Name: _____

◆ Multithread-based codes often speed up the performance of processing. Try to conduct an experiment to experience the **features** and **skill** of coding multithreads. The example shows a "matrix multiplication" as follows, please code it by two different types of programming skill in moder programming language (e.g. C, Python).

$$C_{50\times50} = A_{50\times80} \times B_{80\times50}$$

$$[a_{ij}] = 6.5i - 1.8j \;,\; [b_{ij}] = 30 - 12.1j + 5.5i$$

$$\begin{bmatrix} a_{1,1} & a_{1,2} & \cdots & a_{1,n} \\ a_{2,1} & a_{2,2} & \cdots & a_{2,n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m,1} & a_{m,2} & \cdots & a_{m,n} \end{bmatrix} \begin{bmatrix} b_{1,1} & b_{1,2} & \cdots & b_{1,j} \\ b_{2,1} & b_{2,2} & \cdots & b_{2,j} \\ \vdots & \vdots & \ddots & \vdots \\ b_{n,1} & b_{n,2} & \cdots & b_{n,j} \end{bmatrix} = \begin{bmatrix} \sum_{k=1}^{n} a_{1,k}b_{k,1} & \sum_{k=1}^{n} a_{1,k}b_{k,2} & \cdots & \sum_{k=1}^{n} a_{1,k}b_{k,j} \\ \sum_{k=1}^{n} a_{2,k}b_{k,1} & \sum_{k=1}^{n} a_{2,k}b_{k,2} & \cdots & \sum_{k=1}^{n} a_{2,k}b_{k,j} \\ \vdots & \vdots & \ddots & \vdots \\ \sum_{k=1}^{n} a_{m,k}b_{k,1} & \sum_{k=1}^{n} a_{m,k}b_{k,2} & \cdots & \sum_{k=1}^{n} a_{m,k}b_{k,j} \end{bmatrix}$$

◆ In the ***first*** program, you just code it following the *traditional* skill, ***for-looping***.

◆ In the ***second*** program, you need trying to code it by using the new skill, ***multithreading***.

Q1: Point out the *major parts* coded in the *threaded* program to highlight its differences with *for-loops*.

Q2: Record your *experimental results* at least *3 rounds* execution in the below table, and state how you can count the running time of programs in *ms*.

Q3: State your *discovering* and *comments* on this exercise of coding *threaded* programs.

Coding Skill	No. of threads	Execution Time (ms)			Average 3 Execution Time
		1-round	2-round	3-round	
【A】 *For-loops*	**1** (50*50/thread)				
【B1】 *Multithread*	**50** (1*50/thread)				
【B2】 *Multithread*	**10** (10*25/thread)				
Differences 【B1 – A】	**49**				
Differences 【B2 – A】	**9**				

* State your comments on this homework, and note that you must take some pictures on the running screen of LCD, and appendix your two *source codes* in your report.

Due date: **Nov. 18**, 2024.