Intro to R

Start with opening default R (no script) We want to change one setting: Go to tools -> global options -> General -> Basic. Under "workspace", make sure "Restore .RData into workspace at startup" is NOT checked and make sure "Save workspace to .RData on exit" is set to "Never".

Mention how there are different quadrants

Next, introduce the console: - In this section, we can run all of our code - R, like most other programming languages can be used as a fancy calculator - Type in `2+2` to the console (spacing doesn't matter). It returns 4! - Notice how there is a [1] in front of the 4. In R, most things are treated as a vector. A vector is just a list of values where all the values are the same type. In this case, R is telling us that the value at index 1 is the value 4. When we get into longer vectors it will make more sense, but just know that it's normal to have a little [1] there for now.

- We can also use functions here in the console. Let's try with a classic "hello world". To do this, we will use the `print()` function. Type `print("hello world")` into the console. What happens if we forget the quotes? Try doing `print(hello)`
- It says it can't find a hello object! Objects are how we can store information to use later. To create an object and assign it a value, we will use the arrow (`<-`). Try typing `number <- 4`. Huh, where did it go? When we save a value to an object, it doesn't print to the console. Instead, it saves the value under a name in the environment. Look up in the top right quadrant! Now, try typing `number` into the console. We can also formally `print(number)` -What happens if we do `number + 2`? Look in the environment, does the value stored in `number` change? No! To change it, we need to do `number <- number + 2` -Okay, let's say we are done for the day, and we close this window. -When we open it back up, all our work is gone! The console is a good place to test out some code or to look at something quickly, but nothing typed directly into the console will be saved! -Let's go to the top left and make a script. Click on "R Script". Now, we can take some notes as we practice and save it for later! Let's test it. -Now, type `number <- 4` into the script. Now since we are in a script, we will need to run this line of code after we type it. We can do that by doing command+enter on a mac or control+enter on a windows. number is back in our environment! Now, close R Studio and open it up again. -See, our environment is clear, but our script is still there! We can run our code again and get everything back exactly as it was -Just to be safe (and good practice for later), let's go ahead and name our script. Click the save button or go to file -> save and give it a name. How about "IntroR". You can also choose where you want to save it. Pick a folder to save it, then let's go find it! -If you close your script, you will have to find it in your files. One way to do this is with the file quadrant on the bottom right! I saved mine in the DSRP2023 folder, and there it is! Now, I can open it back up again!

Another way we can stay organized is by using R projects. This keeps all your files in a nice tidy place for you to come back and find everything easily. Let's make one for this program. Go to the top right where there is a cube with the letter R in it where it says "Project: (None)" and choose "New project". Choose "R project" and give it a name and save it to a location of your choosing.

Now, let's get a little organized. Let's make a folder called "Notes". Go to the file tab and click on "New Folder". Name it "Notes". Click it to open it up, then while inside the folder choose new blank file -> R Script. Call it whatever you want, I am going to call it 1_Intro. Try not to include spaces.

Great, now we are really ready to get going!

-So I mentioned one reason we should make a script is to make notes, but we can't just type like normal or R will think it is code and get confused and throw a lot of errors. Instead, we will write our notes as comments. Any text after a `#` will be ignored by R. Let's try!

```
# This is a comment
number <- 5
number + 2 # R doesn't care what I put here
```

```
## [1] 7
```

See how it just skips right over it with no errors! Comments help keep our code organized and easy to follow for anyone we share code with or our future selves!

```
# save the number 4 to an object
number <- 4

# print out the number
print(number)
```

```
## [1] 4
```

```
## We can make sections with 4 hashtags ####
```

Let's talk a bit more about objects

```
## R objects
# can be lots of different types

number <- 5 #decimal as default
decimal <- 1.5

# single letters and full words are both type character
letter <- 'a'
word <- "hello"

logic <- TRUE
logic2 <- T

class(number)
```

```
## [1] "numeric"
```

```
typeof(number)
```

```
## [1] "double"
```

```
# force to integer
int <- as.integer(number)
as.character(number) #force to character
```

```
## [1] "5"
```

```
## Names can be anything, but can't start with a number and can't have spaces
# can't have special characters with other meanings (-, +, /, *, %, $, @) or comment (#)
name <- "Sarah"
Name <- "Bob"
NAME <- "Sam"
n.ame <- "Joe"
```

```r
n_a_m_e <- "Lisa"

## good naming conventions
camelCase <- "camel"
snake_case <- "snake"

# Adding
number + decimal
```

```
## [1] 6.5
```

```r
#remember to save to a new object if you want to use this value later
new_num <- number + decimal
#letter + word #error

floor(1.5)
```

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

```r
ceiling(1.5)
```

```
## [1] 2
```

```r
round(1.5)
```

```
## [1] 2
```

```r
# To add characters together, use paste()
paste(letter,word)
```

```
## [1] "a hello"
```

```r
paste(letter, number) #non-character objects are forced into characters
```

```
## [1] "a 5"
```

```r
paste(logic,letter)
```

```
## [1] "TRUE a"
```

```r
# If you want no spaces, use paste0
paste0(letter,word)
```

```
## [1] "ahello"
```

So far, we have dealt with just one value at a time. Let's talk a bit more about vectors

```r
# Vectors ####
# vectors are objects that store one or more values of the same type

# make a vector of numerics
numbers <- c(1,2,3,4,5) #c means "combine"
?c

# make a vector of characters
letters <- c("a","b","c")

# combine objects
words <- c(letters,word)
words
```

```
## [1] "a"     "b"     "c"     "hello"
```

```r
# shortcuts for vectors of numbers
rep(5,10) # repeat a number a certain number of times
```

```
##  [1] 5 5 5 5 5 5 5 5 5 5
```

```r
seq(0,100,5) # from 0 to 100 by 5s
```

```
##  [1]   0   5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
## [20]  95 100
```

```r
1:15 # all integers 1 to 15
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
```

```r
## How would you do 1 to 5 by 0.5?
seq(1,5,0.5)
```

```
## [1] 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
```

```r
## Vector functions
numbers <- sample(1:25,20,T)
numbers
```

```
##  [1] 19 20 14  8 12  4 21 11 13  1 10 22 12 20  5 25 17  6  7 18
```

```r
sort(numbers)
```

```
##  [1]  1  4  5  6  7  8 10 11 12 12 13 14 17 18 19 20 20 21 22 25
```

```r
numbers <- sort(numbers)
unique(numbers)
```

```
##  [1]  1  4  5  6  7  8 10 11 12 13 14 17 18 19 20 21 22 25
```

```r
length(numbers)
```

```
## [1] 20
```

```r
table(numbers)
```

```
## numbers
##  1  4  5  6  7  8 10 11 12 13 14 17 18 19 20 21 22 25
##  1  1  1  1  1  1  1  1  2  1  1  1  1  1  2  1  1  1
```

```r
## Vector calculations
sum(numbers)
```

```
## [1] 265
```

```r
numbers + 5
```

```
##  [1]  6  9 10 11 12 13 15 16 17 17 18 19 22 23 24 25 25 26 27 30
```

```r
numbers/2
```

```
##  [1]  0.5  2.0  2.5  3.0  3.5  4.0  5.0  5.5  6.0  6.0  6.5  7.0  8.5  9.0  9.5
## [16] 10.0 10.0 10.5 11.0 12.5
```

```r
a <- c(1,2,3)
b <- c(4,5,6)
a + b
```

```
## [1] 5 7 9
```

```r
x <- c(a,b)
x
```

```
## [1] 1 2 3 4 5 6
```

```r
d <- c(1,2)
x + d
```

```
## [1] 2 4 4 6 6 8
```

```r
x %% 2 # remainder
```

```
## [1] 1 0 1 0 1 0
```

```r
## Vector Indexing
x
```

```
## [1] 1 2 3 4 5 6
```

```r
x[1]
```

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

```r
x[-1]
```

```
## [1] 2 3 4 5 6
```

```r
x[2:4]
```

```
## [1] 2 3 4
```

```r
x[d]
```

```
## [1] 1 2
```

```r
x[c(3,4,5,6,1,2)] # use to resort
```

```
## [1] 3 4 5 6 1 2
```

```r
x < 5
```

```
## [1]  TRUE  TRUE  TRUE  TRUE FALSE FALSE
```

```r
x[x < 5]
```

```
## [1] 1 2 3 4
```

```r
x == 5 # is equal
```

```
## [1] FALSE FALSE FALSE FALSE  TRUE FALSE
```

```r
x != 5 # is not equal
```

```
## [1]  TRUE  TRUE  TRUE  TRUE FALSE  TRUE
```

```r
x < 5 # less than
```

```
## [1]  TRUE  TRUE  TRUE  TRUE FALSE FALSE
```

```r
x >= 5 # greater than or equal to
```

```
## [1] FALSE FALSE FALSE FALSE  TRUE  TRUE
```

```r
x %in% c(2,4,6,8)
```

```
## [1] FALSE  TRUE FALSE  TRUE FALSE  TRUE
```

```r
## Indexing character vectors
food <- c("meatballs","potato","rice","popcorn","watermelon")
food[4]
```

```
## [1] "popcorn"
```

```r
food[2:5]
```

```
## [1] "potato"     "rice"       "popcorn"    "watermelon"
```

```r
grep("po",food)
```

```
## [1] 2 4
```

```r
grepl("po",food)
```

```
## [1] FALSE  TRUE FALSE  TRUE FALSE
```

```r
food[grep("po",food)]
```

```
## [1] "potato"  "popcorn"
```

```r
## for loops ####
fruits <- c("apple","banana","mango","tangerine")
for(fruit in fruits){
  print(fruit)
}
```

```
## [1] "apple"
## [1] "banana"
## [1] "mango"
## [1] "tangerine"
```

```r
for(f in fruits){
  print(f)
}
```

```
## [1] "apple"
## [1] "banana"
## [1] "mango"
## [1] "tangerine"
```

```r
## if statements
if(length(fruits) > 5){
  print("That's a lot of fruit!")
} else {
  print("That's a reasonable amount of fruit.")
}
```

```
## [1] "That's a reasonable amount of fruit."
```

```r
ifelse(length(fruits) > 5, "a lot", "a reasonable amount")
```

```
## [1] "a reasonable amount"
```

```r
fruits <- c(fruits, "mango", "strawberry", "watermelon")

print(paste("That's ", ifelse(length(fruits) > 5, "a lot", "a reasonable amount"), " of fruit"))
```

```
## [1] "That's  a lot  of fruit"
```

```r
## Datasets ####
## There are lots of datasets included with R Studio
?datasets

?mtcars
mtcars
```

```
##                     mpg cyl  disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4          21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag      21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710         22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive     21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout  18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
## Valiant            18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
## Duster 360         14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
## Merc 240D          24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
## Merc 230           22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
## Merc 280           19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
## Merc 280C          17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
## Merc 450SE         16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3
## Merc 450SL         17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
## Merc 450SLC        15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
## Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
## Lincoln Continental 10.4  8 460.0 215 3.00 5.424 17.82  0  0    3    4
## Chrysler Imperial  14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
## Fiat 128           32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
## Honda Civic        30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
## Toyota Corolla     33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
## Toyota Corona      21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
## Dodge Challenger   15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
## AMC Javelin        15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
## Camaro Z28         13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
```

```
## Pontiac Firebird    19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
## Fiat X1-9           27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1
## Porsche 914-2       26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
## Lotus Europa        30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
## Ford Pantera L      15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4
## Ferrari Dino        19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
## Maserati Bora       15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
## Volvo 142E          21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
```

```
#View(mtcars)
summary(mtcars)
```

```
##       mpg             cyl             disp             hp
##  Min.   :10.40   Min.   :4.000   Min.   : 71.1   Min.   : 52.0
##  1st Qu.:15.43   1st Qu.:4.000   1st Qu.:120.8   1st Qu.: 96.5
##  Median :19.20   Median :6.000   Median :196.3   Median :123.0
##  Mean   :20.09   Mean   :6.188   Mean   :230.7   Mean   :146.7
##  3rd Qu.:22.80   3rd Qu.:8.000   3rd Qu.:326.0   3rd Qu.:180.0
##  Max.   :33.90   Max.   :8.000   Max.   :472.0   Max.   :335.0
##       drat             wt             qsec             vs
##  Min.   :2.760   Min.   :1.513   Min.   :14.50   Min.   :0.0000
##  1st Qu.:3.080   1st Qu.:2.581   1st Qu.:16.89   1st Qu.:0.0000
##  Median :3.695   Median :3.325   Median :17.71   Median :0.0000
##  Mean   :3.597   Mean   :3.217   Mean   :17.85   Mean   :0.4375
##  3rd Qu.:3.920   3rd Qu.:3.610   3rd Qu.:18.90   3rd Qu.:1.0000
##  Max.   :4.930   Max.   :5.424   Max.   :22.90   Max.   :1.0000
##        am              gear            carb
##  Min.   :0.0000   Min.   :3.000   Min.   :1.000
##  1st Qu.:0.0000   1st Qu.:3.000   1st Qu.:2.000
##  Median :0.0000   Median :4.000   Median :2.000
##  Mean   :0.4062   Mean   :3.688   Mean   :2.812
##  3rd Qu.:1.0000   3rd Qu.:4.000   3rd Qu.:4.000
##  Max.   :1.0000   Max.   :5.000   Max.   :8.000
```

```
head(mtcars)
```

```
##                    mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

```
str(mtcars)
```

```
## 'data.frame':    32 obs. of  11 variables:
##  $ mpg : num  21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...
##  $ cyl : num  6 6 4 6 8 6 8 4 4 6 ...
##  $ disp: num  160 160 108 258 360 ...
##  $ hp  : num  110 110 93 110 175 105 245 62 95 123 ...
##  $ drat: num  3.9 3.9 3.85 3.08 3.15 2.76 3.21 3.69 3.92 3.92 ...
```

```
##  $ wt  : num  2.62 2.88 2.32 3.21 3.44 ...
##  $ qsec: num  16.5 17 18.6 19.4 17 ...
##  $ vs  : num  0 0 1 1 0 1 0 1 1 1 ...
##  $ am  : num  1 1 1 0 0 0 0 0 0 0 ...
##  $ gear: num  4 4 4 3 3 3 3 4 4 4 ...
##  $ carb: num  4 4 1 1 2 1 4 2 2 4 ...
```

```
names(mtcars)
```

```
##  [1] "mpg"  "cyl"  "disp" "hp"   "drat" "wt"   "qsec" "vs"   "am"   "gear"
## [11] "carb"
```

```
mtcars[,1]
```

```
##  [1] 21.0 21.0 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 17.8 16.4 17.3 15.2 10.4
## [16] 10.4 14.7 32.4 30.4 33.9 21.5 15.5 15.2 13.3 19.2 27.3 26.0 30.4 15.8 19.7
## [31] 15.0 21.4
```

```
mtcars[,"mpg"]
```

```
##  [1] 21.0 21.0 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 17.8 16.4 17.3 15.2 10.4
## [16] 10.4 14.7 32.4 30.4 33.9 21.5 15.5 15.2 13.3 19.2 27.3 26.0 30.4 15.8 19.7
## [31] 15.0 21.4
```

```
mtcars$mpg
```

```
##  [1] 21.0 21.0 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 17.8 16.4 17.3 15.2 10.4
## [16] 10.4 14.7 32.4 30.4 33.9 21.5 15.5 15.2 13.3 19.2 27.3 26.0 30.4 15.8 19.7
## [31] 15.0 21.4
```

```
# now we can treat this like any other vector

mtcars[1:2,1:2] #subset to first 2 rows & first 2 columns
```

```
##               mpg cyl
## Mazda RX4      21   6
## Mazda RX4 Wag  21   6
```

```
sum(mtcars$mpg)
```

```
## [1] 642.9
```

We can also read in our own data

- add a folder called “data”
- download the super_hero_powers.csv and put it in this folder

```
getwd()
```

```
## [1] "/Users/sarahparker/Documents/DSRP2023"
```

```
supers <- read.csv("data/super_hero_powers.csv")
#supers
#View(supers)
head(supers)
```

```
##    hero_names Agility Accelerated.Healing Lantern.Power.Ring
## 1     3-D Man    True               False              False
## 2      A-Bomb   False                True              False
## 3  Abe Sapien    True                True              False
## 4    Abin Sur   False               False               True
## 5 Abomination   False                True              False
## 6     Abraxas   False               False              False
##   Dimensional.Awareness Cold.Resistance Durability Stealth Energy.Absorption
## 1                 False           False      False   False             False
## 2                 False           False       True   False             False
## 3                 False            True       True   False             False
## 4                 False           False      False   False             False
## 5                 False           False      False   False             False
## 6                  True           False      False   False             False
##   Flight Danger.Sense Underwater.breathing Marksmanship Weapons.Master
## 1  False        False                False        False          False
## 2  False        False                False        False          False
## 3  False        False                 True         True           True
## 4  False        False                False        False          False
## 5  False        False                False        False          False
## 6   True        False                False        False          False
##   Power.Augmentation Animal.Attributes Longevity Intelligence Super.Strength
## 1              False             False     False        False           True
## 2              False             False      True        False           True
## 3              False             False      True         True           True
## 4              False             False     False        False          False
## 5              False             False     False         True           True
## 6              False             False     False         True           True
##   Cryokinesis Telepathy Energy.Armor Energy.Blasts Duplication Size.Changing
## 1       False     False        False         False       False         False
## 2       False     False        False         False       False         False
## 3       False      True        False         False       False         False
## 4       False     False        False         False       False         False
## 5       False     False        False         False       False         False
## 6       False     False        False         False       False          True
##   Density.Control Stamina Astral.Travel Audio.Control Dexterity Omnitrix
## 1           False    True         False         False     False    False
## 2           False    True         False         False     False    False
## 3           False    True         False         False     False    False
## 4           False   False         False         False     False    False
## 5           False    True         False         False     False    False
## 6           False   False         False         False     False    False
##   Super.Speed Possession Animal.Oriented.Powers Weapon.based.Powers
```

```
## 1        True      False                False               False
## 2       False      False                False               False
## 3       False      False                False               False
## 4       False      False                False               False
## 5        True      False                False               False
## 6        True      False                False               False
##   Electrokinesis Darkforce.Manipulation Death.Touch Teleportation
## 1          False                 False       False         False
## 2          False                 False       False         False
## 3          False                 False       False         False
## 4          False                 False       False         False
## 5          False                 False       False         False
## 6          False                 False       False          True
##   Enhanced.Senses Telekinesis Energy.Beams Magic Hyperkinesis  Jump
## 1           False       False        False False        False False
## 2           False       False        False False        False False
## 3           False       False        False False        False False
## 4           False       False        False False        False False
## 5           False       False        False False        False False
## 6           False       False        False  True        False False
##   Clairvoyance Dimensional.Travel Power.Sense Shapeshifting
## 1        False              False       False         False
## 2        False              False       False         False
## 3        False              False       False         False
## 4        False              False       False         False
## 5        False              False       False         False
## 6        False               True       False         False
##   Peak.Human.Condition Immortality Camouflage Element.Control Phasing
## 1                False       False      False           False   False
## 2                False       False       True           False   False
## 3                False        True      False           False   False
## 4                False       False      False           False   False
## 5                False       False      False           False   False
## 6                False        True      False           False   False
##   Astral.Projection Electrical.Transport Fire.Control Projection Summoning
## 1             False                False        False      False     False
## 2             False                False        False      False     False
## 3             False                False        False      False     False
## 4             False                False        False      False     False
## 5             False                False        False      False     False
## 6             False                False        False      False     False
##   Enhanced.Memory Reflexes Invulnerability Energy.Constructs Force.Fields
## 1           False    False           False             False        False
## 2           False    False           False             False        False
## 3           False     True           False             False        False
## 4           False    False           False             False        False
## 5           False    False            True             False        False
## 6           False    False            True             False        False
##   Self.Sustenance Anti.Gravity Empathy Power.Nullifier Radiation.Control
## 1           False        False   False           False             False
## 2            True        False   False           False             False
## 3           False        False   False           False             False
## 4           False        False   False           False             False
## 5           False        False   False           False             False
```

```
## 6           False        False   False           False             False
##   Psionic.Powers Elasticity Substance.Secretion Elemental.Transmogrification
## 1          False      False               False                         False
## 2          False      False               False                         False
## 3          False      False               False                         False
## 4          False      False               False                         False
## 5          False      False               False                         False
## 6          False      False               False                         False
##   Technopath.Cyberpath Photographic.Reflexes Seismic.Power Animation
## 1                False                False         False     False
## 2                False                False         False     False
## 3                False                False         False     False
## 4                False                False         False     False
## 5                False                False         False      True
## 6                False                False         False     False
##   Precognition Mind.Control Fire.Resistance Power.Absorption Enhanced.Hearing
## 1        False        False           False            False            False
## 2        False        False           False            False            False
## 3        False        False           False            False            False
## 4        False        False           False            False            False
## 5        False        False           False            False            False
## 6        False        False           False            False            False
##   Nova.Force Insanity Hypnokinesis Animal.Control Natural.Armor Intangibility
## 1      False    False        False          False         False         False
## 2      False    False        False          False         False         False
## 3      False    False        False          False         False         False
## 4      False    False        False          False         False         False
## 5      False    False        False          False         False         False
## 6      False    False        False          False         False         False
##   Enhanced.Sight Molecular.Manipulation Heat.Generation Adaptation Gliding
## 1          False                  False           False      False   False
## 2          False                  False           False      False   False
## 3           True                  False           False      False   False
## 4          False                  False           False      False   False
## 5          False                  False           False      False   False
## 6          False                   True           False      False   False
##   Power.Suit Mind.Blast Probability.Manipulation Gravity.Control Regeneration
## 1      False      False                   False           False        False
## 2      False      False                   False           False        False
## 3      False      False                   False           False        False
## 4      False      False                   False           False        False
## 5      False      False                   False           False        False
## 6      False      False                   False           False        False
##   Light.Control Echolocation Levitation Toxin.and.Disease.Control Banish
## 1         False        False      False                    False  False
## 2         False        False      False                    False  False
## 3         False        False      False                    False  False
## 4         False        False      False                    False  False
## 5         False        False      False                    False  False
## 6         False        False      False                    False  False
##   Energy.Manipulation Heat.Resistance Natural.Weapons Time.Travel
## 1               False           False           False       False
## 2               False           False           False       False
## 3               False           False           False       False
```

```
## 4              False          False          False       False
## 5              False          False          False       False
## 6               True          False          False       False
##   Enhanced.Smell Illusions Thirstokinesis Hair.Manipulation Illumination
## 1          False     False          False             False        False
## 2          False     False          False             False        False
## 3          False     False          False             False        False
## 4          False     False          False             False        False
## 5          False     False          False             False        False
## 6          False     False          False             False        False
##   Omnipotent Cloaking Changing.Armor Power.Cosmic Biokinesis Water.Control
## 1     False    False          False        False      False         False
## 2     False    False          False        False      False         False
## 3     False    False          False        False      False         False
## 4     False    False          False        False      False         False
## 5     False    False          False        False      False         False
## 6     False    False          False         True      False         False
##   Radiation.Immunity Vision...Telescopic Toxin.and.Disease.Resistance
## 1              False               False                        False
## 2              False               False                        False
## 3              False               False                        False
## 4              False               False                        False
## 5              False               False                        False
## 6              False               False                        False
##   Spatial.Awareness Energy.Resistance Telepathy.Resistance Molecular.Combustion
## 1             False             False                False                False
## 2             False             False                False                False
## 3             False             False                False                False
## 4             False             False                False                False
## 5             False             False                False                False
## 6             False             False                False                False
##   Omnilingualism Portal.Creation Magnetism Mind.Control.Resistance
## 1          False           False     False                   False
## 2          False           False     False                   False
## 3          False           False     False                   False
## 4          False           False     False                   False
## 5          False           False     False                   False
## 6          False           False     False                   False
##   Plant.Control Sonar Sonic.Scream Time.Manipulation Enhanced.Touch
## 1         False False        False             False          False
## 2         False False        False             False          False
## 3         False False        False             False          False
## 4         False False        False             False          False
## 5         False False        False             False          False
## 6         False False        False             False          False
##   Magic.Resistance Invisibility Sub.Mariner Radiation.Absorption
## 1            False        False       False                False
## 2            False        False       False                False
## 3            False        False        True                False
## 4            False        False       False                False
## 5            False        False       False                False
## 6            False        False       False                False
##   Intuitive.aptitude Vision...Microscopic Melting Wind.Control Super.Breath
## 1              False                False   False        False        False
```

```
## 2              False                False   False        False        False
## 3              False                False   False        False        False
## 4              False                False   False        False        False
## 5              False                False   False        False         True
## 6              False                False   False        False        False
##   Wallcrawling Vision...Night Vision...Infrared Grim.Reaping Matter.Absorption
## 1        False          False             False        False             False
## 2        False          False             False        False             False
## 3        False          False             False        False             False
## 4        False          False             False        False             False
## 5        False          False             False        False             False
## 6        False          False             False        False             False
##   The.Force Resurrection Terrakinesis Vision...Heat Vitakinesis Radar.Sense
## 1     False        False        False         False       False       False
## 2     False        False        False         False       False       False
## 3     False        False        False         False       False       False
## 4     False        False        False         False       False       False
## 5     False        False        False         False       False       False
## 6     False        False        False         False       False       False
##   Qwardian.Power.Ring Weather.Control Vision...X.Ray Vision...Thermal
## 1               False           False          False            False
## 2               False           False          False            False
## 3               False           False          False            False
## 4               False           False          False            False
## 5               False           False          False            False
## 6               False           False          False            False
##   Web.Creation Reality.Warping Odin.Force Symbiote.Costume Speed.Force
## 1        False           False      False            False       False
## 2        False           False      False            False       False
## 3        False           False      False            False       False
## 4        False           False      False            False       False
## 5        False           False      False            False       False
## 6        False           False      False            False       False
##   Phoenix.Force Molecular.Dissipation Vision...Cryo Omnipresent Omniscient
## 1         False                 False         False       False      False
## 2         False                 False         False       False      False
## 3         False                 False         False       False      False
## 4         False                 False         False       False      False
## 5         False                 False         False       False      False
## 6         False                 False         False       False      False
```

Plan: - vector functions (sort, rev, table, unique, summary functions vs vector math) - for loops - vector indexing - conditionals and which() (include grep and grepl) - if statements - dataset functions - dataset indexing ($ and [ ]) - file paths, reading in files (read.csv) - packages (read_csv) - stats

Outline: - the R studio quadrants - create an R project - new R script in notes folder - comments - objects - vectors - for loops/ if statements - datasets