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Using APA format, give short answers to each of the following:

1. What is overflow? What is underflow? How can the probability of their occurrence be minimized?

Overflow is when the result of an equation is too large, in bits, to fit within its data format. Underflow is when the negative exponent, the number of decimal places, is too large to fit within the data format. Double precision data formats, which use two adjacent fixed-length data items to hold a single value, and truncating the number of decimal places, help to reduce under and overflow.

2. How and why are real numbers more difficult to represent and process than integers?

Real numbers have both a fractional portion and whole number portion to them. Deciding how much space to allocate to either of these attributes is complicated. Reducing the number of decimal places reduces the precision of the number, and the providing for the radix to adjust according to how many decimals versus how many whole numbers to process further complicates things.

3. How is an array stored in main memory? How is a linked list stored in main memory? What are their comparative advantages and disadvantages? Give an example of data that would be best stored as an array. Give an example of data that would be best stored as a linked list.

Arrays are stored in contiguous memory locations. Linked lists are stored throughout main memory using pointers to keep their elements connected. Arrays are faster and more efficient to access, linked lists require following the list of links to find an element in the list; at the same time, linked lists are easier to manipulate, since less memory must be reallocated to swap or reorganize elements. A set list of objects, like the letters in the alphabet, are best for arrays. While lists subject to changes are best for linked lists.

4. What are the advantages and disadvantages of fixed length instructions as compared to variable length instructions? Which type generally are used in a RISC processor? Which type are generally used in a CISC processor?

Fixed length instructions means there is a constant amount by which the instruction pointer must be incremented after each fetch. With a variable length instruction, the control unit must check the op code of each fetched instruction to determine the proper increment value. Variable Length complicate instructions, while fixed length can waste memory. RISC tend toward fixed length, while CISC tend toward the more complex Variable Length.

5. How does a RISC processor differ from a CISC processor? Is one processor type better than the other? Why or why not?

RISC processors divide tasks up into simpler processes that require more execution cycles. CISC processors combine tasks in to more complex processes that require less executions cycles. CISC processors are better for performing small tasks, but the complexity of the tasks they perform means that, when they scale to larger, more complex tasks, they fall behind RISC's simpler philosophy. RISC requires more memory to store its simpler processes, but this is a minor drawback.