**Review questions chapter 4**

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| **1. What are the differences among sequential access, direct access, and random access?**  **Sequential access:** Memory is organized into units of data, called records. Access must be made in a specific linear sequence.  **Direct access:** Individual blocks or records have a unique address based on physical location. Access is accomplished by direct access to reach a general vicinity plus sequential searching, counting, or waiting to reach the final location.  **Random access:** Each addressable location in memory has a unique, physically wired-in addressing mechanism. The time to access a given location is independent of the sequence of prior accesses and is constant.  **2. What is the general relationship among access time, memory cost, and capacity?**  Faster access time, greater cost per bit; greater capacity, smaller cost per bit; greater capacity, slower access time.  **3. How does the principle of locality relate to the use of multiple memory levels?**  Slower and less expensive memory is used in higher stages, with the most expensive being the registers in the processor as well as cache. Main memory is slower and less expensive, and is outside of the processor.  **4. What are the differences among direct mapping, associative mapping, and set-associative mapping?**  Direct mapping maps each block of main memory into only one possible cache line. Associative mapping permits each main memory block to be loaded into any line of the cache. The set-associative mapping combines both methods while decreasing disadvantages. The cache consists of a number of sets, each of which consists of a number of line.  **5. For a direct-mapped cache, a main memory address is viewed as consisting of three fields.  List and define the three fields.**  The fields would be i, j, and m. I is the cache line number, j is the main memory block number, and m is the number of lines in the cache.  **6. For an associative cache, a main memory address is viewed as consisting of two fields. List and define the two fields.**  Tag and Word fields. Tag field uniquely identifies a block of main memory. The word is what is to be placed in the block of memory. |