Math 2311 Test 2 Review

Know all definitions!

1. Think about a density curve that consists of two line segments. The first goes from the point (0, 1) to the point (0.4, 1). The second goes from (0.4, 1) to (0.8, 2) in the *xy* plane. Let *X* be the continuous random variable.

Sketch the density curve.



What percent of observations:

- a. fall below 0.2?
- b. lie between 0.2 and 0.8?

2. Consider a uniform density curve (has the same height all the way across) defined for $2 \le X \le 10$, where X is the continuous random variable.

Sketch the uniform density curve.



- a. What is the probability that *X* falls above 7?
- b. What percent of the observations of *X* lie between 2 and 5?

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- 3. The random variable *Z* is the standard normal random variable.
- a. What is the mean and standard deviation for *Z*?
- b. Find P(Z < 1.2) and draw the picture.

Command:

Answer:

c. Find P(Z > -1.39) and draw the picture.

Command:

d. Find P(-0.45 < Z < 1.96).

Command:

e. Find *c* such that P(Z < c) = 0.845

Command:

f. Find *c* such that P(Z > c) = 0.845

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Answer:

Answer:

Answer:

Answer:

- 4. Let *X* be a normal random variable with $\mu = 82$ and $\sigma = 4$.
- a. Sketch the distribution



b. According to the Empirical Rule, the middle 68% of the data falls between what values? *Recall:*



c. Find P(X < 83)



Command:

Answer:

d. Find P(X > 79)



Command:

Answer:

e. Find P(73 < X < 84)



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Answer:

f. Find x such that P(X < x) = .97725



Command:

Answer:

5. Suppose a sample of 100 subjects was taken and their scores on an exam recorded. If the population mean for the exam is 67 and population variance is 36, a. what is the mean and standard error of the sampling distribution, \overline{X} ? Commands: Answers:

b. find the probability that the sample mean is less than 70.

Command:

c. find the probability that the sample mean exceeds 68.

6. In a large population, 67% of the households have cable tv. A simple random sample of 256 households is to be contacted and the sample proportion computed.

a. What is the mean and standard deviation of the sampling distribution of the sample proportions?

Commands:

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Answer:

Answer:

Answers:

b. What is the probability that the sampling distribution of sample proportions is less than 73%?

Command:

Answer:

7. 1000 students were asked to give their favorite subject and hobby (chosen from a list). The results are recorded in this two-way table:

	Math	Science	English	History	Total
Watching Movies	35	70	40	66	
Clothes Shopping	54	75	60	30	
Car Parts Shopping	35	50	80	90	
Playing Video Games	60	100	45	40	
Practicing Ju-Jitsu	25	15	20	10	
Total					

- a. What is the probability that someone's hobby is car parts shopping?
- b. What is the probability that someone's favorite subject is Math?
- c. What percent of those with favorite subject History also like practicing Ju-Jitsu?
- d. What percent of those with hobby playing video games also like English?

- 8. Make each statement a c true.
- a. Voluntary response UNDER or OVER represent people with strong opinions.
- b. Convenience sampling leads to UNDER or OVER coverage bias.
- c. Questionnaires with non-neutral wording or LIKELY or NOT LIKELY to have response bias.

9. In which is treatment imposed? Observational study or experiment.

10. Find 100 women age 40 of which 50 have been smoking a pack a day for 10 years while the other 50 have been smoke free for 10 years. You measure lung capacity for each of the 100 women. Is this an observational study or an experiment?

11. Which is the entire group of interest? Sample or Population

12. For each of the following statements, i - v below, identify the type of sampling. Only one answer may be used for each situation.

- A. Voluntary Response Sampling
- B. SRS
- C. Stratified Sample
- D. Convenience Sampling
- E. Block Design

i. Call in a radio station and give your opinion about a matter.

ii. Choose 5 students from each college classification: freshmen, sophomore, junior, senior

iii. Assign the numbers 1 - 100 to 100 people and twenty are chosen at random.

iv. It is known that men and women are physiologically different and react differently to medication. An experiment is designed to test a new drug on patients. There are two levels of the treatment, *drug*, and *placebo*, administered to *male* and *female* patients in a double blind trial.

v. You are interested in the effects of caffeine on study habits of college students. You decide your sample will be your classmates in your statistics class, and they all agree to participate.

13. The following data indicates the number of hours a swimmer practiced during a week and his best time on the 50 meter free style that week.

Hrs practicing	2.5	4	4.5	6	7	7.5	8.5	9	11
Time/sec	29.33	28.76	28.01	27.96	27.99	27.35	27.02	26.85	26.09

a. Which is the explanatory variable? Hours practicing or Time

b. Which is the response variable? Hours practicing or Time

c. Create a scatterplot.





Answer:

e. Find the correlation coefficient and the coefficient of determination for this data. Commands: Answers:

What do each of these tell you about the relationship between the variables?

Based on this information, do you think your answer in part d is a good model?

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f. Find the residual value that corresponds to the explanatory variable value of 4.

g. Plot the residuals vs explanatory variables.
>residuals=resid(lm(time~practice))
>plot(practice,residuals,cex=2,pch=16)
>abline(0,0)





Based on the plot above, is the LSRL still a good model? Yes! Residuals are a random pattern!

14. A group of 10 frequent shoppers at a pharmacy were surveyed. It was found that 40% (4 out of 10) buy brand A of a certain product, 30% (3 out of 10) buy brand B of a certain product and the rest buy other brands of a certain product. Use line 101 of the Random Digit Table to run three simulations of this situation to see how likely this is to occur by chance. Based on this simulation, how many shoppers bought brand A? Brand B?

Line								
101	98360	26534	47384	94612	88666	14170	10847	05567

a. Using single digits from a section of the random digit table, describe how you will run the simulation.

b. Using line 101 from the random digit table, carry out the simulation with three runs.

Run 1

Run 2

Run 3

c. Based on your simulation, how many bought brand A for each run? Brand B?

d. What is the proportion that bought brand A for each run?

e. What is the expected value of those that brought brand A for this activity?

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