Cache performance analysis program

This program simulates the cache performance of the following cache configurations.

Configurations:

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1. Cache performance analysis on different block sizes (associativity is 1).
    a. Cache size: 1K, 4K, 16K, 64K, 256K and 512K.
    b. Block size: 16, 32, 64, 128 and 256 bytes.
2. Cache performance analysis on different set associativity (block size = 32).
    a. Cache size: 1,2,4,8,16,32,64,128 and 512K
    b. Associativity: 1-way, 2-way, 4-way and 8-way

Input

All possible combinations of the above design parameters (e.g., cache size, block size and set associativity).

Your program is will output performance measures of the given cache configurations.
The input for the simulation is provided in the text file named "cacheInput.txt". Input file contains all possible combinations of the above design parameter (e.g., cache size, block size and set associativity). The input file can be modified to simulate different sets for the configurations.

How to enter input in the cacheInput.txt

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1. Enter the number of instruction for which the simulator is supposed to generate the cache performance.
2. Enter all the cache sizes separated by comma without any space, for configuration 1 in first line of input file.
3. Enter all the block sizes separated by comma without any space, for configuration 1 in second line of input file.
4. Enter all the cache sizes separated by comma without any space, for configuration 2 in third line of input file.
5. Enter all the associativity separated by comma without any space, for configuration 2 in fourth line of input file.

Output

Output displayed in the following format:
Performance analysis on different block sizes:

```
Cache_Size x
            block_size a misstate i AMAT m
            block_size b misstate j AMAT n
```

```
            block_size c misstate k AMAT o
            block_size d misstate l AMAT p

Performance analysis on different set associativity:

Block_Size x
            cache_size a misstate i AMAT m
            cache_size b misstate j AMAT n
            cache_size c misstate k AMAT o
            cache_size d misstate l AMAT p
```

How to compile and execute the code in CSX server

```
To compile:
     javac cachePerformanceAnalysis.java

To execute:
     java cachePerformanceAnalysis

To modify the configuration provided in the input file:
     vim cacheInput.txt

(modify the content of the input file as per the guide lines
provide above. Save and exit the input file. Execute the code.)
```

Example of Input/Output:

Input

```
50000
1024,4096,16384,65536,262144,524288
16,32,64,128,256
1024,2048,4096,8192,16384,32768,65536,131072,524288
1,2,4,8
```

Output

```
--------------CONFIGURATION FOR CACHE ANALYSIS-----------------------------
Cache_Sizes for performance analysis on different block size: [1024, 4096, 16384, 65536, 262144, 524288]
Block_Sizes for performance analysis on different block size: [16, 32, 64, 128, 256]
Cache_Sizes for performance analysis on different set associativities: [1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072, 524288]
Associativities for performance analysis on different set associativities: [1, 2, 4, 8]


--------------PERFORMANCE ANALYSIS ON DIFFERENT BLOCK SIZES----------------
Associativity = 1


Cache Size = 1024
--------------------------------------------------------------------------------
     Cache_Size = 16    Miss_Rate = 14.206   AMAT = 1.42618
     Cache_Size = 32    Miss_Rate = 11.468   AMAT = 1.45872
     Cache_Size = 64    Miss_Rate = 9.684    AMAT = 1.4842
     Cache_Size = 128   Miss_Rate = 8.6      AMAT = 1.516
     Cache_Size = 256   Miss_Rate = 7.98     AMAT = 1.5586


Cache Size = 4096
--------------------------------------------------------------------------------
     Cache_Size = 16    Miss_Rate = 13.798   AMAT = 1.41394
     Cache_Size = 32    Miss_Rate = 10.65    AMAT = 1.426
     Cache_Size = 64    Miss_Rate = 8.7      AMAT = 1.435
     Cache_Size = 128   Miss_Rate = 7.346    AMAT = 1.44076
     Cache_Size = 256   Miss_Rate = 5.76     AMAT = 1.4032
```

```
Cache Size = 16384
--------------------------------------------------------------------------------
      Cache_Size = 16   Miss_Rate = 14.034   AMAT = 1.42102
      Cache_Size = 32   Miss_Rate = 10.924   AMAT = 1.43696
      Cache_Size = 64   Miss_Rate = 8.446    AMAT = 1.4223
      Cache_Size = 128  Miss_Rate = 6.458    AMAT = 1.38748
      Cache_Size = 256  Miss_Rate = 4.534   AMAT = 1.31738

Cache Size = 65536
--------------------------------------------------------------------------------
      Cache_Size = 16    Miss_Rate = 13.806   AMAT = 1.41418
      Cache_Size = 32    Miss_Rate = 10.768   AMAT = 1.43072
      Cache_Size = 64    Miss_Rate = 8.228    AMAT = 1.4114
      Cache_Size = 128   Miss_Rate = 6.432    AMAT = 1.38592
      Cache_Size = 256   Miss_Rate = 4.258    AMAT = 1.29806

Cache Size = 262144
--------------------------------------------------------------------------------
      Cache_Size = 16    Miss_Rate = 14.168   AMAT = 1.42504
      Cache_Size = 32    Miss_Rate = 10.702   AMAT = 1.42808
      Cache_Size = 64    Miss_Rate = 8.456    AMAT = 1.4228
      Cache_Size = 128   Miss_Rate = 6.37     AMAT = 1.3822
      Cache_Size = 256   Miss_Rate = 4.76     AMAT = 1.3332

Cache Size = 524288
--------------------------------------------------------------------------------
      Cache_Size = 16    Miss_Rate = 13.702   AMAT = 1.41106
      Cache_Size = 32    Miss_Rate = 10.728   AMAT = 1.42912
      Cache_Size = 64    Miss_Rate = 8.116    AMAT = 1.4058
      Cache_Size = 128   Miss_Rate = 6.522    AMAT = 1.39132
      Cache_Size = 256   Miss_Rate = 4.102    AMAT = 1.28714

----------PERFORMANCE ANALYSIS ON DIFFERENT SET ASSOCIATIVITIES---------
Block_Size = 32

Associativity = 1
--------------------------------------------------------------------------------
      Cache_Size = 1024    Miss_Rate = 11.498   AMAT = 1.45992
      Cache_Size = 2048    Miss_Rate = 10.762   AMAT = 1.43048
```

```
      Cache_Size = 4096    Miss_Rate = 11.218   AMAT = 1.44872
      Cache_Size = 8192    Miss_Rate = 11.152   AMAT = 1.44608
      Cache_Size = 16384   Miss_Rate = 10.524   AMAT = 1.42096
      Cache_Size = 32768   Miss_Rate = 10.518   AMAT = 1.42072
      Cache_Size = 65536   Miss_Rate = 10.638   AMAT = 1.42552
      Cache_Size = 131072  Miss_Rate = 10.5     AMAT = 1.42
      Cache_Size = 524288  Miss_Rate = 10.554   AMAT = 1.42216

Associativity = 2
-------------------------------------------------------------------------
      Cache_Size = 1024     Miss_Rate = 8.714   AMAT = 1.34856
      Cache_Size = 2048     Miss_Rate = 8.526   AMAT = 1.34104
      Cache_Size = 4096     Miss_Rate = 8.136   AMAT = 1.32544
      Cache_Size = 8192     Miss_Rate = 8.088   AMAT = 1.32352
      Cache_Size = 16384    Miss_Rate = 8.146   AMAT = 1.32584
      Cache_Size = 32768    Miss_Rate = 7.894   AMAT = 1.31576
      Cache_Size = 65536    Miss_Rate = 7.776   AMAT = 1.31104
      Cache_Size = 131072   Miss_Rate = 7.662   AMAT = 1.30648
      Cache_Size = 524288   Miss_Rate = 7.718   AMAT = 1.30872

Associativity = 4
-------------------------------------------------------------------------
      Cache_Size = 1024     Miss_Rate = 8.15    AMAT = 1.326
      Cache_Size = 2048     Miss_Rate = 7.606   AMAT = 1.30424
      Cache_Size = 4096     Miss_Rate = 7.224   AMAT = 1.28896
      Cache_Size = 8192     Miss_Rate = 6.822   AMAT = 1.27288
      Cache_Size = 16384    Miss_Rate = 6.33    AMAT = 1.2532
      Cache_Size = 32768    Miss_Rate = 6.272   AMAT = 1.25088
      Cache_Size = 65536    Miss_Rate = 6.666   AMAT = 1.26664
      Cache_Size = 131072   Miss_Rate = 6.512   AMAT = 1.26048
      Cache_Size = 524288   Miss_Rate = 6.014   AMAT = 1.24056

Associativity = 8
-------------------------------------------------------------------------
      Cache_Size = 1024      Miss_Rate = 7.764   AMAT = 1.31056
      Cache_Size = 2048      Miss_Rate = 6.982   AMAT = 1.27928
      Cache_Size = 4096      Miss_Rate = 5.96    AMAT = 1.2384
      Cache_Size = 8192      Miss_Rate = 5.626   AMAT = 1.22504
      Cache_Size = 16384     Miss_Rate = 5.512   AMAT = 1.22048
      Cache_Size = 32768     Miss_Rate = 5.218   AMAT = 1.20872
```

```
Cache_Size = 65536     Miss_Rate = 4.822   AMAT = 1.19288
Cache_Size = 131072   Miss_Rate = 4.898    AMAT = 1.19592
Cache_Size = 524288   Miss_Rate = 4.836    AMAT = 1.19344
```