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

Subjects for discussion:

1. What is *conditional probability*? How would you calculate the probability of the event knowing all the outcomes it consists of?
2. How can you test if events are *independent*?
3. What is the difference between the *prior* and *posterior probability*?

Problem Set 2:

1. 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?

2. 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**

3. One of the Covid-19 tests correctly identifies 70% of those with COVID-19 (sensitivity) and 95% of those without COVID-19 (specificity). What is the meaning of: **false negative, false positive, true negative, true positive?** Calculate the absolute number of such results if you test 100 people, and among them: a) 10 really have C-19, b) 80 has C19. If we tested a random person using this test and the test came back positive, that is, the test suggested the patient has C-19, what is the probability that a person has C-19? How would the probability change if this patient repeats the test? (adapted from: https://www.weforum.org/agenda/2020/04/coronavirus-covid19-tests-pandemic-virus-antibodies-swab-blood)