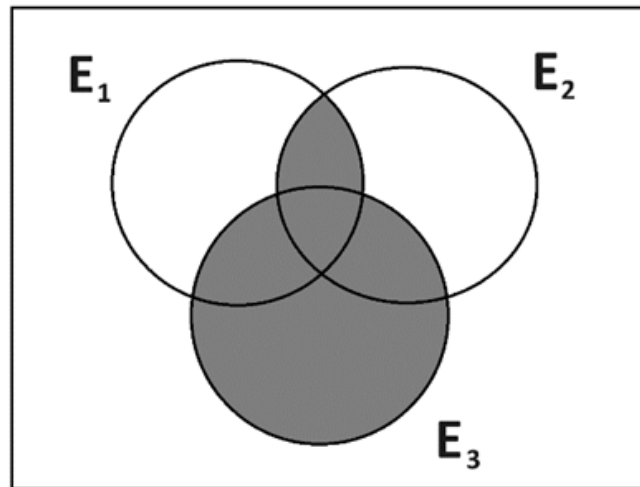


King Fahd University of Petroleum and Minerals
Department of Mathematics
Stat 319
Major Exam I
241
September 30, 2024
Net Time Allowed: 90 Minutes

USE THIS AS A TEMPLATE

Write your questions, once you are satisfied upload this file.

1. (Q: 2-19(c), page 45) Three events are shown on the Venn diagram in the following figure:



The shaded region corresponds to which of the following events?

- (a) $(E_1 \cap E_2) \cup E_3$
- (b) $(E_1 \cup E_2) \cup E_3$
- (c) $(E_1 \cup E_2) \cap E_3$
- (d) $(E_1 \cap E_2) \cap E_3$
- (e) $(E_1 \cup E_2)' \cup E_3$
2. (Q: 2-59(c), page 48) An injection-molded part is equally likely to be obtained from any one of the ten cavities on a mold. What is the probability that a part is from neither cavity 7 nor 8?

- (a) **8/10**
- (b) 10/12
- (c) 2/10
- (d) 8/12
- (e) 2/8

3. (Q: 2-89(a), page 52) The analysis of results from a leaf transmutation experiment (turning a leaf into a petal) is summarized by type of transformation completed:

Total Color Transformation	Total Textural Transformation	
	Yes	No
Yes	232	40
No	18	10

If a leaf completes the color transformation, what is the probability that it will complete the textural transformation?

- (a) **0.853**
- (b) 0.773
- (c) 0.928
- (d) 0.907
- (e) 0.167
4. (Q: 2-129(c), page 55) The probability that a lab specimen contains high levels of contamination is 0.15. Four samples are checked, and the samples are independent. What is the probability that at least one contains high levels of contamination?
- (a) **0.478**
- (b) 0.344
- (c) 0.092
- (d) 0.908
- (e) 0.850

5. (Q: 2-148(a), page 56) An inspector working for a manufacturing company has a 99% (0.99) chance of correctly identifying defective items and a 0.5% (0.005) chance of incorrectly classifying a good item as defective. The company has evidence that 2% (0.02) of the items its line produces are nonconforming (i.e. defective). What is the probability that an item selected for inspection is classified as defective?

(a) **0.0247**

(b) 0.0049

(c) 0.0148

(d) 0.0198

(e) 0.0050

6. (Q: 3-28, page 94) An assembly consists of two mechanical components. Suppose that the probabilities that the first and second components meet specifications are 0.95 and 0.98, respectively. Assume that the components are independent. Which one of the following is the correct probability mass function of the number of components in the assembly that meet specifications?

(a) $\begin{cases} P(X = 0) = 0.001 \\ P(X = 1) = 0.068 \\ P(X = 2) = 0.931 \end{cases}$

(b) $\begin{cases} P(X = 0) = 0.020 \\ P(X = 1) = 0.060 \\ P(X = 2) = 0.920 \end{cases}$

(c) $\begin{cases} P(X = 0) = 0.002 \\ P(X = 1) = 0.070 \\ P(X = 2) = 0.928 \end{cases}$

(d) $\begin{cases} P(X = 0) = 0.010 \\ P(X = 1) = 0.080 \\ P(X = 2) = 0.910 \end{cases}$

(e) $\begin{cases} P(X = 0) = 0.005 \\ P(X = 1) = 0.065 \\ P(X = 2) = 0.930 \end{cases}$

7. (Q: 3-57, page 95) The range of the random variable X is $[1, 2, 4, 7, x]$ where x is unknown. If each value is equally likely and the mean of X is 6, determine x .
Note: The values $[1, 2, 4, 7, x]$ represent all possible values of the discrete random variable X .

- (a) **16**
- (b) 14
- (c) 18
- (d) 20
- (e) 12

8. (Q: 3-88, page 97) A multiple-choice test contains 14 questions, each with five answers. Assume that a student just guesses on each question. What is the probability that the student answers fewer than 2 questions correctly?

- (a) **0.1979**
- (b) 0.1539
- (c) 0.0440
- (d) 0.2501
- (e) 0.4481

9. (Q: 3-127(a), page 101) A slitter assembly contains 20 blades. Four blades are selected at random and evaluated each day for sharpness. If any dull blade is found, the assembly is replaced with a newly sharpened set of blades. If 3 of the blades in an assembly are dull, what is the probability that the assembly is replaced the first day it is evaluated?

- (a) **0.5088**
- (b) 0.4672
- (c) 0.5328
- (d) 0.4816
- (e) 0.4211

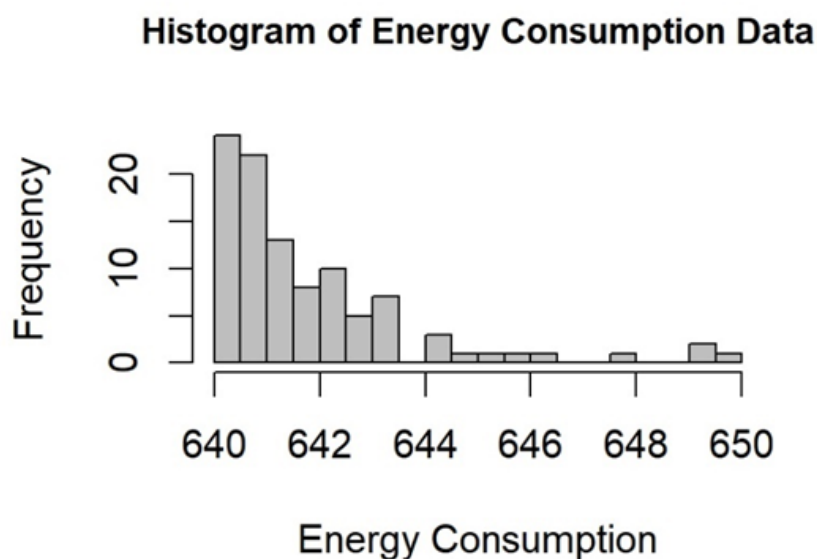
10. (Q: 3-143, page 102) The number of content changes to a Web site follows a Poisson distribution with a mean of 0.15 per day. What is the probability of no content changes in six days?

- (a) **0.4066**
- (b) 0.3585
- (c) 0.4275
- (d) 0.3894
- (e) 0.3916

11. (Q: 6-17, page 219) The pH of a solution (X) is measured eight times by one operator using the same instrument. She obtains the following data: 7.05, 6.89, 7.14, 7.03, 7.20, 6.92, 7.07, and 7.11 with $\sum_{i=1}^8 X_i = 56.41$ and $\sum_{i=1}^8 X_i^2 = 397.8385$. Calculate the sample standard deviation.

- (a) **0.1052**
- (b) 0.0984
- (c) 0.0111
- (d) 0.2784
- (e) 0.0775

12. (Q: 6-50, page 222) Following is a histogram for energy consumption data:



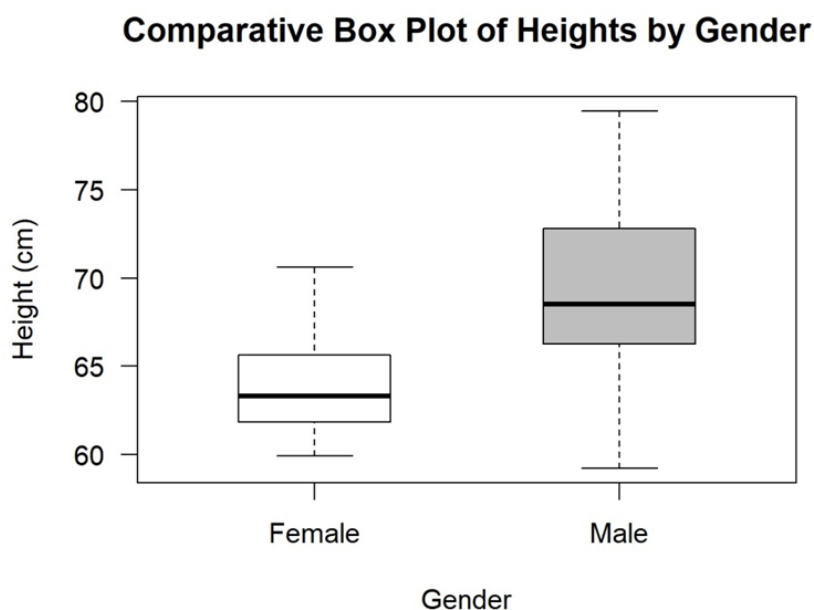
Which one of the following comments on the shape of the histogram is true?

- (a) **The data is positively skewed.**
- (b) The data is normally distributed.
- (c) The data is negatively skewed.
- (d) The data has a symmetric distribution.
- (e) The data has no skewness.

13. (Q: 6-30, page 220) The students in an undergraduate engineering core course self-reported their heights to the nearest inch. The data follow. Calculate the sample median of height.

67, 65, 61, 63, 64, 69, 64, 66, 66, 68, 62, 64, 63, 62, 65, 66, 67, 68, 66, 68.

- (a) **65.5**
 (b) 65
 (c) 67.5
 (d) 66
 (e) 67
14. (Q: 6-63, page 223) Using the data on heights of female and male students, we constructed the following comparative box plots:



Which one of the following is true about the above comparative boxplot?

- (a) **Male students have a higher IQR.**
 (b) Female students have a higher median.
 (c) Both genders have the same range.
 (d) Female students have a higher Q_1 .
 (e) Q_3 is the same for both genders.