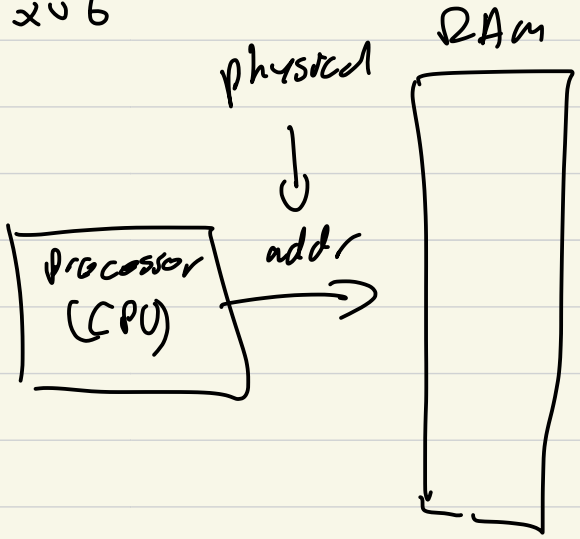
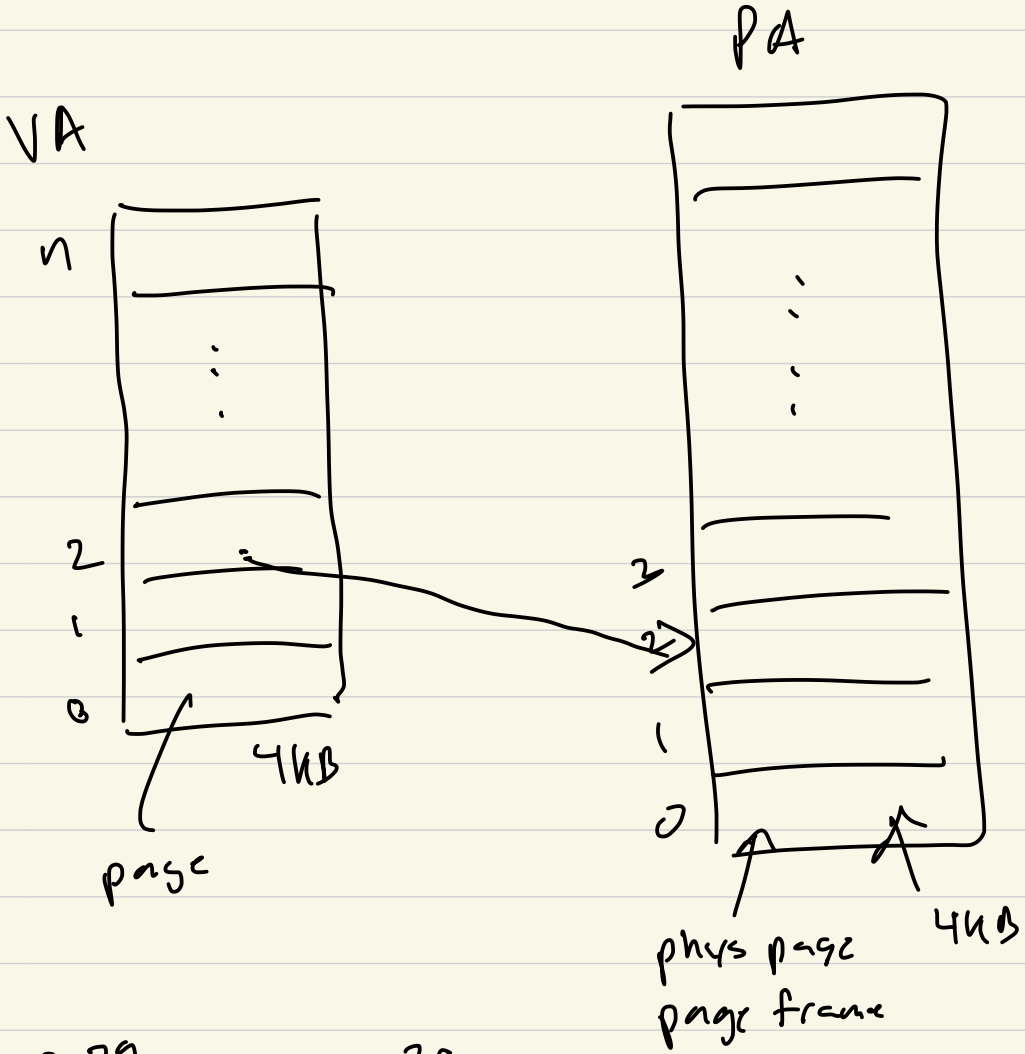
CS 326-02 Lab Page Tables in xv6

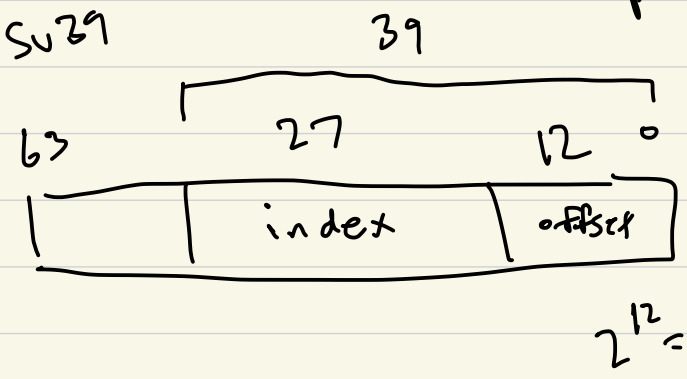
Goal: VA → PA

virtual address

physical address







$2^{12} = 4KB$

One large linear page table takes 1 GB RAM

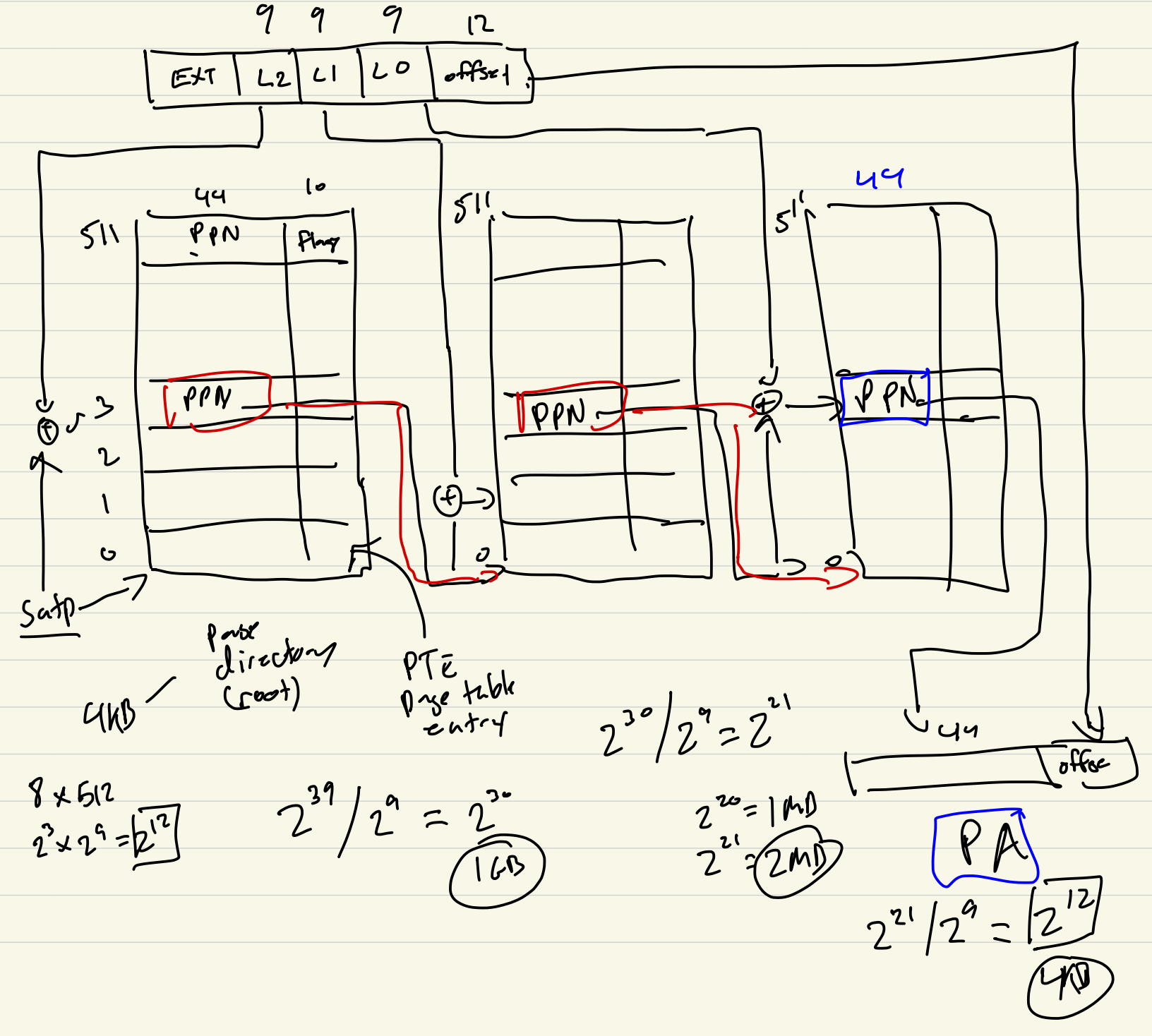
2^{27} pages

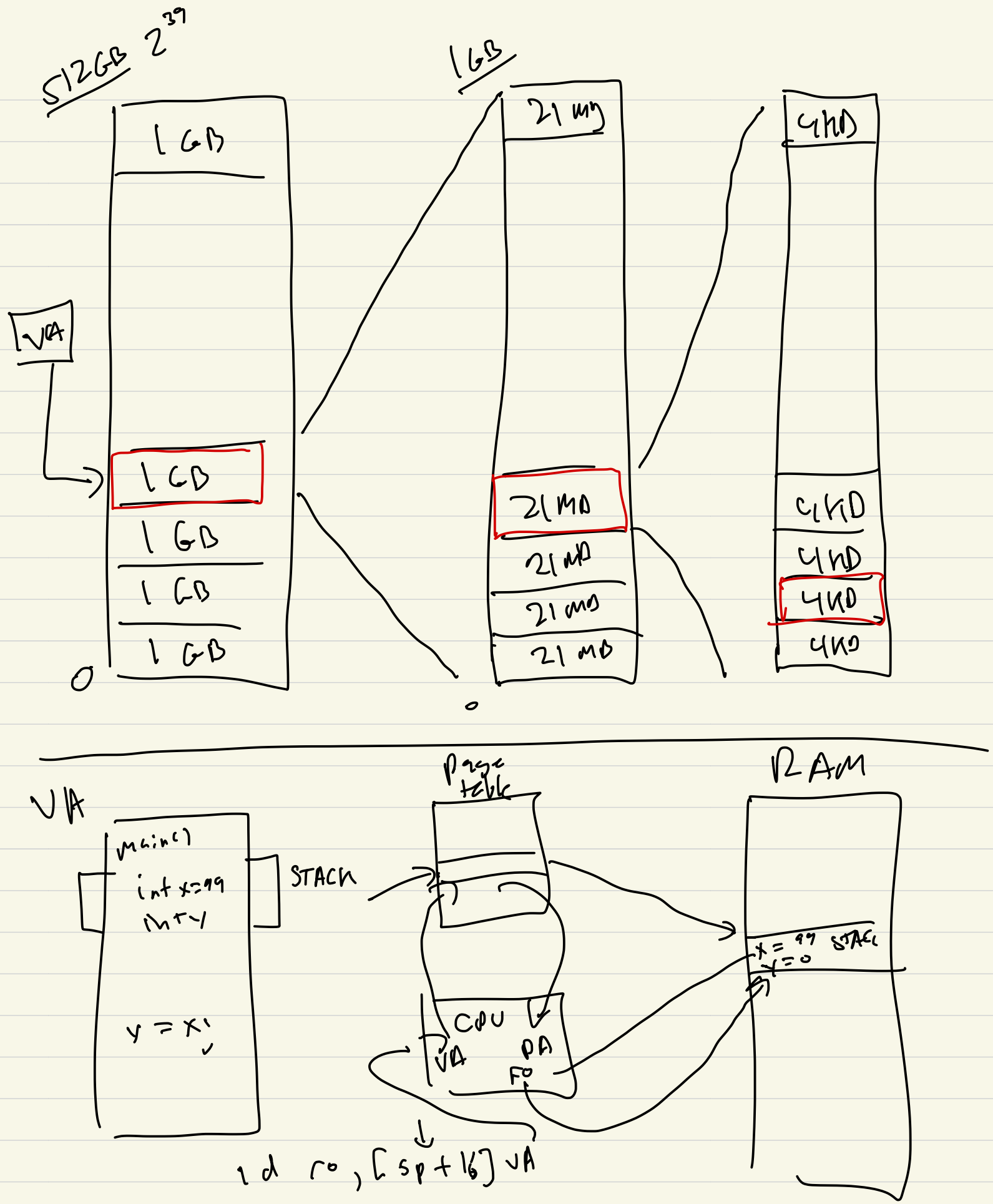
$2^{27} \times 2^{12} = 2^{39}$

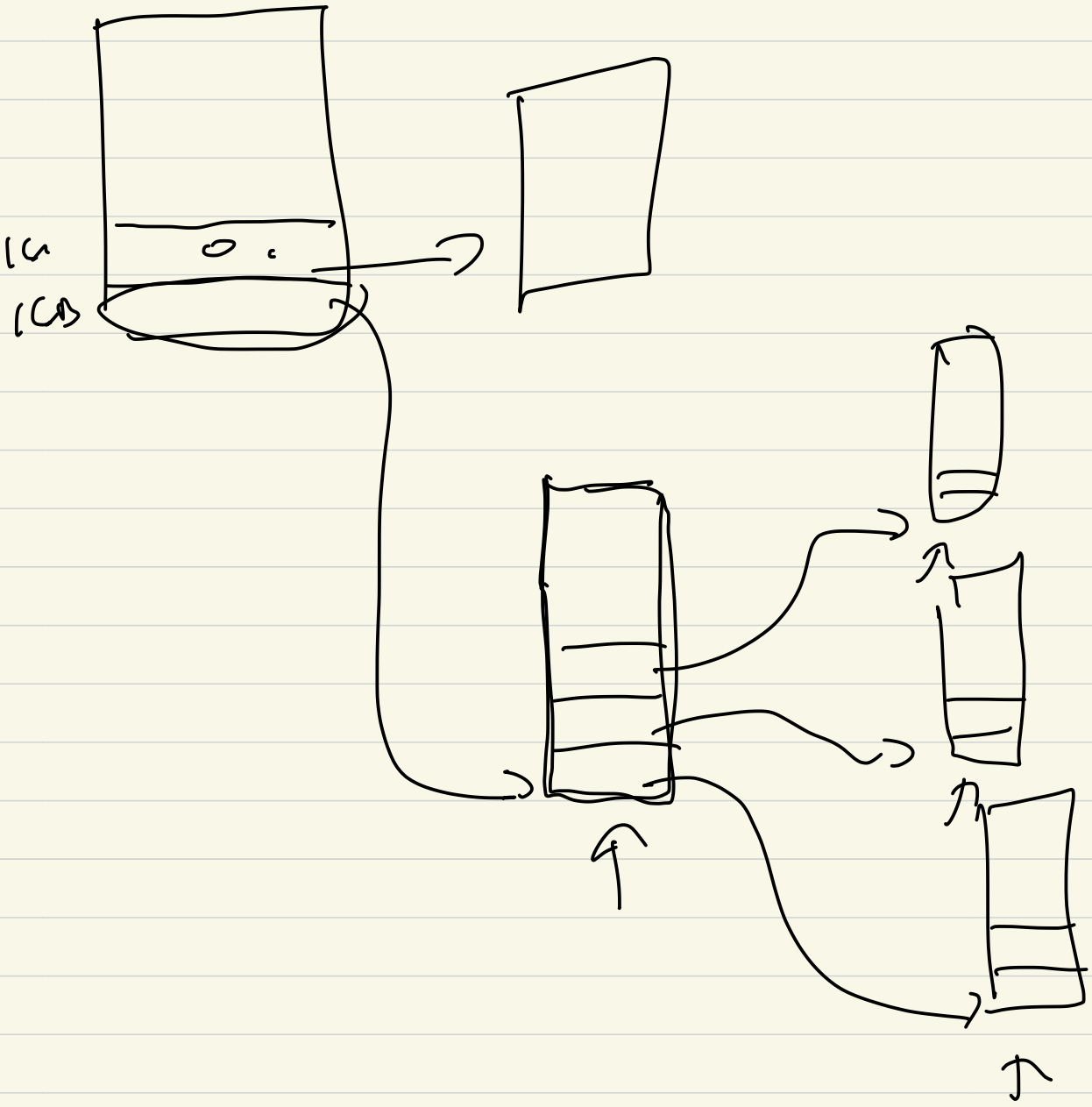
$2^{39} / 2^{30} = 2^9$ GB

(1GB) 512 GB

$\frac{2^{39} \text{ bytes}}{2^{30} \text{ bytes}}$ $\frac{213 \text{ cgs}}{12 \text{ cgs}}$




512GB 2^39
1GB
2MB
4KB
VA
1 GB
1 GB
1 GB
1 GB
0
2MB
2MB
2MB
2MB
0
4KB
4KB
4KB
4KB
4KB
VA
Page table
RAM
main()
int x=99
int y
STACK
y = x;
CPU
VA
PA
FO
x = 99
y = 0
STACK
ld r0, [sp+16] VA
sd r0, [sp+12] VA



Large linear page table is 1 GB

$$2^{12} + 512 \times 2^{12} + 512 \times 512 \times 2^{12}$$

$$2^{12} + 2^9 \times 2^{12} + 2^9 \times 2^9 \times 2^{12}$$

$$2^{12} + 2^{21} + 2^{30}$$

4KB + 2 MB + 1 GB