Topic 3B

Making Comparisons & Choices

(More If /else, Logical Operator (And/Or/Not))

Part II

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Topics

Objectives:

- Understand the use of if/else Control structure for decision making
- Be able to use If-else to make decisions with more than one conditions using logical operators (AND and OR)

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Quick Review

- In last lesson, we learnt about Relational operators that can be use to compare numerical values, strings or char
- Compare operators return either True or False

<	Less than
>	Greater than
==	Equal to
<=	Less than or equal to
>=	Greater than or equal to
!=	Not Equal to

- Relational operators can be used to compare numerical values, strings or char

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Quick Review

- The if/else control enables the computer to do different actions depending on certain Test Conditions.
- The key control structure is:

```
if ( test is true )
{
    perform these statements
}
else  // if test is false
{
        perform these statements
            if test is false;
}
```

- We will now look at if / else in more detail.

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Making decisions using Nested if/else

- Very often, real life problems require us to select from more than 2 choices.
- Example:

```
if (marks >= 80)
1   lblResult.Text = “Grade is A”;
else if (marks >= 70 )
2   lblResult.Text = “Grade is B”;
else if (marks >= 60 )
3   lblResult.Text = “Grade is C”;
else if (marks >= 50)
4   lblResult.Text =“Grade is D”;
else
5   lblResult.Text =“Grade is F”;
```

Assume marks = 85
(85 > 80) is TRUE
Grade is A

Single IF/ELSE block

- It depends on **marks value**, finally Only **ONE path** will be executed
- It can be 1 or 2 or 3 or 4 or 5

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Making decisions using Nested if/else

- Very often, real life problems require us to select from more than 2 choices.
- Example:

```
if (marks >= 80)
    lblResult.Text = “Grade is A”;
else if (marks >= 70 )
    lblResult.Text = “Grade is B”;
else if (marks >= 60 )
    lblResult.Text = “Grade is C”;
else if (marks >= 50)
    lblResult.Text =“Grade is D”;
else
    lblResult.Text =“Grade is F”;
```

Assume marks = 65

(65 > 80) is FALSE

(65 > 70) is FALSE

(65 > 60) is TRUE

Grade is C

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Making decisions using Nested if/else

- Very often, real life problems require us to select from more than 2 choices.
- Example:

```
if (marks >= 80)
    lblResult.Text = “Grade is A”;
else if (marks >= 70 )
    lblResult.Text = “Grade is B”;
else if (marks >= 60 )
    lblResult.Text = “Grade is C”;
else if (marks >= 50)
    lblResult.Text =“Grade is D”;
else
    lblResult.Text =“Grade is F”;
```

Assume marks = 45

(45 > 80) is FALSE

(45 > 70) is FALSE

(45 > 60) is FALSE

(45 > 50) is FALSE

Grade is F

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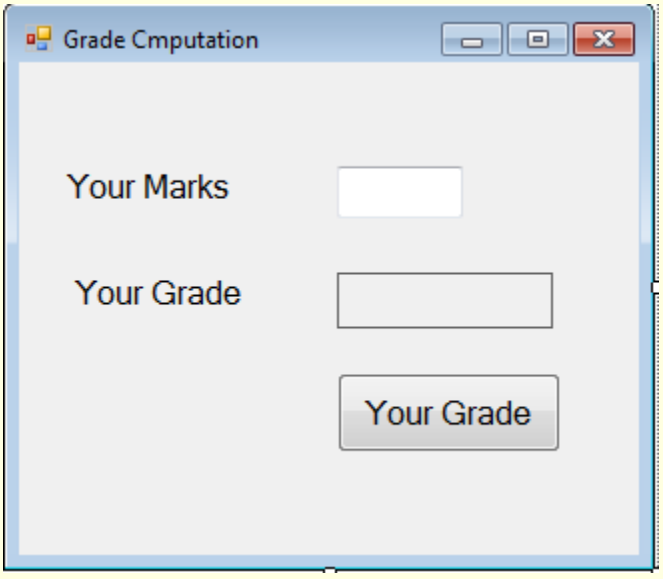
Example 1: Grade Computation

- **Problem Statement**: Create a Form to allow the user to enter marks of a student. The Grade will be computed based on following criterion:

Greater than or equal to 80	A
Between 70 to 79 (both inclusive)	B
Between 60 to 69 (both inclusive)	C
Between 50 to 59 (both inclusive)	D
Below 50	F

- **Form Design:**



Algorithm:
Read mark.
Compute grade (see above)
Display grade

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Example 1: Grade Computation

- Code:

```
private void btnGrade_Click(object sender
{
    int marks;

    marks = int.Parse(txtMarks.Text);
    if (marks >= 80)
        lblResult.Text = "Grade is A";
    else if (marks >= 70)
        lblResult.Text = "Grade is B";
    else if (marks >= 60)
        lblResult.Text = "Grade is C";
    else if (marks >= 50)
        lblResult.Text = "Grade is D";
    else
        lblResult.Text = "Grade is F";
}
```

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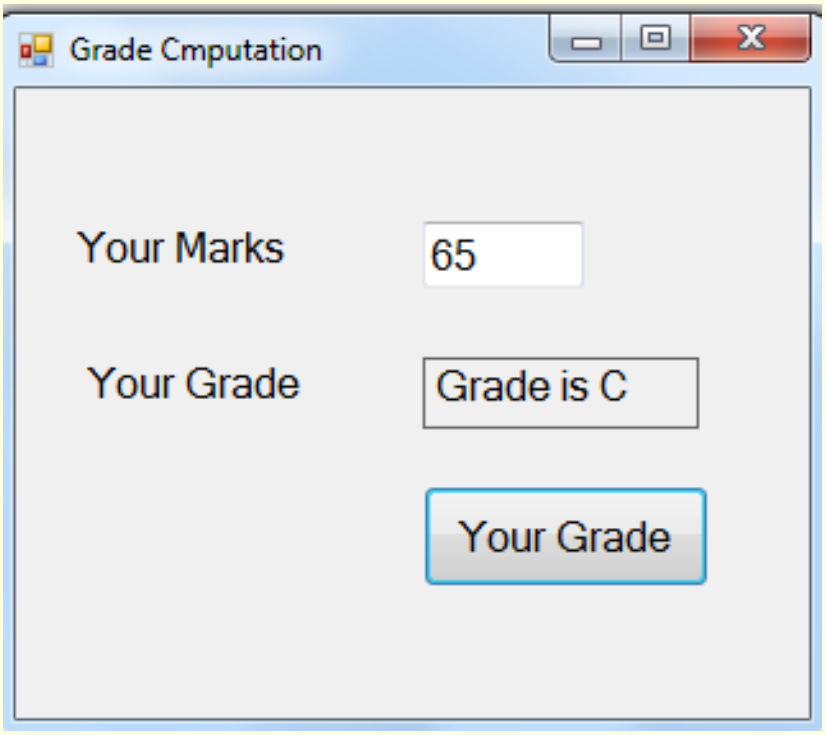
Example 1: Grade Computation

- Sample Output:



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Using Logical Operators

- So far the IF statements are used for single condition
- Combinations of Conditions
  - An IF statement can have multiple conditions combined, each connected with logical operators **AND** or **OR.**
  - In C#, the operators used are
    - **&&** for AND
    - **||** for OR

Logical Operator	In C#	Meaning
AND	&&	**ALL** conditions tested in the IF statement must be true
OR	||	**ONE** condition tested in the IF statement must be true

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AND – Making decisions using if/else

- Examples:

If it is raining **AND** it is wet, bring along an umbrella

```
char rain = 'Y';
char wet = 'Y';
If ( (rain == 'Y') && (wet == 'Y'))
{
        lblMessage.Text = "Bring umbrella
      as wet, rainy weather expected today.";
}
```

1 2

Message will only be displayed when both conditions 1 2 are met

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OR – Making decisions using if/else

- Examples:

If you have a fever **OR** a headache, take panadol

```
char  fever = 'Y';
char  headache = 'Y';
if ( (fever == 'Y') || (headache == 'Y') )
{
        lblMessage.Text = "Take panadol";
}
```

1 2

Message will only be displayed when ONE of the conditions 1 2 is met

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Making decisions using if/else

- Condition 1 **AND** Condition 2
  - BOTH Condition 1 and Condition 2 MUST be TRUE for the combined condition to be TRUE

Condition1	Condition2	1 AND 2
True	True	True
False	True	False
True	False	False
False	False	False

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Making decisions using if/else

- Examine the following C# code:

```
int age, discount=0;
char working;
.....
.....
If ((age >= 55) && (working == 'N' ))
        discount = 20;
```

age	Age > 55	working	working == 'N'	Result	discount
50	False	'N'	True	False	0
50	False	'Y'	False	False	0
60	True	'N'	True	True	**20**
60	True	'Y'	False	False	0

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Making decisions using if/else

- Condition 1 OR Condition 2
  - ONLY Condition 1 OR Condition 2 MUST be TRUE for the combined condition to be TRUE

Condition1	Condition2	1 OR 2
True	True	True
False	True	True
True	False	True
False	False	False

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Making decisions using if/else

- Examine the following C# code:

```
int discount = 0;

if ((age < 55) ||(working != 'N'))
{
    discount = 10;
}
```

age	Age < 55	working	working != 'N'	Result	discount
50	True	'N'	False	True	10
50	True	'Y'	True	True	10
60	False	'N'	False	False	0
60	False	'Y'	True	True	10

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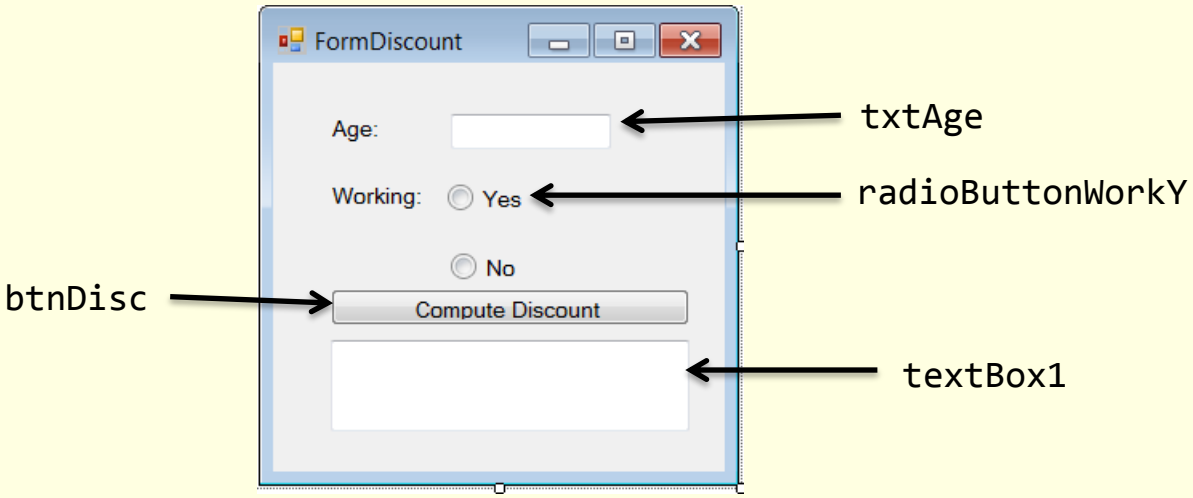
Example 2: Compute Discounted Cost

- Let's run the following application to experience the OR and AND logical operators.

- **Problem Statement**:
  - Create a Form to accept age and working status. User clicks on Compute Discount button to get the discount information.

- **GUI Form Design**



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Example 2: Compute Discounted Cost

- Code using && and ||

```
private void btnDisc_Click(object sender, EventArgs e)
       {
           int age;
           bool working = false;

           //read in age and working status
           age = int.Parse(txtAge.Text);
           working = radioButtonWorkY.Checked; // true or false

           // if age is greater than or equal to 55 and is NOT working
1          if ((age >=55) && (working==false))
           {
               textBox1.Text = "Discount is 20%";
           }

           // if age is less than 55 OR is working
2          if ((age < 55) || (working == true))
           {
               textBox1.Text = "Discount is 10%";
           }
       }
```

- Run the program and see the logic work in 1 2
- State the difference.

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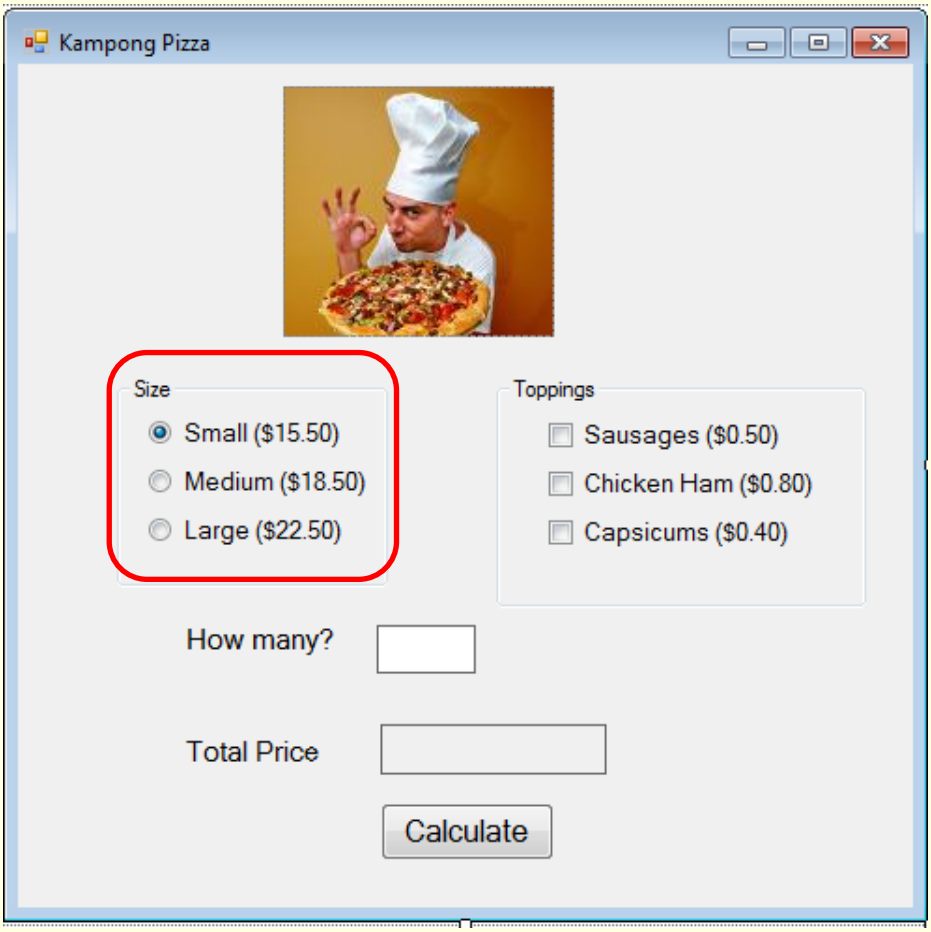
Example 3: Pizza Ordering System

- Let us apply nested if/else to the Pizza Ordering System in the last lesson. We will modify the application to allow the user to choose different sizes of pizza using radio buttons as shown:



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Example 3: Pizza Ordering System

- Code:

```
private void btnCalculate_Click(object send
{

    float totalPrice = 0.0f;
    float basicPrice = 0f;
    int quantity;

    if (radSmall.Checked == true)
        basicPrice = 15.50f;
    else if (radMedium.Checked == true)
        basicPrice = 18.50f;
    else
        basicPrice = 22.50f;

    // Get qty ordered
    quantity = int.Parse(txtQuantity.Text);
    totalPrice = basicPrice * quantity;
```

To do: Explain code

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Example 3: Pizza Ordering System

- Code:
  - The remaining code remains unchanged.

```
    if (chkSausages.Checked == true)
        totalPrice = totalPrice + 0.50f;

    if (chkChickenHam.Checked == true)
        totalPrice = totalPrice + 0.80f;

    if (chkCapsicums.Checked == true)
        totalPrice = totalPrice + 0.40f;

    lblTotalPrice.Text = totalPrice.ToString("C");
}
```

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Example 3: Pizza Ordering System

- Sample output:

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Summary

- The if/else control enables the computer to do different actions depending on certain Test Conditions.
- The key control structure is:

```
if ( test is true )
    {
        // perform these statements
    }else if (test is true )
    {
        // perform these statements
    }else
    {
        // perform these statements only if       // rest
    are  all not true
    }
```

- Logical Operators:

Logical Operator	In C#	Meaning
AND	&&	**ALL** conditions tested in the IF statement must be true
OR	||	**ONE** condition tested in the IF statement must be true

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Practical 3B

- There are 3 questions in Practical 3B
- There is no startup file provided.
- You need to create a new project file in Visual Studio
- Develop the complete solution with form, user control and code the logic
- Some samples of code are provided to help you
- Good Luck ☺

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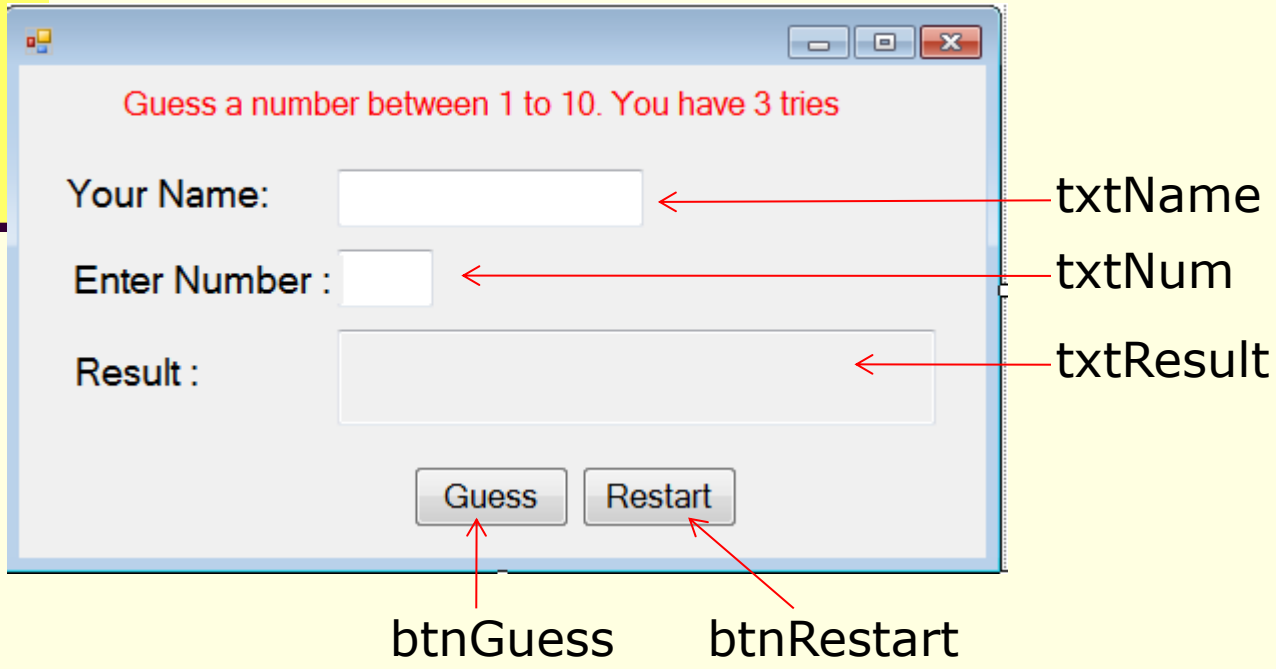
Practical 3B

Question 1: Number Guessing Game

- **Task**: Create a Form to accept the following:
  - Name of Person
  - A number

  The program should allow user to attempt maximum of 3 tries to guess a number from 1 to 10. It should also allow user to restart a new game.
- **Form Design:**



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Practical 3B

Question 1: Number Guessing Game

- Think of the Algorithm (solution) and the pseudo code first.

- **Code**:

```
public partial class Form1 : Form
{
    // class variables
    int tries = 0; // track how many tries made
    int secret = 8; // secret number
    string name; // store user name
```

TO DO : Explain code

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Practical 3B

Question 1: Number Guessing Game

- **Code**:

```
private void btnGuess_Click(object sender, EventArgs e)
{
    name = txtName.Text;
    int guessNumber = int.Parse(txtNum.Text);
    bool isCorrect = false; // set to true if guess correct

1   if (guessNumber == secret)
    {
        txtResult.Text = "Congratulations, " + txtName.Text + "!";
        isCorrect = true;
    }
2   else if (guessNumber > secret)
    {
        txtResult.Text = "The secret number is smaller";
        txtNum.Clear();
        txtNum.Focus();
    }
3   else
    {
        txtResult.Text = "The secret number is larger";
        txtNum.Clear();
        txtNum.Focus();
    }
```

TO DO : Explain code

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Practical 3B

Question 1: Number Guessing Game

- **Code**:

```
// increase 1 try attempt
tries = tries + 1;
// if he has not guess correctly
if (isCorrect == false)
{
    // 3 tries reached
    if (tries == 3)
    {
        txtResult.Text = "Sorry, " + txtName.Text;
        txtResult.Text = txtResult.Text +".Maximum tries exceeded.";
    }
}
```

1

2

3

TO DO : Explain code

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Practical 3B

Question 1: Number Guessing Game

- **Code**:

```
private void btnRestart_Click(object sender, EventArgs e)
{
    tries = 0;
    txtNum.Clear();
    txtNum.Focus();
    txtResult.Clear();
}
```

TO DO : Explain code

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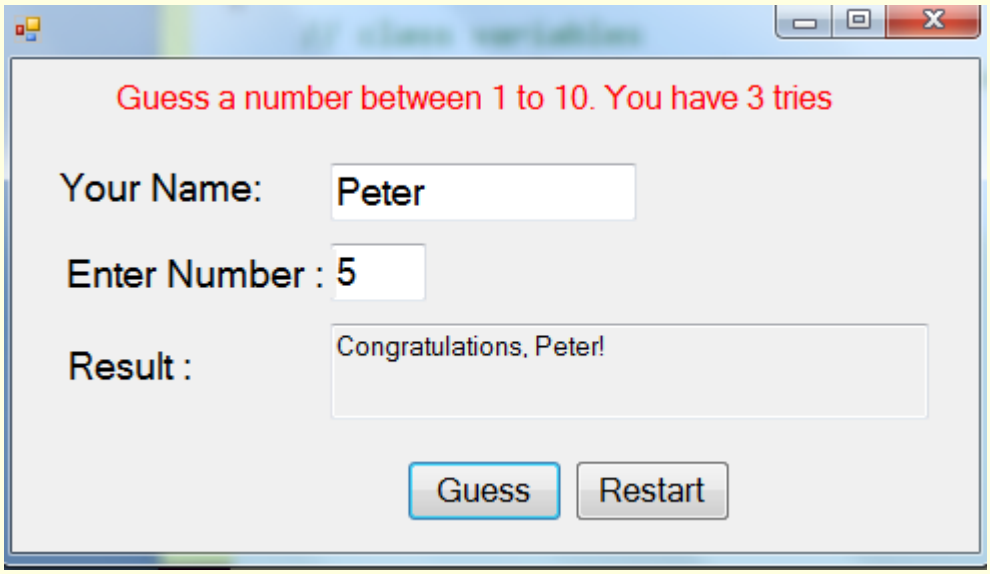
Practical 3B

Question 1: Number Guessing Game

- **Sample Output:**



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Practical 3B

Question 1:
Number Guessing Game (Improved)

- Improve the program to generate a secret random number between 1 to 10 instead.

```
private void Form1_Load(object sender, EventArgs e)
{
    // create an object from Random Class
1   Random random = new Random();
    // call Next Method to generate number
    // between 1 to 10
2   secret =random.Next(1,10);
}

private void btnRestart_Click(object sender, EventArgs e)
{
    tries = 0;
    txtNum.Clear();
    txtNum.Focus();
    txtResult.Clear();
3   Random random = new Random();
    secret = random.Next(1, 10);
}
```

TO DO : Explain code

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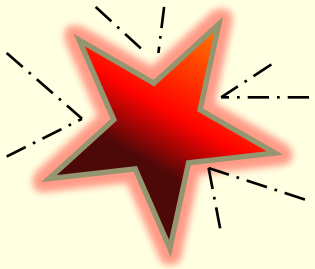
Practical 3B



Question 2:

- **Task:**

  Create a window application to read in name, age and mark of a student. The assignment base mark is 20. When user clicks on Show Performance button, it computes the percentage score (upon 100%) and displays the performance.

Percentage Score	Performance
70% and above	Excellent
69% - 60%	Average
59% - 50%	Pass
49% and less	Fail

The application has the following features:

- Display the result as follows:

  John scores 20 marks. Performance is Excellent.

  (where John is the name and 20 is the mark entered)

- Student who is below 20 years old and failed the test, it displays :

  John needs to attend remedial session.

  (where John is the name)

- Student who is above 50 or scores Excellent, it displays

  Sally will be rewarded.

  (where Sally is the name)

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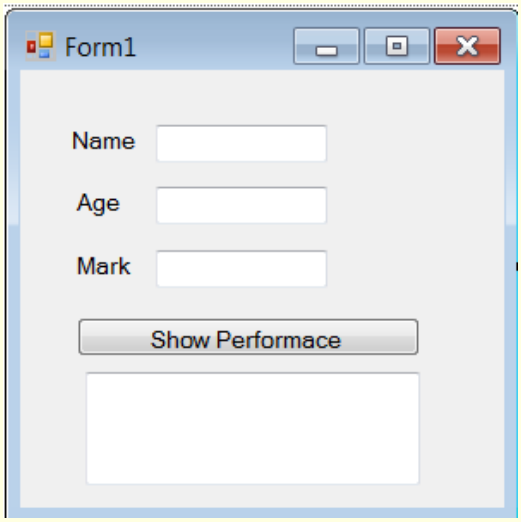
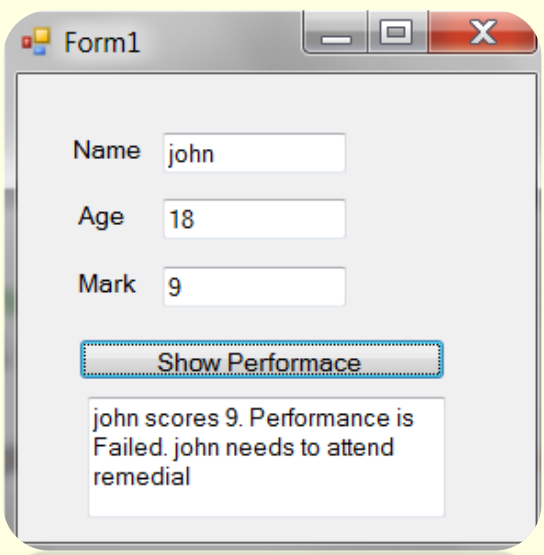
Practical 3B

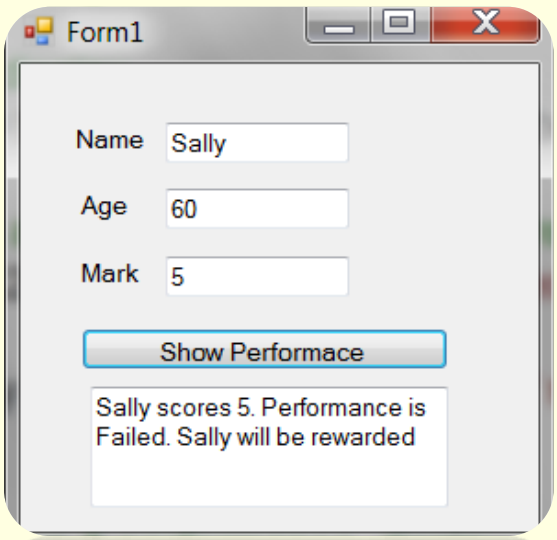
Question 2:

- **GUI Form Design:**



- **Sample output:**





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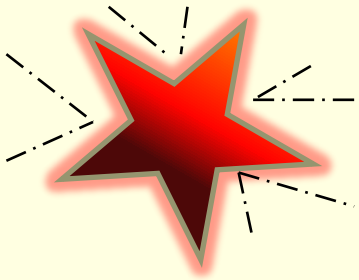
Practical 3B



Question 3:

- **Task:**

  Create a window application to read in a home loan amount (in dollars) and a senior citizen radio button. When user clicks on Compute Deposit button, it computes the required deposit based on the following schedule. It displays the calculated deposit.

Loan ($)	Calculated Deposit ($)
Greater than $300,000	$10,000 + 15% of loan
$100,000 - $300,000	$5,000 + 10% of loan
Less than $100,000	5% of loan

The application has the following features:

- Display the result as follows:

  Your loan amount is $10000 , calculated deposit is S$500

- There is a special discount of 0.5% for all senior citizen customers whose calculated deposit is more than or equal to $500. It displays the calculated deposit after discount.

  You are entitled for 5% discount. Discounted deposit is S$475.

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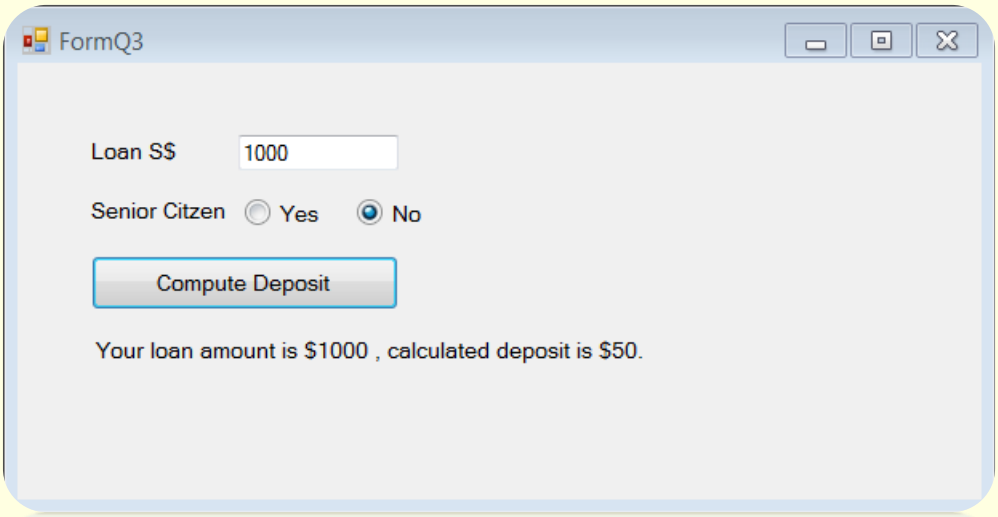
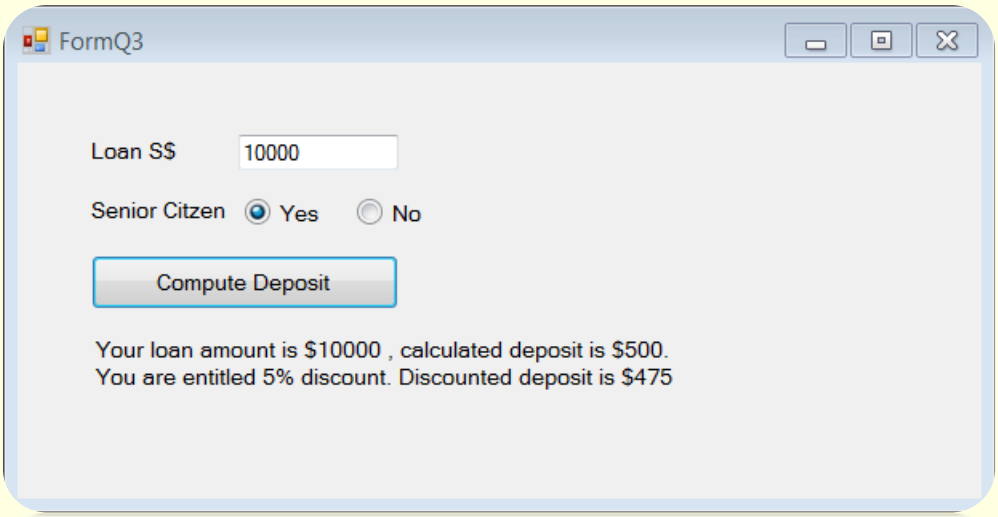
Practical 3B

Question 3:

- **GUI Form Design and Sample output:**





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Practical 3B
Extras – Help for You! (Optional)

If you need extra help in applying IF / ELSE statements:

- You may refer to the elearning exercises
- It teaches you How to do a grade calculator using IF/ELSE statement
- The teaching aids are:
  - Grade Calculator Part 1
  - Grade Calculator Part 2
  - Grade Calculator Part 3
- They are video clip for you to follow. Have fun!

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End of Topic 3B

Making Comparisons & Choices

(More If /else and Exception Handling)

Part II

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