

# CPP Coding Problem

**Subject: Debugging Code**

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**Main testing concept: Code Reviewing, working with others.**

## Basics

- C++ BASICS
- FLOW OF CONTROL
- FUNCTION BASICS
- PARAMETERS AND OVERLOADING
- ARRAYS
- STRUCTURES AND CLASSES
- CONSTRUCTORS AND OTHER TOOLS
- OPERATOR OVERLOADING, FRIENDS, AND REFERENCES
- STRINGS
- POINTERS AND DYNAMIC ARRAYS

## Functions

- SEPARATE COMPILATION AND NAMESPACES
- STREAMS AND FILE I/O
- RECURSION
- INHERITANCE
- POLYMORPHISM AND VIRTUAL FUNCTIONS
- TEMPLATES
- LINKED DATA STRUCTURES
- EXCEPTION HANDLING
- STANDARD TEMPLATE LIBRARY
- PATTERNS AND UML

## Description:

### ● Background Story (\*Skippable):

As a programmer, you always need to debug. Today, your job is to review and debug codes of programs in a project due to your PM (Project Manager) had told you there are some bugs in this program.

### ● Brief Introduction:

In this coding problem, you'd have a program project that can be built and run. But you have to understand how it works, and **fix bugs** to meet the requirements.

### ● Program Guideline:

This program is a **sorting system**, which can sort a list of names of guests who are invited by a host or other invited guests. A host can only invite guests, while a guest not only can be invited but can invite more guests as well.

There are 3 types of people: host, VIP guest, and non-VIP guest.

A host or a VIP guest can invite unlimited number of any guests. But a non-VIP guest can only invite up to 3 non-VIP guests, and unlimited number of VIP guests.

Every guest has a priority number (*Prio*). The priority number determines if the guest is allowed to invite other guests. For a non-VIP guest, its *Prio* is equal to its inviter's *Prio* + 1. (For details, please see the rules below.)

### ■ Priority Number / Invitations Rules:

Person type	Priority Number ( <i>Prio</i> )	How many guests can the person invite?
Host	-1	all unlimited.
VIP Guest	0	all unlimited.
Non-VIP Guest	Inviter's <i>Prio</i> + 1	$\begin{cases} Prio < 2, & 3 \text{ non-VIPs, unlimited VIPs} \\ Prio \geq 2, & 0 \text{ non-VIP, unlimited VIPs} \end{cases}$

### ● Bugs Reported (The Bug List):

A list of bugs has reported below, you need to fix them all:

1. If I enter the same names again, this program should output "ERROR: This is a duplicated name, cannot be imported." and do nothing for that duplicated input name.
2. When I tried to add a VIP guest invited by a non-VIP guest who has invited 3 non-VIPs. The system failed to add the VIP guest. But a VIP guest should ALWAYS can be invited.
3. Output list of names is not sorted properly! Eventually, the non-VIP guests should be sorted by their priority numbers first, and then names in alphabetical order.

## Input:

In this coding program, users should input lines of hosts' names first, and then the lines of guests' names. Both ended with a line of "END".

- The input format for a host is: "host's name"
- The input format for a non-VIP guest is: "guest's name;inviter's name".
- The input format for a VIP guest is: "#guest's name;inviter's name".

Note that if a guest is entered with an inviter's name that has never imported before, the system should not import the guest.

### Output:

- Before inputting hosts' names, output these 2 lines:  
"Please enter the names of the hosts."  
"(Enter "END" when finished):"
- After inputting hosts' names, output these 2 lines:  
"Please enter the names of the guests and their inviters."  
"(Add # in front of the line if it's VIP. Separated with ";". Enter "END" when finished):"
- For each name inputted, outputs the import result by these rules:
  1. When a person with name ABC imported successfully:  
For host, output: "Host: ABC imported."  
For guest invited by DEF, output: "Guest: ABC (invited by DEF) imported."  
For VIP guest invited by DEF, output: "Guest(VIP): ABC (invited by DEF) imported."
  2. When the name of an inviter doesn't exist:  
"ERROR: The inviter doesn't exist."
  3. When the name of a new guest is duplicated:  
"ERROR: This is a duplicated name, cannot be imported."
  4. When the priority number  $\geq 2$ , cannot invite other non-VIP:  
"ERROR: The inviter with priority  $\geq 2$ , can't invite the guest."
  5. When the inviter cannot invite more guests:  
"ERROR: The inviter can't invite more guests."

\*If there are multiple errors, output only one message that found first in the order above.
- After all the names are inserted, this system output a list of names sorted by these rules:
  1. The hosts' names would not be on the list.
  2. The VIP guests are always on most top of other non-VIP guests.
  3. The names of VIP guests should be in alphabetical order.
  4. The names of non-VIP guests are sorted by their priority numbers.
  5. If some non-VIP guests have same priority number, sorted in alphabetical order.

### Sample Input / Output :

Sample Input	Sample Output
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Host A	Please enter the names of the hosts.
Host A	(Enter "END" when finished):
Host B	Host: Host A imported.
END	ERROR: This is a duplicated name, cannot be imported.
ABC;Host A	Host: Host B imported.
ABC;Host A	Please enter the names of the guests and their inviters.
DEF;Host X	(Add # in front of the line if it's VIP. Separated with ";". Enter "END" when finished):
DEF;ABC	Guest: ABC (invited by Host A) imported.
GHI;DEF	ERROR: This is a duplicated name, cannot be imported.
JKL;GHI	ERROR: The inviter doesn't exist.
#JKL;GHI	Guest: DEF (invited by ABC) imported.
PQR;MNO	Guest: GHI (invited by DEF) imported.
MNO;Host B	ERROR: The inviter with priority $\geq 2$ , can't invite the guest.
PQR;MNO	Guest(VIP): JKL (invited by GHI) imported.
STU;MNO	ERROR: The inviter doesn't exist.
VWX;MNO	Guest: MNO (invited by Host B) imported.
#YZA;MNO	Guest: PQR (invited by MNO) imported.
BCD;MNO	Guest: STU (invited by MNO) imported.
END	Guest: VWX (invited by MNO) imported.
	Guest(VIP): YZA (invited by MNO) imported.
	ERROR: The inviter can't invite more guests.
	=====
	The Guest List:
	VIP: JKL
	VIP: YZA
	ABC
	MNO
	DEF
	PQR
	STU
	VWX
	GHI

- ☐ **Easy.** Only basic programming syntax and structure are required.
- ☐ **Medium.** Multiple programming grammars and structures are required.
- ☒ **Hard.** Need to use multiple program structures or complex data types.

### Expected solving time:

40 minutes

### Other notes:

- It's OK if you want to change any code. (OJ won't replace any file.)
- Every input/output format remains the same as the program provided.
  - Means you only need to fix the bugs reported.
  - The input test data won't contain any bad format.
  - The mentioned *alphabetical order* sorting is as same as ASCII order.