

CPE 100 Digital Logic Design

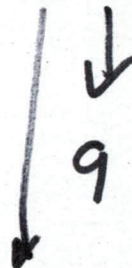
Lecture 1

1/20/2021

$$3 \times 10^2 = 300$$

↑ 0,00

379



$$9 \times 10^0 = 9$$

$$7 \times 10^1 = 70$$

MAX
3 digits
dec.

999 → 10³ - 1
0

↓ n places 10 values
0-9

0
3
2
1
0
↑

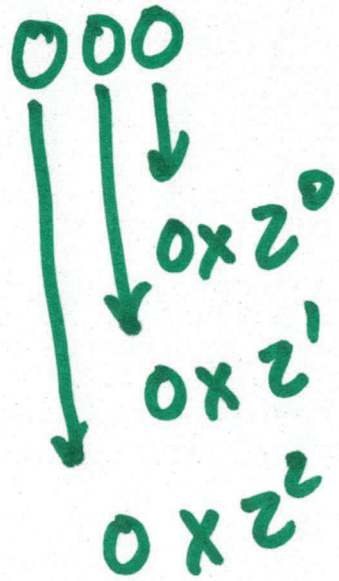
Decimal

$$10^n - 1$$

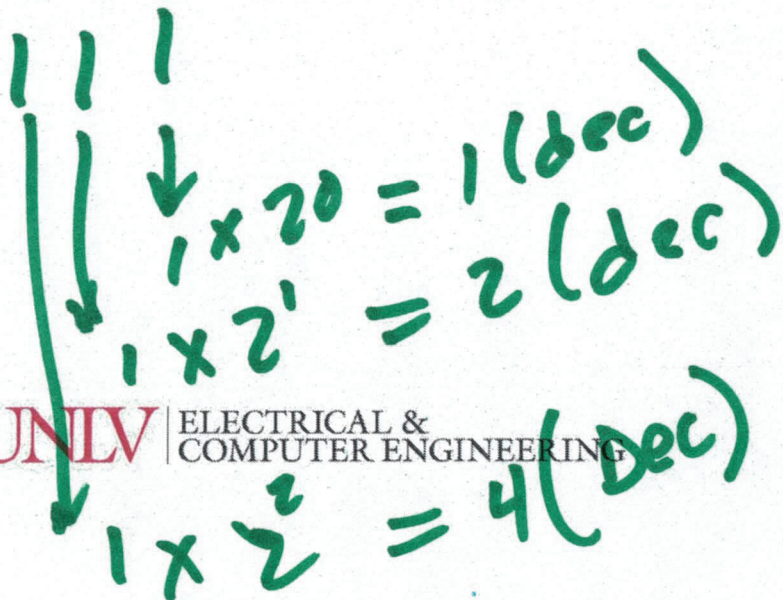
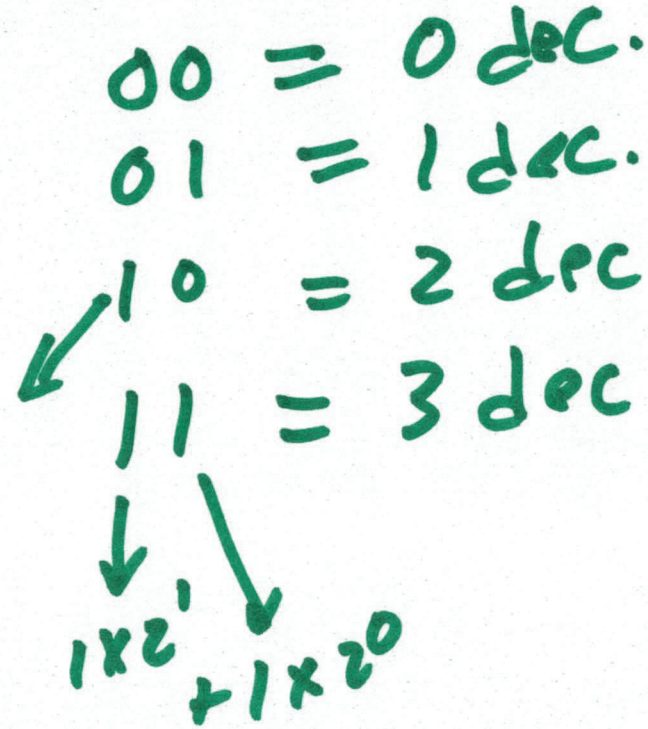
N. .4321

BINARY

0 → 1



1x2¹



0000 0000 — 1-digit = bit

8-digits = Byte

4-digits = nibble

4-digit 0000
0

1111

$$\boxed{2^N - 1}$$

$$2^4 - 1$$

$$15$$

word = # of bits

8421		
0000	=	0
0001	=	1
0010	=	2
0011	=	3
0100	=	4
0101	=	5
0110	=	6
0111	=	7
1000	=	8
1001	=	9
1010	=	10
1011	=	11
1100	=	12
1101	=	13
1110	=	14
1111	=	15

3)

Example:

Convert 22_{10} to binary

- 1
- 2
- 4
- 8
- 16
- 32
- 64
- 128
- 256
- 512
- 1024
- 2048

16 0110
 1 XXXX
 16 8421

22
 -16

 6
 -4

 2
 -2

 0

22 → 1 0 1 1 0

1K 512 256 128 64 32 16 8 4 2 1
 2¹⁰ → XX XXXX XXXX XXXX
 2²⁰ = 1MEV
 = 1024 × 1024

4)

1 1
 2 2
 4 3
 8 4
 16 5
 32 6
 64 7
 128 8
 256 9
 512 10
 1024

$$\begin{array}{r}
 796 \rightarrow \\
 - 512 \\
 \hline
 284 \\
 - 256 \\
 \hline
 28 \\
 - 16 \\
 \hline
 12 \\
 - 8 \\
 \hline
 4 - 4 = 0
 \end{array}$$

~~decimal~~ binary

11 0001 1100

1
 1
 9

0001 1100

$$\begin{array}{r}
 4 \\
 28 \\
 16 \\
 256 \\
 512 \\
 \hline
 796 \\
 \checkmark
 \end{array}$$

5)

10
 20
 40
 81
 160
 320
 640
 1281
 2561
 5120

$$\begin{array}{r}
 392 \\
 - 256 \\
 \hline
 136 \\
 - 128 \\
 \hline
 8
 \end{array}$$

091.000



0001 1000 1000

6)

$$.01 \text{ N} \rightarrow 1 \times 10^2 \quad 10^{-2}$$

$$10 \text{ m} \rightarrow \text{m} \rightarrow \text{milli} \rightarrow 10^{-3}$$

$$10 \cdot 10^{-3} = .01 \quad 54 \text{ A}$$

$$10^{-3} \rightarrow \text{milli} - \text{m}$$

$$10^{-6} \rightarrow \mu \rightarrow \text{Micro}$$

$$10^{-9} \rightarrow \text{n} \rightarrow \text{NANO}$$

$$10^{-12} \rightarrow \text{p} \rightarrow \text{pico}$$

$$10^{-15} \rightarrow \text{f} \rightarrow \text{femto}$$

$$10^{-18} \rightarrow \text{a} \rightarrow \text{atto}$$

$$1 \text{ PF} \rightarrow 1 \text{ Pico FARAD}$$

$$0.000005$$

7)

Octal numbers

0 → 7

³8 ²8 ¹8 ⁰8

5126481

Hexadecimal

0 → 15

0
1
2
3
4
5
6
7
8

~~9~~
~~10~~
~~11~~
12
13
14
15
A
B
C
D
E
F

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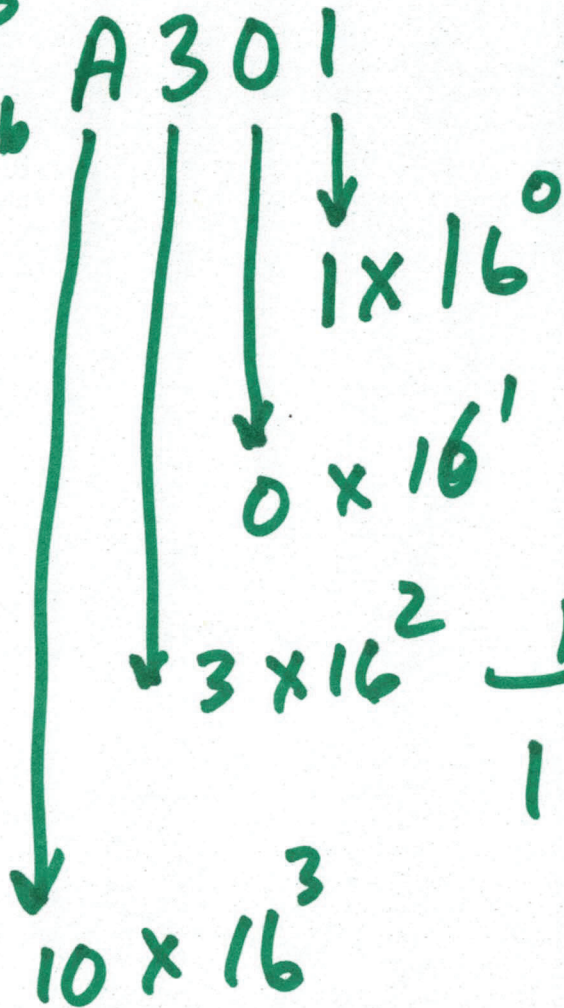
$10^3 \rightarrow$ kilo \rightarrow k
 $10^6 \rightarrow$ Mega \rightarrow MEB eb
 $10^9 \rightarrow$ Giga 1eb
 $10^{12} \rightarrow$ Tera 1000000
 $10^{15} \rightarrow$ Peta? 1MEB

8)

binary	1101	1111	0010	1000
	D	F	2	8
	DF28		hex	0x0000
	0xDF28			

001	101	111	100	101	000
				5	0
1	5	7	4		
				15	74508
				DF28	=
				DF28 ₁₆	=

$16^2 \rightarrow 256$
 $16^3 \rightarrow 4096$



40960
768
1

Dec ?
OCT ?
bin ?

A

3

0

1

1010
1 2

0011 0000 0001
1 4 0 1

121401