CSCI 447 Homework 1

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1. The three choices that best specify the main functional roles of an OS are
    - Allocate Resources
    - Control and Supervise the execution of multiple processes
    - Act as an intermediate between the user and hardware
2. One example of when an OS might want to *permit the CPU to be idle* even when some processes are in need of compute resources are when the device that the OS is running on has a limited battery, and thus the CPU is idle to conserve power.
3. The following instructions should be run in kernel mode.
    - Clear Memory
    - Modify the entries in a device-status table
    - Turn off interrupts
    - Switch from user to kernel mode
4. While such a computer could potentially be powerful, having a computer that is only cache would disallow it to have persistent storage. As a result, the computer would need to be repeatedly programmed every time it shut down.
5. Much like how `sudo` is limited to those with the proper permissions, and by default is not enabled, restricting access to processes, memory, and other sensitive / private data to the kernel requires applications go through the OS or use system calls. This allows for moderating, auditing, and authorized access of these kernel-level actions.
6. Interrupts inform the OS that a device requires attention. Traps are a type of interrupt that are triggered by software. System calls are a type of trap that are used to request services from the OS.
7. Ideally DMA should have no effect on the CPU's operation, as it uses a separate bus to communicate with memory. In the instances where both the DMA and CPU are trying to access the same memory (level?), there may be overhead to ensure that the CPU and DMA do not interfere with each other.
8. Some challenges that arise when developing an OS for a mobile device are:
    - Balancing power consumption with performance
    - Privacy and Security in addition to compatability
    - Supporting many different applications and support for background tasks