INTRODUCTION TO NUMBER SYSTEM

Number Representation

Basic Number System Types

NUMBER REPRESENTATION

Base/Radix

Least Significant Digit

$$N_b = d_{n-1} \ldots\ldots d_2 d_2 d_2 . \; d_{-1} \; d_{-2} \ldots\ldots \; d_{-m}$$

Number

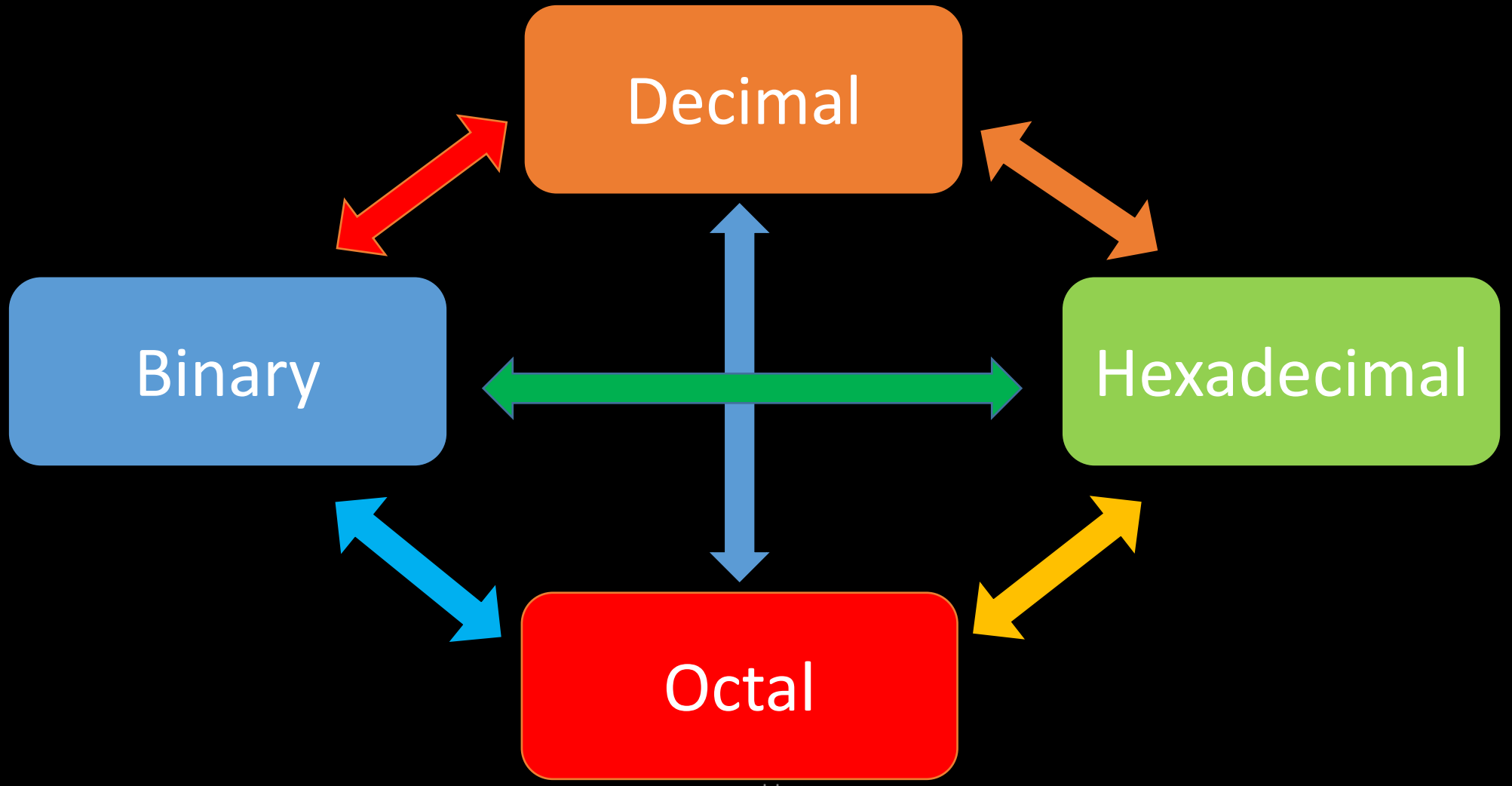
Most Significant Digit

BASIC NUMBER SYSTEM TYPES

Binary	Octal	Decimal	Hexadecimal
Base/Radix: 2	Base/Radix: 8	Base/Radix: 10	Base/Radix: 16
Characters: 0,1	Characters: 0,1,2,3,4,5,6,7	Characters: 0,1,2,3,4,5,6,7,8,9	Characters: 0,1,2,3,4,5,6,7,8,9, A,B,C,D,E,F
Eg: $(1101)_2$	Eg :: $(37)_8$	Eg: $(245)_{10}$	Eg: $(2AEF)_{16}$

NUMBER SYSTEM HISTORY VIDEO

NUMBER SYSTEM CONVERSION



I. DECIMAL TO BINARY CONVERSION

FOR INTEGER PART

- CONTINEOUSE DVSION BY 2
- KEEPING THE TRACK ON REMAINDER
- GO FROM BOTTOM TO TOP

+

FOR FRACTIONAL PART

- CONTINEOUSE MULTIPLICATION BY 2
- KEEPING THE TRACK OF INTEGER PART
- GO FROM LEFT TO WRITE

=

FINAL CONVERTED BINARY NUMBER

- MERGE BOTH (INTEGER AND FRACTIONAL PART) BINARY BITS

I. DECIMAL TO BINARY CONVERSION

Convert given $(42.65625)_{10}$ into BINARY

INTEGER PART : 42

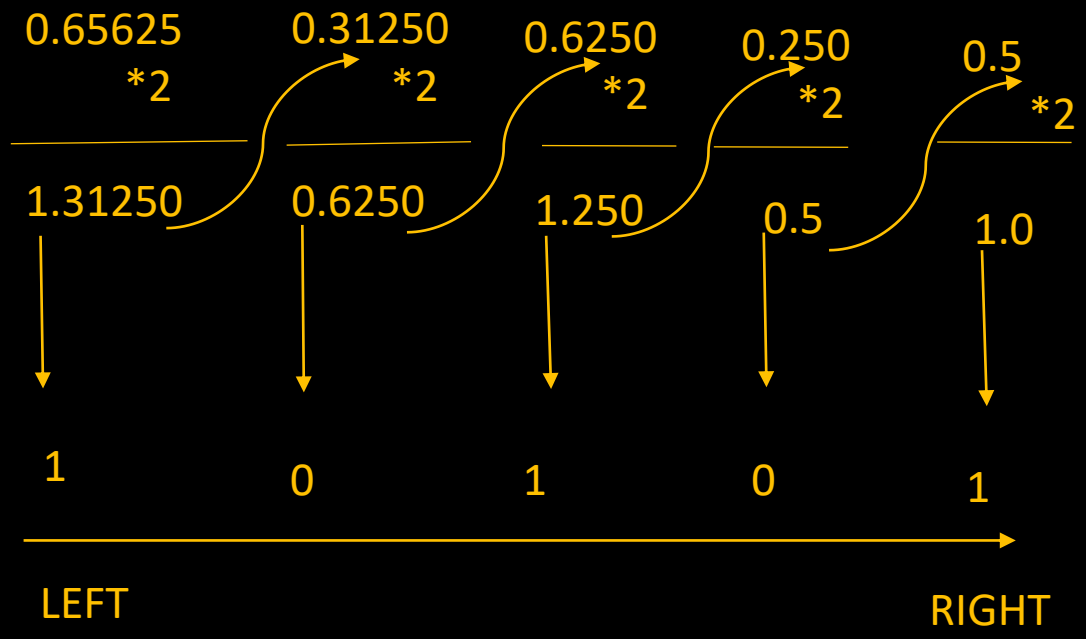
2	42	
2	21	0
2	10	1
2	5	0
2	2	1
2	1	0
	0	1

TOP

BOTTOM

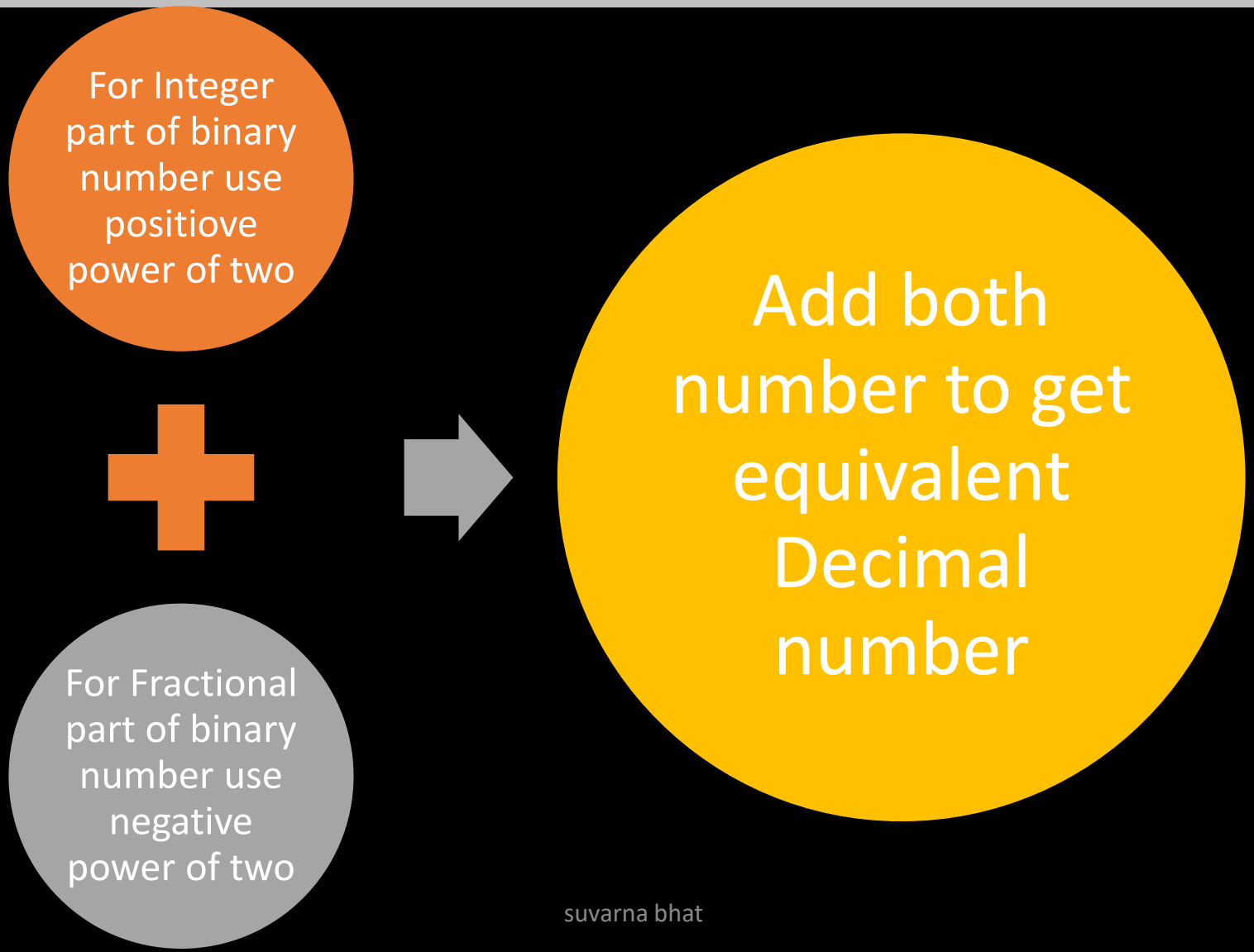
$(42)_{10} = (101010)_2$

FRACTIONAL PART : .65625



$(.65625)_{10} = (.10101)_2$

II. BINARY TO DECIMAL CONVERSION



II. DECIMAL BINARY TO DECIMAL CONVERSION

- Eg. Convert the following binary no into Decimal

$(1011.01)_2$

Positive power of 2 Negative power of 2

$= (2^3 * 1) + (2^2 * 0) + (2^1 * 1) + (2^0 * 1) + (2^{-1} * 0) + (2^{-2} * 1)$

$= 11 + 0.25$

$=(11.25)_{10}$

III. DECIMAL TO OCTAL

- EXAMPLE
  - $(67.517)_{10}$
  - $(451.43)_{10}$

IV. OCTAL TO DECIMAL

- EXAMPLE:
  - $(670.17)_8$

V. DECIMAL TO HEXADECIMAL

- EXAMPLE:
  - $(95.5)_{10}$
  - $(451.43)_{10}$

VI. HEXADECIMAL TO DECIMAL

- EXAMPLE
  - $(AFC.CD)_{16}$

NUMBER SYSTEM TABLE

Decimal	BINARY	OCTAL	HEXADECIMAL
0	0000	0	0
1	0001	1	1
2	0010	2	2
3	0011	3	3
4	0100	4	4
5	0101	5	5
6	0110	6	6
7	0111	7	7
8	1000		8
9	1001		9
10	1010		A
11	1011		B
12	1100		C
13	1101		D
14	1110		E
15	1111		F

VII. BINARY TO OCTAL

- STEPS:
  - Group bits in threes, starting on right
  - Convert to octal digits

VII. BINARY TO OCTAL

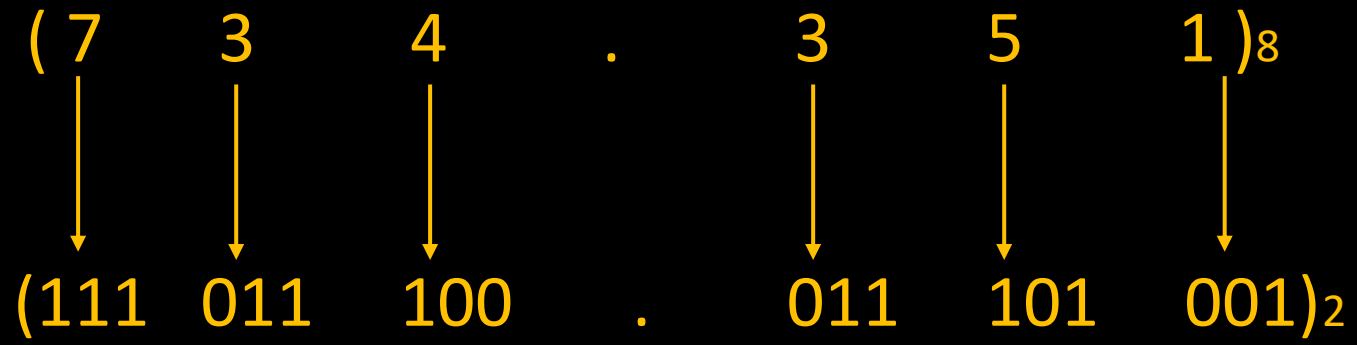
EXAMPLE:

$$(10101111.010011)_2$$

$$(2\quad 5\quad 7\ .\ 2\quad 6)_8$$

VIII. OCTAL TO BINARY

- EXAMPLE:



IX. BINARY TO HEXADECIMAL

- STEPS:
  - Group bits in fours, starting on right
  - Convert to Hexadecimal digits

IX. BINARY TO HEXADECIMAL

EXAMPLE:

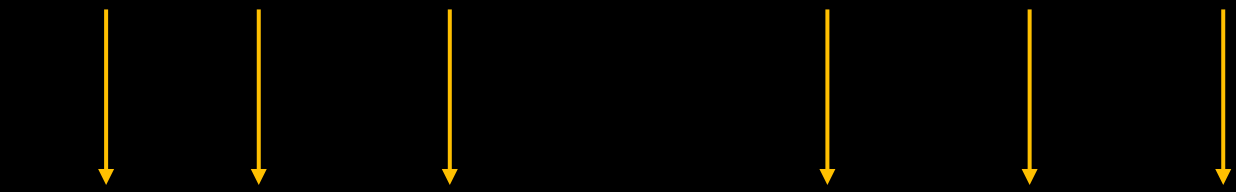
$$(10101111.010011)_2$$

$$(\ A\quad F\ .\ 4\quad C\ )_{16}$$

X. HEXADECIMAL TO BINARY

- EXAMPLE:

$$(A\ \ 8\ \ 7\ .\ 9\ \ E\ \ 1)_{16}$$



$$(1010\ \ 1000\ \ 0111\ .\ 1001\ \ 1110\ \ 0001)_2$$

HOME WORK

XI : OCTAL TO HEXADECIMAL

$(723.17)_8$

XII: HEXADECIMAL TO OCTAL

$(1D3.CD)_{16}$

CRITICAL THINKING QUESTION

Convert $(451.43)_{10}$ into base 7 Number system

USE OF CALCULATOR