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CSC6013

**Module 04: Programming Assignment 04**

**Problem 1:**

1) Find the number of entries in an array of integers that are divisible by a given integer. Your function should have two input parameters – an array of integers and a positive integer – and should return an integer indicating the count using a return statement.

Run your algorithm on the problem instances:  
a) [20, 21, 25, 28, 33, 34, 35, 36, 41, 42] number of entries that are divisible by 7  
and  
b) [18, 54, 76, 81, 36, 48, 99] number of entries that are divisible by 9

Problem 1 Code

def divisible(a, n):

'''

This function takes two inputs; an array and an integer

It will start the count at zero and add a number from

the array to the count if that number is divisible by the inputted int

'''

count = 0

for num in a:

if num % n == 0:

count += 1

return count

a1 = [20, 21, 25, 28, 33, 34, 35, 36, 41, 42]

n1 = 7

a2 = [18, 54, 76, 81, 36, 48, 99]

n2 = 9

print(divisible(a1, n1))

print(divisible(a2, n2))

Problem 1 Output

4

5

**Problem 2:**

2) Given an array of real numbers, without sorting the array, find the smallest gap between all pairs of elements (for an array A, the absolute value of the difference between elements 𝐴[i] and 𝐴[𝑗]). Your function should have one input parameter – an array of numbers – and should return a non-negative number indicating the smallest gap using a return statement.

Run your algorithm on the problem instances:

a) <50, 120, 250, 100, 20, 300, 200>

b) <12.4, 45.9, 8.1, 79.8, -13.64, 5.09>

Problem 2 Code

def smallestGap(a):

'''

This function takes an array as an input

It will use nested loops to look at the

elements in pairs, and find the smallest

gap between them

'''

# infinite number as placeholder to compare gaps

small\_gap = float("inf")

num = len(a)

# loop through array

for i in range(num):

# second loop to compare next element

for j in range(i + 1, num):

# gap between the pair

gap = abs(a[i] - a[j])

# sets initial gap to new value and loops again

if gap < small\_gap:

small\_gap = gap

return small\_gap

a1 = [50, 120, 250, 100, 20, 300, 200]

a2 = [12.4, 45.9, 8.1, 79.8, -13.64, 5.09]

print(smallestGap(a1))

print(smallestGap(a2))

Problem 2 Output

20

3.01

**Problem 3:**

3) Given an integer n>=2 and two nxn matrices A and B of real numbers, find the product AB of the matrices. Your function should have three input parameters – a positive integer n and two nxn matrices of numbers– and should return the nxn product matrix using a return statement.

Run your algorithm on the problem instances:

Text, letter

Description automatically generated

Problem 3 Code

def matrix\_multiply(n, x, y):

'''

This function will take an integer and two matricies as inputs

It will use nested loops to go through each matrix and

multiply its values correspondingly

'''

# nested loop to create matrix

m = [[0 for i in range(n)] for j in range(n)]

# first looping through x's rows

for i in range(len(x)):

# then looping through y's columns

for j in range(len(y[0])):

# lastly looping through y's rows

for k in range(len(y)):

m[i][j] += x[i][k] \* y[k][j]

return m

n1 = 2

x1 = [[2, 7], [3, 5]]

y1 = [[8, -4], [6, 6]]

n2 = 3

x2 = [[1, 0, 2], [3, -2, 5], [6, 2, -3]]

y2 = [[0.3, 0.25, 0.1], [0.4, 0.8, 0], [-0.5, 0.75, 0.6]]

print(matrix\_multiply(n1, x1, y1))

print(matrix\_multiply(n2, x2, y2))

Problem 3 Output

[[58, 34], [54, 18]]

[[-0.7, 1.75, 1.3], [-2.4000000000004, 2.9, 3.3], [4.1, 0.85000000000001, -1.199999999999997]]