

# Lab: State Management & Asynchronous Programming

This document defines the lab problems for the ["ASP.NET Fundamentals" Course @ SoftUni](#).

## I. State Management

### 1. Examine Your Cookies

Most cookies are stored in a RDBMS, usually SQLite. You can download SQLite browser from [here](#).

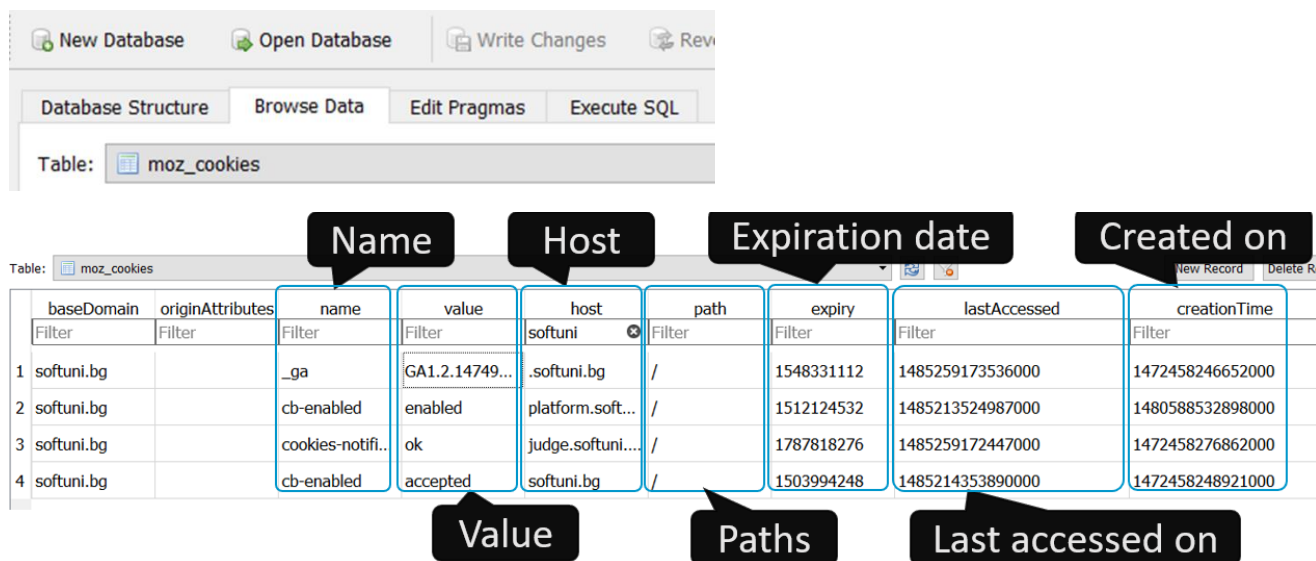
The location of the Mozilla cookies is the following:

**C:\Users\{username}\AppData\Roaming\Mozilla\Firefox\Profiles\{name}.default\cookies.sqlite**

The location of the Chrome cookies is the following:

**C:\Users\{username}\AppData\Local\Google\Chrome\User Data\Default\Cookies**

Open the file with the **SQLite** browser and explore your cookies.



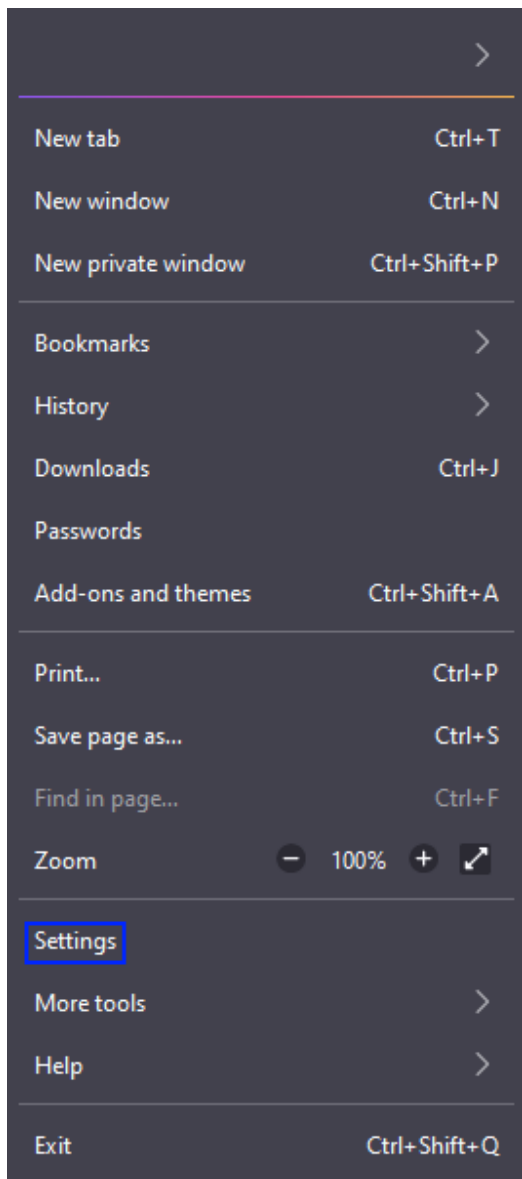
The screenshot shows the SQLite browser interface with the 'moz\_cookies' table selected. The table has the following columns: baseDomain, originAttributes, name, value, host, path, expiry, lastAccessed, and creationTime. The first four columns are highlighted with blue boxes and labeled with callouts: 'Name' for 'name', 'Host' for 'host', 'Expiration date' for 'expiry', and 'Created on' for 'creationTime'. The last three columns are also highlighted with blue boxes and labeled with callouts: 'Value' for 'value', 'Paths' for 'path', and 'Last accessed on' for 'lastAccessed'. The table contains four rows of data for the domain 'softuni.bg'.

	baseDomain	originAttributes	name	value	host	path	expiry	lastAccessed	creationTime
1	softuni.bg		_ga	GA1.2.14749...	softuni.bg	/	1548331112	1485259173536000	1472458246652000
2	softuni.bg		cb-enabled	enabled	platform.soft...	/	1512124532	1485213524987000	1480588532898000
3	softuni.bg		cookies-notifi..	ok	judge.softuni....	/	1787818276	1485259172447000	1472458276862000
4	softuni.bg		cb-enabled	accepted	softuni.bg	/	1503994248	1485214353890000	1472458248921000

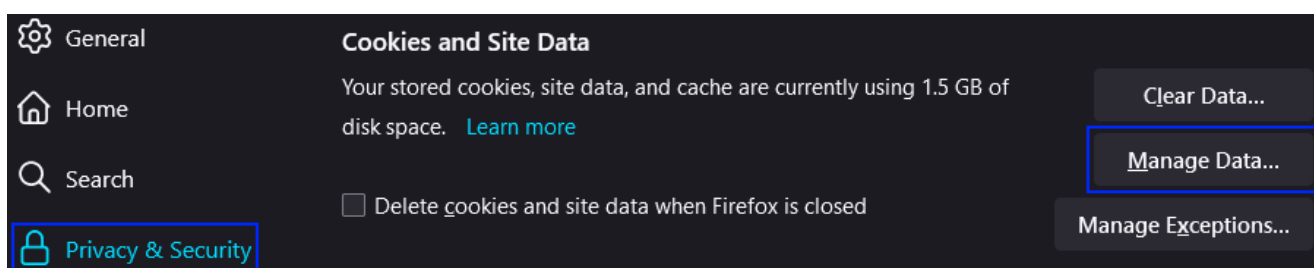
### 2. Control Your Cookies (Mozilla)

Use Mozilla Browser to explore and control your cookies.

Open the hamburger menu button and select **Settings**:

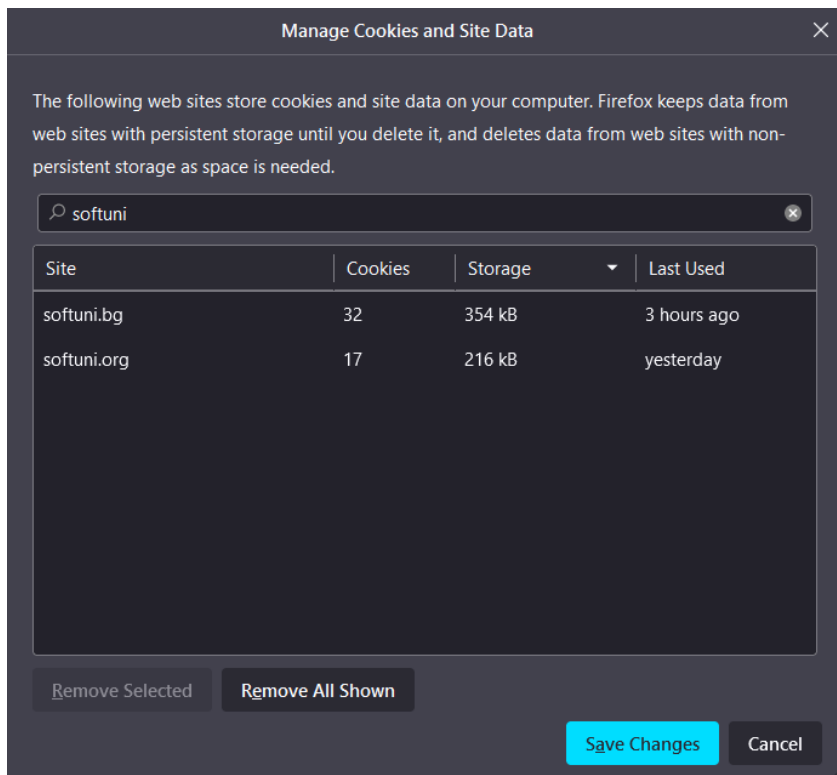


Select **Privacy & Security** and click on the **[Manage Data]** button:



Type **softuni** in the **Search** bar and browse the cookies from the selected website.

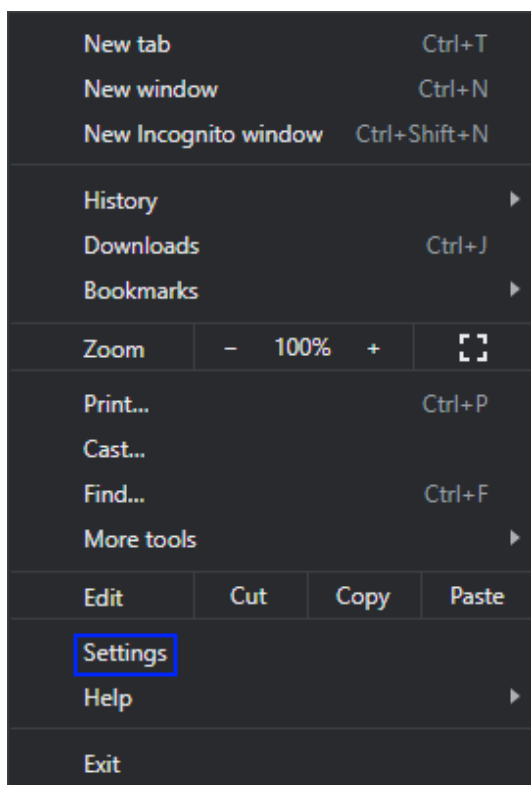
You can also delete a particular cookie or all of the cookies.



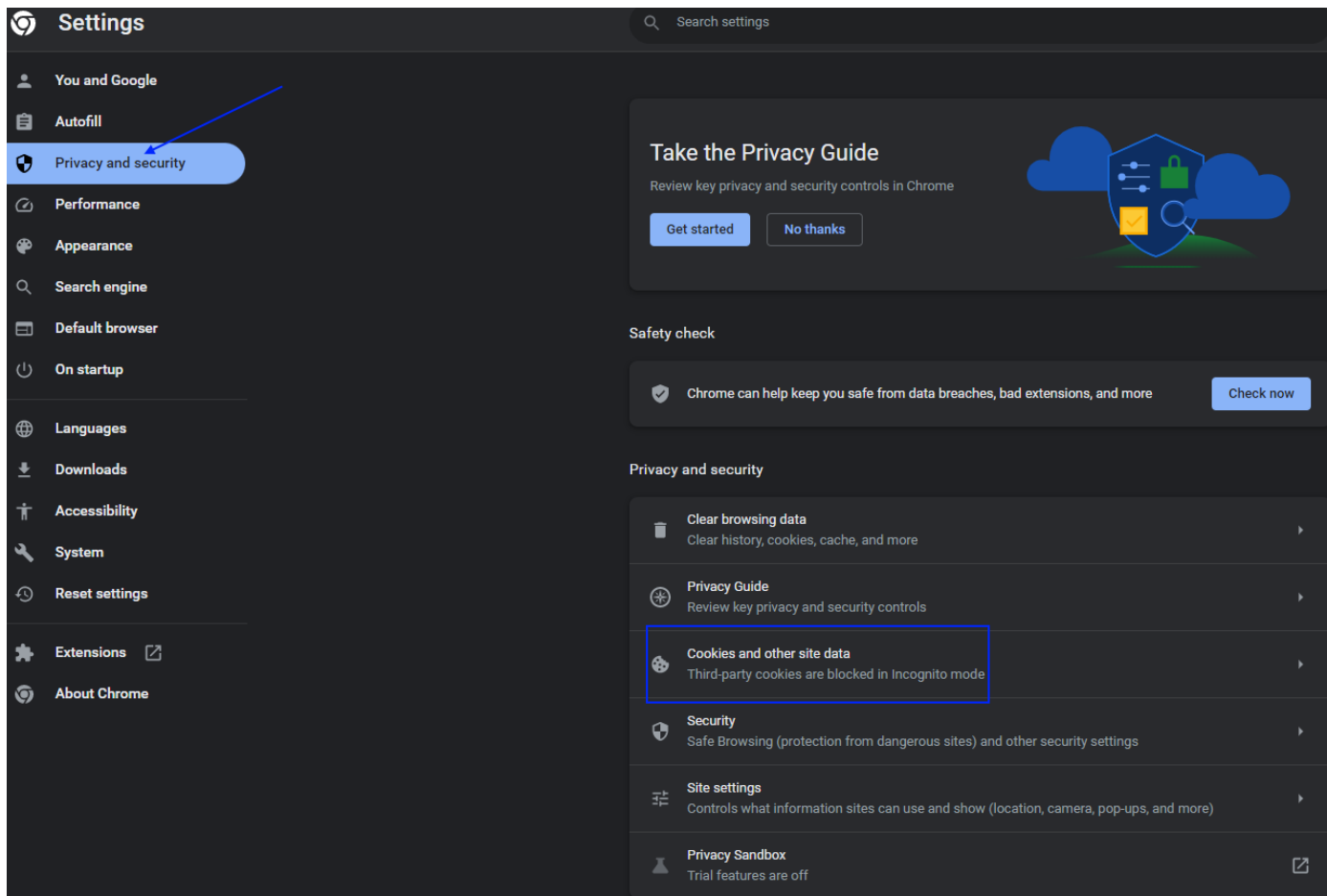
### 3. Control Your Cookies (Chrome)

Use Chrome Browser to explore and control your cookies.

Open the Kebab menu button and select **Settings**:



Go to **Privacy and security** and select **Cookies and other site data**:

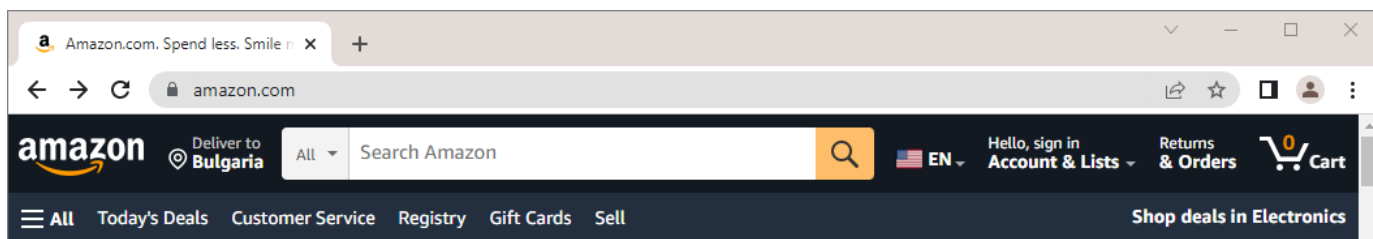


On the next window, click on **See all site data and permissions**. A new window opens with all of the websites that you have visited and their cookies, where you can browse the cookies.

You can also delete some of the cookies.

## 4. Change Cookie

Go to [Amazon](https://www.amazon.com) and look at the **menu language**.



Open **DevTools** or press **F12** → **[Application]** and search for the language cookie:

Name	Value	Dom...	Path	Expir...	Size	Http...	Secu...	Sam...	Parti...
csm-hit	tb:NSJPVQGBYC5MPX606T4+s-SYQ...	www...	/	2024...	96				
lc-main	en_US	.ama...	/	2024...	12		✓		
ubid-main	130-4982244-4798366	.ama...	/	2024...	28		✓		
skin	noskin	.ama...	/	Sessi...	10				
sp-cdn	"L5Z9:BG"	.ama...	/	2024...	15	✓	✓		
session-id-time	20827872011	.ama...	/	2024...	26		✓		
i18n-prefs	USD	.ama...	/	2024...	13				
session-token	MRNq9L/rRqC3pDRIf7HVhN+YSHjIT5...	.ama...	/	2024...	249	✓	✓		
session-id	141-8482257-9238628	.ama...	/	2024...	29		✓		

Change the cookie value to "de\_DE" in order to change the language of the app:

Name	Value
csm-hit	tb:NSJPVQGBYC5MPX606T4+s-SYQ...
lc-main	de_DE
ubid-main	130-4982244-4798366
skin	noskin
sp-cdn	"L5Z9:BG"
session-id-time	20827872011
i18n-prefs	USD
session-token	MRNq9L/rRqC3pDRIf7HVhN+YSHjIT5...
session-id	141-8482257-9238628

Refresh the site – it should be in **German** now:

## 5. Authentication with Cookies

Go to the [SoftUni Judge](#) site and log in. Search for the **authentication** cookie in the **Cookies** menu:

Application	Name	Value	Dom...	Path	Expir...	Size	Http...	Secu...
Manifest	AspNet.SoftUniJudgeC...	yHdIV2DUOKFjTCVSXhE8lkdtiwJcRDJ...	judg...	/	Sessi...	544	✓	✓
Service Workers	_RequestVerificationTo...	bD7zQsXuKrl73WQNvkl8Go5OC8UCD...	judg...	/	Sessi...	118	✓	
Storage	_gid	GA1.2.2041045918.1682611055	.soft...	/	2023...	31		
Local Storage	language	en	judg...	/	Sessi...	10		
Session Storage	_gat	1	.soft...	/	2023...	5		
IndexedDB	_ga	GA1.2.283974134.1678438788	.soft...	/	2024...	29		
Web SQL	undefined	undefined	judg...	/	2024...	18		
Cookies								
https://judge.softuni.org								
https://www.youtube.com								
Trust Tokens								

Delete the **authentication cookie**. Refresh Judge's site – you should **not** be logged-in **anymore**. The authentication cookie should be missing, too.

You can log in again – a new cookie should appear.

## 6. Session

Go to the [GitHub](#) site. Examine the **session cookie**, which holds the **current session id**.

Name	Value
_gh_sess	w5atA%2Fh3rM1NiGKjuYxMC3AR%2...

Close the browser and visit the site again. Notice that now there is a new session with a **different ID**.

Name	Value
_gh_sess	t5N7PG%2FUtdtAAxdCGWlsn4Ihlbx05...

## II. Asynchronous Processing

### 7. Even Numbers Thread

Print **all even** numbers in a given **range**. Printing should be executed on a **separate thread**. After all numbers are printed print "Thread finished work".

#### Example

Input	Output
1	2
10	4
	6
	8
	10
	Thread finished work

## Hint

```
// TODO: Read the start and end number

Thread evens = new Thread(() => PrintEvenNumbers(start, end));
evens.Start();
evens.Join();
Console.WriteLine("Thread finished work");

// TODO: Implement the method PrintEvenNumbers
```

## 8. Sum Evens in Range

Sum all even numbers in given range [1 to 1000]. Read commands and print the result only on command "show".

### Solution

```
public static void Main()
{
    while (true)
    {
        var command = Console.ReadLine();
        if (command == "show")
        {
            var result = SumAsync();
            Console.WriteLine(result);
        }
    }
}
```

1 reference

```
private static long SumAsync()
{
    return Task.Run(() =>
    {
        long sum = 0;
        for (int i = 1; i < 10000; i++)
        {
            if (i % 2 == 0)
            {
                sum += i;
            }
        }
        return sum;
    }).Result;
}
```

## 9. Sum Evens in Background

This problem is similar to the previous one. You have to sum all even numbers in given range (1 to 1000000000), but this time leave the console interface unblocked while calculating the sum. Read commands and print the result only on command "show". Stop calculating on command "exit".

## Solution

```
public static void Main()
{
    long sum = 0;

    var task = Task.Run(() =>
    {
        for (long i = 0; i < 1000000000; i++)
        {
            if (i % 2 == 0)
            {
                sum += i;
            }
        }
    });

    while (true)
    {
        var line = Console.ReadLine();
        if (line == "exit")
        {
            return;
        }
        else if (line == "show")
        {
            Console.WriteLine(sum);
        }
    }
}
```

## 10. Chronometer

The **Chronometer** is one of the easiest examples of an **asynchronous processes**. Let's implement a simple Chronometer.

Create an **interface IChronometer** like this:

```
public interface IChronometer
{
    0 references
    string GetTime { get; }

    0 references
    List<string> Laps { get; }

    0 references
    void Start();

    0 references
    void Stop();

    0 references
    string Lap();

    0 references
    void Reset();
}
```

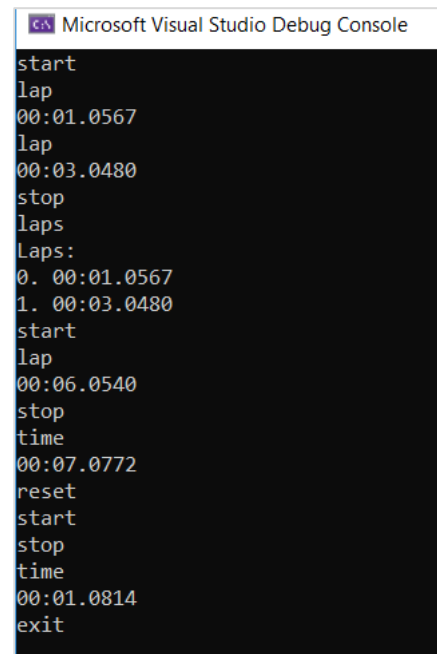


... and implement a class **Chronometer**, that implements it.

Implement a program which provides a **Chronometer functionality**, that responds to several commands from the user input:

- **start** – starts counting time in milliseconds, seconds and minutes
- **stop** – stops the process of counting time, but the counted time remains
- **lap** – creates a lap at the current time
- **laps** – returns all of the currently recorded laps
- **time** – returns the currently recorded time
- **reset** – stops the Chronometer, resets the currently recorded time and deletes all of the currently recoded laps
- **exit** – stops and exits the program

Here is an example screenshot of the functionality:



```
start
lap
00:01.0567
lap
00:03.0480
stop
laps
Laps:
0. 00:01.0567
1. 00:03.0480
start
lap
00:06.0540
stop
time
00:07.0772
reset
start
stop
time
00:01.0814
exit
```

The time is outputted in the following format: "{minutes}:{seconds}:{milliseconds}", each of them should be **padding** with zeros.

Upon **making** a **lap** you should print the **time** at which it was made.

Requesting **all laps** should print them in the following format:

**Laps:**

- 0. {lap1}
- 1. {lap2}
- ...

In case there are no laps, you should print "**Laps: no laps**".

## Hints

Let's start implementing our **asynchronous chronometer**. First, we need to create the **Chronometer class**, which implements the **Chronometer interface**:

```
public class Chronometer : IChronometer
```

Use the **Stopwatch C# class**, which provides a **set of methods and properties** that you can use to accurately measure elapsed **time**. Create a **field** for the stopwatch. Also, create a **collection for the laps**. Initialize the **fields** in the **constructor** like this:

```
public class Chronometer : IChronometer
{
    private Stopwatch _stopWatch;
    private List<string> _laps;

    1 reference
    public Chronometer()
    {
        _stopWatch = new Stopwatch();
        _laps = new List<string>();
    }
}
```

We have the **GetTime** property, which should return the **currently recorded time** since the start of the chronometer counter. Use the **Elapsed** property of the **Stopwatch** class to **get the total elapsed time**. This property returns the time as a **TimeSpan**, so you should convert it to **string** in the **correct format**. Do it like this:

```
public string GetTime => _stopWatch.Elapsed.ToString(@"mm\:ss\.ffff");
```

The other property we have is the **Laps** property. It should just **return the current laps collection**:

```
public List<string> Laps => _laps;
```

Next, we should **implement the Start() and Stop() methods** of the **Chronometer** class. The **Stopwatch** class has its own **methods for starting and stopping** – use them as shown below:

```
public void Start()
{
    _stopWatch.Start();
}

public void Stop()
{
    _stopWatch.Stop();
}
```

The **Lap()** method returns the **current elapsed time** as a **string** and **adds it to a collection of laps**. It uses the **GetTime** property:

```
public string Lap()
{
    string result = GetTime;
    _laps.Add(result);
    return result;
}
```

Finally, we have the **Reset()** method, which should **invoke the Reset()** method of the **Stopwatch** class and **clear the laps collection**. Do it like this:

```
public void Reset()
{
    _stopWatch.Reset();
    _laps.Clear();
}
```

As we already have the **Chronometer** class let's use it and invoke its methods depending on **commands** from the console. **Instantiate the chronometer** in the **Main()** method of a class called **Startup**:

```
public class Startup
{
    0 references
    static void Main()
    {
        var chronometer = new Chronometer();
    }
}
```

Then, we will **read a command** from the console, until the **"exit"** command.

```

string line;

while ((line = Console.ReadLine()) != "exit")
{

```

In the **while** loop, work with the chronometer depending on the **read** command. Don't forget that the **Start()** command of the **Chronometer** class should be run as a task to be asynchronous. After the **while** loop you should stop the chronometer. Complete the **Startup** class like this:

```

    if (line == "start")
    {
        Task.Run(() =>
        {
            chronometer.Start();
        });
    }
    else if (line == "stop")
    {
        chronometer.Stop();
    }
    else if (line == "lap")
    {
        Console.WriteLine(chronometer.Lap());
    }
    else if (line == "laps")
    {
        if (chronometer.Laps.Count == 0)
        {
            Console.WriteLine("Laps: no laps");
            return;
        }
        Console.WriteLine("Laps: ");
        for (int i = 0; i < chronometer.Laps.Count; i++)
        {
            Console.WriteLine($"{i+1} - {chronometer.Laps[i]}");
        }
    }
    else if (line == "reset")
    {
        chronometer.Reset();
    }
    else if (line == "time")
    {
        Console.WriteLine(chronometer.TotalTime);
    }
}
chronometer.Stop();
}
}

```