<u>SC1003 2023/24 Sem 1 Assignment</u>

The NTU Bookshop has a capacity of selling MAX (e.g., 5 for this program) number of books. You are required to write a NTU Bookshop Management Program. The program uses an array of **Book** structures for storing the books in the bookshop.

Each structure **Book** should hold the following information:

- bookID – It stores the book identification number.
- title – It stores the book title.
- author – It stores the name of the author of the book.
- price – It stores the price for the book.
- quantity – It stores the quantity available for the book.

A structure is defined to represent a book record as follows:

```
typedef struct
{
   int bookID;
   char title[40];
   char author[40];
   double price;
   int quantity;
} Book;
```

The **bookID** must be **<u>unique</u>**. Therefore, each Book structure will have a different bookID when it is created. You may assume that the title and author name of a book are not more than 40 characters long. In the program, it should display a menu to support the following functions:

NTU BOOKSHOP MANAGEMENT PROGRAM:
1: listBook()
2: addBook()
3: removeBook()
4: findBook()
5: updateBook()
6: quit

The program should execute the functions (or options) of its menu. It will continue execution until the user selects to quit from the program.

The functions are described as follows:

(1) **listBooks()** – The function requirements are given as follows:

- This function prints the following message when it is executed: "olvwE rrnv+,="
- It then prints the content of each book in the bookshop.
- If the bookshop is empty, the function should display the message:
  "The bookshop is empty"

(2) **addBook()** – The function requirements are given as follows:

- This function prints the following message when it is executed: **"addBook():"**

- It adds a new book into the bookshop. Before and after this function call, the bookshop should be an array of Book structures stored in **ascending order** according to the integer value of bookID.
- After adding the new book, the function should display the message:
  "The book has been added successfully"
- If the book's bookID has already existed in the bookshop, the function should display the message:
  "The bookID has already existed! Unable to addBook()"
  and no addition should be done. The program will then ask the user to enter a new option for execution.
- If the bookshop is full before insertion, i.e., it is equal to the maximum capacity of MAX (e.g., 5), the function should display the message:
  "The bookshop is full! Unable to addBook()"
  and no addition should be done. The program will then ask the user to enter a new option for execution.

(3) **removeBook()** – The function requirements are given as follows:

- This function prints the following message when it is executed: **"removeBook():"**
- It first reads the target book that is going to be removed by asking: **"Enter the target book title: "** and **"Enter the target author name: "**
- It then removes the target book from the bookshop accordingly.
- The string matching between the target book (i.e. based on book title and author name) and the books stored in the bookshop should be done irregardless of the letter cases (upper case letter and lower case letter will be treated to be the same). As such, when doing string matching, all characters in the string should be converted into lower case or upper case before matching is done.
- Before and after this function call, the bookshop is an array of structures stored in **ascending order** according to the integer value of bookID.
- After the book is removed, the function should display the message:
  "The target book is removed"
  and the contents of the corresponding book should be displayed.
- If the bookshop is empty before removal, the function should display the message:
  "The bookshop is empty"
  and no removal should be done. The program will then ask the user to enter a new option for execution.
- If target book does not exist in the bookshop, the function should display the error message: **"The target book is not in the bookshop"**

(4) **findBook()** – The function requirements are given below:

- This function prints the following message when it is executed: **"findBook():"**
- It first reads the target book that is going to be searched by asking: **"Enter the target book title: "** and **"Enter the target author name: "**
- It will then find the target book stored in the bookshop accordingly, and prints the target book information to the screen.
- The string matching that is used to find the target book should be done irregardless of the letter cases (upper case letter and lower case letter will be treated to be the same).
- If the target book is found in the bookshop, the function should display the message: **"The target book is found"**

and display the contents of the corresponding book.

- If the target book does not exist in the bookshop, the function should issue the message: **"The target book is not found"**

(5) **updateBook()** – The function requirements are given below:

- This function prints the following message when it is executed: **"updateBook():"**
- It first reads the target book that is going to be updated b y asking: **"Enter the target book title: "** and **"Enter the target author name: "**
- It reads the target book's updated price and quantity, and prints the updated book information to the screen.
- If target book is updated, the function should issue the message:
  "The target book is updated"
  and display the updated contents of the corresponding book.
- If target book does not exist in the bookshop, the function should issue the message: **"The target book is not in the bookshop"**

You are required to write the program and the functions according to the program requirements. Note that:

- You should design the program and define the functions according to the requirements.
- You only need to consider the requirements stated in the program specification, and you do not need to implement any user input checking which is not stated in the specification.
- You may add any other supporting functions in the program if needed.
- You may include any C library functions in your program if needed.
- Sample test case are also given in this assignment. You may just follow the sample test cases for building the program.

A sample program running session is given below (please note that the input data are shown in orange color):

```
NTU BOOKSHOP MANAGEMENT PROGRAM:
1: listBooks()
2: addBook()
3: removeBook()
4: findBook()
5: updateBook()
6: quit
Enter your choice:
2
addBook():
Enter bookID:
1
Enter book title:
C Programming
Enter author name:
PC Leong
Enter price:
20.20
Enter quantity:
12
The book has been added successfully
```

```
Enter your choice:
2
addBook():
Enter bookID:
5
Enter book title:
ava Programming
Enter author name:
WC Tan
Enter price:
25.25
Enter quantity:
0
The book has been added successfully
Enter your choice:
2
addBook():
Enter bookID:
3
Enter book title:
Python Programming
Enter author name:
Philip Fu
Enter price:
30.30
Enter quantity:
100
The book has been added successfully
Enter your choice:
1
listBooks():
BookID: 1
Book title: C Programming
Author name: PC Leong
Book price: 20.20
Quantity: 12
BookID: 3
Book title: Python Programming
Author name: Philip Fu
Book price: 30.30
Quantity: 100
BookID: 5
Book title: Java Programming
Author name: WC Tan
Book price: 25.25
Quantity: 50
Enter your choice:
6
```

Sample Test Cases (Pretest)

Case 1 - listBooks (empty bookshop)

Input	Output
1 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **listBooks():** **The bookshop is empty** Enter your choice:

Case 2 – addBook (3 books are added)

Input	Output
2 1 C Programming PC Leong 20.20 12 2 5 Java Programming WC Tan 25.25 50 2 3 Python Programming Philip Fu 30.30 100 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice:

Case 3 – addBook (3 books are added) + listBooks

Input	Output
2 1 C Programming PC Leong 20.20 12 2 5 Java Programming WC Tan 25.25 50 2 3 Python Programming Philip Fu 30.30 100 1 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **listBooks():** BookID: 1 Book title: C Programming Author name: PC Leong Book price: 20.20 Quantity: 12 BookID: 3 Book title: Python Programming Author name: Philip Fu Book price: 30.30 Quantity: 100 BookID: 5 Book title: Java Programming Author name: WC Tan Book price: 25.25 Quantity: 50 Enter your choice:

Case 4 – addBook (3 books are added and bookID already existed)

Input	Output
2 1 C Programming PC Leong 20.20 12 2 5 Java Programming WC Tan 25.25 50 2 3 Python Programming Philip Fu 30.30 100 2 3 Ada Programming SC Hui 30.00 10 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The bookID has already existed! Unable to addBook()** Enter your choice:

Case 5 – addBook (bookshop is full)

Input	Output
2	NTU BOOKSHOP MANAGEMENT PROGRAM:
1	1: listBooks()
C Programming	2: addBook()
PC Leong	3: removeBook()
20.20	4: findBook()
12	5: updateBook()
2	6: quit
5	Enter your choice:
Java Programming	**addBook():**
WC Tan	Enter bookID:
25.25	Enter book title:
50	Enter author name:
2	Enter price:
3	Enter quantity:
Python Programming	**The book has been added successfully**
Philip Fu	Enter your choice:
30.30	**addBook():**
100	Enter bookID:
2	Enter book title:
15	Enter author name:
Ada Programming	Enter price:
SC Hui	Enter quantity:
30.00	**The book has been added successfully**
10	Enter your choice:
2	**addBook():**
10	Enter bookID:
Cobol Programming	Enter book title:
H Seah	Enter author name:
30.90	Enter price:
10	Enter quantity:
2	**The book has been added successfully**
9	Enter your choice:
C# Programming	**addBook():**
SC Hui	Enter bookID:
50.80	Enter book title:
50	Enter author name:
1	Enter price:
6	Enter quantity:
	The book has been added successfully
	Enter your choice:
	addBook():
	Enter bookID:
	Enter book title:
	Enter author name:
	Enter price:
	Enter quantity:
	The book has been added successfully
	Enter your choice:
	addBook():
	Enter bookID:
	Enter book title:
	Enter author name:
	Enter price:
	Enter quantity:
	The bookshop is full! Unable to addBook()
	Enter your choice:
	listBooks():
	BookID: 1

	Book title: C Programming Author name: PC Leong Book price: 20.20 Quantity: 12 BookID: 3 Book title: Python Programming Author name: Philip Fu Book price: 30.30 Quantity: 100 BookID: 5 Book title: Java Programming Author name: WC Tan Book price: 25.25 Quantity: 50 BookID: 10 Book title: Cobol Programming Author name: H Seah Book price: 30.90 Quantity: 10 BookID: 15 Book title: Ada Programming Author name: SC Hui Book price: 30.00 Quantity: 10 Enter your choice:

Case 6 – removeBook (empty)

Input	Output
1 3 Java Programming WC Tan 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **listBooks():** **The bookshop is empty** Enter your choice: **removeBook():** Enter the target book title: Enter the target author name: **The bookshop is empty** Enter your choice:

Case 7 – removeBook (exact string matching & target found & removed)

Input	Output
	NTU BOOKSHOP MANAGEMENT PROGRAM:
2	1: listBooks()
1	2: addBook()
C Programming	3: removeBook()
PC Leong	4: findBook()
20.20	5: updateBook()
12	6: quit
2	Enter your choice:
5	**addBook():**
Java Programming	Enter bookID:
WC Tan	Enter book title:
25.25	Enter author name:
50	Enter price:
2	Enter quantity:
3	**The book has been added successfully**
Python Programming	Enter your choice:
Philip Fu	**addBook():**
30.30	Enter bookID:
100	Enter book title:
2	Enter author name:
10	Enter price:
Ada Programming	Enter quantity:
SC Hui	**The book has been added successfully**
30.00	Enter your choice:
10	**addBook():**
3	Enter bookID:
Java Programming	Enter book title:
WC Tan	Enter author name:
1	Enter price:
6	Enter quantity:
	The book has been added successfully
	Enter your choice:
	addBook():
	Enter bookID:
	Enter book title:
	Enter author name:
	Enter price:
	Enter quantity:
	The book has been added successfully
	Enter your choice:
	removeBook():
	Enter the target book title:
	Enter the target author name:
	The target book is removed
	BookID: 5
	Book title: Java Programming
	Author name: WC Tan
	Book price: 25.25
	Quantity: 50
	Enter your choice:
	listBooks():
	BookID: 1
	Book title: C Programming
	Author name: PC Leong
	Book price: 20.20
	Quantity: 12
	BookID: 3
	Book title: Python Programming

	Author name: Philip Fu Book price: 30.30 Quantity: 100 BookID: 10 Book title: Ada Programming Author name: SC Hui Book price: 30.00 Quantity: 10 Enter your choice:

Case 8 – removeBook (mixed case string matching & target found & removed)

<table>
<tr><th>Input</th><th>Output</th></tr>
<tr><td>2
1
C Programming
PC Leong
20.20
12
2
5
Java Programming
WC Tan
25.25
50
2
3
Python Programming
Philip Fu
30.30
100
2
10
Ada Programming
SC Hui
30.00
10
3
Java PROGRAMMING
WC TAN
1
6</td><td>NTU BOOKSHOP MANAGEMENT PROGRAM:
1: listBooks()
2: addBook()
3: removeBook()
4: findBook()
5: updateBook()
6: quit
Enter your choice:
addBook():
Enter bookID:
Enter book title:
Enter author name:
Enter price:
Enter quantity:
The book has been added successfully
Enter your choice:
addBook():
Enter bookID:
Enter book title:
Enter author name:
Enter price:
Enter quantity:
The book has been added successfully
Enter your choice:
addBook():
Enter bookID:
Enter book title:
Enter author name:
Enter price:
Enter quantity:
The book has been added successfully
Enter your choice:
addBook():
Enter bookID:
Enter book title:
Enter author name:
Enter price:
Enter quantity:
The book has been added successfully
Enter your choice:
removeBook():
Enter the target book title:
Enter the target author name:
The target book is removed
BookID: 5
Book title: Java Programming
Author name: WC Tan
Book price: 25.25
Quantity: 50
Enter your choice:
listBooks():
BookID: 1
Book title: C Programming
Author name: PC Leong
Book price: 20.20
Quantity: 12
BookID: 3
Book title: Python Programming</td></tr>
</table>

	Author name: Philip Fu Book price: 30.30 Quantity: 100 BookID: 10 Book title: Ada Programming Author name: SC Hui Book price: 30.00 Quantity: 10 Enter your choice:

Case 9 – removeBook (target not found)

Input	Output
2 1 C Programming PC Leong 20.20 12 2 5 Java Programming WC Tan 25.25 50 2 3 Python Programming Philip Fu 30.30 100 2 10 Ada Programming SC Hui 30.00 10 3 Jav Programming WC Tan 1 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **removeBook():** Enter the target book title: Enter the target author name: **The target book is not in the bookshop** Enter your choice: **listBooks():** BookID: 1 Book title: C Programming Author name: PC Leong Book price: 20.20 Quantity: 12 BookID: 3 Book title: Python Programming Author name: Philip Fu Book price: 30.30 Quantity: 100 BookID: 5 Book title: Java Programming

	Author name: WC Tan Book price: 25.25 Quantity: 50 BookID: 10 Book title: Ada Programming Author name: SC Hui Book price: 30.00 Quantity: 10 Enter your choice:

Case 10 – findBook (target is found)

Input	Output
2 1 C Programming PC Leong 20.20 12 2 5 Java Programming WC Tan 25.25 50 2 3 Python Programming Philip Fu 30.30 100 2 10 Ada Programming SC Hui 30.00 10 4 Java PROGRAMMING WC TAN 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **findBook():** Enter the target book title: Enter the target author name: **The target book is found** BookID: 5 Book title: Java Programming Author name: WC Tan Book price: 25.25 Quantity: 50 Enter your choice:

Case 11 – findBook (target not found)

Input	Output
2 1 C Programming PC Leong 20.20 12 2 5 Java Programming WC Tan 25.25 50 2 3 Python Programming Philip Fu 30.30 100 2 10 Ada Programming SC Hui 30.00 10 4 Jav PROGRAMMING WC TAN 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **findBook():** Enter the target book title: Enter the target author name: **The target book is not found** Enter your choice:

Case 12 – updateBook (target found & updated)

Input	Output
 2 1 C Programming PC Leong 20.20 12 2 5 Java Programming WC Tan 25.25 50 2 3 Python Programming Philip Fu 30.30 100 2 10 Ada Programming SC Hui 30.00 10 5 Java PROGRAMMING WC TAN 50.99 66 1 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **updateBook():** Enter the target book title: Enter the target author name: Enter updated book price: Enter updated quantity: **The target book is updated** BookID: 5 Book title: Java Programming Author name: WC Tan Book price: 50.99 Quantity: 66 Enter your choice: **listBooks():** BookID: 1 Book title: C Programming Author name: PC Leong Book price: 20.20 Quantity: 12

	BookID: 3 Book title: Python Programming Author name: Philip Fu Book price: 30.30 Quantity: 100 BookID: 5 Book title: Java Programming Author name: WC Tan Book price: 50.99 Quantity: 66 BookID: 10 Book title: Ada Programming Author name: SC Hui Book price: 30.00 Quantity: 10 Enter your choice:

Case 13 – updateBook (target not found)

Input	Output
2 1 C Programming PC Leong 20.20 12 2 5 Java Programming WC Tan 25.25 50 2 3 Python Programming Philip Fu 30.30 100 2 10 Ada Programming SC Hui 30.00 10 5 Jav Programming WC Tan 1 6	NTU BOOKSHOP MANAGEMENT PROGRAM: 1: listBooks() 2: addBook() 3: removeBook() 4: findBook() 5: updateBook() 6: quit Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **addBook():** Enter bookID: Enter book title: Enter author name: Enter price: Enter quantity: **The book has been added successfully** Enter your choice: **updateBook():** Enter the target book title: Enter the target author name: **The target book is not in the bookshop** Enter your choice: **listBooks():** BookID: 1 Book title: C Programming Author name: PC Leong Book price: 20.20 Quantity: 12 BookID: 3 Book title: Python Programming Author name: Philip Fu Book price: 30.30 Quantity: 100 BookID: 5 Book title: Java Programming

	Author name: WC Tan Book price: 25.25 Quantity: 50 BookID: 10 Book title: Ada Programming Author name: SC Hui Book price: 30.00 Quantity: 10 Enter your choice: