QUESTION 1

What is the sum of 10101_2 and 111_2?

A. 11100_2 B. 1110_2 C. 11111_2 D. 11000_2 E. 10001_2

QUESTION 2

What is output by the code to the right?

A. 5 B. 7 C. 8

D. -3 E. 6

```
int x = 5;
int y = x + 2;
x++;
System.out.println( y );
```

QUESTION 3

What is output by the code to the right?

A. 16 B. 0 C. 32

D. 10 E. 15

```
int count = 0;
for(int i = 0; i < 15; i++){
  count++;
}
System.out.print( count );
```

QUESTION 4

What is output by the code to the right?

A. matlab B. ma C. mat

D. atlab E. tlab

```
String lang = "matlab";
String res = lang.substring(2);
System.out.println( res );
```

QUESTION 5

What is output by the code to the right?

A. 5 B. 4 C. 2

D. 3 E. 6

```
int[] nums = {5, 12, -7, 4, 5, 2};
System.out.print( nums[4] );
```

QUESTION 6

What is output by the code to the right?

A. 0 B. 0.25 C. 2.5

D. 4.5 E. 5.0

```
double a = 2.5;
a += 5 / 2;
System.out.print( a );
```

QUESTION 7

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

A. 1 B. 4 C. 7

D. 0 E. 3

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

boolean d = ( a || b || c );
```

QUESTION 8

What is output by the code to the right?

A. 2 B. 12 C. 123

D. 13 E. 3

```
int u = 5;
double v = 5.5;
if( v > u )
  System.out.print( 1 );
if( (int)v > u )
  System.out.print( 2 );
else
  System.out.print( 3 );
```

QUESTION 9

What replaces **<*1>** in the code to the right so that the `Pizza` class inherits from the `Food` class?

A. `implements`

B. `inherits`

C. `final`

D. `static`

E. `extends`

Assume **<*1>** is filled in correctly.

QUESTION 10

What replaces **<*2>** in the code to the right to concatenate to result the value stored in the variable `cost`?

I. `super.cost`
II. `super.getCost()`
III. `getCost()`

A. I only

B. II only

C. III only

D. Both I and II

E. Both II and III

```
public class Food{
  private int cost;

  public Food(int c){
    cost = c;
  }

  public int getCost(){
    return cost;
  }
}

public class Pizza <*1> Food{
  private int size;

   public Pizza(int cost, int sz){
    super(cost);
    size = sz;
  }

  public String toString(){
    String result = "sz: " + size;
    result += ", cost: " + <*2>;
    return result;
  }
}
```

QUESTION 11

What is output by the code to the right?

A. 47 B. 32 C. true

D. 15 E. false

```
int m = 15;
int n = 32;
System.out.print( m | n );
```

QUESTION 12

What is output by the code to the right?

A. 9 B. 9.0

C. 4 D. 4.0

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

```
int num = 3;
System.out.print( Math.pow(num, num - 1) );
```

QUESTION 13

What is output by the code to the right?

A.
```
One
Two
Three
```

B.
```
One
TwoThree
```

C.
```
OneTwo
Three
```

D.
```
123
```

E.
```
OneTwoThree
```

```
System.out.print("One");
System.out.println("Two");
System.out.println("Three");
```

QUESTION 14

What is output by the code to the right?

A. `33.10` B. `33.1000` C. `33.100`

D. `4.2f` E. `33.10000`

```
System.out.printf("%4.2f", 33.1);
```

QUESTION 15

What is returned by the method call `basic(3)`?

A. `3` B. `16` C. `0`

D. `10` E. `34`

```
public int basic(int x){
  x = x * x;
  x++;
  return x;
}
```

QUESTION 16

The code to the right does not compile. Which line contains the syntax error?

A. `Line A` B. `Line B`

C. `Line C` D. `Line D`

E. `Line E`

```
Object[] things = new Object[10];
things[0] = "cat"; // line A
things[1] = new Integer(12); // line B
things[12] = new Character('A'); // line C
char c2 = things[0].charAt(1); // line D
System.out.print( things[1] );  // line E
```

QUESTION 17

What are the possible outputs for the code to the right?

I. 0
II. 1
III. 3

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

D. I and II E. I, II, and III

```
int x, y, z;
// code to initialize x, y, and z
String result = "";
if ( x > 10 )
  result += "a";
else if( y > 10 )
  result += "a";
else if( z > 10 )
  result += "a";
else
  result += "a";
System.out.println( result.length() );
```

QUESTION 18

What is output by the code to the right?

A. `DC3DC3NY` B. `DC` C. `DCDCNY`

D. `3DC3DCNY` E. `DCDCDCDCDCDCNY`

```
String temp = "DC";
temp += 3;
temp += temp + "NY";
System.out.print( temp );
```

QUESTION 19

What is output by the code to the right?

A. 0 B. 3 C. 9

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

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

```
String[] subjs = {"Chem", "Bio", "CS"};
int total = 0;
for( String st : subjs )
  total += st.length();
System.out.print( total );
```

QUESTION 20

What replaces **<*1>** in the code to the right so that the value stored in `LIMIT` cannot be changed?

A. `local` B. `const` C. `static`

D. `final` E. `this`

```
public int check(int x){
  <*1> double LIMIT = Math.sqrt(x);

  // rest of the method not shown
}
```

QUESTION 21

What is output by the code to the right?

A. 12 B. 11 C. 14

D. 8 E. 10

```
int v = 5;
int w = --v * 2;
System.out.print(w);
```

QUESTION 22

What is output by the client code to the right?

A. 6 B. 2 C. 10

D. 5 E. 4

QUESTION 23

Which searching algorithm does method `indexOf` use?

A. `Binary` B. `Quick` C. `Merge`

D. `Bubble` E. `Sequential`

```
public int indexOf(int start, int[] data,
                                    int tgt){
  int result = -1;
  for(int i = start; i < data.length; i++){
    if( tgt == data[i] ){
      result = i;
      break;
    }
  }
  return result;
}

//client code
int[] scores = {0, -5, 10, 240, 10, 10};
System.out.print( indexOf(3, scores, 10) );
```

QUESTION 24

What is output by the code to the right?

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

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

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

```
ArrayList<Integer> laps;
laps = new ArrayList<Integer>();
laps.add(2);
laps.add(0, 1);
laps.add(0, 3);
laps.set(2, laps.get(1) );
System.out.print( laps );
```

QUESTION 25

What is returned by the method call `many(4)`?

A. 10 B. 9 C. 12

D. 5 E. 14

```
public int many(int n){
  if(n == 1)
    return 5;
  else
    return n + many(n - 1);
}
```

QUESTION 26

What is output by the code to the right when given this input?

```
5.2.1.2\2\2.2
```

A. 10 B. 16 C. 14

D. 5 E. 8

```
Scanner sc = new Scanner(System.in);
sc.useDelimiter("\\.");

int sum = 0;
while( sc.hasNextInt() )
  sum += sc.nextInt();
System.out.print( sum );
```

QUESTION 27

What replaces **<*1>** in the code to the right so method `numVowels` generates an exception and ends if the precondition is not met?

A. `return` B. `catch` C. `end`

D. `throw` E. `assert`

```
// pre: s != null, s.length() > 0
public boolean same(String s){
  if( s == null || s.length() <= 0 )
    <*1> new IllegalArgumentException();

  int last = s.length() - 1;
  return s.charAt(0) == s.charAt(last);
}
```

QUESTION 28

Which sorting algorithm does method `sort` implement?

A. Quicksort B. Insertion sort

C. Merge sort D. Radix sort

E. Selection sort

QUESTION 29

What is the Big O of method `sort` given an `ArrayList` of `Integers` already sorted in descending order? Pick the most restrictive correct answer.

A. $O(N^2)$ B. $O(N)$

C. $O(1)$ D. $O(N^3)$

E. $O(N \log N)$

```
// post: sort elements into desending order
public void sort(ArrayList<Integer> data){
  int max, temp;
  int lim = data.size() - 1;
  for(int i = 0; i < lim; i++){
    max = i;
    for(int j = i + 1; j < data.size(); j++)
      if( data.get(j) > data.get(max) )
        max = j;
    if( i != max ){
      temp = data.remove(i);
      data.add(i, data.remove(max - 1) );
      data.add(max, temp);
    }
  }
}
```

QUESTION 30

Which of the following can replace **<*1>** in the code to the right without causing a syntax error?

A. `new HashSet<Integer>()`

B. `new List<Integer>()`

C. `new LinkedList<Integer>()`

D. `new int[10]`

E. More than one of these are correct.

```
List<Integer> times;
times = <*1>;
```

QUESTION 31

What is output by the code to the right?

A. 12 B. 5 C. 7

D. 8 E. null

```
PriorityQueue<Integer> pq;
pq = new PriorityQueue<Integer>();
int[] toAdd = {12, 5, 7, 5, 8};

for(int i : toAdd)
  pq.add(i);
pq.remove();
System.out.println( pq.peek() );
```

QUESTION 32

What is output by the code to the right?

A. obj B. null

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

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

E. The output can not be determined until runtime.

```
Object obj = new Object();
System.out.println( obj.toString() );
```

QUESTION 33

If N equals `rds.length` what is the Big O of method `process`? Pick the most restrictive correct answer.

A. O(NlogN) B. O(N!) C. $O(N^2)$

D. $O(N^2 \log N)$ E. $O(N^3)$

```
public int process(int[] rds){
  int total = 0;
  int lim = rds.length;
  for(int i = 0; i < lim; i++){
    for(int j = 1; j < lim; j *= 2)
      total += rds[i] * rds[j];
    for(int j = i; j < lim; j++)
      total += rds[i] + rds[j];
  }
  return total;
}
```

QUESTION 34

The height of a tree is the number of links from the root of the tree to the deepest leaf in the tree. The following values are inserted one at a time in the order shown into a binary search tree using the traditional insertion algorithm. What is the height of the resulting tree?

`12, 52, 100, 13, 50, -10`

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

QUESTION 35

What is output by the code to the right?

A. [5]

B. [5, 11]

C. [5, 7, 13]

D. [13, 5, 7]

E. There is no way to determine the output until runtime.

```
TreeSet<Integer> t1 = new TreeSet<Integer>();
TreeSet<Integer> t2 = new TreeSet<Integer>();
t1.add(5);
t1.add(11);
t2.add(13);
t2.add(5);
t2.add(7);
t1.retainAll(t2);
System.out.println(t1);
```

QUESTION 36

What is output by the code to the right when method `testA` is called?

A. 14 B. 11 C. 17

D. There is no output due to a syntax error in method `testA`.

E. There is no output due to an `ArrayIndexOutOfBoundsException`.

QUESTION 37

What is output by the code to the right when method `testB` is called?

A. 22 B. 19 C.

D. There is no output due to a syntax error in method `testB`.

E. There is no output due to an `ArrayIndexOutOfBoundsException`.

```
public int sum(int[][] mat, int pos){
  int result = 0;
  for(int i = 0; i < mat.length; i++){
    result += mat[i][pos];
    result += mat[pos][i];
  }
  return result;
}

public void testA(){
  int[][] mA = {{5,1,3},{1,5,3},{1,2,2}};
  System.out.print( sum(mA, 1) );
}

public void testB(){
  int[][] mB = {{3,1,4},{1,6,2},{2,3,5},
                                {2,5,1}};
  System.out.print( sum(mB, 2) );
}
```

QUESTION 38

What replaces **<*1>** in the code to the right to make that block of code the default constructor for the `Structure` class?

A. `Structure()` B. `new Structure()`

C. `()` D. `Structure`

E. `void Structure()`

Assume **<*1>** is filled in correctly.

QUESTION 39

What is output by the following client code?

```
Structure s = new Structure();
s.add("A");
System.out.println( s.get(0) );
```

A. `A` B. `null`

C. `start` D. `temp`

E. There is no output due to a `NullPointerException`.

QUESTION 40

What type of data structure do the `Node` and `Structure` classes implement?

A. A linked list B. A binary tree

C. A min heap D. A hash table

E. A max heap

```
public class Node{
  public Object data;
  public Node next;
}

public class Structure{
  private Node start;

  public <*1>{
    start = new Node();
  }

  public void add(Object obj){
    Node temp = start;
    while( temp.next != null )
      temp = temp.next;
    temp.next = new Node();
    temp.next.data = obj;
  }

  public Object get(int pos){
    Node temp = start.next;
    for(int i = 0; i < pos; i++)
      temp = temp.next;
    return temp.data;
  }

  public void remove(int pos){
    Node temp = start;
    for(int i = 0; i < pos; i++)
      temp = temp.next;
    temp.next = temp.next.next;
  }
}
```