QUESTION 1

What is the sum of 10001_2 and 1011_2?

A. 11100_2 B. 11111_2 C. 10111_2 D. 11000_2 E. 11110_2

QUESTION 2

What is output by the code to the right?

A. 0 B. 0.4 C. 40

D. 2 E. 2.5

```
int x = 10;
int y = 4;
x = y / x;
System.out.println( x );
```

QUESTION 3

What is output by the code to the right?

A. 7 B. 18 C. 14

D. 6 E. 12

```
int accum = 0;
for(int i = 0; i <= 6; i++){
  accum++;
  accum++;
}
System.out.print( accum );
```

QUESTION 4

What is output by the code to the right?

A. 1 B. 0 C. -1

D. 4 E. 3

```
String prog = "haskell";
System.out.print( prog.indexOf('E', 3) );
```

QUESTION 5

What is output by the code to the right?

A. 2 B. 7 C. 5

D. 8 E. 10

```
int[] data = {2, 3, 1, 5, 3, 1};
data[1] += data[2] + data[5];
System.out.println( data[1] );
```

QUESTION 6

What is output by the code to the right?

A. 100 B. 35 C. 15

D. 50 E. 12

```
int r = 5;
int s = 2;
r *= s + r;
System.out.print( r );
```

QUESTION 7

What is output by the code to the right?

A. true true

B. true false

C. false true

D. false false

E. false true false true

```
boolean p = (4 > 5);
boolean q = (0 != 0);
System.out.print( p && q );
System.out.print( " " );
System.out.print( !p || p );
```

QUESTION 8

What is output by the code to the right?

A. `8 8` B. `8 9` C. `7 7`

D. `7 9` E. `7 8`

```
int x = 8;
int y = 4 * 2;
if( x == y ){
  if( x % 2 == 0 )
    x--;
  else
    y++;
}
System.out.print( x + " " + y );
```

QUESTION 9

What replaces **<*1>** in the code to the right so that `MAX_PTS` and `PASS_RATE` are class constants that are accessible only in the `Grade` class?

A. `public final`

B. `private static`

C. `private final`

D. `private void final`

E. `private static final`

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

```
public class Grade{

  <*1> int MAX_PTS = 100;
  <*1> double PASS_RATE = 0.7;

  private int points;

  public Grade(int p){
    points = p;
  }

  public boolean pass(){
    double ave = 1.0 * points / MAX_PTS;
    return ave >= PASS_RATE;
  }
}
```

QUESTION 10

What is output by the client code to the right?

A. `true` B. `false` C. `1`

D. `180` E. `true true`

```
////////////////////////////////////////
// client code
Grade hist = new Grade(75);
Grade cs = new Grade(105);
boolean result = hist.pass() && cs.pass();
System.out.print( result );
```

QUESTION 11

What is output by the code to the right?

A. `3` B. `15` C. `77`

D. `4` E. `12`

```
int m = 11;
int n = 7;
System.out.print( m ^ n );
```

QUESTION 12

What is output by the code to the right?

A. `0` B. `24` C. `12`

D. `36` E. `-12`

```
int x = 12;
System.out.print( Math.abs(x) + x );
```

QUESTION 13

What is output by the code to the right?

A. `ipipip` B. `ipip` C. `ip`

D. `yyyyip` E. `ipipipip`

```
String text = "ip";
System.out.print( text + text );
System.out.print( text );
```

QUESTION 14

What is output by the code to the right?

A. `03.10` B. `3.10000` C. `0x3.10`

D. `3.10x8` E. `003.10`

```
System.out.printf("%05.2f", 3.1);
```

QUESTION 15

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

A. `11` B. `-1` C. `-3`

D. `5` E. `-13`

```
public int joy(int w){
  w = w * w;
  w -= w;
  w--;
  return w;
}
```

QUESTION 16

What is output by the code to the right?

A. `a` B. `99` C. `c`

D. `2` E. `y`

```
int let = 'a';
let += 2;
System.out.print( (char)let );
```

QUESTION 17

What is output by the code to the right?

A. `3mid3` B. `3mid12` C. `3sum3`

D. `12mid12` E. `12mid3`

```
String sum = 1 + 2 + "mid" + 1 + 2;
System.out.print( sum );
```

QUESTION 18

What is output by the code to the right?

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

D. `[0, 2]` E. `[2, 0, 1]`

```
ArrayList<Integer> readings;
readings = new ArrayList<Integer>();
readings.add(2);
readings.add(0, 1);
System.out.print( readings );
```

QUESTION 19

What is output by the code to the right?

A. `3` B. `12` C. `4`

D. `6` E. There is no output due to an infinite loop.

```
int test = 3;
int flag = 6;
do{
  test++;
  flag *= 2;
} while( flag < test );
System.out.print( test );
```

QUESTION 20

What is output by the code to the right?

A. `0` B. `null` C. `1`

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

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

```
String[] courses = new String[5];
System.out.print( courses[4].length() );
```

QUESTION 21

Which of the following can replace **<*1>** in the code to the right so that the code segment compiles without error?

I. `name`
II. `(Object)name`
III. `name.toObject()`

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

D. I and II E. II and III

```
String name = "Sam";
Object obj;
obj = <*1>;
System.out.print( obj );
```

QUESTION 22

What is output by the code to the right?

A. `Abe` B. `P` C. `?:`

D. `V` E. `Mondale`

```
String pres = "Abe";
String vice = "Mondale";
char res;
res = ( pres.length() > vice.length() )
          ? 'P' : 'V';
System.out.print( res );
```

QUESTION 23

What is output by the code to the right?

A. `3` B. `2` C. `13`

D. `12` E. `10`

```
int hold = 10;
int other = 2;
if((hold % 5 == 0) || (other++ % 2 == 0))
  hold += other;
System.out.print( hold );
```

QUESTION 24

What replaces **<*1>** in the code to the right to indicate the block of code that sets `count` to `-1` is the exception handling code for any `IOException`s generated by the code in the preceding `try` block?

A. `catch(IOException e)`

B. `finally(IOException e)`

C. `then`

D. `catch`

E. `throws(RuntimeException e)`

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

QUESTION 25

If no file exists with the name specified by the `String nm` what does method `count` do?

A. Returns `-1`.

B. Returns `0`.

C. Returns `null`.

D. The program halts due to a runtime error.

E. Method `count` never ends due to an infinite loop.

```
public int count(String nm){
  int count = 0;
  try{
    FileReader f;
    f = new FileReader( new File(nm) );
    while( f.ready() ){
      f.read();
      count++;
    }
  } <*1> {
    count = -1;
  }
  return count;
}
```

QUESTION 26

Which of the following can replace **<*1>** in the code to the right so that the code segment compiles without error?

I. `26.2`
II. `new Double(26.2)`
III. `"26.2"`

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

D. I and II E. I and III

```
ArrayList<Double> distances;
distances = new ArrayList<Double>();
distances.add(<*1>);
```

QUESTION 27

What is output by the client code to the right?

A. `[5, 1, -5, 0, 2]`

B. `[5, 2, 1, 0, -5]`

C. `[0, 1, 2, 3, 4]`

D. `[5, 2, 1, 0]`

E. `[-5, 0, 1, 2, 5]`

QUESTION 28

Which searching algorithm does method `find` use?

A. sequential search

B. interpolation search

C. quick search

D. linear search

E. binary search

QUESTION 29

Which sorting algorithm does method `sort` implement?

A. a modified insertion sort

B. a modified radix sort

C. a modified selection sort

D. a modified quick sort

E. a modified merge sort

```
/* If tgt is present in nums return the
index of an element equal to tgt
else return the index of where tgt should
be placed to maintain nums in sorted order.
*/
public int find(int[] nums,
                          int tgt, int high){
  int low = 0;
  int mid = (low + high) / 2;
  boolean found = false;
  while( !found && low <= high){
    mid = (low + high) / 2;
    if( nums[mid] < tgt )
      low = mid + 1;
    else if( nums[mid] > tgt )
      high = mid - 1;
    else
      found = true;
  }
  return found ? mid : low;
}

public void sort(int[] nums){
  for(int i = 1; i < nums.length; i++){
    int tgt = find(nums, nums[i], i - 1);
    int temp = nums[i];
    for(int j = i; j > tgt; j--){
      nums[j] = nums[j -1];
    }
    nums[tgt] = temp;
  }
}

// client code
int[] nums = {5, 1, -5, 0, 2};
sort(nums);
System.out.print( Arrays.toString(nums) );
```

QUESTION 30

What is the Big O of method `range`? The `LinkedList data` contains N distinct `Intgers`. Pick the most restrictive correct answer.

A. O(NlogN) B. $O(N^{3/2})$ C. $O(N^2 logN)$

D. $O(N^2)$ E. O(N)

```
public int range(LinkedList<Integer> data){
  Collections.sort( data );
  int min = data.getFirst();
  int max = data.getLast();
  return max - min + 1;
}
```

QUESTION 31

What is output by the code to the right?

A. 31 B. 0 C. 64

D. 128 E. 223

```
int alpha = 64;
int beta = 31;
int gamma = 128;
gamma = alpha & beta | gamma;
System.out.println( gamma );
```

QUESTION 32

Which of the following replaces **<*1>** in the code to the right to return the value in `max` if the value in `max` is greater than or equal to the number of elements in array `d` from index `i` to the last element in the array, inclusive?

A.
```
if( max >= lim - i )
  return max;
```

B.
```
if( max >= i )
  break;
```

C.
```
if( max >= d.length )
  return max;
```

D.
```
if( max >= d[i] )
  return max;
```

E.
```
if( max > d.length - d[i] )
  break;
```

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

```
public int trace(int[] d){
  int max = 0;
  int lim = d.length;
  for(int i = 0; i < lim; i++){
    <*1>
    int j = i + 1;
    int len = 1;
    while( j < lim && d[j] > d[j - 1] ){
      len++;
      j++;
    }
    max = Math.max(max, len);
  }
  return max;
}

// client code
int[] values = {2, 1, -1, 4, 8, 8, 10};
System.out.print( trace(values) );
```

QUESTION 33

What is output by the client code to the right?

A. 4 B. 7 C. 2

D. 10 E. 3

QUESTION 34

Assume method `sample(int[] data)` is $O(N^3)$ where N = `data.length`. When method `sample` is passed an array with `length` = 2,000 it takes 1 second for method `sample` to complete. If method `sample` is then passed an array with `length` = 4,000 what is the expected time it will take method `sample` to complete?

A. 4 seconds B. 9 seconds C. 64 seconds D. 16 seconds E. 8 seconds

QUESTION 35

What is output by the code to the right?

A. `[4, 2]` B. `[2, 4, 6, 12]`

C. `[6, 12]` D. `[6, 2, 4, 12]`

E. `[2, 4]`

```
Set<Integer> s1 = new TreeSet<Integer>();
Set<Integer> s2 = new TreeSet<Integer>();
int[] data1 = {6, 2, 4, 12};
int[] data2 = {0, 5, 4, 2};
for(int i = 0; i < data1.length; i++){
  s1.add(data1[i]);
  s2.add(data2[i]);
 }
s1.retainAll(s2);
System.out.print(s1);
```

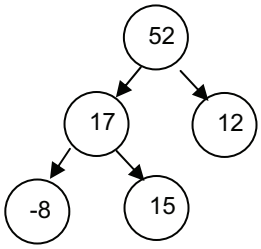
QUESTION 36

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

A. A stack tree B. A min heap

C. A max heap D. A red black tree

E. A binary search tree



QUESTION 37

Consider the code to the right. Which of the following data types can replace **`<*1>`** in the following client code so that the client code compiles without error?

`<*1>` `currentScore = new Score();`

A. `Score`, `int`

B. `Object`, `Incrementable`, and `Score`

C. `E`, `Object`, `Comparable`, and `Score`

D. `Object`, `String`, and `Score`

E. `String`, `Object`, `Incrementable`, and `Score`

```
public interface Incrementable{
  public void increment();
}

public class Score implements
Incrementable{

  private int points;

  public Score(){
    points = 0;
  }

  public void increment(){
    points++;
  }
}
```

QUESTION 38

What replaces **<*1>** in the code to the right to allocate a new array of the proper type with `cap` elements?

A. `new E`

B. `(E[])(new Object[cap])`

C. `E[cap]`

D. `(E)(new Object[])`

E. `new E[cap]`

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

QUESTION 39

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

A. A list

B. A stack

C. A queue

D. A binary search tree

E. A hash table

```
public class Structure<E>{
  private int size;
  private E[] con;

  public Structure(){ con = getCon(10); }

  public void add(E obj){
    if( size == con.length )
      con = getCon( size * 2 );
    con[size++] = obj;
  }

  public E get(int pos){
    return con[pos];
  }

  public void remove(int pos){
    size--;
    for(int i = pos; i < size; i++)
            con[i] = con[i + 1];
   }

  public int size(){ return size; }

  private E[] getCon(int cap){
    E[] temp = <*1>;
    for(int i = 0; i < size; i++)
      temp[i] = con[i];
    return temp;
  }
}
```

QUESTION 40

What is output by the client code to the right?

A. `131` B. `13` C. `1`

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

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

```
public interface Card{
  public static final int ACE = 13;
}

public class BlackjackCard implements Card{
  public static final int ACE = 1;
}

// client code
System.out.print( BlackjackCard.ACE );
```