### **Activity Selection Problem (ASP)**

**Problem:**

You are organizing a series of events, and each event has a start time and an end time. You need to select the maximum number of non-overlapping events.

### **Input Activities:**

|  |  |  |
| --- | --- | --- |
| **Activity** | **Start** | **Finish** |
| 1 | 5 | 9 |
| 2 | 1 | 4 |
| 3 | 8 | 11 |
| 4 | 3 | 5 |
| 5 | 0 | 6 |
| 6 | 3 | 8 |
| 7 | 2 | 5 |
| 8 | 5 | 7 |
| 9 | 13 | 15 |
| 10 | 7 | 9 |
| 11 | 9 | 11 |
| 12 | 12 | 14 |
| 13 | 6 | 10 |
| 14 | 4 | 6 |
| 15 | 8 | 12 |
| 16 | 10 | 12 |
| 17 | 3 | 4 |
| 18 | 2 | 13 |
| 19 | 11 | 13 |
| 20 | 1 | 3 |

### **Steps to Solve:**

#### **Step 1: Sort Activities by Finish Time**

Sort the activities in ascending order of their finish times:

|  |  |  |
| --- | --- | --- |
| **Activity** | **Start** | **Finish** |
| 20 | 1 | 3 |
| 2 | 1 | 4 |
| 17 | 3 | 4 |
| 7 | 2 | 5 |
| 4 | 3 | 5 |
| 5 | 0 | 6 |
| 14 | 4 | 6 |
| 8 | 5 | 7 |
| 6 | 3 | 8 |
| 1 | 5 | 9 |
| 10 | 7 | 9 |
| 3 | 8 | 11 |
| 11 | 9 | 11 |
| 15 | 8 | 12 |
| 16 | 10 | 12 |
| 18 | 2 | 13 |
| 19 | 11 | 13 |
| 12 | 12 | 14 |
| 9 | 13 | 15 |

#### **Step 2: Select the First Activity**

* Select **Activity 20** (start = 1, finish = 3).

#### **Step 3: Select Non-Overlapping Activities**

Iterate through the sorted list and select the next activity only if its start time is greater than or equal to the finish time of the last selected activity.

**Selected Activities:**

1. **Activity 20** (start = 1, finish = 3)
2. **Activity 17** (start = 3, finish = 4)
3. **Activity 14** (start = 4, finish = 6)
4. **Activity 10** (start = 7, finish = 9)
5. **Activity 11** (start = 9, finish = 11)
6. **Activity 13** (start = 11, finish = 13)
7. **Activity 9** (start = 13, finish = 15)

### **Time Complexity:**

* **Sorting Activities**: *O(n log ⁡n)*, where *nn* is the number of activities.
* **Selecting Activities**: *O(n)* (single iteration through the list).
* **Total Complexity**: *O(n log ⁡n)*.

### **Final Output:**

The maximum number of non-overlapping activities is **8**, and the selected activities are **20, 17, 14, 10, 11, 13, 9**.