Homework 1

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Classmates/other resources consulted: https://bookdown.org/yihui/rmarkdown-cookbook/pagebreaks.html

Question 1 (10 points)

** Successfully knitting this file and turning it into a PDF, however you do that, is worth 10 points.**

Question 2 (28 points)

The answers to the following questions can be found in the syllabus.

a. **Where do you submit homework assignments?**

On GradeScope

b. **What do you need to do before every class?**

Watch a 20 minute video on VidGrid, covering basic defintions and concepts. The video has embedded questions that we need to answer.

c. **What do you need to do at some point during the first 2-3 weeks of the semester?**

Have an individual meeting with you

d. **In addition to your name, what needs to go at the top of every homework assignment?**

At the top of every assignment, list the names of any other students you worked with and any other resources you used

e. **What happens to your lowest homework grade?**

The lowest homework grade will be dropped

f. **Can you work with other students on the homework assignments?**

Yes, you can but you must submit your own work and solutions independently. These should not be shared with or show to other students.

g. **Is letting another student look at your completed homework assignment an example of academic dishonesty?**

Yes

h. **If you are taking an extension on a homework assignment that is less than 48 hours, and you have not yet reached 144 hours of homework extensions used, do you need to contact Prof. Cannon about it?**

No

i. **What is the QCL, and what services do they offer?**

The Murty Sunak Quantitative and Computing Lab. They offer one on one tutoring sessions, skill-based mentoring, training workshops and senior thesis and research project assistance.

j. **Can you attend class remotely over Zoom?**

Yes

k. **Can you take tests and quizzes remotely over Zoom?**

No

l. **Are office hours in-person or over Zoom?**

Both intially but will change over the semester

m. **Per CMC policy, how many hours per week are you expected to be spending on this course?**

12

n. **Are you allowed to share any course materials with students who are not enrolled in this class this semester?**

Only after obtaining permission from the instructor as any materials from the class are their intellectual property.

Question 3 (10 points)

a. **(2 points) Write R code that creates a variable x that has the value 4; a variable y that has the value 7; and a variable z that has the value 5.**

```
x <- 4
y <- 7
z <- 5
```

b. **(4 points) Write code to combine the values 3, 7, 2, 1.47, -9, and 10000 into one object. Then, your code should change the value 7 to be -100 instead. Then, it should find the average of the stored values.**

```
w <- c(3, 7, 2, 1.47, -9, 10000)

w[2] <- -100

mean(w)
```

```
## [1] 1649.578
```

c. **(4 points) In two different ways, calculate the sum of the three variables for part (a). (your code should only include the variables, and not the values they were set to in part (a))**

```
x + y + z
```

```
## [1] 16
```

```
sum(x,y,z)
```

```
## [1] 16
```

Question 4 (4 points)

Suppose you have the variables a and b given as in the following code chunk. What happens when you compute mean(a/b)? Explain both what happens, and why this happens.

```
a <- c(3, 0, 0, 6)
b <- c(2, 7, 0, 8)

mean(a/b)
```

```
## [1] NaN
```

It outputs NaN. This is because the variable b has 0 as one of its values, so when a is being divided by b it will divide by zero which produces an imaginary number.

Question 5 (10 points)

Consider the R object mtcars.

a. **(2 points) What data does this object contains, and where does that data come from?**

This object contains data on Mazda's rotary engine as a straight six-cylinder engine and the Porsche's flat engine as a V engine, as well as the inclusion of the diesel Mercedes 240D. Specfically to compare their miles/(US) gallon, number of cylinders, displacement, gross horse power, rear axle ratio, weight, 1/4 mile time, engine (v-shaped or straight), transmission (automatic, or manual), number of forward gears, and number of carburetors

This data comes from a Henderson and Velleman (1981), Building multiple regression models interactively. Biometrics, 37, 391–411.

b. **(2 points) What is the mean miles per gallon among the cars included?**

```
mean(mtcars$mpg)
```

```
## [1] 20.09062
```

20.09062

c. **(2 points) What is the median Rear axle ratio among the cars included?**

```
median(mtcars$drat)
```

```
## [1] 3.695
```

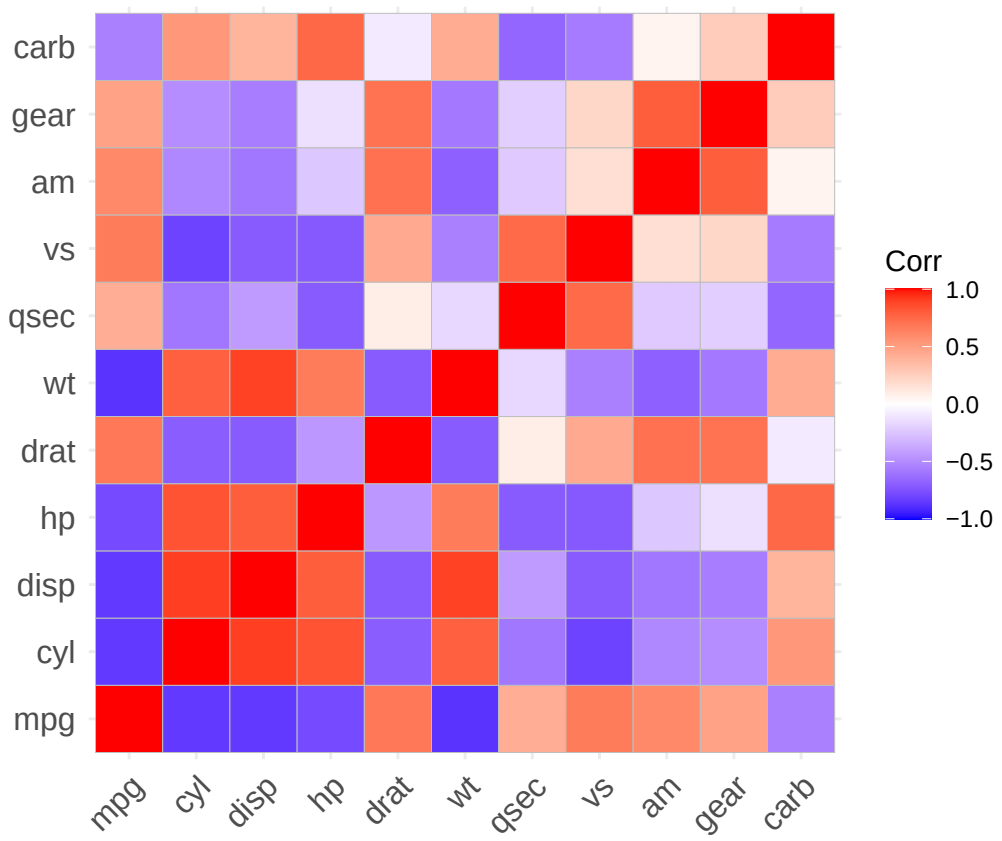
3.695

d. **(4 points) Suppose you want to make a correlation plot, and you know it is part of the ggcorrplot package. Install and load this package. You will know it works if the following command produces a plot (remove the # in front of this command before running it):**

```
# install.packages("ggcorrplot")
library(ggcorrplot)
```

```
## Loading required package: ggplot2
```

```
ggcorrplot(cor(mtcars))
```



[we will learn more about correlation plots later in this course]

Question 6 (12 points)

Call this function on the following input: difference(3,7), difference (b = 5), difference(4), and difference(3, neg = TRUE). For each, explain in 1-2 sentences why you get the answer that you do.

```
difference <- function(a = 0, b = 1, neg = FALSE){
  s <- a - b
  if(neg == FALSE)
      return(s)
    else
      return(-s)
}
```

difference(3,7) a is set to 3 instead of 0, b is set to 7 instead of 1, and neg remains being false. Then s is set to (a - b) or (3 - 7) which is -4, since neg remains false it will return -4. So when you call the function difference(3, 7) it'll print -4.

difference(b = 5) a remains as 0, and neg as FALSE, but b is set to 5. Then s equals (0 - 5) or -5, since neg is still FALSE s is returned as the value -5.So when you call the function difference(b = 5) it'll print -5.

difference(4) The function defaults attributing an input to the first variable, difference(4) will set a = 4 and leave b = 1 and neg = FALSE. Then s equals (4 - 1) or 3, since neg is still FALSE s is returned as 3. So when you call the function difference(4) it'll print 3.

difference(3, neg = TRUE) Since the function defaults an input to the first variable, a will be set to 3 and b will remain equal to 1. neg will now be set to true. First the function will set s to (a - b) or (3 - 1) which is 2. Then it will check to see if neg is equal to FALSE, since it is not it will return -s or -2. So when you call the function difference(3, neg = TRUE) it'll print -2.

Question 7 (21 points)

Find the html file HW_example.html attached to this assignment in Sakai. Write RMarkdown code to replicate this html document (minus the title and author) below.

Section: LaTex

It holds that $x_7 \geq x_8$ and $3^2 \neq 2^3$. The formula for *volume of a sphere* is

$$V = \frac{4}{3}\pi r^3$$

Subsection: Lists

The five Claremont colleges are:

- CMC
  - Claremont McKenna College
- HMC
  - Harvey Mudd College
- Scripps
- Pitzer
- Pomona

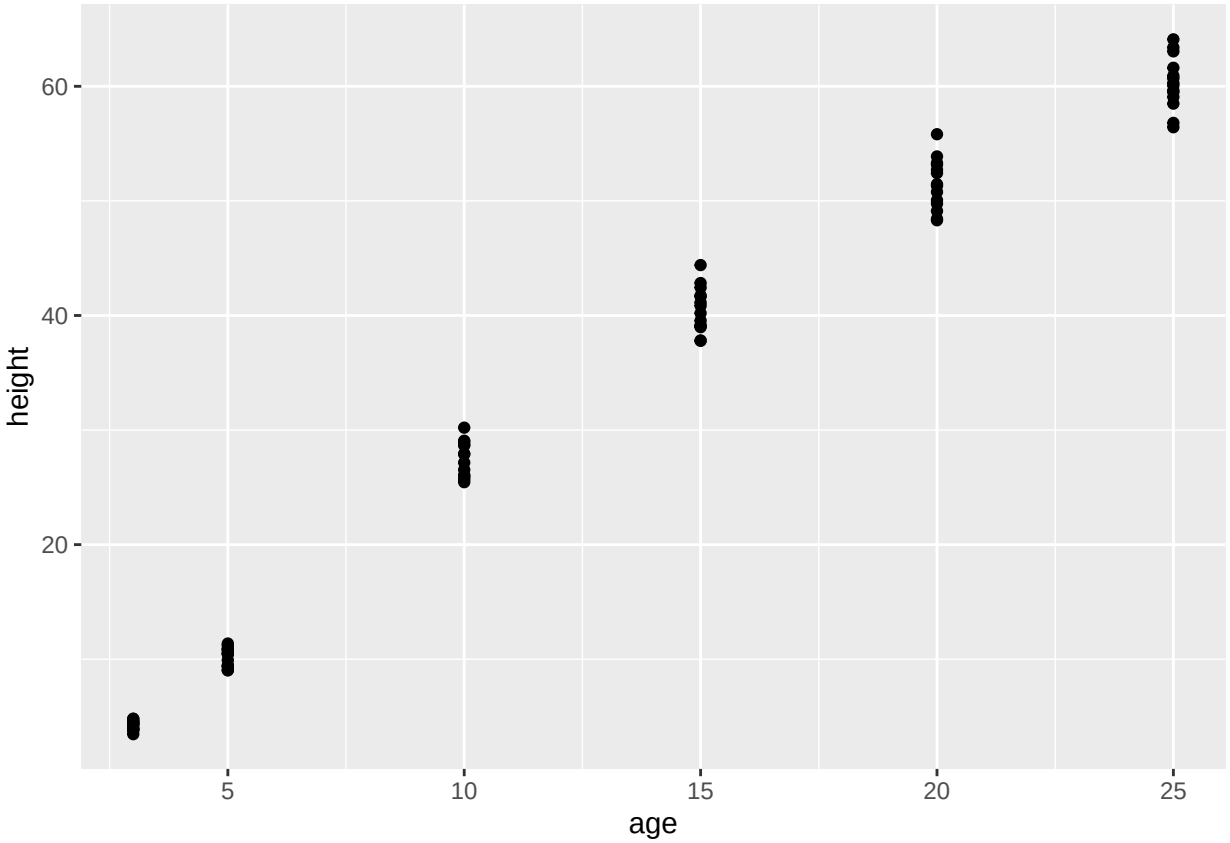
My three favorite ice cream flavors are:

- Chocolate
- Vanilla
- Strawberry

Subsection: Loblolly

Looking at the R object Loblolly, we can plot the age vs. height Loblolly pine trees.

```
library(ggplot2)
ggplot(data = Loblolly) + geom_point(mapping = aes(x = age, y = height))
```


60
40
20
height
5
10
15
20
25
age

Question 8 (5 points)

Reflection: How do you feel you did on this assignment? How confident are you in your answers? What did you find challenging or easy? For next week's assignment, is there anything you would do differently? Write at least 4-5 sentences

I believe I did well on this assignment. I'm confident most of the felt simple or were easy to find on the syllabus. It was challenging recreating the document for question 7, mostly tying to figure out how to get the bullet points and specific symbols. The easiest part was looking through the syllabus and going through the logic of the difference function. For next week's assignment, I'll start it a bit earlier so I'll have more time to go to office hours if I feel stuck.