University Interscholastic League
Computer Science Competition

Number 145 (District 1 - 2014)

General Directions:

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

2) **NO CALCULATOR 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. 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.

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.

Note: Correct responses are based on Java, **J2sdk v 1.7.25**, from Sun Microsystems, Inc. All provided code segments are intended to be syntactically correct, unless otherwise stated (i. e. `error` is an answer choice) and any necessary Java 2 Standard Packages have been imported. Ignore any typographical errors and assume any undefined variables are defined as used. **For all output statements, assume that the System class has been statically imported…** ***import static java.lang.System.*;***

QUESTION 1

Which of these is NOT equivalent to $10101_2 + 10000_2$?

A. 35_{10} B. 45_8 C. 25_{16} D. 100101_2 E. All are equivalent

QUESTION 2

For which initial values of p and q will the code on the right output `true`?

A. `p=true, q=true;` B. `p=false, q=true;`

C. `p=true, q=false;` D. `p=false, q=false;`

E. None of these

```
boolean p=<value1>, q=<value2>;
out.println(p&&q);
```

QUESTION 3

What is output by the code to the right?

A. `4` B. `4.0` C. `5`

D. `5.0` E. `6`

```
double a = 4.1573;
out.println(Math.ceil(a));
```

QUESTION 4

What is output by the code to the right?

A. `13.9` B. `15.7`

C. `27.0` D. `27.4`

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

```
double x = 13.7;
x = 2 * x;
out.println(x);
```

QUESTION 5

What is output by the code to the right?

A. `biminitop biminitop`

B. `biminitop bikinitop`

C. `bikinitop bikinitop`

D. `bikinitop biminitop`

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

```
String s = "biminitop";
String t = s.replace('m','k');
out.println(s+" "+t);
```

QUESTION 6

What is output by the code to the right?

A. `-4.0` B. `-5.0`

C. `-8.2` D. `-9.0`

E. `17.0`

```
out.printf("%.1f\n",9/2-6.5*2);
```

QUESTION 7

What is output by the code to the right?

A. `null` B. `null5` C. `5`

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

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

```
Integer x = null;
int y = 5;
out.println(x + y);
```

QUESTION 8

What is output by the code to the right?

A. `-50 -2 1` B. `-49 -56 57`

C. `-51 -1 0` D. `-51 -56 55`

E. `-50 -56 56`

```
int x = ~50;
int y = x/7<<3;
int z = ~y;
out.println(x+" "+y+" "+z);
```

QUESTION 9

What is output by the code to the right?

A. `Chill` B. `Dude`

C. `Yo` D. `Sup`

E. `DudeSupWordChill`

```
char a = 'e';
switch(a)
{
  case 'a':out.println("Yo");break;
  case 'e':out.println("Dude");break;
  case 'i':out.println("Sup");break;
  case 'o':out.println("Word");break;
  default :out.println("Chill");
}
```

QUESTION 10

What is output by the code to the right?

A. `7` B. `6`

C. `5` D. `4`

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

```
int x=0;
String [] a = {"red","white","blue"};
char[][]list=new char[a.length][];
for(String s:a)
  list[x]=a[x++].toCharArray();
int k=0;
for(char[]j:list)
  for(char m:j)
     k+="yellow".indexOf(m)>=0?0:1;
  out.println(k);
```

QUESTION 11

The `toString` method is partially implemented in the code to the right. Which statement below would **best** replace <statement1> so that the output in the client code shows `"6 string acoustic"`?

A. `return "6 string acoustic"`

B. `return numStrings + " string " + type`

C. `out.println("6 string acoustic")`

D. `out.println(numStrings + " string " + type)`

E. `"6 string acoustic"`

QUESTION 12

In what Java class is the `toString` method originally defined ?

A. `Guitar`

B. `Object`

C. `System`

D. `String`

E. `Scanner`

QUESTION 13

What term refers to redefining the `toString` method as shown in the code to the right ?

A. inheritance

B. overloading

C. overriding

D. polymorphism

E. interfacing

```
class Guitar
{
  private String type;
  private int numStrings;
  public Guitar()
  {
     type = "acoustic";
     numStrings = 6;
  }
  public Guitar(int n)
  {
     this();
     numStrings = n;
  }
  public Guitar(int n, String s)
  {
     this(n);
     type = s;
  }
  public String toString()
  {
     <statement1>;
  }
////////////////////////////////
////client code
Guitar g = new Guitar();
out.println(g);
```

QUESTION 14

What is output by the code to the right?

A. `523` B. `637`

C. `790` D. `951`

E. `1003`

```
static int stuf(int [] list){
  int k=0,m=0;
  for(int x:list){
     int c=0;
     String s = Integer.toString(x);
     char []ss=s.toCharArray();
     for(char a:ss)
        c+=a-48;
     if(c>k){
        k=c;m=x;
     }
  }
  return m;
}
//client code
int [] list = {523,637,951,790,1003};
out.println(stuf(list));
```

QUESTION 15

What is output by the code to the right?

A. `630` B. `963` C. `9630`

D. There is no error, but there is no output

E. There is no output due to a compile error

```
for(int x=9; x==0;x-=3)
  out.print(x);
```

QUESTION 16

What is output by the code to the right?

A. `123456` B. `125456` C. `156456`

D. `153456` E. `433456`

```
int [] list = {1,2,3,4,5,6};
list[list[1]]=list[list[4]];
list[1]=list[list[3]];
for(int x:list)
 out.print(x);
```

QUESTION 17

What is output by the client code to the right?

A. `2.0` B. `6.0` C. `8.0`

D. `10.0` E. `14.0`

QUESTION 18

What term best describes the function of the `myst` method defined on the right?

A. Euclid's greatest common factor algorithm

B. Pascal's triangle

C. Leibniz integral rule

D. Newton's law of gravitation

E. Pythagorean theorem

```
public static double myst(double A,
double B)
{
  double AA = Math.pow(A,2);
  double BB = Math.pow(B,2);
  double C = Math.sqrt(AA+BB);
  return C;
}
//client code
double a = 6.0;
double b = 8.0;
out.println(myst(a,b));
```

QUESTION 19

What is output by the code to the right?

A. `1` B. `-1` C. `9` D. `-9` E. `0`

```
String a = "Auburn";
String b = "Alabama";
out.println(a.compareTo(b));
```

QUESTION 20

What is output by the code to the right?

A. `B4 114 1110010` B. `B4 176 10110000`

C. `B4 180 10110100` D. `B4 B416 1011010000010110`

```
String s = "B4";
int i = Integer.parseInt(s,16);
String t = Integer.toBinaryString(i);
out.println(s+" "+i+" "+t);
```

QUESTION 21

What is output by the code to the right?

A. -21 B. -27 C. 21

D. 24 E. 27

```
static int t(int x)
{
  return x%7>3?x-3:x+3;
}
//client code
out.println(t(24));
```

QUESTION 22

What is output by the code to the right?

A. 01100100 B. 0110010 C. 100

D. 1100100 E. 1101100

```
String s;
s = Integer.toBinaryString(100>>32);
out.println(s);
```

QUESTION 23

What is output by the code to the right?

A. -1.00 B. 0.50 C. 0.71

D. 1.00 E. 1.73

```
double d = Math.log(Math.E);
out.printf("%.2f\n",d);
```

QUESTION 24

What is output by the code to the right?

A. 10000000000000000000000000000000 (1, 31 0s)

B. 100000000000000000000000000000000 (1, 32 0s)

C. 11111111111111111111111111111111 (32 1s)

D. 11111111111111111111111111111111 (32 1s, 0)

E. 10000000000000000000000000000001 (1, 30 0s, 1)

```
int x = Integer.MIN_VALUE;
String s = Integer.toBinaryString(x);
out.println(s);
```

QUESTION 25

Find f(-4) according to the recursive function definition shown on the right. You may use the space below to do your work.

f(-4) =

$$f(x,y) = \begin{cases} 2(f(x+2))-f(x+1)+1 & \text{when } x<0 \\ 1 & \text{when } x=0 \\ 0 & \text{when } x>0 \end{cases}$$

A. -6 B. -2 C. 3

D. 5 E. 9

QUESTION 26

What is output by the code to the right?

A. [3, 5, 1, 7] B. [4, 2, 6, 0]

C. [1, 3, 5, 7] D. [0, 2, 4, 6]

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

```
int [] list = {3,4,2,5,1,6,7,0};
ArrayList<Integer> List1 = new
  ArrayList<Integer>();
ArrayList<Integer> List2 = new
  ArrayList<Integer>();
for(int x:list){
     if(x%2==0)
        List1.add(x);
     List2.add(x);
  }
List2.removeAll(List1);
out.println(List1);
```

QUESTION 27

What is output by the code to the right?

A. `I` B. `L`

C. `R` D. `S`

E. `T`

```
String s = "UILDISTRICTCONTEST";
char[]list = s.toCharArray();
int x=1;
PriorityQueue<Character> pq;
pq = new PriorityQueue<Character>();
for(char a:list){
     pq.offer(a);
     if(x%3==0){
        pq.poll();pq.poll();
     }
     x++;
  }
out.println(pq.peek());
```

QUESTION 28

What is output by the code to the right?

A. `5 4.0` B. `4 5.0`

C. `5.0 4.0` D. `4 5`

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

```
int j = 100;
double k = 20;
j/=k;
k/=j;
out.println(j+" "+k);
```

QUESTION 29

What is output by the code to the right?

A. `000 011 101 111` B. `000 011 100 110`

C. `001 011 101 111` D. `000 010 100 111`

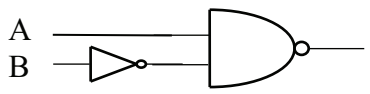
```
for(int p = 0; p <= 1; p++)
  for(int q = 0;q <= 1; q++)
     out.print(""+p+q+(p|q^p)+" ");
```

QUESTION 30

Which of the following logical statements is represented by the digital electronics diagram on the right ?

A. !A || !B B. !(A || !B)

C. !(A && !B) D. !A && !B



QUESTION 31

There is possibly something wrong with the code on the right that would cause a compile error, or it could be just fine. Which answer choice best describes the situation ?

A. There is nothing wrong…the code is fine as is.

B. The interface methods should not have semicolons

C. The class B method A1 needs something inside the {}

D. {} brackets are missing in the interface methods

E. The word `public` needs to precede each method definition.

QUESTION 32

Assuming the code is correct as is, or that the proper fix has been applied so that method A1 outputs the phrase "Hello World" and method A2 returns the value 0, what is the output of the client code listed?

A. `0` B. `HelloWorld0`

C. `HelloWorld`

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

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

```
interface A
{
  void A1();
  int A2();
}
class B implements A
{
  void A1(){}
  int A2(){return 0;}
}
//client code
A b = new B();
b.A1();
out.print(b.A2());
```

QUESTION 33

What is output by the code to the right?

A. `{a=5, b=7, e=3, f=7}`

B. `{a=5, b=7, c=3, e=3, f=7}`

C. `{c=4, e=3, b=7, a=5, f=7}`

D. `{e=3, b=7, a=5, f=7}`

E. `{a=5, e=3, f=7}`

```
Map<Character,Integer> m = new
  TreeMap<Character,Integer>();
m.put('c',4);
m.put('e',3);
m.put('b',7);
m.put('a',5);
m.put('c',3);
m.put('f',7);
m.remove('c');
out.println(m);
```

QUESTION 34

Which of these is the most efficient O(N) rating?

A. O(N) B. $O(N^2)$ C. O(log N) D. O(N log N) E. O(1)

QUESTION 35

In the code to the right, what value is the last one popped ?

A. 3
B. 5
C. 6
D. 7
E. 9

```
Stack<Integer> s = new
   Stack<Integer>();
s.push(3);
s.push(5);
s.push(9);
s.pop();
s.push(6);
s.pop();
s.pop();
s.push(2);
s.push(7);
```

QUESTION 36

If A and B are Boolean values, which is the most simplified expression for A*0 + B + 1, where * means AND, + means OR, 0 means false, and 1 means true?

A. `0` B. `1` C. `A` D. `B` E. `A+B`

QUESTION 37

What is the length of the longest diagonal of 1s printed by this code?

A. 3
B. 4
C. 5
D. 7
E. 6

```
for(int x=0;x<8;x++) {
  for(int y=0;y<8;y++)
     out.print(((x+y)%4==0)?1:0);
     out.println();
  }
```

QUESTION 38

What is output by the code to the right?

A. `9` B. `10` C. `11`

D. `12` E. `16`

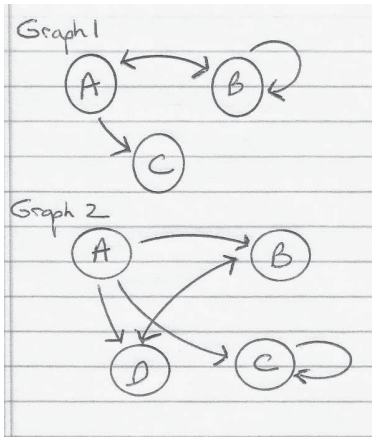
```
int a = 45;
int b = 34;
out.println(a%10+b/10+b%10);
```

QUESTION 39

In graph 1 on the right, the adjacency matrix would look like this, where 1 means a one way connection and 0 would mean no connection:

	A	B	C
A	0	1	1
B	1	1	0
C	0	0	0

Which choice below represents the adjacency matrix for Graph 2 on the right?



A.

	A	B	C	D
A	0	1	1	0
B	1	0	0	1
C	0	0	1	0
D	0	1	0	0

B.

	A	B	C	D
A	0	1	1	1
B	0	0	0	1
C	0	0	0	0
D	0	1	0	0

C.

	A	B	C	D
A	0	1	1	1
B	0	0	0	1
C	0	0	1	0
D	0	1	0	0

D.

	A	B	C	D
A	0	0	0	0
B	1	0	0	1
C	1	0	1	0
D	1	1	0	0

QUESTION 40

What is output by the code to the right?

A. `16.0 15.0`

B. `16.0 16.0`

C. `14.0 17.0`

D. `12.0 18.0`

E. `5.0 20.0`

```
double a = 5,b=20;
do{
  if (a<b)
     a=a+(int)(b/a)+1;
  b=b-1;
  }
while(a<=b);
out.println(a+" "+b);
```