(T12)比較 Contains、Equals、SequenceEqual、GetHashCode。比較 IEqualityComparer、AnonymousTypes(匿名型別)
CourseGUID: 29f1196a-1950-41a4-b9c1-dd13a9e92d92
==========
(T12)比較 Contains、Equals、SequenceEqual、GetHashCode。比較 IEqualityComparer、AnonymousTypes(匿名型別)
==========

==========

0. Summary

0.

0.1.
Three popular ways to solve the problems of Contains() and Equals() and SequenceEqual() for Reference Type, ClassA

0.1.1.
Override Equals() and GetHashCode() methods in ClassA

0.1.2.
If you can not access ClassA, then
Use another overloaded version of SequenceEqual(),Contains() method which can take a sub-class of IEqualityComparer as parameter.

0.1.3.
If you can not access ClassA, then
use Select() or SelectMany() to project into a new anonymous type,
which overrides Equals() and GetHashCode() methods.

0.2.
Three popular ways to solve the problems of Compare() and Sort() for Reference Type, ClassA

0.2.1.
ClassA implement IComparable<ClassA>
and then implement
//public int CompareTo(ClassA other)

0.2.2.
If you can not access ClassA, then
use other class to implement IComparer<ClassA>
E.g.
//public class ClassACompareName: IComparer<ClassA >
and then implement
public int Compare(ClassA current, ClassA other)

0.2.3.
If you can not access ClassA, then
use anonymous type to provide the method to compare.

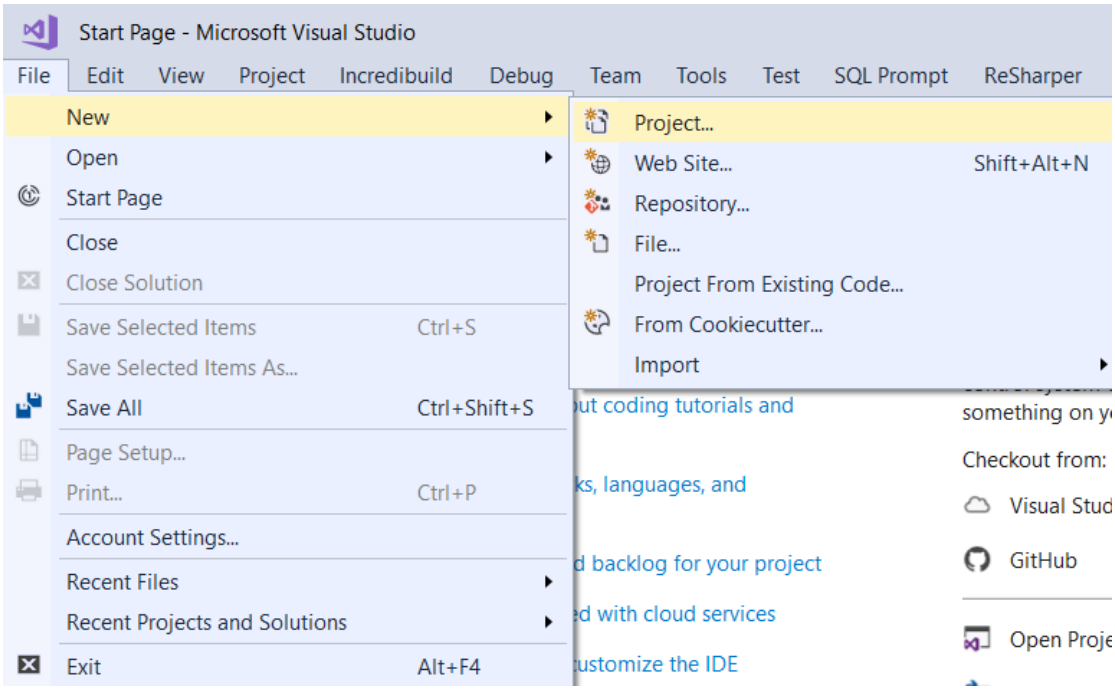
1. New Project

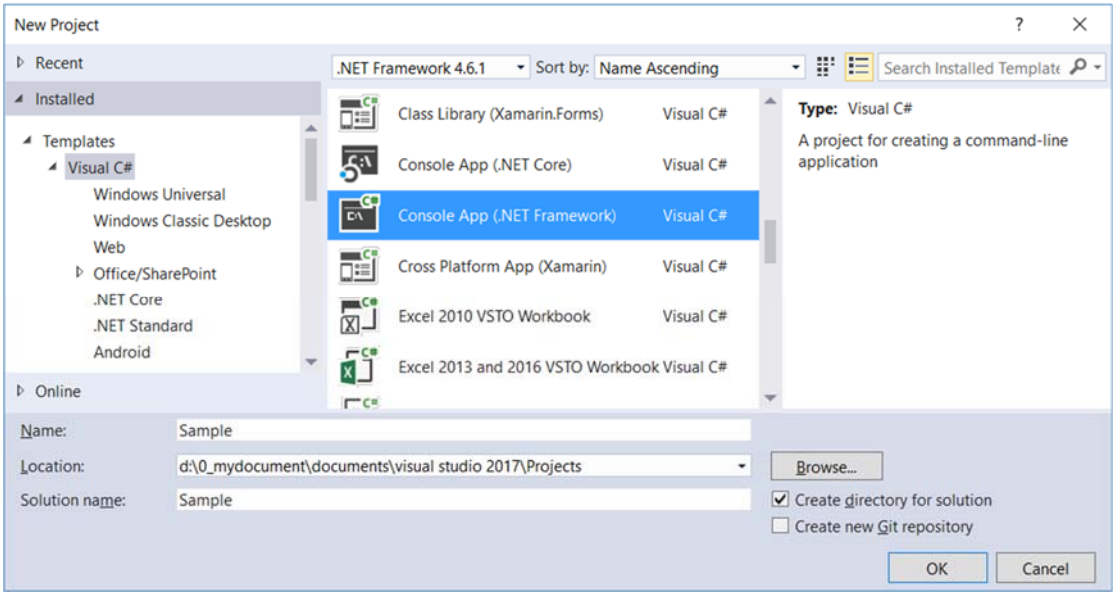
1.1. Create New Project

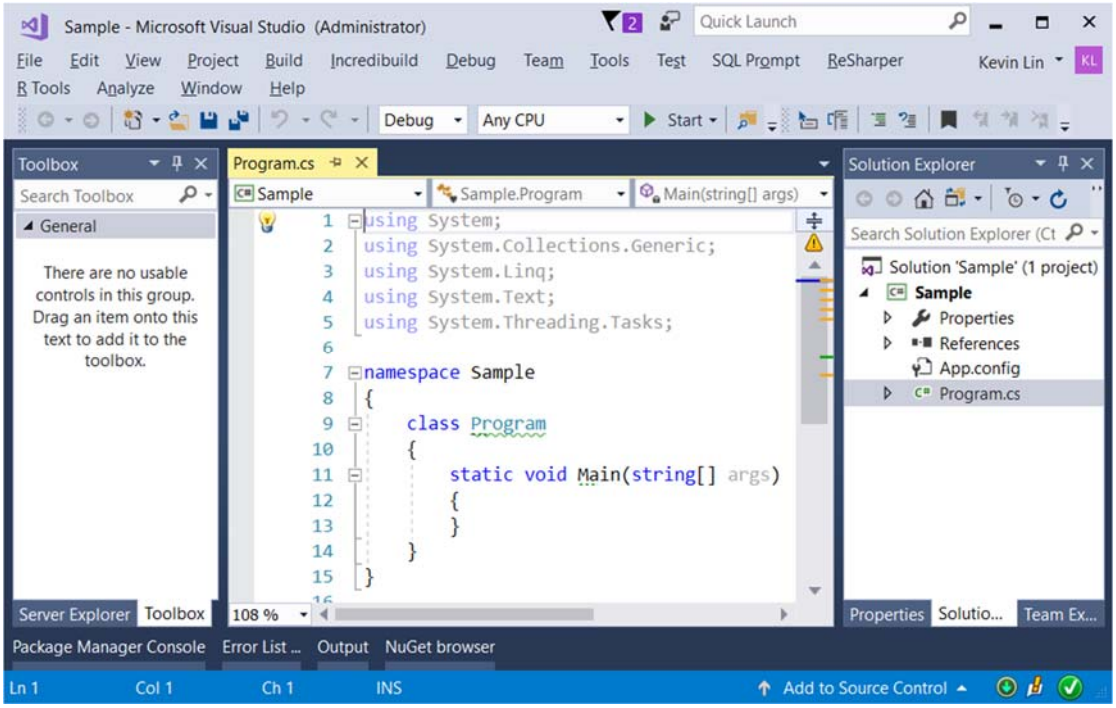
File --> New --> Project... -->

Visual C# --> **Console App (.Net Framework)** -->

Name: **Sample**







==========

2. Program.cs

```
using System;
namespace Sample
{
    class Program
    {
        static void Main(string[] args)
        {
            // 1. ---------------------------------
            Console.WriteLine("1 ValueTypeEqualSample ============================");
             ValueTypeEqualSample();
            // 2. ---------------------------------
```

```
    Console.WriteLine("2 EnumEqualSample ============================");
     EnumEqualSample();
    // 3. ---------------------------------
    Console.WriteLine("3 ReferenceTypeEqualSample ============================");
     ReferenceTypeEqualSample();
    // 4. ---------------------------------
    // Reason to override Equal method.
    Console.WriteLine("4 ReferenceTypeEqualSample2 ============================");
     ReferenceTypeEqualSample2();
    // 5. ---------------------------------
    Console.WriteLine("5 ReferenceTypeEqualSample3 ============================");
     ReferenceTypeEqualSample3();
    Console.ReadLine();
}

// 1. ---------------------------------
static void ValueTypeEqualSample()
{
    int i = 10;
    int j = 10;
    Console.WriteLine($"i == j  : {i == j}");
    Console.WriteLine($"i.Equals(j) : {i.Equals(j)}");
    //i == j  :  True
    //i.Equals(j) : True
    //1.
    // System.Object has Equals() virtual method.
    // int is value type which stored in the stack.
    // Thus, "==" and "Equals()" will return the same result.
}
// 2. ---------------------------------
static void EnumEqualSample()
{
    MagicType enum1 = MagicType.Metal;
    MagicType enum2 = MagicType.Metal;
    Console.WriteLine($"enum1 == enum2  : {enum1 == enum2}");
    Console.WriteLine($"enum1.Equals(enum2)  ; {enum1.Equals(enum2)}");
    //enum1 == enum2  :  True
    //enum1.Equals(enum2); True
    //1.
    //Enum keyword can create enumerations and
    //it is strongly value typed constants.
    //The default underlying type of an enum is int.
    //Since, enum is value type, and
    //both enums has the same underlying integer value.
    //Thus, "==" and "Equals()" will return the same result.
}
// 3. ---------------------------------
static void ReferenceTypeEqualSample()
{
    Gamer g1 = new Gamer();
     g1.FirstName = "F01";
     g1.LastName = "L01";
    Gamer g2 = g1;
    Console.WriteLine($"g1 == g2  : {g1 == g2}");
    Console.WriteLine($"g1.Equals(g2)  : {g1.Equals(g2)}");
```

```
    //g1 == g2  :  True
    //g1.Equals(g2)  :  True
    //1.
    //"==" operator checks for reference equality.
    //g1 and g2 are different object reference variables which stores in Stack.
    //Both g1 and g2 refer to the same memory location.
    //Thus, g1 == g2 will return true.
    //2.
    //Equals() method checks for value equality.
    //g1 and g2 variables are pointing to the same object instance which stores in Heap.
    //thus, the values are the same,
    //Therefore, g1.Equals(g2) will return true.
    //3.
    //If "obj1==obj2", that means they have reference equality,
    //then they must also have value equality which is obj1.Equals(obj2).
    //However, if obj1.Equals(obj2) that means they have value equality.
    //then "obj1==obj2" reference equality will not be guarantee.
}

// 4. ---------------------------------
// Reason to override Equal method.
static void ReferenceTypeEqualSample2()
{
    Gamer g1 = new Gamer();
     g1.FirstName = "F01";
     g1.LastName = "L01";
    Gamer g2 = new Gamer();
     g2.FirstName = "F01";
     g2.LastName = "L01";
    Console.WriteLine($"g1 == g2  : {g1 == g2}");
    Console.WriteLine($"g1.Equals(g2)  : {g1.Equals(g2)}");
    //g1 == g2  :  False
    //g1.Equals(g2)  :  False
    //1.
    //"==" operator checks for reference equality.
    //g1 and g2 are different object reference variables which stores in Stack.
    //g1 and g2 refer to the different memory location.
    //Thus, g1 != g2
    //2.
    //Equals() method checks for value equality.
    //g1 and g2 variables are pointing to the different object instance which stores in Heap.
    //thus, the values are different,
    //Therefore, !g1.Equals(g2)
    //3.
    //The FirstName and LastName are the same.
    //Thus, g1.Equals(g2) should return true.
    //However, it return false.
    //Therefore, it make sense to override Equals.
}
// 5. ---------------------------------
// Reason to override Equal method.
static void ReferenceTypeEqualSample3()
{
    GamerA gA1 = new GamerA();
```

```
            gA1.FirstName = "F01";
            gA1.LastName = "L01";
            GamerA gA2 = new GamerA();
            gA2.FirstName = "F01";
            gA2.LastName = "L01";
            Console.WriteLine($"gA1 == gA2  :  {gA1 == gA2}");
            Console.WriteLine($"gA1.Equals(gA2)  :  {gA1.Equals(gA2)}");
            //gA1 == gA2  :  False
            //gA1.Equals(gA2)  :  True
            //1.
            //"==" operator checks for reference equality.
            //g1 and g2 are different object reference variables which stores in Stack.
            //g1 and g2 refer to the different memory location.
            //Thus, g1 != g2
            //2.
            //Equals() method checks for value equality.
            //g1 and g2 variables are pointing to the different object instance which stores in Heap.
            //thus, originally values are different and !g1.Equals(g2)
            //However, we override Equals method,
            //thus g1.Equals(g2) will return true.
        }
    }

    // 2. ---------------------------------
    public enum MagicType   // : int
    {
        Wood,
        Fire,
        Earth,
        Metal,
        Water
    }
    // 3. ---------------------------------
    public class Gamer
    {
        public string FirstName { get; set; }
        public string LastName { get; set; }
    }
    // 5. ---------------------------------
    public class GamerA
    {
        public string FirstName { get; set; }
        public string LastName { get; set; }
        public override bool Equals(object obj)
        {
            // If the passed in object is null
            if (!(obj is GamerA))
            {
                return false;
            }
            return FirstName == ((GamerA)obj).FirstName
                && LastName == ((GamerA)obj).LastName;
        }
        public override int GetHashCode()
        {
            return FirstName.GetHashCode() ^ LastName.GetHashCode();
        }
```

```
        //1.
        //Reference:
        //https://stackoverflow.com/questions/371328/why-is-it-important-to-override-gethashcode-when-equals-method-is-overridden
        //https://stackoverflow.com/questions/2363143/whats-the-best-strategy-for-equals-and-gethashcode
        //http://www.cnblogs.com/gentlewolf/archive/2007/07/09/810815.html
        //https://en.wikipedia.org/wiki/Exclusive_or
        //It is important to override GetHashCode
        //when Equals method is overridden.
        //1.1.
        //HashCode is a 32bit int.
        //If the item will be used as a key in a dictionary, or HashSet<T>, etc
        //since key is used to group items into buckets.
        //(in the absence of a custom IEqualityComparer<T>)
        //If the hash-code for two items does not match,
        //they may never be considered equal
        //(Equals will simply never be called).
        //1.2.
        //The popular way to override GetHashCode is
        //using XOR to connect all fields.
    }
}

/*
1.
Value Type V.S. Reference Type
E.g.
//int i1 = 2;
//int i2 = i1;
//i2++;
...
//PersonClass pc1 = new PersonClass();
//pc1.Id = 1;
//pc1.Name = "Name01";
//PersonClass pc2 = pc1;
//pc2.Id = 2;
//pc2.Name = "Name02";
    Stack          |        Heap
-------------------------------------------------
int i1 = 2;        |
int i2 = 3;        |
PersonClass pc1 --|-->
                   |     PersonClass object instance
PersonClass pc2 --|-->
                   |
-------------------------------------------------------------
2.
Enum
---------------------
2.1.
Using Enum keyword to create enumerations and it is strongly value typed constants.
The default underlying type of an enum is int.
You may use " : short " to set the underlying type of an enum is short.
The default value for first element is ZERO and gets incremented by 1.
---------------------
2.2.
Syntax :
//public enum EnumName  [ : underlyingType ]
//{
//    EnumValue1 [ = StarValue],
//    EnumValue2,
//    EnumValue3 [ = SpecificValue],
```

```
//    ....
//}
E.g.1.
//public enum MagicType   // : int
//{
//    Wood,
//    Fire,
//    Earth,
//    Metal,
//    Water
//}
E.g.2.
//public enum MagicType2 : short
//{
//    Wood = 5,
//    Fire,   //6
//    Earth   //7
//}
E.g.3.
//public enum MagicType4 : short
//{
//    Wood = 8,
//    Fire = 100,
//    Earth = 20
//}
---------------------
2.3.
//int woodInt = (int)MagicType.Wood;
Convert Enum to int
---------------------
2.4.
//MagicType magicType1 = (MagicType)1;
Convert int to Enum
---------------------
2.5.
Enum.GetValues list Enum underlying type values.
E.g.
int[] MagicTypeValues = (int[])Enum.GetValues(typeof(MagicType));
//MagicTypeValues == {0,1,2,3,4}
---------------------
2.6.
Enum.GetNames list Enum underlying type names.
string[] MagicTypeNames = Enum.GetNames(typeof(MagicType));
//MagicTypeNames == {"Wood","Fire","Earth","Metal","Water"}
 */
```

```
1 ValueTypeEqualSample ==============================
i == j   :  True
i.Equals(j) : True
2 EnumEqualSample ==============================
enum1 == enum2   :  True
enum1.Equals(enum2)   ;  True
3 ReferenceTypeEqualSample ==============================
g1 == g2   :  True
g1.Equals(g2)   :  True
4 ReferenceTypeEqualSample2 ==============================
g1 == g2   :  False
g1.Equals(g2)   :  False
5 ReferenceTypeEqualSample3 ==============================
gA1 == gA2   :  False
gA1.Equals(gA2)   :  True
```