6. Constructing a Frequency Table

Write a procedure named Get\_frequenciesthat constructs a character frequency table. Input to

the procedure should be a pointer to a string and a pointer to an array of 256 doublewords initialized to all zeros. Each array position is indexed by its corresponding ASCII code. When the procedure returns, each entry in the array contains a count of how many times the corresponding

character occurred in the string. For example,

.data

target BYTE "AAEBDCFBBC",0

freqTable DWORD 256 DUP(0)

.code

INVOKE Get\_frequencies, ADDR target, ADDR freqTable

Figure 9–6 shows a picture of the string and entries 41 (hexadecimal) through 4B in the frequency table. Position 41 contains the value 2 because the letter A (ASCII code 41h) occurred

twice in the string. Similar counts are shown for other characters. Frequency tables are useful in

data compression and other applications involving character processing. The Huffman encoding

algorithm, for example, stores the most frequently occurring characters in fewer bits than other

characters that occur less often.

7. 1The Sieve of Eratosthenes,invented by the Greek mathematician of the same name, provides a

quick way to find all prime numbers within a given range. The algorithm involves creating an array

of bytes in which positions are “marked” by inserting 1’s in the following manner: Beginning with

position 2 (which is a prime number), insert a 1 in each array position that is a multiple of 2. Then

do the same thing for multiples of 3, the next prime number. Find the next prime number after 3,

which is 5, and mark all positions that are multiples of 5. Proceed in this manner until all multiples

of primes have been found. The remaining positions of the array that are unmarked indicate which

numbers are prime. For this program, create a 65,000-element array and display all primes

between 2 and 65,000. Declare the array in an uninitialized data segment (see Section 3.4.11) and

use STOSB to fill it with zeros. In 32-bit mode, your array can be much larger. (A VideoNote for

this exercise is posted on the Web site.)