

CSI 30 LECTURE NOTES (Ojakian)

Topic 9: Binary and Other Base Numbers

OUTLINE

(References: 4.2, 4.1 (part))

1. Binary and other base numbers
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1. Number Systems

- (a) Many number systems have base
- (b) Will see application of binary and hexadecimal to computer memory
- (c) Recall meaning of places in decimal

2. Quotient and Remainder (4.1)

- (a) Division Algorithm (Theorem 2, Section 4.1 p. 253)
 - i. Quotient and Remainder
 - ii. Examples (include negative ones like example 4)
- (b) Quotient: use “div” (like Python)
- (c) Remainder: use “%” (like Python). Book uses: “mod” (confusing with other use of mod). Other books: “rem”
- (d) Examples:

3. Binary Numbers

- (a) Convert Binary to Decimal
- (b) Convert Decimal to Binary
 - i. Divide N by 2 and record the remainder
 - ii. Make the quotient the “new N ” and repeat the division by 2
 - iii. Stop when the quotient = 0

4. Any Base Numbers

Choose base as integer that is 2 or larger.

- (a) Convert Base b to Decimal (like above for binary, but powers of b)
- (b) Convert Decimal to Base b (like above for binary but divide by b)

5. Adding Any Base Numbers

- (a) Recall for decimal.
- (b) Do the same for other bases.

6. Applications: Computer memory

- (a) A byte in memory takes up 8 bits.
- (b) Each byte has an address: just a number, often in hex.
- (c) Byte addresses are arranged contiguously.
- (d) Exercises
 - i. Some data's address is *30A1* in Hex. What is the address in binary?
 - ii. Some byte is at address *E0A8*. What is the address of the next byte? What is the address of the byte after that?
 - iii. Some data spans 4 bytes of memory (an "int"), starting at address *F14AE*. What are the addresses of the 4 bytes occupied by this data?
 - iv. Some data spans 8 bytes of memory (a "double"), starting at address *10FD*. What is the last address for this data?

7. Exercises

Section 4.1: 13, 14

Section 4.2: 1 - 4, 7 - 12,

Section 4.2: 21 - 24 (just do sums)