import numpy  
import random  
import csv  
import sys  
  
generateFault = input("Please select a matrix to generate a fault : 1. A matrix; 2. B matrix. 3. C matrix (The product of the first two matrix) 4. Any matrix 5. Nothing")  
if generateFault == "4":  
 generateFault = str(random.randint(1,4))  
  
  
firstMatrix = []  
csvfile1 = open("C:\\Users\\zhang\\Desktop\\matrix1.csv","r",encoding='utf-8-sig')  
reader1 = csv.reader(csvfile1)  
for line in reader1:  
 eachline = []  
 for i in line:  
 eachline.append(int(i))  
 firstMatrix.append(eachline)  
  
secondMatrix = []  
csvfile2 = open("C:\\Users\\zhang\\Desktop\\matrix2.csv","r",encoding='utf-8-sig')  
reader2 = csv.reader(csvfile2)  
for line in reader2:  
 eachline = []  
 for i in line:  
 eachline.append(int(i))  
 secondMatrix.append(eachline)  
  
x = numpy.array(firstMatrix, dtype='int64')  
y = numpy.array(secondMatrix, dtype='int64')  
  
print ("The product of matrices is : ")  
fullMultiplication = numpy.dot(x,y)  
print (fullMultiplication)  
  
with open("C:\\Users\\zhang\\Desktop\\matrix3.csv","w+") as my\_csv:  
 csvWriter = csv.writer(my\_csv,delimiter=',')  
 csvWriter.writerows(fullMultiplication)  
  
# Calculate the checkSum for each rows and columns of C matrix  
  
checkSumRow = []  
for i in range(0,1024):  
 sum = 0  
 for j in range(0,1024):  
 sum += fullMultiplication[i][j]  
 checkSumRow.append(sum)  
  
checkSumColumn = []  
for i in range(0,1024):  
 sum = 0  
 for j in range(0,1024):  
 sum += fullMultiplication[j][i]  
 checkSumColumn.append(sum)  
  
# Gernerate a fault in C matrix  
  
faultRow = random.randint(0,1023)  
faultColumn = random.randint(0,1023)  
  
if generateFault != "5":  
 print("Injecting an error in row: ")  
 print(faultRow)  
 print("Injecting an error in column: ")  
 print(faultColumn)  
  
if generateFault == "3":  
 fullMultiplication[faultRow][faultColumn] += 5  
  
  
if generateFault == "1":  
 firstMatrix[faultRow][faultColumn] += 5  
  
if generateFault == "2":  
 secondMatrix[faultRow][faultColumn] += 5  
  
x = numpy.array(firstMatrix, dtype='int64')  
y = numpy.array(secondMatrix, dtype='int64')  
fullMultiplication2 = numpy.dot(x,y)  
  
  
  
# Detect a fault in C matrix  
  
for i in range(0,1024):  
 sum = 0  
 for j in range(0,1024):  
 sum += fullMultiplication[i][j]  
 if sum != checkSumRow[i]:  
 print("The error is from matrix C, The error row is : ")  
 print(i)  
  
  
for i in range(0,1024):  
 sum = 0  
 for j in range(0,1024):  
 sum += fullMultiplication[j][i]  
 if sum != checkSumColumn[i]:  
 print("The error is from matrix C, The error column is : ")  
 print(i)  
 sys.exit()  
  
  
for i in range(0,1024):  
 sum = 0  
 for j in range(0,1024):  
 sum += fullMultiplication2[i][j]  
 if sum != checkSumRow[i]:  
 print("\nThere is an ERROR !!!!! \nThe error is from matrix A or B")  
 break