CS₋161 Introduction to Computing - January 2006

Question 1.

(a.) Name several techniques (at least 7) for good programming practice that enhance the readability and structure of programs.

[7 marks]

(b.) Write a method that takes as parameters an hour (between 0 and 23) and minutes (between 0 and 59) and returns how many minutes are left until the end of the day.

[6 marks]

(c.) Determine whether the following statements are true or false. Justify your answers and give corrections in case the statement is false.

   i) All classes have a common super class.

   ii) The static and dynamic type of a variable must always be the same.

   iii) A method which has been overridden can not be accessed anymore.

[6 marks]

(d.) A writer wants to know how often he is using a certain word in his new novel. Design a method `countWord` that allows to count occurrences of a given word in a given array. [You may assume that the text is stored in an array. Your method should take the word and the array as parameters.]

[6 marks]

Question 2.

(a.) Name the main components of a computer and briefly describe what each component does.

[6 marks]

(b.) In the following we want to model a bank account.

Write a class `BankAccount` that has the three fields, `name`, `accountNumber` and `balance`. Add a constructor that takes as parameters a name and an account number and creates a new (empty) account. Finally add a method `payIn` that allows to add a positive amount to the balance.

[7 marks]

(c.) Explain the difference between

   i) an accessor method and a mutator method,

  ii) the keywords `private, protected, public`.

 iii) the static type and the dynamic type of a variable.

[6 marks]

(d.) This question is about making the decimal notation of integers more readable by inserting commas at appropriate intervals .

To this end, design a solution (either a method or a whole program - as you prefer) that takes an integer as input, and prints the integer with commas inserted where appropriate (i.e. at intervals of a thousand.)

Example: the output for 4611472 will be 4,611,472.

[6 marks]

Question 3.

(a.)   i) Name three possibilities for Java programs to receive input from the user.

     ii) Briefly explain how data (e.g. a character or an integer) is stored on a computer. How is data represented in Java? What are the consequences of this (with respect to input)?

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[7 marks]

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(b.) What is the value of the following boolean expressions?

   i) `(true || false) && true`

   ii) `!(1 != 0)`

  iii) `20 % 6 == 17 % 5`

  iv) In Java, there also exists a class called `Boolean`. Explain the difference between `Boolean` and `boolean`.

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[6 marks]

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(c.) Explain the concepts *inheritance* and *encapsulation*.

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[6 marks]

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(d.) Which function is computed by the following method?

```
public int f(int n){
   if  (n==0)
     return 0;
   else
     return f(n-1) + n;
}
```

Which kind of programming concept is used? What is `f(10)`?

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[6 marks]

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