

EGC220 Class Notes 1/27/2023

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$$(XYZ.W)_n = X \cdot n^2 + Y \cdot n^1 + Z \cdot n^0 + \underbrace{W \cdot n^{-1}}_{\frac{W}{n}} = (\quad)_{10}$$

\uparrow
 $X, Y, Z, W \in \mathbb{N}$

$$(MOP.Q)_{10} \rightarrow (\quad)_n$$

$$MOP \div n = J \quad R = \frac{W}{n}$$

$$J \div n = \dots \quad R = Y$$

$\emptyset \leftarrow \text{stop}$

$$\dots \cdot YW \left. \begin{array}{l} \cdot Q \cdot n = K \cdot r \\ \cdot r \cdot n = \emptyset : 0 \end{array} \right\}$$

$YW \cdot \emptyset ku$

Convert the following numbers to base 10

a. $(127.4)_8$

$$1 \times 8^2 + 2 \times 8^1 + 7 \times 8^0 + 4 \times 8^{-1} \rightarrow \frac{4}{8}$$

$$64 + 16 + 7 + .5 = (87.5)_{10}$$

b. $(B65F)_{16}$

$$11 \times 16^3 + 6 \times 16^2 + 5 \times 16^1 + 15 \times 16^0 = (46687)_{10}$$

$$45056 \quad 1536 \quad 80 \quad 15$$

c. $(110101)_2$

$$1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$$

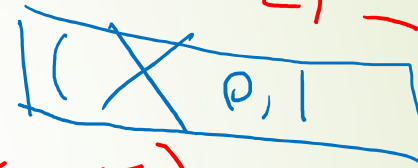
$$1 \times 32 + 1 \times 16 + 0 \times 8 + 1 \times 4 + 0 \times 2 + 1 \times 1$$

weights

32	16	8	4	2	1
1	1	0	1	0	1

$$53 - 32 = 21$$

$$21 - 16 = 5$$



$$327 - 256 = 71$$

256	128	64	32	16	8	4	2	1
1	0	1	0	0	1	1	1	1

$$= (53)_{10}$$

32	16	8	4	2	1
1	1	0	1	0	1

Convert the following numbers from base 10 to indicated based

a. $(87.5)_{10} \rightarrow$ base 8

$$.5 \times 8 = 4.0 \leftarrow \text{stop}$$

$$\sqrt{\times 8}$$

$$87 \div 8 = 10 \quad R_0 = 7$$

$$10 \div 8 = 1 \quad R_1 = 2$$

$$1 \div 8 = 0 \quad R_2 = 1$$

(LSB)

$$(127.4)_8$$

$$\begin{array}{r} 53 - 32 = 21 \\ 21 - 16 = 5 \end{array}$$

b. $(46,687)_{10} \rightarrow$ Base 16

$$46687 \div 16 = 2917$$

$$2917 \div 16 = 182$$

$$182 \div 16 = 11$$

$$11 \div 16 = 0 \leftarrow \text{stop}$$

$$R_0 = 15 \rightarrow F$$

$$R_1 = 5$$

$$R_2 = 6$$

$$R_3 = 11 \rightarrow B$$

$$(B65F)_{16}$$

$$.25 \times 16 = 4.0$$

stop

c. $(53)_{10} \rightarrow$ Base 2

$$53 \div 2 = 26 \quad R_0 = 1$$

$$26 \div 2 = 13 \quad R_1 = 0$$

$$13 \div 2 = 6 \quad R_2 = 1$$

$$6 \div 2 = 3 \quad R_3 = 0$$

$$3 \div 2 = 1 \quad R_4 = 1$$

$$1 \div 2 = 0 \quad R_5 = 1$$

stop

$$32168421$$

$$110101$$

$$(87.3)_{10} \rightarrow (\quad)_8$$

$$87 \div 8 = 10 \quad R_0 = 7$$

$$10 \div 8 = 1 \quad R_1 = 2$$

$$1 \div 8 = 0 \quad R_2 = 1$$

$$(127.23)_8$$

$$\cdot 3 \times 8 = 2.4$$

$$\cdot 4 \times 8 = 3.2$$

$$\cdot 2 \times 8 = 1.6$$

$$(30.7)_{10} = (\quad)_8$$

$$\underbrace{3 \times 8^1}_{24} + \underbrace{0 \times 8^0}_0 + \underbrace{7 \times 8^{-1}}_{.875} = (24.875)_{10}$$

$$(24.875)_{10} \rightarrow (\quad)_8$$

$$24 \div 8 = 3$$

$$R_0 = 0$$

$$3 \div 8 = 0$$

$$R_1 = 3$$

↑
stop

$$(30.7)_8$$

$$.875 \times 8 = 7.0$$

↑
stop

$$(462.5)_9 \Rightarrow (\quad)_{10}$$

$$4 \times 9^2 + 6 \times 9^1 + 2 \times 9^0 + 5 \times 9^{-1}$$

$$324 \quad 54 \quad 2 \quad .555 \dots$$

$$(\underline{380.555})_{10} \Rightarrow (\quad)_9$$

$$380 \div 9 = 42 \quad R_0 = 2$$

$$42 \div 9 = 4 \quad R_1 = 6$$

$$4 \div 9 = 0 \quad R_2 = 4$$

$$462.488$$

$$.555 \times 9 = 4.99$$

$$.99 \times 9 = 8.91$$

$$.91 \times 9 = 8.9$$

$$(40.7)_{10} = (\quad)_8$$

$$40 \div 8 = 5 \quad R_0 = 0$$

$$5 \div 8 = 0 \quad R_1 = 5$$

1 0 -1 -2 -3

$$(50.546)_8$$

$$.7 * 8 = 5.6$$

$$.6 * 8 = 4.8$$

$$.8 * 8 = 6.4$$

$$5 \times 8^1 + 0 \times 8^0 + 5 \times 8^{-1} + 4 \times 8^{-2} + 6 \times 8^{-3}$$

$\frac{4}{64}$ $\frac{6}{512}$

$$40 + 0 + .625 + 0.0625 + 0.0117$$

$$(40.6992)_8$$

Hex $\rightarrow 16 = 2^4$

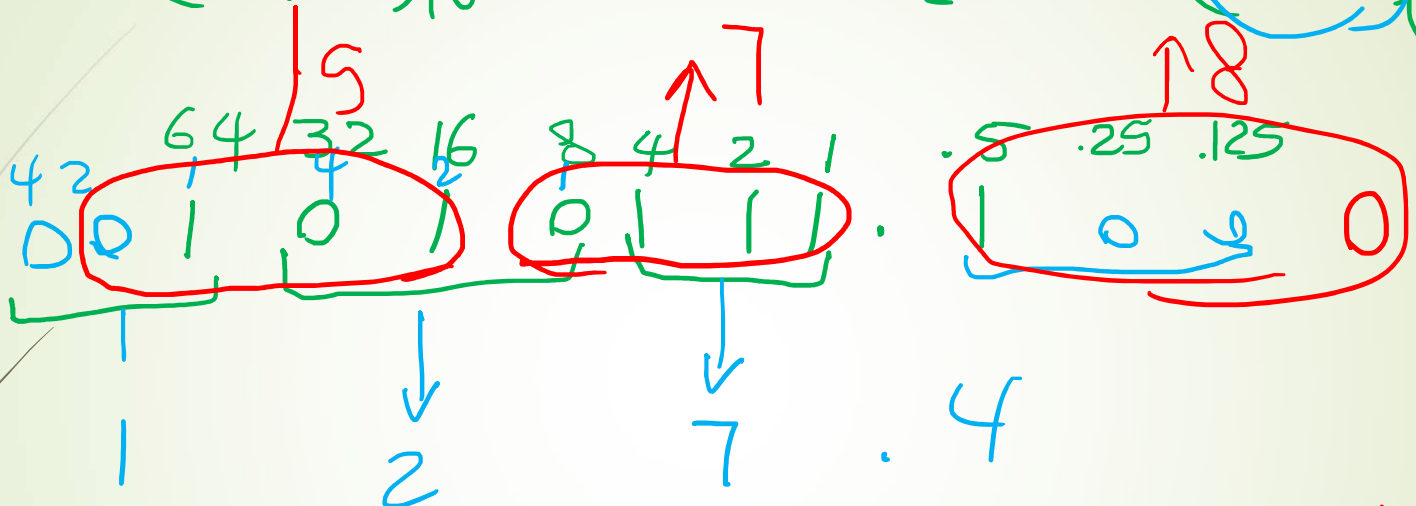
Oct $\rightarrow 8 = 2^3$

$(87.5)_{10} \rightarrow ()_2 \xrightarrow{?} (127.4)_{16} \xrightarrow{3} ()_2$

87
-64

23
-16

7



421

$2 = 2^1$ \rightarrow groups of 3 bits

Octal $8 = 2^3$ \rightarrow " " 4 bits

Hex $16 = 2^4$

$(57.8)_{16}$
each group \rightarrow 8421

~~$(3.11)_4$~~

$$(3.11)_4 = (\quad)_6$$

a. $(3.11)_4 \rightarrow (\quad)_{10}$

$$= 3 \times 4^0 + 1 \times 4^{-1} + 1 \times 4^{-2}$$

$$= 3 + .25 + 0.0625$$

$$= (3.3125)_{10} \approx (\quad)_6$$

$(3.1513)_6$

$$3 \div 6 = 0 \quad R_0 = 3$$

↑
stop

$$\begin{array}{l} \cdot 3125 \times 6 = 1.875 \\ \cdot 875 \times 6 = 5.25 \\ \cdot 25 \times 6 = 1.5 \\ \cdot 5 \times 6 = 3.0 = \text{stop} \end{array}$$

$$\begin{array}{r} 3 \\ 21 \overline{) 71} \end{array} \cdot \begin{array}{r} 1 \\ 5 \overline{) 1} \end{array} \cdot \begin{array}{r} 1 \\ 25 \overline{) 1} \end{array} \cdot \begin{array}{r} 1 \\ 125 \overline{) 1} \end{array} \cdot \begin{array}{r} 1 \\ 0625 \overline{) 1} \end{array}$$

3.

$$(345.7)_{10} = (101011001.1011)_{2}$$

~~512~~ 256
 0001
 |

128	64	32	16	8	4	2	1	.	5	.25	.125	.0625
0	1	0	1	1	0	0	1	.	0	0	1	1
5								9	9		7	

345
256
89
64
25
16
16

$(59.\overset{7}{\cancel{7}})_{16}$