STOR 320 Workflow in RMarkdown

Lecture 2

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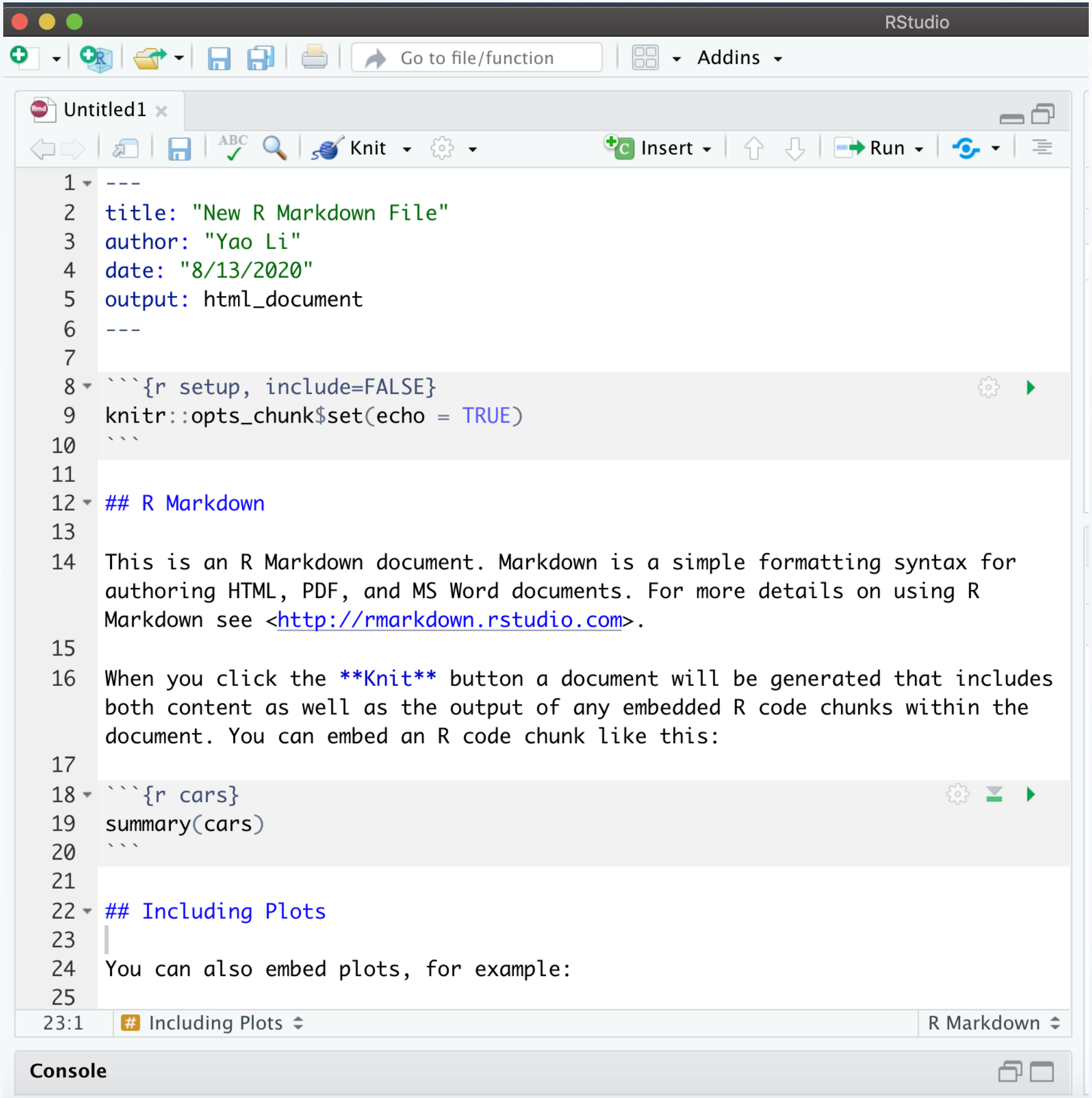
Workflow Information

- Chapters Discussing Workflow
  - Chapter 4: Basics
  - Chapter 6: Rscripts
  - Chapter 8: Projects
- Our Focus is on Workflow Within RMarkdown
- Today's Lecture on RMarkdown
  - Running R Code
  - Objects
  - Functions

Essential Reads

- Highly Advised Reading
  - Chapter 27: RMarkdown
    - Basics
    - Text Formatting
    - Code Chunks
  - Chapter 28: More ggplot Info
    - Labeling
    - Annotating
    - Scaling
    - Zooming
    - Themes
    - Saving Graphics

Rmarkdown File



~~~
---
title: "New R Markdown File"
author: "Yao Li"
date: "8/13/2020"
output: html_document
---

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
~~~

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```{r cars}
summary(cars)
```

Including Plots

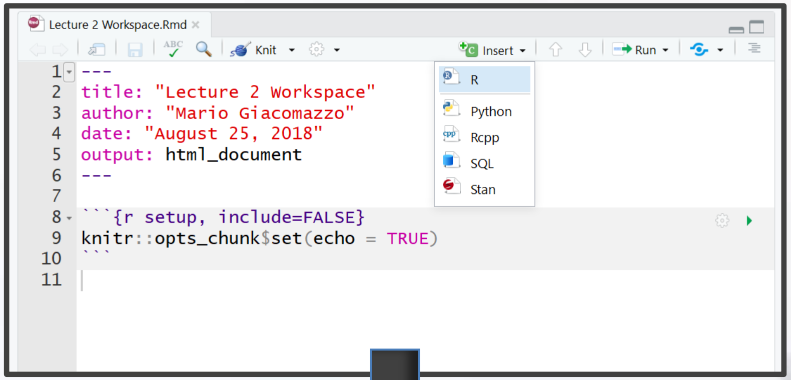
You can also embed plots, for example:

```

[Cheat Sheet]()
```

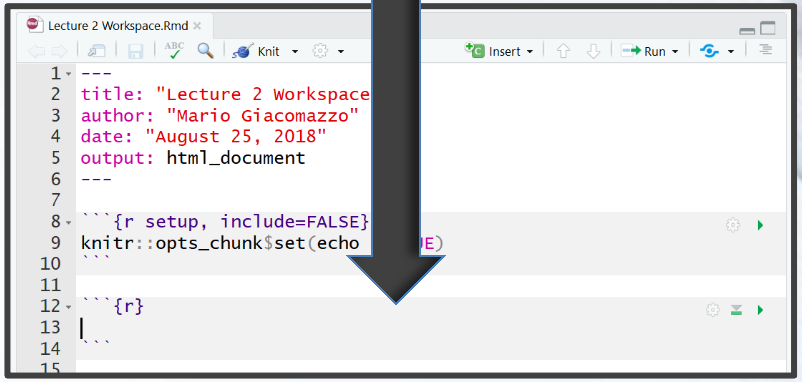
Placing Code in RMarkdown

- Code Chunks (Mini Rscripts)
  - R, Python, SQL, Rcpp (C++)
  - Inserting R Chunks
    - Method 1:



~~~
---
title: "Lecture 2 Workspace"
author: "Mario Giacomazzo"
date: "August 25, 2018"
output: html_document
---

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
~~~
```


Lecture 2 Workspace.Rmd
Knit
Insert
Run

```
---
title: "Lecture 2 Workspace
author: "Mario Giacomazzo"
date: "August 25, 2018"
output: html_document

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo     E)
```

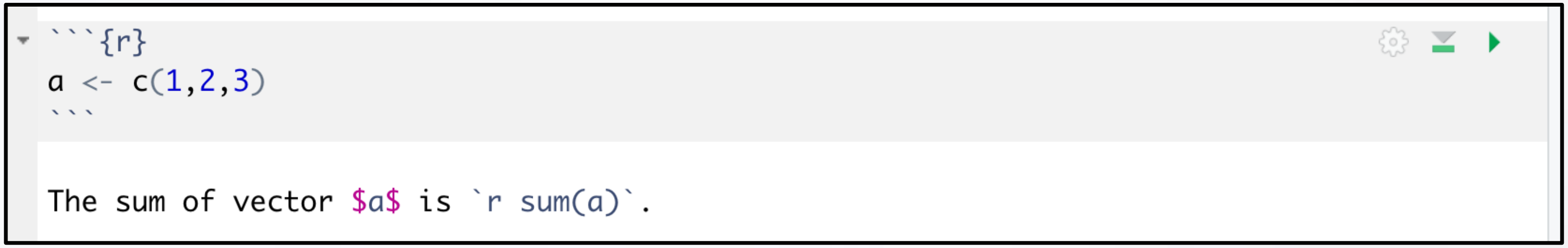
```{r}

```
```

    - Method 2: Ctrl+Alt+I
    - Method 3: Type ```{r} ```

Put R code here
```

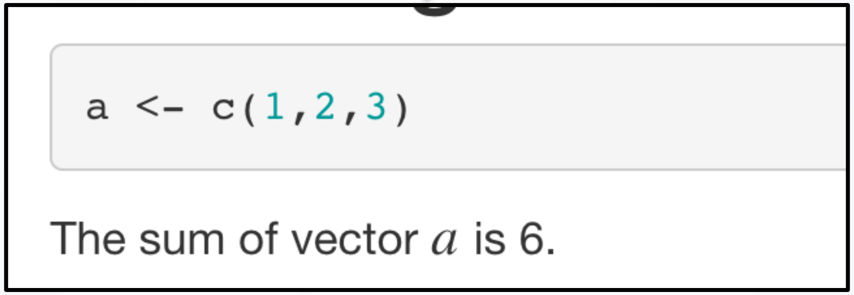
Inline Code in RMarkdown



~~~~
```{r}
a <- c(1,2,3)
```

The sum of vector $a$ is `r sum(a)`.
~~~~

Knit to HTML

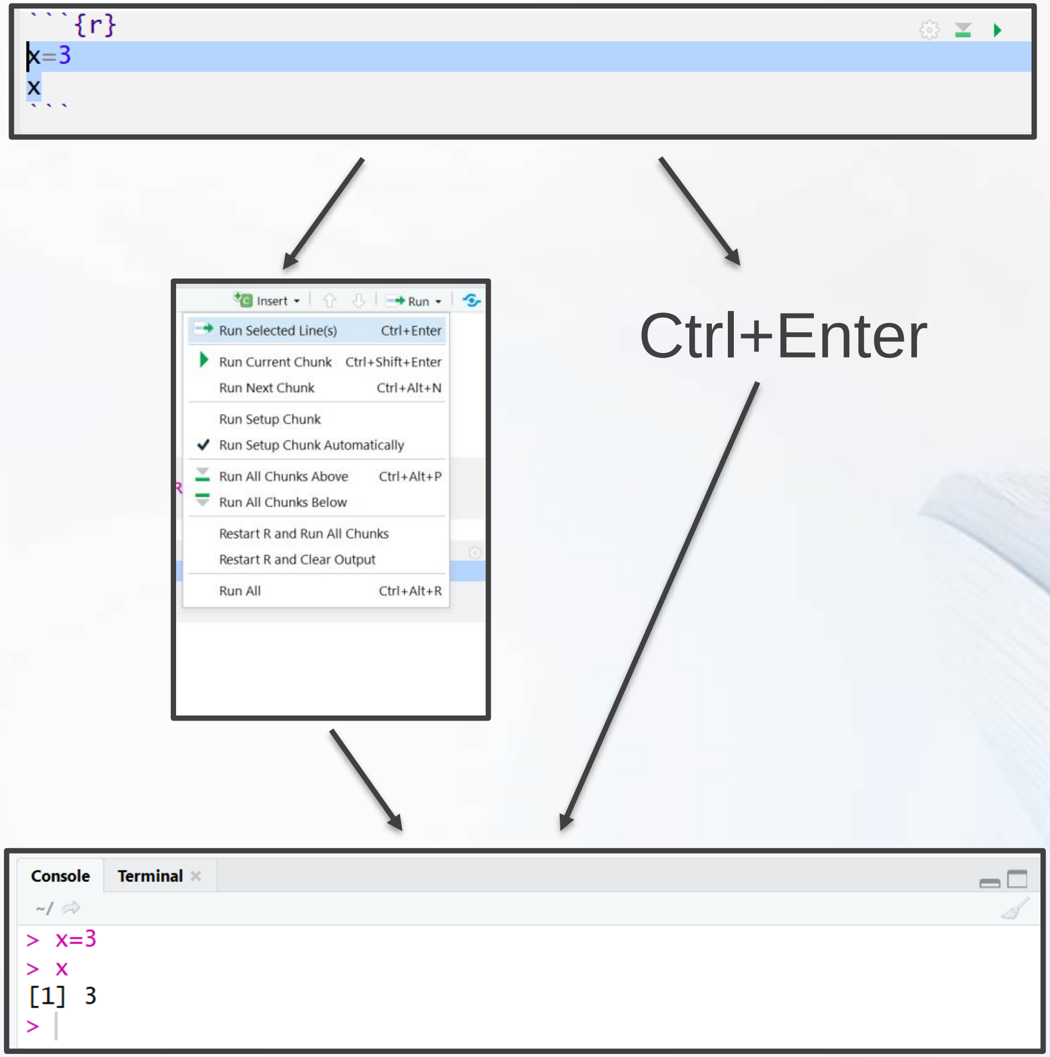


```
a <- c(1,2,3)
```

The sum of vector a is 6.

Running Code in RMarkdown

- Various Ways
  - Highlighted Code



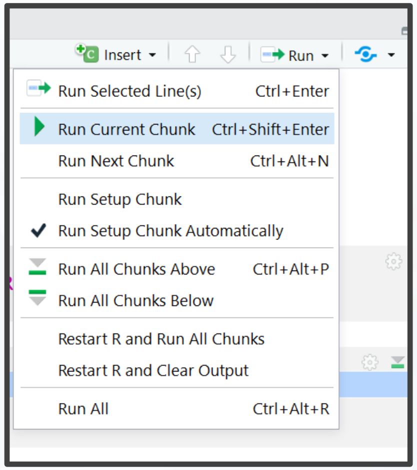
~~~
```{r}
x=3
x
```
~~~

Ctrl+Enter

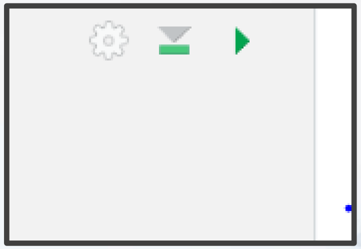
```
> x=3
> x
[1] 3
> 
```

Running Code in RMarkdown

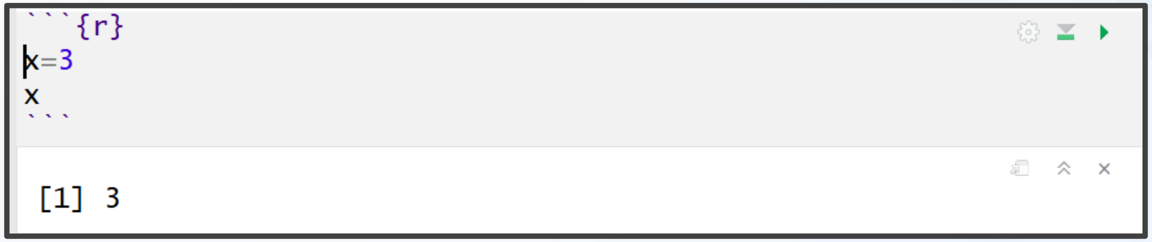
- Various Ways (Cont.)
  - Chunking It (Recommended)


Insert
Run
Run Selected Line(s) Ctrl+Enter
Run Current Chunk Ctrl+Shift+Enter
Run Next Chunk Ctrl+Alt+N
Run Setup Chunk
✓ Run Setup Chunk Automatically
Run All Chunks Above Ctrl+Alt+P
Run All Chunks Below
Restart R and Run All Chunks
Restart R and Clear Output
Run All Ctrl+Alt+R

Press Play



Ctrl+Shift+Enter

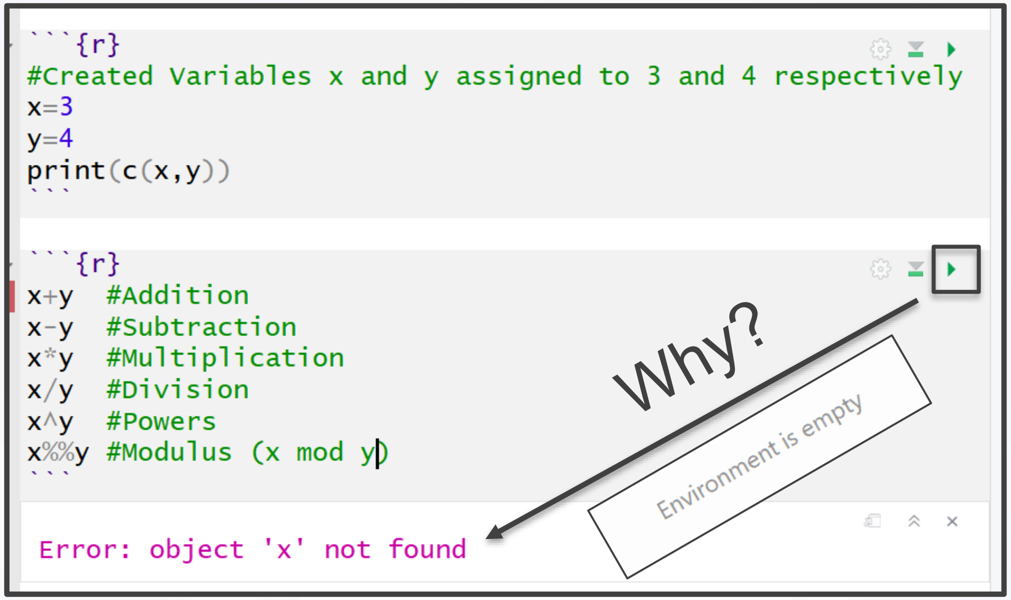


~~~
```{r}
x=3
x
```
~~~

```
[1] 3
```

Order

- Order Matters



~~~
```{r}
#Created Variables x and y assigned to 3 and 4 respectively
x=3
y=4
print(c(x,y))
```
~~~

~~~
```{r}
x+y   #Addition
x-y   #Subtraction
x*y   #Multiplication
x/y   #Division
x^y   #Powers
x%%y #Modulus (x mod y)
```
~~~

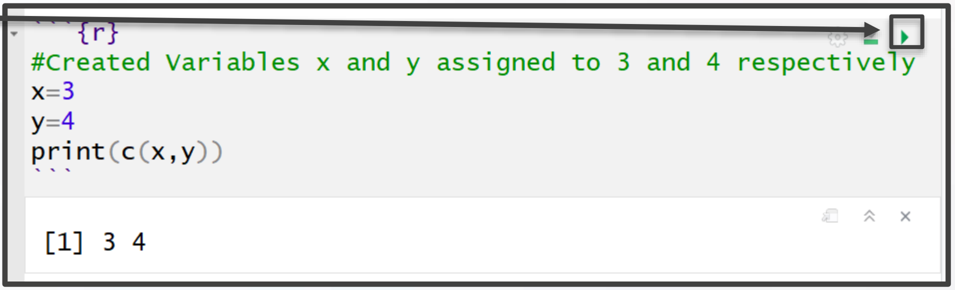
```
Error: object 'x' not found
```

Why?

Environment is empty

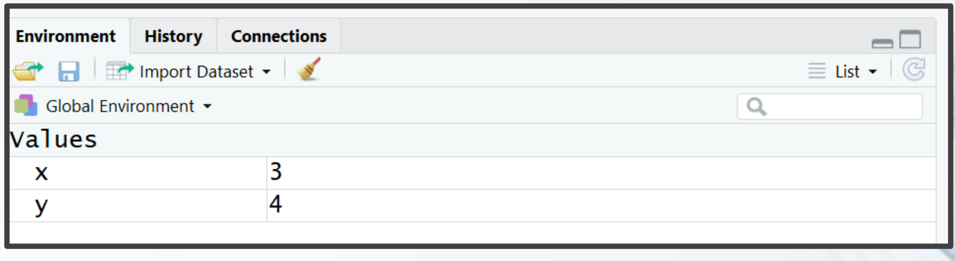
Order

- Order Matters (Cont.)
  - Run First Chunk
  - Then, Run Second Chunk



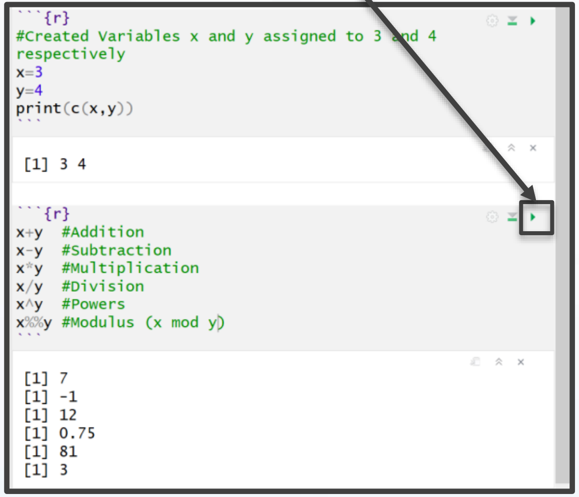
~~~
```{r}
#Created Variables x and y assigned to 3 and 4 respectively
x=3
y=4
print(c(x,y))
```

[1] 3 4
~~~



Values

x	3
y	4



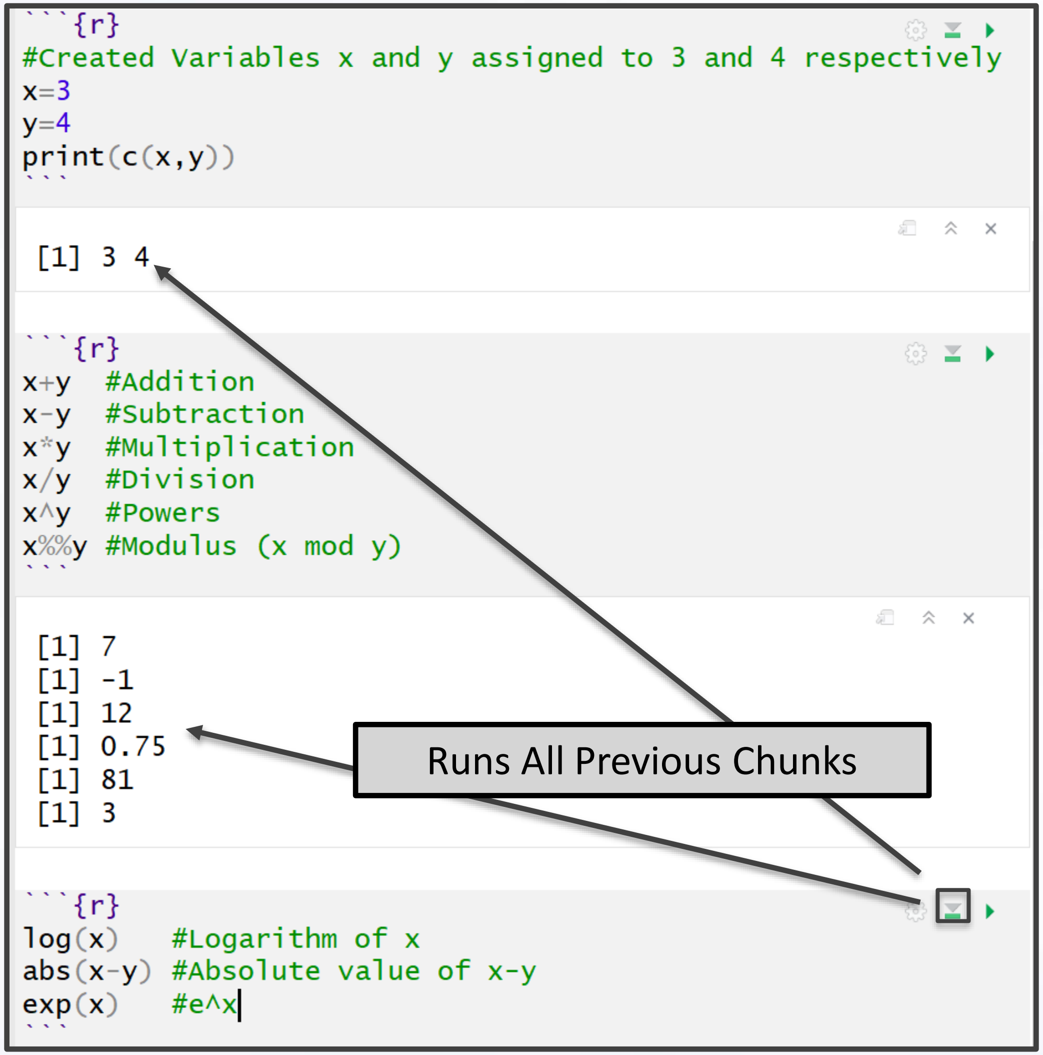
~~~
```{r}
#Created Variables x and y assigned to 3 and 4 respectively
x=3
y=4
print(c(x,y))
~~~

[1] 3 4

```{r}
x+y  #Addition
x-y  #Subtraction
x*y  #Multiplication
x/y  #Division
x^y  #Powers
x%%y #Modulus (x mod y)
```

[1] 7
[1] -1
[1] 12
[1] 0.75
[1] 81
[1] 3
```
```

Run All Previous Chunks



~~~
```{r}
#Created Variables x and y assigned to 3 and 4 respectively
x=3
y=4
print(c(x,y))
```
~~~

```
[1] 3 4
```

~~~
```{r}
x+y  #Addition
x-y  #Subtraction
x*y  #Multiplication
x/y  #Division
x^y  #Powers
x%%y #Modulus (x mod y)
```
~~~

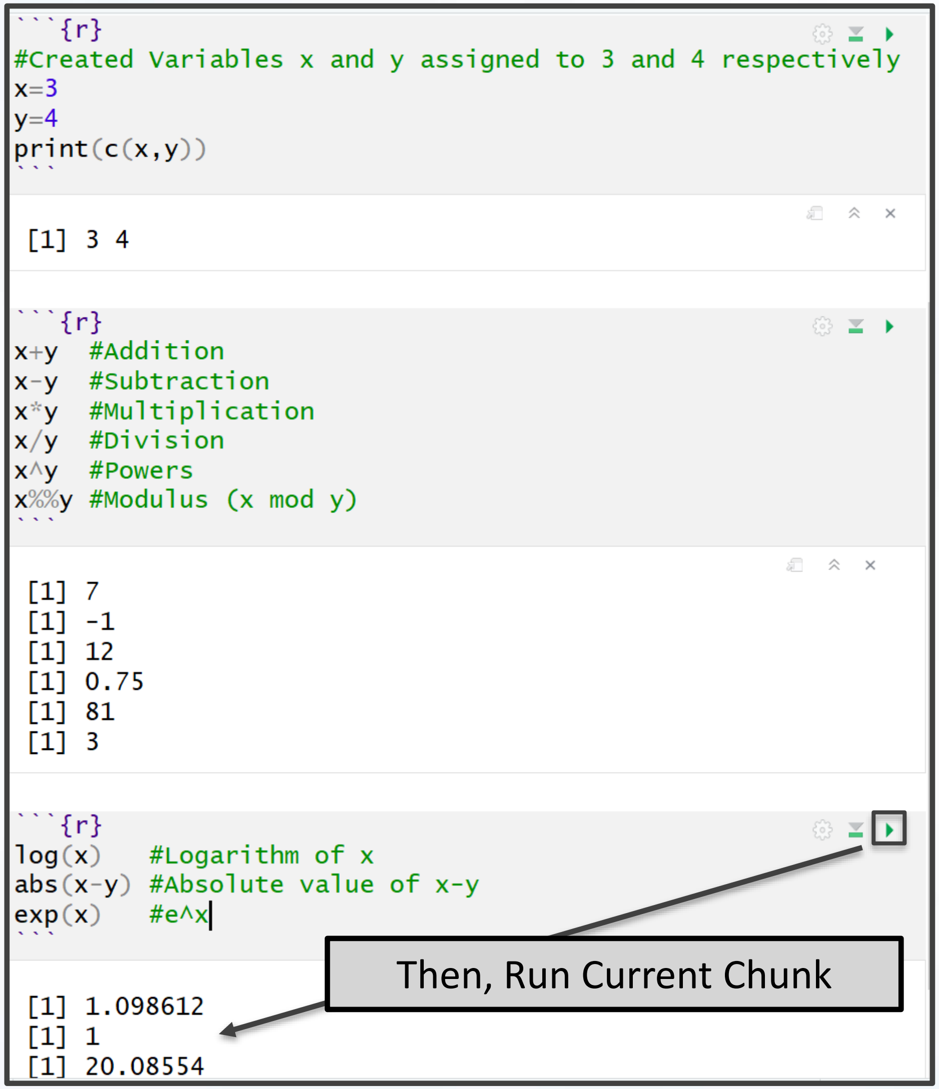
```
[1] 7
[1] -1
[1] 12
[1] 0.75
[1] 81
[1] 3
```

~~~
```{r}
log(x)   #Logarithm of x
abs(x-y) #Absolute value of x-y
exp(x)   #e^x
```
~~~

Runs All Previous Chunks

- Order Matters (Cont.)
  - Super Chunky

Run All Previous Chunks



~~~
```{r}
#Created Variables x and y assigned to 3 and 4 respectively
x=3
y=4
print(c(x,y))
```
~~~

```
[1] 3 4
```

~~~
```{r}
x+y  #Addition
x-y  #Subtraction
x*y  #Multiplication
x/y  #Division
x^y  #Powers
x%%y #Modulus (x mod y)
```
~~~

```
[1] 7
[1] -1
[1] 12
[1] 0.75
[1] 81
[1] 3
```

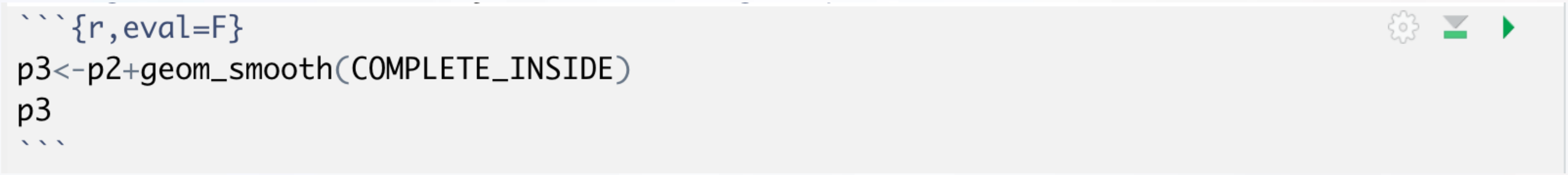
~~~
```{r}
log(x)    #Logarithm of x
abs(x-y) #Absolute value of x-y
exp(x)    #e^x
```
~~~

```
[1] 1.098612
[1] 1
[1] 20.08554
```

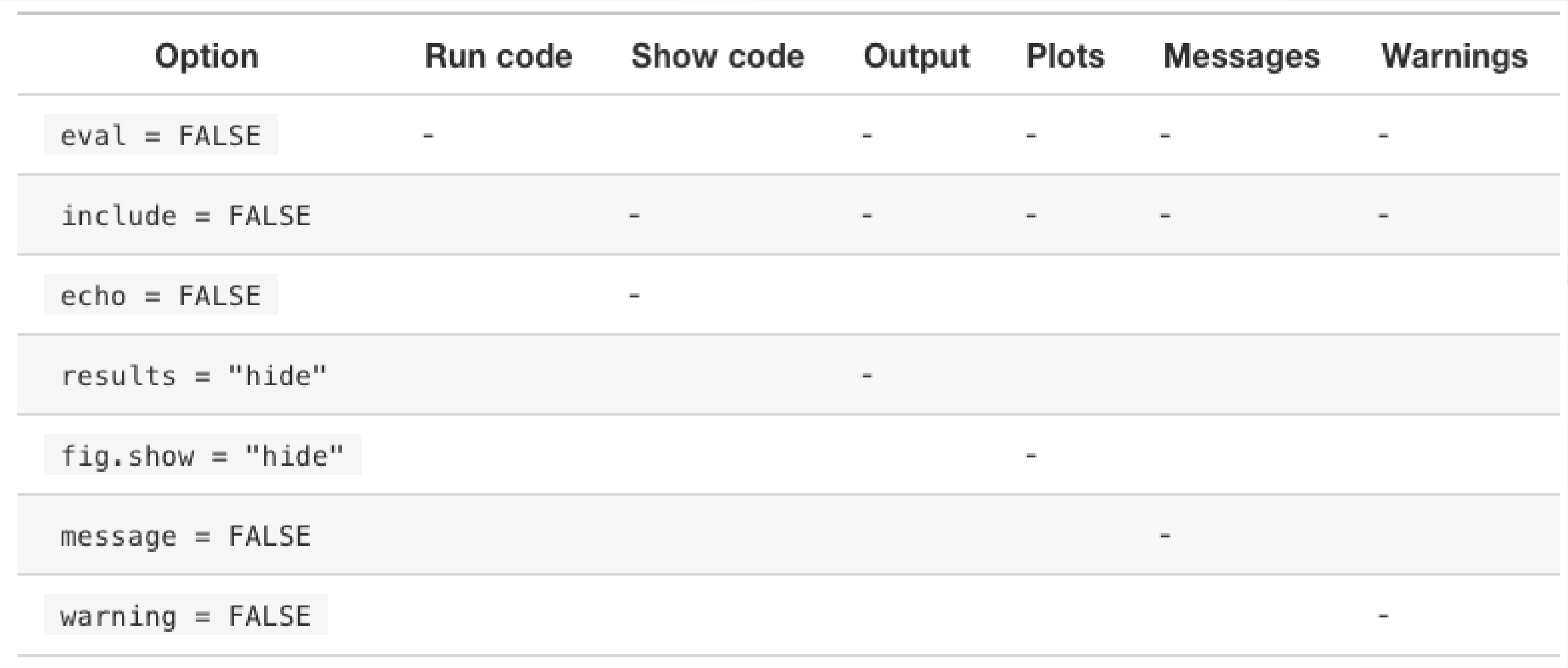
Then, Run Current Chunk

- Order Matters (Cont.)
  - Super Chunky (Cont.)

Chunk Options



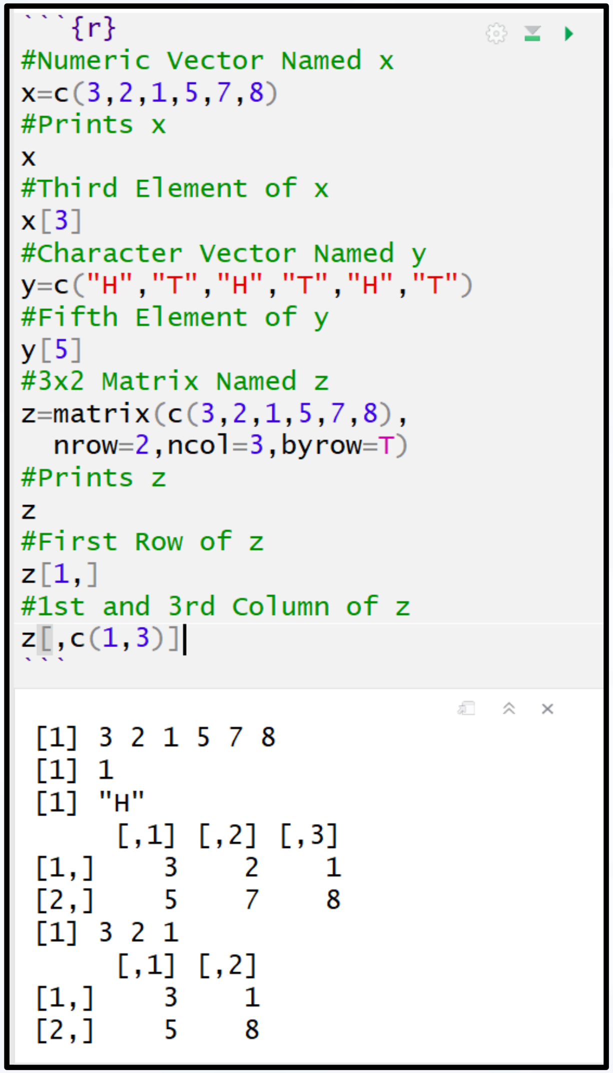
~~~
```{r,eval=F}
p3<-p2+geom_smooth(COMPLETE_INSIDE)
p3
```
~~~



Option	Run code	Show code	Output	Plots	Messages	Warnings
`eval = FALSE`	-		-	-	-	-
`include = FALSE`		-	-	-	-	-
`echo = FALSE`		-				
`results = "hide"`			-			
`fig.show = "hide"`				-		
`message = FALSE`					-	
`warning = FALSE`						-

[Chunk Options]

Objects in R: Vector and Matrix

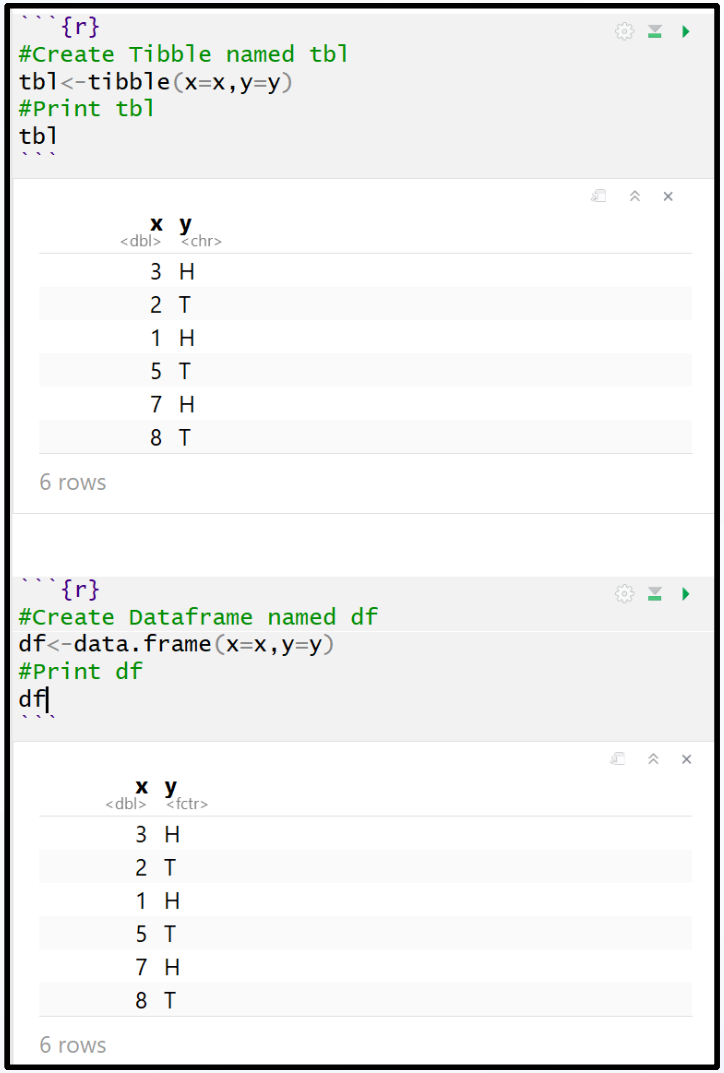


~~~
```{r}
#Numeric Vector Named x
x=c(3,2,1,5,7,8)
#Prints x
x
#Third Element of x
x[3]
#Character Vector Named y
y=c("H","T","H","T","H","T")
#Fifth Element of y
y[5]
#3x2 Matrix Named z
z=matrix(c(3,2,1,5,7,8),
  nrow=2,ncol=3,byrow=T)
#Prints z
z
#First Row of z
z[1,]
#1st and 3rd Column of z
z[,c(1,3)]
```
~~~

```
[1] 3 2 1 5 7 8
[1] 1
[1] "H"
     [,1] [,2] [,3]
[1,]    3    2    1
[2,]    5    7    8
[1] 3 2 1
     [,1] [,2]
[1,]    3    1
[2,]    5    8
```

- Many Types of Objects
  - Vector and Matrix

Objects in R: Dataframe



~~~
```{r}
#Create Tibble named tbl
tbl<-tibble(x=x,y=y)
#Print tbl
tbl
```
~~~

```
    x     y
<dbl> <chr>
    3     H
    2     T
    1     H
    5     T
    7     H
    8     T
6 rows
```

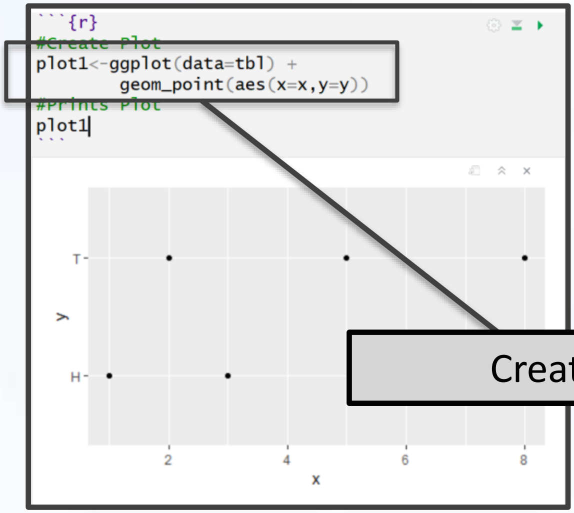
~~~
```{r}
#Create Dataframe named df
df<-data.frame(x=x,y=y)
#Print df
df
```
~~~

```
    x      y
<dbl> <fctr>
    3      H
    2      T
    1      H
    5      T
    7      H
    8      T
6 rows
```

- Many Types of Objects (Cont.)
    - Tibble/Dataframe

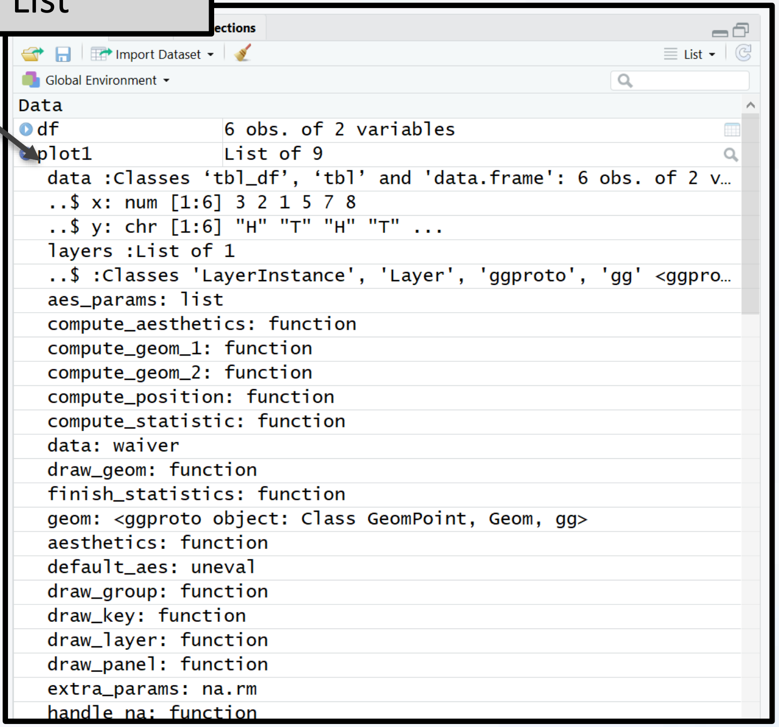
Objects in R: Lists

- Many Types of Objects (Cont.)
  - Lists (Combines Different Objects)



~~~
```{r}
#Create Plot
plot1<-ggplot(data=tbl) +
        geom_point(aes(x=x,y=y))
#Prints Plot
plot1
```
~~~

Creates Long List

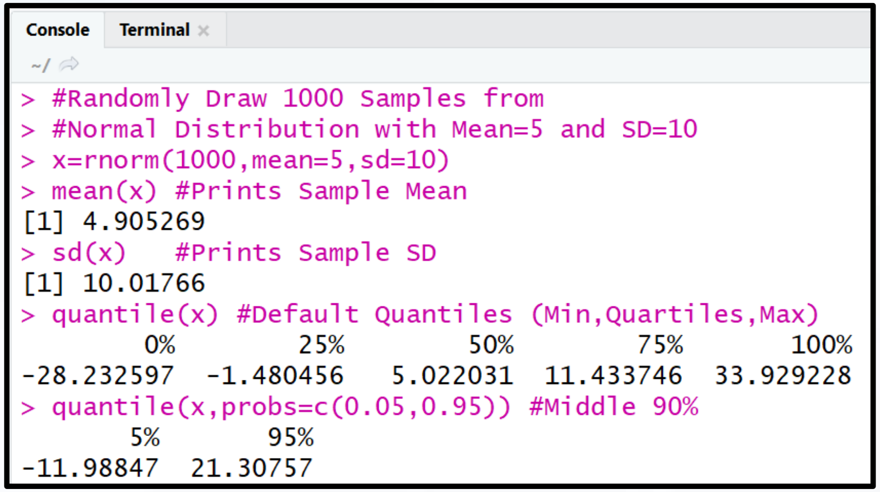


```
Data
df                 6 obs. of 2 variables
plot1              List of 9
  data :Classes ‘tbl_df’, ‘tbl’ and 'data.frame': 6 obs. of 2 v…
  ..$ x: num [1:6] 3 2 1 5 7 8
  ..$ y: chr [1:6] "H" "T" "H" "T" ...
  layers :List of 1
  ..$ :Classes 'LayerInstance', 'Layer', 'ggproto', 'gg' <ggpro…
  aes_params: list
  compute_aesthetics: function
  compute_geom_1: function
  compute_geom_2: function
  compute_position: function
  compute_statistic: function
  data: waiver
  draw_geom: function
  finish_statistics: function
  geom: <ggproto object: Class GeomPoint, Geom, gg>
  aesthetics: function
  default_aes: uneval
  draw_group: function
  draw_key: function
  draw_layer: function
  draw_panel: function
  extra_params: na.rm
  handle_na: function
```

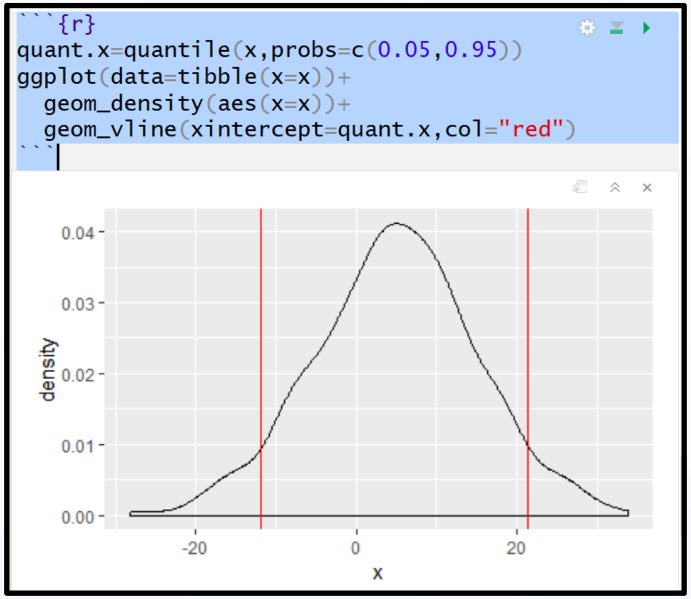
Functions in R

- Many Types of Functions
  - You: Input Objects and Specify Arguments (Defaults Exist)
  - Function: Outputs Objects
  - Example `> quantile()`
    - Input: Vector and Specified Percentiles
    - Output: Desired Percentiles
    - For online help, `> ?quantile`

Functions in R



```
> #Randomly Draw 1000 Samples from
> #Normal Distribution with Mean=5 and SD=10
> x=rnorm(1000,mean=5,sd=10)
> mean(x) #Prints Sample Mean
[1] 4.905269
> sd(x)    #Prints Sample SD
[1] 10.01766
> quantile(x) #Default Quantiles (Min,Quartiles,Max)
        0%        25%        50%        75%       100% 
-28.232597  -1.480456   5.022031  11.433746  33.929228 
> quantile(x,probs=c(0.05,0.95)) #Middle 90%
       5%       95% 
-11.98847  21.30757 
```



~~~~
```{r}
quant.x=quantile(x,probs=c(0.05,0.95))
ggplot(data=tibble(x=x))+
  geom_density(aes(x=x))+
  geom_vline(xintercept=quant.x,col="red")
```
~~~~

- Many Types of Functions (Cont.)
    - Example (Cont.)

Rmarkdown Training

Now, let us

PRACTICE

Download the Rmd for Tutorial 2 to Your Computer from the Course Website and open the file in RStudio