

Introduction to Computers and Programming LAB-5^{2016/10/26}

- ✧ You **cannot** use **array** even if you have learned them.
- ✧ The output must be in our sample output format.
- ✧ If you cannot finish it in time, you should demo your lab work at next lab hours.
- ✧ TAs will update lab records every Monday after the lab hours in the link: <http://goo.gl/ZVJu2Y>

1. Baby Rabbits

Mr. and Mrs. Smith buy a rabbit farm. At the beginning, they only have 2 adult rabbits (1 female and 1 male). After one month, the 2 adult rabbits give birth to 2 baby rabbits (also 1 female and 1 male). Therefore, there are 2 baby rabbits and total 4 rabbits in the rabbit farm. Each baby rabbit needs 1 month to grow up to be an adult rabbit.

Assume, every adult rabbits, including female and male rabbits, can only mate once in a month to give birth to baby rabbits. Baby rabbits don't have the ability to birth baby rabbits. Besides, every turn of birth has to be 1 female and 1 male baby rabbits. That means the amount of female and male rabbit is always the same.

Some examples: Initial (after 0 month): 2 rabbits, after 1 month: 4 rabbits, after 2 months: 6 rabbits, after 3 months: 10 rabbits, etc.

Your mission is to write a program that can predict there will be how many baby rabbits and the total amount of rabbits in Mr. and Mrs. Smith's rabbit farm after X month. (X is the input number)

Notes: You needs to handle the error input range (negative integers), e.g. after "-1" months, and print "Error". And your program must be repeated.



```
After how many months:0
There are 0 baby rabbit
Total:2 rabbit

After how many months:30
There are 1664080 baby rabbit
Total:4356618 rabbit

After how many months:-7
Error
```

2. Approximation of e

Write a program that approximates e by computing the value of

$1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots + \frac{1}{n!}$ where n is an integer entered by the user. The program should allow user to input continuously.

```
Input a Number: 1
Answer: 2.000000

Input a Number: 5
Answer: 2.716667

Input a Number: 10
Answer: 2.718282

Input a Number: 20
Answer: 2.718282
```

3. Character Decoder

Write a program to convert input message by the following rule:

(1) If the input character is a number **N**, and next character **α** is not a number
Output next character **α** for **N** times.

(2) If the input character is a number **N**, and next character is also a number **M**
then you get the total number **N' = N * 10 + M**

repeat it until next character **α** is not a number, then output **α** for **N** times.

```
Please input plain text: 3a4b5c10x
Cipher text: aaabbbbccccccccccccxxx

Please input plain text: 2P1A0B1P
output text: PPAP
```

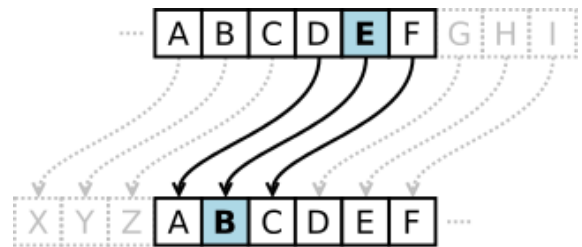
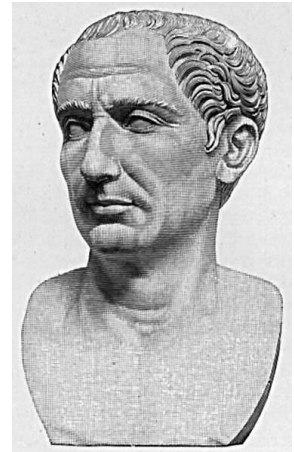
4. Caesar Cipher

The Caesar cipher is named after Julius Caesar, who, according to Suetonius, used it with a shift of three to protect messages of military significance. While Caesar's was the first recorded use of this scheme, other substitution ciphers are known to have been used earlier.

It is unknown how effective the Caesar cipher was at the time, but it is likely to have been reasonably secure, not least because most of Caesar's enemies would have been illiterate and others would have assumed that the messages were written in an unknown foreign language. There is no record at that time of any techniques for the solution of simple substitution ciphers. The earliest surviving records date to the 9th century works of Al-Kindi in the Arab world with the discovery of frequency analysis.

The action of a Caesar cipher is to replace each plaintext letter with a different one a fixed number of places down the alphabet.

The cipher illustrated here uses a left shift of three, so that (for example) each occurrence of E in the plaintext becomes B in the cipher text.



Note:

1. Your program should ignore all none alphabet character, and **print it without shift.**
2. Although the plain text may have some uppercase letters, please output cipher text in Uppercase.
3. You cannot use array even if you have learned them.

```
Please input shift: 1
Please input plain text: zero 1 Two 3
Cipher text: AFSP 1 UXP 3
```

```
Please input shift: -4
Please input plain text: Secret message!
Cipher text: OAYNAP IAOOWCA!
```