Computer Science 133, Homework 1

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Problem 1

My phone has 4 cores, and the processor is a Qualcomm Snapdragon 820 MSM8996. My computer has 4 cores, and the processor is an Intel Core i7-4700MQ CPU @ 2.40GHz.

Problem 2

Dennard Scaling refers to the phenomenon of the power density of a processor staying constant as transistor size decreases. So smaller transistors would consume the same amount of power on a chip of a given size. This was partially due to voltage levels across the transistors decreasing. It broke down because current leakage would occur as the voltage became smaller, so voltage could no longer scale. As a side effect, processor frequencies could not be increased without increasing power consumption by too much.

Problem 3

System	Efficiency (Rmax/Power)
Summit	14.6683
Sierra	12.72385
Sunway TaihuLight	6.051304
Tianhe-2A	3.324559
Piz Daint	8.905201
Trinity	2.660161
AI Bridging Cloud Infrastructure	12.05579
SuperMUC-NG	N/A
Titan	2.14277
Sequoia	2.176578

The top 3 most power efficient computers are Summit, Sierra, and AI Bridging Cloud Infrastructure.

Problem 4

An example of a application in which we don't know the number of tasks ahead of time is an event queue. In an event queue, we must wait for tasks to come in during the lifetime of the event queue.

Problem 5

We can write the code as follows.

```
i=1;
r=d[0];
for (i=0; i<=SIZE; i++) {
  r*=v[i];
}
```

Then each loop iteration only needs to load then multiply. There is no data dependency, and this loop produces the same result as the original while reducing the initiation interval to 1.