Programming Project #5

This assignment is worth 45 points (4.5% of the course grade) and must be completed and turned in before 11:59 PM on Monday, October 16, 2017

Assignment Overview

This assignment involves coding and testing of a program that reads input files, and uses functions to calculate statistical information about the input data.

Assignment Background

Unable to find a tenure-track job in Academia, and unwilling to make slave-wages as an adjunct, you turn to jobs in industry. You find yourself employed at RobCo, a multinational corporation producing dozens of different products for different markets all over the United States. The suits in marketing have assigned you your first big project, identifying trends in product sales, and the effectiveness of advertising. You must identify which ads for what products are performing best, and identify, for each product, the ad that gives the best ROI, or Return On Investment. When your boss's boss is finally done flapping his mouth and leaves your cubicle, you sit dumbfounded for a moment. You can't believe it. That's it? This is the big project? Obviously, this joker can't operate a calculator, so he hired you to do it. You can't believe he makes ten times your salary. You have a degree in Computer Science, for Pete's sake! Well, the cat won't feed itself, and you need the money. You crunch on a Mentat, and boot your terminal to hunt down the project specifications.

In order to calculate per-ad ROI, and identify the best-performing ads, you are given a file containing a list of ads for products, and for each ad, the product, the number of ads run, the cost per ad, the number of sales associated with this ad, sale price for the product, and the per-product production cost.

*While you're reading, you notice a post-it note stuck to the underside of your terminal keyboard. It's dusty, and crumbs are stuck to the adhesive. There's a username and password, a directory and a filename: **proj05.py**. Intrigued, you log in with the password, open up the file, and find a program skeleton, with some partly implemented functions in it to calculate ROI, and some comments that imply that it's for this exact project. Huzzah! But where did this come from? The only clue as to the author are the initials, RCK. Strange. There must have been a developer before you, assigned to this same project. You wonder what happened to them. Why did they quit an easy project half-way? Maybe your boss knows. You keep reading.*

For each product, you must identify the ad with the most sales, and you must also identify which ad has the best ROI. They might be different!

Example:

Given the marketing data for the following products and ads:

PipBoy 2000 -

Atomic Radio Ad
17 plays
$100 per play
372 sales
$499.99 sale price
$77.02 production cost

Tesla Science Magazine Ad
2 issues
$500 per issue
5013 sales
$459.99 sale price
$77.02 production cost

Capital Post Newspaper Ad
36 spots
$2 per issue
200 sales
$499.99 sale price
$77.02 production cost

Boston Bugle Newspaper Ad
23 spots
$3.50 per issue
1100 sales
$499.99 sale price
$77.02 production cost

Mister Handy -

RobCo Fun Magazine Ad
5 issues
$300 per issue
113 sales
$1199.99 sale price
$372.14 production cost

Poster
3200 placements
$0.25 per poster
1,508 sales
$1299.99 sale price
$372.14 production cost

Boston Bugle Newspaper Ad
11 spots
$5 per issue
252 sales
$1299.99 sale price
$372.14 production cost

Abraxo Scouring Powder -

Atomic Radio Ad
27 plays
$200 per play
30,020 sales
$3.49 sale price
$0.11 production cost

Poster
3000 placements
$0.25 per poster
20,002 sales
$3.99 sale price
$0.11 production cost

The program would output the following statistics:

```
PipBoy 2000
   Best-Performing Ad                sales
   Tesla Science Magazine Ad          5013

   Best ROI                         percent
   Boston Bugle Newspaper Ad          5.49%

Mister Handy
   Best-Performing Ad                sales
   Boston Bugle Newspaper Ad          252

   Best ROI                         percent
   Boston Bugle Newspaper Ad          2.49%

Abraxo Scouring Powder
   Best-Performing Ad                sales
   Atomic Radio Ad                   30020

   Best ROI                         percent
   Poster                            26.05%
```

This is all weirdly detailed, but somehow strangely vague. Is this a test of some kind? You hide the post-it in your sock. The adhesive sticks to your leg hair.

Program Specification

The program must prompt the user for one filename, and then output the best performing ad, as well as the ad with the best return on investment (ROI).

Input Files
There is one input file, which contains the advertising return data for each product.

Advertising Return Data File

There is one line per ad, and each line contains the name of the product, the ad (type and placement), the number of ad placements (int), the cost per ad placement (float in dollars), the number of sales associated with the ad (int), the product sale price (float in dollars), and the product production cost (float in dollars). Products will ALWAYS be grouped together.

The first two columns are 27 characters wide; each of the remaining columns (the ones with numbers) are 8 characters wide. Hint: use this information for slicing!

For the example output above, the advertising data file would be as follows:

```
PipBoy 2000                Atomic Radio Ad                17  100.00    372  499.99   77.02
PipBoy 2000                Tesla Science Magazine Ad       2  500.00   5013  459.99   77.02
PipBoy 2000                Capital Post Newspaper Ad      36    2.00    200  499.99   77.02
PipBoy 2000                Boston Bugle Newspaper Ad      23    3.50   1100  499.99   77.02
Mister Handy               RobCo Fun Magazine Ad           5  300.00    113 1199.99  372.14
Mister Handy               Poster                       3200    0.25      1  508.00 1299.99
Mister Handy               Boston Bugle Newspaper Ad      11    5.00    252 1299.99  372.14
Abraxo Scouring Powder     Atomic Radio Ad                27  200.00  30020    3.49    0.11
Abraxo Scouring Powder     Poster                       3000    0.25  20002    3.99    0.11
```

Calculating Advertising ROI (return on investment)

Return on investment in advertising is calculated by subtracting the cost of the production and advertising of the goods sold because of the ad (Cost of Goods Sold) from the revenue collected because of the ad (Revenue), then dividing this total by the Cost of Goods Sold. This gives a ratio of advertising profit to the cost of performing the advertising.

- ROI = (Revenue - Cost of Goods Sold) / Cost of Goods Sold

- Revenue = Number of Sales * Sale Price
- Costs of Goods Sold = Total Ad Price + Total Production Cost
- Total Ad Price = Number of Ads Placed * Cost per Ad
- Total Production Cost = Number of Sales * Production Cost

Implementation

1. **Prompt the user for the advertising data file.**
   a. Check for filename errors and keep prompting until a file is found.
2. **Process the data file and produce output.**
   a. Read each line, keeping a running tally of the highest sales count for the product, as well as a running tally of the best ROI found so far.
   b. For each product, output the product name, the ad with the best sales count and count (int), and the ad with the best ROI and the ROI as a percent (float to 2 decimal places).
   c. If the next line is for a different product, reset the running tallies for best ROI and highest sales count.

Other Requirements

1. You are required to use a main() function (as in the skeleton file provided)
2. You are required to finish implementing and use the following functions:

a. `open_file()`
Returns a file pointer. Keeps looping until a file is successfully opened.
Use try-except and `FileNotFoundError`.

b. `revenue(num_sales, sale_price)`
Returns a floting point value that is the revenue.
`num_sales` is an int, `sale_price` is a float.
Revenue = Number of Sales * Sale Price

c. `cost_of_goods_sold(num_ads, ad_price, num_sales, production_cost)`
Returns a floating point value that is the cost of goods sold.
`num_ads` and `num_sales` are ints; `ad_price` and `production_cost` are floats.
Cost of Goods Sold = Total Ad Price + Total Production Cost

d. `calculate_ROI(num_ads, ad_price, num_sales, sale_price, production_cost)`
Returns a floating point number that is the return on investment (ROI).
`num_ads` and `num_sales` are ints; `ad_price`, `sale_price` and `production_cost` are floats
ROI = (Revenue - Cost of Goods Sold) / Cost of Goods Sold

e. You are welcome to make additional helper functions.
3. You are not allowed to use complex data structures such as lists or dictionaries. Nor do you need them for this project.
4. Coding Standard 1-9 is required.

Deliverables

The deliverable for this project is the following file:

`proj05.py` -- your source code solution

Be sure to use the specified filename, and submit it via the handin system before the project deadline.

Tips and Tricks

1. The ads for a product will always be grouped together. In order to figure out when to print the output for a product, save the previous product name in a variable, and check whether the line you are reading has a different product name. If it's different, print out the running tallies for the previous product, and then continue processing the new line.
2. *Don't over-think it. Use the code skeleton.*

You blink at that last line. Did the skeleton writer also write this project specification? What's going on here? This is definitely some kind of test.

Test Case 1

```
Input a file name: test1.txt

RobCo AdStats M4000
-------------------

Securitron
  Best-Performing Ad              sales
  Guns & Bullets Magazine Ad        231

  Best ROI                      percent
  Guns & Bullets Magazine Ad    32.83%
```

Test Case 2

```
Input a file name: test2.txt

RobCo AdStats M4000
-------------------

PipBoy 2000
  Best-Performing Ad              sales
  Tesla Science Magazine Ad        5013

  Best ROI                      percent
  Boston Bugle Newspaper Ad      5.49%

Mister Handy
  Best-Performing Ad              sales
  Boston Bugle Newspaper Ad         252

  Best ROI                      percent
  Boston Bugle Newspaper Ad      2.49%

Abraxo Scouring Powder
  Best-Performing Ad              sales
  Atomic Radio Ad                 30020

  Best ROI                      percent
  Poster                         26.05%
```

Test Case 3

```
Input a file name: xxx
Unable to open file. Please try again.

Input a file name: test3.txt

RobCo AdStats M4000
-------------------

Protectron
  Best-Performing Ad                sales
  RobCo Fun Magazine Ad              113

  Best ROI                        percent
  RobCo Fun Magazine Ad             2.08%

Stealth Boy
  Best-Performing Ad                sales
  Atomic Radio Ad                   1012

  Best ROI                        percent
  Atomic Radio Ad                   0.89%
```

Grading Rubric

```
Project #5                                    Scoring Summary

General Requirements:

__0__     (5 pts)    Coding Standard 1-9
                     (descriptive comments, function headers, etc…)

Implementation:

__0__     (10 pts)   open_file uses try-except to test for file

__0__     (10 pts)   Pass Test1

__0__     (10 pts)   Pass Test2

__0__     (10 pts)   Pass Test3
```