Introduction to Probability, Statistics and Data Handling	Conditional Probability, Bayes' Theorem
Tutorial 2	

1. What are Independent events? What are the conditions for the events to be independent? Give an example.

2. What do you mean by conditional probability? What is the formula for conditional probability? Explain it with the help of an example.

3. In a factory four machines produce the same product. Machine A produces 10% of the output, but 0.1% of them may be defective, machine B 20% of the output with 0.05% of defects, machine C 30% with 0.5% with problems, machine D 40% with 0.2% defective. An item selected at random is found to be defective. What is the probability that it was produced by factory A? B? C? D?

4. What is Bayes' Theorem? Write its mathematical expression, pointing out the prior and posterior probability and explain it with the help of an example.

5. How would you define mutually exclusive events? Give an example

6. Are students more likely to smoke when theirs parents smoke? The smoking habits among students and parents is shown in the Table. The "smoke" in case of a student means that she/he smokes, even occasionally, whereas in case of parents means, that at least one parent smokes.

   a) If at least one parent smoked, what is the chance their child (student) smokes?

   b) A student is randomly selected from the study and she/he does not smoke. What is the probability that at least one of her parents smoked?

Students	Parents	
	smoked	not
smoke	125	94
not	85	141

7. As you know, Covid-19 tests are common nowadays, but some results of tests are not true. Let's assume; sample size is 100, a diagnostic test has 99% accuracy and 60% of all people have Covid-19. If a patient tests positive, what is the probability that they actually have the disease? What is the meaning of: **false negative, false positive, true negative, true positive?**

8. Hunter says she is itchy. There is a test for Allergy to Cats, but this test is not always right:For people that really do have the allergy, the test says "Yes" 80% of the timeFor people that do not have the allergy, the test says "Yes" 10% of the time ("false positive")
   If 1% of the population have the allergy, and Hunter's test says "Yes", what are the chances that Hunter really has the allergy?