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 11100110_2 - 11001000_2 ?

A. $1C_{16}$ B. 36_8 C. 11110_2 D. 30_{10} E. `All are`

QUESTION 2

What is the result of the expression shown?

A. `5` B. `6` C. `7` D. 12 E. `1`

```
7 * 3 / 10 + 5 = _____
```

QUESTION 3

What is output by the code segment to the right?

A. `2.3boo2` B. `4.1boo2`
C. `4.3 - 2 + "boo" + 2 * 1`
D. `2.3boo21` E. There is no output due to an error.

```
out.println(4.3 - 2 + "boo" + 2 * 1);
```

QUESTION 4

What is output by the code segment to the right?

A. `hSchoolRocks12` B. `SchoolRocks11`
C. `hSchoolRocks15` D. `SchoolRocks15`
E. There is no output due to an error

```
String t = "HighSchoolRocks";
out.println(t.substring(4)+""
             +t.length());
out.println();
```

QUESTION 5

What is output by the code segment to the right?

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

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

QUESTION 6

What is output by the code segment to the right?

A. `-4` B. `4` C. `-5` D. `5`
E. There is no output due to an error.

```
int a = -5;
int b = -4;
out.println(Math.min(a,b));
```

QUESTION 7

What is output by the code segment to the right?

A. `-0.6` B. `1.4` C. `0.6` D. `-1.4`
E. There is no output due to an error.

```
double d1 = 9.7;
double d2 = 10.3;
out.printf("%.1f",d1 - d2);
```

QUESTION 8

What is output by the code segment to the right?

A. `disc mush disk` B. `disc gee disk`
C. `disk gee disc` D. `disk mush disc`
E. There is not output due to an error

```
String s = "disc";
String t = "disk";
if(s.compareTo(t)<0)
 out.println(s+" mush "+t);
else
 out.println(t+" gee "+s);
```

QUESTION 9

What are the first and last values output by the code shown below?

A. 36 and 9
B. 73 and 4
C. 73 and 9
D. 36 and 4
E. There is no output due to an error.

```
int num = 73;
do{
 out.println(num/=2);
}while(num>5);
out.println();
```

QUESTION 10

What is output by the code segment to the right?

A. `01234567` B. `73541206` C. `76543210`
D. `64213570` E. There is no output due to an error.

```
int [] list = {7,3,5,4,1,2,0,6};
for(int x:list)
  out.print(list[x]);
```

QUESTION 11

Below are the contents of a data file called **"stuff.dat"**, which contains several lines of data. Which choice below shows the proper code to input and output the data sets in the file?

```
apple jacks
4.5
34
A
```

A. All code segments will work properly

B.
```
Scanner f = new Scanner(new File("stuff.dat"));
out.println(f.nextLine());
out.println(f.nextDouble());
out.println(f.nextInt());
out.println(f.next().charAt(0));
```

C.
```
Scanner f = new Scanner(new File("stuff.dat"));
out.println(f.next());
out.println(f.nextDouble());
out.println(f.nextInt());
out.println(f.next().charAt(0));
```

D.
```
Scanner f = new Scanner(new File("stuff.dat"));
out.println(f.next());
out.println(f.nextDouble());
out.println(f.nextInteger());
out.println(f.next().charAt(0));
```

E.
```
Scanner f = new Scanner(new File("stuff.dat"));
out.println(f.next());
out.println(f.nextDouble());
out.println(f.nextInt());
out.println(f.nextChar());
```

QUESTION 12

What is output by the code segment to the right?

A. `4 19 5 8 16 7 16 13 9`
B. `2 22 3 4 19 5 8 16 7`
C. `2 22 3 4 19 5 8 15 7 16 13 9`
D. `2 22 3 4 19 5 8 16 7 16 13 9`
E. There is no output due to an error.

```
int x=2,y=22,z=3;
for(;x<y+z;x*=2,y-=3,z+=2)
 out.print(x+" "+y+" "+z+" ");
```

QUESTION 13

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

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

E. II, III, I

```
I. * / %
II. == !=
III. = += -= *= /= %= &= ^= |= <<= >>= >>>=
```

QUESTION 14

Which of the following choices is the correct scientific notation expression for the maximum value of an **`int`** in Java?

A. 2^31-1 B. 2^16-1 C. 2^32-1 D. 2^15-1 E. None of these

QUESTION 15

What is output by the code segment to the right?

A. `5[null, null, null, null, null]`
B. `5["", "", "", "", ""]`
C. `0[null]`
D. `0[]`
E. There is no output due to an error

```
ArrayList<String> list;
list = new ArrayList<String>(5);
out.print(list.size());
out.println(list);
```

QUESTION 16

What is output by the code segment to the right?

A. `mn.day` B. `tFirst` C. `mn.First` D. `tday`
E. There is no output due to an error.

```
String s;
s = "First day of autumn.";
out.println(s.split("[aeiou]+")[6]+
            s.split("\\s")[1]);
```

QUESTION 17

What is output by the code segment to the right?

A. `8192` B. `2048` C. `1024` D. `13`
E. There is no output due to an error.

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

QUESTION 18

What is the output at the end of the third iteration in the method called by the client code segment shown on the right?

A. `1 2 3 4 5 7 8`
B. `2 4 3 7 5 8 1`
C. `2 3 4 5 7 8 1`
D. `2 3 4 7 5 8 1`
E. `2 4 3 7 5 1 8`

QUESTION 19

What is the least restrictive Big O classification for the average case running time for the insertion sort shown on the right?

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

```
static void insertionSort(int[] list)
{
 for (int j=1; j < list.length; j++)
 {
  int temp = list[j];
  int i = j;
  while (i > 0 && temp < list[i - 1])
  {
     list[i] = list[i - 1];
     i--;
   }
  list[i] = temp;
  //output temporary list
  for(int x:list)
    out.print(x+" ");
  out.println();
 }
}
////////////////////////////////
//client code
int [] list = {4,2,3,7,5,8,1};
insertionSort(list);
```

QUESTION 20

What is output by the code segment to the right?

A. 156 B. 182 C. 196 D. 169 E. 144

```
int num = 0;
String list =
"ABCEDFGHIJKLMNOPQRSTUVWXYZ";
for(int x=list.length()/2;x>=0;x--)
 for(int y=list.length()-
1;y>=list.length()/2;y--)
    num++;
out.println(num);
```

QUESTION 21

What is output by the code segment to the right?

A. 9 4 7 6 8 13 9 17 13 10 13 17
B. 9 4 7 5 8 12 9 17 12 10 13 17
C. 9 4 7 6 8 13 9 17 12 10 13 17
D. 9 4 7 5 8 12 9 17 13 10 13 17
E. There is no output due to an error.

```
int [][] g1 =
{{1,2,3},{4,5,6},{7,8,9},{10,11,12}};

int [][] g2 =
{{8,2,4},{1,3,6},{2,9,4},{0,2,5}};

int [][] g3 = new int[4][3];

for(int r=0;r<g3.length;r++)
 for(int c=0;c<g3[r].length;c++)
  g3[r][c]=g1[r][c]+g2[r][c];

for(int [] a:g3)
 for(int x:a)
  out.print(x+" ");

out.println();
```

QUESTION 22

In the code shown to the right, which statement correctly replaces <statement1> so that class B inherits class A

A. implements B. extends C. inherits D. imports E. None of these

QUESTION 23

Assuming that class B correctly inherits class A, regardless of the choice you made in the previous question, what is the output of **client code 1** shown to the right?

A. dog6 B. dog5 C. cat6 D. cat5 E. None of these

QUESTION 24

Again assuming that class B correctly inherits class A, what is the output of **client code 2** shown to the right?

A. cat5dog5 B. cat5dog6 C. cat6dog6
D. cat6dog5 E. None of these

```
class A
{
 int x=5;
 void do_(){
  out.println("dog"+this.x);
 }
}

class B <statement1> A
{
 int x = super.x;
 void do_(){
  out.print("cat"+x);
  x=6;
  super.do_();
 }
}

//client code 1
A a=new A();
a.do_();

//client code 2
B b=new B();
b.do_();
```

QUESTION 25

What is output by the code segment to the right?

A.
```
[4, 9]
[5, 4, 9]
5
4
null
```

B.
```
[4, 9]
[5, 4, 9, 5]
5
4
runtime error
```

C.
```
[4, 9]
[5, 4, 9, 5]
5
4
null
```

D.
```
[4, 9]
runtime error
```

E.
```
[4, 9]
[5, 4, 9, 5]
5
9
runtime error
```

```
LinkedList<Integer> list;
list = new LinkedList<Integer>();
list.add(4);
list.add(9);
out.println(list);

list.add(2,5);
list.addFirst(5);
out.println(list);

list.addLast(7);
out.println(list.element());

list.removeFirst();
list.removeLast();
out.println(list.peekFirst());

list.remove();
list.remove();
list.remove();
out.println(list.peekFirst());
```

QUESTION 26

What is output by the code segment to the right?

A. `8 7 -1` B. `6 5 -4` C. `8 7 -7`

D. `8 6 -7` E. `8 6 -1`

```
int [] list =
          {3,5,7,6,3,1,2,0,8,9,1,5};
Arrays.sort(list);

out.print
   (Arrays.binarySearch(list,6)+" ");

out.print
   (Arrays.binarySearch(list,5)+" ");

out.println
   (Arrays.binarySearch(list,4));
```

QUESTION 27

How many ordered triples make this boolean expression false?

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

A. 7 B. 2 C. 5 D. 3 E. 6

QUESTION 28

What is output by the code segment to the right?

A. `[G, O, _, E, A, G, L, E, !, !, S, !, !]`

B. `[G, O, _, E, A, G, L, E, !, S, !, !, !]`

C. `[G, O, _, E, A, G, L, E, !, !, !, !, S]`

D. `[G, O, _, E, A, G, L, E, S, !, !, !, !]`

E. There is no output due to an error.

```
Stack<Character> st = new
    Stack<Character>();
String s = "GO_EAGLES";
for(int x = 0;x<s.length();x++)

st.add(s.charAt(x));
st.add(s.length()-1,'!');
st.push('!');
st.add('!');
st.add(s.length(),'!');

out.println(st);
```

QUESTION 29

Which of the following output statements will generate some random value between 0 and 10, inclusive?

A. I and III only

B. IV only

C. III only

D. I, III, and IV

E. II and IV only

```
Random r = new Random();
//I
out.println(r.nextInt(11));
//II
out.println(r.nextInt(10)+1);
//III
out.println(r.nextInt(100)/10);
//IV
out.println((int)(Math.random()*11));
```

QUESTION 30

What is output by the code to the right?

A. `[E, E, I, E, R, P, M, X, N, T]`
`E E E I M N P R T X`

B. `[E, E, E, I, M, N, P, R, T, X]`
`E E E I M N P R T X`

C. `[T, N, X, M, P, R, E, I, E, E]`
`X T R P N M I E E E`

D. `[X, T, R, P, N, M, I, E, E, E]`
`X T R P N M I E E E`

E. There is no output due to an error.

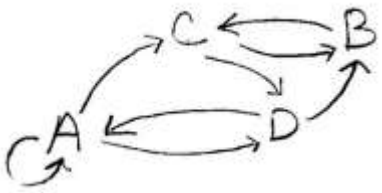
```
String s = "EXPERIMENT";
char[] chars = s.toCharArray();

PriorityQueue<Character> list;
list = new
         PriorityQueue<Character>();

for(char a:chars)
 list.add(a);
out.println(list);
while(!list.isEmpty())
 out.print(list.poll()+" ");
out.println();
```

QUESTION 31

In the graph pictured below, each letter is a vertex, or node, of the graph. The vertices are connected by a directed edge, or an arrow, indicating a one-way connection. The graph could represent a flight system for an airline among a groups of cities, like Austin, Boston, Chicago, and Dallas.

The edges are one-way flights between the cities. A two-hop flight would contain three letters, the starting city, the middle city after the first hop, and the final destination after the second hop. For example, ACB represents a two-hop flight starting at Austin, going through Chicago, and ending in Boston.

AAC also counts, since Austin has a scenic tour flight that departs and lands back in Austin after flying around the city for an hour or so. ADA and DAD would count as different two-hop flights.



Given all of that information, how many DIFFERENT two-hop flights are there in this graph?

A. 14 B. 20 C. 12 D. 18 E. 16

QUESTION 32

What is output by the code segment to the right?

A. 2 B. 4 C. 3 D. 1 E. 5

```
static int mystNum(int x, int c){
 for(int v = 3;v<=30;v+=2)    {
   if(x/v==(double)x/v)
     c=c+1;
 }
 return c;
}

////////////////////////////////
//client code
out.println(mystNum(50,0));
```

QUESTION 33

What is output by the code segment to the right?

A. 5 B. 41 C. 15 D. 1000 E. 375

```
int c = 125;
c>>=3;
out.println(c);
```

QUESTION 34

What is output by the code segment to the right?

A. 9 1 9 B. 9 3 8 C. 23 3 8 D. 23 1 9

E. There is no output due to an error.

```
int [] list =
{3,6,5,9,8,6,2,3,5,4,6,7,5,1,3,2,4,6,
5,7,6,9,8};

TreeSet<Integer> set;
set = new TreeSet<Integer>();

for(int x:list)
 set.add(x);

out.println(set.size()
        +" "+set.first()
        +" "+set.last());
```

QUESTION 35

Which of these Big O descriptions regarding TreeSet and HashSet methods is NOT correct?

A. HashSet `remove()` - constant time
B. HashSet `contains()` - constant time
C. HashSet `size()` - constant time (assuming even bucket distribution)
D. TreeSet `add()` - log N time
E. TreeSet `remove()` - constant time

QUESTION 36

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 8-bit binary representation of -63?

A. 10111110 B. 11000000 C. 11000001 D. 10111111 E. 00111111

QUESTION 37

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 to the prefix expression `- + * 6 7 9 * 8 2`, and `6 7 * 9 + 8 2 * -` in postfix.

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

```
+ - 4 5 * 3 2
```

A. `4 - 5 + 3 * 2` B. `4 - 5 * 3 + 2` C. `4 + 5 - 3 * 2`

D. `4 * 5 + 3 - 2` E. `(4 - 5) + 3 * 2`

QUESTION 38

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

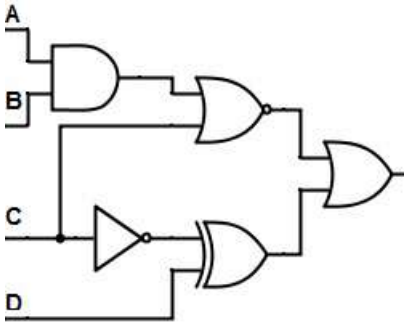
A. $(A*B+\overline{C})+\overline{C}\oplus D$

B. $\overline{(A+B)*C}*\overline{C}\oplus D$

C. $\overline{A*B+C}+\overline{C}\oplus D$

D. $\overline{A*B\oplus C}\oplus\overline{C}+D$

E. $\overline{A+B*C}*\overline{C}\oplus D$



QUESTION 39

Free Response Question: Using Boolean Identities, simplify the following expression to one that uses only **two** operators.

Circle your final answer.

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

QUESTION 40

Free Response Question:

Find A(5) according to the recursive function definition shown below. **Circle your final answer.**

```
A(5) = 0 when x<0
     = 1 when x==0
     = A(n-1)*A(0)+A(n-2)A(1)+A(n-3)A(2)+... otherwise
```