

Tutorial 6

1. Modern computers are *digital* computers. What does that mean, and how do these compare with analog computers (what's an analog computer? See https://en.wikipedia.org/wiki/Analog_computer for some background information)? Why have digital computers become much more commonplace than analog computers?
2. What might the binary string 01100110 01101011 represent?
3. Discuss the advantages and disadvantages of using flash memory (sometimes known as solid state drives) rather than hard disc memory for secondary storage. Which sorts of devices use which type of storage, and why?
4. How many bits are needed to store a variable which represents something that might have 250000 different values? How many bits would be likely to be used if the code was programmed in a high level language? Why are these different from each other?
5. A CPU can operate at 2,000,000,000 instructions/second. Each instruction is 4 bytes long. On average, 25% of the instructions need to read data (again, 4 bytes) from the memory, and, on average 10% of instructions need to write data to memory (again 4 bytes). Calculate the amount of data per second that needs to be transferred from the memory to the CPU, and from the CPU to the memory to keep the processor running at full speed.
6. In general, it is not possible to achieve this data rate using a large (say 16 GByte) main memory. It is however, possible to achieve it using a smaller cache memory. Why does cache memory help?
7. Processors are often described as running at a certain number of Gigahertz (GHz). What does this mean? If I have a 2.8 GHz processor, will it actually run this many instructions/second? What factors affect the number of instructions/second that it can run?
8. The machine I am writing this on is a dual processor quad core machine. What does that mean?