Extra Exercise Session (It's never enough)

Clone the following repository: **https://github.com/jindosanda/algo_tests** and place your programs inside the exercises folder under the appropriate session folder (session_2/exercises)
Read the README files to run the tests!

Let's solve some simple programming exercises.

The problems go from easiest to hardest, let's code!

Fibonacci Sequence (fibonacci.py)

Write a function `fibonacci` (inside a the file exercises/fibonacci.py) that generates a list containing the first `n` numbers of the Fibonacci sequence.

Examples

```
>>> fibonacci(7)
[0, 1, 1, 2, 3, 5, 8]
>>> fibonacci(10)
[0, 1, 1, 2, 3, 5, 8, 13, 21, 34]
>>> fibonacci(15)
[0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377]
```

Factorial of a Number (factorial.py)

Implement a function `factorial( n )` calculates the factorial of a given number. The factorial of a number `n` is the product of all positive integers less than or equal to `n`.

Examples

```
  >>> factorial(1)
  1
  >>> factorial(3)
  6
```

```
>>> factorial(5)
120
>>> factorial(10)
3628800
>>> factorial(15)
1307674368000
```

Unique Characters (unique.py)

Write a function `unique( uniq_string )` that determines if a string `uniq_string` has all unique characters. For example, the string "hello" has repeating characters, while "uniq" does not.

Examples

```
  >>> unique("hello")
  False
  >>> unique("uniq")
  True
  >>> unique("world")
  True
  >>> unique("python")
  True
  >>> unique("passing algo course is difficult")
  False
```

Calculate the Determinant of a 2x2 Matrix (determinant.py)

Write a Python function `determinant( A )` to calculate the determinant of a 2x2 matrix. The determinant is a value that can be computed from the elements of a square matrix. For a 2x2 matrix, it provides information about the matrix that can be used in various areas of mathematics and engineering.

The determinant of a 2x2 matrix `[[a, b], [c, d]]` is calculated using the formula `ad - bc`. This value can, for example, be used to determine if the matrix is invertible.

Examples

```
>>> determinant([[1, 2], [3, 4]])
-2
>>> determinant([[5, 3], [2, 1]])
-1
>>> determinant([[3, 4], [5, 6]])
-2
>>> determinant([[1, 0], [0, 1]])
1
```

String Compression (compress_string.py)

Write a Python function `compress_string(s)` that performs basic string compression using the counts of repeated characters. For example, the string `"aabcccccaaa"` would become `"a2b1c5a3"`. If the compressed string does not become smaller than the original string, your function should return the original string. You can assume the string has only uppercase and lowercase letters (a-z).

This is useful in many areas including data transmission and file compression where reducing the size of data can significantly improve performance.

Examples

```
>>> compress_string("aabcccccaaa")
"a2b1c5a3"
>>> compress_string("abcdef")
"abcdef"
>>> compress_string("aabbccdd")
"aabbccdd"
>>> compress_string("aaabbbcccddd")
"a3b3c3d3"
```