1. Calculate Book Number and Cluster Count

- Use a counter to calculate the frequency of each book number and its associated cluster.

```
Books = {
    3: {0: 107, 3: 62, 1: 15, 4: 12, 2: 4},
    4: {3: 200},
    0: {3: 114, 0: 82, 4: 4},
    2: {1: 173, 2: 10, 3: 9, 0: 8},
    1: {1: 174, 0: 26},
}
```

Book	Clusters
3	(0:107) , (3:62) , (1:15) , (4,12), (2,4)
4	(3:200)
0	(3:114) , (0:82) , (4:4)
2	(1:173) , (2:10) , (3:9) , (0:8)
1	(1:174) , (0:26)

2. Sort Clusters by Book Count:

- Retrieve the cluster numbers and their corresponding books with counts.
- Sort the clusters based on the number of books in each cluster, in ascending order.

Book	Clusters
3	(0:107) , (3:62) , (1:15) , (4,12), (2,4)
4	(3:200)
0	(3:114) , (0:82) , (4:4)
2	(1:173) , (2:10) , (3:9) , (0:8)
1	(1:174) , (0:26)

→

Cluster	Book(Occurrences)
2	(3:4) , (2:10)
4	(3:12) , (0,4)
1	(3:15) , (2:173) , (1:174)
0	(3:107) , (0:82), (2:8) , (1:26)
3	(3:62) , (4:200) , (0:114) , (2:9)

3. Sort Book Numbers within Clusters:

- Sort the book numbers within each cluster based on their count, in descending order.

Cluster	Occurrences
2	(3:4) , (2:10)
4	(3:12) , (0,4)
1	(3:15) , (2:173) , (1:174)
0	(3:107) , (0:82), (2:8) , (1:26)
3	(3:62) , (4:200) , (0:114) , (2:9)

Cluster	Occurrences
2	(2:10) , (3:4)
4	(3:12) , (0,4)
1	(1:174) , (2:173) , (3:15)
0	(3:107) , (0:82), (1:26) , (2:8)
3	(4:200) , (0:114) , (3:62) , (2:9)

4) Iterate and Assign Clusters:

- Iterate through each cluster.
- For each cluster, check if the first book number has been assigned to another cluster before.

Cluster	Occurrences
2	(2:10) (3:4)
4	(3:12) , (0,4)
1	(1:174) , (2:173) , (3:15)
0	(3:107) , (0:82), (1:26) , (2:8)
3	(4:200) , (0:114) , (3:62) , (2:9)

Taken?

No

Book	Token
0	
1	
2	2
3	
4	

- If the book number has not been assigned, assign the current cluster to the book number.
- If the book number has been assigned, try the next highest book number.
- Repeat until all book numbers have been assigned to clusters or until the maximum number of attempts is reached.

Cluster	Occurrences
2	(2:10) , (3:4)
4	(3:12) , (0,4)
1	(1:174) , (2:173) , (3:15)
0	(3:107) , (0:82), (1:26) , (2:8)
3	(4:200) , (0:114) , (3:62) , (2:9)

Taken?

No

→

Book	Token
0	
1	
2	2
3	4
4	

Cluster	Occurrences
2	(2:10) , (3:4)
4	(3:12) , (0,4)
1	(1:174) , (2:173) , (3:15)
0	(3:107) , (0:82), (1:26) , (2:8)
3	(4:200) , (0:114) , (3:62) , (2:9)

Taken?

No

Book	Token
0	**0**
1	**1**
2	**2**
3	**4**
4	

5) Best Cluster Assignment:
Once all book numbers have been assigned, you will have the best cluster assignment for each book number.

Cluster	Occurrences
2	(2:10) , (3:4)
4	(3:12) , (0,4)
1	(1:174) , (2:173) , (3:15)
0	(3:107) , (0:82), (1:26) , (2:8)
3	(4:200) (0:114) , (3:62) , (2:9)

Taken?

No

Book	Token
0	0
1	1
2	2
3	4
4	3