Open book and open notes. No calculators, no computer. Write all answers on these sheets. Do not ask questions!

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<thead>
<tr>
<th>question</th>
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1. Consider the modular structure of a program to compose music for a band consisting of guitar, drum, and piano. Each instrument comes with \texttt{in} and \texttt{out} functions. The \texttt{in} function takes instructions and simulates the sound of the instrument. The \texttt{out} function prints instructions for the musician to play the composition.

We can design the program in two ways:

(a) There are two modules: \texttt{input} and \texttt{output}. The \texttt{input} module collects all \texttt{in} functions of the instrument. All \texttt{out} functions are contained in the module \texttt{output}.

(b) There is a module for each instrument. Each module contains the specific \texttt{in} and \texttt{out} functions for the instrument.

Which design would be best? Justify using the principles of good modular design.
2. Several procedures in the computer algebra software system Maple are visible to the user, but the license explicitly forbids to modify or distribute the code. Does this license conform to GNU GPL? Justify your answer.

3. An algorithm to process $n$ Gigabytes of data has cost $O(n^2)$. Suppose processing one Gigabyte takes 15 minutes. What is the largest number of Gigabytes that the algorithm can process within an hour? Justify your answer.

4. Give Python code to define the following function:

   ```python
   def GetValue():
       """
       Asks the user for an integer number. As long as the user input cannot be converted into an int, an error message is printed and the user is invited to try again. The function returns the int given by the user.
       """
   ```
5. Write a program that prompts the user for the name of a Python script.
   The program counts all assignments and appends the lefthand side of each assignment to a list. After reading the entire script, the program writes the number of assignments and the list of all variables that occurred at the left of an assignment.

   The length of the list must equal the number of assignments, mind assignments to tuples, e.g.: \((a, b) = (0, 1)\). You may assume the script has at most one statement per line, but do not make any assumptions about spaces or tabs.
6. Draw the class diagram to represent a bank account. The name of the account is public, whereas the balance is protected by a password. Do not give Python code but explain how in Python certain object data attributes can be hidden.

7. The RGB code of a color is a triplet of numbers between zero and one. Red is encoded as \((1.0, 0.0, 0.0)\), Green as \((0.0, 1.0, 0.0)\), and Blue as \((0.0, 0.0, 1.0)\). Draw the design of a GUI to display colors corresponding to any RGB code \((r, g, b)\). Label each component of the GUI with the proper name of the widget. Do not give any Python code.