EECS 3421B - Introduction to Database Systems

Project 4 - Fall 2019

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-- Project 4 Part A (Triggers)
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-- Examples/Tests are located in file: trigger_test_examples.sql
-- NOTE: execute bash script: runA.sh to test these triggers

--#SET TERMINATOR @
-- trigger #1
-- on delete book cascade delete its offers as well
create or replace trigger cleanUpOffers
after delete on yrb_book
referencing
    old as O
for each row mode db2sql
begin atomic
    DELETE FROM new_offer AS Y WHERE Y.title = O.title and Y.year = O.year ;
end@


-- trigger #2
-- reject insertion into purchase if customer is not a member of offering club
create or replace trigger rejectNonMemberPurchase
before insert on new_purchase
referencing
    new as N
for each row mode db2sql
when (
    N.cid not in
(SELECT M.cid from new_member AS M where M.club = N.club))
begin atomic
SIGNAL SQLSTATE '80000'
('Error: Purchase is invalid since customer is not a member');
end@

-- trigger #3
-- on insert customer, add customer to club 'Basic' as well
create or replace trigger addToClubBasic
after insert on yrb_customer
referencing
    new as N
for each row mode db2sql
when (
    N.cid not in
(SELECT cid from new_member where club = 'Basic'))
begin atomic
    insert into new_member (club, cid) values('Basic', N.cid) ;
end@
```

```
-- =========================================================================
-- Testing Trigger # 1
-- By deleing the following book
-- title = 'Acrimony Made Simple' and year = 1992"
-- expected result:
--                      1. The book should be deleted
--                      2. All offers for this book should also be deleted

-- This drop is necessary to test trigger # 1
drop table YRB_OFFER;

-- make sure book is present
select * from yrb_book where title = 'Acrimony Made Simple' and year = 1992;

-- make sure book has offers
select * from new_offer where title = 'Acrimony Made Simple' and year = 1992;

-- delete the book
delete from yrb_book where title = 'Acrimony Made Simple' and year = 1992;

-- check if all the others also got deleted
select * from new_offer where title = 'Acrimony Made Simple' and year = 1992;


-- =========================================================================
-- Testing Trigger # 2
-- reject insertion into purchase if customer is not a member of offering club

-- see who is and isnt member of club 'AAA', cid 2 is while 1 isnt.
select * from new_member where club = 'AAA';

-- make sure insertion is sucessfull since cid = 2 is a member of club = 'AAA'
insert into new_purchase values
    (2, 'AAA', 'Richmond Underground','1997', '2019-11-29-04.55.46.656000', 2);

-- insertion should fail since cid = 1 is not a member of club = 'AAA'
-- i.e. a trigger violation should show
-- "Error: Purchase is invalid since customer is not a member".
insert into new_purchase values
(1, 'AAA', 'Richmond Underground','1997', '2019-11-29-04.55.46.656000', 2);

-- an extra check to make sure that the purchase was rejected
-- bookt with title = Richmond Underground and year = 1997 should not be among
-- purchases of cid = 1
select * from new_purchase where cid = 1;

-- =========================================================================
-- Testing Trigger # 3
-- when a new customer is inserted make them a member of club 'Basic'

insert into yrb_customer values (50, 'Joe Jackson', 'Boston');

-- check if customer was inserted
select * from yrb_customer where cid = 50;

-- make sure customer is now a member of club basic
select * from new_member where cid = 50 and club = 'Basic';


-- =========================================================================
```

Part A (Triggers)

Triggers Run Instructions:

1. Download the submitted file: **ha104_p4_parta.zip**
2. cd to ha104_p4_partb.zip and execute: **unzip ha104_p4_parta.zip**
3. **cd ha104_p4_partb**
4. Execute the script: runA.sh
    Note: if there is a permission error execute: chmod +x runA.sh

The results from testing triggers were also submitted, see location:

ha104_p4_parta/**output**/trigger_1_test_output.txt
ha104_p4_parta/**output**/trigger_2_test_output.txt
ha104_p4_parta/**output**/trigger_3_test_output.txt

Part B (Database Application)

Program Installation Guide

Note: This installation guide was tested successfully on Lassonde's server: **red.cs.yorku.ca**

There are 4 steps to install/run this program
5. Download the submitted file: **ha104_p4_partb.zip**
6. cd to ha104_p4_partb.zip and execute: **unzip ha104_p4_partb.zip**
7. **cd ha104_p4_partb**
8. Execute the script: **runB.sh**
   *Note: if there is a permission error execute: **chmod +x runB.sh***

NOTE: *Every time the runB.sh script runs it will drop all tables and create new schemas. However, this is not an issue for us since this project is not running in a production environment.*
To keep the same schema between executions, comment out lines 12 and 16 from runB.sh (see screenshot on the next page).

After the above steps the program should be running as shown below:
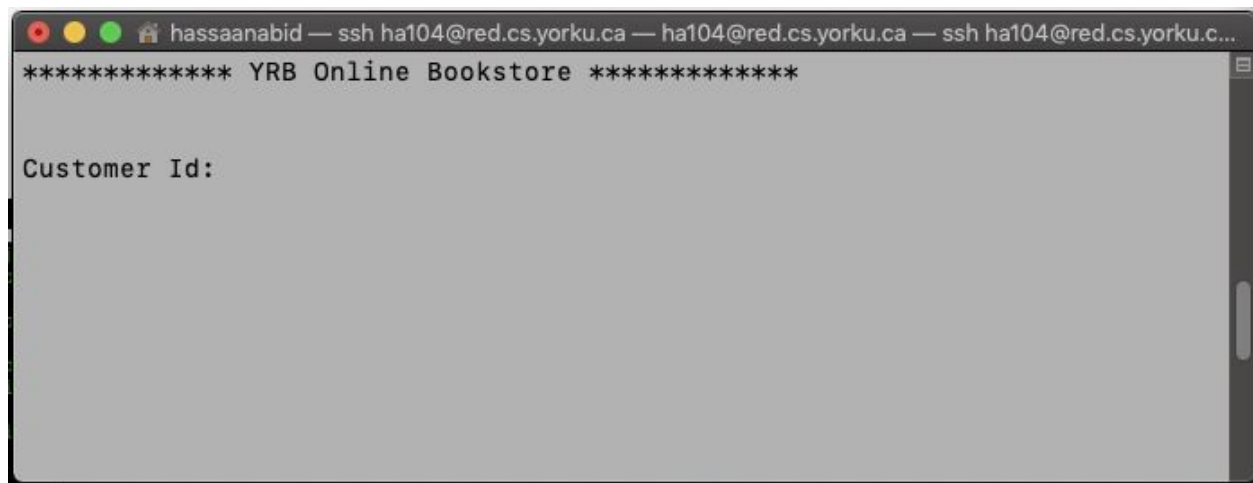
File runB.sh contains the following commands

```
 9    # connect to database
10    db2 connect to c3421a
11
12    # delete existing schema
13    db2 -tf ./util/yrb_drop.sql
14
15    # create new schema
16    db2 -tf ./util/yrb_create.sql
17
18    # setup enviorment variables
19    source ~db2leduc/cshrc.runtime
20
21    # compile java files
22    javac Connect.java YRBQueries.java YRB.java
23
24    clear
25
26    # run the program
27    java YRB
28
```

Tools used in this project

- ➢ **IDE**: IntelliJ IDEA 2018.3.2 (Ultimate Edition)
- ➢ **TextEditor**: Visual Studio Code - Version: 1.40.2
- ➢ **JRE**: java version "1.8.0_202"
- ➢ **JVM**: Java HotSpot(TM) 64-Bit Server VM (build 25.202-b08, mixed mode)
- ➢ **OS**: macOS 10.14.3
- ➢ **Imports**: import java.sql.* , java.util.*
- ➢ **Database**: IBM DB2

Scenario #1 - Customer updates their information

The following shows, the customer with **cid = 6** confirm that they would like to **update** their information.

- The customer enters a new name and a new city.
- After executing an SQL update command, the program returns with a success message.

```
● ● ●  🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 95×18
[************* YRB Online Bookstore *************


Customer Id: 6
[                                                                                              ]
-----------------------------------------------------------------------------------------------
Customer Information Retrieved
ID : 6
Name : Boswell Biddles
City : Yorktown
-----------------------------------------------------------------------------------------------

Would you like to update the customer information? (Y/N) y
[Customer Name: Nick Wayne                                                                     ]
[Customer City: oklahoma                                                                       ]
[Update Successful !                                                                           ]

  ************* Book Categories *************
```

As a cross-check(outside of the application) the following query shows that indeed customer with cid =6 is now named 'Nick Wayne' and lives in "oklahoma".

```
● ● ●  🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.c...
[                                                                                      ]
 red 305 % db2 "select * from yrb_customer where cid = 6"



CID    NAME                    CITY
------ --------------------    ----------------
     6 Nick Wayne              oklahoma

   1 record(s) selected.

 red 306 % █
```
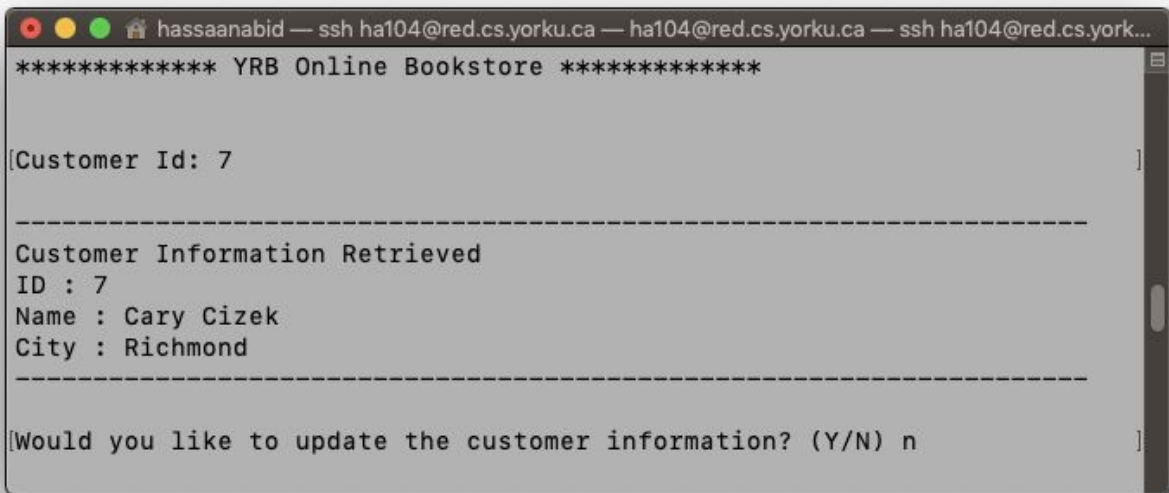
Scenario #2 - Customer purchases a book

This would be the most typical scenario that a customer wants to purchase a book.
- ● The customer enters their **cid**.
- ● The customer says 'n' when asked to update their information.


```
● ● ● 🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.york...
************ YRB Online Bookstore *************

[Customer Id: 7                                                           ]


---------------------------------------------------------------------
Customer Information Retrieved
ID : 7
Name : Cary Cizek
City : Richmond
---------------------------------------------------------------------

[Would you like to update the customer information? (Y/N) n              ]
```

continues..

The customer chooses the book category.

The customer enters a book title of their choice. In this case, the title is being sold by a club that they are a member of.

The customer purchases 2 copies of the same books and exits the session.
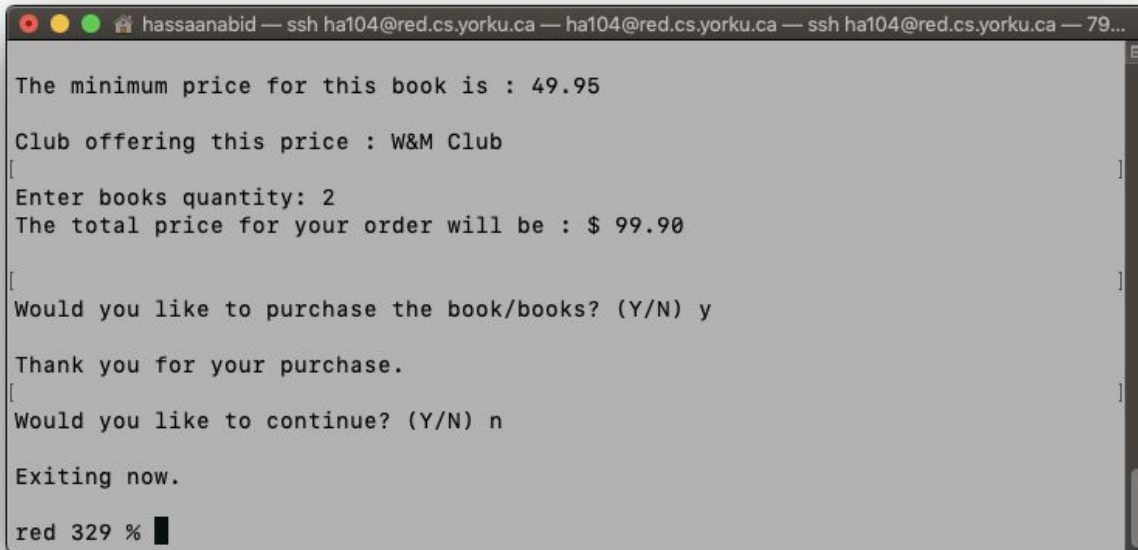
```
●  ●  ●      hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 79...

The minimum price for this book is : 49.95

Club offering this price : W&M Club
[                                                                                              ]
Enter books quantity: 2
The total price for your order will be : $ 99.90


[                                                                                              ]
Would you like to purchase the book/books? (Y/N) y

Thank you for your purchase.
[                                                                                              ]
Would you like to continue? (Y/N) n

Exiting now.

red 329 % ▊
```

A DB2 query (outside of the application) confirms that indeed that purchase was added to the database.

```
●  ●  ●              hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 112×12

red 331 % db2 "select * from yrb_purchase where cid = 7 and title = 'Tensor Calculus made Easy' and qnty = 2"

[                                                                                                                ]

CID    CLUB             TITLE                      YEAR   WHEN                       QNTY
------ ---------------  -------------------------  ------ -------------------------  ------
     7 W&M Club         Tensor Calculus made Easy   1992 2019-12-01-01.23.39.281000      2

  1 record(s) selected.

red 332 % ▊
```

10

Scenario #3 - Customer purchases multiple books in one session

Customer (cid = 8) chooses category 9 ('phi'l) to purchase the first book.

```
●●●      🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 92×38
************* YRB Online Bookstore *************

[Customer Id: 8

------------------------------------------------------------------
Customer Information Retrieved
ID : 8
Name : Jack Daniels
City : Blacksburg
------------------------------------------------------------------

[Would you like to update the customer information? (Y/N) n

  ************* Book Categories *************


Number   Category Name
------------------------------------------------------------------
    1.   children
    2.   cooking
    3.   drama
    4.   guide
    5.   history
    6.   horror
    7.   humor
    8.   mystery
    9.   phil
   10.   romance
   11.   science
   12.   travel

[Choose a category number: 9

Category phil is selected.

[Would you like to continue? (Y/N) y
```

Customer purchases 'Plato Rocker'.


```
[Would you like to continue? (Y/N) y

[Title: Plato Rocks

  ************ Books Found ************

Number                Title    Year        Language        Category Weight
------------------------------------------------------------------
   1.          Plato Rocks   1975           Greek            phil    467

[Enter a book number to purchase: 1

Book number 1 is selected.
Book details:         Plato Rocks   1975          Greek           phil    467

[Would you like to continue? (Y/N) y

The minimum price for this book is : 38.95

Club offering this price : YRB Bronze

[Enter books quantity: 1
The total price for your order will be : $ 38.95


[Would you like to purchase the book/books? (Y/N) y

Thank you for your purchase.

Would you like to continue? (Y/N) ▮
```

The customer continues their shopping experience after the purchase (without terminating the application/ current session). This time customer chooses category 2 (cooking).

```
●  ●  ●   🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 87×39
Thank you for your purchase.

Would you like to continue? (Y/N) y


 ************* Book Categories *************


Number   Category Name
-------------------------------------------------------------------------
    1.   children
    2.   cooking
    3.   drama
    4.   guide
    5.   history
    6.   horror
    7.   humor
    8.   mystery
    9.   phil
   10.   romance
[  11.   science                                                               ]
   12.   travel

Choose a category number: 2
[                                                                             ]
Category cooking is selected.
[                                                                             ]
Would you like to continue? (Y/N) y

Title: Radiator Barbecuing

 ************* Books Found *************

Number               Title   Year        Language        Category Weight
[-------------------------------------------------------------------------     ]
   1.  Radiator Barbecuing   1998         English         cooking    154

Enter a book number to purchase: 1
```

Customer purchases 'Radiator Barbecuing'. In total the customer purchased two different books in the same session.


```
●  ●  ●        🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 90×31

 ************* Books Found *************

Number                   Title    Year        Language        Category Weight
------------------------------------------------------------------
   1.  Radiator Barbecuing   1998         English         cooking    154

[Enter a book number to purchase: 1                                                    ]

Book number 1 is selected.
Book details:  Radiator Barbecuing   1998          English           cooking    154

Would you like to continue? (Y/N) y

The minimum price for this book is : 11.7
[                                                                                       ]
Club offering this price : AAA

Enter books quantity: 1
The total price for your order will be : $ 11.70

[                                                                                       ]
Would you like to purchase the book/books? (Y/N) y

Thank you for your purchase.
[                                                                                       ]
Would you like to continue? (Y/N) n

Exiting now.
[                                                                                       ]
red 334 % █
```

Scenario #4 - The title customer entered does not exist (customer may choose a different category)

The customer selects the children category to purchase a book.

```
●●● ⌂ hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 87×36
     ************* YRB Online Bookstore *************

[Customer Id: 4

------------------------------------------------------------------
Customer Information Retrieved
ID : 4
Name : Suzy Sedwick
City : Williamsburg
------------------------------------------------------------------

[Would you like to update the customer information? (Y/N) n

  ************* Book Categories *************


Number  Category Name
------------------------------------------------------------------
   1.   children
   2.   cooking
   3.   drama
   4.   guide
   5.   history
   6.   horror
   7.   humor
   8.   mystery
   9.   phil
  10.   romance
  11.   science
  12.   travel

[Choose a category number: 1

Category children is selected.
```

The customer selects the title 'harry potter' but unfortunately it does not exist (i.e. the club(s) they are a member of are not offering this book. However, customer would like to continue shopping. Hence, they are taken back to select another category.


```
     8.  mystery
     9.  phil
    10.  romance
    11.  science
    12.  travel

[Choose a category number: 1                                                        ]

 Category children is selected.

[Would you like to continue? (Y/N) y                                                ]

[Title: harry potter                                                                ]
 Unfortunately, The book is not offered by your clubs.
[Would you like to continue? (Y/N) y                                                ]


  ************* Book Categories *************


Number  Category Name
----------------------------------------------------------------------
     1.  children
     2.  cooking
     3.  drama
     4.  guide
     5.  history
     6.  horror
     7.  humor
     8.  mystery
     9.  phil
    10.  romance
    11.  science
    12.  travel

Choose a category number: █
```

Scenario #6 - Customer exits after choosing a category

Supported feature: the customer may exit after choosing a category as shown below.

```
● ● ●   🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 82×42
[red 337 % java YRB
************* YRB Online Bookstore *************


[Customer Id: 2

------------------------------------------------------------------
Customer Information Retrieved
ID : 2
Name : Qfwfq
City : Pluto
------------------------------------------------------------------

[Would you like to update the customer information? (Y/N) n

 ************* Book Categories *************


Number  Category Name
------------------------------------------------------------------
    1.  children
    2.  cooking
    3.  drama
    4.  guide
    5.  history
    6.  horror
    7.  humor
    8.  mystery
    9.  phil
   10.  romance
   11.  science
   12.  travel

[Choose a category number: 3

Category drama is selected.

[Would you like to continue? (Y/N) n

Exiting now.

red 338 % █
```
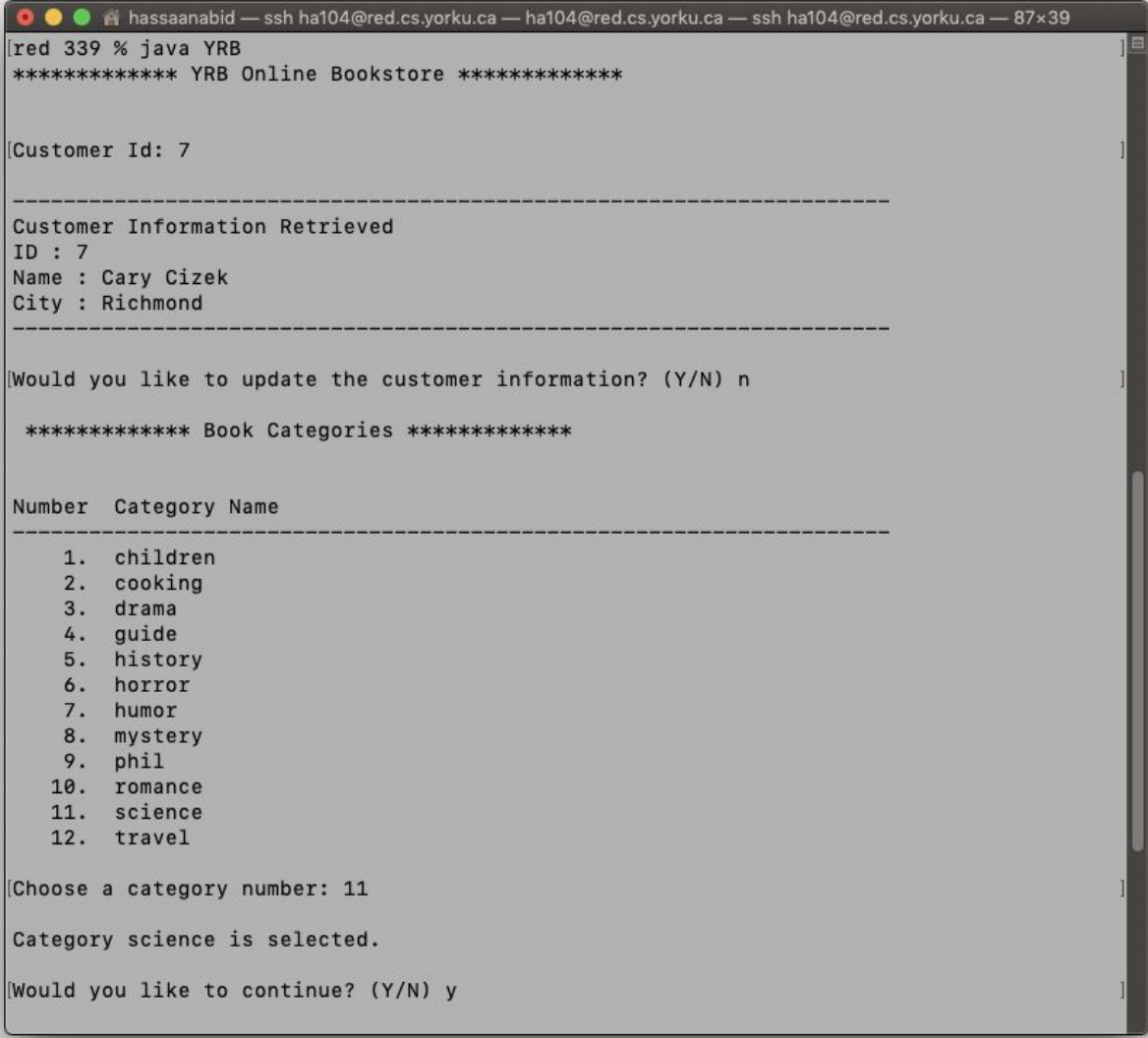
Scenario #7 - Customer exits after choosing a book

Supported feature: the customer may exit after choosing a book title as shown below.
(see the second screenshot)

```
● ● ●  🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 87×39
[red 339 % java YRB                                                              ]
************ YRB Online Bookstore *************


[Customer Id: 7                                                                  ]

------------------------------------------------------------------------
Customer Information Retrieved
ID : 7
Name : Cary Cizek
City : Richmond
------------------------------------------------------------------------

[Would you like to update the customer information? (Y/N) n                       ]

  ************* Book Categories *************


Number  Category Name
------------------------------------------------------------------------
    1.   children
    2.   cooking
    3.   drama
    4.   guide
    5.   history
    6.   horror
    7.   humor
    8.   mystery
    9.   phil
   10.   romance
   11.   science
   12.   travel

[Choose a category number: 11                                                    ]

Category science is selected.

[Would you like to continue? (Y/N) y                                             ]
```

```
[Choose a category number: 11                                                        ]

 Category science is selected.

[Would you like to continue? (Y/N) y                                                 ]

[Title: Tensor Calculus made Easy                                                    ]

  ************* Books Found *************

Number                 Title    Year        Language        Category Weight
------------------------------------------------------------------
   1. Tensor Calculus made Easy   1992            English          science    582

[Enter a book number to purchase: 1                                                  ]

Book number 1 is selected.
Book details: Tensor Calculus made Easy   1992            English          science    582

Would you like to continue? (Y/N) n
[                                                                                    ]
Exiting now.

red 340 % █
```
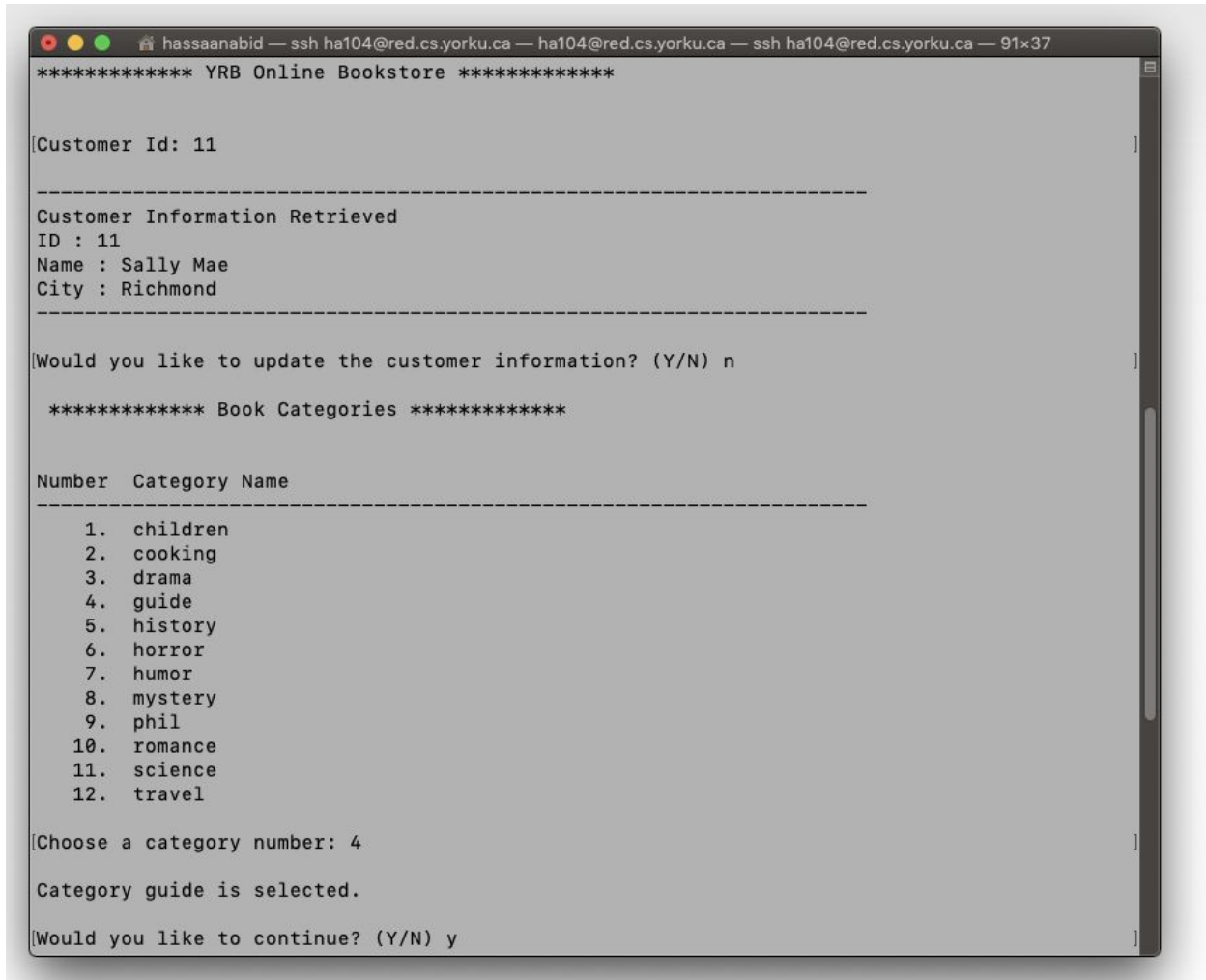
Scenario #8 - Customer exits before purchasing a book

Supported feature: the customer may exit right before purchasing a book.
This screenshot shows that they select a category.

```
● ● ●      hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 91×37
************* YRB Online Bookstore *************

[Customer Id: 11                                                                      ]

-------------------------------------------------------------------
Customer Information Retrieved
ID : 11
Name : Sally Mae
City : Richmond
-------------------------------------------------------------------

[Would you like to update the customer information? (Y/N) n                           ]

  ************* Book Categories *************


Number  Category Name
-------------------------------------------------------------------
    1.   children
    2.   cooking
    3.   drama
    4.   guide
    5.   history
    6.   horror
    7.   humor
    8.   mystery
    9.   phil
   10.   romance
   11.   science
   12.   travel

[Choose a category number: 4                                                          ]

Category guide is selected.

[Would you like to continue? (Y/N) y                                                  ]
```
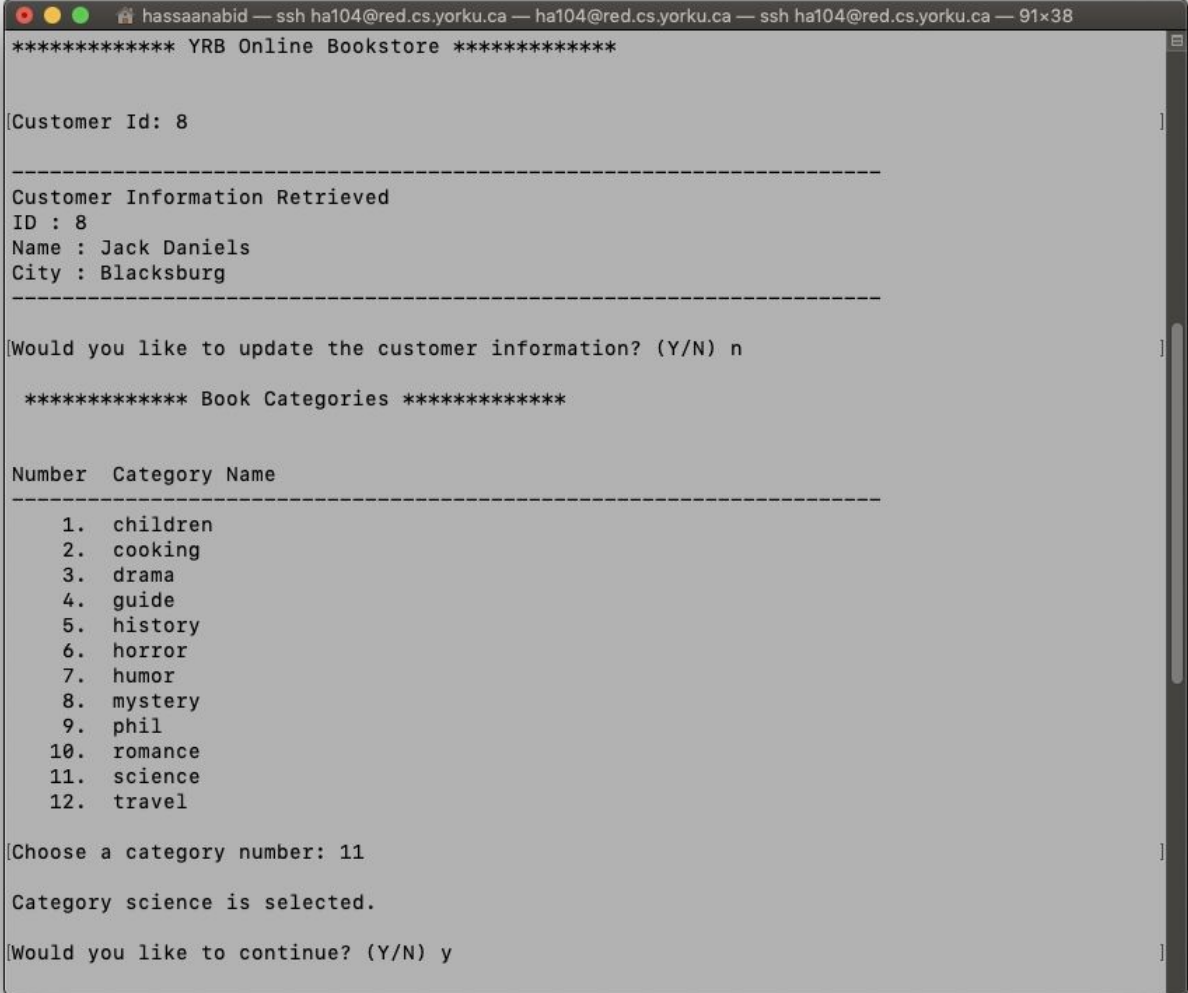
Here, after entering a title and quantity customer says 'n' to final purchase and exits.

```
Category guide is selected.

Would you like to continue? (Y/N) y

Title: Learn How To Vote

 ************* Books Found *************

Number              Title    Year        Language        Category Weight
----------------------------------------------------------------
   1.    Learn How To Vote    2000        English            guide    153

Enter a book number to purchase: 1

Book number 1 is selected.
Book details:    Learn How To Vote   2000          English           guide    153

Would you like to continue? (Y/N) y

The minimum price for this book is : 13.95

Club offering this price : YRB Silver

Enter books quantity: 1
The total price for your order will be : $ 13.95


Would you like to purchase the book/books? (Y/N) n
Would you like to continue shopping? (Y/N) n
red 347 %
```

Scenario #9 - Customer exits after purchasing a book

After purchasing a book the customer can exit the session. (see the second screenshot)

```
  ●  ●  ●        hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 91×38
************* YRB Online Bookstore *************


[Customer Id: 8                                                                          ]


-------------------------------------------------------------------
Customer Information Retrieved
ID : 8
Name : Jack Daniels
City : Blacksburg
-------------------------------------------------------------------

[Would you like to update the customer information? (Y/N) n                               ]

 ************* Book Categories *************


Number  Category Name
-------------------------------------------------------------------
    1.  children
    2.  cooking
    3.  drama
    4.  guide
    5.  history
    6.  horror
    7.  humor
    8.  mystery
    9.  phil
   10.  romance
   11.  science
   12.  travel

[Choose a category number: 11                                                            ]

Category science is selected.

[Would you like to continue? (Y/N) y                                                     ]
```

```
●●●   🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 91×37

Category science is selected.

[Would you like to continue? (Y/N) y

[Title: Tensor Calculus made Easy

 ************* Books Found *************

Number              Title   Year        Language      Category Weight
------------------------------------------------------------------
   1. Tensor Calculus made Easy   1992        English          science    582

[Enter a book number to purchase: 1

Book number 1 is selected.
Book details: Tensor Calculus made Easy   1992          English          science    582

[Would you like to continue? (Y/N) y

The minimum price for this book is : 56.95

Club offering this price : YRB Bronze

[Enter books quantity: 1
The total price for your order will be : $ 56.95


[Would you like to purchase the book/books? (Y/N) y

Thank you for your purchase.

[Would you like to continue? (Y/N) n

Exiting now.

red 343 % █
```
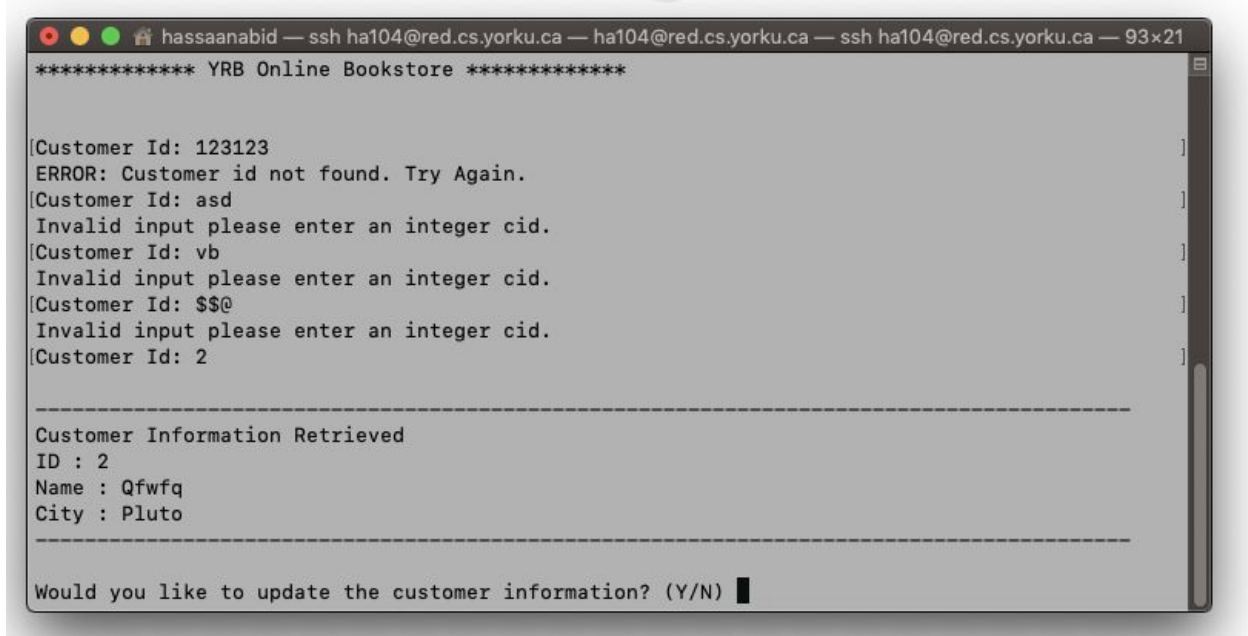
Scenario #10 - Customer enters invalid customer ID

Supported feature: handle invalid customer ID

```
hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 93×21
************* YRB Online Bookstore *************


[Customer Id: 123123                                                                          ]
 ERROR: Customer id not found. Try Again.
[Customer Id: asd                                                                             ]
 Invalid input please enter an integer cid.
[Customer Id: vb                                                                              ]
 Invalid input please enter an integer cid.
[Customer Id: $$@                                                                             ]
 Invalid input please enter an integer cid.
[Customer Id: 2                                                                               ]


------------------------------------------------------------------------------------
Customer Information Retrieved
ID : 2
Name : Qfwfq
City : Pluto
------------------------------------------------------------------------------------

Would you like to update the customer information? (Y/N) █
```
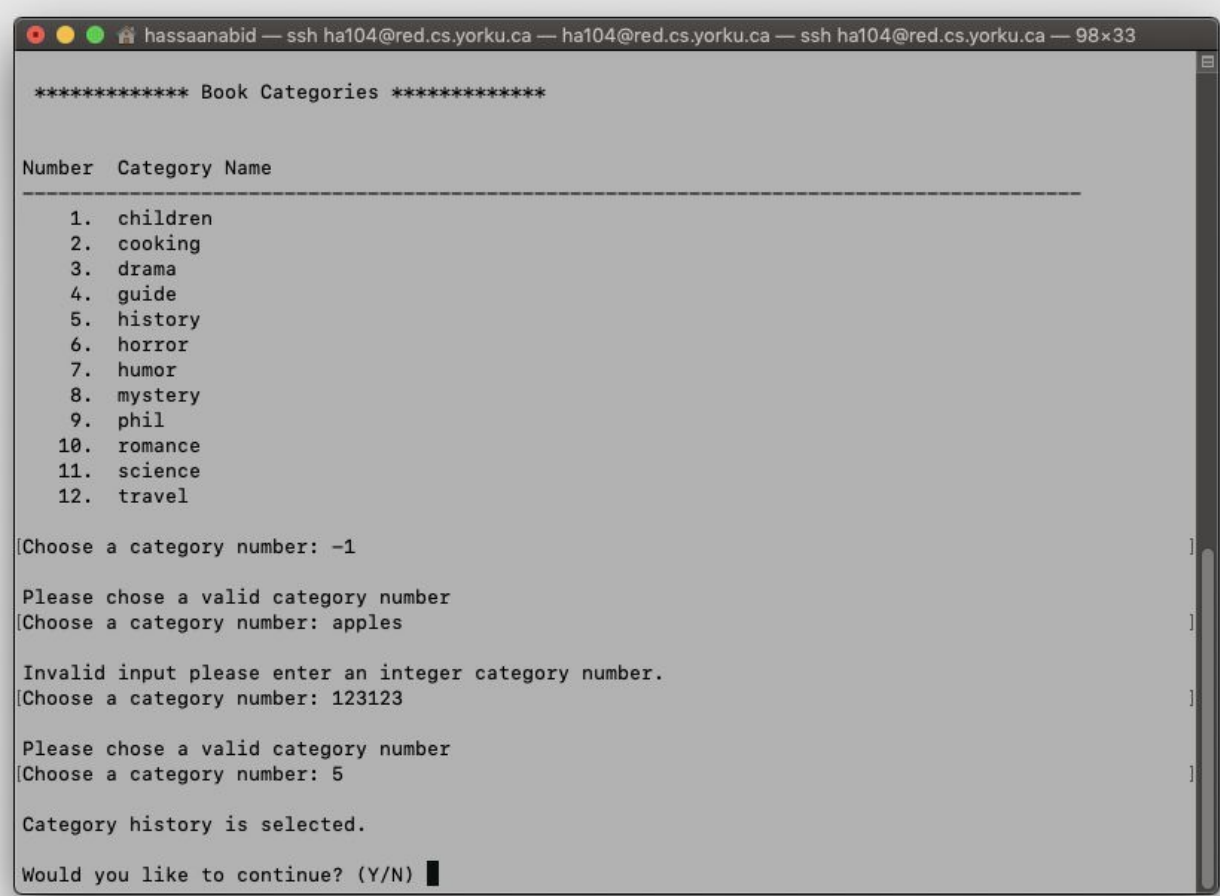
Scenario #11 - Customer enters invalid Book category (number)

Supported feature: handle invalid book category


```
● ● ●   🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 98×33

    ************* Book Categories *************


Number  Category Name
-----------------------------------------------------------------------------------
    1.  children
    2.  cooking
    3.  drama
    4.  guide
    5.  history
    6.  horror
    7.  humor
    8.  mystery
    9.  phil
   10.  romance
   11.  science
   12.  travel

[Choose a category number: -1                                                      ]

Please chose a valid category number
[Choose a category number: apples                                                  ]

Invalid input please enter an integer category number.
[Choose a category number: 123123                                                  ]

Please chose a valid category number
[Choose a category number: 5                                                       ]

Category history is selected.

Would you like to continue? (Y/N) ▌
```

Scenario #12 - Customer enters invalid input when choosing a book to purchase

Supported feature: handle invalid book number.

Scenario #13 - Customer enters an invalid quantity of books

Supported feature: handle invalid book quantity

```
● ● ●  🏠 hassaanabid — ssh ha104@red.cs.yorku.ca — ha104@red.cs.yorku.ca — ssh ha104@red.cs.yorku.ca — 8...

Book number 1 is selected.
Book details:   Napolean's Revenge   1952           English           history    1479

[Would you like to continue? (Y/N) y                                                      ]

[The minimum price for this book is : 139.85                                               ]

[Club offering this price : Oprah                                                          ]

[Enter books quantity: qwe                                                                 ]
 Invalid input please enter a valid number as quantity.
 Enter books quantity: $123##
 Invalid input please enter a valid number as quantity.
 Enter books quantity: ][;[op
 Invalid input please enter a valid number as quantity.
 Enter books quantity: 3
 The total price for your order will be : $ 419.55


 Would you like to purchase the book/books? (Y/N) █
```

Thank you.