Quiz 4, CSCI 210, Spring 2004

Name: _____

1. [10 pts] Tests on an Intel Pentium III processor
    reveal that the performance of the code at right
    depends heavily on the value of `skip`.

skip	time
16,352	40 ms
16,384	480 ms

    Surprisingly, with a *larger* value of `skip`, for
    which the code will add *fewer* numbers, the code
    takes twelve times as long.

    Explain how the cache is making a difference
    here. (Recall that a Pentium III's L1 cache is 4-
    way set associative, with 512 lines, each of 32
    bytes. Note that the cache holds $512 \times 32 = 16,384$
    bytes.)

    ```
    int sum(char *arr, int skip) {
        int i, k, total;
        total = 0;
        for(k = 0; k < 4000; k++) {
            for(i = k; i < 4000000; i += skip) {
                total += arr[i];
            }
        }
        return total;
    }
    ```

2. [10 pts] Define the *relocation problem* that arises in the context of segments.

3. [10 pts] Describe the purpose of the *dirty bit* found in each page table entry in most virtual memory
    systems. How does the use of the dirty bit help the system's performance?