Discovering Objects

Unit 1 - Lab 3

Directions: Follow along with the slides and answer the questions in **red** font in your journal.

# What are objects?

* When data is loaded into R, it's stored as an *object*:
  + Don't have to type out all of the data's values each time you want to use it.
  + Just use the name of the object (our data in this case)
  + For example, View(cdc) is telling R to show you the object called *cdc*.
* Data is just **one** object that R can use.

# Why are objects awesome?

* Using objects makes it easy to:
  + Store information
  + Manipulate information
  + And use information!

# How about an example

* Let's suppose we wanted to find the sum of all integers between 5 and 14
* **Using RStudio, calculate the sum of all integers between 5 and 14**

# How about an example

* One way to find this sum might be

5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13 + 14

# How about an example

* Now suppose you wanted to calulate the difference of the sum you calculated and each integer between 5 and 14.
  + Meaning,  
    95 minus 5  
    95 minus 6  
    95 minus 7 and so on ...
* **Go ahead and calculate these differences**

# How about an example

* You should notice by now that doing these calculations is tedious.
* Let's use objects to make our lives easier!

# Creating objects

* Every *object* needs 3 things:
  1. A *name*
  2. The *assignment* symbol
  3. A *value*
* We'll start by creating a **vector** of values for integers between 5 and 14
  + A **vector** is a single *object* that can contain many *values*

# Making vectors (tra-la-la!)

* Let's create our **vector** of integers between 5 and 14:
  + We'll *name* it numbers
  + We'll *assign* it values using <-
  + Our *values* will be the numbers 5 through 14
* Write the following code into your console.

numbers <- c(5, 6, 7, 8, 9, 10, 11, 12, 13, 14)

* Click on the *environment* pane.
  + Objects you create will show up there!

# Let's review what we just did

numbers <- c(5, 6, 7, 8, 9, 10, 11, 12, 13, 14)

* This line of code tells R:

1. Create a single *object* called numbers
2. **Combine** the numbers 5 through 14 into a *single object* using the c() function
3. **Assign** the values we combined, using the <- symbol, to the object we created.

* The numbers object you created is an example of a *vector*

# Let's review what we just did

numbers <- c(5, 6, 7, 8, 9, 10, 11, 12, 13, 14)

* After running the code:
  + The *object* pops up in the *environment* tab.
  + Nothing is printed in the console.
* **What happens if you type numbers into the console and hit *enter*?**

# Try the example again using objects

* Let's go back now and redo our previous example:
* Create the object

numbers <- c(5, 6, 7, 8, 9, 10, 11, 12, 13, 14)

* **What type of object is this again? Why?**

# Try the example again using objects

* R contains many convenient functions.
* One such function is the sum() function.
  + It takes vectors of numbers and adds all the values in them together.

sum(numbers)

* **Do you think using objects is any easier than just adding the numbers together in the console? Why or why not? Be honest!**

# Try the example again using objects

* Let's save the sum of all numbers between 5 and 15 as another new object.
* Run these lines of code:

total <- sum(numbers)

total

* **What is the *name* of the object? What is its value? How did you tell R to *assign* the value to the object?**

# Try the example again using objects

* Finally, let's calculate the differences of the sum and the numbers
  + Meaning, 95 minus 5, 95 minus 6, and so on
* We already have the sum (total) and all of the values (numbers)
* To calculate the differences of these two objects:

total - numbers

* **In your opinion, was using objects for this task easier than before? Why or why not?**

# Other ways to save time!

* The sum() function was just one function that saves you time.
* Compare the outputs of the following:

c(5, 6, 7, 8, 9, 10, 11, 12, 13, 14)

5:14

seq(from = 5, to = 14, by = 1)

* **How are these 3 methods different?**
* **Explain how you think R interprets each line.**

# ... a twist

* Compare the following outputs:

5:14

14:5

* **What do you notice about the outputs?**

# ... a final twist

* Compare the following outputs:

seq(from = 5, to = 14, by = 1)

seq(from = 5, to = 14, by = 3)

seq(5, 14, 1)

* **What do you notice about the outputs?**
* **For each line, explain how each part effects the output**

# On your own:

* **Create a *vector* of numbers and save it as an *object***
* Run the commands with *your\_object* (whatever you decide to name it):

your\_object + your\_object

your\_object \* 2

cumsum(your\_object)

* **Describe the computations that take place for each output**