University Interscholastic League

Computer Science Competition

Number 92 (District 2 - 2005)

General Directions (Please read carefully!):

1) DO NOT OPEN EXAM UNTIL TOLD TO DO SO.

2) **NO CALCULATORS OF ANY KIND MAY BE USED.**

3) You have 45 minutes to complete this contest. If you are in the process of actually writing an answer when the signal to stop is given, you may finish writing that answer.

4) Papers may not be turned in until 45 minutes have elapsed. If you finish the test before the end of the allotted time, remain at your seat and retain your paper until told to do otherwise. You may use this time to check your answers.

5) All answers must be written on the answer sheet/Scantron card provided. Indicate your answers in the appropriate blanks provided on the answer sheet or on the Scantron card. Clean erasures are necessary for accurate Scantron grading.

6) You may place as many notations as you desire anywhere on the test paper, but not on the answer sheet or Scantron card which are reserved for answers only.

7) You may use additional scratch paper provided by the contest director.

8) All questions have ONE and only ONE correct (BEST) answer. There is a penalty for all incorrect answers. **All provided code segments are intended to be syntactically correct, unless otherwise stated. Ignore any typographical errors and assume any undefined variables are defined as used.**

9) A reference to commonly used Java classes is provided at the end of the test, and you may use this reference sheet during the contest. You may detach the reference sheets from the test booklet, but DO NOT DO SO UNTIL THE CONTEST BEGINS.

Scoring:

1) All questions will receive **6 points** if answered correctly; no points will be given or subtracted if unanswered; **2 points** will be deducted for an incorrect answer.

QUESTION 1

What is the value of 10110101_2?

A. 178_{10} B. 179_{10} C. 180_{10} D. 181_{10} E. None of these

QUESTION 2

What replaces **<*1>** in the code to the right to indicate that `main()` does not return anything?

A. `void` B. `zero`

C. `catch` D. nothing

E. None of these

```
public class Test {
  public static <*1> main(String[] args) {
    System.out.print("Hello, world!");
  }
}
```

QUESTION 3

How many `*`s are output by the code to the right if `x` is initialized to `10` and `y` is initialized to `20`?

A. `8` B. `9`

C. `10` D. `11`

E. None of these

```
// code to initialize x and y

while (x++ < y) System.out.print('*');
```

QUESTION 4

Which of these initializations of `x` and `y` would cause no `*`s to be output?

A.
```
x = 10;
y = 15;
```

B.
```
x = 10;
y = 13;
```

C.
```
x = 10;
y = 11;
```

D.
```
x = 10;
y = 9;
```

E. More than one of these

QUESTION 5

What replaces **<*1>** in the code to the right to make `employeeCount` a class variable shared by all instances of `Employee` and hidden from other classes?

A. `final` B. `static`

C. `private final` D. `private static`

E. None of these

```
public class Employee {
  <*1> int employeeCount = 0;
  // other constants and methods
  // not shown
}
```

QUESTION 6

A variable of which of these types must be cast to store its value in a variable of type `double`?

A. `byte` B. `short` C. `int` D. `long` E. None of these

QUESTION 7

What replaces **<*1>** in the code to the right to initialize private data member v to be an array of integers with the appropriate number of rows and columns?

A. `v = int[cols][rows];`

B. `v = int[rows][cols];`

C. `v = new int[cols][rows];`

D. `v = new int[rows][cols];`

E. None of these

QUESTION 8

What replaces **<*2>** in the code to the right to throw an instance of `IllegalArgumentException` with the message `"Wrong size"`?

A.
```
String s ="Wrong size";
throw new Exception(Runtime, s);
```

B.
```
throw new IllegalArgumentException(
          "Wrong size");
```

C.
```
throw new Exception(IllegalArgument,
          "Wrong size");
```

D. This is not legal since there is no `throws` list for the method

E. More than one of these

```
public class Matrix {

  public Matrix(int rows, int cols) {
    <*1>
  }

  public Matrix(int vals[][]) {
    v = vals;
  }

  public Matrix add(Matrix m) {
    if ((v.length != m.v.length) ||
        (v[0].length != m.v[0].length))
      <*2>
    Matrix answer =
         new Matrix(v.length, v[0].length);
    for (int i=0; i<v.length; ++i)
      for (int j=0; j<v[0].length; ++j)
        answer.v[i][j] =
                    v[i][j] + m.v[i][j];
    return answer;
  }

  public Matrix multiply(Matrix m) {
    // code not shown
  }

  private int v[][];
}
```

QUESTION 9

What is output by the code to the right?

A. `BocaGrande` B. `s1Grande`

C. `Bocas2` D. `s1s2`

E. None of these

```
String s1 = "Boca";
String s2 = "Grande";

System.out.print("s1" + s2);
```

QUESTION 10

What replaces **<*1>** in the code to the right as the type of an object representing the integer 278?

A. `278`

B. `int`

C. `integer`

D. `Integer`

E. None of these

```
TreeMap tm = new TreeMap();

String employee = "Jane Johnson";

<*1> id = new <*1>(278);

tm.put(employee, id);
```

QUESTION 11

What is output by the call `output("cstest")`?

A. `cstest`

B. `csteststesttesteststt`

C. `cstestcstescstecstcsc`

D. `cstestcstestcstestcstestcstestcstest`

E. None of these

QUESTION 12

Suppose the call to `substring()` is changed from `s.substring(1)` to `s.substring(0,i-1)`. What is output by the call `output("cstest")`?

A. `cstestcstescstecstcsc`

B. `csteststesttesteststt`

C. `cstestcstecs`

D. `cstesttestte`

E. None of these

```
public static void output(String s) {
  int len = s.length();
  for (int i=len; i>0; --i) {
    System.out.print(s);
    s = s.substring(1);
  }
}
```

QUESTION 13

What is returned by `mixer(0,0,2)`?

A. `-2` B. `4` C. `-6`

D. `8` E. None of these

QUESTION 14

What is returned by `mixer(6,4,-2)`?

A. `-2` B. `4` C. `-6`

D. `8` E. None of these

```
public static int mixer(int x, int y,
                                    int z) {
  x += y + z;
  y -= x + z;
  z *= x + y;
  return x + y + z;
}
```

QUESTION 15

Which of these expressions has the value `0` for all integers `x` and `y`?

A. `x & y` B. `~x & y` C. `x^x^y^y`

D. Both B and C E. A, B, and C

QUESTION 16

What replaces **<*1>** in the code to the right to call the `Shape` constructor with an argument of `-1`?

A. `super(-1);` B. `Shape(-1);`

C. `this(-1);` D. `build(-1);`

E. None of these

```
public class Circle extends Shape {
  public Circle() { this(1.0); }
  public Circle(double radius) {
    <*1>
    r = radius;
  }

  public double area() {
    return Math.PI * r * r;
  }

  public double circum() {
    return 2 * Math.PI * r;
  }

  private double r;
}
```

QUESTION 17

Which of these gives the beginning of the declaration of a class named `PlaneCircle` which extends the classes `Circle` and `PlaneObject`?

A. It is not legal to extend two classes

B.
```
public class PlaneCircle extends
                Circle and PlaneObject {
```

C.
```
public class PlaneCircle extends
          Circle extends PlaneObject {
```

D.
```
public class PlaneCircle extends
                  Circle, PlaneObject {
```

E. None of these

QUESTION 18

What is output by the code to the right?

A. `0` B. `01` C. `10`

D. `1` E. None of these

```
int x = 0, y = 1;

if (x < y)
  System.out.print(x);
else System.out.print(y);
```

QUESTION 19

What is returned by the static method call `f(4021)`?

A. `"baaa"` B. `"ba"`

C. `"baa"` D. `"b"`

E. None of these

```
public static String f(int z) {
  String s = "";
  while (z>0) {
    switch(z%10) {
    case 0: s+=s;
            break;
    case 1: s = s + 'a';
            break;
    case 2: s = 'b' + s;
            break;
    }
    z /= 10;
  }
  return s;
}
```

QUESTION 20

Which of these strings cannot be returned by `f()`?

A. `"aaaa"` B. `"baba"`

C. `"bbbb"` D. `"bababa"`

E. All of these could be returned

QUESTION 21

Suppose `IO.readLine()` reads a string of input from the keyboard and returns its representation as a `String`, removing any trailing whitespace. Which of these correctly checks that the input read from the keyboard is the word "Bill"?

A. `name == in`
B. `name.equals(in)`
C. `name.compareTo(in) == 0`
D. Both B and C
E. A, B, and C

```
String name = "Bill";

String in = IO.readString();
```

QUESTION 22

What replaces **<*1>** in the code to indicate the block of code which follows may throw exceptions that will be processed by the `catch` block?

A. `test` B. `try`
C. `error` D. `oops`
E. None of these

QUESTION 23

What replaces **<*2>** in the code to the right to extract a floating point value from `s` and store the result in `d`?

A. `d = (double)s;`
B. `d = s;`
C. `d.parseDouble(s);`
D. `d = Double.parseDouble(s);`
E. None of these

```
String s;
double d;

// code to initialize s

<*1> {
  <*2>
}
catch (Exception e) {
  d = 0;
}
```

QUESTION 24

What is output by the code to the right?

A. `15` B. `27` C. `19`
D. `array[1]` E. None of these

```
int array[] = {13, 15, 27, 19, 20};

System.out.print(array[1]);
```

QUESTION 25

What is the worst case running time of binary search on an array with `n` entries? Choose the smallest correct answer.

A. `O(1)` B. `O(log n)` C. `O(n)` D. `O(n log n)` E. None of these

QUESTION 26

What replaces **<*1>** in the code to the right to declare a reference to a `CD` named `cd` which is set to the `CD` referenced by parameter `o`?

A. `CD cd = o;`

B. `CD cd = CD(o);`

C. `CD cd = new CD(o);`

D. `CD cd = (CD)o;`

E. None of these

```
public class CD implements Comparable {

  public CD(String musician,String title) {
    this.musician = musician;
    this.title = title;
  }

  public int compareTo(Object o) {
    <*1>
    int test = musician.compareTo(
                              cd.musician);
    if (test != 0) return test;
    test = title.compareTo(cd.title);
    return test;
    }


  private String musician;
  private String title;
}
```

For the remaining questions, assume that **<*1>** has been filled in correctly.

QUESTION 27

What is output by the code below?

```
CD cd1 = new CD("Over the Rhine",
                                "Ohio");
CD cd2 = new CD("Over the Rhine",
                                "Ohio");

System.out.print(cd1.equals(cd2));
```

A. `true` B. `0` C. `1`

D. `false` E. None of these

QUESTION 28

What is output by the code below?

```
CD cd1 = new CD("Lucinda Williams",
                "Lucinda Williams");
CD cd2 = new CD("Lucinda Williams",
                "Essence");

System.out.print(cd1.compareTo(cd2));
```

A. `7` B. `-1` C. `0`

D. `-7` E. None of these

QUESTION 29

For which of these looping constructs is it possible to use a `break` statement to exit the loop?

A. `while` B. `do/while` C. `for` D. All of these E. None of these

QUESTION 30

Which of the following methods could be added to the class, providing a way to check whether a `Queue` is empty?

A.
```
public boolean isEmpty() {
  return items == null;
}
```

B.
```
public boolean isEmpty() {
  return items.length == 0;
}
```

C.
```
public boolean isEmpty() {
  return items.get(0) == Exception;
}
```

D.
```
public boolean isEmpty() {
  return items.size() == 0;
}
```

E. None of these

```
public class Queue {
  public Queue() {
    items = new LinkedList();
  }

  public void enqueue(Object o) {
    items.addLast(o);
  }

  public Object dequeue() {
    return items.removeFirst();
  }

  private LinkedList items;
}
```

QUESTION 31

What is output by the code below?

```
Queue s = new Queue();
s.enqueue("te");
s.enqueue("x");
s.enqueue("as");
System.out.print(s.dequeue());
System.out.print(s.dequeue());
System.out.print(s.dequeue());
```

A. `texas` B. `saxet`

C. `asxte` D. `etxsa`

E. None of these

QUESTION 32

What is the worst case running time of the `enqueue()` method for a `Queue` which contains `n` objects?

A. `O(1)` B. `O(log n)` C. `O(n)`

D. $O(n^2)$ E. None of these

QUESTION 33

Which of these conditions causes the right side of the boolean operator `&` not to be evaluated?

A. left side true B. right side true C. left side false D. right side false E. None of these

QUESTION 34

Which of the following outputs the character stored in `char ch`, first converting it to upper case if it is in lower case?

A.
```
System.out.print(ch);
```

B.
```
System.out.print(
                    Character.toUpperCase(ch));
```

C.
```
System.out.print(
                ch.toUpperCase());
```

D.
```
System.out.print(((ch>='a') && (ch<='z'))
                    ?(char)(ch+'A'-'a'):ch);
```

E. More than one of these

QUESTION 35

What is output by the code below?

```
int m[] = new int[27];
for (int i=0; i<27; ++i) m[i] = 3;
System.out.print(process(m));
```

A. 0 B. 3

C. 4 D. **Does not terminate**

E. None of these

QUESTION 36

What is output by the code below?

```
int m[] = {2,3,2,4,2,2,2,0};
System.out.print(process(m));
```

A. 0 B. 3

C. 4 D. **Does not terminate**

E. None of these

QUESTION 37

What is output by the code below?

```
int m[] = {2,3,2,4,2,2,2,0};
process(m);
System.out.print(m[4]);
```

A. 1 B. 2

C. 4 D. 8

E. None of these

```
public static int process(int [] m) {
  int count = 0;
  int front = m[0];
  int [] newm;
  while (front > 0 && front <= m.length) {
    newm = new int[m.length/front];
    for (int i=1; i<=newm.length; ++i)
      newm[i-1] = m[i*front-1];
    m = newm;
    front = m[0];
    count++;
  }
  return count;
}
```

QUESTION 38

What is output by the code to the right?

A. `5.5 2.25` B. `5 2.5`

C. `6 2.5` D. `5 2.0`

E. None of these

```
int x = 22, y = x/4;

double z = y/2;

System.out.print(y + " " + z);
```

QUESTION 39

Which of these is an accurate description of static method `mystery()` when its first argument is an array with an even number of integers?

A. Sorts `m`

B. Sorts `m` between index `i` and `j`

C. Partitions `m` between indices `i` and `j`

D. Merges sorted subarrays of `m` between indices `i` and `j`

E. None of these

QUESTION 40

Which of these sorting methods is most likely to use `mystery()` as a subroutine?

A. Selection Sort B. Insertion Sort

C. Merge Sort D. Quick Sort

E. More than one of these

```
public static void mystery(int m[],
                           int i, int mid, int j)
{
  int temp[] = new int[j-i];
  int a = i;
  int b = mid;
  int z = 0;
  while (a<mid && b<j)
    if (m[a]<m[b])
      temp[z++] = m[a++];
    else temp[z++] = m[b++];
  while (a<mid) temp[z++] = m[a++];
  while (b<j) temp[z++] = m[b++];
  for (z=0; z<j-i; ++z) m[i+z] = temp[z];
}
```

Computer Science Answer Key
UIL District 2 2005

1.	D	11.	B	21.	D	31.	A
2.	A	12.	A	22.	B	32.	A
3.	C	13.	C	23.	D	33.	E
4.	D	14.	C	24.	A	34.	E
5.	D	15.	C	25.	B	35.	B
6.	E	16.	A	26.	D	36.	E
7.	D	17.	A	27.	D	37.	B
8.	B	18.	A	28.	A	38.	D
9.	B	19.	E	29.	D	39.	D
10.	D	20.	D	30.	D	40.	C

IMPORTANT NOTE TO GRADERS: Correct answers receive **6 points**, and incorrect answers receive a deduction of **2 points**. No points are given or deducted for unanswered questions.