NAAC ACCREDITED "B++" (CGPA 2.89)

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Course :Computer System Architecture

Class : Sem-1

Lesson :Number System Contd..

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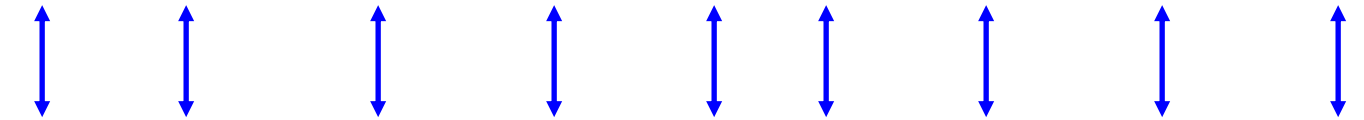
Binary ↔ Octal

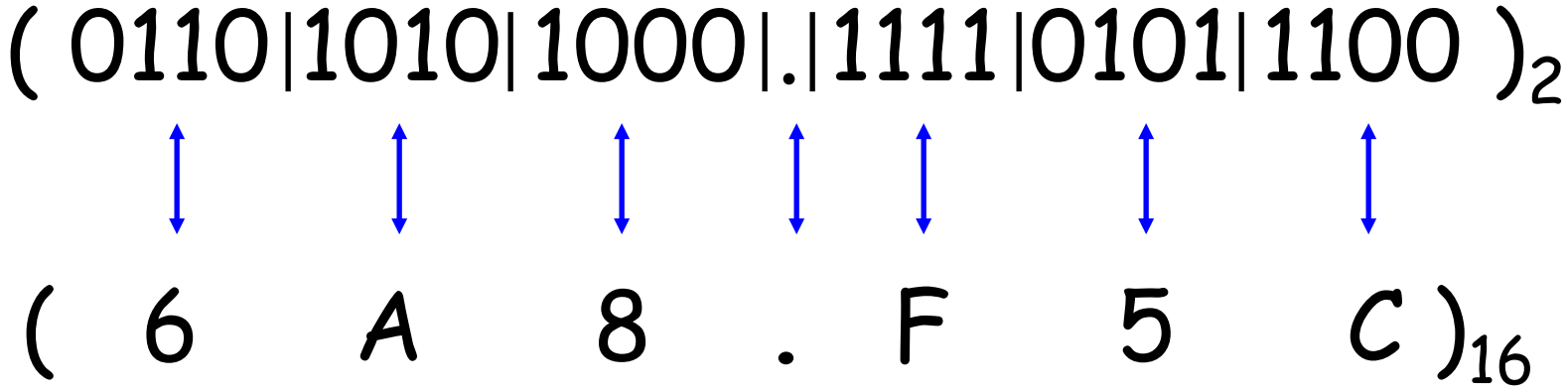
$(011|010|101|000|.|111|101|011|100)_2$



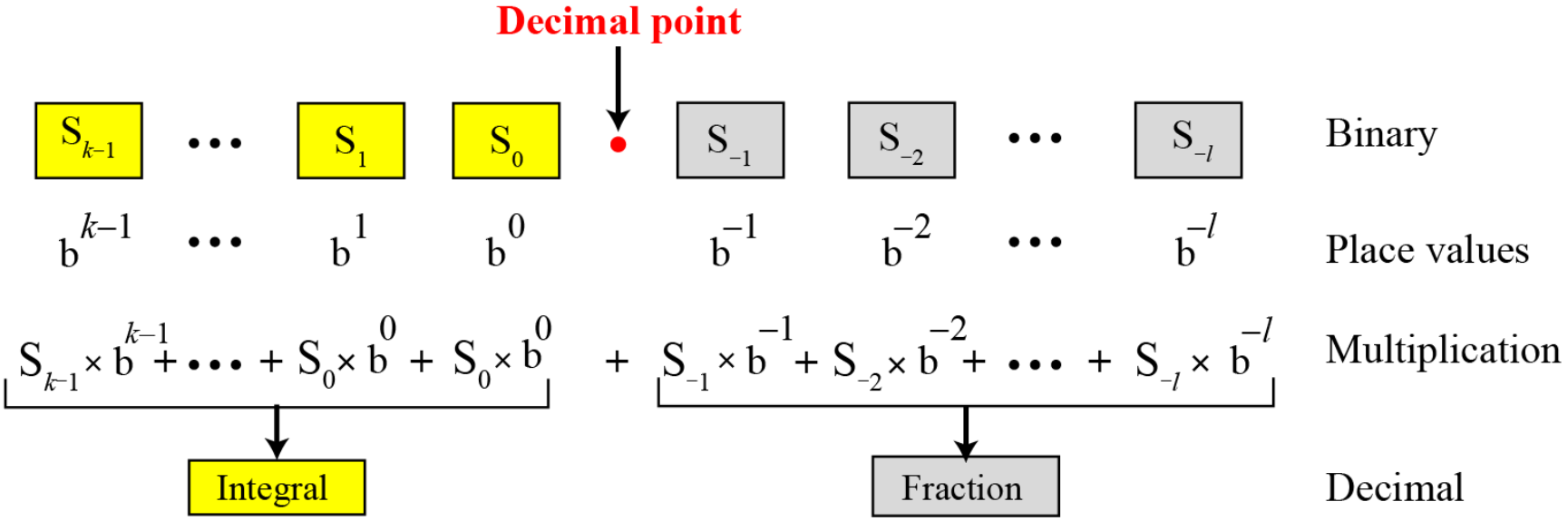
$(3\ 2\ 5\ 0\ .\ 7\ 5\ 3\ 4)_8$

Dec	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	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

Binary ↔ Hex



Any base to decimal conversion



Example

The following shows how to convert the binary number $(110.11)_2$ to decimal: $(110.11)_2 = 6.75$.

Binary	1		1		0	•	1		1
Place values	2^2		2^1		2^0		2^{-1}		2^{-2}
Partial results	4	+	2	+	0	+	0.5	+	0.25

Decimal: 6.75

Example

The following shows how to convert the hexadecimal number $(1A.23)_{16}$ to decimal.

Hexadecimal	1		A	•	2		3
Place values	16^1		16^0		16^{-1}		16^{-2}
Partial result	16	+	10	+	0.125	+	0.012

Decimal: 26.137

Note that the result in the decimal notation is not exact, because

$3 \times 16^{-2} = 0.01171875$. We have rounded this value to three digits (0.012).

Example

The following shows how to convert $(23.17)_8$ to decimal.

Octal	2		3	•	1		7
Place values	8^1		8^0		8^{-1}		8^{-2}
Partial result	16	+	3	+	0.125	+	0.109
Decimal: 19.234							

This means that $(23.17)_8 \approx 19.234$ in decimal. Again, we have rounded up $7 \times 8^{-2} = 0.109375$.

Convert Decimal to any base *r*

- Fractional part: Multiply by the base, keep track of integer part, and read-down
- e.g. $(0.78125)_{10} = (\ ?\ )_{16}$, *r = 16*

.78125	*	16=	12.5	12	C
.5	*	16=	8	8	8

$(0.78125)_{10} = (0.C8)_{16}$

Decimal to Binary Conversion
(Fractional Part)

.3125	* 2	0.625	0
.625	* 2	1.25	1
.25	* 2	0.5	0
.5	* 2	1	1

$.3125_{10} = .0101_2$

Decimal to Binary Conversion
(Fractional Part: Repeated Multiplication)

$.1 \times 2 \rightarrow 0.2$ (fractional part = .2, whole part = 0)

$.2 \times 2 \rightarrow 0.4$ (fractional part = .4, whole part = 0)

$.4 \times 2 \rightarrow 0.8$ (fractional part = .8, whole part = 0)

$.8 \times 2 \rightarrow 1.6$ (fractional part = .6, whole part = 1)

$.6 \times 2 \rightarrow 1.2$ (fractional part = .2, whole part = 1)

Result = $.0001100011000110011_2$.....

Decimal to Octal Conversion
(Fractional Part)

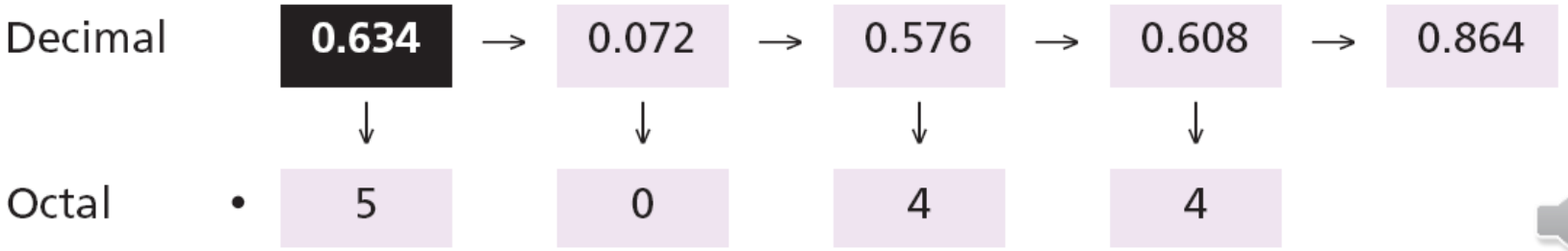
.3125	*8=	2.5	2
.5	* 8=	4.0	4

$.3125_{10}=.24_{8}$

Decimal to Octal Conversion
(Fractional Part: Repeated Multiplication)

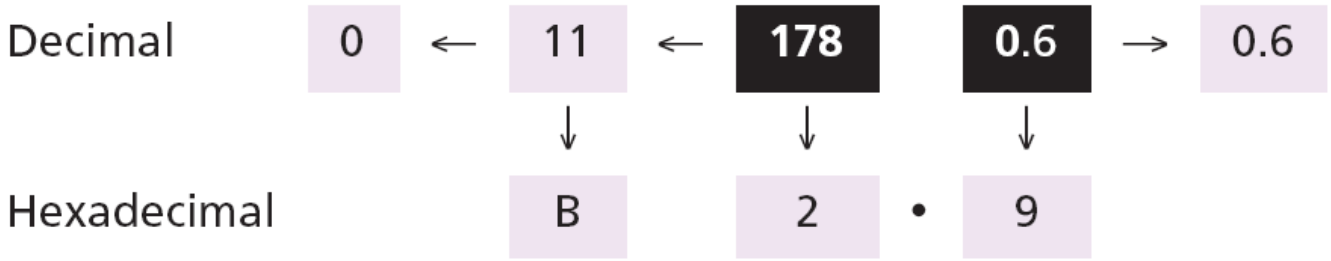
The following shows how to convert 0.634 to octal using a maximum of four digits. The result is $0.634 = (0.5044)_8$. Note that we multiple by 8 (base octal).

.634 X 8 = 5.072	5
.072 X 8 =0.576	0
.576 X 8 =4.608	4
.608 X8 = 4.864	4



Decimal to Hexadecimal Conversion
(Fractional Part: Repeated Multiplication)

The following shows how to convert 178.6 in decimal to hexadecimal using only one digit to the right of the decimal point. The result is $178.6 = (B2.9)_{16}$ Note that we divide or multiple by 16 (base hexadecimal).



Thank You