Practice 8

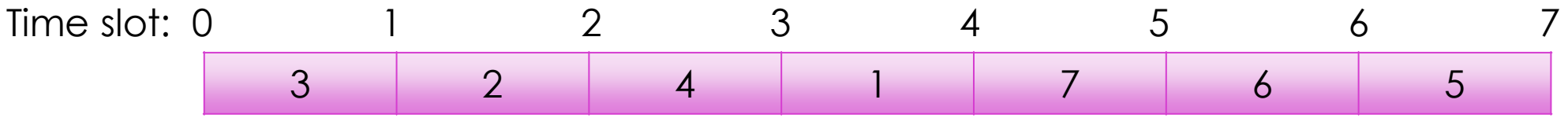
A Task-scheduling Problem

- A **unit-time task** is a job, such as a program to be run on a computer, that requires **exactly one unit of time** to complete. Given a finite set S of unit-time tasks, a schedule for S is a permutation of S specifying the order in which to perform these tasks. The first task in the schedule begins at time 0 and finishes at time 1, the second task begins at time 1 and finishes at time 2, and so on.
- The problem of **scheduling unit-time tasks with deadlines and penalties for a single processor** has the following inputs:
- a set $S = \{a_1, a_2, \ldots a_n\}$ of n unit-time tasks;
- A set of n integer **deadlines** $d_1, d_2, \ldots d_n$,such that each d_i satisfies $1 \leq d_i \leq n$ and task a_i is supposed to finish by time d_i ; and
- a set of n nonnegative weights or **penalties** $w_1, w_2, \ldots w_n$, such that we incur a penalty of w_i if task a_i is not finished by time d_i , and we incur no penalty if a task finishes by its deadline.
- We wish to find a schedule for S that minimizes the total penalty incurred for missed deadlines.

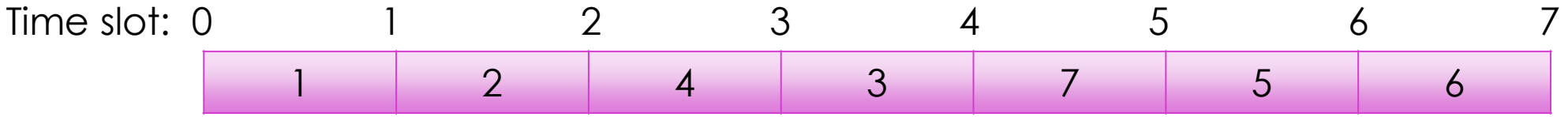
Sample Input:

	Task						
a_i	1	2	3	4	5	6	7
d_i	4	2	4	3	1	4	6
w_i	70	60	50	40	30	20	10

Sample output:



The answer is not unique. There are many other possible solutions.
For example:



Another Task-scheduling Problem

- The problem of **scheduling non-unit time tasks with deadlines and penalties for a single processor** has the following inputs:
- a set $S = \{a_1, a_2, \ldots a_n\}$ of n non-unit time tasks;
- A set of n integer **time** $t_1, t_2, \ldots t_n$, to finish a_i need $t_i$time**;**
- A set of n integer **deadlines** $d_1, d_2, \ldots d_n$,such that each d_i satisfies $1 \leq d_i \leq n$ and task a_i is supposed to finish by time d_i ; and
- a set of n nonnegative weights or **penalties** $w_1, w_2, \ldots w_n$, such that we incur a penalty of w_i if task a_i is not finished by time d_i , and we incur no penalty if a task finishes by its deadline.
- We wish to find a schedule for S that minimizes the total penalty incurred for missed deadlines.

Please implement the question.

The practice will be checked in this lab class or the next lab class(before **May.26**) by teachers or SAs.

This practice will contribute **1 mark** to your overall grade. Late submissions within 1 weeks after the deadline (before June.2)will incur a 20% penalty, meaning that you can only get 80% of the score.