Computer Sciences 302
Midterm Exam 1, 20%

Thursday 10/20, 2011

Print last name: ________________________________, first: __________________

Signature: ________________________________ CS login: __________________

Circle Your Lecture

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<tr>
<td>Skrentny</td>
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Before you Begin:
(1) Take a separate answer sheet (i.e., scantron) and write your UW student ID number on it.
(2) Turn in your UW student ID.
(3) On the separate answer sheet:
   - Fill in the bubbles corresponding to each digit of your UW student ID number.
   - Write your name and then fill in the bubbles corresponding to each letter.
   - In the “Special Codes” section under letter "A" write your lecture number and fill in the corresponding bubble, and under letter "B" write S but do not fill in a bubble.
(4) On this examination booklet:
   - Print and sign your name above.
   - Write your CS login and circle your lecture above.
(5) Check that there is a total of 12 pages in this exam.
(6) You may not use notes, books, calculators (or any other electronic devices), or neighbors on this exam. Turn off and put away your cell phone, pager, pda, etc. now.
(7) The exam is intended to take 90 minutes, but we will give you 2 hours to complete the exam.
(8) We can’t provide hints but if you need an exam question clarified or feel that there is an error, please bring this to our attention. If needed, corrections will be written on the board.

When you’ve Finished:
(9) Double check that you have correctly marked the bubbles on your answer sheet. Only answers marked on your answer sheet matter. Marks in this examination booklet don’t count.
(10) Turn in this examination booklet and your answer sheet, and make sure we return your ID.

Taking the Exam

There are 25 question each worth 3 points with a maximum score of 72 points (there is a bonus question).

For the questions on the following pages, choose the one best answer after reading all of the choices.

Use a #2 pencil to fill in the bubble on your answer sheet that corresponds to your answer for each question.
Note a reference is provided on the next page, which you should review when the exam begins.
Exam Reference Page

Operator Precedence Table:

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</tr>
<tr>
<td></td>
<td>+ -</td>
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Constant and Methods from the `java.lang.Math` class:

```
PI //represents the constant π
double abs (double n) //Returns the absolute value of n.
double pow (double n, double p) //Returns np.
double sqrt(double n) //Returns the square root of n.
```

Methods from the `java.lang.String` class (*REMEMBER 0-based indexing is used)*:

```
int length() //Returns # of characters in this String.
char charAt(int index) //Returns the character at the index.
boolean equals(String s)//Returns true if the contents of this String
//is the same as the contents of String s.
boolean equalsIgnoreCase(String s)// Returns true iff the contents of the
//this string is the same as that of the
//string s, ignoring differences in case.
String substring(int beginIndex)
    //Returns a new string that is a substring of this string
    //starting at beginIndex to the end of the this string.
String substring(int beginIndex, int endIndex)
    //Returns a new string that is a substring of this string
    //starting at beginIndex up to but not including endIndex.
```

Methods from the `java.util.Random` class:

```
Random() //Creates a new random number generator.
Random(int s) //Creates a new random number generator seeded with s.
int nextInt() //Returns the next pseudo-random integer value.
int nextInt(int n) //Returns the next pseudo-random integer value
    //between 0 (inclusive) and n (exclusive).
```

Methods from the `java.util.Scanner` class:

```
Scanner(System.in) //Creates a Scanner object that reads from the keyboard.
boolean hasNextInt() //Returns true if the next input would be an integer.
int     nextInt() //Returns the next input as an integer.
String  nextLine() //Returns the next input line as a String.
```
1.) Consider the following incomplete method that is passed an index named `pos` and a partially-filled array of integers named `list` with `size` guaranteed to be number of used elements in the array:

```java
public static boolean removeValue(int pos, int[] list, int size){
    if (CONDITION) {
        return false;
    }
    for (int i = pos; i < LIMIT; i++){
        array[i] = array[i+1];
    }
    STATEMENT
}
```

Which one of the following replacements for `CONDITION`, `LIMIT`, and `STATEMENT` when used to complete the code above, results in the value at index `pos` being removed from `list`?

- **A.** `pos < 0 || pos >= size; size--;`
- **B.** `pos < 0 || pos >= size; size - 1; return true;`
- **C.** `pos < 0 || pos >= size; size - 1; size--;`
- **D.** `pos < 0 && pos >= size; size--;`
- **E.** `pos < 0 && pos >= size; size - 1; return true;`

2.) What would be displayed if the following code fragment was executed?

```java
int n = 5;
if (n > 0) {
    System.out.print(n);
    n--;
}
```

A. 5  
B. 43210  
C. 54321  
D. 4  
E. 5  

3.) Consider the following code:

```java
for (int i = 1; i <= 20; i+=2) {
    System.out.println("Repeat");
}
```

How many times is the word "Repeat" displayed by this code fragment?

A. 9  
B. 10  
C. 11  
D. 20  
E. more than 20
4.) Consider the following code fragment, where \( i \) is declared as an integer and \( d \) is type double:

```java
switch (i) {
    case 10: d = 2.2; break;
    case 15: 
    case 25: d = 7.7; break;
    default: d = 1.1; break;
}
```

This fragment is equivalent to which one of the following?

A. ```java
if (i == 10) { d = 2.2; }
if (i == 15 || i == 25) { d = 7.7; }
d = 1.1;
```  

B. ```java
if (i == 10) { d = 2.2; }
else if (i == 15 || i == 25) { d = 7.7; }
else { d = 1.1; }
```  

C. ```java
if (i == 10) { d = 2.2; }
if (i >= 15 && i <= 25) { d = 7.7; }
d = 1.1;
```  

D. ```java
if (i == 10) { d = 2.2; }
else if (i >= 15 && i <= 25) { d = 7.7; }
else { d = 1.1; }
```  

E. ```java
if (i == 10) { d = 2.2; }
else if (i >= 15 || i <= 25) { d = 7.7; }
else { d = 1.1; }
```  

5.) Consider the following code fragment:

```java
String s1 = "one-fish";
String s2;
s2 = 2 + s1.substring(3);
System.out.println(s1 + "\n" + s2);
if (s1.equals(s2)) {
    System.out.println("blue fish");
} else {
    System.out.println("red fish");
}
```

What is displayed when the code fragment is executed?

A. one-fish,2-fish
   red fish
B. one-fish,2fish
   red fish
C. one-fish,2fish
   blue fish
D. one-fish,fishfish
   blue fish
E. one-fish,
   2fish
   blue fish
6.) Assume month is an integer variable representing the month number (i.e., 1 is January, 2 is February, etc.) and day is an integer variable representing the day of the month (i.e., 1 to 31). Which one of the following code fragments best implements code that displays the date in the form "month/day" except for the date October 31st, which displays "Happy Halloween" instead?

A. 
```java
if (month != 10 && day != 31) {
    System.out.println(month + "/" + day);
} else {
    System.out.println("Happy Halloween");
}
```

B. 
```java
if (month != 10) {
    if (day != 31) {
        System.out.println(month + "/" + day);
    } else {
        System.out.println("Happy Halloween");
    }
}
```

C. 
```java
if (month != 10) {
    System.out.println(month + "/" + day);
} else if (day != 31) {
    System.out.println(month + "/" + day);
} else {
    System.out.println("Happy Halloween");
}
```

D. 
```java
if (month == 10 && day == 31) {
    System.out.println("Happy Halloween");
} else {
    System.out.println(month + "/" + day);
}
```

E. 
```java
if (month == 10) {
    if (day == 31) {
        System.out.println("Happy Halloween");
    } else {
        System.out.println(month + "/" + day);
    }
}
```

7.) Consider the following code: 
```java
Random gen = new Random(11);
```

Which one of the following statements about this code is false?

A. gen references a Random object (random number generator) that has been seeded.
B. The code gen.nextInt(5) + 2 generates a random number in the range of 2 to 7 inclusive.
C. The same sequence of numbers will be generated by gen each time the program using gen is run.
D. gen is not an example of a primitive variable.
E. gen can be used as an argument in a method call.
8.) Consider the following code fragment where \texttt{density} is an integer variable:

\begin{verbatim}
if (density > 100) {
    System.out.print("Class 1");
} else if (density <= 200) {
    System.out.print("Class 2");
} else {
    System.out.print("Class 3");
}
\end{verbatim}

Which one of the following statements about this code fragment is true?

A. "Class 1" is displayed if and only if \texttt{density} is greater than 200.
B. "Class 2" is displayed if and only if \texttt{density} is less than or equal to 200.
C. "Class 2" is displayed if and only if \texttt{density} is less than 100.
D. "Class 3" is displayed if and only if \texttt{density} is equal to 100.
E. "Class 3" will never be displayed.

9.) Consider the following code fragment (assume \texttt{stdIn} is a properly constructed \texttt{Scanner} object and \texttt{answer} is a \texttt{String} object). Review the reference page if necessary.

\begin{verbatim}
do {
    // code here not shown ...  
    System.out.print("Would you like to try again? ");
    answer = stdin.next();
} while (CONDITION);
\end{verbatim}

Which one of the following replacements for \texttt{CONDITION} does \textit{not} evaluate to true if a player enters "yes"?

A. \texttt{answer == "yes"}
B. \texttt{answer.equals("yes")}
C. \texttt{answer.equalsIgnoreCase("yes")}
D. \texttt{answer.charAt(0) == 'y'}
E. \texttt{answer.charAt(0) == 'y' || answer.charAt(0) == 'Y'}

10.) Consider the following code fragments where \texttt{a} is an array of integers and \texttt{INIT} is an integer constant:

\begin{verbatim}
fragment 1
    for (int i=INIT; i < a.length; i++) {
        System.out.print(a[i]);
    }

fragment 2
    int i = INIT;
    while (i < a.length) {
        System.out.print(a[i]);
        i++;
    }
\end{verbatim}

Under which of the following circumstances will the two code fragments produce the same output?

i. \texttt{INIT} is equal to 0.
ii. \texttt{INIT} is greater than 0 but less than the array's length.
iii. \texttt{INIT} is greater than the array's length.

A. \textit{ii} only
B. \textit{iii} only
C. \textit{i} and \textit{ii} only
D. \textit{ii} and \textit{iii} only
E. \textit{i}, \textit{ii}, and \textit{iii}
11.) Consider the following incomplete method that is passed two character arrays possibly of different lengths:

```java
public static boolean isDisjoint(char[] array1, char[] array2) {
    for (int i = 0; i < array1.length; i++) {
        for (int j = 0; EXPRESSION; j++) {
            if (array1[i] OPERATOR array2[j]) {
                return VALUE;
            }
        }
    }
    return true;
}
```

Which one of the following replacements for `EXPRESSION`, `OPERATOR` and `VALUE`, when used to complete the method above, results in `true` being returned if and only if `array2` has none of the values in `array1` (i.e., `array1` and `array2` have no values in common)?

<table>
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<tr>
<th>EXPRESSION</th>
<th>OPERATOR</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. j &lt; array1.length != true</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. j &lt;= array1.length-1 == true</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. j &lt; array2.length != false</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. j &lt; array2.length == false</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. j &lt;= array2.length-1 != true</td>
<td></td>
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</tbody>
</table>

12.) Assume the code fragment below was used in Program 1 to determine which phrase to use to describe the digital pet's facial expression based on its happiness score (assume `score` is an `int` variable and `phrase` is a `String` variable):

```java
if (score >= 9) { phrase = "big smile"; }  
else if (score >= 6) { phrase = "smile"; }  
else if (score <= 3) { phrase = "frown"; }  
else { phrase = "expressionless"; }
```

If this code was put in its own method, which method header below should be used?

A. `public static void getExpression( )`  
B. `public static char getExpression(int score)`  
C. `public static String getExpression(int score)`  
D. `public static String getExpression(String word)`  
E. `public static int getExpression(String word)`

13.) Consider the following method:

```java
public static int mystery (int n) {
    int r = 0;
    while (n > 0) {
        r *= n;
        n--;
    }
    return r;
}
```

Which one of the following best describes what method `mystery` does?

A. It returns the numbers from 1 to `n` added together.  
B. It returns the numbers from 1 to `n` added together or 0 if `n` is less than 1.  
C. It returns the numbers from 1 to `n` multiplied together.  
D. It returns the numbers from 1 to `n` multiplied together or 0 if `n` is less than 1.  
E. It always returns 0.
14.) Consider the following class:

```java
public class ArrayParameters {
    public static void main(String[] args) {
        char[] a = {'a', 'e', 'i', 'o'};
        int n = 2;
        a = oops(a, n);
        for (int i = 0; i < a.length; i++) {
            System.out.print(a[i] + " ");
        }
    }
    public static char[] oops(char[] n, int a) {
        char[] c = {'r', 's', 't'};
        n[1] = c[0];
        c[a] = n[a];
        return c;
    }
}
```

Which one shows what the `ArrayParameters` program displays when executed?

A. r s e
B. r s i
C. r s t
D. a e i o
E. a r i o

15.) Consider the following flow diagram:

![Flow Diagram]

This flow diagram represents which one of the following?

A. an if statement with an if statement nested inside
B. an if statement with a while loop nested inside
C. a while loop with an if statement nested inside
D. a while loop with an if-else statement nested inside
E. a do-while loop with an while loop nested inside
16.) Assume you are given three integer variables: \( i_1, i_2 \) and \( i_3 \). Which one of the following conditions best implements the idea of "three of a kind" (i.e., the variables have the same value)?

A. \( i_1 == i_2 == i_3 \)
B. \( i_1 && i_2 && i_3 \)
C. \( i_1 == 11 && i_2 == 11 && i_3 == 11 \)
D. \( i_1 == i_2 == i_2 == i_3 \)
E. \( i_1 == i_2 && i_2 == i_3 == i_3 \)

17.) Consider the following condition where \( n \) is an integer variable:

\[
\text{\( n > -3 \) \&\& \( n <= 6 \) \&\& \( n \neq 3 \) || \( n == 9 \)}
\]

Which one of the following number lines correctly shows in bold the range of \( n \) where the condition evaluates to true? Note filled circles represent points that are included in the range and hollow circles represent points that are not included.

A. 

B. 

C. 

D. 

E. 

18.) Consider the following formula for the surface area of a right circular cone:

\[
a = \pi \times r^2 + \pi \times r \times \sqrt{h^2 + r^2}
\]

Which one of the following best implements this formula in Java? Assume the variables \( a, r, \) and \( h \) used below have been declared to be type double.

A. \( a = 3.15 \times r^2 + 3.15 \times r \times \text{Math.sqrt}(h^2 + r^2); \)
B. \( a = \text{Math.PI} \times r^2 + \text{Math.PI} \times r \times \text{Math.sqrt}(h^2 + r^2); \)
C. \( a = 3.15 \times r \times r + 3.15 \times r \times \text{Math.sqrt}(h \times h + r \times r); \)
D. \( a = \text{Math.PI} \times \text{Math.pow}(2.0, r) \)
  + \( \text{Math.PI} \times r \times \text{Math.sqrt} \left( \text{Math.pow}(2.0, h) + \text{Math.pow}(2.0, r) \right); \)
E. \( a = \text{Math.PI} \times \text{Math.pow}(r, 2.0) \)
  + \( \text{Math.PI} \times r \times \text{Math.sqrt} \left( \text{Math.pow}(h, 2.0) + \text{Math.pow}(r, 2.0) \right); \)
19.) Which one of the following statements about arrays in Java is false?

A. An array variable’s name is associated with a memory location that stores the address where its elements are found.
B. An initial values list can be used to allocate and initialize the elements of an array.
C. The length of an array can be increased by adding elements to its end.
D. A run-time error will result when the array index is out of bounds for its array.
E. When an array is passed to or returned from a method only its address is copied.

20.) Program 1 simulated 9 days in the life of a digital pet by calculating a pet’s health, happiness and hunger based on the pet owner’s actions. The code fragments below each go through 9 days displaying the day number for day. Which code fragment below accomplishes this using the best program structure?

A. for (int i = 0; i < 9; i++) {
    if (i == 0) { System.out.println("Day 1:"); }  
    else if (i == 1) { System.out.println("Day 2:"); }  
    //assume similar else if’s for days 3 - 8  
    else if (i == 9) { System.out.println("Day 9:"); }  
}

B. for (int d = 1; d <= 9; d++) {
    switch (d) {
    case 1: System.out.println("Day 1: "); break;
    case 2: System.out.println("Day 2:"); break;
    //assume similar cases for days 3 - 8
    case 9: System.out.println("Day 9:"); break;
    }
}

C. int d = 1;  
    for (int i = 0; i < 9; i++) {
    System.out.println("Day " + d + ":");
    d++;
    }

D. for (int i = 0; i < 9; i++) {
    System.out.println("Day " + (i + 1) + ":");
}

E. for (int d = 1; d <= 9; d++) {
    System.out.println("Day " + d + ":");
}

21.) Consider the following expression containing operators (identified by the numbers above them) and where a, t, z and u are variables of type double:

\[
\begin{align*}
1 & \quad 2 \quad 3 & \quad 4 & \quad 5 & \quad 6 & \quad 7 \\
\text{a} &= \left( t \times z / 2.0 \right) - \left( t \times t + 3.7 / u \right)
\end{align*}
\]

Which one lists the order that the operators are executed when the expression is evaluated? The first operator to be executed is operator 2, so its listed first. Review the reference page if necessary.

A. 2, 3, 5, 7, 6, 1, 4  
B. 2, 3, 5, 7, 6, 4, 1  
C. 2, 3, 7, 5, 6, 4, 1  
D. 2, 5, 3, 7, 6, 4, 1  
E. 2, 5, 3, 7, 4, 6, 1
22.) Consider the following code fragment where `a` is an array of integers and `stdIn` is a properly initialized `Scanner`:

```java
boolean done = false;
while (!done) {
    //location A
    System.out.print("Enter an integer: ");
    int x = stdIn.nextInt();
    for (int i = 0; i < a.length; i++)
        //location B
        if (a[i] == x) {
            //location C
            done = true;
        }
    //location D
}
//location E
```

At which of the locations labeled above can the code `System.out.print(x);` be added without causing a compile-time error?

A. only locations A and E  
B. only locations B and C  
C. only locations B and D  
D. only locations B, C and D  
E. only locations B, C, D and E

23.) Consider the following program:

```java
public class Parameters {
    public static void main(String[] args) {
        int x = 1, y = 4, z = 7;
        z += flip(x, y);
        System.out.println(x + y + z);
    }

    public static int flip(int y, int x) {
        y++;
        x--;
        return flop(x, y);
    }

    public static int flop(int x, int y) {
        return x - y;
    }
}
```

Which one of the following shows what the `Parameters` program displays when executed?

A. 6  
B. 7  
C. 13  
D. 147  
E. 148
24.) Consider the following program:

```java
public class Methods {
    public static void main(String[] args) {
        System.out.print("main, ");
        m2();
        m3();
        System.out.println("bye!");
    }
    public static void m1() {
        System.out.print("m1, ");
    }
    public static void m2() {
        m1();
        System.out.print("m2, ");
    }
    public static void m3() {
        m1();
        m2();
        System.out.print("m3, ");
    }
}
```

Which one of the following shows what the `Methods` program displays when executed?

A. `main, m1, m1, m1, m2, m2, m3, bye!`
B. `main, m1, m1, m2, m3, m1, m2, bye!`
C. `main, m1, m2, m1, m1, m2, bye!`
D. `main, m1, m2, m1, m1, m2, m3, bye!`
E. `main, m2, m1, m3, m1, m2, m1, bye!`

25.) What would be displayed if the following code fragment was executed?

```java
int count = 1;
boolean done = false;

    do {
        if (count > 4) {
            done = true;
        } else if (count % 2 == 1) {
            count += 3;
        } else {
            count--;
        }
        System.out.print(count + ", ");
    } while (!done);
```

A. `4,`
B. `4, 4,`
C. `4, 3, 6,`
D. `4, 3, 6, 6,`
E. The loop displays numbers continuously since it’s an infinite loop.