New York University
Introduction to Computer Science
Midterm2 Sample Problems
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Instructions:

KEEP TEST BOOKLET CLOSED UNTIL YOU ARE INSTRUCTED TO BEGIN.

This exam is double sided (front and back)!

No calculators, notes, textbooks, or any other aids are allowed except writing utensils (pens, pencils, crayons, erasers, etc.) or other aids provided to you by the instructor. If you need extra scratch paper, please pick it up from the front of the class.

You should also be provided with an appendix that provides helpful documentation.

All answers must be submitted on (or attached to) this exam sheet. All answers must be clearly legible.

Commenting code: Comments aren’t required, but if you provide good comments, they can earn you partial credit if your code isn’t correct.

Total Points Available:

Total Missed:

Final Score:
Example True or False (10 points):

Instructions: Circle either True or False based on the validity of the statement.

1. A String is a mutable data type.
   
   \[
   \text{statement} = \text{true} \quad || \quad \text{statement} = \text{false};
   \]

[There are usually 5-10 questions of this type]
Example Multiple Choice (10 points):
Instructions: Circle the letter of the best answer.

1. Given a string variable named 'foo' that contains a string "Where in the world is Carmen Sandiego?", what would foo.charAt(foo.length() - 1) return?
   A. 'W'
   B. 'n'
   C. '?'
   D. 'o'
   E. 'h'

[There are usually 5-10 questions of this type]
Example Short Answer (10 points):
Instructions: In your own words, answer the questions as best as possible in one or two sentences.

1. What is the difference between a Class and an Object.

[There are usually 5-10 questions of this type]
Example Entomology - Study of Bugs (10 points):

Instructions: Find 3 bugs in the following program (there are more than three):
1) Specify the line number of the bug (Note: there can be more than one bug per line)
2) Check the box next to the type of error; either "Logic" for logic errors or "Other" for (syntax, type, etc.).
3) Write a short explanation or fix for the error.

```java
/**
 * Exercise06_03: Count occurrences of numbers entered (values between
 * <code>START_NUM_RANGE</code> and <code>END_NUM_RANGE</code>)
 */
public class Exercise06_03 {
    public static final int START_NUM_RANGE = 1;
    public static final int END_NUM_RANGE = 100;

    /**
     * Main program driver
     * @param args is ignored
     */
    public static void main(String[] args) {
        // Initialize counter array (using one extra index to simply logic)
        int[] number_counter = new int(END_NUM_RANGE + 1);

        // Get user inputed values
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter integers between "+START_NUM_RANGE+" and "+END_NUM_RANGE+": ");
        int input = scanner.nextInt(); // get next input
        while (input != 0) {
            number_counter[input]++;// update counter
            input = scanner.nextInt(); // get next input
        }

        // Print out count for values that were encountered
        for (int i = 0; i < number_counter.length; i++) {
            if (number_counter[i] == 0) {
                System.out.println(i + " occurs " + number_counter[i] + " time");
            } else if (number_counter[i] > 1) {
                System.out.println(i + " occurs " + number_counter[i] + " times");
            }
        }
    }
}
```

<table>
<thead>
<tr>
<th>Bug</th>
<th>Line #</th>
<th>Type of Error</th>
<th>Explanation or Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ ]</td>
<td>Logic Other</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>[ ]</td>
<td>Logic Other</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>[ ]</td>
<td>Logic Other</td>
<td></td>
</tr>
</tbody>
</table>
Example What is the Output (10 points):

Instructions: What is the output if the following code is run?

```java
public class OutputSample {
    public static void main(String[] args) {
        int[] ints = { 9, 8, 5, 4, 6, 7, 1, 2, 3 };  
        rearrange(ints);
        for (int value : ints) {
            System.out.print(value + " ");
        }
    }

    /**
     * Takes an array and swaps values from two positions
     */
    public static void swap(int[] ints, int index1, int index2) {
        int temp = ints[index1];
        ints[index1] = ints[index2];
        ints[index2] = temp;
    }

    public static void rearrange(int[] ints) {
        // for the number of elements in ints
        for (int count = 0; count < ints.length; count++) {
            // for every pair of elements
            for (int i = 1; i < ints.length; i++) {
                // if current element is smaller than the the next element, swap those values
                if (ints[i - 1] < ints[i]) {
                    swap(ints, i - 1, i);
                }
            }
        }
    }
}
```

Answer: 6
Example Comment the Code (10 points):

Instructions: The following code was written, but the documentation was left out. Analyze the code to determine what each function does and then what the program as a whole does. Fill in the missing comments. Be as specific as possible. Remember that Javadocs should explain WHAT the code does, and inline comments are generally best if they explain why the code is doing what it does.

```java
/**
 *
 * static int[] dostuff(int size, int min, int max)
 {
     Random rand = new Random();
     // ______________________
     int[] ints = new int[size];
     // ______________________
     for (int i = 0; i < ints.length; i++) {
         int nextRandom = rand.nextInt(max-min + 1);
         // ______________________
         nextRandom += min;
         // ______________________
         ints[i] = nextRandom;
     }
     return ints;
}

/**
 * static int doSomething(int[] ints) {
     int sum = 0;
     // ______________________
     for (int i = 0; i < ints.length; i++) {
         sum += ints[i];
     }
     return sum;
}
```
Example Fill in the Code (10 points):

Instructions: Fill in the missing code.

    public enum Day {
        SUNDAY, MONDAY, WEDNESDAY, TUESDAY, THURSDAY, FRIDAY, SATURDAY;
        /**
         * @return true if Day is a weekend, otherwise false
         */
        _______________ isWeekend() {
            switch(this) {
                case _________________:
                case _________________:
                    return true;
                _________________:
                    return false;
            }
        }
        /**
         * @return true if Day is a weekday, otherwise false
         */
        _______________ isWeekday() {
            return !_______________;
        }
        /**
         * Implicitly called when a string representation is requested
         */
        public _______________ toString() {
            switch(this) {
                case SUNDAY: return "Sunday";
                case MONDAY: return "Monday";
                case TUESDAY: return "Tuesday";
                case WEDNESDAY: return "Wednesday";
                case THURSDAY: return "Thursday";
                case FRIDAY: return "Friday";
                case SATURDAY: return "Saturday";
            }
        }
        /**
         * @return the Day of the week immediately following this Day.
         */
        _______________ getTomorrow() {
            switch(this) {
                case SUNDAY: return MONDAY;
                case MONDAY: return TUESDAY;
                case TUESDAY: return WEDNESDAY;
                case WEDNESDAY: return THURSDAY;
                case THURSDAY: return FRIDAY;
                case FRIDAY: return SATURDAY;
                case SATURDAY: return SUNDAY;
            }
Example Write the Code:

In java code, write a class that has the following data and methods:

Ball:
---data-------------
- xPosition: int
- yPosition: int
- xSpeed: int
- ySpeed: int
- size: int
---methods---------
+ Ball()
+ Ball(xPosition: int, yPosition: int, xSpeed: int, ySpeed: int, size: int)
+ updatePosition()
+ reverseSpeedY()
+ reverseSpeedX()

[There are usually about 3 of these types of questions]