```
1  Time Series is an important form (type) of data in many different fields(Stock Market,Physisc,Neuro Science), Any Data
   that changes with the change in time comes under the category of time series analysis
2
3  => Time Series can be irregular without any fixed unit of time or offset.
```

In [ ]:

```
1
```

Datetime

In [1]:

```
1  from datetime import datetime
```

In [2]:

```
1  now = datetime.now()
```

In [3]:

```
1  print(now)
```

2021-08-02 11:27:53.643797

In [4]:

```
1  now.year
```

Out[4]:

2021

In [5]:

```
1  now.month
```

Out[5]:

8

In [6]:

```
1  now.day
```

Out[6]:

2

In [7]:

```
1  now.hour
```

Out[7]:

11

In [8]:

```
1  now.minute
```

Out[8]:

27

In [9]:

```
1  now.second
```

Out[9]:

53

In [ ]:

```
1
```

In [ ]:

```
1
```

difference between two dates

In [11]:

```
1  delta = datetime(2011,1,7) - datetime(2008,6,24,8,15)
```

In [12]:

```
1  delta
```

Out[12]:

```
datetime.timedelta(days=926, seconds=56700)
```

In [13]:

```
1  delta.days
```

Out[13]:

```
926
```

In [14]:

```
1  delta.seconds
```

Out[14]:

```
56700
```

In [ ]:

```
1
```

Converting Between String & Datatime

In [15]:

```
1  stamp = datetime(2021,1,15)
```

In [16]:

```
1  stamp
```

Out[16]:

```
datetime.datetime(2021, 1, 15, 0, 0)
```

In [17]:

```
1  type(stamp)
```

Out[17]:

```
datetime.datetime
```

In [18]:

```
1  str(stamp)
```

Out[18]:

```
'2021-01-15 00:00:00'
```

In [19]:

```
1  stamp
```

Out[19]:

```
datetime.datetime(2021, 1, 15, 0, 0)
```

In [20]:

```
1  stamp.strftime('%Y-%m-%d')
```

Out[20]:

```
'2021-01-15'
```

```
1  %Y  - Four digit Year
2  %y - Two digit Year
3  %m - Two digit month [01-12]
4  %d - Two digit day [01-31]
5  %H - Hour(24 hour clock) [00 - 23]
6  %I - Hour(12 hour clock) [01-12]
7  %M - Two digit minutes[00-59]
8  %S - Second [00-60]
9  %w - Weekday as an integer[0(sunday).... 6]
```

In [ ]:

```
1
```

In [21]:

```
1  val = '2011-02-22'
```

In [22]:

```python
1  type(val)
```

Out[22]:

str

In [24]:

```python
1  val1 = datetime.strptime(val,'%Y-%m-%d')
```

In [25]:

```python
1  type(val1)
```

Out[25]:

datetime.datetime

In [26]:

```python
1  print(val1)
```

2011-02-22 00:00:00

In [113]:

```python
1  import datetime
```

In [111]:

```python
1  mydates = ['08/Jan/1993','11/Feb/2000','20/Mar/1999','20/Apr/2003']
```

In [115]:

```python
1  res = [datetime.datetime.strptime(items,'%d/%b/%Y') for items in mydates]
```

In [32]:

```python
1  res
```

Out[32]:

```
[datetime.datetime(1993, 1, 8, 0, 0),
 datetime.datetime(2000, 11, 11, 0, 0),
 datetime.datetime(1999, 12, 20, 0, 0),
 datetime.datetime(2003, 10, 20, 0, 0)]
```

In [121]:

```python
1  print(res[3])
```

2003-04-20 00:00:00

In [ ]:

```python
1
```

Time Series Basics

In [36]:

```python
1  from datetime import datetime
```

In [37]:

```python
1  import pandas as pd
2  import numpy as np
```

In [34]:

```python
1  dates = [datetime(2011,1,2),datetime(2011,1,5),
2           datetime(2011,1,7),datetime(2011,1,8),
3           datetime(2011,1,10),datetime(2011,1,12)
4  ]
```

In [35]:

```python
1  dates
```

Out[35]:

```
[datetime.datetime(2011, 1, 2, 0, 0),
 datetime.datetime(2011, 1, 5, 0, 0),
 datetime.datetime(2011, 1, 7, 0, 0),
 datetime.datetime(2011, 1, 8, 0, 0),
 datetime.datetime(2011, 1, 10, 0, 0),
 datetime.datetime(2011, 1, 12, 0, 0)]
```

In [38]:

```
1 mydata = pd.Series(np.random.randn(6),index=dates)
```

In [39]:

```
1 mydata
```

Out[39]:

```
2011-01-02   -0.631451
2011-01-05    0.482522
2011-01-07   -0.117951
2011-01-08   -0.098926
2011-01-10    1.161048
2011-01-12   -0.352065
dtype: float64
```

In [40]:

```
1 mydata.index
```

Out[40]:

```
DatetimeIndex(['2011-01-02', '2011-01-05', '2011-01-07', '2011-01-08',
               '2011-01-10', '2011-01-12'],
              dtype='datetime64[ns]', freq=None)
```

In [41]:

```
1 stamp = mydata.index[0]
```

In [42]:

```
1 stamp
```

Out[42]:

```
Timestamp('2011-01-02 00:00:00')
```

In [ ]:

```
1
```

In [43]:

```
1 new_data = pd.Series(np.random.randn(1000),index=pd.date_range('1/1/2000',periods=1000))
```

In [44]:

```
1 new_data
```

Out[44]:

```
2000-01-01   -1.204848
2000-01-02   -0.344245
2000-01-03    0.792727
2000-01-04    1.235803
2000-01-05   -2.153127
                ...
2002-09-22    0.779393
2002-09-23    0.614757
2002-09-24   -1.410091
2002-09-25   -1.279570
2002-09-26   -0.469532
Freq: D, Length: 1000, dtype: float64
```

In [47]:

```
1 new_data['2001']   #accessing data for a specific year
```

Out[47]:

```
2001-01-01   -0.403511
2001-01-02   -0.175399
2001-01-03   -0.781649
2001-01-04   -1.149631
2001-01-05    0.772323
                ...
2001-12-27   -0.009951
2001-12-28   -0.670436
2001-12-29   -0.529240
2001-12-30    0.331252
2001-12-31    0.847257
Freq: D, Length: 365, dtype: float64
```

In [48]:

```
1  new_data['2001-08']   #acceesing the data for a specific month of the year
```

Out[48]:

```
2001-08-01   -0.008428
2001-08-02    0.021957
2001-08-03    1.843265
2001-08-04   -0.577748
2001-08-05    0.039757
2001-08-06   -0.740787
2001-08-07    0.680401
2001-08-08   -1.761519
2001-08-09   -0.786644
2001-08-10    0.375018
2001-08-11   -1.702495
2001-08-12    0.914445
2001-08-13    0.202223
2001-08-14   -1.498955
2001-08-15   -0.379468
2001-08-16    2.055245
2001-08-17   -1.399645
2001-08-18   -2.124821
2001-08-19   -1.112336
2001-08-20    0.123358
2001-08-21    1.195812
2001-08-22    1.688855
2001-08-23    0.724333
2001-08-24   -0.029784
2001-08-25    0.241831
2001-08-26   -2.238030
2001-08-27    0.261633
2001-08-28   -0.483235
2001-08-29    1.228420
2001-08-30    0.276277
2001-08-31    1.627825
Freq: D, dtype: float64
```

In [ ]:

```
1
```

In [49]:

```
1  new_data['2001-08-01':'2001-08-15'] #slicing between days
```

Out[49]:

```
2001-08-01   -0.008428
2001-08-02    0.021957
2001-08-03    1.843265
2001-08-04   -0.577748
2001-08-05    0.039757
2001-08-06   -0.740787
2001-08-07    0.680401
2001-08-08   -1.761519
2001-08-09   -0.786644
2001-08-10    0.375018
2001-08-11   -1.702495
2001-08-12    0.914445
2001-08-13    0.202223
2001-08-14   -1.498955
2001-08-15   -0.379468
Freq: D, dtype: float64
```

In [ ]:

```
1
```

In [57]:

```
1  dates = pd.date_range('1/1/2000',periods=100,freq='W-WED')
```

In [58]:

```
1  dates
```

Out[58]:

```
DatetimeIndex(['2000-01-05', '2000-01-12', '2000-01-19', '2000-01-26',
               '2000-02-02', '2000-02-09', '2000-02-16', '2000-02-23',
               '2000-03-01', '2000-03-08', '2000-03-15', '2000-03-22',
               '2000-03-29', '2000-04-05', '2000-04-12', '2000-04-19',
               '2000-04-26', '2000-05-03', '2000-05-10', '2000-05-17',
               '2000-05-24', '2000-05-31', '2000-06-07', '2000-06-14',
               '2000-06-21', '2000-06-28', '2000-07-05', '2000-07-12',
               '2000-07-19', '2000-07-26', '2000-08-02', '2000-08-09',
               '2000-08-16', '2000-08-23', '2000-08-30', '2000-09-06',
               '2000-09-13', '2000-09-20', '2000-09-27', '2000-10-04',
               '2000-10-11', '2000-10-18', '2000-10-25', '2000-11-01',
               '2000-11-08', '2000-11-15', '2000-11-22', '2000-11-29',
               '2000-12-06', '2000-12-13', '2000-12-20', '2000-12-27',
               '2001-01-03', '2001-01-10', '2001-01-17', '2001-01-24',
               '2001-01-31', '2001-02-07', '2001-02-14', '2001-02-21',
               '2001-02-28', '2001-03-07', '2001-03-14', '2001-03-21',
               '2001-03-28', '2001-04-04', '2001-04-11', '2001-04-18',
               '2001-04-25', '2001-05-02', '2001-05-09', '2001-05-16',
               '2001-05-23', '2001-05-30', '2001-06-06', '2001-06-13',
               '2001-06-20', '2001-06-27', '2001-07-04', '2001-07-11',
               '2001-07-18', '2001-07-25', '2001-08-01', '2001-08-08',
               '2001-08-15', '2001-08-22', '2001-08-29', '2001-09-05',
               '2001-09-12', '2001-09-19', '2001-09-26', '2001-10-03',
               '2001-10-10', '2001-10-17', '2001-10-24', '2001-10-31',
               '2001-11-07', '2001-11-14', '2001-11-21', '2001-11-28'],
              dtype='datetime64[ns]', freq='W-WED')
```

In [ ]:

```
1
```

TimeSeries with Duplicate Dates

In [59]:

```
1  dates = pd.DatetimeIndex(['1/1/2000','1/2/2000','1/2/2000','1/2/2000','1/3/2000'])
```

In [60]:

```
1  dates
```

Out[60]:

```
DatetimeIndex(['2000-01-01', '2000-01-02', '2000-01-02', '2000-01-02',
               '2000-01-03'],
              dtype='datetime64[ns]', freq=None)
```

In [61]:

```
1  dup_ser = pd.Series(np.arange(5),index=dates)
```

In [62]:

```
1  dup_ser
```

Out[62]:

```
2000-01-01    0
2000-01-02    1
2000-01-02    2
2000-01-02    3
2000-01-03    4
dtype: int64
```

In [64]:

```
1  dup_ser.index.is_unique
```

Out[64]:

```
False
```

In [ ]:

```
1
```

In [65]:

```
1  dup_ser['2000-01-03']
```

Out[65]:

```
4
```

In [66]:

```python
1  dup_ser['2000-01-02']
```

Out[66]:

```
2000-01-02    1
2000-01-02    2
2000-01-02    3
dtype: int64
```

In [ ]:

```python
1
```

In [67]:

```python
1  grouped = dup_ser.groupby(level=0)
```

In [69]:

```python
1  grouped.mean()
```

Out[69]:

```
2000-01-01    0
2000-01-02    2
2000-01-03    4
dtype: int64
```

In [70]:

```python
1  grouped.sum()
```

Out[70]:

```
2000-01-01    0
2000-01-02    6
2000-01-03    4
dtype: int64
```

In [ ]:

```python
1
```

In [ ]:

```python
1
```

In [77]:

```python
1  month_name = "01-jan-2000"
```

In [94]:

```python
1  month_name
```

Out[94]:

```
'01-jan-2000'
```

In [99]:

```python
1  dt = datetime(2020,4,8)
```

In [100]:

```python
1  strdt = str(dt)
```

In [101]:

```python
1  strdt
```

Out[101]:

```
'2020-04-08 00:00:00'
```

In [104]:

```python
1  mt = dt.strftime("%B")
```

In [108]:

```python
1  import datetime
```

In [109]:

```
1  datetime.datetime.strptime('Jan 10 2021','%b %d %Y')
```

Out[109]:

```
datetime.datetime(2021, 1, 10, 0, 0)
```

In [110]:

```
1  datetime.datetime.strptime('1-Jan-2021','%d-%b-%Y')
```

Out[110]:

```
datetime.datetime(2021, 1, 1, 0, 0)
```

In [ ]:

```
1
```

Date Range, Frequencies and Shifting

In [1]:

```
1  import pandas as pd
2  import numpy as np
```

In [3]:

```
1  index = pd.date_range('2021-07-01','2021-07-21')
```

In [4]:

```
1  index
```

Out[4]:

```
DatetimeIndex(['2021-07-01', '2021-07-02', '2021-07-03', '2021-07-04',
               '2021-07-05', '2021-07-06', '2021-07-07', '2021-07-08',
               '2021-07-09', '2021-07-10', '2021-07-11', '2021-07-12',
               '2021-07-13', '2021-07-14', '2021-07-15', '2021-07-16',
               '2021-07-17', '2021-07-18', '2021-07-19', '2021-07-20',
               '2021-07-21'],
              dtype='datetime64[ns]', freq='D')
```

In [5]:

```
1  pd.date_range(start='2021-07-01',periods=21)
```

Out[5]:

```
DatetimeIndex(['2021-07-01', '2021-07-02', '2021-07-03', '2021-07-04',
               '2021-07-05', '2021-07-06', '2021-07-07', '2021-07-08',
               '2021-07-09', '2021-07-10', '2021-07-11', '2021-07-12',
               '2021-07-13', '2021-07-14', '2021-07-15', '2021-07-16',
               '2021-07-17', '2021-07-18', '2021-07-19', '2021-07-20',
               '2021-07-21'],
              dtype='datetime64[ns]', freq='D')
```

In [ ]:

```
1
```

In [9]:

```
1  pd.date_range('2021-07-01','2021-07-21',freq='H')
```

Out[9]:

```
DatetimeIndex(['2021-07-01 00:00:00', '2021-07-01 01:00:00',
               '2021-07-01 02:00:00', '2021-07-01 03:00:00',
               '2021-07-01 04:00:00', '2021-07-01 05:00:00',
               '2021-07-01 06:00:00', '2021-07-01 07:00:00',
               '2021-07-01 08:00:00', '2021-07-01 09:00:00',
               ...
               '2021-07-20 15:00:00', '2021-07-20 16:00:00',
               '2021-07-20 17:00:00', '2021-07-20 18:00:00',
               '2021-07-20 19:00:00', '2021-07-20 20:00:00',
               '2021-07-20 21:00:00', '2021-07-20 22:00:00',
               '2021-07-20 23:00:00', '2021-07-21 00:00:00'],
              dtype='datetime64[ns]', length=481, freq='H')
```

In [ ]:

```
1
```

In [ ]:

```
1
```

In [6]:

```
1  pd.date_range('2020-01-01','2020-12-31',freq='BM')  #where BM stands for business end month
```

Out[6]:

```
DatetimeIndex(['2020-01-31', '2020-02-28', '2020-03-31', '2020-04-30',
               '2020-05-29', '2020-06-30', '2020-07-31', '2020-08-31',
               '2020-09-30', '2020-10-30', '2020-11-30', '2020-12-31'],
              dtype='datetime64[ns]', freq='BM')
```

In [7]:

```
1  pd.date_range('2020-01-01','2020-12-31',freq='MS')  #where MS stands for first calandar day of month
```

Out[7]:

```
DatetimeIndex(['2020-01-01', '2020-02-01', '2020-03-01', '2020-04-01',
               '2020-05-01', '2020-06-01', '2020-07-01', '2020-08-01',
               '2020-09-01', '2020-10-01', '2020-11-01', '2020-12-01'],
              dtype='datetime64[ns]', freq='MS')
```

```
    Abbrevation            OffSet Type            Description

    D                      Day                    Calendar daily
    B                      Business Day           Business Day
    H                      Hour                   Hourly
    T or min               Minute                 Minutely
    S                      Second                 Secondly
    L or ms                milli seconds          Milliseconds (1/1000 of 1 second)
    U                      Micro Seconds          Micro-seconds (1/1000000 of 1 second)
    M                      Month End              Last calendar day of the Month
    BM                     Business Month End     Last business day (weekday) of the month
    MS                     Month Begin            First Calendar day of the month
    BMS                    Business Month Begin   First weekday of the month
    W-MON,W-TUES ..        Week                   Weekly on given day of week(MON,TUE,WED,THU,FRI,SAT
    WOM-1MON,WOM-2MON..    WeekofMonth            Generate weekly date in first or second,third or fourth
week of the month (eg WOM-3FRI for the third friday of                                        each mo
nth)
    Q-JAN , Q-FEB ..       Quarter                Quarterly date on last calendar day of each month
    BQ-JAN, BQ-FEB...      BusinessQuarterEnd     Quarterly dates on last weekday of each month
    A-JAN,A-FEB....        YearEnd                Annual date on last calendar day of given month
    BA-JAN,BA-FEB ..       BusinessYearEnd        Annual date on last weekday of given month
    AS-JAN,AS-FEB....      YearBegin              Annual date on first day of given month
    BAS-JAN,BAS-FEB....    BusinessYearBegin      Annual date on first weekday of given month
```

In [ ]:

```
1
```

frequencies & date offset

In [10]:

```
1  from pandas.tseries.offsets import Hour,Minute
```

In [11]:

```
1  four_hour = Hour(4)
```

In [12]:

```
1  four_hour
```

Out[12]:

```
<4 * Hours>
```

In [15]:

```
1  pd.date_range('2021-08-01','2021-08-04 23:59',freq='4h')
```

Out[15]:

```
DatetimeIndex(['2021-08-01 00:00:00', '2021-08-01 04:00:00',
               '2021-08-01 08:00:00', '2021-08-01 12:00:00',
               '2021-08-01 16:00:00', '2021-08-01 20:00:00',
               '2021-08-02 00:00:00', '2021-08-02 04:00:00',
               '2021-08-02 08:00:00', '2021-08-02 12:00:00',
               '2021-08-02 16:00:00', '2021-08-02 20:00:00',
               '2021-08-03 00:00:00', '2021-08-03 04:00:00',
               '2021-08-03 08:00:00', '2021-08-03 12:00:00',
               '2021-08-03 16:00:00', '2021-08-03 20:00:00',
               '2021-08-04 00:00:00', '2021-08-04 04:00:00',
               '2021-08-04 08:00:00', '2021-08-04 12:00:00',
               '2021-08-04 16:00:00', '2021-08-04 20:00:00'],
              dtype='datetime64[ns]', freq='4H')
```

In [16]:

```
1  pd.date_range('2021-08-01','2021-08-04 23:59',freq='1h30min')
```

Out[16]:

```
DatetimeIndex(['2021-08-01 00:00:00', '2021-08-01 01:30:00',
               '2021-08-01 03:00:00', '2021-08-01 04:30:00',
               '2021-08-01 06:00:00', '2021-08-01 07:30:00',
               '2021-08-01 09:00:00', '2021-08-01 10:30:00',
               '2021-08-01 12:00:00', '2021-08-01 13:30:00',
               '2021-08-01 15:00:00', '2021-08-01 16:30:00',
               '2021-08-01 18:00:00', '2021-08-01 19:30:00',
               '2021-08-01 21:00:00', '2021-08-01 22:30:00',
               '2021-08-02 00:00:00', '2021-08-02 01:30:00',
               '2021-08-02 03:00:00', '2021-08-02 04:30:00',
               '2021-08-02 06:00:00', '2021-08-02 07:30:00',
               '2021-08-02 09:00:00', '2021-08-02 10:30:00',
               '2021-08-02 12:00:00', '2021-08-02 13:30:00',
               '2021-08-02 15:00:00', '2021-08-02 16:30:00',
               '2021-08-02 18:00:00', '2021-08-02 19:30:00',
               '2021-08-02 21:00:00', '2021-08-02 22:30:00',
               '2021-08-03 00:00:00', '2021-08-03 01:30:00',
               '2021-08-03 03:00:00', '2021-08-03 04:30:00',
               '2021-08-03 06:00:00', '2021-08-03 07:30:00',
               '2021-08-03 09:00:00', '2021-08-03 10:30:00',
               '2021-08-03 12:00:00', '2021-08-03 13:30:00',
               '2021-08-03 15:00:00', '2021-08-03 16:30:00',
               '2021-08-03 18:00:00', '2021-08-03 19:30:00',
               '2021-08-03 21:00:00', '2021-08-03 22:30:00',
               '2021-08-04 00:00:00', '2021-08-04 01:30:00',
               '2021-08-04 03:00:00', '2021-08-04 04:30:00',
               '2021-08-04 06:00:00', '2021-08-04 07:30:00',
               '2021-08-04 09:00:00', '2021-08-04 10:30:00',
               '2021-08-04 12:00:00', '2021-08-04 13:30:00',
               '2021-08-04 15:00:00', '2021-08-04 16:30:00',
               '2021-08-04 18:00:00', '2021-08-04 19:30:00',
               '2021-08-04 21:00:00', '2021-08-04 22:30:00'],
              dtype='datetime64[ns]', freq='90T')
```

In [ ]:

```
1  
```

In [ ]:

```
1  
```

In [17]:

```
1  pd.date_range('2021-07-01','2021-08-31',freq='WOM-3FRI')
```

Out[17]:

```
DatetimeIndex(['2021-07-16', '2021-08-20'], dtype='datetime64[ns]', freq='WOM-3FRI')
```

In [ ]:

```
1  
```

Shifting Data

In [18]:

```
1  ts = pd.Series(np.random.randn(4),index=pd.date_range('1/1/2021',periods=4,freq='M'))
```

In [19]:

```
1  ts
```

Out[19]:

```
2021-01-31   -1.157642
2021-02-28    0.121874
2021-03-31   -0.502678
2021-04-30   -0.883601
Freq: M, dtype: float64
```

In [ ]:

```
1
```

In [21]:

```
1  ts.shift(2)
```

Out[21]:

```
2021-01-31        NaN
2021-02-28        NaN
2021-03-31   -1.157642
2021-04-30    0.121874
Freq: M, dtype: float64
```

In [22]:

```
1  ts.shift(-2)
```

Out[22]:

```
2021-01-31   -0.502678
2021-02-28   -0.883601
2021-03-31        NaN
2021-04-30        NaN
Freq: M, dtype: float64
```

In [23]:

```
1  ts
```

Out[23]:

```
2021-01-31   -1.157642
2021-02-28    0.121874
2021-03-31   -0.502678
2021-04-30   -0.883601
Freq: M, dtype: float64
```

In [25]:

```
1  from datetime import datetime
```

In [52]:

```
1  from pandas.tseries.offsets import Day,MonthEnd,Easter
```

In [26]:

```
1  now = datetime(2021,8,10)
```

In [27]:

```
1  now
```

Out[27]:

```
datetime.datetime(2021, 8, 10, 0, 0)
```

In [28]:

```
1  now + 3*Day()
```

Out[28]:

```
Timestamp('2021-08-13 00:00:00')
```

In [29]:

```
1  now
```

Out[29]:

```
datetime.datetime(2021, 8, 10, 0, 0)
```

In [30]:

```
1 now+MonthEnd()
```

Out[30]:

```
Timestamp('2021-08-31 00:00:00')
```

In [31]:

```
1 now
```

Out[31]:

```
datetime.datetime(2021, 8, 10, 0, 0)
```

In [32]:

```
1 now+MonthEnd(2)
```

Out[32]:

```
Timestamp('2021-09-30 00:00:00')
```

In [34]:

```
1 now
```

Out[34]:

```
datetime.datetime(2021, 8, 10, 0, 0)
```

In [37]:

```
1 from pandas.tseries.offsets import SemiMonthEnd,SemiMonthBegin
```

In [36]:

```
1 now+SemiMonthEnd()
```

Out[36]:

```
Timestamp('2021-08-15 00:00:00')
```

In [39]:

```
1 now+SemiMonthBegin()
```

Out[39]:

```
Timestamp('2021-08-15 00:00:00')
```

In [49]:

```
1 now
```

Out[49]:

```
datetime.datetime(2021, 8, 10, 0, 0)
```

In [47]:

```
1 res = MonthEnd()
```

In [48]:

```
1 type(res)
```

Out[48]:

```
pandas._libs.tslibs.offsets.MonthEnd
```

In [50]:

```
1 res.rollback(now)
```

Out[50]:

```
Timestamp('2021-07-31 00:00:00')
```

In [51]:

```
1 res.rollforward(now)
```

Out[51]:

```
Timestamp('2021-08-31 00:00:00')
```

In [ ]:

```
1
```

```
In [ ]:
```
```
1
```

Timezone

```
In [82]:
```
```python
1  import pytz
```

```
In [ ]:
```
```
1
```

```
In [59]:
```
```python
1  pytz.common_timezones[::]
```
```
 'Africa/Dar_es_Salaam',
 'Africa/Djibouti',
 'Africa/Douala',
 'Africa/El_Aaiun',
 'Africa/Freetown',
 'Africa/Gaborone',
 'Africa/Harare',
 'Africa/Johannesburg',
 'Africa/Juba',
 'Africa/Kampala',
 'Africa/Khartoum',
 'Africa/Kigali',
 'Africa/Kinshasa',
 'Africa/Lagos',
 'Africa/Libreville',
 'Africa/Lome',
 'Africa/Luanda',
 'Africa/Lubumbashi',
 'Africa/Lusaka',
 'Africa/Malabo'
```

```
In [60]:
```
```python
1  tz = pytz.timezone('Asia/Kolkata')
```

```
In [61]:
```
```python
1  tz
```
```
Out[61]:
```
```
<DstTzInfo 'Asia/Kolkata' LMT+5:53:00 STD>
```

```
In [62]:
```
```python
1  pd.date_range('3/9/2021 9:30',periods=10,freq='D',tz='Asia/Kolkata')
```
```
Out[62]:
```
```
DatetimeIndex(['2021-03-09 09:30:00+05:30', '2021-03-10 09:30:00+05:30',
               '2021-03-11 09:30:00+05:30', '2021-03-12 09:30:00+05:30',
               '2021-03-13 09:30:00+05:30', '2021-03-14 09:30:00+05:30',
               '2021-03-15 09:30:00+05:30', '2021-03-16 09:30:00+05:30',
               '2021-03-17 09:30:00+05:30', '2021-03-18 09:30:00+05:30'],
              dtype='datetime64[ns, Asia/Kolkata]', freq='D')
```

```
In [72]:
```
```python
1  pd.date_range('3/9/2021 9:30',periods=10,freq='D',tz='Europe/Stockholm')
```
```
Out[72]:
```
```
DatetimeIndex(['2021-03-09 09:30:00+01:00', '2021-03-10 09:30:00+01:00',
               '2021-03-11 09:30:00+01:00', '2021-03-12 09:30:00+01:00',
               '2021-03-13 09:30:00+01:00', '2021-03-14 09:30:00+01:00',
               '2021-03-15 09:30:00+01:00', '2021-03-16 09:30:00+01:00',
               '2021-03-17 09:30:00+01:00', '2021-03-18 09:30:00+01:00'],
              dtype='datetime64[ns, Europe/Stockholm]', freq='D')
```

Periods

```
1  periods represent timespan like days,months,quarters or year,
```

```
In [63]:
```
```python
1  p = pd.Period(2021,freq='A-DEC')
```

In [64]:

```python
1  p
```

Out[64]:

```
Period('2021', 'A-DEC')
```

In [65]:

```python
1  p+5
```

Out[65]:

```
Period('2026', 'A-DEC')
```

In [66]:

```python
1  p
```

Out[66]:

```
Period('2021', 'A-DEC')
```

In [67]:

```python
1  p-5
```

Out[67]:

```
Period('2016', 'A-DEC')
```

In [68]:

```python
1  p
```

Out[68]:

```
Period('2021', 'A-DEC')
```

In [70]:

```python
1  p.asfreq('M','start')
```

Out[70]:

```
Period('2021-01', 'M')
```

In [71]:

```python
1  p.asfreq('M','end')
```

Out[71]:

```
Period('2021-12', 'M')
```

In [ ]:

```python
1
```

In [73]:

```python
1  data = pd.date_range('2000-01-01',periods=100,freq='D')
```

In [74]:

```
1  data
```

Out[74]:

```
DatetimeIndex(['2000-01-01', '2000-01-02', '2000-01-03', '2000-01-04',
               '2000-01-05', '2000-01-06', '2000-01-07', '2000-01-08',
               '2000-01-09', '2000-01-10', '2000-01-11', '2000-01-12',
               '2000-01-13', '2000-01-14', '2000-01-15', '2000-01-16',
               '2000-01-17', '2000-01-18', '2000-01-19', '2000-01-20',
               '2000-01-21', '2000-01-22', '2000-01-23', '2000-01-24',
               '2000-01-25', '2000-01-26', '2000-01-27', '2000-01-28',
               '2000-01-29', '2000-01-30', '2000-01-31', '2000-02-01',
               '2000-02-02', '2000-02-03', '2000-02-04', '2000-02-05',
               '2000-02-06', '2000-02-07', '2000-02-08', '2000-02-09',
               '2000-02-10', '2000-02-11', '2000-02-12', '2000-02-13',
               '2000-02-14', '2000-02-15', '2000-02-16', '2000-02-17',
               '2000-02-18', '2000-02-19', '2000-02-20', '2000-02-21',
               '2000-02-22', '2000-02-23', '2000-02-24', '2000-02-25',
               '2000-02-26', '2000-02-27', '2000-02-28', '2000-02-29',
               '2000-03-01', '2000-03-02', '2000-03-03', '2000-03-04',
               '2000-03-05', '2000-03-06', '2000-03-07', '2000-03-08',
               '2000-03-09', '2000-03-10', '2000-03-11', '2000-03-12',
               '2000-03-13', '2000-03-14', '2000-03-15', '2000-03-16',
               '2000-03-17', '2000-03-18', '2000-03-19', '2000-03-20',
               '2000-03-21', '2000-03-22', '2000-03-23', '2000-03-24',
               '2000-03-25', '2000-03-26', '2000-03-27', '2000-03-28',
               '2000-03-29', '2000-03-30', '2000-03-31', '2000-04-01',
               '2000-04-02', '2000-04-03', '2000-04-04', '2000-04-05',
               '2000-04-06', '2000-04-07', '2000-04-08', '2000-04-09'],
              dtype='datetime64[ns]', freq='D')
```

In [75]:

```
1  ts = pd.Series(np.random.randn(len(data)),index=data)
```

In [76]:

```
1  ts
```

Out[76]:

```
2000-01-01    0.748697
2000-01-02    0.222463
2000-01-03   -0.069090
2000-01-04    0.280688
2000-01-05   -0.555618
                ...
2000-04-05   -1.107925
2000-04-06   -0.421136
2000-04-07    2.388472
2000-04-08    1.099127
2000-04-09    1.473786
Freq: D, Length: 100, dtype: float64
```

In [85]:

```
1  ts.resample('M').mean()
```

Out[85]:

```
2000-01-31   -0.010284
2000-02-29   -0.061212
2000-03-31    0.081719
2000-04-30    0.114260
Freq: M, dtype: float64
```

In [ ]:

```
1
```

In [ ]:

```
1
```