Name:-Devansh Koyani

Er no:-22162171007

Batch:-54

# Institute of Computer Technology
# B. Tech Computer Science and Engineering

## Sub: Algorithm Analysis and Design

## Practical 7

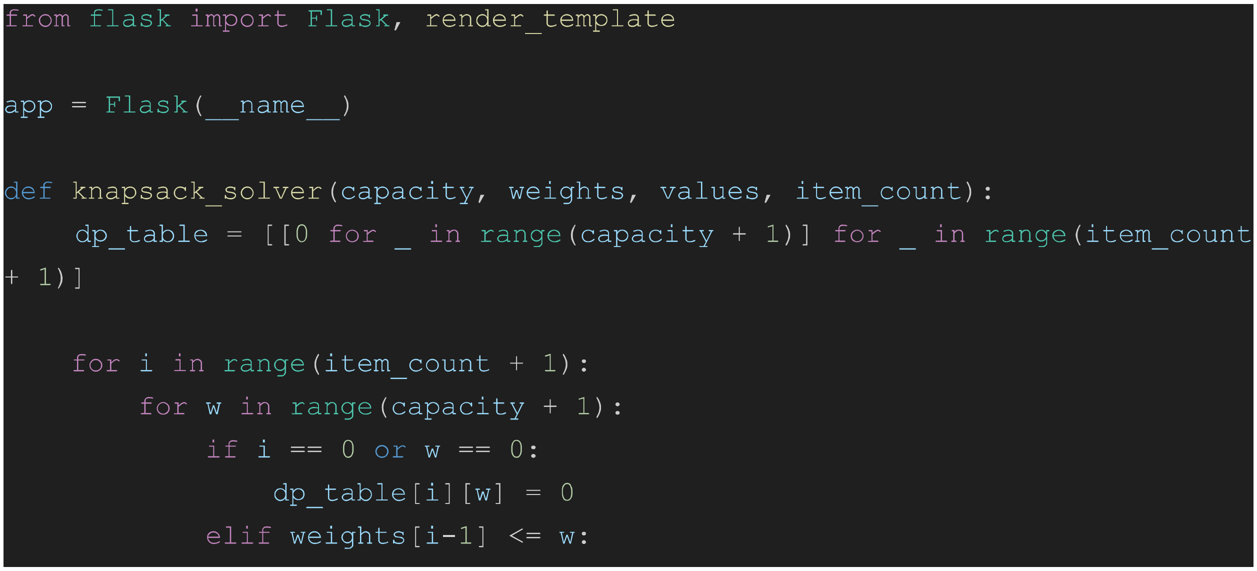
A thief carrying a single knapsack with limited (W = 5) capacity. The museum you stole had (n=4) artefacts that you could steal. Unfortunately, you might not be able to steal the entire artefact because of your limited knapsack capacity.

Help the thief to cherry pick the artefact in order to maximise the total value (<=W) of the artefacts you stole.

First solve the given below example:
Let n = 4, W=5

(P1, P2, P3, P4) = (3,4,5,6)
(w1, w2, w3, w4) = (2,3,4,5)

Code:-



```
from flask import Flask, render_template

app = Flask(__name__)

def knapsack_solver(capacity, weights, values, item_count):
    dp_table = [[0 for _ in range(capacity + 1)] for _ in range(item_count
+ 1)]

    for i in range(item_count + 1):
        for w in range(capacity + 1):
            if i == 0 or w == 0:
                dp_table[i][w] = 0
            elif weights[i-1] <= w:
```

Name:-Devansh Koyani

Er no:-22162171007

Batch:-54

```
                dp_table[i][w] = max(values[i-1] + dp_table[i-1][w-weights[i-1]], dp_table[i-1][w])
            else:
                dp_table[i][w] = dp_table[i-1][w]

    max_profit = dp_table[item_count][capacity]
    w = capacity
    chosen_items = []

    for i in range(item_count, 0, -1):
        if max_profit <= 0:
            break
        if max_profit == dp_table[i-1][w]:
            continue
        else:
            chosen_items.append(i)
            max_profit -= values[i-1]
            w -= weights[i-1]

    return dp_table, dp_table[item_count][capacity], chosen_items

@app.route('/')
def display_knapsack():
    values = [3, 4, 5, 6]
    weights = [2, 3, 4, 5]
    capacity = 5
    item_count = len(values)

    dp_table, max_value, selected_items = knapsack_solver(capacity, weights, values, item_count)

    return render_template('knapsack_result.html', dp_table=dp_table, capacity=capacity, item_count=item_count, max_value=max_value, selected_items=selected_items)

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

Name:-Devansh Koyani

Er no:-22162171007

Batch:-54

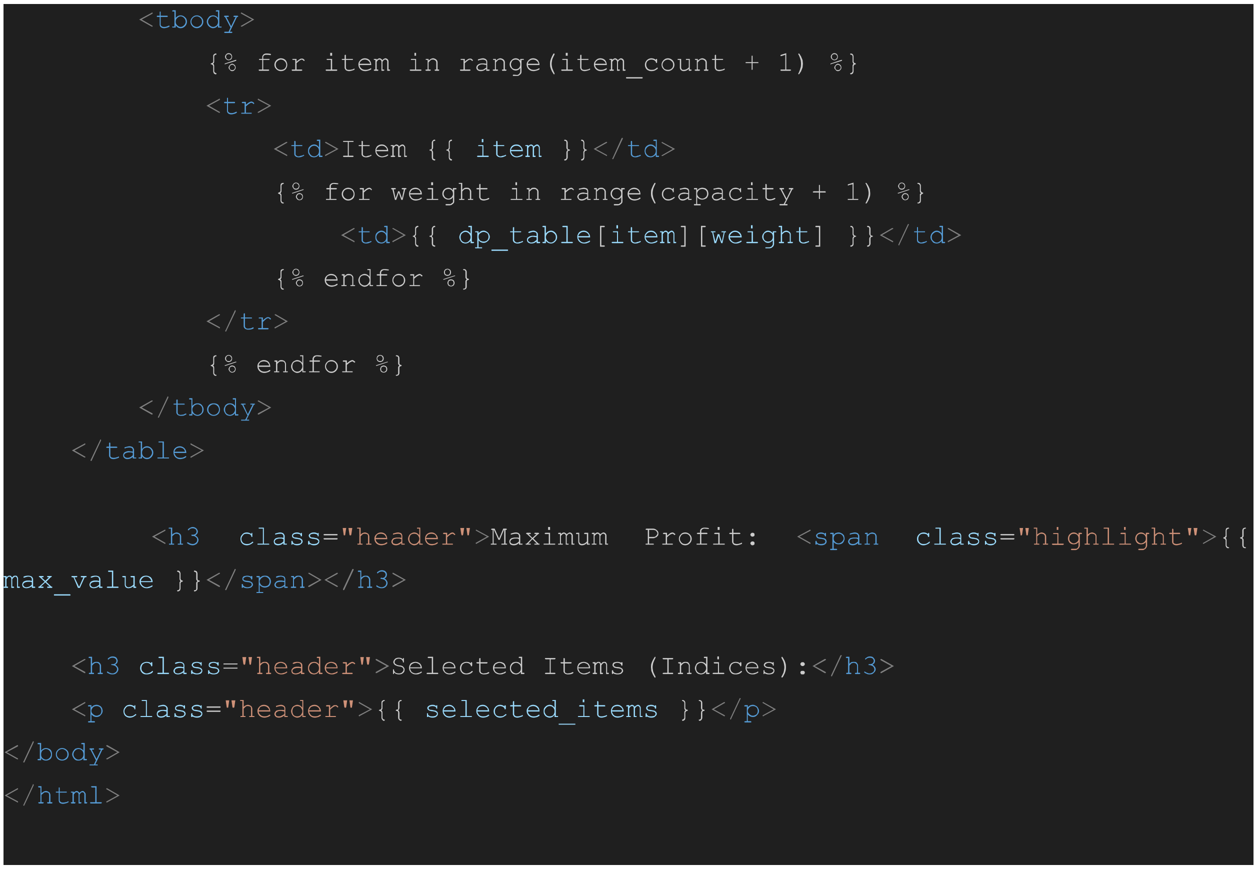
## Html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Knapsack Optimization</title>
    <style>
        table {
            width: 60%;
            margin: 20px auto;
            border: 1px solid #333;
            border-collapse: collapse;
        }
        th, td {
            border: 1px solid #000;
            padding: 8px;
            text-align: center;
        }
        .header {
            text-align: center;
        }
        .highlight {
            font-weight: bold;
        }
    </style>
</head>
<body>
    <h2 class="header">Knapsack Dynamic Programming Table</h2>
    <table>
        <thead>
            <tr>
                <th></th>
                {% for weight in range(capacity + 1) %}
                    <th>W = {{ weight }}</th>
                {% endfor %}
            </tr>
        </thead>
```

Name:-Devansh Koyani

Er no:-22162171007

Batch:-54

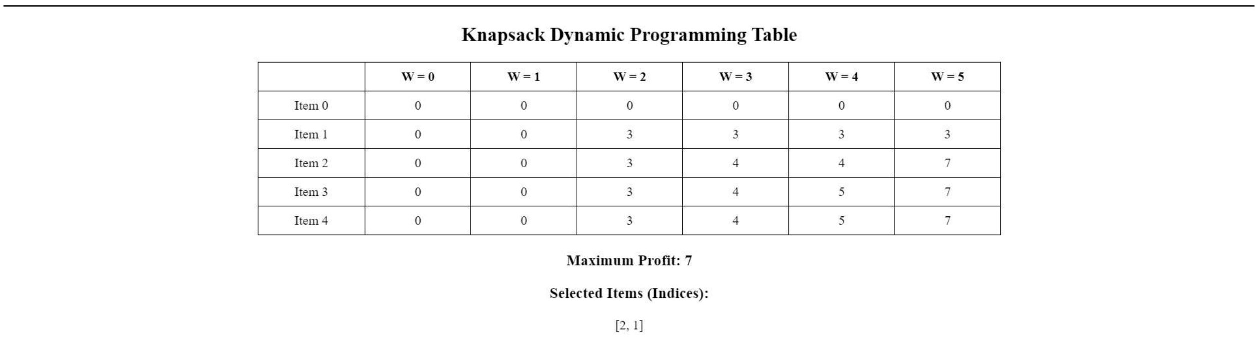


```
        <tbody>
            {% for item in range(item_count + 1) %}
            <tr>
                <td>Item {{ item }}</td>
                {% for weight in range(capacity + 1) %}
                    <td>{{ dp_table[item][weight] }}</td>
                {% endfor %}
            </tr>
            {% endfor %}
        </tbody>
    </table>

        <h3 class="header">Maximum Profit: <span class="highlight">{{
max_value }}</span></h3>

    <h3 class="header">Selected Items (Indices):</h3>
    <p class="header">{{ selected_items }}</p>
</body>
</html>
```

Output:-



**Knapsack Dynamic Programming Table**

| | W = 0 | W = 1 | W = 2 | W = 3 | W = 4 | W = 5 |
|---|---|---|---|---|---|---|
| Item 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Item 1 | 0 | 0 | 3 | 3 | 3 | 3 |
| Item 2 | 0 | 0 | 3 | 4 | 4 | 7 |
| Item 3 | 0 | 0 | 3 | 4 | 5 | 7 |
| Item 4 | 0 | 0 | 3 | 4 | 5 | 7 |

**Maximum Profit: 7**

**Selected Items (Indices):**

[2, 1]