COSC 1047 EL01/02 FINAL EXAM
INTRODUCTION TO COMPUTER SCIENCE II

Tuesday, April 22/2003, 7:00 pm (19:00 hr)

Time Allowed: 3 hours

Instructor: Barry G. Adams

Name (please print) 

Student # 

1. Answer ALL questions. Write your answers on this questionnaire.
2. Use back of exam pages for rough work if necessary.
3. Do not write comments in your programs.
4. Number of Questions: 6
5. Total Marks: 60
Question 1 (10 marks)

Write a complete class called `Worker` that encapsulates two private data fields: `name` of type `String` and `year` of type `int`, for the year of birth of the worker. Include the following constructors and methods:

1. a constructor for a `Worker` object with a given name and year of birth,
2. a `getName` method to return the name,
3. a `getYear` method to return the year of birth, and
4. a `toString` method.

Do not write any comments in your program.

**Answer:**
Question 2 (10 marks)

(a) Write two subclasses, *OfficeWorker* and *ConstructionWorker*, each extending the *Worker* class from Question 1. An office worker object has a fixed monthly salary, and a construction worker object has a monthly salary determined as the number of hours worked times an hourly rate. For each of these subclasses provide (1) a constructor, (2) an inquiry method (get method) for the new salary data field, (3) a *toString* method.

Answer:
(b) Define a `Worker` array of size four. Create two office worker objects and two construction worker objects and store them in the array. Print in a loop the details of each object using the `toString` method.

Also calculate in this loop the average birth year and the average monthly salary of all four people and display them. (Note that the data fields of the `Worker` superclass are private).

**Answer:**
Question 3 (10 marks)

Given a Point class having the structure

```java
public class Point {
    private double x, y;
    // constructor for point (0,0)
    public Point() {...}
    // constructor for point (x,y)
    public Point(double x, double y) {...}
    // return string representation of this point
    public String toString() {...}
    // return true if this point has same coordinates as p
    public boolean isEqual(Point p) {...}
    // return x coordinate of this point
    public double getX() {...}
    // return y coordinate of this point
    public double getY() {...}
}
```

write a Circle class using as data fields a Point object for the center and a double number for the radius. The class should have the following constructors and methods:
(1) A default constructor for center (0,0) and radius 1,
(2) a constructor for a circle given the coordinates x, y of the center and radius r,
(3) a constructor for a circle given the center as a Point object and the radius r,
(4) an isEqual instance method to determine if two circles are equal (same center and radius),
(5) getCenter and getRadius instance methods to return the center and radius of a circle,
(6) and a toString method that returns a string representation of a circle.

Do not write any comments in your program.

Answer:
Answer to question 3 continued
Question 4 (10 marks)

Write a GUI application called `CurrencyConverter` that looks as follows:

![Currency Converter GUI](image)

The input field contains an amount in Canadian dollars (CDN). Each of the four buttons converts this amount to the currency shown on the button and displays it in the output field. The conversion factors are (1 dollar CDN = 0.638176 USD (US dollars), 1 dollar CDN = 0.771643 Euros, 1 dollar CDN = 78.2069 Yen, and 1 dollar CDN = 4.71399 Francs). Do not write any import statements.

**Answer:**
Answer to question 4 continued
Question 5 (10 marks)

Write a complete program that takes three arguments from the command line: the name of an input text file, the name of an output text file, and a string representing a search pattern. The program reads each line of the input file using a BufferedReader and writes to the output file, using a PrintWriter, only those lines that contain the search pattern. The files can be opened using statements such as

```java
BufferedReader in = new BufferedReader(new FileReader(inFileName));
PrintWriter out = new PrintWriter(new BufferedWriter(new FileWriter(outFileName)));
```

and a string str can be searched for a pattern p using `str.indexOf(p)` which returns a non-negative index if the pattern is found.

You do not need to write the import statements or include any comments.

**Answer:**
Question 6 (10 marks)

The selection sort algorithm for an integer array is given by

```java
public void sort(int[] a, int start, int end) {
    for (int i = start; i < end; i++) {
        int k = i;
        for (int j = i + 1; j <= end; j++) {
            if (a[j] < a[k])
                k = j;
        }
        int temp = a[k];
        a[k] = a[i];
        a[i] = temp;
    }
}
```

Write a version of this algorithm that sorts an array of `BankAccount` objects in alphabetical order by owner name (use the `compareTo` method).