# ICT SBA report

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5A(26)

# Index

## Classroom Booking System

# 1. Objective & Analysis

## 1.1 Objective

To allow teacher to book the classroom for test or activities online without going to the ground floor to sign up.

## 1.2 Analysis

### The operation of the old classroom booking system

The school classroom booking system currently is not electronic. When the teachers want to book the classroom, they need to go the ground floor and check out the blackboard to see if there is available room to book.

The blackboard is designed in the form of table. The first column contains range of period of times like 16:00-17:00 and 17:00-18:00. And the first row contains choice of classrooms such as 2-01 and 3-02. When the teachers want to book the classroom, firstly, they need to check out which rooms are available in that period of time when they need the room. After that, they need to sign their name and usage of that room with chalk like ICT test Chris Wong on the corresponding place so that they can book the room. More importantly, to let other teachers know that that room is not available.

Since the school is not spacious enough, there is only 1 classroom booking blackboard. Hence, the classroom booking system can only book the room on that day. Pre-booking function is not available which cause inconvenience to teacher to manage the classroom for test on the weekend.

Furthermore, for the cost of operating classroom booking system, chalks are needed to write on the blackboard. And, the blackboard needs to be cleaned every morning as well.

### The data or information used in the old system

List of period of times, classroom list and booking record are used in the old system

### Study different electronic classroom booking system features

- Multi-user Systems

There is more than one user using the systems which are the teachers. They have their own account to log in to the system.

- Real-time Processing

The system execute immediately without waiting after users have inputted information.

- Online Interactive Systems

The system will output to interact with the users after users have inputted information. In this case, the system will show the available rooms after the users

have imputed the date and the time when they need the room.

## Consult the teachers how should be the operation of the system which may facilitate them in booking the classrooms

The new school classroom booking system will be electronic. The users can use the system in front of computer through internet without going to the ground floor.

Concerning the processing of booking the classroom, in the system, the teachers can book the classroom by inputting their name, classroom number, date, starting time and ending time. The system would check if that room is available at that time. If it is available, the system will ask the teacher to input the usage of the room. And after inputting the usage, the booking is finish. But if it is not available, the system would check if there is other neighboring room available and return the suggestion of the closest room which is available at that time to the users. The users can accept the suggestion and input the usage of the room or choose to view the state of all rooms at different time in the form of table as the one in classroom booking blackboard. And they can continue to book the room.

Since there may be mistake on booking the room such as booking wrong classroom or time, the teachers can choose to edit or delete the booking record. For editing the booking record, the system will ask the teacher to input their name, classroom number, date and starting time of booking. The system will check if there is this record. If there is, the system will ask the teachers to input classroom number, date, starting time and ending time of booking again respectively to make edit. And for example if a teacher want to keep the classroom the same, the teacher can just leave it blank when the system asking the classroom number. But if there is no that record, the system will return " Not found" to the users.

For deleting the booking record, the process is similar to editing record. The system will ask the teacher to input their name, classroom number, date and starting time of booking same as editing record. The system will check if there is this record. If there is, the record will be deleted. And the system will return "The booking has cancelled" to the users. But if there is no that record, the system will return " Not found" to the users.

## Consult the teachers any functions should be included in the system which may facilitate them in booking the classrooms

Pre-booking functions should be included in the system. That mean the system can book not only on that day but any day in that year .As a result, teachers can book the room in advance. And, this facilitates them in booking the classroom.

☐ Consult the administration teachers any functions should be included which

may facilitate them in managing the booking information

Add teacher name to the list and delete teacher name from the list.

The system will check the name inputted by the teachers if it can be found in the list to increase the accuracy of the system. And since there may be new teachers or some teachers may retire , so this function should be included.

## 1.3 Comparison on programming language

- Pascal

Pascal is a procedural programming language.

- C++

C++ has object-oriented programming features.

- Classroom booking system

  It is only a simple system without the need of data hiding and special data manipulation so it is believe it is no necessary to have object-oriented programming feature. AndPascal is used.

# 2. Design & Implementation

## 2.1 Basic concept of the program

**The class room booking system consists of two part - general user mode and administrator mode.**

**Administrator mode**

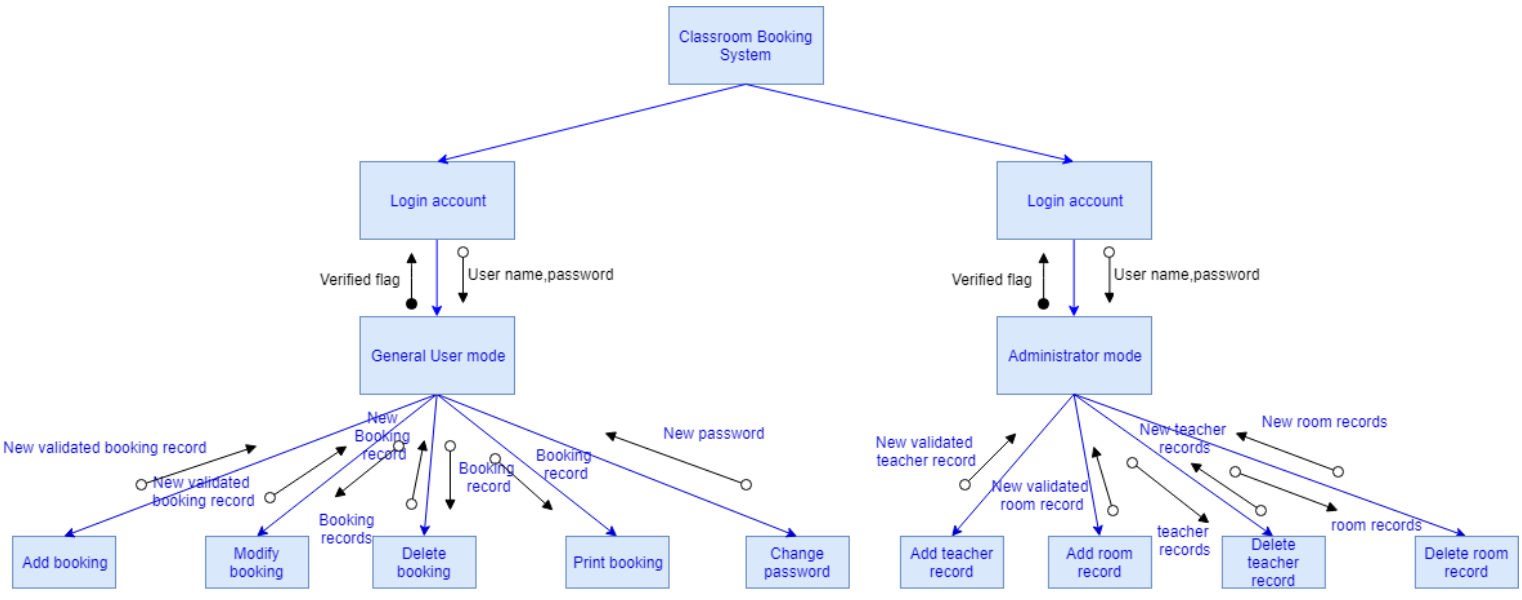
**Administrator mode includes add and delete teacher initial and room. Take adding teacher as an example, the program will print out the existing teacher initial stored in the text file first. To allow the administrator to know the existing teacher to prevent duplication occur manually. Of course, my program contains validation to check if the inputted teacher initial is already existed. After input and validation, the system will print out the record for the administrator to check to avoid mistake. The administrator needs to input "YES" to confirm. Secondly, for delete teacher, similarly, the system will print out the teacher initial first for the administrator to skim. Then, the process is very similar. The difference is only the adding and deleting processing. The adding and deleting of room is similar to that of teacher also.**

**General user mode**

**To get into the general user mode, there is a log in process. The teacher need to log in their account with their teacher initial and password.This is to prevent turmoil during the booking process because the teacher may delete their booking. During that time, it is possible to delete other teacher's booking carelessly. For the booking of room, there are three different method. Two of them are more intelligent. Firstly, let's see book by room and time. The system will print out the existing room first. And allow users to input the line no of the room they want to book. Then, the system will print out the period list for the user to choose. Each period is one hour. Then, the system will ask you to input the year and month which you would like to check the availability of the room at that period for the whole month in form of calendar. The calendar of that month is shown. You will see that there is two different colour light under each day. Red light means that the room the user choose is unavailable at that period on that day. while green light means available. Under the calendar, function menu is shown. There are 3 functions. The users can check available day in the other month and year, check availability of other room as well as directly book the room the users have chosen. Let's try to book the room. The booking information will be shown for the users to check. Similarly, the users have to input "YES" to confirm the booking. Then, for**

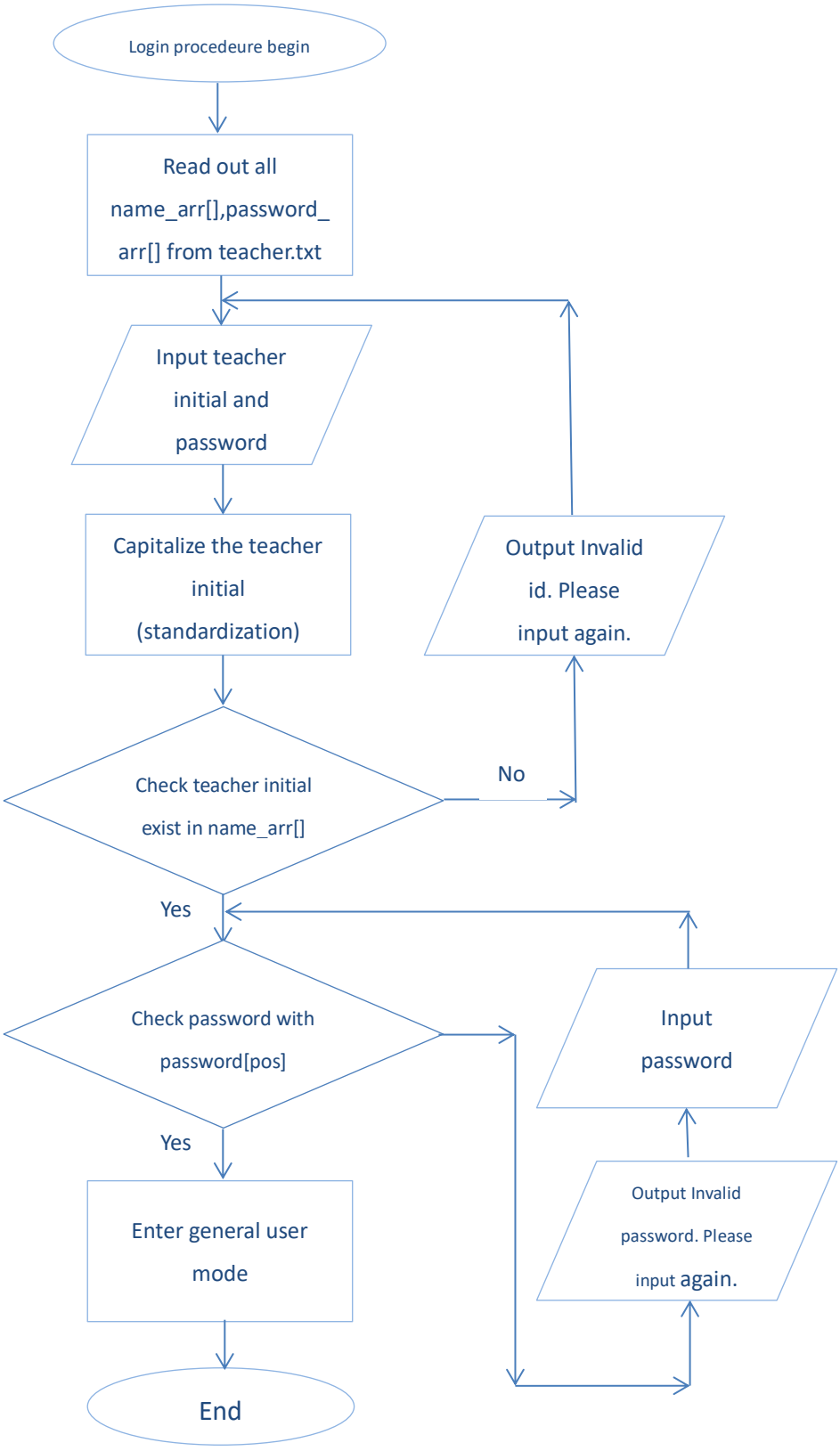
booking by date and time, the system will ask which year and month which the users want the calendar is. After that, the users need to input the day they want to book. And the period list will be shown as well. Finally, the availability of room list is printed out with green and red light too. The users just need to input the line no of room they want to book. Of course, if they input the line no with red light, the system will talk them the room is unavailable. And then the following process is very similar. If the user input nothing or anything other than"yes", the booking will be cancelled. The third method of booking room is less intelligent that won't show the users the availability. But we can see how it work. Calendar will be shown and ask the users to input the date in form of year followed by month and day. Room list is shown. In this time, the users have to input the room no. If you input not existing room, the system will ask the users to input again. Then, starting time of booking is need to input. And this time the user can input the time as they want like 8:30 to 9:32. The system shows that it is not available. From previous example, you will see that room 101 during 8-9 o'clock on 7 April is unavailable. 0830 to 0932 will have some time overlap with 0800 to 0900 so the system shows that it is unavailable. Moreover, it can show that the three different method of booking room are compatible with each other. For the delete booking, all the booking of the users will be printed out. And the users just need to input the no. of booking that they want to delete. Similarly, the booking will be shown and ask the users to confirm. Then, for the modifying booking, all the booking of the users will be printed out. And the following process is the same as the third method of booking room. Checking of unavailability of room is provided as well. Let's talk about the printing all record. There are 3 kinds of sorting method -by time,name and room. All booking record will be shown with that sorting method. Finally, the users can change their password and they have input "YES" to confirm also. After input the new password, the password need to be input again to verify. And there is confirming process also.

## 2.2 Structure Chart



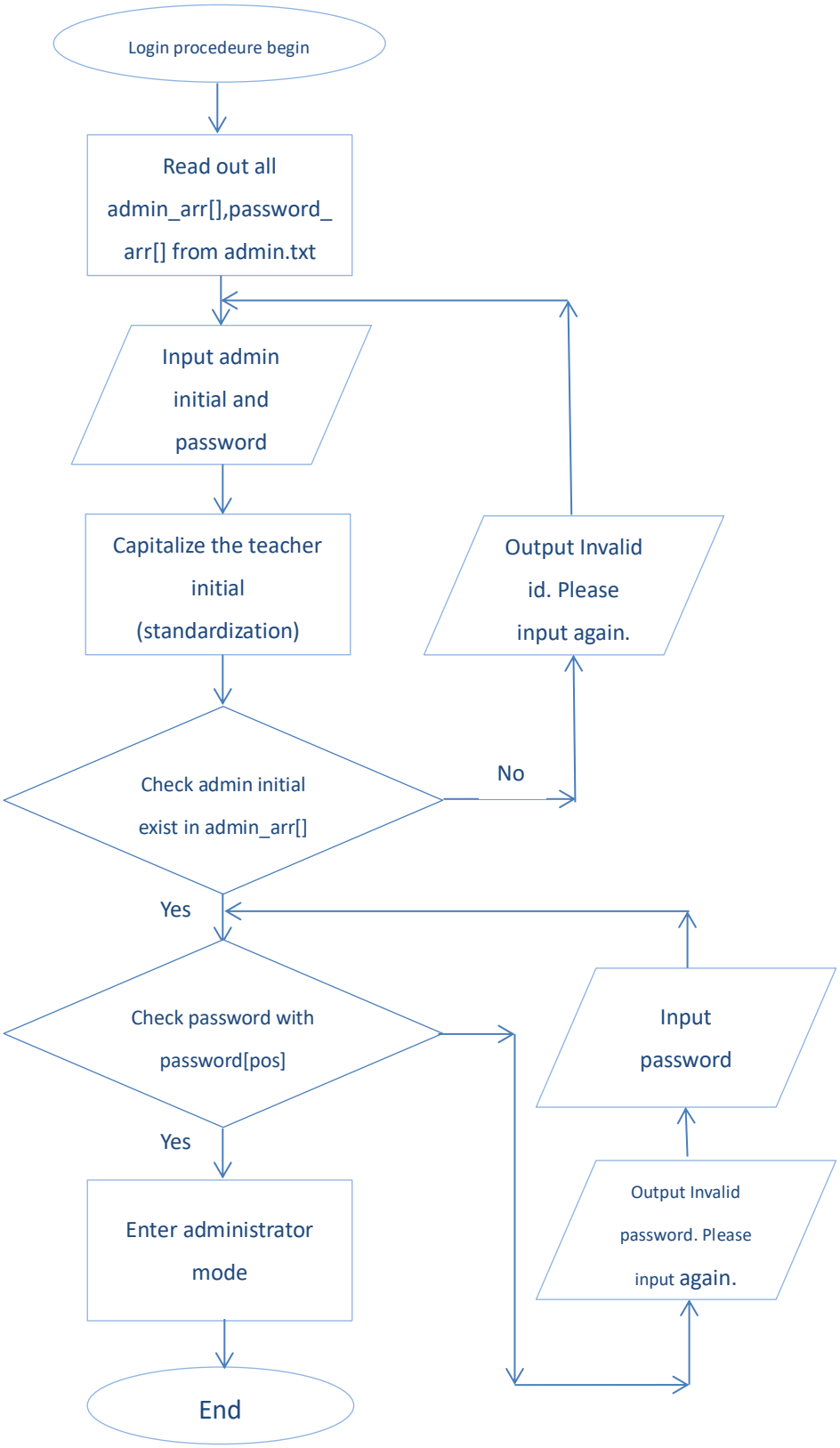
## 2.3 Procedure Table

### Login account (General user mode)



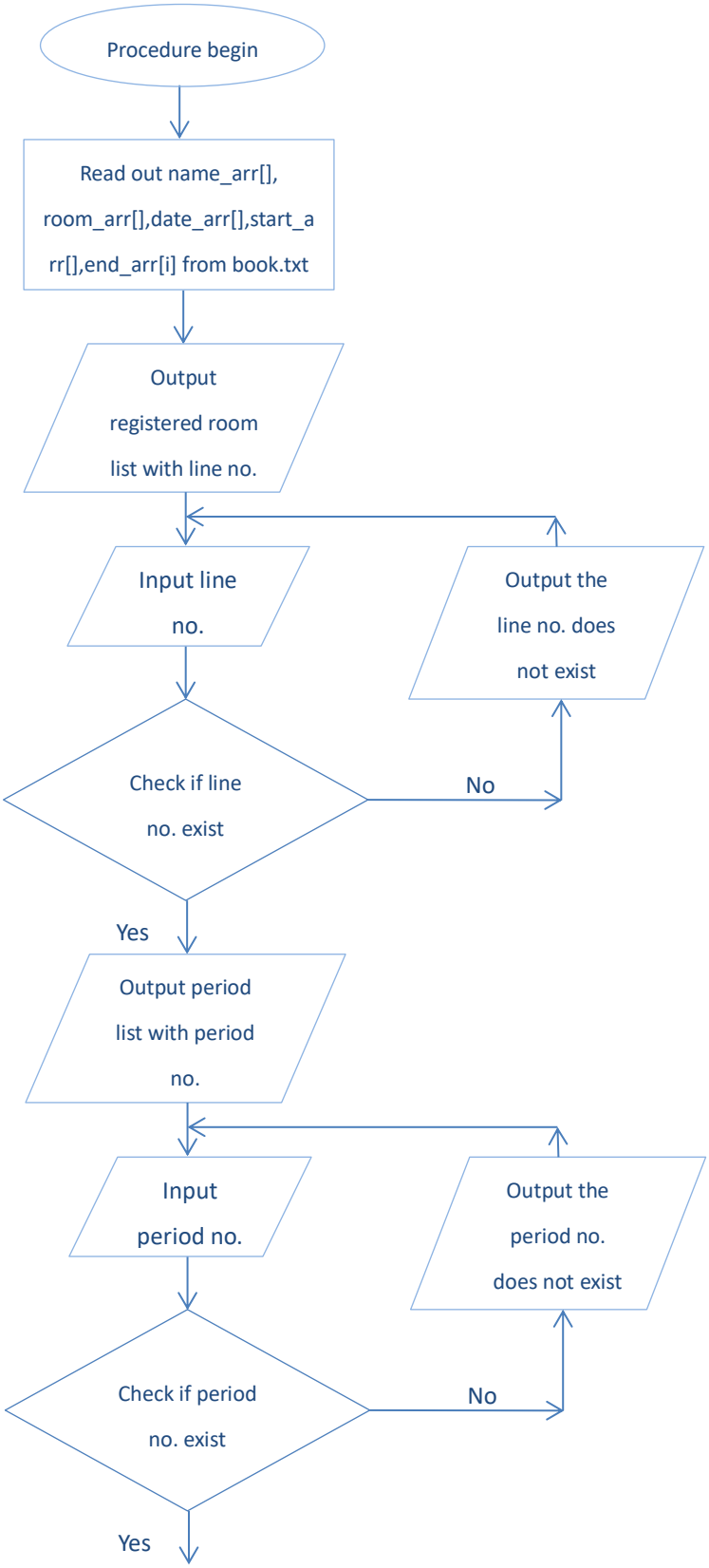

Remark: pos is the index of teacher initial in name_arr[]

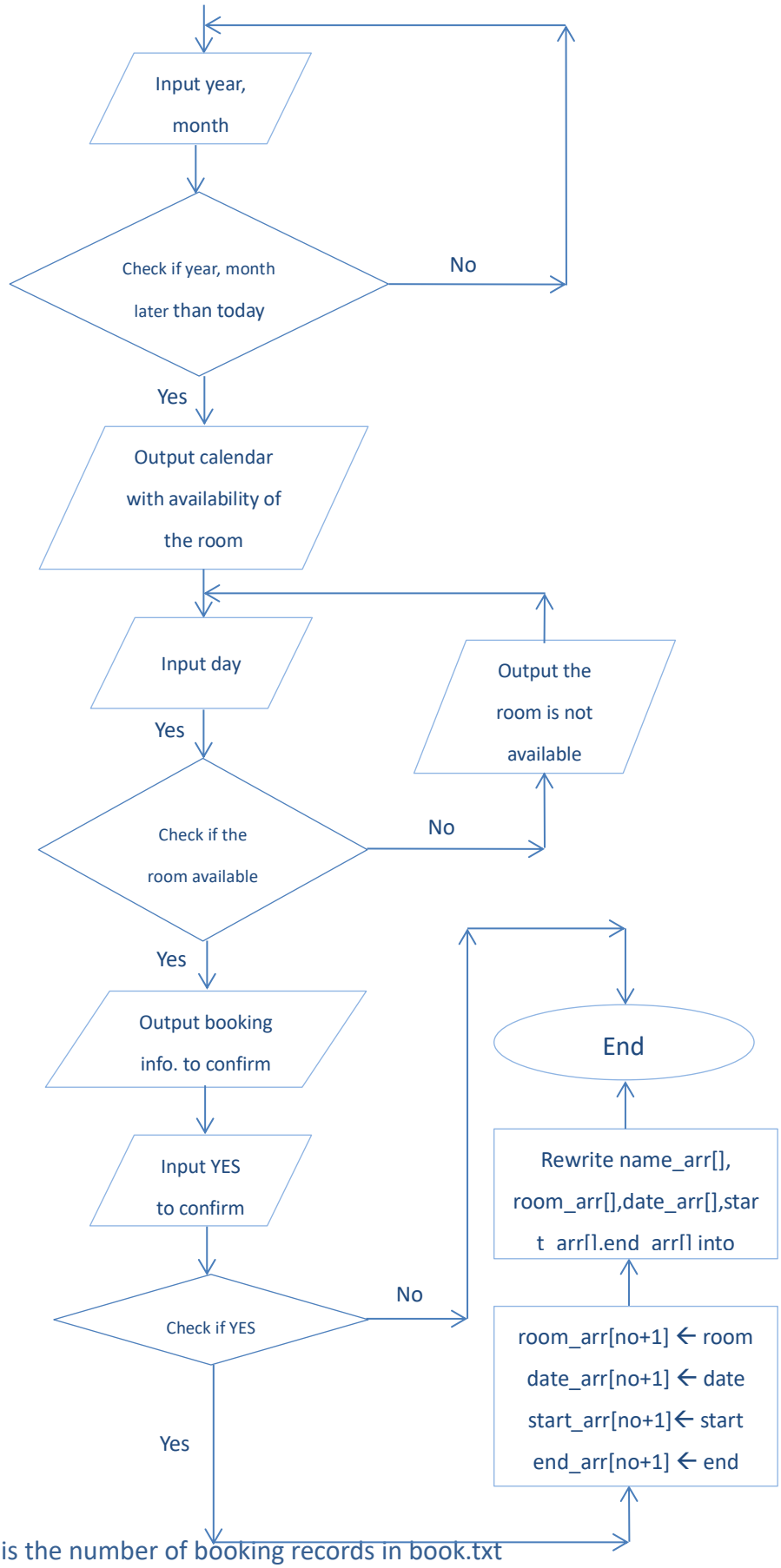
## Login account (Administrator mode)




Remark: pos is the index of admin initial in admin_arr[]

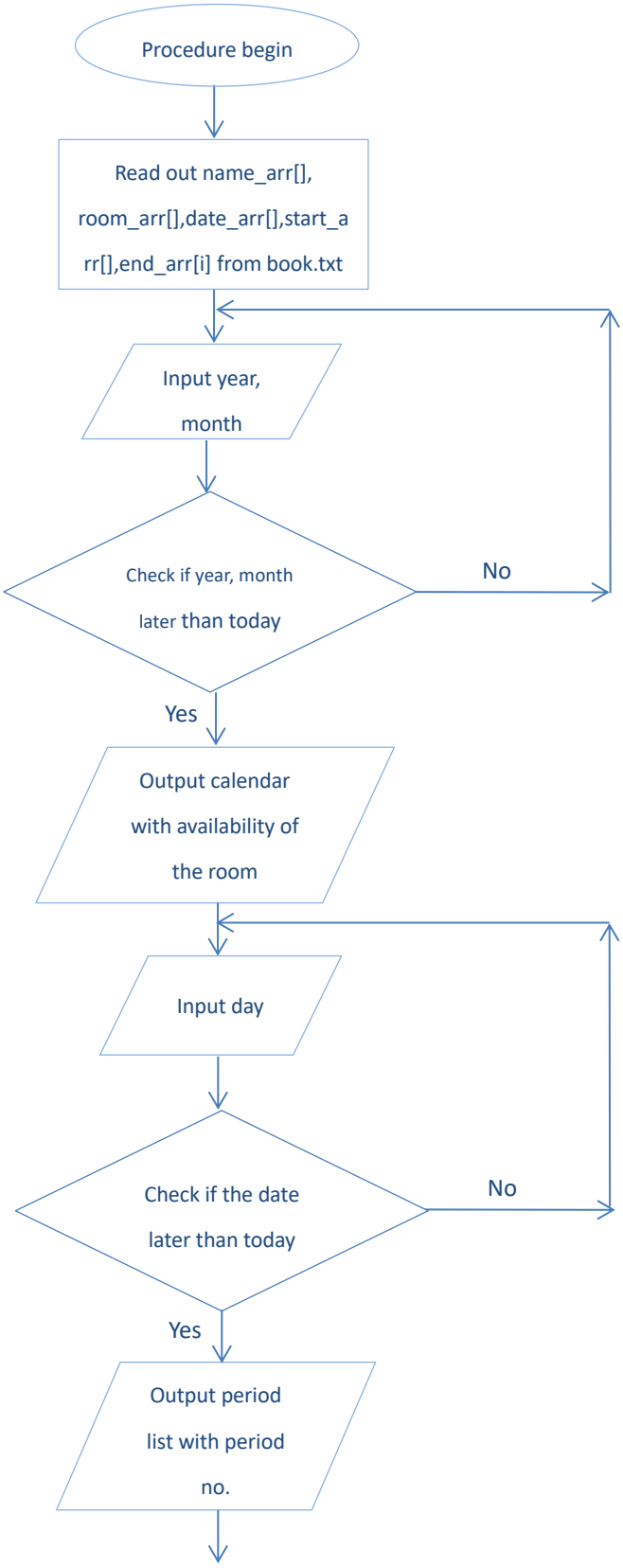
## Add booking (method1 : book by room and time)

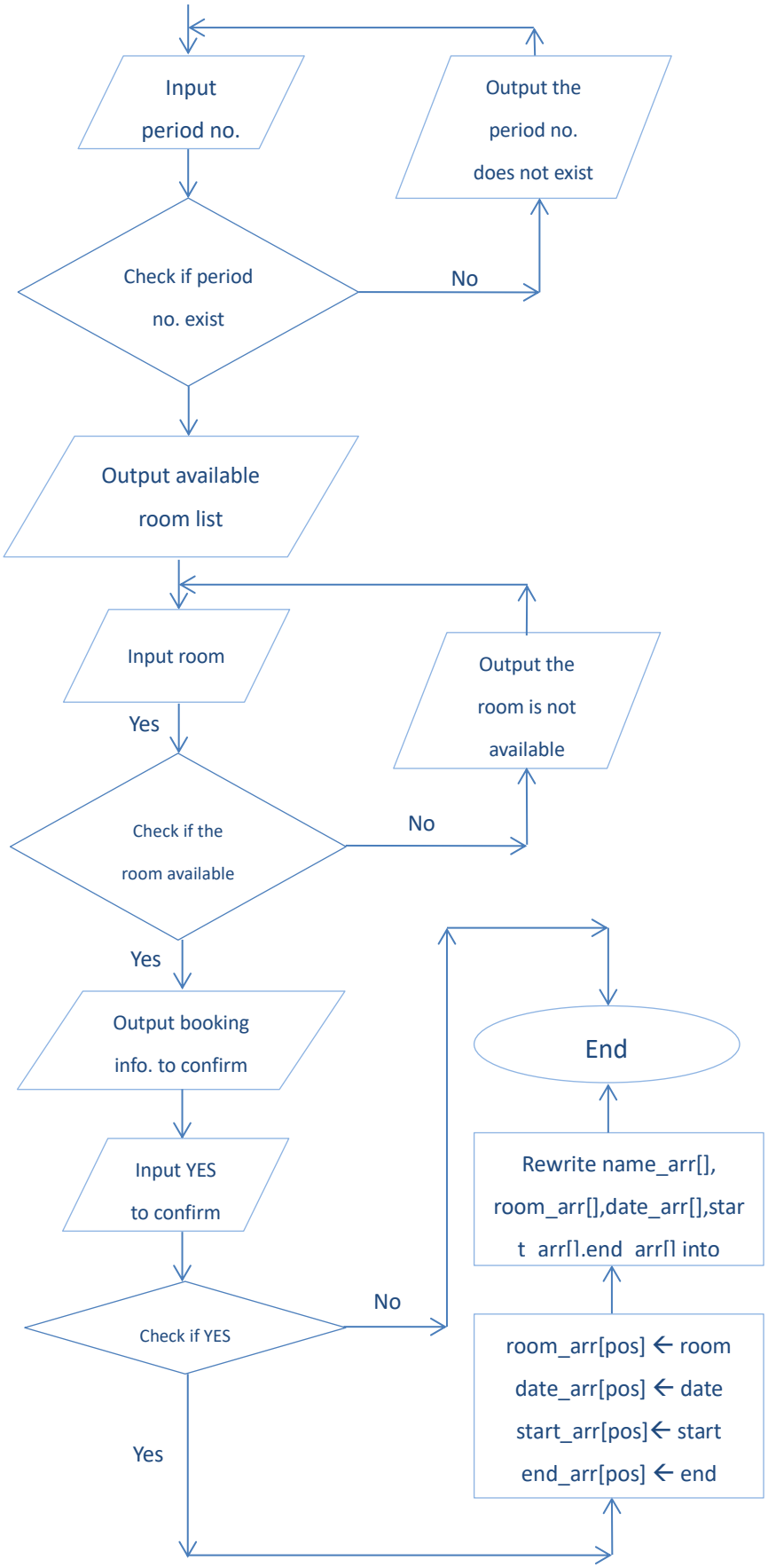





Remark: no is the number of booking records in book.txt

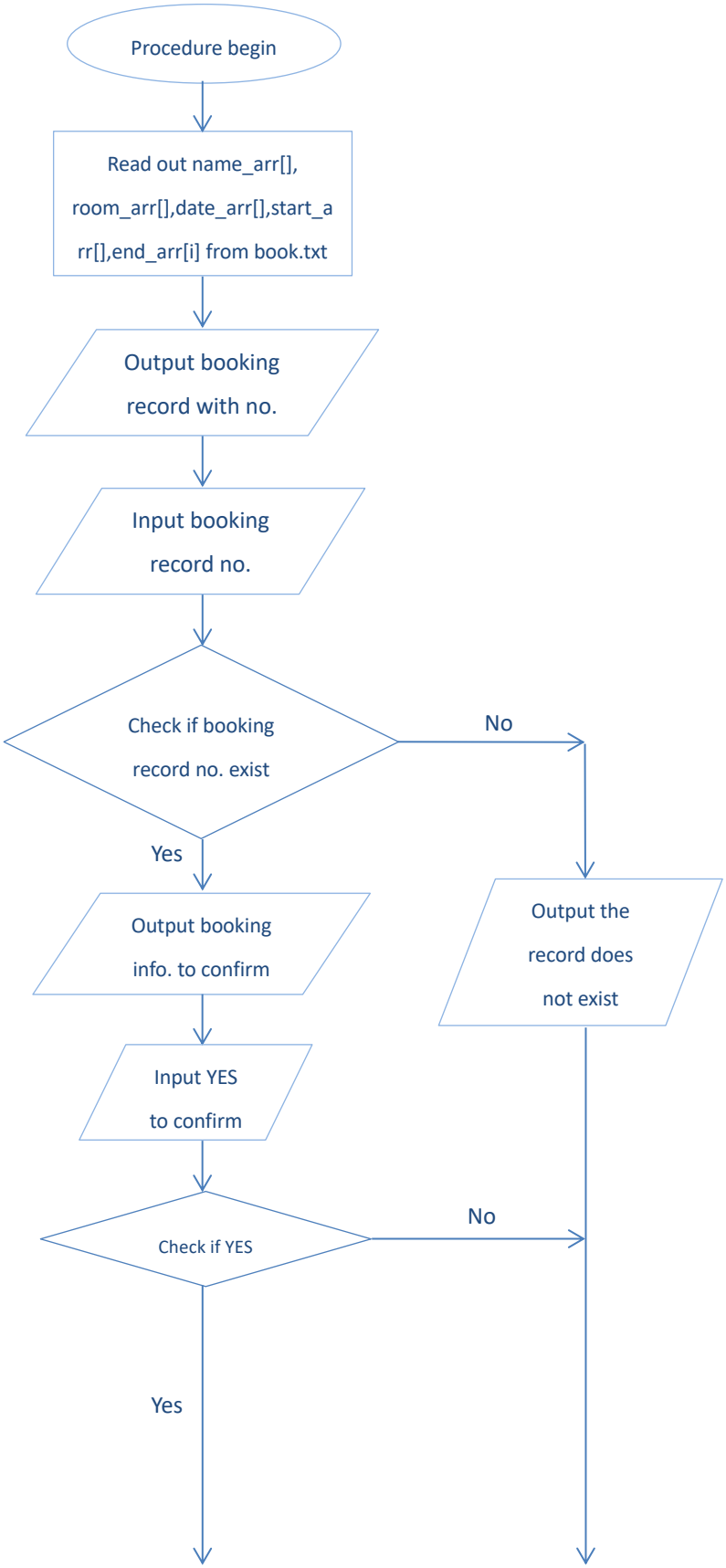
## Add booking (method2 : book by date and time)

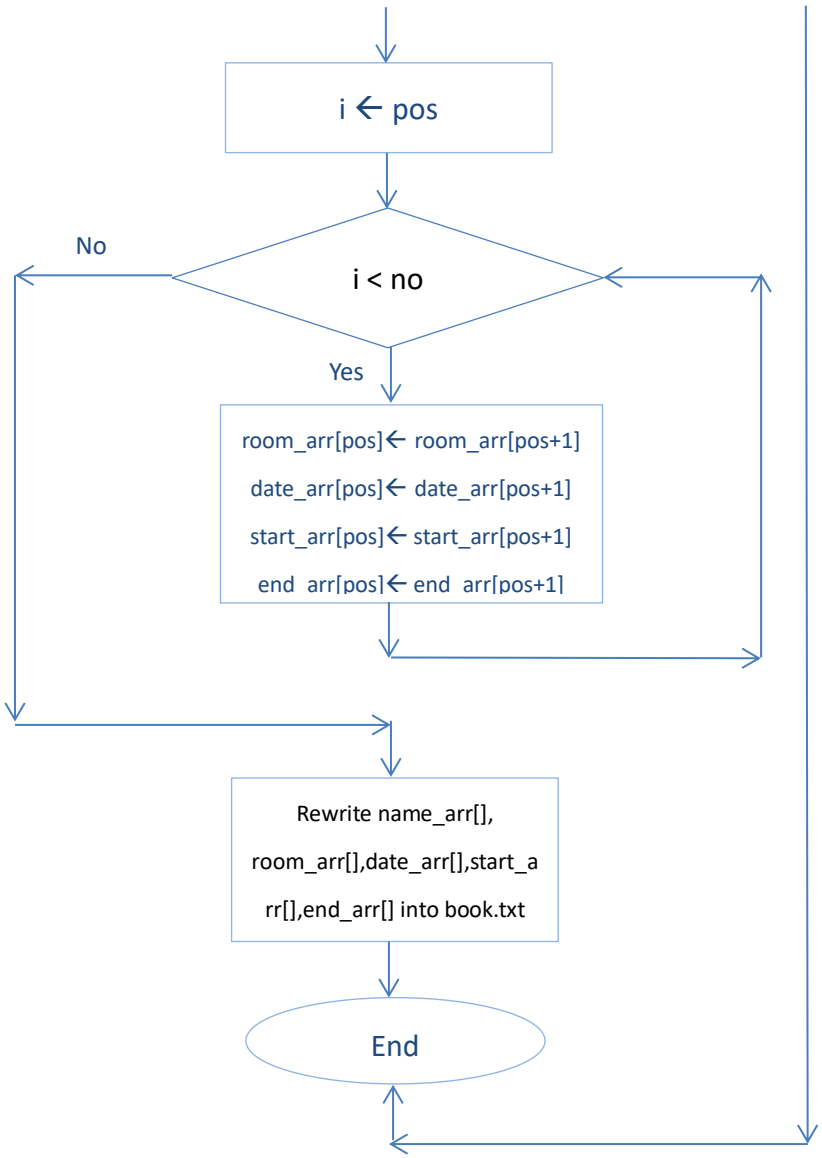





Remark: no is the number of booking records in book.txt

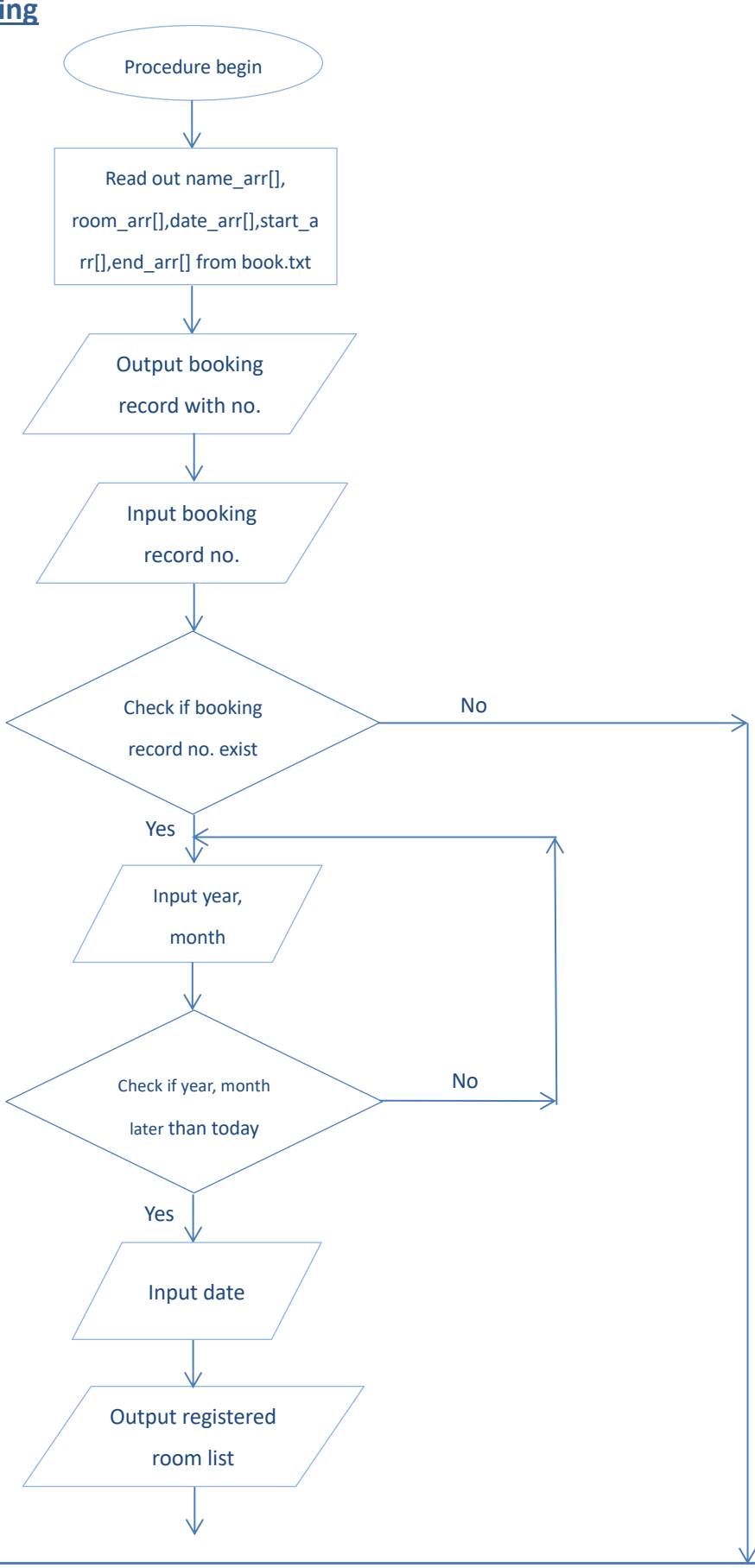
## Delete booking

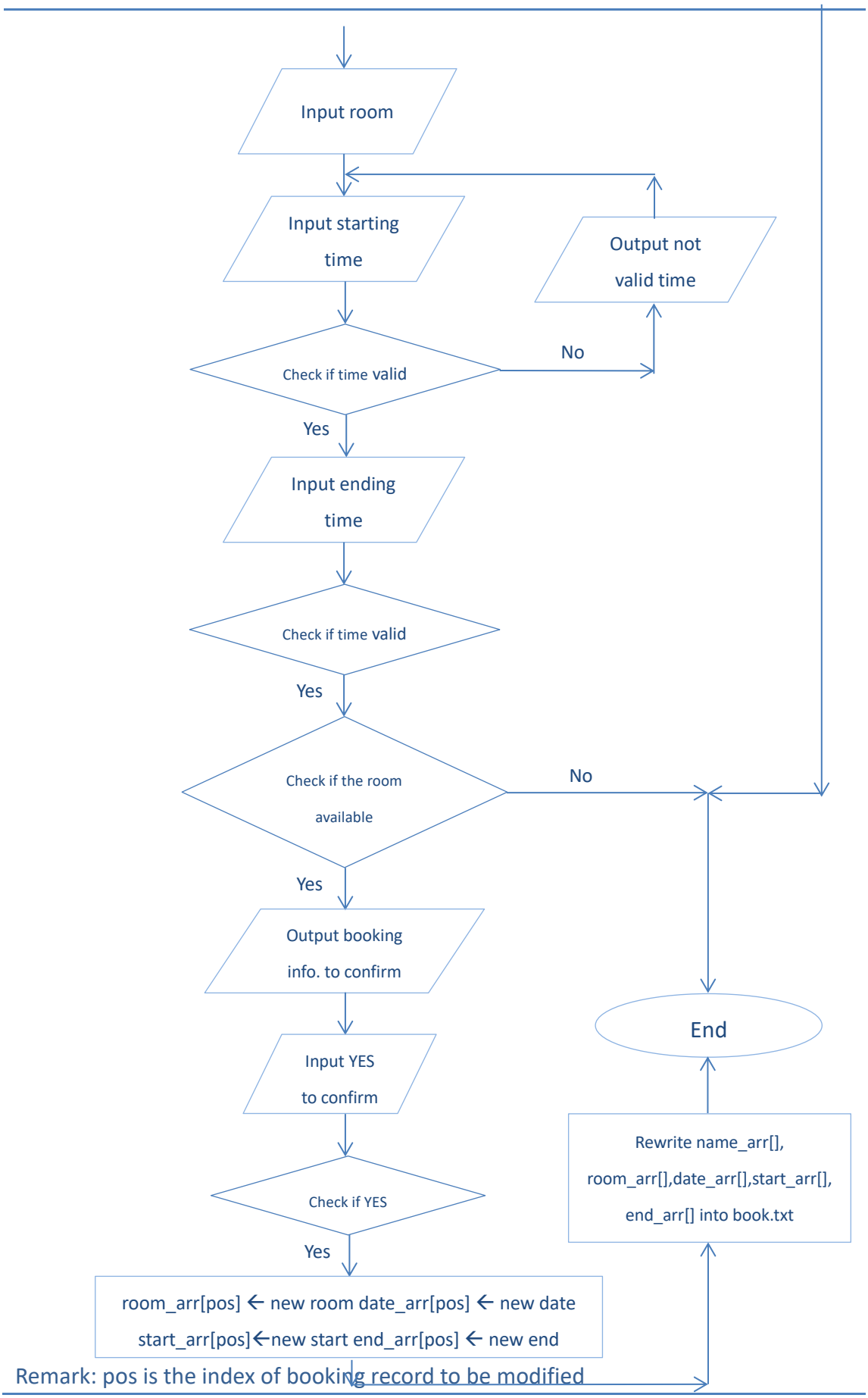





Remark: pos is the index of booking record to be deleted

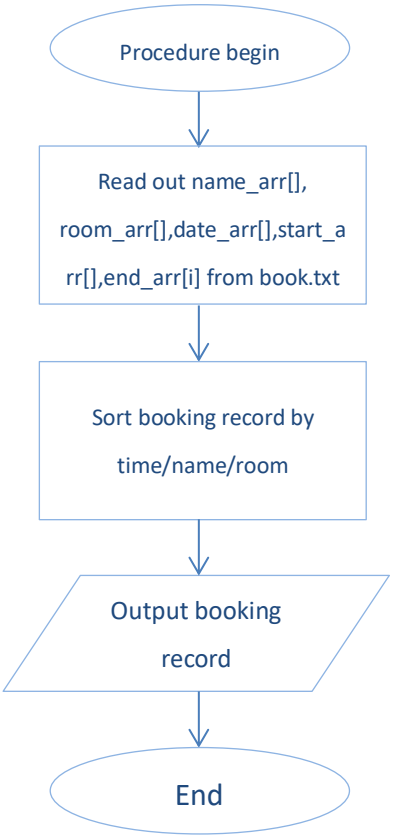
## Modify booking



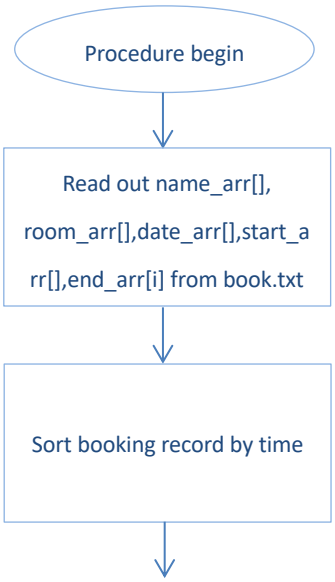


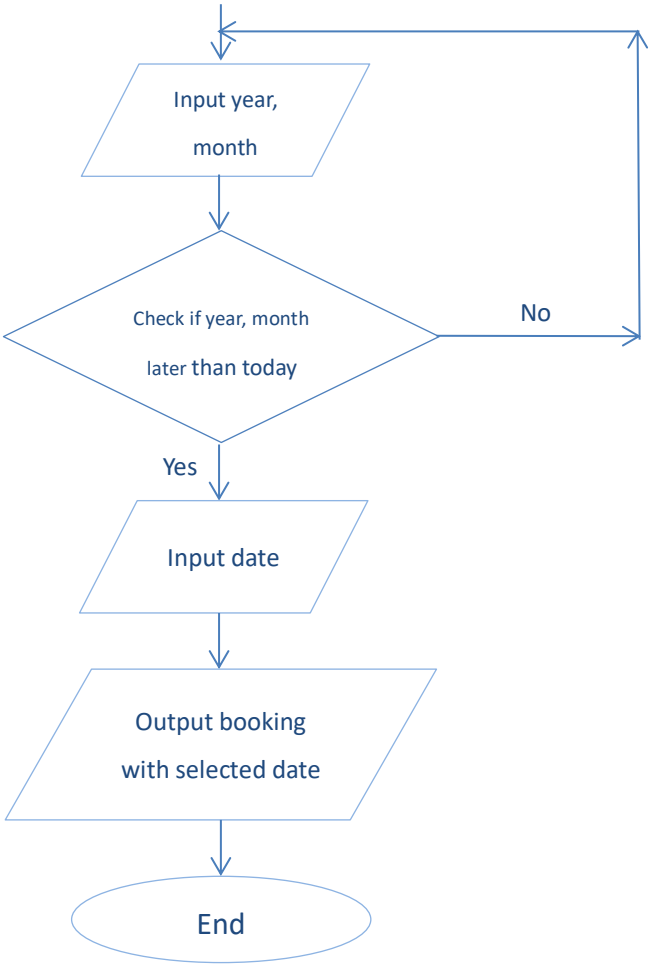

Remark: pos is the index of booking record to be modified

## Print booking (all record sort by time/name/room)

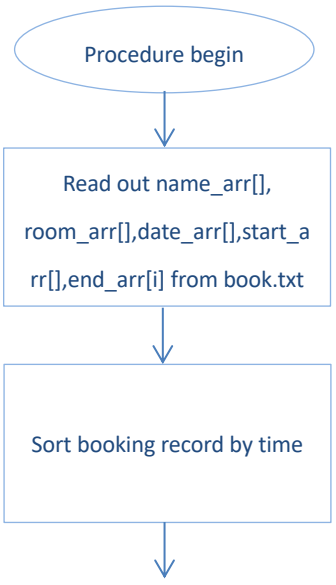


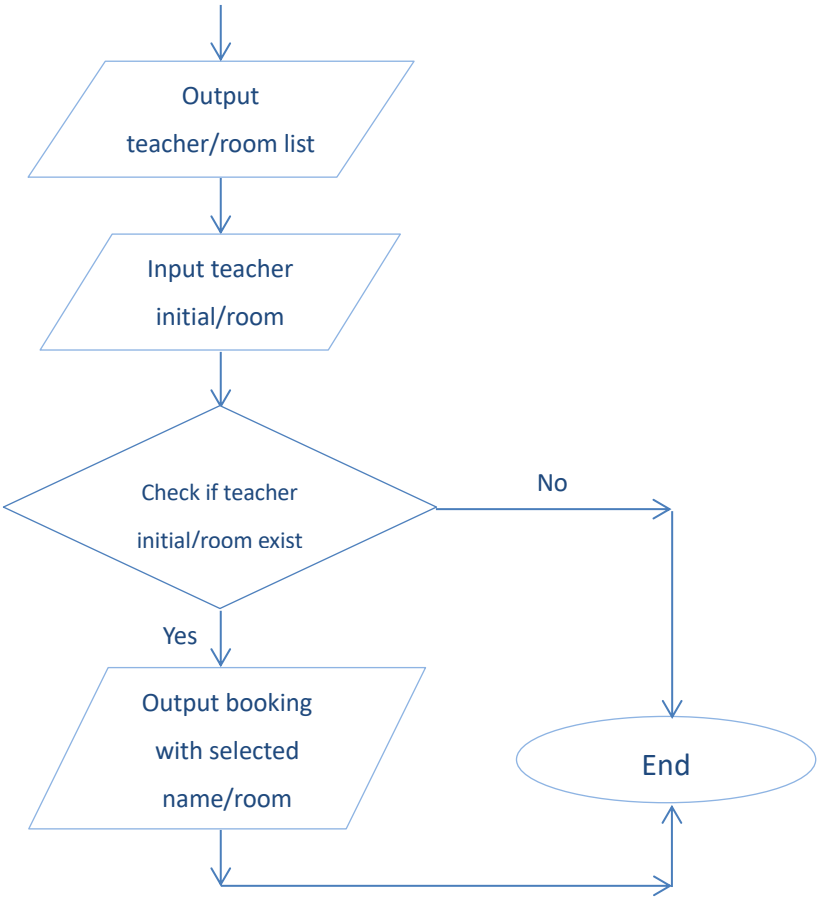

## Print booking (print by selected date)



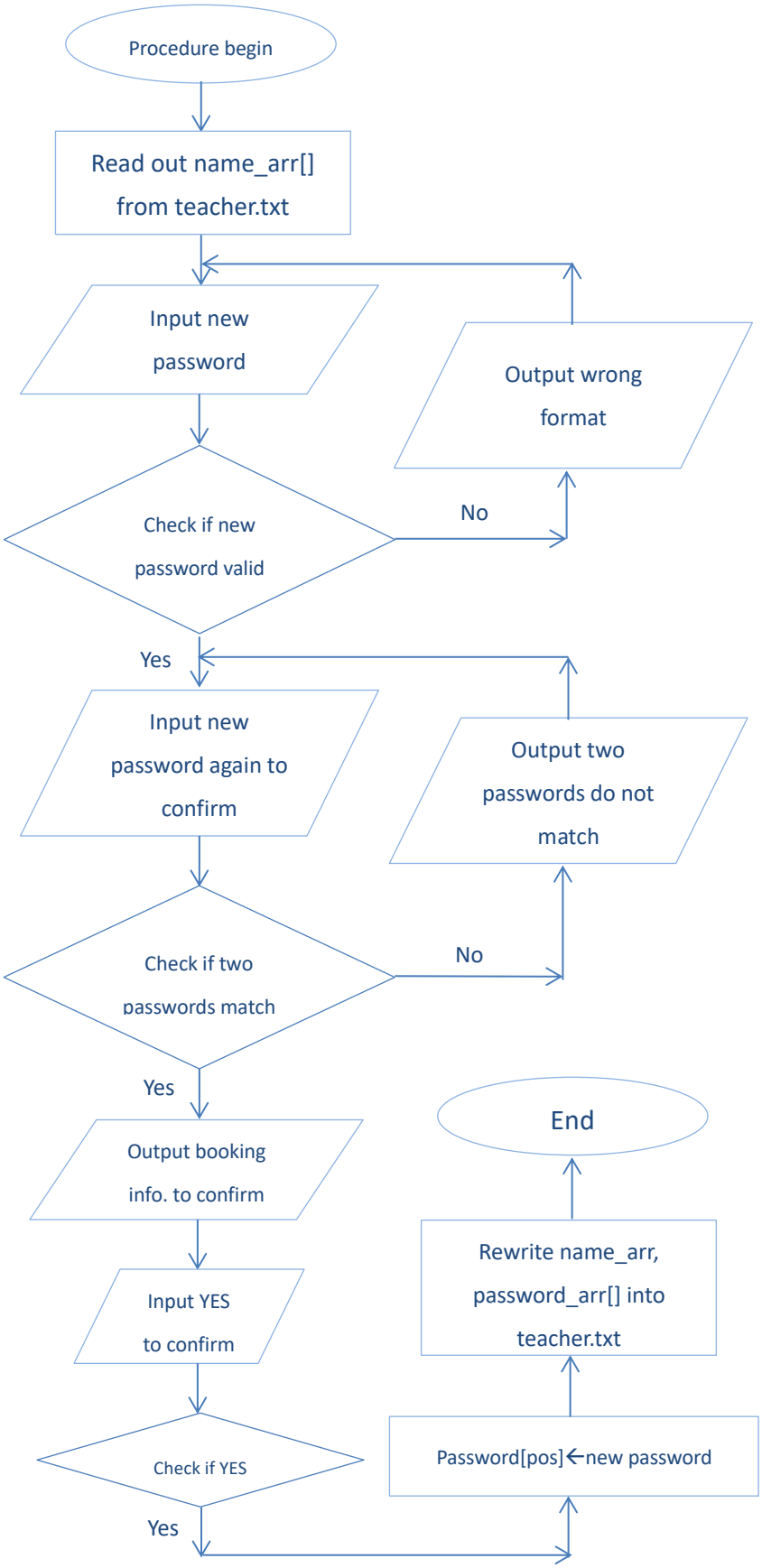



## Print booking (print by selected name/room)



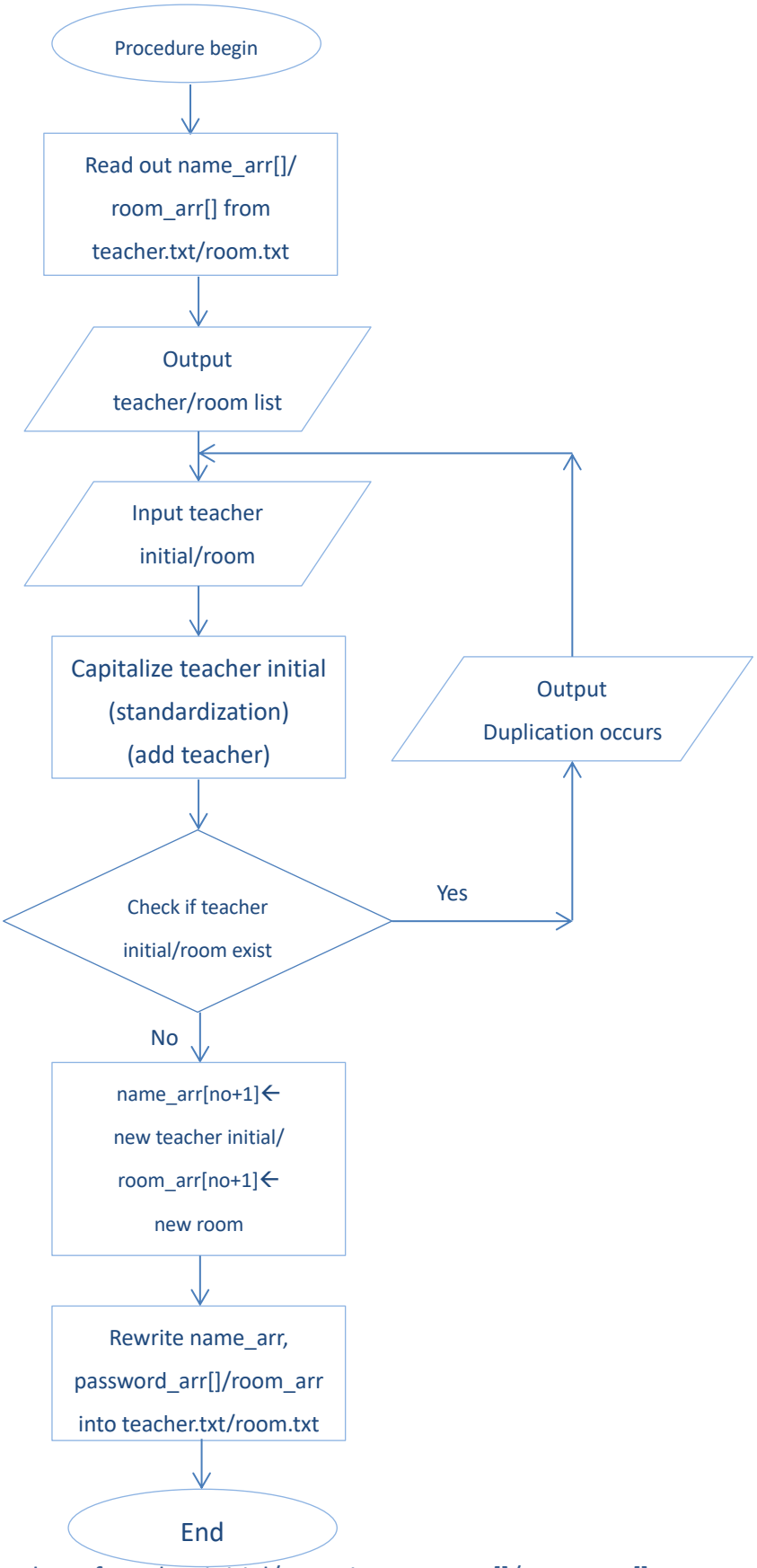

Output
teacher/room list
Input teacher
initial/room
Check if teacher
initial/room exist
No
Yes
Output booking
with selected
name/room
End

## Change password



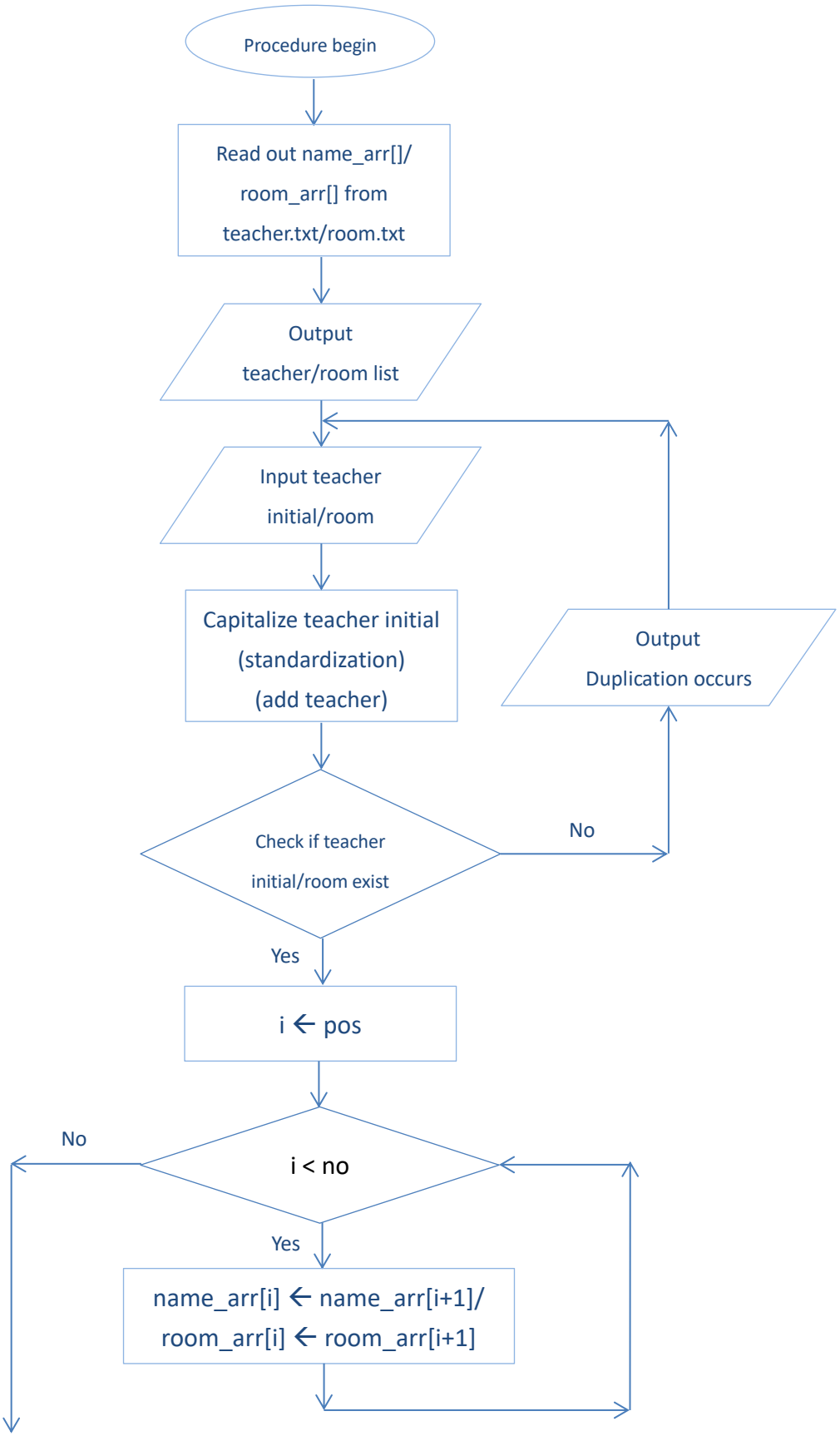

Remark: pos is the index of user name in teacher.txt

## Add teacher/room

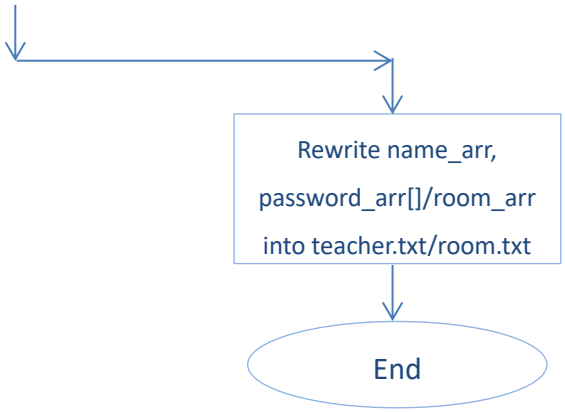



Remark: no is the number of teacher initial/room in name_arr[]/room_arr[]

## Delete teacher/room




Remark: pos is the index of inputted teacher initial/room in name_arr[]/room_arr[]




## 2.4 Data Control

### Data capture

**There are four files to save the data used in the system:**

1. **Name.txt**
   - **saving the information general user name(teacher initial) and password to log into the general user mode**
   - **Advantage: the teachers can easily modify and delete their own booking without checking their identity for every changes they want to make**
   - **the information of general user name and password can be added and deleted in the administrator mode when there is personnel changes**
2. **Room.txt**
   - **saving the information of the room for the teachers to book**
   - **the information of ro can be added and deleted in the administrator mode**
3. **Book.txt**
   - **saving the booking records**
   - **the booking record includes: teacher initial, room information, date, starting time and ending time**
4. **Admin.txt**
   - **Saving the information of administrator name(teacher initial of teacher-in-charge) and password to log into the administrator mode**
   - **Advantage: the information general user name(teacher initial) ,password and the room can be added and deleted in the administrator mode**

### Data input

#### Format of data

1. **time: HHMM (24-hour clock) e.g 1800**
2. **date: YYYYMMDD (year-month-day) e.g 13072018**

**Validation**

1. **Add booking**
   - **Time validation:**
     I. **Check if HH is between 00 to 12**
     II. **Check if MM is between 00 to 59**
     III. **Check if the time is within the operation time of the school (e.g 0800-1800)**
     IV. **Check if the ending time is later than the starting time**
   - **Date validation:**
     I. **Check if the date is or is later than today**
     II. **Check if that year is leap year**
     **if (YYYY mod 4=0) and (YYYY mod 100<>0) or (YYYY mod 400=0) then the year is leap year**
     III. **Check if the day exist in that month (e.g July has 31 days June has 30days only)**
2. **Change password**
   - **Password validation:**
     **Check if the length of the password is 6**

**Verification**

1. **Use "Input Data Twice" to check whether the user input the new password correctly as he wants :**
   - **Change password**
2. **Show the information that the user has inputted and ask him to confirm before changing the data in the source file :**
   - **Add booking**
   - **Delete booking**
   - **Modify booking**
   - **Add room/teacher**
   - **Delete room/teacher**
   - **Change password**

**Capitalize (standardization)**

**Teacher initial will be capitalize :**

- **Login**
- **Add room/teacher**

**Advantage:**

1. **The data in the file is standard.**
2. **The user can input in small letter or big letter as he wants.**

## Date output

### Sorting ( by bubble sort)

1. Print by selected day/name/room : booking records are sorted by time in ascending order.
2. Print all booking: booking records can be sorted by time,name or room in ascending order.

## Data control

### Check the availability of the room before booking

Check with every booking records(target) with same date and room in book.txt :

Consider the time period of two booking during each comparison

Case1:

✓ 

Case2:

✗ 

Case3:

✓ 

Representing time period of
two booking of the same room
on the same day

Therefore, if the room is available for booking, the following condition should be all satisfied :

1. starting time < ending time 
2. starting time < ending time 

### Delete outdated data

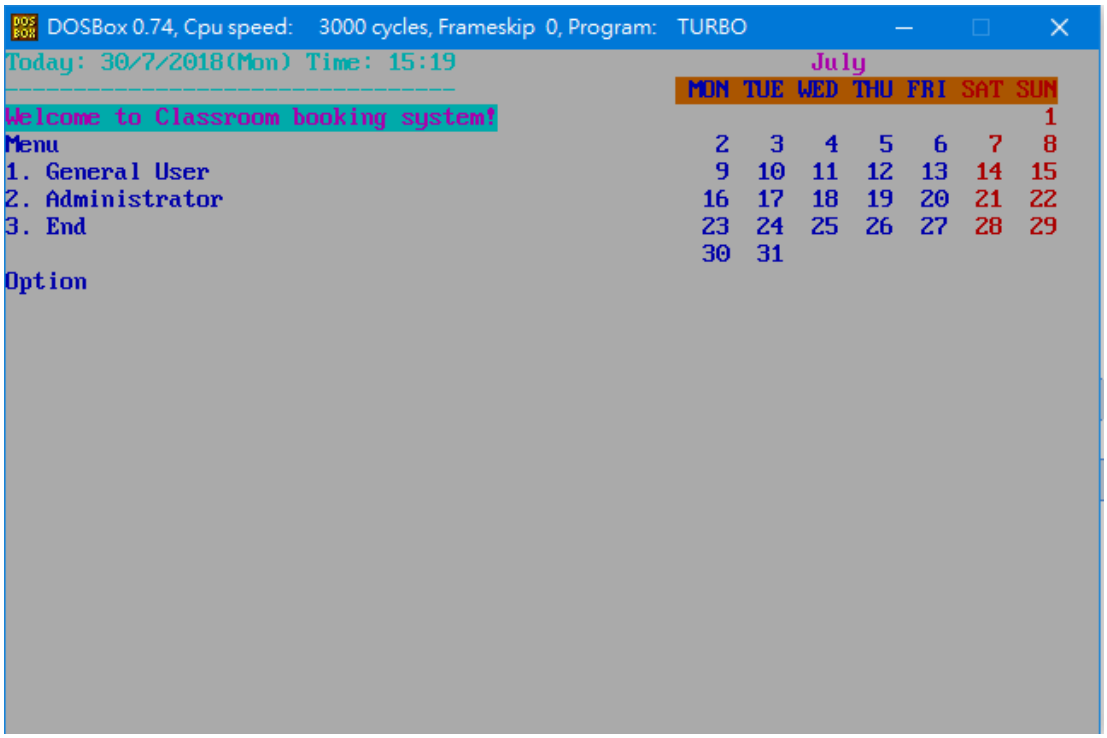
Outdated booking records will be deleted.

Advantage:

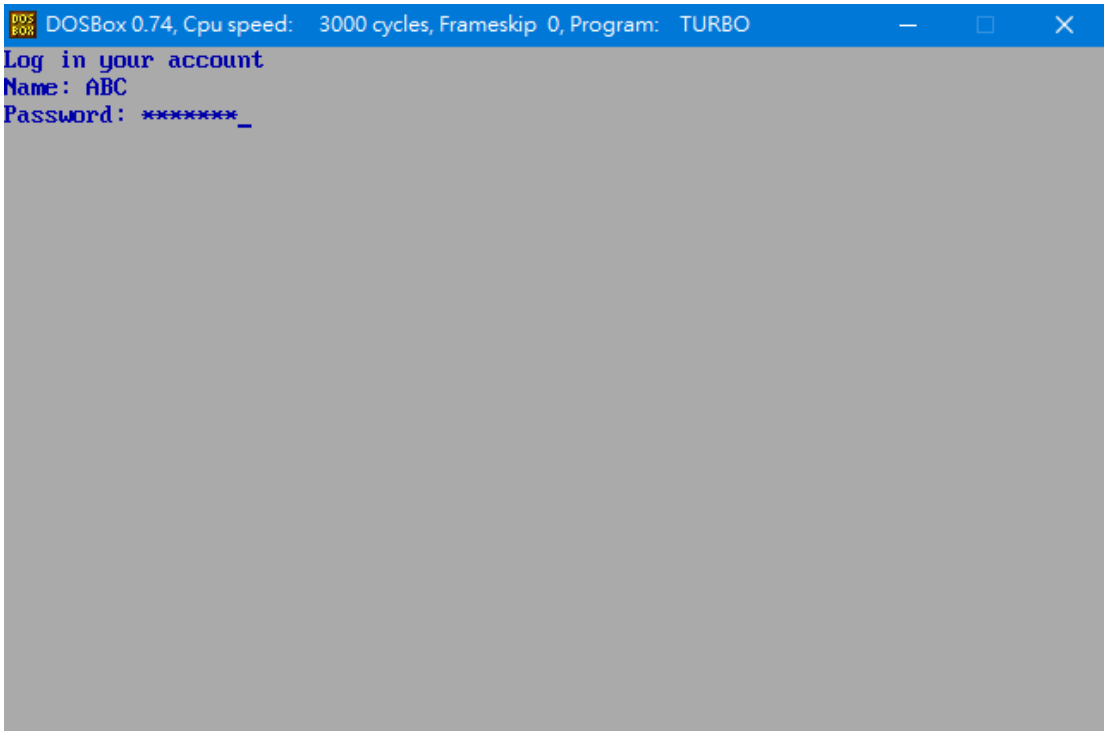
1. The booking records can be manipulated more easily. (reduce sorting ,seeking time)
2. Less memory is needed to handle all the data.

## 2.5 Sample Run

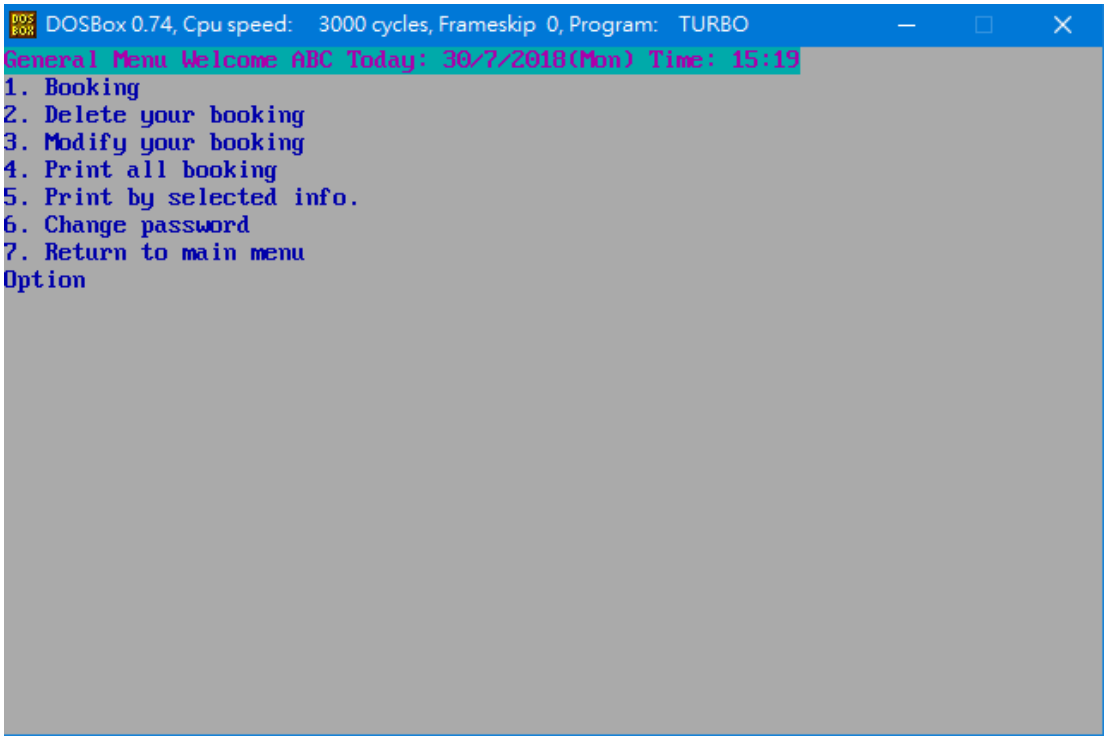
### Main menu



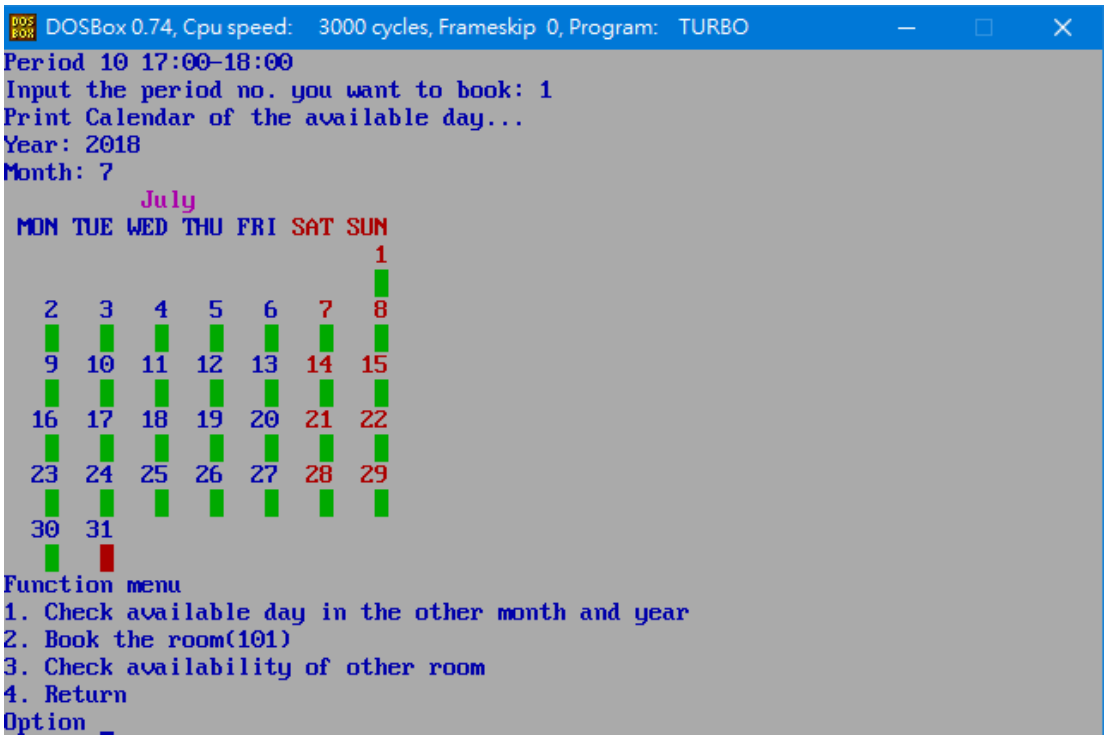

### Login



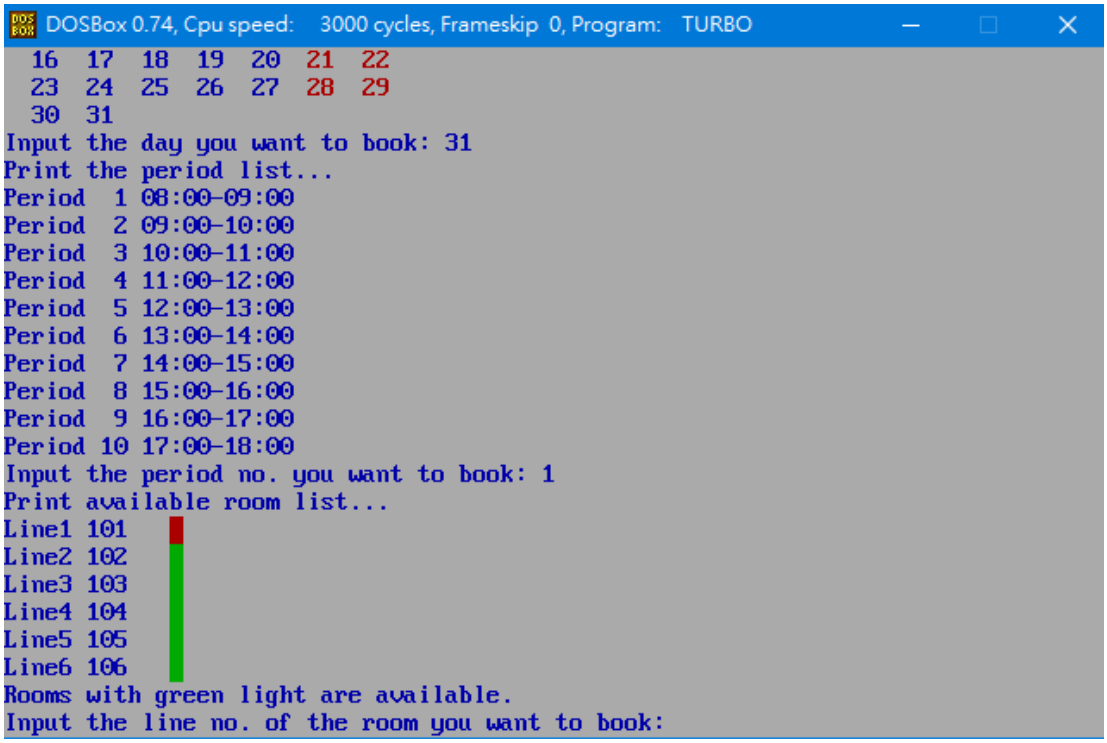
## Gerneral Menu



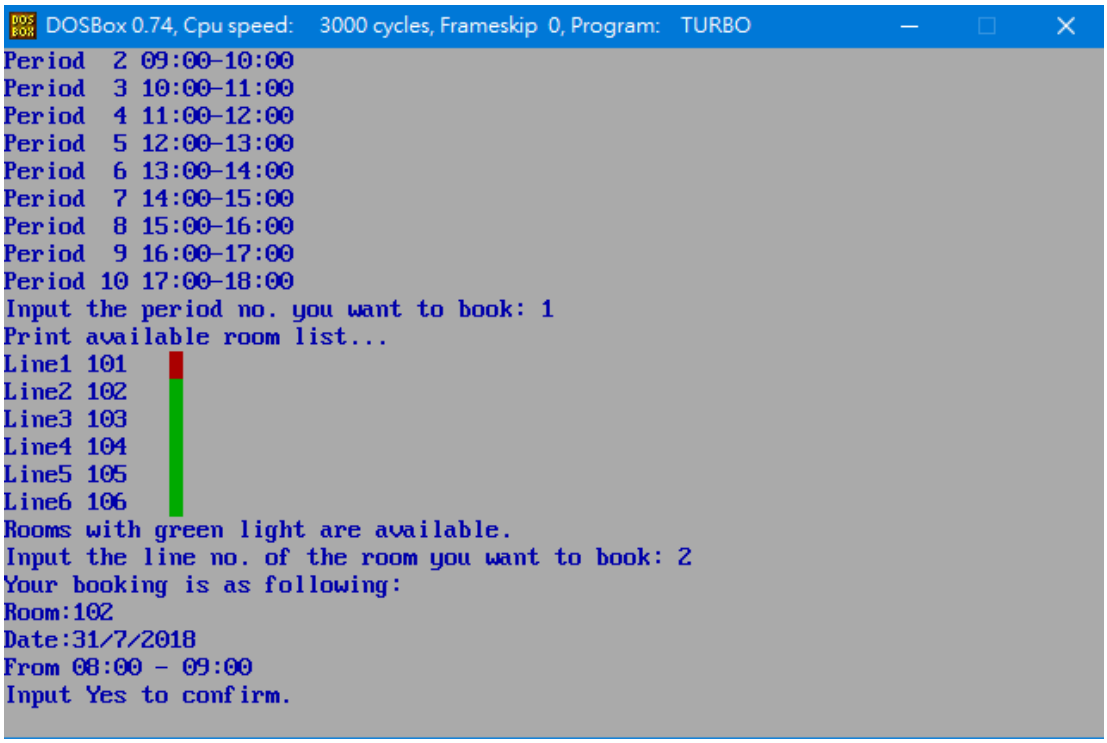

## Show availability of room (1)



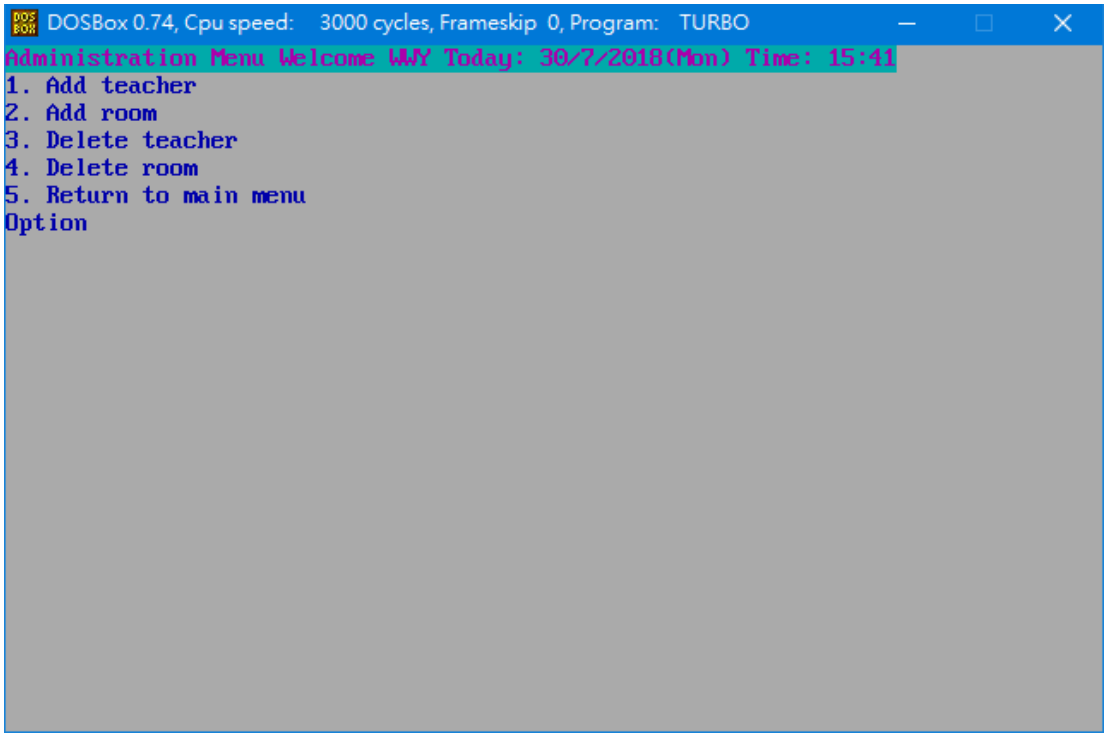
## Show availability of room (2)



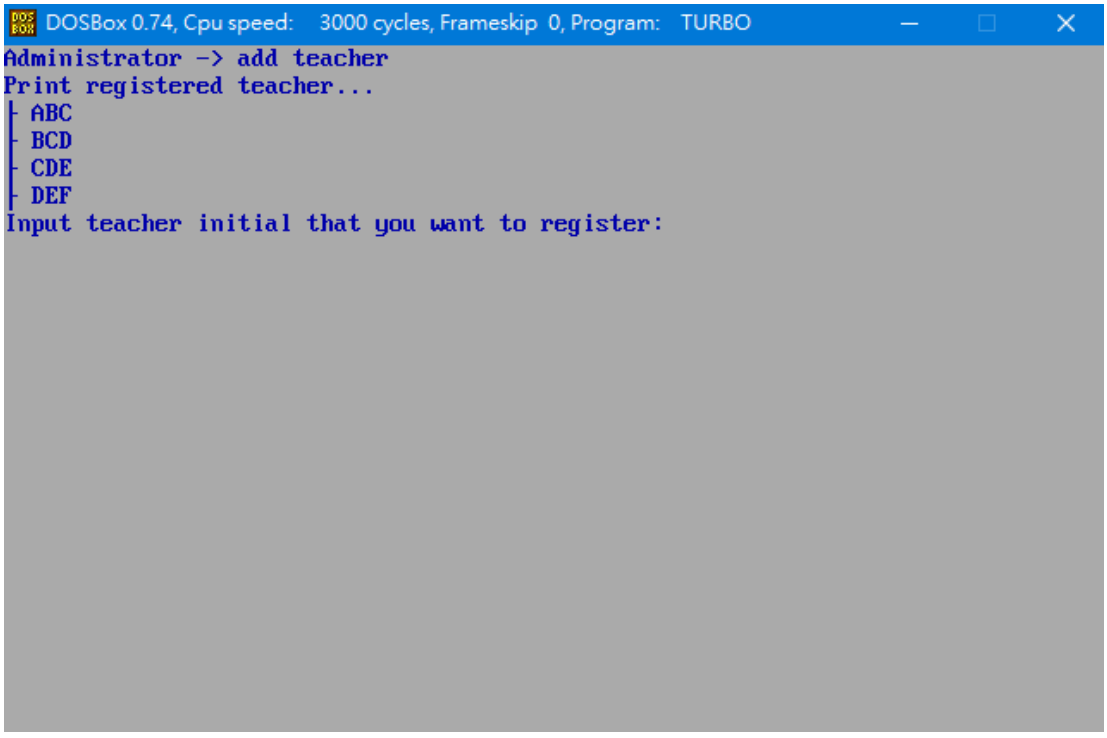

## Confirm booking



## Administrator Menu




## Add techer (show registered teacher)



# 3. Test & Evaluation

## 3.1 Unit test – Login general user mode

Teacher.txt

| Record | Teacher initial | Password |
|---|---|---|
| 1 | ABC | 123456 |
| 2 | BCD | 234567 |
| 3 | CDE | 987654 |
| 4 | DEF | 456789 |

Remark: length of password should be 6. Length of teacher initial should be 3.

| case | Teacher | Password | Expected Result | Test Result | Testing objective |
|---|---|---|---|---|---|
| 1 | ABC | 123456 | Valid | OK | Existing account |
| 2 | BCD | 123456 | Show invalid | OK | Incorrect account |
| 3 | CDE | 9876543 | Show invalid | OK | Length not match |
| 4 | DEFG | 456789 | Show invalid | OK | Length not match |

## 3.2 Unit test – Validation function in Add booking / Modify booking

Validation of room

Room.txt

| Record | Room |
|---|---|
| 1 | 101 |
| 2 | 102 |
| 3 | 103 |
| 4 | 104 |

Remark: all room record should be number and the length is 3

| case | room | Expected Result | Test Result | Testing objective |
|---|---|---|---|---|
| 1 | 101 | Valid | OK | Existing room |
| 2 | 102 | Valid | OK | Existing room |
| 3 | 103 | Valid | OK | Existing room |
| 4 | 104 | Valid | OK | Existing room |
| 5 | 105 | Show Invalid | OK | Not existing room |
| 6 | 1010 | Show Invalid | OK | Length not match |
| 7 | 99999 | Show Invalid | OK | Length not match |

Validation of date

Remark: today is 20180713

| case | date | Expected Result | Test Result | Testing objective |
|---|---|---|---|---|
| 1 | 20180731 | Valid | OK | Future day |

| | | | | |
|---|---|---|---|---|
| 2 | 20180713 | Valid | OK | Today |
| 3 | 20200229 | Valid | OK | Leap year |
| 4 | 20180732 | Show Invalid | OK | Last day of month |
| 5 | 20181301 | Show Invalid | OK | Last month of year |
| 6 | 20170712 | Show Invalid | OK | Past day |
| 7 | 20170229 | Show Invalid | OK | Leap year |

Validation of time

Remark: operation time of school is 0800-1800

| case | time | Expected Result | Test Result | Testing objective |
|---|---|---|---|---|
| 1 | 0800 | Valid | OK | Within operation time |
| 2 | 1800 | Valid | OK | Within operation time |
| 3 | 0860 | Show Invalid | OK | Incorrect time |
| 4 | 1900 | Show Invalid | OK | Not within operation time |
| 5 | 08123 | Show Invalid | OK | Length not match |

### 3.3 Unit test - Check availability function in Add booking / Modify booking

Booking.txt

| Record | Teacher | Room | Date | Start time | End time |
|---|---|---|---|---|---|
| 1 | ABC | 101 | 20180731 | 0800 | 0900 |
| 2 | BCD | 101 | 20180731 | 0900 | 1000 |
| 3 | CDE | 101 | 20180731 | 1100 | 1259 |
| 4 | DEF | 101 | 20180731 | 1300 | 1302 |

Remark: Teacher initial is not consider in this part. (validation of teacher initial is done during login process)

Room: 101 Date: 20180731

| case | start time | end time | Expected Result | Test Result |
|---|---|---|---|---|
| 1 | 1000 | 1100 | Valid | OK |
| 2 | 1258 | 1300 | Show Invalid | OK |
| 3 | 1000 | 1130 | Show Invalid | OK |
| 4 | 1101 | 1102 | Show Invalid | OK |

# 4. Conclusion & Discussion

## 4.1 Conclusion

This Classroom Booking System facilitates the efficiency of booking classroom. The teacher can easily add, modify and delete their booking. Since the system provides many data validation and verification for the input, it greatly reduce chance of human mistake. Thus, the accuracy increases. Also, the teacher can check out all the information of booking by print booking function with sorting and searching function. They can organize the room better. The disadvantage is that there is cost for maintaining the system. For example, the eletricity and secondary storage device are needed to maintain the system and save the data. And, server may be needed.

## 4.2 Improvement and Further Development

Mouse click function should be available for the user to use the Classroom booking system so that the user can click the date on the calendar without inputting a string of number. Thus, it can reduce human mistake.

# 5. Appendix

## 5.1 Reference

1. free pascal
   https://www.freepascal.org/
2. HOW TO CALCULATE THE DAY OF THE WEEK FROM ANY DATE - Art of Memory Blog
   https://blog.artofmemory.com/how-to-calculate-the-day-of-the-week-4203.html