Solution to Hands-on Problems

L #1 Review Questions (True/False)

- __T___ The name of the first general-purpose electronic digital computer is ENIAC
- __F___ IBM (→ Intel) introduces the first microprocessor 4004
- __T__ Computers are made of hardware and software
- __T___ It's widely accepted to classify computers into generations based on the fundamental hardware technology employed (vacuum tubes → transistors → integrated circuits)
- __F___ The evolution of computers has been characterized by increasing processor speed, increasing (→ decreasing) component size, and increasing memory size.

Solution to Slide 11

- Specify the value of the digit 5 in the following decimal numbers:

the 5 in 25 = 5 x 10^0 = 5

the 5 in 51 = 5 x 10^1 = 50

the 5 in 4538 = 5 x 10^2 = 500

Solution to Slide 19

Decimal (base 10)	Binary (base 2)	Octal (base 8)	Hexadecimal (base 16)
……	……	……	……
15	1111	17	F
16	10000	20	10
17	10001	21	11
18	10010	22	12
19	10011	23	13
20	10100	24	14
21	10101	25	15
22	10110	26	16
23	10111	27	17
24	11000	30	18

Binary to Decimal Conversion (Solution to Examples on Slide 25)

$\mathbf{1001101_2}$ =

$= 1 \times 2^6 + 0 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$

$\mathbf{= 64 + 0 + 0 + 8 + 4 + 0 + 1}$

$= \mathbf{77_{10}}$

$\mathbf{1101.11_2}$ =

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

$\mathbf{= 8 + 4 + 0 + 1 + 1/2 + 1/4}$

$= \mathbf{13.75_{10}}$

Octal to Decimal Conversion (Solution to Examples on Slide 26)

$$\mathbf{173.25_8} = 1 \times 8^2 + 7 \times 8^1 + 3 \times 8^0 + 2 \times 8^{-1} + 5 \times 8^{-2}$$
$$= 1 \times 64 + 7 \times 8 + 3 \times 1 + 2/8 + 5/64$$
$$= 64 + 56 + 3 + 0.25 + 0.078125$$
$$= \mathbf{123.328125_{10}}$$

Hexadecimal to Decimal Conversion (Solution to Examples on Slide 27)

$$\mathbf{1AB.6_{16}} = 1 \times 16^2 + A \times 16^1 + B \times 16^0 + 6 \times 16^{-1}$$
$$= 1 \times 256 + 10 \times 16 + 11 \times 1 + 6 \times 16^{-1}$$
$$= 256 + 160 + 11 + 0.375$$
$$= \mathbf{427.375_{10}}$$

F A C E |$_{16}$ = ? |$_{10}$

| | | |

| | | `--- E x 16^0 = 14 x 1 = 14

| | `----- C x 16^1 = 12 x 16 = 192

| `------- A x 16^2 = 10 x 256 = 2560

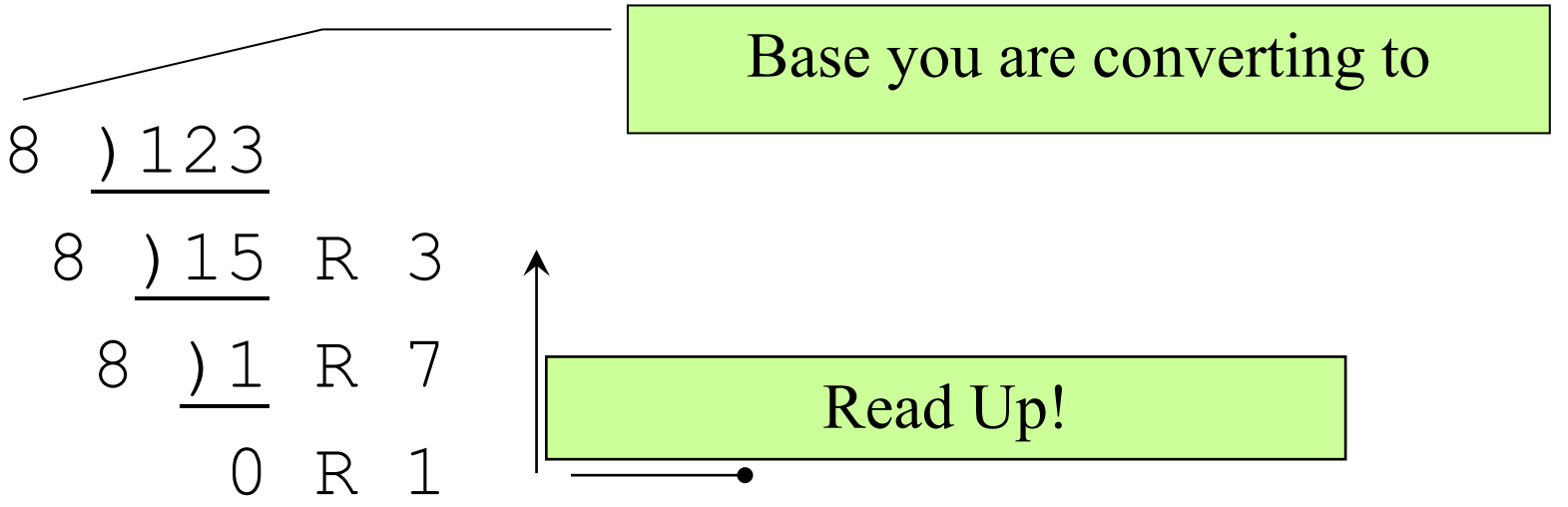
`--------- F x 16^3 = 15 x 4096 = 61440

64206

Therefore, **FACE|$_{16}$ = 64206|$_{10}$**

Decimal to Octal Conversion (Solution to Example on Slide 31)

Convert $123|_{10}$ to Base 8:



Therefore, $123|_{10} = 173|_{8}$

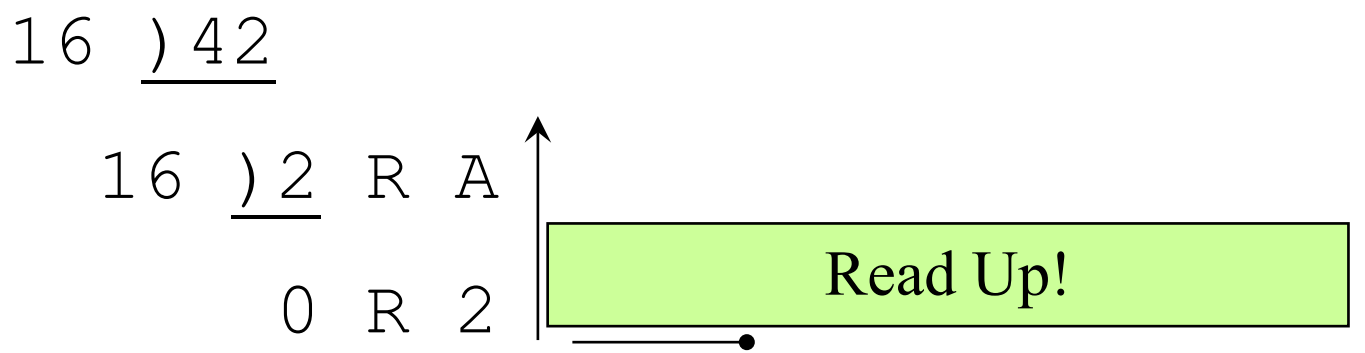
Decimal to Binary Conversion (Solution to example on Slide 32)

- Example: convert 42_{10} to Base 2

2^5	2^4	2^3	2^2	2^1	2^0
1	**0**	**1**	**0**	**1**	**0**

Decimal to Hexadecimal Conversion (Solution to example on Slide 33)

- Example: convert 42_{10} to Base 16



Therefore, $42|_{10} = 2A|_{16}$

Solution to Slide 44

- Convert 181_{10} to binary (10110101) and hex (B5)
- Convert $121F_{16}$ to decimal (4639_{10})
- Convert 010101011100_2 to hex ($2AC_{16}$)
- Convert $A17F_{16}$ to octal (120577_8)
- Convert 010101.011_2 to octal (25.3_8)

① $16\overline{)181}$ R 5 ; $16\overline{)11}$ R 11 ; 0

$181_{10} = B5_{16}$ (To Hex first)

$B5_{16} = 1011\,0101_2$ (Then Hex → Binary)

② $121F_{16} = 1\times16^3 + 2\times16^2 + 1\times16 + 15\times16^0$

$= 4639_{10}$

③ $0\,10\,10\,11\,00_2$

2 A C

④ $A17F_{16}$ → Binary → Octal

$10\,100\,010\,111\,111_2$

124577_8

⑤ $0\,10\,10.011_2$

25.3_8