# Homework: C# Advanced Topics

This document defines the homework assignments from the [“C# Basics“ Course @ Software University](http://softuni.bg/courses/csharp-basics/).

## Fibonacci Numbers

Define a method Fib(n) that calculates the nth [Fibonacci number](https://en.wikipedia.org/wiki/Fibonacci_number). Examples:

|  |  |
| --- | --- |
| **n** | **Fib(n)** |
| 0 | 1 |
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 5 |
| 5 | 8 |
| 6 | 13 |
| 11 | 144 |
| 25 | 121393 |

## Prime Checker

Write a Boolean method IsPrime(n) that check whether a given integer number n is [prime](https://en.wikipedia.org/wiki/Prime_number). Examples:

|  |  |
| --- | --- |
| **n** | **IsPrime(n)** |
| 0 | false |
| 1 | false |
| 2 | true |
| 3 | true |
| 4 | false |
| 5 | true |
| 323 | false |
| 337 | true |
| 6737626471 | true |
| 117342557809 | false |

## Primes in Given Range

Write a method that calculates **all prime numbers in given range** and returns them as list of integers:

|  |
| --- |
| static List<int> FindPrimesInRange(startNum, endNum)  {  …  } |

Write a method to **print a list of integers**. Write a program that enters two integer numbers (each at a separate line) and prints all primes in their range, separated by a comma.

Examples:

|  |  |
| --- | --- |
| **Start number End number** | **Output** |
| 0  10 | 2, 3, 5, 7 |
| 5  11 | 5, 7, 11 |
| 100  200 | 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199 |
| 250  950 | 251, 257, 263, 269, 271, 277, 281, 283, 293, 307, 311, 313, 317, 331, 337, 347, 349, 353, 359, 367, 373, 379, 383, 389, 397, 401, 409, 419, 421, 431, 433, 439, 443, 449, 457, 461, 463, 467, 479, 487, 491, 499, 503, 509, 521, 523, 541, 547, 557, 563, 569, 571, 577, 587, 593, 599, 601, 607, 613, 617, 619, 631, 641, 643, 647, 653, 659, 661, 673, 677, 683, 691, 701, 709, 719, 727, 733, 739, 743, 751, 757, 761, 769, 773, 787, 797, 809, 811, 821, 823, 827, 829, 839, 853, 857, 859, 863, 877, 881, 883, 887, 907, 911, 919, 929, 937, 941, 947 |
| 100  50 | *(empty list)* |

## Difference between Dates

Write a program that enters two dates in format dd.MM.yyyy and returns the number of days between them. Examples:

|  |  |
| --- | --- |
| **First date Second date** | **Days between** |
| 17.03.2014  30.04.2014 | 44 |
| 17.03.2014  17.03.2014 | 0 |
| 14.06.1980  5.03.2014 | 12317 |
| 5.03.2014  3.03.2014 | -2 |

## Point class

Define a simple class Point(x, y) where **x** is the **x value** of the point and **y** is the **y value** of the point in a **Cartesian** coordinate system. In your main class, **instantiate** a couple of points. Example:

|  |
| --- |
| **static** **void** Main()  {  Point a = **new** Point(20, 30);  Point b = **new** Point(0, 100);  } |

## \*Perimeter and Area of Polygon

Write a program that **calculates the perimeter and the area of given polygon** (not necessarily convex) consisting of n floating-point coordinates in the 2D plane. Print the result rounded to two decimal digits after the decimal point. Use the input and output format from the examples. To hold the points, define a **Polygon** class that will hold a **List<Points>**. The class will also have a **methods** called **getPerimeter()** and **getArea()** that will calculate the Polygon's perimeter and area. Find in Internet how to calculate the [polygon perimeter](http://www.mathopenref.com/polygonperimeter.html) and how to calculate the [area of a polygon](http://www.mathopenref.com/coordpolygonarea.html). Examples:

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| 3  0 0  0 1  1 1 | perimeter = 3.41  area = 0.50 |  |
| 7  -2 1  1 3  5 1  1 2  1 1  3 -2  -2 1 | perimeter = 22.64  area = 9.5 |  |