Note: Correct responses are based on Java, J2sdk v 6.0, from Sun Microsystems, Inc. All provided code segments are intended to be syntactically correct, unless otherwise stated (i. e. `error` is an answer choice) and any necessary Java 2 Standard Packages have been imported. Ignore any typographical errors and assume any undefined variables are defined as used.

QUESTION 1

What is 101_2 plus 1010_2 ?

A. 111010_2 B. 010111_2 C. 010110_2 D. 10111_3 E. 15_{10}

QUESTION 2

What is output by the code to the right?

A. `3.0` B. `4.5` C. `4.0` D. `5.0`

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

```
Double b = 9/2;
b++;
out.println( b );
```

QUESTION 3

What is output by the code to the right?

A. `10` B. `58` C. `57` D. `9` E. `8`

```
int cnt = 0;
for(int i = '0'; i < '9'; i=i+1){
  cnt = cnt + 1;
}
out.print( cnt );
```

QUESTION 4

What is output by the code to the right?

A. `2010wil` B. `wil2010`

C. `ny2010` D. `wil`

E. `fun2010`

```
String fun = "wil";
String ny = fun + 2010;
out.print( ny );
```

QUESTION 5

What is output by the code to the right?

A. `15` B. `21` C. `24` D. `12`

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

```
double[] fox = {4,5,6,7,8,9,10,11};
out.println( fox[fox[1]]*3 );
```

QUESTION 6

What is output by the code to the right?

A. `13 8` B. `13 9` C. `12 8` D. `13 10` E. `12 10`

```
int x = 10;
int y = x++ * ++x / ++x;
out.print( x + " " + y );
```

QUESTION 7

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

A. `2` B. `7` C. `1` D. `3` E. `0`

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

boolean c = !a || !b  || a;
```

QUESTION 8

What is output by the code to the right?

A. `4` B. `13` C. `23` D. `24`

E. There is no output.

```
int j = 2;
String s = "january";
if( s.charAt(j) == 'a' )
  out.print( 1 );
else
  out.print( 2 );
  if( s.charAt(j) == 'n' )
    out.print( 3 );
  else
    out.print( 4 ) ;
```

QUESTION 9

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

A. `0`

B. `1`

C. `true`

D. `false`

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

QUESTION 10

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

A. `0`

B. `1`

C. `true`

D. `false`

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

```
public class Vampire{
  public boolean isThirsty;
  public double speed;

  public Vampire(double sp){
    isThirsty = false;
    speed = sp;
  }

  public void setThirsty( boolean b){
    isThirsty = b;
  }

  public boolean isSuper(){
    if( isThirsty && speed > 45 )
      return true;
    if( speed > 75 )
      return true;
    return false;
  }
}

////////////////////////////////////
// client code
Vampire guy = new Vampire(54.3);
out.println(guy.isSuper()); //1
guy.setThirsty(true);
out.println(guy.isSuper()); //2
```

QUESTION 11

What is output by the code to the right?

A. `28` B. `40` C. `20` D. `7` E. `35`

```
int fringe = 5;
int weird = fringe << 3;
out.print( weird );
```

QUESTION 12

What is output by the code to the right?

A. `30` B. `10` C. `20` D. `3` E. `-1`

```
int bishop = 10;
int mulder = bishop * 3;
out.print(Math.max( bishop, mulder));
```

QUESTION 13

What is output by the code to the right?

A. `believe`

B. `be\\li\eve`

C. `be\\\\li\\eve`

D. `lieve\\`

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

```
String truth = "be\\\\li\\eve";
out.print( truth );
```

QUESTION 14

What is output by the code to the right?

A. `8.23` B. `000008.23`

C. `008.24` D. `008.23`

E. `008.240`

```
out.printf("%06.2f", 8.237);
```

QUESTION 15

What is returned by the method call `ghost(3, 8.0)`?

A. `1.0` B. `2.0`

C. `2.5` D. `3.0`

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

```
public float ghost(long a, double b){
  a *= 7;
  a = a / 2 / b;
  return (float)a;
}
```

QUESTION 16

What is output by the client code to the right?

A. `[3, 6, 9, 12]`

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

C. `[3, 6, 10, 12]`

D. `[3, 6, 10, 0]`

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

```
public void fun(int[] list){
  list[2]++;
  list = new int[4];
  list[1]++;
}

// client code
int[] vals = {3, 6, 9, 12};
fun(vals);
out.print( Arrays.toString(vals) );
```

QUESTION 17

Which of the following type(s) could be assigned the value `32768`?

A. `boolean` B. `int` C. `byte` D. `short` E. more than one of these

QUESTION 18

What is output by the code to the right?

A. `false false` B. `true false`

C. `false true` D. `true true`

E. `false`

```
String sam = new String("mind");
String ben = "mind";
out.print( sam.equals(ben) + " " );
out.print( sam == ben );
```

QUESTION 19

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

A. `10`

B. `11`

C. `9`

D. `7`

E. `8`

QUESTION 20

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

A. `0`

B. `1`

C. `7`

D. `5`

E. `3`

```
long dna = 1210124031;
int count = 1;
while(dna > 0){
  long piece = dna % 10;
  if( piece != 0 )
    count++;
  dna = dna /10;
}
out.println(count);     //1
out.println(dna);       //2
```

QUESTION 21

Which of the following is a not a primitive data type in Java?

A. `boolean` B. `long` C. `char` D. `Object` E. `double`

QUESTION 22

Which of the following most accurately replaces **<*1>** in the code to the right so that method `getIt` can return the appropriate list of integers?

A. `ArrayList`
B. `ArrayList<Integer>`
C. `Object[]`
D. A and B only
E. A and C only

```
public <*1> getIt(int num){
  ArrayList it;
  it = new ArrayList();
  for(int i = 1; i <= num; i++)
    if( num % i != 0 )
      it.add( i );
  return it;
}
```

Assume **<*1>** has been filled in correctly.

QUESTION 23

What is the intended purpose of method `getIt`?

A. It returns a list of all digits in num.
B. It returns a list of all even factors of num.
C. It returns a list of all numbers that are not factors of num.
D. It returns a list of all factors of num.
E. It returns a list of some of the factors of num.

QUESTION 24

What is output by the code to the right?

A. `34` B. `20` C. `2` D. `8` E. `35`

```
int[] fib = {1, 1, 2, 3, 5, 8, 13};
int mutant = 1;
for(int dig : fib)
  mutant += dig;
out.print(mutant);
```

QUESTION 25

What is output by the code to the right?

A. `ge` B. `div` C. `in`
D. There is no output due to a syntax error.
E. There is no output due to a runtime error.

```
String funny = "1fr2in3ge4div5ision";
String[] whoot = funny.split("\\d");
out.println( whoot[4] );
```

QUESTION 26

Assuming that the code to the right is the code for an insertion sort, which of the following lines of could should be used to fill **<*1>**?

A. `j > 0`
B. `j < 0`
C. `j == 0`
D. `j == 1`
E. `j > i`

```
public static void sort(int[] stuff)
{
  for(int i = 1; i < stuff.length; i++)
  {
    int j = i;
    while(  <*1> &&
              stuff[j] < stuff[j - 1])
    {
      int temp = stuff[j - 1];
      stuff[j - 1] = stuff[j];
      stuff[j] = temp;
      <*2>
    }
  }
}
```

QUESTION 27

Assuming that the code to the right is the code for an insertion sort, which of the following lines of could should be used to fill **<*2>**?

A. `j = j--;`
B. `j++;`
C. `j = j - 2;`
D. `j = j - 1;`
E. `j = j - i;`

QUESTION 28

Which of the following replaces **<*1>** in the code to the right so that the value of `spooky` is cut in half each iteration of the loop?

A. `spooky = spooky >> 1;`

B. `spooky *= 2;`

C. `spooky = spooky / stop;`

D. `spooky = spooky - spooky;`

E. more than one of these

QUESTION 29

Assuming that **<*1>** is filled correctly, what is output by the code to the right?

A. `64`

B. `8`

C. `128`

D. `16`

E. `32`

```
int stop = 5;
int spooky = 256;
for(int i = 1; i < stop; i++)
{
  <*1>
}
out.println(spooky);
```

QUESTION 30

What is output by the code to the right?

A. `true` B. `false` C. `null`

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

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

```
Object it = "scary stuff";
out.print( it instanceof null );
```

QUESTION 31

Assume the method `getDown(int[] data)` is O(N) where N = `data.length`. When the method `getDown` is passed an array with `length` = 100,000 it takes 8 seconds for method `getDown` to complete. If method `getDown` is then passed an array with `length` = 25,000 what is the expected time it will take method `getDown` to complete?

A. 16 seconds

B. 1 second

C. 6 seconds

D. 2 seconds

E. 4 seconds

QUESTION 32

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

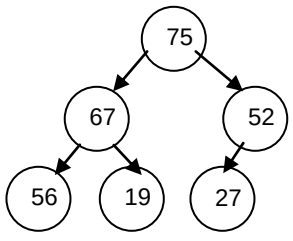
A. A min heap

B. A red black tree

C. A hash table

D. A max heap

E. A binary search tree



QUESTION 33

If a `Structure` object already contains N items, what is the Big O of the remove method? Pick the most restrictive correct answer.

A. O(NlogN)
B. $O(N^2)$
C. O(1)
D. $O(N^3)$
E. O(N)

QUESTION 34

Which of the following replaces **`<*1>`** in the code to the right so that method `remove` will correctly remove parameter `val`?

A. `h.get(mod).remove( val );`

B. `h.get(val).remove(new Integer(mod));`

C. `h.get(mod).remove(new Integer(val));`

D. `h.get(mod).remove(new int(val));`

E. More than one of these.

QUESTION 35

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

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

```
public class Structure
{
  private List<Stack<Integer>> h;

  public Structure(){
    h =
       new ArrayList<Stack<Integer>>();
    for(int i=0; i<10; i++)
      h.add(new Stack<Integer>());
  }

  public void add(int val){
    int mod = val % 10;
    h.get(mod).add(val);
  }

  public void remove(int val){
    int mod = val % 10;
    <*1>
  }

  public boolean isEmpty(){
    return h.isEmpty();
  }

  public String toString()
  {
    String st = "";
    for(Stack<Integer> s : h )
      st = st + s.toString() + "\n";
    return st;
  }
}
```

QUESTION 36

The following values are inserted one at a time in the order shown into a binary search tree using the traditional insertion algorithm.

`80 90 100 110 120`

What is the result of a post order traversal of the resulting tree?

A. `120 110 100 90 80`
B. `80 90 100 110 120`
C. `80 120 110 90 100`
D. `90 80 120 110 100`
E. `90 120 80 100 110`

QUESTION 37

How many leaves are there in the tree resulting from question 36?

A. 5
B. 0
C. 2
D. 1
E. 4

QUESTION 38

What is output by the client code to the right?

A. `-8`

B. `4`

C. `9`

D. `11`

E. `16`

QUESTION 39

Which of the following best describes what method `go` does?

A. Returns the maximum value in `d`.

B. Returns the minimum value in `d`.

C. Returns the sum of the elements in `d`.

D. Returns the first value in `d`.

E. Returns the last value in `d`.

```
public static int go(int[] ray,
                     int spot,
                     int s)
{
  if( spot == ray.length )
    return s;
  int it = Math.max(s, ray[spot]);
  return
     go(ray, spot + 1, it);
}

// client code
int[] stuff = {-8, 11, 4, 9};
int fnd = Integer.MIN_VALUE;
out.print( go(stuff, 0, fnd) );
```

QUESTION 40

What is output by the code to the right?

A. `12`

B. `23`

C. `15`

D. `7`

E. `31`

```
int broyles = 90;
broyles = broyles & 57 | 35 ^ 19;
broyles = broyles >> 3;
out.print(broyles);
```