LAB 09

Pseudocode

```
GET number
SET list nums <- [number]</pre>
SET francois_number <- 0</pre>
WHILE list nums is not empty
    num <- list nums[0]</pre>
                                                         #A
    IF num > 2
                                                         #B
        append num - 1 and num - 2 to list nums
    ELSE IF num = 2
                                                         #C
        francois number + 1
    ELSE IF num = 1
                                                         # D
        francois number + 2
    REMOVE list nums[0] in list nums
                                                         #E
PUT The number is francois number
                                                         #F
```

Logarithmic efficiency

O(2ⁿ)

Every line in the program is an instant action except for the WHILE loop. At the WHILE loop, it will iterate through the list and the list will expand by two everytime the number is not 1 or 2. So the list could expand exponentially meaning it is very inefficient.

Program Trace

list_nums	num	francois_number
7	7	0
7, 6, 5		
6, 5		
6, 5	6	
6, 5, 5, 4		
5, 5, 4		
5, 5, 4	5	
5, 5, 4, 4, 3		
5, 4, 4, 3		
5, 4, 4, 3		
5, 4, 4, 3, 4, 3		
4, 4, 3, 4, 3		
4, 4, 3, 4, 3	4	
4, 4, 3, 4, 3, 3, 2		
4, 3, 4, 3, 3, 2		
4, 3, 4, 3, 3, 2		
4, 3, 4, 3, 3, 2, 3, 2		
3, 4, 3, 3, 2, 3, 2		
3, 4, 3, 3, 2, 3, 2	3	
3, 4, 3, 3, 2, 3, 2, 2, 1		
4, 3, 3, 2, 3, 2, 2, 1		
4, 3, 3, 2, 3, 2, 2, 1	4	
4, 3, 3, 2, 3, 2, 2, 1, 3, 2		
3, 3, 2, 3, 2, 2, 1, 3, 2		
3, 3, 2, 3, 2, 2, 1, 3, 2	3	
3, 3, 2, 3, 2, 2, 1, 3, 2, 2, 1		
3, 2, 3, 2, 2, 1, 3, 2, 2, 1		
3, 2, 3, 2, 2, 1, 3, 2, 2, 1		
	7 7, 6, 5 6, 5 6, 5 6, 5 6, 5, 5, 4 5, 5, 4 5, 5, 4, 4, 3 5, 4, 4, 3 5, 4, 4, 3 5, 4, 4, 3 4, 4, 3, 4, 3 4, 4, 3, 4, 3 4, 4, 3, 4, 3, 3, 2 4, 3, 4, 3, 3, 2 4, 3, 4, 3, 3, 2 4, 3, 4, 3, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2, 2, 1 4, 3, 3, 2, 3, 2, 2, 1 4, 3, 3, 2, 3, 2, 2, 1 4, 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1	7 7, 6, 5 6, 5 6, 5 6, 5 6, 5, 4 5, 5, 4 5, 5, 4 5, 5, 4, 4, 3 5, 4, 4, 3 5, 4, 4, 3 5, 4, 4, 3 4, 4, 3, 4, 3 4, 4, 3, 4, 3 4, 4, 3, 4, 3 4, 4, 3, 4, 3, 3, 2 4, 3, 4, 3, 3, 2 4, 3, 4, 3, 3, 2 4, 3, 4, 3, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 4, 3, 3, 2, 3, 2 3, 3, 2, 3, 2, 2, 1 4, 3, 3, 2, 3, 2, 2, 1 4, 3, 3, 2, 3, 2, 2, 1 4, 3, 3, 2, 3, 2, 2, 1 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2 3, 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1 3, 2, 3, 2, 2, 1, 3, 2, 2, 1

B 3, 2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 A 2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 C 2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 A 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 B 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 2, 2, 1, 3, 2, 2, 1, 2, 1 A 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 E 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 3, 2, 2, 1, 2, 1 C 2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 A 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 B 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 A 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 E 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 A 1, 3, 2, 2, 1, 2, 1, 2, 1 A 1, 3, 2, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 C 2, 1, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 A 2, 1, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1, 2, 1 B 2, 2, 1, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 B 4, 2, 1, 2, 1, 2, 1 B 5, 2, 1, 2, 1, 2, 1 B 6, 2, 1, 2, 1, 2, 1 B 7, 1,				
A	В	3, 2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1		
C	Е	2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1		
E 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 A 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 B 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 2, 2, 1, 3, 2, 2, 1, 2, 1 A 2, 2, 1, 3, 2, 2, 1, 2, 1 A 2, 2, 1, 3, 2, 2, 1, 2, 1 C 2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 A 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 B 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 B 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 B 3, 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 E 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 C 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 B 1, 3, 2, 2, 1, 2, 1, 2, 1 A 1, 3, 2, 2, 1, 2, 1, 2, 1 A 1, 3, 2, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 C 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 1, 2, 1, 2, 1 A 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 1, 2, 1, 2, 1	Α	2, 3, 2, 2, 1, 3, 2, 2, 1, 2, 1	2	
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C	E	2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1		
E 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 A 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 B 3, 2, 2, 1, 3, 2, 2, 1, 2, 1 E 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 E 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 E 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 E 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 C 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 2, 1, 3, 2, 2, 1, 2, 1, 2, 1 A 1, 3, 2, 2, 1, 2, 1, 2, 1 A 1, 3, 2, 2, 1, 2, 1, 2, 1 D 1, 3, 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 B 3, 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 A 3, 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 A 2, 2, 1, 2, 1, 2, 1 C 2, 2, 1, 2, 1, 2, 1 A 2, 1, 2, 1, 2, 1 B 2, 1, 2, 1, 2, 1 C 2 2 2	A	2, 2, 1, 3, 2, 2, 1, 2, 1, 2, 1	2	
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C 2	2, 1, 2, 1, 2, 1		11
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D 1	1, 2, 1, 2, 1		13
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A 2	2, 1, 2, 1	2	
C 2	2, 1, 2, 1		14
E 1	1, 2, 1		
A 1	1, 2, 1	1	
D 1	1, 2, 1		15
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C 2	2, 1		16
E 1	1		
A 1	1	1	
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