1. **Installation and Importing**

Installing	pip install pandas
Importing Convention	`import pandas as pd`

2. **Reading and Writing data**

Reading data	`df = pd.read_csv('filename.csv')`
	
	`# can extend for json, excel types too using pd.read_json/pd.read_excel, etc.`

Writing data	`df.to_csv('filename.csv')`
	
	`# can extend for json, excel and such too using df.to_json/df.to_excel, etc.`

3. **Series and Dataframes**
    a. **Creating a series**
        pd.Series([‘a’, ‘b’, ‘c’])
    b. **Creating a dataframe**

Row Oriented	`pd.DataFrame([['a', 1], ['b', 2]], columns=['name', 'id'])`
Column Oriented	`pd.DataFrame({'name':['a', 'b'], 'id':[1, 2]})`

4. **Info extraction**

Shape (Return a tuple representing the dimensionality of the DataFrame.)	`df.shape`

	`# e.g.-(2,3) for 2 rows and 3 columns`
Head (first n rows, default 5)	`df.head(n)`
Tail (last n rows, default 5)	`df.tail(n)`
Info (return info of all columns)	`df.info()`
Describe (gives statistical information of data)	`df.describe()`

5. **Accessing and Indexing**
    a. **Direct accessing columns and rows, as well as both together**

Accessing a row	`df.loc[ei]`
	`# ei here is explicit index`
	`df.iloc[ii]`
	`# ii here is implicit index`

Accessing a column	`df['column_name']`
	`# for single column`
	
	`df[['col1', 'col2']]`
	`# for multiple columns`

b. Slicing

Row	`df.loc[1:3]`
	`# 1 and 3 are the explicit indices here`
	
	`df.iloc[2:4]`
	`# 2 and 4 are the implicit indices here`

Column	`df.loc[:, 'a':'b']`

Both rows and columns	`df.loc[1:3, 'a':'b']` `# 1 and 3 are explicit indices here`

c. **Feature exploration (masking, filtering)**

Masking
Creates a mask based on our required condition
	`df['col']>value`
	`# E.g.`
	`df['age'] > 30`

Filtering
Filters data based on conditions
	`df.loc[(df['col1'] == val1) & (df['col2'] ==val2)]`
	
	`# E.g`
	`df.loc[(df['month'] == 'January') & (df['year']=='2022')]`
	`# filters out data for january 2022`

6. **Dataframe Manipulation**
   a. **Adding a new row/column**

Row	`df.loc[(df['col1'] == val1) & (df['col2'] ==val2)]`
	
	`# E.g:.`
	`df.loc[len(df.index)] = ['a', 1]`
	
	`# this will add a row at the end of the dataframe`

Column	`df['new_col']=data`

b. Deleting a new row/column

Row	`df.drop(labels=None, axis=0)`
	
	`# E.g.`
	`df.drop(3, axis=0)`
	`# Here 3 is the explicit index, axis=0 is for row`

Column	`df.drop('col_name', axis=1)`

c. Renaming a column

Column	`df.rename({'old_name':'new_name', axis=1})`
Row	`df.index=new_indices`

d. Duplicates and dropping duplicates

i. Find duplicate rows

```
df.duplicated(subset=None, keep='first')
# subset can be used to specify certain column(s) for identifying the duplicates
# keep determines which duplicates to mark
first : Mark duplicates as True except for the first occurrence.
last : Mark duplicates as True except for the last occurrence.
False : Mark all duplicates as True.

# Returns a boolean series for each duplicate row marked as True
```

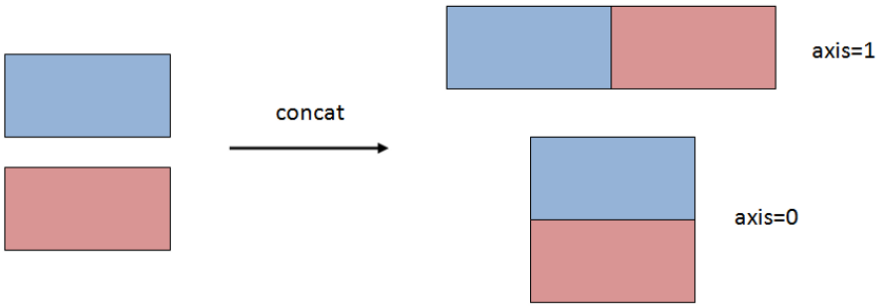
ii. Drop duplicate values

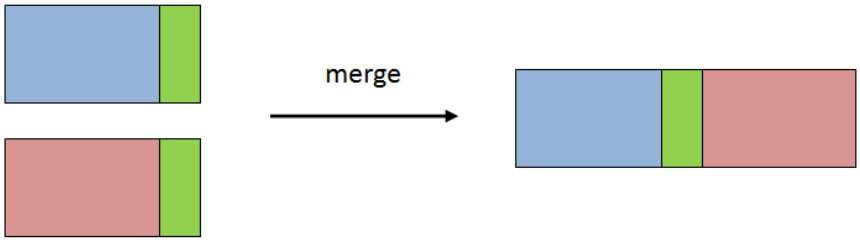
df.drop_dupicates(subset=None, keep='first')

Parameters have the same meaning as in df.duplicated, except here it will drop the rows marked duplicate

7. **Operations**
    a. **Sorting**
        df.sort_values([‘col1’], ascending=[True])
    b. **Built in ops**
        - Built in ops such as mean, min, max, etc.
        - E.g., df[‘col1’].min(), df[‘col1’].count(), etc.
    c. **Apply**
        Applies a function along one of the axis of the dataframe
        df[‘col’].apply(function)

        E.g.
        data[['revenue', 'budget']].apply(np.sum, axis=1)
        #sums values of revenue and budget across each row
8. **Joins**





9.
    a. **Concat**
        pd.concat([df1, df2], axis = 0] (for concatenating horizontally, change axis = 1)
    b. **Merge**
        df1.merge(df2, on=’foreign_key’, how=’type_of_join’)
        - Optional -> left_on and right_on
        - Eg. df1.merge(df2, on=’id’, how=’inner’)
10. **Groupby**

Grouping based on a single aggregate	df.groupby(‘group_col_name’)[‘col(s)’].aggregate_function() E.g.

	df.groupby('director_name')['title'].count() # Finds number of titles per director
Grouping based on multiple aggregates	df.groupby(['group_col_name'])['col'].aggregate(['func1', 'func2']) E.g. df.groupby(['director_name'])["year"].aggregate(['min', 'max']) # Finds first and recent year of movies made by all directors
Group based filtering	df.groupby('group_col_name').filter(boolean array based oncondition) E.g. data.groupby('director_name').filter(lambda x: x["budget"].max() >= 100) # This filters all rows of those directors whose maximum budget is greater than 100 million)

Group based apply	df.groupby('group_col_name').apply(function)
	
	E.g.
	def func(x):
	  x["risky"] = x["budget"] - x["revenue"].mean() >= 0
	  return x
	data_risky = data.groupby("director_name").apply(func)
	
	# Finds movies whose budget is higher than its director's average revenue

11. Cleaning our data

a. None and nan

- "NaN" is for columns with numbers as their values
- "None" is for columns with non-number entries(e.g. String, object type, etc.)
- Can check for null values using "isna()"

- E.g. df.isna() # returns the dataframe with True/False for null values in the respective element's position
- df.isna().sum() # returns number of null values per column. Can modify with df.isna().sum(axis=1) for each row's null count
- df.isna().sum().sum() # returns total number of null values

b. Filling null values

df.fillna(n) # fills null values with value 'n'

c. Dropping null values

df.dropna(axis = 0)
# Default axis=0, use 1 for columns
# Drops rows/columns with even a single missing value

12. Data Restructuring

Melt Convert dataframe from wide to long format	pd.melt(df, id_vars=['list of columns'] E.g. pd.melt(data, id_vars=['Date', 'Parameter', 'Drug_Name']) # This will melt all the columns except the ones mentioned inside id_vars list
Pivot Opposite of melt, converts dataframe from long to wide format Outputs a multi-index dataframe	df.pivot(index=['list of columns], columns='col_name', values='col_name') E.g. data_melt.pivot(index=['Date','Drug_Name','Parameter'], columns = 'time', values='reading') # This will keep the index columns mentioned as constant, while making new columns from the "time" column, whose values will be the ones in the "reading" column.
Cut Bins continuous data into categorical groups	df['new_cat_column']=pd.cut(df['continous_col'],bins=bin_values, labels=label_values)

	E.g. data_tidy['temp_cat'] = pd.cut(data_tidy['Temperature'], bins=temp_points, labels=temp_labels) # This will bin the temperature column into the respective bins, and will label the bins as per temp_labels
Shift Shifts the values of rows/columns	df[‘col’].shift(periods=n, axis=0) E.g. df["Marks"].shift(periods = 1, axis = 0) # This shifts the values of the Marks col by one, so basically the value of first row will be NaN, second row will be the one of first row, and so on.

13. Misc Topics

a. Datetime

i. Convert to Datetime object: pd.to_datetime(df[‘col’])

ii. Extracting Information

df[‘col’][0].year	Extracts the year for the 0th index value Here 0 is the implicit index Use .month and .day for the respective data
df[‘col’].dt.year	Extracts the year for whole columns (all the datetime values)
df[‘col’][0].strftime(‘%M%Y’)	Formats the select data (0th index datetime value here) into the required data time format (month and year in this case)

b. String functions

We can use .str to apply string functions to any column
df[‘col’].str.function()

E.g.

i. data_tidy['Date'].str.split('-')
  # This will split the “Date” column into elements separated by “-”
ii. data_tidy.loc[data_tidy['Drug_Name'].str.contains('hydrochloride')]
  # Will filter out rows containing the string “hydrochloride”