Lab4 Questions

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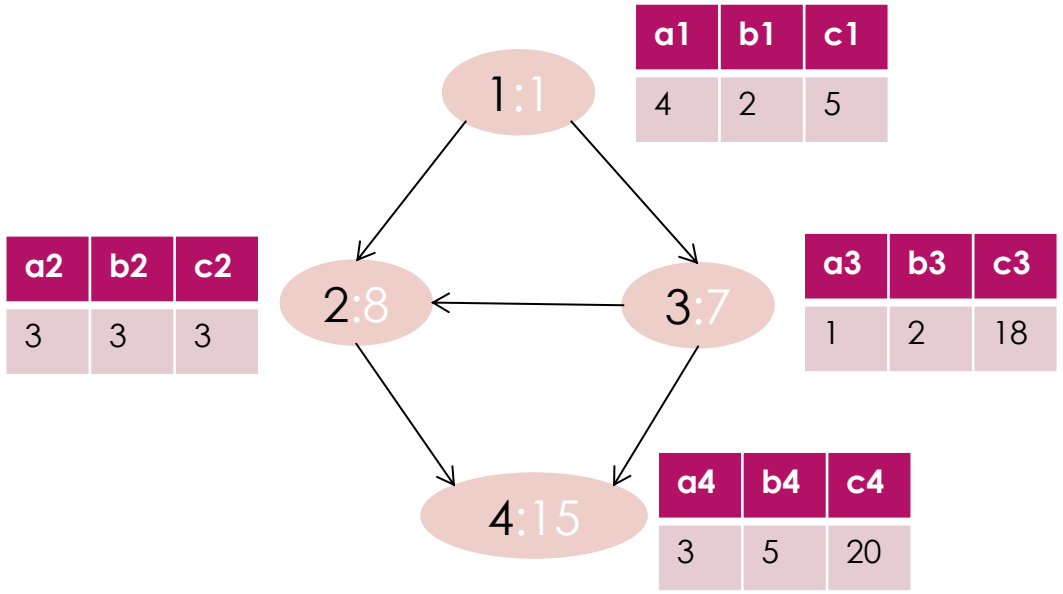
Lab4.A: Brknight

- Recently Andrea is obsessed with a Roguelike game named Brknight.
- The map of Brknight can be seen as a directed acyclic graph (DAG) with N points and M edges, in which there exists one single starting point and multiple terminal points. A point is a terminal point iff Andrea can go nowhere from it.
- Andrea's squad is at point 1 (the starting point) and has Combat Effectiveness (CE) C initially. At point i, she would encounter a stage with dangerous level h_i, and if Andrea's CE is less than h_i, she would lose immediately. Otherwise, she would complete the stage successfully and can choose one reward among the three below:
  - Recruit an operator: Andrea's current CE would increase by a_i
  - Obtain a powerful collection: Andrea's current CE would multiply by b_i
  - Reset her squad: Andrea's current CE would become c_i
- After that, if this point is a terminal point, Andrea will fight against a BOSS. Otherwise, she would choose an edge from point i to another point j and move to j.
- If Andrea can make her way to the BOSS, tell her the maximum possible CE module $10^9 + 7$ when she fights the BOSS.

Sample Input

4 5 3
1 4 2 5
8 3 3 3
7 1 2 18
15 3 5 20
1 2
2 4
1 3
3 2
3 4



Sample Input

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1 4 2 5
8 3 3 3
7 1 2 18
15 3 5 20
1 2
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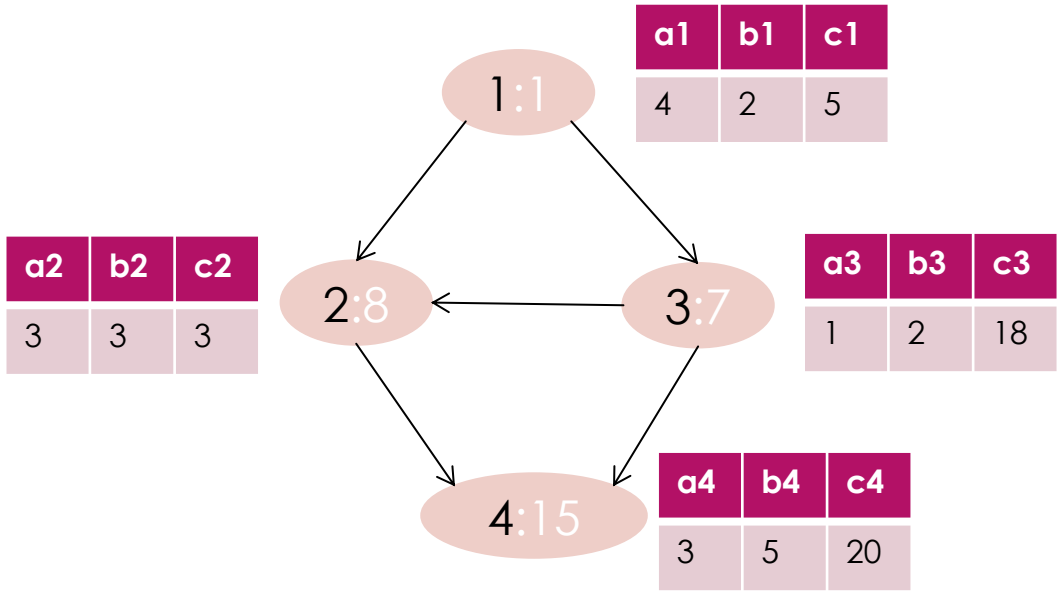
3 2
3 4



Initial c = 3

Point 1: c≥ h1
c=3 -> c=3+a1=7

Move to Point 3: c≥h3
c=7->c=c3=18

Move to Point 2: c≥h2
c=18->c=18*b2=54

Move to Point 4: c≥h4
c=54->c=54*b4=270

Sample Output 1

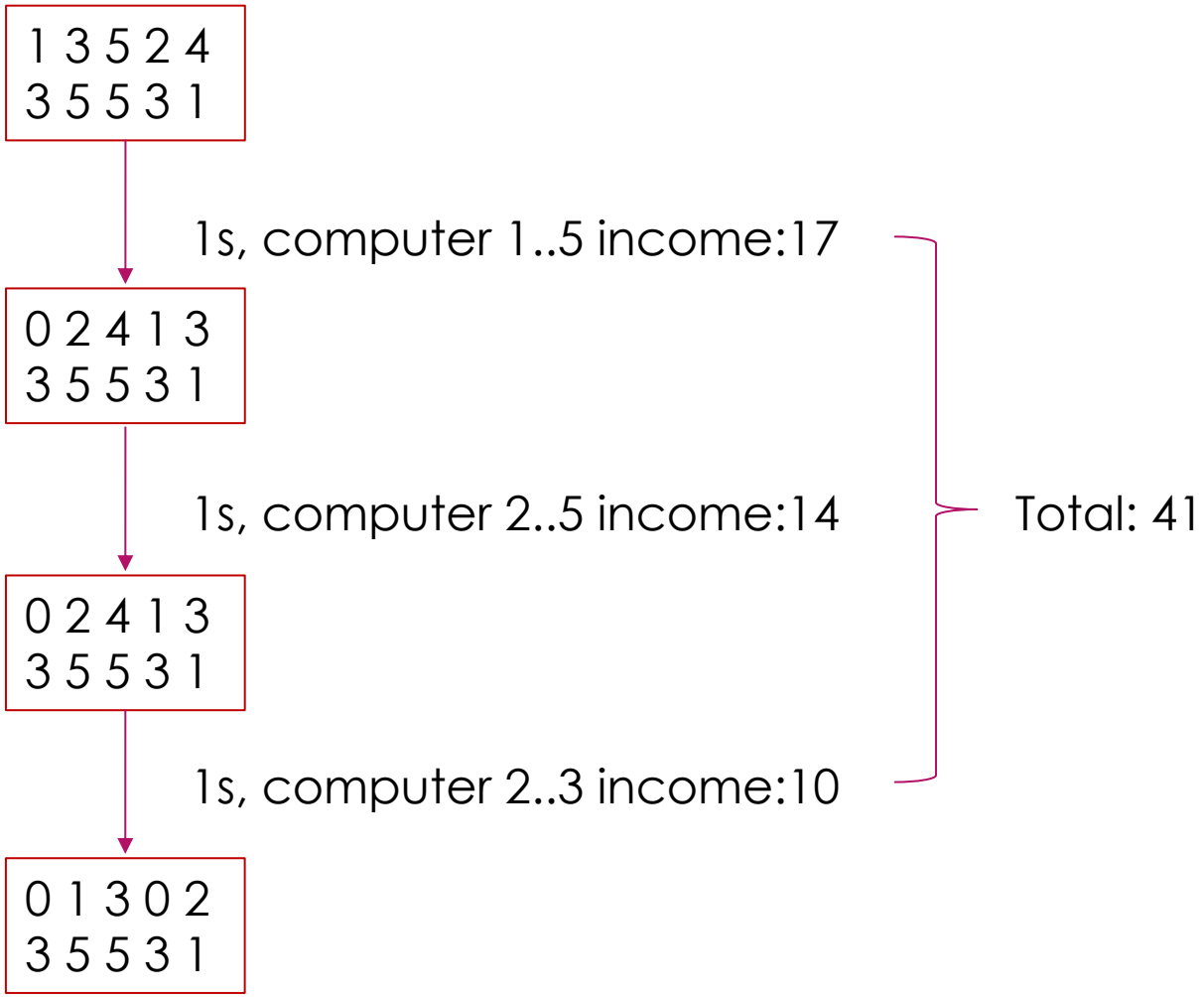
270

Lab4.B: Precarious Computing

- Sky has N expendable computers $1,2,\ldots,N$ lining up from left to right.
- The i^{th} computer can only be powered up for a_i seconds and generates b_i income per second when powered. If the total workload exceeds a_i seconds, the computer will blow up Sky's bedroom. It is guaranteed that a_i is unique.
- Sky has a special cable. He can only power up a consecutive interval of computers at a time. Sky can change the powered interval at anytime.
- Unfortunately, the cable is also expendable and can only function for M seconds. How much income can Sky obtain if he operates optimally? Sky does not want any splendid explosion since he still needs the bedroom to sleep.

Sample Input 1

5 3
1 3 5 2 4
3 5 5 3 1



Sample Output 1

41

Sample Input 2

10 30
44 32 6 1 7 18 27 21 40 48
97 39 32 23 18 32 34 34 21 5

44 32 6 1 7 18 27 21 40 48
97 39 32 23 18 32 34 34 21 5

1s, computer 1..10, income:335

43 31 5 0 6 17 26 20 39 47
97 39 32 23 18 32 34 34 21 5

5s, computer 1..3, income:168*5

38 26 0 0 6 17 26 20 39 47
97 39 32 23 **18 32 34 34 21 5**

6s, computer 5..10, income:144*6

38 26 0 0 0 11 20 14 33 41
97 39 32 23 18 32 34 34 21 5

18s, computer 1..2, income:136*18

20 8 0 0 0 11 20 14 33 41
97 39 32 23 18 32 34 34 21 5

1s+5s+6s+18s = 30s
Total income: 4487

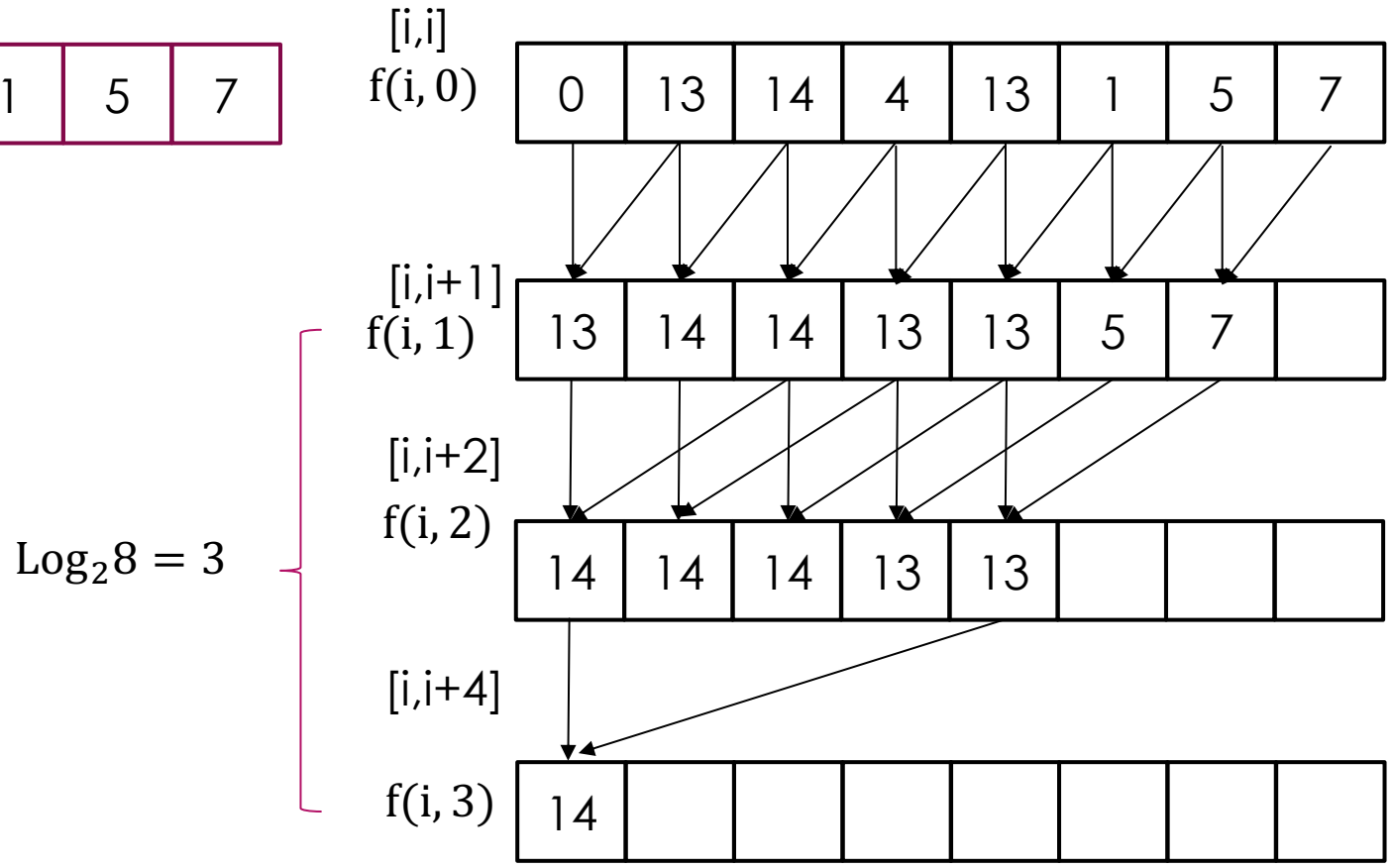
Sample Output 2
4487

ST table

Data:

0	13	14	4	13	1	5	7

Creating ST table:



Query:

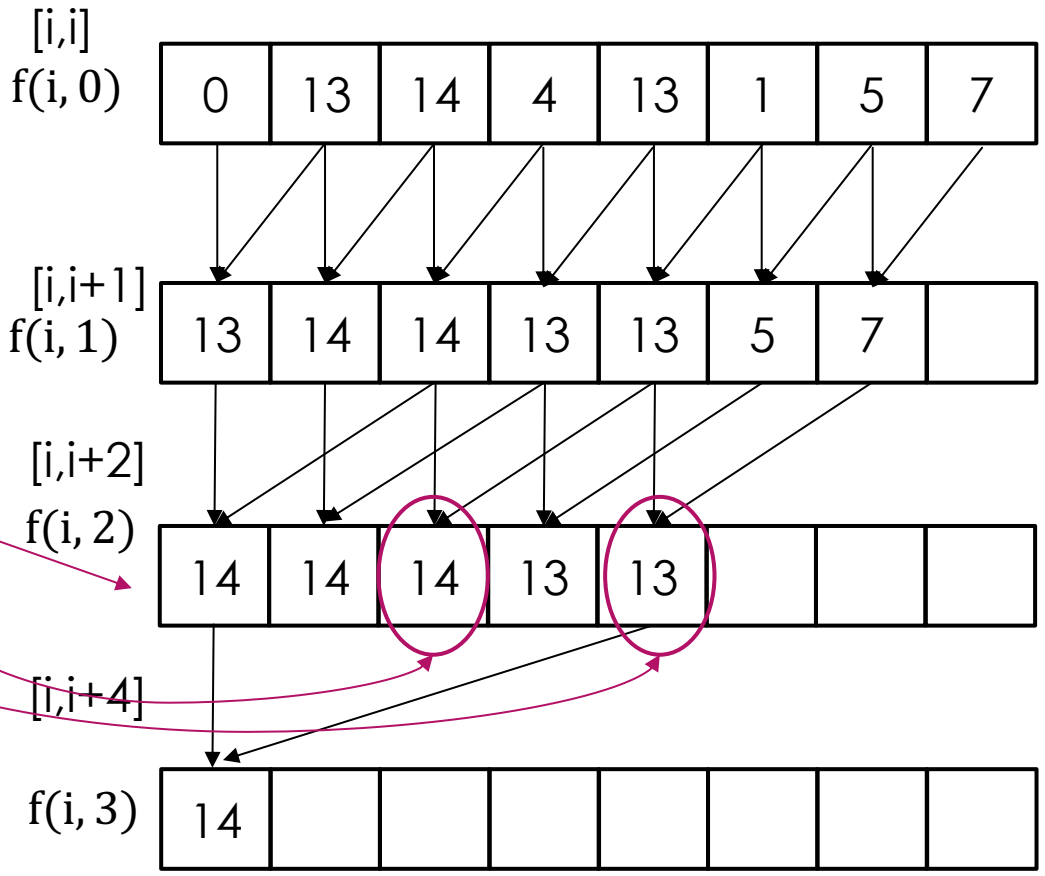
Data:

0	13	14	4	13	1	5	7

Maximum Query:
Range: [2,7]

S=$\lfloor log_2(7-2+1) \rfloor = 2$
L=2, index1 =2
R=7,index2 =7-2^2+1=4

Max(14,13) = **14**



https://oi-wiki.org/ds/sparse-table/