

Institute of Computer Technology

B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

Practical 1

(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:

```
from flask import Flask, render_template_string, request
```

```
app = Flask(__name__)
```

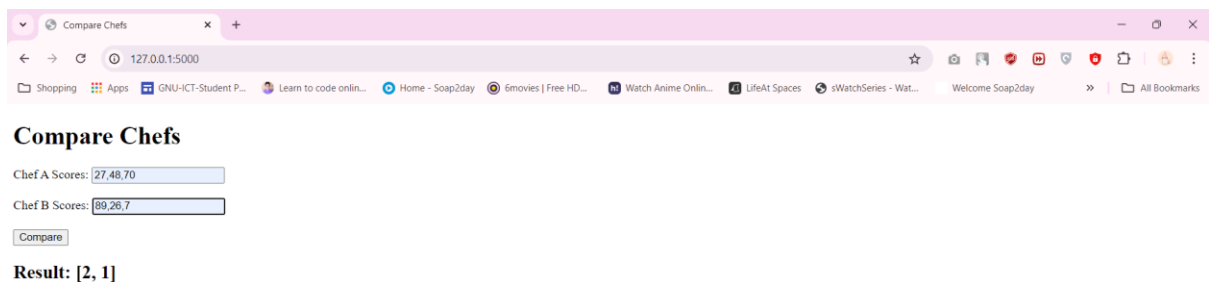
```
def compare_chefs(a, b):  
    chef1_points = 0  
    chef2_points = 0  
    for i in range(3):  
        if a[i] > b[i]:  
            chef1_points += 1  
        elif a[i] < b[i]:  
            chef2_points += 1  
        # No points are awarded if a[i] == b[i]  
  
    return [chef1_points, chef2_points]  
  
@app.route('/', methods=['GET', 'POST'])  
def index():  
    result = None  
    if request.method == 'POST':  
        a = list(map(int, request.form['a'].split(',')))  
        b = list(map(int, request.form['b'].split(',')))  
        result = compare_chefs(a, b)  
  
    return render_template_string("""  
        <!doctype html>  
        <title>Compare Chefs</title>  
        <h1>Compare Chefs</h1>  
        <form method="post">  
            Chef A Scores: <input type="text" name="a" placeholder="e.g. 27,48,70"><br><br>  
            Chef B Scores: <input type="text" name="b" placeholder="e.g. 89,26,7"><br><br>  
            <input type="submit" value="Compare">  
        </form>  
        {% if result is not none %}
```

```
<h2>Result: {{ result }}</h2>

{% endif %}

", result=result)

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



(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:

```
from flask import Flask, render_template_string, request
```

```
app = Flask(__name__)
```

```
def find_closest_sum_pair(arr):
```

```
    arr.sort()
```

```
    left = 0
```

```
    right = len(arr) - 1
```

```
    closest_sum = float('inf')
```

```
    closest_pair = (0, 0)
```

```
    while left < right:
```

```
        current_sum = arr[left] + arr[right]
```

```
        if abs(current_sum) < abs(closest_sum):
```

```
            closest_sum = current_sum
```

```
            closest_pair = (arr[left], arr[right])
```

```
        if current_sum < 0:
```

```
            left += 1
```

```
        else:
```

```
        right -= 1

    return closest_pair

@app.route('/', methods=['GET', 'POST'])
def index():
    pair = None
    if request.method == 'POST':
        arr = list(map(int, request.form['array'].split(',')))
        pair = find_closest_sum_pair(arr)

    return render_template_string("""
        <!doctype html>

        <title>Find Closest Sum Pair</title>

        <h1>Find the Pair Whose Sum is Closest to Zero</h1>

        <form method="post">

            Array (comma-separated): <input type="text" name="array"
placeholder="e.g. 1, 60, -10, 70, -80, 85"><br><br>

            <input type="submit" value="Find Pair">

        </form>

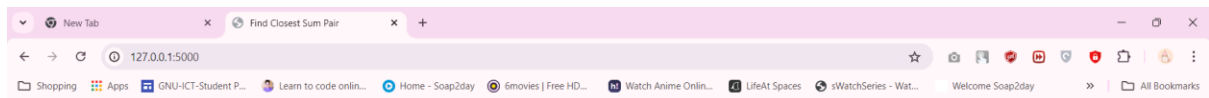
        {% if pair is not none %}

            <h2>The pair whose sum is closest to zero is: {{ pair }}</h2>

        {% endif %}

    """, pair=pair)

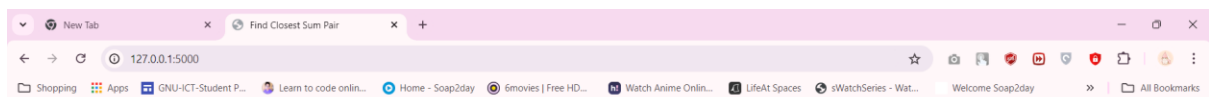
if __name__ == '__main__':
    app.run(debug=True)
```



Find the Pair Whose Sum is Closest to Zero

Array (comma-separated):

The pair whose sum is closest to zero is: (-20, 15)



Find the Pair Whose Sum is Closest to Zero

Array (comma-separated):

The pair whose sum is closest to zero is: (-20, 25)