Lab 5 – Inheritance

Due Date: Tuesday, March 2, 8:30 am **Marks: 20 (rubric)**

In this lab, you'll practice creating a base and derived classes, using a date time picker and operator overloading. Download and extract **Lab5.zip** (form already created). See screenshots on last page and watch video run. **Only certain components of this lab will be marked (seen in the rubric).**

- ✓ **Form:** add your name to the end of the title
- ✓ **As you add classes, make sure the access modifier on them is public**
- ✓ **Whenever you have repeated code, create a method**
- ✓ Some information on working with dates found here

1. Add a class named **Employee** to your project and add the properties and methods as shown below:

Property	Description: with Validation
ID	Use an auto-implemented property. (integer)
Name	Use an auto-implemented property. (string)
StartDate	Use an auto-implemented property. (DateTime)
NextID	private Static that starts at 3000. (integer)
Method	Description
Employee()	Set ID to nextID available. IDs go up by 5 each time.
Employee(name, startdate)	Validates and sets the properties. Set name (no validation required). Set ID to nextID available. Validate start date is 1/1/2000 or later. If not, set start date to 1/1/2000.
DisplayData()	Returns a string that contains the id, name, start date and class name. Use **String.Format** to line up data. **GetType().Name** gives class name. See screenshots.

2. Add a **Supervisor** class that is derived from the **Employee** class: (cannot fully test until later!)

Property	Description: with Validation
Bonus	Use an auto-implemented property. (decimal)
Shift	Use an auto-implemented property. (integer)
Method	Description
Supervisor()	Set bonus to $250. (Base automatically called and ID set).
Supervisor(name, startdate, shift)	Call base and then set shift to data sent and bonus to $250.
DisplayData()	Call base and then add shift and bonus (currency 0 decimals). See screenshots. Use **String.Format** to line up data.

3. Add a **TeamLead** class that is derived from the **Employee** class: (cannot fully test until later!)

Property	Description: with Validation
Project	Use an auto-implemented property. (string)
Method	Description
TeamLead()	Set Project to Migration. (Base automatically called and ID set).
TeamLead (name, startdate, project)	Call base and then set project to Migration.
DisplayData()	Call base and then add project. See screenshots. Use **String.Format** to line up data.

4. **Form1 Code:** create a class-level list of Employees called **workers**.

5. **Form Load:** Select the **Employee** radiobutton**.** Set the **Compare** button to not be enabled. Run a **For** loop to create 3 employees using the custom constructor and put them in the **workers** list. Update screen output display (listbox, combobox). All data goes into listbox formatted as seen on screenshots. Only employee names go in the combobox.

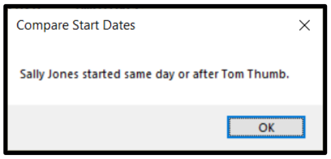
6. **Combinations** group: The label within the combinations group box will display ***n*****C2** (***n*** being the numbers of **workers** in the list) while 2 is the number of workers to choose to do a comparison (button below). Label updates whenever the list is updated. Use the Combination formula: ${}_{\mathbf{n}}\mathbf{C}_{\mathbf{2}} = \frac{n!}{2!(n-2)!}$

7. **Add Click:** Validate only that the name is at least 5 characters. Based on the radiobutton selected, create an **Employee**, **Supervisor** or **TeamLead** using the custom constructor. Send in **1** for the shift of the supervisor and **Backup** for the project for the team lead. Update the combobox and listbox. See screenshots.

8. **Delete Click:** verify that an item is selected in the listbox. If it is, remove that employee from the list and update the listbox and combobox.

9. **Employees class**: overload **<=** operator. This operator will compare the start dates for two employees that are sent.

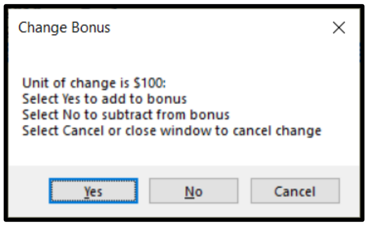
10. **Compare click:** This button is only enabled if items are selected in both list controls (listbox and combobox) and the same employee is not selected in both. If all conditions are good for comparison, compare using the overloaded <=. Display messagebox following comparison. Example shown here, see screenshots below.



Sally Jones started same day or after Tom Thumb.

11. **Supervisor class**: overload the **++** and **--** unary operators. The ++ will add $100 to the bonus while the -- will attempt to subtract $100 from the bonus (if there is $100).

12. **Bonus click**: A Supervisor must be selected for the code to run. A messagebox will appear asking what the user wants to do (seen here). Store the record in separate class object and call ++ or – using the stored object. Update the screen displays.



Unit of change is $100:
Select Yes to add to bonus
Select No to subtract from bonus
Select Cancel or close window to cancel change

Submission Requirements:

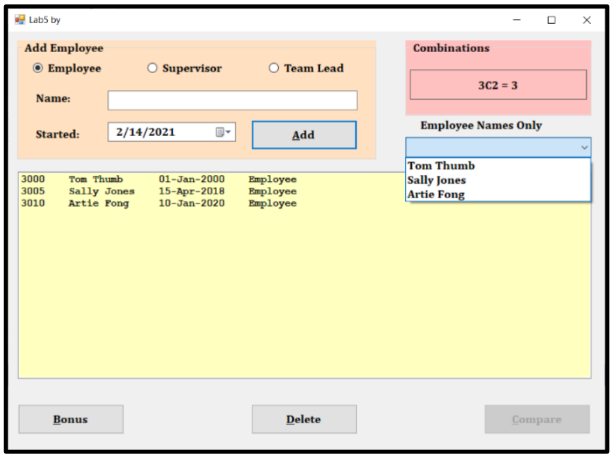
- **Memo:** memo, code for all (Form, Employee class, Supervisor class, TeamLeader class). Ensure comments on all
- **Brightspace:** Memo, zip entire program and submit

Working with dates in C#:

Description	Syntax	Example
Declare a date	`DateTime d1;`	`DateTime dob;`
Set a fixed date	`DateTime d1 = new DateTime(y, m, d);`	`DateTime dob = new DateTime(2021, 2, 14);`
Format a date	`ToString("dd-MMM=yyyy")`	`Formats as 14-Feb-2021`

Screenshots:

Form Load: (Compare not enabled)



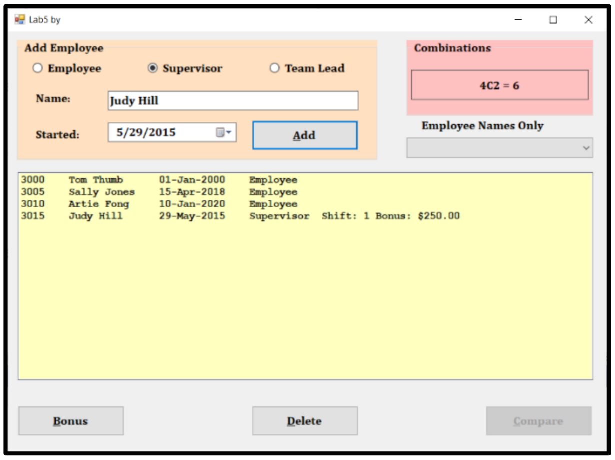
Started: 2/14/2021

3C2 = 3

Tom Thumb
Sally Jones
Artie Fong

```
3000    Tom Thumb      01-Jan-2000    Employee
3005    Sally Jones    15-Apr-2018    Employee
3010    Artie Fong     10-Jan-2020    Employee
```

Add a Supervisor: (notice Combination updated)



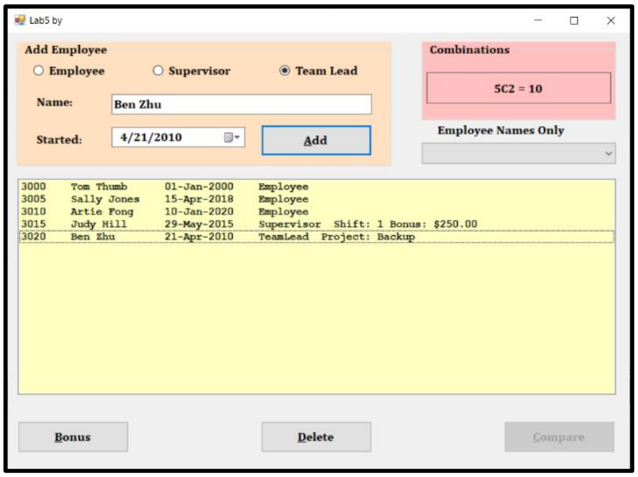
Name: Judy Hill

Started: 5/29/2015

4C2 = 6

```
3000    Tom Thumb      01-Jan-2000    Employee
3005    Sally Jones    15-Apr-2018    Employee
3010    Artie Fong     10-Jan-2020    Employee
3015    Judy Hill      29-May-2015    Supervisor  Shift: 1 Bonus: $250.00
```

Add a Team Lead:



○ Employee ○ Supervisor ● Team Lead

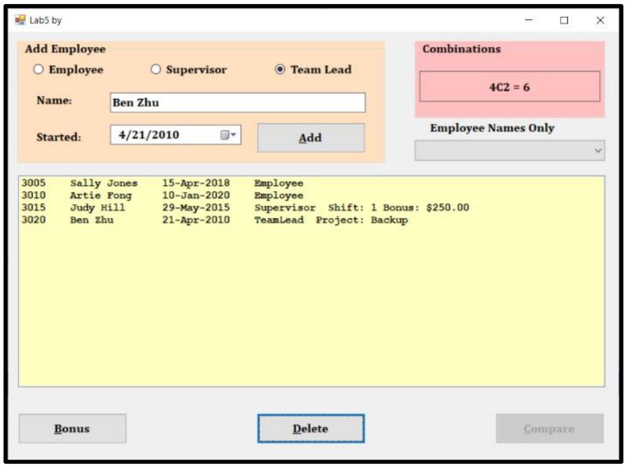
Name: Ben Zhu

Started: 4/21/2010

5C2 = 10

```
3000   Tom Thumb     01-Jan-2000   Employee
3005   Sally Jones   15-Apr-2018   Employee
3010   Artie Fong    10-Jan-2020   Employee
3015   Judy Hill     29-May-2015   Supervisor  Shift: 1 Bonus: $250.00
3020   Ben Zhu       21-Apr-2010   TeamLead  Project: Backup
```

Select and Delete first employee in listbox:



○ Employee ○ Supervisor ● Team Lead

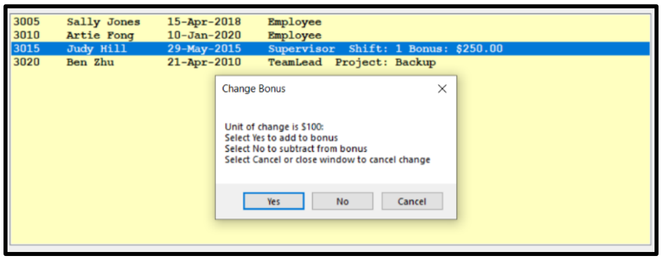
Name: Ben Zhu

Started: 4/21/2010

4C2 = 6

```
3005   Sally Jones   15-Apr-2018   Employee
3010   Artie Fong    10-Jan-2020   Employee
3015   Judy Hill     29-May-2015   Supervisor  Shift: 1 Bonus: $250.00
3020   Ben Zhu       21-Apr-2010   TeamLead  Project: Backup
```

Select Supervisor, click Bonus

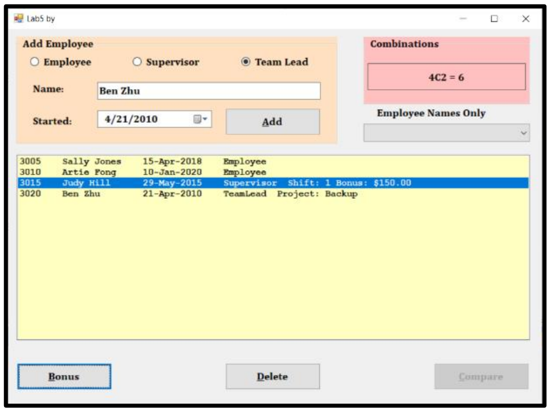


```
3005   Sally Jones   15-Apr-2018   Employee
3010   Artie Fong    10-Jan-2020   Employee
3015   Judy Hill     29-May-2015   Supervisor  Shift: 1 Bonus: $250.00
3020   Ben Zhu       21-Apr-2010   TeamLead  Project: Backup
```

Change Bonus

Unit of change is $100:
Select Yes to add to bonus
Select No to subtract from bonus
Select Cancel or close window to cancel change

Select No on Bonus: (deducts $100 and list item still selected)



○ Employee ○ Supervisor ● Team Lead

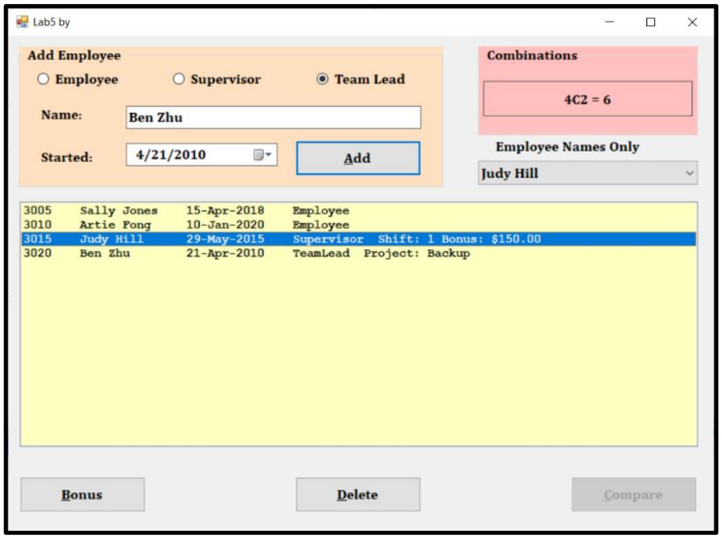
Name: Ben Zhu

Started: 4/21/2010

4C2 = 6

```
3005   Sally Jones   15-Apr-2018   Employee
3010   Artie Fong    10-Jan-2020   Employee
3015   Judy Hill     29-May-2015   Supervisor  Shift: 1 Bonus: $150.00
3020   Ben Zhu       21-Apr-2010   TeamLead  Project: Backup
```

Select same employee
(from listbox and combobox) Compare is not enabled



○ Employee ○ Supervisor ● Team Lead

Name: Ben Zhu

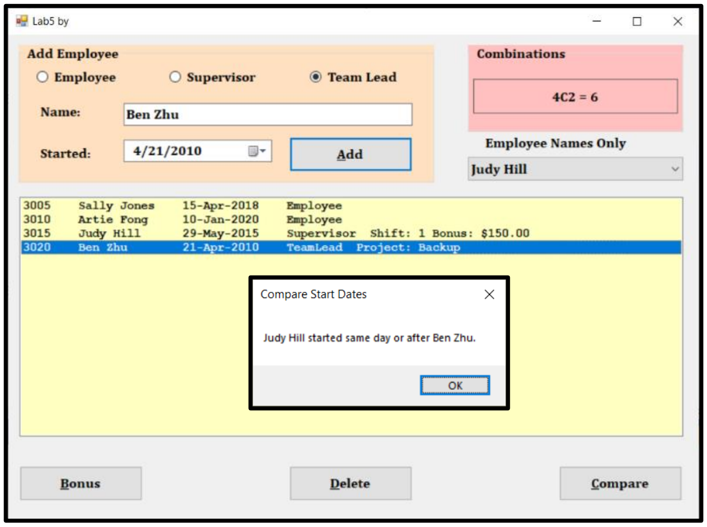
Started: 4/21/2010

4C2 = 6

Judy Hill

```
3005   Sally Jones   15-Apr-2018   Employee
3010   Artie Fong    10-Jan-2020   Employee
3015   Judy Hill     29-May-2015   Supervisor  Shift: 1 Bonus: $150.00
3020   Ben Zhu       21-Apr-2010   TeamLead  Project: Backup
```

Select different employees
(from listbox and combobox) Compare enabled



○ Employee ○ Supervisor ● Team Lead

Name: Ben Zhu

Started: 4/21/2010

4C2 = 6

Judy Hill

```
3005   Sally Jones   15-Apr-2018   Employee
3010   Artie Fong    10-Jan-2020   Employee
3015   Judy Hill     29-May-2015   Supervisor  Shift: 1 Bonus: $150.00
3020   Ben Zhu       21-Apr-2010   TeamLead  Project: Backup
```

Compare Start Dates

Judy Hill started same day or after Ben Zhu.