

Hypothesis Testing Exercises

Hans Georg Schaathun

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We aim to cover the exercises in this document during the classroom sessions. You should work on other exercises from Chapter 11 in the textbook as well. You may skip exercises using the special cases which have not been covered in the videos. However, most of these special cases will be very easy to understand if you have a good understanding of the general concepts, and may be well worth doing to develop the general understanding.

Session 1. Wednesday

Exercise 1.1 *Exercise 11.1 p. 192 in Frisvold and Moe.*

Exercise 1.2 *Exercise 11.2 p. 193 in Frisvold and Moe.*

Exercise 1.3 *Exercise 11.3 p. 195 in Frisvold and Moe.*

Exercise 1.4 *You want to test if the traffic flow increases through a certain roundabout when the speed limit is reduced from 50 km/h to 30 km/h. You run your simulator and count the vehicles through the roundabout over a ten-minute period, repeating the trial a number of times. You get the following results:*

30 km/h 120, 99, 80, 86, 115, 101, 93, 112, 104, 96

50 km/h 77, 82, 97, 107, 114, 86, 92, 104, 96, 104

Do the following.

- 1. Phrase a null hypothesis and an alternative hypothesis.*
- 2. Define the test statistic that you want to use.*
- 3. Calculate the test statistic based on the data above.*
- 4. Calculate the p-value of the test.*
- 5. Decide whether you can reject the null hypothesis with a significance level of 5%,*

Session 2. Thursday

Exercise 2.1 *Exercise 11.4 p. 197 in Frisvold and Moe.*

Exercise 2.2 *Exercise 11.6 p. 201 in Frisvold and Moe.*

Exercise 2.3 *Exercise 11.9 p. 205 in Frisvold and Moe.*

Exercise 2.4 *Exercise 11.8 p. 204 in Frisvold and Moe.*

Exercise 2.5 *We want to develop an automatic system to count vehicles of different types (e.g. lorries, buses, MC-s, and cars) as they pass on the road. Such a device can be constructed using machine learning (artificial intelligence), but it must be tested. The probability of misclassification should be at most 2%.*

We run 1000 vehicles past the system and find that seven are misclassified and 9993 are correctly classified. Answer the following questions

- 1. Phrase a null hypothesis and an alternative hypothesis.*
- 2. Calculate the p-value of the test.*
- 3. In your opinion, is the performance of the system satisfactory? Give reasons for your answer.*