Lecture 3

- $\sqrt{(144)_x}$ for base ≥ 5

$(x^2+4x+4)_{10} = \sqrt{(x+2)^2}_{10}$

$(x+2)_{10} \Rightarrow (12)_x$

- $\sqrt{(69)_{10}} = (13)_x$ for base ≥ 10

$\sqrt{(x^2+6x+9)_{10}} = \sqrt{(x+3)^2}_{10}$

$(13)_x$

- $\sqrt{(81)_x} = (\ )_x$

$\sqrt{(8x+1)_{10}} =$

$\sqrt{(81)_{10}} = (9)_0$

Q In a number system range of number are from −3 to 3 represented as CBA0123 Represent 18, 26 & 102 in this number system.

- Base x ⟶ 0 to $x-1$
- Base = Total Number ~~supper~~ of digits supported by number System.

Base — 7, coz we have 7 digits - ~~CAB~~ CBA0123

→

7 | 18	
7 | 3	−3 = C
0	3

$(18)_{10} = (3C)$

→

7 | 26	
7 | 4	−2 = B
7 | 1	−3 = C
0	1 = 1

$(26)_{10} = (1CB)$

→ 102

7 | 102	
7 | 15	−3 = C
7 | 2	1
0	2

$(102)_{10} = (21C)$

* Base r to r^2 Conversion

Rules:

Make cells of size k
→ Before point R to L
→ After " L to R
write decimal eq.

- $0(10\ 11)_2 \longrightarrow (\ )_8$

  $2\ 7 \longrightarrow (27)_8$

- $00(1010\ 1100\ 11 \cdot 1011)_2 \longrightarrow (\ )_8$

  $1\ 2\ 6\ 3 \cdot 5\ 4 \longrightarrow (1263.54)_8$

- $(1000\ 1010\ 1101 \cdot 1010\ 1)_2 \longrightarrow (\ )_{16}$

  $1\ 1\ A\ D \cdot D\ 4 \longrightarrow (11AD.D4)_{16}$

- $0(1\ 211\ 2\ 001 \cdot 211)_3 \longrightarrow (\ )_9$

  $1\ 7\ 5\ 3\ 1.53 \longrightarrow (1753)_9$

- $012(2211\ 2\ 001 \cdot 21)_3 \longrightarrow (\ )_{27}$

  $5\ 25\ 16\ 1 \cdot 16 \longrightarrow (525\ 161.16)_{27}$

Base 4 — Base 16

0 to 3

$(32120321.32102)_4$ — $(\quad)_{16}$

3 9 8 7 9 . 7 9 2 — $(39879.792)_{16}$

- $\frac{66}{6} = 11$ is true in which base?

$$\frac{(66)_x}{(6)_x} = (11)_x$$

$$\frac{6x+6}{6} = x+1 = 6x+6 = 6x+6$$

True in every base ≥ 7

Q Roots of $x^2 - 11x + 22 = 0$ are 3 & 6 in which base?

Let base y

$(1)_y = (1)_{10}$ $\left\{ \begin{array}{l} 1 \times x^2 - 11 * x + 22 = 0 \\ 1 \times x^2 - (y+1) * x + (2y+2) \end{array} \right.$

Convert this in base 10

Sum of root $= -\frac{b}{a}$

$(3)_y + (6)_y = y+1$

$3+6 = y+1 \Rightarrow y = 8$

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Base x to y Conversion

Base 8 → 0 to 7 digits

- $(765204)_8 \rightarrow (\quad)_2$
  - write three bit binary for every digit cuz = $2^3 = 8$

7 6 5 1 2 0 4

$(111\,110\,101\,001\,010\,000\,100)_2$ Ans

- $(751\,2 \cdot 142)_8$

$(111101001010 \cdot 001100010)_2$

- $(\quad)_{16}$ to $(\quad)_2$

$(AB12FC3)_{16}$ — $2^4 = 16$ 4 bit binary

$(1010101100010010111111000011)_2$

Base 9 → 0 to 8

$(876102.15)_9$ — $(\quad)_3$

for each base 9 bit write 2 digit base 3

- Assume 9 is in decimal

$(876102.15)_9$

$(2221201100002.0112)_3$

3	5
3	1 ... 2
	0 ... 1

Tip: write remainder first then quotient from right to left

- $(8176253.865)_9$ — $(\ )_3$

$(2201212002121 0.222012)_3$

- $(24225.15)_{27}$ — ~~(3)~~ $(\ )_3$

$(220211221.120)_3$

$(1820226.1915)_{27}$

$(200202211222201120)_3$

Tip: ~~write~~ divide the number with 3 then write its remainder the do the same thing as above.

for ex: 3 | 15 / 5 ... 0

then:

3	5
3	1 ... 2
	0 ... 1

$(AB105.2A)_{16}$ — $(\quad)_4$

$(22\,2\,33\,0\,10\,0\,110.0222)$ of base x

Rule: . Assume every ~~didi~~ digit ^ to be decimal and Convert ~~it~~ into base x

- $(786)_9 \longrightarrow (\quad)_{27}$

  $(\quad)_3$

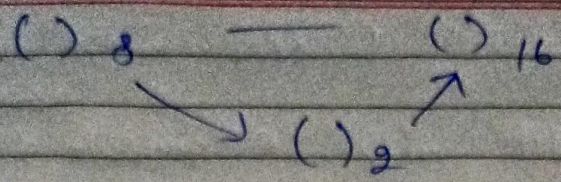
  $(786)_9$

  $(21\,22\,20)_3$

  $(23\,24)_{27}$ Ans

- $(7812346)_{27} \longrightarrow (\quad)_7$

  $(\quad)_3$



$(765104)_8$

- $5 * 512 + 3 * 64 + 7 * 8 * 2$ How many 1's in binary eq of no.

$5 \times 8^3 + 3 * 8^2 + 7 \times 8^1 * 2 \times 8^0$

~~5378~~ $(5372)_8$

$(101\,011\,111\,010)_2 = 8$ Ans

- $7 \times 729 + 6 * 81 + 3 \times 9 + 5$ How many 2's in Converted no in base 3

$7 \times 9^3 + 6 \times 9^2 + 3 \times 9^1 + 5 \times 9^0$

$(7635)_9$

$(21201012)_3 = 3$ Ans