

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 question, 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. Using the data on Sheet 1 in the Excel file **154exam2data.xlsx**, Calculate a complete set of descriptive statistics for units sold. Report the following below.
 - a. Mean and standard deviation. (6 points)

$$\text{mean} = 593.7$$

$$\text{st. dev.} = 147.31$$

- b. Five-number summary. (10 points)

min	1 st Q	med.	3 rd Q	Max
275	497.25	623	688	863

- c. Range and mode. (4 points)

$$\text{range} = 588$$

$$\text{mode} = 637$$

2. Using the same data on Sheet 1, make a histogram of ~~car value~~ ^{Units}. 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? (6 points)

left-skewed

3. When Excel makes a boxplot, what does the \times in the boxplot represent? [Hint: it may help to do the first question of Part 2.] (3 points)

mean

4. On Sheet 2, the number of accidents reported on the job and their likelihood is listed. Find the weighted average of this data, treating the category greater than or equal to 9 as just 9. Report below the value you find. What is the average number of accidents reported? (6 points)

1.101

5. On Sheet 2, does the data provided represent a probability distribution? Explain your reasoning. (4 points)

yes. probabilities add to 1, none are negative

6. The standard deviation of Income is \$16,423 for a sample of 751 incomes. Find the standard error if $SE = \frac{SD}{\sqrt{n}}$. (5 points)

$$SE = \frac{16,423}{\sqrt{751}} = 599.28$$

7. The formula for the standard error for a proportion is $SE = \sqrt{\frac{p(1-p)}{n}}$. If 948 people have tried the lasagna in a sample of 1196, what is the standard error for the proportion found? (5 points)

$$P = \frac{948}{1196} = 0.79264\dots$$

$$SE = \sqrt{\frac{(948/1196)(248/1196)}{1196}} = 0.0117228\dots$$

$\approx 1.2\%$

8. The formula for the standard score is $Z = \frac{x - \mu}{\sigma}$. The mean height of women is 64.3" with a standard deviation of 3.4", and the mean height of men is 70.2" with a standard deviation of 3.5". Richard is 5'3" and Pamela is 5'0". What is Richard's standard score? What is Pamela's standard score? Which of them is shorter for their gender? (8 points)

$$z_R = \frac{63 - 70.2}{3.5} = -2.057 \dots$$

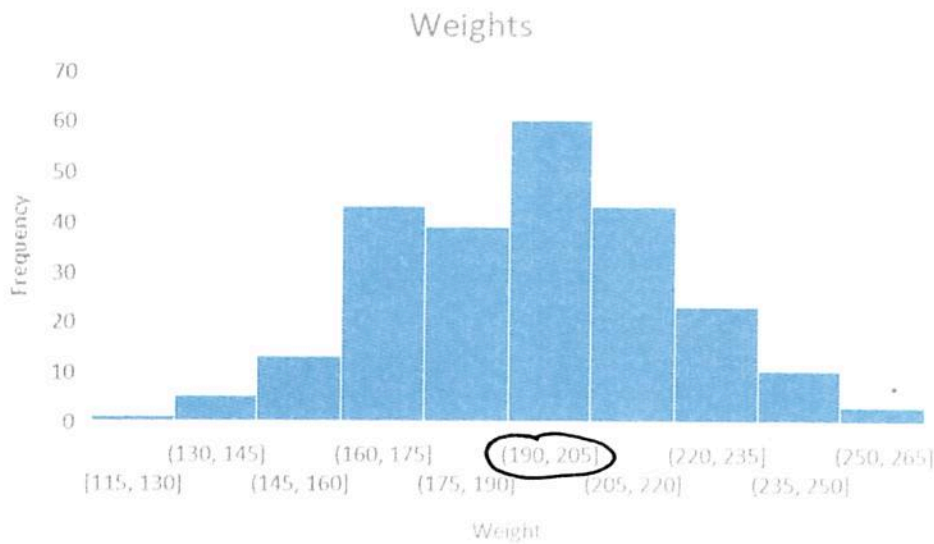
$$z_P = \frac{60 - 64.3}{3.4} = -1.2647 \dots$$

Richard is shorter

9. What does it indicate for the skewness of a histogram if the mean is lower than the median? (3 points)

left-skewed

10. A sample of 240 people is taken and their weights measured. A histogram of the data is shown below. Based on the graph, describe the shape of the distribution, and state the modal class. (6 points)



approximately symmetric

modal class is (190, 205]

11. A 1/8 scale model of a house made of a revolutionary plastic uses 0.51 cubic meters of the new material. How much of the new material is needed for the full-size structure if the plastic is used for all of the same elements as in the model? (6 points)

$$0.51 \times 8^3 = 261.12 \text{ cubic meters}$$

12. 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 = $\frac{5}{9}(\text{°F} - 32)$
- °F = $\frac{9}{5}\text{°C} + 32$

- a. Convert 91 miles to kilometers

$$91 \text{ mi.} \times 1.6093 \frac{\text{km}}{\text{mi}} = 146.4 \text{ km}$$

- b. Convert 18.3 miles to inches

$$18.3 \times 5280 \frac{\text{ft}}{\text{mi}} \times 12 \frac{\text{in}}{\text{ft}} = 1,159,488$$

- c. Convert 41°F to degrees Celsius

$$\frac{5}{9}(41 - 32) = 5^\circ\text{C}$$

13. The standard score for Aleyah's temperature test is $z = -1.3$. If the mean of the test is 97.4°F and has a standard deviation of 0.5°F . The observation value can be found by rearranging the standard score equation to be $x = \mu + z\sigma$. What is Aleyah's temperature according to the test? (5 points)

$$97.4 - 1.3(0.5) = 96.75^{\circ}$$

14. When a standard deviation value is requested and the problem does not specify whether to calculate the sample or population standard deviation, which one should you assume? (3 points)

Sample

15. A probability distribution is shown below. Use it to answer the questions that follow. (3 points each)

x	0	1	2	3	4	5	6	7
$p(x)$	5%	12%	29%	9%	19%	12%	8%	6%

- a. $P(x = 3)$ 9%
- b. $P(x < 2)$ 17%
- c. $P(x \geq 5)$ 26%
- d. $P(3 < x < 6)$ 31%
- e. $P(x < 0)$ 0%
- f. $P(x \leq 1 \text{ OR } x \geq 6)$ 31%

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 Final Exam Part 2 submission folder.

16. Using the data on Sheet 1 of 154exam2data.xlsx, make a boxplot. Does the boxplot support your description of the skew or symmetry above? Explain why or why not. (6 points)

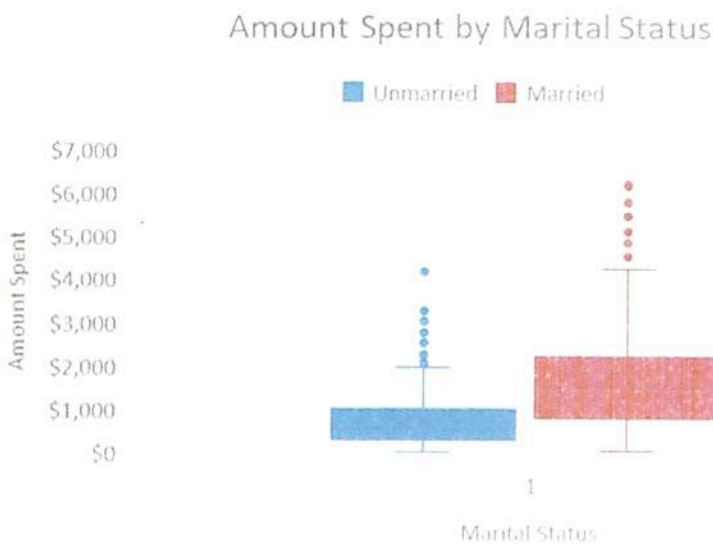
yes, the lower tail is slightly longer
the mean is below the median

17. Create a simulation in Excel that will model 100 rolls of a 12-sided die whose sides are numbered 1-12. Freeze a copy of the simulation, and report the average outcome of the rolls, and the proportion of rolls that resulted in a 9. (6 points)

avg. 7.06 (answers will vary somewhat)

prop. 9/100 (answers will vary around 8.3)

18. A boxplot comparing the amount spent by marital status in a sample is shown. Describe any differences you notice between the amount spent by married and unmarried people according to the graph. (5 points)



married is higher
both as a mean/median
and max values
greater spread

19. 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. (4 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 mean of the data?

$$= \text{AVERAGE}(AG1:AG10)$$

- b. What formula would be needed to find the sample standard deviation?

$$= \text{STDEV.S}(AG1:AG10)$$

- c. What formula would be needed to find the population standard deviation?

$$= \text{STDEV.P}(AG1:AG10)$$

[Hint: For parts a-c, I don't want the value, I want the formula you would write in Excel to calculate the value.]

20. Three coins are flipped and the outcome of each flip is recorded as either H or T. What are all the possible outcomes of the three flips? (6 points)

HHH, HHT, HTH, THH, TTH, THT, HTT, TTT

Excel work -- 20 points