

Project manual for

Coupon Inventory System

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a. Project managing schedule

Day	Date	Description	Time in 24hr scale									Hrs spent
			10-11	11-12	12-13	17-18	18-19	19-20	20-21	21-22	22-23	
Mon	18-Apr	Understanding the project										1
Tue	19-Apr	Preparing input data file, writing code for reading the input from file and user										1
		Code for 'purchase coupon' method										1
		Learning sorting techniques (quick sort)										1
Wed	20-Apr	Code to implement quick sort on coupon details based on user choice										3
		Building BST and code for 'search coupon' method										2
		Debugging the code written till this stage										2
Thu	21-Apr	Code for 'list coupons' method + Debugging										2
Fri	22-Apr	Providing comments in the code										1
Sat	23-Apr											0
Sun	24-Apr	Documentation										5
Cumulative hrs												19

b. Problem specification:

The project is to build a Coupon Inventory System with implementation of data structures (it is sufficient to use Linked list and Array) in Java language.

c. Software specification:

The project will have a menu to perform the below operations:

1. Purchase coupon:

This function will take input data from a file and then from the user manually. The details of the coupon include the following:

- Coupon provider
- Coupon discount (%)
- Expiry period (in days)
- Coupon status (unused or redeemed)
- Product name
- Product price (in \$)

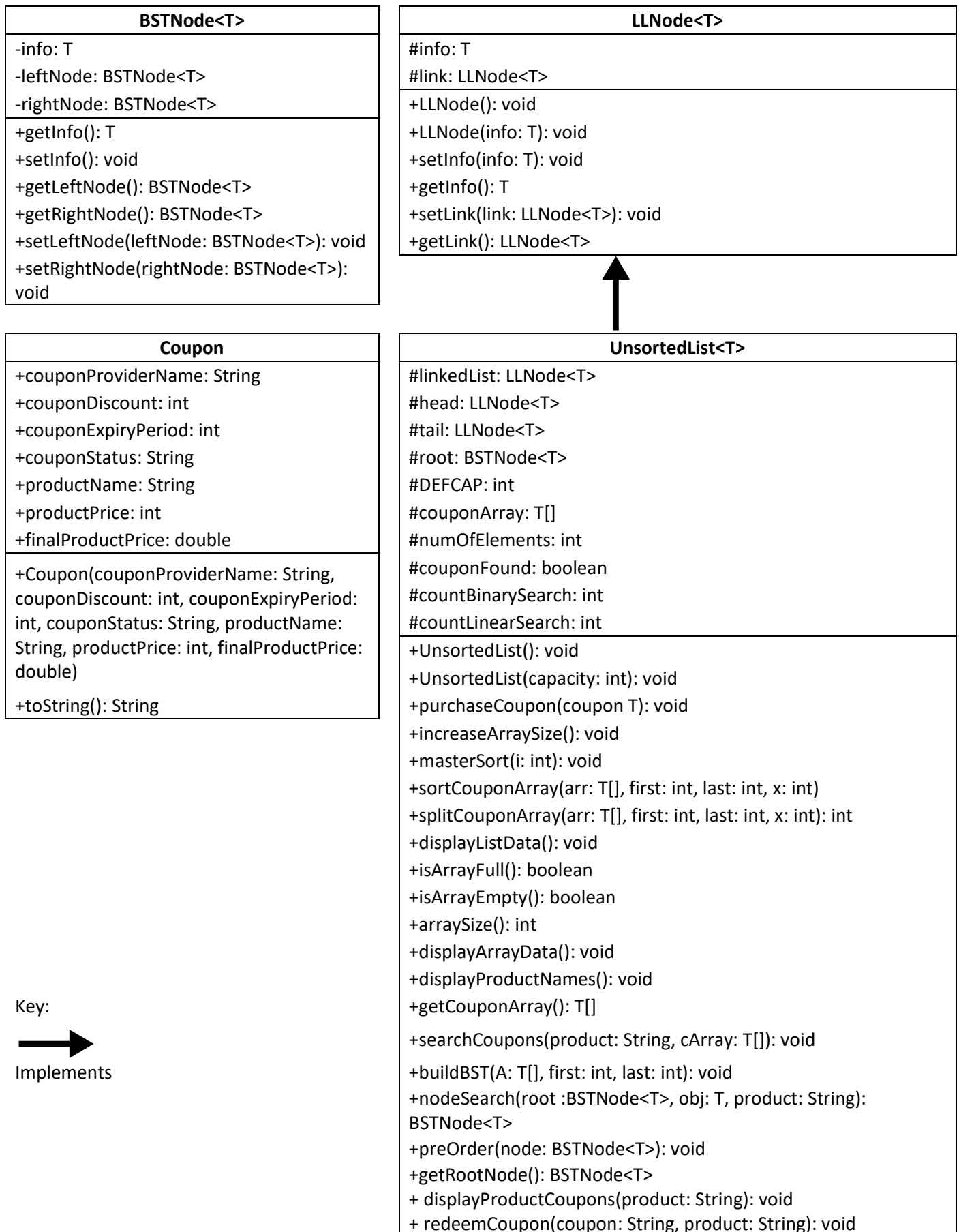
Adding the data by file will create an Unsorted List and an Array, and the details entered manually are added to this list and array. By default, all the details stored are unsorted.

2. Search coupons:

- This function will display all the details of a coupon applicable on a product. User will select a product name from the list of options provided to them and this method will return the details of a coupon that is found in the least possible iterations.

- Eg: If a product is having 2 applicable coupons—one is found in 3rd iteration in linear search and the other is found in 9th iteration in linear search, the function will return the details of coupon that is found in 3rd iteration in linear search. The function will also return the count of search in BST for the same coupon as found in 3rd iteration in linear search. If no coupon is found, it will return “no coupon found” along with iteration count.
 - To find the iteration count in BST, the Binary Tree was built based on the “coupon discount”.
3. List coupons:
- This method will display the details of all coupons in a sorted fashion based on the attribute chosen by the user.
 - This method also takes into account the coupon discount and product price to calculate the final discounted price so that the user can also have an option to sort the list based on the final discounted price.
4. Redeem coupon: (additional method)
- User will select a product from the list of products available. The system will then display all the coupons applicable on that particular product. User will have to choose one coupon and the status of that coupon for that product will change from “unused” to “redeemed”.

d. Design diagram document:



e. Operational document (user's manual):

- Check that "data.txt" file is present in the main project folder as well as "src" folder. If not, kindly keep it in the above locations, and then do the following
- javac *.java
- java Application

f. Testing document:

- "data.txt" file attached separately

g. Debugging note:

- null values observed while displaying BST in preorder traversal

```
<terminated> Application (8) [Java Application] C:\Program Files\Java\jdk-17.0.1\bin\javaw.exe (A
BeFrugal,13,110,unused,jeans,60,52.4
Swagbucks,5,125,unused,jeans,60,57.0
BeFrugal,13,110,unused,bed,130,113.1
BradsDeals,32,56,unused,mobile,500,340.0
Rakuten,6,20,unused,mobile,500,470.0
RetailMeNot,60,100,unused,mobile,500,200.0
null
null
BradsDeals,32,56,unused,laptop,1500,1020.0
Amazon coupons,8,338,unused,ipad,900,828.0
SlickDeals,77,201,unused,ipad,900,207.0
null
null
null
null
null
```

- The available elements in couponArray[] are 33. Since its default value is 30, adding more elements increased its size to 60(as per logic in the code) and hence null values are being stored by default.
- When this array is passed to another class, null values are being transferred. Null values in 'couponArray' are eliminated using the below logic in getCouponArray() method.

```
public T[] getCouponArray() {
    List<T> list = new ArrayList<T>();
    for(T t:couponArray) {
        if(t!=null)
            list.add(t);
    }
    couponArray = (T[]) list.toArray(new Object[list.size()]);
    return couponArray;
    // couponArray = Arrays.stream(couponArray).filter(t -> (t!=null)).toArray(T[]::new);
}
```

- Output after resolution.

```

BST pre order..
SlickDeals,77,201,unused,milk,6,1.38
Rakuten,6,20,unused,bottle,2,1.88
Ibotta,10,30,unused,drink,2,1.8
BradsDeals,32,56,unused,pen,1,0.68
Rakuten,6,20,unused,pen,1,0.94
Hip2Save,18,300,unused,pen,1,0.82
SmartSource,26,90,unused,chips,2,1.48
Groupon,56,265,unused,drink,2,0.88
Savings.com,43,38,unused,drink,2,1.14
Groupon,56,265,unused,water,4,1.76
Ibotta,10,30,unused,chips,2,1.8
CouponCause,80,198,unused,chips,2,0.4
Coupons.com,13,250,unused,water,4,3.48
Rakuten,6,20,unused,bag,5,4.7

```

- Null pointer exception observed while printing BST search output

```

Select a product to display the applicable coupons:
List of available products are:
[bag, bed, bottle, chips, drink, ipad, jeans, laptop, milk, mobile, pen, shirt, water]
laptop
Coupon Details: Brad'sDeals,32,56,unused,laptop,1500,1020.0 ---found 22 by LinearSearch
Exception in thread "main" java.lang.NullPointerException: Cannot invoke "BSTNode.getInfo()" because "root" is null
    at UnsortedList.nodeSearch(UnsortedList.java:307)
    at UnsortedList.nodeSearch(UnsortedList.java:321)
    at UnsortedList.nodeSearch(UnsortedList.java:321)
    at UnsortedList.nodeSearch(UnsortedList.java:321)
    at UnsortedList.nodeSearch(UnsortedList.java:321)
    at UnsortedList.nodeSearch(UnsortedList.java:321)
    at UnsortedList.nodeSearch(UnsortedList.java:321)
    at UnsortedList.searchCoupons(UnsortedList.java:275)
    at Application.main(Application.java:115)

```

- Existing code is comparing the attributes “expiry period” while the BST was built based on “coupon discount”

```

public BSTNode<T> nodeSearch(BSTNode<T> root, T obj){
    countBinarySearch++;
    if(root==null||root.getInfo().toString().equalsIgnoreCase(obj.toString())) {
        System.out.println("Coupon Details: "+root.getInfo().toString()+" ---found "+countBinarySearch+" by BST");
        foundCoupon = true;
        return root;
    }

    if(root.getInfo().toString().split(",")[2].compareTo(obj.toString().split(",")[2])<0)
        return nodeSearch(root.getRightNode(), obj);

    return nodeSearch(root.getLeftNode(), obj);
}

```

- Modified code as below

```

public BSTNode<T> nodeSearch(BSTNode<T> root, T obj){
    countBinarySearch++;
    if(root==null||root.getInfo().toString().equalsIgnoreCase(obj.toString())) {
        System.out.println("Coupon Details: "+root.getInfo().toString()+" ---found "+countBinarySearch+" by BST");
        foundCoupon = true;
        return root;
    }

    if(root.getInfo().toString().split(",")[1].compareTo(obj.toString().split(",")[1])<0)
        return nodeSearch(root.getRightNode(), obj);

    return nodeSearch(root.getLeftNode(), obj);
}

```

h. Future improvement:

- The following additional functions can be added to the existing one
 - *Coupon expiry check*: With time, coupons are set to expire as they have certain expiry period. A function can be implemented to obtain coupons that are set to expire within a user defined period (eg. Get all coupons that are going to expire in next 30 days).
 - *Best coupon applicable*: Same product can have multiple coupons which means their discounts vary. This function lists best available coupon (or coupons in sorted manner) for a user-selected product.

i. Visual presentation screenshots of the project:

- Menu will be displayed from starting and at every step. User has to choose an option by entering an integer.

```
Choose an option...
1: Purchase coupon
2: Search coupons
3: List coupons
4: Exit
1
Available coupon details are....
Cp provider: Rakuten, Cp. discount: 10%, Expiry: 20days, Status: unused, Product: bag, Price: $5, Final price: $4.5
Cp provider: Rakuten, Cp. discount: 7%, Expiry: 20days, Status: unused, Product: bottle, Price: $2, Final price: $1.86
Cp provider: Rakuten, Cp. discount: 8%, Expiry: 20days, Status: unused, Product: pen, Price: $1, Final price: $0.92
Cp provider: Rakuten, Cp. discount: 9%, Expiry: 20days, Status: unused, Product: mobile, Price: $500, Final price: $455.0
Cp provider: Ibotta, Cp. discount: 13%, Expiry: 30days, Status: unused, Product: chips, Price: $2, Final price: $1.74
Cp provider: Ibotta, Cp. discount: 12%, Expiry: 30days, Status: unused, Product: drink, Price: $2, Final price: $1.76
Cp provider: Swagbucks, Cp. discount: 2%, Expiry: 125days, Status: unused, Product: milk, Price: $6, Final price: $5.88
Cp provider: Swagbucks, Cp. discount: 3%, Expiry: 125days, Status: unused, Product: ipad, Price: $900, Final price: $873.0
Cp provider: Swagbucks, Cp. discount: 4%, Expiry: 125days, Status: unused, Product: shirt, Price: $35, Final price: $33.6
Cp provider: Swagbucks, Cp. discount: 6%, Expiry: 125days, Status: unused, Product: jeans, Price: $60, Final price: $56.4
Cp provider: BeFrugal, Cp. discount: 15%, Expiry: 110days, Status: unused, Product: jeans, Price: $60, Final price: $51.0
Cp provider: BeFrugal, Cp. discount: 11%, Expiry: 110days, Status: unused, Product: bed, Price: $130, Final price: $115.7
Cp provider: Groupon, Cp. discount: 52%, Expiry: 265days, Status: unused, Product: drink, Price: $2, Final price: $0.96
Cp provider: Groupon, Cp. discount: 48%, Expiry: 265days, Status: unused, Product: water, Price: $4, Final price: $2.08
Cp provider: Groupon, Cp. discount: 40%, Expiry: 265days, Status: unused, Product: milk, Price: $6, Final price: $3.6
Cp provider: Amazon coupons, Cp. discount: 19%, Expiry: 338days, Status: unused, Product: milk, Price: $6, Final price: $4.86
Cp provider: Amazon coupons, Cp. discount: 29%, Expiry: 338days, Status: unused, Product: ipad, Price: $900, Final price: $639.0
Cp provider: Amazon coupons, Cp. discount: 22%, Expiry: 338days, Status: unused, Product: shirt, Price: $35, Final price: $27.3
Cp provider: Coupons.com, Cp. discount: 14%, Expiry: 250days, Status: unused, Product: water, Price: $4, Final price: $3.44
Cp provider: RetailMeNot, Cp. discount: 60%, Expiry: 100days, Status: unused, Product: mobile, Price: $500, Final price: $200.0
Cp provider: SmartSource, Cp. discount: 26%, Expiry: 90days, Status: unused, Product: chips, Price: $2, Final price: $1.48
Cp provider: Savings.com, Cp. discount: 43%, Expiry: 38days, Status: unused, Product: drink, Price: $2, Final price: $1.14
Cp provider: BradsDeals, Cp. discount: 36%, Expiry: 56days, Status: unused, Product: pen, Price: $1, Final price: $0.64
Cp provider: BradsDeals, Cp. discount: 28%, Expiry: 56days, Status: unused, Product: mobile, Price: $500, Final price: $360.0
Cp provider: BradsDeals, Cp. discount: 32%, Expiry: 56days, Status: unused, Product: laptop, Price: $1500, Final price: $1020.0
Cp provider: SlickDeals, Cp. discount: 74%, Expiry: 201days, Status: unused, Product: milk, Price: $6, Final price: $1.56
Cp provider: SlickDeals, Cp. discount: 70%, Expiry: 201days, Status: unused, Product: ipad, Price: $900, Final price: $270.0
Cp provider: CouponCause, Cp. discount: 81%, Expiry: 198days, Status: unused, Product: chips, Price: $2, Final price: $0.38
Cp provider: CouponCause, Cp. discount: 83%, Expiry: 198days, Status: unused, Product: shirt, Price: $35, Final price: $5.95
```

- Upon choosing option 1, the details from input file are read automatically and it prompts user to add more details if they would like to.

```
Enter the no. of coupon details you'd like to add (add at least 1):
1
Coupon provider:
Amazon
Coupon discount(in %):
5
Coupon expiry period(in days):
25
Product type/name:
Bag
Product price(in $):
10
Details added!
```

- Updated details are automatically printed upon successful addition

Updated details are:

Cp provider: Rakuten, Cp. discount: 10%, Expiry: 20days, Status: unused, Product: bag, Price: \$5, Final price: \$4.5

Cp provider: Rakuten, Cp. discount: 7%, Expiry: 20days, Status: unused, Product: bottle, Price: \$2, Final price: \$1.86

Cp provider: Rakuten, Cp. discount: 8%, Expiry: 20days, Status: unused, Product: pen, Price: \$1, Final price: \$0.92

Cp provider: Rakuten, Cp. discount: 9%, Expiry: 20days, Status: unused, Product: mobile, Price: \$500, Final price: \$455.0

Cp provider: Ibotta, Cp. discount: 13%, Expiry: 30days, Status: unused, Product: chips, Price: \$2, Final price: \$1.74

Cp provider: Ibotta, Cp. discount: 12%, Expiry: 30days, Status: unused, Product: drink, Price: \$2, Final price: \$1.76

Cp provider: Swagbucks, Cp. discount: 2%, Expiry: 125days, Status: unused, Product: milk, Price: \$6, Final price: \$5.88

Cp provider: Swagbucks, Cp. discount: 3%, Expiry: 125days, Status: unused, Product: ipad, Price: \$900, Final price: \$873.0

Cp provider: Swagbucks, Cp. discount: 4%, Expiry: 125days, Status: unused, Product: shirt, Price: \$35, Final price: \$33.6

Cp provider: Swagbucks, Cp. discount: 6%, Expiry: 125days, Status: unused, Product: jeans, Price: \$60, Final price: \$56.4

Cp provider: BeFrugal, Cp. discount: 15%, Expiry: 110days, Status: unused, Product: jeans, Price: \$60, Final price: \$51.0

Cp provider: BeFrugal, Cp. discount: 11%, Expiry: 110days, Status: unused, Product: bed, Price: \$130, Final price: \$115.7

Cp provider: Groupon, Cp. discount: 52%, Expiry: 265days, Status: unused, Product: drink, Price: \$2, Final price: \$0.96

Cp provider: Groupon, Cp. discount: 48%, Expiry: 265days, Status: unused, Product: water, Price: \$4, Final price: \$2.08

Cp provider: Groupon, Cp. discount: 40%, Expiry: 265days, Status: unused, Product: milk, Price: \$6, Final price: \$3.6

Cp provider: Amazon coupons, Cp. discount: 19%, Expiry: 338days, Status: unused, Product: milk, Price: \$6, Final price: \$4.86

Cp provider: Amazon coupons, Cp. discount: 29%, Expiry: 338days, Status: unused, Product: ipad, Price: \$900, Final price: \$639.0

Cp provider: Amazon coupons, Cp. discount: 22%, Expiry: 338days, Status: unused, Product: shirt, Price: \$35, Final price: \$27.3

Cp provider: Coupons.com, Cp. discount: 14%, Expiry: 250days, Status: unused, Product: water, Price: \$4, Final price: \$3.44

Cp provider: RetailMeNot, Cp. discount: 60%, Expiry: 100days, Status: unused, Product: mobile, Price: \$500, Final price: \$200.0

Cp provider: SmartSource, Cp. discount: 26%, Expiry: 90days, Status: unused, Product: chips, Price: \$2, Final price: \$1.48

Cp provider: Savings.com, Cp. discount: 43%, Expiry: 38days, Status: unused, Product: drink, Price: \$2, Final price: \$1.14

Cp provider: BradsDeals, Cp. discount: 36%, Expiry: 56days, Status: unused, Product: pen, Price: \$1, Final price: \$0.64

Cp provider: BradsDeals, Cp. discount: 28%, Expiry: 56days, Status: unused, Product: mobile, Price: \$500, Final price: \$360.0

Cp provider: BradsDeals, Cp. discount: 32%, Expiry: 56days, Status: unused, Product: laptop, Price: \$1500, Final price: \$1020.0

Cp provider: SlickDeals, Cp. discount: 74%, Expiry: 201days, Status: unused, Product: milk, Price: \$6, Final price: \$1.56

Cp provider: SlickDeals, Cp. discount: 70%, Expiry: 201days, Status: unused, Product: ipad, Price: \$900, Final price: \$270.0

Cp provider: CouponCause, Cp. discount: 81%, Expiry: 198days, Status: unused, Product: chips, Price: \$2, Final price: \$0.38

Cp provider: CouponCause, Cp. discount: 83%, Expiry: 198days, Status: unused, Product: shirt, Price: \$35, Final price: \$5.95

Cp provider: Hip2Save, Cp. discount: 27%, Expiry: 300days, Status: unused, Product: pen, Price: \$1, Final price: \$0.73

Cp provider: Hip2Save, Cp. discount: 25%, Expiry: 300days, Status: unused, Product: water, Price: \$4, Final price: \$3.0

Cp provider: Hip2Save, Cp. discount: 37%, Expiry: 300days, Status: unused, Product: shirt, Price: \$35, Final price: \$22.05

Cp provider: Hip2Save, Cp. discount: 18%, Expiry: 300days, Status: unused, Product: bed, Price: \$130, Final price: \$106.6

Cp provider: Amazon, Cp. discount: 5%, Expiry: 25days, Status: unused, Product: Bag, Price: \$10, Final price: \$9.5

- Search coupon function

Choose an option...

1: Purchase coupon

2: Search coupons

3: List coupons

4: Exit

2

Select a product to display the applicable coupons:

List of available products are:

[bag, bottle, pen, mobile, chips, drink, milk, ipad, shirt, jeans, bed, water, laptop, Bag]

drink

Cp provider: Ibotta, Cp. discount: 12%, Expiry: 30days, Status: unused, Product: drink, Price: \$2, Final price: \$1.76 --->found in iteration 6 by LinearSearch

Cp provider: Ibotta, Cp. discount: 12%, Expiry: 30days, Status: unused, Product: drink, Price: \$2, Final price: \$1.76 ---->found in iteration 5 by BST

- Coupon not found case

Choose an option...

1: Purchase coupon

2: Search coupons

3: List coupons

4: Exit

2

Select a product to display the applicable coupons:

List of available products are:

[bag, bottle, pen, mobile, chips, drink, milk, ipad, shirt, jeans, bed, water, laptop]

car

No Coupons found - 34th by Linear Search and 7th by BST

- List coupons function: User has to select an option based on below recommendation. Below data is sorted based on coupon discount.

Select a criteria to list the details of coupons:

Coupon provider: 1, Coupon discount: 2, Expiry period: 3, Coupon status: 4, Product name: 5, Product price: 6, Final product price(incl discount): 7
2

Cp provider: Swagbucks, Cp. discount: 2%, Expiry: 125days, Status: unused, Product: milk, Price: \$6, Final price: \$5.88
Cp provider: Swagbucks, Cp. discount: 3%, Expiry: 125days, Status: unused, Product: ipad, Price: \$900, Final price: \$873.0
Cp provider: Swagbucks, Cp. discount: 4%, Expiry: 125days, Status: unused, Product: shirt, Price: \$35, Final price: \$33.6
Cp provider: Amazon, Cp. discount: 5%, Expiry: 25days, Status: unused, Product: Bag, Price: \$10, Final price: \$9.5
Cp provider: Swagbucks, Cp. discount: 6%, Expiry: 125days, Status: unused, Product: jeans, Price: \$60, Final price: \$56.4
Cp provider: Rakuten, Cp. discount: 7%, Expiry: 20days, Status: unused, Product: bottle, Price: \$2, Final price: \$1.86
Cp provider: Rakuten, Cp. discount: 8%, Expiry: 20days, Status: unused, Product: pen, Price: \$1, Final price: \$0.92
Cp provider: Rakuten, Cp. discount: 9%, Expiry: 20days, Status: unused, Product: mobile, Price: \$500, Final price: \$455.0
Cp provider: Rakuten, Cp. discount: 10%, Expiry: 20days, Status: unused, Product: bag, Price: \$5, Final price: \$4.5
Cp provider: BeFrugal, Cp. discount: 11%, Expiry: 110days, Status: unused, Product: bed, Price: \$130, Final price: \$115.7
Cp provider: Ibotta, Cp. discount: 12%, Expiry: 30days, Status: unused, Product: drink, Price: \$2, Final price: \$1.76
Cp provider: Ibotta, Cp. discount: 13%, Expiry: 30days, Status: unused, Product: chips, Price: \$2, Final price: \$1.74
Cp provider: Coupons.com, Cp. discount: 14%, Expiry: 250days, Status: unused, Product: water, Price: \$4, Final price: \$3.44
Cp provider: BeFrugal, Cp. discount: 15%, Expiry: 110days, Status: unused, Product: jeans, Price: \$60, Final price: \$51.0
Cp provider: Hip2Save, Cp. discount: 18%, Expiry: 300days, Status: unused, Product: bed, Price: \$130, Final price: \$106.6
Cp provider: Amazon coupons, Cp. discount: 19%, Expiry: 338days, Status: unused, Product: milk, Price: \$6, Final price: \$4.86
Cp provider: Amazon coupons, Cp. discount: 22%, Expiry: 338days, Status: unused, Product: shirt, Price: \$35, Final price: \$27.3
Cp provider: Hip2Save, Cp. discount: 25%, Expiry: 300days, Status: unused, Product: water, Price: \$4, Final price: \$3.0
Cp provider: SmartSource, Cp. discount: 26%, Expiry: 90days, Status: unused, Product: chips, Price: \$2, Final price: \$1.48
Cp provider: Hip2Save, Cp. discount: 27%, Expiry: 300days, Status: unused, Product: pen, Price: \$1, Final price: \$0.73
Cp provider: BradsDeals, Cp. discount: 28%, Expiry: 56days, Status: unused, Product: mobile, Price: \$500, Final price: \$360.0
Cp provider: Amazon coupons, Cp. discount: 29%, Expiry: 338days, Status: unused, Product: ipad, Price: \$900, Final price: \$639.0
Cp provider: BradsDeals, Cp. discount: 32%, Expiry: 56days, Status: unused, Product: laptop, Price: \$1500, Final price: \$1020.0
Cp provider: BradsDeals, Cp. discount: 36%, Expiry: 56days, Status: unused, Product: pen, Price: \$1, Final price: \$0.64
Cp provider: Hip2Save, Cp. discount: 37%, Expiry: 300days, Status: unused, Product: shirt, Price: \$35, Final price: \$22.05
Cp provider: Groupon, Cp. discount: 40%, Expiry: 265days, Status: unused, Product: milk, Price: \$6, Final price: \$3.6
Cp provider: Savings.com, Cp. discount: 43%, Expiry: 38days, Status: unused, Product: drink, Price: \$2, Final price: \$1.14
Cp provider: Groupon, Cp. discount: 48%, Expiry: 265days, Status: unused, Product: water, Price: \$4, Final price: \$2.08
Cp provider: Groupon, Cp. discount: 52%, Expiry: 265days, Status: unused, Product: drink, Price: \$2, Final price: \$0.96
Cp provider: RetailMeNot, Cp. discount: 60%, Expiry: 100days, Status: unused, Product: mobile, Price: \$500, Final price: \$200.0
Cp provider: SlickDeals, Cp. discount: 70%, Expiry: 201days, Status: unused, Product: ipad, Price: \$900, Final price: \$270.0

- Sorting again, based on final product price

Choose an option...

1: Purchase coupon
2: Search coupons
3: List coupons
4: Exit
3

Select a criteria to list the details of coupons:

Coupon provider: 1, Coupon discount: 2, Expiry period: 3, Coupon status: 4, Product name: 5, Product price: 6, Final product price(incl discount): 7
7

Cp provider: CouponCause, Cp. discount: 81%, Expiry: 198days, Status: unused, Product: chips, Price: \$2, Final price: \$0.38
Cp provider: BradsDeals, Cp. discount: 36%, Expiry: 56days, Status: unused, Product: pen, Price: \$1, Final price: \$0.64
Cp provider: Hip2Save, Cp. discount: 27%, Expiry: 300days, Status: unused, Product: pen, Price: \$1, Final price: \$0.73
Cp provider: Rakuten, Cp. discount: 8%, Expiry: 20days, Status: unused, Product: pen, Price: \$1, Final price: \$0.92
Cp provider: Groupon, Cp. discount: 52%, Expiry: 265days, Status: unused, Product: drink, Price: \$2, Final price: \$0.96
Cp provider: Savings.com, Cp. discount: 43%, Expiry: 38days, Status: unused, Product: drink, Price: \$2, Final price: \$1.14
Cp provider: SmartSource, Cp. discount: 26%, Expiry: 90days, Status: unused, Product: chips, Price: \$2, Final price: \$1.48
Cp provider: SlickDeals, Cp. discount: 74%, Expiry: 201days, Status: unused, Product: milk, Price: \$6, Final price: \$1.56
Cp provider: Ibotta, Cp. discount: 13%, Expiry: 30days, Status: unused, Product: chips, Price: \$2, Final price: \$1.74
Cp provider: Ibotta, Cp. discount: 12%, Expiry: 30days, Status: unused, Product: drink, Price: \$2, Final price: \$1.76
Cp provider: Rakuten, Cp. discount: 7%, Expiry: 20days, Status: unused, Product: bottle, Price: \$2, Final price: \$1.86
Cp provider: Groupon, Cp. discount: 48%, Expiry: 265days, Status: unused, Product: water, Price: \$4, Final price: \$2.08
Cp provider: Hip2Save, Cp. discount: 25%, Expiry: 300days, Status: unused, Product: water, Price: \$4, Final price: \$3.0
Cp provider: Coupons.com, Cp. discount: 14%, Expiry: 250days, Status: unused, Product: water, Price: \$4, Final price: \$3.44
Cp provider: Groupon, Cp. discount: 40%, Expiry: 265days, Status: unused, Product: milk, Price: \$6, Final price: \$3.6
Cp provider: Rakuten, Cp. discount: 10%, Expiry: 20days, Status: unused, Product: bag, Price: \$5, Final price: \$4.5
Cp provider: Amazon coupons, Cp. discount: 19%, Expiry: 338days, Status: unused, Product: milk, Price: \$6, Final price: \$4.86
Cp provider: Swagbucks, Cp. discount: 2%, Expiry: 125days, Status: unused, Product: milk, Price: \$6, Final price: \$5.88
Cp provider: CouponCause, Cp. discount: 83%, Expiry: 198days, Status: unused, Product: shirt, Price: \$35, Final price: \$5.95
Cp provider: Amazon, Cp. discount: 5%, Expiry: 25days, Status: unused, Product: Bag, Price: \$10, Final price: \$9.5
Cp provider: Hip2Save, Cp. discount: 37%, Expiry: 300days, Status: unused, Product: shirt, Price: \$35, Final price: \$22.05
Cp provider: Amazon coupons, Cp. discount: 22%, Expiry: 338days, Status: unused, Product: shirt, Price: \$35, Final price: \$27.3
Cp provider: Swagbucks, Cp. discount: 4%, Expiry: 125days, Status: unused, Product: shirt, Price: \$35, Final price: \$33.6
Cp provider: BeFrugal, Cp. discount: 15%, Expiry: 110days, Status: unused, Product: jeans, Price: \$60, Final price: \$51.0
Cp provider: Swagbucks, Cp. discount: 6%, Expiry: 125days, Status: unused, Product: jeans, Price: \$60, Final price: \$56.4

```

<terminated> Application (8) [Java Application] C:\Program Files\Java\jdk-17.0.1\bin\javaw.exe (Apr 24, 2022, 6:29:57 AM – 6:31:55 AM)
Cp provider: Groupon, Cp. discount: 40%, Expiry: 265days, Status: unused, Product: milk, Price: $6, Final price: $3.6
Cp provider: Rakuten, Cp. discount: 10%, Expiry: 20days, Status: unused, Product: bag, Price: $5, Final price: $4.5
Cp provider: Amazon coupons, Cp. discount: 19%, Expiry: 338days, Status: unused, Product: milk, Price: $6, Final price: $4.86
Cp provider: Swagbucks, Cp. discount: 2%, Expiry: 125days, Status: unused, Product: milk, Price: $6, Final price: $5.88
Cp provider: CouponCause, Cp. discount: 83%, Expiry: 198days, Status: unused, Product: shirt, Price: $35, Final price: $5.95
Cp provider: Amazon, Cp. discount: 5%, Expiry: 25days, Status: unused, Product: Bag, Price: $10, Final price: $9.5
Cp provider: Hip2Save, Cp. discount: 37%, Expiry: 300days, Status: unused, Product: shirt, Price: $35, Final price: $22.05
Cp provider: Amazon coupons, Cp. discount: 22%, Expiry: 338days, Status: unused, Product: shirt, Price: $35, Final price: $27.3
Cp provider: Swagbucks, Cp. discount: 4%, Expiry: 125days, Status: unused, Product: shirt, Price: $35, Final price: $33.6
Cp provider: BeFrugal, Cp. discount: 15%, Expiry: 110days, Status: unused, Product: jeans, Price: $60, Final price: $51.0
Cp provider: Swagbucks, Cp. discount: 6%, Expiry: 125days, Status: unused, Product: jeans, Price: $60, Final price: $56.4
Cp provider: Hip2Save, Cp. discount: 18%, Expiry: 300days, Status: unused, Product: bed, Price: $130, Final price: $106.6
Cp provider: BeFrugal, Cp. discount: 11%, Expiry: 110days, Status: unused, Product: bed, Price: $130, Final price: $115.7
Cp provider: RetailMeNot, Cp. discount: 60%, Expiry: 100days, Status: unused, Product: mobile, Price: $500, Final price: $200.0
Cp provider: SlickDeals, Cp. discount: 70%, Expiry: 201days, Status: unused, Product: ipad, Price: $900, Final price: $270.0
Cp provider: BradsDeals, Cp. discount: 28%, Expiry: 56days, Status: unused, Product: mobile, Price: $500, Final price: $360.0
Cp provider: Rakuten, Cp. discount: 9%, Expiry: 20days, Status: unused, Product: mobile, Price: $500, Final price: $455.0
Cp provider: Amazon coupons, Cp. discount: 29%, Expiry: 338days, Status: unused, Product: ipad, Price: $900, Final price: $639.0
Cp provider: Swagbucks, Cp. discount: 3%, Expiry: 125days, Status: unused, Product: ipad, Price: $900, Final price: $873.0
Cp provider: BradsDeals, Cp. discount: 32%, Expiry: 56days, Status: unused, Product: laptop, Price: $1500, Final price: $1020.0

Choose an option...
1: Purchase coupon
2: Search coupons
3: List coupons
4: Exit
6

invalid input..!

Choose an option...
1: Purchase coupon
2: Search coupons
3: List coupons
4: Exit
4

```

- Redeem coupon function: User will select product first and then appropriate coupon to redeem

```

Choose an option...
1: Purchase coupon
2: Search coupons
3: List coupons
4: Redeem coupon
5: Exit
4

Select a product to display the applicable coupons:
List of available products are:
[bag, bottle, pen, mobile, chips, drink, milk, ipad, shirt, jeans, bed, water, laptop]
drink
Coupon provider: Ibotta
Coupon provider: Groupon
Coupon provider: Savings.com
Enter the coupon you want to redeem:
groupon

Success!! Coupon Groupon redeemed for drink

```

- Updated coupon details (redeemed status of the coupon) can also be seen in the entire coupon array

Updated coupon details:

Cp provider: Rakuten, Cp. discount: 10%, Expiry: 20days, Status: unused, Product: bag, Price: \$5, Final price: \$4.5
Cp provider: Rakuten, Cp. discount: 7%, Expiry: 20days, Status: unused, Product: bottle, Price: \$2, Final price: \$1.86
Cp provider: Rakuten, Cp. discount: 8%, Expiry: 20days, Status: unused, Product: pen, Price: \$1, Final price: \$0.92
Cp provider: Rakuten, Cp. discount: 9%, Expiry: 20days, Status: unused, Product: mobile, Price: \$500, Final price: \$455.0
Cp provider: Ibotta, Cp. discount: 13%, Expiry: 30days, Status: unused, Product: chips, Price: \$2, Final price: \$1.74
Cp provider: Ibotta, Cp. discount: 12%, Expiry: 30days, Status: unused, Product: drink, Price: \$2, Final price: \$1.76
Cp provider: Swagbucks, Cp. discount: 2%, Expiry: 125days, Status: unused, Product: milk, Price: \$6, Final price: \$5.88
Cp provider: Swagbucks, Cp. discount: 3%, Expiry: 125days, Status: unused, Product: ipad, Price: \$900, Final price: \$873.0
Cp provider: Swagbucks, Cp. discount: 4%, Expiry: 125days, Status: unused, Product: shirt, Price: \$35, Final price: \$33.6
Cp provider: Swagbucks, Cp. discount: 6%, Expiry: 125days, Status: unused, Product: jeans, Price: \$60, Final price: \$56.4
Cp provider: BeFrugal, Cp. discount: 15%, Expiry: 110days, Status: unused, Product: jeans, Price: \$60, Final price: \$51.0
Cp provider: BeFrugal, Cp. discount: 11%, Expiry: 110days, Status: unused, Product: bed, Price: \$130, Final price: \$115.7
Cp provider: Groupon, Cp. discount: 52%, Expiry: 265days, Status: redeemed, Product: drink, Price: \$2, Final price: \$0.96
Cp provider: Groupon, Cp. discount: 48%, Expiry: 265days, Status: unused, Product: water, Price: \$4, Final price: \$2.08
Cp provider: Groupon, Cp. discount: 40%, Expiry: 265days, Status: unused, Product: milk, Price: \$6, Final price: \$3.6
Cp provider: Amazon coupons, Cp. discount: 19%, Expiry: 338days, Status: unused, Product: milk, Price: \$6, Final price: \$4.86
Cp provider: Amazon coupons, Cp. discount: 29%, Expiry: 338days, Status: unused, Product: ipad, Price: \$900, Final price: \$639.0
Cp provider: Amazon coupons, Cp. discount: 22%, Expiry: 338days, Status: unused, Product: shirt, Price: \$35, Final price: \$27.3
Cp provider: Coupons.com, Cp. discount: 14%, Expiry: 250days, Status: unused, Product: water, Price: \$4, Final price: \$3.44
Cp provider: RetailMeNot, Cp. discount: 60%, Expiry: 100days, Status: unused, Product: mobile, Price: \$500, Final price: \$200.0
Cp provider: SmartSource, Cp. discount: 26%, Expiry: 90days, Status: unused, Product: chips, Price: \$2, Final price: \$1.48
Cp provider: Savings.com, Cp. discount: 43%, Expiry: 38days, Status: unused, Product: drink, Price: \$2, Final price: \$1.14
Cp provider: BradsDeals, Cp. discount: 36%, Expiry: 56days, Status: unused, Product: pen, Price: \$1, Final price: \$0.64
Cp provider: BradsDeals, Cp. discount: 28%, Expiry: 56days, Status: unused, Product: mobile, Price: \$500, Final price: \$360.0
Cp provider: BradsDeals, Cp. discount: 32%, Expiry: 56days, Status: unused, Product: laptop, Price: \$1500, Final price: \$1020.0
Cp provider: SlickDeals, Cp. discount: 74%, Expiry: 201days, Status: unused, Product: milk, Price: \$6, Final price: \$1.56
Cp provider: SlickDeals, Cp. discount: 70%, Expiry: 201days, Status: unused, Product: ipad, Price: \$900, Final price: \$270.0
Cp provider: CouponCause, Cp. discount: 81%, Expiry: 198days, Status: unused, Product: chips, Price: \$2, Final price: \$0.38
Cp provider: CouponCause, Cp. discount: 83%, Expiry: 198days, Status: unused, Product: shirt, Price: \$35, Final price: \$5.95
Cp provider: Hip2Save, Cp. discount: 27%, Expiry: 300days, Status: unused, Product: pen, Price: \$1, Final price: \$0.73
Cp provider: Hip2Save, Cp. discount: 25%, Expiry: 300days, Status: unused, Product: water, Price: \$4, Final price: \$3.0
Cp provider: Hip2Save, Cp. discount: 37%, Expiry: 300days, Status: unused, Product: shirt, Price: \$35, Final price: \$22.05
Cp provider: Hip2Save, Cp. discount: 18%, Expiry: 300days, Status: unused, Product: bed, Price: \$130, Final price: \$106.6

j. Data file:

Attached separately.