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HW 2 part 2

⑥ microprocessor uses RAM chips of 1024×1 capacity.

⑦ How many chips needed? How should address lines be connected to provide mem. capacity of 1024 bytes

$$1024 \times 1$$

$$\hookrightarrow 1024 \text{ bytes} = 8 \times 1024 \times 1 \text{ bits RAM}$$

$$\hookrightarrow (8192) / 1024 = 8 \text{ chips}$$

All the same address lines

⑧ How many chips needed to provide mem. capacity of 16K bytes?

How should chips be connected to address Bus?

$$16K \text{ bytes} = 16 \times 1024 \times 8 \text{ bits RAM}$$

$$\hookrightarrow (131,072) / 1024 = 128 \text{ chips}$$

-16 groups of 8 chips, all have same address and chip select lines.

-first chip of each group of 8 corresponds to and is connected to the first bit of output. This repeats for each chip sequentially.

8)

a) 8 chips, the same address lines are connected to each.

b) 128 chips, 16 groups of 8, all have the same address and chip select lines, first chip of each group of 8 corresponds to and is connected to the first bit of output. This repeats for each chip sequentially.

⑨ One of the last minicomputers had a 12-bit address bus. What was the last address in the memory space? $2^7, 8^7, 10^7, 16^7$?

$$2^{12} = 4096 \text{ addresses}$$

$$()_2 = (1111\ 1111\ 1111)_2$$

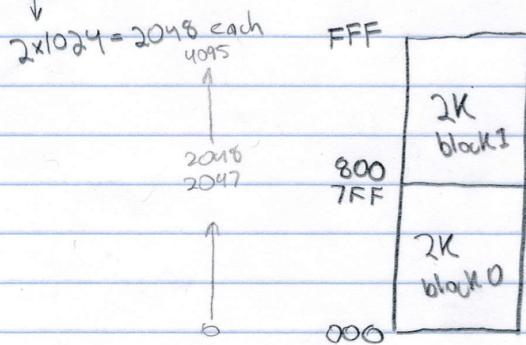
$$()_8 = (7777)_8$$

$$()_{10} = (4095)_{10}$$

$$()_{16} = (FFF)_{16}$$

9) 4096 addresses so the last address is 4095 in decimal, 7777 octal, (1111,1111,1111) in binary, and FFF in hex.

- ⑩ Draw mem. map of system w/ 12-bit address bus, dividing mem space into 2K blocks. Indicate HEX address of First + last add. in blocks.



10) diagram shown above

- ⑪ 68000 microprocessor has 24-bit address bus. Into how many 64K blocks can the 68000's mem. be divided?

$$2^{24} = 16,777,216 \text{ addresses}$$

$$64K = 1024 \times 64 = 65,536 \text{ bits}$$

$$16777216 / 65536 = 256 \text{ 64K blocks}$$

11) The 68000's memory space can be divided into 256 64K blocks.

- ⑫ What are the first and last addresses of the 1M block of mem at the top of the 68000's address space?

$$16777216 - 1 = (16777215)_{10} \rightarrow (FFFFF)_{16}$$

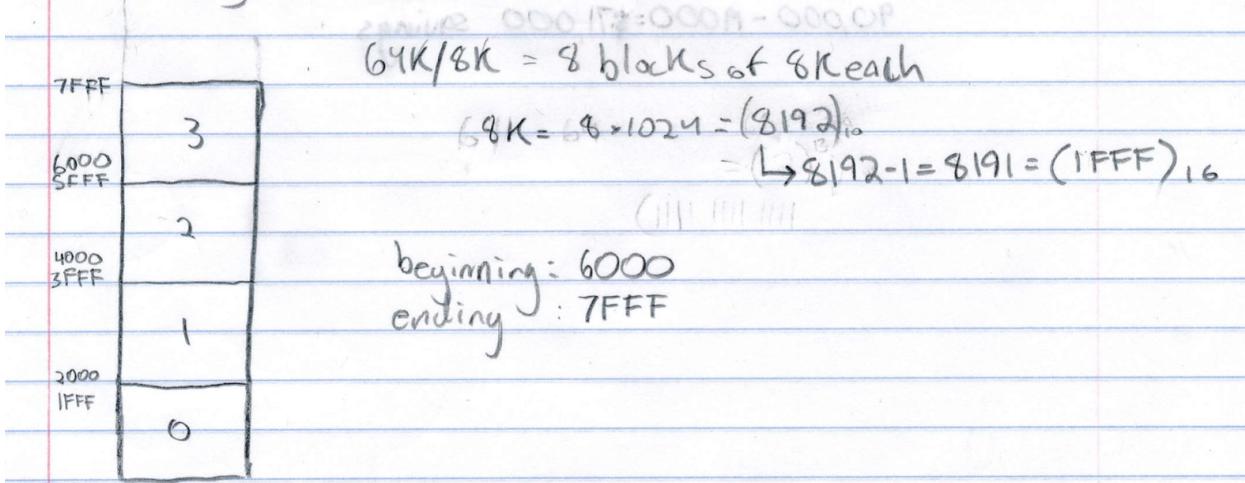
$$1M = 1024K$$

$$= 1024 \times 1024 = 1048576$$

$$16777215 - 1048576 = (15,728,639)_{10} \rightarrow (EFFFFF)_{16}$$

12) first: EFFFFF, last: FFFFFF, both base 16

- ⑬ If a 64K mem space is divided into 8K blocks what are the beginning and ending addresses of block #3?



13) beginning: 6000, ending: 7FFF, both base 16

- ⑭ A computer has a 4Meg address space. How many bits wide is the comp. address

$$\begin{aligned}
 4M &= 4 \times 1024K \\
 &= 4 \times 1024 \times 1024 = 4194304 \text{ addresses} = 2^{22} \\
 &\quad \downarrow \\
 &\quad 22 \text{ address bits}
 \end{aligned}$$

14) 22 bits wide

⑯ A pop. microcontroller is model setup each after setup

87S1 \$0 \$30

8051 \$10000 \$3

a) How many units to justify 8051 device?

$$y_{8051} = 3x + 10000$$

$$y_{87S1} = 30x$$

$$3x + 10000 = 30x$$

$$10000 = 27x$$

$$x = \frac{10000}{27} = 371 \text{ units}$$

371 or more units

b) $y_{8051} = 3(3000) + 10000 = 19000$

$$y_{87S1} = 30(3000) = 90,000$$

$$90,000 - 19000 = \$71,000 \text{ savings}$$

15) a) 371 units would justify the 8051 device

b) you would save \$71,000