University Interscholastic League

Computer Science Competition

Number 101 (Invitational A - 2007)

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) There are 40 questions on this contest exam. 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.

9) Assume that any necessary import statements for standard Java 2 packages and classes (e.g. .util, System, Math, Double, etc.) are included in any programs or code segments that refer to methods from these classes and packages.

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 101101_2 minus 1110_2?

A. 1111_2 B. 111011_2 C. 100010_2 D. 11111_2 E. 11011_2

QUESTION 2

What is output by the code to the right?

A. 6 B. 2 C. 18

D. 12 E. 3

```
int x1 = 3;
int y1 = 2;
x1 = y1 * 3;
y1 = x1 * 2;
System.out.print( y1 );
```

QUESTION 3

How many *'s are output by the code to the right?

A. None, because the code contains a syntax error.

B. Unknown, because the code contains an infinite loop.

C. 0

D. 11

E. 10

```
for(int j = 10; j >= 0; j--)
  System.out.print("*");
```

QUESTION 4

What is output by the code to the right?

A. CS* B. CS*cs* C. CS*CS*

D. CSDCSD E. CScs

```
String s1 = "cs*";
String s2 = s1.toUpperCase() + s1;
System.out.print( s2 );
```

QUESTION 5

What is output by the code to the right?

A. 11111

B. There is no output due to a syntax error in the code.

C. 0000

D. 00000

E. The output that will be produced cannot be determined.

```
int[] list1 = new int[5];
for(int i = 0; i < list1.length; i++)
  System.out.print( list1[i] );
```

QUESTION 6

What is output by the code to the right?

A. 416 B. 412 C. 341

D. 342 E. 4167

```
int[][] mat1 = {{3,4,1,2},
                {4,1,6,7},
                {2,2,13,10}};
for(int i = 0; i < 3; i++)
  System.out.print( mat1[i][1] );
```

Question 7

What is output by the code to the right?

A. false

B. true

C. falsetrue

D. false||true

E. There is no output due to a syntax error in the code.

```
int x2 = 3;
double a2 = 2.5;
boolean b2 = x2 < a2 || x2 * a2 < 100;
System.out.print( b2 );
```

Question 8

What is output by the code to the right?

A. L

B. L_

C. 5

D. There is no output due to a syntax error in the code.

E. There is no output due to a runtime error.

```
String s3 = "CS_UIL";
if( s3.length() > 7 )
  System.out.print( s3.charAt(7) );
if( s3.length() > 5 )
  System.out.print( s3.charAt(5) );
if( s3.length() > 2 )
  System.out.print( s3.charAt(2) );
```

Question 9

What replaces **<*1>** in the code to the right so that the field size can only be accessed by code in the Square class.

A. static B. package C. public

D. private E. final

```
public class Square{
  <*1> int size;

  public Square(int s){
    size = s;
  }

  public int areas(){
    return size * size;
  }
}
```

Question 10

Assume **<*1>** is filled in correctly. What is the output of the following client code. (The code appears in a class other than Square.)

```
Square s = new Square(3);
System.out.print( s.size() );
```

A. 3

B. 9

C. 12

D. There is no output due to a syntax error in the client code.

E. There is no output due to a runtime error.

Question 11

Assume the method sample(int[] data) is O(N) where N = data.length. When the method sample is passed an array with length = 100,000 it takes 2 seconds for method sample to complete. If method sample is then passed an array with length = 200,000 what is the expected time it will take method sample to complete?

A. 4 seconds B. 2 seconds C. 3 seconds D. 8 seconds E. 1 second

QUESTION 12

What is output by the code to the right?

A. 148

B. true

C. false

D. 9

E. There is no output due to a syntax error in the code.

```
int val = 37;
val = val >> 2;
System.out.print( val );
```

QUESTION 13

What is output by the code to the right?

A. ere_   B. en_   C. ho_

D. hy   E. There is no output.

```
String sent = "what_where_when_who" +
              "_why";
String[] result = sent.split("wh+");
System.out.print( result[3] );
```

QUESTION 14

What is output by the code to the right?

A. 002.5100   B. 0000002   C. 0002.51

D. 2.51000   E. 02.5100

```
double ave = 2.51;
System.out.printf("%07.4f", ave);
```

QUESTION 15

What is output by the code to the right?

A. 1315434

B. 35434

C. 2279

D. 2345279

E. 11

```
public void process(Collection<Integer> c1,
                  Collection<Integer> c2){
  c1.removeAll(c2);
}

//client code
ArrayList<Integer> a1 = new
ArrayList<Integer>();
ArrayList<Integer> a2 = new
ArrayList<Integer>();
int[] b1 = {1, 3, 1, 5, 4, 3, 4};
int[] b2 = {2, 3, 4, 5, 2, 7, 9};
for(int i = 0; i < b1.length; i++){
  a1.add( b1[i] );
  a2.add( b2[i] );
}
process(a1, a2);
for(int i : a1)
  System.out.print( i );
```

QUESTION 16

What replaces **<*1>** in the code to the right to immediately exit the loop?

A. `return` B. `break` C. `continue`

D. `goto` E. `search()`

Assume **<*1>** is filled in correctly.

QUESTION 17

What is returned by `search(null, 0)` ?

A. Nothing is returned due to a syntax error.

B. Nothing is returned due to a runtime error.

C. `-1`

D. `null`

E. `0`

QUESTION 18

What searching algorithm is implemented by method `search`?

A. binary B. interpolation C. Monte Carlo

D. sequential E. probabilistic

QUESTION 19

What is the maximum value the variable `checks` will have in method `search`?

A. `data.length + 1`

B. `data.length`

C. `data.length / 2`

D. `tgt`

E. `data`

```
public int search(int[] data, int tgt){
  int checks = 0;
  int result = -1;
  for(int i = 0; i < data.length; i++){
    if( data[i] == tgt ) {
      result = i;
      checks++;
      <*1>;
    }
    checks++;
  }
  return result;
}
```

QUESTION 20

What is the output by the following client code?

```
int[][] d = {{13, 9, 17, 21},
             {1, 3, 0, 2}};
System.out.print( manip(d) );
```

A. `6` B. `41` C. `0`

D. `42` E. `50`

```
public int manip(int[][] data){
  int tgt = 0;
  while( data[0][tgt] > 0 ){
    data[0][tgt] -= data[1][tgt];
    tgt = data[1][tgt];
  }
  for(int i : data[0] )
    tgt += i;
  return tgt;
}
```

Question 21

What is output by the code to the right?

A. EBULLUBE

B. BLUE

C. BELUULEB

D. BLUEBLUE

E. BLUEEULB

```
// Assume Queue<E>
// is implemented correctly.
Queue<String> q1 = new Queue<String>();
Queue<String> q2 = new Queue<String>();
Queue<String> q3 = new Queue<String>();
String st = "BLUE";
for(int i = 0; i < st.length(); i++){
  int pos = st.length() - i - 1;
  q1.enqueue( st.substring(i, i+1 ) );
  q2.enqueue( st.substring(pos, pos+1) );
}
while( !q1.isEmpty() )
  q3.enqueue( q2.dequeue() +
    q1.dequeue() );

while( !q3.isEmpty() )
  System.out.print( q3.dequeue() );
```

Question 22

What is output by the code to the right?

A. c

B. cccc

C. cc

D. There is no output due to a syntax error.

E. There is no output due to a runtime error.

```
Object[] mixedBag = {"hello",
  new HashSet<Integer>(), 12,
  new ArrayList<String>()};
for(int i = 0; i < mixedBag.length; i++)
  if( mixedBag[i] instanceof Collection )
    System.out.print( "c");
```

Question 23

What is output by the code to the right?

A. There is no output due to a syntax error.

B. C

C. N

D. A

E. M

```
String st3 = "MNO";
String st4 = "ABC";
char c = (st3.charAt(1) > st4.charAt(2))
  ? st3.charAt(0) : st4.charAt(0);
System.out.print( c );
```

Question 24

What is returned by `cn(9, 1)` ?

A. Nothing is returned due to an infinite loop.

B. 0

C. -6

D. 8

E. -5

```
public int cn(int x, int y){
  if( x < 0 )
    return x;
  return cn( x - 2 * y, y * 2 );
}
```

QUESTION 25

What replaces **<*1>** in the code to the right to create an ArrayList of the proper type?

A. new ArrayList<String>()

B. ArrayList<E>()

C. new ArrayList<E>()

D. new ArrayList<E>

E. new ArrayList<Object>()

```
public <E> void mist(ArrayList<E> vals){
  int nu = 0;
  ArrayList<E> t = <*1>;
  for(int i = 0; i < vals.size(); i++){
    boolean f = false;
    int ic = 0;
    while( !f && ic < nu){
      f = <*2>;
      ic++;
    }
    if( !f ){
      t.add( vals.get(i) );
      nu++;
    }
  }
  vals.clear();
  for( E v : t )
    vals.add( v );
}
```

QUESTION 26

What replaces **<*2>** in the code to the right to test if the object at position i in vals has the same state as the object at position ic in t?

A. vals[i] == t[ic]

B. vals[i].equals(t[ic])

C. vals.get(i) == t.get(ic)

D. t(ic).equals(vals(i))

E. vals.get(i).equals(t.get(ic))

Assume **<*1>** and **<*2>** are filled in correctly.

QUESTION 27

What is output when method mistExample is called?

A. ABCEG B. ACAEBGAE C. ACEBG

D. GECBA E. AAABCEEG

```
// method mistExample is in the same
// class as method mist
public void mistExample(){
  String sd = "ACAEBGAE";
  ArrayList<String> sk = new
                     ArrayList<String>();

  for(int i = 0; i < sd.length(); i++)
    sk.add(sd.substring(i, i+1));

  mist( sk );
  for( String sc : sk )
    System.out.print( sc );
}
```

QUESTION 28

Which of the following best describes what method mist does?

A. It sorts the elements in vals in ascending order.

B. It sorts the elements in vals in descending order.

C. Nothing.

D. It shuffles the elements in vals.

E. It removes all duplicates from vals.

QUESTION 29

What is output by the code to the right?

A. 0 B. 4 C. 8

D. 0.5 E. 4_8

```
System.out.print( 4 % 8 );
```

QUESTION 30

After the code on the right executes what possible values could the variable xa be holding?

A. 6 to 15 inclusive

B. 0 to 15 inclusive

C. 5 to 14 inclusive

D. 0 to 14 inclusive

E. 5 to 15 inclusive

```
Random r = new Random();
int xa = r.nextInt( 10 ) + 5;
```

QUESTION 31

What replaces **<*1>** in the code to the right so that code in any class can access method val?

A. static B. package C. class

D. private E. public

```
public class X{
  <*1> int val(int y){
    // implementation not shown
  }
}
```

QUESTION 32

What boolean expression replaces **<*1>** in the code to the right so that the expression evaluates to true if c is a vowel? Let vowels be the characters 'a', 'e', 'i', 'o', and 'u'.

A. c=='a' || c=='e' || c=='i' || c=='o'|| c=='u'

B. c=='a' && c=='e' && c=='i' && c=='o'&& c=='u'

C. "aeiou".indexOf(c) != -1

D. Character.isLetter(c)

E. More than one of these

QUESTION 33

Assume **<*1>** is filled in correctly. What is returned by make("Moore") ?

A. oooomoorem

B. omooeoreMr

C. oMoooreM

D. moooooroem

E. omoooooorem

```
public String make(String init){

  StringBuffer s = new StringBuffer();
  s.append( init.toLowerCase() );
  char c;
  int j = 1;
  int limit = init.length();

  for(int i = 0; i < limit; i++){
    c = s.charAt( i );
    if( <*1> ){
      s.insert(j, c);
      j += 2;
    }
    else
      s.append(c);
  }
  return s.toString();
}
```

QUESTION 34

What is returned by use(3) ?

A. Nothing is returned due to a runtime error.

B. Nothing is returned due to a syntax error.

C. 0

D. 3

E. The return value will not be known until the program is run.

```
public int use(int y){
  int x;
  return y * x;
}
```

Question 35

What Boolean expression replaces **`<*1>`** in the code to the right to check if the element at position `j` in `data` is less than the element at position `(j + 1)` in `data` according to the natural ordering of its class?

A. `data[j].compareTo(data[j+1]) < 0`

B. `data[j] < data[j+1]`

C. `data[j].compareTo(data[j+1]) == 0`

D. `data[j+1].compareTo(data[j]) > 0`

E. More than one of these.

Question 36

Assume **`<*1>`** has been filled in correctly.
What replaces **`<*2>`** in the code to the right to swap the elements at positions `j` and `j+1` ?

A.
```
Object temp = data[j];
data[j] = data[j+1];
data[j+1] = temp;
```

B.
```
data[j] = data[j+1];
data[j+1] = data[j];
```

C.
```
int temp = data[j];
data[j] = data[j+1];
data[j+1] = temp;
```

D.
```
Comparable temp = data[j];
data[j] = data[j+1];
data[j+1] = temp;
```

E.
```
data[j] = data[j] ^ data[j+1];
data[j+1] = data[j+1] ^ data[j];
```

Question 37

Assume **`<*1>`** and **`<*2>`** have been filled in correctly.
Which of the following best describes what method `move` does to the elements of `data` ?

A. It sorts the elements into ascending order.

B. It sorts the elements into descending order.

C. It only puts the maximum element into position 0.

D. Nothing.

E. It randomizes the elements.

```
public void move(Comparable[] data){
  int lim1 = data.length - 1;
  for(int i = 0; i < lim1; i++){
    int lim2 = data.length - i - 1;
    for(int j = 0; j < lim2; j++)
      if( <*1> ){
        <*2>
    }
  }
}
```

QUESTION 38

What is output by the code to the right?

A. There is no output due to a syntax error.

B. There is no output due to a runtime error.

C. `LIUUIL`

D. `UILUIL`

E. `UILLIU`

```
LinkedList<Character> list3 =
          new LinkedList<Character>();
String n = "UIL";
for(int i = 0; i < n.length(); i++){
  list3.addFirst( n.charAt(i) );
  list3.addLast( n.charAt(i) );
}
for( char ch : list3 )
  System.out.print( ch );
```

QUESTION 39

What is output by the code to the right?

A. There is no output due to a syntax error.

B. There is no output due to a runtime error.

C. `false`

D. `true`

E. `null`

```
ArrayList<Integer> data1 =
                new ArrayList<Integer>();
ArrayList<Integer> data2 = null;
System.out.println( data1 == data2 );
```

QUESTION 40

What is output by the code to the right?

A. `c1c1c22`

B. `c12`

C. `c1c12`

D. `c1c1c21`

E. `truefalsetrue2`

```
public static boolean con1(int x, int y){
  System.out.print("c1");
  return x < y;
}

public static boolean con2(int x, int y,
                         int z){
  System.out.print("c2");
  return x + y < z;
}

//client code
int x5 = 2;
int y5 = 3;
if( con1(x5,y5) && con1(x5 * 2,y5)
    && con2(x5, y5, x5) )
  System.out.print(1);
else
  System.out.print(2);
```

Computer Science Answer Key
UIL Invitational A 2007

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