Programming Assignment (20 marks)

You will use object-oriented principles, design class(es) and implement them as a Java program. Specifically, you will create *a Java program* based on the following requirements.

We frequently use time information in our daily life. A time is displayed with hours, minutes and seconds.

Q1: Define the class for time and other needed classes, with attributes, accessor/mutator methods and constructors (don't consider following questions at this moment). (2 marks)

Q2: Generate a time with keyboard input. Reminder: what if you input with 25 for hours? (1 mark)

Q3: Generate a **random** time in the form of hours:minutes:seconds. (1 mark)

Q4: Generate two **random** times, in the form of hours:minutes:seconds, and add them together, to produce a time in the form of hours:minutes:seconds. (3 marks)

Q5: Generate **multiple random** times, in the form of hours:minutes:seconds, and add them together, to produce a time in the form of hours:minutes:seconds. (4 marks)

Q6: Using keyboard to iteratively input a limited number of values for total seconds (e.g., 3 iterations, 54000 seconds, 30080 seconds, 79950 seconds), then convert them to the form of hours:minutes:seconds, respectively. Reminder: it's optional to specify a range for the total seconds, e.g., [3000, 100000). (4 marks)

Q7: The above should form a single Java program, compile the program and run it with testing your implementation for Q2-Q6. Explain steps briefly to run your .java program. (5 marks)

Notes:

1. The above requirements form a single Java program, with a single main(), and multiple .java files.

2. A time should be valid in terms of hours:minutes:seconds in the real world.

2. respond to questions one by one in a .doc or .pdf file.

3. zip all files including .doc or .pdf file, the .java file(s), and the screenshot(s) of your program running for submission. Your program should be ready to run with the provided .java files.

4. Using concepts in Java like inheritance, arrays, scanner class, control flow, constructor, overloaded methods/constructors etc will be considered to give higher marks.

Marking rubric:

It should be noted that the above Note 4 will be considered for Q1-Q6 marking implicitly. For example, assume Q2 needs a for loop, and students with the loop code will be considered to give relatively higher marks.

Q1: 2 marks

Is the class(es) name appropriate?	0.5 mark
Does the class(es) involve suitable attributes?	0.5 mark
Does the class(es) involve suitable constructors?	0.5 mark
Does the class(es) involve basic accessor and mutator methods?	0.5 mark

Q2: 1 mark

Has the student attempted to provide a code section to this question?	0.5 mark
Is the provided code section successfully addressing this question and successful in running (see Q7)?	0.5 mark

Q3: 1 mark

Has the student attempted to provide a code section to this question?	0.5 mark
Is the provided code section successfully addressing this question and successful in running (see Q7)?	0.5 mark

Q4: 3 marks

Has the student attempted to provide a code section to this question? 0.5 mark

Can the code generate two random times? 0.5 mark

Is the provided code section successfully addressing this question and successful in running (see Q7)? 2 marks

Q5: 4 marks

Has the student attempted to provide a code section to this question? 0.5 mark

Can the code generate multiple random times? 0.5 mark

Can the code add these multiple times together? 1 mark

Is the provided code section successfully addressing this question and successful in running (see Q7)? 2 marks

Q6: 4 marks

Has the student attempted to provide a code section to this question? 0.5 mark

Can the code iteratively read several numbers for total seconds? 0.5 mark

Can the code convert these total seconds into valid hours:minutes:seconds? 1 mark

Is the provided code section successfully addressing this question and successful in running (see Q7)? 2 marks

Q7: 5 marks

Is the student's code to Q2 successfully tested? 1 mark

Is the student's code to Q3 successfully tested? 1 mark

Is the student's code to Q4 successfully tested? 1 mark

Is the student's code to Q5 successfully tested? 1 mark

Is the student's code to Q6 successfully tested? 1 mark