

**QUESTION 1**

What is the sum of  $1BC_{16}$  and  $11100111_2$ ?

- A.  $FBC_{16}$       B.  $2A3_{16}$       C.  $717_{10}$       D.  $679_8$       E.  $369_{16}$

**QUESTION 2**

What is output by the code to the right?

- A. 18      B. 15      C. 8  
D. 335      E. 14

```
int x = 3;
int y = x + 1 * x + 2;
System.out.println( y );
```

**QUESTION 3**

What is output by the code to the right?

- A. 5 12      B. 4 8      C. 6 10  
D. 5 10      E. 6 12

```
int store = 0;
int i;
for(i = 1; i <= 5; i++){
    store += 2;
}
System.out.print( i + " " + store );
```

**QUESTION 4**

What is output by the code to the right?

- A. `c==c3basic`      B. `c++c#basic`  
C. `false`      D. `ccbasic`  
E. `C++C#BASIC`

```
String langs = "C++C#BASIC";
System.out.print( langs.toLowerCase() );
```

**QUESTION 5**

What is output by the code to the right?

- A. 1      B. 2      C. 12  
D. 21      E. The code to the right does not produce any output.

```
boolean[] ans = new boolean[5];
char[] lets = new char[5];

if( ans[2] )
    System.out.print( "1" );
if( lets[0] == '0' )
    System.out.print( "2" );
```

**QUESTION 6**

What is output by the code to the right?

- A. 34      B. 3      C. 10  
D. 12      E. 38

```
int r = 31;
int s = 7;
System.out.print( r % s + s % r );
```

**QUESTION 7**

How many of the 8 possible combinations of values for the variables `a`, `b`, and `c` will result in `d` being set to true?

- A. 3      B. 1      C. 0  
D. 5      E. 8

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

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

**QUESTION 8**

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

- I. 0
- II. 1
- III. 2
- A. I only      B. II only      C. III only
- D. II and III      E. I, II, and III

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

**QUESTION 9**

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

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

```
public class Timestamp{

    private static int myst = 0;

    private String day;
    private int hour;

    public Timestamp(String d){
        this(d, 0);
        myst++;
    }
```

**QUESTION 10**

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

- A. Mon\_Mon
- B. Mon\_3
- C. Mon\_2
- D. 1\_3
- E. Mon\_0

```
    public Timestamp(String d, int h){
        day = d;
        hour = h;
        myst++;
    }

    public static int getMyst(){
        return myst;
    }

    public String toString(){
        return day + "_" + hour;
    }

    public static void reset(){
        myst = 0;
    }
}

////////////////////////////////////
// client code
Timestamp.reset();
Timestamp t1 = new Timestamp("Sun");
Timestamp t2 = new Timestamp("Mon", 3);

int tot = Timestamp.getMyst();
System.out.println( tot ); // line 1
System.out.println( t2 ); // line 2
```

<p><b>QUESTION 11</b></p> <p>What is output by the code to the right?</p> <p>A. 0                      B. 256                      C. 640</p> <p>D. true                      E. 1010000000</p>	<pre>int m = 512; int n = 128; System.out.print( n   m );</pre>
<p><b>QUESTION 12</b></p> <p>What is output by the code to the right?</p> <p>A. 1.0                      B. 0                      C. 0.0</p> <p>D. 2.0                      E. 1</p>	<pre>double a2 = 1.05; System.out.print( Math.ceil(a2) );</pre>
<p><b>QUESTION 13</b></p> <p>What is output by the code to the right?</p> <p>A. 105=2                      B. 10\\5=2                      C. 10\\\5=2</p> <p>D. 10\5=2                      E. 10\\\\5=2</p>	<pre>String prob = "10\\\\\\5="; int ans = 2; System.out.print( prob + ans );</pre>
<p><b>QUESTION 14</b></p> <p>What is output by the code to the right?</p> <p>A. 0.315                      B. .315                      C. (0.315)</p> <p>D. -(0.315)                      E. .3150</p>	<pre>System.out.printf("%(4.3f", .315);</pre>
<p><b>QUESTION 15</b></p> <p>What is returned by the method call <code>adjust(1.7)</code>?</p> <p>A. 3.0                      B. 1.7                      C. 3.6</p> <p>D. 4.0                      E. 5.4</p>	<pre>public double adjust(double a){     a++;     a *= 2;     return a; }</pre>
<p><b>QUESTION 16</b></p> <p>What is output by the code to the right?</p> <p>A. 3sc12                      B. 3sc3                      C. 12sc12</p> <p>D. sc                      E. 1+2+mid+1+2</p>	<pre>String mid = "sc"; String result = 1 + 2 + mid + 1 + 2; System.out.print( result );</pre>
<p><b>QUESTION 17</b></p> <p>What is output by the code to the right?</p> <p>A. 12                      B. 8                      C. 9.0</p> <p>D. 18                      E. 9</p>	<pre>int z = 4; double a = 2.5; System.out.print( (int) a * 2 + z );</pre>

<p><b>QUESTION 18</b></p> <p>What is output by the line marked line 1 in the client code to the right?</p> <p>A. null</p> <p>B. 5</p> <p>C. 5null</p> <p>D. There is no output.</p> <p>E. The output cannot be determined until runtime.</p>	<pre>public class Problem{     private int points;      public Problem(int pts){         points = pts;     }      public int getPoints(){         return points;     } }</pre>
<p><b>QUESTION 19</b></p> <p>What is output by the line marked line 2 in the client code to the right?</p> <p>A. 10</p> <p>B. 10gack</p> <p>C. gack</p> <p>D. 5gack</p> <p>E. gack5</p>	<pre>public class HardProblem extends Problem{     private String exclam;      public HardProblem(int pts, String e){         super(pts);         exclam = e;     }      public String toString(){         return super.getPoints() + exclam;     } }</pre> <p>////////////////////////////////////</p> <p>// client code</p> <p>Problem p = new Problem(5);</p> <p>HardProblem hp;</p> <p>hp = new HardProblem(10, "gack");</p> <p>System.out.println( p ); // line 1</p> <p>System.out.println( hp ); // line 2</p>
<p><b>QUESTION 20</b></p> <p>What is output by the line of code to the right that comes after the comment // Question 20?</p> <p>A. 2                      B. 4                      C. 7</p> <p>D. 4,7                    E. 2,2</p>	<pre>TreeSet&lt;String&gt; ts = new TreeSet&lt;String&gt;(); String lets = "SANTANA";  for(int i = 0; i &lt; lets.length(); i++)     ts.add( lets.charAt(i) + " " );</pre>
<p><b>QUESTION 21</b></p> <p>What is output by the code segment to the right that comes after the comment // Question 21?</p> <p>A. SANTANA</p> <p>B. ANST</p> <p>C. SANT</p> <p>D. S1A3N2T1</p> <p>E. The output cannot be determined until runtime.</p>	<pre>// Question 20 System.out.println( ts.size() );  // Question 21 for(String s : ts)     System.out.print( s );</pre>

**QUESTION 22**

Which of the following statements about classes that have the clause `implements Collection` in their class header are true?

- I. The class can never store duplicate elements.
- II. The class can never be declared `abstract`.
- III. The elements stored in the class must always be kept in order based on the `compareTo` method.

A. I only      B. II only      C. III only      D. I and III      E. None of the statements are true.

**QUESTION 23**

What is output by the code to the right?

- A. 08      B. 10      C. 09  
D. 9      E. 5

```
String times;
times = "7:48:1:09:08";
String[] pieces = times.split(":");
System.out.print( pieces[3] );
```

**QUESTION 24**

What replaces `<*1>` in the code to the right to set the variable `cs` equal to the number of columns in the two-dimensional array of `ints` named `t`?

- A. `t[0].length`      B. `t.0.length`  
C. `t->length`      D. `t.length`  
E. `t[0][0].length`

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

**QUESTION 25**

What is returned by method `handle` if `t` is the matrix shown below?

1	4	0	2	1	6
0	-1	5	4	0	-4
2	2	7	1	13	2
11	5	13	13	4	20

- A. 15      B. 18      C. 19  
D. 14      E. 16

```
public int handle(int[][] t){
    int tot = 0;
    int rs = t.length;
    int cs = <*1>;
    int start = Math.min(rs, cs) - 1;
    int m = start / 2;
    for(int i = start; i >= 0; i--){
        tot += t[i][m];
        tot += t[m][i];
    }
    return tot;
}
```

<p><b>QUESTION 26</b></p> <p>What is output by the code to the right?</p> <p>A. 1.100      B. 1100.0      C. 1.331</p> <p>D. There is no output due to a syntax error.</p> <p>E. There is no output due to a runtime error.</p>	<pre>String value = "1.1e3"; double a = Double.parseDouble( value ); System.out.print( a );</pre>
<p><b>QUESTION 27</b></p> <p>What replaces <code>&lt;*1&gt;</code> in the code to the right to indicate method <code>count</code> will pass along any <code>FileNotFoundException</code> it may generate instead of handling them locally?</p> <p>A. <code>throws FileNotFoundException</code></p> <p>B. <code>finally FileNotFoundException</code></p> <p>C. <code>throws new FileNotFoundException()</code></p> <p>D. <code>throw new FileNotFoundException</code></p> <p>E. <code>catch FileNotFoundException</code></p>	<pre>public int count(String filename) &lt;*1&gt; {     Scanner sc;      // The next line of code can result in     // a FileNotFoundException.     sc = new Scanner( new File(filename) );      int count = 0;      // rest of method not shown      return count; }</pre>
<p><b>QUESTION 28</b></p> <p>What is output by the code to the right?</p> <p>A. 2              B. 4              C. 6</p> <p>D. There is no output due to a syntax error.</p> <p>E. There is no output due to a <code>NoSuchElementException</code>.</p>	<pre>int[] sample = {2, 4, 6}; Iterator&lt;Integer&gt; it = sample.iterator(); it.next(); it.next(); System.out.println( it.next() );</pre>
<p><b>QUESTION 29</b></p> <p>Which of the following best describes what method <code>mystery</code> does if the precondition that <code>text</code> does not equal <code>null</code> is met?</p> <p>A. Always returns the number of spaces in <code>text</code>.</p> <p>B. Always returns the number of tokens in <code>text</code>.</p> <p>C. Always returns the number of tokens in <code>text</code> that start with the character <code>'A'</code>.</p> <p>D. Prints out all the tokens in <code>text</code> that start with the character <code>'A'</code>.</p> <p>E. Always returns the number of <code>'A'</code>'s in <code>text</code>.</p>	<pre>// pre: text != null public int mystery(String text){     Scanner sc = new Scanner(text);     int count = 0;     while( sc.hasNext() ){         String temp = sc.next();         int len = temp.length();         if( len &gt; 0 &amp;&amp; temp.charAt(0) == 'A' )             count++;     }     return count; }</pre>
<p><b>QUESTION 30</b></p> <p>Assume method <code>performAction(int[] data)</code> is <math>O(N^2)</math> where <math>N = \text{data.length}</math>. When method <code>performAction</code> is passed an array with <code>length=2,000</code> it takes 4 seconds for method <code>performAction</code> to complete. If method <code>performAction</code> is then passed an array with <code>length = 4,000</code> what is the expected time it will take the method to complete?</p> <p>A. 8 seconds      B. 16 seconds      C. 28 seconds      D. 32 seconds      E. 64 seconds</p>	

<p><b>QUESTION 31</b></p> <p>What replaces <b>&lt;*1&gt;</b> in the code to the right so that the body of the <code>if</code> statement is executed if one or more of the conditions <code>p == vs.length</code> and <code>cap == 0</code> evaluate to <code>true</code>?</p> <p>A. <code>^</code>                      B. <code>  </code>                      C. <code>^^</code></p> <p>D. <code>%%</code>                      E. <code>&amp;&amp;</code></p>	<pre>public int find(int[] vs, int[] ws,                int p, int val, int cap){      if( p == vs.length &lt;*1&gt; cap == 0 )         return val;      int wo = find(vs, ws, p + 1, val, cap);     int th = 0;     if( ws[p] &lt;= cap)         th = find(vs, ws, p + 1,                   val + vs[p], cap - ws[p]);     return Math.max(wo,th); }  // client code int[] vs = {6, 5, 9, 6, 2}; int[] ws = {4, 4, 8, 4, 2}; System.out.println(find(vs, ws, 0, 0, 10));</pre>
<p>Assume <b>&lt;*1&gt;</b> is filled in correctly.</p> <p><b>QUESTION 32</b></p> <p>What is output by the client code to the right?</p> <p>A. 13                      B. 14                      C. 8</p> <p>D. 11                      E. 28</p>	
<p><b>QUESTION 33</b></p> <p>Which of the following can replace <b>&lt;*1&gt;</b> in the code to the right to always set the variable <code>z</code> to the minimum of the variables <code>x</code> and <code>y</code>?</p> <p>I. <code>Math.min(x,y)</code>          II. <code>(x &lt; y) ? x : y</code>          III. <code>x &amp;&amp; y</code></p> <p>A. I only                      B. II only                      C. III only</p> <p>D. I and II                      E. II and III</p>	<pre>int x; int y; // code to initialize x and y  int z = &lt;*1&gt;;</pre>
<p><b>QUESTION 34</b></p> <p>A sort is defined to be <i>stable</i> for a given array if equal elements in the original array maintain their relative positions in the sorted array. For example consider the following array of <code>ints</code>:</p> <pre>{0, 7, 5, 3, 7}</pre> <p>If the sort is stable for this array then in the sorted array, the 7 originally at index 1 will be before the 7 originally at index 4.</p> <p>Method <code>sort</code> to the right implements the selection sort algorithm. For what input arrays is method <code>sort</code> stable?</p> <p>A. All arrays</p> <p>B. Some arrays</p> <p>C. No arrays</p> <p>D. It is not possible to determine if the method <code>sort</code> is stable or not.</p> <p>E. More than one of these is correct.</p>	<pre>public void sort(int[] vals){     int minIndex;     int limit = vals.length;     for(int i = 0; i &lt; limit ; i++){         minIndex = i;         for(int j = i + 1; j &lt; limit ; j++){             if( vals[j] &lt; vals[minIndex] ){                 minIndex = j;             }         }         int temp = vals[i];         vals[i] = vals[minIndex];         vals[minIndex] = temp;     } }</pre>

**QUESTION 35**

Method `search` to the right implements the binary search algorithm. If `list.length` is 256 what is the largest possible value the method will print out at the line of code marked `// line 1`?

- A. 1
- B. 6
- C. 9
- D. 25
- E. 257

```
// pre: list != null and
// elements in list are sorted in
// ascending order.

public int search(int[] list, int tgt){
    int res = -1;
    int low = 0;
    int hi = list.length - 1;
    int count = 0;
    while( res == -1 && low <= hi ){
        count++;
        int mid = (low + hi) / 2;
        if( list[mid] == tgt )
            res = mid;
        else if( list[mid] < tgt )
            low = mid + 1;
        else
            hi = mid - 1;
    }
    System.out.println( count ); // line 1
    return res;
}
```

**QUESTION 36**

What replaces `<*1>` in the code to the right so that the code segment compiles without error.

- A. `new HashSet()`
- B. `new HashMap(Character, Integer)`
- C. `new HashMap<Character, Integer>()`
- D. `new Map<Character, Integer>()`
- E. More than one of these are correct.

```
String word = "riffraf";
Map<Character, Integer> tags;
tags = <*1>;
for(int i = 0; i < word.length(); i++){
    char ch = word.charAt(i);
    if( !tags.containsKey(ch) )
        tags.put( ch, 1 );
    else
        tags.put( ch, tags.get(ch) + 1 );
}
System.out.println( tags.size() );
```

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

**QUESTION 37**

What is output by the code to the right?

- A. 1                      B. 3
- C. 4                      D. 7
- E. The output cannot be determined until runtime.

**QUESTION 38**

What is output by the code to the right?

- A. `null`              B. `true`              C. `false`
- D. There is no output due to a syntax error.
- E. There is no output due to a `NullPointerException`.

```
String[] langs = new String[10];
boolean isObject;
isObject = langs[2] instanceof Object;
System.out.print( isObject );
```



**QUESTION 39**

Consider the `Structure` class to the right. What is output by the following client code?

```
Structure s = new Structure();
s.add("dog");
s.add("dad");
s.add("cab");
s.add("add");
s.add("dad");
s.showAll();
```

- A. dog dad cab add dad
- B. dog dad cab
- C. add cab dad dog
- D. cab add dad dog
- E. cab dad add dog

**QUESTION 40**

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

- A. A binary search tree
- B. A hash table
- C. A stack
- D. A heap
- E. A queue

```
public class Structure{
    private LinkedList[] con;

    public Structure(){
        con = new LinkedList[100];
        for(int i = 0; i < con.length; i++){
            con[i] = new LinkedList();
        }

        public void add(String obj){
            int val = getValue(obj);
            if( !con[val].contains(obj) )
                con[val].add(obj);
        }

        public boolean isPresent(String obj){
            int val = getValue(obj);
            return con[val].contains(obj);
        }

        public boolean remove(String obj){
            int val = getValue(obj);
            return con[val].remove(obj);
        }

        public void showAll(){
            for( LinkedList<String> i : con )
                for( String st : i )
                    System.out.print( st + " " );
        }

        private int getValue(String obj){
            int val = 0;
            obj = obj.toLowerCase();
            for(int i = 0; i < obj.length(); i++){
                char ch = obj.charAt(i);
                if( Character.isLetter( ch ) )
                    val += ch - 'a';
            }
            return val % con.length;
        }
    }
}
```