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Assignment: U9C1 Grid Sums

Description: A program that determines a list of lists that includes the z by z grid of
numbers and also T lists of x and y pairs, the z by z grid of numbers in an array, the test
cases in an array, as well as a list for the sum of the numbers in row x plus the sum of the
numbers in column y using data files containing inputs and four functions called
readData(filename),getZGrid(dataList),getTestCases(dataList),and getSums(grid, testCases).

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import numpy as np

# readData(filename: str): list

def readData(filename):
  """readData function that returns a list of lists including z by z grid and x/y pairs"""

  # opens the specified file for reading input and converting to list
  inputData = open(filename)
  lst =[]
  for i in inputData :
    stringLst = i.split()
    for j in stringLst:
      lst.append(int(j))
  inputData.close()

  # creates a separate list to make a list of lists including the z by z grid of numbers
  correctedLst =[]
  z = lst[0]
  correctedLst.append(list(lst[i] for i in range(1, (1 + (z * z)))))

  # adds on to the list of lists to include a list of x and y pairs
  startingTestCaseIndex = (z * z) + 2
  correctedLst.append(list(lst[j] for j in range(startingTestCaseIndex, len(lst))))

  return correctedLst


# getZGrid(dataList: list): ndarray

def getZGrid(dataList):
  """getZGrid function that returns the z by z grid of numbers in a 2-D array"""
  import math

  # converts the grid list in the list of lists into numpy array of z rows and z columns
  arr = np.array(dataList[0])
  z = int(math.sqrt(len(dataList[0])))
  gridArr = arr.reshape(z, z)

  return gridArr
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# getTestCases(dataList: list): ndarray

def getTestCases(dataList):
  """getTestCases function that returns the test cases in a 2-D array"""

  # converts the test case list in the list of lists into numpy array of t rows, 2 columns
  t = len(dataList[1]) // 2
  arr = np.array(dataList[1])
  testCaseArr = arr.reshape(t, 2)

  return testCaseArr


# getSums(grid: ndarray, testCases: ndarray): list

def getSums(grid, testCases):
  """getSums function that calculates sum for each test case and returns in a list"""
  sumLst = []
  for i in range(len(testCases)):
    totalSum = 0

    # determines the sum of the numbers in row x
    row = (testCases[i, 0]) - 1
    for j in range(len(grid[row])):
      totalSum = totalSum + grid[row, j]

    # determines the sum of the numbers in column y and adds to the sum of row x
    column = testCases[i, 1] - 1
    for k in range(len(grid)):
      totalSum = totalSum + grid[k, column]

    # adds the sum of the numbers in row x plus column y to the list for each test case
    sumLst.append(totalSum)

  return sumLst


# Code to test the readData(), getZGrid(), getTestCases(), and getSums() functions

def testCode():
  # independent tests for readData() function
  print("Lists of lists including the z by z grid and x and y pairs from content of
givenSampleDataFile.txt and givenSampleDataFile2.txt:")
  print(readData("givenSampleDataFile.txt"))
  print()
  print(readData("givenSampleDataFile2.txt"))

  # independent tests for getZGrid() function
  print("\n2-D Arrays of the z by z grid from content of givenSampleDataFile.txt and
givenSampleDataFile2.txt:")
  print(getZGrid(readData("givenSampleDataFile.txt")))
  print()
  print(getZGrid(readData("givenSampleDataFile2.txt")))

  # independent tests for getTestCases() function
  print("\n2-D Arrays of the test cases from content of givenSampleDataFile.txt and
givenSampleDataFile2.txt:")
  print(getTestCases(readData("givenSampleDataFile.txt")))
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  print()
  print(getTestCases(readData("givenSampleDataFile2.txt")))

  # unison tests for readData(), getZGrid(), getTestCases(), and getSums() function
  print("\nSum of the numbers in row x plus sum of the numbers in column y of
givenSampleDataFile.txt and givenSampleDataFile2.txt:")
  print(getSums(getZGrid(readData("givenSampleDataFile.txt")),
getTestCases(readData("givenSampleDataFile.txt"))))
  print()
  print(getSums(getZGrid(readData("givenSampleDataFile2.txt")),
getTestCases(readData("givenSampleDataFile2.txt"))))


testCode()

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OUTPUT FOR THE PROGRAM:

Lists of lists including the z by z grid and x and y pairs from content of
givenSampleDataFile.txt and givenSampleDataFile2.txt:
[[1, 2, 3, 4, 5, 6, 7, 8, 9], [1, 3, 2, 2]]

[[1, 2, 3, 4, 5, 5, 4, 3, 2, 2, 1, 3, 4, 2, 7, -1, 0, 0, 0, 0, 1, 5, 4, 3, 0], [1, 1, 1, 2,
1, 3, 1, 4, 1, 5, 2, 1, 2, 2, 2, 3, 2, 4, 2, 5, 3, 1, 3, 3, 3, 5, 4, 5, 5, 1]]

2-D Arrays of the z by z grid from content of givenSampleDataFile.txt and
givenSampleDataFile2.txt:
[[1 2 3]
 [4 5 6]
 [7 8 9]]

[[ 1  2  3  4  5]
 [ 5  4  3  2  2]
 [ 1  3  4  2  7]
 [-1  0  0  0  0]
 [ 1  5  4  3  0]]

2-D Arrays of the test cases from content of givenSampleDataFile.txt and
givenSampleDataFile2.txt:
[[1 3]
 [2 2]]

[[1 1]
 [1 2]
 [1 3]
 [1 4]
 [1 5]
 [2 1]
 [2 2]
 [2 3]
 [2 4]
 [2 5]
 [3 1]
 [3 3]
 [3 5]
 [4 5]
 [5 1]]
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Sum of the numbers in row x plus sum of the numbers in column y of givenSampleDataFile.txt
and givenSampleDataFile2.txt:
[24, 30]

[22, 29, 29, 26, 29, 23, 30, 30, 27, 30, 24, 31, 31, 13, 20]
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