

R/exams installation and set-up

Daniel Wildt

SWARM

Training for WB teaching staff

21–25 March 2022

University of Natural Resources and Life Sciences, Vienna



Outline I

Sources

Installation

R

RStudio

R/exams

First example

Examples and tutorials



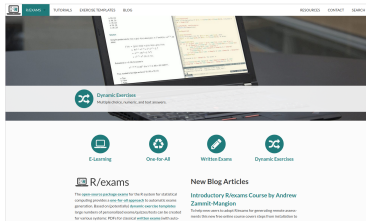
Sources

► Homepage www.r-exams.org
(R/Exams 2020)

- installation notes
- tutorials
- exercise templates

► Publication:

A. Zeileis et al. (2014). 'Flexible Generation of E-Learning Exams in R: Moodle Quizzes, OLAT Assessments, and Beyond'. *Journal of Statistical Software* 58 (1). DOI: [10.18637/jss.v058.i01](https://doi.org/10.18637/jss.v058.i01)



Flexible Generation of E-Learning Exams in R: Moodle Quizzes, OLAT Assessments, and Beyond

Achim Zeileis
University of Innsbruck

Niklaus Umlauf
University of Innsbruck

Friedrich Leisch
University of Innsbruck

Abstract

The capabilities of the package **r-exams** for automatic generation of statistical exams in R are extended by adding support for learning management systems. As in earlier versions of the package, exam generation is still based on separate **R-exams** files for each exercise – but rather than just producing different types of PDF output files, the package can now render the same exercises into a wide variety of output formats. These include HTML (with various options for displaying mathematical content) and XML specifications for online exams in learning management systems such as Moodle or OLAT. This flexibility is implemented by a new module and extensible design of the package that allows for creating all relevant exercises into R and generating personalized registration files (such as questionnaires or data files). The manuscript discusses the readily available user interfaces, the design of the underlying infrastructure, and how new functionality can be built on top of the existing tools.

Keywords: exams, e-learning, multiple choice, algorithmic problems, R-exams, R, PDF, HTML, XML, OLAT, Moodle, OLAT.

Installation: R

Installation notes can be found on:
<http://www.r-exams.org/tutorials/installation/>

1. R can be downloaded from the Comprehensive R Archive Network (CRAN): <https://cran.r-project.org/>
2. Download R for your operating system
3. Choose subdirectories “base” and “Rtools”



[Home]

Download
CRAN

R Project

About R
Logos
Contributors
What's New?
Reporting Bugs
Conferences
Search
Get Involved: Mailing Lists
Get Involved: Contributing
Developer Pages
R Blog

R Foundation

Foundation
Board
Members
Donors
Donors

Help With R

Getting Help

Documentation

Manuals
FAQs
The R Journal
Books
Certification
Other

Links

Bioconductor
R Forge



CRAN
New?
What's new?
Task Force
Search
About R
R Foundation
The R Journal
Software
R Packages
R Manuals

The R Project for Statistical Computing

Getting Started


R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS. To [download R](#), please choose your preferred CRAN mirror.

If you have questions about R like how to download and install the software, or what the license terms are, please read our [frequently asked questions](#) before you send an email.

News

- **R version 4.1.0 (Devo Push-Up)** [pre-release versions](#) will appear starting Monday 2020-02-08. Final release is scheduled for Thursday 2020-03-10.
- **R version 4.1.2 (Bird Hippie)** has been released on 2021-11-01.
- **R version 4.0.5 (Shake and Throw)** was released on 2021-03-31.
- Thanks to the organizers of userR 2020 for a successful online conference. Recorded tutorials and talks from the conference are available on the R Consortium YouTube channel.
- You can support the R Foundation with a renewable subscription as a [supporting member](#)

News via Twitter

 [The R Foundation Network](#) 

 [R Contributors](#)
@R_Contributors

Note the Applicant deadline has been extended to March 2 at 4pm UTC.

We are busy working on project proposals and hope to member some great interns from the [affiliated@Rcontributor.com](https://twitter.com/R_Contributors/status/1494710264710081943) contributors.

Feb 25, 2022

 [The R Foundation Network](#) 

 [R Contributors](#)
@R_Contributors

The R Project plans to participate in the @Outreach internship scheme, in partnership with @Bioconductor.

R for Windows

Subdirectories:

[base](#)

[contrib](#)

[wincontrib](#)

[src](#)

[Rtools](#)

Desires for base distribution. This is what you want to [install R for the first time](#).

Desires of contributed CRAN packages (for R >= 2.13.0, managed by User Ligges). There is also information

on [R packages](#) available for CRAN. Windows version and corresponding environment and tools

installations.

Desires of contributed CRAN packages for existing versions of R (for R > 2.13.0, managed by User Ligges).

This is build R and R packages. This is what you want to build your own packages on Windows, or build R

tools.

Please do not submit binaries to CRAN. Package developers might want to contact User Ligges directly in case of questions / suggestions related to

Windows binaries.


You may also want to read the [R FAQ](#) and [R for Windows FAQ](#).

Note: CRAN does some checks on these binaries for viruses, but cannot give guarantees. Use the normal precautions with downloaded executables.

Installation: RStudio

Integrated development environment
for development of R-scripts:

1. Download and install RStudio Desktop for your operating system <https://rstudio.com/products/rstudio/download/#download>
2. Start RStudio (e. g. via Start menu on Windows)

	RStudio Desktop Open Source License	RStudio Desktop Pro Commercial License	RStudio Server Open Source License	RStudio Workbench Commercial License
	Free	\$995 <small>/year</small>	Free	\$4,975 <small>/year (3 Named Users)</small>
	DOWNLOAD	BUY	DOWNLOAD	BUY
	Learn more	Learn more	Learn more	Evaluation / Learn more
Integrated Tools for R	✓	✓	✓	✓
Priority Support		✓		✓
Access via Web Browser			✓	✓
RStudio Professional Drivers		✓		✓
Connect to RStudio Workbench  remotely		✓		
Enterprise Security				✓
Project Sharing				✓

All Installers

Linux users may need to import RStudio's public code-signing key [prior](#) to installation, depending on the operating system's security policy.
RStudio requires a 64-bit operating system. If you are on a 32 bit system, you can use an [older version](#) of RStudio.

OS	Download	Size	SHA-256
Windows 10	RStudio-2022.02.0-443.exe	176.76 MB	198676ad
macOS 10.14+	RStudio-2022.02.0-443.dmg	217.28 MB	3911d5f18
Ubuntu 18+/Debian 10+	rstudio-2022.02.0-443-amd64.deb	129.80 MB	a61800959

Installation: RStudio

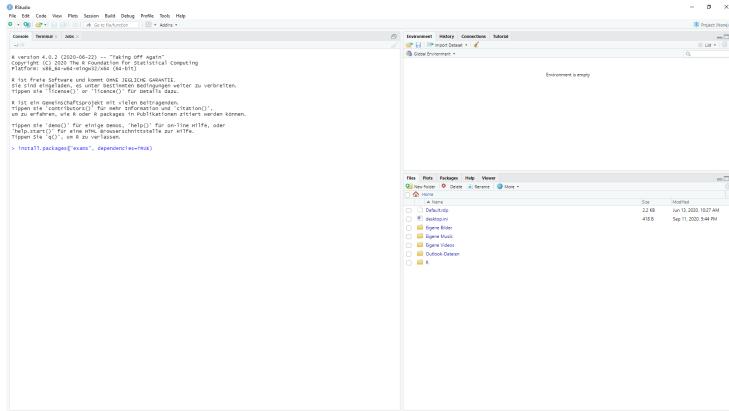


Fig.: View of RStudio after first start

Installation: R/exams

Download and install R/exams package via command line in RStudio (only necessary before first use of R/exams):

```
> install.packages("exams",  
  dependencies=TRUE)
```

Load R/exams package via command line in RStudio (necessary every time after RStudio is started):

```
> library(exams)
```

```
Console Terminal Jobs
~/Seafire/RExams_Tutorial/

R version 3.6.3 (2020-02-29) -- "Holding the Windsock"
Copyright (C) 2020 The R Foundation for Statistical Computing
Platform: x86_64-pc-linux-gnu (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

  Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[Workspace loaded from ~/Seafire/RExams_Tutorial/tutorial/.Rdata]

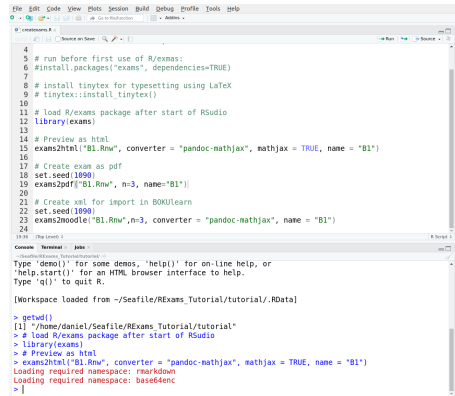
> getwd()
[1] "/home/daniel/Seafire/RExams_Tutorial/tutorial"
> setwd("/home/daniel/Seafire/RExams_Tutorial/")
> install.packages("exams", dependencies=TRUE)
```

First example

When working with RStudio: Open project via File > Open Project
Example is defined and created by two R-scripts:

1. B1.Rnw definition of the exercise
2. createexams.R script which runs commands of the R/exams API

Open files via File > Open File
Image files for figures to be included in the exercise are saved in the figures folder.



```

4
5 # run before first use of R/exams:
6 #install.packages("exams", dependencies=TRUE)
7
8 # install tinytex for typesetting using LaTeX
9 # tinytex::install_tinytex()
10
11 # load R/exams package after start of RStudio
12 library(exams)
13
14 # Preview as html
15 exams2html("B1.Rnw", converter = "pandoc-nathjax", mathjax = TRUE, name = "B1")
16
17 # Create exam as pdf
18 set.seed(1090)
19 exams2pdf("B1.Rnw", n=3, name="B1")
20
21 # Create xsl for import in BOKUlearn
22 set.seed(1090)
23 exams2noodle("B1.Rnw", n=3, converter = "pandoc-nathjax", name = "B1")
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

```

```

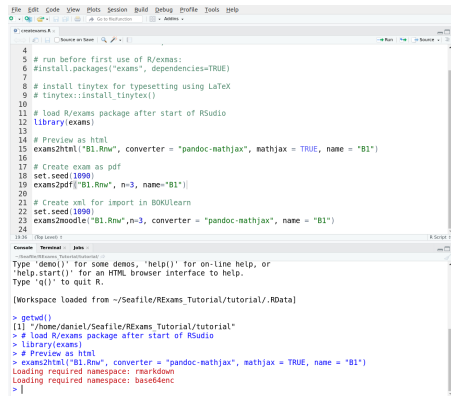
[1] "/home/daniel/Seafire/RExams_Tutorial/tutorial"
> # load R/exams package after start of RStudio
> library(exams)
> # Preview as html
> exams2html("B1.Rnw", converter = "pandoc-nathjax", mathjax = TRUE, name = "B1")
Loading required namespace: rmarkdown
Loading required namespace: base64enc
>

```


First example

Execute commands in `createexams.R` by pressing `Crtl + Enter` with the cursor in the respective line.

- ▶ `exmas2html()` create html of exercise, useful for testing and debugging
- ▶ `exmas2pdf()` create pdf of exercise, e. g. for test on paper
- ▶ `exmas2moodle()` create xml of exercise for import into Moodle



```

4
5 # run before first use of R/exams:
6 #install.packages("exams", dependencies=TRUE)
7
8 # install tinytex for typesetting using LaTeX
9 # tinytex::install_tinytex()
10
11 # load R/exams package after start of RStudio
12 library(exams)
13
14 # Preview as html
15 exmas2html("B1.Rnw", converter = "pandoc-mathjax", mathjax = TRUE, name = "B1")
16
17 # Create exam as pdf
18 set.seed(1090)
19 exmas2pdf("B1.Rnw", n=3, name="B1")
20
21 # Create xml for import in BOKUlearn
22 set.seed(1090)
23 exmas2moodle("B1.Rnw", n=3, converter = "pandoc-mathjax", name = "B1")
24
25

```

Console: Terminal | Jobs

```

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[Workspace loaded from ~/Seafire/RExams_Tutorial/tutorial/.RData]

> getwd()
[1] "/home/daniel/Seafire/RExams_Tutorial/tutorial"
> # load R/exams package after start of RStudio
> library(exams)
> # Preview as html
> exmas2html("B1.Rnw", converter = "pandoc-mathjax", mathjax = TRUE, name = "B1")
Loading required namespace: rmarkdown
Loading required namespace: base64enc
>

```

Set path:

`setwd("path/to/files")`

First example

2 components

1. L^AT_EX (default):

- ▶ for text
- ▶ comment: %
- ▶ commands started with
backslash (e.g. `\rho` for ρ)

2. R-code:

```
<<echo=FALSE, results=hide>>=
# R-code and calculations
@
```

- ▶ comment: #
- ▶ global variable definition by <-



```
1 % B1
2 % #Hydrostatic: alloy brass B1
3 % author: Daniel Wildt
4 % last modified: Daniel Wildt, 2022-03-07
5
6 <<echo=FALSE, results=hide>>=
7
8 ## DATA =====
9
10 # prepare sketch
11 include_supplement("B1_figure.PNG",dir = "figures", recursive = TRUE)
12
```

First example

Create random numbers with R:

- ▶ **runif(n,low,high)** creates a vector with **n** elements from a uniform distribution with limits **low** and **high**
- ▶ **sample(d, n)** randomly choose **n** elements from a vector **d**
- ▶ e. g. vector of pipe diameters in m:
`d<-c(50,65,80,100,125,150)/1000`
- ▶ **round(x, n)** round **x** to **n** decimal places

```
1 % B1
2 % #Hydrostatic: alloy brass B1
3 % author: Daniel Wildt
4 % last modified: Daniel Wildt, 2022-03-07
5
6 <-echo=FALSE, results=hide>>
7
8 ## DATA =====
9
10 # prepare sketch
11 include_supplement("B1_figure.PNG",dir = "figures", recursive = TRUE)
12
13 # weight of alloy in air
14 GL <- round(runif(1,25,50),3)#N rounded, 3 decimal places
15
16 # volumetric proportion of zinc in range of 5 to 45 percent
17 wZn <- runif(1,5,45)/100
18
19 # fluid density
20 rhoF <- sample(seq(from=700, to=1300, by=10),1)#kg/m3
21
22 # volumetric proportion of copper
23 wCu <- 1.0 - wZn
24
25 # density zinc
26 rhoZn <- 7190#kg/m3
27
28 # density copper
29 rhoCu <- 8920#kg/m3
30
31 # density water at 20 degrees Celcius
32 rhoW <- 998.21#kg/m3
33
34 # acceleration due to gravity
35 g <- 9.81
36
37 -# SOLUTION =====
38
```

First example

- ▶ basic arithmetic +, -, *, /
- ▶ functions e. g. trigonometry:
`cos()`, `sin()`, `tan()`
- ▶ mathematical constants: `pi`,
`exp(1)`
- ▶ `if` – `then` – `else` statements
- ▶ `for`-loops, conditional loops

```

36
37 ## SOLUTION =====
38
39 # mass and volume
40 m <- GL / g
41
42 mZn <- m * wZn
43 mCu <- m * wCu
44
45 VZn <- mZn / rhoZn
46 VCu <- mCu / rhoCu
47
48 V <- VZn + VCu
49
50 # weight under buoyancy
51 GA <- GL - V * rhoF * g
52
53 # density brass
54 rhoL <- m / V
55

```

First example

- ▶ questions: text for the question (defined later)
- ▶ solutions: correct answers
- ▶ explanations: additional explanations
- ▶ tolerances: $+/ -$ tolerances (for numeric questions)
- ▶ type: question type
- ▶ points: integers for weighting of sub-questions

```
56
57 ## QUESTION =====
58
59 questions <- solutions <- explanations <- tolerances <- rep(list(""), 6)
60 type <- rep(list("num"), 6)
61
62 questions[[1]] <- ""
63 solutions[[1]] <- explanations[[1]] <- mCu
64 tolerances[[1]] <- 0.01
65
66 questions[[2]] <- ""
67 solutions[[2]] <- explanations[[2]] <- mZn
68 tolerances[[2]] <- 0.01
69
70 questions[[3]] <- ""
71 solutions[[3]] <- explanations[[3]] <- wCu
72 tolerances[[3]] <- 0.002
73
74 questions[[4]] <- ""
75 solutions[[4]] <- explanations[[4]] <- wZn
76 tolerances[[4]] <- 0.002
77
78 questions[[5]] <- ""
79 solutions[[5]] <- explanations[[5]] <- rhoL
80 tolerances[[5]] <- 10
81
82 questions[[6]] <- c("weight would be higher", "weight would be lower")
83 type[[6]] <- "schoice"
84 solutions[[6]] <- explanations[[6]] <- c((rhoF > rhoW), (rhoF < rhoW))
85 tolerances[[6]] <- 0
86
87 if(any(explanations[c(1,2,3,4,5)] < 0)) explanations[c(1,2,3,4,5)] <- lapply(solutions[c(1,2,3,4,5)], function(x) paste("$", x, "$", sep = ""))
88
89 explanations[[6]] <- lapply(solutions[[6]], function(x) ifelse(x, "True", "False"))
90 solutions[[6]] <- lapply(solutions[[6]], mchoice2string)
91 @
```

First example

Question types (Zeileis et al., 2014):

- ▶ `num`: for questions with a numeric answer
- ▶ `string`: for questions with a (short) text answer
- ▶ `schoice`: for single-choice questions where exactly one of the questions/statements is true and all others are false (drop-down menu)
- ▶ `mchoice`: for multiple-choice questions where each element of the question/statement can either be true or false
- ▶ `cloze`: combination of questions/statements with `num`, `string`, or `mchoice` answers. Thus, each element of the question has either a numeric, short text, or single/multiple-choice answer

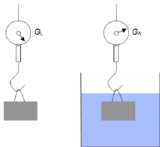
First example

Exam 1

1. Question

The weight of a piece of brass amounts to G_L . Its weight under buoyancy in a fluid with density ρ_F amounts to G_A . The density of the components of the alloy are given with ρ_{Cu} and ρ_{Zn} for copper and zinc respectively.

- $G_L = 35.648 \text{ N}$
- $G_A = 31.712 \text{ N}$
- $\rho_{Zn} = 7190 \text{ kg m}^{-3}$
- $\rho_{Cu} = 8920 \text{ kg m}^{-3}$
- $\rho_F = 950 \text{ kg m}^{-3}$
- $\rho_W = 998.21 \text{ kg m}^{-3}$



What is the mass of copper in the alloy in kg? . kg
 What is the mass of zinc in the alloy in kg? . kg
 What is the mass proportion of copper in the alloy? . 1
 What is the mass proportion of zinc in the alloy? . 1
 What is the density of the brass in kg m^{-3} ? . kgm-3
 Would the weight of the brass under buoyancy in water at 20°C with density ρ_W weight would be higher./ weight would be higher or lower? . be lower.

- ▶ question text in \LaTeX
- ▶ code for mathematical symbols between $\text{\$}$
- ▶ value from R-variable by Sexpr

```

92 solutions[6] <- lapply(solutions[6], HTMLtoCstring)
93 @
94
95 \begin{question}
96
97 The weight of a piece of brass amounts to  $G_L$ . Its weight under buoyancy in a fluid with density  $\rho_F$ 
98 amounts to  $G_A$ . The density of the components of the alloy are given with  $\rho_{Cu}$  and  $\rho_{Zn}$  for copper and zinc respectively.
99
100 \begin{itemize}
101 \item  $G_L = \text{Sexpr}(\text{format}(\text{round}(G_L, 3), \text{nsml}(-3)), \text{mathR})$ 
102 \item  $G_A = \text{Sexpr}(\text{format}(\text{round}(G_A, 3), \text{nsml}(-3)), \text{mathR})$ 
103 \item  $\rho_{Zn} = \text{Sexpr}(\text{rhoZn}, \text{mathR}, \text{m}^{-3})$ 
104 \item  $\rho_{Cu} = \text{Sexpr}(\text{rhoCu}, \text{mathR}, \text{m}^{-3})$ 
105 \item  $\rho_F = \text{Sexpr}(\text{rhoF}, \text{mathR}, \text{m}^{-3})$ 
106 \item  $\rho_W = \text{Sexpr}(\text{rhoW}, \text{mathR}, \text{m}^{-3})$ 
107 \end{itemize}
108
109 \begin{center}
110 \includegraphics[width=0.4\textwidth]{81_figure.PNG}
111 \end{center}
112
113 \begin{tabular}{|r|}
114 \hline
115 \text{What is the mass of copper in the alloy in kg?} \\
116 \text{What is the mass of zinc in the alloy in kg?} \\
117 \text{What is the mass proportion of copper in the alloy?} \\
118 \text{What is the mass proportion of zinc in the alloy?} \\
119 \text{What is the density of the brass in } \text{kg m}^{-3} \text{?} \\
120 \text{Would the weight of the brass under buoyancy in water at } 20^\circ \text{C} \text{ with density } \rho_W \text{ weight would be higher or lower?} \\
121 \hline
122 \end{tabular}
123
124 \end{question}

```

First example

Solutions:

- ▶ optional part
- ▶ either for students or for own reference

L^AT_EX references:

- ▶ mathematical symbols:
<http://detexify.kirelabs.org/classify.html>
- ▶ numerous further resources for e. g. special characters online

```

125 & ##ANSWER6## \\
126 \end{tabular}
127
128
129 <<echo=FALSE, results=hide, results=tex>>
130 answerlist(paste(unlist(questions), ".", sep=""))
131 @
132
133 \end{question}
134
135
136 \begin{solution}
137
138 <<echo=FALSE, results=hide, results=tex>>
139 answerlist(paste(unlist(explanations), ".", sep=""))
140 @
141
142 \section*{Masses}
143
144 Weight in air:
145
146 \begin{equation}
147 G_L = \rho_{\text{Cu}} \cdot g \cdot \left( V_{\text{Zn}} + V_{\text{Cu}} \right)
148 \end{equation}
149
150 Buoyant forces equal the weight of the displaced volumen of fluid as well as the difference
151 between the weight of the piece of brass in air and in the fluid:
152
153 \begin{equation}
154 G_L - G_A = \rho_F \cdot g \cdot \left( V_{\text{Zn}} + V_{\text{Cu}} \right)
155 \end{equation}
156
157 Volumes from the solution of the lineat system of equations:
158
159 \begin{equation}
160 V_{\text{Zn}} = \frac{G_L - G_A - \rho_{\text{Cu}} \cdot g \cdot V_{\text{Cu}}}{\rho_{\text{Zn}} \cdot g - \rho_{\text{Cu}} \cdot g}
161 \end{equation}
162
163 \begin{equation}
164 V_{\text{Cu}} = \frac{G_L - G_A - \rho_{\text{Zn}} \cdot g \cdot V_{\text{Zn}}}{\rho_{\text{Cu}} \cdot g - \rho_{\text{Zn}} \cdot g}
165 \end{equation}
166
167 \end{solution}
168
169 \end{tabular}
170
171 \end{document}

```


First example

Meta-information defined at the end of the file:

- ▶ question type
- ▶ exam name, section, version
- ▶ concatenate solutions, points, tolerances

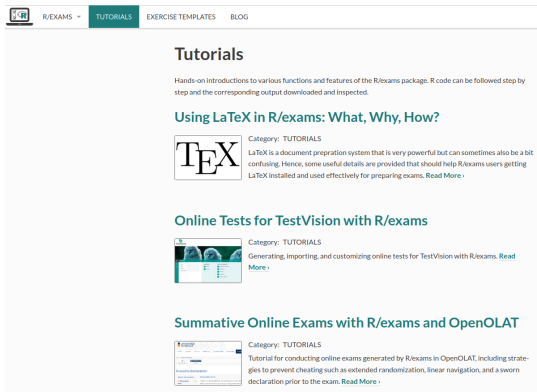
```

158 \begin{equation}
159 V_{\mathrm{Zn}} = \frac{G \cdot L \cdot A \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}}}{g \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}}
160 \end{equation}
161
162 \begin{equation}
163 V_{\mathrm{Cu}} = \frac{G \cdot L \cdot A \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}}}{g \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}} \cdot \frac{\rho_{\mathrm{W}}}{\rho_{\mathrm{Cu}}}
164 \end{equation}
165
166 \dots
167
168 \end{solution}
169
170 %% META-Information
171 %% \xtype{close}
172 %% \xsolution{\Sexpr{paste(solutions, collapse = "|")}}
173 %% \xclozetype{\Sexpr{paste(type, collapse = "|")}}
174 %% \exname{B}
175 %% \exsection{B1}
176 %% \extitle{Hydrostatik}
177 %% \extol{\Sexpr{paste(tolerances, collapse = "|")}}
178 %% \exversion{20205}
179

```

Examples and tutorials

- wide range of example exercises and exams available on <http://www.r-exams.org/tutorials/>

A screenshot of the R/exams website. The top navigation bar includes links for 'R/EXAMS', 'TUTORIALS' (highlighted in green), 'EXERCISE TEMPLATES', and 'BLOG'. The main content area is titled 'Tutorials' and contains three sections: 1. 'Using LaTeX in R/exams: What, Why, How?' with a 'TeX' logo and a 'Read More' link. 2. 'Online Tests for TestVision with R/exams' with a screenshot of the TestVision interface and a 'Read More' link. 3. 'Summative Online Exams with R/exams and OpenOLAT' with a screenshot of the OpenOLAT interface and a 'Read More' link. Each section also includes a 'Category: TUTORIALS' label.

University of Natural Resources and Life Sciences, Vienna
Department of Water, Atmosphere and Environment
Institute of Hydraulic Engineering and River Research (IWA)

Dipl.-Ing. Daniel Wildt, MSc

Muthgasse 107, A - 1190 Wien

Tel.: 01-47654-81935

daniel.wildt@boku.ac.at

<http://www.wau.boku.ac.at/iwa/>

References I

R/Exams (2020). URL: <http://www.r-exams.org/>.

Zeileis, A., N. Umlauf and F. Leisch (2014). 'Flexible Generation of E-Learning Exams in R: Moodle Quizzes, OLAT Assessments, and Beyond'. *Journal of Statistical Software* 58 (1). DOI: [10.18637/jss.v058.i01](https://doi.org/10.18637/jss.v058.i01).