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**.