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Case for:               **EXC 23041 Statistics**  
Case out:              **06.126.2005, 09.00**  
Exam:                  20.12.2005, 09.00-12.00  
Number of pages:     4

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## General information

The case analysis will be the basis for 15 out of the 30 multiple choice questions. You have to bring the case text and the results of your analysis to the exam. Your analysis will hopefully supply the answers to the exam questions. You will not be required to hand in your analysis.

The case is relatively open. The questions invite to different approaches and use of different statistical methods. You should focus on the approach you find the most interesting and the methods you find to be the most relevant.

As you do not know in advance the questions that will be asked, your analysis should be a broad one. The questions in the multiple choice exam are posed in such a way that, even if you haven't worked out the exact answer required, a thorough analysis of the case will enable you to choose the right answer.

You can analyse the case on your own or together with a group of other students. What is important is that you acquire an insight into the data material, that you understand the analytical methods used and that you are able to draw the right conclusions. The multiple choice exam is an individual exam.

## Case 1: Choice of surname at marriage

In the beginning of the 20th century the woman usually assumed her husband's family name at marriage. A new law in 1964, however, allowed for the opposite; and in 1979 men and women were made completely equal in this sense. But what is happening in practice – do we see equality? Table 1 shows the results of a survey that was conducted by the Central Bureau of Statistics and supported by the Norwegian Research Council. 6,317 women and men with at least one Norwegian-born parent participated in the survey.<sup>1</sup> The respondents filled in the questionnaire themselves. The sample was representative with a no-response rate of 37%, which is not unusual in this kind of postal inquiries.

**Table 1: Choice of surname at marriage after region. Married women (20-44 years old). Percent. Source CBS<sup>2</sup>**

Region	Retained own name as surname	Took husband's name as surname and own name as middle name	Only husband's name	N
Oslo and Akershus	29	42	29	274
Østlandet	18	43	39	377
Agder and Rogaland	14	51	35	257
Vestlandet	22	52	26	267
Trøndelag	10	54	36	119
Nord-Norge	24	38	38	140
Total Norway	20	46	34	1 434

- Descriptive statistics:* Make yourself familiar with the data (Weight 2)
- Equality:* What can be said about the ratio of women in the population that retains her own name? Could the ratio be as large as 50 %? (Weight 3)
- Regional differences:* Do the data indicate regional differences in the population? Which regions are most atypical? (Weight 3)

<sup>1</sup> Fremtidsplaner, familie og samliv (FFS 2003)

<sup>2</sup> <http://www.ssb.no/samfunnsspeilet/utg/200505/01/tab-2005-11-08-01.html>

## Case 2: Learning level

According to the SOLO<sup>3</sup> taxonomy in pedagogy, there are four different learning levels, from superficial to deep<sup>4</sup>. The theory predicts that most serious students will reach level 1, fewer level 2, still fewer level 3, and only a few level 4. Common types of questions in multiple choice exams in statistics can be connected to the four learning levels:

1. *Unistructural level*: Ability to repeat directly what is read or heard; ability to answer simple questions. Examples: Quoting key figures, computation of mean and median; direct interpretation of SPSS output.
2. *Multistructural level*: Ability to integrate several types of information. Example: Computation that requires several parameter values such as prognoses based on regression models.
3. *Relation level*: Ability to consider several types of knowledge in relation to each other. Examples: Evaluation of graphs and choice of method.
4. *Expanded abstract*: Ability to generalize and reflect. Examples: Making statements about reality based on the outcome of statistical tests. To apply the concept of probability on new problems.

The main question of the case is whether the SOLO theory accords with what we experience in the discipline of statistics. Table 2 shows a judgmental classification of the 30 questions that were given at the multiple-choice exam in the fall of 2004. You are supposed to consider these questions as a random sample from a large population of questions. The table shows question number, question class, SOLO level, as well as the percentage that answered right, R, wrong W, and did not answer, U. Regard the percentages as measurements and use the table to investigate the following issues:

### A. KEY FIGURES (WEIGHT 2)

Compute relevant key figures for percent right answers for different SOLO levels.

### B. COMPREHENSION OF THE WHOLE (WEIGHT 2)

Acquire a comprehension of the main features behind the data with illustrative graphs or other means.

### C. IS THE SOLO THEORY CORRECT? (WEIGHT 3)

Choose an appropriate test and compare SOLO level 1 with level 2, level 2 with level 3, and level 3 with level 4. (You need only consider the percentages of Right answers.)

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<sup>3</sup> Structure of the Observed Learning Outcome

<sup>4</sup> John Biggs (2003): *Teaching for quality learning at university*. 2<sup>nd</sup> ed. Open University Press

**Table 2: Question type and SOLO learning level, as well as percent Right, Wrong and Unanswered for the 30 questions that were given at the multiple-choice exam in the fall of 2004.**

Nr.	Type	SOLO	R	W	U
1	Quoting median	1	77	2	21
2	Evaluation of graph	3	30	48	22
3	Computation of conf. Int.	2	32	19	49
4	Test conclusion	4	85	5	10
5	Unidirectional interval	3	11	21	68
6	Choice of test	3	85	4	11
7	Test conclusion	4	72	13	15
8	Test conclusion	4	60	13	27
9	Test conclusion	4	83	6	11
10	Test conclusion	4	78	13	9
11	Evaluation of graph	3	72	7	21
12	Test conclusion	4	64	28	8
13	Test conclusion	4	69	11	20
14	Computation of conf. Int.	2	27	42	31
15	Prognosis	2	44	33	23
16	Output interpretation	1	64	15	21
17	Output interpretation	1	69	13	18
18	Output interpretation	1	62	23	15
19	Prognosis	2	31	32	37
20	Evaluation of graph	3	37	46	17
21	Computation	1	90	5	5
22	Computation	1	96	2	2
23	Computation	1	73	8	19
24	Computation	2	54	38	8
25	Test conclusion	4	30	50	20
26	Choice of method	3	61	14	25
27	Choice of method	3	52	15	33
28	Choice of method	3	67	16	17
29	Choice of method	3	56	14	30
30	Comprehension of probability	4	38	29	33