Landon Leigh Homework 5

5.1.1) There can be 4 32-bit integers in a 16-byte cache line because 16*8 = 128 -> 128/32 = 4

5.1.2) Variables I and J and B[I][O] are used consistently so they exhibit temporal locality.

5.1.3) A[J][I] and A[I][J] change with J so it exhibits spatial locality.

5.2.1)

Reference	Binary Word Address	Tag	Index	Hit or Miss
0x03	00000011	0	3	Miss
0xb4	10110100	B	3	Miss
0x2b	00101011	2	B	Miss
0x02	00000010	0	2	Miss
0xbf	10111111	B	F	Miss
0x58	01011000	5	8	Miss
0xbe	10111110	B	E	Miss
0x0e	00001110	0	E	Miss
0xb5	10110101	B	5	Miss
0x2c	00101100	2	C	Miss
0xba	10111010	B	A	Miss
0xfd	11111101	F	D	Miss

5.2.2)

Reference	Binary Word Address	Tag	Index	Offset	Hit or Miss
0x03	00000011	0	1	1	Miss
0xb4	10110100	B	2	0	Miss

0x2b	00101011	2	5	1	Miss
0x02	00000010	0	1	0	Hit
0xbf	10111111	B	7	1	Miss
0x58	01011000	5	8	0	Miss
0xbe	10111110	B	E	0	Hit
0x0e	00001110	0	E	0	Miss
0xb5	10110101	B	5	1	Hit
0x2c	00101100	2	C	0	Miss
0xba	10111010	B	5	0	Miss
0xfd	11111101	F	6	1	Miss

5.3.1) The block size in words is 32 because 2^5 = 32

5.3.2) Cache has 32 entries because 2^5 = 32 with 5 blocks

5.3.3) 704 bits because 32*22 = 704

5.6.1) P1 = 1/0.66 = 1.515 GHz

P2 = 1/0.9 = 1.11 GHz

5.6.2) P1 = 0.66 + (0.08 * 70) = 6.26 ns

P2 = 0.9 + (0.06 * 70) = 5.1 ns

5.6.3) P1 = 1 + ((0.08 * 70) / 0.66) * 0.36 = 4.054 CPI

P2 = 1 + ((0.06 * 70) / 0.9) * 0.36 = 2.68 CPI

P2 is faster because it has less CPI

5.12.1) PTE's for a single level page table = 2^43/2^12 = 2^31 PTE's

2^33 bytes needed to store the page table because 2^31*2^2 = 2^33