MAT 2377 – Assignment 1

Deadline: Thursday Feb 04, 2021 at 3:00 pm

Total = 100 marks

Please complete **all** the questions in this assignment. However, due to our limited TA resources, it is possible that not all the questions will be marked. You will not be informed beforehand which questions will be marked.

Please follow the instructions on course syllabus to submit your assignment online. **Late assignments will not be accepted.**

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1. Suppose that John and Tom are sitting in a classroom containing 9 students in total. A teacher randomly divides these 9 students into two groups: Group I with 4 students, Group II with 5 students.

(a) What is the probability that John is in Group I?

(b) If John is in Group I, what is the probability that Tom is also in Group I?

(c) What is the probability that John and Tom are in the same group?

2. In a certain group of people with two opposite-sex parents, it was found that 42% of them have alcoholic fathers, 8% of them have alcoholic mothers, and 48% of them have at least one alcoholic parent. If we randomly choose one individual from this group, what is the probability that:

(a) the selected individual has two alcoholic parents?

(b) the selected individual has an alcoholic mother but he/she does not have an alcoholic father?

(c) the selected individual has an alcoholic mother, if he/she has an alcoholic father?

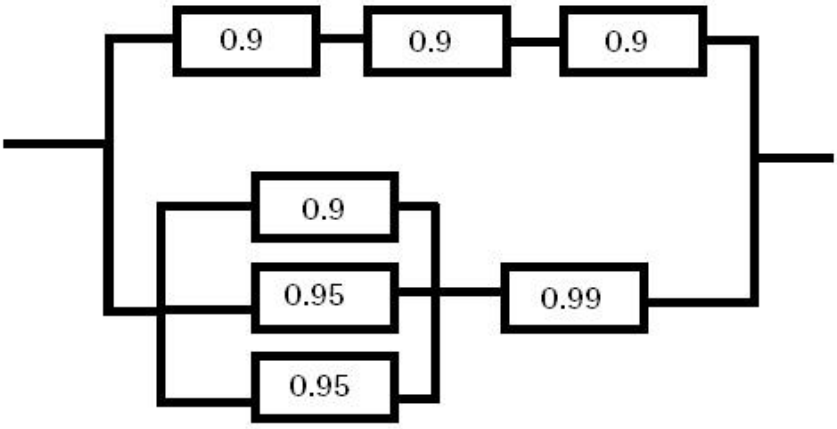
(d) the selected individual has an alcoholic mother, if he/she does not have an alcoholic father?

3. Assume that company A makes 75% of all electrocardiograph machines in the market, company B makes 20% of them, and company C makes the other 5%. The electrocardiographs machines made by company A have a 4% rate of defects, the company B machines have a 5% rate of defects, while the company C machines have a 8% rate of defects.

(a) If a randomly selected electrocardiograph machine is tested and is found to be defective. Find the probability that it was made by company A.

(b) Suppose we randomly select one electrocardiograph machine from the market. Find the probability that it was made by company A and it is not defective.

4. The following circuit operates only if there is a path of functional devices from left to right. The probability that each device functions is shown on the graph. Assume that devices fail independently. What is the probability that the circuit operates?



5. Let X be a discrete random variable. The following table shows its possible values x and the associated probabilities $P(X = x) = f(x)$.

x	-1	0	1	3
$f(x)$	2/8	3/8	2/8	1/8

(a) Verify that $f(x)$ is a probability mass function.

(b) Calculate $P(X < 1)$, $P(X \leq 1)$, and $P(X < 0.5 \text{ or } X > 2)$.

(c) Find the cumulative distribution function of X.

(d) Compute the mean and the variance of X.