Assignment 3, PME, 4th Semester, Spring 2022

Deadline: Before the start of PME mid-term exam paper

Assignment should be hand written.
Write your name, registration No. and section; else your assignment may not be marked.
Copying is not allowed.
Write in your own words.
Properly staple your pages (binding is not required).

(i) Suppose the test for HIV is 99% accurate in both directions and 0.3% of the population is HIV positive. If someone tests positive, what is the probability they actually are HIV positive?

(ii) A family has 2 children. Given that one of the children is a boy, what is the probability that the other child is also a boy?

(iii) Suppose 30% of the women in a class received an A on the test and 25% of the men received an A. The class is 60% women. Given that a person chosen at random received an A, what is the probability this person is a women?

(iv) susan took two tests.the probability of her passing both tests is 0.6.the probability of her passing the first test is 0.8.what is the probability of her passing the second test given that she has passed the first test?

(v) Two masked robbers try to rob a crowded bank during the lunch hour but the teller presses a button that sets off an alarm and locks the front door. The robbers realizing they are trapped, throw away their masks and disappear into the chaotic crowd. Confronted with 40 people claiming they are innocent, the police gives everyone a lie detector test. Suppose that guilty people are detected with probability 0.85 and innocent people appear to be guilty with probability 0.08. What is the probability that Mr. Smith was one of the robbers given that the lie detector says he is?

(vi) Subject in an experiment are told that either a red or a green light will flash. Each subject is to guess which light will flash. The subject is told that the probability of a red light is 0.7, independent of guesses. Assume that the subject is a probability matcher- that is , guesses red with probability .70 and green with probability .30.

- What is the probability that the subject guesses correctly?
- Given that a subject guesses correctly, what is the probability that the light flashed red?

(vii) A student answers a multiple choice examination question that has 4 possible answers. Suppose that the probability that the student knows the answer to the question is 0.80 and the probability that the student guesses is 0.20. If student guesses, probability of correct answer is 0.25.

(i) What is the probability that the fixed question is answered correctly?
(ii) (ii) If it is answered correctly what is the probability that the student really knew the correct answer.

(viii) 4 One out of 1000 coins has two tails. The coin is selected at random out of these 1000 coins and flipped 5 times. If tails appeared all 5 times, what is the probability that the selected coin was 'two-tailed'?

(ix) In Kokomo, IN, 65% are conservatives, 20% are liberals and 15% are independents. Records show that in a particular election 82% of conservatives voted, 65% of liberals voted and 50% of independents voted. If the person from the city is selected at random and it is learned that he/she did not vote, what is the probability that the person is liberal?

(x) One of three words AAAA, BBBB, and CCCC is transmitted via an information channel. The probabilities of these words are 0.3, 0.5, and 0.2, respectively. Each letter is transmitted independently of the other letters and it is received correctly with probability 0.6. Since the channel is not perfect, the letter can change to one of the other two letters with equal probabilities of 0.2. What is the probability that word AAAA had been submitted if word ABCA was received.

(xi) It is known that in a certain city one out of every 100 citizens is a tubercular person. A test was administered to a citizen. When a person is tubercular the test gives a positive result in 97% of cases. When he/she is not tubercular, only 0.01% of the cases give positive results. If the test is positive for these people, what is the probability that he/she is tubercular?

(xii) A diagnostic test for diabetes has an FPC of 4% and an FNC of 5%. If the prevalence of diabetes in a town is 7%, what is the probability that a person is diabetic if his/ her test was positive? What is the probability that a person is not diabetic if his/her test was negative? Q3. A diagnostic test for uterine cancer has a false positive coefficient of 0.05 and false negative of 0.01. A woman with a pre-test probability of 0.15 of having the disease has a negative result in her test. Calculate the probability that she is not ill?