# Date and Time in Python

How do computers measure time?
What is the point of reference, or zero, for time?

Today scientists use atomic clocks in multiple laboratories across the world to get the most accurate and constant measure of a second, which allows us to compute the time intervals with utmost accuracy.

Coordinated Universal Time abbreviated to UTC, is the primary time standard by which the world regulates clocks and time. It is within about 1 second of mean solar time at 0° longitude. For most purposes, UTC is considered interchangeable with Greenwich Mean Time (GMT).

What is Greenwich and where is it?
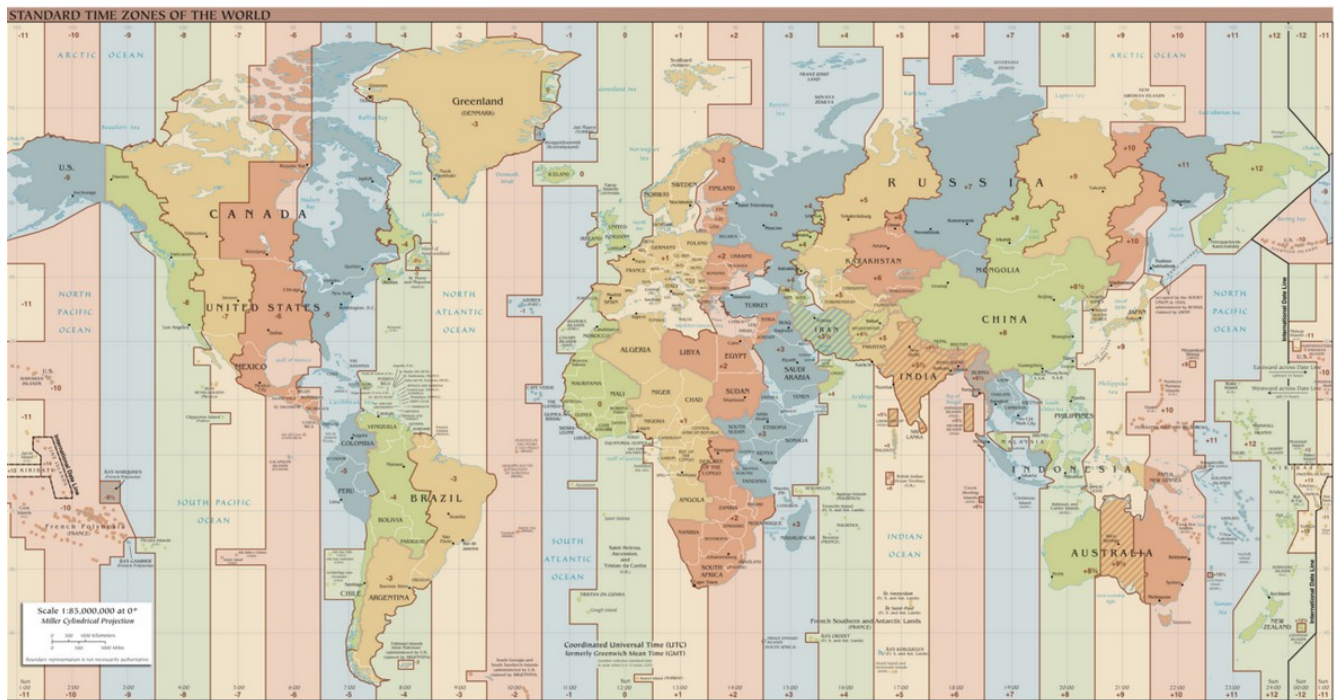
Our computers use internal clock that is synchronized with the rest of the world using Network Time Protocol (NTP).

In Unix-like systems, the most common way to measure time is by using POSIX time, which is defined as the number of seconds that have elapsed the Unix epoch (**Thursday, January 1, 1970**).

Python datetime

```
import datetime
now = datetime.datetime.now()
print "-" * 25
print now
print now.year
print now.month
print now.day
```

```
print now.hour
print now.minute
print now.second

print "-" * 25
print "1 week ago was it: ", now - datetime.timedelta(weeks=1)
print "100 days ago was: ", now - datetime.timedelta(days=100)
print "1 week from now is it: ",  now + datetime.timedelta(weeks=1)
print "In 1000 days from now is it: ", now + datetime.timedelta(days=1000)

print "-" * 25
birthday = datetime.datetime(2012,11,04)

print "Birthday in ... ", birthday - now
print "-" * 25
```
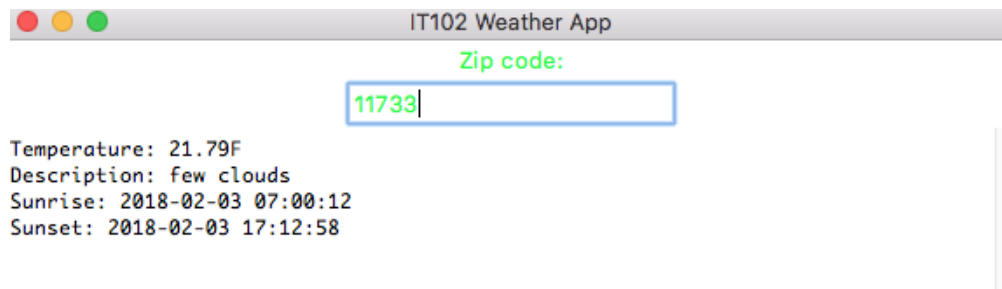
Output:
```
------------------------
2012-10-03 16:04:56.703758
2012
10
3
16
4
56
------------------------
The date and time one week ago from now was:  2012-09-26 16:04:56.703758
100 days ago was:  2012-06-25 16:04:56.703758
One week from now is it:  2012-10-10 16:04:56.703758
In 1000 days from now is it:  2015-06-30 16:04:56.703758
------------------------
Birthday in ...  31 days, 7:55:03.296242
------------------------
```

Exercises

1. Using the weather program from last week, display the sunrise and sunset times alongside with the weather information.
   1. If you don't have the code from last week, download it from http://www.schoolnova.org/student_area/IT102/weather.zip
   2. Print out the entire JSON object to see where sunrise and sunset data is specified
   3. Extract the sunrise and sunset data from the JSON object and display it in the Weather UI.
      1. Use `datetime.datetime.fromtimestamp(...)` to convert data into the datetime object
      2. Use `strftime('%Y-%m-%d %H:%M:%S')` to convert the datetime object to a human readable date/time format

```
●  ●  ●              IT102 Weather App
                        Zip code:

            11733

Temperature: 21.79F
Description: few clouds
Sunrise: 2018-02-03 07:00:12
Sunset: 2018-02-03 17:12:58
```

Home work

1. Complete the exercises
2. Change the sunrise and sunset date format to spell out the month, e.g. "February 3, 2018"

Additional resources

- https://docs.python.org/3/library/datetime.html
- https://www.saltycrane.com/blog/2008/06/how-to-get-current-date-and-time-in/
- http://www.pythonforbeginners.com/basics/python-datetime-timedelta