CS1101 Programming and Problem Solving

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Spring 2023

Logistics

- **ZY-10** on zyBook > Assignments
  - Due: **Monday, April 24**, at 11:59pm

- Extra Credit Opportunity – OOP
  - OPTIONAL
  - 0.5pts to the course grade
  - Due: **Monday, April 24**, at 11:59pm

Common Final Exam…

- Friday, April 28th, 7-10pm, at the Sarrat Cinema
  - No alternate exam times provided
  - If you miss the exam, we will require a Dean's Notification; otherwise, a late penalty (20% - 100%) will be applied
  - No additional time will be given if you are late (make sure you know where the Sarrat Cinema is before the final exam)

- Final exam grades will be posted on Brightspace
  - If you want to look at your final exam and the deductions (if any), please email me and make an in-person appointment

Q: What’s the output of the following code?

```java
import java.util.Arrays;

public class SplitStr{
     public static void main(String []args){
        String str = "CS1101 CS2201";
        String[] strSplit = str.split("0");
        System.out.println(Arrays.toString(strSplit));
     }
}
```

```
[CS11, 1 CS22, 1]
```

Q: What elements do the array **numbers** contain after the following code is executed?

```
int[] numbers = new int[8];
numbers[1] = 4;
numbers[4] = 99;
numbers[7] = 2;
int x = numbers[1];
numbers[x] = 44;
numbers[numbers[7]] = 11;
```

```
[0, 4, 11, 0, 44, 0, 0, 2]
```

```
 public static void mystery(int[] a, int[] b) {
       for (int i = 0; i < a.length; i++) {
           a[i] = a[2 * i % a.length] - b[3 * i % b.length];
       }
}
```

Q: What are the values of the elements in array **a1** after the following code executes?

```
int[] a1 = {2, 4, 6, 8, 10, 12, 14, 16};
int[] a2 = {1, 1, 2, 3, 5, 8, 13, 21};
mystery(a1, a2);
```

```
[1, 3, -3, 13, -4, -24, -6, -14]
```

Q: True/False…

1) Scanners do not support reading the input backwards.

   True

2) When a Scanner is passed as a parameter to a method, the input cursor resets to the beginning of the File.

   False

3) When creating the FileOutputStream object for outputting to a file, if the file already exists, an exception will be thrown.

   False

4) When creating the FileOutputStream object for outputting to a file, if the file does not exist, a new file will be created.

   True

Q: True/False…

1) When you don’t write a constructor for a class, Java creates one for you **True**

2) A class can have only one constructor. **False**

3) A valid array index must be > 0 and < the length of the array. **False**

4) A class constructor method must have the same name as the class and a void return type. **False**

5) null is a Java keyword signifying no object. **True**
6) A subclass inherits and has direct access to all fields from its superclass **False**

Q: Which of the following statements about constructors are true? Check ALL that apply.

A. A constructor can be used instead of fields to represent the data inside a class.

B. A class can have many methods but only one constructor.

[✓ C.] A constructor is a special method that creates an object and initializes its state.

[✓ D.] A constructor is declared without a return type.

E. A constructor wastes memory in the computer so it should be used sparingly.

[✓ F.] A constructor is the code that is called when you use the 'new' keyword.

```
public class Vehicle {…}
public class Car extends Vehicle {…}
public class SUV extends Car {…}
```

Q: Which of the following are legal statements? Check ALL that apply.

✓ A. Vehicle v = new SUV();

B. Car c = new Vehicle();

✓ C. Car c = new SUV();

✓ D. Vehicle v = new Car();

✓ E. SUV s = new SUV();

F. SUV s = new Car();

Q: Sort the following array with Selection Sort.

Show each iteration (after iteration #x: […]).

3, 8, 9, 2, 10, 5, 7, 1

After iteration #0: [1, 8, 9, 2, 10, 5, 7, 3]

After iteration #1: [1, 2, 9, 8, 10, 5, 7, 3]

After iteration #2: [1, 2, 3, 8, 10, 5, 7, 9]

After iteration #3: [1, 2, 3, 5, 10, 8, 7, 9]

After iteration #4: [1, 2, 3, 5, 7, 8, 10, 9]

After iteration #5: [1, 2, 3, 5, 7, 8, 10, 9]

After iteration #6: [1, 2, 3, 5, 7, 8, 9, 10]

Traverse the unsorted array
Select the smallest one
Swap it to the front

Q: Sort the following array with Insertion Sort.

Show each iteration (after iteration #x: […]).

3, 8, 9, 2, 10, 5, 7, 1

After iteration #1: [3, 8, 9, 2, 10, 5, 7, 1]

After iteration #2: [3, 8, 9, 2, 10, 5, 7, 1]

After iteration #3: [2, 3, 8, 9, 10, 5, 7, 1]

After iteration #4: [2, 3, 8, 9, 10, 5, 7, 1]

After iteration #5: [2, 3, 5, 8, 9, 10, 7, 1]

After iteration #6: [2, 3, 5, 7, 8, 9, 10, 1]

After iteration #7: [1, 2, 3, 5, 7, 8, 9, 10]

Consider the first element to be sorted
Pick the first val in the unsorted part
Insert it to its proper place in the sorted part

Q: Find number 5 in the following array with Binary Search. Show each iteration (lowerIndex, upperIndex, midVal).

index: 0, 1, 2, 3, 4, 5, 6, 7

array: 1, 3, 5, 7, 8, 10, 14, 20

Iteration 1: lowerIndex = 0, upperIndex= 7, midVal = 7

remaining: 1, 3, 5

Iteration 2: lowerIndex = 0, upperIndex= 2, midVal = 3

remaining: 5

Iteration 3: lowerIndex = 2, upperIndex= 2, midVal = 5

found

Q: Write a method named **banish** that accepts two arrays of integers **a1** and **a2** as parameters and removes all occurrences of **a2**'s values from **a1**. An element is "removed" by shifting all subsequent elements one index to the left to cover it up, placing a 0 into the last index. The original relative ordering of a1's elements should be retained.

For example, suppose the following two arrays are declared and the following call is made:

```
int[] a1 = {42, 3, 9, 42, 42, 0, 42, 9, 42, 42, 17, 8, 2222, 4, 9, 0, 1};
int[] a2 = {42, 2222, 9};
banish(a1, a2);
```

After the call has finished, the contents of a1 should become:

{3, 0, 17, 8, 4, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0}

Q & A