

1. Bits, bytes, and ints
  2. (continued) Mechanics and admin
  3. Crash course of computer organization
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• bit: 0 - 1

2 bit, # patterns?  $\square \square^4$

0	0
0	1
1	0
1	1

3 bit  $2 \times 4 = 8$

0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1

Q: n bit?

$2^n$

4-bit  $2 \times 8 = 16$

0	3 bits
⋮	
1	
0	

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

$\nearrow$  09/12 or 13       $\updownarrow$  10/24

• Ternary machine

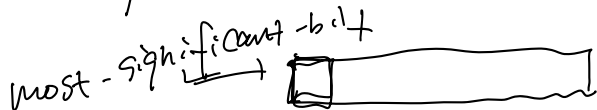
• bytes = 8 bits

$2^8 = 256$

$00 \dots 00 \Rightarrow 0$   
 $0 \dots 01 \Rightarrow 1$   
 $\vdots$   
 $1 \dots 1 \Rightarrow 2^8 - 1 = 255$

unsigned int  $\Rightarrow$  "non-negative"

• signed int: -1 (+1)



$\begin{cases} 0 : 0 + \text{positive} \\ 1 : \text{negative} \end{cases}$

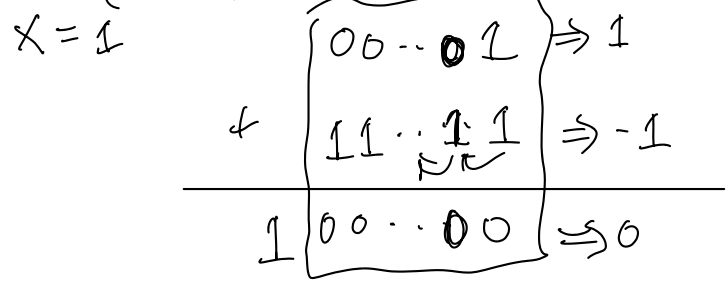
Q: (A)  $V_1 > V_2$   
 (B)  $V_1 < V_2$

increasing  $\left\{ \begin{array}{l} 00 \dots 00 = 0 \\ 0 \dots 01 = 1 \\ \vdots \\ 0111 \dots 1 = 2^7 - 1 = 127 \end{array} \right.$

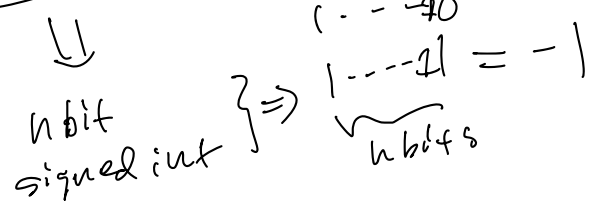
B.

increasing  $\left\{ \begin{array}{l} 2000 \dots 0 = -128 \\ \vdots \\ 1 \dots 1 = -1 \end{array} \right.$

$(-X) + (X) = 0$



Two's Complement



$2^{10} = 1024 \approx 10^3$  Kilo, KB


$2^{20} = (1024)^2 \approx 10^6$  Mega, MB


(DRAM) memory

$\Rightarrow 2^{30} = (1024)^3 \approx 10^9$  Giga, GB  $\rightarrow$  disk/SSD

$\Rightarrow 2^{40} = (1024)^4 \approx 10^{12}$  Tera, TB  $\rightarrow$  disk/SSD

$2^{50} = (1024)^5 \approx 10^{15}$  Peta, PB

 #bytes?  $10^{12}$  Bytes  $< 2^{40}$

 #bytes?  $2^{30}$  Bytes  $> 10^9$

• Labs

• Late submission 120hr  
 - 1% (50%)

• Lottery - 1 for final grade

• integrity policies

80+

$$\hookrightarrow \frac{10}{80} = 12.5\%$$

$$E = 24 * 12.5\% \ll 3$$

### 3. Crash Course

