Note: Correct responses are based on Java, J2sdk v 5.0, 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

$11101_2 + 1110_2 = ?$

A. 11111_2 B. 111011_2 C. 111111_2 D. 101011_2 E. 1011_2

QUESTION 2

What is output by the code to the right?

A. 4 B. 28 C. 64 D. 32 E. 72

```
int x = 4;
int y = 5;
int z = 3;
System.out.print(y * x + x * z);
```

QUESTION 3

What is output by the code to the right?

A. -1 B. 9 C. 6

D. 5 E. 4

```
int x = 4;
int y = 5;
int z = 3;
y += z - x;
System.out.print(y);
```

QUESTION 4

What is output by the code to the right?

A. 128 B. 32 C. 64

D. Nothing is printed due to an infinite loop in the code.

E. Nothing is printed due to a syntax error in the code.

```
int x = 2;
for(int i = 1; i < 20; i += i){
      x = x * 2;
}
System.out.print(x);
```

QUESTION 5

What is output by the code to the right?

A. 0 B. 1 C. 10

D. 45 E. 55

```
int[] list = new int[10];
int total = 0;
for(int i = 0;i < list.length;i++){
      total += list[i];
}
System.out.print( total );
```

QUESTION 6

What is output by `line1` in the code to the right?

A. ss_blowing_class B. _blowing_cla

C. _blowing_class D. glass_blowing_class

E. gla

QUESTION 7

What is output by `line2` in the code to the right?

A. s_blowing_class B. _blowing_class

C. glass_blowing_class D. ss_blowing_class

E. glass_blowing_clas

QUESTION 8

What is output by `line3` in the code to the right?

A. _blowing_class B. _blowing_cla

C. ss_blowing_class D. _blowing_

E. There is no output due to a runtime error

```
String s1 = "glass_blowing_class";
int loc1 = s1.indexOf("ss");
String s2 = s1.substring(loc1);
int loc2 = s1.indexOf("ss",
                  loc1 + 1 );
String s3 = s1.substring( loc1 + 2,
                  loc2 );

System.out.print( s1 ); //line 1
System.out.print( s2 ); //line 2
System.out.print( s3 ); //line 3
```

QUESTION 9

What is output by the code to the right?

A. `dauxceezbbay`

B. `dauxceezbbayabix`

C. `abcdbbeaiaeu`

D. `abcdbbeaiaeuxyzx`

E. There is no output due to a runtime error

```
char[][] mat = {{'a','b','c','d'},
                {'b','b','e','a'},
                {'i','a','e','u'},
                {'x','y','z','x'}};
String result = "";
int start = mat.length - 1;
int stop = mat[0].length;
for(int i = start; i > 0; i--){
  for(int j = 0; j < stop; j++){
    result += mat[j][i];
  }
}
System.out.println( result );
```

QUESTION 10

Which of the following `boolean` expressions is logically equivalent to the `boolean` expression on line1 in the code to the right?

A. `!(x<=y)&&!(y>z)` B. `!(x>y)&&!(y<=z)`

C. `!((x>y)&&(y<=z))` D. `x <= y <= z`

E. `(x<=y) || (y<=z)`

```
int x, y, z;
// code to initialize x, y, z
if( (x > y) && (y <= z) ) //line 1
  x++;
```

QUESTION 11

What replaces `<*1>` in the code to the right so that the class variables `NUM` will be initialized when the class `Shirt` is loaded?

A. `class` B. `public` C. `private`

D. `static` E. `final`

For questions 12 and 13 assume `<*1>` has been filled in correctly.

QUESTION 12

The following code appears in a client class of `Shirt`. What is the output?

```
Shirt s = new Shirt(1);
System.out.print( s.toString() );
```

A. `Size: medium`

B. `Size small with no sleeves`

C. `size: small with sleeves`

D. `Size: medium, with no sleeves`

E. `Size: medium, with sleeves`

QUESTION 13

The following code appears in a client class of `Shirt`. What is the output?

```
System.out.print( Shirt.getNumSizes() );
```

A. `3` B. `4` C. `5` D. `0`

E. There is no output due to a syntax error in the code above.

```
public class Shirt{
 private int size;
 private boolean sleeves;

 private static String[] sizes;
 public static final int NUM;

 <*1>{
  sizes = new String[] {"small",
        "medium", "large",
        "extra large"};
  NUM = sizes.length; // line 1
 }
 public static int getNumSizes(){
  return NUM;
 }

 public Shirt(int size){
  this(size, true);
 }

 public Shirt(int size,
              boolean sleeves){
  this.size = size;
  this.sleeves = sleeves;
}

 public String toString(){
  String t = (sleeves) ? "" :"no ";
  return "Size: " + sizes[size] +
         ", with " + t + "sleeves";
   }
}
```

QUESTION 14

What is output by the code to the right?

A. `16 10` B. `26`

C. `32 -22` D. `8 18`

E. `10 16`

```
int total = 30;
int x = -2;
while( x < total ) {
  x *= x;
  total -= x;
}
System.out.print(x + " " + total);
```

QUESTION 15

What is output by he method call: `pink(5, 12)` ?

A. `121`

B. `11`

C. `122`

D. `1212`

E. `211`

```
public void pink(int a, int b){
 if( c1(a,b) || c2(a,b) )
  System.out.print("1");
 else
  System.out.print("2");
}

public boolean c1(int a, int b){
 System.out.print("1");
 return a < b;
}

public boolean c2(int a, int b){
 System.out.print("2");
 return a > b;
}
```

QUESTION 16

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

A. `0` B. `1`

C. `false` D. `true`

E. `a1==a2`

QUESTION 17

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

A. `0` B. `1` C. `false`

D. `true` E. `a1.equals(a2)`

```
ArrayList<String> a1 = new
              ArrayList<String>();
ArrayList<String> a2 = new
              ArrayList<String>();
a1.add("a");
a1.add(0,"b");
a2.add("b");
a2.add("a");
System.out.println(a1==a2);//line 1

System.out.println(a1.equals(a2));
//previous line is line 2
```

QUESTION 18

What is output by the code to the right?

A. `1`

B. `3`

C. `6`

D. `9`

E. `12`

```
int total = 0;
for(int i = 0; i < 7; i++)
  if( i % 2 == 0 )
    for(int j = 1; j <= i; j++){
      if( j % 3 == 0 )
        break;
      total++;
    }
System.out.print(total);
```

QUESTION 19

What is output by the code to the right?

A. `12.56` B. `12.55`

C. `2.56` D. `2.55`

E. `12.6`

```
double a = 12.555;
System.out.printf("%4.2f",a);
```

QUESTION 20

What is the value of x after the code to the rights executes?

A. 0 B. 3 C. 4 D. 17
E. The code to the right results in a runtime error

```
int x = 3;
x++;
x = x % 17;
```

QUESTION 21

What is output by the code to the right?

A. kngl

B. cenl

C. ceenly

D. The code to the right runs, but produces no output

E. There is no output due to a runtime error

```
String r = "";
String[] sList = {"red", "black",
    "green", "blue", "orange",
    "yellow", "grey"};
for(String s : sList)
    if( s.length() > 4 )
        r += s.charAt(3);
System.out.print( r );
```

QUESTION 22

What is output by the code to the right?

A. i1 is bigger B. i2 is bigger
C. i1 equals i2

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

E. There is no output due to a runtime error

```
Integer i1 = 42;
Integer i2 = 12;
if( i1.compareTo(i2) > 0 )
  System.out.print("i1 is bigger");
else if( i1.compareTo(i2) < 0 )
  System.out.print("i2 is bigger");
else
  System.out.print("i1 equals i2");
```

QUESTION 23

What is output by the code to the right?

A. -1 B. 0 C. 1 D. 125 E. 126

```
int x = 49;
int y = 77;
int z = x & y;
System.out.print(z);
```

QUESTION 24

What is returned by f(11) ?

A. 1 B. 2 C. 3 D. 4 E. 5

```
public int f(int x){
 return (x % 2 == 0 ) ?
      (x % 3 == 0 ) ? 1 : 2 : 3;
}
```

QUESTION 25

What is output by the code to the right?

A. 24 B. 48 C. 18 D. 30 E. 0

```
int k = 0;
for(int i = 0; i < 5; i+=2)
  for(int j = 0; j <= 3; j++)
     k += 2;
System.out.print(k);
```

QUESTION 26

What is the output by the code to the right?

A. abcabcabcab B. abcab C. abcccab
D. abccc E. cccabccc

```
String s4 = "ab";
for(int i = 0; i < 2; i++)
  s4 = s4 + "c" + s4;
System.out.print(s4);
```

QUESTION 27

What is output by the code to the right?

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

```
double a = -1.3;
int x = (int)Math.ceil(a);
System.out.print(x);
```

QUESTION 28

What is output by the code to the right?

A. BCBA B. ABBC C. CBAA D. ABC
E. The output of the code will vary from one execution to the next.

```
Set<String> ts = new
                 TreeSet<String>();
ts.add("B");
ts.add("C");
ts.add("B");
ts.add("A");
for(String val : ts)
  System.out.print(val);
```

QUESTION 29

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

A. `0` B. `1`

C. `2` D. `3`

E. `4`

QUESTION 30

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

A. `2` B. `0`

C. `1` D. `4`

E. `c1`

QUESTION 31

What is output by `line 3` in the code to the right?

A. `0` B. `2`

C. `1` D. `5`

E. `4`

QUESTION 32

What is output by `line 4` in the code to the right?

A. `1` B. `3`

C. `0` D. `4`

E. `2`

QUESTION 33

What is output by `line 5` in the code to the right?

A. `0` B. `1`

C. `16` D. `4`

E. `2`

```
public class Count{
  private int c;
  public void inc() { c++; }

  public void d()   { c = c + this.c;  }

  public int g()
  { return c;  }
}
// ---- client code ----------------------
public void one(){
  Count c1 = new Count();
  System.out.print(c1.g()); //line 1
  c1.inc();
  c1.d();
  System.out.print(c1.g()); //line 2
  c1 = new Count();
  c1.inc();
  c1.inc();
  three(c1);
  System.out.print(c1.g()); //line 3
  c1 = new Count();
  c1.inc();
  four(c1);
  System.out.print(c1.g()); //line 4
  c1 = new Count();
  five(c1, c1);
  System.out.print(c1.g()); //line 5
}

public void three(Count c){
  c.d();
  c.inc();
}

public void four(Count c1){
  c1.inc();
  c1 = new Count();
  c1.inc();
}
public void five(Count a, Count b){
  a.inc();
  b.inc();
  a.d();
}
```

QUESTION 34

What does method `f` return?

I. The index of the first occurrence of `t` in `list`
II. The index of the last occurrence of `t` in `list`
III. `-1` if `t` is not in `list`.

A. `I` only B. `II` only

C. `III` only D. `I` and `II` only

E. `II` and `III` only

```
public int f(int[] list, int t){
  for(int i = list.length - 1;
                      i >= 0; i--)
    if( list[i] == t )
      return i;
  return -1;
}
```

QUESTION 35

What is output by the following client code?

```
Cat c = new Cat();
System.out.print( c.speak() + "_" + c.birth() );
```

A. `live_meow` B. `meow_live`

C. `live` D. `meow_meow`

E. There is no output due to a syntax error in the client code.

QUESTION 36

What is output by the following client code?

```
Mammal m = new Mammal();
System.out.print( m.speak() + "_" + m.birth() );
```

A. `_meow` B. `_live` C. `meow_live`

D. The output cannot be determined until the code is executed.

E. There is no output due to a syntax error in the client code.

QUESTION 37

What is output by the following client code?

```
Mammal m = new Cat();
System.out.print( m.speak() + "_" + m.birth() );
```

A. `_meow` B. `_live`

C. `live_meow` D. `meow_live`

E. There is no output due to a syntax error in the client code.

QUESTION 38

What is output by the following client code?

```
Mammal p = new Platypus();
System.out.print( p.speak() + "_" + p.birth() );
```

A. `squeak_egg` B. `squeak_live` C. `_live`

D. The output cannot be determined until the code is executed.

E. There is no output due to a syntax error in the client code.

QUESTION 39

What is output by the following client code?

```
Primate p = new Primate();
System.out.print( p.speak() +  "_" + p.birth() );
```

A. `oop_live` B. `_live` C. `live_oop`

D. There is no output due to a syntax error in the Primate class code.

E. There is no output due to a syntax error in the client code.

```
public abstract class Mammal{

  public String birth(){
    return "live";
  }

public abstract String speak();
}

public class Cat extends Mammal{
  public String speak(){
    return "meow";
  }
}

public class Platypus extends
                              Mammal{

  public String speak(){
    return "squeak";
  }

  public String birth(){
    return "egg";
  }
}

//------------------------------
// Consider this code only for
// question 39
public class Primate extends
                              Mammal{

  public String sound(){
    return "oop";
  }
}
```

QUESTION 40

Assume a priority queue is implemented with an `ArrayList` as its backing container. What is the expected average case Big O of the `enqueue` operation? Choose the most restrictive correct answer.

A. `O(1)` B. `O(log N)` C. `O(N)` D. `O(N log N)` E. `O(N^2)`