



### PROBLEM 8 – CLOCK SYNCHRONISATION

Consider a set of  $C$  clocks. Each clock has a single hour hand that can only point to one of the following hours: 3, 6, 9, or 12. These clocks can be moved in  $B$  different ways called block moves. Each block move applies to a specified subset of clocks, and consists of moving the hand of each clock in the subset clockwise by 3 hours. Your task is to find a minimal sequence of block moves that sets all clocks to 12 hours. Multiple repetitions of a single block move are allowed. If two solutions of the same length exist, then give the lesser one in dictionary order. If there is no solution then write "No solution." If no move is required then write "No moves required."

For example, consider a set of 9 clocks ( $C = 9$ ) with initial positions as shown in the following table, and 9 available block moves ( $B = 9$ ), where ticks indicate the clocks affected by each block move:

Clock numbers	0	1	2	3	4	5	6	7	8
Clock positions	9	9	12	6	6	6	6	3	6
Block move 0	√	√		√	√				
Block move 1	√	√	√						
Block move 2		√	√		√	√			
Block move 3	√			√			√		
Block move 4		√		√	√	√		√	
Block move 5			√			√			√
Block move 6				√	√		√	√	
Block move 7							√	√	√
Block move 8					√	√		√	√

With clocks in the initial positions shown in the above table, applying block move 3 would result in the following updated clock positions (clocks 0, 3, and 6 have been moved clockwise by 3 hours):

Clock numbers	0	1	2	3	4	5	6	7	8
Clock positions	12	9	12	9	6	6	9	3	6

Further applying block moves 4, 7, and 8 would result in all clocks being set to 12 hours. The move sequence 3, 4, 7, 8 is actually the required solution in this case.



## INPUT FORMAT

Input consists of a number of scenarios. Each scenario starts with a line containing a scenario title, which is a string of 1 to 20 letters, digits, and underscores (with no intervening spaces). A single # on a line indicates the end of input.

The “title” line is followed by one line consisting of two integers  $C$  and  $B$ , separated by a single space:

- $C$  is the number of clocks,  $1 \leq C \leq 11$ , where the clocks are numbered sequentially starting with 0 (i.e., 0, 1, 2, 3, ...  $C-1$ ),
- $B$  is the number of blocks,  $0 \leq B \leq 11$ , where the blocks are numbered sequentially starting with 0 (i.e., 0, 1, 2, 3, ...  $B-1$ ).

This line is followed by one line representing the starting positions of our clocks. This line consists of  $C$  clock positions separated by single spaces, each position being an integer number in the set {3, 9, 6, 12}.

This “clocks” line is followed by  $B$  other lines, one line for each block move operation. Each “block” line consists of 1 or more clock numbers (in no particular order), separated by single spaces, representing the clocks that will advance together by 3 hours in this block.

## SAMPLE INPUT:

```
Test_1_0
1 0
12
Test_1_1
1 1
12
0
Test_3_3
3 3
9 9 9
0 1
1 2
0 2
Test_9_9
9 9
9 9 12 6 6 6 6 3 6
1 3 4 0
0 1 2
2 4 5 1
0 3 6
4 5 7 1 3
2 5 8
3 4 6 7
8 7 6
8 7 4 5
#
```



## OUTPUT FORMAT

Each set of output data consists of a single output line showing in order: the problem title, a colon (“:”), a space (“ ”), and one of the following answers:

- the text “No moves required.”, if no moves are required to solve the problem,
- the text “No solution.”, if the problem doesn’t have any solution,
- the block numbers making up the minimal solution (in the required length/dictionary order), separated by single spaces.

## SAMPLE OUTPUT:

```
Test_1_0: No moves required.  
Test_1_1: No moves required.  
Test_3_3: No solution.  
Test_9_9: 3 4 7 8
```