QUESTION 1

What is the sum of 7643_8 and 3556_8?

A. 11199_8 B. 12311_8 C. 13421_8 D. 12310_8 E. $FFFF_{16}$

QUESTION 2

What is output by the code to the right?

A. 17 B. 10 C. 5

D. 22 E. 22.5

```
int x = 5;
int y = 3;
int z = 2;
x = y * x + x / z;
System.out.print(x);
```

QUESTION 3

What is output by the code to the right?

A. 20 B. 2 C. 11

D. 10 E. 22

```
int total = 0;
for(int i = 0; i <= 10; i++)
  total += 2;
System.out.println(total);
```

QUESTION 4

What is output by the code to the right?

A. Alan Turing

B. AlanTuring

C. Alan_Turing

D. TuringAlan

E. s3

```
String s1 = "Turing";
String s2 = "Alan";
String s3 = s2 + s1;
System.out.print(s3);
```

QUESTION 5

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

A. uilS B. uil C. UIL3

D. s5 E. uil3

QUESTION 6

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

A. uilS B. uil C. UIL3

D. uil# E. uil3

```
String s4 = "UIL3";
String s5 = s4.toLowerCase();
System.out.print( s5 ); //line 1
System.out.print( s4 ); //line 2
```

QUESTION 7

What is output by the code to the right?

A. `CDAAaAB` B. `BAaAACD` C. `CDaaaAB`

D. `A` E. There is no output due to a syntax error in the code.

```
String s6 = "A";
String[] sList = {"B", s6,
         s6.toLowerCase(), s6 + s6, "CD"};
s6 = "";
for(String s : sList)
      s6 = s + s6;
System.out.println( s6 );
```

QUESTION 8

What is output by the code to the right?

A. `null`

B. `NULL`

C. There is no output because `st` is the empty `String`.

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

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

```
String[] names = new String[10];
String st = names[5].toUpperCase();
System.out.println( st );
```

QUESTION 9

What is output by the code to the right?

A. `34` B. `19` C. `20`

D. `14` E. `12`

```
int[][] mat = {{2,7,5},
               {2,1,3},
               {8,4,2}};
int tot = 0;
for(int r = 0; r < mat.length; r++)
  for(int c = r; c < mat[0].length; c++)
    tot += mat[r][c];
System.out.print(tot);
```

QUESTION 10

What is output by the code to the right?

A. `210-1` B. `-1012` C. `-2-101`

D. `-101` E. `2345`

```
int[][] mat1 = new int[4][4];
for(int i = 0; i < 4; i++)
  for(int j = 0; j < 4; j++)
    mat1[j][i] = i - j;

for(int i = 0; i < 4; i++)
  System.out.print( mat1[2][i]);
```

QUESTION 11

What is output by the code to the right?

A. `16` B. `16.0` C. `-16.0`

D. `-16` E. There is no output due to a syntax error in the code.

```
System.out.print(
 Math.pow(Math.min(-4,-2),Math.abs(-2)) );
```

QUESTION 12

What is output by the code to the right?

A. `86420` B. `8642` C. `1086420`

D. `97531` E. `9876543210`

```
// IntStack implements the traditional
// stack operations for ints
IntStack s = new IntStack();
for(int i = 0; i < 10; i += 2)
  s.push(i);
while( !s.isEmpty() )
  System.out.print( s.pop() );
```

QUESTION 13

Which of the following statements are syntactically correct?

I. `Plan p1 = new Plan();`

II. `Plan p2 = new CallingPlan(1, 5);`

III. `CallingPlan p3 = new CallingPlan();`

A. I only

B. III only

C. I and II only

D. II and III only

E. I, II, and III

QUESTION 14

What is output by the following client code?

```
CallingPlan p4 = new CallingPlan();
System.out.println( p4.cost(10) );
```

A. 10 B. 20 C. 30

D. 120 E. 0

QUESTION 15

What is output by the following client code?

```
CallingPlan p5 = new CallingPlan();
CallingPlan p6 = new CallingPlan();
System.out.print( p5==p6 );
```

A. 0 B. p5==p6 C. 1

D. true E. false

QUESTION 16

What is output by the following client code?

```
WithBaseMin w1 =
            new WithBaseMin(1, 5, 10);
System.out.print( w1.cost(5) );
```

A. 15 B. 5 C. 25

D. 50 E. 10

QUESTION 17

What is output by the following client code?

```
WithBaseMin w2 =
            new WithBaseMin(2, 10, 20);
System.out.print( w2.cost(30) );
```

A. 70 B. 10 C. 30

D. 20 E. 120

```
public interface Plan{
  public int cost(int used);

  public int baseCost();
}
```

```
public class CallingPlan implements Plan{
  private int cpm;
  private int base;

  public CallingPlan(){
    this(2, 10);
  }

  public CallingPlan(int c, int b){
    cpm = c;
    base = b;
  }

  public int cost(int used){
    return base + cpm * used;
  }

  public int baseCost(){
    return base;
  }

  public void priceIncrease(){
    cpm++;
  }
}
```

```
public class WithBaseMin
                    extends CallingPlan{

  private int baseMin;

  public WithBaseMin (int c, int b, int m){
    super(c, b);
    baseMin = m;
  }

  public int cost(int used){
    int result = 0;
    if( used <= baseMin )
      result = baseCost();
    else
      result = super.cost(used - baseMin);
    return result;
  }
}
```

Questions 18 through 22 refer to the interface `Plan` and classes `CallingPlan` and `WithBaseMin` on page 4.

QUESTION 18

What is output when method `jg24` is called?

A. `30` B. `130` C. `0`

D. `40` E. `10`

```
public void jg24(){
  CallingPlan c1 = new CallingPlan();
  jj48(c1);
  System.out.print( c1.cost(10) );
}

public void jj48(CallingPlan c){
  c.priceIncrease();
}
```

QUESTION 19

What is output when method `de8` is called?

A. `25` B. `2525` C. `2530`

D. `3030` E. `30`

```
public void de8(){
  CallingPlan c1 = new CallingPlan(1,20);
  mw99(c1);
  System.out.print(c1.cost(10));
}

public void mw99(CallingPlan c){
  c = new CallingPlan(2,5);
  System.out.print( c.cost(10) );
}
```

QUESTION 20

What is output by the code to the right?

A. `true`

B. `false`

C. `b@12`

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

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

```
Plan p1;
WithBaseMin m1 = new WithBaseMin(1,10,10);
p1 = m1;
boolean b = m1.equals(p1);
System.out.print( b );
```

QUESTION 21

What is output when method `k9` is called?

A. `2550`

B. `2540`

C. `2045`

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

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

```
public void k9(){
  CallingPlan[] pList = new CallingPlan[2];
  pList[0] = new CallingPlan(1, 5);
  pList[1] = new WithBaseMin(2, 10, 5);
  be9( pList );
}

public void be9(CallingPlan[] ps){
  for(int i = 0; i < ps.length; i++)
    System.out.print( ps[i].cost(20) );
}
```

QUESTION 22

What must be done to the class to the right so that it will compile?

A. Nothing, the class will compile as is.

B. The class must have a constructor.

C. The class must be declared `abstract`.

D. The class must have an instance variable for the cost per minute.

E. The `cost` method must make use of the parameter named `used`.

```
public class SimplePlan implements Plan{

  public int cost(int used){
    return 20;
  }

}
```

QUESTION 23

What is output when method `show` is called?

A. `-1 1 5 10 14`

B. `-1 1 14 10 5`

C. `14 10 5 1 -1`

D. `14 1 -1 10 5`

E. `1 5 -1 10 14`

QUESTION 24

Method `sort` attempts to implement the selection sort algorithm. The method is designed to sort the elements of `data` into increasing order, but the method does not always work as intended. What change should be made so the method always works as intended?

A. `//line 1` should be changed to `index = 0;`

B. `//line 2` should be changed to `m = -1;`

C. `//line 2` should be changed to `m = data[i];`

D. `//line 3` should be changed to `index = i;`

E. `//line 4` should be changed to `m = j;`

Assume the logic error in `sort` has been corrected.

QUESTION 25

Let `N = data.length` from method `sort`. What will the variable `count` equal at the line marked `// line 5` ?

A. `N!`

B. N^2

C. `(N + 1) * N / 2`

D. `N * (N + 1) * (N + 2)`

E. `N / 3 + N / 2`

QUESTION 26

Let `N = data.length` from method `sort`. What is the minimum number of times the statement at the line marked `// line 4` will be executed?

A. `0` B. `1` C. `N / 2`

D. $\log_2 N$ E. `N`

```
public static void sort(int[] data){
  int m;
  int index;
  int temp;
  int count = 0;

  for(int i = 0; i < data.length; i++){
    index = i; // line 1
    m = 0; // line 2

    for(int j = i; j < data.length; j++){
      count++;

      if( data[j] < m){
        index = j; // line 3
        m = data[j]; // line 4
      }
    }

    temp = data[i];
    data[i] = data[index];
    data[index] = temp;
  }
  // line 5
}

public static void show(){
  int[] d2 = {14, 1, -1, 10, 5};
  sort(d2);

  for(int i = 0; i < d2.length; i++)
    System.out.print( d2[i] + " ");
}
```

QUESTION 27

What replaces **<*1>** in the code to the right to subtract `1` from `total` only if element `w[row][col]` is equal to `1`?

A.
```
if( w[row][col] == 1 )
  total -= 1;
```
B.
```
if( w[r][c] == 1 )
  total -= 1;
```
C.
```
if( w[row][col] )
  total -= 1;
```
D.
```
if( w[row][col] != 2 )
  total--;
```
E. More than one of these.

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

QUESTION 28

Assuming `w` is a square matrix with `N` rows and `N` columns, what is the running time of method `numNeigh`? Choose the most restrictive correct answer.

A. $O(1/N)$ B. $O(1)$ C. $O(N)$

D. $O(N^2)$ E. $O(2^N)$

QUESTION 29

Assuming `w` is a square matrix with `N` rows and `N` columns, what is the running time of method `next`? Choose the most restrictive correct answer.

A. $O(N^2)$ B. $O(N^3)$ C. $O(2^N)$

D. $O(N^8)$ E. $O(N^4)$

QUESTION 30

What is output by the following client code?

```
int[][] m = {{1,1,1,0},
             {0,0,0,1}};
Game g = new Game(m);
g.next();
System.out.print(g);
```

A.
```
0110
0110
```
B.
```
***.
...*
```
C.
```
....
....
```
D.
```
***.
.***
```
E.
```
.**.
.**.
```

```
class Game {
  private int[][] w;

  public Game(int[][] init){
    int r = init.length;
    int c = init[0].length;
    w = new int[r][c];
    for(int i = 0; i < r; i++)
      for(int j = 0; j < c; j++)
        w[i][j] = init[i][j];
  }

  public void next(){
    int[][] gen1 = new int[w.length][w[0].length];
    int n;
    for(int r = 0; r< w.length; r++)
      for(int c = 0; c < w[0].length; c++){
        n = numNeigh(r, c);
        if( w[r][c] == 1 && (n == 2 || n == 3) )
          gen1[r][c] = 1;
        else if( n == 3 )
          gen1[r][c] = 1;
      }
    w = gen1;
  }

  private int numNeigh(int row, int col){
    int total = 0;
    for(int r = row -1; r <= row + 1; r++)
      for(int c = col - 1; c <= col + 1; c++)
        if(inbounds(r,c,w) && w[r][c] == 1)
          total++;
    <*1>
    return total;
  }

  private boolean inbounds(int row,
                           int col, int[][] mat){
    return row >= 0 && row < mat.length
           && col >= 0 && col < mat[row].length;
  }

  public String toString(){
    String result = "";
    for(int r = 0; r < w.length; r++){
      for(int c = 0; c < w[0].length; c++)
        result += ( w[r][c] == 1 ) ? "*" : ".";
      result += "\n";
    }
    return result;
  }

}
```

QUESTION 31

What is output by the code to the right?

A. 26521 B. 3210 C. 02683

D. 83620 E. 621

```
ArrayList<Integer> dr =
                    new ArrayList<Integer>();
for(int i = 1; i < 40; i = 1 + i * i)
      dr.add(i);
for(int i = dr.size()-1; i >= 0; i--)
      System.out.print( dr.get(i) );
```

QUESTION 32

What is output by the code to the right?

A. A&MM1M

B. 1

C. A&M

D. 1M

E. M

```
String res = "";
try{
  String col = "A&M";
  for(int i = 2; i < 6; i++)
    res += col.charAt(i);
  System.out.print(col);
  System.out.print(res);
}
catch(Exception e){
  System.out.print(res.length());
}
finally{
  System.out.print(res);
}
```

QUESTION 33

What is output by the code to the right?

A. 2HC3

B. 2HC

C. 1HC

D. 1HC3

E. 3

```
double len = 13.6;
double inc = 8.6;
if( len > 10 ){
  if( inc < 6.5  )
    System.out.print(1);
  else
    System.out.print(2);
  if( inc > 7 && len > 10)
    System.out.print("HC");
}
else
  System.out.print(3);
```

QUESTION 34

What is output by the code to the right?

A. 63 B. 19 C. 44

D. 18 E. 1

```
int d = 31;
int f = 51;
System.out.print( d & f );
```

QUESTION 35

What is output by the code to the right?

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

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

C. all

D. true

E. false

```
String tag = "/TaB";
boolean all = true;
char c;
for(int i=0; i < tag.length() && all; i++){
  c = tag.charAt(i);
  all = Character.isLetter(c)
            && Character.isUpperCase(c);
}
System.out.print(all);
```

QUESTION 36

What is output by the code to the right?

A. 0
B. 1
C. ut
D. same
E. tech

```
String n1 = "TexasTech";
String n2 = "TexasLonghorns";
if( n1.compareTo(n2) > 0 )
  System.out.print("tech");
else if( n1.compareTo(n2) < 0 )
  System.out.print("ut");
else
  System.out.print("same");
```

QUESTION 37

What is output by the code to the right?

A. 10
B. 9
C. 13
D. 0
E. 2436

```
String d3 = "acbbeab";
int t = 0;
for(int i = 0; i < d3.length(); i++){
   switch( d3.charAt(i) ){
   case 'a' :
      t++;
      break;
   case 'b' :
      t += 2;
      break;
   case 'c' :
      t *= 3;
   }
}
System.out.print(t);
```

QUESTION 38

What is output by the code to the right?

A. ngs B. ngs m C. m
D. n E. There is no output.

```
String nm = "mustangs miners";
String[] tok = nm.split("[aeiou]");
System.out.print( tok[2]);
```

QUESTION 39

What is output by the code to the right?

A. fghnors
B. fghnoorrs
C. sronhgf
D. hornfgs
E. hornfrogs

```
TreeSet<Character> set =
                  new TreeSet<Character>();
String mas = "hornfrogs";

for(int i = 0; i < mas.length(); i++)
  set.add(mas.charAt(i));

for(Character ch : set)
  System.out.print(ch);
```

QUESTION 40

What is output by the code to the right?

A. runners
B. falcons
C. true
D. false
E. There is no output.

```
String r = "falcons";
boolean obj = r instanceof Object;
boolean str = r instanceof String;
if( obj &&  str )
      r = "runners";
System.out.print( r );
```