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HW #3

1)

2^N = Bytes of $ blk -> offset = N
2^M = total $ size /(# ways * & blk size) -> index = M
Tag = 32 - N - M

A)

Field	Size (bits)
Offset	6 bits
Index	12 bits
Tag	14 bits

B)

Field	Size (bits)
Offset	6 bits
Index	0 bits
Tag	26 bits

C)

Field	Size (bits)
Offset	6 bits
Index	10 bits
Tag	16 bits

2)

1) Calculate M & N based on cache architecture
2) Convert address to binary numbers (hex -> binary)
3) map/locate data based on architecture

A)

Direct Mapped
8 Sets
$ blk size 16 B

N = 4
M = 3

offset is right most 4 bits
index is 3 bits to the left of offset
tag is left most 5 bits

Address	Instruction	Iteration 1	Iteration 2
	loop:		
0x108->0001 0000 1000	addiu r1, r1, -1	Compulsory	
0x11c->0001 0001 1100	addiu r2, r2, 1	Compulsory	conflict
0x110->0001 0001 0000	j foo		
	...		
	foo:		
0x218->0010 0001 1000	addiu r6, r6, 1	Conflict	Conflict
0x21c->0010 0001 1100	bne r1, r0, loop		

1) Conflict
2) Compulsory
3) Capacity

B)

Miss Rate = (3 + 31*2) / (32*5) = 65/160 = .40625

Time = IC*CPI*CycleTime
=(32*5) * (.40625*6) * 1/3
= 130

3) A)

Computer A: Time = IC*CPI*CycleTime
= 1.5 * 1 * ⅓
= .5

Computer B: Time = IC*CPI*CycleTime
= 1 * 2 * ¼
= .5

Speedup:
.5/.5 = 1
(1 - 1) * 100 = 0%
Both computer A and B are equivalent therefore the speedup is 1 or 0%.

B)

Computer A: CPI = 1 + .03(15+.03(250)) + .3(.09)(15+.03(250))
= 1 + .675 + .6075
= 2.2825
Time = 2.2825 * 1.5 * ⅓
= 1.141
Computer B: CPI = 2 + .02(12+.04(300)) + .3(.05)(12+.04(300))
= 2 + .48 + .36
= 2.84
Time = 2.84 * 1 * ¼
= .71
Speedup:
1.141/.71 = 1.607
(1.607 - 1) * 100 = 60.7%

Computer B is faster by 60.7%