MATH 460: Probability & Statistics — September 2018

Homework #2 — Dr. Basilio

DUE: Wednesday 9.19.2018

Southern California Institute of Technology

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Concept of Probability

Problem 1: Frequency Approach

Flip a coin 20 times. What are the empirical probabilities from your experiment?

Axioms of Probability

Problem 2: Probability

Suppose A and B are two disjoint events in a sample space S and that $P(A) = .16$; $P(B) = .43$. Calculate the following probabilities.

(a) $P(A \cup B)$

(b) $P(A \cap B)$

(c) $P(A' \cup B)$

(d) $P(A' \cap B)$

(e) $P(A - B)$

Problem 3: Probability

A marble is drawn at random from a box containing 10 red, 30 white, 20 blue, and 15 orange marbles. Find the probability that it is

(a) orange or red

(b) not red or blue

(c) not blue

(d) white

(e) ed, white, or blue.

Conditional Probability

Problem 4: Probability

Find the probability of drawing 3 aces at random from a deck of 52 ordinary cards if the cards are

(a) replaced

(b) not replaced

Problem 5: Conditional Probability

(a) Four marbles are picked at random out of a jar containing 10 red marbles, 15 white marbles, 20 blue marbles, 25 orange marbles, and 30 purple marbles. What is the probability of picking one of each color, assuming you pick a marble one at a time?

(b) Drawing a four and a spade cards for first two draws from a well-shuffled 52 card deck.

Chapter 5: Sampling Theory

Organizing and Visualizing Data

Measurements of Central Tendency

Problem 6: Mean

Suppose 6 students take an exam and the mean score is 80%. Five of the students scores are: 95,78,85,56, 96. What is the sixth student?s score?

Problem 7: Mean-Median-Mode-Range

(a) The front row in a movie theatre has 23 seats. If you were asked to sit in the seat that occupied the median position, in which seat would you have to sit?

(b) What is the median score achieved by a student who recorded the following scores on 10 math quizzes? Scores: $S = \{68, 55, 70, 62, 71, 58, 81, 82, 63, 79\}$.

(c) The number of service upgrades sold by each of 30 employees is as follows:

$$\{32, 6, 21, 10, 8, 11, 12, 36, 17, 16, 15, 18, 40, 24, 21, 23, 24, 24, 29, 16, 32, 31, 10, 30, 35, 32, 18, 39, 12, 20\}$$

Find the mean, median, and mode of the service upgrades.

Measurement of Dispersion

Problem 8: Standard Deviation

Find the standard deviation of the data set $S = \{3123, 1040, 1511, 2124, 1332, 2154, 5132, 6160\}$.

Problem 9: Five-Number-Summary

(a) Find the five number summary, and draw a Box-Whisker plot for $S = \{3, 7, 8, 5, 12, 14, 21, 15, 18, 14\}$.

(b) Find the standard deviation for the set from part (a).

Chapter 2: Random Variables

Discrete vs Continuous Variables

Problem 10: Random-Variables

Suppose our experiment is to toss a single fair die, and we are interested in the number rolled. We define our random variable X to be the outcome of a single die roll.

(a) Why is the variable X a random variable?

(b) What are the possible values that the random variable X can take?

(c) What is the notation used for rolling a 5?

(d) Use random variable notation to express the probability of rolling a 5.

Problem 11: Random-Variables

Identify each as a discrete or continuous random variable.

(a) Total amount in ounces of soft drinks you consumed in the past year.

(b) The number of cans of soft drinks that you consumed in the past year.

Chapter 4: Probability Distribution Functions

Binomial Distribution

Problem 12: Binomial-Distribution-Probability

Find the probability that in a family of four children there will be

(a) at least one boy

(b) at least one boy and at least one girl

Assume that the probability of male birth is $1/2$.

Problem 13: Binomcdf-probability

What is the probability of at least four successful trials in a random experiment, with probability of success of a single trial being 8% if twenty trials are run?

Problem 14: Binomial-Distribution-Probability

If 20% of the bolts produced by a machine are defective, determine the probability that out of four bolts chosen at random,

(a) one bolt will be defective

(b) zero bolts will be defective

(c) less than 2 bolts will be defective

Problem 15: Binomial-Distribution-Probability

Find the probability of getting a total of 7 at least once in three tosses of a pair of fair dice.