# STAT 33B Homework 5

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This homework is due **Apr 16, 2021** by 11:59pm PT.

Homeworks are graded for correctness.

As you work, write your answers in this notebook. Answer 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.

You need to submit your work in two places:

- Submit this Rmd file with your edits on bCourses.
- Knit and submit the generated PDF file on Gradescope.

The purpose of this homework 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 percentage of the total add as a tip
- `post_tax` – if `TRUE`, calculate the tip after adding tax; otherwise, calculate the tip before adding tax
- `percent_tax` – the percentage of the total to add as tax

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*0.0925
```

```
  grand_total == subtotal + tax + tip

  out = c("tip" = tip "total" = grand_total)

  out
}
```

```
## Error: <text>:6:15: unexpected '{'
## 5:   pre_tip = subtotal
## 6:   if(post_tax {
##                  ^
```

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 finding and fixing a bug, put the fixed code **in a new code chunk**. Then explain the steps you took to find and fix the bug.

You must perform at least 3 rounds of debugging, but more may be necessary to fix all of the bugs. Use the `browser()` function in at least one round (comment out the call to `browser()` in your fixed code).

You have not fixed all of the bugs until all of the pre-written tests at the end of this exercise 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 ANSWER GOES HERE:**

```
# Your fixed code after round 1 goes here.
tip_calculator = function(subtotal, percent_tip = 0.20, post_tax = TRUE,
  percent_tax = 0.0925)
{
  tax = subtotal**percent_tax
  pre_tip = subtotal
  # added a missing parentheses
  if(post_tax) {
    pre_tip = subtotal + tax
  }
  tip = pre_tip*0.0925
  grand_total == subtotal + tax + tip

  # added a missing comma between the two parameters
  out = c("tip" = tip, "total" = grand_total)

  out
}

tip_calculator(100)
```

```
## Error in tip_calculator(100): object 'grand_total' not found
```

```
tip_calculator(100, post_tax = FALSE)
```

```
## Error in tip_calculator(100, post_tax = FALSE): object 'grand_total' not found
```

## 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 ANSWER GOES HERE:**

```
# Your fixed code after round 2 goes here.
tip_calculator = function(subtotal, percent_tip = 0.20, post_tax = TRUE,
  percent_tax = 0.0925)
{
  tax = subtotal**percent_tax
  pre_tip = subtotal
  # added a missing parentheses
  if(post_tax) {
    pre_tip = subtotal + tax
  }
  tip = pre_tip*0.0925
  # got rid of the double == since that caused an error. Mostly used for T/F instead of defining a vari
  grand_total = subtotal + tax + tip

  # added a missing comma between the two parameters
  out = c("tip" = tip, "total" = grand_total)

  out
}

tip_calculator(100)
```

```
##        tip      total
##   9.391626 110.922713
```

```
tip_calculator(100, post_tax = FALSE)
```

```
##      tip    total
##   9.2500 110.7811
```

## 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 ANSWER GOES HERE:**

```
# Your fixed code after round 3 goes here.
tip_calculator = function(subtotal, percent_tip = 0.20, post_tax = TRUE,
  percent_tax = 0.0925)
{
  tax = subtotal**percent_tax
  pre_tip = subtotal
  # added a missing parentheses
  if(post_tax) {
    pre_tip = subtotal + tax
  }
  # instead of percent tax, it should be the percent tip when measuring since you're not taxing the tip
  tip = pre_tip * percent_tip
  # got rid of the double == since that caused an error. Mostly used for T/F instead of defining a vari
  grand_total = subtotal + tax + tip

  # added a missing comma between the two parameters
  out = c("tip" = tip, "total" = grand_total)

  out
}

tip_calculator(100)
```

```
##       tip     total
##  20.30622 121.83730
```

```
tip_calculator(100, post_tax = FALSE)
```

```
##      tip    total
##  20.0000 121.5311
```

## 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.*

**YOUR ANSWER GOES HERE:**

```
# Your fixed code after round 4 goes here.
tip_calculator = function(subtotal, percent_tip = 0.20, post_tax = TRUE,
  percent_tax = 0.0925)
{
  # got rid of double ** since the right way to find tax is the total * tax in decimal form.
  tax = subtotal * percent_tax
  pre_tip = subtotal
  # added a missing parentheses
  if(post_tax) {
    pre_tip = subtotal + tax
  }
  # instead of percent tax, it should be the percent tip when measuring since you're not taxing the tip
```

```
  tip = pre_tip * percent_tip
  # got rid of the double == since that caused an error. Mostly used for T/F instead of defining a vari
  grand_total = subtotal + tax + tip

  # added a missing comma between the two parameters
  out = c("tip" = tip, "total" = grand_total)

  out
}

tip_calculator(100)
```

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

```
tip_calculator(100, post_tax = FALSE)
```

```
##    tip  total
##  20.00 129.25
```

### 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.

```
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
```