

Please follow the submission guidelines on discord.

Problem: Minimum Cost Rod Cutting

- You are given a rod that is N inches long and a set of M cutting points on the rod.
- You will need to cut the rod from these M points.
- You can only cut from these points.
- You can perform the cuts in any order of these points.
- After a cut, the rod gets divided into two smaller sub-rods.
- The cost of making a cut is the length of the current sub-rod in which you are making a cut.
- Your goal is to minimize the total cost of cutting.
- Output: the minimum cost. Don't output anything else. Only the minimum cost. Use System.out to output to the console.
- Write a program MA3.java that reads (from a file "input.txt") the size of the rod, the number of cutting points, and the cutting points in the format below:
 - The size of the rod, $2 \leq N \leq 100$, in the first line.
 - The number of cutting points, $1 \leq M \leq N - 1$, in the second line.
 - The location of each of the M distinct cutting points (the locations will be integer values > 0 and $< N$ given in increasing order).

Example

Input in correct format

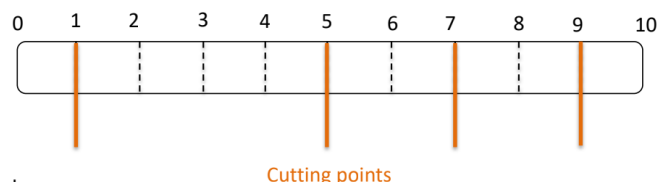
```
10
4
1
5
7
9
```

Order	Cost
1) Cutting at 5:	10
2) Cutting at 1:	5
3) Cutting at 7:	5
4) Cutting at 9:	3

Total Cost:	23

Correct output

23



An order of cutting points that gives the min cost is 5,1,7,9 (there are also others giving the same minimum, e.g., 5,7,9,1)

Bad cut example: Cutting in the order of 1,5,7,9 which has cost $10+9+5+3=27$.

Hints and Remarks:

- Define the problem in terms of cutting the rod from one cutting point to another one.
 - Let $C(i, j)$ = cost of cutting the rod from point i to point j .
- Find a recursive formula.
- Apply a dynamic programming approach.
- Your algorithm should have $O(M^3)$ complexity, where M is the number of cutting points.
- Complexity should not depend on N , the length of rod.
- You will get a lower grade if it does or if you have a larger complexity in general.
- Solutions like finding the cutting point closest to middle of the rod or selecting the median of the cutting points at each step will not always work (Do not use these).
 - Ex: Cutting points 3, 5, 6 on a rod of size 10. Selecting 5, 3, 6 yields $10 + 5 + 5 = 20$, while the optimal cost is obtained by selecting 6, 3, 5 which gives $10 + 6 + 3 = 19$.

Submission through Canvas:

- Date due: Sat, April 8th, 11:59 pm.
- Submit only the Java source code file MA3.java
- Do not submit a zip file. Also no need to add your name to the submitted file's name as Canvas does it for you.
- Remember: in Java, class name should match the file name, and is case sensitive.
- Please do not create your own packages or use built-in libraries/functions/classes.
- You can use simple built-in math functions like min/max etc.
- You can use data structures like Lists, Hash Maps etc.