Problem 1	**User Profiling**	8 Points

Program Name: profile.cpp **Input File: profile.dat**

The software development project that you are working on needs someone to write a program that will parse a transaction file and calculate some user profile statistics. Table 1 contains a list of the "activities" that your program will parse and interpret in order to compute the statistics listed in Table 2. Note that all statistics are rounded to the nearest millisecond.

Activities	Meaning	Example
LOGIN	The user is starting a new session.	`00784932 LOGIN izzod`
TRANS	The user is executing a transaction.	`00923523 TRANS izzod`
LOGOUT	The user is terminating a session.	`01230012 LOGOUT izzod`

Table 1: User Activities in the Transactions File

The format for every transaction includes an eight-digit timestamp which represents the number of milliseconds elapsed since midnight. Therefore, the time will range from 00000000 to 86399999. Every transaction also contains the associated user ID which is made up of between 5 and 8 lower case alphabetic characters.

Some rules about the content of the input file.

1. There will be no TRANS activities for any user ID such that there is not a currently active session.
2. There will be no LOGIN activities for any user ID with a currently active session.
3. There will be no LOGOUT activity for any user without a currently active session.
4. Each LOGIN activity will have a corresponding LOGOUT activity.
5. The activities are in chronological order.
6. The file contains exactly one day's activity such that the times will start as early as 00000000 and will not exceed 86399999.
7. The computer is slow enough that no two activities will occur with the same timestamp.
8. Users may log out and then log into subsequent sessions later in the day.
9. No user will have more than 1 session active at any given time.
10. The input sequence is a list of successful activities by the user and therefore contains no data that violates these input rules.
11. The number of activities in the file is limited only by the number of milliseconds in the day.
12. It is possible that the user simply logs in and then logs out without any transactions.

Statistic	Example Computed Data	How the Statistic is Computed
Average Session Length (**ASL**) (rounded down to nearest integer)		$\frac{\sum_{i=1}^{N} (\texttt{LOGOUT\_time}_i - \texttt{LOGIN\_time}_i)}{N}$ Where N is the total number of sessions in the activities file.

Mean Time Between Activities for the same user (**MTBA**) (rounded down to nearest integer)	`01921520 LOGIN izzod`
	`01976089 TRANS izzod`
	`01997011 LOGIN isnot`
	`02193028 TRANS izzod`
	`02243853 TRANS izzod`
	`02353252 LOGOUT izzod`
	`02418238 TRANS isnot`
	`02428132 LOGOUT isnot`
	
	izzod's session time = 431732
	isnot's session time = 431121
	
	MTBA=((431732/2)+(431121/1))/ 2 = 323493
		$\frac{\sum_{i=1}^{N} (\texttt{LOGOUT\_time}_i - \texttt{LOGIN\_time}_i)/T_i}{N}$
		Where
		N is the total number of sessions in the activities file, and
		T_i is the total number of transactions in the activities file for session i.
		If the user does not conduct any activities in the session, the session is completely ignored when computing this statistic.

Longest Session Length (**LSL**)		The LSL is the length of the longest duration session.
Shortest Session Length (**SSL**)		The SSL is the length of the shortest duration session.

Table 2: Statistics Your Program is Required to Compute

Input

Your program is to read in all activities from the activities file. The input file consists of a single day of activities with one activity per line in the file. Columns 1-8 contain the time of the activity in milliseconds since midnight (with leading zeroes). Column 9 contains a blank. One of the activities from Table 1 starts in column 10. The activity is followed by a single space and then by the user ID associated with the activity. There will be no extraneous input, blank lines, or spaces in the file.

Output

Output from your program consists of exactly four lines of output to the screen. The first line should contain the ASL; the second line should contain the SSL; the third line should contain the LSL; and the fourth line of the output should contain the MTBA. Your program should follow the output format in the Example Output below.

Example: Input File

```
00784932 LOGIN izzod
00923523 TRANS izzod
00939482 TRANS izzod
01023458 LOGIN lizard
01080384 LOGOUT izzod
01103848 LOGIN stevie
01203902 TRANS lizard
01213842 LOGIN izzod
01218293 TRANS izzod
01223483 LOGIN unused
01228293 TRANS stevie
01230012 LOGOUT izzod
02348203 TRANS lizard
03020389 TRANS stevie
03123834 LOGOUT unused
03289893 TRANS stevie
03349583 LOGOUT lizard
04038208 LOGOUT stevie
```

Output to screen

```
ASL=1494491
SSL=16170
LSL=2934360
MTBA=576269
```