STAT 33B Lab 6

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This assignment is due **Apr 16, 2020** by 11:59pm.

Edit this file, knit to PDF, and:

- Submit the Rmd file on bCourses.
- Submit the PDF file on Gradescope.

If you think you'll need help with submission, please ask during the lab.

Answer all questions with complete sentences, and put code in code chunks. You can make as many new code chunks as you like. Please do not delete the exercises already in this notebook, because it may interfere with our grading tools.

As you work, you may find it helpful to be able to run your code. You can run a single line of code by pressing Ctrl + Enter. You can run an entire code chunk by clicking on the green arrow in the upper right corner of the code chunk.

Knit the document from time to time to make sure that your code runs without errors from top to bottom in a fresh R environment.

Debugging

The purpose of this lab is to practice debugging.

The function in the next section has many bugs. Some of these bugs cause errors which show up when trying to parse the function, while others don't show up until trying to run the function. There are also "silent bugs", which will not cause errors but will lead to incorrect results.

The Function

The `tip_calculator()` function, shown below, is meant to calculate the tip and grand total for a restaurant bill. There are multiple ways to calculate these, depending on the tip rate, tax rate, and whether the tip is on the subtotal before or after tax. The function's parameters are:

- `subtotal` - the bill before taxes are added
- `percent_tip` - the desired percentage of the tip
- `post_tax` - whether or not the tip should be calculated on the bill before or after taxes have been added.
- `percent_tax` - the tax rate

The function is defined as:

```
tip_calculator = function(subtotal, percent_tip = 0.20, post_tax = TRUE,
  percent_tax = 0.0925)
{
  tax = subtotal*percent_tax
  pre_tip = subtotal
  if(post_tax) {
    pre_tip = subtotal + tax
  }
  tip = pre_tip*percent_tax
  grand_total == subtotal + tax + tip

  out = c("tip" = tip, "total" = grand_total)
  out
}
```

Your task is to find and fix each bug in the `tip_calculator()` function. Do the debugging in rounds, with one round for each bug. After fixing a bug, start a new round of debugging **in a new code cell**. You must perform at least 3 rounds of debugging, but more may be necessary to fix all of the bugs. You must use the `debug()` or `browser()` function for at least one round.

You have not fixed all of the bugs until all of the pre-written tests at the end of this lab run and return `TRUE`. Note that these tests may not be exhaustive, so you may want to add more tests of your own.

Round 1

Describe the bug, the steps you took to find the bug, and the steps you took to fix the bug. Place the fixed code in the cell below.

```
# Your fixed code after round 1 goes here.

tax = subtotal*percent_tax
```

```
## Error in eval(expr, envir, enclos): object 'subtotal' not found
```

YOUR WRITTEN ANSWER GOES HERE: Previously, the subtotal was being raised to the exponent of the percent_tax. I changed to be multiplied by the percent_tax.

Round 2

Describe the bug, the steps you took to find the bug, and the steps you took to fix the bug. Place the fixed code in the cell below.

```
# Your fixed code after round 2 goes here.
debug(tip_calculator)
tip_calculator()
```

```
## debugging in: tip_calculator()
## debug at <text>#1: {
##     tax = subtotal * percent_tax
##     pre_tip = subtotal
##     if (post_tax) {
```

```
##          pre_tip = subtotal + tax
##      }
##      tip = pre_tip * percent_tax
##      grand_total == subtotal + tax + tip
##      out = c(tip = tip, total = grand_total)
##      out
## }
## debug at <text>#4: tax = subtotal * percent_tax

## Error in tip_calculator(): argument "subtotal" is missing, with no default
```

```
  if(post_tax) {
    pre_tip = subtotal + tax
  }
```

```
## Error in eval(expr, envir, enclos): object 'post_tax' not found
```

YOUR WRITTEN ANSWER GOES HERE: The if statement's conditional expression was not correctly inclosed in parentheses. I fixed this by adding a ')'

Round 3

Describe the bug, the steps you took to find the bug, and the steps you took to fix the bug. Place the fixed code in the cell below.

```
# Your fixed code after round 3 goes here.
debug(tip_calculator)
tip_calculator()
```

```
## debugging in: tip_calculator()
## debug at <text>#1: {
##      tax = subtotal * percent_tax
##      pre_tip = subtotal
##      if (post_tax) {
##          pre_tip = subtotal + tax
##      }
##      tip = pre_tip * percent_tax
##      grand_total == subtotal + tax + tip
##      out = c(tip = tip, total = grand_total)
##      out
## }
## debug at <text>#4: tax = subtotal * percent_tax

## Error in tip_calculator(): argument "subtotal" is missing, with no default
```

```
tip = pre_tip*percent_tip
```

```
## Error in eval(expr, envir, enclos): object 'pre_tip' not found
```

YOUR WRITTEN ANSWER GOES HERE: Tip was being calculated incorrectly by multiplying pre_tip by the default tax. I corrected this by multiplying the pretip times the percent tip.

Round 4

Describe the bug, the steps you took to find the bug, and the steps you took to fix the bug. Place the fixed code in the cell below.

Note: If you need more that 4 rounds of debugging, add them after this section.

```r
# Your fixed code after round 4 goes here.
debug(tip_calculator)
tip_calculator()
```

```
## debugging in: tip_calculator()
## debug at <text>#1: {
##     tax = subtotal * percent_tax
##     pre_tip = subtotal
##     if (post_tax) {
##         pre_tip = subtotal + tax
##     }
##     tip = pre_tip * percent_tax
##     grand_total == subtotal + tax + tip
##     out = c(tip = tip, total = grand_total)
##     out
## }
## debug at <text>#4: tax = subtotal * percent_tax
```

```
## Error in tip_calculator(): argument "subtotal" is missing, with no default
```

```r
tip_calculator = function(subtotal, percent_tip = 0.20, post_tax = TRUE,
  percent_tax = 0.0925)
{
  tax = subtotal*percent_tax
  pre_tip = subtotal
  if(post_tax) {
    pre_tip = subtotal + tax
  }
  tip = pre_tip*percent_tip
  grand_total = subtotal + tax + tip
  out = c("tip" = tip, "total" = grand_total)
  out
}
```

YOUR WRITTEN ANSWER GOES HERE: There was a missing comma that was supposed to separate the arguments in 'out'. I fixed this by adding the comma after tip. Also there was an eqaulity check instead of assignment when assigning the variable grand_total

Test Cases

Below are a few calls to `tip_calculator()`. The results are assigned to variables so that they can be used in further tests below.

```r
test_a = tip_calculator(100)
test_a
```

```
##    tip  total
##  21.85 131.10
```

```
test_b = tip_calculator(100, 0.15)
test_b
```

```
##      tip    total
##  16.3875 125.6375
```

```
test_c = tip_calculator(100, 0.15, FALSE)
test_c
```

```
##    tip  total
##  15.00 124.25
```

```
test_d = tip_calculator(100, 0.15, FALSE, 0.0725)
test_d
```

```
##    tip  total
##  15.00 122.25
```

Below are tests that check the correctness of the results from the previous calls.

```
# Confirm that the default tip is more than the 15% tip
test_a["tip"] > test_b["tip"]
```

```
##  tip
## TRUE
```

```
test_a["total"] > test_b["total"]
```

```
## total
##  TRUE
```

```
# Confirm that tipping post-tax is more than tipping pre-tax
test_b["tip"] > test_c["tip"]
```

```
##  tip
## TRUE
```

```
test_b["total"] > test_c["total"]
```

```
## total
##  TRUE
```

```
# Confirm that the default tax is more than the base California tax of 7.25%
test_c["total"] > test_d["total"]
```

```
## total
##  TRUE
```

```
# Confirm that the grand total minus the tip is the subtotal plus tax
(test_a["total"] - test_a["tip"]) == 100 * 1.0925
```

```
## total
##  TRUE
```

```
(test_b["total"] - test_b["tip"]) == 100 * 1.0925
```

```
## total
##  TRUE
```

```
(test_c["total"] - test_c["tip"]) == 100 * 1.0925
```

```
## total
##  TRUE
```

```
(test_d["total"] - test_d["tip"]) == 100 * 1.0725
```

```
## total
##  TRUE
```