Homework 1-1

- Write an application that runs 1000 games of craps (Fig. 6.8 Craps.java) and answers the following questions:
  - a) How many games are won on the first roll, second roll, …, twentieth roll and after the twentieth roll?
  - b) How many games are lost on the first roll, second roll, …, twentieth roll and after the twentieth roll?
  - c) What are the chances of winning at craps? (贏的機率有多高)
  - d) What is the average length of a game of craps? (平均一次遊戲擲幾次骰子)

Sample Output

```
224 games won and 99 games lost on roll #1
74 games won and 119 games lost on roll #2
50 games won and 96 games lost on roll #3
33 games won and 54 games lost on roll #4
23 games won and 47 games lost on roll #5
22 games won and 37 games lost on roll #6
18 games won and 13 games lost on roll #7
8 games won and 18 games lost on roll #8
7 games won and 14 games lost on roll #9
5 games won and 6 games lost on roll #10
5 games won and 6 games lost on roll #11
4 games won and 3 games lost on roll #12
1 games won and 3 games lost on roll #13
1 games won and 0 games lost on roll #14
0 games won and 4 games lost on roll #15
1 games won and 0 games lost on roll #16
0 games won and 0 games lost on roll #17
0 games won and 1 games lost on roll #18
0 games won and 0 games lost on roll #19
0 games won and 0 games lost on roll #20
3 games won and 1 games lost on rolls
after the 20th roll

The chances of winning are 479 / 1000 =
47.90%
The average game length is 3.37 rolls.
```

Hint

- Fig. 6.8 可略做修改(類別從Craps改為CrapsAnalysis)，以紀錄必要的資訊。
- 需宣告陣列，以紀錄不同骰子投擲次數的出現次數。
  - 如diceRollingWonTimes[5] = 23代表擲5次、結果為勝有23次、 diceRollingLostTimes[5] = 47代表擲5次、結果為負有47次。
- 模擬過程中可持續累加每次的骰子投擲次數，即可算平均值。

Homework 1-2₁

- Create a class called *Complex* for performing arithmetic with complex numbers. Complex numbers have the form

  *realPart + imaginaryPart * i*

  - Use *double* variables *real* and *imaginary* to represent the private data of the class.
  - Provide a constructor that enables an object of this class to be initialized when it is declared. (以設定實部與虛部)
  - Provide a no-argument constructor with random positive double values (from 0 to 1).
    - Please use *java.security.SecureRandom* to generate random numbers.

Homework 1-2$_2$

- Provide public methods that perform the following operations:
  - Return the conjugates (共軛) of a Complex number
  - Return the absolute number (絕對值) of a Complex number
  - Add two Complex numbers
  - Subtract two Complex numbers
  - Multiply two Complex numbers
  - Divide two Complex numbers
  - Print Complex numbers in the form a + bi , where a is the real part and b is the imaginary part. (顯示到小數點後兩位)
- References:
  - https://en.wikipedia.org/wiki/Complex_number
  - https://zh.wikibooks.org/zh-tw/複數

Sample Output

```
a = 1.10 + 2.20i
Conjugates of a = 1.10 - 2.20i
Absolute value of a = 2.46

b = 3.30 - 4.40i
Conjugates of b = 3.30 + 4.40i
Absolute value of b = 5.50

a + b = 4.40 - 2.20i
a - b = -2.20 + 6.60i
a × b = 13.31 + 2.42i
a ÷ b = -0.20 + 0.40i
```

```
c = 0.29 + 0.46i
Conjugates of c = 0.29 - 0.46i
Absolute value of c = 0.54

d = 0.79 + 0.68i
Conjugates of d = 0.79 - 0.68i
Absolute value of d = 1.04

c + d = 1.08 + 1.14i
c - d = -0.49 - 0.23i
c × d = -0.08 + 0.56i
c ÷ d = 0.50 + 0.14i
```

- 不需使用者輸入，只要在Test程式中new Complex物件，並呼叫其相關的方法，再印出即可。
- a和b是直接給定實部與虛部，c和d則是亂數產生。

Hint

- For the *conjugates, add, subtract, multiply, and divide* methods of class *Complex*, return a new Complex object with the results of the calculations.
  - You need *java.lang.Math*
- For the *absoluteValue* method of class *Complex*, return a double value.
- To print an object, please add a public method: *toString()* that returns a String.
  - You can refer to https://www.javatpoint.com/understanding-toString()-method
- Please refer to ComplexTest.java.

Homework 1-3

- (Palindromes) A palindrome is a sequence of characters that reads the same backward as forward.
  - For example, each of the following seven-digit integers is a palindrome: 12321, 55555, and 45554.
- Please write an application that reads in a five-digit **integer** and determines whether it is a palindrome.
- If the number is not five digits long, please just display an error message.

Examples

```
Enter a 5-digit number: 12345
12345 is not a palindrome.
```

```
Enter a 5-digit number: 1234
Number must be 5 digits
1234 is not a palindrome.
```

(四個範例都是獨立執行的結果)

```
Enter a 5-digit number: 666666
Number must be 5 digits
666666 is not a palindrome.
```

```
Enter a 5-digit number: 12321
12321 is a palindrome!!!
```

Problem-Solving Tips

- Use division and remainder calculations to obtain the separate digits.
  - For a five-digit number to be a palindrome, the first and fifth digits must be the same, and the second and the forth digits must be the same.
- Using string to store the user input is not allowed!

Homework 1-3 (Bonus)

- Write an application that reads in an positive integer that is less than Integer.MAX_VALUE and determines whether it is a palindrome. (Using string to store the user input is not allowed!)
- If the length of the number is not an odd number or the number is out-of-range, display an error message and allow the user to enter a new value.