Lab3 Questions

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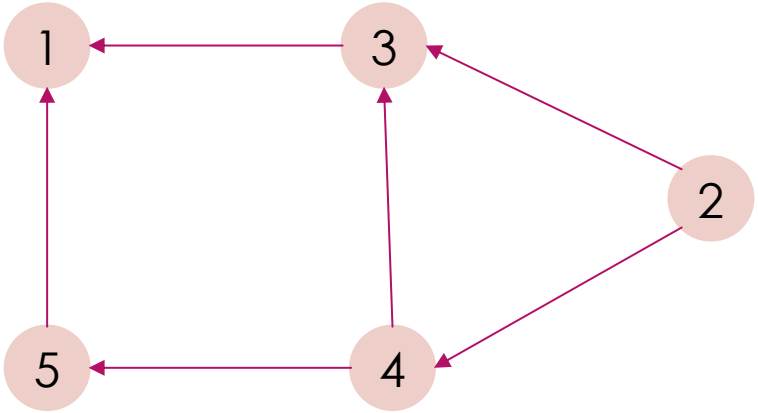
Lab3.A: Biology and CS

- There are M predation relationships among N species in some fauna. It is guaranteed that there is no cyclic predation in the food web.
- A food chain is defined by a sequence of species $[a_1, a_2, \ldots, a_k]$, where
  - nothing can prey on a_1
  - a_k can prey on nothing
  - a_i can prey on a_{i+1} for $i = 1, 2, \ldots, k-1$
- Two food chains are different, if and only if their sequences are different.
- Now each of these N species wants to know how many food chains involve with it, module $10^9 + 7$.

Sample Input 1

5 6
4 5
4 3
2 4
3 1
2 3
5 1



species	food chains	number
1	[2,3,1] [2,4,3,1] [2,4,5,1]	3
2	[2,3,1] [2,4,3,1] [2,4,5,1]	3
3	[2,3,1] [2,4,3,1]	2
4	[2,4,3,1] [2,4,5,1]	2
5	[2,4,5,1]	1

Sample Output 1
3 3 2 2 1

Sample Input 2

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8 8
2 4
7 5
3 4
3 6
2 6
7 8
2 3
5 1
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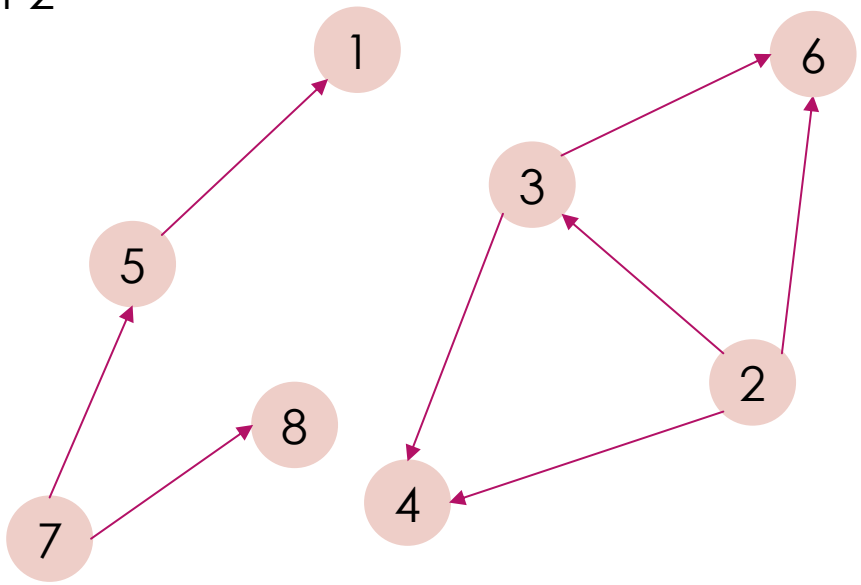


species	food chains	number
1	[7,5,1]	1
2	[2,4] [2,3,4] [2,6] [2,3,6]	4
3	[2,3,4] [2,3,6]	2
4	[2,4] [2,3,4]	2
5	[7,5,1]	1
6	[2,6] [2,3,6]	2
7	[7,5,1] [7,8]	2
8	[7,8]	1

Sample Output 2

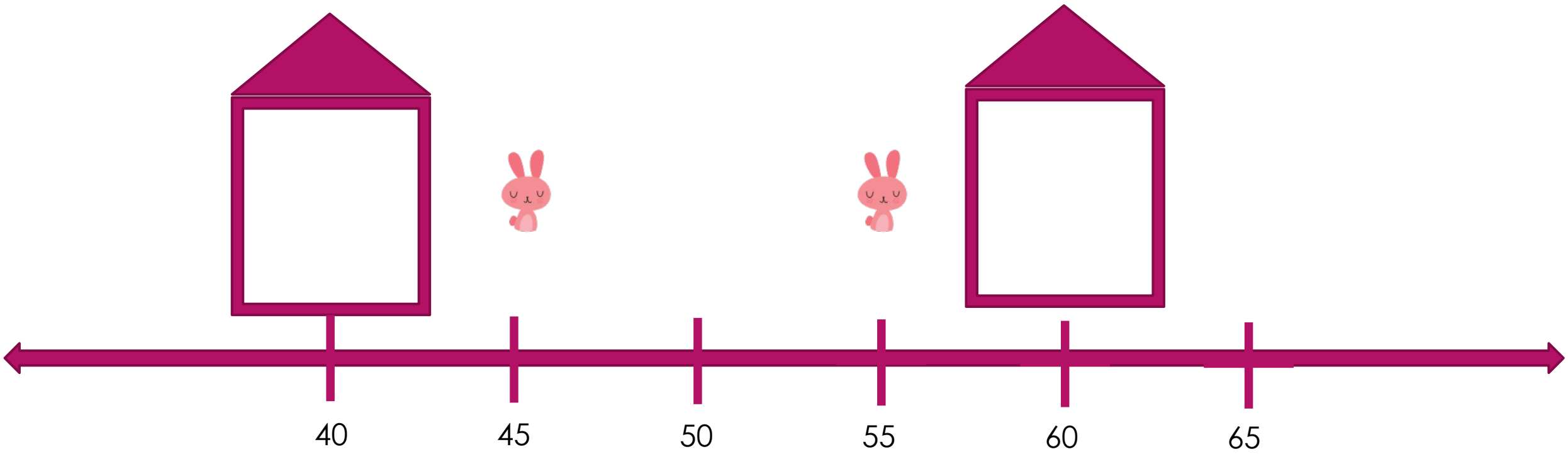
1 4 2 2 1 2 2 1

Lab3.B: Legendary Grabbing Machine

- Satori is a hunter who likes hunting bunnies.
- Initially at moment 0, there are N bunnies, the i^{th} of which is at position p_i.
- There are also M nests, the i^{th} of which is at position q_i. Each nest can hold at most C bunnies.
- Each bunny can move at most 1 unit of distance within 1 unit of time. Once a bunny enters some nest, it will be completely safe from Satori.
- Satori's **Legendary Grabbing Machine** takes T units of time to charge. Once the machine finishes charging at moment T, all bunnies that are out of nest will be captured. Note that bunnies entering nest at moment T will be safe.
- The bunnies very are united. They wish to know the maximal number of safe bunnies if they move optimally.

Input:
2 2 1 5
45 55
40 60

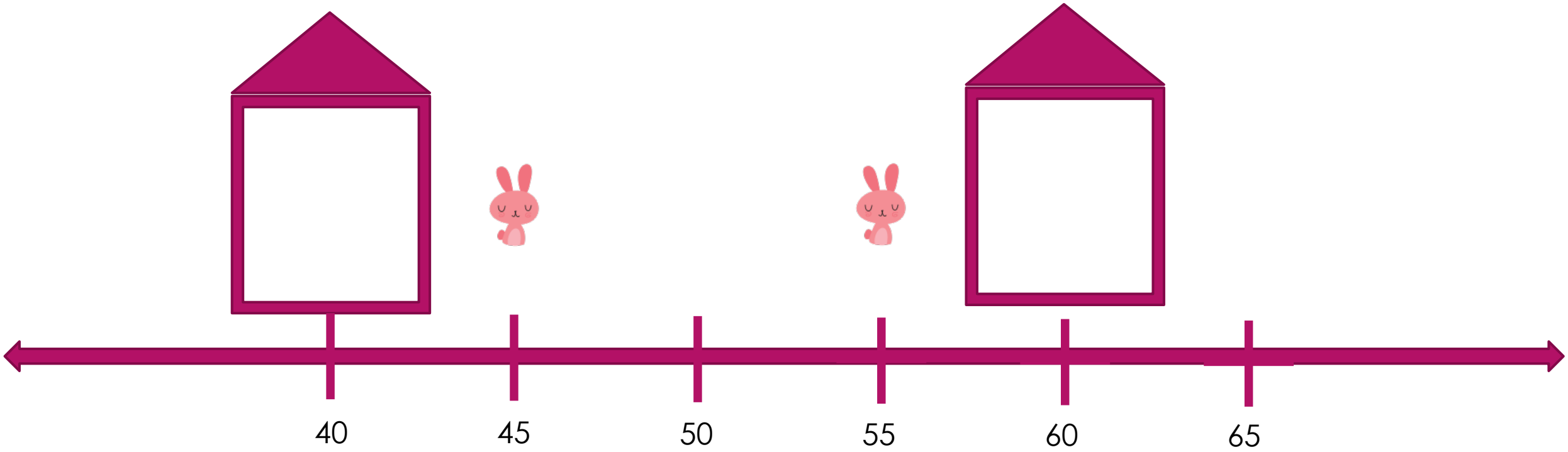
Legendary Grabbing Machine



Input:
2 2 1 5
45 55
40 60

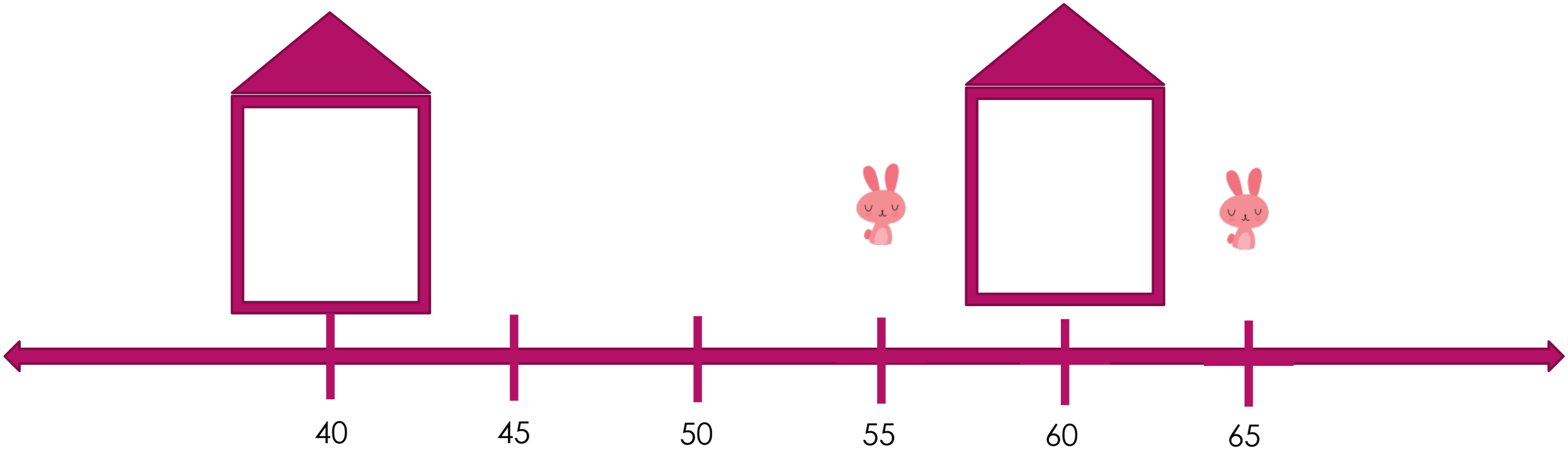
Output:
2

Legendary Grabbing Machine



Input:
2 2 1 5
55 65
40 60

Legendary Grabbing Machine



Input:
2 2 1 5
55 65
40 60

Output:
1

Legendary Grabbing Machine