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How many bits make up the tag, set, and word of its virtual address:

(a) Cache: 1 MB 2-way S-A 256 lines

MM: 32-bit address 1 word/cell, 32 bits/word.

$2^{20}\frac{B}{C} \div 2^{8}\frac{L}{C} = 2^{12}\frac{B}{L} \div 2^{2}\frac{B}{W} = 2^{10}\frac{W}{L}$ $\quad 2^{2}\frac{B}{W} \div 2^{3}\frac{bits}{B}$ 32 bits

32 − 7 − 10 = 15	7	10
T	S	W

(b) Same question but 16-way S-A cache.

18	4	10
T	S	W

(c) What is the tag, set, word for cell # 000E 12A3? answer in base ten.

1110 0001 0010 1010 0011

Tag: 56 Set: 4 Word: 675

A word-addressable computer has a cache capable of holding eight 16-bit words. Each cache line holds one 16-bit word. An executing program reads data in three passes from a set of address sequences as follows (note: the main-memory addresses in each pass are in base ten).

Pass 1: 0, 1, 2, 3, 4, 5, 6, 7, 8

Pass 2: 16, 2, 1, 64, 300, 6, 7, 5, 11

Pass 3: 5, 64, 300, 0, 1, 2, 17, 1, 12

Show the contents (in tabular form) of cache at the end of each pass if a direct-mapped cache is used. Calculate the hit rate for this example. Assume that the cache is initially empty.

Pass 1 – 0, 1, 2, 3, 4, 5, 6, 7, 8
2 – 16, 2, 1, 64, 300, 6, 7, 5, 11
3 – 5, 64, 300, 0, 1, 2, 17, 1, 12

line	Pass 1	Pass 2	Pass 3
0	~~0~~ 8	~~8~~ ~~16~~ 64	~~64~~ ✓ 0
1	1	1 ✓	~~1~~ ✓ ~~17~~ 1
2	2	2 ✓	2 ✓
3	3	~~3~~ 11	11
4	4	~~4~~ 300	~~300~~ ✓ 12
5	5	5 ✓	5 ✓
6	6	6 ✓	6
7	7	7 ✓	7

Hit rate:

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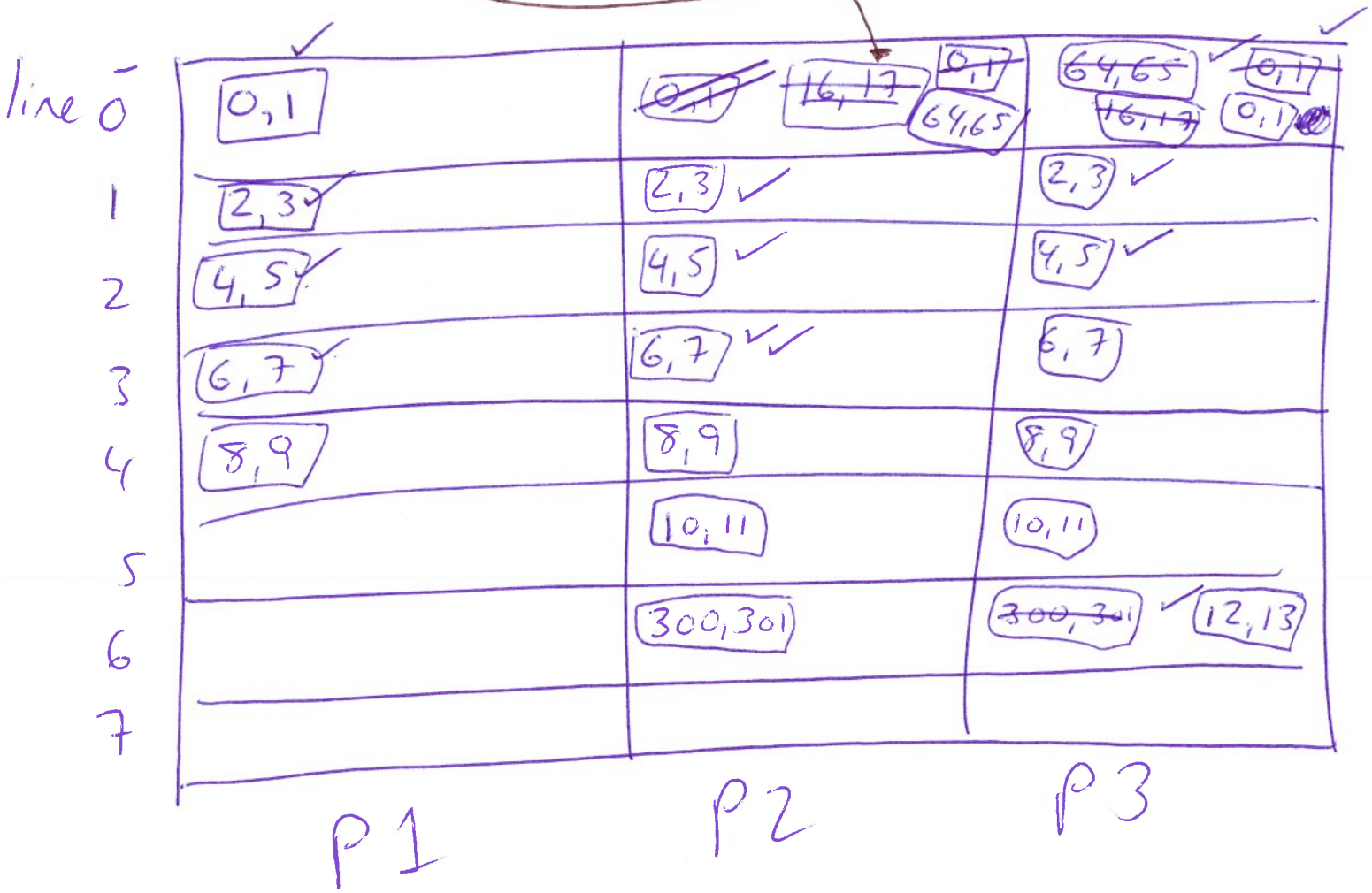
Same question; ~~Always 8 words/line~~ 2 words/line

Pass 1 - ~~0, 1, 2, 3,~~ 4, 5, 6, 7, 8
2 - 16, 2, 1, 64, 300, 6, 7, 5, 11
3 - 5, 64, 300, 0, 1, 2, 17, 1, 12



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