

hands on programming with r write your own functi Workbook

Hands on programming with R: Write your own functions

Embarking on the journey of programming in R can be both exciting and rewarding, especially when you learn to craft your own functions. Writing custom functions in R empowers you to automate repetitive tasks, create modular code, and develop reusable components tailored to your specific data analysis needs. In this comprehensive guide, we'll explore the fundamentals of writing functions in R, step-by-step examples, best practices, and tips to enhance your programming skills. Whether you're a beginner or looking to deepen your R expertise, this hands-on approach will help you become more proficient and confident in your coding abilities.

Understanding the Basics of Functions in R

Before diving into writing your own functions, it's essential to grasp the core concepts behind functions in R.

What is a Function?

A function in R is a block of organized, reusable code that performs a specific task. Functions take inputs (called arguments), process them, and return an output. They help break down complex problems into manageable parts and promote code reusability.

Why Write Your Own Functions?

While R comes with many built-in functions, creating your own allows you to:

- Automate repetitive tasks
- Customize calculations to your specific needs
- Improve code readability and organization
- Reuse code across multiple projects

Creating Your First Function in R

Let's start with a simple example of defining and calling a custom function.

Basic Syntax

```
```\n\nmy_function\nFunction body\n\nReturn statement (optional)\n\n}\n\n```\n
```

## Example: A Function to Calculate the Square of a Number

```
```\n\nsquare_number\nresult\nreturn(result)\n\n}\n\n```\n
```

Usage

square_number(4) Output: 16

```
```\n
```

This basic example demonstrates how to define a function, pass an argument, perform an operation, and return a result.

## Step-by-Step: Writing Your Own Functions in R

Let's walk through the process of creating more complex functions with multiple inputs, default values, and error handling.

### 1. Define the Function Name and Arguments

Choose a descriptive name and specify the inputs your function needs.

## 2. Write the Function Body

Include the computations or operations your function should perform.

## 3. Include Return Statement

Specify what value(s) your function should output. If omitted, R returns the last evaluated expression.

## 4. Test the Function

Run your function with different inputs to ensure correctness.

## Example: Developing a Custom Summary Statistics Function

Suppose you want to create a function that outputs mean, median, and standard deviation for a numeric vector.

```
``r

compute_stats
if (!is.numeric(data)) {

 stop("Input must be a numeric vector.")

}

mean_val
median_val
sd_val
return(list(mean = mean_val, median = median_val, sd = sd_val))

}
```

Usage

```
sample_data
stats
print(stats)
```

```
...
```

This function:

- Checks if the input is numeric
- Calculates mean, median, and standard deviation
- Returns the results in a list for easy access

## Advanced Tips for Writing Effective Functions in R

To write robust and efficient functions, consider the following best practices:

### 1. Use Default Arguments

Provide default values to make functions flexible.

```
```r  
  
greet  
paste("Hello,", name)  
  
}  
  
```
```

### 2. Validate Inputs

Ensure your functions handle unexpected inputs gracefully.

```
```r  
  
if (!is.numeric(x)) {  
  
  stop("x must be numeric.")  
  
}  
  
```
```

### 3. Modularize Your Code

Break complex tasks into smaller functions for clarity and reusability.

## 4. Document Your Functions

Use comments and Roxygen2-style documentation to make your code understandable.

## 5. Test Thoroughly

Check your functions with various inputs, including edge cases.

## Practical Examples of Custom Functions in Data Analysis

Let's explore some real-world scenarios where writing your own functions can streamline your workflow.

### 1. Data Cleaning Function

```
```r

clean_data
for (col in columns) {

  df[[col]]
  df[[col]]
}

return(df)

}

```
```

### 2. Normalization Function

```
```r

normalize
(x - min(x)) / (max(x) - min(x))

}

```
```

### 3. Custom Plot Function

```
``r

plot_histogram
hist(data, breaks = bins, main = title, xlab = "Values")

}

``
```

## Debugging and Optimizing Your Functions

Writing good functions also involves debugging and optimizing.

### Common Debugging Techniques

- Use ``print()`` statements to trace variable values
- Employ ``browser()`` to step through code
- Use ``tryCatch()`` to handle errors gracefully

### Performance Optimization

- Vectorize operations to improve speed
- Avoid unnecessary loops
- Use efficient data structures like `data.tables` or matrices when appropriate

## Conclusion: Becoming Proficient in R Function Programming

Mastering the art of writing your own functions in R unlocks a new level of programming efficiency and flexibility. By understanding the syntax, practicing with real examples, and adhering to best practices, you'll be able to develop robust, reusable, and maintainable code. Remember to validate your inputs, document your functions, and test thoroughly. As you gain experience, you'll find that custom functions become indispensable tools in your data analysis toolkit, enabling you to handle complex tasks with confidence and ease.

Start experimenting today by creating your own functions tailored to your projects, and watch your R programming skills grow exponentially. With consistent practice, writing your own functions will become second nature, transforming you into a more effective and innovative data scientist or

analyst.

## Hands-On Programming with R: Write Your Own Functions

In the world of data analysis and statistical computing, R has established itself as an indispensable tool for researchers, data scientists, and statisticians alike. Its extensive library of packages, intuitive syntax, and powerful data manipulation capabilities make it a go-to language for a broad spectrum of analytical tasks. **Hands-on programming with R: write your own functions** is a vital skill that transforms you from a passive user of pre-built functions to an active creator of custom tools tailored to your specific needs. Developing your own functions not only enhances your coding efficiency but also deepens your understanding of R's core concepts, enabling more sophisticated and reproducible analyses.

This article aims to guide you through the process of writing your own functions in R, illustrating key principles, best practices, and practical examples to empower you on your programming journey.

## Understanding the Significance of Functions in R

Before diving into the mechanics of writing functions, it's essential to grasp why functions are fundamental in R programming.

### What Is a Function?

A function in R is a reusable block of code designed to perform a specific task. Functions accept inputs, process them, and return outputs. They promote code reuse, modularity, and clarity, especially in complex projects.

### Why Write Your Own Functions?

While R provides a vast array of built-in functions for common tasks (like `mean()`, `sum()`, or `lm()`), there are countless scenarios where custom functions are necessary:

- Automating repetitive tasks
- Encapsulating complex calculations
- Creating tailored data transformations
- Building reusable tools for analyses specific to your projects

Writing your own functions streamlines workflows and fosters reproducibility, a cornerstone of scientific research.

## Basics of Writing a Function in R

Creating a function in R involves defining it with the `function()` keyword, specifying its parameters, and including a body of code that executes the desired operations.

### Step-by-Step Example

Let's walk through the process with a simple example: creating a function that calculates the area of a rectangle.

```
```r
```

Define the function

```
calculate_area  
area  
return(area)
```

```
}
```

```
```
```

In this example:

- `calculate_area` is the name of the function.
- `length` and `width` are input parameters.
- The body calculates the area and returns it.

You can call this function with specific values:

```
```r
```

```
calculate_area(5, 3)
```

```
[1] 15
```

```
```
```

### Key Components of an R Function



- Name: Descriptive identifier for the function.
- Parameters: Inputs that the function accepts.
- Body: The code that performs operations.
- Return Statement: Outputs the result; if omitted, R returns the last evaluated expression.

## Best Practices for Writing Effective R Functions

Creating robust, flexible functions requires adherence to best practices that ensure clarity, maintainability, and efficiency.

### 1. Use Descriptive Names and Comments

Choose clear, descriptive names for your functions and parameters. Add comments within your code to explain complex logic.

```
```r
```

Function to calculate the BMI given weight and height

```
calculate_bmi  
bmi  
return(bmi)  
  
}
```

```
```
```

### 2. Handle Inputs Carefully

Validate input types and values to prevent errors during execution.

```
```r
```

```
calculate_bmi  
if (!is.numeric(weight_kg) || !is.numeric(height_m)) {  
  
  stop("Both weight and height must be numeric.")  
  
}  
  
if (any(c(weight_kg, height_m)
```

```
stop("Weight and height must be positive values.")
```

```
}
```

```
bmi  
return(bmi)
```

```
}
```

```
```
```

### 3. Make Functions Flexible

Allow for optional parameters or vectorized inputs to enhance versatility.

```
```r
```

```
calculate_bmi  
Input validation omitted for brevity
```

```
bmi  
if (round_result) {
```

```
bmi  
}
```

```
return(bmi)
```

```
}
```

```
```
```

### 4. Keep Functions Focused

Design functions to perform a single task well, following the principle of modularity.

### 5. Test Thoroughly

Test your functions with different inputs, including edge cases, to ensure robustness.

## Advanced Function Features in R

Once comfortable with basic functions, explore advanced features to elevate your programming skills.

## 1. Default Arguments

Set default values for parameters to simplify function calls.

```
```r  
  
calculate_bmi  
Function body  
  
}  
  
```
```

## 2. Variable Arguments with `...`

Pass additional arguments to other functions or handle multiple inputs flexibly.

```
```r  
  
plot_data  
plot(x, y, ...)  
  
}  
  
```
```

## 3. Returning Multiple Values

Use lists to return multiple outputs from a single function.

```
```r  
  
compute_stats  
list(  
  
  mean = mean(vec),  
  
  median = median(vec),  
  
)
```

```
sd = sd(vec)
```

```
)
```

```
}
```

```
...
```

4. Anonymous and Inline Functions

Create quick, one-off functions using ``function()`` directly within other functions or expressions.

```
```r
```

```
sapply(1:5, function(x) x^2)
```

```
[1] 1 4 9 16 25
```

```
...
```

## Practical Applications: Building Useful Custom Functions

To truly grasp the power of writing your own functions, consider practical examples relevant to data analysis.

### Example 1: Custom Data Cleaning Function

Suppose you often need to remove outliers from your dataset based on z-scores.

```
```r
```

```
remove_outliers
```

```
z_scores
```

```
cleaned_data
```

```
return(cleaned_data)
```

```
}
```

```
...
```

This function simplifies outlier removal, making your workflow more efficient.

Example 2: Automated Summary Report

Create a function that summarizes a dataset's key statistics.

```
```r

generate_summary
summary_stats
Variable = names(df),

Mean = sapply(df, mean, na.rm = TRUE),

Median = sapply(df, median, na.rm = TRUE),

SD = sapply(df, sd, na.rm = TRUE)

)

return(summary_stats)

}

```
```

With such functions, you can automate repetitive reporting tasks, saving time and reducing errors.

Integrating Your Functions into Larger Projects

Once you've developed useful functions, incorporate them into larger scripts, packages, or workflows.

1. Organize Functions in Scripts

Store related functions together in dedicated R script files (`.R` files) for easy maintenance.

2. Create Reusable Packages

Package your functions into R packages for sharing with others or for personal reuse across projects. This involves:

- Writing documentation
- Using tools like `devtools` and `roxygen2`
- Building and installing the package

3. Document Your Functions

Use Roxygen comments to generate documentation, making your functions user-friendly and easier to maintain.

```
``r

' Calculate Body Mass Index (BMI)

.

' @param weight_kg Numeric. Weight in kilograms.

' @param height_m Numeric. Height in meters.

' @param round_result Logical. Whether to round the result to 2 decimal places. Default is TRUE.

' @return Numeric BMI value.

' @examples

' calculate_bmi(70, 1.75)

calculate_bmi
Function body

}

``
```

Conclusion: Empowering Your Data Analysis with Custom Functions

Hands-on programming with R by writing your own functions unlocks a new level of flexibility and efficiency in your data analysis repertoire. Beyond simply using existing tools, crafting custom functions allows you to tailor analyses, automate repetitive tasks, and foster reproducibility. As you master the fundamentals and explore advanced features, you'll find yourself developing a personalized toolkit that accelerates your workflow and deepens your understanding of both R and

your data.

Remember, effective function design is an iterative process?start simple, test thoroughly, and refine continually. With practice, you'll discover that creating your own functions becomes an intuitive and rewarding aspect of your programming journey, transforming you from a passive user into a proactive developer of analytical solutions.

QuestionAnswer What is the purpose of writing your own functions in R? Writing your own functions in R allows for code reuse, modularity, and improved readability, making complex tasks easier to manage and automate. How do you define a simple function in R? You define a function in R using the 'function()' keyword, for example: my_func

Related keywords: R programming, write your own functions, hands-on R, R function creation, R scripting, programming with R, custom functions in R, R coding tutorials, R function examples, R programming exercises

WRITE AND WIPE COUNTING SCHOLASTIC EARLY LEARNERS

Write and Wipe Counting Scholastic Early Learners: A Comprehensive Guide

Write and wipe counting scholastic early learners are invaluable educational tools designed to foster foundational math skills in young children. These versatile resources combine the engaging qualities of handwriting practice with the essential skill of number recognition and counting. As early learners begin their educational journey, providing them with effective, interactive, and durable learning aids can significantly enhance their understanding of basic math concepts. Scholastic, a renowned publisher in educational resources, offers a wide range of write and wipe counting materials tailored to meet the developmental needs of early learners.

Understanding the Importance of Write and Wipe Counting Tools

What Are Write and Wipe Counting Materials?

Write and wipe counting materials are reusable educational aids that typically consist of laminated sheets, whiteboards, or dry-erase mats featuring numbers, counting activities, and interactive exercises. These tools allow children to practice counting, number recognition, and simple arithmetic repeatedly without the need for additional paper or supplies. Using dry-erase markers, children can write directly on the surface, erase, and try again, promoting hands-on engagement and immediate feedback.

Why Are They Essential for Early Learners?

- **Encourage active participation:** Kids learn best when actively involved. Write and wipe tools invite children to manipulate numbers physically, enhancing retention.
- **Reinforce foundational skills:** Counting, number recognition, and basic addition/subtraction are core skills that these materials help develop.
- **Promote independence:** Children can practice at their own pace, fostering confidence and independent learning habits.
- **Durability and cost-effectiveness:** Reusable surfaces mean less waste and more economical use over time.
- **Versatility:** Suitable for classroom, homeschool, or tutoring settings, adaptable for various learning styles.

Features of Scholastic Write and Wipe Counting Resources

Design Elements

Scholastic's write and wipe counting tools are thoughtfully designed to cater to early learners. Key features include:

- **Bright, engaging visuals:** Colorful illustrations and friendly characters to attract children's attention.
- **Clear, large fonts:** Easy-to-read numbers to aid recognition.
- **Interactive activities:** Counting exercises, number lines, and simple puzzles that promote active learning.
- **Durable materials:** Laminated surfaces resistant to tearing and staining.
- **Inclusive content:** Activities designed to cater to diverse learners, including those with special educational needs.

Types of Write and Wipe Counting Materials Offered by Scholastic

- **Number Mats:** Large mats with numbers and corresponding objects for counting practice.
- **Counting Boards:** Interactive boards that facilitate number sequencing and counting exercises.
- **Number Lines:** Writable number lines that help children understand number order and basic addition/subtraction.
- **Activity Sheets:** Laminated worksheets with various counting and number recognition activities.

Benefits of Using Write and Wipe Counting Tools in Early Education

Enhancing Cognitive Development

Using write and wipe counting resources helps develop critical thinking and problem-solving skills. Children learn to recognize patterns, understand numerical relationships, and apply logical reasoning through interactive exercises.

Supporting Differentiated Learning

These tools allow educators and parents to tailor activities to individual learning paces. Struggling learners can practice basic skills repeatedly, while advanced children can be challenged with more complex tasks.

Fostering Fine Motor Skills

Writing and erasing on these surfaces help improve hand-eye coordination and fine motor control, essential for handwriting development.

Encouraging Collaborative Learning

Write and wipe counting activities can be used in group settings, encouraging peer interaction, communication, and teamwork as children solve problems together.

Implementing Write and Wipe Counting Activities Effectively

Setting Up the Learning Environment

- Designate a clean, accessible space for the write and wipe materials.
- Ensure all supplies, such as dry-erase markers and erasers, are available.
- Incorporate these tools into daily lesson plans for consistent practice.

Best Practices for Use

- **Start with the basics:** Introduce number recognition and counting exercises gradually.
- **Use guided instruction:** Demonstrate how to use the materials effectively before children try independently.
- **Incorporate play:** Turn activities into games or challenges to increase engagement.
- **Provide immediate feedback:** Correct misconceptions and praise efforts to build confidence.
- **Encourage repetition:** Repeated practice solidifies learning and mastery.

Assessment and Progress Monitoring

- Use the outcomes of activities to identify areas needing additional support.
- Track progress over time to measure improvements in counting and number recognition skills.
- Adjust activities based on individual student needs for optimal learning outcomes.

Choosing the Right Write and Wipe Counting Materials from Scholastic

Factors to Consider

- **Age appropriateness:** Select materials tailored to the child's developmental level.
- **Curriculum alignment:** Ensure resources complement your educational standards and goals.
- **Durability:** Opt for high-quality laminated surfaces suitable for frequent use.
- **Variety of activities:** Use a mix of mats, boards, and worksheets to maintain interest.
- **Ease of use:** Choose user-friendly designs that children can operate independently.

Popular Scholastic Write and Wipe Counting Products

- **Scholastic Early Learners Count & Write Dry-Erase Mats:** Large mats with guided activities for counting and writing practice.
- **Scholastic Number Line Write & Wipe Boards:** Portable boards for understanding number sequences and basic arithmetic.
- **Scholastic Counting and Number Recognition Activity Sheets:** Laminated sheets for hands-on practice with various exercises.

Conclusion: Enhancing Early Math Skills with Scholastic Write and Wipe Counting Resources

Investing in **write and wipe counting scholastic early learners** tools offers a dynamic and interactive way to build essential math skills in young children. These resources not only make learning engaging but also promote independence, confidence, and mastery of foundational concepts. By incorporating well-designed write and wipe activities into daily routines, educators and parents can create a rich learning environment that nurtures early numeracy skills. As children practice counting, recognize numbers, and develop their problem-solving abilities through these durable and versatile tools, they lay the groundwork for future academic success. The combination of effective design, engaging content, and repeated practice makes scholastic write and wipe counting resources an indispensable part of early childhood education.

Write and Wipe Counting Scholastic Early Learners are a popular educational resource designed to support young children as they develop foundational math skills. These engaging learning tools combine the tactile benefits of writing with the convenience of reusable surfaces, making them an excellent choice for early childhood educators and parents aiming to foster a love for math early on. With a focus on counting, number recognition, and basic arithmetic, these write and wipe products offer a versatile approach to learning that can be easily integrated into daily lessons or home practice sessions.

Overview of Write and Wipe Counting Scholastic Early Learners

Write and wipe counting products are typically laminated or made from dry-erase compatible materials that allow children to write on them with dry-erase markers and then effortlessly erase their work. Scholastic, a well-known educational publisher, offers a variety of these tools specifically tailored to early learners. These resources often come in the form of activity sheets, mats, or books designed to make counting and number recognition both accessible and engaging.

The primary goal of these tools is to reinforce basic math concepts through repetition and hands-on interaction. Children can practice counting objects, writing numbers, and solving simple problems repeatedly without the need for new sheets or materials. This reusable format not only encourages practice but also helps build confidence as children see their progress over time.

Key Features of Scholastic Write and Wipe Counting Materials

Design and Materials

- Durable laminated surfaces or dry-erase boards
- Child-friendly illustrations and layouts
- Sized appropriately for small hands
- Compatible with standard dry-erase markers

Content and Activities

- Counting objects (e.g., apples, blocks, animals)
- Number tracing and writing exercises
- Simple addition and subtraction problems
- Number sequencing and ordering
- Matching numbers to quantities

Ease of Use and Accessibility

- Reusable and easy to erase
- Portable and lightweight
- Suitable for individual or group activities
- Compatible with various dry-erase markers and accessories

Educational Benefits of Write and Wipe Counting Tools

Using write and wipe counting resources offers numerous advantages for early learners, making them an invaluable addition to any early childhood education setting.

Enhances Fine Motor Skills

- Kids practice writing numbers and counting objects, improving hand-eye coordination and pencil grip.
- Repeated tracing and writing help develop muscle memory essential for handwriting.

Builds Number Recognition and Fluency

- Visual exposure to numbers in different contexts reinforces recognition.
- Repetitive practice aids in mastering number sequences and basic arithmetic.

Encourages Active Learning and Engagement

- Hands-on activities keep children actively involved.
- Reusable format allows for iterative learning, boosting confidence.

Provides Immediate Feedback and Self-Correction

- Children can see their work instantly erased and corrected.
- Promotes independent learning and problem-solving skills.

Supports Differentiated Instruction

- Activities can be adapted for varying skill levels.
- Teachers and parents can customize exercises to meet individual needs.

Pros and Cons of Write and Wipe Counting Scholastic Early Learners

Pros:

- Reusable and Cost-Effective: One set can be used repeatedly, reducing waste and ongoing costs.
- Durable Materials: Designed to withstand frequent erasing and handling.
- Versatile Use: Suitable for classroom centers, homeschooling, or one-on-one tutoring.
- Interactive and Engaging: Keeps children interested through tactile learning.
- Supports Multiple Learning Styles: Visual, kinesthetic, and tactile learners benefit equally.

Cons:

- Limited Content Scope: May not cover advanced concepts beyond basic counting and number recognition.
- Requires Maintenance: Markers can dry out or stain if not used properly.
- Potential for Mess: Inappropriate marker use might lead to staining or damage.
- Storage Space Needed: Must be kept organized to prevent damage or loss.
- Not a Complete Curriculum: Should be supplemented with other teaching tools for comprehensive math instruction.

Tips for Maximizing the Effectiveness of Write and Wipe Counting Tools

- Use High-Quality Markers: Invest in good-quality dry-erase markers to prevent staining and ensure smooth writing.
- Incorporate into Routine Activities: Regular practice sessions reinforce learning and retention.
- Personalize Activities: Adapt exercises to match each child's progress and interests.
- Encourage Self-Correction: Teach children to check their work by erasing and reattempting problems.
- Combine with Other Resources: Use alongside manipulatives, digital tools, and traditional worksheets for a well-rounded approach.
- Maintain and Store Properly: Keep laminated sheets flat or in folders to prevent warping or damage.

Choosing the Right Write and Wipe Counting Materials

When selecting Scholastic write and wipe counting products, consider the following factors:

- Age Appropriateness: Ensure activities match the child's developmental level.
- Content Variety: Look for resources that cover a range of skills, from simple counting to basic addition.
- Durability: Check for quality construction to withstand frequent use.
- Ease of Use: Clear instructions and simple layouts facilitate independent work.
- Compatibility: Confirm that the materials are compatible with your preferred dry-erase markers and accessories.
- Supplementary Materials: Consider whether additional activities or guides are included to extend learning.

Conclusion

Write and Wipe Counting Scholastic Early Learners are invaluable educational tools that foster early math skills through interactive, reusable, and engaging activities. Their design encourages active participation, supports differentiated learning, and promotes the development of fine motor and cognitive skills essential for young learners. While they have some limitations, such as content scope and maintenance needs, their benefits far outweigh these drawbacks when used thoughtfully and in conjunction with other instructional methods. Whether in a classroom setting or at home, these tools can help lay a solid foundation for future mathematical success, making learning both fun and effective.

QuestionAnswer What are the benefits of using Write and Wipe Counting materials for early learners? Write and Wipe Counting materials help young children develop fine motor skills, number recognition, and counting confidence by allowing repeated practice in a portable and reusable format. How can I incorporate Write and Wipe Counting tools into my daily early childhood curriculum? You can integrate these tools during math centers, circle time, or small group activities by encouraging children to practice counting, number writing, and number sequencing repeatedly. Are Write and Wipe Counting activities suitable for different learning styles? Yes, they cater to visual, kinesthetic, and tactile learners by allowing children to see numbers, write them, and physically manipulate counters or markers on the wipe surfaces. What materials are typically included in Write and Wipe Counting sets from Scholastic? These sets usually include reusable wipeboards, dry-erase markers, number cards, counters, and activity guides designed to reinforce counting skills. How can parents effectively use Write and Wipe Counting tools at home? Parents can set aside short daily sessions where children practice counting objects, writing numbers, and completing simple math challenges using the wipeable materials. Are Write and Wipe Counting activities aligned with early learning standards? Yes, they are designed to support early math

standards by helping children understand number concepts, counting sequences, and basic numeracy skills. Can Write and Wipe Counting activities be differentiated for learners with varying skill levels? Absolutely. Teachers and parents can modify activities by adjusting the difficulty, such as counting larger numbers or adding number puzzles, to meet each child's individual needs. What are some creative ways to extend Write and Wipe Counting activities? You can incorporate storytelling, use themed counters, create counting games, or challenge children to write number patterns to make learning engaging and fun. Where can I find high-quality Write and Wipe Counting resources from Scholastic? Scholastic offers a variety of printable and physical Write and Wipe Counting materials on their website, available for purchase or download, tailored for early learners' development needs.

Related keywords: early childhood education, counting activities, wipe clean books, preschool learning, educational toys, number recognition, early math skills, reusable activity books, preschool classroom resources, developmental learning tools

Read the full article online: [write and wipe counting scholastic early learners](#)