



HOMEWORK 1

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FEBRUARY 10, 2017

CS 484

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1. a. $(L+1) * N < C < 2 * N^2$

For this scenario A will miss 1x and then hit (L-1) times each iteration. This happens before becoming part of the LRU line and getting kicked out of the cache. For B it will miss L number of times consecutively, but due to the access pattern it will only be the LRU line after L-1 access. This will add up to a total of $2N/L$ of misses

b. This cache will hold $N/2$ integers from A and then $L*N / 2$ integers will be from B. A will miss N/L times and B will always miss N number of times in the inner loop iteration. This will end up having a total number of $N^2/L + N^2$ misses.

```
2. for(int i = 0; i < N; i++){
    for(int j = 0; j < N; j += L){ //L = linesize
        A[ i ][ j ] += B[ i ][ j ] + C[ i ][ j ]
        A[ i ][ j+1 ] += B[ i ][ j+1 ] + C[ i ][ j+1 ]
        ...
        A[ i ][ j + L - 1 ] += B[ i ][ j + L - 1 ] + C[ i ][ j + L - 1 ]
    }
}
```

3. Answers below

a. Offset: 6, Index: 13, Physical Tag: 13, Virtual Tag: 21

b. Offset: 6, Index: 14, Physical Tag: 12, Virtual Tag: 20

c. Offset: 6, Index: 0, Physical Tag: 26, Virtual Tag: 34

d. $2^{40} / 2^{32} = 2^8 = 256$

e. The function of a TLB is to keep a cache of a program. What this does is that it stores recently visited locations in memory in a structure. So what the program will do is check to see if the location was looked at before and grab the information from there rather than having to traverse a page table, this ends up being very time consuming.

4. Code Balance: 1 store + 2 reads / 2 flops = 3/2

Peak Performance: $B_m/B_c = 0.3 / 1.5 = 0.2$

5. $A[0] = 0$

$A[1] = 1 / c$

$A[2] = 4$

$A[3] = 3$