Java实验3

实验3：字符串/输入/随机数/布尔值操作及数组的使用

学习目标：

- 熟悉字符串基本操作
- Scanner的使用
- 随机数的使用
- 熟悉布尔变量
- 使用布尔变量进行逻辑运算
- 数组的使用

学习内容

- 字符串的基本操作函数，可以在IDE里面自行查看

```
String s;
```

Ctrl+鼠标左键点击String即可。

- 将如下代码拷贝到IDE中，修改所有的错误

```
public class StringOops {
    public static void main(String[] args) {
        Scanner console = new Scanner(System.in);
        System.out.print("Type your name: ");
        String name = console.nextString();
        process(name);
    }

    public static void process(string "name") {
        if (name == Whitaker) {
            System.out.println("You must be really awesome.");
        }
        replace("a", "e");
        toUppercase(name);
        name.substring(0, 3);
```

```
        System.out.println(name + " has " + name.length + " letters");
    }
}
```

line 5: nextString should be next
line 9: string should be String
line 9: name should not be in quotes
line 10: Whitaker should be in quotes
line 10: cannot compare strings with ==; must use .equals
line 13: cannot call replace without specifying a string object (name)
line 14: toUppercase should be toUpperCase
line 14: name. should come before toUpperCase, not passed as a parameter to it
line 14: must say name = to store the result of toUpperCase
line 15: must say name = to store the result of substring
line 16: must use parentheses () when calling length

正确版本如下，供参考。

```
public class StringOops {
    public static void main(String[] args) {
        Scanner console = new Scanner(System.in);
        System.out.print("Type your name: ");
        String name = console.next();
        process(name);
    }

    public static void process(String "name") {
        if (name.equals("Whitaker")) {
            System.out.println("You must be really awesome.");
        }
        name = name.replace("a", "e");
        name = name.toUpperCase();
        name = name.substring(0, 3);
        System.out.println(name + " has " + name.length() + " letters");
    }
}
```

- Scanner示例

```
import java.util.*;   // so you can use Scanner
...
Scanner console = new Scanner(System.in);
System.out.print("How old are you? ");   // prompt
```

```
int age = console.nextInt();
System.out.println("You typed " + age);
```

- 在IDE中，找出下面代码的所有语法错误并改正

```
public class StringOops {
    public static void main(String[] args) {
        Scanner console = new Scanner(System.in);
        System.out.print("Type your name: ");
        String name = console.nextString();
        process(name);
    }

    public static void process(string "name") {
        if (name == Whitaker) {
            System.out.println("You must be really awesome.");
        }
        replace("a", "e");
        toUppercase(name);
        name.substring(0, 3);
        System.out.println(name + " has " + name.length + " letters");
    }
}
```

line 5: nextString should be next
line 9: string should be String
line 9: name should not be in quotes
line 10: Whitaker should be in quotes
line 10: cannot compare strings with ==; must use .equals
line 13: cannot call replace without specifying a string object (name)
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- 将下面代码修改为通过使用Scanner类，从标准输入读取low和high的值并计算统计结果（任务1：类名称SimpleScanner）

```
public class SumNumbers {
    public static void main(String[] args) {
        int low = 1;
        int high = 100;
```

```
        int sum = 0;
        for (int i = low; i <= high; i++) {
            sum += i;
        }
        System.out.println("sum = " + sum);
    }
}
```

- 随机数的创建，可使用Random类

```
Random randy = new Random();
int aRandomNumber = randy.nextInt(10);  // 0-9
```

- 编写代码，创建100个属于[-17,2017]闭区间的随机数，并输出平均值（任务2：类名称CalcRandInt）
- 布尔类型及boolean关键字

示例

```
boolean test1 = 7 < 10;             // true
boolean test2 = (1 == 2);           // false
if ((test1 || test2) && 2 + 2 != 5) {
    System.out.print("hello");     // output: hello
}
```

```
String name = "Professor Smith";
if (name.startsWith("Prof")) {
    System.out.println("When are your office hours?");
}
```

- 给出如下布尔计算的结果

```
int x = 12;
int y = 7;
int z = 28;
String s = "mid term";
```

那么，如下各个表达式的值分别是true还是false？请自行分析、思考，必要时可编写代码片段确认。

```
x < 14
!(x % 2 < 1)
x < y || x < z
z / x < x / y * x
s.length() == y
s.toUpperCase().equals("MID TERM")
!s.equals("mid term") || x * y != z
s.substring(z / x).length() > y
```

- 编写程序，比较两个字符串中“-”的位置是否都完全一样，是则返回true，否则返回false（任务3：类名称CompareMinus）
    - 测试例字符串为如下两组，第一组均返回成功，第二组均返回失败

```
string 1: "hi--there-you."    "-15-389"    "criminal-plan"    "abc"
string 2: "12--(134)-7539"    "-xy-zzy"    "(206)555-1384"    "9.8"
```

```
string 1: "hello--world" "---456" "123" "-"
string 2: "bupt---Java." "1---78" "-22" "1"
```

- 数组的声明和使用

```
int[] a = new int[10];
int a[] = new int[10];
int a[] = {17, -3, 42, 5, 9, 28};

a[0] = 10;
a[1] = 11;
```

- 数组的遍历

```
int[] list = {2, 18, 6, -4, 5, 1};
for (int i = 0; i < list.length; i++) {
    list[i] = list[i] + (list[i] / list[0]);
}
```

- 补足如下代码，实现所需功能

```
public class PromptNumbers {
    public static void main(String[] args) {
```

```
        Scanner console = new Scanner(System.in);
        System.out.print("How many numbers will you enter? ");
        int count = console.nextInt();


        for (int i = ???; i < ???; i++) {
            // your code goes here; store the numbers
            System.out.print("Type a number: ");

        }

        System.out.println();
        System.out.println("Your numbers in forward order:");

        for (int i = ???; i < ???; i++) {
            // your code goes here; print the numbers in forward order

        }

        System.out.println();
        System.out.println("Your numbers in backward order:");

        // your code goes here; print the numbers in backward order

    }
}
```

- 使用Math.random()创建一个10000个范围在(-1,1)开区间的随机数的数组（任务4：类名称ArrayStatistics），要求如下：

  i. 将(-1,1)等分为20个区段，统计每个区段的数字数量并显示
  ii. 计算全部数字的数学期望并显示
  iii. 计算其均方差并显示
  iv. 使用如下函数产生随机数，重复上述1~3的工作

```
static double getNormRand()
{
    double sum = 0;
    for(int i=0; i<12; i++)
    {
        sum += Math.random();
    }
    return sum - 6;
}
```

  - 附录：

- 数学期望的计算公式

$$\mu = E(x) = \sum_{i=1}^{n} x_i P(x_i)$$

- 均方差(标准差)的计算公式

$$\sigma = SD = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$$