Array

Wednesday, December 28, 2022 2:16 PM

1. **What is an array and how to create an array**

ONE-DIMENSIONAL ARRAYS

An array is a data structure used to implement a list object, where the elements in the list are of the same type; for example, a class list of 25 test scores, a membership list of 100 names, or a store inventory of 500 items.

For an array of N elements in Java, index values ("subscripts") go from 0 to $N-1$. Individual elements are accessed as follows: If `arr` is the name of the array, the elements are `arr[0]`, `arr[1]`, ..., `arr[N-1]`. If a negative subscript is used, or a subscript k where $k \geq N$, an `ArrayIndexOutOfBoundsException` is thrown.

Example: [1,2,3,4,5]
["Bob", "Amy", "Nicole"]

You can think of String as an array of characters:
["N", "i", "c", "o", "l", "e"]

Notice that there can only be one type in an array

So how do we define an array of double type

1. `double[] data = new double[25];`
2. `double data[] = new double[25];`
3. `double[] data;`
   `data = new double[25];`

Use the first one

把 double[] 想象成一个class name

Or you can do the following:

INITIALIZER LIST

Small arrays whose values are known can be declared with an *initializer list*. For example, instead of writing

```
int[] coins = new int[4];
coins[0] = 1;
coins[1] = 5;
coins[2] = 10;
coins[3] = 25;
```

you can write

```
int[] coins = {1, 5, 10, 25};
```

Notice that the length of an array is fixed after creation

coins

Length of Array

A Java array has a final public instance variable (i.e., a constant), `length`, which can be accessed when you need the number of elements in the array. For example,

```
String[] names = new String[25];
< code to initialize names >

//loop to process all names in array
for (int i = 0; i < names.length; i++)
    < process names >
```

Loop through an array

```
double[] list1 = new double[3];

list1[0] = 3.1;
list1[1] = 3.3;
list1[2] = 2.7;

for (int i = 0; i < list1.length; i++) {
    System.out.println(list1[i]);
}
```

Or we can use **for each** loop

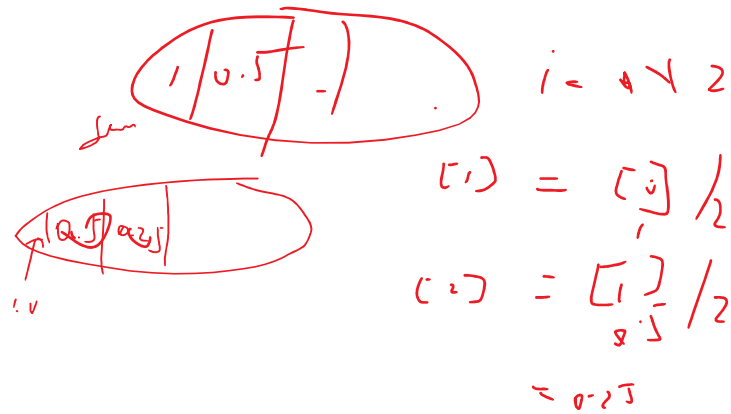
```
for (double element : list1) {
    System.out.println(element);
}
```

Some example :

Create an array of geometric sequence starting from 1 with length 20

```
double[] geometric = new double[20];
geometric[0] = 1.0;
for (int i = 1; i < geometric.length; i++) {
    geometric[i] = geometric[i-1]/2;
}

for (double element : geometric) {
    System.out.print(element + " ");
}
```



Create a method that return an array

```
public static String[] Decompose(String input) {
    // this method takes a String as input and output an array of character of that String
    String[] output = new String[input.length()];

    for (int i = 0; i < input.length(); i++) {
        output[i] = input.substring(i, i+1);
    }

    return output;
}
```

Create a method that takes an array as parameter

```
public static String Compose(String[] input) {
    // this method takes an array of string and concatenate them to one string
    String output = "";

    for (String str : input) {
        output += str;
    }

    return output;
}
```