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 $1001_2 + 1011_2$?

A. 20_{10} B. 24_8 C. 12_{16} D. 10100_2 E. All are

QUESTION 2

What is output by the code to the right?

A. 16 B. 4

C. 12 D. 42

E. 32

```
int a = 4;
a = a + 12;
out.println(a);
```

QUESTION 3

What is output by the code to the right?

A. 6 B. null 6

C. 0 6 D. <blank space> 6

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

```
Integer x = null;
int y = 6;
out.println(x + " " + y);
```

QUESTION 4

What is output by the code to the right?

A. -5-7 B. -3-5-7-8

C.-3-5-7-9 D. -3-5-7

E. There is no output.

```
int b = -3;
while(b >= -8){
  out.print(b);
  b -= 2;
}
```

QUESTION 5

What is output by the code to the right?

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

```
String s = "noBrainer";
out.println( s.indexOf("rain") );
```

QUESTION 6

What is output by the code to the right?

A. 5 B. 4 C. 8 D. 6

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

```
int[] list = {0,2,4,6,8};
out.println( list.length );
```

QUESTION 7

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 a runtime error.

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

QUESTION 8

What is output by the code to the right?

A. 4 B. 14

C. 144 D. There is no output.

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

```
int w = 14;
if(w > 10)
  out.print(w);
  out.print(w-10);
```

QUESTION 9

What is output by the code to the right?

A. `2.0`

B. `9.0`

C. `27.0`

D. `-27.0`

E. `3.0`

```
double d = 27.0;
out.println( Math.cbrt(d) );
```

QUESTION 10

What is output by the code to the right?

A. `234` B. `334`

C. `342` D. `242`

E. `231`

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

out.println(r.length + "" +
             r[1].length + ""
              + r[2].length);
```

QUESTION 11

How many constructors are shown in the class definition on the right?

A. 0

B. 1

C. 2

D. 3

E. 4

QUESTION 12

Which of these statements correctly constructs a typical 6 string acoustic guitar?

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

II. `Guitar g = new Guitar(6);`

III. `Guitar g = new Guitar("acoustic",6);`

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

QUESTION 13

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

A. `test$1Guitar@a200d0c`

B. `Guitar 5 bass`

C. `bass: 5 string`

D. `acoustic: 6 string`

E. `5 string bass`

```
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()
  {
     return type + ": " +
        numStrings + " string";
  }
}

////////////////////////////////
////client code
Guitar g = new Guitar(5,"bass");
out.println(g);
```

QUESTION 14

What is output by the code to the right?

A. `26` B. `36`

C. `22` D. `50`

E. `27`

```
int j = 5;
double t = 7.5;
long v = 3;
j += t *= v;
out.println(j);
```

QUESTION 15

What is output by the code to the right?

A. 55 B. 0 C. 10 D. 45

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

```
int dog = 0;
for(int m = 0;m<10;m++)
     dog += m;
out.println(dog);
```

QUESTION 16

What is output by the code to the right?

A. 15flyNeb B. 14flyNeb

C. 14rflyNe D. 15rflyNe

E. 14rflyNeb

```
String s = "butterflyNebula";
String t = s.substring(6,12);
out.println( s.length() + t );
```

QUESTION 17

What is output by the code to the right?

A. 000 011 101 110

B. 001 010 100 110

C. 000 011 101 111

D. 000 010 100 111

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

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

QUESTION 18

What is output by the code to the right?

A. 3_4 B. 4_3

C. 3.4_4 D. 4_3.4

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

```
int x = 34;
out.println(x%10 + "_" + x/10);
```

QUESTION 19

What is output by the code to the right?

A. 23

B. 33

C. 75

D. 100

E. 25

```
int c = 50;
c = c << 2 >> 3;
out.println(c);
```

QUESTION 20

Below are the five outputs for the code on the right. Which output line is ***NOT*** in the correct format ?

A. 0x0.0p0

B. 0.000000e+00

C. 0.00000

D. 0.00000

E. 0.0

```
double k = 0.0;
out.printf("%a\n%e\n%f\n%g\n%s\n",
             k,  k,  k,  k,  k);
```

QUESTION 21

Which term ***best*** describes the variable x in the code shown on the right?

A. actual parameter

B. formal parameter

C. global variable

D. instance field

E. static variable

QUESTION 22

Which term correctly replaces ***<item1>*** in the code shown on the right?

A. `int`

B. `void`

C. `return`

D. `double`

E. `parameter`

QUESTION 23

Which term correctly replaces ***<item2>*** in the code shown on the right?

A. `double`

B. `int`

C. `void`

D. `return`

E. `out.println`

QUESTION 24

Assuming that ***<item1>*** and ***<item2>*** have been correctly replaced, what is the output of the client code shown?

A. `98 14 15`

B. `14 15`

C. `98 15`

D. `98 105`

E. `28 15`

```
static <item1> stuff(int x)
{
     if(x%7==0)
        <item2>(x*7);
     <item2>(x);
}


////////////////////////////
/////client code
int a = 14;
int b = 15;
out.print(stuff(a)+" ");
out.println(stuff(b));
```

QUESTION 25

What is output by the code to the right?

A. `0`

B. `00000000` (8 zeroes)

C. `0000000000000000` (16 zeroes)

D. `000000000000000000000000` (24 zeroes)

E. `00000000000000000000000000000000` (32 zeroes)

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

QUESTION 26

What is output by the code to the right?

A. 8 B. 16 C. 24 D. 32 E. 64

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

QUESTION 27

What is output by the code to the right?

A. 0.00 B. 0.71

C. 0.50 D. 1.00

E. -1.00

```
double angle = Math.PI/2;
out.printf("%.2f\n",Math.sin(angle));
```

QUESTION 28

What is output by the code to the right?

A. 11110000 B. 00001111

C. 1111 D. 00011111

E. 15

```
byte b = 15<<0;
String s = Integer.toBinaryString(b);
out.println(s);
```

QUESTION 29

A. 0true92 B. 0993

C. 0973 D. 0true93

E. 0true73

```
ArrayList <Integer> list;
list = new ArrayList<Integer>();
out.print(list.size());
list.add(5);
list.add(7);
out.print(list.add(9));
out.print(list.get(2));
out.print(list.size());
```

QUESTION 30

What is output by the code to the right?

A. truetruetrue B. falsefalsefalse

C. truetruefalse D. falsefalsetrue

E. falsetruefalse

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

QUESTION 31

Find f(6) according to the recursive function definition shown on the right. You may use the space below to do your work.

f(6) =

A. 1

B. 2

C. 3

D. 4

E. 5

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

QUESTION 32

What is output by the code to the right?

A. 2 lem

B. 3 lem

C. 2 mmingContestPro

D. 3 mmingContestPro

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

```
String s;
s = "ProgrammingContestProblem";
String[] ar = s.split("[abc]");
int a = ar.length;
out.println(a + " " + ar[a-1]);
```

QUESTION 33

What is output by the code to the right?

A. `42 answer`

B. `42 universal`

C. `42 universal answer`

D. galaxy hitchhikers rule!

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

```
int w = 42;
String s;
s = (w==42)?"universal":"answer";
out.println(w + " " + s);
```

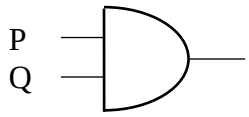
QUESTION 34

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 35

On the right is a boolean expression using generic notation. Which of the expressions below represents the simplest form of this expression ?

A. AA + AB B. A + AB

C. A D. B

E. A ⊕ B

```
A(A + B)
```

(this translates to ***"A and (A or B)"***)

QUESTION 36

What is output by the code to the right?

A. `423612` B. `412362`

C. `234612` D. `123462`

E. `122346`

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

QUESTION 37

What is output by the code to the right?

A. `9 # 9 @ 4 % [9, 6, 5, 8]`

B. `6 # 5 @ 3 % [6, 9]`

C. `6 # 5 @ 3 % [6, 8, 9]`

D. `6 # 5 @ 3 % [6, 8]`

E. `9 # 9 @ 3 % [5, 6, 8]`

```
PriorityQueue <Integer> pq;
pq = new PriorityQueue<Integer>();
out.println();
pq.add(9);
pq.offer(6);
out.print(pq.peek()+" # ");
pq.offer(5);
pq.add(8);
out.print(pq.poll()+" @ ");
out.print(pq.size()+" % ");
pq.remove(2);
out.print(pq);
```

QUESTION 38

Using the generic stack pseudocode on the right, what was the last value popped, and which item is left at the top of the stack ?

A. `1 3` B. `7 5`

C. `6 3` D. `7 3`

E. `1 5`

```
Push 5
Push 3
Push 6
Pop x
Push 1
Push 7
Pop x
Pop x
```

QUESTION 39

Of the descriptions of general code situations with least restrictive Big O classifications, which description on the right is NOT correct ?

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

I. Output first element of an array – O(1)

II. Output the contents of a non-empty array – O(N)

III. Do a merge sort on an array of size 100 – O(N)

IV. Search through a 2-dimensional grid – $O(N^2)$

V. Search through an ordered list using a binary search. – O(log N)

QUESTION 40

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

*If not labeled, the order you put your answers will be assumed to be **leaves**, then **height**.*

Using the space on the right, create a binary search tree using the letters, APLUSCOMPSCI. After creating the tree, indicate how many leaves there are, and the height of the resulting tree.

Assume that the initial tree shown on the right has a height of zero, and that any duplicate letters **<u>are allowed</u>**, and slide to the **left** of matching elements.

Number of leaves Height of tree