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 $1100011_2 + 10011101_2$?

A. 256_{10} B. 400_8 C. 100_{16} D. 100000000_2 E. All are

QUESTION 2

What is the result of the expression shown?

A. 7 B. 3 C. 5 D. 12 E. 0

```
15 % 4 + 1 * 2 = _____
```

QUESTION 3

What is the output of the code segment shown?

A. 56.2testtest5 B. 11.26.2testtest5
C. 11.2test6.2test5 D. 56.26.2testtest5
E. There is no output due to an error.

```
int num = 5;
double dub = 6.2;
String str = "test";
out.printf("%s%s%s\n",
            num+dub,dub+str,str+num);
```

QUESTION 4

What is output by the code to the right?

A. MississippiBurning B. MUssUssUppUBurnUng
C. MussussuppuBurnung D. MississippiBirning
E. There is no output due to an error

```
String t = "MississippiBurning";
t.replaceAll("i","U");
out.println(t);
```

QUESTION 5

What is output by the code to the right?

A. false false B. false true
C. true false D. true true
E. There is no output due to an error.

```
boolean p = true;
boolean q = true;
out.println((p||!p&&q)+" "+(p^q));
```

QUESTION 6

Which of the choices below could NOT be output by the code segment shown?

A. 16.03 B. 14.24 C. 19.99 D. 10.00 E. 20.00

```
double dub = (Math.random()+1)*10
out.println(dub);
```

QUESTION 7

What is output by the code to the right?

A. 11.4 B. 16.5 C. 11.2 D. 16.4
E. There is no output due to an error.

```
char c = 'd';
double d = 0.165;
out.printf("%.1f",c * d);
```

QUESTION 8

What is the output of the code shown to the right?

A. steveneasypeezyno match B. steveneasypeezy
C. no match D. even
E. steven

```
int k = 45;
switch(k%4) {
 case 0: out.print("even");
 case 1: out.print("steven");
 case 2: out.print("easy");
 case 3: out.print("peezy");
 default:out.print("no match");
}
```

QUESTION 9

What is output by the code segment to the right?

A. `oconiosis` B. `noconiosis` C. `pneumonou`
D. `pneumonoul` E. There is no output due to an error.

```
String s = "pneumonoultramicroscop"+
           "icsilicovolcanoconiosis";

while(s.length()>10) {
 s=s.substring(3);
}
out.println(s);
```

QUESTION 10

What is the output of the code on the right?

A. `-3.4 -3.4 2.1 2.1 4.7 4.7 -3.4 2.1 4.7`
B. `-3.4 -6.8 2.1 4.2 4.7 9.4 -6.8 4.2 9.4`
C. `-3.4 -6.8 2.1 4.2 4.7 9.4 -3.4 2.1 4.7`
D. `-6.8 -6.8 4.2 4.2 9.4 9.4 -6.8 4.2 9.4`
E. There is no output due to an error.

```
double dubs [] = {-3.4, 2.1, 4.7};
for(double d:dubs){
  out.print(d+" ");
  d*=2;
  out.print(d+" ");
}

for(double d:dubs)
 out.print(d+" ");
```

QUESTION 11

Below are the contents of a data file called **`"stuff.dat"`**, which contains an initial integer value N, followed by N sets of data. Which choice below does NOT show the proper code to input and output the data sets in the file?

```
5
apple
banana
pear
rambutan
mango
```

A.
```
Scanner f = new Scanner(new File("stuff.dat"));
int n = f.nextInt();
for(int x = 0;x<n;x++)
  out.println(f.next());
```

B.
```
Scanner f = new Scanner(new File("stuff.dat"));
int n = f.nextInt();
f.nextLine();
for(int x = 0;x<n;x++)
  out.println(f.nextLine());
```

C.
```
Scanner f = new Scanner(new File("stuff.dat"));
int n = f.nextInt();
while(n-->0)
{
  String s = f.next();
  out.println(s);
}
```

D.
```
Scanner f = new Scanner(new File("stuff.dat"));
int n = f.nextInt();
while(f.hasNext())
  out.println(f.next());
```

E. All code segments will work properly

QUESTION 12

What is output by the code to the right?

A. `1 3 3 2 9 8 4 27 24 8 81 74`
B. `1 3 2 2 9 7 4 27 23 8 81 73`
C. `1 3 3 2 9 8 4 27 24 8 81 21`
D. `1 3 2 2 9 7 4 27 23 8 81 20`
E. There is no output due to an error.

```
String s,t="";
s="antidisestablishmentarianism";
int i=1,j=3;

do{
 t=s.substring(i,j);
 out.print(""+i+" "+j+" "
           +t.length()+" ");
 i*=2;
 j*=3;
}while(j<s.length());

t=s.substring(i);
out.println(""+i+" "+j+" "
            +t.length()+" ");
```

QUESTION 13

Here are three lines from the Java Order of Precedence chart. Which choice represents the correct order of precedence for these three lines?

A. I, II, III B. III, II, I C. II, I, III
D. I, III, II E. II, III, I

I. `^`
II. `++expr --expr +expr -expr ~ !`
III. `+ -`

QUESTION 14

Which of the following choices represents the storage limit of precision in decimal places for a double value?

A. 7 B. 15 C. 23 D. 52

QUESTION 15

What is the output of the code segment shown?

A. `[2, 3, 9, 17]`

B. `[4, 7]`

C. `[4, 2, 7, 3, 9, 17, 5, -7, 0, 4, 11, 7]`

D. `[4, 7, 7]`

E. `[5, -7, 0, 4, 11, 7]`

```
ArrayList<Integer> list1;
list1 = new ArrayList<Integer>();
ArrayList<Integer> list2;
list2 = new ArrayList<Integer>();

list1.add(4);list1.add(2);
list1.add(7);list1.add(7);
list2.add(5);list2.add(-7);
list2.add(0);list1.add(3);
list1.add(9);list1.add(17);
list2.add(4);list2.add(11);
list2.add(7);list2.add(7);
list1.retainAll(list2);
out.println(list1);
```

QUESTION 16

Which of the ordered triples shown below make this expression true?

I. (0,0,0)
II. II. (0,1,0)
III. III. (1,0,0)
IV. IV. (1,1,0)
V. V. (1,1,1)

A. II only B. IV only C. V only D. I and III only E. II and IV only

$$\overline{\overline{A * B} + C}$$

QUESTION 17

What is output by the code to the right?

A. -2 B. -1 C. 0 D. 1
E. There is no output due to an error.

```
int i1=1,i2=2,i3=3,i4=4;
int answer = i4-=++i1*i2+i3---i1;
out.printf("%d",answer);
out.println();
```

QUESTION 18

What is output by the code shown below?

```
char[][][]grid;

grid={{{'b','e','a','r'},{'w','o','o','d'},{'p','u','m','a'},{'r','o','c','k'}},

      {{'t','r','e','e'},{'p','a','t','h'},{'t','w','i','g'},{'d','i','r','t'}}};

String s = "";

int y=0,z=0;

for(int x=0;x<grid[0][0].length;x++,y++,z++)
  s+=grid[z/2][y][x];

out.println(s);

 }
}
```

A. boit B. bwpr

C. bomk D. bear

E. There is no output due to an error.

QUESTION 19

The two's complement system is all about representing negative numbers in binary. For example, the positive value 72 in 8-bit binary is **01001000**. To find the binary representation for -72 using two's complement, you use this easy conversion process.

Start from the right and keep all zeroes the same until you reach the first 1 digit. Keep that 1 the same also, and flip everything else, with an 8-bit binary result of **10111000** for -72.

With that in mind, which of the following choices represents the decimal equivalent of the two's complement binary value 10101111?

A. -81 B. -82 C. -80 D. -79 E. -83

QUESTION 20

What is output by the code segment shown?

A. 1.0 B. 0.5

C. 0.9 D. 1.7

```
int angle = 30;

out.printf("%.1f\n",

Math.sin(Math.toRadians(angle)));
```

QUESTION 21

How many lines of output will be produced by **<partial code segment 1>** in the code shown to the right?

A. 8 B. 9 C. 10 D. 11 E. 12

QUESTION 22

At the end of which iteration in the selection sort shown to the right is the output line given below by **<partial code segment 1>**?

Output:

```
-5 -3 0 1 3 8 7 9 5 4
```

A. 1st B. 3rd C. 5th

D. 7th E. 9th

QUESTION 23

What is the output for **<partial code segment 2>** in the code segment shown to the right?

A. 85 B. 72 C. 81 D. 95 E. impossible to determine

QUESTION 24

What would be the output for **<partial code segment 2>** in the code segment shown to the right if the number of elements contained in list was 5?

A. 35 B. 22 C. 30 D. 26 E. impossible to determine

QUESTION 25

What is the least restrictive running time for the average case in the sort shown in the code to the right?

A. O(N) B. O(N^2) C. O(log N)

D. O(N log N) E. O(1)

QUESTION 26

If line A in the code segment to the right was replaced by:

```
if (list[y] > list[best])
```

what would the final output line be?

A. -5 -3 0 1 3 4 5 7 8 9

B. 9 8 7 5 4 3 1 0 -3 -5

C. impossible to determine

```
public static void sort(int[] list)
{
 int step = 0;
 for(int x=0;x<list.length - 1; x++)
 {
  int best = x;
  step++;
  for(int y=x+1;y< list.length; y++)
  {
      //line A
      if (list[y] < list[best])
          best = y;
      step++;
  }
  swap(list, x, best);
  step+=3;
  <partial code segment 1>
  for(int i:list)
    out.print(i+" ");
  out.println();
  <end partial code segment 1>
 }
  <partial code segment 2>
  out.println(step);
  <end partial code segment 2>
}

////////////////////////////////
////client code
int[]list={5,7,3,9,4,8,-3, 1,-5, 0};
sort(list);
```

QUESTION 27

On the right is a fairly common version of the binary search algorithm, a standard search method often used in computer science.

What process (if any) needs to placed below line A in the client code to the right for this algorithm to work properly?

A. sort the list in descending order
B. sort the list in ascending order
C. reverse the list
D. process the list into a hash table
E. there is no required process; the list is fine as is

```
int binarySearch(int[]  elements,
                         int target)
{
 int left = 0;
 int right = elements.length - 1;
 while (left <= right)
 {
 int middle = (left + right) / 2;
 if (target < elements[middle])
    right = middle - 1;
 else if (target > elements[middle]){
    left = middle + 1;
 else
    return middle;
 return -1;
}

////////////////////////////////
//client code
int[]list={5,7,3,9,4,8,-3, 1,-5, 0};

//line A
_____________________________

//line B
out.println(binarySearch(list,-3));

//line C
out.println(binarySearch(list,-4));
```

QUESTION 28

Assuming that line A in the code is correct, what would be the output for the line of code directly below **line B** in the client code?

A. 1 B. 2 C. 6 D. 7 E. none of these

QUESTION 29

Assuming that line A in the code is correct, what would be the output for the line of code directly below **line C** in the client code?

A. 0 B. -2 C. 6 D. 7 E. none of these

QUESTION 30

What is the least restrictive running time in the worst case scenario for this binary search algorithm?

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

QUESTION 31

How many "Yes"s will result from the code segment shown?

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

```
int [] list =
       {20,34,75,18,4,72,33,24,13};

for(int a:list)
 out.println(a%2==0?a%3==0?"Yes"
                 :"No":"Heck No");
```

QUESTION 32

What initial value of N would output the value 107 in the code segment to the right?

A. 71 B. 163 C. 856 D. 13.375 E. None of these

```
int n = <N>;
String s = Integer.toString(n,8);
out.println(s);
```

QUESTION 33

Which of these terms is commonly associated with the concept of a queue?

I. LIFO
II. FIFO
III. Cafeteria line where no one cuts
IV. Cafeteria line where certain people cut in based on seniority

A. I only B. II only C. II and III only D. IV only E. none of these

QUESTION 34

What is output by the code to the right?

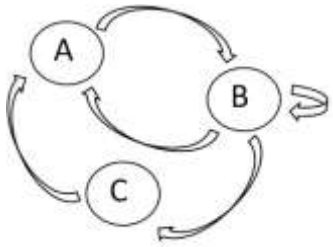
A. 60 B. 120 C. 180 D. 240 E. 19

```
int c = 15;
c<<=4;
out.println(c);
```

QUESTION 35

Which of the choices below represents the adjacency matrix for the graph shown?

```
A.          B.          C.
110         010         101
111         101         000
101         110         011

D.          E.
010         111
111         000
100         101
```



QUESTION 36

Infix notation is the kind normally used in algebraic expressions, such as **3 + 5 * 6**, where the operators are between the operands. However, there is also prefix notation, where the operators are before the operands, such as **+ 3 * 5 6**, and postfix notation, operators after operands, like this: **3 5 6 * +**. Notice carefully that the operands never move around: only the operators change places.

Here is another example: the infix expression **6 * 7 + 9 - 8 * 2** translates the prefix expression **- + * 6 7 9 * 8 2**, and **6 7 * 9 + 8 2 * -** for postfix.

Given these examples to examine and study carefully, which of the **postfix expressions** below matches the **infix expression** shown?

7 * 6 - 4 + 6 / 2 - 9

A. **7 6 4 6 2 9 * - / + -** B. **7 6 * 4 - 6 2 / 9 + -** C. **7 6 * 4 - 6 2 / + 9 -**

D. **7 6 * 4 6 - 2 / 9 + -** E. **7 6 * 4 + - 6 2 / 9 -**

QUESTION 37

What is output by the code segment shown?

A. 5
   [2, 3, 5, 6, 7]
   [2=5, 3=4, 5=2, 6=5, 7=4]
B. 7
   [2, 2, 3, 5, 5, 6, 7]
   [2=4, 2=5, 3=4, 5=4, 5=2, 6=5, 7=4]
C. 7
   [3, 7, 5, 2, 5, 2, 6]
   [3=4, 7=4, 5=4, 2=4, 5=2, 2=5, 6=5]
D. 3
   [2, 3, 5]
   [2=5, 3=4, 5=6]
E. There is no output due to an error.

```
Map<Integer,Integer> m;
m = new HashMap<Integer,Integer>();

m.put(2,3); m.put(3,4);
m.put(4,3);  m.remove(6);

m.put(7,4); m.put(5,4);
m.remove(2); m.put(2,4);

m.put(5,2); m.put(2,5);
m.put(6,5);  m.remove(4);

out.println(m.size());

out.println(m.keySet());

out.println(m.entrySet());
```

QUESTION 38

Find f(10,6) according to the recursive function definition shown on the right.

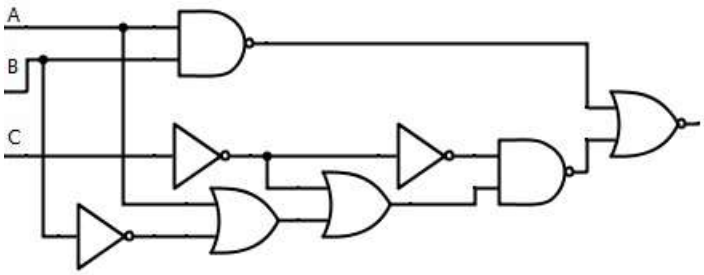
```
f(x,y) =

  f(x-1,y)          if x>7
  f(y-2,x)+4        if 1<=x<=7
  -10               otherwise
```

A. 6 B. 8 C. 10 D. 12 E. 14

QUESTION 39

Free Response Question:

Express the following circuit as a Boolean expression, using Boolean identities to simplify it completely.



QUESTION 40

Free Response Question:

Draw the binary tree (not a binary **search** tree) that is defined by the following traversal orders:

Inorder: A, P, L, U, S, C
Preorder: L, P, A, S, U, C