Question 1 [10 points, 2 points each]

The code given below is correct: it compiles without errors. I have added some extra spacing to make this question easier to answer.

Circle, and identify by number, one and only one example of each of the following items in the code below. If you believe no example exists, write “no example” next to that item in the list. To show you how I want the question answered, the first one is done for you.

1. access control modifier
2. expression
3. argument list
4. local variable declaration
5. reserved word
6. assignment statement

```java
package control;

public class Device {

    private component.Screen _viewer;

    public Device() {
        component.Image pic;
        pic = new component.Image();
        pic.refresh();
        _viewer = new component.Screen();
        _viewer.display( pic );
    }
}
```
Question 2 [9 points]

For each of the following questions, select the **BEST** answer from the available choices.

[1 POINT] Where in memory is a local variable stored?
   a) secondary storage
   b) heap
   c) static region
   d) runtime stack

[1 POINT] Where in memory is an object stored?
   a) secondary storage
   b) heap
   c) static region
   d) runtime stack

[1 POINT] Which of the following has the same value as \(101_2\)?
   a) \(3_{10}\)
   b) \(5_{10}\)
   c) \(11_{10}\)
   d) \(101_{10}\)

[2 POINTS] Which of the following properties of a variable is determined by a variable declaration?
   a) value
   b) type
   c) name
   d) a and b
   e) a and c
   f) b and c
   g) none of the above

[2 POINTS] Which of the following properties of a variable is determined by an assignment statement?
   a) value
   b) type
   c) name
   d) a and b
   e) a and c
   f) b and c
   g) none of the above

[1 POINT] What is the value of a ‘new’ expression, such as `new example1.Terrarium()`?
   a) a reference
   b) an instance
   c) a variable
   d) an object

[1 POINT] What elements must every variable declaration contain?
   a) name and value
   b) type and value
   c) type and name
   d) object and reference
   e) header and body
Question 3 [9 points]

The code sample given below is correct: it compiles without errors. Assume that the classes it references (e.g. Device, Screen) are defined; the definition of Device is given in Question 1.

Answer the questions below.

```java
package exam1;

public class Factory {
    public Factory() {
        control.Device x;
        x = new control.Device();
        component.Screen y;
        y = new component.Screen();
    }
}
```

a) How many variables are declared in the code shown above? [1 point]

For questions (b) through (e) assume that the expression `new exam1.Factory()` is evaluated. **Remember to consider the definition of control.Device given in question 1.** You may assume that the classes Screen and Image do not create any additional objects when instantiated.

b) How many exam1.Factory objects are created? [2 points]

c) How many control.Device objects are created? [2 points]

d) How many control.Screen objects are created? [2 points]

e) How many objects in total are created? [2 points]
Question 4 [9 points]

Write a variable declaration for a variable of type `exam1.Color`
Use your favorite color as the name of the variable, making sure to use only lowercase letters.
[3 points]

Assume now that the variable described above has been correctly declared. Assign to it a
reference to a newly created `exam1.Color` object.
[3 points]

Assume now that the variable described above has been correctly declared and has been assigned
a reference to a new `exam1.Color` object. Assume that there is a method named `mix`, taking no
arguments, defined for this object. Using the variable you declared, call the `mix` method on the
`exam1.Color` object whose reference is stored in it.
[3 points]
Question 5 [9 points]

Complete each of the following sentences. Choose the best answer for each sentence from the phrases given below. You may use each phrase at most once; not all phrases will be used.

• A class definition consists of a/the ________________ and a/the ________________.

• A variable declaration determines a/the ________________ and a name for a variable.

• When carrying out an assignment statement a/the ________________ on the right of the a/the ________________ operator is evaluated first, and the resulting value is stored in a/the ________________ on the left.

• A compiler translates a program from a/the ________________ level language to a/the ________________ level language.

• The ‘new’ operator allocates ________________ to hold the representation of an object.

PHRASES:

a) assignment  
j) class body
b) stack  
k) type
c) high  
l) low
d) expression  
m) memory
e) variable  
n) name
f) heap  
o) value
g) class header  
p) object
h) private  
q) class
i) access control modifier  
r) method
Question 6 [4 points]

As part of your lab work you read some information about the first programmers of the ENIAC. Who were the first programmers? You can but need not list their names, but describe them and their backgrounds. How well were their accomplishments recognized at the time? Explain.