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Assignment 8

1- Given a series of references in word addresses: 5,1,4,8,17,20,11,9,4,5,6,17,9

a. Show the hits and misses and final cache contents for a direct mapped cache with a total of 8 one-word blocks. Initially the cache is empty.

0	8
1	1/17/9/17/9
2	
3	11
4	4/20/4
5	5
6	6
7	

Refs =13,
Misses=12,
Hits =1.

b. Show the hits and misses and final cache contents for a 2-way set associative cache with a total of 4 two-word blocks. Initially the cache is empty. Assume LRU replacement. 5,1,4,8,17,20,11,9,4,5,6,17,9

0	4/20	8/4
1	5/17/5/9	1/9/17
2	6	
3	11	

Refs =13,
Misses=13,
Hits =0.

c. Suppose we have the following address sequence is required for a program: 2,3,5,2,3,4,2,3,5,2,3,5,4,2,4,5,6,3,2,1. The cache is 3 blocks with LRU placement policy. What is the hit ratio? IT IS FULLY associative.

0	2/4/5/2
1	3/2/6/1
2	5/4/5/4/3

Refs =20,
Misses=13,
Hits =7.

2- For an address structure, that has 16 MB memory size, 4 MB cache size, and 32 Block size, what is the address for the fully associative methodology, direct mapped, and set associative (set size is 2 blocks)

a. Direct mapped:

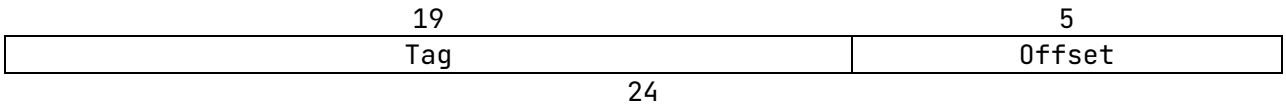
Memory size = 16 MB = 2^24 bits
Cache size = 4 MB = 2^22 bits
Block size = 32 B = 2^5 bits
Number of blocks = 2^22/2^5 = 2^17
Tag bits = 24-17-5 = 12 bits

12	17	5
Tag	Index	Offset
	24	

b. Fully associative:

Memory size = 16 MB = 2^24 bits

Block size = 32 B = 2^5 bits
Tag bits = 24-5 = 19 bits



c. Set associative:

Memory size = 16 MB = 2^24 bits
Cache size = 4 MB = 2^22 bits
Block size = 32 B = 2^5 bits
Set size = 2 * 2^5 = 2^6 bits
Number of sets = 2^22/2^6 = 2^16 bits
Tag bits = 24-16-5 = 13 bits