

University of California, Los Angeles
Department of Statistics

Statistics 13

Instructor: Nicolas Christou

Homework 1

EXERCISE 1

You draw a card at random from a standard deck of 52 cards. Find each of the following conditional probabilities.

- a. The card is a heart, given that it is black.
- b. The card is black, given that it is a heart.
- c. The card is an ace, given that it is black.
- d. The card is a queen, given that it is a face card.

EXERCISE 2

The probabilities that an adult American man has high blood pressure and/or high cholesterol are shown in table below:

		Blood Pressure	
		High	OK
Cholesterol	High	0.11	0.21
	OK	0.16	0.52

An adult American is randomly selected:

- a. What is the probability that he has both conditions?
- b. What is the probability that he has high blood pressure?
- c. Suppose that this a man has high blood pressure. What is the probability that he has high cholesterol?
- d. What is the probability that this man has high blood pressure if it is known that he has high cholesterol?

EXERCISE 3

Use the table of the previous exercise: Are high blood pressure and high cholesterol independent?

EXERCISE 4

Suppose a woman tries on a dress. The probability that she asks for alterations is 0.65. The probability that she asks for delivery is 0.32. The probability that she asks for alterations and delivery is 0.21. Suppose that you randomly select a woman who has tried on a dress. What is the probability that:

- a. She will either ask for alterations or for delivery of the dress or both.
- b. She will not ask for alterations and she will not ask for delivery of the dress.

EXERCISE 5

A tennis player A has probability of $\frac{2}{3}$ of winning a set against player B . A match is won by the player who first wins three sets. Find the probability that A wins the match.

EXERCISE 6

Observations of a waiting line at a medical clinic indicates that the probability that a new arrival will be an emergency case is $p = \frac{1}{6}$. Find the probability that the r_{th} patient is the first emergency case. Assume that conditions of arriving patients represent independent events.

EXERCISE 7

Given that a person has a certain disease, a diagnostic test will detect it with probability 0.90. Also, given that a person does not have the disease, the diagnostic test will detect that the person has the disease with probability 0.10. Only 1% of the population has the disease in question.

You can use:

T = {diagnostic test detects that a person has the disease}

D = {person actually has the disease}

- A person is randomly selected from the population and tested for this disease. What is the probability that the diagnostic test will detect that the person has the disease?
- A person is chosen at random from the population. Given that the diagnostic test detects that the person has the disease, what is the probability that the person actually has the disease?

EXERCISE 8

Employment data at a large company reveal that 72% of the workers are married, that 44% are college graduates, and that half of the grads are married. What is the probability that a randomly chosen worker

- is neither married nor a college graduate?
- is married but not a college graduate?
- is married or a college graduate?

EXERCISE 9

Suppose that 23% of adults smoke cigarettes. It is known that 57% of smokers and 13% of non-smokers develop a certain lung condition by age 60.

- Explain how these statistics indicate that lung condition and smoking are not independent.
- What is the probability that a randomly selected 60-year-old has this lung condition?

EXERCISE 10

Three different machines M_1 , M_2 , and M_3 were used for producing a large batch of similar manufactured items. Suppose that 20% of the items were produced by machine M_1 , 30% by machine M_2 , and 50% by machine M_3 . Suppose further that 1% of the items produced by machine M_1 are defective, that 2% of the items produced by machine M_2 are defective, and that 3% of the items produced by machine M_3 are defective.

- Find the probability that an item selected at random will be found defective.
- Suppose that one item is selected at random from the entire batch, and it is found to be defective. What is the probability that this item was produced by machine M_2 ?

EXERCISE 11

Refer to page 16 of the handout "Probability" (game of craps). Compute the probability of winning the game of craps.