

# Package ‘exams’

January 2, 2012

**Version** 1.0-4

**Date** 2011-08-22

**Title** Automatic Generation of Standardized Exams for Large-Lecture Courses

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**Description** Sweave-based automatic generation of exams with multiple-choice questions and arithmetic problems.

**Depends** R (>= 2.0.0), stats, graphics, tools, utils

**License** GPL-2

**Repository** CRAN

**Date/Publication** 2011-08-22 07:12:48

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exams	<i>Generation of Simple Exams</i>
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## Description

Sweave-based automatic generation of exams including multiple choice questions and arithmetic problems.

**Usage**

```
exams(file, n = 1, nsamp = NULL, dir = NULL, template = "plain",
      inputs = NULL, header = list(Date = Sys.Date()), name = NULL,
      quiet = TRUE, edir = NULL, tdir = NULL, control = NULL)
```

**Arguments**

file	character. A specification of a (list of) exercise files, for details see below.
n	integer. The number of copies to be compiled from file.
nsamp	integer. The number of exercise files sampled from each list element of file. Sampling without replacement is used if possible. (Only if some element of nsamp is larger than the length of the corresponding element in file, sampling with replacement is used.)
dir	character. The output directory, this has to be set if n is greater than 1 (or template is longer than 1).
template	character. A specification of a LaTeX template. The package currently provides "exam", "solution", "plain". For details see below.
inputs	character. Names of files that are needed as inputs during LaTeX compilation (e.g., style files, headers). Either the full path must be given or the file needs to be in edir.
header	list. A list of further options to be passed to the LaTeX files.
name	character. A name prefix for resulting exercises, by default chosen based on template.
quiet	logical. Should output be suppressed when calling <a href="#">Sweave</a> and <a href="#">texi2dvi</a> .
edir	character specifying the path of the directory in which the files in file are stored (see also below).
tdir	character specifying a temporary directory, by default this is chosen via <a href="#">tempdir</a> .
control	A list of control arguments for the appearance of multiple choice results (see 'Details').

**Details**

exams generates exams from lists of [Sweave](#) source files by: (1) running Sweave on each exercise, (2) including the resulting LaTeX files in a template, (3) running [texi2dvi](#) on the template, and (4) storing the resulting PDF file in an output dir (or displaying it interactively).

Each exercise in an exam is essentially a standalone Sweave source file that exams knows (almost) nothing about, it just calls Sweave (n times). The only exception is some meta-information which is passed by means of four commands back to exams. The commands are '\extype' (which may be 'mchoice' or 'num'), '\exsolution' (e.g., 3.124 for a numeric solution and 10010 for a multiple choice solution), '\exstring' (containing a human-readable string with the solution), and '\extol' (a tolerance for numeric solutions).

The specification in file should be either of form "foo" or equivalently "foo.Rnw", where the file "foo.Rnw" should either be in the local directory, the edir directory or in the exercises directory of the package. file can either be a simple vector or a list of vectors. In the latter case, exercises

are chosen randomly within each list element. For example, the specification `file = list(c("a", "b"), "xyz")` will result in an exam with two exercises: the first exercise is chosen randomly between "a" and "b" while "xyz" is always included as the second exercise.

The `template` is a (vector of) specification(s) of LaTeX templates. It can be "foo" or equivalently "foo.tex" where "foo.tex" should either be in the local directory (or provided with the full path) or in the `tex` directory of the package. It should specify where in the template the exercises are included, using the markup `\xinput{exercises}`. Additionally, it may contain `\xinput{questionnaire}` and `\xinput{header}`. `template` can also be a vector, then for each of the `n` runs several output files (one for each template) are created.

The name prefix for each file is by default the base name of the corresponding template but can also be changed via `name`.

`exams` creates the PDF files and stores them in an output directory together with the solution meta information as `'metainfo.rda'` (see also below). If only a single PDF is created (currently the default), `dir` may be `NULL` and it is only displayed on the screen.

The argument `control` is specified by a named list with elements `mchoice.print` and `mchoice.symbol`. The element `mchoice.print` is used for specifying the characters used for printing. It is again a named list where element `True` gives the (five) characters used for printing when the answer is correct and `False` if the answer is wrong. The symbol used for the questionnaire output in the final PDF file is defined by `mchoice.symbol` which is vector with elements `True` and `False`.

### Value

An object of class "exams\_metainfo" is returned invisibly. It is a list of length `n`, containing a list of meta informations for each exercise:

<code>mchoice</code>	logical. Is the exercise a multiple choice exercise?
<code>length</code>	integer. Length of solution.
<code>solution</code>	either a logical vector (for multiple choice) or numeric vector (for arithmetic problems).
<code>string</code>	character. A human-readable version of the solution.

### References

Gruen B, Zeileis A (2009). Automatic Generation of Exams in R. *Journal of Statistical Software*, 29(10), 1–14. <http://www.jstatsoft.org/v29/i10/>.

### See Also

[Sweave](#), [texi2dvi](#), [mchoice2string](#)

### Examples

```
## load package and enforce par(ask = FALSE)
library("exams")
options(device.ask.default = FALSE)

## define an exams (= list of exercises)
myexam <- list(
```

```

    "boxplots",
    c("tstat", "ttest", "confint"),
    c("regression", "anova"),
    "scatterplot",
    "relfreq"
  )

  ## compile a single random exam (displayed on screen)
  sol <- exams(myexam)
  sol

  ## generate multiple exams (stored in output directory)
  odir <- tempfile()
  sol <- exams(myexam, n = 5, dir = odir, template = c("exam", "solution"))
  sol

  ## inspect solution for a particular exam
  print(sol, 3)

  ## modify control argument for printing
  mymchoice.control <- list(mchoice.print = list(True = LETTERS[1:5], False = "_"))
  sol <- exams("boxplots", template = "solution",
    control = mymchoice.control)
  sol

```

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mchoice2string

*Convenience Functions for Exam Generation*


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## Description

A collection of convenience functions for exam generation that can be used for switching between suitable logical/text/numeric representations of multiple choice solutions.

## Usage

```

mchoice2string(x)
string2mchoice(x)
mchoice2text(x)

```

## Arguments

x                    an object, see below for examples

## Details

Three convenience functions for facilitating work with multiple choice solutions of exams. All have almost trivial definitions, see also examples below.

**See Also**

[exams](#)

**Examples**

```
## multiple choice answer
mc <- c(TRUE, FALSE, TRUE, FALSE, FALSE)

## switching to string representation
mchoice2string(mc)

## reverse string encoding
string2mchoice("10100")

## switching to text
mchoice2text(mc)
```

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