Problem 3: TT Securities, Incorporated

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Week 8: Loops > Homework 8 > Problem 3: TT Securities, Incorporated

For this problem, you will implement a (text-based) menu of options for analyzing a list of stock prices (or any list of floating-point values). This provides an opportunity to use loops in a variety of ways, as well as experience handling user input.

Using Your Own Loops

Do ***not*** use the built-in functions `sum`, `min`, or `max` in this problem—instead, as you work through the different menu options, write helper functions that handle the data appropriately. If you *really* want to use those functions, feel free to write versions of your own (we worked through examples in class, in fact).

Support Code

In class, we looked at an example user-interaction loop. Here is a variation on that code—this may be a good place to start with this problem. We've named the primary function `main()` in order to set things up similar to how you'll write the larger version described below:

```
#
# example user-interaction looping program
#  (a variant of the one done in class)
#

def menu():
    """ a function that simply prints the menu """
    print
    print "(1) Enter a list"
    print "(2) Predict the next element"
    print "(9) Quit"
    print

def predict(L):
    """ predict ignores its input and returns
        what the next element should have been
    """
    return 42.0

def main():
    """ the main user-interaction loop """

    L = [12,22,32] # an initial list

    while True:   # the user-interaction loop
        print "\nThe list is", L
        menu()
        uc = raw_input( "Choose an option: " )

        if uc == '9': # we want to quit
            break

        elif uc == '1': # we want to enter a new list
            numString = raw_input("Enter a new list: ")
            L = makeList(numString)

        elif uc == '2': # predict and add the next
element
            n = predict(L)
            L = L + [n]

        else:
            print "That's not on the menu!"

    print
    print "I knew you were going to quit!"

def makeList(numString):
    numString = numString.replace('[', '')
    numString = numString.replace(']', '')
    numList = numString.split(',')
    L = []
    for x in numList:
        L.append(float(x.strip()))
    return L
```

The TTS Software

The top-level function to write for this problem is called `main()`. Note that it takes no inputs. Instead, it should offer the user a menu with these choices:

```
(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard
deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice:
```

Feel free to change the wording or text, but please keep the functionality of these choices intact. If you'd like to add additional menu options of your own design, please use different values for them (see the extra challenge for this week!).

Once the menu is presented, the program should wait for the user's input. (You may assume that the user will type an integer as input.) The function should then:

- Print a warning message if the integer is not a valid menu option
- Quit if the user inputs `9`
- Allow the user to input a new list of stock prices, if the user selects choice `0`
- Print a table of days and prices, with labels, if the user selects choice `1`
- Compute the appropriate statistics about the list for choices `2-6`

For any option except `9`, the function should reprompt the user with the menu after each choice.

Many of the pieces are straightforward, but here are a couple of pointers on two of them:

- In order to print in neatly formatted columns, the following approach will help (try it out at the Python shell, just to get the hang of it):

  ```
  >>> x = 42
  >>> print ("%7.2f" %
  x)
    42.00
  >>> x = 5
  >>> print ("%7.2f" %
  x)
    5.00
  ```

  Here, the print statement is using a *formatting string*, namely `"%7.2f"`, which is saying "print the number at the right-hand side of a 7-space textfield using two digits after the decimal point"
- **The time-travel strategy**: For menu option 6, you will want to find the best day on which to buy and sell the stock in question in order to maximize the profit earned. However, the ***sell day must be greater than or equal to the buy day***. You may want to adapt the example function `diff` from class in order to find this

maximum profit.

- **Calculating the standard deviation**: Please use this formula to calculate the standard deviation of the stock. Note that L_{av} is the average (mean) value of the elements of the list L. Also, it's OK to assume that L will always be non-empty.
  ∑i(L[i]−Lav)2len(L)

Helper functions

You **should** write a helper function for each of the menu options. Please use the following names for your helper functions:

- Option 1: `printList(L)` prints the input list of stock prices
- Option 2: `averagePrice(L)` returns the average price of the input list of prices
- Option 3: `standardDev(L)` returns the standard deviation of the input list of prices
- Option 4: `minDay(L)` returns a list containing the minimum price and the day that price occurred on (in that order)
- Option 5: `maxDay(L)` returns a list containing the maximum price and the day that price occurred on (in that order)
- Option 6: `TTPlan(L)` returns a list containing the day to buy on, the day to sell on, and the profit (in that order)

We include an example run that illustrates one possible interface for your `main()` function a little further down on this page

Example Run

Here is an example run—you do not need to follow this format exactly (though you may), but it's meant to show an example of each menu possibility:

```
>>> main()
(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice: 0
Enter a new list of prices:
[20,10,30]
(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit
```

```
Enter your choice: 1

Day Price
--- -----
 0 20.00
 1 10.00
 2 30.00


(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice: 2

The average price is 20.0


(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice: 3

The st. deviation is 8.16496580928


(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice: 4

The min is 10 on day 1


(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
```

```
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice: 5

The max is 30 on day 2


(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice: 6
Your TTS investment strategy is to

 Buy on day 1 at price 10
 Sell on day 2 at price 30

 For a total profit of 20


(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice: 7


The choice 7 is not an option.
Try again



(0) Input a new list
(1) Print the current list
(2) Find the average price
(3) Find the standard deviation
(4) Find the min and its day
(5) Find the max and its day
(6) Your TT investment plan
(9) Quit

Enter your choice: 9


See you yesterday!
See you yesterday!
```

Submit Homework 8, Problem 3

25.0/25.0 points (graded)

To submit your Homework 8, Problem 3 code, you'll need to copy it from your trinket or file and paste it into the box below. After you've pasted your code below, click the "Check" button.

IMPORTANT: Make sure that there aren't spaces at the beginning of your code, and that you copied all of the characters. If there are extra spaces or you are missing spaces, our server won't be able to run your code and we won't be able to give you any of the points you deserve for your hard work.

```
def menu():
    """ a function that simply prints the menu """
print("")
    print("(0) Input a new list")
    print("(1) Print the current list")
    print("(2) Find the average price")
    print("(3) Find the standard deviation")
    print("(4) Find the min and its day")
    print("(5) Find the max and its day")
    print("(6) Your TT investment plan")
    print("(9) Quit")
print("")


def main():
    """ the main user-interaction loop """

```

Press ESC then TAB or click outside of the code editor to exit
correct

correct

Test results
CORRECT See full outputSee full output

You have used 1 of 3 attempts Some problems have options such as save, reset, hints, or show answer. These options follow the Submit button.