

## Chapter 1 - Study Guide

Below is a list of questions that we consider representative of the questions that will be asked on the competency demo for this unit. You may see some of these exactly as is. Others may be worded slightly differently or contain different examples. However, this guide should help you understand what we consider key and what will be part of the question pool for the competence demo.

1. Determine the results of a labelled logic circuit involving two “gates” [See Chapter Review Problem #1 for examples]
2. Among the Boolean operations AND, OR, EXCLUSIVE OR, and NOT, which is least like the others? Explain your answer.
3. Describe how a computer can produce an incorrect answer when performing numerical computations even though it has not malfunctioned.
4. Why is 19.20 sometimes replaced with 19.19666666667? (Why is binary an imprecise encoding for floating point numbers?)?
5. Explain why such terms as kilo, mega, and giga have acquired double meanings.
6. For each of the following kinds of errors: 1) indicate how it may arise, 2) provide an example of when it might occur (if reasonable), and 3) indicate an approach to mitigate the error if that is possible.
  - Overflow error
  - Truncation error
  - Communication error
7. How many unique values can be represented using 32 bits? Does your answer change depending of what is being represented—integers, floating point values, items in a set, ...? (Why or why not?)
8. Suppose a digital camera has a storage capacity of 256MB. How many photographs could be stored in the camera if each consisted of 1024 pixels per row and 1024 pixels per column if each pixel required three bytes of storage?
9. Suppose a picture is represented on a display screen by a rectangular array containing 1024 columns and 768 rows of pixels. If for each pixel, 8 bits are required to encode the intensity, how many byte-size memory cells are required to hold the entire picture?

10. If a term paper consisted 42 pages, each containing 40 lines of 100 symbols each (counting each space as a symbol), was to be encoded using Unicode, how many bytes of storage space would be required?
11. Approximately how much storage would be required to store an image of what you are looking at every minute of the day?
12. Identify a numeric value that cannot be represented accurately in binary. Provide context information (e.g., length of bit representation) and reasoning to support the correctness of your response?
13. A truncation error has occurred in a critical situation, causing extensive damage and loss of life. Who is liable, if anyone? The designer of the hardware? The company providing the software? The designer of the software? The programmer who actually wrote that part of the program? The person who decided to use the software in that particular application? What if the software had been corrected by the company that originally developed it, but that update had not been purchased and applied in the critical application? What if the software had been pirated?
14. The following bytes were originally encoded using odd parity. In which of them do you know that an error has occurred?
  - 100101101
  - 100000001
  - 000000000
  - 111000000
  - 011111111
15. Could errors have occurred in a byte from the previous question without your knowing it? Explain your answer.
16. How would your answers to the previous two questions change if you were told that even parity had been used instead of odd.