

CIS 110 Fall 2015 — Introduction to Computer Programming
6 Oct 2015 — Midterm Exam

Name: _____

Recitation # (e.g., 201): _____

Pennkey (e.g., eeaton): _____

My signature below certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this examination.

Signature

Date

Instructions:

- **Do not open this exam until told by the proctor.** You will have exactly 110 minutes to finish it.
- **Make sure your phone is turned OFF (not to vibrate!) before the exam starts.**
- Food, gum, and drink are strictly forbidden.
- **You may not use your phone or open your bag for any reason**, including to retrieve or put away pens or pencils, **until you have left the exam room.**
- This exam is closed-book, closed-notes, and closed-computational devices.
- If you get stuck on a problem, it may be to your benefit to move on to another question and come back later.
- All code must be written out in proper Java format, including all curly braces and semicolons.
- Do not separate the pages. If a page becomes loose, reattach it with the provided staplers.
- Staple all scratch paper to your exam. Do not take any sheets of paper with you.
- If you require extra paper, please use the backs of the exam pages or the extra pages provided at the end of the exam. **Clearly indicate on the question page where the graders can find the remainder of your work (e.g., “back of page” or “on extra sheet”).**
- Use a pencil, or blue or black pen to complete the exam.
- If you have any questions, raise your hand and a proctor will come to answer them.
- When you turn in your exam, you may be required to show ID. **If you forgot to bring your ID, talk to an exam proctor immediately.**
- We wish you the best of luck. Have a great Fall break!

Scores: [For instructor use only]

Question 0		1 pts
Question 1		9 pts
Question 2		10 pts
Question 3		5 pts
Question 4		15 pts
Question 5		8 pts
Question 6		20 pts
Total:		68 pts

0.) The Easy One (1 point total)

- Check to make certain that your exam has all 7 pages (excluding the cover sheet).
- Write your name, recitation number, and PennKey (username) on the front of the exam.
- Sign the certification that you comply with the Penn Academic Integrity Code.

1.) Value Judgments (9 points total)

Fill in the data type and final value of the variable **a**. (Assume **a** is always declared with the most appropriate data type.) Write “**CE**” as the data type if the statements will cause compiler error, or “**RE**” if they will cause a run-time error. Give the reason for the error in the third column. The first row has been filled in for you.

	Type of a	Value of a/Error explanation
----- a = 2;	int	2
int[] b = new int[5]; ----- a = b.length;		
String s = "CIS"; ----- a = s + 110;		
String s = "CIS"; ----- a = s - 110;		
----- a = 5 % -4;		
----- a = Integer.parseInt(3);		
----- a = "A" == "A";		
----- a = 'A' == 'A';		
----- a = 4 + 7 / 2;		
----- a = 8.0 / ((int) 4.0);		

2.) Loopy Loop-de-Loops (10 points total)

Consider the following program:

```
public class Amusement {
    public static void main(String[] args) {
        int foo = 100;
        for (int i = 5; i < 25; i+= 10) {
            System.out.println(foo / i + "?");
            for (int j = 0; j <= 3; j++) {
                System.out.print(args[j] + "!");
            }
        }
    }
}
```

Assume you run the program at the DrJava interactions pane using the command below, then answer the questions:

```
java Amusement Loop-de-loop roller coasters are fun
```

2.1) (2 points) How many question marks (?) will get printed? _____

2.2) (2 points) How many exclamation points (!) will get printed? _____

2.3) (6 points) What does the program print?

3.) Changing Gears (5 points total)

Study the following program, then answer the questions.

```
public class VWDiesel {  
    public static void main(String[] args) {  
        int smog = Integer.parseInt(args[0]);  
        int emissions = 0;  
  
        while (smog != 0) {  
            emissions = 10 * emissions;  
            emissions = emissions + (smog % 10);  
            smog = smog / 10;  
        }  
  
        System.out.println(emissions);  
    }  
}
```

3.1) (2 points) What gets printed when you run "java VWDiesel 143"?

3.2) (3 points) In 15 words or less, explain in simple English what the VWDiesel program does.

4.) So the pope opens a restaurant... (15 points total)

Although it wasn't widely publicized, the pope opened a trendy new restaurant in Old City during his recent visit. The city did publish a short press release about the event, but the Secret Service classified much of the pope's long-planned remarks by garbling the text. Fortunately, an enterprising CIS 110 TA discovered a recursive program that can ungarble them among Edward Snowden's NSA leaks. Unfortunately, the leaked code is missing certain key elements.

Complete the program below, then tell us what the pope said at his new restaurant's opening.

4.1) (11 points) Complete the program:

```
public class PopeUngarbler {

    public static _____ ungarble(_____ code, _____ start, _____ end) {

        if (end < start) _____ ""; // base case

        int mid = (start + end) / 2;    // mid-point

        char a = code._____(mid); // character at mid-point

        // recursively ungarble

        return a + _____(code, start, mid - 1) + _____(code, mid + 1, end);
    }

    public static _____ main(_____ _____) {
        String a = "EEHSECTESAK";
        String b = "EAHEVN";
        String c = "TIRM-ED";
        System.out.println("Welcome to " +
                           ungarble(a, 0, a.length() - 1) + " " +
                           ungarble(b, 0, b.length() - 1) + ". " +
                           "I will be your " + ungarble(c, 0, c.length() - 1) + ".");
    }
}
```

4.2) (4 points) What did the pope say at the restaurant opening?

5.) The Trump Exam Question (8 points total)

Real-estate, gambling, reality TV mogul, and Wharton-alumnus Donald Trump is famous for his business empire of branded skyscrapers, resorts, casinos, and presidential campaigns. A fan of poker and blackjack, Trump is rumored to despise the card game bridge because it values No Trump bids above all others.

We are proud to offer you his latest—and potentially most profitable ever—luxury, Trump-branded venture: the first in what promises to be a long line of lucrative Trump Exam Questions.

```
public static int trump(int tower, int tajmahal) {  
    if (tajmahal == 0)  
        return 0;  
    else if (tajmahal % 2 == 0)  
        return trump(tower + tower, tajmahal / 2);  
    else  
        return trump(tower + tower, tajmahal / 2) + tower;  
}
```

5.1) (2 points) What is the value returned by `trump(2, 1)`?

5.2) (2 points) What is the value returned by `trump(2, 4)`?

5.3) (2 points) What is the value returned by `trump(3, 3)`?

5.4) (2 points) What was the name of this function before Trump purchased the naming rights?
(We will accept any reasonable answer.)

6.) Coding (20 points total)

Write a function `risingSequence` that takes an array of integers, and returns the length of the longest sequence of consecutive, rising numbers in the array. For example, the longest sequence of consecutive rising numbers in the array `{3, 45, 6, 12, 18, 21, 21, 19, 41, 2}` is `{6, 12, 18, 21}`, so `risingSequence` would return 4 for this array. If the array is `null`, return 0. As long as the array has at least one element, the longest sequence of consecutive rising numbers should be at least 1.

Do not write the class structure, only write the function itself. Make a reasonable effort to indent your code, but it does not have to be perfect. Comments will not be graded, so you do not have to include any at all. However you are welcome to include them — writing comments may well help you work out the solution.

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