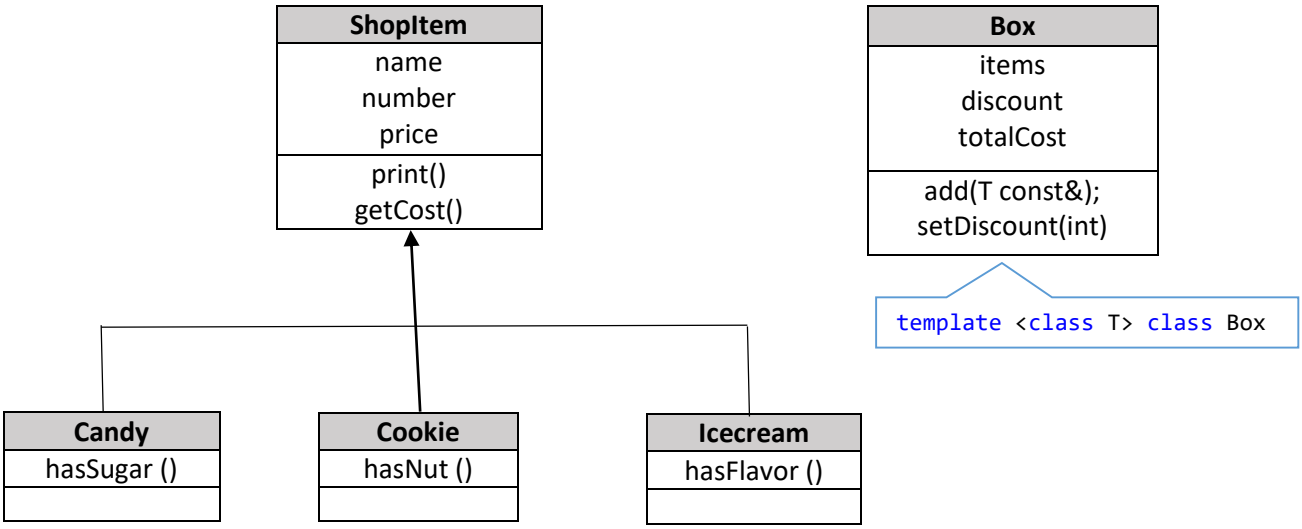
ITU Computer Engineering Department
BLG252E Object Oriented Programming
Fall 2018, 2nd Homework (due Dec 28 at 23:55)

In this homework, you will be writing **ShopItem**, **Cookie**, **Candy**, **Icecream**, and **Box** classes in support of a Dessert Shop which sells candy by the kg, cookies by the dozen and ice cream by litre. You will use these classes for the checkout system and the classes are described below. You should take into account some rules and if the given rules are not met, error messages must be thrown.



- **Cookie**, **Candy** and **Icecream** classes are inherited from **ShopItem** class as shown in Figure below. There is also a class template so that **Box** class can store different type of items (candy, cookie, icecream).
- To determine the *cost* of a **Candy** object, its *weight* and *price per kg* are used.
  To determine the *cost* of a **Cookie** object, its *number* and *price per dozen* are used.
  To determine the *cost* of a **Icecream** object, its *litre* and *price per litre* are used.

- Discount percentage for any item must be in range of [0, 30] and an exception should be thrown for an invalid value.

- Any type of dessert box (Box <cookie>, Box <candy>, Box <icecream>) can be stored as a dynamic array and the total cost can be calculated according to tax rate (static constant defined 8%) and discount rate.

- All the dynamic data members should be declared as **private**.

- You should successfully **deallocate** all of the allocated memory before termination of your program.

A test program "Checkout.cpp" is given to guide the design of your classes. It illustrates the usage of all methods and operators you will implement. Your implementation must be compatible with this test program. Without erasing the given content, you may add libraries, fields or other methods.

* Note that before catching an exception it must be thrown first. This means that there should be a code somewhere in the program that could catch the exception.

Test Program:

```
#include <cstdlib>
#include <string>
#include "box.h"
#include "shopItem.h"
#include "candy.h"
#include "cookie.h"
#include "icecream.h"

using namespace std;

int main() {
Cookie cookie1("Chocolate Chip Cookies",10, 180); //(name, pieces, priceperdozen)
Cookie cookie2("Cake Mix Cookies", 16, 210);
Box<Cookie> cookieBox(cookie1);
cookieBox.add(cookie2);
cout<<cookieBox<<endl;

cout << cookieBox[2] << endl;

Icecream icecream1("Chocolate ice cream",1.5, 170); //(name, litre, priceperlitre)
Box<Icecream> icecreamBox(icecream1);
cout<<icecreamBox<<endl;

icecreamBox.setDiscount(50);

Candy candy2("Gummi bears",12,89); //(name, weight, priceperkg)
Candy candy3("Hanukkah gelt",8,110);
Box<Candy> candyBox(candy2);
candyBox.add(candy3);
candyBox.setDiscount(15);
cout<<candyBox<<endl;

}
```

Overload << operator to print items in a box.

Catch an exception here while trying to access the element at(2)

Catch an exception here while trying to set the discount to(50)

Output of the test program:

```
**********
Number of items:2
1: Chocolate Chip Cookies #10 Cost: 150
2: Cake Mix Cookies #16 Cost: 280
**********
Total cost: 464.4
**********
We don't have enough cookies!
**********
Number of items:1
1: Chocolate ice cream #1.5 Cost: 255
**********
Total cost: 275.4
**********
Discount rate is out of range!
**********
Number of items:2
1: Gummi bears Cost: 1068
2: Hanukkah gelt Cost: 880
**********
Total cost: 2103.84
Discount: 15%
Discount amount: -315.576
Discounted cost: 1788.26
**********
```

Tax is added to the totalcost.

Submission

- The aim of this homework is to understand inheritance, polymorphism, templates and implement the classes and methods based on these concepts.
- Please submit all .h and .cpp files to **only** Ninova system **on time**. Late submission will not be accepted. Your source code should be named as “box.h”, “cookie.h”, “candy.h”, “icecream.h”, “shopItem” and (if required) “box.cpp”, “cookie.cpp”, “candy.cpp”, “icecream.cpp”, “shopItem.cpp”.
- Don’t change the test code. Make sure you write your name and number to all the header files of your project.
- Please use comments in your code to explain what you did and write your own code and also make sure that GNU C++ compiler (g++) compiles your project.
- Plagiarism and any other forms of cheating will have serious consequences as in the previous assignments. If you have any questions about homework, you can ask Mine Yasemin via e-mail (yaseminm@itu.edu.tr).