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 21_3 times 12_4 ?

A. 111_6 B. 61_7 C. 132_4 D. $A9_{11}$ E. 222_4

QUESTION 2

What is output by the code to the right?

A. 7.0 B. 6 C. 6.0 D. 7

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

```
Double a = 6.0;
a=(double)a++;
System.out.println(a);
```

QUESTION 3

What is output by the code to the right?

A. 40 B. 50 C. 40.0 D. 50.0

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

```
int b = 20;
b *= 2.5;
System.out.println(b);
```

QUESTION 4

What is output by the code to the right?

A. 66 B. 50 C. 37 D. 14 E. 61

```
int much = 0;
for(int c=1; c<10; c=c+3)
  much = much + c ^ 2;
System.out.print(much);
```

QUESTION 5

What is output by the code to the right?

A. 9 B. 3 C. 13 D. 16 E. 7

```
String d = "reg_UIL_rocks_da_house";
Integer loc = d.lastIndexOf("_",9);
System.out.print(loc);
```

QUESTION 6

What is output by the code to the right?

A. 12 B. 8 C. 13 D. 14 E. 15

```
long[] ray = {1,15,6,13,2,14,8,9};
Arrays.sort(ray);
out.println(ray[4/2] * ray[1]);
```

QUESTION 7

Which answer is logically equivalent to the following `boolean` expression, where `p` and `q` are `boolean` variables?

```
p && (p || q && p)
```

A. `!(p && q)` B. `p ^(p && q)` C. `!p || !q` D. `p || p && q` E. `!(p ^ q)`

QUESTION 8

What is output by the code to the right?

A. 20

B. 23

C. 10

D. 40

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

```
int frog = 23;
switch(frog){
   case 23 : frog = 20; continue;
   case 20 : frog = 23; break;
   default : frog = 20;
}

if(frog > 10)
   frog = frog / 2;
else
   frog = frog * 2;

System.out.println(frog);
```

QUESTION 9

Which of the following could replace **<*1>** in the code of class `Grid` to the right so that the constructor would properly instantiate instance variable `mat` using parameters `r` and `c`?

A. `mat = new Object[r][c];`

B. `mat = new Object[][c-1];`

C. `mat = Object[r][c];`

D. A and B only.

E. A, B, and C.

QUESTION 10

Assuming that **<*1>** is filled correctly, what is output by the line marked `//1` in the code to the right?

A. `null`

B. `0`

C. `22`

D. `go`

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

```
public class Grid
{
  private Object[][] mat;

  public Grid(int r, int c){
    <*1>
  }

  public void add(Object o, int r, int c){
    mat[r][c] = o;
  }

  public Object get(int r, int c){
    return mat[r][c];
  }
}

////////////////////////////////////////
//client code
Grid grid = new Grid(5,9);
grid.add("it",1,1);
grid.add("22",2,2);
grid.add("go",3,3);
System.out.println(grid.get(4,4));   //1
```

QUESTION 11

What is output by the code to the right?

A. `10` B. `7` C. `9` D. `11` E. `8`

```
System.out.println(10 & 6 | 8 ^ 2);
```

QUESTION 12

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

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

```
System.out.printf("ju\nmp\nup\ne\n");
```

QUESTION 13

What is output by the code to the right?

A. `4.0` B. `3.0` C. `4` D. `3` E. `3.98`

```
Double big = Math.sqrt(8.654);
big = Math.ceil(big);
System.out.println(big);
```

QUESTION 14

Which of the following could replace **<*1>** in method `doIt` in the code to the right?

A. `Long` B. `long` C. `int`

D. A and B only E. A, B, and C

QUESTION 15

Which of the following could replace **<*2>** in method `doIt` in the code to the right?

A. `whut.longValue();` B. `whut;`

C. `whut.intValue();` D. A and B only

E. A, B, and C

QUESTION 16

Assuming that **<*1>** and **<*2>** are filled correctly, what is output by the line marked `//1` in the code to the right?

A. `32` B. `29` C. `31` D. `32L` E. `31L`

```
public static long doIt( <*1> what)
{
  Long whut = what;
  whut++;
  whut+=3;
  whut = whut - 5;
  return <*2>
}

////////////////////////////////////
//client code

Long how = 32L;
System.out.println(doIt(how));   //1
```

QUESTION 17

What is output by the code to the right?

A. `12,345.0` B. `12,345.00` C. `12345`

D. `12345.00` E. `,12345.0`

```
System.out.printf("%,.2f", 12345.0);
```

QUESTION 18

What is output by the code to the right?

A. `false` B. `true` C. `stop`

D. `0` E. `1`

```
boolean k = Character.isDigit('3');
boolean m = Character.isLetter('3');
out.println(k ^ m);
```

QUESTION 19

What is output by the code to the right?

A. `8` B. `2` C. `10`

D. `5` E. `1`

```
int ter = ( 8 > 2 ) ? 10 : 5;
out.println(ter);
```

QUESTION 20

What is output by the code to the right?

A. `61.0` B. `0.0` C. `29.0`

D. `32.0` E. `41.0`

```
double dbl = 22 >> 2 | 7 << 3;
System.out.println(dbl);
```

QUESTION 21

What is output by the code to the right?

A. `java.lang.ArithmeticException: / by zero`

B. `9`

C. `0`

D. `div`

E. `5`

```
int div = 0;
try{
  div = 9 % 3;
  div = 5 % div;
}
catch(Exception  e)
{
   System.out.print(e);
}
System.out.print(div);
```

QUESTION 22

What is returned by the method call `what(new int[]{1,2,3,4,5,6,7,8,9,10})` ?

A. `1` B. `6` C. `5` D. `2` E. `0`

QUESTION 23

What is returned by the method call `what(new int[]{2,1,2,2,6,10,12,8})` ?

A. `1` B. `6` C. `5` D. `2` E. `0`

```
public static int what(int[] x)
{
  int back=0;
  int old = x[x.length-1];
  for(int it : x)
  {
    if(it % old == 0)
      back++;
    old--;
  }
  return back;
}
```

QUESTION 24

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

A. `[2, 5, 10]`

B. `[5, 2, 10]`

C. `[10, 5, 2]`

D. `[10, 2, 5]`

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

QUESTION 25

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

A. `[23, 17, 5, 2, 10]`

B. `[23, 17, 10, 5, 2]`

C. `[23, 10, 17, 2, 5]`

D. `[23, 10, 5, 17, 2]`

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

QUESTION 26

What data structure is being created by class `Structure`?

A. a binary search tree

B. a heap

C. a map

D. a hash table

E. a radix heap tree

QUESTION 27

What is the expected run-time of method go? Choose the most restrictive answer.

A. $O(1)$

B. $O(N)$

C. $O(Log_2N)$

D. $O(Log_2N*N)$

E. $O(N^2)$

```
public class Structure{

   private ArrayList<Integer> list;

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

   public void add(int value)
   {
      list.add(value);
      go(list.size()-1);
   }

   public void go(int x)
   {
     while(x>0)
     {
        int y = (x-1)/2;
        if(list.get(y) < list.get(x))
        {
          swap(y, x);
          x=y;
        }
        else{
          break;
        }
     }
   }

   private void swap(int s, int f)
   {
     int temp = list.get(s);
     list.set(s,list.get(f));
     list.set(f,temp);
   }

   public String toString()
   {
     return "" + list;
   }
}


////////////////////////////////////////
//client code
Structure ds = new Structure();
ds.add(5);
ds.add(2);
ds.add(10);
System.out.println(ds);        //1
ds.add(23);
ds.add(17);
System.out.println(ds);        //2
```

QUESTION 28

What is the best case run-time for a merge sort? Choose the most restrictive answer.

A. $O(1)$ B. $O(N)$ C. $O(Log_2N)$ D. $O(Log_2N*N)$ E. $O(N^2)$

QUESTION 29

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

A. `11` B. `8` C. `5` D. `6` E. `13`

QUESTION 30

What is returned by the method call `wow(11)` ?

A. `11` B. `8` C. `5` D. `6` E. `13`

```
public static int wow(int x)
{
  if(x<0)
    return x+1 + wow(x-2) - wow(x-1);
  else
    return x;
}
```

QUESTION 31

What is the run-time for adding to the front of an ArrayList ? Choose the most restrictive answer.

A. $O(1)$ B. $O(N)$ C. $O(Log_2N)$ D. $O(Log_2N*N)$ E. $O(N^2)$

QUESTION 32

What is output by the code to the right?

A. `27` B. `24`

C. `6` D. `13`

E. `30`

```
Integer bitwise = 17^11|18^14&12;
System.out.println(bitwise);
```

QUESTION 33

Which of the following could replace **`<*1>`** in the code to the right so that `YoYo` could be added to the PriorityQueue `pq`?

A. `extends Comparable`

B. `implements Comparable`

C. `implements Comparator`

D. `implements Interface`

E. more than one of these

QUESTION 34

Assuming that **`<*1>`** is filled correctly, what is output by the line marked `//1` in the code to the right?

A. `8`

B. `1`

C. `7`

D. `-2`

E. `6`

QUESTION 35

Assuming that **`<*1>`** is filled correctly, what is output by the line marked `//2` in the code to the right?

A. `8`

B. `1`

C. `7`

D. `-2`

E. `6`

```
public class YoYo <*1>
{
  private int num;

  public YoYo(int n)
  {
     num=n;
  }

  public int compareTo(Object other)
  {
     YoYo y = (YoYo)other;
     if(y.num > num)
        return 1;
     else if(y.num < num)
        return -1;
     return 0;
     }

  public String toString()
  {
     return "" + num;
  }
}

//////////////////////////////////////////
//client code
PriorityQueue<YoYo> pq;
pq = new PriorityQueue<YoYo>() ;
pq.add(new YoYo(8));
pq.add(new YoYo(1));
pq.add(new YoYo(7));
pq.add(new YoYo(-2));
pq.add(new YoYo(6));

System.out.println(pq.remove());    //1
System.out.println(pq.remove());    //2
```

QUESTION 36

What standard algorithm is being created by the code to the right?

A. linear / sequential search

B. selection sort

C. insertion sort

D. binary search

E. quick sort

```
public class What
{
  public static int fly(int[] x, int y )
  {
    int b = 0, t = x.length-1;
    while(b <= t)
    {
      int m = (b + t) / 2;
      if( x[m] == y )
         return m;
      else
         if (x[m] > y)
            t = m - 1;
         else
            b = m + 1;
     }
     return -1;
  }
}
```

QUESTION 37

What is the expected worst case run-time of method `fly`? Choose the most restrictive answer.

A. `O(1)`

B. `O(N/2)`

C. $O(Log_2N)$

D. $O(Log_2N+1)$

E. `O(N-1)`

QUESTION 38

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

A. `false`

B. `true`

C. `bird`

D. `toot`

E. There is no output due to an `IndexOutOfBoundsException`.

QUESTION 39

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

A. `false`

B. `true`

C. `bird`

D. `toot`

E. There is no output due to an `IndexOutOfBoundsException`.

QUESTION 40

What is method `isIt` checking about parameter `wrd`?

A. does `wrd` have an odd number of letters

B. does `wrd` have an even number of letters

C. does `wrd` have the same letters going forward as backwards

D. does `wrd` have all capital letters

E. does `wrd` have all lowercase letters

```
public class Fun
{
   public static boolean isIt(String wrd)
   {
     Stack stack;
     LinkedList queue;
     stack = new Stack();
     queue = new LinkedList();

     char[] s = wrd.toCharArray();
     for(char c : s)
     {
       stack.add(c);
       queue.add(c);
     }

     while(!stack.isEmpty())
     {
       if(!(stack.pop()==queue.remove()))
         return false;
     }
     return true;
   }
}

//////////////////////////////////////////
//client code
System.out.println(Fun.isIt("bird"));  //1
System.out.println(Fun.isIt("toot"));  //2
```