```python
# 1. Ładowanie biblioteki Pandas
import pandas as pd

# 2. Tworzenie ramki danych ze słownika
dane_slownik = {
    "Kraj": ["Polska", "Niemcy", "Francja"],
    "Ludność (mln)": [38, 83, 67],
    "PKB (mld)": [600, 4000, 3000]
}
ramka_danych_slownik = pd.DataFrame(dane_slownik)

print("Ramka danych utworzona ze słownika:")
print(ramka_danych_slownik)
```

```
Ramka danych utworzona ze słownika:
      Kraj  Ludność (mln)  PKB (mld)
0   Polska             38        600
1   Niemcy             83       4000
2  Francja             67       3000
```

```python
# 3. Zachowanie ramki danych pobranych z pliku w formacie .csv
plik_csv = "IHME_GDP_1960_2050_Y2021M09D22.CSV"
ramka_danych_csv = pd.read_csv(plik_csv)
print("\nRamka danych wczytana z pliku CSV:")
print(ramka_danych_csv.head())
```

```
Ramka danych wczytana z pliku CSV:
   location_id location_name iso3   level  year  gdp_ppp_mean
gdp_ppp_lower  \
0            1        Global    G  Global  1960  1.748345e+13
1.601915e+13
1            1        Global    G  Global  1961  1.813537e+13
1.659537e+13
2            1        Global    G  Global  1962  1.895328e+13
1.739039e+13
3            1        Global    G  Global  1963  1.965662e+13
1.811706e+13
4            1        Global    G  Global  1964  2.100575e+13
1.935664e+13

   gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower  gdp_usd_upper
0   1.911586e+13  1.296863e+13   1.266890e+13   1.334177e+13
1   1.982493e+13  1.346097e+13   1.314767e+13   1.383021e+13
2   2.061477e+13  1.406576e+13   1.376060e+13   1.443746e+13
3   2.134993e+13  1.461831e+13   1.432132e+13   1.497693e+13
4   2.276791e+13  1.552986e+13   1.523498e+13   1.587998e+13
```

```python
# 4. Tworzenie ramki danych z listy list
dane_lista = [
    ["Polska", 38, 600],
```

```
    ["Niemcy", 83, 4000],
    ["Francja", 67, 3000]
]
ramka_danych_lista = pd.DataFrame(dane_lista, columns=["Kraj",
"Ludność (mln)", "PKB (mld)"])

print("\nRamka danych utworzona z listy list:")
print(ramka_danych_lista)
```

```
Ramka danych utworzona z listy list:
      Kraj  Ludność (mln)  PKB (mld)
0   Polska             38        600
1   Niemcy             83       4000
2  Francja             67       3000
```

```
# 5. Transponowanie (wymiana kolumny a wierszy)
ramka_danych_slownik_transponowany = ramka_danych_slownik.T
print(ramka_danych_slownik_transponowany)
```

```
                    0       1        2
Kraj           Polska  Niemcy  Francja
Ludność (mln)      38      83       67
PKB (mld)         600    4000     3000
```

```
# 6. Wyświetlić pierwsze 10 wierszy ramki danych
print(ramka_danych_csv.head(10))
```

```
   location_id location_name iso3   level  year  gdp_ppp_mean
gdp_ppp_lower  \
0            1        Global    G  Global  1960  1.748345e+13
1.601915e+13
1            1        Global    G  Global  1961  1.813537e+13
1.659537e+13
2            1        Global    G  Global  1962  1.895328e+13
1.739039e+13
3            1        Global    G  Global  1963  1.965662e+13
1.811706e+13
4            1        Global    G  Global  1964  2.100575e+13
1.935664e+13
5            1        Global    G  Global  1965  2.202459e+13
2.034585e+13
6            1        Global    G  Global  1966  2.306193e+13
2.136085e+13
7            1        Global    G  Global  1967  2.391268e+13
2.217842e+13
8            1        Global    G  Global  1968  2.516723e+13
2.340479e+13
9            1        Global    G  Global  1969  2.642403e+13
2.464521e+13
```

```
   gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower  gdp_usd_upper
0   1.911586e+13  1.296863e+13   1.266890e+13   1.334177e+13
1   1.982493e+13  1.346097e+13   1.314767e+13   1.383021e+13
2   2.061477e+13  1.406576e+13   1.376060e+13   1.443746e+13
3   2.134993e+13  1.461831e+13   1.432132e+13   1.497693e+13
4   2.276791e+13  1.552986e+13   1.523498e+13   1.587998e+13
5   2.382275e+13  1.628972e+13   1.598727e+13   1.663310e+13
6   2.489782e+13  1.708885e+13   1.678223e+13   1.742396e+13
7   2.577837e+13  1.770884e+13   1.740660e+13   1.804193e+13
8   2.698215e+13  1.865379e+13   1.833216e+13   1.898399e+13
9   2.831984e+13  1.955395e+13   1.921164e+13   1.987990e+13
```

```
# 7. Wyświetlić ostatnie 10 wierszy ramki danych
print(ramka_danych_csv.tail(10))
```

```
       location_id location_name iso3                    level
year  \
19828        44578    Low income  NaN  World Bank Income Group  2041

19829        44578    Low income  NaN  World Bank Income Group  2042

19830        44578    Low income  NaN  World Bank Income Group  2043

19831        44578    Low income  NaN  World Bank Income Group  2044

19832        44578    Low income  NaN  World Bank Income Group  2045

19833        44578    Low income  NaN  World Bank Income Group  2046

19834        44578    Low income  NaN  World Bank Income Group  2047

19835        44578    Low income  NaN  World Bank Income Group  2048

19836        44578    Low income  NaN  World Bank Income Group  2049

19837        44578    Low income  NaN  World Bank Income Group  2050


       gdp_ppp_mean  gdp_ppp_lower  gdp_ppp_upper  gdp_usd_mean  \
19828  3.120963e+12   2.724077e+12   3.582807e+12  9.752426e+11
19829  3.216988e+12   2.801335e+12   3.686394e+12  1.008813e+12
19830  3.314031e+12   2.886768e+12   3.815672e+12  1.042881e+12
19831  3.413020e+12   2.968361e+12   3.933135e+12  1.077714e+12
19832  3.514244e+12   3.055623e+12   4.049325e+12  1.113207e+12
19833  3.617310e+12   3.140835e+12   4.166469e+12  1.149318e+12
19834  3.724063e+12   3.225849e+12   4.292403e+12  1.186597e+12
19835  3.831942e+12   3.307609e+12   4.424674e+12  1.224062e+12
19836  3.941856e+12   3.398884e+12   4.560961e+12  1.262129e+12
19837  4.053883e+12   3.482933e+12   4.713596e+12  1.300764e+12

       gdp_usd_lower  gdp_usd_upper
```

```
19828   8.875033e+11   1.068693e+12
19829   9.169149e+11   1.107239e+12
19830   9.461940e+11   1.147550e+12
19831   9.735487e+11   1.188093e+12
19832   1.003241e+12   1.228145e+12
19833   1.031500e+12   1.271992e+12
19834   1.061313e+12   1.318836e+12
19835   1.092874e+12   1.365610e+12
19836   1.122895e+12   1.413991e+12
19837   1.151548e+12   1.457362e+12
```

```
# 8. Wyświetlić informacje o ramce danych
print(ramka_danych_csv.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 19838 entries, 0 to 19837
Data columns (total 11 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   location_id    19838 non-null  int64
 1   location_name  19838 non-null  object
 2   iso3           18655 non-null  object
 3   level          19838 non-null  object
 4   year           19838 non-null  int64
 5   gdp_ppp_mean   19838 non-null  float64
 6   gdp_ppp_lower  19838 non-null  float64
 7   gdp_ppp_upper  19838 non-null  float64
 8   gdp_usd_mean   19838 non-null  float64
 9   gdp_usd_lower  19838 non-null  float64
 10  gdp_usd_upper  19838 non-null  float64
dtypes: float64(6), int64(2), object(3)
memory usage: 1.7+ MB
None
```

```
# 9. Wyświetlić ile wierszy i kolumn znajduje się w ramce danych
print(ramka_danych_csv.shape)
```

```
(19838, 11)
```

```
# 10. Wyświetlić informacje statyczną o kolumnach liczbowych (wartości niepowtarzalne, średnia, odchylenie standardowe, minimum, kwartyle, maksimum)
print(ramka_danych_csv.describe())
```

```
        location_id          year  gdp_ppp_mean  gdp_ppp_lower
gdp_ppp_upper  \
count  19838.000000  19838.000000  1.983800e+04   1.983800e+04
1.983800e+04
mean     949.871560   2005.000000  1.334543e+12   1.235788e+12
1.444079e+12
std     5965.433243     26.268513  9.148287e+12   8.610030e+12
```

```
9.789327e+12
min        1.000000   1960.000000  1.448063e+02   6.299026e+01
2.621094e+02
25%       63.000000   1982.000000  3.678736e+03   2.639116e+03
4.829886e+03
50%      125.500000   2005.000000  1.103640e+04   8.105541e+03
1.346178e+04
75%      183.000000   2028.000000  2.949281e+04   2.308992e+04
3.562660e+04
max    44578.000000   2050.000000  1.827414e+14   1.667007e+14
2.025062e+14

       gdp_usd_mean  gdp_usd_lower  gdp_usd_upper
count  1.983800e+04   1.983800e+04   1.983800e+04
mean   8.554096e+11   8.197528e+11   8.967612e+11
std    6.286364e+12   6.041288e+12   6.585419e+12
min    1.174979e+02   8.318772e+01   1.270468e+02
25%    1.624411e+03   1.395430e+03   1.828575e+03
50%    4.863298e+03   4.279291e+03   5.465731e+03
75%    1.997525e+04   1.795003e+04   2.223434e+04
max    1.119468e+14   1.017185e+14   1.239708e+14
```

```
# 11. Wyświetlić informacje statyczną o kolumnach kategoryzowanych
(ile unikalnych wartości, top - jaka jest najpopularniejsza wartość,
freq - jak często najpopularniejsza)
print(ramka_danych_csv.describe(include=['object']))
```

```
       location_name   iso3    level
count          19838  18655    19838
unique           216    205        4
top       South Asia      G  Country
freq             182     91    18564
```

```
# 12. Usunąć brakujące wartości w ramce danych
ramka_danych_csv = ramka_danych_csv.dropna()

# 13. Przedstawić wybór wierszy i kolumny używając nazw oraz indeksów
na różne sposoby
print(ramka_danych_csv.loc[0:5, ['location_name', 'gdp_ppp_mean']]) #
Nazwy kolumn
print(ramka_danych_csv.iloc[0:5, 1:3]) # Indeksy kolumn
```

```
  location_name  gdp_ppp_mean
0        Global  1.748345e+13
1        Global  1.813537e+13
2        Global  1.895328e+13
3        Global  1.965662e+13
4        Global  2.100575e+13
5        Global  2.202459e+13
  location_name iso3
```

```
0        Global    G
1        Global    G
2        Global    G
3        Global    G
4        Global    G
```

```
# 14. Przedstawić wybór wierszy z ramki danych pod warunkiem określonej wartości kolumny
print(ramka_danych_csv[ramka_danych_csv['location_name'] == 'Poland'])
```

```
      location_id location_name iso3    level  year  gdp_ppp_mean  \
3913           51        Poland  POL  Country  1960   6477.852541
3914           51        Poland  POL  Country  1961   6854.160388
3915           51        Poland  POL  Country  1962   6696.268564
3916           51        Poland  POL  Country  1963   6981.908383
3917           51        Poland  POL  Country  1964   7192.051449
...           ...           ...  ...      ...   ...           ...
3999           51        Poland  POL  Country  2046  38341.602497
4000           51        Poland  POL  Country  2047  38361.930630
4001           51        Poland  POL  Country  2048  38342.127372
4002           51        Poland  POL  Country  2049  38291.223003
4003           51        Poland  POL  Country  2050  38239.561147

      gdp_ppp_lower  gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower
gdp_usd_upper
3913    3974.353115    8867.341510   3340.866044    3013.073267
3767.183362
3914    4209.334194    9266.617081   3528.521854    3181.314168
3955.470420
3915    4137.676353    9056.936779   3447.774153    3104.590497
3867.083569
3916    4381.353870    9390.144726   3589.554120    3242.049335
4016.402456
3917    4537.064677    9677.839801   3693.222182    3344.989514
4126.100385
...             ...            ...           ...            ...
...
3999   28096.663520   51449.445517  17392.703365   12862.490537
23265.109294
4000   27796.090370   52186.079877  17401.902620   12665.251631
23581.749549
4001   27466.932992   52654.694631  17393.027956   12498.169215
23783.922827
4002   27105.252343   53056.023696  17369.859621   12305.183049
24051.240960
4003   26728.543779   53156.930801  17346.349035   12139.994778
24206.609198

[91 rows x 11 columns]
```

```python
# 15. Przedstawić wybór wierszy z ramki danych pod warunkiem spełnienia kilku warunków jednocześnie
print(ramka_danych_csv[(ramka_danych_csv['location_name'] == 'Poland') & (ramka_danych_csv['year'] > 2024)])
```

```
      location_id location_name iso3    level  year  gdp_ppp_mean  \
3978           51        Poland  POL  Country  2025  32746.999437
3979           51        Poland  POL  Country  2026  32914.035363
3980           51        Poland  POL  Country  2027  33150.861860
3981           51        Poland  POL  Country  2028  33466.534617
3982           51        Poland  POL  Country  2029  33845.943995
3983           51        Poland  POL  Country  2030  34262.156546
3984           51        Poland  POL  Country  2031  34684.507200
3985           51        Poland  POL  Country  2032  35094.834819
3986           51        Poland  POL  Country  2033  35489.219953
3987           51        Poland  POL  Country  2034  35879.588365
3988           51        Poland  POL  Country  2035  36263.317214
3989           51        Poland  POL  Country  2036  36623.408529
3990           51        Poland  POL  Country  2037  36958.569309
3991           51        Poland  POL  Country  2038  37248.918811
3992           51        Poland  POL  Country  2039  37497.939670
3993           51        Poland  POL  Country  2040  37703.604057
3994           51        Poland  POL  Country  2041  37879.536633
3995           51        Poland  POL  Country  2042  38038.938282
3996           51        Poland  POL  Country  2043  38167.733724
3997           51        Poland  POL  Country  2044  38255.709502
3998           51        Poland  POL  Country  2045  38310.991457
3999           51        Poland  POL  Country  2046  38341.602497
4000           51        Poland  POL  Country  2047  38361.930630
4001           51        Poland  POL  Country  2048  38342.127372
4002           51        Poland  POL  Country  2049  38291.223003
4003           51        Poland  POL  Country  2050  38239.561147

      gdp_ppp_lower  gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower
gdp_usd_upper
3978   30092.195731   35503.313225  14854.849644   14056.398773
15663.528879
3979   30046.680048   35995.808629  14930.623781   13960.885206
15925.104161
3980   30041.903293   36610.693734  15038.027521   13912.362504
16230.319850
3981   30109.057428   37248.220741  15181.254112   13888.157933
16582.456688
3982   30090.325852   38041.964433  15353.331066   13889.111499
16968.669700
3983   30186.653655   38853.442510  15542.161674   13915.431093
17385.081872
3984   30209.883184   39742.317576  15733.699224   13858.453725
17760.333322
3985   30242.053023   40568.105501  15919.873491   13830.697742
```

```
18222.190232
3986   30241.783438   41443.235244  16098.718258   13797.457684
18617.895687
3987   30266.595933   42462.257986  16275.785255   13745.584028
19099.749770
3988   30205.053229   43340.288613  16449.871159   13742.795346
19506.562473
3989   30174.544960   44185.732988  16613.238344   13656.622696
19947.251805
3990   30087.477029   45077.191565  16765.299346   13687.881303
20306.946127
3991   30023.264809   45975.391029  16897.055787   13648.635010
20730.760082
3992   29889.878587   46915.521299  17010.031047   13616.621123
21116.041100
3993   29784.460066   47441.689278  17103.321801   13514.969487
21467.346446
3994   29534.567189   48331.668321  17183.191423   13383.267219
21827.744208
3995   29205.795211   49230.732911  17255.501259   13298.015373
22242.787940
3996   28876.433219   49729.333605  17313.833385   13152.190918
22513.534843
3997   28612.932167   50457.779813  17353.713535   13095.302179
22773.395829
3998   28210.802867   50856.938961  17378.830577   12966.356828
22982.886727
3999   28096.663520   51449.445517  17392.703365   12862.490537
23265.109294
4000   27796.090370   52186.079877  17401.902620   12665.251631
23581.749549
4001   27466.932992   52654.694631  17393.027956   12498.169215
23783.922827
4002   27105.252343   53056.023696  17369.859621   12305.183049
24051.240960
4003   26728.543779   53156.930801  17346.349035   12139.994778
24206.609198

# 16. Wybrać wiersze które zawierają w kolumnie skategoryzowanej
określone słowo
print(ramka_danych_csv[ramka_danych_csv['location_name'].str.contains(
'United', na=False)])

      location_id                location_name iso3    level
year  \
7553           95               United Kingdom  GBR  Country  1960

7554           95               United Kingdom  GBR  Country  1961

7555           95               United Kingdom  GBR  Country  1962
```

```
7556             95                 United Kingdom  GBR  Country  1963
7557             95                 United Kingdom  GBR  Country  1964
...             ...                            ...  ...      ...   ...
19287           422  United States Virgin Islands  VIR  Country  2046
19288           422  United States Virgin Islands  VIR  Country  2047
19289           422  United States Virgin Islands  VIR  Country  2048
19290           422  United States Virgin Islands  VIR  Country  2049
19291           422  United States Virgin Islands  VIR  Country  2050

       gdp_ppp_mean  gdp_ppp_lower  gdp_ppp_upper  gdp_usd_mean  \
7553   16310.982717   13739.359462   18211.080013  14468.928557
7554   16637.378306   14021.255691   18552.357712  14738.960806
7555   16699.652950   14116.793663   18618.780049  14794.176887
7556   17204.352407   14568.220451   19153.680713  15283.800698
7557   17964.368546   15412.086655   19860.371971  15932.807887
...             ...            ...            ...           ...
19287  41287.177057   30556.895863   55066.904811  41234.500216
19288  41596.380683   30505.069557   56047.487106  41543.041145
19289  41923.883728   30508.427873   56639.931939  41869.856709
19290  42269.179899   30601.194839   57629.728086  42214.585846
19291  42600.038587   30535.154812   58469.665785  42545.067618

       gdp_usd_lower  gdp_usd_upper
7553    13698.701744   15172.657255
7554    13978.985853   15434.739721
7555    14036.102767   15483.073848
7556    14647.369479   15921.312162
7557    15383.515617   16539.728393
...              ...            ...
19287   31638.150835   53139.473363
19288   31569.471257   53287.294060
19289   31488.955147   54291.408201
19290   31839.581250   54988.746887
19291   31823.556963   55743.351459

[455 rows x 11 columns]
```

```
# 17. Wybrać wiersze które nie zawierają w kolumnie skategoryzowanej określonego słowa
print(ramka_danych_csv[~ramka_danych_csv['location_name'].str.contains('United', na=False)])
```

```
       location_id location_name iso3    level  year  gdp_ppp_mean  \
0                1        Global    G   Global  1960  1.748345e+13
1                1        Global    G   Global  1961  1.813537e+13
2                1        Global    G   Global  1962  1.895328e+13
3                1        Global    G   Global  1963  1.965662e+13
4                1        Global    G   Global  1964  2.100575e+13
...            ...           ...  ...      ...   ...           ...
19469          522         Sudan  SDN  Country  2046  6.656899e+03
19470          522         Sudan  SDN  Country  2047  6.729027e+03
19471          522         Sudan  SDN  Country  2048  6.796123e+03
19472          522         Sudan  SDN  Country  2049  6.866343e+03
19473          522         Sudan  SDN  Country  2050  6.935555e+03

       gdp_ppp_lower  gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower  \
0       1.601915e+13   1.911586e+13  1.296863e+13   1.266890e+13
1       1.659537e+13   1.982493e+13  1.346097e+13   1.314767e+13
2       1.739039e+13   2.061477e+13  1.406576e+13   1.376060e+13
3       1.811706e+13   2.134993e+13  1.461831e+13   1.432132e+13
4       1.935664e+13   2.276791e+13  1.552986e+13   1.523498e+13
...              ...            ...           ...            ...
19469   3.356042e+03   1.155051e+04  1.459547e+03   9.801683e+02
19470   3.374504e+03   1.171206e+04  1.475378e+03   9.886902e+02
19471   3.398699e+03   1.184386e+04  1.490021e+03   9.935248e+02
19472   3.417444e+03   1.196204e+04  1.505368e+03   1.002889e+03
19473   3.429198e+03   1.208179e+04  1.520564e+03   1.002953e+03

       gdp_usd_upper
0       1.334177e+13
1       1.383021e+13
2       1.443746e+13
3       1.497693e+13
4       1.587998e+13
...              ...
19469   2.269566e+03
19470   2.286933e+03
19471   2.322390e+03
19472   2.362591e+03
19473   2.408108e+03

[18200 rows x 11 columns]
```

```
# 18. Utwórz kolumnę na podstawie istniejącej
ramka_danych_csv['gdp_ppp_diff'] = ramka_danych_csv['gdp_ppp_upper'] -
ramka_danych_csv['gdp_ppp_lower'] # Utworzenie kolumny z różnicą
między gdp_ppp_upper i gdp_ppp_lower
print(ramka_danych_csv['gdp_ppp_diff'].head(10))

0    3.096716e+12
1    3.229556e+12
2    3.224381e+12
```

```
3    3.232877e+12
4    3.411270e+12
5    3.476908e+12
6    3.536968e+12
7    3.599954e+12
8    3.577357e+12
9    3.674624e+12
Name: gdp_ppp_diff, dtype: float64
```

```
# 19. Usuń kolumnę
# ramka_danych_csv = ramka_danych_csv.drop(columns=['gdp_ppp_diff']) #
Nie usuwamy kolumy, bo operujemy na niej niżej!

# 20. Zmień nazwę kolumny
ramka_danych_csv = ramka_danych_csv.rename(columns={'gdp_ppp_diff':
'gdp_ppp_difference'})

# 21. Zachowaj ramkę danych jako plik csv na komputerze
ramka_danych_csv.to_csv('updated_data.csv', index=False)

# 22. Wyświetlić liczbę wierszy
print(len(ramka_danych_csv))
```

```
18655
```

```
# 23. Wyświetlić wartości unikatowe w kolumnie
print(ramka_danych_csv['location_name'].unique())
```

```
['Global' 'China' "Democratic People's Republic of Korea"
 'Taiwan (Province of China)' 'Cambodia' 'Indonesia'
 "Lao People's Democratic Republic" 'Malaysia' 'Maldives' 'Myanmar'
 'Philippines' 'Sri Lanka' 'Thailand' 'Timor-Leste' 'Viet Nam' 'Fiji'
 'Kiribati' 'Marshall Islands' 'Micronesia (Federated States of)'
 'Papua New Guinea' 'Samoa' 'Solomon Islands' 'Tonga' 'Vanuatu'
'Armenia'
 'Azerbaijan' 'Georgia' 'Kazakhstan' 'Kyrgyzstan' 'Mongolia'
'Tajikistan'
 'Turkmenistan' 'Uzbekistan' 'Albania' 'Bosnia and Herzegovina'
'Bulgaria'
 'Croatia' 'Czechia' 'Hungary' 'North Macedonia' 'Montenegro' 'Poland'
 'Romania' 'Serbia' 'Slovakia' 'Slovenia' 'Belarus' 'Estonia' 'Latvia'
 'Lithuania' 'Republic of Moldova' 'Russian Federation' 'Ukraine'
 'Brunei Darussalam' 'Japan' 'Republic of Korea' 'Singapore'
'Australia'
 'New Zealand' 'Andorra' 'Austria' 'Belgium' 'Cyprus' 'Denmark'
'Finland'
 'France' 'Germany' 'Greece' 'Iceland' 'Ireland' 'Israel' 'Italy'
 'Luxembourg' 'Malta' 'Netherlands' 'Norway' 'Portugal' 'Spain'
'Sweden'
 'Switzerland' 'United Kingdom' 'Argentina' 'Chile' 'Uruguay' 'Canada'
 'United States of America' 'Antigua and Barbuda' 'Bahamas' 'Barbados'
```

```
 'Belize' 'Cuba' 'Dominica' 'Dominican Republic' 'Grenada' 'Guyana'
 'Haiti' 'Jamaica' 'Saint Lucia' 'Saint Vincent and the Grenadines'
 'Suriname' 'Trinidad and Tobago' 'Bolivia (Plurinational State of)'
 'Ecuador' 'Peru' 'Colombia' 'Costa Rica' 'El Salvador' 'Guatemala'
 'Honduras' 'Mexico' 'Nicaragua' 'Panama'
 'Venezuela (Bolivarian Republic of)' 'Brazil' 'Paraguay' 'Algeria'
 'Bahrain' 'Egypt' 'Iran (Islamic Republic of)' 'Iraq' 'Jordan'
'Kuwait'
 'Lebanon' 'Libya' 'Morocco' 'Palestine' 'Oman' 'Qatar' 'Saudi Arabia'
 'Syrian Arab Republic' 'Tunisia' 'Turkey' 'United Arab Emirates'
'Yemen'
 'Afghanistan' 'Bangladesh' 'Bhutan' 'India' 'Nepal' 'Pakistan'
'Angola'
 'Central African Republic' 'Congo' 'Democratic Republic of the Congo'
 'Equatorial Guinea' 'Gabon' 'Burundi' 'Comoros' 'Djibouti' 'Eritrea'
 'Ethiopia' 'Kenya' 'Madagascar' 'Malawi' 'Mauritius' 'Mozambique'
 'Rwanda' 'Seychelles' 'Somalia' 'United Republic of Tanzania'
'Uganda'
 'Zambia' 'Botswana' 'Lesotho' 'Namibia' 'South Africa' 'Eswatini'
 'Zimbabwe' 'Benin' 'Burkina Faso' 'Cameroon' 'Cabo Verde' 'Chad'
 "Côte d'Ivoire" 'Gambia' 'Ghana' 'Guinea' 'Guinea-Bissau' 'Liberia'
 'Mali' 'Mauritania' 'Niger' 'Nigeria' 'Sao Tome and Principe'
'Senegal'
 'Sierra Leone' 'Togo' 'American Samoa' 'Bermuda' 'Cook Islands'
 'Greenland' 'Guam' 'Monaco' 'Nauru' 'Niue' 'Northern Mariana Islands'
 'Palau' 'Puerto Rico' 'Saint Kitts and Nevis' 'San Marino' 'Tokelau'
 'Tuvalu' 'United States Virgin Islands' 'South Sudan' 'Sudan']
```

```python
# 24. Wyświetlić liczby rekordów odpowiadających do wartości
print(ramka_danych_csv['location_name'].value_counts())
```

```
location_name
Global                                    91
China                                     91
Democratic People's Republic of Korea     91
Taiwan (Province of China)                91
Cambodia                                  91
                                          ..
Tokelau                                   91
Tuvalu                                    91
United States Virgin Islands              91
South Sudan                               91
Sudan                                     91
Name: count, Length: 205, dtype: int64
```

```python
# 25. Sortowanie wierszy ramki danych według wartości określonej
kolumny (malejąco, rosnąco)
ramka_danych_csv = ramka_danych_csv.sort_values(by='location_name',
ascending=False)
```

```python
# 26. Wyświetlić wierszy dla 10 największych (najmniejszych) wartości określonej kolumny
print(ramka_danych_csv.nlargest(10, 'gdp_ppp_difference'))
print(ramka_danych_csv.nsmallest(10, 'gdp_ppp_difference'))
```

```
    location_id location_name iso3   level  year  gdp_ppp_mean
gdp_ppp_lower  \
90            1        Global    G  Global  2050  1.827414e+14
1.667007e+14
89            1        Global    G  Global  2049  1.811701e+14
1.657675e+14
88            1        Global    G  Global  2048  1.795422e+14
1.647031e+14
87            1        Global    G  Global  2047  1.778053e+14
1.635681e+14
86            1        Global    G  Global  2046  1.759560e+14
1.622744e+14
85            1        Global    G  Global  2045  1.740498e+14
1.608327e+14
84            1        Global    G  Global  2044  1.720934e+14
1.594056e+14
83            1        Global    G  Global  2043  1.701152e+14
1.579438e+14
82            1        Global    G  Global  2042  1.681175e+14
1.566207e+14
81            1        Global    G  Global  2041  1.661209e+14
1.552230e+14

    gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower  gdp_usd_upper  \
90   2.025062e+14  1.119468e+14   1.017185e+14   1.239708e+14
89   2.003282e+14  1.110748e+14   1.012670e+14   1.226294e+14
88   1.978349e+14  1.101656e+14   1.008704e+14   1.212579e+14
87   1.952850e+14  1.091923e+14   1.003097e+14   1.197614e+14
86   1.928964e+14  1.081513e+14   9.968511e+13   1.180625e+14
85   1.903320e+14  1.070717e+14   9.903290e+13   1.164315e+14
84   1.874514e+14  1.059643e+14   9.831993e+13   1.147651e+14
83   1.847172e+14  1.048522e+14   9.771637e+13   1.129875e+14
82   1.817886e+14  1.037319e+14   9.697921e+13   1.115238e+14
81   1.792966e+14  1.026157e+14   9.630379e+13   1.098151e+14

    gdp_ppp_difference
90        3.580549e+13
89        3.456061e+13
88        3.313177e+13
87        3.171689e+13
86        3.062192e+13
85        2.949930e+13
84        2.804583e+13
83        2.677341e+13
82        2.516788e+13
```

```
81        2.407368e+13
       location_id location_name iso3    level  year  gdp_ppp_mean  \
17791          218          Togo  TGO  Country  2006   1256.106656
15701          194       Lesotho  LSO  Country  2009   2386.813789
15891          196  South Africa  ZAF  Country  2017  13415.109285
17790          218          Togo  TGO  Country  2005   1251.135277
17794          218          Togo  TGO  Country  2009   1269.161805
15066          185        Rwanda  RWA  Country  2011   1626.420947
14974          184    Mozambique  MOZ  Country  2010   1060.720788
15067          185        Rwanda  RWA  Country  2012   1717.968641
17795          218          Togo  TGO  Country  2010   1308.887516
17798          218          Togo  TGO  Country  2013   1441.917427

       gdp_ppp_lower  gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower  \
17791    1239.451885    1272.811018    525.427266     524.712203
15701    2364.955982    2408.208729    762.378717     729.814377
15891   13392.134704   13438.793149   5331.268573    5327.630613
17790    1228.017491    1278.123473    525.655949     524.957683
17794    1235.694959    1303.017996    525.753280     525.026947
15066    1592.229066    1663.254347    562.630729     558.618670
14974    1029.574562    1100.995605    382.037004     370.488013
15067    1678.204824    1753.122750    595.431231     591.130483
17795    1276.145386    1351.422620    542.979145     542.113686
17798    1412.922361    1488.496965    634.980682     594.900379

       gdp_usd_upper  gdp_ppp_difference
17791     525.969435           33.359132
15701     789.724274           43.252747
15891    5334.127410           46.658445
17790     526.226948           50.105982
17794     526.332654           67.323037
15066     568.725657           71.025280
14974     390.499028           71.421043
15067     600.995223           74.917925
17795     543.708334           75.277235
17798     706.144537           75.574603
```

```
# 27. Wyświetlić wierszy dla 10 największych wartości określonej
kolumny pod warunkiem określonych wartości innej kolumny
filtered_data = ramka_danych_csv[ramka_danych_csv['location_name'] ==
'Global']
print(filtered_data.nlargest(10, 'gdp_ppp_mean'))
```

```
    location_id location_name iso3   level  year  gdp_ppp_mean
gdp_ppp_lower  \
90            1        Global    G  Global  2050  1.827414e+14
1.667007e+14
89            1        Global    G  Global  2049  1.811701e+14
1.657675e+14
88            1        Global    G  Global  2048  1.795422e+14
```

```
1.647031e+14
87            1        Global    G  Global  2047  1.778053e+14
1.635681e+14
86            1        Global    G  Global  2046  1.759560e+14
1.622744e+14
85            1        Global    G  Global  2045  1.740498e+14
1.608327e+14
84            1        Global    G  Global  2044  1.720934e+14
1.594056e+14
83            1        Global    G  Global  2043  1.701152e+14
1.579438e+14
82            1        Global    G  Global  2042  1.681175e+14
1.566207e+14
81            1        Global    G  Global  2041  1.661209e+14
1.552230e+14

    gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower  gdp_usd_upper  \
90   2.025062e+14  1.119468e+14   1.017185e+14   1.239708e+14
89   2.003282e+14  1.110748e+14   1.012670e+14   1.226294e+14
88   1.978349e+14  1.101656e+14   1.008704e+14   1.212579e+14
87   1.952850e+14  1.091923e+14   1.003097e+14   1.197614e+14
86   1.928964e+14  1.081513e+14   9.968511e+13   1.180625e+14
85   1.903320e+14  1.070717e+14   9.903290e+13   1.164315e+14
84   1.874514e+14  1.059643e+14   9.831993e+13   1.147651e+14
83   1.847172e+14  1.048522e+14   9.771637e+13   1.129875e+14
82   1.817886e+14  1.037319e+14   9.697921e+13   1.115238e+14
81   1.792966e+14  1.026157e+14   9.630379e+13   1.098151e+14

    gdp_ppp_difference
90        3.580549e+13
89        3.456061e+13
88        3.313177e+13
87        3.171689e+13
86        3.062192e+13
85        2.949930e+13
84        2.804583e+13
83        2.677341e+13
82        2.516788e+13
81        2.407368e+13
```

```python
# 28. Grupowanie wierszy według wartości kolumny skategoryzowanej,
potem uśrednienie wartości wszystkich kolumn w grupie - MultiIndex
grouped_mean = ramka_danych_csv.groupby(['location_name',
'year']).mean(numeric_only=True)
print(grouped_mean)
```

```
                     location_id  gdp_ppp_mean  gdp_ppp_lower
gdp_ppp_upper  \
location_name year
```

```
Afghanistan   1960        160.0   2221.335586    1353.292858
3082.415995
              1961        160.0   2192.653614    1336.349002
3012.241102
              1962        160.0   2178.869688    1327.326777
2963.810432
              1963        160.0   2169.572283    1322.003248
2940.315793
              1964        160.0   2155.861769    1324.331042
2932.818437
...                         ...           ...            ...
...
Zimbabwe      2046        198.0   3086.223490    1856.652268
4531.850929
              2047        198.0   3116.294363    1866.152043
4625.577546
              2048        198.0   3145.941464    1857.642354
4693.442459
              2049        198.0   3175.312716    1861.027391
4766.207444
              2050        198.0   3204.717710    1852.077740
4849.920213

                     gdp_usd_mean  gdp_usd_lower  gdp_usd_upper  \
location_name year
Afghanistan   1960    690.992776     516.513170     964.233914
              1961    682.493782     507.833855     958.141591
              1962    678.584622     510.383482     950.032579
              1963    676.055466     509.234425     943.496288
              1964    672.157496     506.548073     932.652043
...                          ...            ...            ...
Zimbabwe      2046   1283.050542     990.146349    1666.231011
              2047   1295.530479     992.038533    1691.789642
              2048   1307.813498     982.320381    1719.039709
              2049   1319.994426     986.284349    1749.976131
              2050   1332.173722     981.546944    1767.718479

                     gdp_ppp_difference
location_name year
Afghanistan   1960         1729.123137
              1961         1675.892100
              1962         1636.483654
              1963         1618.312546
              1964         1608.487395
...                                ...
Zimbabwe      2046         2675.198661
              2047         2759.425503
              2048         2835.800105
              2049         2905.180053
```

```
              2050         2997.842472

[18655 rows x 8 columns]
```

```
# 29. Grupowanie wierszy według wartości kolumny skategoryzowanej,
potem uśrednienie wartości dla pewnych kolumn, liczba wartości i
mediana dla pozostałych kolumn w grupach
grouped_stats = ramka_danych_csv.groupby('location_name').agg({
    'gdp_ppp_mean': ['mean', 'count'],
    'gdp_usd_mean': 'median',
    'year': 'max'
})
print(grouped_stats)
```

```
                                    gdp_ppp_mean         gdp_usd_mean
year
                                            mean count         median
max
location_name

Afghanistan                          1941.160286    91    515.274036
2050
Albania                              9092.515182    91   3098.516205
2050
Algeria                              8820.271149    91   3163.885729
2050
American Samoa                      15340.365197    91  13620.772462
2050
Andorra                             25139.562251    91  38178.372791
2050
...                                          ...   ...           ...
...
Venezuela (Bolivarian Republic of)  10594.142490    91   5823.785745
2050
Viet Nam                             5737.873614    91   1437.919432
2050
Yemen                                2637.237249    91    828.806903
2050
Zambia                               3107.029470    91   1078.009951
2050
Zimbabwe                             2925.918096    91   1069.856772
2050

[205 rows x 4 columns]
```

```
# 30. Wyświetlić nazwy kolumn indeksu złożonego
print(grouped_mean.index.names)
```

```
['location_name', 'year']
```

```python
# 31. Posortować kolumnę, indeksu złożonego
sorted_index = grouped_mean.sort_index()
print(sorted_index)
```

```
                    location_id  gdp_ppp_mean  gdp_ppp_lower
gdp_ppp_upper  \
location_name year

Afghanistan   1960        160.0   2221.335586    1353.292858
3082.415995
              1961        160.0   2192.653614    1336.349002
3012.241102
              1962        160.0   2178.869688    1327.326777
2963.810432
              1963        160.0   2169.572283    1322.003248
2940.315793
              1964        160.0   2155.861769    1324.331042
2932.818437
...                         ...           ...            ...
...
Zimbabwe      2046        198.0   3086.223490    1856.652268
4531.850929
              2047        198.0   3116.294363    1866.152043
4625.577546
              2048        198.0   3145.941464    1857.642354
4693.442459
              2049        198.0   3175.312716    1861.027391
4766.207444
              2050        198.0   3204.717710    1852.077740
4849.920213

                    gdp_usd_mean  gdp_usd_lower  gdp_usd_upper  \
location_name year
Afghanistan   1960    690.992776     516.513170     964.233914
              1961    682.493782     507.833855     958.141591
              1962    678.584622     510.383482     950.032579
              1963    676.055466     509.234425     943.496288
              1964    672.157496     506.548073     932.652043
...                          ...            ...            ...
Zimbabwe      2046   1283.050542     990.146349    1666.231011
              2047   1295.530479     992.038533    1691.789642
              2048   1307.813498     982.320381    1719.039709
              2049   1319.994426     986.284349    1749.976131
              2050   1332.173722     981.546944    1767.718479

                    gdp_ppp_difference
location_name year
Afghanistan   1960         1729.123137
              1961         1675.892100
              1962         1636.483654
```

```
              1963         1618.312546
              1964         1608.487395
...                                ...
Zimbabwe      2046         2675.198661
              2047         2759.425503
              2048         2835.800105
              2049         2905.180053
              2050         2997.842472

[18655 rows x 8 columns]
```

```
# 32. Stworzyć tabele przestawną (pivot table) na podstawie ramki
danych
pivot_table = pd.pivot_table(ramka_danych_csv, values='gdp_ppp_mean',
index=['location_name'], columns=['year'], aggfunc='mean')
print(pivot_table)
```

```
year                                          1960          1961
1962  \
location_name

Afghanistan                             2221.335586   2192.653614
2178.869688
Albania                                 3158.241995   3179.711325
3272.046583
Algeria                                 5006.438360   4453.400566
3658.175321
American Samoa                         22109.859273  21946.482938
21884.955783
Andorra                                15636.337352  15796.419665
16031.522138
...                                             ...           ...
...
Venezuela (Bolivarian Republic of)     10432.796342  10430.234336
10804.655654
Viet Nam                                1301.479002   1319.501206
1427.159417
Yemen                                   1207.599807   1213.637071
1220.327712
Zambia                                  2685.864457   2613.932835
2518.024702
Zimbabwe                                2408.747887   2460.565228
2405.779753

year                                          1963          1964
1965  \
location_name

Afghanistan                             2169.572283   2155.861769
2151.064936
```

```
Albania                                3370.096538   3471.383451
3583.125647
Algeria                                4362.291504   4467.247662
4635.281973
American Samoa                        21746.150959  22039.103093
21967.292708
Andorra                               16212.717854  16721.236248
16962.500876
...                                            ...           ...
...
Venezuela (Bolivarian Republic of)    11116.532476  11810.328016
11935.494850
Viet Nam                               1421.953513   1440.696855
1413.406360
Yemen                                  1230.605680   1236.624591
1245.455329
Zambia                                 2545.033066   2794.094677
3042.546710
Zimbabwe                               2377.944795   2361.629168
2451.921918

year                                           1966          1967
1968  \
location_name

Afghanistan                            2121.159148   2125.293873
2141.203832
Albania                                3701.606998   3826.761339
3947.787571
Algeria                                4234.622602   4531.823753
4803.430268
American Samoa                        21941.986732  21778.478625
21809.608764
Andorra                               17243.441075  17419.093114
17753.186591
...                                            ...           ...
...
Venezuela (Bolivarian Republic of)    11691.544995  11714.768598
12148.279419
Viet Nam                               1386.091408   1196.087362
1147.824135
Yemen                                  1257.818357   1271.555576
1282.432072
Zambia                                 3136.130606   3299.617291
3305.972107
Zimbabwe                               2371.081395   2426.346281
2334.537805

year                                           1969  ...          2041  \
location_name                                        ...
```

```
Afghanistan                             2120.287941  ...   2342.098650
Albania                                 4065.934215  ...  14819.211029
Algeria                                 5051.997456  ...  11030.573193
American Samoa                         21868.789321  ...  11893.422465
Andorra                                18116.808178  ...  29227.359814
...                                             ...  ...           ...
Venezuela (Bolivarian Republic of)     12262.570715  ...   5936.593472
Viet Nam                                1207.247597  ...  11978.148704
Yemen                                   1296.296950  ...   2687.929912
Zambia                                  3412.255898  ...   4528.583497
Zimbabwe                                2607.252194  ...   2920.094735

year                                          2042          2043
2044  \
location_name

Afghanistan                             2373.513925   2408.692690
2447.457933
Albania                                15023.009454  15229.411365
15463.602305
Algeria                                11103.336795  11165.459200
11210.295359
American Samoa                         11930.178447  11982.538279
12045.045051
Andorra                                28842.858958  28498.492075
28158.292062
...                                             ...           ...
...
Venezuela (Bolivarian Republic of)      5910.458362   5877.138076
5836.249945
Viet Nam                               12143.050046  12305.079272
12460.181246
Yemen                                   2721.105116   2752.205471
2782.981501
Zambia                                  4596.447849   4663.435135
4728.373411
Zimbabwe                                2953.357891   2987.035398
3019.468770

year                                          2045          2046
2047  \
location_name

Afghanistan                             2484.684464   2526.771339
2568.918404
Albania                                15675.489103  15891.474827
16093.835400
Algeria                                11241.399380  11262.030649
11271.942839
American Samoa                         12116.603188  12194.337343
```

```
12275.051475
Andorra                                27813.855276  27554.062720
27352.447739
...                                             ...           ...
...
Venezuela (Bolivarian Republic of)   5796.897698   5752.656452
5711.373515
Viet Nam                               12612.891371  12763.816982
12904.398221
Yemen                                   2813.127885   2842.694538
2871.818130
Zambia                                  4794.522235   4860.353288
4926.102992
Zimbabwe                                3052.770960   3086.223490
3116.294363

year                                          2048          2049
2050
location_name

Afghanistan                             2612.639879   2655.415849
2702.860491
Albania                                16272.721532  16445.334011
16597.323356
Algeria                                11275.241774  11262.595293
11244.318633
American Samoa                         12365.951829  12458.781807
12552.708157
Andorra                                27197.498599  27089.146046
27037.722215
...                                             ...           ...
...
Venezuela (Bolivarian Republic of)   5673.687788   5629.163661
5586.185557
Viet Nam                               13041.740748  13175.413001
13307.742671
Yemen                                   2900.489905   2928.794443
2955.558976
Zambia                                  4989.723480   5050.614585
5113.775149
Zimbabwe                                3145.941464   3175.312716
3204.717710

[205 rows x 91 columns]
```

```python
# 33. Wyświetlić indeksy i kolumny tabeli przestawnej
print(pivot_table.index)
print(pivot_table.columns)
```

```
Index(['Afghanistan', 'Albania', 'Algeria', 'American Samoa',
'Andorra',
       'Angola', 'Antigua and Barbuda', 'Argentina', 'Armenia',
'Australia',
       ...
       'United States Virgin Islands', 'United States of America',
'Uruguay',
       'Uzbekistan', 'Vanuatu', 'Venezuela (Bolivarian Republic of)',
       'Viet Nam', 'Yemen', 'Zambia', 'Zimbabwe'],
      dtype='object', name='location_name', length=205)
Index([1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969,
1970, 1971,
       1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981,
1982, 1983,
       1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993,
1994, 1995,
       1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005,
2006, 2007,
       2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017,
2018, 2019,
       2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029,
2030, 2031,
       2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041,
2042, 2043,
       2044, 2045, 2046, 2047, 2048, 2049, 2050],
      dtype='int64', name='year')
```

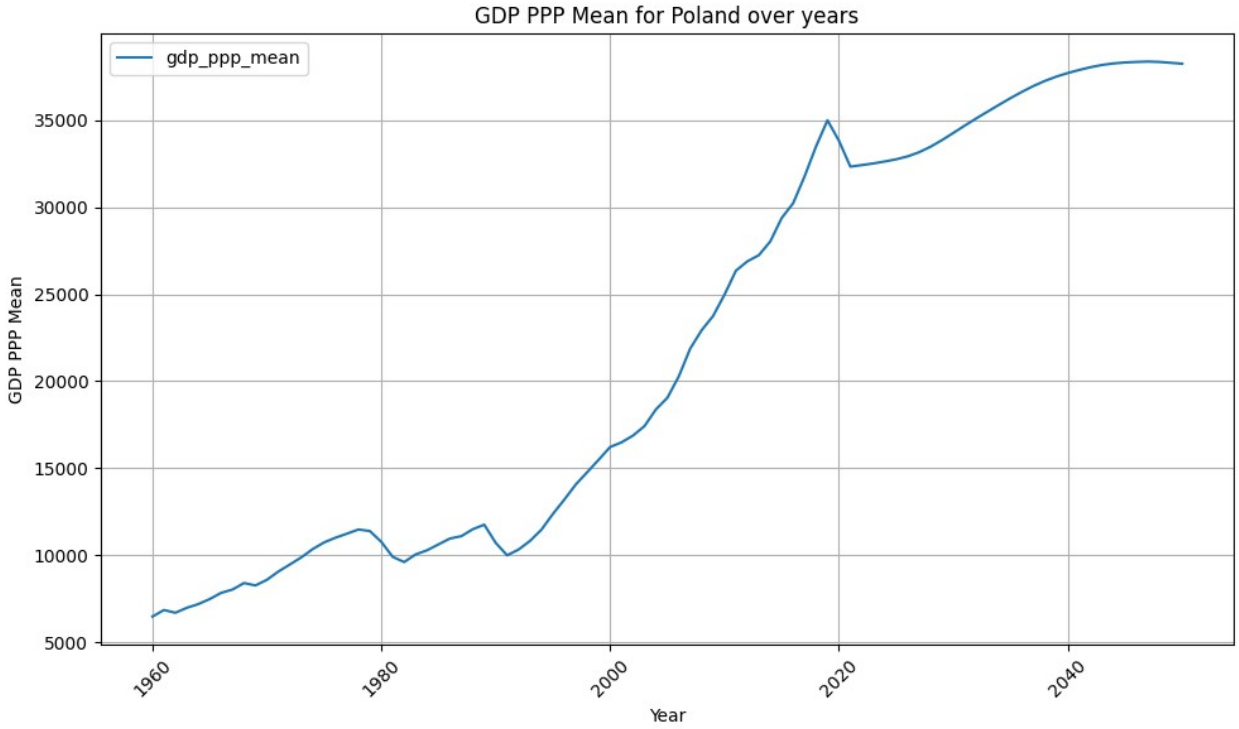
```
# 34. Utwórz indeks złożony tabeli przestawnej i wyświetl go
pivot_table = pivot_table.reset_index()
pivot_table.set_index(['location_name'] +
list(pivot_table.columns[1:]), inplace=True)
print(pivot_table.index)
```

```
MultiIndex([(                         'Afghanistan',
2221.33558642915, ...),
            (                             'Albania',
3158.24199462837, ...),
            (                             'Algeria',
5006.43835997237, ...),
            (                      'American Samoa',
22109.859272757, ...),
            (                             'Andorra',
15636.3373517101, ...),
            (                              'Angola',
4424.22337093641, ...),
            (                 'Antigua and Barbuda',
3939.96456079785, ...),
            (                           'Argentina',
9947.85853860087, ...),
            (                             'Armenia',
```

```
4717.49893052611, ...),
            (                            'Australia',
17521.8499818484, ...),
            ...
            (      'United States Virgin Islands',
11402.6973448973, ...),
            (           'United States of America',
21498.7249723008, ...),
            (                             'Uruguay',
8032.29318246791, ...),
            (                          'Uzbekistan',
2971.75653904325, ...),
            (                             'Vanuatu',
1761.93293871854, ...),
            ('Venezuela (Bolivarian Republic of)',
10432.796342326, ...),
            (                           'Viet Nam',
1301.47900194441, ...),
            (                               'Yemen',
1207.59980696746, ...),
            (                              'Zambia',
2685.86445730912, ...),
            (                            'Zimbabwe',
2408.74788699075, ...)],
          names=['location_name', 1960, 1961, 1962, 1963, 1964, 1965,
1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976,
1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987,
1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998,
1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009,
2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020,
2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031,
2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042,
2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050], length=205)
```

```
# 35. Zaimportuj moduł pyplot z biblioteki matplotlib i 36. Wskazać,
że wykresy należy rysować bezpośrednio w zeszycie, a nie w osobnej
zakładce
import matplotlib.pyplot as plt
%matplotlib inline
# 37. Wyświetlić wykres na podstawie tabeli przestawnej
pivot_table_reset = pivot_table.reset_index()
pivot_table_melted = pd.melt(pivot_table_reset,
id_vars=["location_name"], var_name="year", value_name="gdp_ppp_mean")
# Meltujemy (przetapiamy) dane, aby 'year' stał się kolumną,
location_name = 'Poland'
data = pivot_table_melted[pivot_table_melted['location_name'] ==
location_name]
data.plot(x='year', y='gdp_ppp_mean', kind='line', title=f'GDP PPP
Mean for {location_name} over years', figsize=(10,6))
plt.xlabel('Year')
```

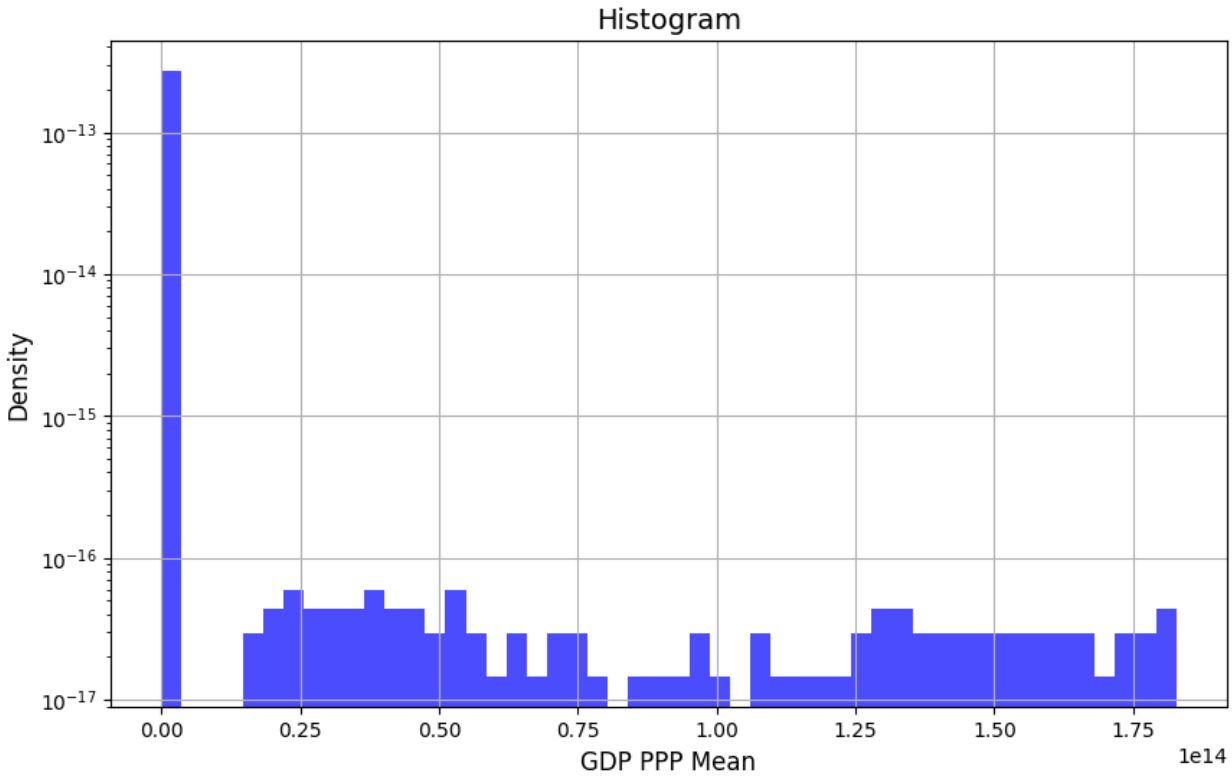
```
plt.ylabel('GDP PPP Mean')
plt.grid(True)
plt.xticks(rotation=45)  # Rotacja etykiet osi X dla lepszej
czytelności
plt.tight_layout()
plt.show()
```




```
# 38. Narysować histogram na podstawie wartości kolumny
# Usunięcie wierszy z brakującymi danymi
ramka_danych_csv = ramka_danych_csv.dropna(subset=['gdp_ppp_mean'])

# Narysowanie histogramu z mniejszą liczbą przedziałów i zastosowanie
skali logarytmicznej
plt.figure(figsize=(10,6))
ramka_danych_csv['gdp_ppp_mean'].hist(bins=50, density=True,
alpha=0.7, color='blue')

plt.title('Histogram', fontsize=14)
plt.xlabel('GDP PPP Mean', fontsize=12)
plt.ylabel('Density', fontsize=12)
plt.yscale('log')
plt.show()
```




```python
# 39. Przedstawić sposoby łączenia ramek danych za pomocą metod merge
i concat
# Metoda merge:
df1 = pd.DataFrame({'key': ['A', 'B', 'C'], 'value1': [1, 2, 3]})
df2 = pd.DataFrame({'key': ['A', 'B', 'D'], 'value2': [4, 5, 6]})
merged_df = pd.merge(df1, df2, on='key', how='inner')
print(merged_df)
# Metoda konkatenacji:
df3 = pd.DataFrame({'key': ['A', 'B'], 'value1': [7, 8]})
df4 = pd.DataFrame({'key': ['C', 'D'], 'value1': [9, 10]})
concatenated_df = pd.concat([df3, df4], ignore_index=True)
print(concatenated_df)
```

```
  key  value1  value2
0   A       1       4
1   B       2       5
  key  value1
0   A       7
1   B       8
2   C       9
3   D      10
```

```python
# 40. Pokazać dodawanie nowych kolumn za pomocą operacji
matematycznych
ramka_danych_csv['gdp_growth'] = ramka_danych_csv['gdp_ppp_mean'] /
ramka_danych_csv['gdp_ppp_mean'].shift(1) - 1
```

```
print(ramka_danych_csv[['location_name', 'year',
'gdp_growth']].head())
```

```
      location_name  year  gdp_growth
16017      Zimbabwe  1961         NaN
16084      Zimbabwe  2028    0.033804
16082      Zimbabwe  2026   -0.019321
16081      Zimbabwe  2025   -0.008344
16080      Zimbabwe  2024   -0.007727
```

```
# 41. Przedstawić na przykładzie dodawanie nowych kolumn z pomocą
funkcji lambda
ramka_danych_csv['gdp_per_capita'] = ramka_danych_csv.apply(lambda
row: row['gdp_ppp_mean'] / row['gdp_usd_mean'], axis=1)
print(ramka_danych_csv[['location_name', 'year',
'gdp_per_capita']].head())
```

```
      location_name  year  gdp_per_capita
16017      Zimbabwe  1961        3.002179
16084      Zimbabwe  2028        2.404670
16082      Zimbabwe  2026        2.404573
16081      Zimbabwe  2025        2.404522
16080      Zimbabwe  2024        2.404459
```

```
# 42. Przedstawić możliwości pracy z dużymi plikami przy użyciu
argumentu chunksize
chunksize = 10000
for chunk in pd.read_csv('IHME_GDP_1960_2050_Y2021M09D22.CSV',
chunksize=chunksize):
    print(chunk.head(4))
```

```
   location_id location_name iso3   level  year  gdp_ppp_mean
gdp_ppp_lower  \
0            1        Global    G  Global  1960  1.748345e+13
1.601915e+13
1            1        Global    G  Global  1961  1.813537e+13
1.659537e+13
2            1        Global    G  Global  1962  1.895328e+13
1.739039e+13
3            1        Global    G  Global  1963  1.965662e+13
1.811706e+13

   gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower  gdp_usd_upper
0   1.911586e+13  1.296863e+13   1.266890e+13   1.334177e+13
1   1.982493e+13  1.346097e+13   1.314767e+13   1.383021e+13
2   2.061477e+13  1.406576e+13   1.376060e+13   1.443746e+13
3   2.134993e+13  1.461831e+13   1.432132e+13   1.497693e+13
       location_id location_name iso3    level  year  gdp_ppp_mean  \
10000          126    Costa Rica  CRI  Country  2041  21222.968139
10001          126    Costa Rica  CRI  Country  2042  21384.771030
```

```
10002          126    Costa Rica  CRI  Country  2043  21531.353078
10003          126    Costa Rica  CRI  Country  2044  21654.766957

       gdp_ppp_lower  gdp_ppp_upper  gdp_usd_mean  gdp_usd_lower  \
10000   16351.045982   26688.622084  12731.983537   10072.290068
10001   16373.548021   27237.275872  12828.873351   10014.947690
10002   16295.954034   27650.146027  12916.696284    9925.971971
10003   16183.900733   28059.557778  12990.534044    9872.441363

       gdp_usd_upper
10000   15839.573177
10001   16094.157651
10002   16384.105693
10003   16584.745555
```