

HIT OR MISS?

$$67: (67 \text{ MOD } \underbrace{1K}_{\text{\# sets}}) / \underbrace{64}_{\substack{\text{Each} \\ \text{block} \\ 64B}} = \underbrace{1}_{\text{set 1}} \text{ R } \underbrace{3}_{\text{offset 3}} \quad \text{Miss; cold}$$

$$125: (125 \text{ MOD } 1K) / 64 = 1 \text{ Remainder } 61 \quad \text{HIT; way 0}$$

$$18: (18 \text{ MOD } 1K) / 64 = 0 \text{ R } 18 \quad \text{Miss; cold}$$

$$10: (10 \text{ MOD } 1K) / 64 = 0 \text{ R } 10 \quad \text{HIT; way 0}$$

$$64K + 67: (64K + 67 \text{ MOD } 1K) / 64 = 1 \text{ R } 3 \quad \begin{array}{l} \text{HIT, way 1} \\ \text{Miss; cold} \end{array}$$

$$128K + 67: (128K + 67 \text{ MOD } 1K) / 64 = 1 \text{ R } 3 \quad \begin{array}{l} \text{CONFLICT} \\ \text{Miss; CAPACITY} \\ \text{Both ways full} \end{array}$$

FIRST 3 blocks that map to set 2?

set 0: [0:63], [64K: 64K+63], [128K: 128K+63]

set 1: [64: 127]

set 2: [128: 191], [64K+128, 64K+191], [128K+128, 128K+191]

FIRST 3 blocks that map to set 7?

① 7 → binary: 0111

set: 000...0111

A) tag of 0th block that maps to set 7: 000...000

B) tag of 1st block: 000...001

C) tag of 2nd block: 000...010

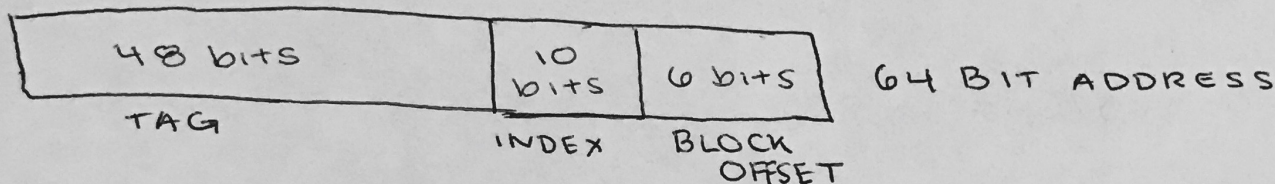
② tag + set: i.e. B) $\underbrace{000...001}_{\text{tag}} \underbrace{000...0111}_{\text{set}} = 1031$

A) 7th block → [384: 447]

B) 1031st block

C) 3079th block

- 64 bit address
- 128 kb cache (capacity)
- 2-way associative
- 64 B blocks



BLOCK OFFSET: blocks 64B so $\log_2 64 = 6$
 \rightarrow 6 bits to identify byte within block

SET INDEX: ① 2-way assoc. \rightarrow each set contains 2 cache blocks, so a set contains $64 + 64 = 128B$.
 ② 128KB in entire cache so $128KB / 128B = 1K$ sets

③ #sets: 1K
 $1K = 2^{10}$, so 10 bits to identify set field

TAG: 64 bit machine
 10 bit index
 6 bit offset
 $\left. \begin{array}{l} \end{array} \right\} 64 - 10 - 6 = 48 \text{ bits}$

