Practice Exam

Basic Concepts (30%), Graphics /Interpretation (20%), Choice of Tests (50%)

0.1 Terminologie, Basisbegrippen

'T' for True, and 'F' for false. Some questions refer to the following list of data. The numbers show how many questions were answered correctly in a language exam. The language learners tested were chosen randomly from all pupils in an elementary school.

$$4, 4, 5, 5, 6, 7, 8, 9$$

3. The 90%-confidence interval for this sample is smaller than the 99%-confidence interval. T F

4. A test that has results at the level $p = 0.01$ always has results significant at the level $p = 0.05$. T F

5. There are two modi (plural of 'modus'), namely four and five. T F

6. The confidence interval (see 3) takes into account information that may be missing due to schoolchildren who didn't show up for the test or schoolchildren who did not turn in an exam. T F

7. To check whether these data come from a population with $\mu = 6.7$ one could apply a χ^2 (Chi-Square) test of independence. T F

8. ANOVA may only be applied if all subgroups are normally distributed and have approximately the same sd (standard deviation). T F

9. Assume that the data above were used to estimate a population mean. Then the t-statistic would be appropriate because the number of data points is small. T F

10. A t-test on the data above would assume 7 degrees of freedom. T F

11. The significance level $p = 0.04$ means that there's 4% chance of seeing results as extreme as the sample if the null hypothesis is true. T F

12. You read an article in which results are analysed with help of a Kruskal-Wallis test and a significance level of $p = 0.0448$ is reported. The result is also significant at the level $p = 0.05$. T F

13. To check whether there are difference among three groups of schoolchildren, one might apply the t-test to all pairs (1-2, 2-3, 1-3). T F

14. The Wilcoxon signed rank test is applicable even when data are asymmetrically distributed. T F

15. χ^2 (Chi-Square) is often applied to see whether there's a dependency between two nominal variables. T F

Graphics

The graphic below shows for two samples of texts what percentage of sentences end in verb, noun and other parts of speech.

Cases weighted by FREQ
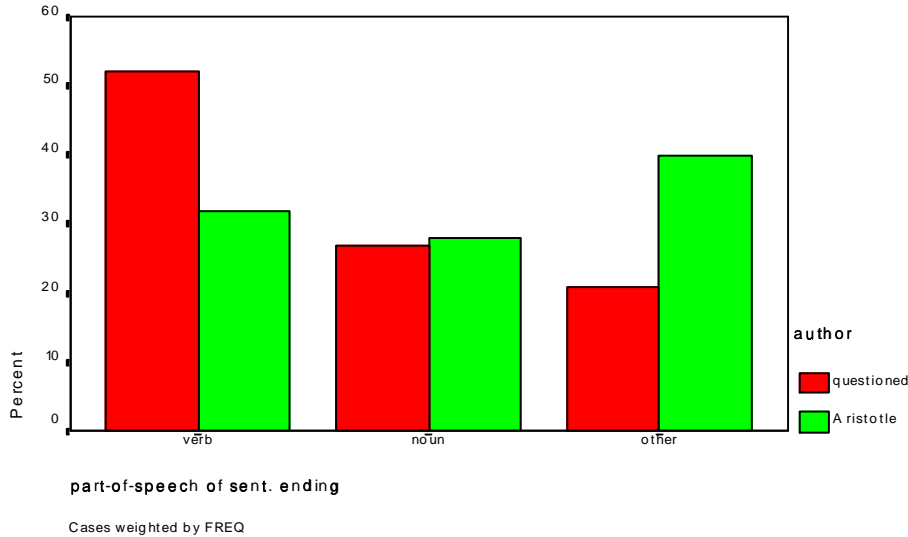
1. Is it correct to say that two relative *histograms* are shown in the graphic above?

2. What does the graphic suggest with respect to the variable "part-of-speech of sentence ending"?

3. Which statistical test can be used to check whether the difference in the pattern of the light bars vs. that shown by the dark bars is significant?

Interpretation

Below is the results of an ANOVA test.

Source	dF	SS	MSS	F	F-Prob.
between-g	3	79.9	26.6	.55	.64
within-g	36	1731.9	48.1		
Total	39	1811.8			

1. How many groups were compared in this ANOVA?

2. How many subjects (data points) groups were compared in total?

3. Which conditions would you check to be sure that ANOVA is applicable in this case?

4. What must H_0 have been (in general terms), en could it be rejected?

Tests

Choice of Test (10pt) You have to examine the results of an therapy program. There is a test available with mean 85 and sd 5.

It has been said that achievements are higher for patients who followed the program. You want to check whether the program really led to improvement.

You randomly select a sample of 25 patients who have followed the program. Their mean score is 87.5

1. Identify the null hypothesis and the alternative.

2. The test statistic is the mean. Is the test one-sided or two-sided?

3. Which test should you use? Motivate your answer.

Choice of Test (20pt) You want to see if there's connection between the age at which language is learned and the ability level that is eventually achieved. You're especially interested in the question of whether puberty is an important dividing line.

You have data over when people began learning a foreign language and how well they score on a standardized test. The data have the following form:

10	English	8
16	French	3
12	English	8
$\vdots$	$\vdots$	$\vdots$

An (indirect) test of the relationship could take the following form. One could divide the group into two, *under* 14 and 14 *or older*, and then test whether there is a difference between the age groeps. Assume that this has been done in order to answer the following questions.

1. Which test is applicable?

2. Formulate H_0 and H_a.

3. Assume that the distriution of test results turns out to be non-normal, but that you have 100 persons in each category. Should this change the design of the study (which test is applicable or how the null and alternative hypotheses are formulated)? Provide reasons with your answers.

Choice of Test (20pt) You want to see whether there's an important relation between native language and the sorts of syntactic errors that are made by aphasics. You distinguish three sorts of errors:

1. order: *girl pretty* instead of *pretty girl*

2. case (government): *him goes* instead of *he goes*

3. omission: *man left* instead of *The/a man left*

You have data on how often these errors arise in the speech of aphasics from three native language groups: English, Spanish and Japanese.

1. Which tests could be used?

2. Identify the statistical variables and there range of values.

3. Formulate H_0 and H_a.

4. How many degrees of freedom do you expect?

5. What else do you need to pay attention to in your study? (Provide reasons for your answer.)