Old exam practice questions

Question 1A [4]

What will be printed by the following program? Write your answer below the program.

```
class ABC
{
    public static void main(String[ ] args)
    {
        char[][] x = {{'i', 'j'}, {'4', '5'}};
        char[][] y = {{'x', 'y'}, {'a', 'b'}};
        int i;
        char t;

        for (i = 0; i < 2; i=i+1)
        {
           t = y[(i+1)%2][1];
           y[i][(i+1)%2] = x[i][0];
           y[(i+1)%2][1] = t;
        }

        System.out.print(y[0][1]);
        System.out.println(y[1][0]);
    }
}
```

Question 1B [4]

```
class C1
{
   private int[] v1 = {1,4,9};
   public int v3;

   public static int m1 (C2 p)
    {
       ...
    }
   private C1 m2 (int m)
    {
       ...
    }
}
```

```
class C2
{
    public static char v3;

    public C2 (int n)
    {
       ...
    }

    private void m3 (int m)
    {
       ...
    }
}
```

Suppose that the following instructions are used in the **main()** method in a class **Test**. Each choice should be considered **independently** – as it if were in its own **main()** method. Circle the letter of the statement which does NOT cause a compilation error.

Question 1B

(a) `int v2 = C1.m1(this);`

(b) `char v3 = C2.v3;`

(c) `C1 x = new m2(4);`

(d)
```
C1 w = new C1();
w.v1[2] = 3;
```

(e)
```
C2 y = new C2();
int z = C1.m1(y);
```

Question 2 [8]

```
class AClass
{
  public static void main(String[ ] args)
  {
    aMethod(137210);
    System.out.println( );
  }

 public static void aMethod(int i)
  {

     // see next slide

  }


}
```

- Here is a program that uses recursion.
- What is printed by this program?

Question 2

```
public static void aMethod(int i)
  {
    if (i == 0)
    {  ; // do nothing
    }
    else
    {
      if ( i%10 == 1 )
      {
        System.out.print( "one " );
      }
      else
      {
         if ( i%10 == 2 )
         {
           System.out.print( "two " );
         }
         else
         {
            if ( i%10 == 3 )
            {
              System.out.print( "three " );
            }
            else
            {    ; // do nothing
            }
         }
      }
      aMethod(i/10);
    }
  }
```

Question 3 [15]

Implement a recursive Java method that tests if an array of characters is a palindrome, that is, it looks the same if read from the beginning or from the end.

Question 4 [15]

- A "magic square" is a square matrix of integers where every row and every column can be summed to the same single value. For example, in the matrix ***A*** below, the sum of every row and column is 15.

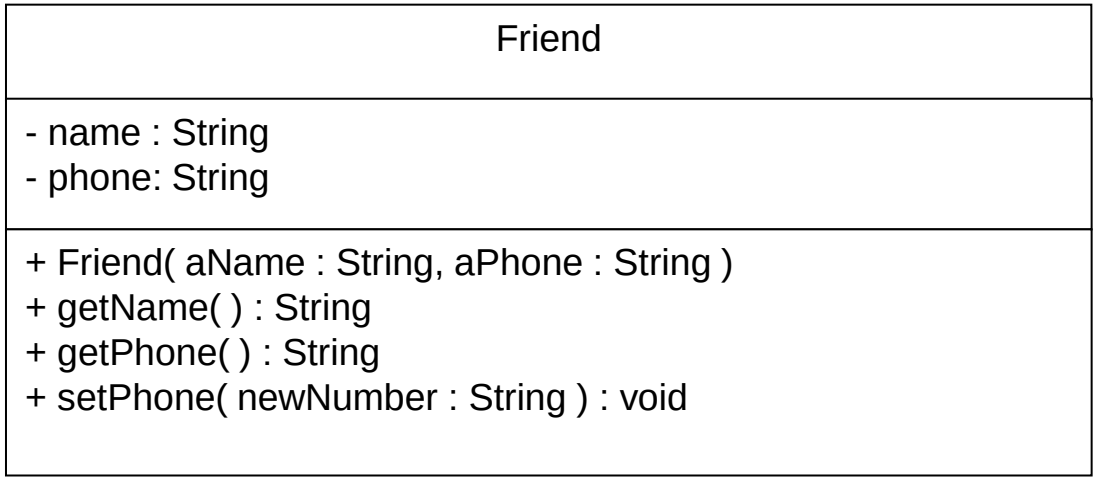
$$A = \begin{bmatrix} 2 & 9 & 4 \\ 7 & 5 & 3 \\ 6 & 1 & 8 \end{bmatrix}$$

- Write a Java method that will take a square matrix of integers ***A*** and returns true if A represents a "magic square" and false otherwise. Your method should be efficient.

```
public static boolean isMagic( int[][] a )
```

Question 5 [25]

- In this question, you will create a class AddressBook that will be able to store a collection of Friend objects.
- The class Friend, which has already been implemented, provides storage for a person's name and phone number. The class contains a constructor, and two accessor methods. A UML class diagram for the class Friend is as follows:



Question 5

Fill in the methods for AddressBook. Your AddressBook class should provide a constructor and three public methods that would permit the following class TestAddressBook to execute:

```
class TestAddressBook
{
 public static void main (String[] args)
 {
   AddressBook myBook = new AddressBook( 2 );
   myBook.addFriend( new Friend( "Alice", "555-1212" ) );
   myBook.addFriend( new Friend( "Tommy", "555-3434 " ) );
   myBook.addFriend( new Friend( "Pizza", "737-1111" ) );
   myBook.changePhone( "Tommy", "867-5309" );
   myBook.print();
   myBook.changePhone( "Pizza", "310-1010" );
 }
}
```

Question 5

Executing main() would result in the following being printed on the screen :

```
The address book is full.
Name: Alice, Phone: 555-1212
Name: Tommy, Phone: 867-5309
Pizza is not a name in the address book.
```

Complete the class AddressBook

Question 5

```
class AddressBook
{
// ATTRIBUTES: (3 marks)




// CONSTRUCTOR: (5 marks)
// Takes one integer parameter representing the
// maximum number of entries that can be put into
// the address book.
```

Question 5

```
// METHOD addFriend: (6 marks)
// Method parameters: a Friend object that should be added to
// the AddressBook.
// Results:  will print a message if the address book is full
// Modified:  the AddressBook object
```

Question 5

```
// METHOD print: (5 marks)
// Method parameters: (none)
// Returns: (none)
// This method prints a list of names and phone numbers in
// the address book.
```

Question 5

```
// METHOD changePhone (6 marks)
// Updates the phone number of the first Friend with the
// specified name
// Method parameters: a String which is the name of a Friend,
// and a String which is a new phone number for that Friend.
// Result: an error message if the friend is not in the book

// NOTE:  recall that two strings s1 and s2 can be checked
// for equality with s1.equals(s2)
```

Question 6 [10]

Write a **recursive** method that takes as a parameter a non-negative integer and generates the following pattern of stars.

You may use a loop to generate one line of stars, but **not** the entire pattern. If the non-negative integer is 4, then the pattern generated is:

```
****
***
**
*
*
**
***
****
```

The header of the method should be the following:

```
public static void stars(int n)
```