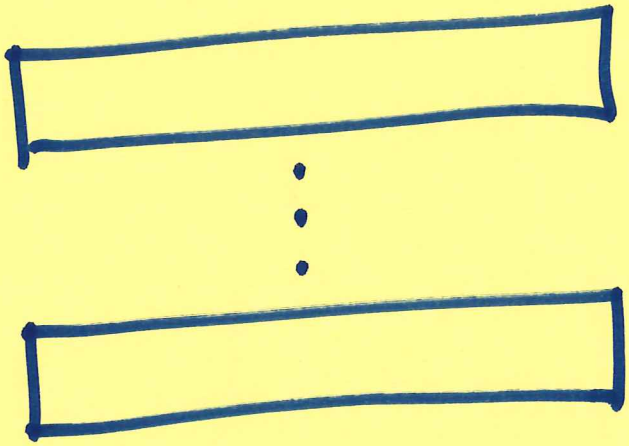
Lecture - 27
Associative Caches

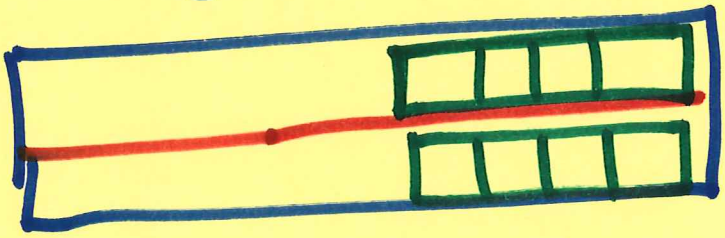
Review

1. Sets (S)



2. Cache Lines (E)

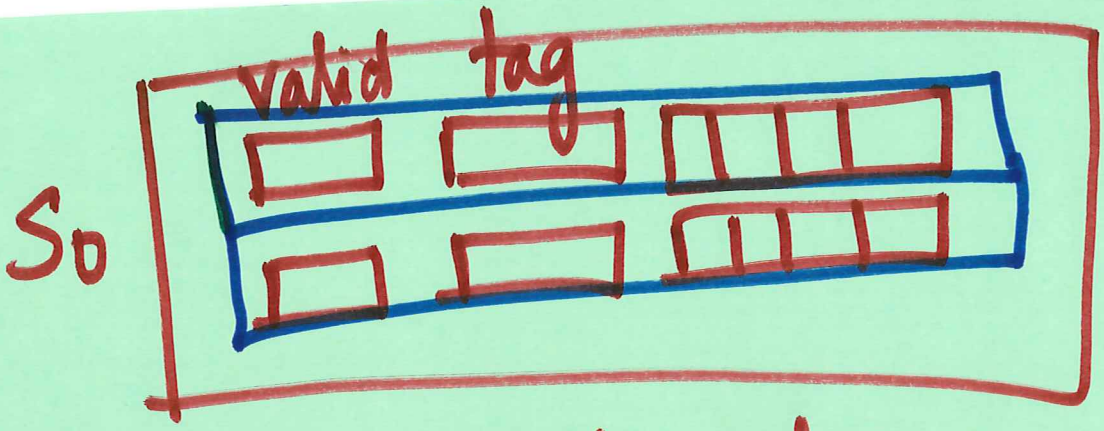
So



E = 2.

3. Cache block size (B).

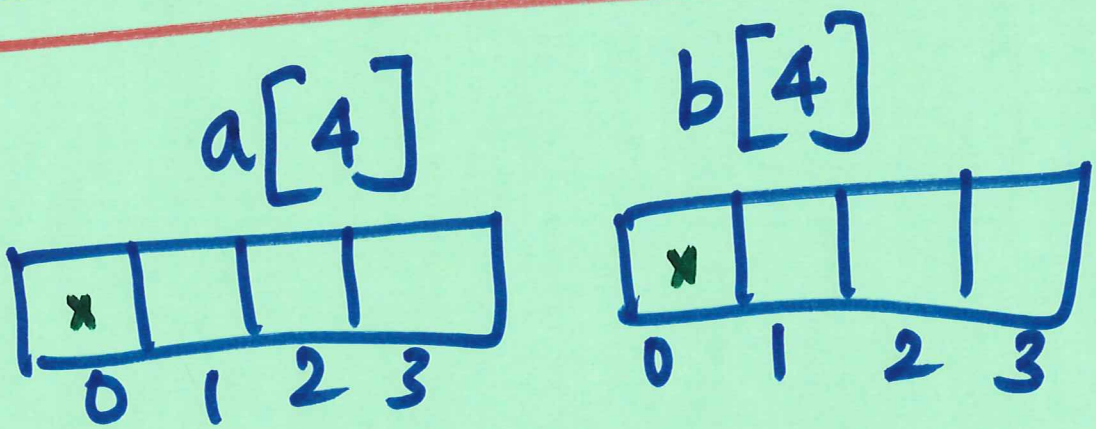
Cache size (C) = S × E × B



Direct mapped caches

E = 1

Issue

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for(i=0; i<4; i++)
    sum += a[i] * b[i];
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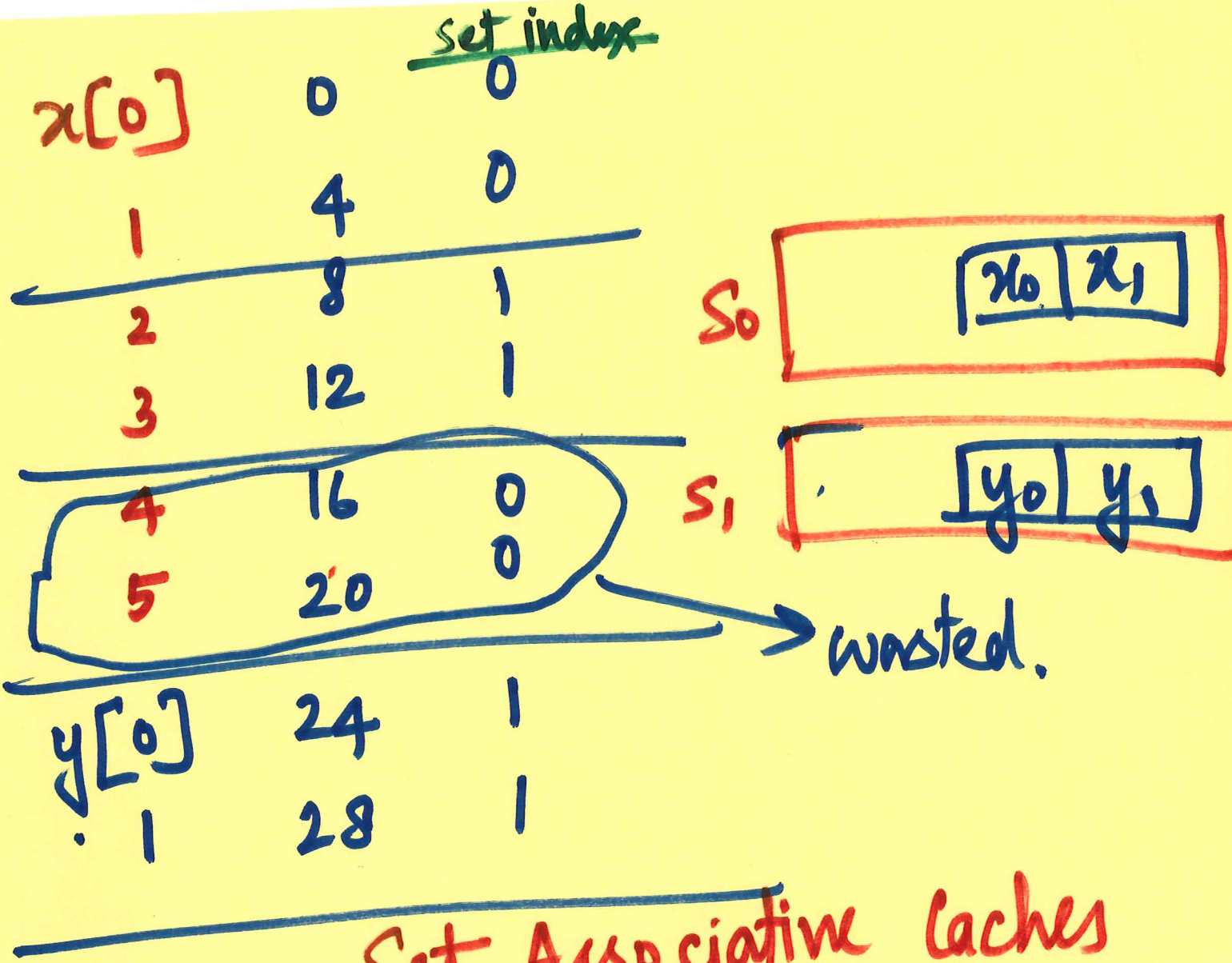
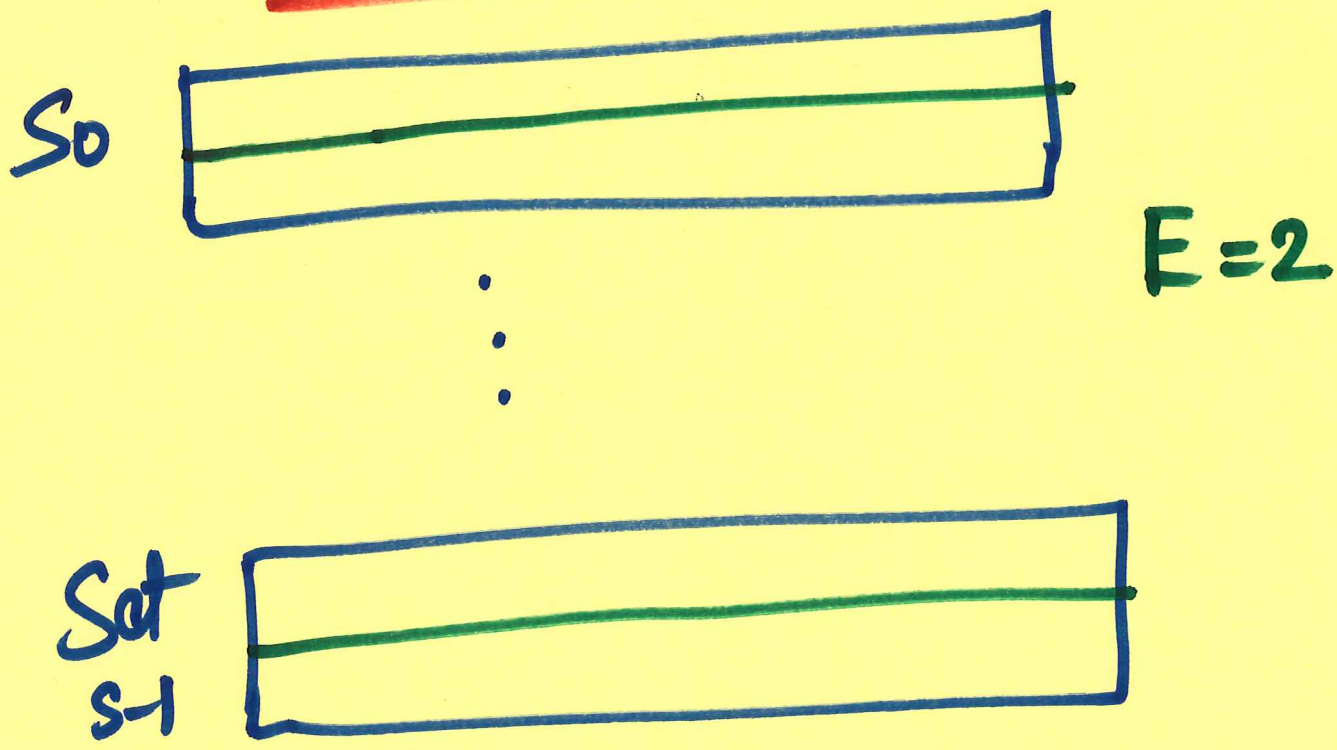


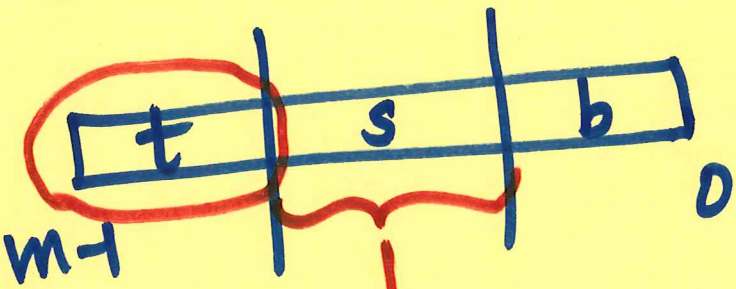
Set Associative Caches



$1 < E < \frac{C}{B}$

1. set selection.

$\frac{C}{B} = \frac{S \times E \times B}{B}$



find the set.

$E < S \times E$

$\Rightarrow$ $S > 1$

2. Line matching and block selection.

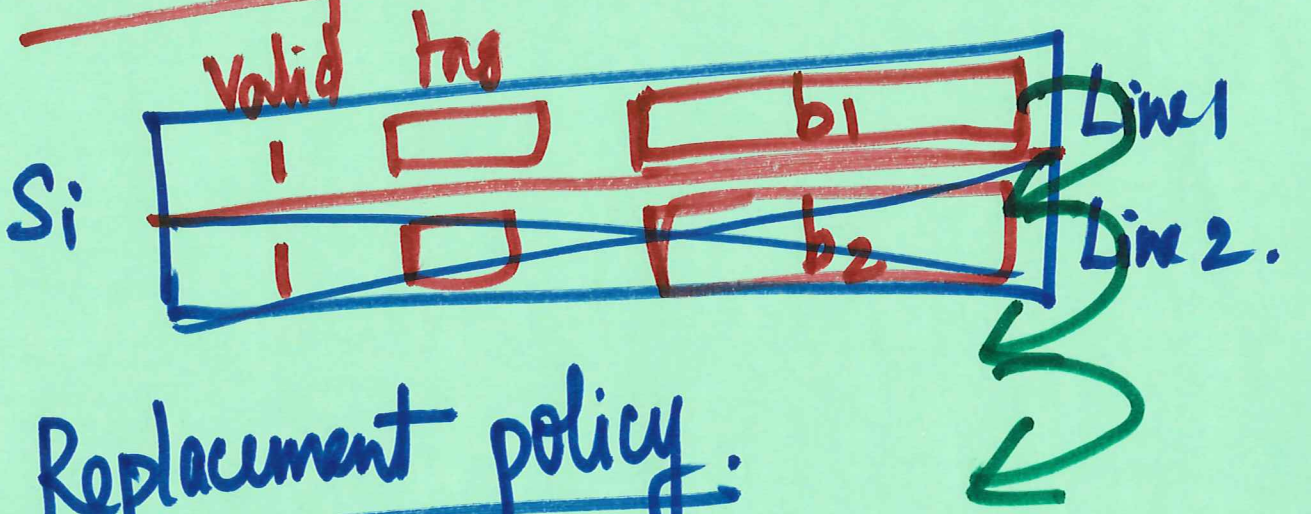
Si

selected set

1. search the tag. ✓

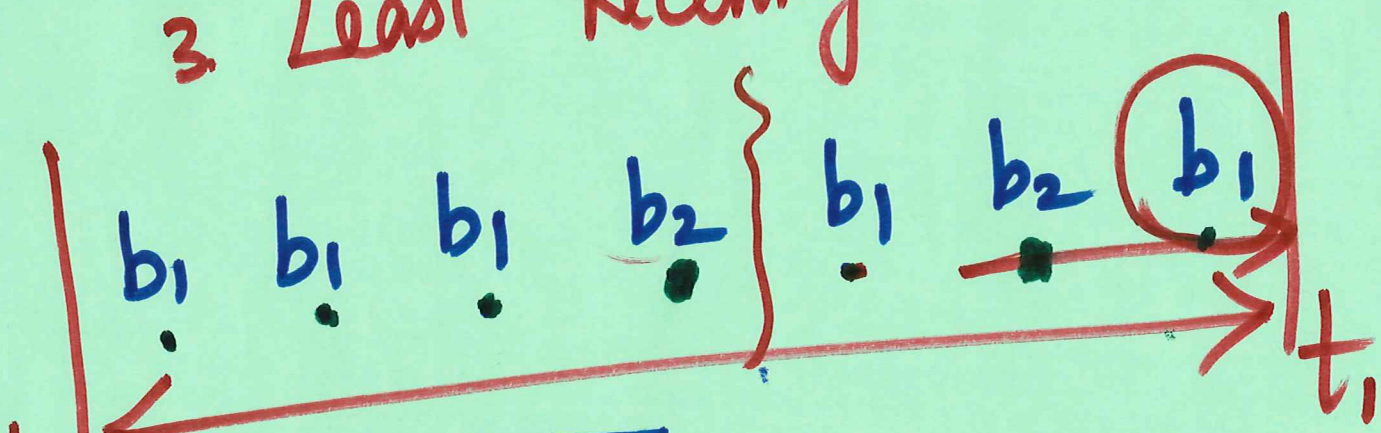
2. valid == 1 ✓

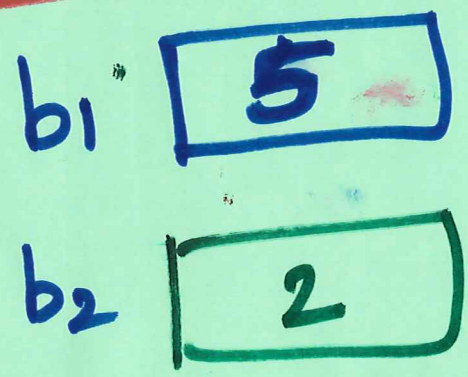
3. Line replacement on Misses

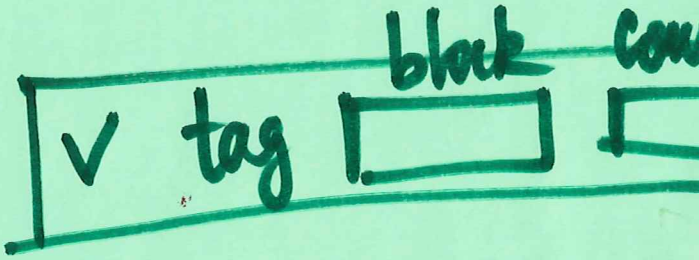


Replacement policy:

1. Random.
2. Least Freq. used.
3. Least Recently used.

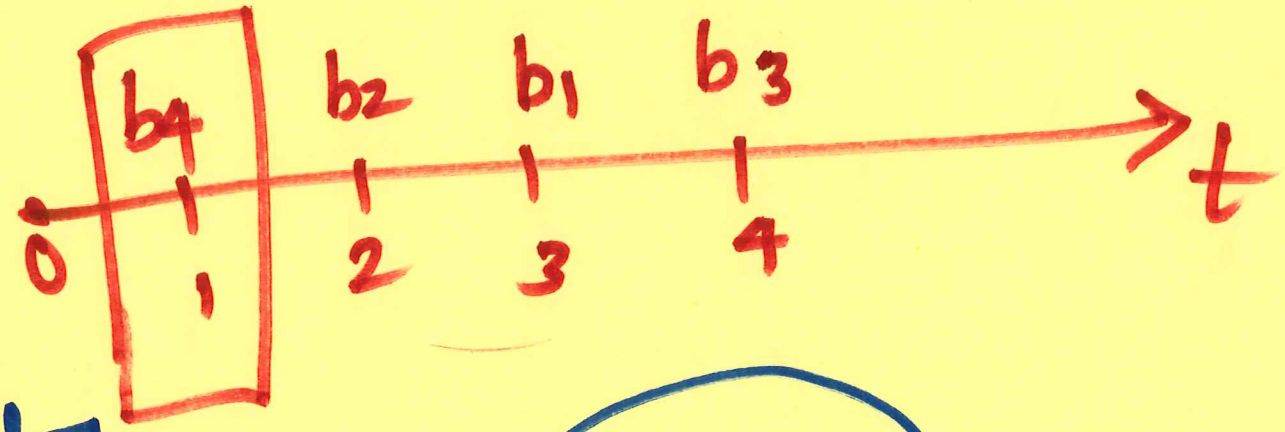


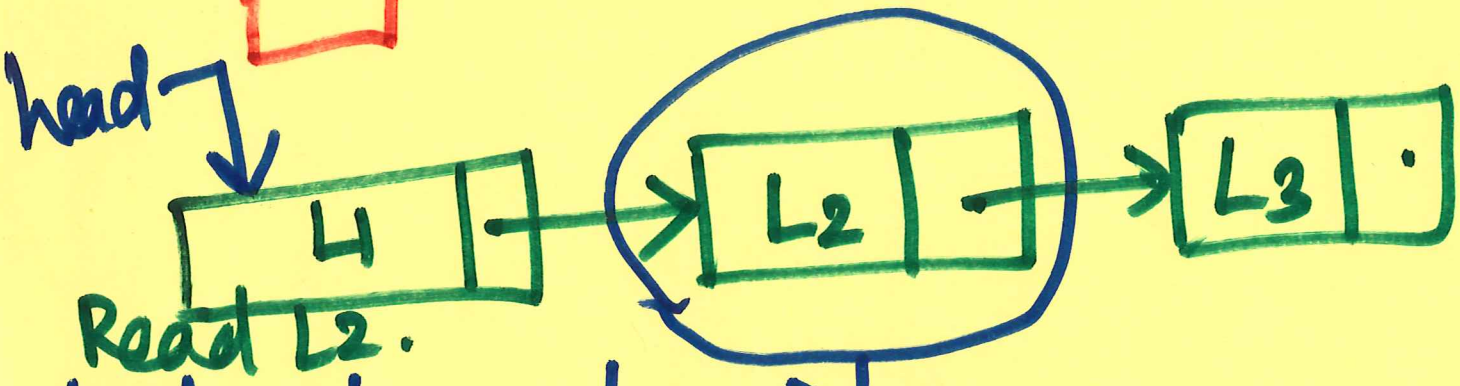




b_1 b_2 . . . b_1 . . . . b_2

	t
b_1	3
b_2	2
b_3	4
b_4	1





Read L2.

head → L2 → L1 → L3

Read L3

h → L3 → L2 → L1

$S = 1$

Fully Associative Cache

"small caches"