EXAMINATION INSTRUCTIONS

This examination has 6 pages. Check that you have a complete paper.
Each candidate should be prepared to produce, upon request, his or her SUNY/UB card.
This examination has 5 questions. Answer all questions.
You have 60 minutes to complete this examination. Use your time accordingly.

READ AND OBSERVE THE FOLLOWING RULES:

- Names are pre-printed on the exam booklets. Ensure that you have YOUR exam.
- Sign, using your usual signature, in the space provided on the back cover.
- All of your writing must be handed in. This booklet must not be torn or mutilated in any way, and must not be taken from the examination room.
- Show all of your work in arriving at an answer, unless instructed otherwise. Partial credit will be awarded as appropriate.
- Candidates are not permitted to ask questions of the invigilators, except in cases of supposed errors or ambiguities in examination questions.
- CAUTION – Candidates guilty of any of the following, or similar, dishonest practices shall be immediately dismissed from the examination and shall be liable to disciplinary action.
  - Making use of any books, papers or memoranda, calculators or computers, audio or visual cassette players, or other memory aid devices, other than those explicitly authorised by the examiners.
  - Speaking or communicating with other candidates.
  - Purposely exposing written papers to the view of other candidates. The plea of accident or forgetfulness shall not be received.

---------- DO NOT WRITE BELOW THIS LINE! ----------

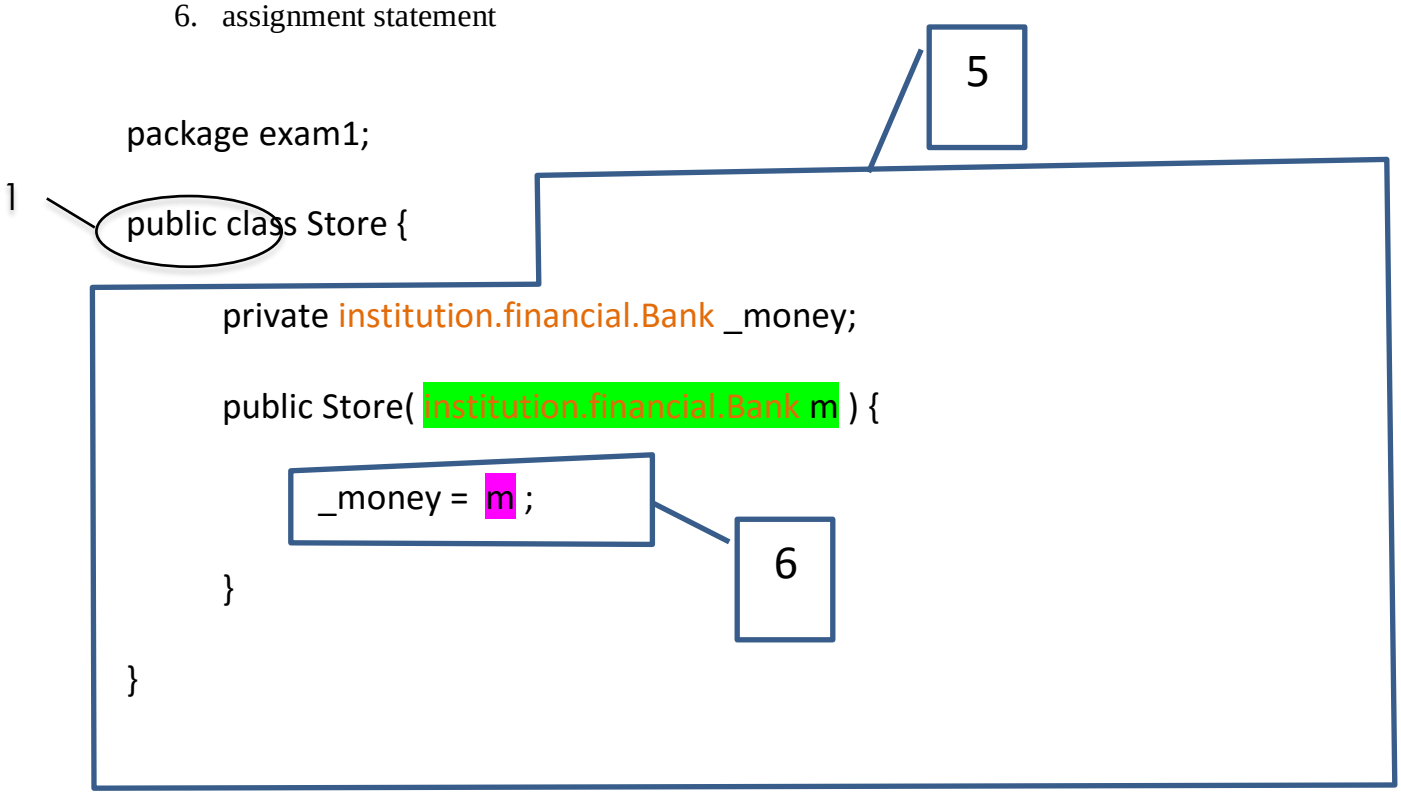
Q1	Q2	Q3	Q4	Q5	TOTAL	**%**
/10	/10	/10	/10	/10	/50	**/100**

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. fully qualified name
3. parameter declaration
4. expression
5. scope of instance variable declaration
6. assignment statement



Question 2 [10 points, 2 points each]

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

[2 POINTS] From which area of memory does 'new' allocate space?
a) secondary storage
b) heap
c) static region
d) runtime stack

[2 POINTS] What is the value of a 'new' expression, such as
new example1.BarnYard() ?
a) a reference
b) an instance
c) a variable
d) an object

[2 POINTS] Where in memory are local variables stored?
a) secondary storage
b) heap
c) static region
d) runtime stack

[2 POINTS] Which answer best explains the effect of carrying out the assignment x = y where x and y are both variables of type example1.Pig?
a) x and y hold references to the same example1.Pig object
b) x and y hold references to different example1.Pig objects
c) x and y are the same example1.Pig object
d) x holds a reference to y, and y holds a reference to an example1.Pig object

[2 POINTS] Where in memory are method invocation records stored?
a) secondary storage
b) heap
c) static region
d) runtime stack

Question 3 [10 points, 2 points each]

The code sample given below is correct: it compiles without errors.

```
package exam1;
public class Zoo {
        public Zoo() {
                Habitat jungle;
                jungle = new Habitat();
                Tiger tigger;
                tigger = new Tiger();
                Lion nala;
                nala = new Lion();
                jungle.addTiger(new Tiger());
                jungle.addTiger(tigger);
        }
}
```

ANSWER THE QUESTIONS BELOW:

a) How many variables are declared in the code shown above? [2 points]

Two variables are declared. Explanation: "Habitat jungle;" is one variable declaration "Tiger tigger;" is the second.

For questions **(b) through (e)** **assume that the class exam1.Zoo is instantiated once.**

b) How many Habitat objects are created? [2 points]

Just one: there is only one "new Habitat()" expression.

c) How many Tiger objects are created? [2 points]

Two, since there are two "new Tiger()" expressions.

d) How many Lion objects are created? [2 points]

Just one: there is only one "new Lion()" expression.

e) How many Zoo objects are created? [2 points]

Just one: see here

Question 4 [10 points – 10 points perfect, 7 points essentially correct but with small mistakes, 3 points clearly wrong but with some correct elements, 0 points for anything else]

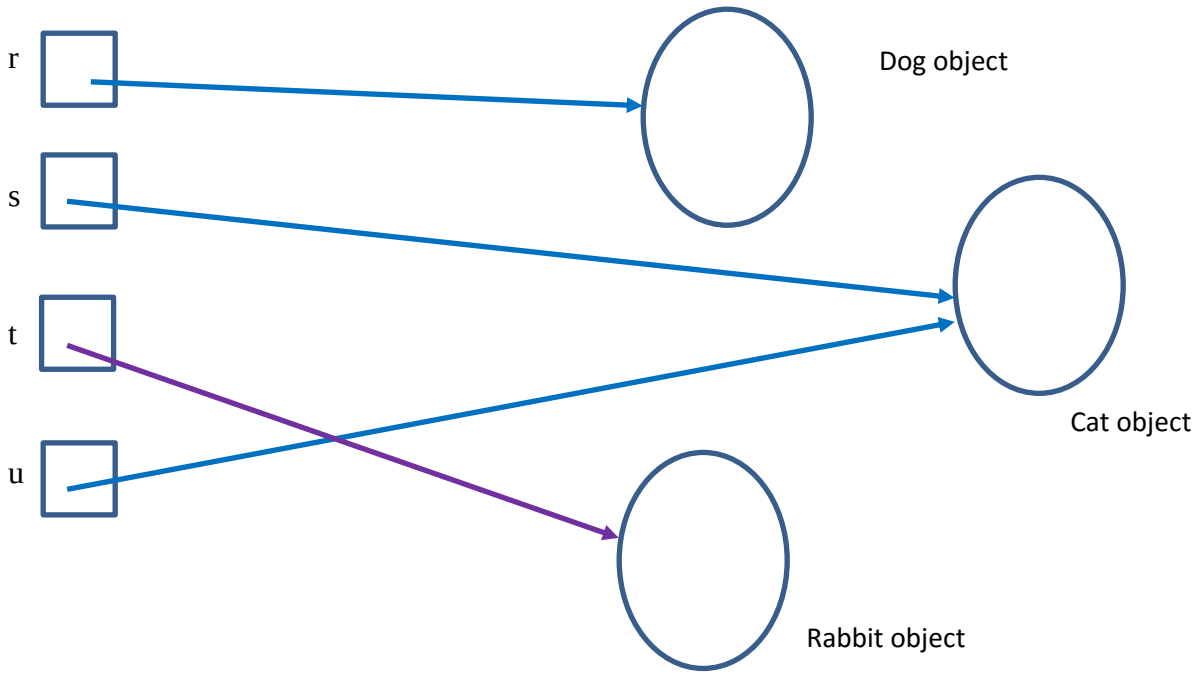
Draw an object diagram which corresponds to the following memory diagram.

234	
235	18952
236	18956
237	
238	18959
239	18956
240	
241	

18952	
18953	
18954	
18955	
18956	
18957	
18958	
18959	

Assume that the variable r has location 235, s has location 236, t has location 238 and u has location 239. Also assume that r is of type Dog, s is of type Cat, t is of type Rabbit and u is of type Cat.

Draw an object diagram which corresponds to the memory diagram.



Question 5 [10 points – 10 points perfect, 7 points essentially correct but with small mistakes, 3 points clearly wrong but with some correct elements, 0 points for anything else]

In this question you must define a class. The class must be in a package whose name matches your last name. The class itself must be the same as your first name. Define two instance variables in this class, one of type State and one of type County. Assume that constructors State() and County() are defined for these classes. You may name the instance variables however you wish, as long as you follow the naming rules and conventions that we have been using in class. Make sure that each instance variable is initialized to a new instance.

Write your code below:

```
package alphonce;

public class Carl {

        private State _s;

        private County _c;

        public Carl() {

                _s = new State();

                _c = new County();

        }

}
```

Commentary:

The names of the two instance variables do not have to be as shown here – they just have to follow the naming conventions we discussed in class.

Notice that the class has a constructor (whose name is the same as that of the class). It is the role of the constructor to initialize the instance variables of the class. Hence, we find two assignment statements in the body of the constructor, once for each instance variable.

In order to correctly initialize each instance variable we need to know how to instantiate the two classes State and County. In the statement of the question we are told "Assume that constructors State() and County() are defined". This is used in the class instantiation expressions on the right of the assignment operator '=' in each assignment statement. For example,

_c = new County();