

## App Dev 1 B Virtual Lecture 7: By Mrs. J. Dwarika

### Tutorial Exercises: Hierarchical Inheritance with one parent class and two child classes

Date: 13 November 2020 @ 11:00

Students are advised to read and draft an attempted solution to the following question after the virtual lecture.

Instruction: You are required to USE the Object Oriented Programming paradigm (create your own classes and then instantiate objects within the driver code) to answer the following questions.

#### Exercise 1

Splish Splash is a pool company that builds pools. You have been hired as a system developer for this company and assigned the task of developing a C# Windows Application to assist in cost quotations for a pool. There is a basic pool from which two types of pools can be built i.e. a heated pool and a salt water pool. Customers have the choice to purchase **either** a heated pool or a salt water pool.

The following class diagram depicts the design of the application:

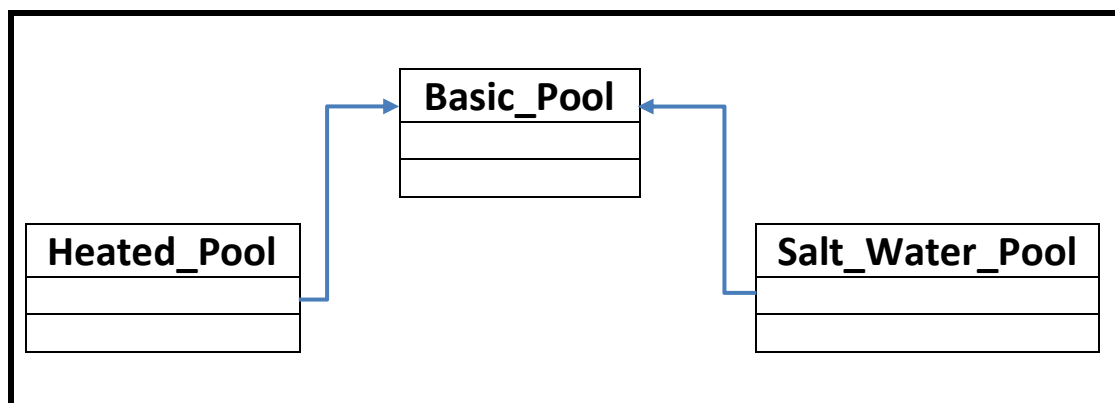


Figure 1.1

The size measurements of the pool are input by the user (in metres and can contain decimals). These variables include Length, Width and Depth, which are used to determine the number of litres of water required to fill the pool and the cost of the basic pool.

- To calculate the number of litres, you need to find the Volume of the pool. You can do so using the formula  $\text{Length} * \text{Width} * \text{Depth}$ . To calculate the number of litres, you divide the Volume by 0.13368.
- To calculate the cost of the basic pool, you need to find the Area of the pool. To calculate the Area, multiply the Length and Width measurements. The company charges R500 per square metre.

The heated pool cost is charged at the basic pool cost **plus a heating cost**. There are three alternate heating costs applicable and depends on the choice of heating type made by the customer, as shown in Table 1.1 below.

Heating Type	Heating cost
Solar heating	10000
Heatpump heating	45000
Geyser heating	15000

**Table 1.1**

The salt water pool cost is charged at the basic pool cost **plus a salt cost**. The salt cost is calculated at 15 cents for every litre of water.

***The following sequence was agreed upon for the normal use of the system:***

- The user will enter the Length, Width and Depth.
- The user has to select the pool type i.e. either the heated pool or salt water pool.
- Should the customer want a heated pool quotation then the user must also select the heating type required for a heated pool.
- Calculate and display the number of litres of water required to fill the pool, the basic pool cost and either the heated pool cost or the salt water pool cost. Output must be displayed to two decimal places.

Develop an inheritance based C# Windows Application based on the information provided above (see Sample GUI in Figure 1.2 below). The classes must contain constructors and property methods to store the data members. Use function methods to perform the calculations. Create instances and use objects of the base class or the derived classes.

**Figure 1.2**

## Exercise 2

Angela's Cards designs and manufactures a wide range of uniquely designed extraordinary cards. You have been hired as a system developer for this small company and assigned the task of developing an object orientated C# Windows Application to assist in generating quotations for card orders. There is a standard card from which two types of cards can be created, namely wedding invitation or greeting card each with its own unique and special extra embellishments. Customers can choose whether they wish to enhance their standard cards so that it becomes **either** a wedding invitation or a greeting card.

The following class diagram (see Figure 2.1 below) depicts the design of the application:

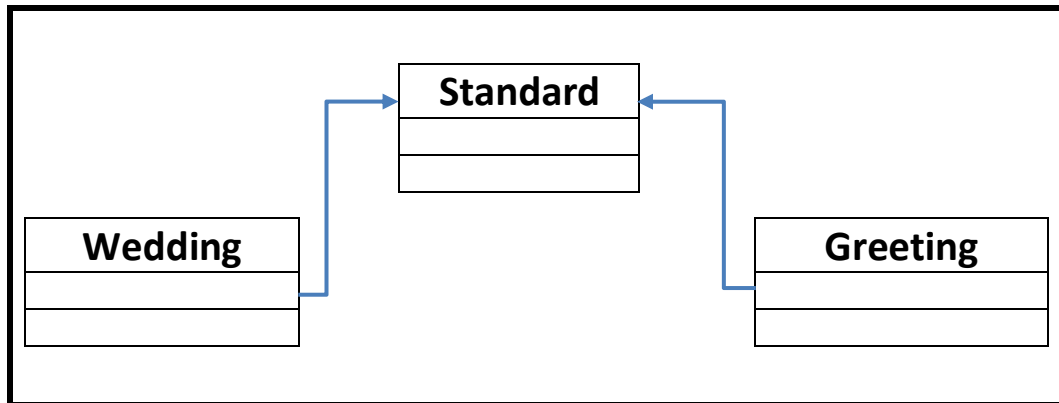


Figure 2.1

The procedure for using the system begins with the user entering the number of standard cards to order. The company offers discounted prices to wholesalers who purchase more than 500 cards and a further discount for more than 1000 cards. The basic cost of standard cards is calculated as indicated in Table 2.1 below.

Number of cards ordered	Price
1 – 500	R24 per card
> 500	R24 per card for the first 500 cards and a discounted R20 per card for the number of cards that exceed 500
> 1000	R24 per card for the first 500 cards and a discounted R20 per card for the next 500 cards and a further discounted R18.50 per card for the number of cards that exceed 1000

Table 2.1

Angela's Cards offers extra embellishments that can enhance the design of the standard cards, at an additional cost per card.

The wedding invitation offers a choice of **one or more** of the following embellishments per card:

- handmade paper,
- ribbons and;
- 3-D envelopes.

The greeting card offers a choice of **either one** of the following embellishments per card:

- clear polyprop bags and;
- colour envelopes.

The user must select the type of card and the specific extra embellishments as desired by the customer. The prices of these extra embellishments are indicated in Table 2.2 and Table 2.3 below.

Wedding Invitation extra embellishments	Price
Handmade paper	R10 per card
Ribbons	R5.50 per card
3-D envelopes	R15 per card

Table 2.2

Greeting Card extra embellishments	Price
Clear polyprop bags	50c per card
Colour envelopes	R5.99 per card

Table 2.3

The quotation program must calculate and display the basic cost of standard cards and the cost of either the wedding invitations or the greeting cards with its additional cost of selected embellishments included. Create instances of the base class or the derived classes and use appropriate function methods to perform the calculations.

The system graphical user interface is provided in Figure 2.2 below.

Figure 2.2