Quiz 4

A computer has a byte-addressable main memory size of 1 kbyte. It also has a 16-byte cache with 4-byte (32 bit) blocks.

1) Determine the following:
   a. Number of blocks in main memory: $2^{10} / 2^2 = 2^8 = 256$ blocks
   b. Number of blocks in the cache: 16 /4 = 4 blocks
   c. Number of bits required to address main memory: 2^{10} bytes → 10 bits

2) Determine the bit mappings (number of bits in the byte, block, set, tag fields) in the address if the cache is organized as follows:

   a. Direct-mapped cache

Tag	Block	Byte
6	2	2

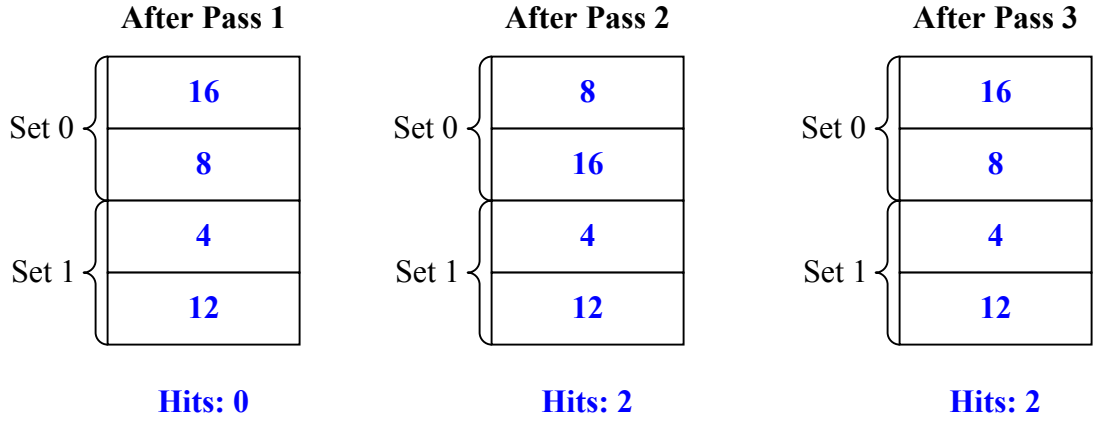
   b. Associative cache

Tag	Byte
8	2

   c. 2-way set-associative cache

Tag	Set	Byte
7	1	2

3) Assume the cache is organized as a 2-way set-associative cache and is initially empty. Suppose the processor fetches 5 words (each word is 32 bits) from locations 0, 4, 8, 12 and 16 in that order. It then repeats this sequence 2 more times (3 times total). What is the cache hit rate if the LRU (least recently used) replacement algorithm is used?



Hit rate: 4 / 15 = 0.267