Code Competition

Set Cover Problem

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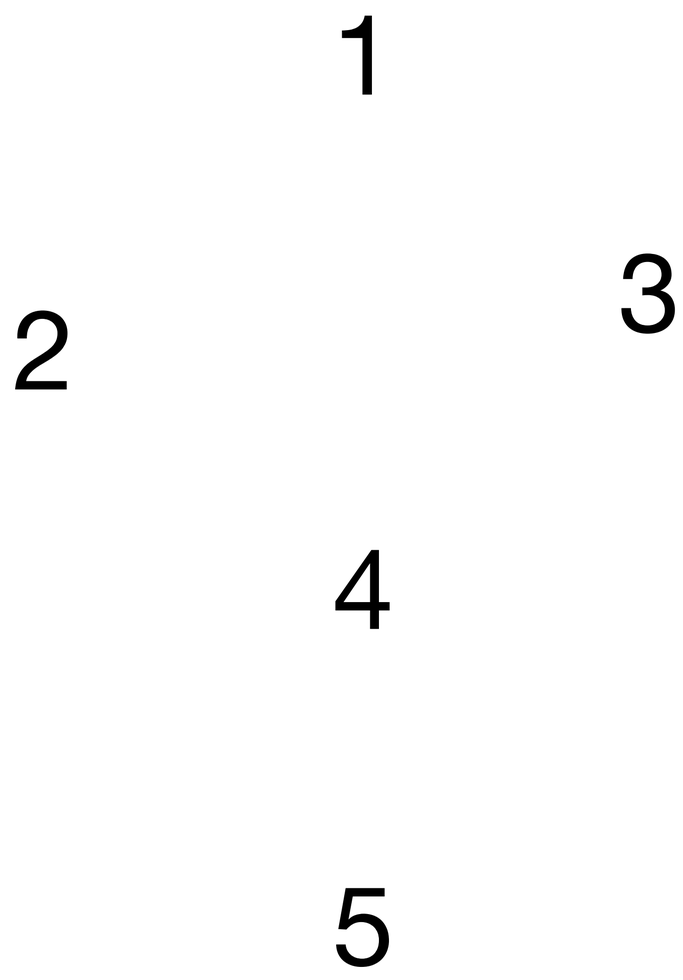
Set Cover Problem

You are given a universe of elements $U = \{0,1,2,\ldots,n-1\}$



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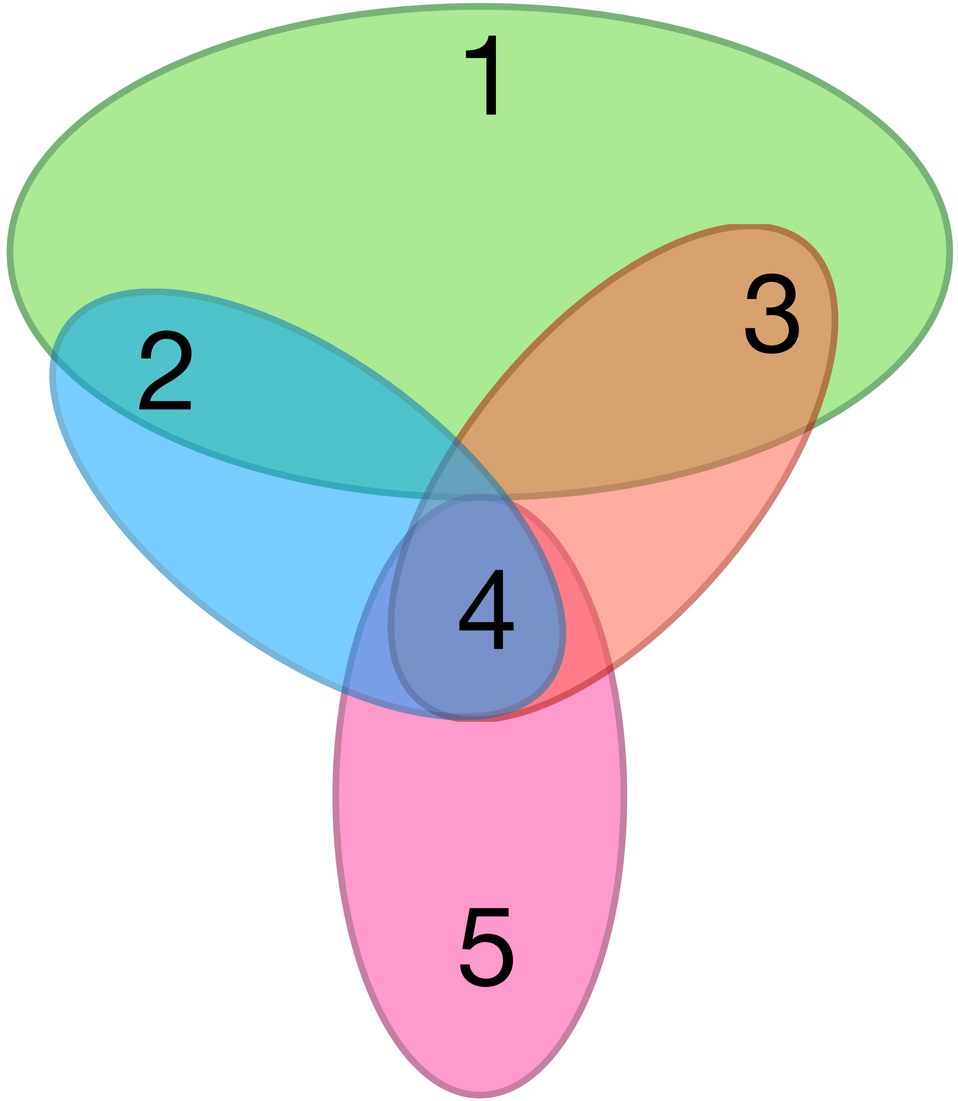
And a collection of sets $S = \{S_0, S_1, S_2, \ldots, S_{m-1}\}$ such as $\forall S_i \in S : S_i \subseteq U$



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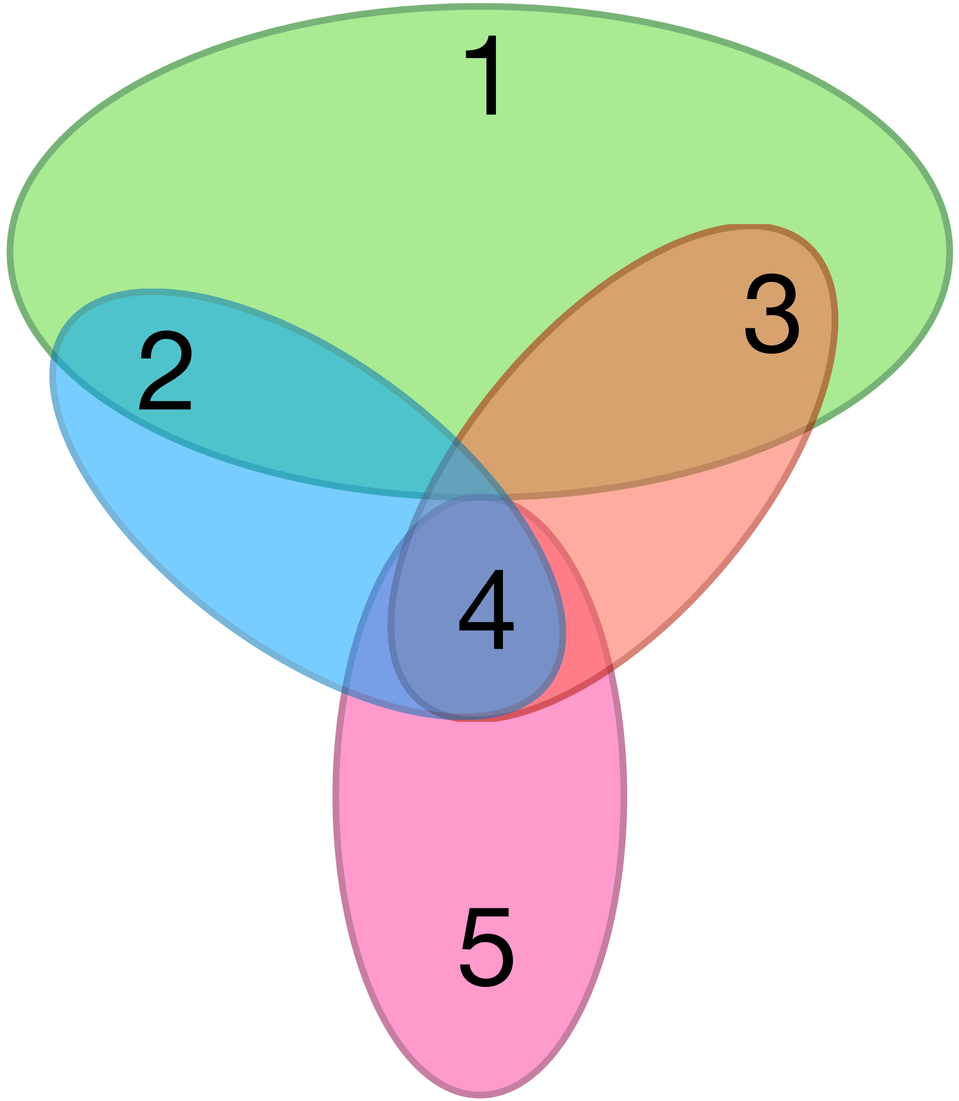
Find the smallest $P \subseteq S$ such as $\bigcup_{S_i \in P} S_i = U$



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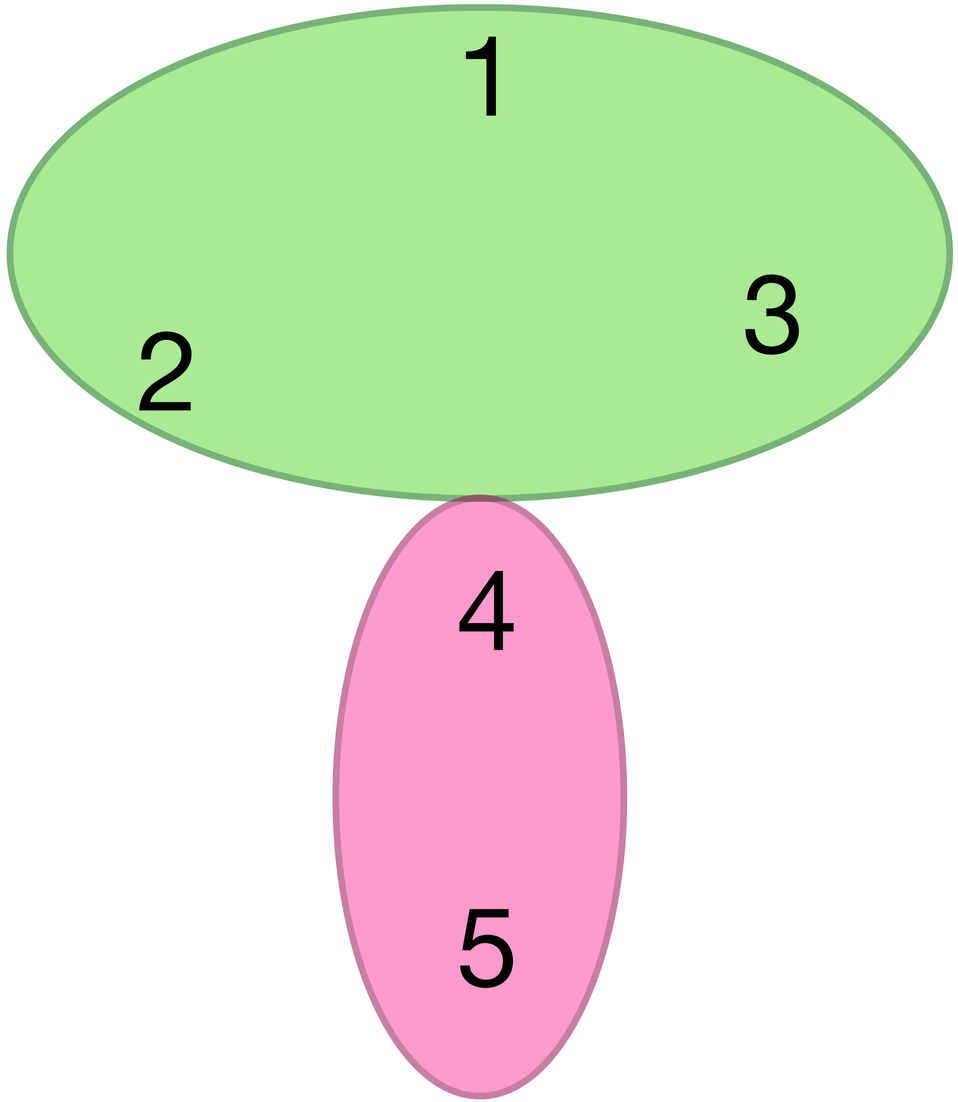
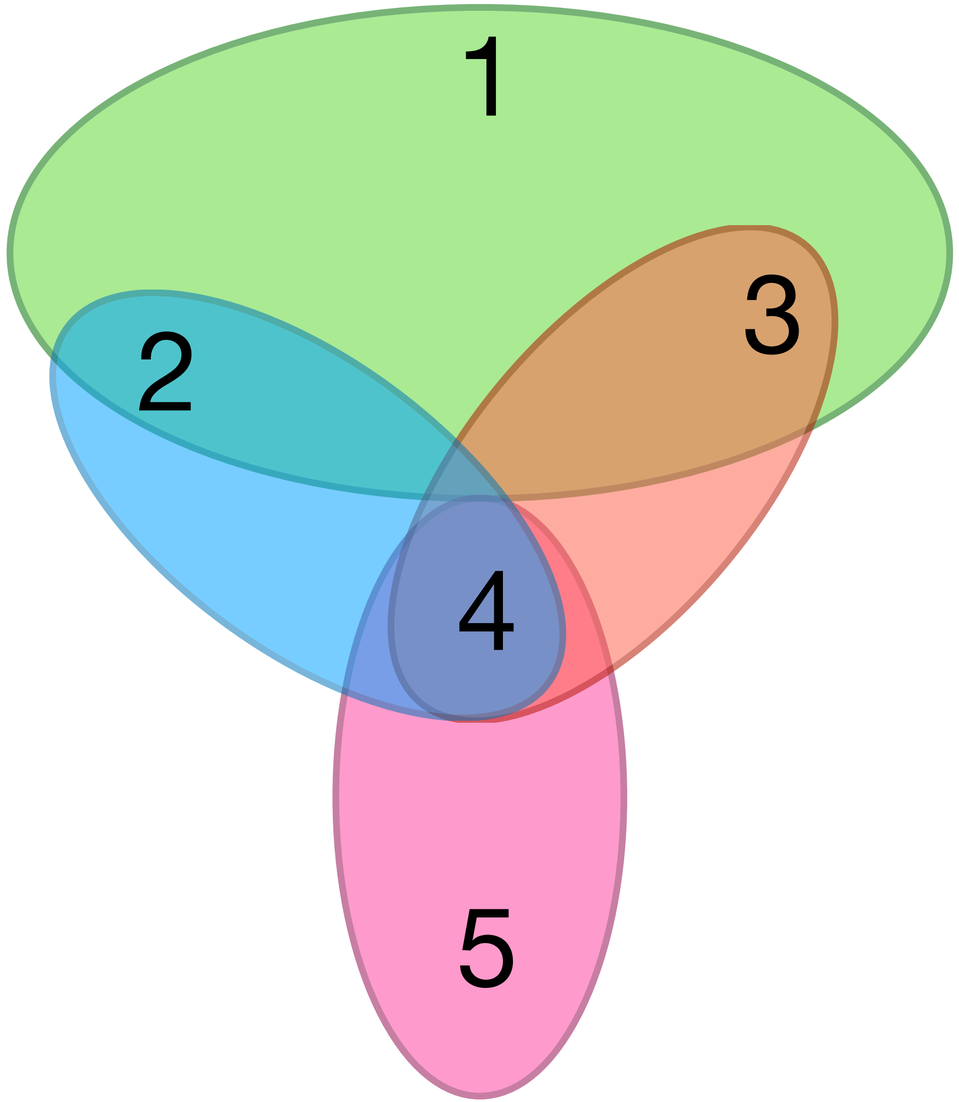


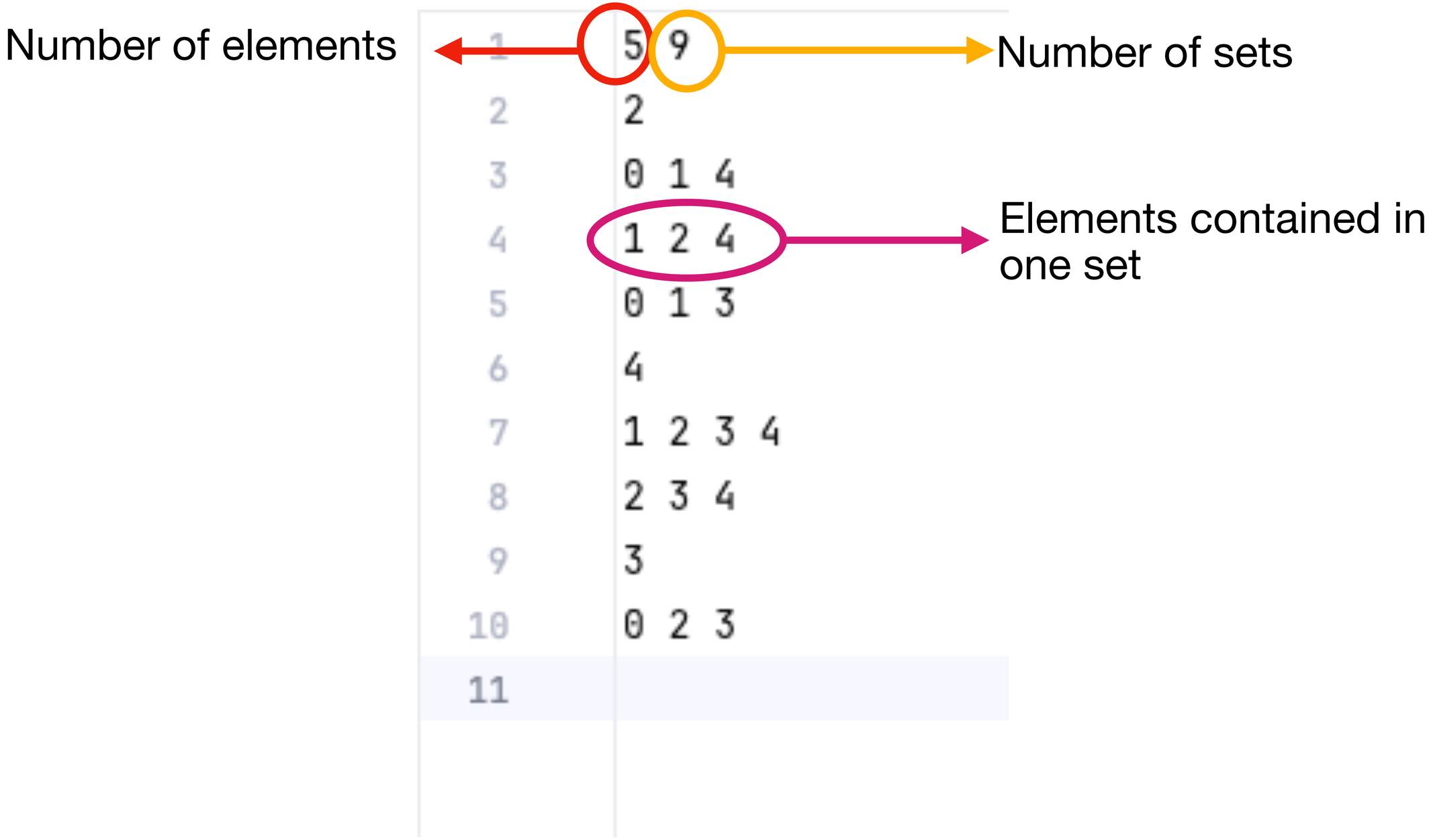
Set Cover Problem

- Simple to explain and to model
- But hard to solve
  - NP-hard
- A lot of concrete applications



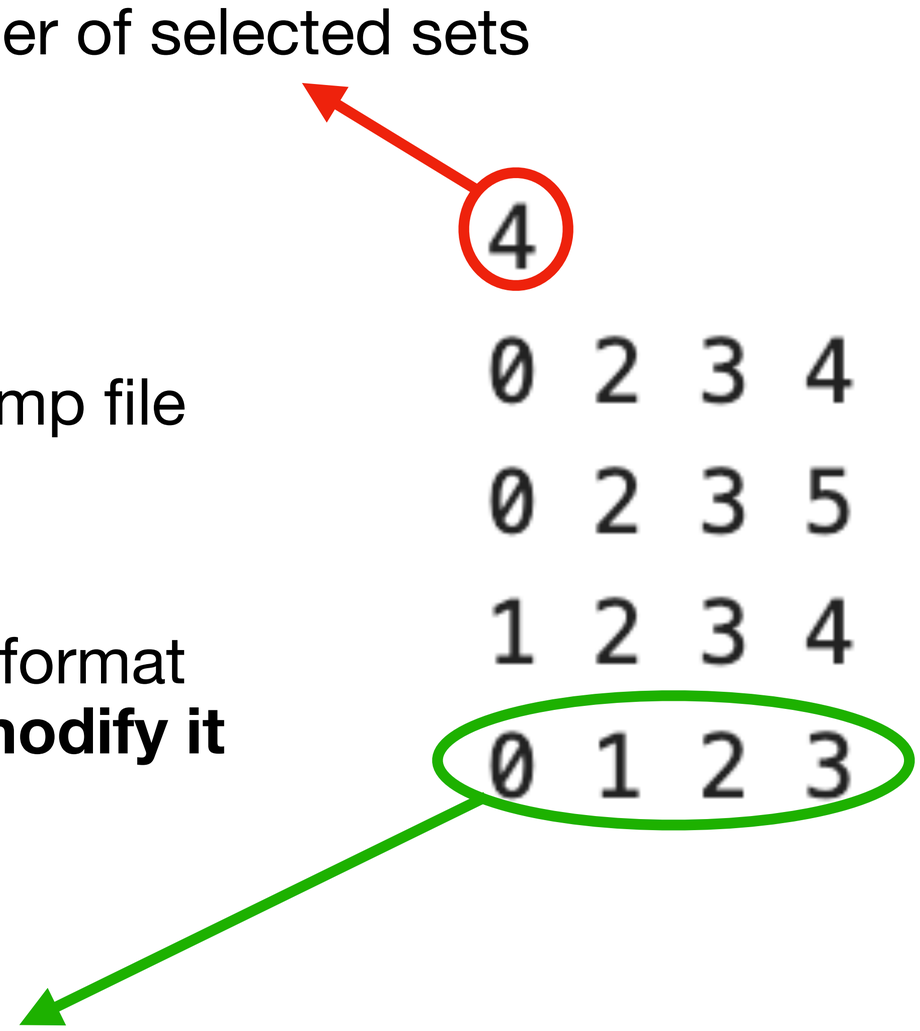
Input

- 4 instances available in data/competition
- The instance file contains :
  - The number of elements in the universe
  - The number of available sets
  - The description of the available sets
- The parsing is already done


Number of elements
5 9
Number of sets
2
0 1 4
1 2 4
Elements contained in one set
0 1 3
4
1 2 3 4
2 3 4
3
0 2 3

Output

- The solution must be written in a solution.tmp file
- Follow this format
- The method *writeSolution* do it in the right format and in the right file, so **use it and do not modify it**



Competition rule

- 3 instances on Inginious (different from the ones given to you)
- 5 minutes to solve each instance (CPU time)
- Make sure that your algo finish and save your best solution before the timeout
- You have until the 19/12/2025 at 4pm

Grading

- Evaluated on 5 points
- 1 pt on the Instance 1, 2pt on the Instance 2 and 2 pt on the Instance 3
- Each instance has a threshold on the cost
  - If the returned solution has a superior cost -> 0pt on the Instance
  - Otherwise it depends on how far you are from the best solution returned by another student (check the scoreboards and ignore my scores)

Grading

- If you have X points on the competition your final grade is:
  - grade_on_20/20 * (20 - X) + X

- Having 0 point on the competition won’t make your grade lower
- If your grade is 12/20 and you have 5 pts at the competition, your grade is:
  - $\frac{12}{20} * 15 + 5 = \frac{14}{20}$