MATH 460: Probability & Statistics — September 2018

Chapter 1: Basic Probability

Homework #1 — Dr. Basilio

Southern California Institute of Technology

DUE: Monday 9.10.2018

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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) $A - B$

Permutations

Problem 7: Permutations

Calculate the following:

(a) $15!$

(b) ${}_4P_2$

(c) ${}_7P_5$

Problem 8: Permutations and Combinations

In how many ways can 7 books be arranged on a shelf if

(a) any arrangement is possible

(b) 3 particular books must always stand together

(c) two particular books must occupy the ends?

Combinations

Problem 9: Combinations

Calculate the following:

(a) ${}_5C_3$

(b) ${}_8C_4$

Problem 10: Permutations and Combinations

(a) In how many ways can 6 questions be selected out of 10?

(b) Find the number of (i) combinations and (ii) permutations of 4 letters each that can be made from the letters of the word Tennessee.