QUESTION 1

What is the number AC_{16} when converted to binary?

A. 10011100_2 B. 10011010_2 C. 10101100_2 D. 10101010_2 E. None of these

QUESTION 2

What is the value of `A[3]` after executing the code to the right?

A. 3

B. 4

C. 5

D. 12

E. None of these

```
int [] A = {1, 2, 3, 4, 5};
int [] B;

B = A;
B[3] = 12;
```

QUESTION 3

The constructor for the `Clock` class takes three integer parameters, and sets the private data members to those three parameters if they are all valid, and to all zeros otherwise. Valid values for `hour` are `0-23`, inclusive. Valid values for `min` and `sec` are `0-59`, inclusive. Which of these correctly implements the constructor?

A.
```
public Clock() {}
```

B.
```
public Clock(int h, int m, int s) {
  if (h >=0 && h < 24 &&
      m >=0 && m < 60 &&
      s >=0 && s < 60) {
     hour = h;
     min = m;
     sec = s;
  }
}
```

C.
```
public Clock(int h, int m, int s) {
  hour = ((h>=0 && h<24)?h:0);
  min =  ((m>=0 && m<60)?m:0);
  sec =  ((s>=0 && s<60)?s:0);
}
```

D. Both B and C

E. None of these

```
public class Clock {

  // Constructor not shown

  private int hour;
  private int min;
  private int sec;
}
```

QUESTION 4

What is output by the code to the right?

A. 128 B. 100

C. 64 D. 7

E. None of these

```
int i = 1;

do {
  i = i*2;
} while (i<100);

System.out.print(i);
```

QUESTION 5

Which of the following replaces **<*1>** in the code to the right to produce a string consisting of the first name, a space, and the last name?

A. `return "firstName lastName";`

B. `return firstName + " " + lastName;`

C.
```
return "this.firstName "
          "this.lastName";
```

D. `return firstName" "lastName;`

E. None of these

QUESTION 6

Which of the following declares a variable of type `Person` and initializes it to Jane Doe?

A. `Person p = new Person("Jane","Doe");`

B. `Person p = new Person("Jane Doe");`

C. `Person p("Jane", "Doe");`

D. `Person p("Jane Doe");`

E. None of these

QUESTION 7

Assume that **<*1>** is filled in correctly and that `p` is declared correctly to represent Jane Doe. What is output by the statement below?

```
System.out.print(p);
```

A. Nothing

B. `Doe, Jane`

C. `JaneDoe`

D. `Jane Doe`

E. None of these

```
public class Person {

  public Person(String first, String last){
    firstName = first;
    lastName = last;
  }

  public String toString() {
    <*1>
  }

  private String firstName;
  private String lastName;
}
```

QUESTION 8

Assume static method `readLine()` reads a line from standard input. Which of these checks whether the line read is `"Hello"`?

A. `"Hello" == s`

B. `"Hello".equals(s)`

C. `s == "Hello"`

D. `s.equals("Hello")`

E. More than one of these

```
String s = readLine();
```

QUESTION 9

What replaces **<*1>** in the code to the right to generate a random integer between `1` and `6`, inclusive?

A. `r.next(new Integer(), 6)`
B. `r.nextInt(6) + 1`
C. `r.next(6)`
D. `r.nextInt(1, 7)`
E. None of these

QUESTION 10

Assume **<*1>** is filled in correctly. What does the static method `roll()` simulate?

A. Rolling `x` dice, dropping the lowest `y` values
B. Rolling `x` dice, dropping the highest `y` values
C. Rolling `y` dice, dropping the lowest `x` values
D. Rolling `y` dice, dropping the highest `x` values
E. None of these

```
public static int roll(int x, int y) {
  Random r = new Random();
  int[] rolls = new int[x];
  for(int i=0; i<x; ++i)
    rolls[i] = <*1>;
  Arrays.sort(rolls);
  int sum=0;
  for (int i=y; i<x; ++i)
    sum += rolls[i];
  return sum;
}
```

QUESTION 11

What replaces **<*1>** in the code to the right to return the string in `sb`?

A. `return (String)sb`
B. `return sb.toString()`
C. `return sb.data`
D. `System.out.print(sb)`
E. None of these

QUESTION 12

Assume **<*1>** has been filled in correctly. What is returned by the static method call `mangle("Freedom!")`?

A. `"FreeFree"`
B. `"FFeeddmm"`
C. `"Frreroe!"`
D. `"!modeerF"`
E. None of these

```
public static String mangle(String s) {
  StringBuffer sb = new StringBuffer(s);
  for (int i=0; i<s.length()/2; ++i)
    sb.setCharAt(i*2, sb.charAt(i));
  <*1>;
}
```

QUESTION 13

Which of these could be used anywhere to declare variable `a` to have type `A`, and to create an instance with data member x set to 10?

A.
```
A a = new A();
a.x = 10;
```

B.
```
A a = new A;
a.x = 10;
```

C.
```
A a = new A;
a.setX(10);
```

D.
```
A a = new A();
a.setX(10);
```

E. More than one of these

QUESTION 14

Which of these replaces **<*1>** in the declaration of class `B` to indicate that `B` is a subclass of `A`?

A. `implements A`
B. `extending A`
C. `superclass A`
D. `subclass of A`
E. None of these

```
public class A {
  public void setX(int x) { this.x = x; }
  public int getX() { return x; }

  private int x;
}

public class B <*1> {
  // methods and data not shown
}
```

QUESTION 15

Which of these replaces **<*1>** in the code to the right to return `1` if `x` is not positive?

A. `if (x<1) return 1;`
B. `if x < 1 return 1;`
C. `do { return 1; } if (x<1);`
D. `do { return 1; } if x < 1;`
E. More than one of these

QUESTION 16

Assume **<*1>** is filled in correctly. What is returned by `recurse(12)`?

A. `1`
B. `12`
C. `216`
D. `479001600`
E. None of these

```
public static int recurse(int x) {
   <*1>
   else return x * recurse(x/2);
}
```

QUESTION 17

Which of these replaces **<*1>** in the code to the right to make the default constructor call the other constructor with the argument `10`?

A. `this(10);`
B. `super(10);`
C. `Stack(10);`
D. `maxSize=10;`
E. None of these

QUESTION 18

The `push()` method should add the new item at the location represented by `currentSize` and increment `currentSize`. The `pop()` method should decrement `currentSize` and return the item at the location represented by `currentSize` after the decrement. Which of these replace **<*2>** and **<*3>** so that the methods work this way?

A. **<*2>:** `items[currentSize++]`
<*3>: `items[currentSize--]`

B. **<*2>:** `items[++currentSize]`
<*3>: `items[--currentSize]`

C. **<*2>:** `items[++currentSize]`
<*3>: `items[currentSize--]`

D. **<*2>:** `items[currentSize++]`
<*3>: `items[--currentSize]`

E. All of these

QUESTION 19

Assume **<*1>**, **<*2>**, and **<*3>** are filled in correctly. What happens if a stack is built using this class, and a call to `pop()` is made on that stack before any call to `push()`?

A. The call is ignored
B. The method returns `null`
C. The method returns an arbitrary object
D. An `ArrayIndexOutOfBoundsException` is thrown
E. None of these

```
public class Stack {
  public Stack() { <*1> }

  public Stack(int max) {
    maxSize = max;
    items = new Object[maxSize];
  }

  public void push(Object o) {
    <*2> = o;
  }

  public Object pop() {
    return <*3>;
  }

  private Object[] items;
  private int maxSize;
  private int currentSize;
}
```

QUESTION 20

If the items 15, 27, and 12 are pushed onto a stack in that order, in what order will they be returned by popping the stack?

A. 15, 27, 12 B. 12, 27, 15 C. 12, 15, 27 D. 27, 15, 12 E. None of these

QUESTION 21

What is the value of `z` after the declarations to the right?

A. `0` B. `4`

C. `12` D. `65536`

E. None of these

```
int x = 12;
int y = 4;
int z = x << y;
```

QUESTION 22

If `n` is initialized to `10`, how many `*`'s are output by the code to the right?

A. `0` B. `9`

C. `10` D. `11`

E. None of these

```
int n;

// code to initialize n

int i = 0;

while (i < n) {
  ++i;
  System.out.print('*');
}
```

QUESTION 23

What is the running time of the loop for an arbitrary `n`? Choose the smallest correct answer.

A. `O(1)` B. `O(log n)`

C. `O(n)` D. $O(n^2)$

E. None of these

QUESTION 24

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

A. `0` B. `1`

C. `10` D. `20`

E. None of these

```
for (int i=0; i<10; ++i) {
  System.out.print('*');
  if (i%2 == 0) break;
  System.out.print('*');
}
```

QUESTION 25

If the `break` statement in the code to the right is changed to a `continue` statement, how many `*`'s are output?

A. `0` B. `1`

C. `10` D. `20`

E. None of these

QUESTION 26

Which of these character sequences can be put inside a string literal to cause a line break?

A. `\n` B. `\t` C. `\l` D. `\b` E. None of these

QUESTION 27

Which of these declares and initializes `m` to be the array represented below?

1	2	3
4	5	6
7	8	9

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

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

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

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

E. None of these

QUESTION 28

What does `m` look like after calling static method `reverse(m)`?

```
public static void reverse(int[][] matrix){
  for (int i=0; i<matrix.length; ++i)
    for (int j=i; j<matrix.length; ++j)
      matrix[i][j] = matrix[j][i];
}
```

A.

1	4	7
4	5	8
7	8	9

B.

1	2	3
2	5	6
3	6	9

C.

1	2	3
4	5	6
7	8	9

D.

1	4	7
2	5	8
3	6	9

E. None of these

QUESTION 29

Which of the following data structures stores a collection of items in an array where the position of an item in the array is determined by applying a mapping function to the item's key?

A. linked list B. binary tree C. queue D. hash table E. None of these

QUESTION 30

Assume the static method `readLine()` reads a line from standard input. What is output by the code to the right on the input below?

```
 ABC 123  DEF   456
```

A. `0ABC11232DEF3456`

B. `0ABC 1123  2DEF   3456`

C. `0ABC112323DEF456456`

D. `ABC 123 DEF 456`

E. None of these

```
String s = readLine();

String regex = "\\s+";

String[] sArray = s.split(regex);

for (int i=0; i < sArray.length; ++i)
  System.out.print(i + sArray[i]);
```

QUESTION 31

Which of these is a valid test condition for a `switch` statement?

A. `d + i`

B. `b == true`

C. `s.charAt(i)`

D. `d`

E. More than one of these

```
String s;
boolean b;
int i;
double d;
```

QUESTION 32

What sorting algorithm is being used by `sort()`?

A. Selection sort

B. Insertion sort

C. Quick sort

D. Merge sort

E. None of these

```
public static void sort(int[] v) {
  int len=v.length;
  for (int i=0; i<len-1; ++i) {
    int min=i;
    for (int j=i+1; j<len; ++j)
      if (v[j]<v[min]) min=j;
    int temp=v[i];
    v[i]=v[min];
    v[min]=temp;
  }
}
```

QUESTION 33

What is the running time of `sort()` if `v` has length `n`? Choose the smallest correct answer.

A. `O(log n)` B. `O(n)`

C. `O(n log n)` D. $O(n^2)$

E. None of these

QUESTION 34

Which of these replaces **<*1>** in the code to the right to give the type of objects that implement the interface containing the `compareTo()` method?

A. `Implements`

B. `CompareTo`

C. `Comparable`

D. `Object`

E. None of these

QUESTION 35

Which of these replaces **<*2>** in the code to the right to check whether the element at the current position in the array is smaller than `min`?

A. `vec[i].compareTo(min) < 0`

B. `vec[i].compareTo(min) > 0`

C. `vec[i].compareTo(min) == -1`

D. `vec[i].compareTo(min) == 1`

E. None of these

```
public static <*1> smallest(<*1> [] vec){
  <*1> min = vec[0];
  for (int i=0; i<vec.length; ++i)
    if (<*2>) min = vec[i];
  return min;
}
```

QUESTION 36

What boolean function is represented by this truth table?

a	b	c	d
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

A. `d = (a||!b)&&c` B. `d = !(a&&b)||c` C. `d = (a&&c)||(b&&!c)`

D. `d = a || b || c` E. None of these

QUESTION 37

Suppose `Circle` is a subclass of `Shape` and `Shape` is a subclass of `Picture`. If a method takes a parameter of type `Shape`, the method could be called without a cast using objects of which of these types?

A. `Circle` B. `Shape` C. `Picture` D. Both A and B E. Both B and C

QUESTION 38

What word replaces **<*1>** in the code to the right to indicate that after initialization `jump` cannot be changed?

A. `static`

B. `final`

C. `const`

D. `fixed`

E. None of these

For the remaining questions, assume that **<*1>** has been filled in correctly.

QUESTION 39

Which of these declares and builds an object of type `Increment` which starts with a total of `0`, and decreases by `2` every time `change()` is called?

A. `Increment i = new Increment(0,2);`

B. `Increment i = new Increment(2,0);`

C. `Increment i = new Increment(0,-2);`

D. `Increment i = new Increment(-2,0);`

E. More than one of these

QUESTION 40

Assume `Increment i` is correctly declared according to the previous question. What is output by the code below?

```
i.change();
i.change();
System.out.print(i.getValue());
```

A. `0` B. `-4`

C. `-2` D. `null`

E. None of these

```
public class Increment {

  public Increment(int init, int jump) {
    total = init;
    this.jump = jump;
  }

  public void change() {
    total += jump;
  }

  public int getValue() {
    return total;
  }

  private int total;
  private <*1> int jump;
}
```

Computer Science Answer Key
UIL Invitational A 2005

1.	C	11.	B	21.	E	31.	C
2.	D	12.	C	22.	C	32.	A
3.	B	13.	D	23.	C	33.	D
4.	A	14.	E	24.	B	34.	C
5.	B	15.	A	25.	E	35.	A
6.	A	16.	C	26.	A	36.	A
7.	D	17.	A	27.	A	37.	D
8.	D	18.	D	28.	A	38.	B
9.	B	19.	D	29.	D	39.	C
10.	A	20.	B	30.	A	40.	B