Homework 1

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1.

Concurrency is when multiple tasks can start start and make progress in overlapping time periods but not necessarily in the same time.

Parallelism is when multiple tasks run at the same time, taking advantage of multiple cores.

If an OS has one core, a scheduler will execute the three programs by blocking and resuming them while making overall progress.

If an OS has three cores and running three programs in parallel, then progress in these three programs will happen simultaneously.

Running parallel programs on one core is not possible with just one core.

2.

The BSP model often has large overhead when it comes to synchronization (computations). However, the LogP model doesn't take into account communication time. Since our application has low computation but a high amount of communication, its better to use a BSP model in my opinion.

3.

seq = 37%

para = 63%

a) 1

b) 1.46

c) 1.9

d) 2.23

e) 2.37

f) 2.44

g) approaches 2.7

4.

Hazards are problems that arise which make it so the CPU cannot execute the next instruction until the next CPU cycle, reducing the IPC.

Data hazards are when instructions modify the same data in different stages of pipelining. The IPC is reduced in order to prevent race conditions.

Structural hazards are when a part of a processor's hardware is needed by multiple instructions.

Control hazards are when pipelining of other branches change the PC.

5.

```
class Class
        public:
                Class(init arguments…)
                datatype property
                datatype memberFunction() returns something that has to do with the class' variables.
        private:
                …. classes should contain private variables, else use struct.
struct Struct
        string name;
```