Compsci210 Tutorial IEEE754 exercise Answers

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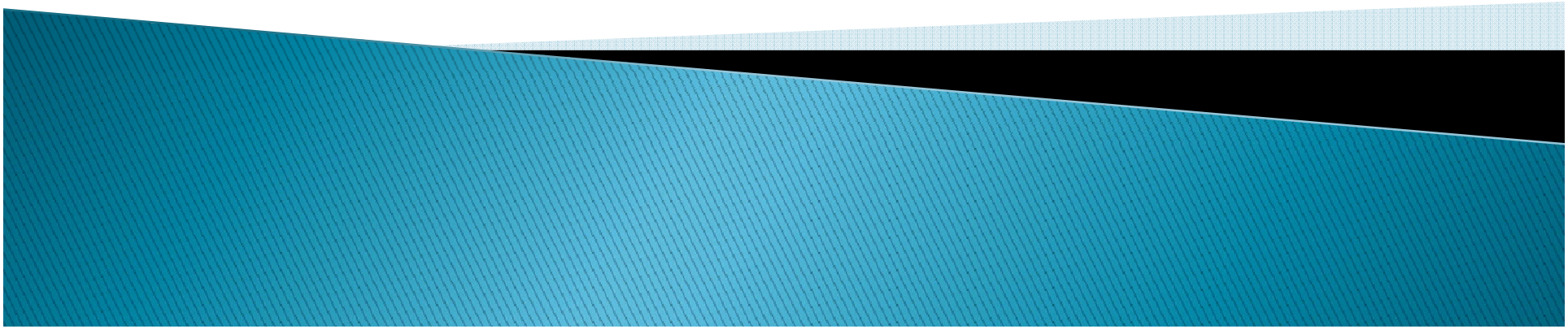


Question 1

- +0.1 === 3DCCCCCC, find first 12 digits of -0.4
- 3DCCCCCC = 0011 1101 1100 …
- But we know
  - -0.4 is negative -> sign bit = 1
  - 0.4 = 4 * 0.1 = 2^2 * 0.1 -> exponent of 0.4 = 2^2 * exponent of 0.1
  - → exponent bits of 0.4
    = 011 1101 1_2 + 2_{10} = 011 1101 1_2 + 10_2
    = 01111101_2

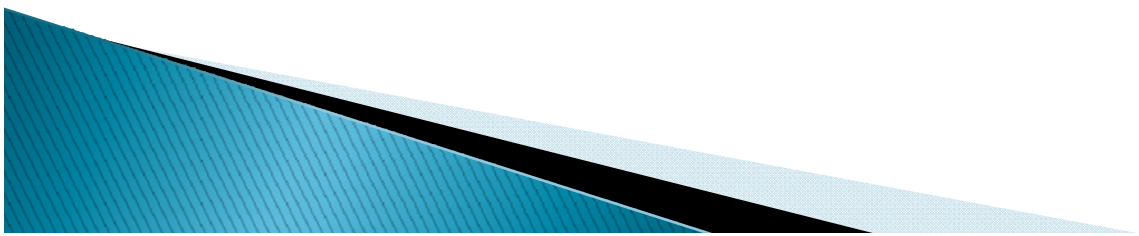
Group together == 1011 1110 1100

Question 2

- Turn 40D00000 to decimal
  - Convert to binary:
    - 0100 0000 1101 0000 0000 0000 0000 0000
  - Determine 3 components:
    - Sign bit = 0 -> positive number
    - Exponent bits = 100 0000 1
    - Mantissa bits = 10100…
  - Apply formula:
    - $= +1 * (1.101 * 2^{(100\ 0000\ 1 - 01111111)})$
    - $= 1.625 * 2^{129-127}$
    - $= 1.625 * 2^2$
    - $= 1.625 * 4$
    - $= 6.5$

Question3

- FE400000
- What is the value of the exponent in base 2?
- FE400000 = 1111 1110 0100 0000 …
  - Exponent bits:
  - = 111 1110 0
  - = 11111111 – 11
  - = 255 – 3 = 252
  - Remember this is biased by 127
  - → real exponent = 252–127 = **125**



Question 4

- A = 40A00000, B = 40E00000, find A+B
- 0100 0000 1010 0000 0000 0000 0000 0000
- 0100 0000 1110 0000 0000 0000 0000 0000
- Same exponent so do not need to normalise
- Doing addition on Mantissa:
  - 1.010 + 1.110 = 11.000
- → A+B
  - = $11.00 * 2^{100\ 0000\ 1}$
  - = $1.100 * 2^{100\ 0000\ 1+1}$
  - = $1.100 * 2^{100\ 0001\ 0}$
- Group → 0 10000010 1000000000…
- = 41400000

Question 5

- X = 41820000, Y = 3F200000, find X*Y
- 0100 0001 1000 0010 0000 0000 0000 0000
- 0011 1111 0010 0000 0000 0000 0000 0000
- Mantissa = man1*man2
- = 1.000 001*1.01
- = 1.01000101
- Exponent = exp1+exp2-bias
- = 100 0001 1 + 011 1111 0 - 01111111= 10000010
- Combine together
- X*Y = 0 10000010 01000101000000 =0x41228000