Package ‘klausuR’

February 20, 2015

Type    Package
Title   Multiple Choice Test Evaluation
Depends R (>= 2.9.0), xtable, psychometric, polycor, methods,
         graphics, tools
Enhances rkward
Description A set of functions designed to quickly generate results of a
       multiple choice test. Generates detailed global results, lists for
       anonymous feedback and personalised result feedback (in LaTeX
       and/or PDF format), as well as item statistics like Cronbach's alpha
       or discriminatory power. klausuR also includes a plugin for the R
       GUI and IDE RKWard, providing dialogs for its basic features. To
       use them, install RKWard from http://rkward.sf.net (plugins are
       detected automatically). Due to some restrictions on CRAN, the full
       package sources are only available from the project homepage.
License  GPL (>= 3)
Encoding UTF-8
LazyLoad yes
URL     http://r-forge.r-project.org/projects/klausur
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Date    2015-02-07
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         '00_class_03_klausuR.answ.R' '00_class_04_klausuR.mult.R'
         '01_method_plot.klausuR.R' '01_method_show.klausuR.R'
         '01_method_sort.klausuR.R' 'compare.R' 'grand.table.R'
         'klausuR-internal.R' 'klausuR-internal.roxy.all.R'
         'klausuR-package.R' 'klausur.R' 'klausur.data.R'
         'klausur.gen.R' 'klausur.gen.corr.R' 'klausur.gen.marks.R'
         'klausur.mufo.R' 'klausur.report.R' 'nret.rescale.R'
         'nret.translator.R'
Author  m.eik michalke [aut, cre]
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NeedsCompilation no
The klausuR Package

Description

Multiple Choice Test Evaluation.

Details

- Package: klausuR
- Type: Package
- Version: 0.12-10
- Date: 2015-02-07
- Depends: R (>= 2.9.0), xtable, psychometric, polycor, methods, graphics, tools
- Enhances: rkward
- Encoding: UTF-8
A set of functions designed to quickly generate results of a multiple choice test. Generates detailed global results, lists for anonymous feedback and personalised result feedback (in LaTeX and/or PDF format), as well as item statistics like Cronbach’s alpha or discriminatory power. klausuR also includes a plugin for the R GUI and IDE RKWard, providing dialogs for its basic features. To use them, install RKWard from http://rkward.sf.net (plugins are detected automatically). Due to some restrictions on CRAN, the full package sources are only available from the project homepage.

Author(s)

m.eik michalke

Sample dataset: antworten

Description

Sample data of a multiple choice test.

Usage

data(antworten)

Format

A data.frame with 20 observations of the following 37 variables.

no  Serial number for each subject (numeric vector)
name Family name (character vector)
FirstName First name (character vector)
MatrNo Matriculation number (numeric vector)
Pseudonym Pseudonym for anonymous feedback (character)
Item1 to Item30 given answers, only one answer per item (numeric vector)
Item31 to Item32 given answers, several answers per item (numeric vector)

Details

This data was anonymised and Items 31 and 32 modified, to demonstrate items with multiple answers as well.
Source
The data was taken from a final exam test in differential psychology at the Institute for Experimental Psychology of the Heinrich-Heine-University Düsseldorf, summer term 2009.

Examples
data(antworten)

Sample dataset: antworten.mufo

Description
Sample data of a multiple choice test with two test forms.

Usage
data(antworten.mufo)

Format
A data.frame with 20 observations of the following 38 variables.

No Serial number for each subject (numeric vector)
Name Family name (character vector)
FirstName First name (character vector)
MatrNo Matriculation number (numeric vector)
Pseudonym Pseudonym for anonymous feedback (character)
Item01 to Item30 given answers, only one answer per item (numeric vector)
Item31 to Item32 given answers, several answers per item (numeric vector)
Form Test form (character vector)

And a matrix called corr.key with indices for all items in the two test forms.

Details
The data is actually the same as antworten. But in this object the items of the last 10 test subjects were reversed, hence this is test form "b". As a convenience, a matrix called corr.key is also included. This data can be used to test klausur.mufo.

Source
The data was taken from a final exam test in differential psychology at the Institute for Experimental Psychology of the Heinrich-Heine-University Düsseldorf, summer term 2009.

Examples
data(antworten.mufo)
**compare**

**Comparison of data sets**

**Description**

The function `compare` will take two data frames (or objects of class `klausuR.answ-class`) and compare them for equality. This is useful to check for typos before you calculate the results with `klausur`. If you need to type in the given answers by hand, errors easily occur, so it is advisable to input all data at least twice (perhaps by different persons) and check for differences with this function, which can then be corrected by looking up the original answer in the test.

**Usage**

```r
compare(set1, set2, select = NULL, ignore = NULL, new.set = FALSE,
        rename = c(), trim = FALSE, id = list(No = "No", Name = c("FirstName",
        "Name")))
```

**Arguments**

- **set1, set2** The data sets to be compared. Can be two data.frames or objects of class `klausuR.answ-class`. If the latter, their slots `id` and `items` will be compared.

- **select** A vector with variables that should be compared, all others are omitted. At least all the values given in `id` are needed for the output! If `NULL`, all variables are examined.

- **ignore** A vector with variables that should be dropped from both sets. See also `select`.

- **new.set** Logical. If `TRUE`, a data.frame of the compared sets is returned, with all unequal cells set to `NA`.

- **rename** A named vector defining if variables in `set1` and `set2` need to be renamed into the `klausuR` name scheme. Accepts elements named `No`, `Name`, `FirstName`, `MatrNo`, `Pseudonym` and `Form`. The values of these elements represent the variable names of the input data.

- **trim** Logical. Indicates whether whitespace in character variables should be trimmed.

- **id** A named list of character vectors to help identify differing cases in the input data. The element names of this list will become column names in the generated output table, their values define the respective column names of the input data. If a value has more than one element, they will be collapsed into one string for the output.

**Details**

If you don’t want to compare all variables but only a subset, you can use the `select` option (see examples below). But be careful with this, at least all the values given in `id` are needed to produce the output table.

If `new.set=TRUE`, a new data.frame will be returned, that is identical in both sets compared, but all dubious values will be replaced by `NA`. 
Value

If new.set=FALSE, a data.frame of the differences, if found (if not, just a message is returned). Otherwise returns a combined data.frame (see details).

Author(s)

m.eik michalke <meik.michalke@uni-duesseldorf.de>

See Also

tau

Examples

```r
## Not run:
data(antworten)

# create some differences
antworten2 <- antworten[-3, -7]  # create differences
antworten2[4,6] <- NA
antworten2[8,8:10] <- antworten2[8,8:10] + 1

# default comparison
compare(antworten, antworten2)

# compare only variables 1 to 12
compare(antworten, antworten2, select=c(1:12))

# omit variables 3 to 8 and create a new set called "antworten.comp"
# from the results
antworten.comp <- compare(antworten, antworten2, select=-c(3:8), new.set=TRUE)

## End(Not run)
```

---

**grand.table**

*Export results to a table*

**Description**

Try this function to combine results from an evaluated test into a matrix and export it to a table, e.g. to import in other software products. It can be particularly helpful for ET/NRET coded tests, if you want to compare the results of different valid scoring functions.

**Usage**

```r
grand.table(NR.res = NULL, NRET.res = NULL, NRETp.res = NULL, ET.res = NULL, rescale = TRUE, file = NULL, csv2 = TRUE, encoding = "CP1252", ...)
```
klausur

Arguments

NR.res
An object of class klausur which was evaluated according to the NR scoring policy. Usual MC tests must be given as NR.res, too.

NRET.res
An object of class klausur which was evaluated according to the NRET scoring policy.

NRETp.res
An object of class klausur which was evaluated according to the NRET+ scoring policy.

ET.res
An object of class klausur which was evaluated according to the ET scoring policy.

rescale
Logical, whether ET/NRET scaled results should be rescaled by nret.rescale.

file
A character string giving a file name to save to. If NULL, no file will be written.

csv2
Logical. If FALSE, write.csv will be used instead of write.csv2.

encoding
Encoding of the exported table.

... Additional options for write.csv/write.csv2.

Value

A data.frame.

Note

For obvious reasons at least one of NR.res, NRET.res, NRETp.res or ET.res, or any combination of those, must be specified.

Author(s)

m.eik michalke <meik.michalke@uni-duesseldorf.de>

klausur Evaluate multiple choice tests

Description

The function klausur expects an object of class klausur.answ-class, containing some identification data on all subjects and their answers to the test items, a vector with the correct answers, and optionally a vector with marks assigned to the points achieved. It will compute global test results as well as some item analysis (including Cronbach’s alpha, discriminatory power and Lienert’s selection index of the test items), and anonymous feedback for the test subjects.

Usage

klausur(data, marks = NULL, mark.labels = NULL, items = NULL, wght = NULL, score = "solved", matn = NULL, na.rm = TRUE, cronbach = TRUE, item.analysis = TRUE, sort.by = "Name", maxp = NULL)
Arguments

data An object of class `klausurR.anaw-class`.
marks A vector assigning marks to points achieved (see details). Alternatively, set it to
"suggest" to let `klausur.gen.marks` calculate suggestions under the assump-
tion of normal distribution. If NULL, this value must be set in the data object.
mark.labels If marks="suggest", use these as the marks you want to give.
items Indices of a subset of variables in data to be taken as items.
wght A vector with weights for each item (named also according to Item###). If
null, the value from the data object will be used.
score Specify the scoring policy, must be one of "solved" (default), "partial",
"liberal","pick-n","NR","ET","NRET", or "NRET+".
matn A matriculation number of a subject, to receive detailed results for that subject.
na.rm Logical, whether cases with NAs should be ignored in data. Defaults to TRUE.
cronbach Logical. If TRUE, Cronbach's alpha will be calculated.
item.analysis Logical. If TRUE, some usual item statistics like difficulty, discriminatory
power and distractor analysis will be calculated.
sort.by A character string naming the variable to sort the results by. Set to c() to skip
any re-ordering. If cronbach is TRUE, too, it will include the alpha values if
each item was deleted.
maxp Optional numeric value, if set will be forced as the maximum number of points
achievable. This should actually not be needed, if your test has no strange errors.
But if for example it later turns out you need to adjust one item because it has two
instead of one correct answers, this option can become handy in combination
with "partial" scoring and item weights.

Details

For details on the expected data structure refer to `klausur.data`.

Scoring functions

In combination with multiple (correct) answers for certain items you can specify one of six scoring
policies via the score-parameter. If you set it to something othe than "solved", as the names may
suggest you allow partially given answers under the condition that the test subject didn't check
more alternatives than there are correct ones (that is, if you checked four alternatives where three
correct ones were possible, you're out):

- "solved" Multiple Choice: Check all correct alternatives. This is the default, which means
  that one will only get any points for an item if the answer was 100% correct (that is, all or
  nothing).
- "partial" Multiple Choice: Check all correct alternatives, allow partially given answers, but
  none of the distractors must be checked.
- "liberal" Multiple Choice: Check all correct alternatives, allow partially given answers,
  even distractors can be checked.
• "pick-n" Multiple Choice: Check all correct alternatives, allow partially given answers, even distractors can be checked. Difference to "liberal" is that you will also get points for unchecked distractors.

• "ET" Elimination Testing: In contrast to the usual MC procedure, eliminate/strike all wrong alternatives.

• "NRET" Number Right Elimination Testing: Like ET+MC, eliminate/strike all wrong alternatives and check the correct one.

• "NRET+" Number Right Elimination Testing, more strict: Like NRET, but if more alternatives are checked right than there are right answers, it will automatically yield to 0 points for that item.

• "NR" Number Right: The usual MC scoring, but works with ET/NRET data. It was implemented for completeness, e.g. to compare results of different scoring techniques.

An example for "solved", "partial" and "liberal": If an item has five answer alternatives, the correct answer is "134" and a subject checked "15", "solved" will give no point (because "15" is not equal to "134"), as will "partial" (because "5" is wrong), but "liberal" will give 1/3 (because "1" is correct), and "pick-n" will give 2/5 (because "1" was correctly checked and "2" correctly unchecked).

( )

(Number Right) Elimination Testing

Note that "ET", "NRET"/"NRET+" and "NR" will disable wght as of now, and need the data in different format than the other scoring functions (see klausur.data for details). klausur will evaluate each answer individually and sum up the points for each item. The alternative-wise evaluations will be documented in the trfls slot of the results. Therefore, in these cases that matrix is not boolean, but more complex. For each item and each subject, a character string represents the evaluated answer alternatives, with the following elements:

- P True positive: Alternative was checked as right and is right. Points: +1 (+ constant)
- p False positive: Alternative was checked as right but is wrong. Points: 0 (+ constant)
- N True negative: Alternative was checked as wrong and is wrong. Points: +1 (+ constant)
- n False negative: Alternative was checked as wrong but is right. Points: -(alternatives-1) (+ constant)
- 0 Missing: Alternative wasn’t checked at all. Points: 0 (+ constant)
- * Error: Alternative was checked both wrong and right. Points NRET+: 0 (+ constant); NR scores 1 point if this was the correct alternative, ET 1 point if it hit a wrong one, and NRET sums up the points for both the positive and negative answer (all + constant)

An example: If we have an item with four alternatives, and the third one is right (i.e., "=+-="), and a test subject considered the first alternative to be correct and eliminated all others (i.e., "+----"), it would be evaluated as "pNnN", that is 0+1-3+1=-1 point, not considering the constant. As you can see, it would be possible to end up with a negative sum of points. If you consider how in the end a mark will be assigned to the achieved points, this would be a problem, because a vector cannot have negative indices. To circumvent this issue, klausurR automatically adds a constant to all results, so that the worst possible result is not negative but 0. This constant is simply (alternatives-1), i.e. 3 for the example. In other words, if our test had 10 such items, the results minus 30 would be equivalent to scoring without that constant. You can use nret.rescale to remove the constant from the results afterwards.
Marks

The **assigned marks** are expected to be in a certain format as well (see `klausur.data` for details), as long as you don’t want `klausur` to suggest them itself. If you want to let `klausuR` make a suggestion, set `marks="suggest"`, and `klausur.gen.marks` kicks in and takes either the `mark.labels` you have defined here or will ask you step by step. See the documentation of that function for details. To see the suggested result in detail, have a look at the slot `marks` of the returned object.

To calculate Cronbach’s alpha and item analysis methods from the package `psychometric` are used. Lienert’s selection index (“Selektionskennwert”) aims to consider both discriminatory power (correlation of an item with the test results) and difficulty to determine the quality of an item. It is defined as

\[
S = \frac{r_{it}}{2 \times \sqrt{Difficulty \times (1 - Difficulty)}}
\]

Value

An object of class `klausuR-class` with the following slots.

- `results`: A data.frame with global results
- `answ`: A data.frame with all given answers
- `corr`: A vector with the correct answers
- `wght`: A vector with the weights of items
- `points`: A data.frame with resulting points given for the answers
- `marks`: A vector with assignments of marks to achieved score
- `marks.sum`: A more convenient matrix with summary information on the defined marks
- `trfls`: A data.frame of TRUE/FALSE values, whether a subject was able to solve an item or not
- `anon`: A data.frame for anonymous feedback
- `mean`: A table with mean, median and quartiles of the test results
- `sd`: Standard deviation of the test results
- `cronbach`: Internal consistency, a list of three elements ”alpha”, ”ci” (confidence interval 95%) and ”deleted” (alpha if item was removed)
- `item.analysis`: A data.frame with information on difficulty, discriminatory power, discriminant factor and Lienert’s selection index of all items.
- `distractor.analysis`: A list with information on the selected answer alternatives for each individual item (only calculated if `item.analysis=TRUE`). Also lists the discriminatory power of each alternative, being the point-biserial (a.k.a Pearson) correlation of it with the global outcome.
- `misc`: Anything that was stored in the `misc` slot of the input data.

Not all slots are shown by default (refer to `show` and `plot`).
Note

klausur allows some tweaks that are probably not as useful as they seem. For instance, having items with more than one correct answer doesn’t necessarily yield more diagnostic information, allowing for those being answered partially adds to that, and binding marks blindly to a normal distribution can give quite unfair test results! In addition, please do always check a sample of the results to make sure no errors occurred.

Author(s)

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See Also

klausur.data, klausur.report, compare, klausur.gen, klausur.gen.marks, klausur.gen.corr, plot, psychometric

Examples

data(antworten)

# vector with correct answers:
richtig <- c(Item01=3, Item02=2, Item03=2, Item04=2, Item05=4, Item06=3, Item07=4, Item08=1, Item09=2, Item10=2, Item11=4, Item12=4, Item13=2, Item14=3, Item15=2, Item16=3, Item17=4, Item18=4, Item19=3, Item20=5, Item21=3, Item22=3, Item23=1, Item24=3, Item25=1, Item26=3, Item27=5, Item28=3, Item29=4, Item30=4, Item31=13, Item32=234)

# vector with assignment of marks:
notenschluessel <- c()
# scheme of assignments: marks[points_from:to] <- mark
notenschluessel[0:12] <- 5.0
notenschluessel[13:15] <- 4.0
notenschluessel[16:18] <- 3.7
notenschluessel[19:20] <- 3.3
notenschluessel[21] <- 3.0
notenschluessel[22] <- 2.7
notenschluessel[23] <- 2.3
notenschluessel[24] <- 2.0
notenschluessel[25:26] <- 1.7
notenschluessel[27:29] <- 1.3
notenschluessel[30:32] <- 1.0

# now combine all test data into one object of class klausur.answ
data.obj <- klausur.data(answ=antworten, corr=richtig, marks=notenschluessel)

# if that went well, get the test results
klsr.obj <- klausur(data.obj)

# to try pick-n scoring, we must also define all distractors
falsch <- c(Item01=1245, Item02=1345, Item03=1345, Item04=1345, Item05=1235,
```r
Item06=1245, Item07=1235, Item08=2345, Item09=1345, Item10=1345, Item11=1235,
Item12=1235, Item13=1345, Item14=1245, Item15=1345, Item16=1245, Item17=1235,
Item18=1235, Item19=1245, Item20=1234, Item21=1245, Item22=1245, Item23=2345,
Item24=1245, Item25=2345, Item26=1245, Item27=1234, Item28=1245, Item29=1235,
Item30=1235, Item31=2345, Item32=15)

data.obj <- klausur.data(answ=antworten, corr=richtig, wrong=falsch,
marks=notenschluessel)
klsr.obj <- klausur(data.obj, score="pick-n")

# example for an NRET test
# load sample data in SPSS format
data(spss.data)
# define correct answers
spss.corr <- c(
  item01=2, item02=3, item03=3, item04=3, item05=2,
  item06=2, item07=3, item08=1, item09=1, item10=2)

# convert into klausuR type coding
klausur.data <- nret.translator(spss.data, spss="in")
klausur.corr <- nret.translator(spss.corr, spss="in", corr=TRUE,
num.alt=3, spss.prefix=c(corr="item"))

# now create the data object; "Nickname" must be renamed
data.obj <- klausur.data(answ=klausur.data, corr=klausur.corr,
rename=c(Pseudonym="Nickname"))

# finally, the test can be evaluated, using the scoring functions available
NRET.results <- klausur(data.obj, marks="suggest", mark.labels=11, score="NRET")
NRETPlus.results <- klausur(data.obj, marks="suggest", mark.labels=11, score="NRET+"
NR.results <- klausur(data.obj, marks="suggest", mark.labels=11, score="NR")
ET.results <- klausur(data.obj, marks="suggest", mark.labels=11, score="ET")
```

---

```r
# klausuR-class

**Class klausuR**

**Description**

This class is used for objects that are returned by `klausur`.

**Slots**

- `results` A data.frame with global results
- `answ` A data.frame with all given answers
- `corr` A vector with the correct answers
- `wght` A vector with the weights of items
- `points` A data.frame with resulting points given for the answers
```
**marks** A vector with assignments of marks to achieved score

**marks.sum** A more convenient matrix with summary information on the defined marks

**trfls** A data.frame of TRUE/FALSE values, whether a subject was able to solve an item or not

**anon** A data.frame for anonymous feedback

**mean** A table with mean, median and quartiles of the test results

**sd** Standard deviation of the test results

**cronbach** Internal consistency, a list of three elements "alpha", "ci" (confidence interval 95%) and "deleted" (alpha if item was removed)

**item.analysis** A data.frame with information on difficulty, discriminant power, discriminant factor and selection index of all items.

**distractor.analysis** A list with information on the selected answer alternatives for each individual item.

**test** Currently an empty placeholder. Planned to hold the actual test items in future releases.

**misc** Anything that was stored in the misc slot of the input data.

---

*Description*

This class is used for objects needed by klausur. They contain all relevant data to calculate test results.

*Slots*

**corr** Contains three elements:

- **corr** The correct answers to each item.
- **corr.key** An optional data.frame or matrix for test with multiple test forms, indicating the positions of all items (columns) in all forms (rows). Must have a column called Form (like in id), and the item columns must follow the usual name scheme Item###. NULL if not needed.
- **wrong** For pick-n scoring, this is the inverse of corr, i.e., all wrong item alternatives.

**id** Contains the columns No, Name, FirstName, MatrNo, Pseudonym and Form.

**items** Contains a copy of id$MatrNo and all answers to the test items (one item per column).

**score** Contains three elements:

- **marks** The assigned marks for achieved points (NULL if none)
- **wght** Weights for each item (NULL if none)
- **maxp** Optional, to force a certain maximum points value (NULL if none)

**test** Currently an empty placeholder. Planned to hold the actual test items in future releases.

**misc** Any additional data you’d like to be stored along with id and items, e.g. table data from/for other software products. Won’t be used for anything.
Note
The slots .id,.items and .misc, must have the same number of rows and contain copies of the column MatrNo for identification.

klausur.data
A function to create data objects with given and correct answers to a test.

Description
klausur.data automatically parses the variable names in answ to decide which variables are actual test items, if they are named according to the given scheme Item###. To help in constructing a data.frame with correct column names one can call the klausur.gen utility to generate an empty data object of a given number of items and test subjects.

Usage
```r
klausur.data(answ, corr, items = NULL, marks = NULL, wght = NULL,
corr.key = NULL, rename = c(), dummies = c(), disc.miss = FALSE,
na.rm = TRUE, item.prefix = c(), sort.by = "Name", maxp = NULL,
wrong = NULL, keep.cases = NULL, recode.na = 0)
```

Arguments
- **answ**: A `data.frame` which has to include at least these variables: No, Name, FirstName, MatrNo, as well as Pseudonym (optional) and variables for the answered items (according to the scheme Item###, where ### is a number with leading zeros, if needed).
- **corr**: A vector with the correct answers to all items in answ (named also according to Item###).
- **items**: Indices of a subset of variables in answ to be taken as items.
- **marks**: A vector assigning marks to points achieved (see details). Leave NULL if not available.
- **wght**: A vector with weights for each item (named also according to Item###). Leave NULL if not available.
- **corr.key**: If test has several test forms: A data.frame or matrix indicating the positions of all items (columns) in all forms (rows). Must have a column called Form (like answ), and the item columns must follow the explained name scheme Item###. NULL if not needed.
- **rename**: A named vector defining if variables in answ need to be renamed into the klausurR name scheme. Accepts elements named No, Name, FirstName, MatrNo, Pseudonym and Form. The values of these elements represent the variable names of the input data.
klausur.data

**dummies**
A vector of dummy variables to be created, e.g. if you don’t need/want actual data in the id slot. Can include "No", "Name", "FirstName", "MatrNo" and "Pseudonym". Columns will just be filled with increasing integers.

**disc.misc**
Logical. If TRUE, left over columns from answ will not be stored in slot misc but silently discarded.

**na.rm**
Logical, whether cases with NAs should be ignored in answ. Defaults to TRUE.

**item.prefix**
A named character vector with two optional elements, item and corr, defining the name prefix used for the items in the test data and the vector with correct answers, respectively. Defaults to item="Item" and corr="Item".

**sort.by**
A character string naming the variable to sort the answ data by. Set to c() to skip any re-ordering.

**maxp**
Optional numeric value, if set will be forced as the maximum number of points achievable. This should actually not be needed, if your test has no strange errors. But if for example it later turns out you need to adjust one item because it has two instead of one correct answers, this option can become handy in combination with "partial" scoring and item weights.

**wrong**
If you want full pick-n scoring: A vector similar to corr, but this time listing all alternatives that are wrong.

**keep.cases**
A vector of MatrNo values, if you want to prevent these cases from being dropped even if they contain missing data. If not NULL, missing values in all test items are replaced by the value given to recode.na, before na.rm is evaluated.

**recode.na**
A value to replace missing data with in all cases specified by keep.cases. Ignored if keep.cases=NULL.

**Details**
If you have **items with multiple correct answers** you can easily code these as one single item: All alternatives a subject has marked should be combined to a single value without spaces. The vector with correct answers will have to be coded accordingly, of course. An example: If someone marked the first, third and fourth answer, you would code this as "134". See klausur.gen.corr for a helpful function to create such an answer vector. Internally klausur checks for equality of given answers and correct values, that is, it will only give that person a point if the correct answer was coded as "134" as well.

**Data for (Number Right) Elimination Testing**
If your test is to be evaluated according to elimination testing (ET), number right elimination testing (NRET) or number right (NR, which is actually multiple choice) scoring, the data has to be in a different format: In contrast to the usual MC procedure, ET items are answered by eliminating all alternatives a subject considers wrong; in an NRET test subjects are asked to eliminate all wrong alternatives and mark the one they consider the correct answer. That is, for both scoring functions, you need to know for each answer alternative whether a subject saw it as right, wrong or was not sure and left it open.

In this implementation, these answers are to be coded as a plus sign "+" (right answer), a minus sign "-" (wrong answer) or a zero "0" (missing). If you need to code errors (like both 'right' and 'wrong' have been marked), use the asterisk "*" for these cases. All answers to one item belong into one column. E.g., if you have four answer alternatives, a subject thought the second one to be
the correct answer and eliminated the rest, you’d have to code this item as "-+-". The same is true for the vector of correct answers, of course.

**Marks**

The **assigned marks** are expected to be in a certain format as well, as long as you don’t want `klausur` to suggest them itself. Just create an empty vector to start with (say `your.marks <- c()` and fill it according to the scheme `your.marks[<points from>:<points to>] <- <mark>`. For example: Should one get a 1.7 if in sum 27 to 30 points were achieved, you’d assign these points as indices to the vector with `your.marks[27:30] <- "1.7"` (see example section below). It is crucial to assign marks to the whole range of points that can be achieved in the test. On the other hand, it’s irrelevant whether you assign decimal marks as in the example, only integer values, a 15 marks scheme or whatever. The convenience function `klausur.gen.marks` can assist you in creating such a valid vector.

**Value**

An object of class `klausur.answ-class`.

**Examples**

data(antworten)

# vector with correct answers:
richtig <- c(Item01=3, Item02=2, Item03=2, Item04=2, Item05=4, Item06=3, Item07=4, Item08=1, Item09=2, Item10=2, Item11=4, Item12=4, Item13=2, Item14=3, Item15=2, Item16=3, Item17=4, Item18=4, Item19=3, Item20=5, Item21=3, Item22=3, Item23=1, Item24=3, Item25=1, Item26=3, Item27=5, Item28=3, Item29=4, Item30=4, Item31=13, Item32=234)

# vector with assignment of marks:
notenschluessel <- c()
# scheme of assignments: marks[points_from:to] <- mark
notenschluessel[0:12] <- 5.0
notenschluessel[13:15] <- 4.0
notenschluessel[16:18] <- 3.7
notenschluessel[19:28] <- 3.3
notenschluessel[21] <- 3.0
notenschluessel[22] <- 2.7
notenschluessel[23] <- 2.3
notenschluessel[24] <- 2.0
notenschluessel[25:26] <- 1.7
notenschluessel[27:29] <- 1.3
notenschluessel[30:32] <- 1.0

# now combine all test data into one object of class klausur.answ
data.obj <- klausur.data(antworten, corr=richtig, marks=notenschluessel)

# if that went well, get the test results
klsr.obj <- klausur(data.obj)
**klausur.gen**

*Generate empty data sets for the use with klausur*

**Description**

Generate empty data sets for the use with klausur

**Usage**

```r
klausur.gen(items = NULL, obs = 1, items.char = FALSE)
```

**Arguments**

- **items**: An integer declaring the number of items to be created
- **obs**: Integer, number of observations
- **items.char**: Logical, will the answers be coded as characters or integer numbers (default)?

**Value**

A data.frame containing the variables "No", "Name", "FirstName", "MatrNo", "Pseudonym", "Form" and the number of items as needed.

**Author(s)**

m.eik michalke <meik.michalke@uni-duesseldorf.de>

**See Also**

klausur, compare, klausur.gen.mark, klausur.gen.corr

**Examples**

```r
antworten2 <- klausur.gen(items=20, obs=40)
```

---

**klausur.gen.corr**

*A function to generate a vector with correct answers*

**Description**

Create a vector of correct answers to be used by klausur.

**Usage**

```r
klausur.gen.corr(answ = NULL, items.char = FALSE, test.forms = 1)
```
Arguments

answ Either an object with item names in klausuR scheme (see klausur), e.g. your observation data, or an integer representing the maximum score of the test. If NULL, you will be asked for the maximum score.

test.forms An integer value specifying how many parallel test forms are available

Details

By default answers are expected to be numeric values. You can change that to character with items.char=TRUE.

The parameter answ is quite versatile. You can just feed it your observation data, if it complies with the naming scheme for items (Item###, see also klausur.gen), and klausur.gen.corr will use all of its items automatically. Or you assign the number of items directly as an integer value. If you leave answ=NULL, you will be asked for the number of items.

Value

A numeric or character vector (depending on the parameter items.char).

Author(s)

m.eik michalke <meik.michalke@uni-duesseldorf.de>

See Also

klausur

Examples

```r
## Not run: richtig <- klausur.gen.corr(answ=antworten)
## End(Not run)
```

klausur.gen.marks  Generate mark assignments

Description

Create a vector of marks to be used by klausur.

Usage

klausur.gen.marks(mark.labels = NULL, answ = NULL, wght = NULL, 
suggest = list(mean = NULL, sd = NULL), minp = 0)
Arguments

mark.labels

Either a vector with labels (names) for all marks that should be assigned to certain test scores, or one of the arguments 6, 11, 16, "DIHK", "UK", "USA" or "A" (see Details). If NULL, you will be asked to type in labels.

answ

Either an object with item names in klausuR scheme (see klausur), e.g. your observation data, or an integer representing the maximum score of the test. If NULL, you will be asked for the maximum score.

wght

A vector with weights for each item. If NULL, the number of items is used as maximum score, that is, each item gives a point.

suggest

A list with the elements mean and sd. If both are not NULL, this function will suggest marks for achieved points assuming normal distribution. That is, "mean" and "sd" should be set to the corresponding values of the test’s results.

minp

An integer value, in case there is a minimum score no-one can fall below (which can happen, e.g., with ET/NRET scoring and different numbers of answer alternatives). Should be left as is in most cases.

Details

If mark.labels is set to one of the arguments 6, 11, 16, "DIHK", "UK", "USA" or "A", often used schemes for marks will be used as a preset. In case of mark.labels=6, marks will go from 1 (best) to 6 (failed), as widely used in German schools. In case of mark.labels=11, marks will range from 1.0 (best) to 5.0 (failed), with the marks 1 through 3 being split into three decimal steps .0, .3 and .7, as is often used in academic institutions. In case of mark.labels=16, marks will be a range of points from 15 (best) to 0 (failed), as often used in German gymnasiums. If mark.labels="A", marks A to F are given.

For the other cases some more probably useful assumptions are being made, which percentage of achieved points leads to which mark. If mark.labels="DIHK", marks will be 1 through 6, and calculated according to usual standards of the Deutsche Industrie und Handelskammer (1 > 92%, 2 > 81%, 3 > 67%, 4 > 50%, 5 > 30%, 6 below that). If mark.labels="UK", marks are A > 90%, B > 65%, C > 35%, D > 10% and E below that, and for mark.labels="USA" it's A > 90%, B > 80%, C > 70%, D > 60% and F below that. Please note that the percentages indicate individual test results and not "the best X percent of the sample". If you’d rather use your own system, either declare it as a vector, or leave as NULL, and you’ll be asked (be sure to begin with the worst mark!).

The parameter answ is quite versatile as well. You can just feed it your observation data, if it complies with the naming scheme for items (Item##, see also klausur.gen), and klausur.gen.marks will calculate the maximum score automatically. Or you assign the maximum directly as an integer value.

Another feature can be toggled with the parameter suggest. If you feed it with the mean and standard deviation values of your test’s results, marks are automatically assigned to the achieved score under the assumption of normal distribution. Please understand that the naming "suggest" is not an accident! This is only a suggestion, please review it, tweak it, revise it, until it fits your needs. However, this feature can directly be called by klausur.

Value

A character vector.
Author(s)

m.eik michaelke <meik.michaelke@uni-duesseldorf.de>

See Also

klausur

Examples

## Not run:
notenschluessel <- klausur.gen.marks(mark.labels=11, answ=antworten)

## End(Not run)

---

**klausur.mufo**  
*Evaluate multiple choice tests with several test forms*

Description

This function can be used to evaluate tests that have several test forms. Please be aware that its results only make sense if each test form uses the same items, only in a different order.

Usage

```r
klausur.mufo(data, marks = NULL, mark.labels = NULL, items = NULL, wght = NULL, score = "solved", matn = NULL, na.rm = TRUE, cronbach = TRUE, item.analysis = TRUE)
```

Arguments

- **data** An object of class `klausuR.answ-class`.
- **marks** A vector assigning marks to points achieved (see details). Alternatively, set it to "suggest" to let `klausur.gen.marks` calculate suggestions under the assumption of normal distribution. If NULL, this value must be set in the data object.
- **mark.labels** If `marks`="suggest", use these as the marks you want to give.
- **items** Indices of a subset of variables in `answ` to be taken as items.
- **wght** A vector with weights for each item (named also according to Item##). If NULL, the value from the data object will be used.
- **score** Specify the scoring policy, must be one of "solved" (default), "partial", "liberal", "NR", "ET", "NRET", or "NRET+".
- **matn** A matriculation number of a subject, to receive detailed results for that subject.
- **na.rm** Logical, whether cases with NAs should be ignored in data. Defaults to TRUE.
- **cronbach** Logical. If TRUE, Cronbach's alpha will be calculated.
- **item.analysis** Logical. If TRUE, some usual item statistics like difficulty and discriminatory power will be calculated. If cronbach is TRUE, too, it will include the alpha values if each item was deleted.
Details

Firstly, klausur.mufo will compute partial results for each parallel form, and in the end combine these to global results. Cronbach alpha and item analysis will be calculated for all subjects accordingly, therefore the test items of all tests will be re-ordered to fit the order of the first given test form (this does not apply to the partial results).

The parameters are mostly the same as those for klausur. However, in the data object the slot corr must also contain corr.key, to communicate the order of items in each test form, and the slot id needs one additional variable called Form.

An example: You have prepared a test in two different parallel forms "A" an "B", So in addition to the variables in data@id you need to create a variable called Form, to document which test subject was given which test form. Since form "B" holds the same items as form "A", only in a different order, we only need to define these positions and we’re done. Therefore corr.key must be a matrix or data.frame, again with a column called "Form", one column for each item, and one row of data for each test form. That is, you’d need one row for test form "A" and one for test form "B", giving an index for each item where it is placed in the form. For "A" this is simply ascending numbers from 1 to how many questions you asked, but for row "B" each number indicates at which position an item of "A" is to be found. See the example below.

Value

An object of class klausur.mult-class with the following slots.

forms A character vector naming all test forms
results.part A list of objects of class klausur, holding all partial results
results.glob An object of class klausur with the global results

Not all slots are shown by default (refer to show).

Author(s)

m.eik michalke <meik.michalke@uni-duesseldorf.de>

See Also

klausur, klausur.data

Examples

# this will create the data.frame "antworten.mufo"
# and the matrix "corr.key"
data(antworten.mufo)

# vector with correct answers:
richtig <- c(Item01=3, Item02=2, Item03=2, Item04=2, Item05=4,
Item06=3, Item07=4, Item08=1, Item09=2, Item10=2, Item11=4,
Item12=4, Item13=2, Item14=3, Item15=2, Item16=3, Item17=4,
Item18=4, Item19=3, Item20=5, Item21=3, Item22=3, Item23=1,
Item24=3, Item25=1, Item26=3, Item27=5, Item28=3, Item29=4,
Item30=4, Item31=13, Item32=234)
# vector with assignment of marks:
notenschlüssel <- c()
# scheme of assignments: marks[points_from:to] <- mark
notenschlüssel[0:12] <- 5.0
notenschlüssel[13:15] <- 4.0
notenschlüssel[16:18] <- 3.7
notenschlüssel[19:20] <- 3.3
notenschlüssel[21] <- 3.0
notenschlüssel[22] <- 2.7
notenschlüssel[23] <- 2.3
notenschlüssel[24] <- 2.0
notenschlüssel[25:26] <- 1.7
notenschlüssel[27:29] <- 1.3
notenschlüssel[30:32] <- 1.0

# now combine all test data into one object of class klausur.answ
mufo.data.obj <- klausur.data(answ=antworten.mufo, corr=richtig, marks=notenschlüssel, corr.key=corr.key)
# expect some warnings here, because some items have no variance
# in their subtest results, hence item analysis fails on them
klsr.mufo.obj <- klausur.mufo(mufo.data.obj)

---

klausur_R.mult-class  

Class klausur_R.mult

Description

This class is used for objects that are returned by *klausur.mufo*.

Slots

forms  
A vector with the names of all test forms.

results.part  
A list with the partial results of each test form

results.glob  
An object of class klausur-class with overall results

---

klausur.report  

Generate individual reports on multiple choice test results

Description

*klausur.report* takes (at least) an object of class klausur (or klausur.mult) and a matriculation number to generate personal test results in LaTeX and/or PDF format.
Usage

klausur.report(klsr, matn, save = FALSE, pdf = FALSE, path = NULL,
    file.name = "matn", hist = list(points = FALSE, marks = FALSE),
    hist.merge = list(), hist.points = "hist_points.pdf",
    hist.marks = "hist_marks.pdf", descr = list(title = NULL, name = NULL,
        date = NULL), marks.info = list(points = FALSE, percent = FALSE),
    lang = "en", alt.candy = TRUE, anon.glob.file = "anon.tex",
    decreasing = TRUE, sort.by = "Points", NRET.legend = FALSE,
    table.size = "auto", merge = FALSE, quiet = FALSE)

Arguments

klsr  An object of class klausuR or klausuR.mult. To create reports from more than
one object with the same configuration, you can also give them in one list here,
which will cause the function to call itself recursively.

matn  Matriculation number, "all" (produces individually documents for all subjects),
"anon" (produces anonymous feedback) or "glob" (produces a global results
document).

save  Logical: If TRUE, files are saved to disk (scheme: "path/matn.tex").

pdf   Logical: If TRUE, LaTeX reports will be converted to PDF automatically, using
texi2dvi. If save is FALSE, a temporary directory is used, that is only the PDF
files will be saved.

path  Path for save and hist files.

file.name  File name scheme for the reports, either "matn" (matriculation number) or "name"
(name and firstname).

hist  A list with the logical elements points and marks: If TRUE, the reports will
include histograms of the distribution of points and/or marks. The needed PDF
files will be created by plot and saved as well. (see path, hist.points and
hist.marks).

hist.merge  If you need/want to combine results from several klausuR class objects for the
histograms, provide them all in a list here.

hist.points  File name for the histogram of points.

hist.marks  File name for the histogram of marks.

descr  Details on the test: List with the elements title (title of the test), name (your
name) and date.

marks.info  A list with the logical elements points and percent: If TRUE, the reports
will include a table showing how marks were assigned to points achieved and/or
percent solved, respectively.

lang  Set to "de" for reports in German, English is the default.

alt.candy  If TRUE, a comma will be inserted for items with multiple alternatives ("235"
becomes "2, 3, 5" in the printout)

anon.glob.file  If matn="anon" or matn="glob", you can specify a filename for this particular
report.
decreasing Logical, whether sorting of output should be done increasing or decreasing (only relevant for matn="anon" or matn="glob").

sort.by Character string naming a variable to sort the results by. Defaults to "Marks" (only relevant for matn="anon" or matn="glob").

NRET.legend Logical, If ET/NRET data is reported, you can demand a legend in the table caption by setting this to true.

table.size Character string to shrink the tables, must be one of "auto", "normalsize", "small", "footnotesize", "scriptsize" or "tiny". The default table.size="auto" tries to decide between "normalsize" and "footnotesize" to avoid pages with only one or two rows. If that fails, try to manually set the size.

merge Logical, if TRUE no individual PDFs will be saved, but one large file with all reports. Uses the "pdfpages" package, and only useful if pdf=TRUE as well.

quiet Logical, if TRUE no feedback messages on the current status are given.

Details

The report contains, next to the individual results, a table with all given and correct answers (using xtable), as well as nice histograms showing the distribution of the test results (points and/or marks are supported). If the matriculation numer is set to "all", reports for all subjects are produced. Setting it to "anon" will get you a printable version of the anonymized results.

By default output is sent to standard out. To save them to disk in LaTeX format a "save" parameter is provided. Alternatively, the reports can be converted to PDF format as well. klausur.report is calling texi2dvi from the tools package for that.

If the object is of class klausuR.mult, only the global results for tests with several test forms are evaluated. In case you'd rather like reports on each test form, call klausur.report with the single slots from that object accordingly.

Value

One or several LaTeX and/or PDF documents. If defined two histograms will be plotted.

Author(s)

m.eik michalke <meik.michalke@uni-duesseldorf.de>

See Also

klausur, xtable, texi2dvi

Examples

data(antworten)

# vector with correct answers:
richtig <- c(Item01=3, Item02=2, Item03=2, Item04=2, Item05=4, Item06=3, Item07=4, Item08=1, Item09=2, Item10=2, Item11=4, Item12=4, Item13=2, Item14=3, Item15=2, Item16=3, Item17=4, Item18=4, Item19=3, Item20=5, Item21=3, Item22=3, Item23=1,
klausuR.test-class

Description

This class is currently an empty placeholder. In future releases, it is planned to contain the actual test items in a list like format.

Slots

items Empty dummy.

nret.rescale Rescale test evaluation results

Description

By default klausur adds a constant to results of ET/NRET type tests. This ensures that the minimum value of points can’t fall below zero. If you’d rather like to see the results without this constant, i.e. results can be negative, you can rescale them with this function.
Usage

nret.rescale(res.obj, score = "NRET", points = TRUE, percent = TRUE, marks = TRUE)

Arguments

- `res.obj`: An object of class `klausuR` with results of an ET/NRET coded test.
- `score`: Either "NR", "ET", "NRET" or "NRET+", defining the scoring function used.
- `points`: Logical, whether point values should be rescaled.
- `percent`: Logical, whether the percentage of received points should be rescaled, so that 0 points are 0 percent.
- `marks`: Logical, whether the assigned marks should be rescaled to fit the rescaled points (probably a good idea). However, this will removed the attached mark assignment vector, since its indices can't be negative.

Value

An object of class `klausuR` with rescaled results.

Author(s)

m.eik michalke <meik.michalke@uni-duesseldorf.de>

nret.translator

Convert NRET/ET data between klausuR and other software

Description

This function should help to interchange answer data between R and other statistical software packages – especially SPSS, but it's probably useful for other products as well.

Usage

nret.translator(dat, items = NULL, spss = "out", corr = FALSE, num.alt = NULL, klausuR.alt = c(is.true = "+", is.false = "-", missing = "0", err = "*"), spss.alt = c(is.true = "2", is.false = "1", missing = "0", err = "3"), rm.old.vars = TRUE, items.only = FALSE, klausuR.prefix = c(), spss.prefix = c())

Arguments

- `dat`: A data.frame, the object to convert.
- `items`: Optional vector defining the columns to convert. If NULL, the function will try to autodetect Items: klausuR type items are expected to be named "ItemXXX", with XXX indicating the item number, SPSS type items "itemXXXaYY", with XXX indicating the item number and YY the number of the answer alternative.
spss
Either "in" or "out", depending on the direction of conversion.
corr
Logical. Set to TRUE if dat is a vector with the correct answers. If corr=TRUE and spss="in", you must also set num.alt accordingly!
num.alt
A numeric value defining the number of answer alternatives for each item. Can be a vector, if items have different numbers of options. If it is shorter than the number of items, it will be repeated for all items.
klausur.alt
A named vector defining the codes for klausur type of answers.
spss.alt
A named vector defining the codes for SPSS type of answers.
rm.old.vars
Logical. If TRUE, the converted columns will not be returned. Only relevant if corr=FALSE.
items.only
Logical. If TRUE, only the converted columns will be returned. Only relevant if corr=FALSE.
klausur.prefix
A named character vector with two optional elements, item and corr, defining the name prefix used for the items in the test data and the vector with correct answers, respectively. Defaults to item="Item" and corr="Item".
spss.prefix
Like klausur.prefix, but for the SPSS data. Defaults to item="item" and corr="corr".

Details
klausur expects data in a special format if it should be evaluated according to (Number Right) Elimination Testing (NRET/ET), only one variable per item. Other software products might not be able to process this rather condensed format. In that case, you will most likely need several variables for each item, i.e. one per answer alternative. Adding to that, the coding of answers is by default done with "+", ",", "0" and "*" in klausur, again a solution that might confuse other products.

This function translates data in both directions, and does also convert vectors giving the correct answer. The latter will turn a klausur type answer string into a number indicating the correct alternative (and the other way round). This means that it will only work if there’s exactly one valid answer to each item. If you convert towards SPSS, the resulting list will also include SPSS syntax to define variables respectively.

Value
If corr=FALSE, a data.frame with more or less columns (depending on rm.old.vars and items.only). If corr=TRUE, returns a named vector if spss="in" and a list if spss="out" (containing SPSS syntax in the element syntax and also a named vector, called answ).

Note
The conversion is done on an object basis, that is, nret.translator will not open or write files, but take and return R objects. The function should ignore any other columns/variables in the object.

Author(s)
m.eik michalke <meik.michalke@uni-duesseldorfe>
See Also

klausur

Examples

## Not run:
# from SPSS to R
data(spss.data)
klausuR.data <- nret.translator(spss.data, spss="in")
spss.corr <- c(item01=2, item02=3, item03=3, item04=3, item05=2,
item06=2, item07=3, item08=1, item09=1, item10=2)
klausuR.corr <- nret.translator(spss.corr, spss="in", cor=true, num.alt=3)

# from R to SPSS
spss.data <- nret.translator(klausuR.data)
spss.corr <- nret.translator(klausuR.corr, cor=true, num.alt=3)
# if you find the syntax useful
cat(spss.corr$syntax, file="/somewhere/NRET.sps")

## End(Not run)

---

plot

Plot methods for S4 objects of class klausuR and klausuR.mult

Description

These plot methods are being called by klausur.report. If x is of class klausuR.mult, only the global results will be plotted. Should you rather like plots on each test form, call plot with the single slots from that object accordingly.

Usage

plot(x, y, ...)

## S4 method for signature 'klausuR,missing'
plot(x, marks = FALSE, sd.lines = FALSE,
     plot.normal = TRUE, na.rm = TRUE, ...)

## S4 method for signature 'klausuR.mult,missing'
plot(x, marks = FALSE, sd.lines = FALSE,
     plot.normal = TRUE, ...)

Arguments

x An S4 object of class klausuR or klausuR.mult
y From the generic plot function, ignored for klausuR class objects.
... Any other argument suitable for plot()
plot

marks Logical, whether the histogram should show the distribution of points (default) or marks
sd.lines Logical, whether standard deviation lines should be plotted
plot.normal Logical, whether normal distribution should be plotted (according to mean and Sd of the results)
a.n.rn Logical, whether NA values should be ignored. Defaults to TRUE, because plotting would fail otherwise

Author(s)
m.eik michalke <meik.michalke@uni-duesseldorf.de>

See Also
klausur, klausur.mufo, klausur.report

Examples

data(antworten)

# vector with correct answers:
richtig <- c(Item01=3, Item02=2, Item03=2, Item04=2, Item05=4, Item06=3, Item07=4, Item08=1, Item09=2, Item10=2, Item11=4, Item12=4, Item13=2, Item14=3, Item15=2, Item16=3, Item17=4, Item18=4, Item19=3, Item20=5, Item21=3, Item22=3, Item23=1, Item24=3, Item25=1, Item26=3, Item27=5, Item28=3, Item29=4, Item30=4, Item31=13, Item32=234)

# vector with assignement of marks:
notenschluessel <- c()
# scheme of assignments: marks[points_from:to] <- mark
notenschluessel[0:12] <- 5.0
notenschluessel[13:15] <- 4.0
notenschluessel[16:18] <- 3.7
notenschluessel[19:20] <- 3.3
notenschluessel[21] <- 3.0
notenschluessel[22] <- 2.7
notenschluessel[23] <- 2.3
notenschluessel[24] <- 2.0
notenschluessel[25:26] <- 1.7
notenschluessel[27:29] <- 1.3
notenschluessel[30:32] <- 1.0

data.obj <- klausur.data(answ=antworten, corr=richtig, marks=notenschluessel)
klsr.obj <- klausur(data.obj)
plot(klsr.obj, marks=TRUE)
Show methods for S4 objects of classes klausuR and klausuR.mult

Description

Print a nice summary of the slots results, anon, cronbach and item.analysis. If object is of class klausuR.mult, the global results for tests with several test forms are evaluated.

Usage

```r
## S4 method for signature 'klausuR'
show(object)

## S4 method for signature 'klausuR.mult'
show(object)
```

Arguments

- `object`: An object of class klausuR or klausuR.mult

Author(s)

M.eik michalke <meik.michalke@uni-duesseldorf.de>

See Also

klausur, klausur.mufo

Examples

```r
## Not run:
klausur(data.obj)

# multiple test forms
klausur.mufo(data.obj, marks=notenschluesel)

## End(Not run)
```
Sort method for S4 objects of class klausuR

Description

Returns the given object, with global results and anonymized results sorted by the given variable.

Usage

```r
sort(x, decreasing = FALSE, ...)
```

## S4 method for signature 'klausuR'
```r
sort(x, decreasing = FALSE, sort.by = c())
```

Arguments

- `x`:
  An object of class klausuR

- `decreasing`:
  Logical, whether sorting should be done increasing or decreasing.

- `...`:
  Additional arguments.

- `sort.by`:
  An optional character string naming a variable to sort the results by. Defaults to `c()`, i.e. no re-ordering.

Author(s)

m.eik michalke <meik.michalke@uni-duesseldorf.de>

See Also

- `klausur`

Examples

```r
## Not run:
klsr.obj <- klausur(data.obj)
sort(klsr.obj, sort.by="Points")
```

## End(Not run)
Sample dataset: spss.data

Description
Sample data of a test with NRET data.

Usage
data(spss.data)

Format
A data.frame with 17 observations of the following 35 variables.

- `no`  Serial number for each subject (numeric vector)
- `matrNo`  Matriculation number (character vector)
- `FirstName`  First name (character vector)
- `Name`  Family name (character vector)
- `Nickname`  Pseudonym for anonymous feedback, needs to be renamed (character vector)
- `item01a1` to `item10a3`  Given answers, three answers for each item, i.e. one for each alternative (numeric vector)

Details
This data was anonymised and combined from originally 51 observations. See `nret.translator` on details how the answers are coded.

Source
The data was taken from a final exam test in diagnostic methods at the Institute for Experimental Psychology of the Heinrich-Heine-University Düsseldorf, summer term 2011.

Examples
data(spss.data)
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