Introduction to R and RStudio

optional name

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The yaml

The little bit of code at the top of this document, between some hyphens `---` , is called the yaml. You can add your name to the yaml, but you don't need to as this assignment will be peer graded. They should both be strings (that means "in quotes").

A note on R Assignments

In MTH 142 you will get lots of practice doing statistics through homework assignments and R Assignments. You will have 6 R Assignments during this course that will help you do "modern" statistics with two R packages: the tidyverse and openintro. To load these libraries into RStudio you need to press the green triangle of the grey rectangle above (look around line 11). That grey rectangle is called a chunk.

In this R Assignment the goal is to warm up with some plotting and basic statistical functions. You will have 7 questions at the end which will be graded. Finally you will know if you have done your R Assignment correctly if you are able to knit without errors. Find the knit button and click it now. (Getting errors is normal and common. If you are unable to fix them go to office hours, tutoring, or post to the discussion) Turn in the rendered .pdf to moodle before the due date. You will grade your peers' R Assignments, as such late R_assignments are not accepted, and one will be dropped. Good luck.

The RStudio Interface

This platform your are working in is called Rstudio. In my lectures you will hear words like: **console**, **r-markdown**, and **environment pane**. Take a moment to get to know more about the four main panes of RStudio.See this site for info on the panes. If you watch the video for this assignment I will point those panes out to you.

Part 1 Code Chunks

Code chunks are grey and look like this:

```
#This is an empty code chunk. The computer will not evaluate this green text with a leading # sign. It
```

To make a new chunk you can copy and paste the one above, click on the little green square with a c on the upper right, or manually type `{r}    then`. Those 's are called "back ticks" and they live above the tab key on the keyboard.

To run a code chunk you press the little green triangle. (You should have already done this to load the tidyverse and openintro packages, if you haven't, do it now).

Part 2 Look at Data

To look at data you can simply type the name of the data frame into a code chunk. Let's look at cars93.

```
cars93
```

```
## # A tibble: 54 x 6
##    type    price mpg_city drive_train passengers weight
##    <fct>   <dbl>    <int> <fct>            <int>  <int>
##  1 small    15.9       25 front                5   2705
##  2 midsize  33.9       18 front                5   3560
##  3 midsize  37.7       19 front                6   3405
##  4 midsize  30         22 rear                 4   3640
##  5 midsize  15.7       22 front                6   2880
##  6 large    20.8       19 front                6   3470
##  7 large    23.7       16 rear                 6   4105
##  8 midsize  26.3       19 front                5   3495
##  9 large    34.7       16 front                6   3620
## 10 midsize  40.1       16 front                5   3935
## # i 44 more rows
```

If you get a red message : "Error: object 'cars93' not found" You need to go back up to line 11 and click the green triangle to load the openintro package. cars93 data lives in the openintro package.

You should see a spreadsheet-looking-grid called a dataframe. It has 6 variables: type, price, mpg_city, drive_train, passengers, and weight. We will discuss more on variables in the next few assignments.

Where does the data come from? What are the units for price and weight? To answer these questions we can use the ? operator to pull up the documentation of this data.

```
# This will bring up the cars93 documentation in the help menu to the right.
?cars93
```

```
## starting httpd help server ... done
```

The documentation is just okay for this dataset. It says price is in dollars, but I think it means 1000s of dollars. Weight is in pounds.

It also says there are 54 observations which means 54 cars. Each observation is one row. Each observation is information on one car.

Functions

There are several functions we will use during this course. Most of them are listed on the cheat sheet here.

The mean is one type of statistic, we can tell R to calculate the mean of the weights of these cars with the mean() function:

```
# This calculates the mean weight of the cars in the data. Click the green triangle to run the chunk.
mean(cars93$weight, na.rm = TRUE)
```

```
## [1] 3037.407
```

The $ tells R you are only interested in one variable, in this case the weight variable. We need the second argument “na.rm=TRUE” to tell R that if there is missing data throw the observation out before calculating the mean.

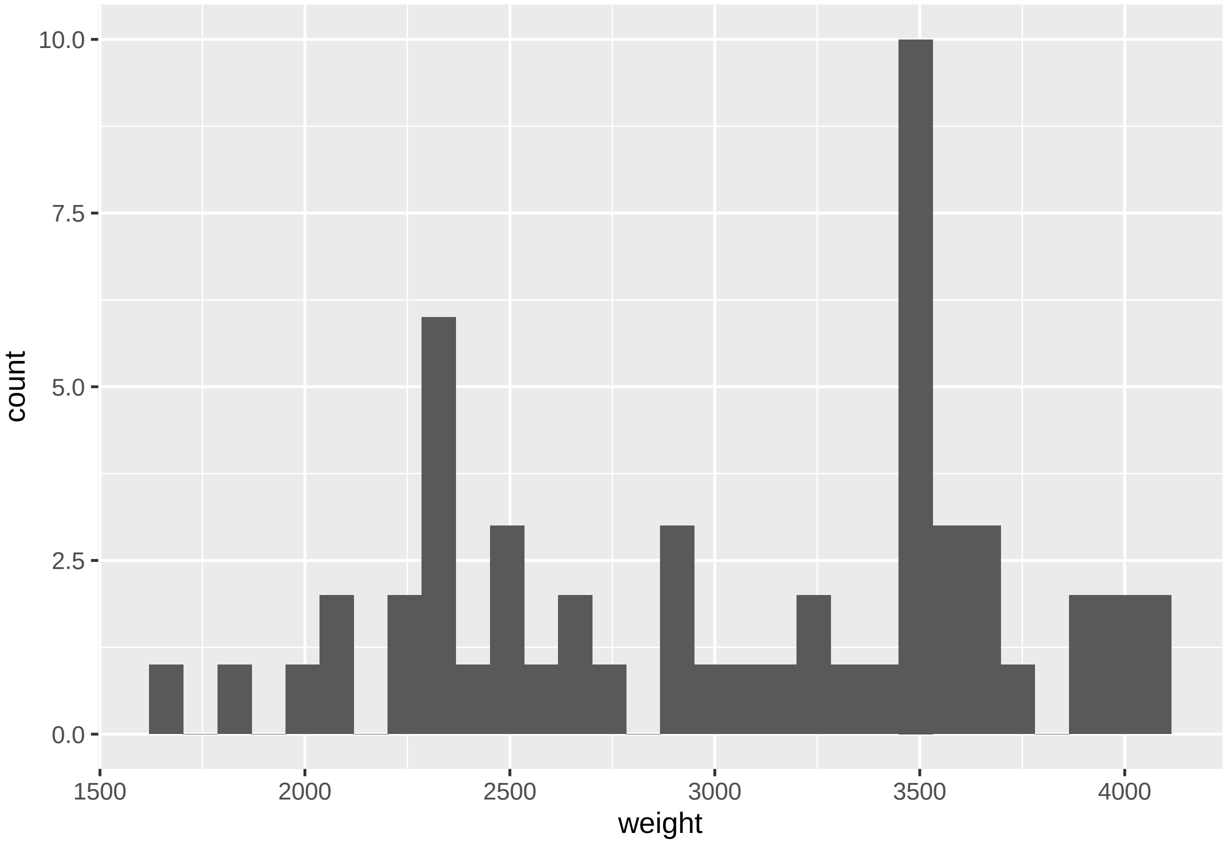
Its important to note that you can only find the mean of numeric data. We cannot find the mean of “type” variable.

Plotting

There are several different plots that we will look at to help us visualize data. Let’s plot a histogram below.

```
# This is code for a histogram
ggplot(data = cars93)+
  geom_histogram(mapping = aes(x= weight))
```

```
## ‘stat_bin()‘ using ‘bins = 30‘. Pick better value with ‘binwidth‘.
```



Every time we make a plot we will put our data into the ggplot function as above. The second line tells R what kind of plot we want to make, it is called a geom. We make about 5 geoms in this class and there are examples of them on the cheat sheet.

More Practice

The following will be graded by your peers. All problems are similar to those discussed above. If you need help check out the examples above first. If you are stuck for a few minutes post a screenshot to the discussion forums or come to office hours. Don’t get stuck for hours, that’s no fun.

1. Make a chunk below and use it to view a new data frame called cars04.
2. Make a new chunk and use the ? operator to take a look at the documentation for cars04. How many cars are in this data frame? How many variables?
3. There is a statistic called the median. It is the midpoint of the data. In a new chunk tell R to calculate the median of the msrp variable. hint: the format is almost the same as finding the mean() above.
4. Make a histogram of the msrp variable. hint: There is nothing wrong with copy and pasting the code from above.

Nice work on the 4 parts above. You're almost done.

5. This is not really an exercise, but something you have to do once. You have to install tinytex on your instance of RStudio. Tinytex helps us turn .rmd files into .pdfs. You will never have to do this again. Carefully run the chunks below to install Tinytex.

First see if you have tinytext. If the below is false then you do not and go to the next chunk.

```
tinytex:::is_tinytex()
```

If you got a false, you need to install tinytex. Run the chunk below. This takes a few moments.

```
#This installs tinytex
tinytex::install_tinytex()
```

We need to restart before we check again to see if you have successfully installed tinytex. Go to the menu above to Session > Restart R. Then run the chunk below. Hopefully you get "true" and you can skip to part 6.

```
tinytex:::is_tinytex()
```

If you do not get true, don't worry, there's a backup method to install.

```
#This is the backup
install.packages("tinytex")
```

Run the chunk below to hopefully get true. If you do not get true, please send me a message in the forums.

```
tinytex:::is_tinytex()
```

6. Assuming you successfully installed tinytex, you can now knit to a pdf then download this file to your computer and upload to canvas for grading. I do this in the video but here are the steps:

- Click "knit" at the top. If you get an error while knitting, post a screen shot of the problematic lines to the R__Assignment__0 discussion forums. You can also see me do this whole assignment in the video.
- In the files pane to the right find the R__Assignment__0.pdf and click the box next to it.
- Click the little gear icon and then export.
- Find the file on your computer (probably in downloads) and upload it to canvas for peer grading.

Wooo you are warmed up to do statistics with R.

Resources for learning R and working in RStudio

If you are very interested see the resources below. Its totally optional.

That was a short introduction to R and RStudio, but we will provide you with more functions and a more complete sense of the language as the course progresses.

In this course we will be using the suite of R packages from the **tidyverse**. The book R For Data Science by Grolemund and Wickham is a fantastic resource for data analysis in R with the tidyverse. If you are Goggling for R code, make sure to also include these package names in your search query. For example, instead of Goggling "scatterplot in R", Goggle "scatterplot in R with the tidyverse".

These may come in handy throughout the semester:

- RMarkdown cheatsheet
- Data transformation cheatsheet
- Data visualization cheatsheet

Note that some of the code on these cheatsheets may be too advanced for this course. However the majority of it will become useful throughout the semester.

This lab was modified from the labs on openintro stats