QUESTION 1

What is the sum of DE_{16} and 22_{16}?

A. FF_{16} B. 100_{16} C. $F0_{16}$ D. $A00_{16}$ E. BC_{16}

QUESTION 2

What is output by the code to the right?

A. 6 B. -6 C. 0

D. -12 E. -9

```
int x = -3;
int y = x + 2 * x;
int z = y + x / -1;
System.out.print( z );
```

QUESTION 3

How many *'s are output by the code to the right?

A. 11 B. 9 C. 0

D. 10 E. 5

```
int limit = 10;
for(int count = 1; count <= limit; count++)
    System.out.print( "*" );
```

QUESTION 4

What is output by the code to the right?

A. 64 B. 02 C. 0-2

D. There is no output due to a syntax error in the code.

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

```
int[] list = new int[6];
for(int i = 0; i < list.length; i++)
    list[i] = list.length - i * 2;
System.out.print( list[3] );
System.out.print( list[list.length - 2] );
```

QUESTION 5

What is output by the code to the right?

A. 21166

B. abcd

C. 20175

D. 231212

E. 71166

```
String name = "abcd";
int[] data = {7, 2, 14, 9};
for(int i = 0; i < data.length; i++){
  if( i % 2 == 0 ){
    if( name.charAt(i) < 'c' )
      data[i] /= 3;
    else
      data[i] -= name.charAt(i) - 'a';
  } else {
      data[i] += name.charAt(i) - 'a';
  }
}
for(int i : data )
  System.out.print( i );
```

QUESTION 6

What replaces **<*1>** in the code to the right so that method `test` always returns `true`?

A. && B. ! C. >>

D. || E. ^

```
public boolean test(int x){
    return ( x > 0 ) <*1> ( x < 100 );
}
```

QUESTION 7

What is output by the code to the right?

A. `12963`

B. `876`

C. `131074`

D. There is no output due to a syntax error in the code.

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

```
int x = 14;
int[][] mat = new int[4][3];
for(int r = 0; r < mat.length; r++){
  for(int c = 0; c < mat[0].length; c++){
    mat[r][c] = x;
    x--;
  }
}
int c = x;
for(int r = 0; r < mat.length; r++){
  System.out.print( mat[r][c] );
}
```

QUESTION 8

What is output by the code to the right?

A. `ineers` B. `n` C. `e`

D. `neers` E. `engineers`

```
String team = "engineers";
System.out.print( team.substring(4) );
```

QUESTION 9

What is output by the code to the right?

A. `22` B. `11` C. `12`

D. `21` E. `221`

```
int x = 15;
int y = 10;
if( x * y > x * x )
  System.out.print( "1");
else
  System.out.print( "2");
if( y - x != x - y )
  System.out.print( "1");
else
  System.out.print( "2");
```

QUESTION 10

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

A. `[1, 2, 3, 4, 5]`

B. `[2, 4, 3, 1, 5]`

C. `[0, 0, 0, 0, 0]`

D. `[5, 4, 3, 2, 1]`

E. `[5, 1, 3, 4, 2]`

QUESTION 11

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

A. `[2, 3, 4, 1, 5]`

B. `[2, 4, 3, 1, 5]`

C. `[5, 1, 3, 4, 2]`

D. `[5, 2, 4, 1, 3]`

E. `[2, 5, 3, 1, 4]`

```
int[] data1 = {5, 1, 3, 4, 2};
ArrayList<Integer> f =
                    new ArrayList<Integer>();

for(int i : data1)
  f.add(i);

System.out.print( f ); // line 1

System.out.println();

for(int i = 0; i < 3; i++){
  f.add(i, f.set(5 - i - 2, f.remove(i) ) );
}

System.out.print( f ); // line 2
```

QUESTION 12

What replaces **<*1>** in the code to the right so that the when the two integer constructor in the `Complex` class is called the resulting `Complex` object's instance variables are initialized to store the same values as the parameters `real` and `imag` ?

I.
```
this.real = real;
this.imag = imag;
```

II.
```
real = real;
imag = imag;
```

III.
```
Complex.real = real;
Complex.imag = imag;
```

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

D. I and II E. I and III

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

QUESTION 13

What replaces **<*2>** in the code to the right to declare a variable of type `Complex` named `c1` and makes `c1` refer to a new `Complex` object with both instance variables initialized to `0`?

A. `Complex c1 = new Complex();`

B. `Complex c1 = new Complex;`

C. `Complex c1 = Complex(0, 0);`

D. `Complex c1 = new Complex(0, 0);`

E. More than one of these.

Assume **<*1>** and **<*2>** are filled in correctly.

QUESTION 14

When method `utep` is called, what is output by the line marked `// line 1` in the code to the right?

A. `0`

B. `0_0`

C. `0_0i`

D. `_i`

E. `0, 0`

QUESTION 15

When method `utep` is called, what is output by the line marked `// line 2` in the code to the right?

A. `1_0i`

B. `1`

C. `0_-2i`

D. `0_-1i`

E. `-2i`

```
public class Complex{
  private int real;
  private int imag;

  public Complex(int real, int imag){
    <*1>
  }

  public String toString(){
    return real + "_" + imag + "i";
  }

  public void alter(){
    real++;
  }
}

-------------------------------------

// in a class other than Complex
public void utep(){
  <*2>
  System.out.print( c1 ); // line 1
  Complex c2 = rice(c1);
  System.out.println();
  System.out.print( c2 ); // line 2
}

public Complex rice(Complex c){
  c.alter();
  c = new Complex( -1, -2 );
  c.alter();
  return c;
}
```

QUESTION 16

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

A. 2 B. 6 C. 3

D. 9 E. 7

QUESTION 17

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

A. 13 B. 27 C. 30

D. 12 E. 3011

QUESTION 18

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

A. 0 B. 2 C. 4

D. 1 E. 3

```
public int tt(int x, int y){
    x = x * 2;
    --y;
    int z = x % y;
    return z + 1;
}

public int aam(int z){
    z++;
    int x = z + 2;
    int y = tt(z, x);
    x += z;
    return x - y + z;
}

public void hsu(){
    System.out.print( tt(13, 11) );
}

public void ut(){
    int x = 12;
    int y = aam(x);
    System.out.print( x );
}

public void ts(){
    int x = 2;
    int y = 4;
    int z = tt( aam(x), y );
    System.out.print( z );
}
```

QUESTION 19

What is returned by `eval(new int[] {3,0,1,5,4,1,7} ) ?`

A. 21 B. 0 C. 24

D. 25 E. 3015417

```
public int eval(int[] org){
  int a;
  int t = 0;
  for(int i : org){
    a = i % 2;
    t += (a == 1) ? i : org[i];
  }
  return t;
}
```

QUESTION 20

What is output by the code to the right?

A. dithering

B. 1dith\ter\ting

C. 1dithterting

D. 3dithering

E. 2dithering

```
String start = "dith\ter\ting";
String[] chop = start.split("\\s");
System.out.print( chop.length );
for(String s : chop)
    System.out.print( s );
```

QUESTION 21

What is output by the code to the right?

A. 2.3

B. 1.8

C. 1.3

D. -0.7

E. 37.3

```
String nums = "-0.5 0.3 A 1A  -.5   2";
double sum = 0;
Scanner s = new Scanner(nums);
while( s.hasNext() ){
    if( s.hasNextDouble() )
        sum += s.nextDouble();
    else
        s.next();
}
System.out.print( sum );
```

QUESTION 22

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

A. 13125807

B. 58121307

C. 13128507

D. 05781213

E. 05812137

QUESTION 23

Which sorting algorithm is implemented by method `sort`?

A. Insertion sort

B. Bubble sort

C. Quick sort

D. Selection sort

E. Merge sort

QUESTION 24

If the value of the parameter `b` is `false`, what is the expected running time of method `sort` on an array containing `N` unique items in descending order? Choose the most restrictive correct answer.

A. $O(N^2)$ B. $O(N)$ C. $O(N^3)$

D. $O(N \log N)$ E. $O(\log N)$

```
public void swap(int[] data, int i, int j){
  int t = data[i];
  data[i] = data[j];
  data[j] = t;
}

public void sort(int[] list, boolean b){
  int temp, j;
  for(int i = 1; i < list.length; i++){
    temp = list[i];
    j = i;
    while( j > 0 && temp < list[j - 1]){
      swap(list, j, j - 1);
      j--;
    }

    if( b && i == 4 ){
      for(int k : list){
        System.out.print(k);
      }
    }

  }
}

public void go(){
  int[] data = {13, 12, 5, 8, 0, 7};
  sort(data, true);
}
```

QUESTION 25

What is output by the code to the right?

A. 0 B. 3 C. 2

D. There is no output due to a syntax error in the code.

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

```
double val = 201;
double div = 100;
double res = val / div;
System.out.print( (int)res );
```

QUESTION 26

What is returned by the method call `utpb("abcdb")` ?

A. `36`

B. `8`

C. `16`

D. `0`

E. `1`

QUESTION 27

What argument to method `utpb` will cause the method to return the `value 3` ?

A. `"aa"` B. `"bba"` C. `"abb"`

D. `"d"` E. More than one of these.

QUESTION 28

What could replace the statement
`res = res * res;`
in `case 'c'` so that method `utpb` functions exactly the same?

A. `res = res * 2;`

B. `res = res ^ 2;`

C. `res *= res;`

D. `Math.pow(2, res);`

E. `res = res >> 2;`

```
public int utpb(String val){
  int res = 1;
  for(int i = 0; i < val.length(); i += 2){
    char c = val.charAt(i);
    switch (c) {
      case 'b': res *= 2; break;
      case 'd': res += 2; break;
      case 'c': res = res * res; break;
      case 'a': res++; break;
      default:
        res = res / 3;
    }
  }
  return res;
}
```

QUESTION 29

What is output by the code to the right?

A. `-1` B. `0` C. `1`

D. An integer less than `-1`.

E. An integer greater than `1`.

```
String name1 = "Manuel_Blum";
String name2 = "Manuel_Mann";
int r = name1.compareTo(name2.toLowerCase());
System.out.print( r );
```

QUESTION 30

What is returned by `uhcl(100)` ?

A. `19` B. `15` C. `0`

D. `12` E. `11`

```
public int uhcl(int n){
    if( n < 20 )
        return n;
    else
        return uhcl( (n + 10) / 2 );
}
```

QUESTION 31

What is output by method `acc` when it is invoked via the call `acc(-2)` ?

A. `-2`

B. `5`

C. `6`

D. `8`

E. None of these.

```
//pre: x > 0
public void acc(int x){
  if( !(x > 0) )
    throw new IllegalArgumentException();
  x = x * x;
  x++;
  System.out.println( x );
}
```

QUESTION 32

What is output by the following code segment?

```
int[] d = {0, 3, 1, 4, 1, 5, 1, 1, 2};
System.out.print( wiley(3, d) );
```

A. `10`

B. `4`

C. `7`

D. `42`

E. `8`

```
//pre: num <= list.length
public int wiley(int n, int[] list){
  int m = 0;
  int rt = 0;
  for(int i = 0; i < list.length - n; i++){
    rt = 0;
    for(int j = 0; j < n; j++){
      rt += list[i + j];
    }
    if( rt > m ){
      m = rt;
    }
  }
  return m;
}
```

QUESTION 33

What is returned by
`tlu("alanperlis", "richhamming")` ?

A. `-1` B. `21` C. `19`

D. `15` E. `1`

```
public int tlu(String s1, String s2){
  int r = 0;
  for(int i = 0; i < s1.length(); i++){
    r += s2.indexOf( s1.charAt(i) );
  }
  return r;
}
```

QUESTION 34

What is output by the code to the right?

A. `5` B. `44` C. `4`

D. `32` E. `12`

```
int k = 200;
int n = 2;
int tot = 0;
while( k > n ){
  k /= 2;
  n *= 2;
  tot++;
}
System.out.print( tot );
```

QUESTION 35

What replaces **<*1>** in the code to the right so that the instance variable `data` and the `parameter val can` refer to objects of any type?

A. `E`

B. `AnyType`

C. `Object`

D. `Node`

E. `String`

```
public class Node{

  public <*1>  data;
  public Node next;

}
```

Assume **<*1>** from Question 35 is filled in correctly

QUESTION 36

What is output by the following code segment?

```
GList s1 = new GList();
s1.insert("A");
s1.insert("C");
s1.insert("B");
s1.insert("A");
System.out.print( s1 );
```

A. `ACBA`

B. `AABC`

C. `CBAA`

D. `ABCA`

E. `ACB`

QUESTION 37

What is output by the following code segment?

```
GList s2 = new GList();
ArrayList<String> a2
              = new ArrayList<String>();
s2.insert("A");
a2.add("A");
a2.add("C");
a2.add("B");
s2.insert(a2);
System.out.print( s2 );
```

A. `[A, C, B]A`

B. `ACBA`

C. `ABCA`

D. `ABC`

E. There is no output due to a syntax error in the code.

```
public class GList{

  private Node head;

  public GList(){
    head = null;
  }

  public void insert(<*1> val){
    if( head == null ){
      head = new Node();
      head.data = val;
    }
    else {
      Node n = new Node();
      n.data = val;
      n.next = head;
      head = n;
    }
  }

  public String toString(){
    String result = "";
    Node t = head;
    while( t != null ){
      result += t.data.toString();
      t = t.next;
    }
    return result;
  }

}
```

QUESTION 38

Which statement below represents the truth table to the right? `a`, `b`, and `c` are all variables of type `boolean` .

a	b	c
false	false	false
false	true	false
true	false	false
true	true	false

A. `c = !a && a && b && !b;`

B. `c = !a && !b;`

C. `c = !a || !b;`

D. `c = (a && !b) || !a;`

E. `c = !ab;`

QUESTION 39

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

A. `9`

B. `18`

C. `45`

D. There is no output due to a syntax error in the code.

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

```
public int calc(int[] list){
  int total = 0;
  int n = list.length;
  int lim = list.length * list.length;
  for(int i = 0; i < lim; i++){
    total += list[i % n];
  }
  return total;
}

public void sted(){
  int[] vals = {2, 2, 3, 1, 1};
  System.out.print( calc(vals) );
}
```

QUESTION 40

What is the running time of method `calc` for an array containing `N` items? Choose the most restrictive correct answer.

A. $O(N^2)$ B. $O(N)$ C. $O(1)$

D. $O(N^3)$ E. $O(NlogN)$