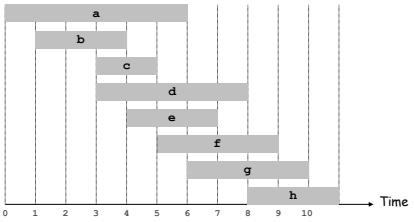

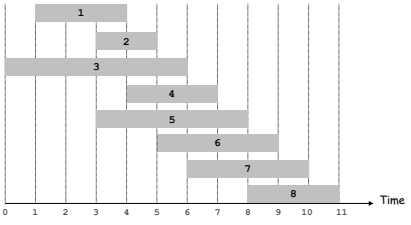

2

Practice problem (prep for exam and homeworks)

- Weighted independent set on the line graph
- Input: a line graph with n vertices with weights given by $v_1, \ldots, v_n$.
- Definition: An independent set is a set of vertices S such that no two vertices in S have an edge between them. For example, in the graph below,
  - the vertex set composed of 8,10,and 2 is an independent set.
  - the vertex set composed of 8,10,7 is NOT an independent set
- The weight of an independent set is the sum of the weights of its elements. For example,
  - 8, 10, 2 has weight 20
  - 8, 7, 7 has weight 22
- In this problem, you are asked to find an independent set with the biggest weight.

9/27/10

How to tackle the problem

- Step 1: Understand the problem. Come up with a couple of examples and try to solve them.
- Step 2: Try brute force. How many possible solutions are there?
- Step 3: Define a natural subproblem.
- Step 4: find a recursive formula for $OPT(i)$
  - Could you quickly find a solution to the problem if you magically had solutions to all the smaller subproblems? Can you capture this in a formula, like we did for rod-cutting?
  - Imagine that magically, you have all the values for $OPT(j)$, for all $j < i$.
- Step 5: How would you turn the formula into an algorithm? What are the two techniques you can use? Write down the pseudocode and analyze its running time.
- Step 6: Modify your algorithm to return the optimal solution itself, not just its value.