

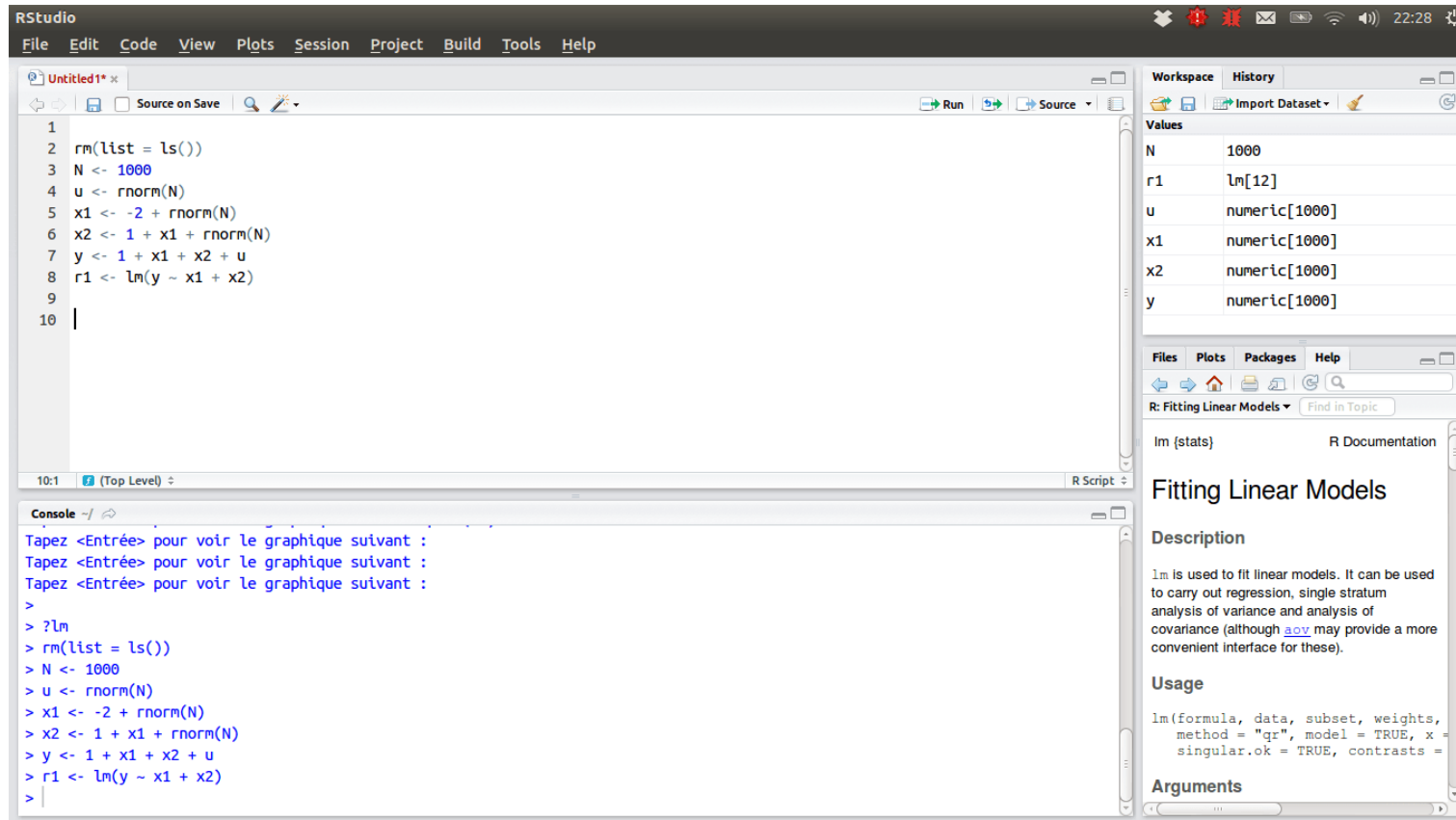
# Introduction to R (and programming)

# What is R?

- Programming language
- Tool for statistics
  
- WHY R?

# R Studio

- Integrated Development Environment



# Programming

- Way of thinking
  - Mathematics
  - Logic based
- Uses defined workflow /instructions and returns results

# Functions

- Groups of Steps that complete a process
- Each function takes input (parameters) and gives a result (output)

# Function To Build Table

- Functions are the Instruction manuals
- Need correct tools/materials

# Function To Build Table

- Functions are the Instruction manuals
- Need correct tools/materials



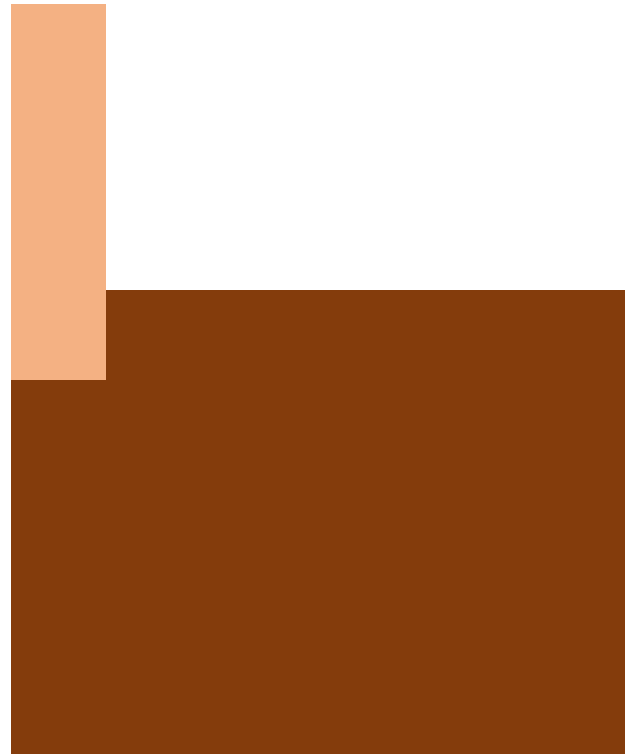
# Function To Build Table

- Functions are the Instruction manuals
- Need correct tools/materials

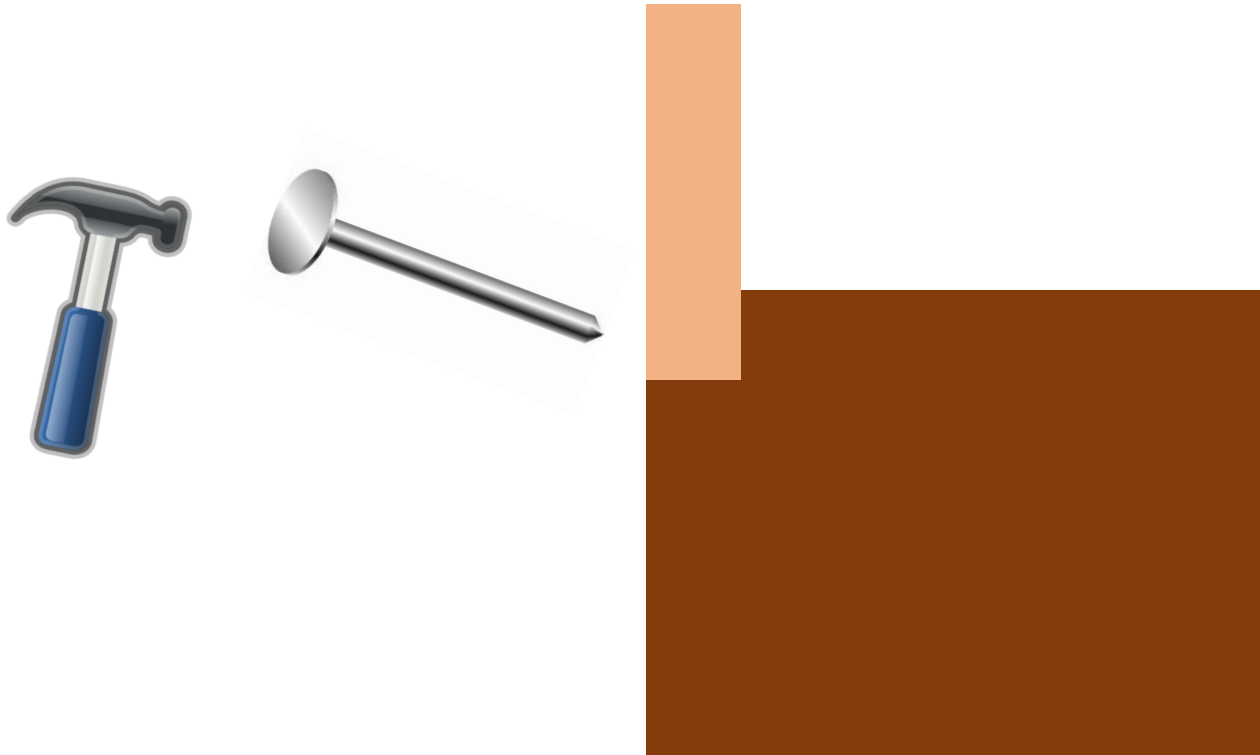




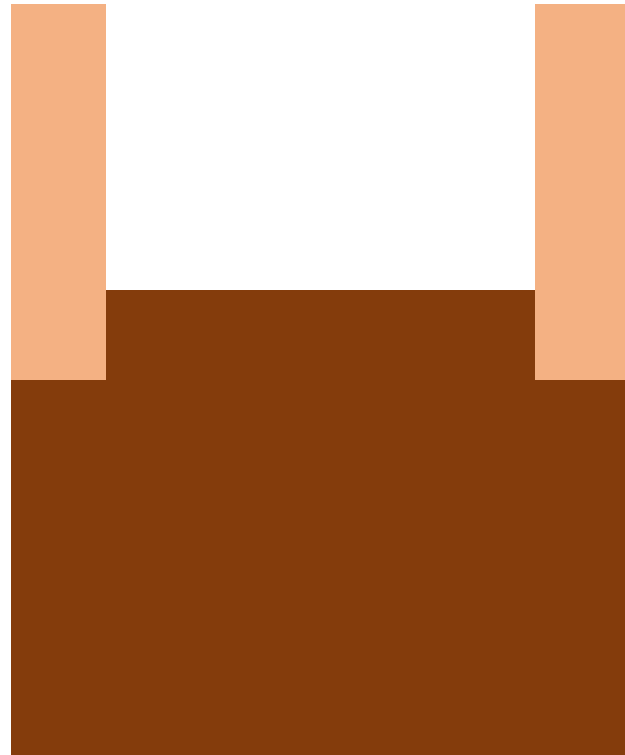
# Function To Build Table



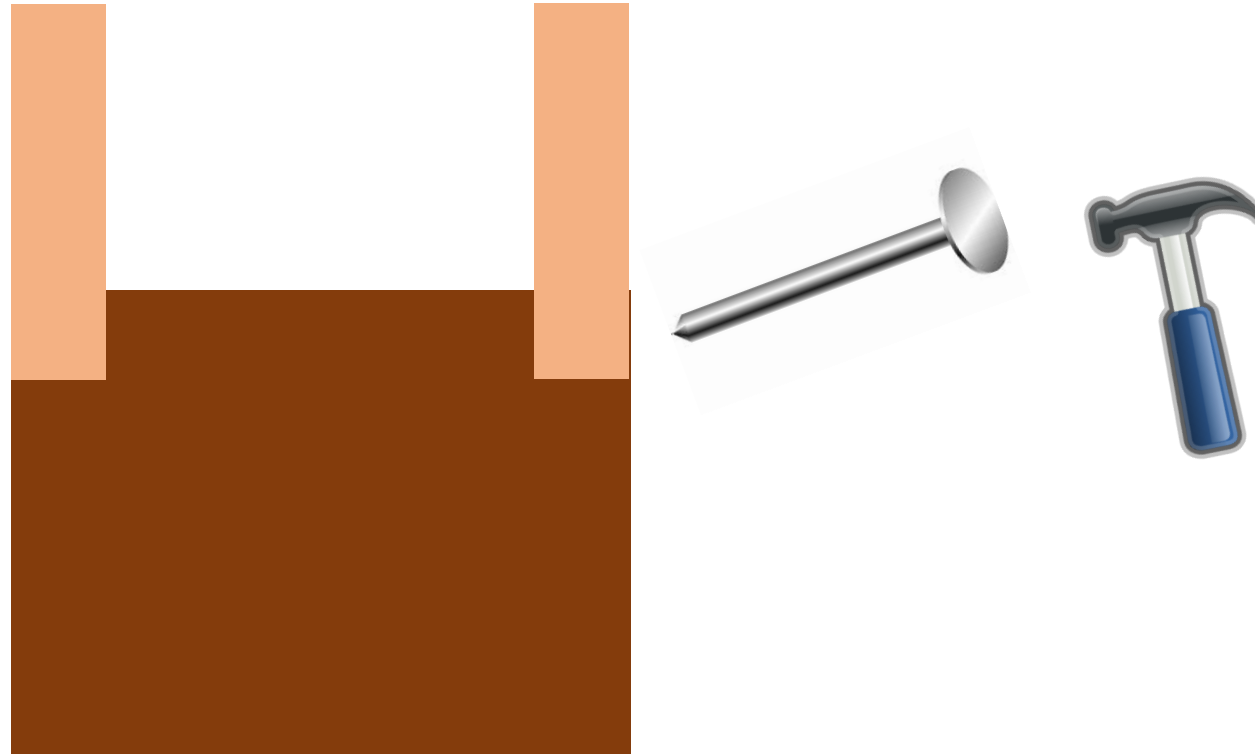
# Function To Build Table



# Function To Build Table



# Function To Build Table



# Function To Build Table



# Thinking Like a Code

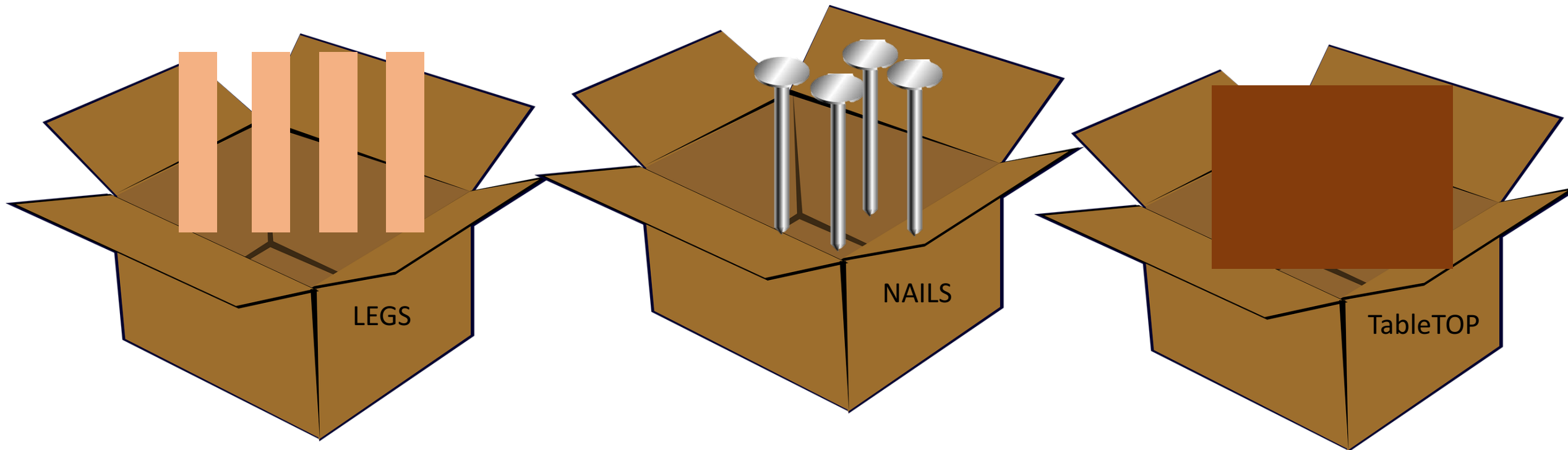
## Averaging Numbers

# Thinking Like a Code

```
Average <- function(num1, num2, num3, n){  
  num1 + num2 + num3 / n  
}
```

# Data Storage

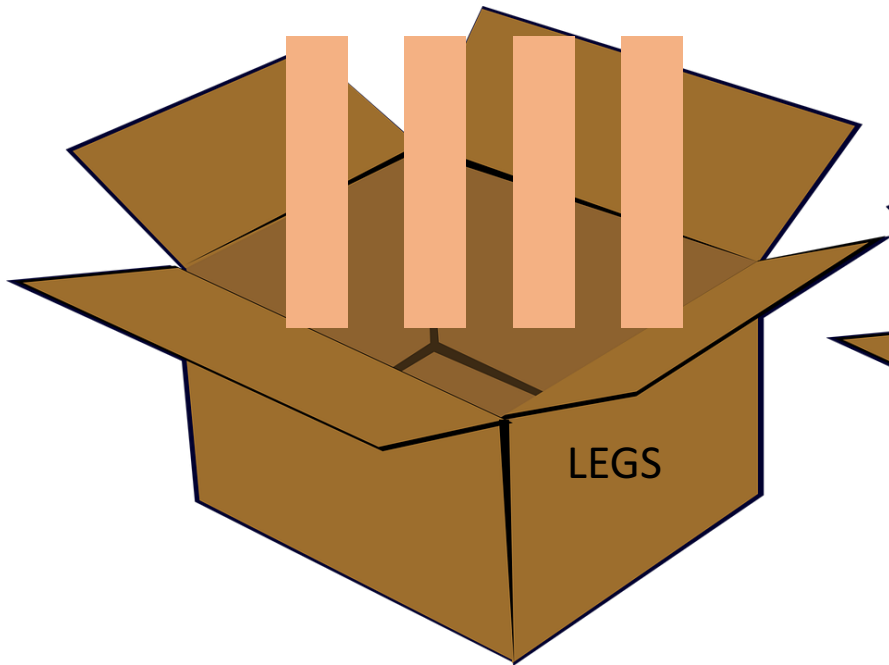
- Store information in objects
  - Objects have names



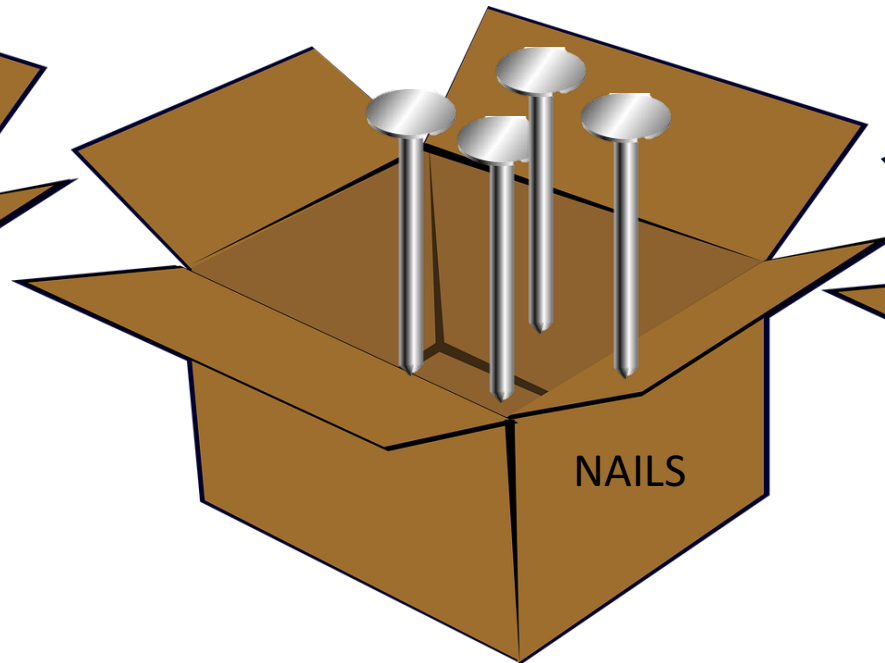


# Object Types

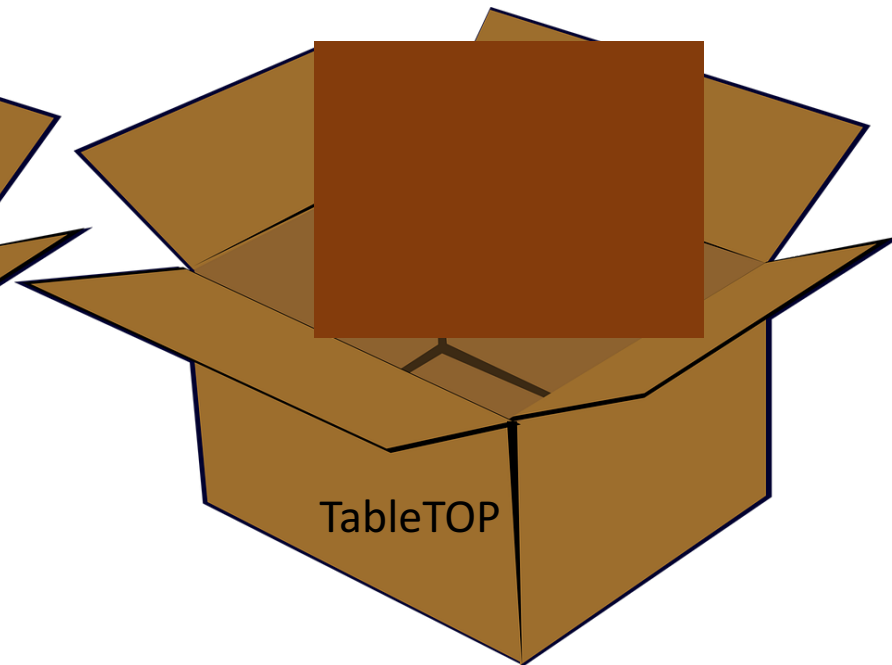
WOOD



FASTENERS



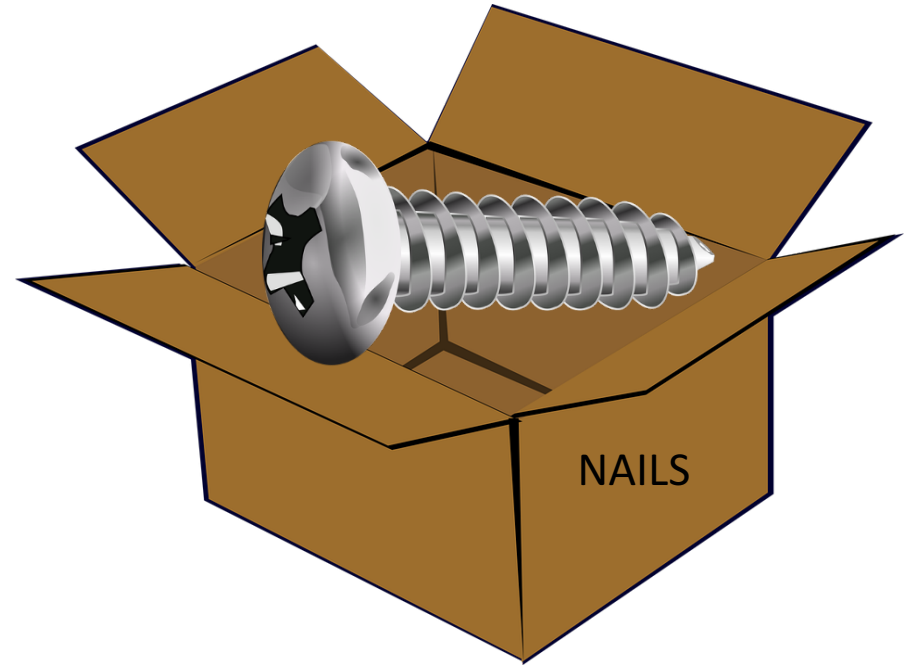
WOOD



# Object Types



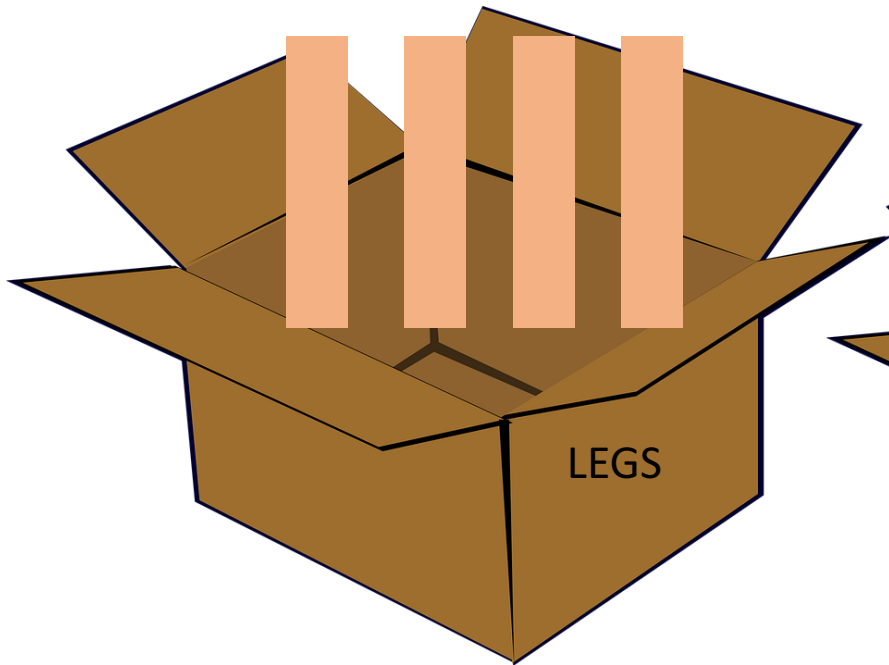
WOOD



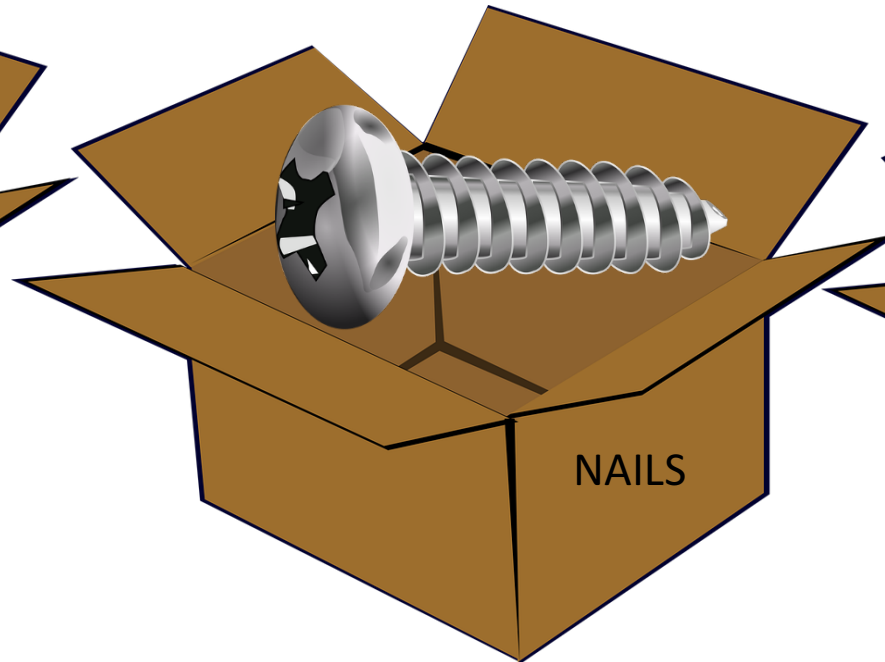
FASTENERS

# Object Types

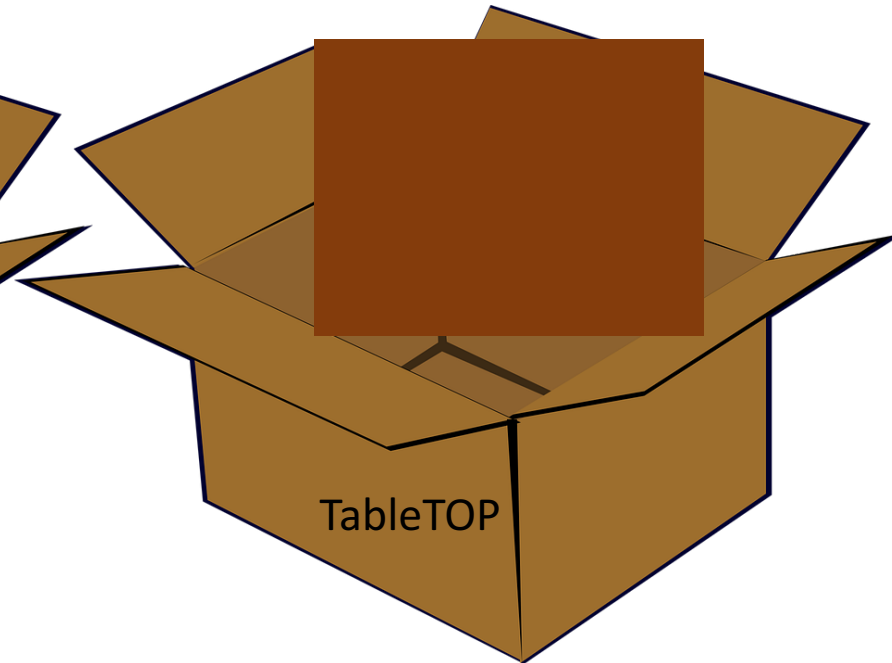
WOOD



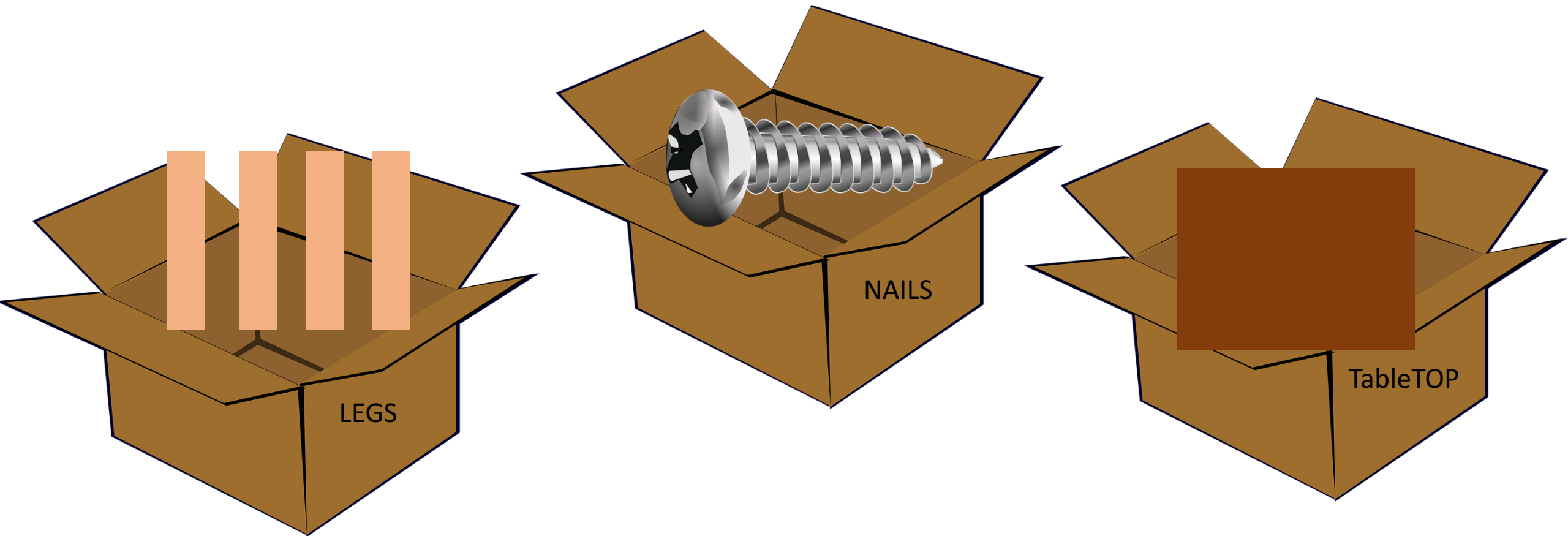
FASTENERS



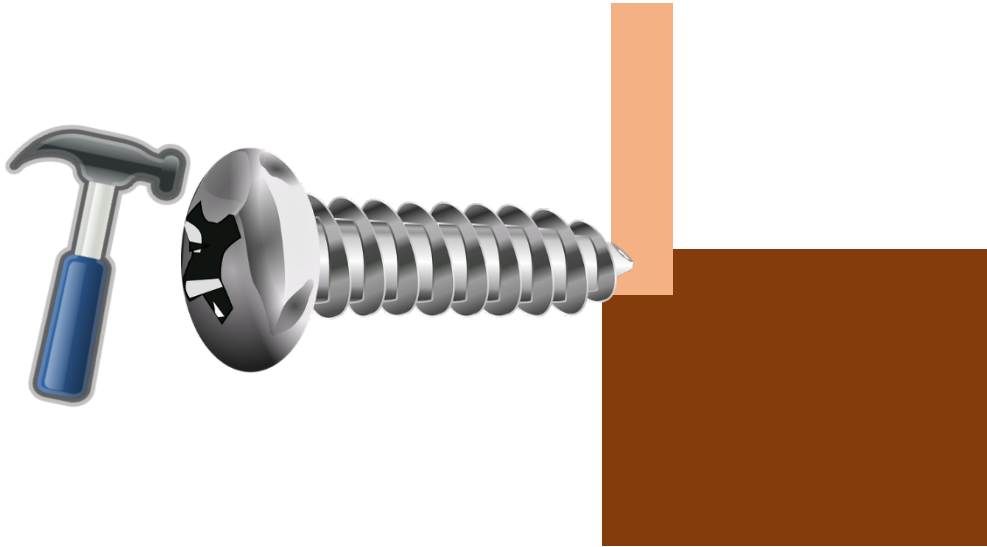
WOOD



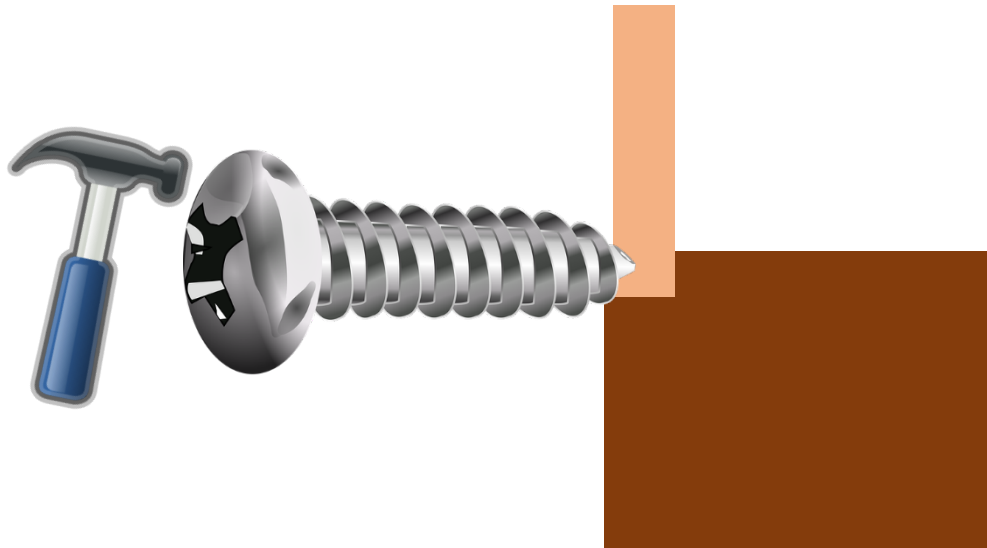
# Object Types



# Use Correct Object Types



# Use Correct Object Types



# Types of Objects

- Vector
- Dataframe
- List
- matrix

# Types of Objects

- Vector
- Dataframe
- List
- matrix

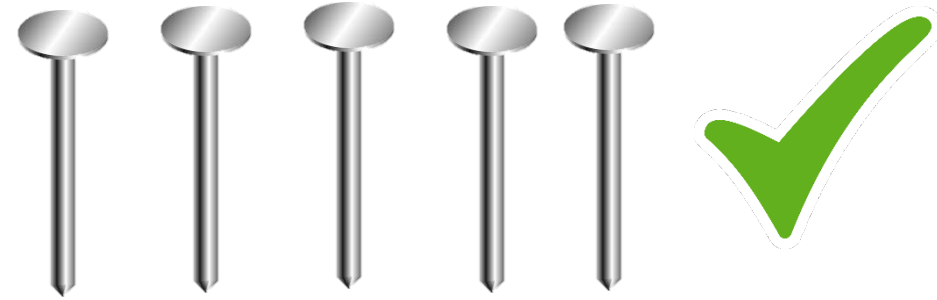
# Types of Variables

- numeric
- string
- date



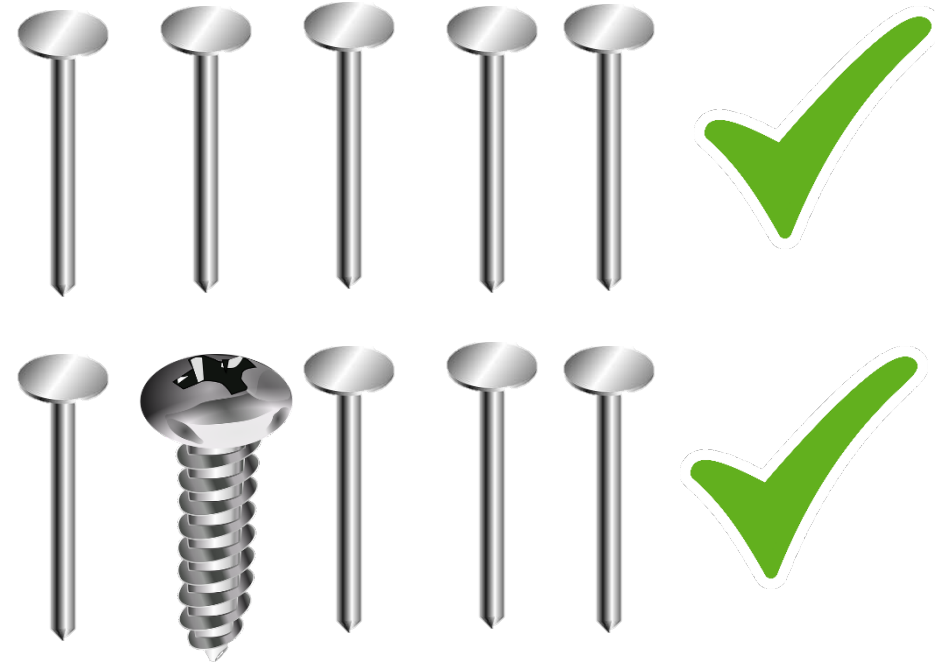
# Vector

- 1 row of data
- All the same type of data



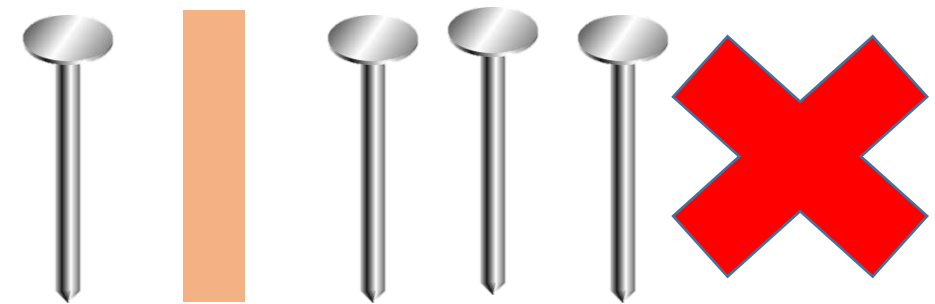
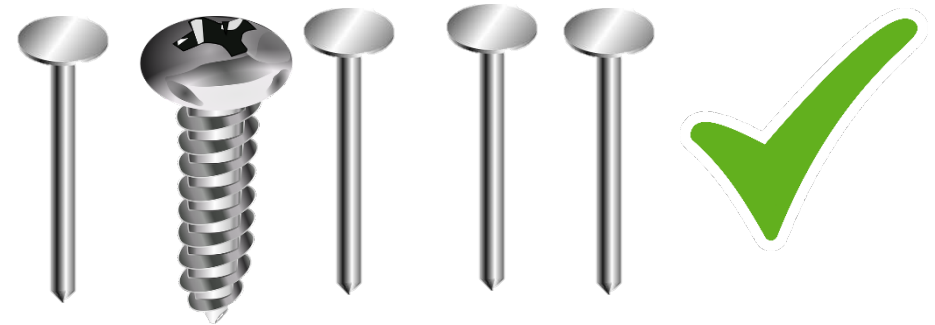
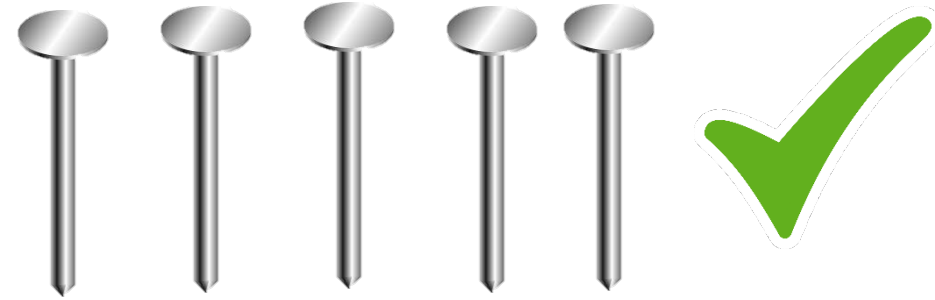
# Vector

- 1 row of data
- All the same type of data



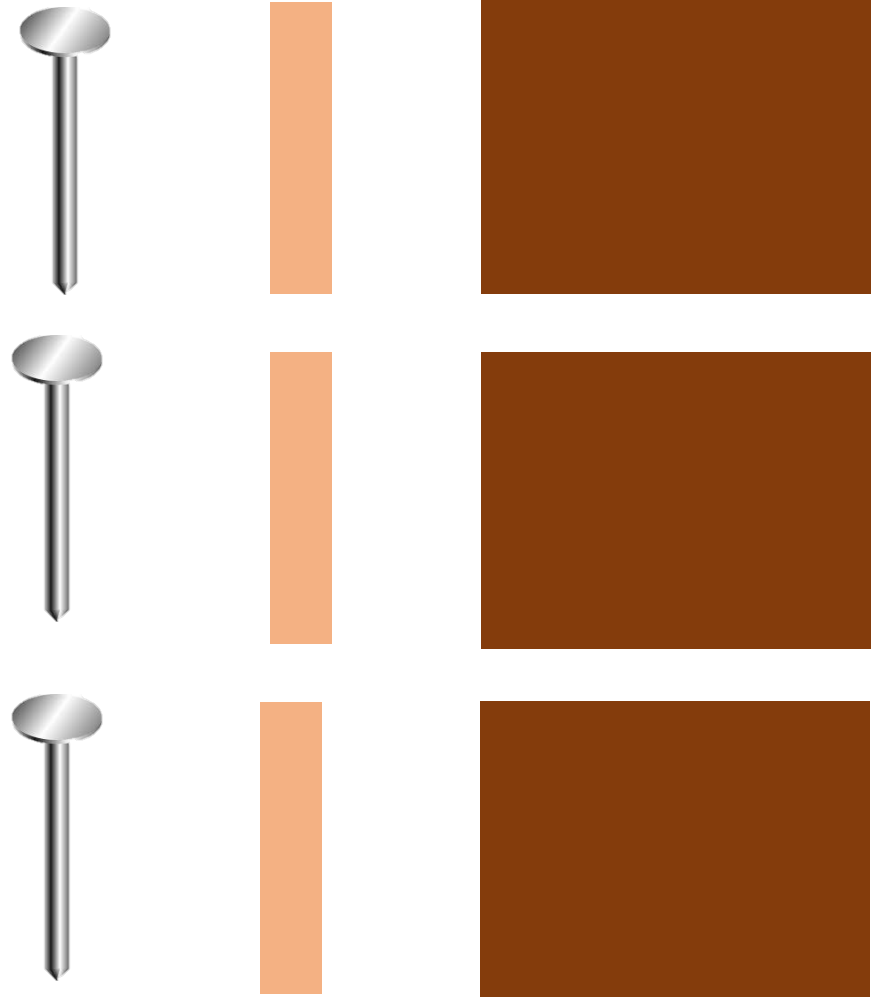
# Vector

- 1 row of data
- All the same type of data

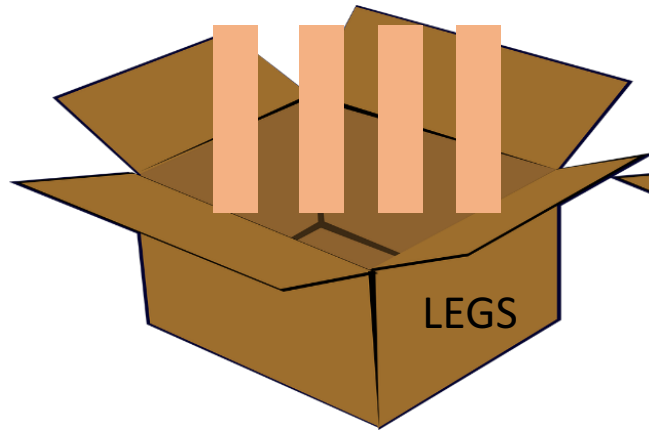


# Dataframe

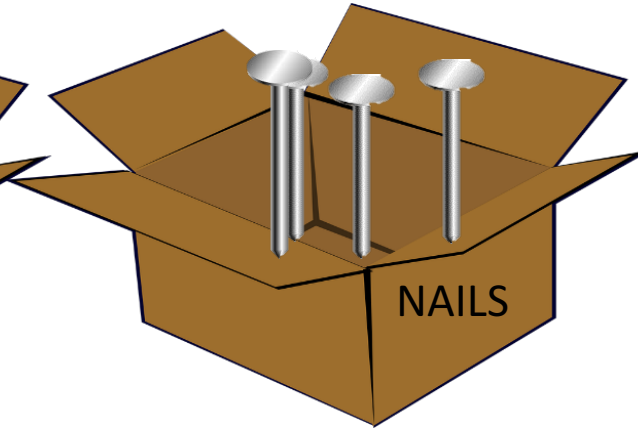
- Rows and columns
- 'spread sheet'



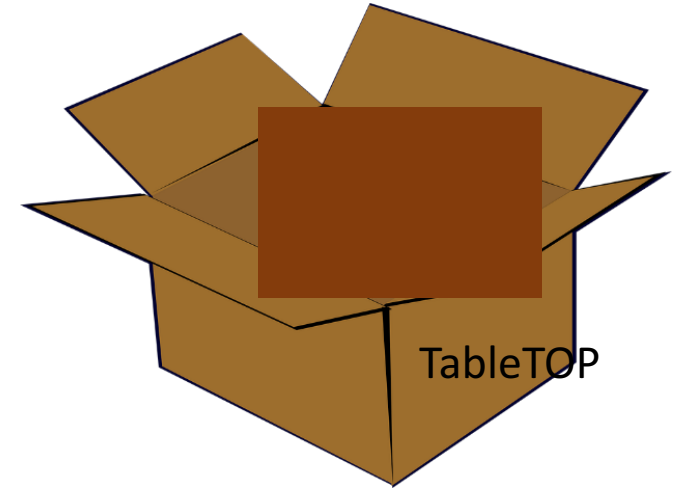
# List – Box of Boxes



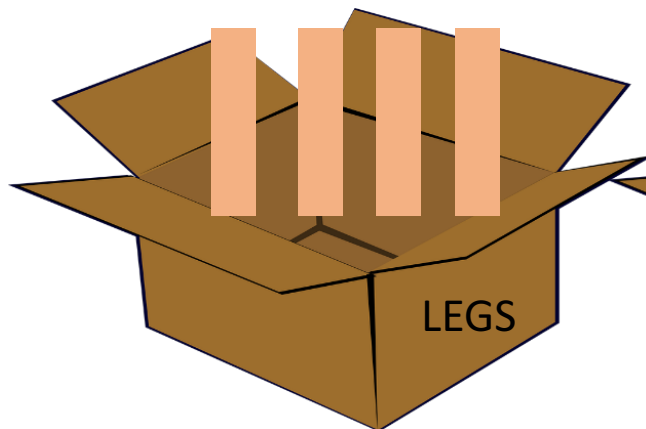
WOOD



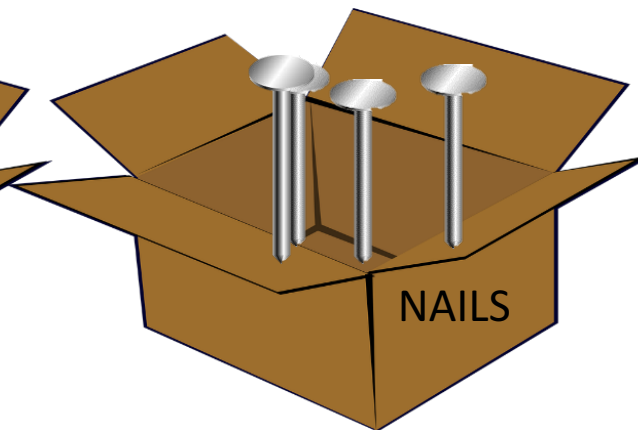
FASTENERS



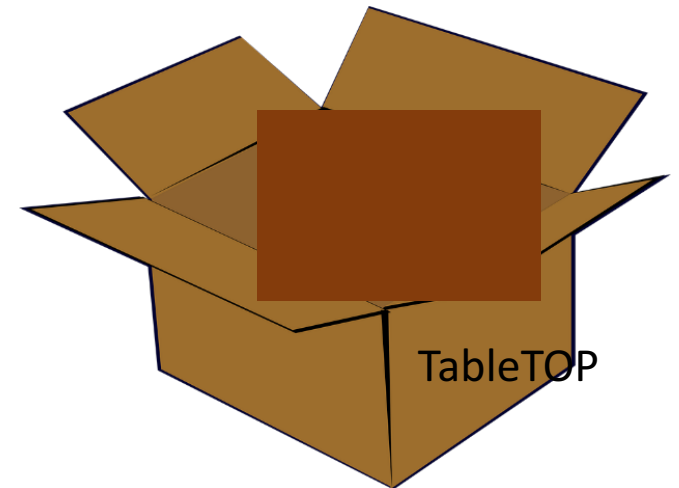
WOOD



WOOD



FASTENERS



WOOD

# Other Object Types

- Matrix
- Array
- Date/Time
- Spatial
- Formula
- Model
- ...etc...

# Thinking in Code

**Create a Vector of 7 numbers**

# Thinking in Code

```
myNUMs <- c(15, 32, 33, 17, 1, 5, 11)
```

1	2	3	4	5	6	7
15	32	33	17	1	5	11



# Thinking Like a Code

**Averaging Numbers when the Parameter is a vector**

Can only do 1 thing at a time, create average

1	2	3	4	5	6	7
15	18	7	17	9	3	15

# Can only do 1 thing at a time, create average

1	2	3	4	5	6	7
15	18	7	17	9	3	15

$$15 + 18 = 33$$

$$33 + 7 = 40$$

$$40 + 17 = 57$$

$$57 + 9 = 66$$

$$66 + 3 = 69$$

$$69 + 15 = 84$$

$$84 / 7 = 12$$

# Can only do 1 thing at a time, create average

1	2	3	4	5	6	7
15	18	7	17	9	3	15

$$15 + 18 = 33$$

$$33 + 7 = 40$$

$$40 + 17 = 57$$

$$57 + 9 = 66$$

$$66 + 3 = 69$$

$$69 + 15 = 84$$

$$84 / 7 = 12$$

```
sum1 = nums[1] + nums[2]
```

```
sum2 = sum1 + nums[3]
```

```
.....
```

```
Average <- function(nums){  
  sum=nums[1]  
  for(onenum in nums ){  
    sum = sum + onenum  
  }  
  sum/length(nums)  
}
```

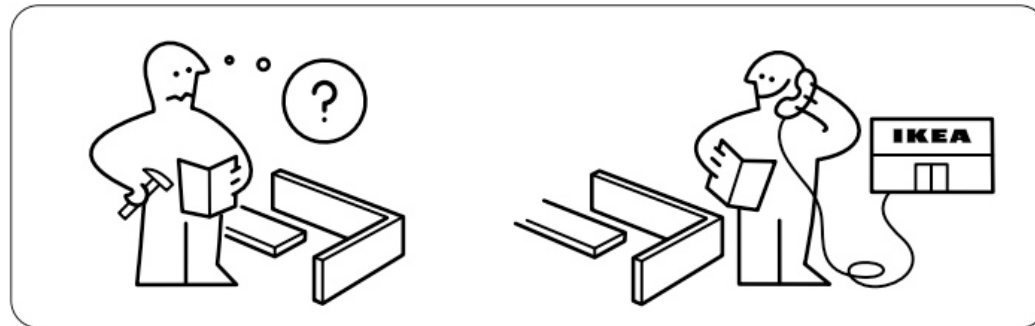
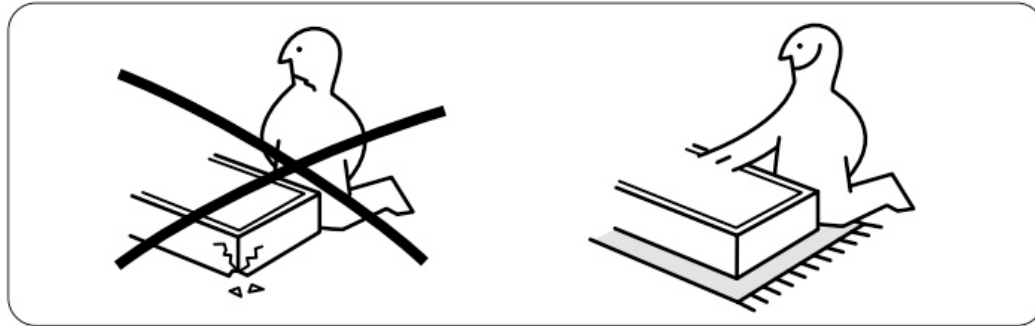
Average(mynums)

```
Average <- function(nums){  
  sum=nums[1]  
  for(onenum in nums ){  
    sum = sum + onenum  
  }  
  sum/length(nums)  
}
```

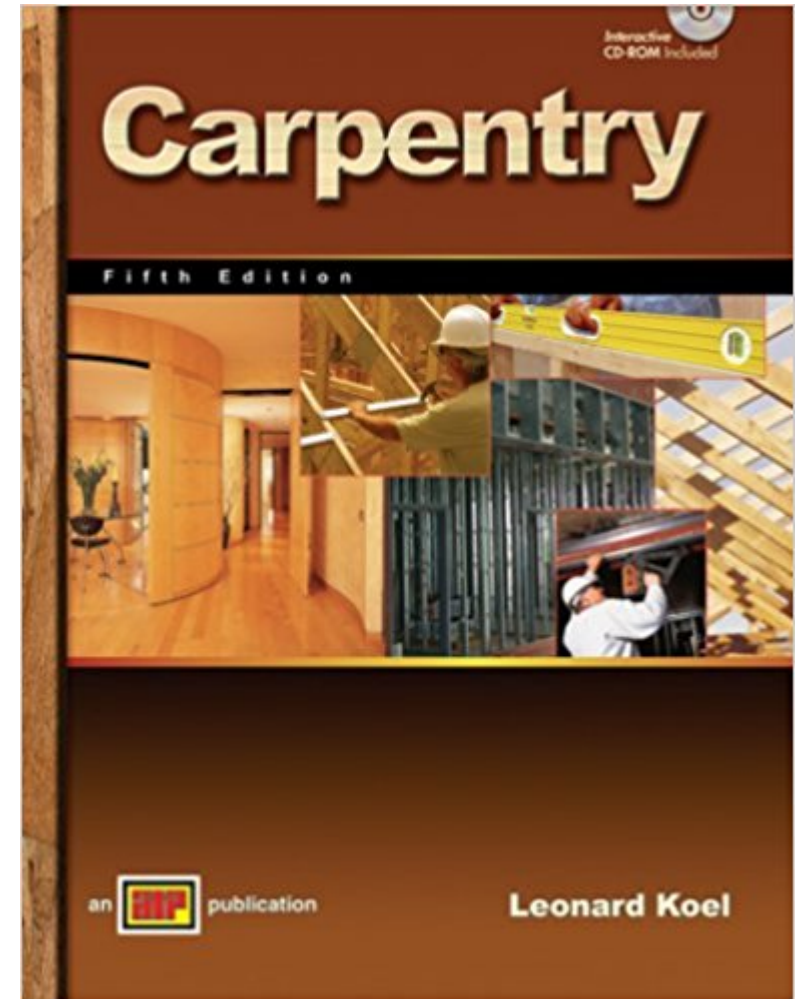
# Built in functions

- `nums <- select(x=1:50, size = 7, replace=TRUE)`
- `Mean(nums)`

# Functions



# Libraries





# Using Libraries

- Install library
  - `install.packages("tidyverse")`
- Load library
  - `library(tidyverse)`

# Other help

- Stack overflow - <https://stackoverflow.com/>
- R bloggers - <https://www.r-bloggers.com/>
- Quick-R - <http://www.statmethods.net/>
- [GOOGLE](#)

# Beginner Courses

- Udemy: <https://www.udemy.com/r-basics>
- DataCamp: <https://www.datacamp.com/courses/free-introduction-to-r>

# Importing Data

<http://www.datacarpentry.org/R-ecology-lesson/02-starting-with-data.html>

Column	Description
record_id	Unique id for the observation
month	month of observation
day	day of observation
year	year of observation
plot_id	ID of a particular plot
species_id	2-letter code
sex	sex of animal ("M", "F")
hindfoot_length	length of the hindfoot in mm
weight	weight of the animal in grams
genus	genus of animal
species	species of animal
taxa	e.g. Rodent, Reptile, Bird, Rabbit
plot_type	type of plot

# Checking data

- What type of object is mydata?
- What does it look like?
- Is it stored correctly?

# Challenges

- How many and what type of plot types in the experiment?
- How many species caught?
- How many species of birds? Rodents?
- Average weight of Male Rodents?
- Average weight of Female Rodents?