**Rainfall Analysis Program Testing**

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|  | **What I did** | **What I expect** | **What happened** |
| 1. | Entering 450 into the rainfall input | Error message, and then looping back to the input | As expected |
| 2. | Entering 500 into the drought input | Error message, and then looping back to the input | As expected |
| 3. | Entering -20 into rainfall input | Error message, and then looping back to the input | As expected |
| 4. | Entering -40 into drought input | Error message, and then looping back to the input | As expected |
| 5. | Entering:  231, 34, 45, 64, 23, 123, 233, 194, 239, 178, 167, 32 in rainfall and 67 into drought | The program will go to the menu with no problems | As expected |
| 6. | Entering 22 into menu | Error message, then menu displays again | As expected |
| 7. | Entering -2 into menu | Error message, then menu displays again | As expected |
| 8. | Entering 0 into menu | Program displays a goodbye message then ends | As expected |
|  | Using data from test case 5 | | |
| 10. | Entering 1 into menu | Display all of the data entered | As expected |
| 11. | Entering 2 into menu | Add up all the rainfall data to 1563 | As expected |
| 12. | Entering 3 into menu | Work out the mean to 130.25 | As expected |
| 13. | Entering 4 into menu | Work out the standard deviation to 82.84 | As expected |
| 14. | Entering 5 into menu | Work out the median to 145 | As expected |
| 15. | Entering 6 into menu | Have 23 and 32 as the lowest values | As expected |
| 16. | Entering 7 into menu | Work out the moving mean  Jan – mar 103.33  Feb – apr 47.67  Mar – may 44  Apr - jun 70  May – jul 126.33  Jun – aug 183.33  Jul – sep 222  Aug – oct 203.67  Sep – nov 194.67  Oct – dec 125.67 | As expected |
| 17. | Entering 8 into menu | Will show the months that were below the drought level:  Feburary, March, April, May, December | As expected |
| 18. | Entering 9 into menu | (Change January to 70 and march 82) Will show the months were 20% from the drought level:  January  February  March  April  May  December | As expected |

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import math

months=['January','Feburary','March','April','May','June','July',

'August','September','October','November','December']

months2=['Jan','Feb','Mar','Apr','May','Jun','Jul','Aug','Sep','Oct','Nov','Dec']

def rainInput(month):

'''Takes input for rainfall data, making sure it is valid'''

valid=False

x=0

msg='Enter a valid rainfall value between 0.0 - 300.0'

while not valid:

try:

x = float(input('Enter the rainfall for '+months[month]+': '))

if rangeCheck(0.0,300.0,x):

valid=True

else:

print(msg)

except ValueError:

print(msg)

return x

def rangeCheck(low,top,val):

"""Checks if the number is in range"""

if val>top:

return False

elif val<low:

return False

else:

return True

def droughtInput():

'''Takes input for the drought level, making sure it is valid'''

ok=True

while ok:

try:

x=int(input('Enter the drought rainfall level: '))

if rangeCheck(0,300,x)==True:

return x

else:

print('You entered a number out of the range 0 - 300, please try again')

except ValueError:

print('You did not enter a valid number, please try again.')

def menu():

'''Displays the menu, and takes input for the menu options'''

menuMsg=['0. Quit','1. Display the data entered','2. Work out and display the total rainfall for the year',

'3. Work out and display the mean railfall for the year','4. Work out and display the standard deviation of the rainfall for the year',

'5. Work out and display the median rainfall for the year','6. Work out and display the lowest and second lowest rainfall for the year',

'7. Work out and display the 3 month moving mean rainfalls for the year','8. Work out and display the months when rainfall was below the drought level',

'9. Work out and display the months when 20% lower rainfall would have put a month below the drought level']

print('\n',menuMsg[0],'\n',menuMsg[1],'\n',menuMsg[2],'\n',menuMsg[3],'\n',menuMsg[4],'\n',menuMsg[5],'\n',menuMsg[6],'\n',menuMsg[7],'\n',menuMsg[8],'\n',menuMsg[9],)

ok=True

while ok:

x=int(input('Please enter the number of the function you wish to use: '))

if rangeCheck(0,9,x):

ok = False

return x

else:

print("You didn't enter a value between 0-9, please try again")

def displayData(rainfall,drought):

'''Displays all the data collected'''

for i in range(len(rainfall)):

print(months2[i],'\t-\t','%.2f'% rainfall[i])

print('The drought level is',drought)

def calculateTotal(rainfall):

'''Adds all the rainfall data together'''

x=0

for i in range(len(rainfall)):

x+=rainfall[i]

return x

def calculateMean(rainfall):

'''Calculates the mean of the rainfall data'''

return calculateTotal(rainfall)/len(rainfall)

def calculateStdDev(rainfall):

'''Calculates the Standard Deviation of the rainfall data'''

differences=[]

difSq=[]

sumDifSq=0

for i in range(len(rainfall)):

differences.append(rainfall[i]-calculateMean(rainfall))

for i in range(len(differences)):

difSq.append(differences[i]\*differences[i])

for i in range(len(difSq)):

sumDifSq+=difSq[i]

var=sumDifSq/12

return math.sqrt(var)

def calculateMedian(rainfall):

'''Calculates the median of the rainfall data'''

for i in range (1,len(rainfall)):

item=rainfall[i]

j=i

while j > 0 and rainfall[j-1] > item:

rainfall[j]=rainfall[j-1]

j-=1

rainfall[j]=item

x=sorted(rainfall)

return (x[5]+x[6])/2

def lowestTwoValues(rainfall):

'''Finds the lowest two rainfall values'''

lowest=[]

val1=500

val2=500

for i in range(len(rainfall)):

if rainfall[i] < val2 and rainfall[i] >= val1:

val2=rainfall[i]

elif rainfall[i] < val1 and rainfall[i] < val2:

val1=rainfall[i]

lowest.append(val1)

lowest.append(val2)

return lowest

def movingMean(rainfall):

'''Finds the moving mean of the rainfall data'''

print('Moving Mean:')

for i in range(10):

x = rainfall[i] + rainfall[i+1] + rainfall[i+2]

x=x/3

print(months2[i],'-',months2[i+2],'= %.2f' % x)

def droughtMonths(rainfall,drought):

'''Finds which months were in a drought'''

print('The months that were droughts were:')

for i in range(len(rainfall)):

if rainfall[i] <= drought:

print('\t',months[i])

def nearDrought(rainfall,drought):

'''Finds which months would have been in a drought if there was 20% less rainfall'''

near=[]

print('The months that were near drought were:')

for i in range(len(rainfall)):

low = (rainfall[i]/5)\*4

near.append(low)

for i in range(len(near)):

if near[i] <= drought:

print('\t',months[i])

rainfall=[]

for i in range(12):

rainfall.append(rainInput(i))

drought=droughtInput()

choice = -1

while choice != 0:

choice = menu()

if choice == 1:

displayData(rainfall,drought)

elif choice == 2:

print('\nThe total of the rainfall data is %.2f' % calculateTotal(rainfall))

elif choice == 3:

print('\nThe mean of the rainfall data is %.2f' % calculateMean(rainfall))

elif choice == 4:

print('\nThe standard deviation is %.2f' % calculateStdDev(rainfall))

elif choice == 5:

print('\nThe median of the rainfall data is %.2f' % calculateMedian(rainfall))

elif choice == 6:

x = lowestTwoValues(rainfall)

print('The lowest rainfall was %.2f and the second lowest was %.2f' % (x[0], x[1]))

elif choice == 7:

movingMean(rainfall)

elif choice == 8:

droughtMonths(rainfall,drought)

elif choice == 9:

nearDrought(rainfall,drought)

print('\nGoodbye!')