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 $10100_2 + 10110_2$?

A. 42_{10} B. 52_8 C. $1A_{16}$ D. 101010_2

E. more than one of these

QUESTION 2

What is output by the code to the right?

A. `false1true` B. `false0true`

C. `true0true`

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

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

```
Integer x = 5;
Integer y = new Integer(5);
out.println((x==y)+""+
             x.compareTo(y)+""+
             x.equals(y));
```

QUESTION 3

What is output by the code to the right?

A. `5` B. `6`

C. `7` D. `8`

E. `9`

```
String s = "riptide";
out.println(s.length());
```

QUESTION 4

What is output by the code to the right?

A. `falsefalse` B. `falsetrue`

C. `truefalse` D. `truetrue`

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

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

QUESTION 5

What is output by the code to the right?

A. `work`
B. `doesthisevenwork?`
C. `work?`
D. There is no output due to a compile error.
E. There is no output due to a runtime error.

```
double d = 2.5;
switch(d){
  case 1.0: out.print("does");break;
  case 1.5: out.print("this");break;
  case 2.0: out.print("even");break;
  case 2.5: out.print("work");break;
  default :out.print("?");
}
```

QUESTION 6

Which of the statements on the right correctly instantiates a new integer array with five elements set to zero?

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

E. More than one of these.

```
I.   int list = {0,0,0,0,0};
II.  int []list = new [5];
III. int []list = new int[5];
IV.  int []list = int [5];
```

QUESTION 7

What is output by the code to the right?

A. `246` B. `2468` C. `2467` D. `468`

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

```
int w = 2;
for(;w<=7;)
  out.print(w+=2);
out.println();
```

QUESTION 8

How many instance variables are shown in the class definition on the right?

A. 0
B. 1
C. 2
D. 3
E. 4

QUESTION 9

Which of these constructor calls will correctly instantiate a 5-string bass Guitar object?

I. `Guitar g = new Guitar(5);`

II. `Guitar g = new Guitar(5,"bass");`

III. `Guitar g = new Guitar("bass",5);`

A. I only B. II only C. III only
D. I and III only E. All do

QUESTION 10

What is the output of the client code shown on the right?

A. `ukelele 100:4 string-mandolin 101:4 string`
B. `ukelele 101:4 string-mandolin 102:4 string`
C. `ukelele 100:4 string-mandolin 100:4 string`
D. There is no output due to a compile error.
E. There is no output due to a runtime error.

```
class Guitar
{
  private String type;
  private int numStrings;
  private int ID;
  private static int serNum=100;
  public Guitar()
  {
     type = "acoustic";
     numStrings = 6;
     ID = ++serNum;
  }
  public Guitar(int n)
  {
     this();
     numStrings = n;
  }
  public Guitar(int n, String s)
  {
     this(n);
     type = s;
  }
  public String toString()
  {
     return type+" "+ID+":"+
            numStrings+" string";
  }
  public int getNumStrings()
  {
     return numStrings;
  }
  public void setNumStrings (int n)
  {
     numStrings = n;
  }
}
////////////////////////////////
////client code

Guitar g = new Guitar (4,"ukelele");
Guitar m = new Guitar (4,"mandolin");
out.println(g+"-"+m);
```

QUESTION 11

What is output by the code to the right?

A. `3.1` B. `6.1`
C. `9.2` D. `5.7`
E. There is no output due to a compile error.

```
float f = 9.2f;
f -= 3.1;
out.println(f);
```

QUESTION 12

What is output by the code to the right?

A. `-55` B. `-56`
C. `55` D. `56`
E. `0`

```
out.println(Math.abs(-56));
```

QUESTION 13

What is output by the code to the right?

A. 012345678
B. 0123456789
C. 48495051525354555657
D. 484950515253545556
E. There is no output due to a compile error.

```
String s = "";
for(char a = 48; a<57; a++)
  s+=a;
out.println(s);
```

QUESTION 14

What is output by the code to the right?

A. Jimi
B. cket
C. nyCr
D. nyCricket
E. inyCricket

```
String jc = "JiminyCricket";
out.println(jc.substring(4));
```

QUESTION 15

What is output by the code to the right?

A. 0
B. 1
C. -1
D. 10
E. 11

```
int a = 10;
a++;
a-=++a;
out.println(a);
```

QUESTION 16

What is output by the code to the right?

A. 11111111111111111111111111111111 (32 1s)
B. 00000000000000000000000000000001 (31 0s, and a 1)
C. 11111111111111111111111111111111 (31 1s)
D. 00000000000000000000000000000001 (30 0s, and a 1)
E. 00000000000000000000000000000000 (32 0s)

```
int x = -1;
String s = Integer.toBinaryString(x);
out.println(s);
```

QUESTION 17

What is output by the code to the right?

A. 3 54
B. 7 35
C. 35 7
D. 54 3
E. There is no output due to a compile error.

```
int x = 927354;
out.println(x%1000/10+" "+x/1000%10);
```

QUESTION 18

What is output by the code to the right?

A. 000 011 101 111
B. 000 010 100 111
C. 000 011 101 110
D. 001 010 100 111
E. 001 010 100 110

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

QUESTION 19

What is output by the code to the right?

A. 49
B. 50
C. 99
D. 100
E. 101

```
int x = -100;
x = ~x>>>1;
out.println(x);
```

QUESTION 20

What is output by the client code 1 to the right?

A. \-ple met-/

B. \-tem elp-/

C. \--/

D. \-3456789-/

E. \-9876543-/

QUESTION 21

What is output by the client code 2 to the right?

A. \-Rumpelstiltskin-/

B. \-nikstlitselpmuR-/

C. \--/

D. \-01234567891011121314-/

E. \-14131211109876543210-/

```
public static String stuff(String s,
                    int a,int b)
{
 String r = "";
 for(int x=b-1;x>=a;x--)
  r+=s.charAt(x);
 return r;
}


////////////////////////////////
//client code 1
String s;
s = stuff("Simple method",3,10);
out.print("\\-"+s+"-/");


////////////////////////////////
//client code 2
s = stuff("Rumpelstiltskin",15,0);
out.print("\\-"+s+"-/");
```

QUESTION 22

What is output by the code to the right?

A. dog***zebra*monkey

B. dog zebra monkey

C. dogzebramonkey

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

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

```
String one = "dog";
String two = "zebra";
String three = "monkey";
char [][] grid = new char[3][6];
Arrays.fill(grid[0],'*');
Arrays.fill(grid[1],'*');
Arrays.fill(grid[2],'*');
grid[0]=one.toCharArray();
grid[1]=two.toCharArray();
grid[2]=three.toCharArray();
for(int r=0;r<grid.length;r++)
  for(int c=0;c<grid[r].length;c++)
     out.print(grid[r][c]);
```

QUESTION 23

Find f(7) according to the recursive function definition shown on the right. You may use the space below to do your work.

f(7) =

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

A. 4

B. 5

C. 6

D. 7

E. 8

QUESTION 24

What is output by the code to the right?

A. `37 45` B. `37 55` C. `45 37`

D. `45 55` E. `55 45`

```
String s = "45";
int x = Integer.parseInt(s);
String t = Integer.toString(x,8);
out.print(s+" "+t);
```

QUESTION 25

What is output by the code to the right?

A. `2-1` B. `2-7` C. `2-8`

D. `3-7` E. `3-8`

```
int [] list = {3,6,5,1,2,8,4,3,9};
Arrays.sort(list);
int x = Arrays.binarySearch(list,3);
int y = Arrays.binarySearch(list,7);
out.println(x + "" + y);
```

QUESTION 26

A. `\123/\45/\6789/\/\/`

B. `\/\123/\45/\6789/`

C. `\/\123/\45/\6789/\/\/`

D. `\123/\45/\6789/`

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

```
String s = "a123b45c6789de";
String [] ar = s.split("\\D");
for(String ss:ar)
  out.print("\\"+ss+"/");
```

QUESTION 27

A. `bunanasandwich booooasoodwich`

B. `bananasandwich bananasandwich`

C. `bununusundwich booooasoodwich`

D. `bununusundwich bananasandwich`

E. There is no output.

```
String s = "bananasandwich";
String t = s.replace('a','u');
String u = s.replaceAll("an","oo");
out.println(t+" "+u);
```

QUESTION 28

What is output by the code to the right?

A. `100` B. `0`

C. `1100100` D. `01100100`

E. `0110010`

```
String s;
s = Integer.toBinaryString(100>>0);
out.println(s);
```

QUESTION 29

What is output by the code to the right?

A. `00000` B. `23412`

C. `46835` D. `81216610`

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

```
int [] list={4,6,8,3,5};
for(int a:list)
  out.print(a*2);
```

QUESTION 30

What is output by the code to the right?

A. `8` B. `16` C. `32`

D. `64` E. `128`

```
out.println(Long.SIZE);
```

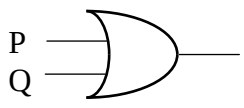
QUESTION 31

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

A. P AND Q B. P OR Q

C. P XOR Q D. P NAND Q

E. P NOR Q



QUESTION 32

What is output by the client code to the right?

A. `1316985`

B. `1135689`

C. `5113869`

D. `9865311`

E. `9683115`

QUESTION 33

Of the Big O classifications shown, which one best represents the least restrictive running time for the average case scenario of the insert method in the BTree code shown on the right?

A. O(1)

B. O(log N)

C. O(N)

D. O(N log N)

E. O(N^2)

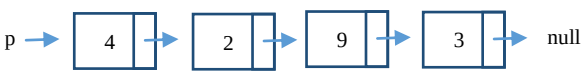
```
class BTree {
  static class Node {
    Node left,right;
    int value;
    public Node(int value) {
      this.value = value;
  }}

  Node root;
  BTree(int n){
  root = new Node(n);
  }
  void insert(Node node,int value) {
   if (value <= node.value) {
    if (node.left != null) {
     insert(node.left, value);
    }else{
      node.left = new Node(value);
     }
   }else
    if (value > node.value) {
     if (node.right != null) {
      insert(node.right, value);
     }else{
       node.right = new Node(value);
      }
    }
  }
  public void print(Node node) {
    if (node != null) {
     print(node.left);
     print(node.right);
     out.print(node.value);
    }
  }
}

////////////////////////////////
//client code
BTree b = new BTree(5);
b.insert(b.root,1);
b.insert(b.root,8);
b.insert(b.root, 6);
b.insert(b.root, 3);
b.insert(b.root,1);
b.insert(b.root, 9);
b.print(b.root);
```

QUESTION 34

Suppose a linked list has been implemented as shown in the diagram on the right, with public fields **`data`** and **`next`**. What is the output of the statement below?

```
out.print(p.data);
```

A. 2 B. 3 C. 4 D. 5 E. 9



QUESTION 35

What is output by the code to the right?

A. `falsefalsefalse`
B. `truetruetrue`
C. `truefalsetrue`
D. `falsetruefalse`
E. `falsefalsetrue`

```
String s = "aaaaabbbbc";
boolean p=Pattern.matches("a*.*",s);
boolean q=Pattern.matches(".+b+.",s);
boolean r=Pattern.matches(".*c",s);
out.println(""+p+q+r);
```

QUESTION 36

What is the correct statement for **<statement1>** to enable the Boo class to correctly use the Comparable interface?

A. `extends Comparable`
B. `extends Comparable<Boo>`
C. `implements Comparable`
D. `implements Comparable<Boo>`
E. No statement is required.

QUESTION 37

What is the correct statement for **<statement2>** to return the value 1 if every element of the current object is greater than every element of the parameter object b?

A. `if(a>x&&b>y&&c>z)`
B. `if(a>b.x&&b>b.y&&c>b.z)`
C. `if(a>b.a&&b>b.b&&c>b.c)`
D. `if(x>b.x&&y>b.y&&z>b.z)`
E. No statement is required.

QUESTION 38

Assuming **<statement1>** and **<statement2>** have been correctly defined, what is the output of the client code on the right?

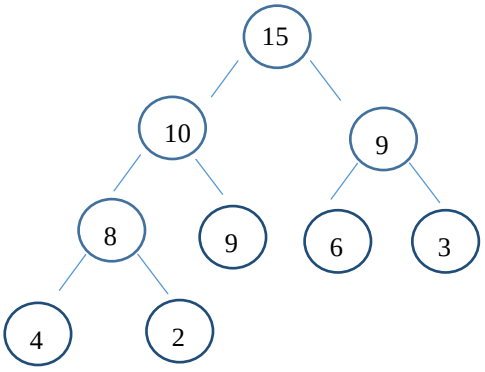
A. `101`
B. `0-11`
C. `10-1`
D. `-110`
E. `110`

```
class Boo <statement1>
{
  int x; char y; double z;
  Boo(int a, char b, double c)
  {
   x=a;y=b;z=c;
  }
  public int compareTo(Boo b)
  {
    <statement 2>
      return 1;
    if(x==b.x&&y==b.y&&z==b.z)
      return 0;
    return -1;
  }
}

////////////////////////////////////
//client code
Boo a = new Boo(2,'d',3.7);
Boo b = new Boo(1,'a',3.4);
Boo c = new Boo(2,'d',3.7);
out.print( a.compareTo(b));
out.print( a.compareTo(c));
out.print( b.compareTo(c));
```

QUESTION 39

The tree on the right is a max heap used to implement a priority queue, with 15 as the root (position 0), 10 at position 1, 9 in position 2, and so on. To retrieve the next element in the priority queue, the root of the heap (15) is removed, and the last element in the tree is assigned to the root (2), and then sifted down into its proper place in order to reestablish a proper max heap. In what position does it finally settle?

A. position 8
B. position 4
C. position 3
D. position 5
E. position 1



QUESTION 40

*OPEN ENDED QUESTION – Find the **two** answers required and write them on your answer sheet, or if using a ScanTron form, out to the side of the bubbles.*

The graph on the right represents the flight system for **UIL Airlines** among these four cities. Each arrow represents a one-hop flight, with back and forth flights between each pair of cities, except for Chicago to Dallas, which are connected only by that one-way flight.

Also, since Chicago is such a beautiful city, **UIL Airlines** has a scenic tour that takes off and lands in Chicago, just to give tourists a view of the city and Lake Michigan.

Your job is to find out how many ways someone could take a **2- hop flight** in this system. For example, ADB is a 2-hop flight from Austin to Boston through Dallas, and ADA is a round trip 2-hop flight from Austin to Dallas and back. DAD would be a different 2-hop flight than ADA, even though it covers the same route.

Note: The return arrow on Chicago indicates a "scenic tour" of Chicago, with the flight taking off and landing at the same airport, therefore CCB would be a valid 2-hop flight, taking the scenic tour before traveling on to Boston. So would CCC since Chicago is such a beautiful city and you might want to see it twice!

The second part of your job is to find the only 5-hop flight that starts and ends in Austin. Indicate that with a letter sequence starting and ending with the letter A, as shown by the blanks below.

Number of 2-hop flights	Path for 5-hop flight
	A __ __ __ __ A