Introduction

The following questions are all related to a fake(for now) game called European Rulers of the 9th Century: HD Remastered.

Instructions

Please provide answers to the following questions. For short answer questions, a paragraph or two should be sufficient. For coding answers, feel free to provide code inline, or to attach separate files with your solutions.

Comments in code are always welcome.

Important
You are allowed, and in fact highly encouraged to make full use of the internet and other development tools while answering these questions.

Question 1: That Age Old Question

To populate the world of ER9C:HD, we've put together a list of rulers and their ages. Unfortunately, the ages are really hard to understand because they have all been provided using roman numerals! Please write a conversion function which takes a roman numeral and converts it to a decimal number.

Roman numerals were a different way of showing numbers:

Example: Instead of writing **5** they wrote **V**
Example: Instead of writing **9** they wrote **IX**

Roman numerals are based on the following symbols:

1	5	10	50	100
I	**V**	**X**	**L**	**C**

Which can be combined like this:

1	2	3	4	5	6	7	8	9
I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**

21	22	23	24	25	26	27	28	29
XXI	**XXII**	**XXIII**	**XXIV**	**XXV**	**XXVI**	**XXVII**	**XXVIII**	**XXIX**

71	72	73	74	75	76	77	78	79
LXXI	**LXXII**	**LXXIII**	**LXXIV**	**LXXV**	**LXXVI**	**LXXVII**	**LXXVIII**	**LXXIX**

When a symbol appears after a larger(or equal) symbol, it is added:

Example: **VII = V + I + I = 5 + 1 + 1 = 7**
Example: **LXXIII = L + X + X + I + I + I = 50 + 10 + 10 + 1 + 1 + 1 = 73**

When a symbol appears before a larger(or equal) symbol, it is subtracted:

Example: **IV = -I + V = -1 + 5 = 4**
Example: **XLII= -X + L + I + I = -10 + 50 + 1 + 1 = 42**

Please fill in the following function:

```
public class RomanNumeral
{
    public static int Convert(string roman_numeral)
    {
      // TODO: Parse the roman numeral and return the decimal value.
    }
}

// Example outputs:
RomanNumeral.Convert(“LIV”) // Returns 54
RomanNumeral.Convert(“XXVII”) // Returns 27
RomanNumeral.Convert(“LXXIII”) // Returns 73
```

Question 2: What's the Point?

We're creating a 2d map screen for the game and every country is going to be represented by a list of triangles. No triangle will overlap with any other triangle. For the player to be able to click on a country, we need a function which takes in a 2d point and returns the country that was clicked on.

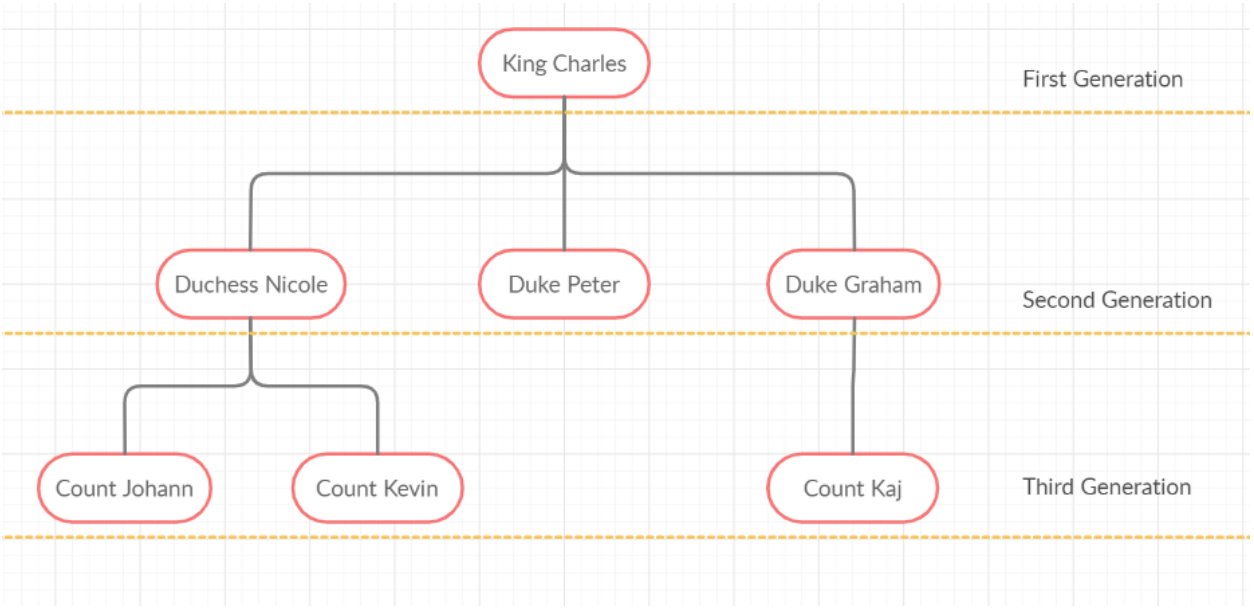
Please fill in the following function:

```
using System.Collections.Generic;

public struct Point
{
    public float x;
    public float y;
}

public struct Triangle
{
    public Point p1;
    public Point p2;
    public Point p3;
}

public class Country
{
    public List<Triangle> triangles = new List<Triangle>();
}

public class Map
{
    public List<Country> countries = new List<Country>();

    public Country Intersects(Point point)
    {
        // TODO: Return the intersecting country.

        // Feel free to add functions to the Triangle, Point and
           Country classes/structs.
    }
}
```

Question 3: Depth of a Dynasty

In ER9C:HD, each ruler is awarded points based on the depth of their family tree. The depth of a ruler's family tree is based on how many generations of rulers follow them.

Example:



In this example family tree, the depth of King Charle's family tree is 2 because there are two generations of rulers that follow him. The depth of Duchess Nicole's family tree is one because there is only one generation and the depth of Count Kaj's family is 0.

Please fill in the following function:

```
using System.Collections.Generic

public class Ruler
{
    public List<Ruler> children = new List<Ruler>();
}

public class FamilyTree
{
    public static int CalculateFamilyTreeDepth(Ruler ruler)
    {
        // TODO: Calculate the depth of the specified ruler's family tree.
    }
}
```

Question 4: Only the Finest

We've decided to add a dueling system to our simulator. We added a bunch of weapons to the game but our play testers are saying the game doesn't feel exciting enough. Could you please write a function that does the following.

- Reads in the text file containing all the weapons
- For each weapon type, keep only the top three weapons with the highest damage per second(Damage divided by Speed)
- Write the text file back out, sorted first by weapon type name, then by highest damage per second

Example:

The following input file:

```
Damage, Speed, Type,
1.0, 0.50, Knife
1.5, 0.80, Sword
1.2, 0.50, Knife
2.3, 2.00, Axe
2.7, 2.00, Axe
1.5, 0.95, Sword
2.1, 2.00, Axe
1.5, 0.70, Sword
2.6, 2.00, Axe
1.5, 0.75, Sword
```

Would give the following output file:

```
Damage, Speed, Type,
2.7, 2.00, Axe
2.6, 2.00, Axe
2.3, 2.00, Axe
1.2, 0.50, Knife
1.0, 0.50, Knife
1.5, 0.70, Sword
1.5, 0.75, Sword
1.5, 0.80, Sword
```

The sword and axe with the lowest damage per second were removed because there were more than three of them. The items have also been sorted by their name followed by their damage per second.

Please fill in the following function:

```
using System.IO;
using System.Collections.Generic;

public class WeaponTuner
{
    public static void TuneWeapons(string input_file_path, string output_file_path)
    {
        // TODO: - Load the input file from input_file_path
        //       - Keep only the top 3 damage per second weapons of each type
        //       - Sort the weapons by type then by damage per second
        //       - Write the results out to the output_file_path
    }
}
```