IT1007 TLAB 2

Variables and Scope

Output?

```
x = "outer"

def xReplace(value):
    x = value

xReplace("inner")

print(x)
```

A. “outer”
B. “inner”
C. The program causes an error

Output?

```
x = 'original'

def foo(value):
    if value:
        x = 'changed'
    print (x)


foo(True)
```

A. “original”
B. “changed” ✓
C. The program causes an error

Output?

```
x = 'original'

def foo(value):
    if value:
        x = 'changed'
    print (x)


foo(False)
```

A. “original”

B. “changed”

C. The program causes an error

Recursion

Factorial

```
def factorial_iterative(n):
    ans = 1
    for i in range(2,n+1):
        ans *= i
    return ans
```

```
def factorial_recursion(n):
    if n == 1:
        return 1
    else:
        return n * factorial_recursion(n-1)
```

Try

- The two functions are already in the file Lab_02_Part_A.py
  - `factorial_iterative(n)`
  - `factorial_recursion(n)`

- Just download and run before modifying the file
- Try
  - Compute 10! with both functions
  - Compute 100! with both functions
  - Compute 993! with both functions
  - Compute 994! with both functions

You cannot go too deep

Submission Reminder

- For your Part B, you have six days to work on it. (E.g. if your Tlab is on Monday, then your deadline is the coming Sunday midnight.)
- Add your student number to your file in your submission, e.g.

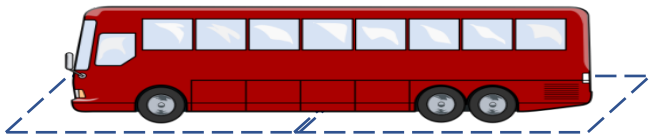
  Lab_02_Part_A**_A1234567X**.py.

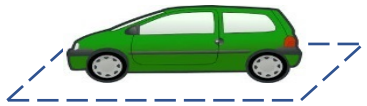
- You should not need any “print()” in the final submission inside the function you wrote. You should just use “print()” outside the function for output and testing.

Fibonacci Number

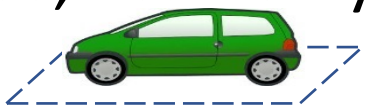
How many ways to arrange cars?

- Let's say we have two types of vehicles, cars and buses



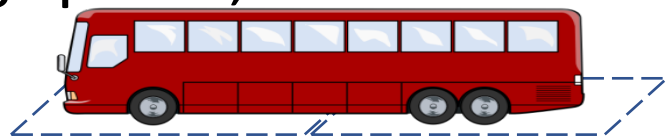


- And each car can park into one parking space, but a bus needs two consecutive ones
- If we have 1 parking space, I can only park a car



1 way

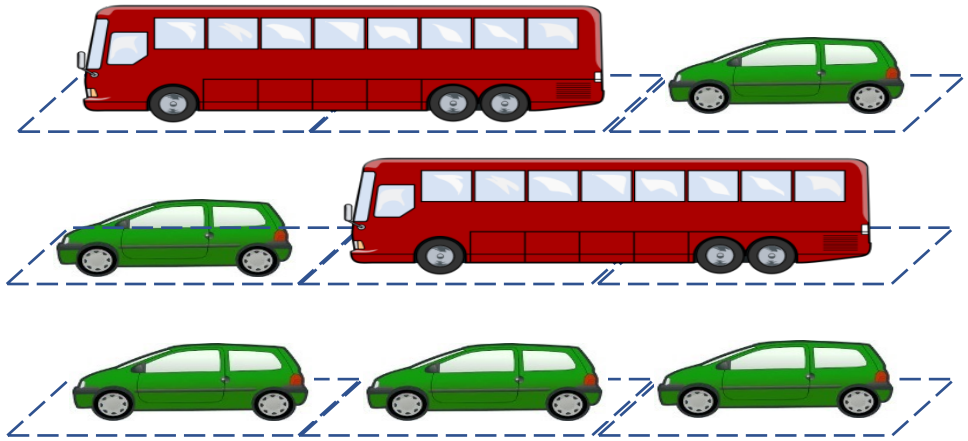
- But if there are 2 parking spaces, we can either park a bus or two cars



2 ways

How many ways to arrange cars?

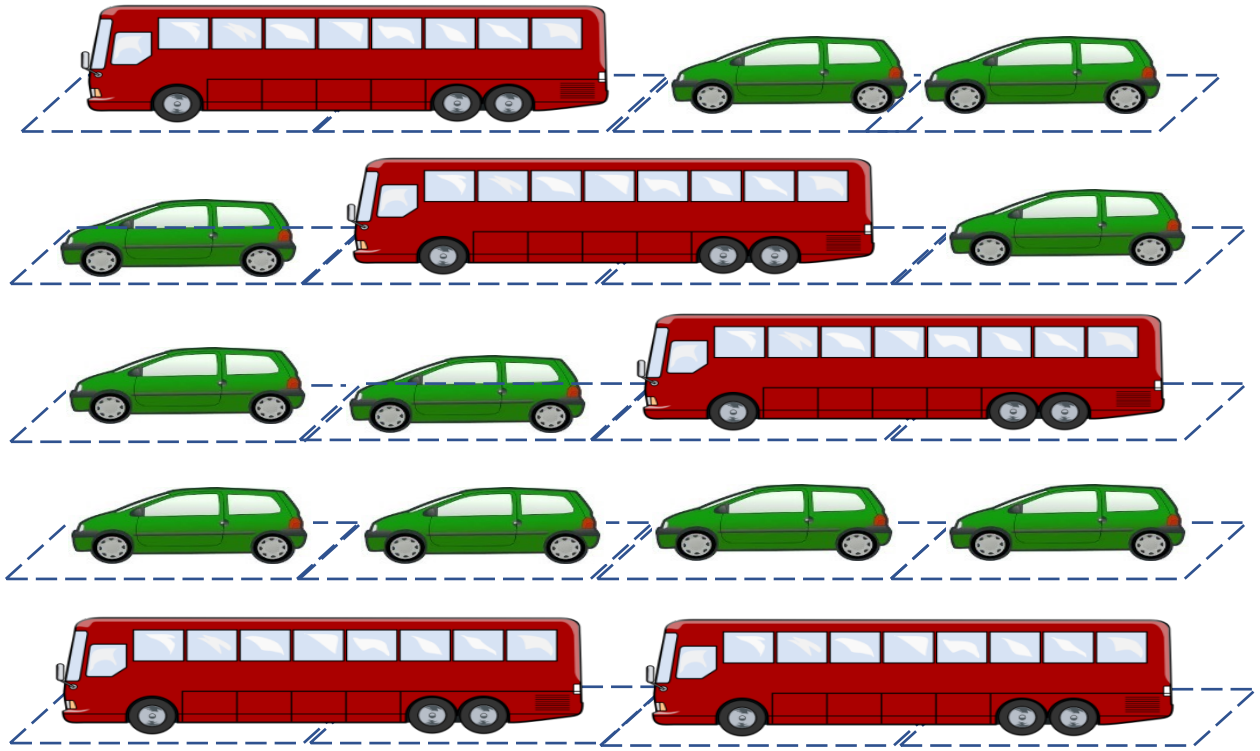
- So if we have 3 parking spaces, how many different ways can we park cars and buses?



3 ways

How many ways to arrange cars?

- So if we have 4 parking spaces, how many different ways can we park cars and buses?



5 ways

How many ways to arrange cars?

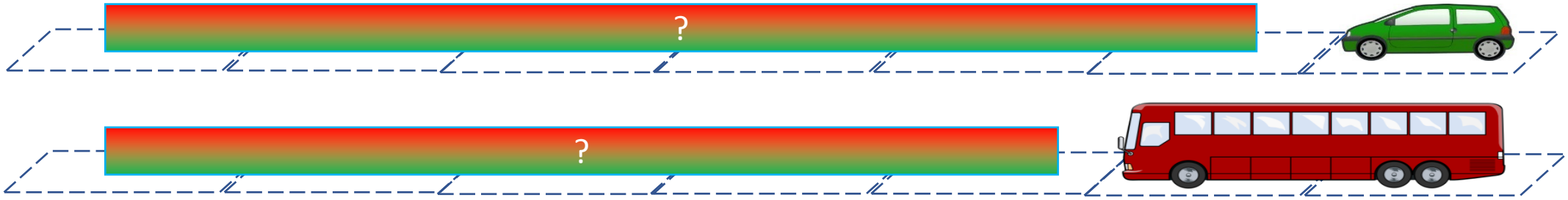
- 5 parking spaces?
- 6 parking spaces?

#parking spaces	#ways
0	1
1	1
2	2
3	3
4	5
5	8
6	13

- Can you figured out THE pattern?
  - 1, 1, 2, 3, 5, 8, 13, …
  - What is the next number?

How many ways to arrange cars?

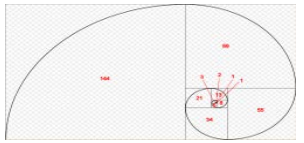
- In general, if we have n parking spaces, how many ways can we park the vehicles?
- You can think backward, the last parking space can be either a car or a bus



- If it's a car, there are n - 1 spaces left, you can have the number of way for n - 1 spaces
  - Otherwise, it's the number of way for n - 2 spaces
- So

$$f(n) = f(n - 1) + f(n - 2) \quad \text{for } f(0) = f(1) = 1$$

Fibonacci Numbers



- Fibonacci numbers are found in nature (sea-shells, sunflowers, etc)
- http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/Fibonacci/fibnat.html