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1.1
In x86-64,
PAGESIZE = 2^{12}B = 4096B
PAGESIZE = 4096 < map1_length = 5120 < 2*PAGESIZE = 2*4096 = 8192
map2_length = 4096 = PAGESIZE
map1 modifies 2 page table entries, map2 modifies 1 page table entry, so there are 3 level-4 page table entries involved in the 2 mmap() calls

1.2
2 physical pages are mapped into the process
The file descriptors used in the two mmap() calls are the same, so the two mmap() are using the same file, maximum bytes of the mapping the 5120 bytes, which is less than the length of 2*PAGESIZE

2.
Make the last allocated byte (the byte at the location of a + 99) to be the last byte of the allocated page, then set the present bit of the page after the byte to be 0, then a memory reference to a + 100 would generate a page-not-present fault