
Sheet (2)
Object Oriented Programming (OOP)
(C#)

1. The following C# code is for the only windows form (Form1) in a simple windows app to calculate the binomial coefficient. Examine the code and answer the following questions :
- a) Design an appropriate layout for that form and label each of its components according to the code.
 - b) Explain each line / block of lines (in Arabic).
 - c) List and count how many :
 - a. Assignment Statements.
 - b. Conditions.
 - c. Global and Local Variables.
 - d. Loop Structures.
 - e. Pre-defined Methods.
 - f. Pre-defined Namespaces.
 - g. Pre-defined used Classes.
 - h. User-defined Classes.
 - i. User-defined Functions.
 - j. User-defined Namespace.
 - k. Using Directives.

```
using System;
using System.Windows.Forms;

namespace Binomial_Coefficient_1
{
    public partial class Form1 : Form
    {
        int n, k, c;
        bool flag;

        public Form1()
        {
            InitializeComponent();
        }

        private void btnClose_Click(object sender, EventArgs e)
        {
            Close();
        }
    }
}
```

```

private void btnCalculate_Click(object sender, EventArgs e)
{
    flag = Int32.TryParse(txtN.Text, out n);
    if (flag == false)
    {
        MessageBox.Show("n should be an integer number .. try again", "Input Error");
        txtN.Clear();
        txtN.Focus();
        return;
    }

    flag = Int32.TryParse(txtK.Text, out k);
    if (flag == false)
    {
        MessageBox.Show("k should be an integer number .. try again", "Input Error");
        txtK.Clear();
        txtK.Focus();
        return;
    }

    if (n < k)
    {
        MessageBox.Show("n should be > or = k .. try again", "Input Error");
        txtK.Clear();
        txtK.Focus();
        return;
    }

    c = fact(n) / (fact(k) * fact(n - k));
    txtC.Text = c.ToString();
}

int fact(int x)
{
    int f = 1;
    while (x > 0)
    {
        f = f * x;
        x = x - 1;
    }
    return f;
}
}

```

2. Design a suitable GUI and write a code for a windows form app to evaluate the sine for any given number x.

a) Use the following formula for some k terms.

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$$
$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1}$$

b) Evaluate sine(x) using the pre-defined function Math.Sin(x) and compare the results.

3. Write an application that estimates the value of the mathematical constant e by using the formula.

$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots$$

4. Write an application that computes the value of ex by using the formula.

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$