

# Summary | Programming A-book

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## Introduction

### Definitions

#### Algorithm

Finite sequence of well-defined instructions for solving a problem. Flowcharts or pseudocode can be used to explain it.

#### Interpreter

A software that reads a source code file, goes through each line and runs the code.

#### Compiler

A software that reads a source code file, builds the software into a runnable version.

## Interning

Interning is re-using objects of equal value on-demand instead of creating new objects. This is done for memory efficiency. Frequently used for numbers and strings in different programming languages.

```
a = 120
b = 120

print(a is b) # True

c = 2000
```



```
d = 2000

print(c is d) # False
```

In the above code, 120 is intered by the Python interpreter but not 2000 . Python's integer interning is done only for numbers in the range: [-5, 256]

Python interpreter also interns small strings.

```
a = "abcd"
b = "abcd"

print(a is b) # True

# Both text are the same
c = "Lorem ipsum dolor sit amet consectetur adipisicing elit. Consequuntur perferendis is
d = "Lorem ipsum dolor sit amet consectetur adipisicing elit. Consequuntur perferendis is

print(c is d) # False
```

Strings in python can be manually interned using `sys.intern` function.

```
a, b=8, 8
c=8
d=8
```

Likewise, in the above code, only 1 integer object is created.

## Practice Resources

### Programs

The programs are listed in no specific order.

1. **is prime number:** A program that takes in a number  $n$  and outputs whether its a [prime number](#) or not.
2. **factors:** Take in a number from user. Output all of its factors.
3. **n-th factorial:** A program that takes in a number  $n$  and outputs n-th [factorial](#).
4. **is perfect number:** A program that takes in a number  $n$  and outputs whether its a [perfect number](#).
5. **fibonacci numbers:** A program that takes in a number  $n$  and prints all [fibonacci numbers](#) less than or equal to  $n$ .
6. **determinant of matrix:** Take in a matrix from user. Output the determinant of the matrix. First try for  $2 \times 2$ . Then go higher-ordered matrices.
7. **pascal's triangle:** Take  $n$  from user input. Print [pascal's triangle](#) to  $n$  rows.
8. **is valid palindrome:** Take a string input from user. Output if the input is palindrome or not.  
A phrase is a palindrome if, after converting all uppercase letters into lowercase letters and removing all non-alphanumeric characters, it reads the same forward and backward.  
Alphanumeric characters include letters and numbers. Try not to use `[::-1]`.
9. **armstrong numbers:** Take  $n$  from user input. Print all [armstrong numbers](#) (in base 10, of course) between 0 and  $n$  (inclusive).
10. **letter analysis:** Take a text input from user. Find how many times each letter is being used in that string. Use a `dictionary` to store the data. Output the final results. Try to read the text from a `.txt` file as well.
11. **word length analysis:** Take a string input from user. Print length of each word separated by a space. Try to include the summary using a `dictionary`.
12. **letter expanding:** A program that converts `b3j8k2` to `bbbjjjjjjkk`. The number can be 1 to 99.
13. **binary addition:** Take in 2 numbers in binary (as strings) and output the sum of both numbers. Try not to use `bin` function.

14. **big integer addition**: Given a *very large integer* represented as a list, where each `digits[i]` is the  $i^{\text{th}}$  digit of the integer. The digits are ordered from most significant to least significant in left-to-right order. Increment the large integer by one and return the resulting array of digits. Don't construct a `int` object.
15. **stack implementation**
16. **queue implementation**

## Platforms

- Codewars - <https://codewars.com> (my most preferred one)
- HackerRank - <https://hackerrank.com>
- Leetcode - <https://leetcode.com> (my least preferred one)

### Hard Problems

If a problem from one of these platforms feels too hard for you, you can just skip and do another problem.