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 the product of 111_2 and 111_2 ?

A. 47_{10} B. 1210_3 C. 110001_2 D. 74_{10} E. 122_6

QUESTION 2

What is output by the code to the right?

A. 16 B. 14 C. 15 D. 18 E. 17

```
int a = 5;
a++;
int elf = +3 + a++;
System.out.println(elf + a);
```

QUESTION 3

What is output by the code to the right?

A. 9 B. 10 C. 8 D. 7

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

```
long c = 2;
double snow = 3;
c = c + snow + 2;
System.out.println( c );
```

QUESTION 4

What is output by the code to the right?

A. 97 B. 4849s

C. 97x D. as

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

```
String d = "01therednosedreindeer";
out.print(d.charAt(0)+ d.charAt(1) + "x");
```

QUESTION 5

What is output by the code to the right?

A. 10 B. 6 C. 7 D. 9

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

```
Integer[] array = {3,6,9,12,15,18,21};
for( Integer it : array )
  it = new Integer(it + 1);
System.out.println(array[2]);
```

QUESTION 6

What is output by the code to the right?

A. 7 B. 21 C. 14.0 D. 14

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

```
int e = 3;
double f = 21;
f = f / e + f / e;
System.out.print( (byte)f );
```

QUESTION 7

What is output by the code to the right?

A. true true B. false false

C. true false D. false true

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

```
boolean g = false;
boolean h = !!g;
System.out.print( !g ^ !h );
System.out.print( " " );
System.out.print( !(h || g) );
```

QUESTION 8

What is output by the code to the right?

A. 1234

B. 12

C. 123

D. 24

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

```
double j = 25;
Double k = 25;
if( j >= k )
  System.out.print("1");
if( j <= k )
  System.out.print("2");
System.out.print("3");
```

QUESTION 9

Which of the following could replace **`<*1>`** in the `HolidayMonster` class at right?

A. `public abstract void fun();`

B. `private static int speed = 90;`

C. `private static final float num = 25.0f;`

D. B and C only

E. A, B, and C

QUESTION 10

Assuming that **`<*1>`** is filled correctly, which of the following could fill blank **`<*2>`** in the client code at right?

A. `System.out.println(Bumble.getName());`

B. `System.out.println(c.howMean());`

C. `System.out.println(c.getName());`

D. A and B only

E. A, B, and C

```
public abstract class HolidayMonster
{
  <*1>
  public abstract double howMean();
}

public class Bumble extends HolidayMonster
{
   private String name;
   private double mean;

   public Bumble(String n, double m)
   {
      name = n;
      mean = m;
   }

   public double howMean()
   {
     //implementation not shown
   }

   public static String getName()
   {
     //implementation not shown
   }

   //other method implementations not shown

}

/////////////////////////////////////////////////
//client code
HolidayMonster c;
c = new Bumble("yetti",560.00);
<*2>
```

QUESTION 11

What is output by the code to the right?

A. `76`

B. `88`

C. `78`

D. `[]`

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

```
ArrayList<Integer> stuff;
stuff = new ArrayList<Integer>();
stuff.add(78);
stuff.add(88);
stuff.add(76);
stuff.add(88);
stuff.remove(new Integer(88));
stuff.remove(0);
java.util.Collections.rotate(stuff,1);
System.out.println(stuff.get(0));
```

QUESTION 12

What is returned by the method call `process(6)`?

A. `33`

B. `32`

C. `35`

D. `34`

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

```
public static int process(int x){
  final int TOY;
  TOY = x * 5;
  x--;
  x = x + --TOY;
  return --x;
}
```

Question 13

What is output by the client code to the right?

A. `trees`

B. `\\trees`

C. `\\trees\\`

D. `\\\\trees\\\\`

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

```
System.out.println("\\\\trees\\\\");
```

Question 14

What is output by the code to the right?

A. `-0.25`

B. `.25`

C. `(0.25)`

D. `-.25`

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

```
System.out.printf("%(5.2f", -.25);
```

Question 15

What is output by the code to the right?

A. `012345`

B. `0b1o2x3e4s5`

C. `boxes`

D. `05`

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

```
String uil = "0b1o2x3e4s5";
uil = uil.replaceAll("\\d+","");
char[] uilRay = uil.toCharArray();
String uilString;
uilString = new String(uilRay);
System.out.println(uilString);
```

Question 16

What is returned by the method call `goofy(5)`?

A. `5.0`

B. `10.0`

C. `15.0`

D. `20.0`

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

```
public static double goofy(double x){
  x = x * 2;
  x *= 2;
  return x;
}
```

Question 17

What is output by the code to the right?

A. `120`

B. `111`

C. `98`

D. `133`

E. `100`

```
int santy = 0;
for(int x1 = 0; x1 < 12; x1=x1+3)
{
  santy++;
  for(int x2 = 0; x2 <= x1; x2++)
  {
     santy++;
     for(int x3 = 0; x3<=x2; x3++)
       santy++;
  }
}
System.out.println(santy);
```

QUESTION 18

Given the following measurements, what is the most likely running time for method `sample(int[] data)` where N is equal to data.length? Choose the most restrictive correct answer.

Value of N	Time for method sample to complete
2,000	1 second
4,000	2 seconds
8,000	4 seconds

A. O(N)

B. O(NlogN)

C. O(N^2)

D. O(1)

E. O($N^{3/2}$)

QUESTION 19

Which of the following can replace `<*1>` in the code to the right so that the code segment compiles without error?

I. `26.2`
II. `new Float(26.2)`
III. `new Float("26.2f")`

A. I only

B. II only

C. III only

D. I and II only

E. II and III only

```
ArrayList<Float> decs;
decs = new ArrayList<Float>();
decs.add(<*1>);
```

QUESTION 20

What is the output by the code to the right?

A. `7ckt`

B. `6allswit`

C. `7stu`

D. `7de`

E. `6ckt`

```
String line = "deckthehallswithstuff";
String[] chunks = line.split("[d-h]");
System.out.print(chunks.length);
System.out.println(chunks[2]);
```

QUESTION 21

Which of the following could replace **`<*1>`** in the code at right so that `it` would refer to a properly instantiated queue?

A. `new Queue<TN>();`

B. `new ArrayList<TN>();`

C. `new List<TN>();`

D. `new QueueList<TN>();`

E. `new LinkedList<TN>();`

QUESTION 22

Which of the following could replace **`<*2>`** in the code at right so that the loop would terminate properly?

A. `!it.isEmpty`

B. `it.isEmpty()`

C. `!it.isEmpty()`

D. `it.notIsEmpty()`

E. more than one of these

QUESTION 23

Which of the following could replace **`<*3>`** in the code at right to add the right node of the tree to the queue?

A. `node.right()`

B. `node.getRight`

C. `node.getRight()`

D. `getRight()`

E. `node.addRight()`

QUESTION 24

Assuming that **`<*1>`** and **`<*2>`** and **`<*3>`** are filled correctly, what type of tree traversal does method `itOrder` perform?

A. post order

B. in order

C. reverse order

D. out of order

E. level order

```
////////class for making a tree node//////////

public class TN {
   private Object value;
   private TN left;
   private TN right;

   public TN(Object value, TN left, TN right){
      this.value = value;
      this.left = left;
      this.right = right;
   }

   public Object getValue() {
      return value;
   }

   public TN getLeft() {
      return left;
   }

   public TN getRight() {
      return right;
   }

   public void setValue(Object value) {
      this.value = value;
   }

   public void setLeft(TN left) {
      this.left = left;
   }

   public void setRight(TN right) {
      this.right = right;
   }
}

////////method for traversing a tree//////////

private void itOrder(TN tree){
   if(tree==null)
     return;

   Queue<TN> it =  <*1>
   it.add(tree);
   while(  <*2>  )
   {
      TN node = it.remove();
      out.print(node.getValue() + " ");
      if(node.getLeft()!=null)
      {
         it.add(node.getLeft());
      }
      if(node.getRight()!=null)
      {
         it.add(  <*3>  );
      }
   }
}
```

QUESTION 25

What is the output by the code to the right?

A. `28`

B. `42`

C. `37`

D. `46`

E. `40`

```
int count = 0;
for(int i = 0; i < 25; i++){
  for(int j = i; j >= 0; j=j-4){
     if( (i * j) % 2 == 0)
        continue;
     count++;
  }
}
System.out.println(count);
```

QUESTION 26

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

A. `7 7`

B. `7 25`

C. `7`

D. `25 7`

E. `25 25`

QUESTION 27

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

A. `25 25 7`

B. `25 7 25`

C. `25 25 8`

D. `8 25 25`

E. `7 7`

QUESTION 28

What is the output by the line marked `//line 3`?

A. `7.0`

B. `25.0`

C. `0.0`

D. `8.0`

E. `7.0`

```
public class Who {
   private int it, thing;

   public Who() {
      it=thing=25;
   }
   public void fun() {
      it=7;
   }
   public double sing() {
      return it;
   }
   public void bang() {
      fun();
   }
   public String toString() {
      return it + " " + thing;
   }
}

public class Grinchy extends Who {
   private int it;

   public Grinchy() {
      it=7;
   }
   public void fun() {
      it=8;
   }
   public double sing() {
      return it;
   }
   public void bang() {
      super.bang();
   }
   public String toString() {
      return super.toString() + " " + it;
   }
}

/////////////////////////////////////
//client code
Who one = new Who();
one.bang();
out.println(one);                 //line 1
one = new Grinchy();
one.fun();
out.println(one);                 //line 2
one.fun();
one.bang();
out.println(one.sing());//line 3
```

QUESTION 29

Which of the following should fill **<*1>** to correctly complete method `moveDown`?

A. `root * 2 + 1;`

B. `root * 2 - 1;`

C. `root * 2 + 2;`

D. `root * 2;`

E. more than one of these

QUESTION 30

Assuming that **<*1>** is filled correctly, which of the following should fill **<*2>** to correctly complete method `go`?

A. `moveDown(i+1);`

B. `moveDown(i);`

C. `moveDown(i-1);`

D. `moveDown(i/2);`

E. more than one of these

QUESTION 31

What standard sorting algorithm is being implemented by `go`?

A. radix

B. merge

C. heap

D. quick

E. more than one of these

```
public class What{
  private ArrayList<Integer> list;

  public What(){
    list = new ArrayList<Integer>();
  }

  public void moveUp(int index){
    int bot = index;
    while(bot > 0){
      int p = (bot-1)/2;
      if(list.get(p) < list.get(bot)){
        swap(p, bot);
        bot=p;
      }
      else
        break;
    }
  }

  public void moveDown(int index){
    int root=0;
    while(root < index)
    {
      int max=0;
      int left = <*1>
      int right = root * 2 + 2;
      if(left < index){
        if(right < index){
          if (list.get(left) <= list.get(right))
            max = right;
          else
            max = left;
        }
        else
          max = left;
      }
      else break;
      if (list.get(root) < list.get(max)) {
        swap(root, max);
        root=max;
      }
      else break;
    }
  }

   public void go(int[] nums) {
     for(int item : nums)
       list.add(item);
     for(int i = 1; i<nums.length; i++)
        moveUp(i);
     for(int i=list.size()-1; i>=1; i--){
        swap(0, i);
        <*2>
     }
   }

   private void swap(int first, int last)
   {
     Integer temp = list.get(first);
     list.set(first, list.get(last));
     list.set(last, temp);
   }
}
```

QUESTION 32

What is returned by the method call `fancy(9)`?

A. `25`

B. `14`

C. `13`

D. `20`

E. `12`

```
public static int fancy(int n){
   int ans = 0;
   if( n <= 1 )
      ans = 0;
   else
      ans = fancy(n - 2) + (n - 1);
   return ans;
}
```

QUESTION 33

What is output by the code to the right?

A. `0`

B. `25`

C. `-1`

D. `7`

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

```
abstract class Rudy{
   private static final int max = 25;
}

class Red extends Rudy{
   public static final int max = 7;
}

//client code
Rudy dk = new Red();
System.out.print( dk.max );
```

QUESTION 34

Which of the following could replace **`<*1>`** in the code to the right so that method lights would access the number of rows matrix mat?

A. `mat.length()`

B. `mat.size`

C. `mat.getNumRows()`

D. `mat.length`

E. More than one of these.

QUESTION 35

Assuming that blank **`<*1>`** is filled correctly, what would method `lights` return assuming the following matrix was passed to parameter `mat`?

3	6
9	1
-6	5
7	2

A. `27`

B. `13`

C. `14`

D. `9`

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

```
public static int lights(int[][] mat){
  int tot = 0;
  int rows = <*1> ;
  int cols = mat[0].length;
  int start = Math.max(rows, cols) - 1;
  int m = start / 2;
  for(int i = start; i >= 0; i--){
    tot += mat[i][m];
    tot += mat[m][i];
  }
  return tot;
}
```

Question 36

Which of the following could correctly fill **`<*1>`** in the code to the right so that the loop would terminate without error?

A. `ch.hasNextInt()`

B. `ch.hasNextDouble()`

C. `ch.hasNextCharacter()`

D. `ch.hasNext()`

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

Question 37

Assuming that **`<*1>`** is filled correctly, what is the purpose of method mystery?

A. to count the number of words in line

B. to count the number of words in line that start with a vowel

C. to count the number of words in line that start with numbers

D. to add up the vowels in all words

E. to add up the letters in all of the words

```
public int mystery(String line)
{
  Scanner ch = new Scanner(line);
  int count = 0;
  String x = "aeiouAEIOU";
  while(  <*1>  )
  {
    String temp = ch.next();
    if(x.indexOf(temp.charAt(0))>-1)
      count++;
  }
  return count;
}
```

QUESTION 38

If N equals `oList.length`, what is the Big O of method `why` when `c` is an `ArrayList` and when `c` is a `HashSet`? Choose the most restrictive set of correct answers.

	ArrayList	HashSet
A.	O(1)	O(1)
B.	O(N)	O(N)
C.	O(N^2)	O(N*Log$_2$N)
D.	O(Log$_2$N)	O(N)
E.	O(N)	O(1)

```
public static void why(
    Collection<Object> c, Object[] oList)
{
  for(Object obj : oList)
  {
    c.add(obj);
  }
}
```

QUESTION 39

Which of the following could replace **`<*1>`** in the code to the right to correctly insert `obj` at the proper location?

A. `stuff[++size] = obj;`

B. `stuff[size] = obj;`

C. `stuff[size++] = obj;`

D. `stuff[size*2] = obj;`

E. `stuff[size--] = obj;`

QUESTION 40

Assuming that **`<*1>`** has been filled correctly, which of the following could replace **`<*2>`** in the code to the right to allocate a new array of the proper type with `max` elements?

A. `(Object[])(new Object[max])`

B. `(E[])(new Object[max])`

C. `E[max]`

D. `(E)(new Object[max])`

E. more than one of these

```
public class Structure<E>
{
  private int size;
  private E[] stuff;

  public Structure(){
    stuff = getStuff(10);
  }

  public void add(E obj){
    if( size == stuff.length )
      stuff = getStuff( size * 2 );
    <*1>
  }

  public E get(int pos){
    return stuff[pos];
  }

  public void remove(int pos){
    size--;
    for(int i = pos; i < size; i++)
      stuff[i] = stuff[i + 1];
  }

  public int size(){
    return size;
  }

  private E[] getStuff(int max){
    E[] temp = <*2>;
    for(int i = 0; i < size; i++)
      temp[i] = stuff[i];
    return temp;
  }
}
```