

First we do elementary exercises. And then dive in.

To execute any command hold SHIFT and press RETURN

```
In[ ]:= 2 + 2
```

```
Out[ ]:= 4
```

```
In[ ]:= Print["My name is blah blah "]  
My name is blah blah
```

- We are going to immediately dive in and see the full power of the software with fairly advanced example. But we will go back to simple examples later. This is just an example to show you that you are not learning something useless.

Let's make charts of some weather data for Windhoek. What has happened to the temperature and rainfall over the last decade ?

If we have Internet access, then the command `WeatherData["location", "parameter", {date1, date2} ]` provides access to a lot of worldwide data.

If we do not have internet access then I have downloaded the data and we will use it from a file. We will learn how to do that in a minute.

```
In[188]:= << "Documents/talks/Africa-lectures/units/unit1-intro-to-pi/windhoekdata.mx"
```

First let's plot the daily temperature in Windhoek. The

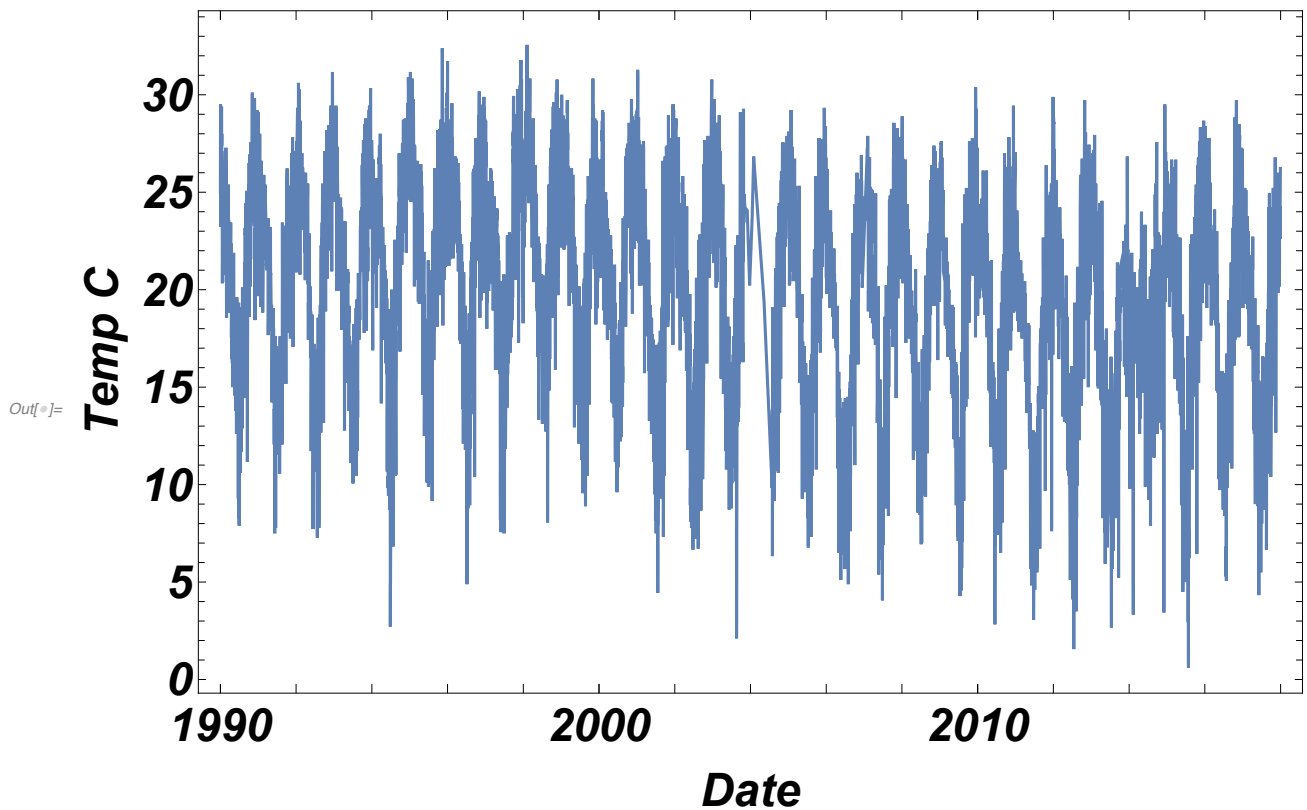
```
In[ ]:= windhoektemp =  
WeatherData["FYWH", "Temperature", {{1990, 1, 1}, {2017, 12, 31}}, "Day"]
```

```
Out[ ]:= TimeSeries[  
  Time: 01 Jan 1990 to 30 Dec 2017  
Data points: 9034  
]
```

We will now make a plot. Do not worry about all the complicated syntax below. You will learn in as you practice.



Notice that the temperature a pattern from winter to summer. But the overall trend seems to be slightly lower. Some days in recent years appear to be quite cold. Now this is the average temperature during each day. We should look at the maximum and minimum temperature each day.

```
In[ ]:= DateListPlot[windhoektemp, Frame -> True, FrameLabel -> {"Date", "Temp C"},
  LabelStyle -> Directive[Bold, Large, Italic], FrameStyle -> Bold]
```



The Weatherdata function allows access to the minimum and maximum temp each day.

```
In[ ]:= windhoekmintemp =
  WeatherData["FYWH", "MinTemperature", {{1990, 1, 1}, {2017, 12, 31}}, "Day"]
```

Out[ ]:= TimeSeries [   Time: 01 Jan 1990 to 30 Dec 2017  
Data points: 9034 ]

```
In[ ]:= windhoekmaxtemp =
  WeatherData["FYWH", "MaxTemperature", {{1990, 1, 1}, {2017, 12, 31}}, "Day"]
```

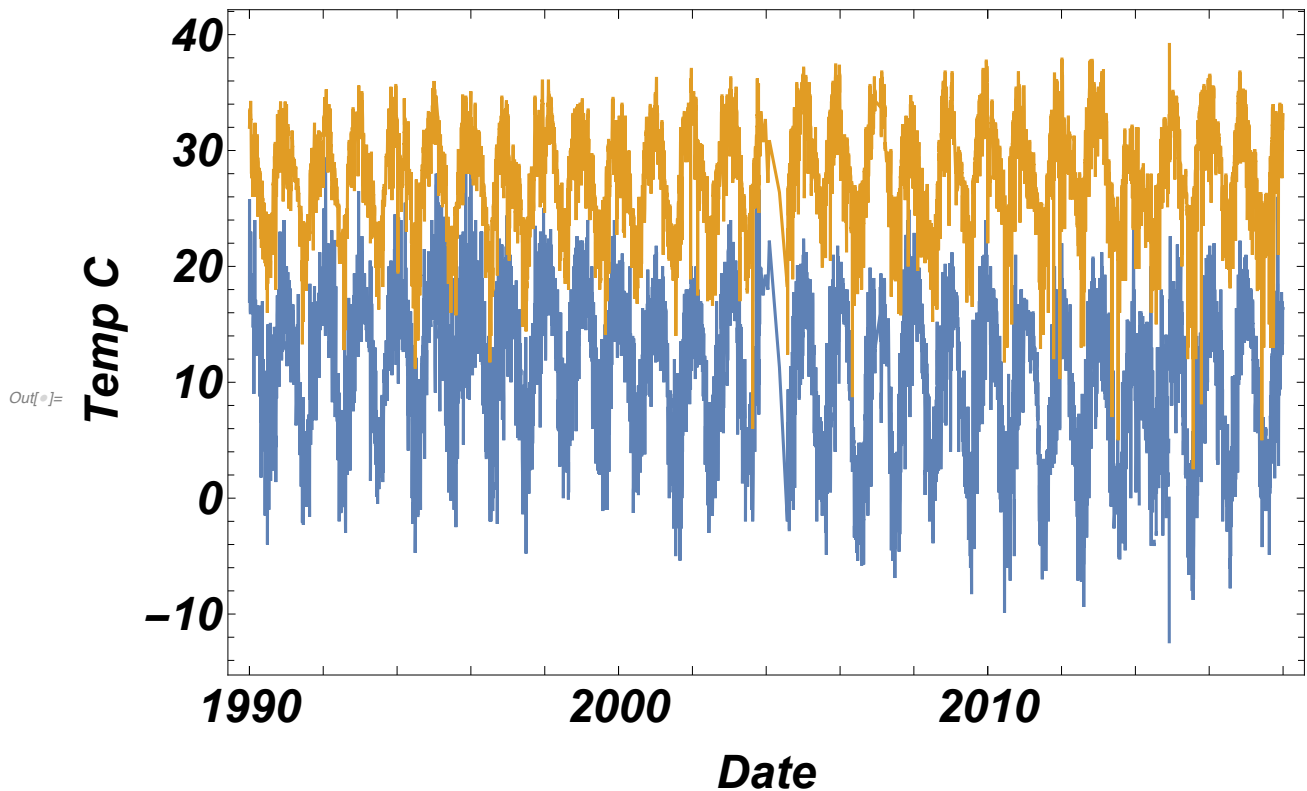
```
Out[ ]:= TimeSeries [  Time: 01 Jan 1990 to 30 Dec 2017  
Data points: 9034 ]
```

We will now plot the minimum and maximum on the same picture. Do not worry if this is complicated. The point of this exercise is to give you a quick look at what power you have at your fingertips ! We will learn how to use this power in the next two days.

Notice that some of the nights in the last few years have gotten very cold in Namibia. Have any of your noticed this ?

Some nights are less than freezing. Also, when you look at the max and min, you see that warm days appear hotter and cold nights colder in recent years.

```
In[ ]:= DateListPlot[{windhoekmintemp, windhoekmaxtemp}, Frame -> True, FrameLabel ->
  {"Date", "Temp C", "Min and Max Temperature in Windhoek over 3 decades"},
  LabelStyle -> Directive[Bold, Large, Italic], FrameStyle -> Bold]
```



Let's quickly learn how to get help from Mathematica on any command. The precede the command with a question mark (?). If you want more then click on the >>.

```
In[ ]:= ? WeatherData
```

WeatherData[loc, "property"] gives the most recent measurement for the specified weather property at the location corresponding to loc.

WeatherData[loc, "property", date] gives all measurements during the specified date.

WeatherData[loc, "property", {start, end}] gives a list of dates and measurements for the time interval start to end.

WeatherData[loc, "property", {start, end, step}] gives measurements aggregated over the time period represented by step. >>

Let's get data on rain. This data is averaged over a week

```
In[ ]:= windhoekrain =
```

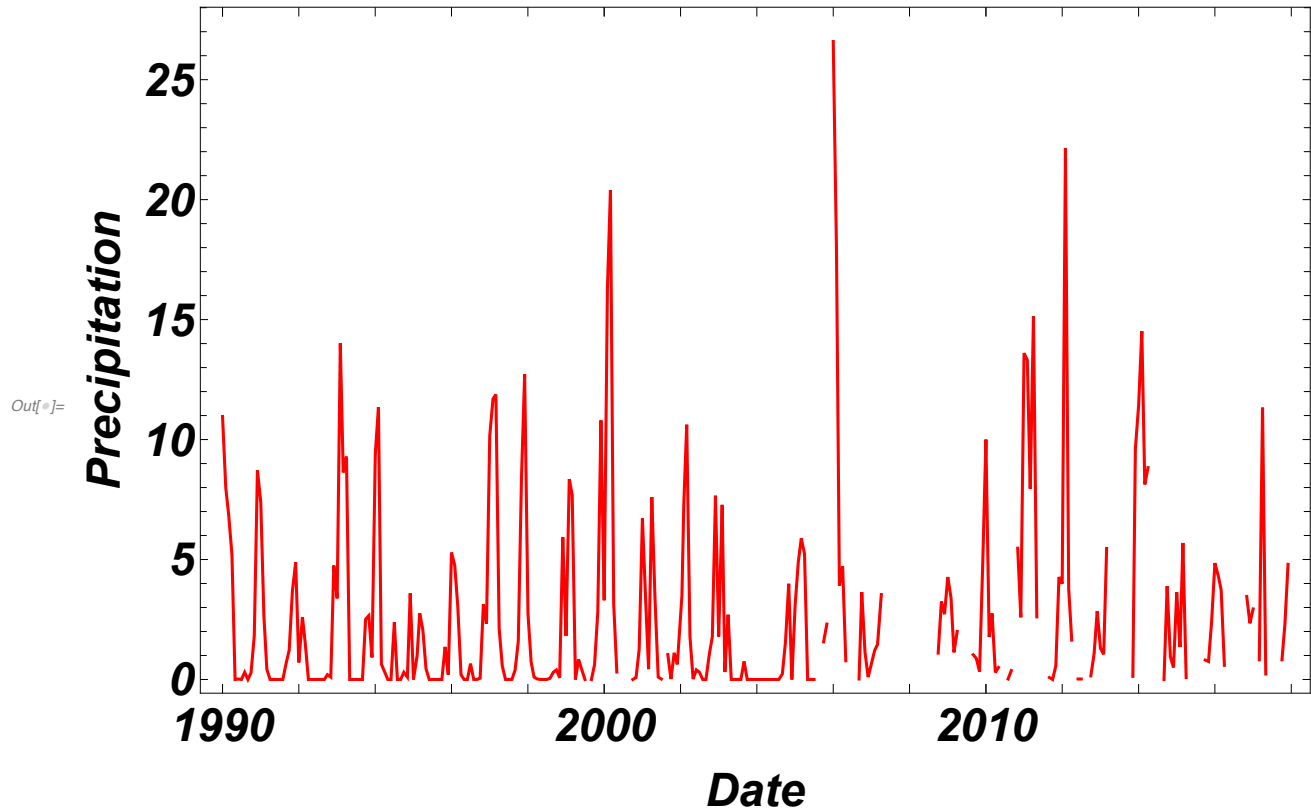
```
WeatherData["FYWH", "TotalPrecipitation", {{1990, 1, 1}, {2017, 12, 31}}, "Month"]]
```

```
Out[ ]:= TimeSeries [  Time: 01 Jan 1990 to 01 Dec 2017  
Data points: 332 ]
```

```

In[ ]:= DateListPlot[windhoekrain, Frame → True, FrameLabel →
  {"Date", "Precipitation", "Weekly rain (cm/month) in Windhoek over 3 decades"},
  LabelStyle → Directive[Bold, Large, Italic], FrameStyle → Bold,
  PlotStyle → Red, Joined → True, PlotRange → Full]

```



Precipitation data appears to be missing in recent years.

```

In[ ]:= DumpSave["windhoekdata.mx", "Global`"]

```

```

Out[ ]:= {Global` }

```

```

<< "Documents/talks/Africa-lectures/units/unit1-intro-to-pi/windhoekdata.mx"

```