

Math 1313
Use of Counting Techniques in Probability

Example 1

In this section, we will learn to compute probability when the sample space is too large to enumerate.

Recall that to compute the probability of an event in a uniform sample space, we found

$$P(E) = \frac{n(E)}{n(S)} = \frac{\text{number of elements in event } E}{\text{number of elements in sample space } S}$$

Example 1: Suppose we flip a fair coin six times and observe the sequence of heads and tails that results.

How many elements are in the sample space?

What is the probability that the coin will land heads exactly four times?

What is the probability that the coin will land heads at most two times?

What is the probability that the coin will land heads on the second and fifth tosses?

Example 2: Two cards are selected from a well-shuffled deck of 52 playing cards.

How many possible outcomes are there?

What is the probability that both cards drawn are tens?

What is the probability that neither card drawn is a ten?

What is the probability that both cards drawn are black?

Example 3: A shipment of computer games contains 100 games, of which four are known to be defective. A customer purchases five of the games.

In how many ways can the customer purchase the five games?

What is the probability that exactly two of the games purchased are defective?

What is the probability that at least one of the games purchased is defective?

Example 4: The student spirit committee is made up of ten students. Suppose six seniors, eight juniors, four sophomores and nine freshmen apply for the committee, and assume each has equal likelihood of being chosen. What is the probability that the committee will be made up of three seniors, 2 juniors, 3 sophomores and two freshmen?

Example 5: A six-person sub-committee is to be formed at random from a committee that is made up of eight Democrats and six Republicans. What is the probability that

the subcommittee is made up of all Democrats?

the subcommittee has exactly three Republicans on it?

there are at least two Democrats on the subcommittee?

Example 6: An urn contains 12 white balls and 14 black balls. Ten of the balls are selected at random. What is the probability that

at least 9 black balls are chosen?

at most 8 black balls are chosen?

3 black balls or 4 black balls are chosen?