

Basis of Computer Programming (java A)

Tutorial 5

(The source code and document description are designed by ZHU Yueming)

[Experimental Objective]

- Learn array initializer (Declare, create, and initialize).
- Learn how to copy and print array by for loop
- Learn how to using array to realize some simple algorithms

[Before Exercises]

(1) Type following code, try to create two arrays and use two different ways to print them.

```
int[] array1 = {1,2,3,4,5};
int[] array2 = new int[5];
array2[0] = 6;
array2[1] = 7;
array2[2] = 8;
array2[3] = 9;
array2[4] = 10;

for(int i = 0; i<array1.length; i++){
    System.out.print(array1[i] + "\t");
}
System.out.println();
for(int e:array2){
    System.out.print(e + "\t");
}
System.out.println();
```

(2) Continue typing, create another array without giving it an address, and then finding what is the difference between two arrays.

```
int[] array3 = null;
System.out.println(array3);

array3=array2;
System.out.println(array3);
```

(3) Why the first loop cannot change the value of array3? The second loop can change the value.

```
for(int e:array3){
    e=1;
}
System.out.println("array3: " + Arrays.toString(array3));
for(int i = 0; i<array3.length; i++){
    array3[i] = 1;
}
System.out.println("array3: "+Arrays.toString(array3));
```

(4) We change the value of elements in array3, why are the elements in array2 changed accordingly?

```
System.out.println("array2: " + Arrays.toString(array2));
```

[Advanced]Try following code:

```
char[] Array4 = {'a', 'b', 'c'};
System.out.println(Array4);
```

[Exercises]

1. Basic operation of array
 - (1) Declare and create an array named *myList1* with n ($0 < n < 20$) elements of double type.
 - (2) Initialize *myList1* with input values and make a copy of *myList1* named *myList2*
 - (3) Circle shift the elements left in *myList1* once
 - (4) print each element in *myList1* and *myList2* using for-each loop.

```
C:\Users\sy\Desktop\Lab5_code>java Lab5E1
Enter the length of myList1:8
Enter 8 values: 2.5 5.5 3.4 6.4 7.7 2.2 8.9 0.2
myList1:5.5 3.4 6.4 7.7 2.2 8.9 0.2 2.5
myList2:2.5 5.5 3.4 6.4 7.7 2.2 8.9 0.2
```

2. Suppose there are 10 students in a class, and we want the average score of these 10 students. Input 10 scores ([0, 100]) from the keyboard. Then after removing the highest score and the smallest score, please find the average score of the other 8 scores.

```
Please input 10 scores of these students:88.3 99 45 78 67.5 98.4 23.5 65.5
82 85.4
Average score is 76.26
```

3. Write a program to compare two arrays.
 - (1) Let user input the array size,
 - (2) Let user input the two arrays,
 - (3) Output the result.

For example, the result may be

```
C:\untitled2\src>java Lab5P3
Enter the length of array:4
Enter the 1st integer array of size 4:1 2 3 4
Enter the 2nd integer array of size 4:1 2 3 4
The two arrays have the same value.

C:\untitled2\src>java Lab5P3
Enter the length of array:3
Enter the 1st integer array of size 3:1 2 3
Enter the 2nd integer array of size 3:3 2 1
The two arrays have different values.
```

4. Write a program that reads the integers between 1 and 100 and counts the occurrences of each. Assume the input ends with 0. Here is a sample run of the program

```
Enter the integers between 1 and 100: 22 33 35 34 99 87 45 34 23 78 45 33
11 23 87 34 76 0
11 occurs 1 time
22 occurs 1 time
23 occurs 2 times
33 occurs 2 times
34 occurs 3 times
35 occurs 1 time
45 occurs 2 times
76 occurs 1 time
78 occurs 1 time
87 occurs 2 times
99 occurs 1 time
```

5. Write a program to sort an out-of-order integer sequence in ascending order. Firstly, input how many numbers you will sort, after that input these integer numbers, and finally the program will output the ordered sequence.

```
How many numbers you will input:10
3 5 2 99 44 54 23 46 87 56
2 3 5 23 44 46 54 56 87 99
```

Further Reading - Bubble sort

Original sequence: 35,64,18,22,51,7

For first outer loop: make sure to move the largest number to the end of array

Compare: if(array[i] > array[i+1]){

Change the value of two elements

}

loop1: 35,64,18,22,51,7 (no change)

loop2: 35,18,64,22,51,7 (change)

loop3: 35,18,22,64,51,7 (change)

loop4: 35,18,22,51,64,7 (change)

loop5: 35,18,22,51,7,64 (change)

For second outer loop: make sure to move the second largest number to the second end position of array

loop1: 18,35,22,51,7,64 (change)

loop2: 18,22,35,51,7,64 (change)

loop3: 18,22,35,51,7,64 (no change)

loop4: 18,22,35,7,51,64 (change)

Third outer loop:

loop1: 18,22,35,7,51,64 (no change)

loop2: 18,22,35,7,51,64 (no change)

loop3: 18,22,7,35,51,64 (change)

6. Writing a program that prompts the user to enter n ($0 < n < 10^4$) integers ($0 < \text{integer} < 10^5$) in ascending order. We want the average value of combinations of picking two numbers from these n integers should larger than the average value of all these integers, and count how many couples satisfy the condition.
(Please try to design your program to accomplish this question as fast as possible)
you can use `current2-current1` to test how many time your program execute this algorithm.

```
long current1=System.currentTimeMillis();  
/* your algorithm */  
long current2=System.currentTimeMillis();  
System.out.printf("your program using %.3f  
second", (current2-current1)/1000.0d);
```

```
Enter how many numbers: 5  
Enter 5 numbers:  
1 2 3 4 5  
average=3.0  
The number of these couple is 4  
your program using 0.004 second
```

```
Enter how many numbers: 30  
Enter 30 numbers:  
2 3 5 6 9 10 12 13 15 16 23 55 66 77 89  
101 220 221 222 255 277 280 290 300 303  
400 420 455 500 520  
average=172.16666666666666  
The number of these couple is 194  
your program using 0.004 second
```