Institute of Computer Technology
B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

Practical 1

Name :- Dhairya Dave

Er no. :- 22162581003

(1) There are 2 chefs, namely chef 1 and chef 2 in the MasterChef competition. The judge is going to judge on the basis of 3 categories: presentation, taste and hygiene to prepare the dishes. The marking is scaling from 1 to 100. The rating for chef 1 challenge is the triplet a = (a[0], a[1], a[2]), and the rating for Chef 2 challenge is the triplet b = (b[0], b[1], b[2]), where 0 index is presentation, 1 index is taste and 2 index is hygiene.
The task is to find their comparison points by comparing a[0] with b[0], a[1] with b[1], and a[2] with b[2].

- If a[i] > b[i], then Chef 1 is awarded 1 point.
- If a[i] < b[i], then Chef 2 is awarded 1 point.
- If a[i] = b[i], then neither person receives a point.

Comparison points are the total points a person earned.
Given a and b, determine their respective comparison points.
Design the algorithm for the same and implement using the programming language of your choice. Make comparative analysis for various use cases & input size.

Sample Input 1

27 48 70
89 26 7

Sample Output 1

2 1

Explanation 1

Comparing the 0th elements, 27<89 so Chef 2 receives a point.
Comparing the 1st and 2nd elements, 48>26 and 70>7 so Chef 1 receives two points.
The return array is [2,1].

Code :-

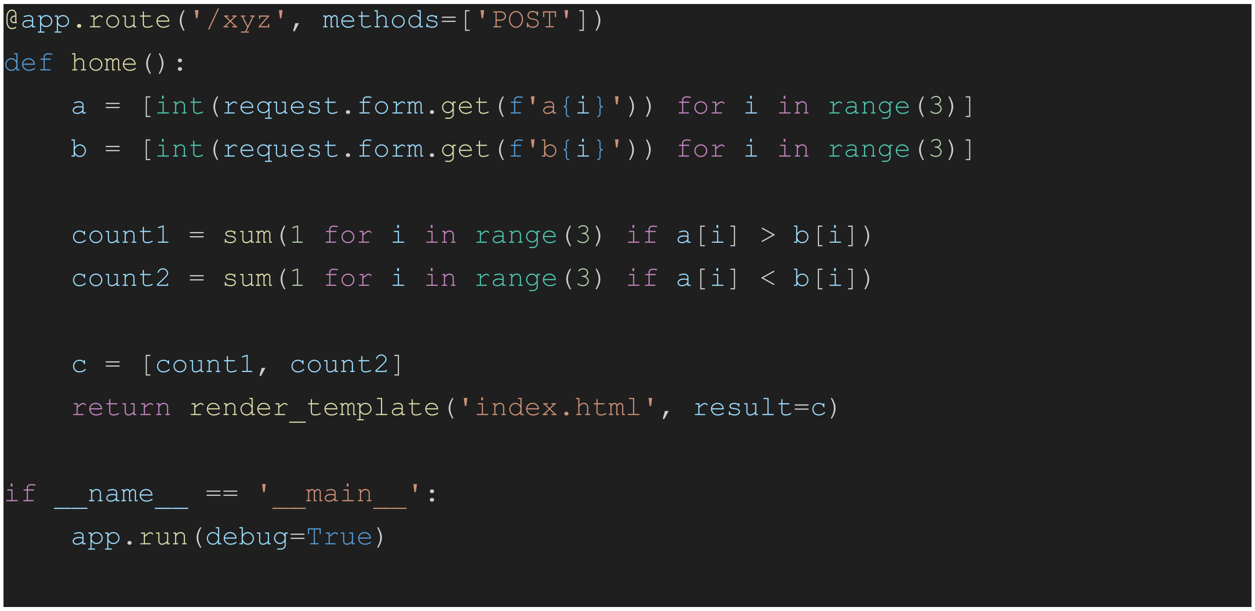
HTML:

```
<!DOCTYPE html>
<html lang="en">
```

```html
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Chef Marks Comparison</title>
</head>
<body>
    <h1>Enter Marks for Chefs</h1>
    <form method="post" action="/xyz">
        <h2>Chef 1:</h2>
        <input type="number" name="a0" required><br>
        <input type="number" name="a1" required><br>
        <input type="number" name="a2" required><br>

        <h2>Chef 2:</h2>
        <input type="number" name="b0" required><br>
        <input type="number" name="b1" required><br>
        <input type="number" name="b2" required><br>

        <button type="submit">Compare</button>
    </form>

    {% if result %}
        <h2>Result:</h2>
        <p>Count for Chef 1: {{ result[0] }}</p>
        <p>Count for Chef 2: {{ result[1] }}</p>
    {% endif %}
</body>
</html>
```

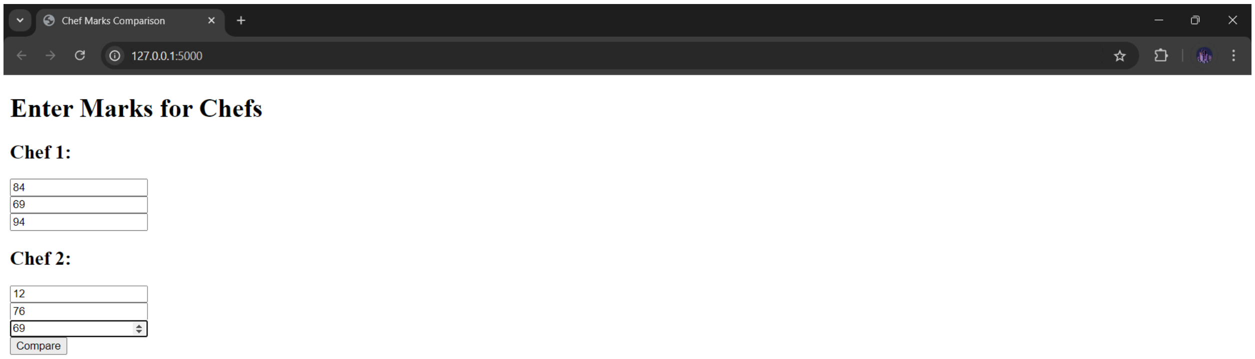
Python:

```python
from flask import Flask, render_template, request

app = Flask(__name__)

@app.route('/')
def index():
    return render_template('index.html')
```



```
@app.route('/xyz', methods=['POST'])
def home():
    a = [int(request.form.get(f'a{i}')) for i in range(3)]
    b = [int(request.form.get(f'b{i}')) for i in range(3)]

    count1 = sum(1 for i in range(3) if a[i] > b[i])
    count2 = sum(1 for i in range(3) if a[i] < b[i])

    c = [count1, count2]
    return render_template('index.html', result=c)

if __name__ == '__main__':
    app.run(debug=True)
```

Output :-



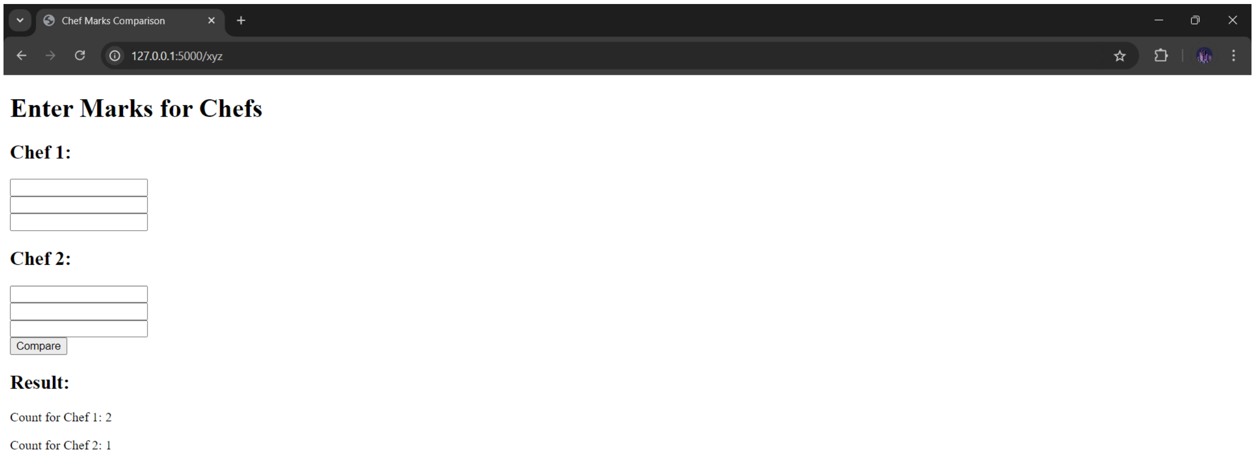
Enter Marks for Chefs

Chef 1:

84
69
94

Chef 2:

12
76
69



Enter Marks for Chefs

Chef 1:

Chef 2:

Result:

Count for Chef 1: 2

Count for Chef 2: 1

(2) Let us suppose that you are having an array containing both positive and negative numbers. Given the numbers you are supposed to find 2 such elements such that the sum of those numbers is closest to zero.

Sample Input 1

15, 5, -20, 30, -45

Sample Output 1

15, -20

Explanation 1

In all the comparison, the sum of 15 and -20 is smallest amount among all other comparison.

Sample Input 2

15, 5, -20, 30, 25

Sample Output 2

15, -20 & -20, 25

Explanation 2

In all the comparison, the sum of 15,-20 & -20, 25 is smallest amount among all other comparison.

Code :-

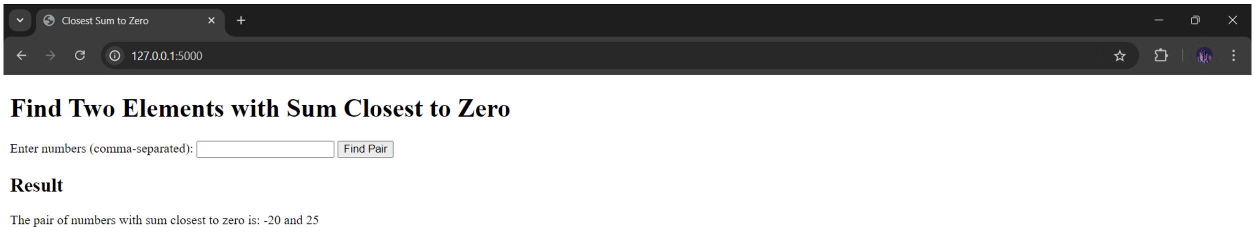
HTML:

```
<!DOCTYPE html>
<html>
<head>
    <title>Closest Sum to Zero</title>
    <link rel="stylesheet" type="text/css" href="{{ url_for('static', filename='style.css') }}">
</head>
<body>
    <div class="container">
        <h1>Find Two Elements with Sum Closest to Zero</h1>
        <form method="post">
            <label for="numbers">Enter numbers (comma-separated):</label>
            <input type="text" id="numbers" name="numbers" required>
            <button type="submit">Find Pair</button>
        </form>
        {% if result %}
            <h2>Result</h2>
            <p>The pair of numbers with sum closest to zero is: {{ result[0] }} and {{ result[1] }}</p>
        {% endif %}
    </div>
</body>
</html>
```

Python:

```
from flask import Flask, request, render_template

app = Flask(__name__)

def find_min_sum_pair(arr):
    arr.sort()
    left = 0
    right = len(arr) - 1
    min_sum = float('inf')
    min_pair = (None, None)

    while left < right:
        current_sum = arr[left] + arr[right]
        if abs(current_sum) < abs(min_sum):
            min_sum = current_sum
            min_pair = (arr[left], arr[right])

        if current_sum < 0:
            left += 1
        else:
            right -= 1

    return min_pair

@app.route('/', methods=['GET', 'POST'])
def index():
    result = None
    if request.method == 'POST':
        input_numbers = request.form['numbers']
        numbers = list(map(int, input_numbers.split(',')))
        result = find_min_sum_pair(numbers)
    return render_template('index.html', result=result)

if __name__ == '__main__':
    app.run(debug=True)
```

Output :-



Find Two Elements with Sum Closest to Zero

Enter numbers (comma-separated):

Result

The pair of numbers with sum closest to zero is: -20 and 25