Noteable™

RStudio: Basic concepts

Understanding the basic principles of R coding in RStudio

Resource

Secondary

14-18 years

EDINA THE UNIVERSITY of EDINBURGH

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Contents

Noteable Activities for Schools: RStudio: Basic Concepts

These resources are a guide for teachers to use with the whole class or direct individual students as appropriate. The activities below can be directly distributed to pupils.

For instructions on how to install and use Noteable resources, please look at our guides for teachers in GLOW: [GLOW guidance for teachers to start using Noteable].

Content and Curriculum links

Level	Context	Indicators
14-18	Understanding basic concepts in R code	

Knowledge	Using bullet point lists to give instructions
Curriculum links (England) Computing KS4	• develop their capability, creativity and knowledge in computer science, digital media and information technology
Scottish Curriculum for Excellence	**Experiences and Outcomes:** • I understand constructs and data structures in a textual programming language **TCH 4-14a**. **Benchmark:** ○ Understands basic control constructs such as sequence, selection repetition, variables and numerical calculations in a textual language. ○ Demonstrates an understanding of how visual instructions and textual instructions for the same construct are related. ○ Identifies and explains syntax errors in a program written in a textual language. ○ Demonstrates an understanding of representations of data structures in a textual language.
All: Cross-curricular opportunities	The activities have identified opportunities for Applications of Maths.

What is RStudio?

RStudio is an integrated development environment (IDE) designed specifically for the R programming language. It provides a user-friendly and interactive environment for writing, running, and debugging R code. RStudio offers a range of features that make R programming more efficient and productive, including:

- Script Editor: A code editor with syntax highlighting, code completion, and other tools to help you write R code.
- Console: An interactive R console where you can enter and execute R commands and see their results immediately.
- Data Viewer: A tool for viewing and manipulating data frames and other data structures.
- Plotting: Built-in support for creating and visualizing plots and graphs.
- Package Management: Tools for installing, updating, and managing R packages, which are collections of functions and data sets for specific tasks.
- Version Control: Integration with version control systems like Git for tracking and managing code changes.
- Integrated Help: Access to R's documentation and help resources within the IDE.
- Project Management: Support for organizing your work into projects, which can include multiple scripts, data files, and other resources.

RStudio is widely used by data scientists, statisticians, and researchers for data analysis, statistical modelling, data visualization, and report generation using the R programming language. It enhances the R programming experience by providing a user-friendly interface and a range of tools that streamline the development and analysis process.

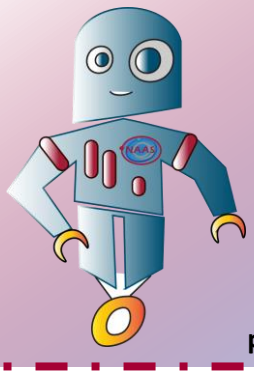
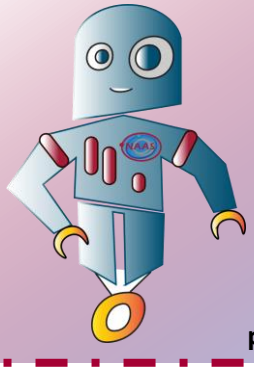
Activity 1

Resources for teachers

This activity is designed to reinforce and solidify students' foundational knowledge of R coding within the RStudio environment. The following cards can be printed and utilized as part of an engaging paired game.

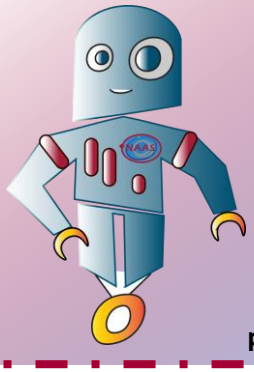
Game Instructions: In pairs, with one student designated as A and the other as B, participants take turns drawing a card and posing the question to their partner. If Student B asks the question to Student A, and Student A responds correctly, a point is awarded to Student A. Student B then draws another card and continues the process. However, if Student A answers incorrectly, Student B provides the correct answer, and they switch roles. Student A then draws a question card and Student B provides the answer. The game concludes when all the cards have been used. Short, concise responses are worth one point, while more comprehensive explanations are valued at two points. There is also one special "magic" card that offers three points.

Please note that the cards provided are suggested questions. Additionally, a blank card has been included in the set, allowing you to insert new questions that align more closely with your specific teaching objectives for your class.

Side 1	Side 2
Is RStudio nessessary for running R code? **Answer:** No, but it does make it easier.	 **points: 1**
Define RStudio. **Answer:** RStudio is an integrated development environment for R	 **points: 1**

Where can you locate error messages in RStudio?

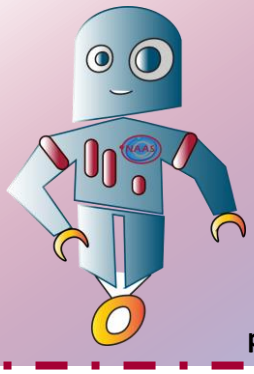
Answer: The Console



points: 1

How do create a fresh R Script?

Answer: File > New file > R Script

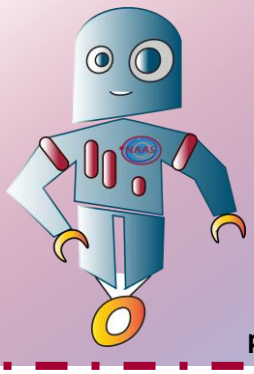


points: 1

The following R code aims to generate a numeric vector but contains an error. How would you correct it? age <- (16,21,18,19)

What would this code look like if the problem was corrected?

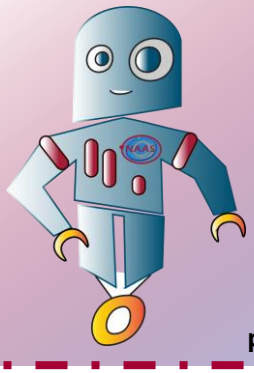
Answer: age <- c(16,21,18,19)



points: 2

What is the purpose of the argument header=TRUE?

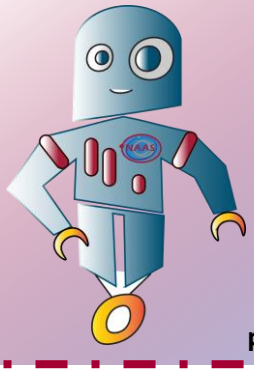
Answer: It indicates that the first row of data contains column headers or variable names.



points: 2

The sep="," command specifies how to separate data in a file. What character is typically used for separating data in most CSV files?

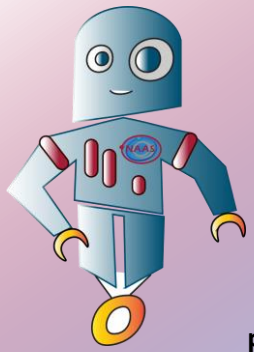
Answer: ,



points: 1

What is the role or function of the names() command?

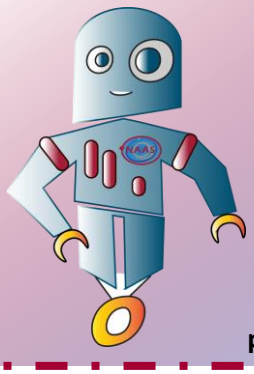
Answer: It retrieves or sets the names of the objects (columns) in a list, data frame, or vector.



points: 2

What happens when you place "#" at the start of a line of code?

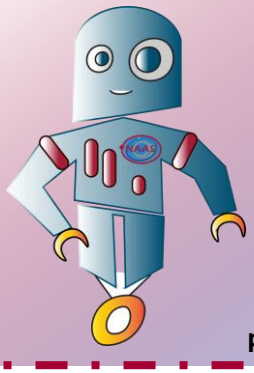
Answer: It comments out the line, making it a non-executable comment that is ignored by R.



points: 2

When you input a dataset into R, what details about the dataset become visible in the R environment?

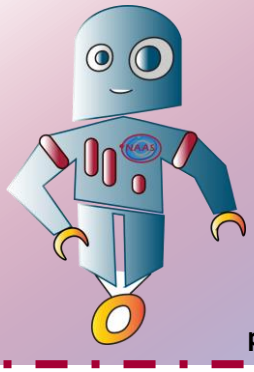
Answer: The data set's name and dimensions (number of rows and columns) appear in the environment.



points: 2

What is the correct way to name an object in R? Write the line of code for opening a file in R and naming it mydata.

Answer: mydata <- read.table(file.choose(), sep=",", header=TRUE)

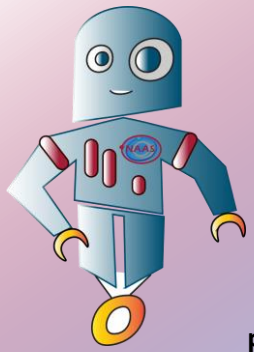


points: 3

The provided code aims to create a character vector named names with four elements. What is missing from this code?

names <- c(John,Mary,Paul,Jane)

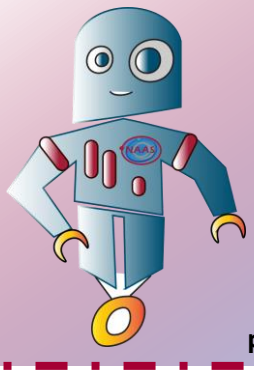
Answer: The character values should be enclosed in quotation marks. Corrected code: names <- c("John", "Mary", "Paul", "Jane")



points: 2

What is the purpose of the attach() command?

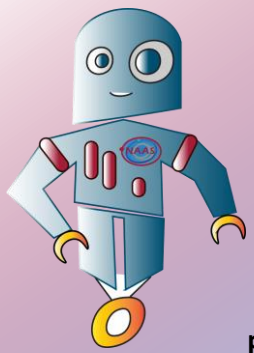
Answer: The attach() function attaches a data frame to the search path, allowing you to refer to its columns by name without specifying the data frame each time.



points: 2

How would you define a package in R?

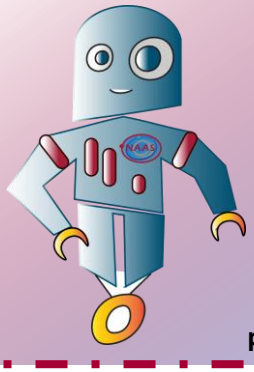
Answer: A collection of R functions, data, and compiled code



points: 1

How can you install packages using R code?

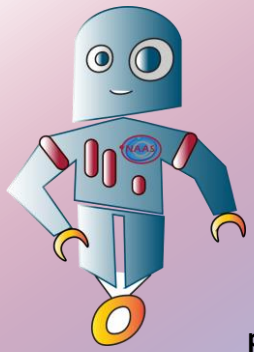
Answer: install.packages()



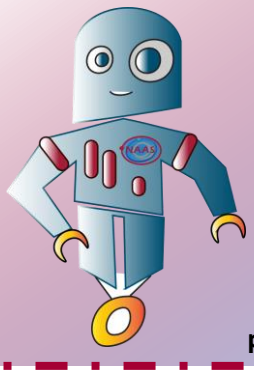
points: 2

How can you access help for commands within R?

Answer: You can find help for commands by using the ? operator followed by the command or function name. For example, ?function_name will display help documentation for that function.



points: 1



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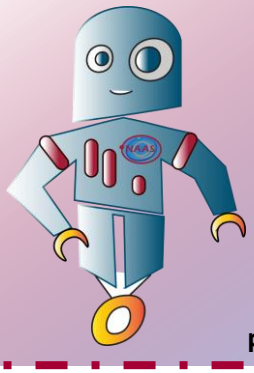

points: 2

Cross-curricular opportunities

Applications of Maths: One area where you can enhance the utility of this resource is by incorporating code related to statistical analysis within RStudio.

RStudio can significantly enhance learning in Applications of Maths for SQA Highers by providing students with a practical and hands-on approach to mathematical concepts and their real-world applications. Here's how it can help:

- **Visualizing Concepts:** RStudio helps students understand math by creating visual representations of math ideas, like graphs and charts.
- **Statistics Made Easier:** It's great for teaching statistics, which is a big part of Applications of Maths. Students can use it to analyse data and learn statistical concepts.
- **Real-World Math:** With RStudio, students can work with real data to solve real problems, connecting math to the real world.
- **Programming Skills:** Students can learn programming basics in RStudio, which is a useful skill in today's job market.
- **Interactive Learning:** RStudio gives instant feedback, making learning more dynamic.
- **Project-Based Learning:** It supports projects where students use math to solve real problems. This builds critical thinking skills.
- **Data Interpretation:** RStudio helps students learn how to understand and analyse data.
- **Reproducibility:** It encourages good research practices by creating documents that show how math was used to solve a problem.
- **Career Readiness:** RStudio skills can prepare students for jobs in data science and other fields.

Using RStudio in your teaching can make math more practical and fun for students, helping them understand math concepts better and preparing them for future opportunities.

Preparation for Further Study and Careers: Proficiency in RStudio and R programming can open doors to careers in data science, statistics, finance, and research. It also prepares students for higher-level mathematical studies.

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