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 1001_2 plus 1010_2 ?

A. 19_{11} B. 10011_2 C. 010110_2 D. 10111_{16} E. 18_{10}

QUESTION 2

What is output by the code to the right?

A. a   B. b   C. c   D. d

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

```
Character b = 97;
b++;
out.println( b );
```

QUESTION 3

What is output by the code to the right?

A. 3   B. 2   C. 4   D. 5

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

```
int cnt = 0;
for(float i = 10; i < 13; i = i+.75){
  cnt = cnt + 1;
}
out.print( cnt );
```

QUESTION 4

What is output by the code to the right?

A. hfalse   B. 3true

C. ofalse   D. rfalse

E. 3false

```
String fun = "h3roes";
char ch = fun.charAt(2);
boolean spr = Character.isDigit(ch);
out.print( ch + "" + spr );
```

QUESTION 5

What is output by the code to the right?

A. 27   B. 21   C. 24   D. 15

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

```
long[] 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. 13 107   B. 13 100

C. 12 100   D. 12 107

E. 13 120

```
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);
```

QUESTION 8

What is output by the code to the right?

A. 24   B. 13   C. 23   D. 3

E. There is no output.

```
int j = 4;
String s = "siler";
if( s.charAt(j) == 's' )
  out.print( 1 );
else if( s.charAt(j) == 'e' )
  out.print( 2 );
if( s.charAt(j) == 'r' )
    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.

```java
public class Hero{
  public boolean canFly;
  public double speed;

  public Hero(double sp){
    canFly = false;
    speed = sp;
  }

  public void setFly( boolean b){
    canFly = b;
  }

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

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

QUESTION 11

What is output by the code to the right?

A. `40`   B. `160`   C. `20`   D. `5`   E. `10`

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

QUESTION 12

Which of the following groups contain possible values `hulk` could store after the code the right is executed?

A. `0`

B. `0,1,3,5,6`

C. `-1,2,3,4`

D. `3,6,7,1,2,4`

E. `0,1,2,3,4,5,6,7`

```java
int hulk = (int)Math.random() * 7 ;
```

QUESTION 13

How many lines of output does the code to the right produce?

A. `0`

B. `3`

C. `1`

D. `2`

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

```java
String truth = "xmen\nrule\rdrool";
out.print( truth );
```

QUESTION 14

What is output by the code to the right?

A. `false`

B. `true`

C. `0`

D. `1`

E. `dog`

```java
out.printf("%b", "dog");
```

QUESTION 15

What is returned by the method call `great(3, 2.0)`?

A. 6.0   B. 11.0

C. 9.0   D. 5.0

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

```java
public double great(int a, double b){
  b = b + big(a);
  b = b + big(a-5);
  return b;
}

public int big(int a){
  return a*3;
}
```

QUESTION 16

What is output by the client code to the right?

A. [4, 9]

B. [7, 11, 3, 1, 9]

C. [7, 11, 3, 1, 4]

D. [9]

E. [7, 11, 3, 1]

```java
public void fun(ArrayList list){
  list.add(4);
  list = new ArrayList();
  list.add(9);
}

// client code
int[] vals = {7, 11, 3, 1};
ArrayList r = new ArrayList();
for(int x : vals )
  r.add(x);
fun(r);
out.print( r );
```

QUESTION 17

Which of the following type(s) could be assigned the value `97`?

A. `char`   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`

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

QUESTION 19

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

A. 5   B. 6

C. 9   D. 7

E. 8

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

QUESTION 20

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

A. 3   B. 1

C. 7   D. 5

E. 0

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 could replace **<*1>** in the code to the right so that method `getIt` will return a list of integers?

A. `ArrayList`   B. `ArrayList<Integer>`

C. `List`   D. `List<Integer>`

E. more than one of these

```
public <*1> getIt(int num){
  ArrayList it;
  it = new ArrayList();
  while(num > 0 )
  {
    it.add( num % 10 );
    num = num / 10;
  }
  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 of the non 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

Assuming that parameter e receives $[1,2,3,4,5]$ and f receives $[4,5,6,7,8]$, what is returned by method voodoo?

A. $[1,2,3,4,5,6,7,8]$

B. $[4,5]$

C. $[1,2,3,6,7,8]$

D. $[1,2,3]$

E. $[6,7,8]$

```
public static Set<Double> voodoo(
      Set<Double> e, Set<Double> f)
{
  Set<Double> g;
  g = new TreeSet<Double>();
  g.addAll(f);
  g.removeAll(e);
  return g;
}
```

QUESTION 25

What is output by the code to the right?

A. `super`   B. `can`   C. `heroes`

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

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

```
String funny =
            "7super3heroes8can7dy";
String[] whoot = funny.split("\\d+");
out.println( whoot[2] );
```

QUESTION 26

What is returned by the method call
    `mess("8x2x3x6x1x6","x")`?

A. `26`   B. `8`

C. `20`   D. `19`

E. There is not output due to a runtime error.

```
public static int mess(String s, String d)
{
  int n = 0;
  Scanner sc = new Scanner(s);
  sc.useDelimiter(d);
  while(sc.hasNext())
  {
    n = n + sc.nextInt();
  }
  return n;
}
```

QUESTION 27

What is returned by the method call
    `mess("8-2-31--6","\\-")`?

A. `41`   B. `10`

C. `47`   D. `6`

E. There is not output due to a runtime error.

QUESTION 28

What is returned by the method call `goofy(m, 2, 3)` where m is the 2D array below?

7	3	1	4	2
0	1	1	1	2
2	3	4	5	6
9	8	7	6	4
1	1	1	1	1

A. 12

B. 16

C. 13

D. 15

E. 10

```
public static int goofy(int[][] m,
                            int r,
                            int c)
{
  Integer sum = 0;
  int rowCap = m.length;
  int colCap = m[0].length;
  do{
   sum = sum + m[r][c];
   if(m[r][c] % 2 != 0)
    r++;
   else
    c++;
 }while( r < rowCap && c < colCap);
 return sum;
}
```

QUESTION 29

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

A. 29

B. 30

C. 36

D. 31

E. 43

```
for(int i = 0; i < 5; i++)
  for(int j = 0; j < i; j++)
    for(int k = 0; k < i; k++)
      System.out.print("*");
```

QUESTION 30

What is output by the code to the right?

A. [false, true, false, true]

B. [true, false, true, false]

C. [false, true]

D. [true, false]

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

```
Stack<Boolean> s;
s = new Stack<Boolean>();
s.push(true);
s.push(false);
s.push(true);
s.push(false);
System.out.println(s);
```

QUESTION 31

Assume the method `getDown(int[] data)` is $O(N^2)$ 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. 1 seconds

B. .5 second

C. 6 seconds

D. 2 seconds

E. 4 seconds

QUESTION 32

What is output by the code at right?

A. `2 Helium 3 Lithium 7 Nitrogen 14 Silicon`

B. `Helium 2 Lithium 3 Nitrogen 7 Silicon 14`

C. `2 Helium`

D. `14 Silicon`

E. `3 Lithium 14 Silicon 7 Nitrogen 2 Helium`

```
Map<String, Integer> m;
m = new TreeMap<String, Integer>();

m.put("Lithium",3);
m.put("Silicon",14);
m.put("Nitrogen",7);
m.put("Helium",2);

for(Map.Entry<String, Integer> e :
                      m.entrySet() )
{
  out.print( e.getValue() + " ");
  out.print( e.getKey() + " ");

}
```

QUESTION 33

If a `Structure` object already contains N items, what is the Big O of the `add` 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. `int x = h[i].indexOf(val);`

B. `int x = h[i].indexOf(mod);`

C. `int x = h[i].indexOf(h);`

D. `int x = h[i].indexOf(s);`

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 String[] h;

  public Structure(){
    h = new String[10];
    for(int i=0; i<10; i++)
      h[i] = "";
  }

  public void add(int val){
    int i = val % 10;
    h[i] = h[i] + val + " ";
  }

  public void remove(int val){
    int i = val % 10;
    String s = "" + val;
    <*1>
    h[i] = h[i].substring(0,x) +
      h[i].substring(x + s.length());
  }

  public String toString()
  {
    String st = "";
    for(String s : h )
      st = st + s + "\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.

```
120 90 100 110 80
```

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

A. 120 110 100 90 80

B. 80 90 100 110 120

C. 120 110 90 100 80

D. 90 80 120 110 100

E. 120 90 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. 20

C. 9

D. 11

E. -3

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

// client code
int[] stuff = {-8, 11, 4, 9, -3, 20};
int fnd = Integer.MAX_VALUE;
out.print( go(stuff, 0, fnd) );
```

QUESTION 39

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

A. Returns the maximum value in `ray`.

B. Returns the minimum value in `ray`.

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

D. Returns the first value in `ray`.

E. Returns the last value in `ray`.

QUESTION 40

What is output by the code to the right?

A. 12

B. 23

C. 15

D. 20

E. 31

```java
int spidey = 111;
spidey = spidey ^ 57 | 35 & 19;
spidey = spidey >> 4 << 1;
spidey = spidey * 2;
out.print(spidey);
```