

Final Exam (Dec 22, 2014)

All multiple choice, literally 100 M/C questions.

- 60 questions come from the "theory" part, namely the readings on the left side of the Topics panels and
- 40 questions come from the "practice" part, the right side of the topics panels

Materials:

Topics A to F:

http://www.eecs.yorku.ca/course_archive/2014-15/F/1520/

Textbook: Ch. 1, 2, 3, 4, 5, 10, 11.1, 11.2, 12.3, 15.1, 15.2, 15.3, 16.1, 16.2

Glade Manual: Ch. 1 – 9 (Support chapters from text: 12.1, 12.2, 14.1)



1. To convert from a decimal number (Base 10) to other bases

Step 1: Always divide the decimal number by the new base, write down the quotient and the reminder
Step 2: Divide the quotient by the new base, write down the new quotient and the new reminder

Step 3: Keep repeating step 2 until quotient is 0

2. To convert from Binary to Octal

- <u>Step 1:</u> group bits into threes, right to left
- <u>Step 2:</u> convert each such group to an octal digit

Ex: what is the Octal representation of 1011010010?

Ans: 001 011 010 010 🛑 Base 2 1 3 2 2 🛑 Base 8 (Octal representation)



3. To convert from binary to Hexadecimal

- <u>Step 1:</u> group bits into fours, right to left
- Step 2: convert each such group to a hexadecimal digit

Ex: what is the hexadecimal representation of 1011010010?





4. To convert from Octal to Binary

convert each octal digit to a three-bit binary representation

Ex: what is the binary representation of 745 (Octal) ?

 Ans:
 7
 4
 5
 <</td>
 Base 8 (Octal representation)

 111
 100
 101

 Base 2

Hence, 745 in octal is 111100101 in binary



5. To convert from Hexadecimal to Binary

convert each hexadecimal digit to a four-bit binary representation

Ex: what is the Binary representation of 745 (Hexadecimal) ?

 Ans:
 7
 4
 5
 Ease 16 (Hexadecimal representation)

 0111
 0100
 0101
 Base 2

Hence, 745 in hexadecimal is 011101000101 in binary



6. To convert from Octal to Hexadecimal

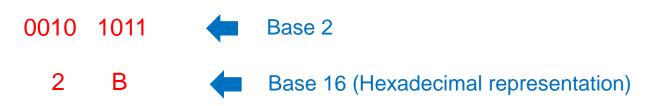
Convert Octal to Binary first and then convert from Binary to Hexadecimal





101 011 🗧 🛑

Group the binary digits in groups of 4:



Base 2

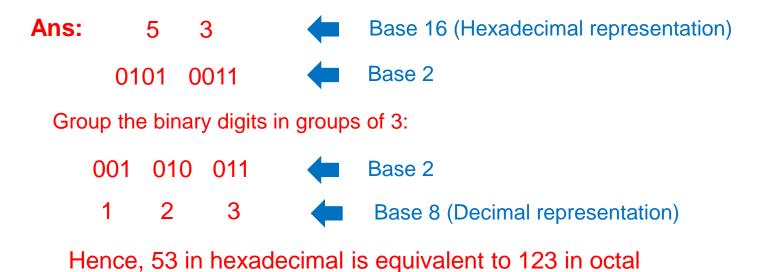
Hence, 53 in octal is equivalent to 2B in hexadecimal



7. To convert from Hexadecimal to Octal

Convert Hexadecimal to Binary first and then convert from Binary to Octal

Ex: Convert 53 (Hexadecimal) to Octal





8. To convert from any bases to decimal (base 10)

Use the following equation (n = number of digits, B = original base, d_i = digit in the ith position in the number) :

 $d_n^* B^{n-1} + d_{n-1}^* B^{n-2} + \dots + d_2^* B^1 + d_1$

Ex: Convert 53 (Hexadecimal) to decimal

Ans: $5*16^1 + 3*16^0 = 80 + 3 = 83$

Ex: Convert 53 (Octal) to decimal

Ans: $5^*8^1 + 3^*8^0 = 40 + 3 = 43$



1. Show how the pattern 10111000 translates using each of the following interpretations

Octal:

Hexadecimal:

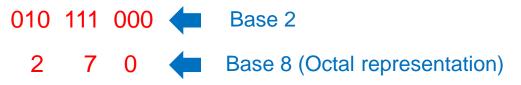
Two's complement:

Floating point:



Ans:

Octal: group bits into threes, add "0" to the front if the group has less than 3 bits



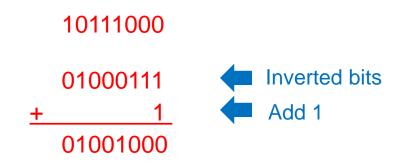
Hexadecimal: group bits into fours, add "0" to the front if the group has less than 4 bits





Ans:

<u>Two's complement:</u> invert all the bits and add 1 to find the original magnitude of the decimal number



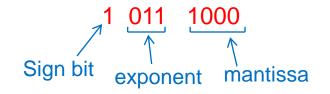
01001000 corresponds to decimal 72

Hence, 10111000 corresponds to decimal -72



Ans:

Floating point: 8-bit floating-point format is 1 bit for sign, 3 bits for exponent, 4 bits for mantissa



011 in decimal is 3, have to subtract 4 based on excess-4 notation, so 3 - 4 = -1

Hence, the format is: -0.1000 x 2⁻¹

-0.01000 x 2^0 \leftarrow Shift the radix point to the left so that the format is expressed in terms = -0.01 \leftarrow Still in base 2

Hence, -0.01 in base 2 is -1/4 or -0.25 in decimal



2. Given that the ASCII code for B is 66, expressed as a decimal value, what is the ASCII code, in hexadecimal, for the letter G?

Ans: Characters in ASCII table are arranged in alphabetical order, hence:

If the character "B" is 66 in decimal, "C" will be 67 in decimal, ... "G" will be 71 in decimal

To convert 71 in decimal to hexadecimal: we keep dividing the decimal number by the new base until the quotient is 0

	<u>quotient</u>	<u>remainder</u>
71/16	4	7
4/16	0	4

Hence, the decimal 71 is 47 in hexadecimal



3. Convert the binary numbers 1010.0110 to decimal representation.

Ans: Consider the integer part first: 1010

To convert to decimal: $1^{2^{3}} + 1^{2^{1}} = 8 + 2 = 10$

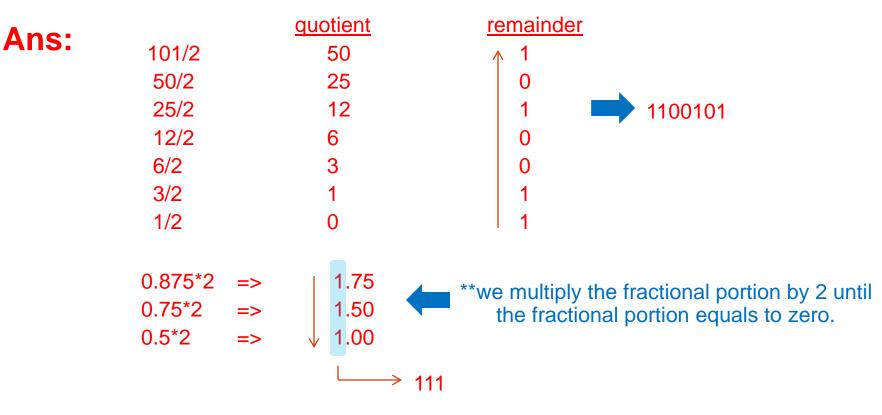
Next, consider the fractional part: .0110

To convert to decimal: $0^{2^{-1}} + 1^{2^{-2}} + 1^{2^{-3}} + 0^{2^{-4}} = 1/4 + 1/8 = 3/8$

Hence, 1010.0110 is $10\frac{3}{8}$ or 10.375 in decimal



4. Convert the decimal number 101.875 to its unsigned binary.



Hence, 101.875 in decimal is 1100101.111 in binary