Computer Science Contest #0607-10   January 27, 2007

Note: Correct responses are based on Java, J2sdk v 5.0, 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.

QUESTION 1

What is the sum of EAC_{16} and 342_8?

A. 2825_{10} B. ECE_{16} C. FCE_{16} D. EFE_{16} E. $F8E_{16}$

QUESTION 2

What is output by the code to the right?

A. 0   B. 7.0   C. 9.0   D. 9.4   E. 2.4

```
int x = 5, y = 12;
int z = x % y + y % x;
out.println((double) z + y / x);
```

QUESTION 3

What is output by `// line 1` in the code to the right? (an `*` indicates a space)

A. mi   B. miss   C. *mis   D. ss*F   E. ss

QUESTION 4

What is output by `// line 2` in the code to the right?

A. I   B. I miss FoxTrot   C. ImFT

D. Ii xo   E. Ii xr

```
String s = "I miss FoxTrot";
out.print(s.substring(2,4));  // line 1
out.println();
for(int i=0; i<s.length(); i+=3)
 out.print(s.charAt(i));      // line 2
out.println();
String sa[] = s.split("[ aeiou]+");
out.print(sa.length + sa[1]); // line 3
```

QUESTION 5

What is output by `// line 3` in the code to the right? (a `""` indicates an empty string)

A. 7""   B. 15I   C. 7s   D. 6m   E. 15""

QUESTION 6

What is output by `// line 4` in the code to the right?

A. 8   B. 5   C. 6   D. 10   E. 0

QUESTION 7

What is output by `// line 5` in the code to the right?

A. 55   B. 25   C. 0

D. 10   E. 15

```
int[] v = new int[10];
int i, sum = 0;
for(i=0; i<v.length; i+=2)
v[i] = i;
sum += i;
out.println(v[3] + v[7]);    // line 4
out.println(sum);            // line 5
```

QUESTION 8

What is output by the code to the right if the input is:

        1 2 3 4 5 4 3 2 1

A. 20   B. 10   C. 25

D. syntax error   E. runtime error

```
Scanner s = new Scanner(System.in);
int sum = 0;
while (s.hasNextInt(5))
  sum += s.nextInt();
out.println(sum);
```

QUESTION 9

What is output by the following code segment?

```
    int a = 2; String t = "t";
    out.print(f(a,t));
    out.println(a + "" + t);
```

A. 33s   B. 32s   C. 32t   D. 3u   E. 33t

```
public int f(int x, String s) {
  x = 3;
  s = "s";
  return x;
}
```

QUESTION 10 What is output by the code segment to the right? A. 31 27 4 B. 11 27 5 C. 4 27 31 D. 27 31 4 E. 5 27 31	```java int x = 14, y = 21, z = 7; int a = x ^ y; int b = x	y; int c = x & y; int d = x ^ z & y	z; out.println(a + " " + b+ " " + c); ```

QUESTION 11   What is the value of d after this code segment is executed?   A. 9   B. 7   C. 15   D. 1   E. 63

QUESTION 12 A StringIndexOutOfBoundsException would occur if **<*1>** were replaced by which of the following? A. { 3 ,5 ,7, 9, 11 ,15} B. {1, 3, 5, 7, 9} C. {3 ,5 ,7, 9, 11 ,1} D. more than one of these E. as long as values of e are positive, an exception will not be thrown	```java int [] e = <*1> ; String s = "JAVA*IS*FUN"; String t = new String(); for(int i=0; i<e.length; i++) { int p = e[i] % 3; switch(p) { case 0: t += s.charAt(i); break; case 1: t += s.charAt(i - 1); break; case 2: t += s.charAt(i + 1); break; } } out.println(t); ```

QUESTION 13   What would be output by the code to the right if **<*1>** were to be replaced by the following: {2, 3, 4, 7, 9}   A. AJAAV   B. AAAJ*   C. AAAV*   D. AA*AV   E. ACASF

QUESTION 14 Which statement represents the truth table to the right. a, b, and c are all variables of type boolean. A. c = !(a || !b) && (a || !b) B. c = (a || b) && (!a || !b) C. c = (a && b) || (!a && !b) D. c = (!a && !b) || (a && !b) E. c = (a || b) && (a && b)	``` a b c ----------------------- false false true false true false true false true true true false ```

QUESTION 15 What is output by the code to the right? A. JaVa IS FUN B. JAVAaISaFUN C. aaaa aa aaa D. java is fun E. JAVA IS FUN	```java String s = "JAVA IS FUN"; s = s.replaceAll("\\W", "a"); out.println(s); ```

QUESTION 16 What is returned by ugly(4,2)? A. 32 B. 74 C. -32 D. -11 E. 54 **QUESTION 17** What is returned by ugly(2,4)? A. 32 B. 22 C. 13 D. -8 E. 29	```java public int ugly(int x,int y) { if(x < 0) return y; else return ugly(x - 1, y * 2) - x; } ```

QUESTION 18
 	
 Which of the following replaces **`<*1>`** without a syntax error?
 	
 A. `short`　　　　B. `Integer`　　　　C. `byte`
 	
 D. A and B only　　　E. A, B, and C
	``
	<*1> x = 150;
	switch(x) {
	 // code not shown
	}
	``

QUESTION 19
 	
 What is output by code to the right if **`<*1>`** is replaced by:
 	
　　　`w = 1; x = -1; y = 2; z = 3;`
 	
 A. `p`　　B. `q`　　C. `r`　　D. `s`　　E. no output
	``
	int w, x, y, z;
	<*1>
	if(x>y)
	if(w>x)
	if(y<z)
	out.print("p");
	else
	out.print("q");
	else
	out.print("r");
	else
	out.print("s");
	``

QUESTION 20 Which replaces **`<*1>`** so the output would be the `String` "r"? A.　`w = 4; x = 3; y = 2; z = 3;` B.　`w = 4; x = 3; y = 2; z = 1;` C　`w = 4; x = 2; y = 3; z = 5;` D.　`w = 0; x = 1; y = 0; z = 1;` E.　`w = 1; x = 0; y = 3; z = 3;`	

QUESTION 21
 	
 What does method `risk` return?
 	
 A.　the number of elements in `r`
 B.　the first element of `r`
 C.　the number of elements in `r` greater than `r[0]`
 D.　the number of elements in `r` greater than `r[r.length - 1]`
 E.　the largest element of `r`
	``
	public int risk(int[] r) {
	   int x=0;
	   for (int i = r.length-1; i>0; i--
	)
	     if (r[i] > r[0])
	       x++;
	   return x;
	}
	``

QUESTION 22 Which replaces **`<*1>`** so the value of `x` will be `2007`? A.　`Integer.valueOf(s)`　　　B.　`i` C.　`i.intValue()`　　　D.　exactly two of these E.　any of these	``` String s = "2007"; Integer i = Integer.parseInt(s); int x = <*1> ; ```

QUESTION 23
 	
 What will be output by the code:
 	
　　　`out.printf("%05d", guess(121));`
 	
 A. `00237`　　　B. `00238`　　　C. `239`
 	
 D. `237`　　　E. `23700`
	``
	public int guess(int x) {
	  if(x <= 0)
	     return 1;
	  else
	     return x + guess(x/2);
	}
	``

QUESTION 24 What is the expected running time of method `guess`? Choose the most restrictive correct answer. A. `O(n`^{2}`)`　　　B. `O(n)`　　　C. `O(log₂n)` D. `O(n log₂n)`　　　E. `O(1)`	
QUESTION 25 Which of the following operators has the highest precedence? A. `.`　　　B. `<<`　　　C. `|`　　　D. `&`　　　E. `~`	

QUESTION 26	
| What is output by line marked `// line 1` in the code to the right?<br><br>A. `[p, s, t]`   B. `[r, s, t]`   C. `[p, s, t, r]`<br>D. `[p, r, t]`   E. `[r, p, s, t]` | ```java
LinkedList <String> list = new
          LinkedList<String>();
LinkedList <String> list2 = list;
list.add("r");
list.add("s");
list.add("t");
ListIterator i=list.listIterator();
i.add("p");
i.next();
i.remove();
out.println(list);        // line 1
out.println(list2);       // line 2
for(String s : list) {
   s = "a";
}
out.println(list);        // line 3
``` |

QUESTION 27

What is output by line marked `// line 2` in the code to the right?

A. `[p, s, t]`   B. `[r, s, t]`   C. `[p, s, t, r]`
D. `[p, r, t]`   E. `[]`

QUESTION 28

What is output by line marked `// line 3` in the code to the right?

A. `[p, s, t]`   B. `[r, s, t]`   C. `[p, s, t, r]`
D. `[p, r, t]`   E. `[a, a, a]`

QUESTION 29	
| What is output by line marked `// line 1` in the code to the right?<br><br>A. `[5, 7]`     B. `[4, 6]`     C. `[4, 7]`<br>D. `[4, 5, 6]`   E. `[4, 6 , 7]` | ```java
Queue<Integer> q = new // class
        // that implements Queue
Stack<Integer>  s = new
        Stack<Integer> ();
q.enqueue(5);
q.enqueue(7);
s.push(4);
s.push(6);
Integer i = s.peek();
q.enqueue(q.dequeue());
i = (Integer)(q.peekFront());
q.enqueue(i);
i = s.pop();
s.push(s.pop());
s.push((Integer)(q.dequeue()));
out.println(s);           // line 1
<*1>
``` |

QUESTION 30

Which replaces `<*1>` so all of the elements of `q` will be output?

 I. `for(Integer p : q) out.print(q);`

 II. `for(int p=0; p<q.size(); p++) out.print(q);`

 III. `while(!q.isEmpty()) out.print(q.dequeue());`

A. I only   B. II only   C. III only

D. I and III only   E. I, II, or III

QUESTION 31

Assume `<*1>` was replaced correctly. What will be output by the code in `<*1>`?

A. `575`   B. `56`   C. `46`   D. `47`   E. `57`

QUESTION 32	
| What is output by the code to the right?<br><br>A. `9`          B. `18 L`          C. `4 GAMMA`<br>D. `9 A`          E. no output due to a runtime error | ```java
String s = "1 ALPHA 2 BETA 3
GAMMA";
String t[] = s.split("[\\s\\d]+");
out.println(t.length + " "+ t[3]);
``` |

QUESTION 33	
| What is output by the code to the right?<br><br>A. `3`   B. `fun2`   C. `fun3`   D. `2`   E. `fun1fun2` | ```java
int x = 0;
if(x++>0 & x++>0 ^ ++x>0)
   out.print("fun");
   out.print(x);
``` |

QUESTION 34	
| What is output by the code to the right?<br><br>A. `65535L`     B. `65535`     C. `-65534`<br>D. syntax error     E. runtime error | ```java
char ch = (int)65535L;
out.println((int)ch);
``` |

QUESTION 35

Which of the following would correctly fill **<*1>**?

A. `o`   B. `new Comparable(o)`

C. `new Object(o)`   D. `new Myst(o)`

E. `(Comparable)o`

QUESTION 36

Assume **<*1>** was filled correctly. What would correctly fill **<*2>** ?

A. `item.compareTo(list[middle])==0`

B. `item.compareTo(list[middle])<0`

C. `item.compareTo(list[middle])>=0`

D. `item.compareTo(list[middle])>0`

E. `item.compareTo(list[middle – 1]) > 0`

QUESTION 37

What best describes method `myst()`?

A. bubble sort   B. selection sort   C. linear search

D. binary search   E. insertion sort

```java
public int myst(Comparable[] list,
                            Object o) {
   Comparable item = <*1> ;
   int front = 0;
   int back = list.length-1;
   int middle = 0;
   while (front < back+1) {
     middle = (front + back)/2;
     if( <*2>   )
       return middle;
     else if
         (item.compareTo(list[middle])<0)
       back = middle-1;
     else
       front = middle+1;
  }
  return -1;
}
```

QUESTION 38

Which could be output by line marked `// line 1`?

A. `{Bob, Rob, Sam }`

B. `{Jones, Brown, Smith}`

C. `{Jones=Bob, Brown=Rob, Smith=Sam}`

D. `{Bob Jones, Rob Brown, Sam Smith}`

E. `{Bob=Jones, Rob=Brown, Sam=Smith}`

QUESTION 39

Which could be output by line marked `// line 2`?

A. `[Bob Jones, Rob Brown, Sam Smith]`

B. `[Smith, Jones, Brown]`

C. `[Bob, Rob, Sam]`

D. `[Sam, Bob, Rob]`

E. more than one of these

```java
HashMap<String,String> h = new
              HashMap<String,String>();
h.put("Sam", "Smith");
h.put("Bob", "Jones");
h.put("Rob", "Brown");
out.println(h);                 // line 1
Set t = new TreeSet(h.keySet());
out.println(t);                 // line 2
```

QUESTION 40

Assume algorithm `sort` has an expected running time of $O(n^2)$. If `sort` takes 7 milliseconds to sort a database with 1000 records, approximately how many milliseconds would `sort` be expected to take to sort 5000 records?

A. `35`   B. `350`   C. `175`   D. `49`   E. `225`