Answer all questions in the space provided. Write clearly and legibly, you will not get credit for illegible or incomprehensible answers. This is a closed book exam. You are allowed one page of hand written notes – This is one side of one sheet of letter sized paper. No other aids are allowed. Print your name at the top of every page.

Please indicate what team you were on: ____________________________

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Java Basics [25 points]

a) List the five Java reserved words that are directly related to exceptions. Also list five keywords that have no direct impact on the control flow of a program (excluding the primitive data types). [2 points]

b) What are the 8 primitive data types in Java, and how much memory does one variable of each type consume? [2 points]

c) How do you declare an array of 200 Integer objects, and initialize all of them to contain the value $-1$? [2 points]

d) Please list 4 packages in the Java inheritance hierarchy, and the name of one class contained in that package. [2 points]

e) What does the abbreviation API stand for (as in Java API)? [2 points]
f) There are four types of loops in Java, please show a very simple example of how to use three of them below. Please indicate the loop name. Use extra space on back if necessary. [3 points]

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g) What is the point of using a private helper method to solve a problem? [3 points]

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h) It is possible to declare a main method in every single class of a project. What would be the point with this? [3 points]

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i) Name one method in the Collections class, and explain what it does. [3 points]

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j) What’s the "real" difference between something static and something non-static? [3 points]

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2. Object Oriented Programming Specifics [25 points]

a) Specifying an interface can be extremely useful in defining some common functionality for several classes. How is this different from having these same classes extend a common superclass? [5 points]

b) What does the following code print out when run. Please briefly explain why! [5 points]

```java
public class TestClass extends SuperClass {
    public TestClass () {
        System.out.println ( "Sub" );
    }
    public TestClass ( int num ) {
        System.out.println ( "Version" );
    }
    public static void main ( String[] args ) {
        TestClass tc = new TestClass(10);
        System.out.println ( tc.myNum );
    }
}

class SuperClass {
    protected int myNum = 0;
    public SuperClass () {
        System.out.println ( "Super" );
    }
    public SuperClass ( int num ) {
        System.out.println ( "Duper" );
        myNum = num;
    }
}
```
e) Java defines four access levels for members of a class. They are **public**, **private**, **protected**, and the default level which is used if no access level specifier is used. In the code example from question b), the **protected** level was used for the instance variable `myNum`. If I change it to **private** the program does not compile. Please explain why, and how to fix the problem, if you are required to keep the variable **private**. [5 points]

d) Inheritance is really the "key" to Object Oriented Programming. I’m hoping that you’ve seen enough of this in CS251 to realize that. So then, what is method **overriding**? Why is method **overriding** such an important concept in OOP? How is it different from **overloading**? [5 points]

e) Write a minimal example where we can see the effects of polymorphism and late binding in effect when compiling and executing a program. Indicate where each concept occurs in your example.[5 points]

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Q: How many object oriented programmers does it take to change a light bulb?
A: None: The light bulb will change itself!  

*Unknown*
a) Write code to create a JButton that exits the program completely when pressed. Only create the button, you do not have to add it to a layout, and show a window. Use an anonymous class for the action listener.

b) The default layout for a JPanel is FlowLayout. How does Java lay out components added to such a layout?

c) Why were generic classes added to Java 1.5, and how do you recognize them in the API. Show a one-line example of how to instantiate an object of some generic class.
d) We wrote some fairly simple multi-threaded programs as an introduction to our projects. What steps are necessary to create a new thread, and make it execute? [5 points]

e) What is the difference between a checked and an unchecked exception? [5 points]

Why Java use references and hash codes instead of pointers.
Please note that these questions are real exam points, and I am very interested in your answers to these questions – So please! Don’t just skim over them and write sloppy answers – Because I will take points off if you don’t seem serious about your answers.

a) What did you think about the project and team selection process? Specifically, what was good about it, and what did you not like about it? How could it be improved for next semester if we were to do something similar? [2 points]

b) What are the names of your team mates ~ Both first and last names please! If you worked alone, what was your reason for choosing to do so? [3 points]

c) What were the individual responsibilities of the members of your team? Who was assigned to what task, and how well did they follow through on their part? If alone, did you feel that you could have taken on a bigger project if you didn’t work alone? [3 points]
d) How often did your group meet during the project (can include online or telephone as well)? Was there enough full-group time scheduled throughout the project. If you worked alone, how often did you sit down and make plans for the project and did you interact with anyone about ideas for how to go forward? [2 points]

e) What did you think about the use of an Subversion repository (except for the hick ups in the beginning that I’m already aware of)? And... what did you think about the ability of the instructor to have access to your repository? [5 points]

f) Roughly how many revisions of your project was checked in to the repository? How many of those commits were done by you? How many were made by your team-mates respectively? [2 points]
g) Please briefly elaborate on one technical detail about the project that you feel that you made a significant contribution to. [5 points]

h) Please elaborate a little on the dynamics within your team. Did you feel that the workload was evenly distributed? Did you feel that you were an integral part of the team? Did you learn anything from being on this team. If you didn’t work on a team, what experiences of being on a project by yourself, do you think could have been improved by being on a project team. Overall, for all of you, if you could redo the project, what would you have done differently? [3 points]

Java is to JavaScript as ham is to hamster. – Jeremy Keith
Extra Credit

Please draw a generic sketch of a generic class. Make us laugh and receive extra credit!