L2 for August 26, 2020 HW: pg 26, #’s 5a,b

pg 32, #’s 11, 18

pg 48, #’s 35, 36, 42, 46, 51

Chapter 2: Probability

Section 2.1 - 2.6 (Review of Finite math.)

**Def. 2.1:** An experiment is the process by which an observation is made.

“A random event cannot be predicted with certainty, but the relative frequency with which they occur in a long series of trials is remarkably stable. This stable long-term relative frequency provides an intuitively meaningful measure of our belief in the occurrence of a random event if a future observation is to be made.” ((page 20)

Section 2.4: Calculating the Probability of an Experiment: The Discrete Case.

*Motivational Illustration:*

Roll a single die:

Q: Name some of the events.

**Definition:** A *simple event* is an event that cannot be decomposed. Each simple event corresponds to one and only one *sample point*. The letter *E* (with subscripts) will be used to denote a simple event or the sample point. *Compound events* can be decomposed into simple events. Compound events are denoted by capital letters.

**Definition:** An *event* in a discrete sample *S* is a collection of sample points, i.e. any subset of *S*.

Q: Roll a single die. What is the sample space and is this a discrete sample space?

Q: Pick a positive integer. What is the sample space and is this a discrete sample space?

Q: What is the sample space of the heights of a person? Is this a discrete sample space?

**Definition:** The *sample space* associated with an experiment is the set consisting of all possible sample points (or outcomes). A sample space will be denoted by *S*.

**Definition:** A *discrete sample space* is one that contains either a finite or a countable number of distinct sample points. A *continuous sample space* is the union of intervals containing the sample points.

**Big Q**: What are (3) conditions or properties of probability?

**Definition 2.6:**

Suppose S is a sample space associated with an experiment. To every event *A* in *S*, we assign a number, P(*A*), called the *probability* of *A*, so that the following axioms hold:

Axiom 1: 

Axiom 2: 

Axiom 3: If form a sequence of pairwise mutually exclusive events in *S*

(i.e. ), , then



Section 2.5 The sample-point method is outlined in the above example:

1. Define the experiment and determine how to describe the simple events.
2. List the simple events associated with the experiment.
3. Assuming reasonable probabilities for the simple event.
4. Define the event of interest, A, as a collection of sample points
5. Find the P(A).

Example.

A balanced coin is tossed three times. Calculate the probability that exactly two of the three tosses result in heads.

Example.

A manufacturer has five identical computer terminals in order to fill shipping orders. Unknown to her, two of the five are defective. A particular order calls for two of the terminals and is filled by randomly selecting two of the five that are available. What is the probability that the order is field with 2 non-defective terminals?

Section 2.3: A review of Set Notation and Venn diagrams

Let A, B, C, … , denote sets of points where S is the sample space. Let  denote the empty set.

Subset 

Union

Intersection

Compliment 

Mutually exclusive or disjoint sets 

Distributive Laws 



DeMorgan’s Law 



Section 2.6: Counting tools.

* *m x n* principle- If you choose one item from a group of *m* items and another item from a group of *n* items, the total number of two-item choices is *m x n.*
* *n!* the number of ways *n* objects can be arranged or ordered.
*  permutation

An ordered arrangement of *r* distinct objects out of a set of *n* objects is called a *permutation*.



*  combinations.

The number of ways you can group (order does not matter) *r* objects from a set of *n* objects.



* Multinomial: The number of ways of ways of partitioning *n* distinct objects into *k* distinct groups containing objects, respectively, where each object appears in exactly one group and , is



Examples

A restaurant offers 7 appetizers and 12 main courses. How many different two-course meals are possible?

Suppose a license plate is to have two letters (the letter O is not used) followed by three numerals. How many different license plates are possible?

Four girls are selected to be on a swimming relay team, how many different ways can you put together the relay team?

Suppose you have 8 girls to choose for a relay team, how many (4 person) possible relay teams are possible?

You are to choose three different flavors of ice cream from 12 different flavors. How many flavor combinations are possible if no flavor is repeated? How many flavor combinations are possible if any flavor can be repeated?

How many 5-card poker hands can be dealt from a standard deck of 52 cards?

A fleet of nine taxis is to be dispatched to three airports in such a way that three go to airport A, five go to airport B, and one goes to airport C. In how many distinct ways can this be accomplished?

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