

Introduction to Computer Architecture

CISC 3310 Principles of Computer Architecture
Lab Activity

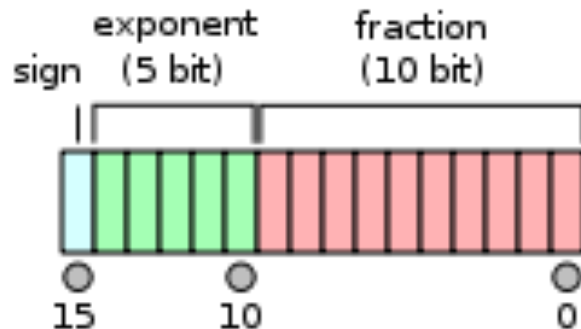
Data Representation - Exercises

Signed Numbers

- CB, Chapter 2, Exercise 24 - Using a “word” of 3 bits, list all the possible signed binary numbers and their decimal equivalents that are representable in:
 - a) Signed magnitude
 - b) One’s complement
 - c) Two’s complement
- CB, Chapter 2, Exercise 25 – repeat the previous question using a “word” of 4 bits
- CB, Chapter 2, Exercise 26 - From the results of the previous two questions, generalize the range of values (in decimal) that can be represented in any given x number of bits the three number representations.

Example: Using IEEE 754 Floating Point Standard *half-precision binary floating point*

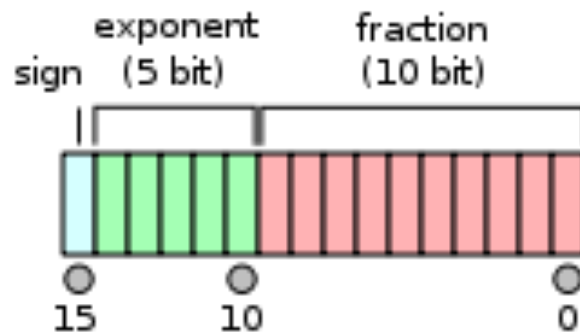
- IEEE 754 *half-precision binary floating point* (or binary16 for short) uses 5 bits for exponents => we get a 15 bias
 - Can represent any exponent between -15 and 16
- Uses 10 bits for the binary fraction



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- Uses 10 bits for the binary fraction
- Floating Number X calculation:

$$x = (-1)^s \times (1 + \text{Fraction}) \times 2^{(\text{Exponent} - \text{Bias})}$$



Floating Point Numbers

- Convert 100.25_{10} to IEEE 754 *half-precision binary floating point*
- Convert 1010011010000000 in IEEE 754 *half-precision binary floating point* representation to a decimal number

* CRC Code

- Generate the CRC code for the number 10111011
 - Using the divisor 1011

Questions?

