Testing guide for PA2

The testing procedure of this programming assignment makes sure that your program is working correctly. In the grading process we will evaluate with the following two steps:

Step 1: We are going to test with the following example to verify that your code is working (taken from the exam of previous year). Your solution should give the same result as below:

Suppose that there are a series of address references given as word addresses: 0, 3, 11, 16, 21, 11, 16, 48, 16.

a) Show the hits and misses and final cache contents for a direct-mapped cache with one-word blocks and a total size of 16 words.
b) Show the hits and misses and final cache contents for a two-way set-associative cache and a total size of 16 words. Assume LRU replacement. (Hint: there is a total of eight sets in this case)

Solution:

PART a:

Here is the hit and miss history for the memory accesses:

(Summary: the second 11 and the second 16 are hits, all others are misses)

0 (miss), 3 (miss), 11 (miss), 16 (miss), 21 (miss), 11 (hit), 16 (hit), 48 (miss), 16 (miss)

Contents in the cache at the end, in the format of (address: content):

0:16, 3:3, 5:21, 11:11

PART b:

The second 11, the second and the third 16 are hits, all others are misses.

0 (miss), 3 (miss), 11 (miss), 16 (miss), 21 (miss), 11 (hit), 16 (hit), 48 (miss), 16 (hit)

Set contents in the end:

Contents of cache blocks in the end															
Set 0	Set 0	Set 1	Set 1	Set 2	Set 2	Set 3	Set 3	Set 4	Set 4	Set 5	Set 5	Set 6	Set 6	Set 7	Set 7
48	16					3	11			21					

Step 2: We are going to test your program's robustness with large inputs, such as the address.txt we provided in the programming assignment. Depending on your configuration of your cache you will get different results. For example, with the block size as 16 words and with a total of 256 blocks, assume direct-mapped approach, then a program may print out the following:

```
Reads: 10000
Hits: 61
Misses: 9939
Hit Rate: 0.61%
Miss Rate: 99.39%
```

On the other hand, if we increase the block size to 256 words, with a total of 256 blocks, the result becomes:

```
Reads: 10000
Hits: 978
Misses: 9022
Hit Rate: 9.78%
Miss Rate: 90.22%
```

As observed, increase the number of block size and cache size helps reduce the cache miss rate.

Finally, to make it easier for the testing and grading, please make sure your program takes the following parameters:

- Options for command line arguments are: block size, number of lines (blocks), associativity, hit time, miss time, LRU, datafile name. Your program should make sure that
  associativity x number of sets = number of blocks
  Your program should also print out the calculated AMAT for the input file.