CS 3320 – IEEE Standard Homework

1. What is the logical bit layout of the number -12.5 in IEEE single-precision format (float)? Separate the 3 parts by a space for readability.

2. What is **ulps(20,30)** in IEEE single-precision?

3. What number is represented by the following IEEE single-precision value?

    1 10000100 10110000000000000000000

4. The number 20 can be expressed in binary as 1.01×2^4, and 11 as 1.011×2^3. Assuming 4 bits of precision:

    a. Do the binary arithmetic to compute 20 – 11. Give the answer in decimal.

    b. Repeat part a) using 1 guard digit.

5. What is meant by the measure, "the number of ulps between floating-point numbers x and y?"

6. Describe the logical bit layout of an IEEE infinity.

7. Describe the logical bit layout of an IEEE NaN.

8. Describe the logical bit layout of an IEEE zero.

9. Describe the logical bit layout of an IEEE subnormal number.

10. How do subnormal numbers differ from normalized numbers with respect to:

    a. Spacing

    b. Relative roundoff error

11. What are *guard digits*, and why are they useful?