

University of Illinois at Urbana-Champaign  
 Department of Computer Science  
**First Examination Spring 2012 SOLUTION**  
 CS 125 Introduction to Computer Science

## 1. Type Analysis and Machine Code – 9 points (3+3+3 points)

(a)

```
String text = TextIO.getln();
int result = text.length() > (int)(6*Math.random());
```

Number of Type Error(s)? <b>1</b>	<b>Cannot assign a boolean value to an integer variable.</b>
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(b)

```
int x = TextIO.getlnInt() * 2;
String result = "ABC" + x;
```

Number of Type Error(s)? <b>0</b>	<b>No errors</b>
-----------------------------------	------------------

(c) Consider the following assembly code for a simple processor:

```
LOAD 0 -> R0      # R0 is now zero.
LOAD 1 -> R1      # R1 is now one.

ADD 1 + R0 -> R0  # R0 is incremented by one.
ADD R1 + R1 -> R1 # R1 is doubled.
SUB R5 - R1 -> R4 # R4 holds the result of R5-R1 (and condition codes are updated).
BR.ZP -4         # Will jump back to the first add instruction if the zero or positive condition code is set.
```

What are the final values of R0 and R1 after the above code completes?

Initial value of R5	Final value of R0	Final value of R1
0	<b>1</b>	<b>2</b>
2	<b>2</b>	<b>4</b>
9	<b>4</b>	<b>16</b>

## 2. Execution Analysis – 10 points

(a) Read the code below then answer the four questions on the right.

```
int a = 0, b = 0, c = -1;
boolean p = true, q = true;
while(b<50) {
    c = a;
    a = TextIO.getlnInt();
    p = b == c;
    if(p) TextIO.putln(b);
    if(p && b<10) q = false;
    b++;
}
```

(b)

Identify the kind of error in the code below.

```
1 while(Math.random()<0.5) {
2     int c = (int)(Math.random() * 42);
3 }
4 TextIO.putln(c);
```

**Scope** error

(c)

What is the smallest possible value printed by this code, irrespective of user's input?

**0**

Choose one variable that best illustrates the following concepts.

*One-way flag***g***Follower/Previous value***c***Stepper/Iteration counter***b**

Carefully analyze the following code. What will it print when executed?

```
for (int a = 10; a > 1; a = a-1) {
    TextIO.put(a);
    TextIO.put(" ");
    a = a/2;
}
```

Output : 10 4

(d)

Write one value for x that will cause the last subexpression,  $z < 10$ , to be evaluated?

```
int x = ...not shown...;           Your answer: x = 11 (or any odd number > 8)
if ( (x%2 != 1) || (x < 8) || (z < 10) ) TextIO.putln();
```

### 3. Pizza Service – 14 Points

PerfectPizza provides custom Pizza recommendations based on the customer's system. Complete the program below to print one of "C", "E", "P", or "S", corresponding to Cheese, Everything, Pepperoni or Surprise types of pizza respectively, using the following rules:

- If none of the other rules below are satisfied, then recommend a **Cheese** pizza.
- Express orders always get the **Surprise** pizza.
- Non-express orders with 5 or more people who are watching a movie or partying, get **Pepperoni**.
- Non-express orders with 3 people studying get the **Everything** pizza.

```
public class PerfectPizza {
    public static void main (String[] args){
        TextIO.putln("Purpose:Movie? Party? Studying?");
        TextIO.putln("Type M, P, or S and press return");
        char purpose = TextIO.getlnChar(); // assume user types M P or S

        TextIO.putln("Express order?")
        boolean express = TextIO.getlnBoolean();

        TextIO.putln("Number of people?");
        int people = TextIO.getlnInt(); // assume user types a positive integer

        if(express) TextIO.putln("S");
        else if(people == 3 && purpose == 'S') TextIO.put("E");
        else if(people >= 5 && (purpose == 'M' || purpose == 'P')) TextIO.put("P");
        else TextIO.put("C");

        // Please continue overleaf or on the spare page if you need more space.
    } // end of main method
} // end of class
```

### 4. Text Processing (With a thermal analysis of your keyboard I found the password) – 15 Points

Complete the following program to process lines from a text file, which contains a transcript of a conversation between four pirates (Lawrence,Cinda,Lenny and Rob). Every line in the file starts with the speaker's two initials, a colon, followed by a transcript of their speech-

Complete the following to print out all of Lawrence's lines (LA) where the previous line is by Lenny Pitt (LP) and includes the text "gold" or "ship" (in upper/lower or mixed case). Stop reading lines from the file when 32 of Lawrence's lines have been printed (you can assume the file has at least this many examples). You can print out the entire line including "LA:"

```
int remain = 32;
String previous = "";
```

```

while (remain > 0) {
    String line = TextIO.getln();
    boolean print = previous.indexOf("lp") == 0 &&
(previous.indexOf("gold") > 0 || previous.indexOf("ship") > 0);
    if (print && line.indexOf("LA") == 0) {
        TextIO.putln(line);
        remain--;
    }
    previous = line.toLowerCase();
}

```

Complete the following to print out all of Cinda's lines (CH) where the previous line is by Lenny Pitt (LP) and includes the text "anchor" (in upper/lower/mixed case) and does not include "hair" (in upper/lower/mixed case). Stop reading lines from the file when 7 of Cinda's lines have been printed (you can assume the file has at least this many examples). Print out the entire line including "CH:"

```

boolean previousLP = false;
for (int remain = 7; remain > 0; ) {
    String line = TextIO.getln();
    String lower = line.toLowerCase();
    if (line.indexOf("CH") == 0 && previousLP) {
        TextIO.putln(line);
        remain--;
    }
    previousLP = line.indexOf("LP") == 0 && lower.indexOf("anchor") != -1
        && lower.indexOf("hair") == -1;
}

```

### 5. Perfect code – 15 Points

For problems i-iv, a user has reported a problem. Show where the error(s) are and fix the code appropriately. There may be more than one error per problem.

i) Support email: "It always says I passed!"

Fix the code so that it only prints when the score is greater than ten

```
boolean isOK = score > 9 10;
```

```
if (isOK = true) TextIO.putln("You got more than ten correct!");
```

ii) Support email: "I get ten correct but the program seems to just stop and not do anything!"

The variable *count* is initially a positive integer. Fix the code so that all three statements are executed by the while loop and the number of stars printed equals the initial value of *count*.

```
while (count > 1 0) { passed++; count--; TextIO.put("*"); }
```

iii) Support email: "It doesn't work properly when I just press return"

Fix the code so that an empty response is treated the same as entering "N"

```
String input = TextIO.getln();
```

```
boolean ok = input.length() > 0 && input.charAt(0) == 'Y';
```

iv) Support email: "It never finds the spoon!"

Fix the code so that "Found" is printed (without the quotes) if the line is exactly spoon.

```
String line = TextIO.getln();
```

```
if (line == "spoon") if (line.equals("spoon")) TextIO.putln("Found");
```

- v) Integer variables `a` and `c` are initially zero. Rewrite the following `while` loops to use `for` loops.  
What will be the final value of `c`?

```

while( a < 5 ) {
    a++;
    int b = 0;
    while( b < a &&
(a%2 == 0) )
        b++;
    c = c + b;
}

```

```

int b;
for( ; a < 5; c += b) {
    a++;
    for(b = 0; b < a && (a%2 == 0); b++) {}
}

```

Final value of `c`: 6

#### 6. Secret (Last Question)

Complete the program below to print the last letter of every word in lowercase. A word is a sequence of letters. All words, except the first one, are preceded by one or more non-letters (`?!space,)` etc (this list is incomplete). The line may end with a letter or non-letter character.

```

m += " "; // ensure we end with a space
boolean wasLetter = false;
for(int i = 0; i < m.length(); i++) {
    char ch = m.charAt(i);
    boolean isLetter = 'a' <= ch && ch <= 'z';
    if(!isLetter && wasLetter)
        TextIO.put( m.charAt(i-1) );
    wasLetter = isLetter;
}

```