AG1:AG10, 0.75)

7. Under what circumstances is it better to use a median as a measure of central tendency than the mean? (4 points)

when the data is skewed

8. Translate the logical and mathematical notation $\exists x(x^2 = 4)$. Then find the value of x. (6 points)

there exists an x such that $x^2 = 4$.

$X = 2$ or -2

9. The screenshot below shows how scientific notation appears in Excel. Write this number in standard scientific notation as it appears in normal mathematical notation and not in "computer" formatting. (4 points)

	U	V	W
1			
2			
3		3.17E-05	
4			

3.17×10^{-5}

10. The 30th percentile of heights of men in the United States is approximately 68.2" or 5'8.2". What does this statement mean in plain English? (5 points)

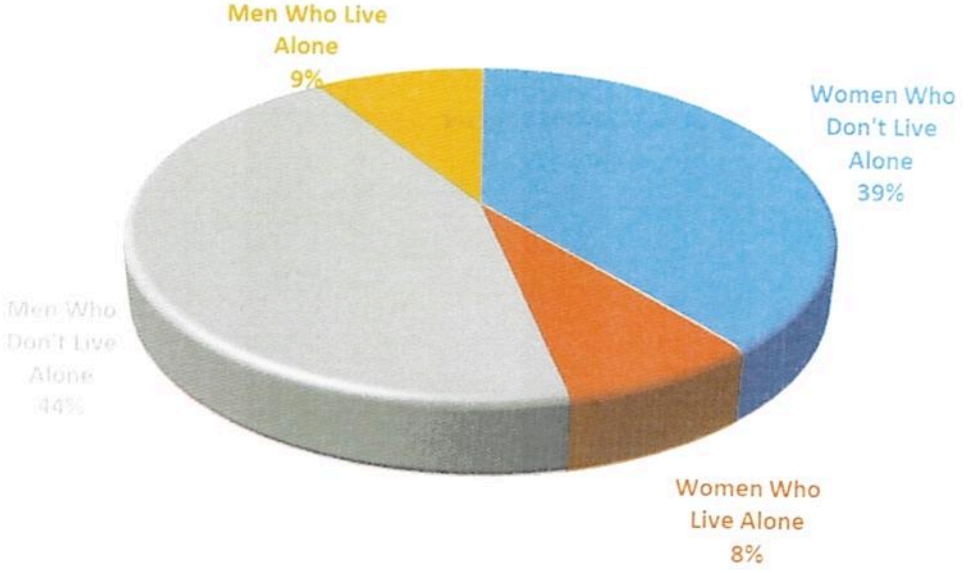
this mean that if a man is 68.2" he is taller than only 30% of other men

11. Using the screenshot of an Excel sheet below to **write a formula** that will evaluate the expression $\frac{A+C^2}{D-\sqrt{B}}$ using the cell references where the values are in the sheet. (8 points)

	A	B	C	D	Formula
3					
4		13	16	13	8
5					

=(A4 + C4^2)/(D4 - SQRT(B4))

12. Explain why the graph below is a bad graph. There are at least two problems with it. (8 points)



bad ~ no title
also 3D is bad ~ perspective can distort the perception of the graph