



VA
Informatics and
Computing
Infrastructure

Introducing R Academy

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Introduction



R Academy

https://sps.vinci.med.va.gov/prod/vinicipedia/VINCIPedia/R_Academy

(Accessible only within VA network)

- Resource Center
- Modules & Tutorials
- Outside & Inside Workspace
- Tailored for VA research



Inside/Outside Workspace

Inside

- VINCI package
 - Learnr interactive tutorials
 - Each module must be launched separately
 - Interactive code sections
 - Interactive quizzes

Outside

- VINCIPedia
 - SharePoint based
 - Easily link and navigate through modules
 - Code & results are static
 - Self-administered quizzes



Core Competencies

- Getting Started
- Objects & Classes
- Packages
- Using R Effectively
- Graphics
- Models
- Bayesian & Stochastic Methods
- Parallel Processing
- Language Interfaces
- Command Line & Batch Operation

Modules

Individual modules denoted in **bold**

Currently ready modules denoted by underline

Subject to change



Getting Started Modules

- **Accessing R in VINCI**

- R & Rstudio

- **Syntax**

- **Variables**

- **Functions**

- **Expressions & Control Structures**

- **Operators**

- **Special Values**

- **Formulas**

- **Data Structures**

- Vectors

- Matrices

- Lists

- Data Frames

- Tibbles

- **Environments**

- Stack

- scope

Getting Started Continued

- **Reading Data**

- CSV
- Excel

(Database data is in Using R Efficiently)

- **Environments**

- Stack
- Scope

- **Help**

- Reading helpfiles
- Online Documentation
- Twitter
- RUGs

Objects & Classes

- **S3 Class System**

- Duck type
- Class attribute
- 'Dot' methods

- **S4**

- Rigorous Classes
- Defining Classes
- Defining Methods

- **Reference Classes**

- Mutable objects
- Copy on edit
- Defining
- Uses

- **R6**

Packages

- **Intro to packages**

- Finding packages
- Package documentation
- Repositories
 - CRAN
 - BioConductor
 - GitHub

- **Building Packages**

- Why?
- File structure
- Help files
- Roxygen
- Testing
- Distribution

Using R Effectively

- **Tidyverse**

- dplyr
- tidyr
- forcats
- etcetera

- **Map/Reduce**

- **Base**
 - For loops
 - lapply, sapply, etc.
 - Map & Reduce
- **purrr (tidyverse)**

- **Databases**

- Connections
 - Manual
 - Rstudio
- DBI, dplyr & dbplyr
- Tibbles
 - Remote vs. local data
 - Collect vs. compute
 - Build/show query

Graphics

- **Base**

- plot
- hist
- etc.

- **Grid**

- Lattice
- Viewports
- Etc.

- **ggplot2**

- Data
- Layers
- Aesthetics
- Themes
- Etc.

Models

- **Linear Models**

- Specifying
- Fitting
- Extracting components
- Evaluating

- **Advanced**

- **Non-linear & mixed effects (nlme)**
- **Generalized**
 - Logistic
 - Poisson
 - etc.

- **Non-Parametric**

- gam
- mgcv

Bayesian & Stochastic Methods

- **Bootstrapping**
- **Markov Chain Monte Carlo (mcmc)**
- **WinBUGS**

Special Topics

- **Parallel Processing**
 - Foreach
 - Futures
 - Reproducibility
 - Fault Tolerance
- **Language Interfaces**
 - Rcpp (C++)
 - Reticulate (python)
 - Calling R from SAS
- **Command Line & Batch Mode**
 - rscript
 - R CMD batch
 - Scripts from RStudio
- **R6**

VINCIPedia

(Outside workspace)



Navigating to VINCIpedia

Home About VINCI Skip to Content

VINCI Central

Welcome to the VA Informatics and Computing Infrastructure

Keyword Search

Andrew Redd
VINCI Email: VINCI@VA.gov
Concierge Desk: 1-801-872-3324
Computer or General Help: Your IT
[VINCI Online Help](#)

- Launch Workspace
- New To VINCI
- My VINCI Dashboard
- VINCI University
- VINCI Tube
- VINCIpedia/FAQ
- User Guides
- VINCI Services
- Computing Cloud
- Data Sources
- Applications
- Policies and Forms
- Let's Collaborate VAI
- Quick Links
- Voogle Notes

New To VINCI
Learn more about VINCI, VINCI Studies and the virtual environment.

My VINCI Dashboard
All your VINCI resources in one place!

VINCI University
Here you learn more

VINCI Tube
Videos on all things VINCI

VINCIpedia/FAQ
VINCI's forum for research & info

User Guides
Let us guide you through VINCI

VINCI Services

Computing Cloud

Data Sources

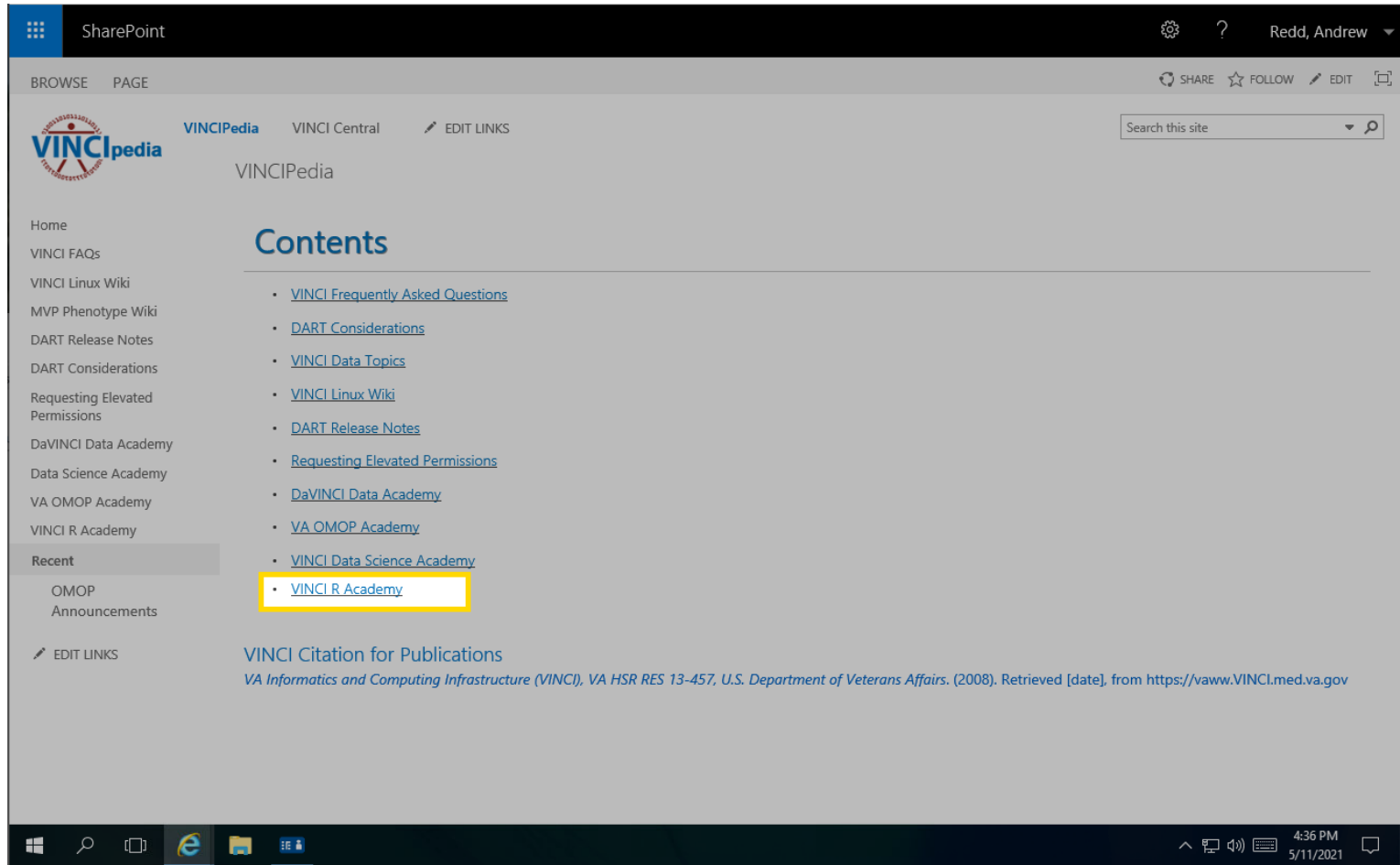
Applications

Feedback

4:26 PM
5/11/2021



Navigating to R Academy



The screenshot shows a SharePoint page titled "VINCIpedia". The page has a dark header with the "SharePoint" logo and the user name "Redd, Andrew". Below the header, there are navigation options: "BROWSE" and "PAGE". The main content area is titled "VINCIpedia" and "Contents". A list of content items is displayed, with "VINCI R Academy" highlighted in a yellow box. The list includes:

- [VINCI Frequently Asked Questions](#)
- [DART Considerations](#)
- [VINCI Data Topics](#)
- [VINCI Linux Wiki](#)
- [DART Release Notes](#)
- [Requesting Elevated Permissions](#)
- [DaVINCI Data Academy](#)
- [Data Science Academy](#)
- [VA OMOP Academy](#)
- [VINCI R Academy](#)
- [VINCI Data Science Academy](#)
- [VINCI R Academy](#)

Below the list, there is a section titled "VINCI Citation for Publications" with the text: "VA Informatics and Computing Infrastructure (VINCI), VA HSR RES 13-457, U.S. Department of Veterans Affairs. (2008). Retrieved [date], from https://vaww.VINCI.med.va.gov".



R Academy Home

The screenshot shows a SharePoint page titled "R Academy Home". The page header includes the SharePoint logo, the name "SharePoint", and the user "Redd, Andrew". The main content area is divided into several sections:

- Updated Pages:** A list of recent pages including "R_Academy/Home", "VINCI R Academy", "R_Academy/Syntax/Special Values", "R_Academy/Syntax/Operators", and "R_Academy/Syntax/Functions".
- Welcome to the VINCI R Academy!**: A central message with a sub-heading and a paragraph: "This is an outline of the training topics. Links to content will be provided as they become available." Below this, it states: "This training seeks to familiarize the user with the R programming language and how to use it in the VINCI Workspace environment including its use with SAS."
- R Training:** A section titled "R Training" with a sub-heading "This training is based on meeting 10 core competencies:". It lists 10 competencies: Getting Started, Objects & Classes, Packages, Using R Effectively, Graphics, Models, Bayesian & Stochastic models, Parallel processing, Language interfaces, and Command line and batch mode. Below the list, it says "These core competencies are broken down as follows:" and provides links for "Introduction to R" and "Getting Started".
- VINCI R Support Contacts:** A section titled "VINCI R Support Contacts" with a paragraph: "If you need help with R in the VINCI environment, please request it from VINCI@va.gov and include 'R help' in the subject line for faster routing to the appropriate VINCI Concierge."
- R Resources:** A section titled "R Resources" with a list of links: "R Project", "R Consortium", "RStudio", "R User Groups" (with a note that a link to <https://www.meetup.com/pro/r-user-groups/> is not accessible within the VA network), and "StackOverflow R Questions".
- How to access R Training in the Workspace:** A section titled "How to access R Training in the Workspace" with the text "Coming soon."
- R Training Videos:** A section titled "R Training Videos" with a sub-heading "Video".

The page also features a search bar, a navigation menu on the left, and a footer with system icons and the date "5/11/2021".



Support Information

- Includes information for contacting the VINCI Helpdesk

VINCI R Support Contacts

If you need help with R in the VINCI environment, please request it from VINCI@va.gov and include "R help" in the subject line for faster routing to the appropriate VINCI Concierge.



Resources

- List of useful resources

R Resources

- R Project
- R Consortium
- RStudio
 - Cheatsheets
- R User Groups
 - link (<https://www.meetup.com/pro/r-user-groups/>) is not accessible within VA network.
- StackOverflow R Questions

- *Still in progress*

Cyber Seminars

R Training Videos

Video

[Efficiently Accessing VINCI Data in R](#)

[Diagnosing Large and Long Running Models in R](#)

Slides



R Syntax Variables Module

🏠 R Academy

R Syntax: Variables

Variables Overview

One of the most important components of any language is variables. Variables are symbols or names that hold the value of something else. In R practically anything can be assigned to a variable including:

- numbers (numeric and integer),
- boolean values `TRUE` and `FALSE`
- character vectors (also known as an array of strings),
- objects,
- language elements such as
 - functions,
 - expressions,
 - and calls.

Variable Assignment

A value is assigned to a variable through the left arrow operator `<-` or the arrow operator for short.



Code Samples

Example

```
x <- TRUE
```

Here the value of `TRUE` is assigned to the variable `x`.

Quizzes

Quiz

Let's take a minute to assess your knowledge with a quiz.

Which of the following is/are **valid** variable names?

- x
- L'Hopital
- prev
- next
- private
- `model for racial inequality in healthcare.`

Which of the names is/are valid and informative?

- x|
- L'Hopital
- prev
- next
- private
- `model for racial inequality in healthcare.`



Prerequisites

- Later modules include prerequisites

Prerequisites

It is assumed that you are familiar with the material covered in

- [R Syntax Variables](#)
- [R Syntax Functions](#)

SharePoint Notes

- VINCIPedia modules include instructions of how to run the same module inside the workspace as an interactive tutorial

SharePoint Note

This presentation will also available inside the VINCI workspace as an interactive tutorial and may be accessed by running

```
learnr::run_tutorial("R SYntax Variables", package="VINCI")
```



VINCI package

(Inside Workspace)

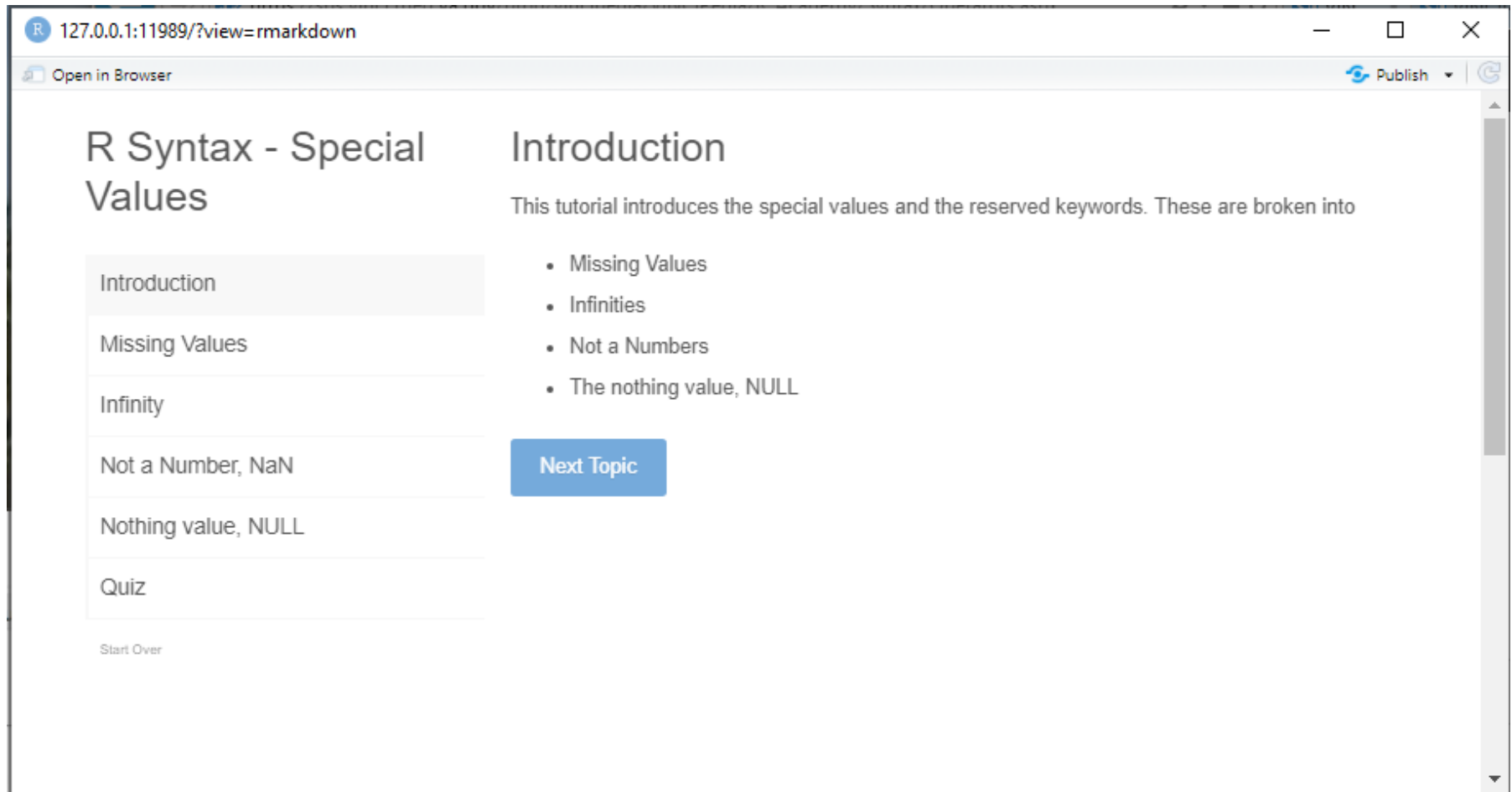


Inside Workspace

- Rstudio + Shiny + learnr = Interactive Tutorials
 1. Launch Rstudio
 2. Load the VINCI Package
 3. Run the tutorial e.g.

```
learnr::run_tutorial("R Syntax Variables",  
package="VINCI")
```

Slide Style



The screenshot shows a web browser window displaying an R Markdown document. The address bar shows the URL `127.0.0.1:11989/?view=rmarkdown`. The page title is "R Syntax - Special Values". The content is presented in a slide style with a table of contents on the left and the main content on the right. The table of contents includes: Introduction (highlighted), Missing Values, Infinity, Not a Number, NaN, Nothing value, NULL, and Quiz. The main content area has the heading "Introduction" and the text "This tutorial introduces the special values and the reserved keywords. These are broken into". Below this text is a bulleted list: "Missing Values", "Infinities", "Not a Numbers", and "The nothing value, NULL". A blue "Next Topic" button is located below the list. At the bottom left of the content area, there is a "Start Over" link. The browser window also shows "Open in Browser" and "Publish" buttons.

127.0.0.1:11989/?view=rmarkdown

Open in Browser Publish

R Syntax - Special Values

Introduction

This tutorial introduces the special values and the reserved keywords. These are broken into

- Missing Values
- Infinities
- Not a Numbers
- The nothing value, NULL

[Next Topic](#)

[Start Over](#)

Exercises

```
Code  
```

```
1 TRUE || NA  
2 NA && FALSE  
3
```

```
[1] TRUE
```

```
[1] FALSE
```

- Exercises are interactive
- Modify and re-evaluate code

```
Code  
```

```
1 TRUE && NA  
2 NA || FALSE  
3
```

```
[1] NA
```

```
[1] NA
```

Quizzes

- Interactive, evaluates correct answers & gives feedback.

What is the type of `NA` ?

- numeric X
- integer X
- logical ✓
- missing X
- NULL X

Correct!

What is the length of `Inf` ?

Submit Answer

Questions?

Or comments?

