

Sample Multiple-Choice Question 1

01. Consider the following method.

```
/** Precondition: list contains [23, 39, 42, 28, 99, 57]
 */
public static void mystery(ArrayList<Integer> list)
{
    for (int k = 0; k < list.size(); k++)
    {
        if (list.get(k) % 2 != 0)
            list.remove(k);
    }
}
```

Which of the following describes the values stored in list after `mystery` executes?

- (A) [39, 42, 28, 57]
- (B) [42, 28]
- (C) [23, 39, 99, 57]
- (D) [23, 39, 42, 28, 99, 57]
- (E) An `IndexOutOfBoundsException` error message

Sample Multiple-Choice Question 2

02. Consider the following code segment.

```
int n1 = Integer.MAX_VALUE;  
int n2 = Integer.MIN_VALUE;  
int result = n1 + n2;  
System.out.println(result);
```

What will be printed as a result of printing the segment?

- (A) 1
- (B) 0
- (C) -1
- (D) compile error indicating that the integer number is too large
- (E) An `ArithmeticException` error message

Sample Multiple-Choice Question 3

03. Consider the following code segment.

```
int[][] matrix = {{11,22,33},{44,55,66},{77,88,99}};
for (int k = 0; k < 3; k++)
{
    matrix[k][k] = matrix[0][0];
}
```

Which of the following describes the contents of `matrix` after the code segment executes?

- (A) All of the integers in the left-bottom to top-right diagonal are the same.
- (B) All of the integers in the top row are the same.
- (C) All of the integers in the bottom row are the same.
- (D) All of the integers in the left-top to bottom-right diagonal are the same.
- (E) All of the integers in the entire matrix are the same.

Sample Multiple-Choice Question 4

04. Consider the following two methods.

```
/** Precondition: x > 0 and y > 0
 */
public static int mango(int x, int y)
{
    int temp = papaya(x,y);
    return (x * y) / temp;
}

public static int papaya(int a, int b)
{
    int temp = a % b;
    if (temp == 0)
        return b;
    else
    {
        a = b;
        b = temp;
    }
    return papaya(a,b);
}
```

What value is returned as a result of the call `mango(45, 60)` ?

- (A) 15
- (B) 90
- (C) 180
- (D) 1350
- (E) 2700

Sample Multiple-Choice Question 5

05. Consider the following interface, classes and code segment.

```
interface Language { public void greeting(); }

class German implements Language
{
    public void greeting()
        {System.out.println("In German you say Guten Tag");}
}

class Dutch implements Language
{
    public void greeting()
        {System.out.println("In Dutch you say Goeden Dag");}
}

class French implements Language
{
    public void greeting()
        {System.out.println("In French you say Bonjour");}
}

ArrayList<Language> countries = new ArrayList<Language>();
countries.add(new German());
countries.add(new Dutch());
countries.add(new French());
for (Language country: countries)
    country.greeting();
```

What is printed as a result of executing the code segment?

- (A) In German you say Guten Tag
In Dutch you say Goeden Dag
In French you say Bonjour
- (B) Guten Tag
Goeden Dag
Bonjour
- (C) German
Dutch
French
- (D) A compile error message, because an abstract class was not used to implement the Language interface
- (E) A compile error message, because the for loop structure does not access array elements properly.

Sample Multiple-Choice Question 6

06. Consider the following method.

```
/** Precondition: n > 1
 */
public static int method2126(int n)
{
    if (n == 1 || n == 2)
        return 1;
    else
        return n + method2126(n-1) + method2126(n-2);
}
```

What value is returned as a result of the call `method2126(5)` ?

- (A) 5
- (B) 10
- (C) 20
- (D) 36
- (E) 63

Sample Multiple-Choice Question 7

07. Consider the following program segment and `List` class.

```
int[] x = {11,22,33,44,55,66,77,88,99};
List list = new List(x);
x[x.length] = 0;
System.out.println(list);

class List
{
    private int[] array;

    public List(int[] x)
    {
        array = x;
    }

    public String toString()
    {
        String temp = "[";
        for (int k = 0; k < array.length; k++)
        {
            temp = temp + array[k];
            if (k < array.length-1)
                temp = temp + ", ";
        }
        temp += "]";
        return temp;
    }
}
```

What is the output of executing the program segment?

- (A) [0, 0, 0, 0, 0, 0, 0, 0, 0]
- (B) [11, 22, 33, 44, 55, 66, 77, 88, 99]
- (C) [11, 22, 33, 44, 55, 66, 77, 88, 0]
- (D) [0, 22, 33, 44, 55, 66, 77, 88, 99]
- (E) `ArrayIndexOutOfBoundsException` message

Sample Multiple-Choice Question 8

08. Consider the following method.

```
/** Precondition: str is a nonempty string of upper-case letters
 */
public static String oddString(String str)
{
    String temp = "";
    for (int k = 0; k < str.length(); k++)
    {
        String t = str.substring(k,k+1);
        System.out.print(t + " ");
        if (t != "A" && t != "E" && t != "I" && t != "O" && t != "U")
            temp += t;
    }
    return temp;
}
```

Which of the following is a correct Postcondition, based on the return of method oddString?

- ### (A) Postcondition: oddstring returns str
(B) Postcondition: oddstring returns str with all vowels removed
(C) Postcondition: oddstring returns only the vowels in str
(D) Postcondition: oddstring returns null
(E) It will generate a StringOutOfBoundsException error message

Sample Multiple-Choice Question 9

09. Consider the following code segment.

```
for (int k = 1; k <= 100; k++)
{
    int n1 = (int) Math.random() * 2;
    int n2 = (int) Math.random() * 2;
    boolean bool = n1 == n2;
    System.out.print(bool + " ");
}
```

What is printed as a result of executing the code segment?

- (A) The code segment always prints `false`.
- (B) The code segment always prints `true`.
- (C) The code segment prints `true` roughly 50% of the time and prints `false` roughly 50% of the time.
- (D) The code segment prints both `true` and `false`, but `true` more frequently.
- (E) The code segment prints both `true` and `false`, but `false` more frequently.

Sample Multiple-Choice Question 10

10. Consider the following two mystery methods. If both methods `mystery1` and `mystery2` are called with an identical integer array of n consecutive integers, starting at 1, like 1, 2, 3, 4, 5 . . . n , what can be stated about the arrays at the conclusion of the execution?

```
public static void mystery1(int[] x1)
{
    for (int k = 1; k < x1.length; k++)
        x1[k] = x1[k] + x1[k-1];
}
```

```
public static void mystery2(int[] x2)
{
    int increase = 2;
    for (int k = 1; k < x2.length; k++)
    {
        x2[k] = x2[k-1] + increase;
        increase++;
    }
}
```

- (A) Nothing can be stated with knowing the size of the arrays.
- (B) Both arrays will be identical.
- (C) Both arrays start with 1 and then they store different values.
- (D) Both arrays store identical values, except for the first element.
- (E) An `ArrayIndexOutOfBoundsException` error message

Sample Free-Response Question 1

Question 1.

This question involves converting numbers from Base16 to Base 10.

Part (a).

Write method `fromHexToBin`, which is described as follows. Method `fromHexToBin` converts the base-16 argument and converts the number to its base-2 equivalent. The base-2 number is returned. In completing method `fromHexToBin` you can use the following table, which details the unique relationship between base-16 and base-2 numbers. Every single base-16 digit corresponds to four base-2 digits.

Base 16	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
Base-2	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111

Complete method `fromHexToBin` below.

```
/** precondition: hexNum is a String of characters, which represents
 *                a correct base-16 number.
 * postcondition: returns a String of characters, which represents
 *                the base-2 number equivalent of hexNum.
 */
public static String fromHexToBin(String hexNum)
```

Part (b).

Write method `fromBinToDec`, which is described as follows. Method `fromBinToDec` converts the base-2 argument and converts the number to its base-10 equivalent. The base-10 number is returned.

Complete method `fromBinToDec` below.

```
/** precondition: binNum is a String of characters, which represents
 *                a correct base-2 number.
 * postcondition: returns an int value, which represents
 *                the base-10 number equivalent of binNum.
 */
public static int fromBinToDec(String binNum)
```

Part (c).

Write method `fromHexToDec`, which is described as follows. Method `fromHexToDec` converts the base-16 argument and converts the number to its base-10 equivalent. The base-10 number is returned.

In writing method `fromHexToDec` you may call methods `fromHexToBin` and `fromBinToDec`, which are specified in Part (a) and Part(b), whether the methods are implemented correctly or not.

Complete method `fromHexToDec` below.

```
/** precondition: hexNum is a String of characters, which represents
 * a correct base-16 number.
 * postcondition: returns an int value, which represents
 * the base-10 number equivalent of hexNum.
 */
public static int fromHexToDec(String hexNum)
```


Consider the following incomplete declaration of a Pascal class.

The intent of the Pascal class is to create *Pascal's Triangle*.

```
public class Pascal
{
    private int n;
    private int[][] triangle;

    public Pascal(int n)
    {
        /* implemented in part (a) */
    }

    public void makeTriangle()
    {
        /* implemented in part (b) */
    }

    public String toString()
    {
        /* not required */
    }
}
```

Part (a).

Complete constructor Pascal below.

```
/** precondition: n is >= 0
 * postcondition: space is allocated for a two-dimensional array, such
 *                that row-0 has 1 element, row-1 has 2 elements, ...
 *                and row-n has row+1 elements.
 */
public Pascal(int n)
```

Part (b).

Complete method `makeTriangle` below.

```
/**  
 * postcondition: Numbers are placed in n+1 rows of the triangle array  
 *                such that it represents Pascal's triangle.  
 */  
public makeTriangle()
```

