Passing Arrays to Methods

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Objectives

- To develop and invoke methods with array arguments and return values (§§7.6–7.8).
- To copy contents from one array to another (§7.5)
- To define a method with a variable-length argument list (§7.9).

Passing Arrays to Methods

```
public static void printArray(int[] array) {
  for (int i = 0; i < array.length; i++) {
    System.out.print(array[i] + " ");
  }
}
```

```
Invoke the method

int[] list = {3, 1, 2, 6, 4, 2};
printArray(list);
```

```
Invoke the method
printArray(new int[]{3, 1, 2, 6, 4, 2});
```

Anonymous array

Anonymous Array

- The statement

  printArray(new int[]{3, 1, 2, 6, 4, 2});

- creates an array using the following syntax:

  new dataType[]{literal0, literal1, ..., literalk};

- There is no explicit reference variable for the array. Such array is called an anonymous array

Pass By Value

- Java uses pass by value to pass arguments to a method.
- However, there are important differences between passing a value of variables of primitive data types and passing arrays.

Pass by Value: Primitive Data Types

- For a parameter of a primitive type value, the actual value is passed.
- Changing the value of the local parameter inside the method does not affect the value of the variable outside the method.

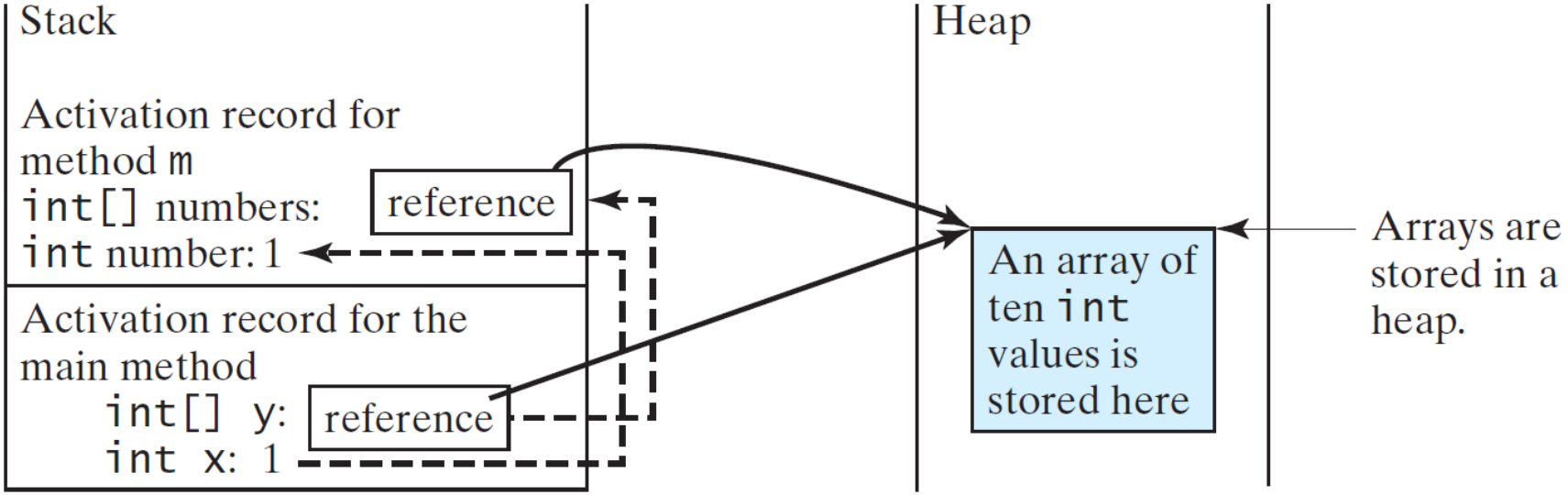
Pass by Value: Array

- For a parameter of an array type, the value of the parameter contains a reference to an array
- This reference is passed to the method.
- Any changes to the array that occur inside the method body will affect the original array that was passed as the argument.

Pass by Value: Example

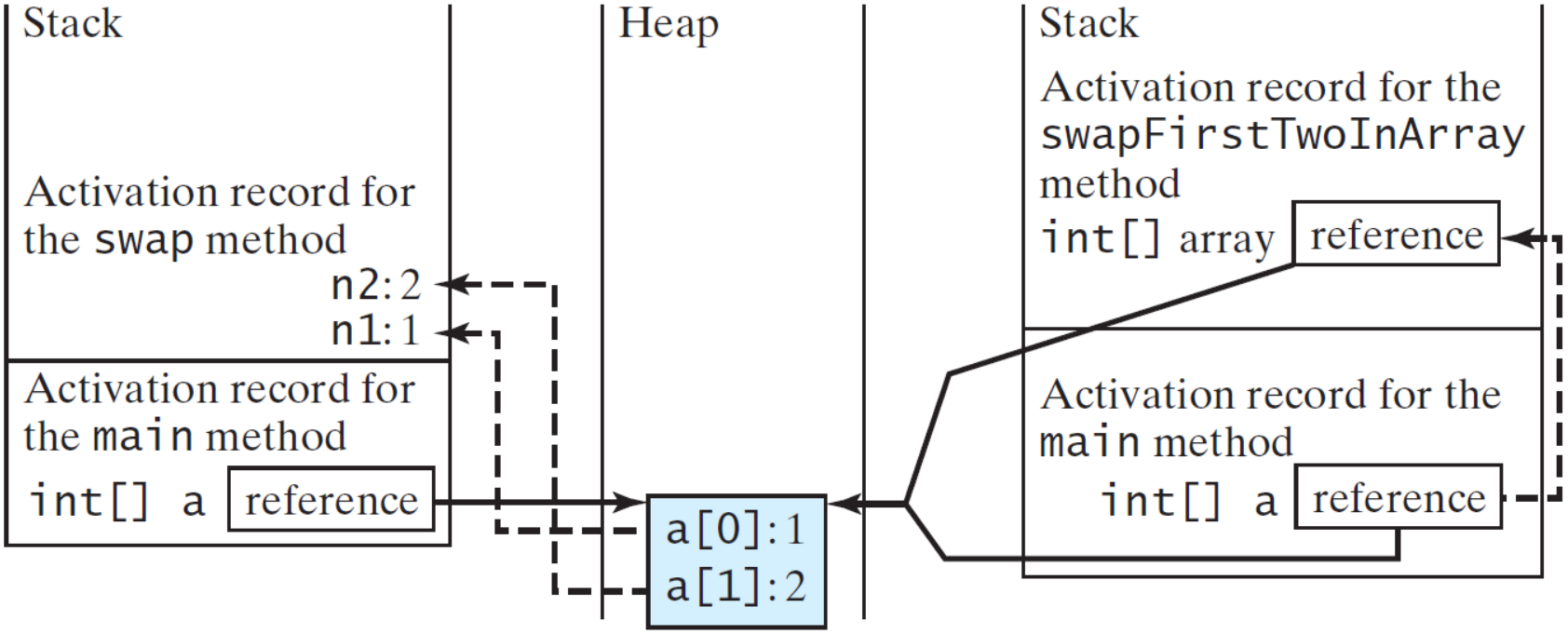
```
public class Test {
  public static void main(String[] args) {
    int x = 1; // x represents an int value
    int[] y = new int[10]; // y represents an array of int values
     m(x, y); // Invoke m with arguments x and y
     System.out.println("x is " + x);
     System.out.println("y[0] is " + y[0]);
  }
   public static void m(int number, int[] numbers) {
    number = 1001; // Assign a new value to number
    numbers[0] = 5555; // Assign a new value to numbers[0]
  }
}
```

Call Stack



- When invoking m(x, y), the values of x and y are passed to number and numbers.
- Since y contains the reference value to the array, numbers now contains the same reference value to the same array

Call Stack



- When invoking m(x, y), the values of x and y are passed to number and numbers.
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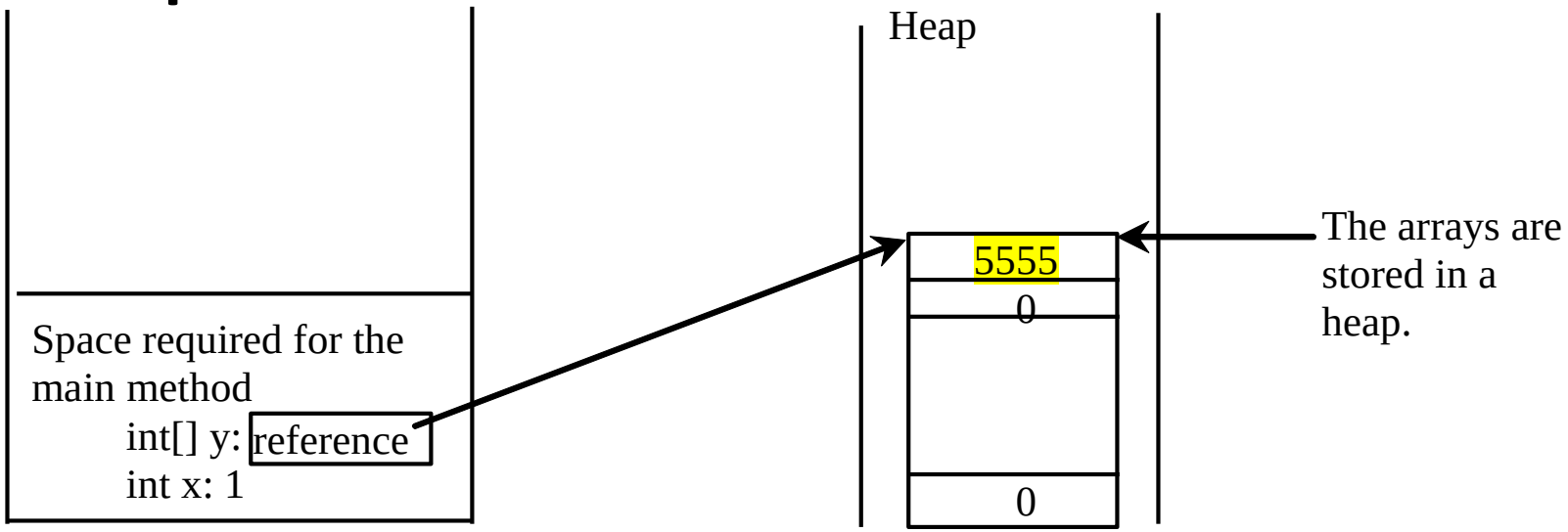
Heap

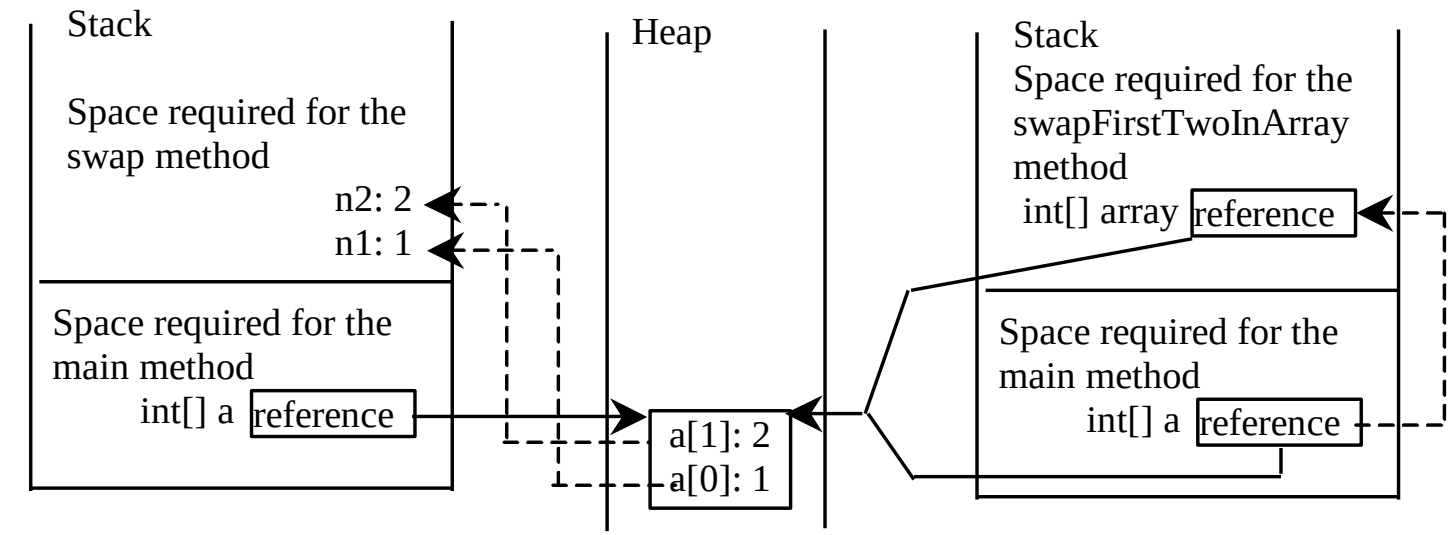


- The JVM stores the array in an area of memory, called *heap*, which is used for dynamic memory allocation where blocks of memory are allocated and freed in an arbitrary order

Questions?

Example Problem. Passing Arrays vs. Passing Primitive Data Types

- Compare swap(int n1, int n2) and swapFirstTwoInArray(int[] array)



Invoke swap(int n1, int n2). The primitive type values in a[0] and a[1] are passed to the swap method.

The arrays are stored in a heap.

Invoke swapFirstTwoInArray(int[] array). The reference value in a is passed to the swapFirstTwoInArray method.

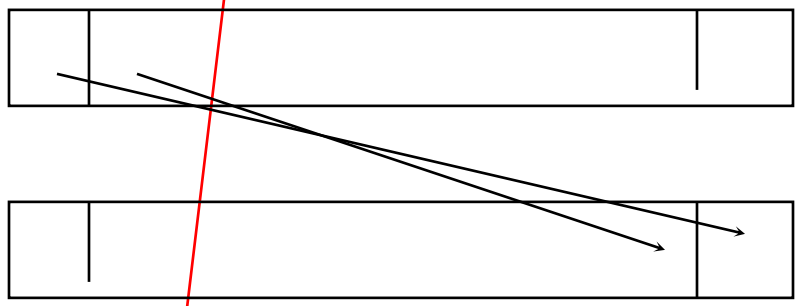
Questions?

Returning an Array from a Method

```
public static int[] reverse(int[] list) {
  int[] result = new int[list.length];

  for (int i = 0, j = result.length - 1;
       i < list.length; i++, j--) {
    result[j] = list[i];
  }

  return result;
}
```

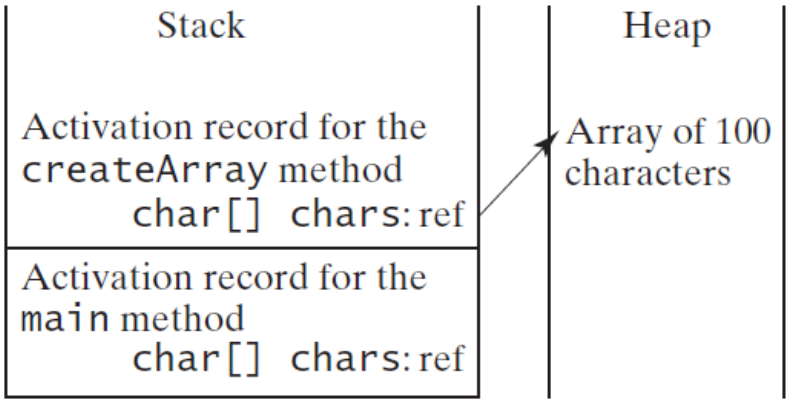



```
int[] list1 = {1, 2, 3, 4, 5, 6};
int[] list2 = reverse(list1);
```

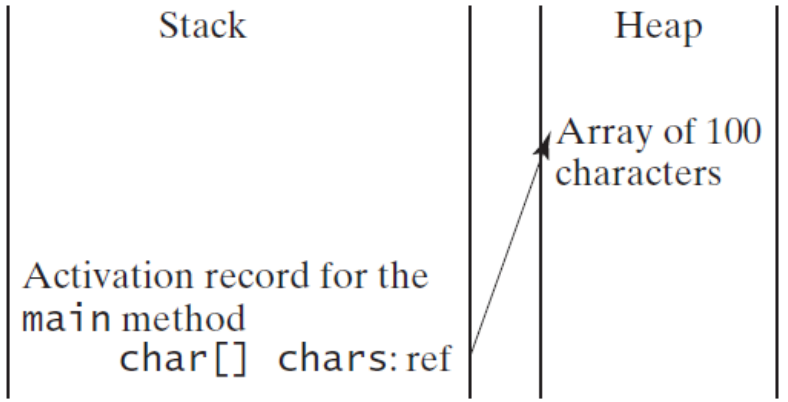
Questions

Problem. Counting Occurrence of Each Letter

- Generate 100 lowercase letters randomly and assign to an array of characters.
- Count the occurrence of each letter in the array.



(a) Executing `createArray` in line 5



(b) After exiting `createArray` in line 5

Variable-Length Arguments and Array

- You can pass a variable number of arguments of the same type to a method

Example

```
public class VarArgsDemo {
  public static void main(String[] args) {
    printMax(34, 3, 3, 2, 56.5);
    printMax(new double[]{1, 2, 3});
  }

  public static void printMax(double... numbers) {
    if (numbers.length == 0) {
      System.out.println("No argument passed");
      return;
    }

    double result = numbers[0];

    for (int i = 1; i < numbers.length; i++)
      if (numbers[i] > result)
        result = numbers[i];

    System.out.println("The max value is " + result);
  }
}
```

Questions?