Practical 9

☐ A thief is robbing a store and can carry a maximal weight of W into his knapsack. There are n items available in the store and weight of ith item is wi and its profit is pi. What items should the thief take?

☐ In this context, the items should be selected in such a way that the thief will carry those items for which he will gain maximum profit. Hence, the objective of the thief is to maximize the profit.

☐ Implement Program for fractional knapsack using Greedy design technique.
Note: First solve the example:
W=60

Item	A	B	C	D
Profit	280	100	120	120
Weight	40	10	20	24

Sample Input:-
p=[280,100,120,120]
w=[40,10,20,24]
W=60

Sample Output:-
Profit [100, 280, 120, 120]
Weight [10, 40, 20, 24]

Ratio [10.0, 7.0, 6.0, 5.0]
[1, 1, 0.5, 0]
Total profit : 440.0

app.py

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

app = Flask(__name__)


def fractional_knapsack(profits, weights, capacity):
    n = len(profits)
    ratio = [(profits[i] / weights[i], i) for i in range(n)]
    ratio.sort(reverse=True, key=lambda x: x[0])

    total_profit = 0
    selected_items = [0] * n

    for r, i in ratio:
        if weights[i] <= capacity:
            selected_items[i] = 1
            total_profit += profits[i]
            capacity -= weights[i]
        else:
            selected_items[i] = capacity / weights[i]
            total_profit += profits[i] * (capacity / weights[i])
            break

    return total_profit, selected_items


@app.route('/', methods=['GET', 'POST'])
def knapsack():
    if request.method == 'POST':
        profits = list(map(int, request.form['profit'].split(',')))
        weights = list(map(int, request.form['weight'].split(',')))
        capacity = int(request.form['capacity'])
```

```python
            total_profit, selected_items = fractional_knapsack(profits,
weights, capacity)

            return render_template_string(result_html, profits=profits,
weights=weights, selected_items=selected_items, total_profit=total_profit)

    return render_template_string(index_html)



index_html = '''
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Fractional Knapsack</title>
                                                                    <link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0-alpha1/dist/css/bootstr
ap.min.css" rel="stylesheet">
</head>
<body class="bg-light">
    <div class="container mt-5">
        <div class="card">
            <div class="card-body">
                <h2 class="card-title text-center">Fractional Knapsack
Problem</h2>
                <form method="POST" class="mt-4">
                    <div class="mb-3">
                        <label class="form-label">Enter Profits (comma
separated):</label>
                                        <input type="text" name="profit"
class="form-control" required placeholder="e.g. 280, 100, 120, 120">
                    </div>
                    <div class="mb-3">
                        <label class="form-label">Enter Weights (comma
separated):</label>
                                        <input type="text" name="weight"
class="form-control" required placeholder="e.g. 40, 10, 20, 24">
                    </div>
                    <div class="mb-3">
```

```html
                                                <label class="form-label">Enter Knapsack
Capacity:</label>
                                                <input type="number" name="capacity"
class="form-control" required placeholder="e.g. 60">
                        </div>
                                <button type="submit" class="btn btn-primary
w-100">Calculate</button>
                    </form>
                </div>
            </div>
        </div>
</body>
</html>
'''


result_html = '''
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Knapsack Result</title>
                                                                    <link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0-alpha1/dist/css/bootstr
ap.min.css" rel="stylesheet">
</head>
<body class="bg-light">
    <div class="container mt-5">
        <div class="card">
            <div class="card-body">
                <h2 class="card-title text-center">Knapsack Result</h2>
                <table class="table table-striped mt-4">
                    <thead>
                        <tr>
                            <th scope="col">Item</th>
                            <th scope="col">Profit</th>
                            <th scope="col">Weight</th>
                            <th scope="col">Fraction Taken</th>
                        </tr>
```

```
                            </thead>
                            <tbody>
                                {% for i in range(profits|length) %}
                                <tr>
                                    <th scope="row">{{ i+1 }}</th>
                                    <td>{{ profits[i] }}</td>
                                    <td>{{ weights[i] }}</td>
                                    <td>{{ selected_items[i] }}</td>
                                </tr>
                                {% endfor %}
                            </tbody>
                        </table>
                        <h3 class="text-center mt-4">Total Profit: {{ total_profit
}}</h3>
                        <div class="text-center mt-4">
                            <a href="/" class="btn btn-primary">Go Back</a>
                        </div>
                    </div>
                </div>
            </div>
</body>
</html>
'''


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

Fractional Knapsack Problem

Enter Profits (comma separated):

280,100,150,200

Enter Weights (comma separated):

40,10,20,30

Enter Knapsack Capacity:

60

Calculate

Knapsack Result

Item	Profit	Weight	Fraction Taken
1	280	40	0.75
2	100	10	1
3	150	20	1
4	200	30	0

Total Profit: 460.0

Go Back