MATH 460: Probability & Statistics — January_2019

Chapter 1: Basic Probability

Homework #1 — Dr. Basilio

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DUE: Mon Jan_14 ∪ Tues Jan_15

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Sets

Problem 1: Venn Diagrams

Use a Venn Diagram with two sets A and B to illustrate

(a) $A \cup B$

(b) $A \cap B$

(c) A'

(d) $B - A$

Problem 2: Venn Diagrams

Use a Venn Diagram with three sets A, B and C to illustrate

(a) $A \cap B$

(b) $(A \cup B) - (A \cap B \cap C)$

Problem 3: Set Theory

Consider the sets $A = \{2, 5, 6, 7, 13, 15\}$ and $B = \{1, 7, 11, 12, 13, 16, 21\}$ where $S = \{$ positive integers from 1 to 21 $\}$. Compute each of the following sets:

(a) $A \cup B$

(b) $A \cap B$

(c) A'

(d) B'

(e) $B - A$

(f) $A - B$

(g) $(A \cup B)'$

(h) $A' \cup B'$

(i) $(B - A') \cap (A \cap B)'$

Problem 4: Set Theory

Consider the sets $A = \{4, 5, 6, 7, 9, 13, 16\}$ and $B = \{3, 6, 9, 12, 15\}$ where the sample space S consists of all positive integers less than or equal to 16. Find the following:

(a) $A \cup B$

(b) $A \cap B$

(c) A'

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

Sample Space

Problem 5: Sample Space/Outcomes

Write the sample space for flipping a coin three times.

Events

Problem 6: Events

Let S be the sample space of flipping a coin THREE times. Let A b the event "at least one head occurs" and B be the event "the second toss results in a tail." Express A and B using the H and T notation and find:

(a) $A \cup B$

(b) $A \cap B$

(c) A'

(d) $A - B$

Concept of Probability

Problem 7: Frequency Approach

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

Axioms of Probability

Problem 8: 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 9: 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) red, white, or blue.

Conditional Probability

Problem 10: 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 11: Conditional Probability

(a) Five 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 jack cards for first and second draws from a well-shuffled 52 card deck.