

A.P. Statistics
Assignment 4.7

Remember to show your thinking through your work.

- 1) The tests done to determine if someone is HIV positive are called Enzyme immunoassay or EIA tests. The test screens a blood sample for the presence of antibodies to HIV. Like most tests, this test is not perfect. The table below shows the approximate probabilities of positive and negative EIA tests when the blood does and does not actually contain the HIV antibodies. Long range studies have shown that only 2% of the population actually has the HIV antibodies.

Test Result →	Positive	Negative
Antibodies Present	0.9985	0.0015
Antibodies Not Present	0.006	0.994

- a) Explain in context all four values in the table. That is, what does each of them actually mean?

Construct a tree diagram to answer the following questions. The first two choices of the tree should be whether or not the antibodies are present. The second choice should be the test result. (What is the probability “split” for the first choice?)

- b) What is the probability that a person without HIV will have a test come out positive (this is called a false-positive)?

- c) What is the probability that a person with HIV will have a test come out negative (this is called a false negative)?

- d) What is the probability that a person with HIV will have a test come out positive?

- 2) More cards! Consider again a standard deck of 52 cards (13 in each of 4 suits). Two cards are dealt in succession (meaning no replacement).

- a) What is the probability that the first card is a queen?

- b) Given that the first card was a queen, what is the probability that the second card is a seven?

- c) What is the probability of being dealt a queen first followed by a seven?

- d) What is the probability that both cards are greater than 7 (assuming that the ace is considered “high” or greater than 7)?

- 3) Teenage drivers may pay more for automobile insurance than older drivers. Also, many insurance companies offer discounts for teenage drivers that achieve good grades. Assume that 20% of all teenage drivers are involved in accidents each year. Assume that 10% of all teenage drivers have GPAs that are 3.5 or above. Of the teenage drivers involved in accidents, only 5% of them have GPAs that are 3.5 or above.

- a) Let A be the event that a teenager has a GPA of 3.5 or above. Let B be the event that a teenage driver is involved in an accident this year. Find $P(A)$ and $P(B)$.

- b) Find $P(A \text{ given } B)$

- c) Find the probability that a randomly chosen teenage driver has a GPA of 3.5 or above and is involved in an accident this year.

- 4) The A.P. Statistics exam consists of a multiple-choice section where each question has five choices. Sara estimates that she has a 75% chance of knowing each question. If she does not know the answer, she will randomly guess.

- a) What is the probability of Sara getting a question correct?

- b) The A.P. exam has 40 questions, how many might Sara expect to get correct?

- 5) Newegg Computers sells computer switches. Out of a lot of 1000 switches, 10 are found to be defective. You purchase switches to sell in your specialty store. Newegg's selection of switches to send to you is randomly selected from the lot of 1000 switches.

- a) You order one switch. What is the probability that it is defective? What is the probability that it is not defective?

- b) Assume that the first switch was bad. So, you order one more switch. What is the probability that this switch is bad?

- c) How many switches would you have to order to guarantee that you had at least one working switch?

- d) How many switches would you have to order to guarantee that you had at least one defective switch?