bookType.h:

```
#ifndef bookType_H
#define bookType_H
#include <string>
#pragma once

using namespace std;
class bookType
{
public:
    bookType();
    ~bookType();
    void printInfo() const;
    void setBookInfo(string title, string ISBN,
      string Publisher, int PublishYear,
      string auth[], double cost, int copies,
      int noAuthors);
    void setBookTitle(string s);
    void setBookISBN(string s);
    void setAuthor(int i, string auth);
    void setBookPrice(double cost);
    void setCopiesInStock(int noOfCopies);
    void setPublisher(string pub);

    bool isISBN(string s) const;
    bool isTitle(string s) const;
    bool isAuthor(string s) const;

    void getBookTitle(string& s) const;
    void getBookISBN(string& s) const;
    void getPublisher(string& s) const;
    int getQuantity() const;
    double getBookPrice() const;
    void getAuthor(vector<string> & vec);
    bool isInStock() const;
    void makeSale();

    void printBookPrice() const;
    void printbookTitle() const;
    void printbookTitleAndISBN() const;
    void showQuantityInStock() const;
    void updateQuantity(int addBooks);
private:
    string bookTitle;
```

```
    string bookISBN;
    string bookPublisher;

    int bookPublishYear;
    string authors[4];

    double price;
    int quantity;

    int noOfAuthors;
};

#endif
```

bookType.cpp:

```
#include "bookType.h"
#include <iostream>
#include <vector>
using namespace std;

bookType::bookType(){
    bookTitle = "";
    noOfAuthors = 0;
    bookPublisher = "";
    bookISBN = "";
    price = 0;
    quantity = 0;
    bookPublishYear = 0;
}

bookType::~bookType()
{

}

void bookType::printInfo() const
{
    int i;

    cout << "Title: " << bookTitle << endl;
    cout << "ISBN: " << bookISBN << endl;
    cout << "Publisher: " << bookPublisher << endl;

    cout << "Year of Publication: " << bookPublishYear << endl;
```

```
    cout << "Number of Authors: " << noOfAuthors << endl;

    cout << "Authors: ";
    for (i = 0; i < noOfAuthors; i++)
        cout << authors[i] << "; ";
    cout << endl;

    cout << "Price: " << price << endl;

    cout << "Quantities in stock: " << quantity << endl;;

}
void bookType::setBookInfo(string title, string ISBN,
     string Publisher, int PublishYear,
     string auth[], double cost, int copies,
     int authorCount)
{
    int i;

    bookTitle = title;
    bookISBN = ISBN;
    bookPublisher = Publisher;

    bookPublishYear = PublishYear;

    noOfAuthors = authorCount;

    for (i = 0; i < noOfAuthors; i++)
        authors[i] = auth[i];

    price = cost;
    quantity = copies;
}
void bookType::setBookTitle(string s){
    bookTitle = s;
}
void bookType::setAuthor(int i, string auth){
    authors[i] = auth;
}
void bookType::setPublisher(string pub){
    bookPublisher = pub;
}
void bookType::setBookISBN(string s){
```

```
    bookISBN = s;
}
void bookType::setBookPrice(double cost){
    price = cost;
}
void bookType::setCopiesInStock(int noOfCopies){
    quantity = noOfCopies;
}
bool bookType::isISBN(string s) const{
    return bookISBN == s;
}
bool bookType::isTitle(string s) const{
    return bookTitle == s;
}
bool bookType::isAuthor(string s) const{
    return bookPublisher == s;
}

void bookType::getBookTitle(string& s) const{
    s = bookTitle;
}
void bookType::getPublisher(string& s) const{
    s = bookPublisher;
}
void bookType::getAuthor(vector<string> & vec){

    for(int i = 0; i < noOfAuthors; i++){
        vec.push_back(authors[i]);
    }
}
void bookType::getBookISBN(string& s) const{
    s = bookISBN;
}
double bookType::getBookPrice() const{
    return price;
}
int bookType::getQuantity() const{
    return quantity;
}
bool bookType::isInStock() const{
    return quantity > 0;
}
void bookType::makeSale(){
    quantity--;
```

```
}

void bookType::printBookPrice() const{
    cout << "The book price is " << price << endl;
}
void bookType::printbookTitle() const{
    cout << "The book title is " << bookPublisher << endl;
}
void bookType::printbookTitleAndISBN() const{
    cout << "The book title is " << bookPublisher << endl;
    cout << "The ISBN is " << bookISBN << endl;
}
void bookType::showQuantityInStock() const{
    cout << "The number of this book is " << quantity << endl;
}
void bookType::updateQuantity(int addBooks){
    quantity += addBooks;
}
```

Hw4Main.cpp:

```
#include <iostream>
#include <vector>
#include <stack>
#include <queue>
#include "bookType.h"
#include "bookType.cpp"
using namespace std;

int main()
{
    bookType books[100];

    string book1Author[2] = {"Bjarne Stroustrup", "jim Butter"};
    string book2Author[2] = {"Scott Meyers", "Tim cook"};
    string book3Author[1] = {"Bjarne Stroustrup"};
    string book4Authors[] = {"Joshua Bloch"};
    string book5Authors[] = {"Brian W. Kernighan", "Dennis M. Ritchie"};
    string book6Authors[] = {"Robert Martin"};
    string book7Authors[] = {"Martin Fowler", "Kent Beck", "John Brant",
"William Opdyke", "Don Roberts"};
    string book8Authors[] = {"John D. Cook"};
    string book9Authors[] = {"Erich Gamma", "Richard Helm", "Ralph Johnson",
"John Vlissides"};
```

```
   books[33].setBookInfo("Effective Java", "978-0134685991", "Addison-Wesley
Professional", 2018, book4Authors, 39.99, 3, 1);
   books[44].setBookInfo("The C Programming Language", "978-0131103627",
"Prentice Hall", 1988, book5Authors, 51.99, 6, 2);
   books[55].setBookInfo("Clean Code: A Handbook of Agile Software
Craftsmanship", "978-0132350884", "Prentice Hall", 2008, book6Authors,
45.59, 4, 1);
   books[66].setBookInfo("Refactoring: Improving the Design of Existing
Code", "978-0201485677", "Addison-Wesley Professional", 1999, book7Authors,
49.99, 2, 5);
   books[77].setBookInfo("A Primer on Scientific Programming with Python",
"978-1466567584", "Chapman and Hall/CRC", 2014, book8Authors, 59.95, 7, 1);
   books[88].setBookInfo("Design Patterns: Elements of Reusable Object-
Oriented Software", "978-0201633610", "Addison-Wesley Professional", 1994,
book9Authors, 47.99, 5, 4);
   books[0].setBookInfo("The C++ Programming Language", "978-
0321563842","Addison-Wesley Professional", 1989 , book1Author, 45.49, 10,
2);
   books[11].setBookInfo("Effective Modern C++", "978-1491903995" ,
"O'Reilly Media", 2000, book2Author, 18.98, 35, 2);
   books[99].setBookInfo("Programming: Principles and Practice Using
C++","978-0321992789", "Addison-Wesley Professional", 2010, book3Author,
34.67, 48, 1);

   // search for a book by title
   string title = "Effective Modern C++";
   for (int i = 0; i < 100; i++) {
      if (books[i].isTitle(title)) {
         cout << "Found book with title \"" << title << "\"." << endl;
         break;
      }
   }

   // search for a book by ISBN
   string ISBN = "978-0321563842";
   for (int i = 0; i < 100; i++) {
      if (books[i].isISBN(ISBN)) {
         cout << "Found book with ISBN \"" << ISBN << "\"." << endl;
         break;
      }
   }
   // update the number of copies of a book
   title = "The C++ Programming Language";
   int numCopies = 5;
```

```
    for (int i = 0; i < 100; i++) {
        if (books[i].isTitle(title)) {
            books[i].updateQuantity(numCopies);
            books[i].makeSale();
            cout << "Updated number of copies of book with title \"" << title
<< "\" to " << books[i].getQuantity() << "." << endl;
            break;
        }
    }
    vector<bookType> vec;
    cout << vec.empty() << endl;
    vec.push_back(books[0]);
    vec.push_back(books[11]);
    vec.push_back(books[33]);
    vec.push_back(books[44]);
    for(vector<bookType>::iterator it = vec.begin(); it != vec.end(); it++){
        cout << "                    " << endl;
        it->printInfo();
        cout << "                    " << endl;
    }
    vec.pop_back();
    vec.insert(vec.begin(), books[66]);
    cout << vec.empty() << endl;
    cout << vec.size() << endl;
    vector<string> author;
    vec.back().getAuthor(author);
    cout << author.back()<< endl;
    cout << "**********************" << endl;


    stack<bookType> sta;
    cout << sta.empty() << endl;
    sta.push(books[0]);
    sta.top().printInfo();
    cout << "                    " << endl;
    sta.push(books[11]);
    sta.top().printInfo();
    cout << "                    " << endl;
    sta.push(books[33]);
    sta.top().printInfo();
    cout << "                    " << endl;
    sta.push(books[44]);
    sta.top().printInfo();
    cout << "                    " << endl;
    sta.pop();
```

```
    bookType remove = sta.top();
    vector<string> author2;
    cout << sta.size() << endl;
    remove.getAuthor(author2);
    cout << *author2.begin() <<endl;
    cout << "----------------" << endl;

    queue<bookType> que;
    cout << que.empty() << endl;
    que.push(books[0]);
    que.front().printInfo();
    cout << "                    " << endl;
    que.push(books[11]);
    que.back().printInfo();
    cout << "                    " << endl;
    que.push(books[33]);
    que.back().printInfo();
    cout << "                    " << endl;
    que.push(books[44]);
    que.back().printInfo();
    cout << "                    " << endl;
    que.pop();
    cout << que.front().getBookPrice() << endl;
    cout << que.back().getBookPrice() << endl;
    cout << que.size();
    return 0;
}
```

Result for q1:

```
Found book with title "Effective Modern C++".
Found book with ISBN "978-0321563842".
Updated number of copies of book with title "The C++ Programming Language" to 14.
```

Result for q2:

(1) vector

```
1

Title: The C++ Programming Language
ISBN: 978-0321563842
Publisher: Addison-Wesley Professional
Year of Publication: 1989
Number of Authors: 2
Authors: Bjarne Stroustrup; jim Butter;
Price: 45.49
Quantities in stock: 14


Title: Effective Modern C++
ISBN: 978-1491903995
Publisher: O'Reilly Media
Year of Publication: 2000
Number of Authors: 2
Authors: Scott Meyers; Tim cook;
Price: 18.98
Quantities in stock: 35


Title: Effective Java
ISBN: 978-0134685991
Publisher: Addison-Wesley Professional
Year of Publication: 2018
Number of Authors: 1
Authors: Joshua Bloch;
Price: 39.99
Quantities in stock: 3


Title: The C Programming Language
ISBN: 978-0131103627
Publisher: Prentice Hall
Year of Publication: 1988
Number of Authors: 2
Authors: Brian W. Kernighan; Dennis M. Ritchie;
Price: 51.99
Quantities in stock: 6

0
4
Joshua Bloch
```

(2) stack:

```
1
Title: The C++ Programming Language
ISBN: 978-0321563842
Publisher: Addison-Wesley Professional
Year of Publication: 1989
Number of Authors: 2
Authors: Bjarne Stroustrup; jim Butter;
Price: 45.49
Quantities in stock: 14

Title: Effective Modern C++
ISBN: 978-1491903995
Publisher: O'Reilly Media
Year of Publication: 2000
Number of Authors: 2
Authors: Scott Meyers; Tim cook;
Price: 18.98
Quantities in stock: 35

Title: Effective Java
ISBN: 978-0134685991
Publisher: Addison-Wesley Professional
Year of Publication: 2018
Number of Authors: 1
Authors: Joshua Bloch;
Price: 39.99
Quantities in stock: 3

Title: The C Programming Language
ISBN: 978-0131103627
Publisher: Prentice Hall
Year of Publication: 1988
Number of Authors: 2
Authors: Brian W. Kernighan; Dennis M. Ritchie;
Price: 51.99
Quantities in stock: 6

3
Joshua Bloch
```

(3) queue:

```
1
Title: The C++ Programming Language
ISBN: 978-0321563842
Publisher: Addison-Wesley Professional
Year of Publication: 1989
Number of Authors: 2
Authors: Bjarne Stroustrup; jim Butter;
Price: 45.49
Quantities in stock: 14

Title: Effective Modern C++
ISBN: 978-1491903995
Publisher: O'Reilly Media
Year of Publication: 2000
Number of Authors: 2
Authors: Scott Meyers; Tim cook;
Price: 18.98
Quantities in stock: 35

Title: Effective Java
ISBN: 978-0134685991
Publisher: Addison-Wesley Professional
Year of Publication: 2018
Number of Authors: 1
Authors: Joshua Bloch;
Price: 39.99
Quantities in stock: 3

Title: The C Programming Language
ISBN: 978-0131103627
Publisher: Prentice Hall
Year of Publication: 1988
Number of Authors: 2
Authors: Brian W. Kernighan; Dennis M. Ritchie;
Price: 51.99
Quantities in stock: 6

18.98
51.99
3%
```