

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 #2 Part 1 submission tool in Canvas.

1. Evaluate the following expressions. (3 points each)

a. $\binom{9}{4}$

126

b. 7P_3

210

c. ${}^{12}C_5$

792

d. $0!$

1

2. A certain game is played by drawing cards with numbers on them according to the following distribution. (6 points)

Score, x	Probability, $P(x)$
0	0.07
1	0.13
2	0.18
3	0.30
4	0.22
5	0.08
6	0.02
	$\Sigma P(x) = 1.00$

Find the expected value (mean) and the standard deviation of this card game.

Mean = 2.79

St. dev = 3.13

3. A charity sells 450 tickets for a raffle, costing \$10 per ticket. The top prize is \$500, a second prize of \$100, and two third prizes of \$50. For someone purchasing a ticket, what is the expected value? Interpret the value in the context of the problem. (8 points)

Value	490	90	40	-10
Probability	$\frac{1}{450}$	$\frac{1}{450}$	$\frac{2}{450}$	$\frac{446}{450}$

$$\text{expected value} = -8.44$$

for every ticket purchased, one can expect to lose \$8.44

4. Two thirds of drivers put their seat belt on when they get into a driving simulator. Use that fact to answer the following questions. (5 points each)
- a. If 10 people get into the simulator, what is the probability that exactly 8 of the people will put on their seat belts?

$$0.195$$

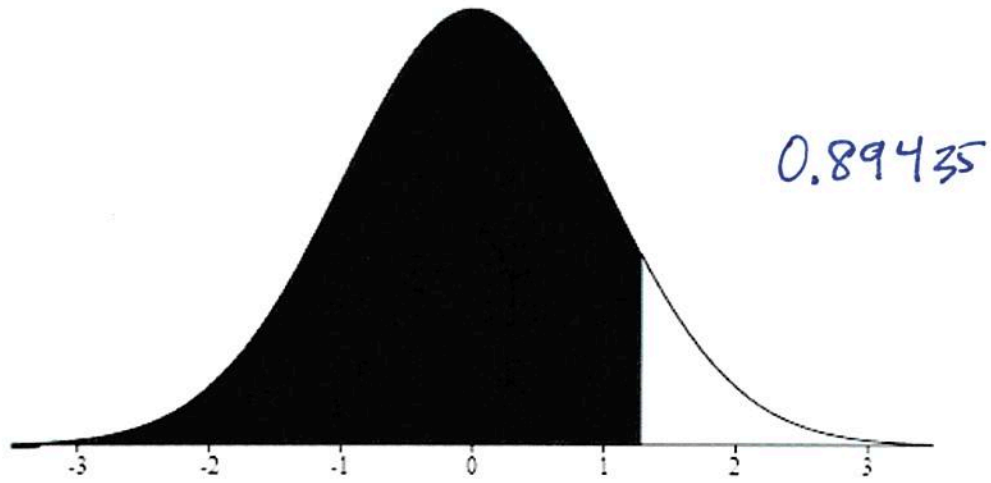
- b. If 10 people get into the simulator, what is the probability that no more than 8 people will put on their seat belts?

$$0.104$$

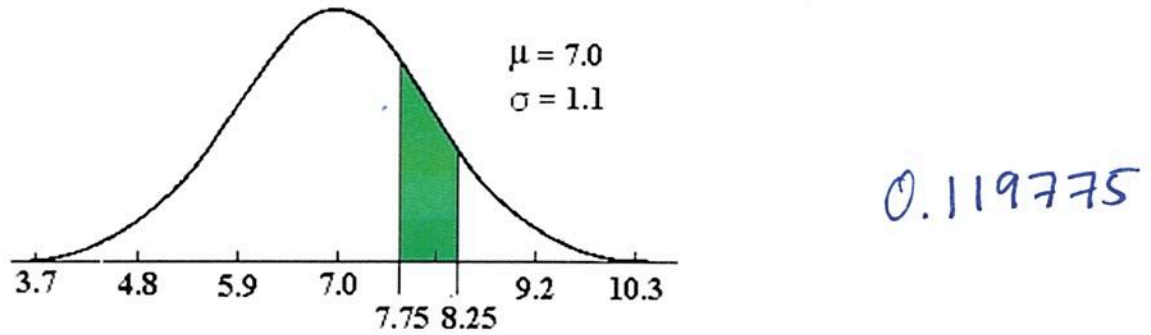
- c. What is the expected number of those 10 people who put on their seat belts?

$$6.67$$

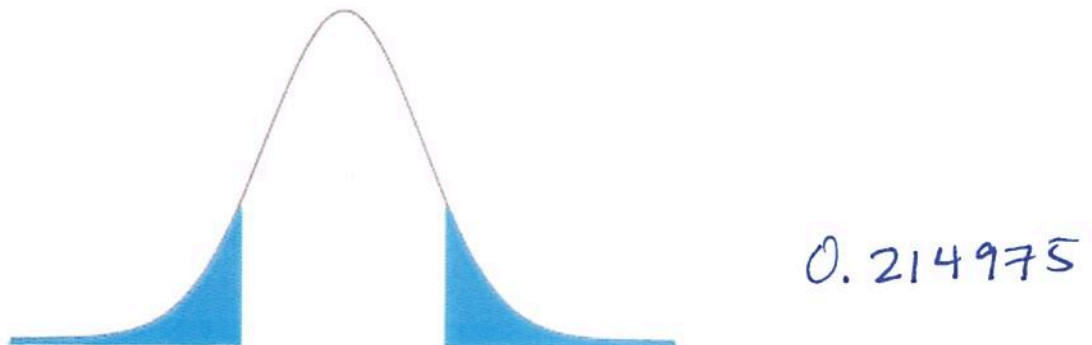
5. Find the probability under the curve of the given normal distributions. (4 points each)
- a. Standard normal distribution. Z-score at the boundary is 1.25.



- b. Mean is 7.0 and the standard deviation 1.1. The probability between 7.75 and 8.25.



- c. The distribution is the standard normal distribution. The boundaries are ± 1.24 .



6. The SAT has a mean score of 1498 and a standard deviation of 199. (5 points each)
- What is the z-score of 1640?

$$0.713568$$

- What score represents the 90th percentile of the distribution? Round your answer to the nearest 10 points.

$$1753$$

- If a school wants to admit only students with the top 5% of SAT scorers, what cut-off score is needed? Round your answer to the nearest 10 points.

$$1825 \sim 1830$$

- The mean score on the ACT is 21 with a standard deviation of 5.2. Which student scored higher: Abby with a score of 28 on the ACT, or Barbara with a score of 1910 on the SAT?

Barbara is higher. $z_B = 2.07$
 $z_A = 1.35$

7. If the mean of a normal distribution is 72 points with a standard deviation of 5 points, find the following: (4 points each)
- The z-score of 88 points.

$$3.2$$

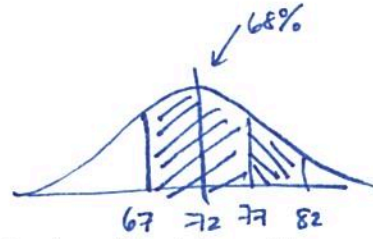
- What percentile 88 points represents.

$$99.9\%$$

- c. The area under the normal curve between 67 and 82 using the Empirical Rule.

$$\frac{95+68}{2} = 81.5\%$$

$$0.815$$



8. Calculate probabilities associated with the following z and t values: (4 points each)

a. $P(z < -0.65)$

$$0.2578$$

b. $P(z \geq 1.78)$

$$0.0375$$

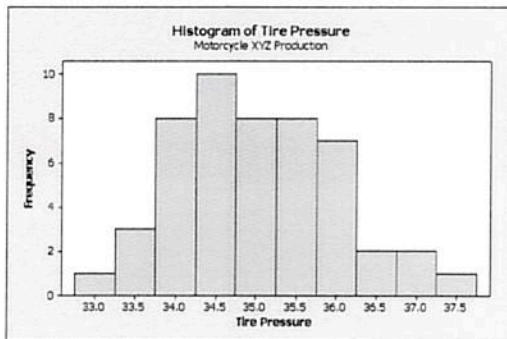
c. $P(t > 1.13, df = 4)$

$$0.1608$$

d. $P(t \leq -2.2, df = 45)$

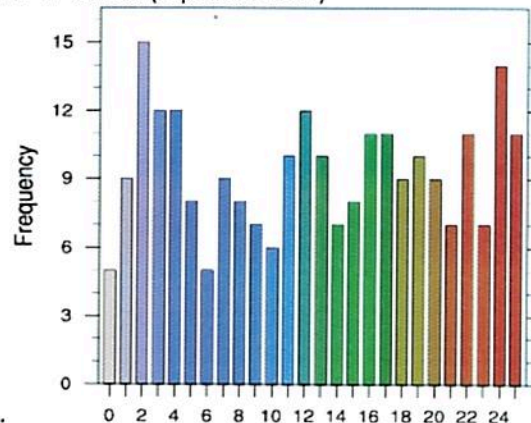
$$0.016492$$

9. For each of the distributions shown below, determine if the distribution is roughly symmetric, left skewed, right skewed, roughly uniform, or none of these. (3 points each)



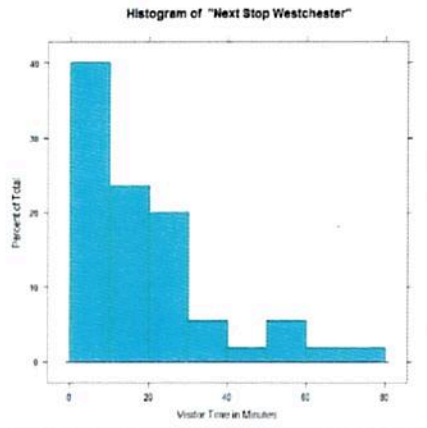
a.

roughly symmetric



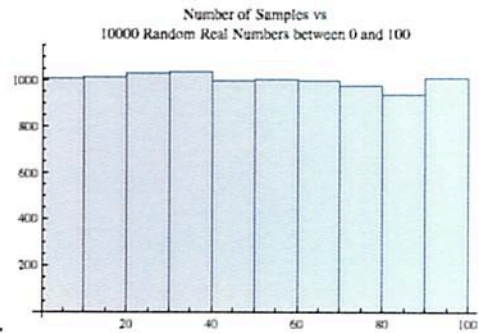
c.

none of these



b.

right-skewed

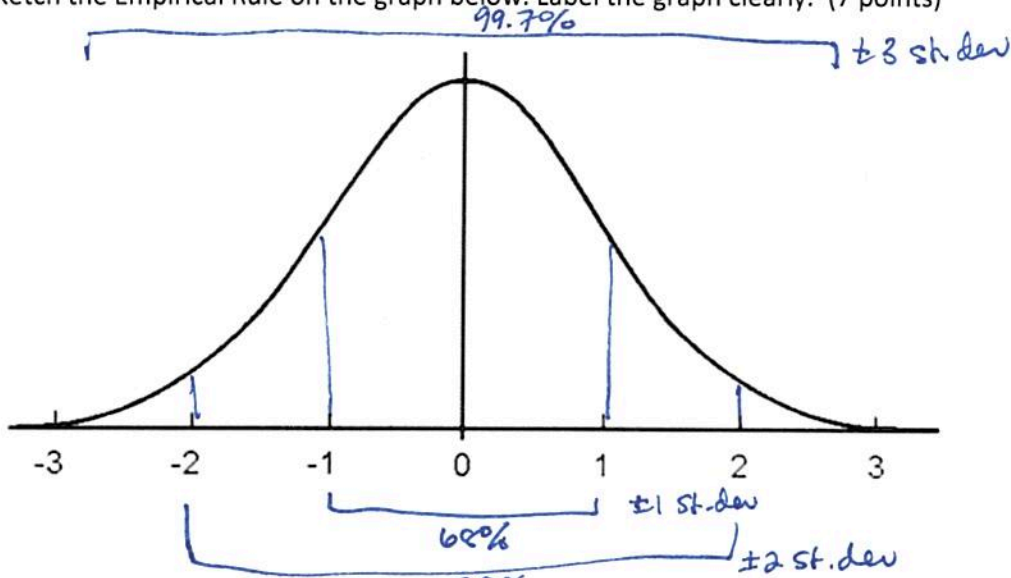


d.

uniform

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 #2 Part 2 submission folder.

10. Sketch the Empirical Rule on the graph below. Label the graph clearly. (7 points)



11. Use the data on Sheet 1 of the data file **245exam2data.xlsx** to answer the following.

a. What is the proportion of homeownership in the sample? (3 points)

56.4%

- b. Construct a 95% confidence interval for this proportion. (8 points)

$$(0.5205, 0.6075)$$

- c. Use the proportion in (a) to determine the sample size needed to calculate a 95% confidence interval that has only a 1% margin of error. (6 points)

$$9447$$

- d. What is the mean and standard deviation of the monthly utility bill? (4 points)

$$\begin{aligned} \text{mean} &= 235.65 \\ \text{st. dev} &= 25.88 \end{aligned}$$

- e. Construct a 99% confidence interval for the sample mean. (8 points)

$$(232.67, 238.63)$$

12. Using the data from Sheet 2 of the data file **245exam2data.xlsx**, you will find salaries from a sample of 75 graduates from Mid-West business schools, and 75 graduates from East Coast business schools, in thousands of dollars, five years out of school. The graduates are matched for major, GPA, industry and experience. Is the data dependent or independent? (6 points)

dependent

13. Use the data from the previous problem to calculate a confidence interval for the difference of means. Report the interval and explain whether it indicates there is (or is not) a difference in earning power between the two groups. (10 points)

$$(-2.4549, 1.7021)$$

there is no meaningful difference
since 0 is included in the interval