Arrays

An *array* is a collection of objects of the same class (or values of the same type).

- Just like a Python list, a linear array is indexed from 0 to the length - 1.
- Unlike a Python list, objects (or values) must be of the same type.
- Unlike a Python list, an array cannot grow, i.e., the length is fixed.

Arrays

An array is declared like a variable in the following way:

```
Class[] name = new Class[size];
```

This is actually an abbreviation of

```
Class[] name;
name = new Class[size];
```


Arrays

Arrays

An array is declared like a variable in the following way:

```
Class[] name = new Class[size];
```

String Arrays

Example. To declare an array of 100 strings named `myArray`, put

```
String[] myArray = new String[100];
```

This is an abbreviation of

```
String[] myArray;
myArray = new String[100];
```


String Arrays

Example. To declare an array of 100 strings named `myArray`, put

```
String[] myArray = new String[100];
```


String Arrays

Example. A `for` loop to print all strings in the array `myArray`:

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


String Arrays

Example. A `for` loop to assign strings to the array `myArray`:

```
for (int i = 0; i < myArray.length; i++)
  myArray[i] = new String("string"+i);
```

int Arrays

Example. To declare an array of 100 ints named `myInts`, put

```
int[] myInts = new int[100];
```

This is an abbreviation of

```
int[] myInts;
myInts = new int[100];
```


intArrays

Example. To declare an array of 100 ints named `myInts`, put

```
int[] myInts = new int[100];
```


int Arrays

Example. A method to print an array of int:

```
public void print(int arr[]) {
    for (int k = 0; k < arr.length; k++) {
        System.out.print(arr[k] + " ");
    }
    System.out.println();
}
```


int Arrays

Example. A code segment to compute the sum of an array of int:

```
int sum = 0;
for (int k = 0; k < myInts.length; k++) {
   sum += myInts[k];
}
System.out.println("sum=" + sum);
```

int Arrays

Example. A method to print an array of int:

```
public void print(int arr[]) {
    for (int k = 0; k < arr.length; k++) {
        System.out.print(arr[k] + " ");
    }
    System.out.println();
}

print(myInts);
```


int Arrays

Example. A method to compute and return the sum of an array of int:

```
public int sum(int arr[]) {
    int sum = 0;
    for (int k = 0; k < arr.length; k++) {
       sum += arr[k];
    }
    return sum;
}

System.out.println("sum=" + sum(myInts));
```


int Arrays

Example. A method to compute and return the sum of an array of int:

```
public int sum(int arr[]) {
    int sum = 0;
    for (int k = 0; k < arr.length; k++) {
       sum += arr[k];
    }
    return sum;
}
```


int Arrays

Example. A method to return an array of random ints 1..n of length n:

```
public int[] makeRandomArray(int n) {
    int[] arr = new int[n];  // Create the array
    for (int k = 0; k < arr.length; k++) {
       arr[k] = 1 + (int)(Math.random() * n);
    }
    return arr;
}
```

Multi-dimensional arrays

Example. To declare a 5 x 10 array of ints named `table`, put

```
int[][] table = new int[5][10];
```


int Arrays

Example. A method to return an array of random ints 1..n of length n:

```
public int[] makeRandomArray(int n) {
    int[] arr = new int[n];  // Create the array
    for (int k = 0; k < arr.length; k++) {
       arr[k] = 1 + (int)(Math.random() * n);
    return arr;
}

System.out.println("sum=" + sum(makeRandomArray(100)));
```


Multi-dimensional arrays

Example. Nested `for` loops to print the sum of all numbers in the array `table`:

```
int sum = 0;
for (int i = 0; i < 5; i++)
  for (int j = 0; j < 10; j++)
    sum = sum + table[i][j];
System.out.println("Sum: " + max);
```


Multi-dimensional arrays

Example. Nested `for` loops to print all integers in the array `table`:

```
for (int i = 0; i < 5; i++) {
  for (int j = 0; j < 10; j++)
    System.out.print(table[i][j] + " ");
  System.out.println();
}
```

Multi-dimensional arrays

Example. Nested `for` loops to print the sum of numbers in each row of the array `table`:

```
int sum = 0;
for (int i = 0; i < 5; i++) {
  sum = 0;
  for (int j = 0; j < 10; j++)
    sum = sum + table[i][j];
  System.out.println("Row " + i + ": " + sum);
}
```


Multi-dimensional arrays

Example. Nested `for` loops to print the largest number in the array `table`:

```
int max = 0;
for (int i = 0; i < 5; i++)
  for (int j = 0; j < 10; j++)
    if (table[i][j] > max)
      max = table[i][j];
System.out.println("Largest: " + max);
```


Inclass Exercises

- Write a method named *getMax()* that takes an array of int as a parameter and returns the largest value in the array.
- Write a method named *squareTheArray()* that takes an array of int as a parameter and squares all its values.
- **Challenging:** Write a method named *countChs()* that takes a String as a parameter and returns an array of int that gives the counts of each letter, 'a' – 'z'. HINT: We need a trick to convert 'a' into 0, 'b' into 1, etc.