COMP3520 Operating Systems Internals
Programming Exercise 2
Oral Examination

General Instructions

In this exercise, you will write a *pthreads* program that uses mutexes and condition variables only to solve a simple synchronization problem involving a teacher and some students.

Please bear in mind that this exercise is intended to introduce the concepts that you will need in order to complete COMP3520 Assignment 1.

This exercise will **not** be marked; assessment for COMP3520 Assignment 1 will be based only on your final source code and discussion document.

The Problem

Students are to take an oral examination. There are N students in a class, each being given a distinctive student id which is a natural number ranged from 1 to N. The teacher will call the students one at a time to enter the office for the oral exam. The exam may take no more than t, but at least $t/2$ units of time. (In your program a unit of time is assumed to be a second.) After finishing the exam, the current student will leave the office immediately, and the teacher then calls for another student to enter the office. The students are called in the natural order of their student ids.

In the *main()* function, the program asks the user to supply the following parameters:

- n – the total amount of students
- t – the time limit for the oral examination

Your *teacher_routine()* needs to print the following status messages wherever appropriate:

- "Teacher: student id [*id*] for next student." – when the teacher is to give an id to a student
- "Teacher: The office is now available. Student [*id*] can enter." – when the teacher is to call a student to enter the office for the oral examination
- "Teacher: "Student [*id*] took [*t*] units to complete the exam." – when the student has finished the oral exam.

Your *student_routine()* needs to print the following status messages wherever appropriate:

- "Student: My student id is [*id*]." – when a student is obtained a student id.
- "Student [*id*]: My id is called by the teacher and I will enter the office now." – when a student is called to enter the office.
- "Student [*id*]: I have completed the exam and leave the room now" – when the student has completed the exam and leave the office.

When every student has been assigned a student id, the main default thread must print the following status message and then terminate:

- "Main thread: All students have done their oral examinations. The simulation will end now."