Note: Correct responses are based on Java, J2sdk v 6.0, 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 11011_2 plus 111_2 ?

A. 100010_2 B. 110001_2 C. 100000_2 D. 11100_{16} E. 11111_2

QUESTION 2

What is output by the code to the right?

A. 2.5 B. 4.5 C. 4.0 D. 3.5 E. 0.0

```
double b = 2.5;
b++;
++b;
out.println( b );
```

QUESTION 3

What is output by the code to the right?

A. 99 B. 100 C. 0 D. 50 E. 101

```
int cnt = 0;
for(int i = 0; i < 100; i++){
  cnt = cnt + 1;
}
out.print( cnt );
```

QUESTION 4

What is output by the code to the right?

A. ada B. 2000 C. adu000
D. adab--- E. ada2000

```
String tool = "ada";
String newTool = tool + 2000;
out.print( newTool );
```

QUESTION 5

What is output by the code to the right?

A. 5 B. 1 C. 4 D. null E. 0

```
double[] res = {.5, .15,
        .75, 12.1, 5};
out.println( res.length );
```

QUESTION 6

What is output by the code to the right?

A. 3 9 B. 2 6 C. 3 6 D. 9 3 E. 3 2

```
int x = 2;
int y = 3 * x++;
out.print( x + " " + y );
```

QUESTION 7

How many combinations of values for the `boolean` variables `a` and `b` will result in `c` being set to `true`?

A. 2 B. 7 C. 1 D. 3 E. 0

```
boolean a, b;
//code to initialize a and b

boolean c = a && !b;
```

QUESTION 8

What is output by the code to the right?

A. 12 B. 13 C. 1 D. 2 E. 3

```
int j = 3;
double k = 3.03;
if( k > j )
  out.print( 1 );
if( j > 0 && k > 0 )
  out.print( 2 );
else
  out.print( 3 ) ;
```

QUESTION 9

What is output by the line marked `//1` in the client code to the right?

A. `89`

B. `30`

C. `-1`

D. `119`

E. `0`

QUESTION 10

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

A. `null`

B. `false`

C. `true`

D. `0`

E. `1`

```
public class Game{
  public int cost;
  public int rating;

  public Game(int cost, int rate){
    cost = cost;
    rating = rate;
  }

  public int getCost(){
    return cost;
  }

  public boolean good(){
    return rating > 80;
  }
}

////////////////////////////////////
// client code
Game ult = new Game(30, 89);
int cs = ult.getCost();
out.println(cs);            //1
out.println(ult.good());    //2
```

QUESTION 11

What is output by the code to the right?

A. `0` B. `3` C. `11000` D. `88` E. `1331`

```
int m = 11;
int n = m << 3;
out.print( n );
```

QUESTION 12

What is output by the code to the right?

A. `-15` B. `-25` C. `5` D. `-10` E. `-5`

```
int a2 = -5;
int b2 = a2 * a2;
out.print(Math.min( a2, b2));
```

QUESTION 13

What is output by the code to the right?

A. `D` B. `D'Te`

C. `"D'TE"` D. `Te`

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

```
String name = "D'Te";
out.print( name );
```

QUESTION 14

What is output by the code to the right?

A. `12.120` B. `12.1`

C. `12.1200` D. `012.12`

E. `012.12000`

```
out.printf("%5.3f", 12.12);
```

QUESTION 15

What is returned by the method call `x(2.0, 2.0)`?

A. `1.0` B. `2.0` C. `2.5` D. `3.0` E. `0.75`

```
public double x(double a,double b){
  a++;
  a = a / b * 2;
  return a;
}
```

QUESTION 16

What is output by the client code to the right?

A. `[2, 0, 2]` B. `[1, 0, 2]`

C. `[1, 1, 2]` D. `[3]`

E. `[2, 1, 3]`

```
public void demo(int[] list){
  list[0]++;
}

// client code
int[] vals = {1, 0, 2};
demo(vals);
out.print( Arrays.toString(vals) );
```

QUESTION 17

Which of the following is a valid Java identifier?

A. `2x` B. `m@n` C. `x_y` D. `x-y` E. `C#`

QUESTION 18

What is output by the code to the right?

A. `1` B. `true` C. `false` D. `0` E. `null`

```
String s1 = "cs";
String s2 = "CONS";
String s3 = "" + s2.charAt(0);
s3 += s2.charAt(3);
out.print( s1 == s3 );
```

QUESTION 19

What is output by the line marked `A` to the right?

A. `30` B. `1` C. `0` D. `-1` E. `-2`

QUESTION 20

What is output by the line marked `B` to the right?

A. `30` B. `8` C. `10` D. `4` E. `15`

```
int k2 = 30;
int c = 0;
while(k2 > 0){
  c += k2 & 1;
  k2 = k2 >> 1;
}
out.println(k2); // A
out.println(c); // B
```

QUESTION 21

Which of the following is a primitive data type in Java?

A. `Integer` B. `long` C. `String` D. `bool` E. `List`

QUESTION 22

What replaces **<*1>** in the code to the right so that method `min` does not have a syntax error?

A. `int` B. `String`

C. `short` D. `char`

E. `int[]`

```
public <*1> min(int[] list){
  int m = 0;
  int lim = list.length;
  for(int i = 0; i < lim; i++)
    if( list[i] < m )
      m = list[i];
  return m;
}
```

Assume **<*1>** has been filled in correctly.

QUESTION 23

The intention of method `min` is to find the minimum value in an array of `int`s. Which of the following is true about method `min`?

A. It always generates a runtime error.

B. It always returns the maximum value in `list`.

C. It always returns the minimum value in `list`.

D. It never returns the minimum value in `list`.

E. It sometimes returns the minimum value in `list`.

QUESTION 24

What is output by the code to the right?

A. 0 B. -3 C. -9 D. 3 E. 9

```
int[] list = {3, 1, 2, 3};
int t = 0;
for(int i : list)
  t -= i;
out.print(t);
```

QUESTION 25

What is output by the code to the right?

A. mom B. dad C. son

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

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

```
String all = "mom8dad8son";
String[] words = all.split("\\d");
out.print( words[2] );
```

QUESTION 26

What is output by the following client code?

```
int[] values = {3, 2, 1};
sort(values);
out.print(Arrays.toString(values));
```

A. [3, 2, 1] B. [0, 0, 0]

C. [1, 2, 3] D. [1, 1, 1]

E. [3, 3, 3]

QUESTION 27

Which sorting algorithm does method sort implement?

A. quicksort B. selection sort

C. merge sort D. insertion sort

E. bubble sort

```
public void sort(int[] vs){
  int temp;
  for(int i = 1; i < vs.length; i++){
    int j = i;
    while(j > 0 && vs[j] < vs[j - 1]){
      temp = vs[j - 1];
      vs[j - 1] = vs[j];
      vs[j] = temp;
      j--;
    }
  }
}
```

QUESTION 28

Which of the following replaces **<*1>** in the condition of the `if` in the code to the right to determine if the variable `i` is even?

A. `i & 2 == 0` B. `i % 2 == 0`

C. `i || 2 == 0` D. `i << 2 == 0`

E. `i % 2 == 1`

QUESTION 29

Assuming that **<*1>** is filled correctly, what is output by the code to the right?

A. 2 B. 9

C. 1 D. 6 E. 3

```
int max = 7;
int sum = 0;
for(int i = 1; i < max; i++){
  sum++;
  if( <*1> ){
    continue;
  }
  sum++;
}
out.print(sum);
```

QUESTION 30

What is output by the code to the right?

A. true B. false C. null

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

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

```
Object obj = "Ron";
out.print( obj instanceof String );
```

QUESTION 31

Assume the method `process(int[] data)` is O(N) where N = `data.length`. When the method `process` is passed an array with `length` = 100,000 it takes 8 seconds for method `process` to complete. If method `process` is then passed an array with `length` = 25,000 what is the expected time it will take method `process` to complete?

A. 64 seconds

B. 1 second

C. 16 seconds

D. 2 seconds

E. 4 seconds

QUESTION 32

Consider the tree to the right. What kind of tree is it?

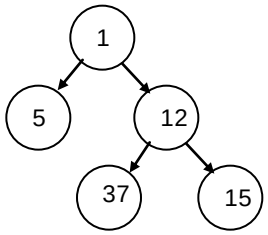
A. A min heap

B. A red black tree

C. A hash table

D. A max heap

E. A binary search tree



QUESTION 33

If a `Structure` object already contains N items, what is the Big O of the remove method? Pick the most restrictive correct answer.

A. O(NlogN)

B. $O(N^2)$

C. O(1)

D. $O(N^3)$

E. O(N)

QUESTION 34

What is the output of the following client code?

```
Structure s = new Structure();
s.add(2);
s.add(5);
s.add(4);
s.add(3);
out.print(s.remove());
```

A. 4 B. 2 C. 5 D. 0 E. 3

QUESTION 35

What kind of data structure does the `Structure` class implement?

A. A list B. A queue

C. A binary search tree D. A hash table

E. A stack

```
public class Structure
{
  private Queue q1;
  private Queue q2;

  public Structure(){
    q1 = new LinkedList();
    q2 = new LinkedList();
  }

  public void add(Object obj){
    q1.add(obj);
  }

  public Object remove(){
    int count = 0;
    while( !q1.isEmpty() ){
      q2.add( q1.remove() );
      count++;
    }
    for(int i = 0; i < count - 1; i++)
      q1.add( q2.remove() );
    return q2.remove();
  }

  public boolean isEmpty(){
    return q1.isEmpty();
  }
}
```

QUESTION 36

The following values are inserted one at a time in the order shown into a binary search tree using the traditional insertion algorithm.

```
19 13 7 -5 -12
```

What is the result of a preorder traversal of the resulting tree?

A. `-12 -5 7 13 19`

B. `7 13 -5 19 -12`

C. `7 -5 13 -12 19`

D. `19 13 7 -5 -12`

E. `7 13 19 -12 -5`

QUESTION 37

How many leaves are there in the tree resulting from question 36?

A. 5

B. 0

C. 2

D. 1

E. 4

QUESTION 38

What is output by the client code to the right?

A. `0`

B. `6`

C. `-2`

D. `10`

E. `3`

```
public int quest(int[] d, int p,
                 int t){
  if( p == d.length )
    return t;
  return quest(d, p + 1, t + d[p]);
}

// client code
int[] figs = {-2, 5, 0, 3};
out.print( quest(figs, 0, 0) );
```

QUESTION 39

Which of the following best describes what method quest does?

A. Returns the maximum value in `d`.

B. Returns the minimum value in `d`.

C. Returns the sum of the elements in `d`.

D. Returns the first value in `d`.

E. Returns the last value in `d`.

QUESTION 40

What is output by the code to the right?

A. `0`

B. `1`

C. `3`

D. `9`

E. `0.0`

```
int q = 3;
int p = q / 2;
q *= (p == 0) ? q : p;
out.print(q);
```