

MATH205, Fall 2021, Homework 2, Due Wednesday, Oct 6, 3:30 pm

Instructions

You can submit the homework either in paper or online

- Online: Take pictures of the written (theory) part; send them (along with the simulation part) to me on Slack or through Canvas before the lecture on Wednesday
- Paper: Print out the result of the simulation part and staple it with the written work; hand it in at the beginning of the lecture on Wednesday

1 Theory

1. Problem 1: Suppose that in a community of 400 adults, 300 bike or swim or do both, 160 swim, and 120 swim and bike. What is the probability that an adult, selected at random from this community, bikes?
2. Problem 2: Event A has $P(A) = 0.5$. Event B has $P(B) = 0.5$. These events are independent. What is $P(A \cup B)$?
3. Problem 3: A disease occurs with probability 0.4 (i.e. it is present in 40% of the population). You have a test that detects the disease with probability 0.6, and produces a false positive with probability 0.1. What is the probability you have the disease if the test comes back positive?
4. From the three basic properties of probability (Useful Facts 3.1 in the text), prove that: If $A \subset B$, then $P(A) \leq P(B)$.

2 Simulations

- Choose and load one built-in dataset in R with (at least) two features
- Construct a plot to visualize the relation between the two features
- Configure at least 5 options of the plot.

Attach the script containing the commands and a screenshot of the result of the script.