

### 1.1

average interrupts per second = (200 words / minute)(1 minute / 60 seconds)(7 letters / word)(1 interrupt / letter) = 70/3 interrupts/second  $\approx$  23 interrupts / second

### 1.2

Since (23 interrupts / second)(1 microsecond / interrupt) = 23 microseconds / second, the computer should use interrupts. If the computer uses interrupts to handle fast typing, the computer spends 23 microseconds per second for interrupts. However, if the computer uses polling to handle fast typing, on the worst case the human might type a letter immediately after the operating system checks the device, then the human must wait 200 milliseconds for the letter to appear on the screen, 200 milliseconds > 100 milliseconds, so annoyance can be caused.

## 2.

To specify the location of a file on disk, a physical address and the length might not be enough, because the computer might not have a contiguous chunk of available space on disk during file allocation. Using metadata and indirect pointers might solve the problem.

### 3.1

Direct pointers: (8 blocks)(1024 bytes / block) =  $(2^3)(2^{\{10\}})$ bytes =  $2^{\{13\}}$ bytes

Indirect pointer: (1 indirect pointer)(1024 pointers / indirect pointer)(1 block / pointer)(1024 bytes / block) =  $(2^{\{10\}})(2^{\{10\}})$ bytes =  $2^{\{20\}}$ bytes

Max file size =  $2^{\{13\}} + 2^{\{20\}}$  bytes

### 3.2

The entire disk can be 1 directory, which has  $2^{\{16\}}$  inodes, each inode represent a file, so the maximum number of files in a directory is  $2^{\{16\}}$ .