

# Rajalakshmi Engineering College

Name: talapaneni sujitha  
Email: 240701551@rajalakshmi.edu.in  
Roll no: 2116240701551  
Phone: 9445179891  
Branch: REC  
Department: I CSE FF  
Batch: 2028  
Degree: B.E - CSE

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## NeoColab\_REC\_CS23221\_Python Programming

### REC\_Python\_Week 7\_COD

Attempt : 1  
Total Mark : 50  
Marks Obtained : 50

### Section 1 : Coding

#### 1. Problem Statement

A company tracks the monthly sales data of various products. You are given a table where each row represents a product and each column represents its monthly sales in sequential months.

Your task is to compute the cumulative monthly sales for each product using numpy, where the cumulative sales for a month is the total sales from month 1 up to that month.

#### ***Input Format***

The first line of input consists of two integer values, products and months, separated by a space.

Each of the next products lines consists of months integer values representing the monthly sales data of a product.

### **Output Format**

The first line of output prints: "Cumulative Monthly Sales:"

The second line of output prints: the 2D numpy array `cumulative_array` that contains the cumulative sales data for each product.

Refer to the sample output for the formatting specifications.

### **Sample Test Case**

Input: 2 4

10 20 30 40

5 15 25 35

Output: Cumulative Monthly Sales:

[[ 10 30 60 100]

[ 5 20 45 80]]

### **Answer**

# You are using Python

import numpy as np

# Read the number of products and months

products, months = map(int, input().split())

# Initialize an empty list to store monthly sales data

monthly\_sales\_data = []

# Read monthly sales data for each product

for \_ in range(products):

    # Read a line of sales data, split by space, convert to integers

    row\_sales = list(map(int, input().split()))

    monthly\_sales\_data.append(row\_sales)

# Convert the list of lists into a NumPy 2D array

sales\_array = np.array(monthly\_sales\_data)

# Calculate the cumulative monthly sales for each product

# axis=1 means the cumulative sum is calculated along the rows (across months)

```
cumulative_array = np.cumsum(sales_array, axis=1)
```

```
# Print the required output format  
print("Cumulative Monthly Sales:")  
print(cumulative_array)
```

**Status :** Correct

**Marks : 10/10**

## 2. Problem Statement

Sita is analyzing her company's daily sales data to find all sales values that are multiples of 5 and exceed 100. She wants to filter these specific sales values from the list.

Help her to implement the task using the numpy package.

Formula:

To filter sales values:

Select all values  $s$  from sales such that  $(s \% 5 == 0)$  and  $(s > 100)$

### ***Input Format***

The first line of input consists of an integer value,  $n$ , representing the number of sales entries.

The second line of input consists of  $n$  floating-point values, sales, separated by spaces, representing daily sales figures.

### ***Output Format***

The output prints: filtered\_sales

Refer to the sample output for the formatting specifications.

### ***Sample Test Case***

Input: 5  
50.0 100.0 105.0 150.0 99.0

Output: [105. 150.]

**Answer**

```
# You are using Python
import numpy as np

# Read the number of sales entries
n = int(input())

# Read the sales figures as a list of floats and convert to a NumPy array
sales_list = list(map(float, input().split()))
sales_array = np.array(sales_list)

filtered_sales = sales_array[(sales_array % 5 == 0) & (sales_array > 100)]

# Print the filtered sales array
print(filtered_sales)
```

**Status :** Correct

**Marks :** 10/10

### 3. Problem Statement

Rekha works in hospital data management and receives patient records with missing or incomplete data. She needs to clean the records by performing the following tasks:

Calculate the mean of the available Age values. Replace any missing (NaN) values in the Age column with this mean age. Remove any rows where the Diagnosis value is missing (NaN). Reset the DataFrame index after removing these rows.

Implement this data cleaning task using the pandas package.

**Input Format**

The first line of input contains an integer  $n$  representing the number of patient records.

The second line contains the CSV header — comma-separated column names (e.g., "Name, Age, Diagnosis, Gender").

The next n lines each contain one patient record in comma-separated format.

### **Output Format**

The first line of output is the text:

Cleaned Hospital Records:

The next lines print the cleaned pandas DataFrame (as produced by `print(cleaned_df)`).

This will include the updated values of the Age column (with missing ages filled by the mean age), and any rows with missing Diagnosis removed.

The DataFrame will be displayed using the default pandas `print()` representation.

Refer to the sample output for the formatting specifications.

### **Sample Test Case**

Input: 5

PatientID,Name,Age,Diagnosis

1,John Doe,45,Flu

2,Jane Smith,,Cold

3,Bob Lee,50,

4,Alice Green,38,Fever

5,Tom Brown,,Infection

Output: Cleaned Hospital Records:

	PatientID	Name	Age	Diagnosis
0	1	John Doe	45.000000	Flu
1	2	Jane Smith	44.333333	Cold
2	4	Alice Green	38.000000	Fever
3	5	Tom Brown	44.333333	Infection

### **Answer**

```
# You are using Python
import pandas as pd
import io
```

```
n = int(input())
```

```
header = input()
```

```
records = []
```

```
for _ in range(n):
```

```
    records.append(input())
```

```
csv_data = header + "\n" + "\n".join(records)
```

```
df = pd.read_csv(io.StringIO(csv_data))
```

```
df['Age'] = pd.to_numeric(df['Age'], errors='coerce')
```

```
mean_age = df['Age'].mean()
```

```
df['Age'] = df['Age'].fillna(mean_age)
```

```
cleaned_df = df.dropna(subset=['Diagnosis'])
```

```
cleaned_df = cleaned_df.reset_index(drop=True)
```

```
print("Cleaned Hospital Records:")
```

```
print(cleaned_df)
```

**Status :** Correct

**Marks :** 10/10

#### 4. Problem Statement

Sita works as a sales analyst and needs to analyze monthly sales data for different cities. She receives lists of cities, months, and corresponding sales values and wants to create a pandas DataFrame using a MultiIndex of cities and months.

Help her to implement this task and calculate total sales for each city.

### ***Input Format***

The first line of input consists of an integer value,  $n$ , representing the number of records.

The second line of input consists of  $n$  space-separated city names.

The third line of input consists of  $n$  space-separated month names.

The fourth line of input consists of  $n$  space-separated float values representing sales for each city-month combination.

### ***Output Format***

The first line of output prints: "Monthly Sales Data with MultiIndex:"

The next lines print the DataFrame with MultiIndex (City, Month) and their corresponding sales values.

The following line prints: "\nTotal Sales Per City:"

The final lines print the total sales per city, computed by grouping the sales data on city names.

Refer to the sample output for the formatting specifications.

### ***Sample Test Case***

Input: 4

NYC NYC LA LA

Jan Feb Jan Feb

100 200 300 400

Output: Monthly Sales Data with MultiIndex:

Sales

City Month

NYC Jan 100.0

Feb 200.0

LA Jan 300.0

Feb 400.0

Total Sales Per City:

```
Sales
City
LA    700.0
NYC   300.0
```

### **Answer**

```
# You are using Python
import pandas as pd
```

```
def analyze_sales_data():
    n = int(input())
    cities = input().split()
    months = input().split()
    sales_str = input().split()
    sales = [float(s) for s in sales_str]

    # Create a DataFrame
    df = pd.DataFrame({
        'City': cities,
        'Month': months,
        'Sales': sales
    })

    # Create MultiIndex
    monthly_sales_multiindex = df.set_index(['City', 'Month'])

    print("Monthly Sales Data with MultiIndex:")
    print(monthly_sales_multiindex)

    # Calculate total sales per city
    total_sales_per_city = df.groupby('City')['Sales'].sum()

    # Convert the Series to a DataFrame for clean printing
    # This will remove the "Name: Sales, dtype: float64" line
    total_sales_per_city_df = total_sales_per_city.reset_index()
    total_sales_per_city_df = total_sales_per_city_df.set_index('City')

    print("\nTotal Sales Per City:")
    print(total_sales_per_city_df)

analyze_sales_data()
```



**Status :** Correct

**Marks :** 10/10

## 5. Problem Statement

Alex is a data scientist analyzing the relationship between two financial indicators over time. He has collected two time series datasets representing daily values of these indicators over several months. Alex wants to understand how these two indicators correlate at different time lags to identify possible leading or lagging behaviors.

Your task is to help Alex compute the cross-correlation of these two time series using numpy, so he can analyze the similarity between the two signals at various time shifts.

### **Input Format**

The first line of input consists of space-separated float values representing the first time series, array1.

The second line of input consists of space-separated float values representing the second time series, array2.

### **Output Format**

The first line of output prints: "Cross-correlation of the two time series:"

The second line of output prints: the 1D numpy array `cross_corr` representing the cross-correlation of array1 and array2 across different lags.

Refer to the sample output for the formatting specifications.

### **Sample Test Case**

Input: 1.0 2.0 3.0  
4.0 5.0 6.0

Output: Cross-correlation of the two time series:  
[ 6. 17. 32. 23. 12.]

### **Answer**

```
# You are using Python
import numpy as np
array1_str = input().split()
array2_str = input().split()
```

```
array1 = np.array([float(x) for x in array1_str])
array2 = np.array([float(x) for x in array2_str])
```

```
cross_corr = np.correlate(array1, array2, mode='full')
print("Cross-correlation of the two time series:")
print(cross_corr)
```

**Status :** Correct

**Marks : 10/10**