Programming Contest Problem
South Jersey High School Programming Contest 2000
Organized by the Computer Science Department
Rowan University

This problem concerns door locks that can be opened by pressing a sequence of digits that constitute the key. Our door has six digits on it, namely, 1 through 6. The key to open the door must satisfy the following properties:

- Each of the six digits will be present ***exactly once*** in the key
- At any time, the user needs to press no more than ***two*** digits.

An example key is 4-13-5-6-2. To open the door using this key, one needs to first press the digit 4, followed by the digits 1 and 3 pressed together (we call this a double-digit stroke), followed by the digit 5 which is followed by the digit 6 and, finally, the digit 2. Note that each of the six digits (1 through 6) occur in the key and the user will not need to press more than two digits at any time. Other example keys include 15-4-6-23 and 1-3-6-2-4-5. Examples of sequences that are ***not*** keys include 16-5-23 (which is missing the digit 4) and 1-245-36 (which cannot be a key because the user will have to press 3 digits, namely, 2, 4 and 5, at the same time).

Your program needs to compute the total number of different keys. Please note that the sequences 4-13-52-6, 4-31-52-6, 4-13-25-6 and 4-31-25-6 are considered to be the ***same*** key and should be counted ***exactly once*** in your answer.

Your program should determine and print the total number of possible keys that do not contain any double-digit strokes. An example of such a key is 1-2-3-4-5-6. Your program should then determine and print the total number of possible keys that contain a single double-digit stroke. An example of such a key is 4-6-13-5-2 (which contains the double-digit stroke 13.) Your program should then determine and print the total number of possible keys that contain two double-digit strokes. An example of such a key is 15-4-23-6. Finally, your program should determine and print the total number of possible keys that contain three double-digit strokes. An example of such a key is 15-46-23.

The output of your program should be:

The total number of different keys: **VALUE_1**
The number of keys with no double digit strokes: **VALUE_2**
The number of keys with one double digit strokes: **VALUE_3**
The number of keys with two double digit strokes: **VALUE_4**
The number of keys with three double digit strokes: **VALUE_5**

Hint: Generate all possible permutations of six *distinct* digits such as, for example, 1 5 3 4 2 6. Each permutation yields several different keys, depending on how one separates the digits within it.