

# Working with Dates and Times in Python

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## > Key definitions

When working with dates and times, you will encounter technical terms and jargon such as the following:

- **Date:** Handles dates without time.
- **POSIXct:** Handles date & time in calendar time.
- **POSIXlt:** Handles date & time in local time.
- **Hms:** Parses periods with hour, minute, and second
- **Timestamp:** Represents a single pandas date & time
- **Interval:** Defines an open or closed range between dates and times
- **Time delta:** Computes time difference between different datetimes

## > The ISO8601 datetime format

The **ISO 8601 datetime format** specifies datetimes from the largest to the smallest unit of time (YYYY-MM-DD HH:MM:SS TZ). Some of the advantages of ISO 8601 are:

- It avoids ambiguities between MM/DD/YYYY and DD/MM/YYYY formats.
- The 4-digit year representation mitigates overflow problems after the year 2099.
- Using numeric month values (08 not AUG) makes it language independent, so dates make sense throughout the world.
- Python is optimized for this format since it makes comparison and sorting easier.

## > Packages used in this cheat sheet

Load the packages and dataset used in this cheatsheet.

```
import datetime as dt
import time as tm
import pytz
import pandas as pd
```

In this cheat sheet, we will be using 3 pandas series — `iso`, `us`, `non_us`, and 1 pandas DataFrame `parts`

iso	us	non_us
1969-07-20 20:17:40	07/20/1969 20:17:40	20/07/1969 20:17:40
1969-11-19 06:54:35	11/19/1969 06:54:35	19/11/1969 06:54:35
1971-02-05 09:18:11	02/05/1971 09:18:11	05/02/1971 09:18:11

parts		
year	month	day
1969	7	20
1969	11	19
1971	2	5

## > Getting the current date and time

```
# Get the current date          # Get the current date and time
dt.date.today()                dt.datetime.now()
```

## > Reading date, datetime, and time columns in a CSV file

```
# Specify datetime column
pd.read_csv("filename.csv", parse_dates = ["col1", "col2"])

# Specify datetime column
pd.read_csv("filename.csv", parse_dates = {"col1": ["year", "month", "day"]})
```

## > Parsing dates, datetimes, and times

```
# Parse dates in ISO format
pd.to_datetime(iso)

# Parse dates in US format
pd.to_datetime(us, dayfirst=False)

# Parse dates in NON US format
pd.to_datetime(non_us, dayfirst=True)

# Parse dates, guessing a single format
pd.to_datetime(iso, infer_datetime_format=True)

# Parse dates in single, specified format
pd.to_datetime(iso, format="%Y-%m-%d %H:%M:%S")

# Parse dates in single, specified format
pd.to_datetime(us, format="%m/%d/%Y %H:%M:%S")

# Make dates from components
pd.to_datetime(parts)
```

## > Extracting components

```
# Parse strings to datetimes
dtm = pd.to_datetime(iso)

# Get year from datetime pandas series
dtm.dt.year

# Get day of the year from datetime pandas series
dtm.dt.day_of_year

# Get month name from datetime pandas series
dtm.dt.month_name()

# Get day name from datetime pandas series
dtm.dt.day_name()

# Get datetime.datetime format from datetime pandas series
dtm.dt.to_pydatetime()
```

## > Rounding dates

```
# Rounding dates to nearest time unit
dtm.dt.round('1min')

# Flooring dates to nearest time unit
dtm.dt.floor('1min')

# Ceiling dates to nearest time unit
dtm.dt.ceil('1min')
```

## > Arithmetic

```
# Create two datetimes
now = dt.datetime.now()
then = pd.Timestamp('2021-09-15 10:03:30')

# Get time elapsed as timedelta object
now - then

# Get time elapsed in seconds
(now - then).total_seconds()

# Adding a day to a datetime
dt.datetime(2022, 8, 5, 11, 13, 50) + dt.timedelta(days=1)
```

## > Time Zones

```
# Get current time zone
tm.localtime().tm_zone

# Get a list of all time zones
pytz.all_timezones

# Parse strings to datetimes
dtm = pd.to_datetime(iso)

# Get datetime with timezone using location
dtm.dt.tz_localize('CET', ambiguous='infer')

# Get datetime with timezone using UTC offset
dtm.dt.tz_localize('+0100')

# Convert datetime from one timezone to another
dtm.dt.tz_localize('+0100').tz_convert('US/Central')
```

## > Time Intervals

```
# Create interval datetimes
start_1 = pd.Timestamp('2021-10-21 03:02:10')
finish_1 = pd.Timestamp('2022-09-15 10:03:30')
start_2 = pd.Timestamp('2022-08-21 03:02:10')
finish_2 = pd.Timestamp('2022-12-15 10:03:30')

# Specify the interval between two datetimes
pd.Interval(start_1, finish_1, closed='right')

# Get the length of an interval
pd.Interval(start_1, finish_1, closed='right').length

# Determine if two intervals are intersecting
pd.Interval(start_1, finish_1, closed='right').overlaps(pd.Interval(start_2, finish_2, closed='right'))
```

## > Time Deltas

```
# Define a timedelta in days
pd.Timedelta(7, "d")

# Convert timedelta to seconds
pd.Timedelta(7, "d").total_seconds()
```