Exercise

- **Convert following into decimal**

- Binary: **1101110_{2}** **110_{10}**
- Octal: **4675_{8}** **2493_{10}**
- Hexadecimal: **$FF4_{16}$** **4084_{10}**

Conversion from Decimal

Decimal -> Binary

567

1000110111_2

2	567	Remainder	
2	283.5 **283**	0.5 x 2 = **1**	
2	141.5 **141**	0.5 x 2 = **1**	
2	70.5 **70**	0.5 x 2 = **1**	
2	35 **35**	0 x 2 = **0**	
2	17.5 **17**	0.5 x 2 = **1**	
2	8.5 **8**	0.5 x 2 = **1**	
2	4 **4**	0 x 2 = **0**	
2	2 **2**	0 x 2 = **0**	
	1	0 x 2 = **0**	

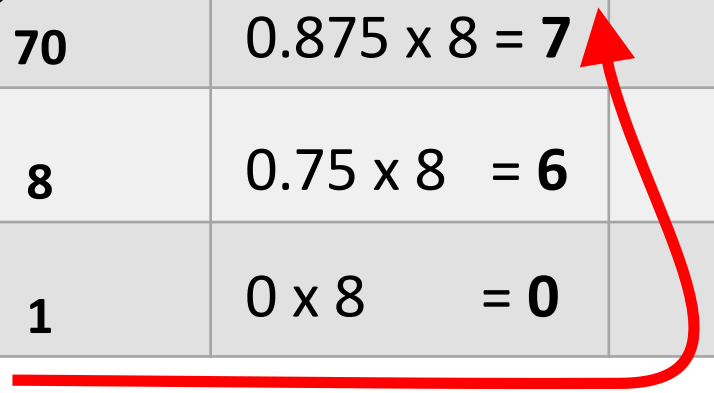
Conversion from Decimal

Decimal -> Octal

567

1067_8

8	567	Remainder	
8	70.875 **70**	0.875 x 8 = **7**	
8	8.75 **8**	0.75 x 8 = **6**	
	1	0 x 8 = **0**	



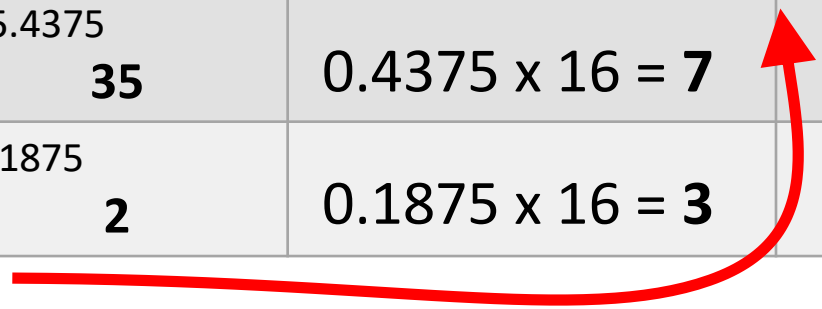
Conversion from Decimal

Decimal -> Hexadecimal

567

237_{16}

16	567	Remainder	
16	35.4375 **35**	0.4375 x 16 = **7**	
	2.1875 **2**	0.1875 x 16 = **3**	



Exercise

- **Convert following decimal number into:**

- Binary: **56_{10}** **111000_{2}**
- Octal: **56_{10}** **70_{8}**
- Hexadecimal: **56_{10}** **38_{16}**

Digit & Position

- The length of a representation grows, from right to left, like:

3rd 2nd 1st 0th

7

17

217

5217

Digit & Position

- In general, a number **x** may be represented with a representation of length **n** in the following manner (here **d_p** means the digit at position p).

d_{n-1}	…	d_3	d_2	d_1	d_0

- So for the number 199834, in decimal, d_0=4, d_1=3, d_2=8, d_3=9, d_4=9 and d_5=1.
- In general, We call the **rightmost digit, d_0**, the **least significant digit (LSD)** and the **leftmost digit d_{n-1}**, the **most significant digit (MSD)**.

BITS, BYTES and WORDS

- A digit in the **binary number system** is more commonly called a **bit**

- When a binary number is represented using 8 bits, the resulting representation, composed of d_0, d_1, d_2… d_7, is called a **byte**

- Similarly:
  - binary representation composed of 16 bits is called a **word (2 bytes)**
  - binary representation composed of 32 bits is called a **double word (4 bytes)**
  - binary representation composed of 64 bits is called a **quadruple word (8 bytes)**

BITS, BYTES and WORDS

- A less common, 4-bit representation of numbers is called **nibble**.
- The concept of a byte is fundamental in computer science because a byte is the **smallest addressable** unit of memory in a modern computer; furthermore, data is quantified in terms of byte!
- A byte is therefore a unit for measuring data in computers.

BITS, BYTES and WORDS

- The following quantifiers are important:
  - KILO
    - $1K = 2^{10} = 1024$ So how many bytes in 37KB?
  - MEGA
    - $1M = 2^{20} = 1,048,576$ So how many Kilo bytes in 137MB?
  - GIGA
    - $1G = 2^{30} = 1,073,741,824$ So how many Mega bytes in 562GB?
  - TERA
    - $1T = 2^{40} = 1,099,511,627,776$ So how Giga bytes in 307TB?

Thanks a lot

If you are taking a Nap, **wake up**.....Lecture Over