

Probability and Statistics: A Primer for Beginners and Pre-Beginners

Coding

Prologue: Obtaining R

What is R?

It's a programming language. *A free one!*

And it's open-source! That means anyone can read the code that was used to build it.

And **that** means lots of people have added lots of stuff to it, so it can do just about anything (in statistics) you want!

Why do we need a programming language for this stuff?

Because, coins and dice are only gonna get us so far! (mostly me, I can't draw that well)



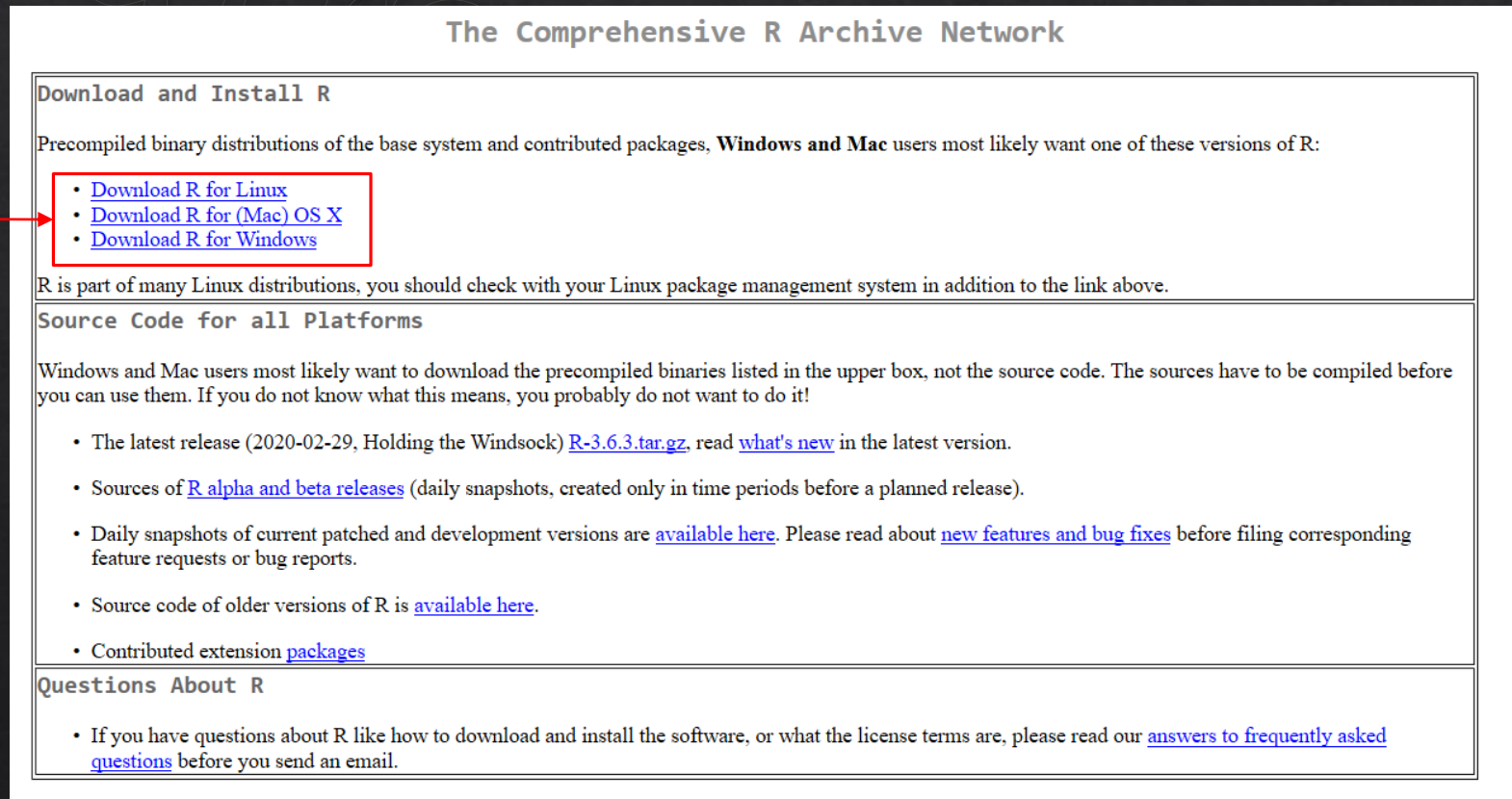
It's gonna let us make graphs, and do simulations, and other things that are gonna make this stuff clearer, especially for people who haven't taken a lot of math and might not get it any other way.

Plus I already added a “Coding” page to the website so it's too late to turn back now!

Where do I get R?

Go here: <https://cran.mtu.edu/>

Choose one.
Install it.



The Comprehensive R Archive Network

Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

Source Code for all Platforms

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

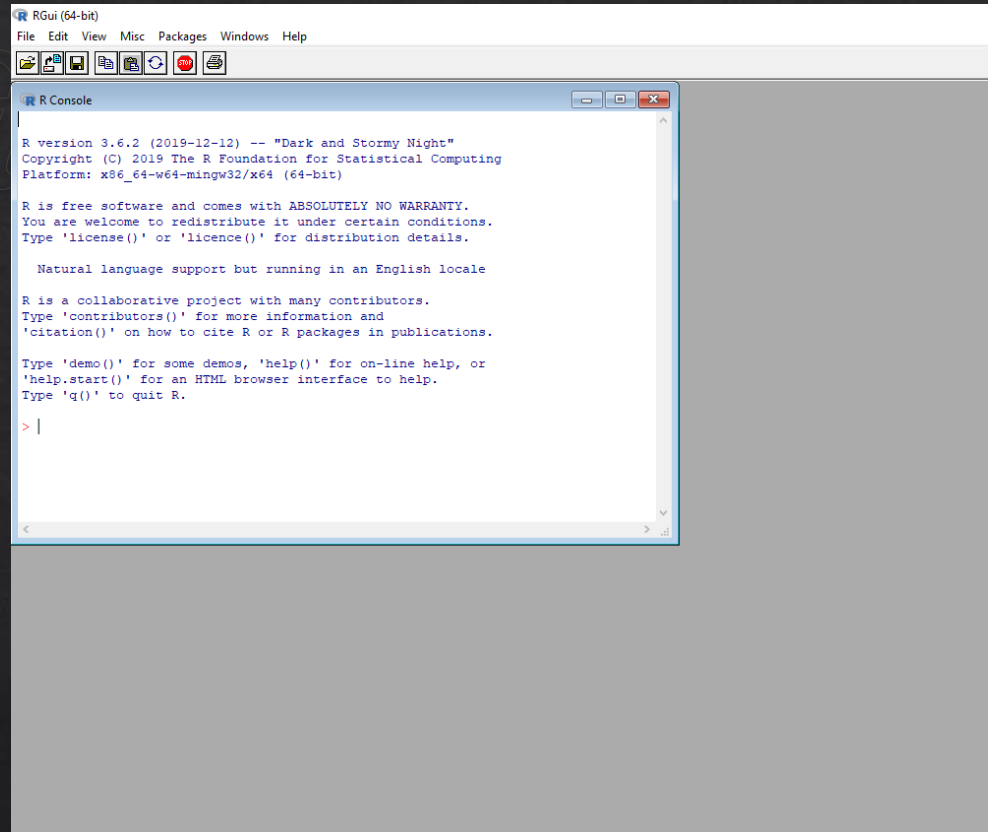
- The latest release (2020-02-29, Holding the Windsock) [R-3.6.3.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#)

Questions About R

- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

Got it. What's next?

Open it:



```
RGui (64-bit)
File Edit View Misc Packages Windows Help

R Console

R version 3.6.2 (2019-12-12) -- "Dark and Stormy Night"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> |
```

Now close it, and never open it again.

What? Why?

You saw that thing. It's hideous, like something out of 1997.

We're gonna get something better: A really good IDE (integrated development environment).

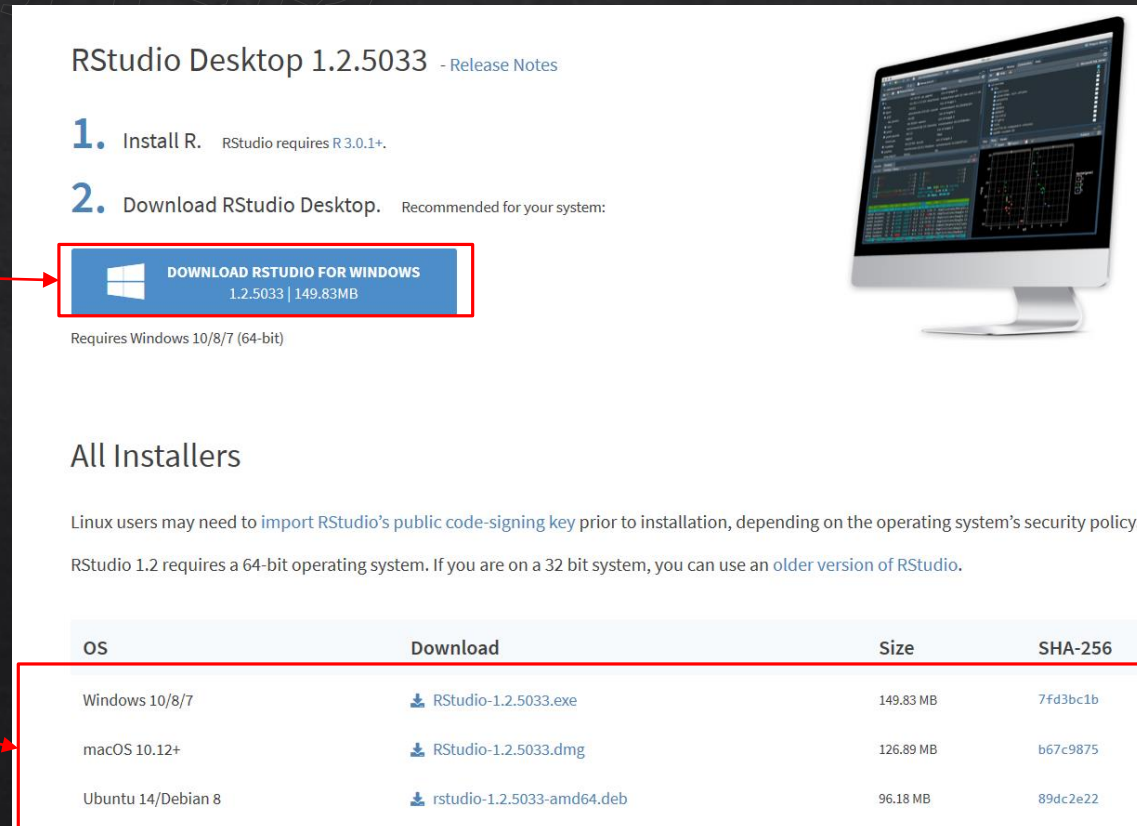
We're going line-by-line through a lot of this early stuff, so we're gonna get a program that'll let us see everything changing step-by-step. And it's *also* free!

What is it? Where do I get it?

It's called RStudio. Go here:

<https://rstudio.com/products/rstudio/download/#download>

Install here.



RStudio Desktop 1.2.5033 - Release Notes

1. Install R. RStudio requires R 3.0.1+.
2. Download RStudio Desktop. Recommended for your system:

[DOWNLOAD RSTUDIO FOR WINDOWS](#)
1.2.5033 | 149.83MB

Requires Windows 10/8/7 (64-bit)

All Installers

Linux users may need to [import RStudio's public code-signing key](#) prior to installation, depending on the operating system's security policy. RStudio 1.2 requires a 64-bit operating system. If you are on a 32 bit system, you can use an older version of RStudio.

OS	Download	Size	SHA-256
Windows 10/8/7	RStudio-1.2.5033.exe	149.83 MB	7fd3bc1b
macOS 10.12+	RStudio-1.2.5033.dmg	126.89 MB	b67c9875
Ubuntu 14/Debian 8	rstudio-1.2.5033-amd64.deb	96.18 MB	89dc2e22

Or down here if you need to.

What's all this?

The image shows the RStudio interface with three red boxes highlighting key components:

- Script Editor:** A red box highlights the main workspace where code is written. The text inside says: "Here's where you'll write code!".
- Environment Pane:** A red box highlights the Environment pane, which shows the current state of the R environment. The text inside says: "This'll show you all kinds of info, especially a little summary of what your data looks like." The pane currently shows "Environment is empty".
- Console:** A red box highlights the Console pane, which displays the output of the code. The text inside says: "This is the console. It'll tell you what your code's doing, and if it's got an error when you run it." The console shows the R version information and a prompt.

Below the Environment pane, the Files pane is visible, showing a file explorer view of the current directory. The text inside says: "This'll show you different kinds of output, and help you keep track of your files, and let you access help documentation."

Neat, can I write some code now?

Sure, just let me find a cool font to type the code in...

```
#All right here we go! I'll type the code in this font.  
#You can copy this whole code block into that upper left window if you want.  
#<-This # symbol tells R you're writing a comment.  
#R ignores comments. They're intended for people to read to understand your code.  
#So remember to write them!
```

When the code's in, just press **Ctrl+A** to highlight it all and press **Ctrl+Enter** to run your code!

You copied. You highlighted. You executed.

When you're done, it'll look something like this:

Also, you can press **Ctrl+S** to save the code you wrote! I saved mine as `first_code.R`. 😊

Hey, it printed your comments to the console!

The screenshot shows the RStudio interface. The top pane displays a file named `first_code.R` with the following code:

```

1 #All right here we go! I'll type the code in this font.
2 #You can copy this whole code block into that upper left window if you want.
3 #<-This # symbol tells R you're writing a comment.
4 #R ignores comments. They're intended for people to read to understand your code.
5 #So remember to write them!
6

```

The bottom pane shows the console output after execution:

```

~/
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Platform: x86_64-w64-mingw32/x64 (64-bit)

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> #<-This # symbol tells R you're writing a comment.
> #R ignores comments. They're intended for people to read to understand your code.
> #So remember to write them!
>

```

Hey, that just copied those comments. I want to write some real code!

All right, fine. Meet me back in the code block.

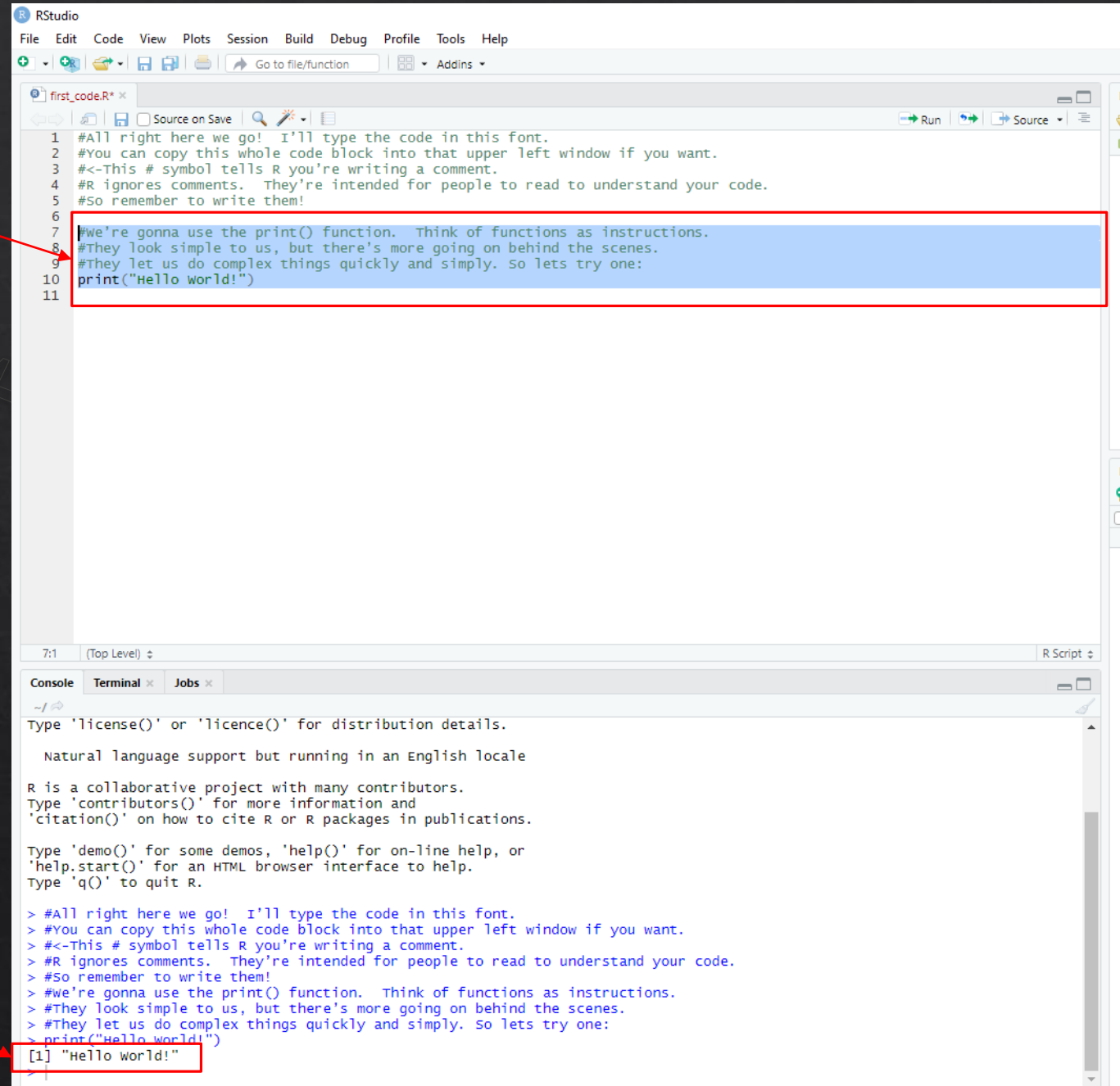
```
#We're gonna use the print() function. Think of functions as instructions.  
#They look simple to us, but there's more going on behind the scenes.  
#They let us do complex things quickly and simply. So let's try one:  
print("Hello World!")
```

When the code's pasted in, highlight the lines you just wrote and press **Ctrl+Enter** to run your code.

Now you're just
running part of your
code.

Now you're a *real*
programmer!

How's that for
coding?



The screenshot shows the RStudio interface. The source editor window displays the following R code:

```
1 #All right here we go! I'll type the code in this font.
2 #You can copy this whole code block into that upper left window if you want.
3 #<-This # symbol tells R you're writing a comment.
4 #R ignores comments. They're intended for people to read to understand your code.
5 #So remember to write them!
6
7 #We're gonna use the print() function. Think of functions as instructions.
8 #They look simple to us, but there's more going on behind the scenes.
9 #They let us do complex things quickly and simply. So lets try one:
10 print("Hello world!")
11
```

The code block from line 7 to line 10 is highlighted in blue. A red box highlights the `print("Hello world!")` line. A red arrow points from the text box "Now you're just running part of your code." to the highlighted code block.

The console window shows the output of the code execution:

```
~/
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> #They look simple to us, but there's more going on behind the scenes.
> #They let us do complex things quickly and simply. So lets try one:
> print("Hello world!")
[1] "Hello world!"
```

A red box highlights the output `[1] "Hello world!"`. A red arrow points from the text box "How's that for coding?" to this output.