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February 6, 2024

1 Prodigy Data Science Internship

Task-01

Create a bar chart or histogram to visualize the distribution of a categorical or continuous variable, such as the distribution of ages or genders in a population.

[24]:
```
#Importing packages

import pandas as pd
import matplotlib.pyplot as plt
```

[3]:
```
# Excel Data stored as dataframe

data = pd.read_excel("G:\My Drive\My Learning\Prodigy Intern\Task 1")
```

[4]:
```
# Displaying the first 5 records

data.head()
```

[4]:

	Country Name	Country Code	Region	IncomeGroup	Year	Birth rate, crude (per 1,000 people)	Death rate, crude (per 1,000 people)	Electric power consumption (kWh per capita)	GDP (USD)
0	Afghanistan	AFG	South Asia	Low income	2018	NaN	NaN	NaN	1.936300e+10
1	Afghanistan	AFG	South Asia	Low income	2017	33.211	6.575		
2	Afghanistan	AFG	South Asia	Low income	2016	33.981	6.742		
3	Afghanistan	AFG	South Asia	Low income	2015	34.809	6.929		
4	Afghanistan	AFG	South Asia	Low income	2014	35.706	7.141		

```
1                                        NaN  2.019180e+10
2                                        NaN  1.936260e+10
3                                        NaN  1.990710e+10
4                                        NaN  2.048490e+10

   GDP per capita (USD)  Individuals using the Internet (% of population)  \
0               520.897                                                NaN
1               556.302                                              13.50
2               547.228                                              11.20
3               578.466                                               8.26
4               613.856                                               7.00

   Infant mortality rate (per 1,000 live births)  \
0                                           47.9
1                                           49.5
2                                           51.2
3                                           53.1
4                                           55.1

   Life expectancy at birth (years)  \
0                               NaN
1                            64.130
2                            63.763
3                            63.377
4                            62.966

   Population density (people per sq. km of land area)  \
0                                            56.9378
1                                            55.5960
2                                            54.1971
3                                            52.7121
4                                            51.1148

   Unemployment (% of total labor force) (modeled ILO estimate)
0                                              1.542
1                                              1.559
2                                              1.634
3                                              1.679
4                                              1.735
```

[5]:
```
# Displaying the last 5 records

data.tail()
```

[5]:
```
       Country Name Country Code             Region IncomeGroup  Year  \
12444     Zimbabwe          ZWE  Sub-Saharan Africa  Low income  1964
12445     Zimbabwe          ZWE  Sub-Saharan Africa  Low income  1963
```

```
12446     Zimbabwe          ZWE  Sub-Saharan Africa  Low income  1962
12447     Zimbabwe          ZWE  Sub-Saharan Africa  Low income  1961
12448     Zimbabwe          ZWE  Sub-Saharan Africa  Low income  1960

       Birth rate, crude (per 1,000 people)  \
12444                                47.770
12445                                47.876
12446                                47.950
12447                                47.988
12448                                47.996

       Death rate, crude (per 1,000 people)  \
12444                                13.083
12445                                13.419
12446                                13.762
12447                                14.104
12448                                14.441

       Electric power consumption (kWh per capita)     GDP (USD)  \
12444                                          NaN  1.217138e+09
12445                                          NaN  1.159512e+09
12446                                          NaN  1.117602e+09
12447                                          NaN  1.096647e+09
12448                                          NaN  1.052990e+09

       GDP per capita (USD)  Individuals using the Internet (% of population)  \
12444               281.558                                                NaN
12445               277.480                                                NaN
12446               276.689                                                NaN
12447               280.829                                                NaN
12448               278.814                                                NaN

       Infant mortality rate (per 1,000 live births)  \
12444                                           83.2
12445                                           85.7
12446                                           88.1
12447                                           90.5
12448                                           92.8

       Life expectancy at birth (years)  \
12444                            54.849
12445                            54.403
12446                            53.946
12447                            53.483
12448                            53.019

       Population density (people per sq. km of land area)  \
```

```
12444                                                11.1745
12445                                                10.8019
12446                                                10.4413
12447                                                10.0944
12448                                                    NaN

       Unemployment (% of total labor force) (modeled ILO estimate)
12444                                                    NaN
12445                                                    NaN
12446                                                    NaN
12447                                                    NaN
12448                                                    NaN
```

[6]:
```
# gives the total number of records (rows) and attributes/fields (columns)

data.shape
```

[6]:
```
(12449, 15)
```

[7]:
```
#total number of records is displayed

data.size
```

[7]:
```
186735
```

[8]:
```
# Displaying all the column/attribute names

data.columns
```

[8]:
```
Index(['Country Name', 'Country Code', 'Region', 'IncomeGroup', 'Year',
       'Birth rate, crude (per 1,000 people)',
       'Death rate, crude (per 1,000 people)',
       'Electric power consumption (kWh per capita)', 'GDP (USD)',
       'GDP per capita (USD)',
       'Individuals using the Internet (% of population)',
       'Infant mortality rate (per 1,000 live births)',
       'Life expectancy at birth (years)',
       'Population density (people per sq. km of land area)',
       'Unemployment (% of total labor force) (modeled ILO estimate)'],
      dtype='object')
```

[9]:
```
#Data type of each type of attribute will be described

data.dtypes
```

[9]:
```
Country Name                                                object
Country Code                                                object
```

```
Region                                                              object
IncomeGroup                                                         object
Year                                                                 int64
Birth rate, crude (per 1,000 people)                              float64
Death rate, crude (per 1,000 people)                              float64
Electric power consumption (kWh per capita)                       float64
GDP (USD)                                                         float64
GDP per capita (USD)                                              float64
Individuals using the Internet (% of population)                  float64
Infant mortality rate (per 1,000 live births)                     float64
Life expectancy at birth (years)                                  float64
Population density (people per sq. km of land area)               float64
Unemployment (% of total labor force) (modeled ILO estimate)      float64
dtype: object
```

[10]:
```
data.index
```

[10]:
```
RangeIndex(start=0, stop=12449, step=1)
```

[11]:
```
# Summary statistics of the dataset

data.describe()
```

[11]:
```
                Year  Birth rate, crude (per 1,000 people)  \
count  12449.00000                           11440.000000
mean    1989.00000                              28.643276
std       17.03007                              13.131893
min     1960.00000                               6.900000
25%     1974.00000                              16.600000
50%     1989.00000                              27.545500
75%     2004.00000                              40.881250
max     2018.00000                              58.227000

       Death rate, crude (per 1,000 people)  \
count                          11416.000000
mean                              10.588539
std                                5.489382
min                                1.127000
25%                                6.863750
50%                                9.200000
75%                               12.687000
max                               54.444000

       Electric power consumption (kWh per capita)     GDP (USD)  \
count                                  5848.000000  9.578000e+03
mean                                   3175.294686  1.700740e+11
std                                    4467.139298  8.979866e+11
```

```
min                                    0.000000  8.824450e+06
25%                                  390.385750  1.393010e+09
50%                                 1541.895000  7.275305e+09
75%                                 4313.767500  4.857782e+10
max                                54799.200000  2.050000e+13

       GDP per capita (USD)  Individuals using the Internet (% of population)  \
count           9575.000000                                        5064.000000
mean            8231.812259                                          23.334471
std            16173.539954                                          28.319388
min               34.790600                                           0.000000
25%              513.145500                                           0.594949
50%             1852.810000                                           8.406225
75%             7774.565000                                          41.295950
max           189171.000000                                         100.000000

       Infant mortality rate (per 1,000 live births)  \
count                                    9984.000000
mean                                       51.704437
std                                        46.131039
min                                         1.400000
25%                                        14.475000
50%                                        37.000000
75%                                        78.200000
max                                       279.400000

       Life expectancy at birth (years)  \
count                      11176.000000
mean                          64.044692
std                           11.491087
min                           18.907000
25%                           55.917750
50%                           67.276000
75%                           72.692250
max                           85.417100

       Population density (people per sq. km of land area)  \
count                                        11845.000000
mean                                           318.861370
std                                           1593.406041
min                                              0.098625
25%                                             19.783400
50%                                             64.007500
75%                                            144.823000
max                                          21389.100000

       Unemployment (% of total labor force) (modeled ILO estimate)
```

```
count                                          5208.000000
mean                                              8.295079
std                                               6.290703
min                                               0.140000
25%                                               3.687000
50%                                               6.775000
75%                                              11.212250
max                                              37.940000
```

[12]:
```
# the output indicates that there is no duplicate values in the records
data.duplicated().sum()
```

[12]:
```
0
```

[13]:
```
# Null and NaN values are dropped from the dataset

data1=data.dropna()
data1.head()
```

[13]:
```
   Country Name Country Code                 Region          IncomeGroup  \
63      Albania          ALB  Europe & Central Asia  Upper middle income
64      Albania          ALB  Europe & Central Asia  Upper middle income
65      Albania          ALB  Europe & Central Asia  Upper middle income
66      Albania          ALB  Europe & Central Asia  Upper middle income
67      Albania          ALB  Europe & Central Asia  Upper middle income

    Year  Birth rate, crude (per 1,000 people)  \
63  2014                                 12.259
64  2013                                 12.257
65  2012                                 12.197
66  2011                                 12.100
67  2010                                 12.001

    Death rate, crude (per 1,000 people)  \
63                                 7.219
64                                 7.096
65                                 6.996
66                                 6.915
67                                 6.841

    Electric power consumption (kWh per capita)     GDP (USD)  \
63                                      2309.37  1.322820e+10
64                                      2533.25  1.277630e+10
65                                      2118.33  1.231980e+10
66                                      2205.70  1.289090e+10
67                                      1943.34  1.192700e+10
```

```
    GDP per capita (USD)  Individuals using the Internet (% of population)  \
63               4578.67                                             60.100
64               4413.08                                             57.200
65               4247.61                                             54.656
66               4437.18                                             49.000
67               4094.36                                             45.000

    Infant mortality rate (per 1,000 live births)  \
63                                            8.9
64                                            9.5
65                                           10.2
66                                           11.0
67                                           11.9

    Life expectancy at birth (years)  \
63                           77.813
64                           77.554
65                           77.252
66                           76.914
67                           76.562

    Population density (people per sq. km of land area)  \
63                                            105.442
64                                            105.660
65                                            105.854
66                                            106.029
67                                            106.315

    Unemployment (% of total labor force) (modeled ILO estimate)
63                                             17.490
64                                             15.866
65                                             13.376
66                                             13.481
67                                             14.086
```

[14]:
```
data1.shape
```

[14]:
```
(2775, 15)
```

[15]:
```
#Verifying to check the presence of null values

data1.isna()
```

[15]:
```
       Country Name  Country Code  Region  IncomeGroup   Year  \
63            False         False   False        False  False
64            False         False   False        False  False
65            False         False   False        False  False
```

```
66           False         False   False        False  False
67           False         False   False        False  False
…            …           …     …          …    …
12410        False         False   False        False  False
12411        False         False   False        False  False
12412        False         False   False        False  False
12413        False         False   False        False  False
12414        False         False   False        False  False

       Birth rate, crude (per 1,000 people)  \
63                                    False
64                                    False
65                                    False
66                                    False
67                                    False
…                                     …
12410                                 False
12411                                 False
12412                                 False
12413                                 False
12414                                 False

       Death rate, crude (per 1,000 people)  \
63                                    False
64                                    False
65                                    False
66                                    False
67                                    False
…                                     …
12410                                 False
12411                                 False
12412                                 False
12413                                 False
12414                                 False

       Electric power consumption (kWh per capita)  GDP (USD)  \
63                                           False      False
64                                           False      False
65                                           False      False
66                                           False      False
67                                           False      False
…                                            …        …
12410                                        False      False
12411                                        False      False
12412                                        False      False
12413                                        False      False
12414                                        False      False
```

```
       GDP per capita (USD)  Individuals using the Internet (% of population)  \
63                    False                                                False
64                    False                                                False
65                    False                                                False
66                    False                                                False
67                    False                                                False
…                     …                                                    …
12410                 False                                                False
12411                 False                                                False
12412                 False                                                False
12413                 False                                                False
12414                 False                                                False

       Infant mortality rate (per 1,000 live births)  \
63                                             False
64                                             False
65                                             False
66                                             False
67                                             False
…                                              …
12410                                          False
12411                                          False
12412                                          False
12413                                          False
12414                                          False

       Life expectancy at birth (years)  \
63                                 False
64                                 False
65                                 False
66                                 False
67                                 False
…                                  …
12410                              False
12411                              False
12412                              False
12413                              False
12414                              False

       Population density (people per sq. km of land area)  \
63                                                   False
64                                                   False
65                                                   False
66                                                   False
67                                                   False
…                                                    …
```

```
12410                                                 False
12411                                                 False
12412                                                 False
12413                                                 False
12414                                                 False

       Unemployment (% of total labor force) (modeled ILO estimate)
63                                                    False
64                                                    False
65                                                    False
66                                                    False
67                                                    False
…                                                     …
12410                                                 False
12411                                                 False
12412                                                 False
12413                                                 False
12414                                                 False

[2775 rows x 15 columns]
```

[16]:
```
#sum() sums up the boolean values [true=1,false=0].

data1.isna().sum()

#Here we can see all columns' NaN values are dropped. There is no missing value␣
 ↪in our data now.
```

[16]:
```
Country Name                                                  0
Country Code                                                  0
Region                                                        0
IncomeGroup                                                   0
Year                                                          0
Birth rate, crude (per 1,000 people)                          0
Death rate, crude (per 1,000 people)                          0
Electric power consumption (kWh per capita)                   0
GDP (USD)                                                     0
GDP per capita (USD)                                          0
Individuals using the Internet (% of population)              0
Infant mortality rate (per 1,000 live births)                 0
Life expectancy at birth (years)                              0
Population density (people per sq. km of land area)           0
Unemployment (% of total labor force) (modeled ILO estimate)  0
dtype: int64
```

[17]:
```
data1.info()
```

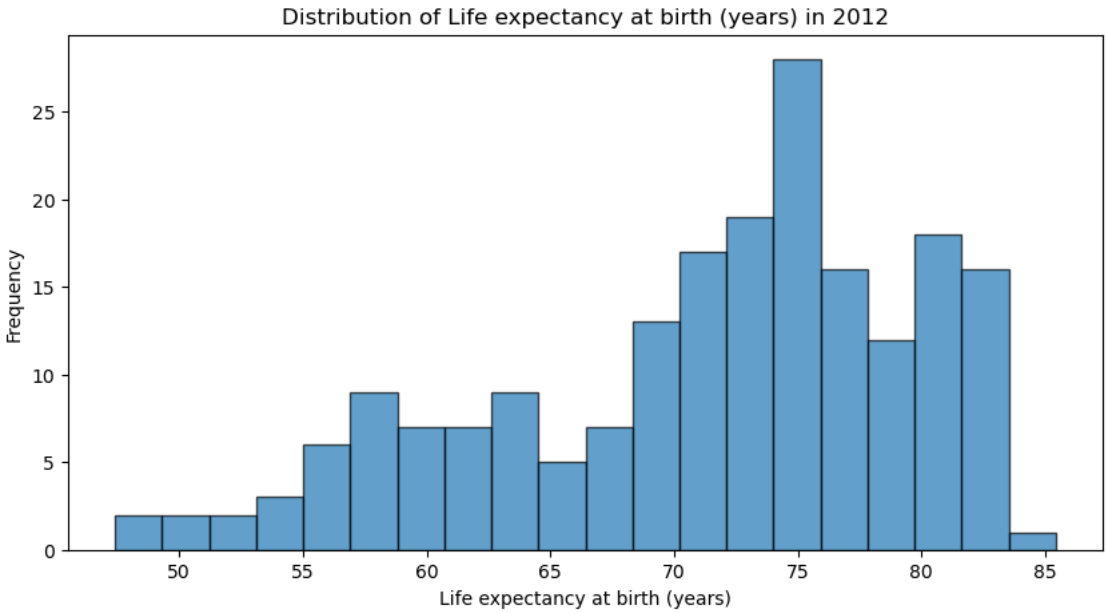
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2775 entries, 63 to 12414
Data columns (total 15 columns):
 #   Column                                                    Non-Null
Count  Dtype
---  ------
--------------  -----
 0   Country Name                                              2775 non-null
object
 1   Country Code                                              2775 non-null
object
 2   Region                                                    2775 non-null
object
 3   IncomeGroup                                               2775 non-null
object
 4   Year                                                      2775 non-null
int64
 5   Birth rate, crude (per 1,000 people)                      2775 non-null
float64
 6   Death rate, crude (per 1,000 people)                      2775 non-null
float64
 7   Electric power consumption (kWh per capita)               2775 non-null
float64
 8   GDP (USD)                                                 2775 non-null
float64
 9   GDP per capita (USD)                                      2775 non-null
float64
 10  Individuals using the Internet (% of population)          2775 non-null
float64
 11  Infant mortality rate (per 1,000 live births)             2775 non-null
float64
 12  Life expectancy at birth (years)                          2775 non-null
float64
 13  Population density (people per sq. km of land area)       2775 non-null
float64
 14  Unemployment (% of total labor force) (modeled ILO estimate)  2775 non-null
float64
dtypes: float64(10), int64(1), object(4)
memory usage: 346.9+ KB
```

[18]:
```
year = 2012
variable = 'Life expectancy at birth (years)'
```

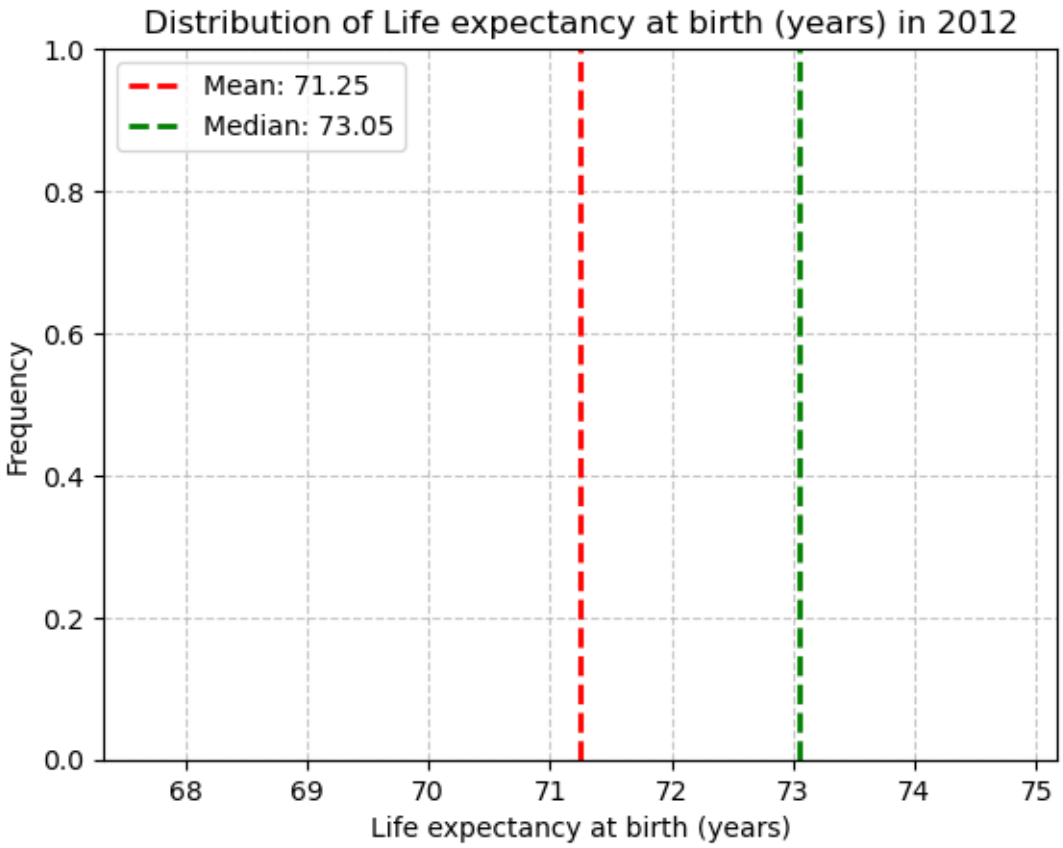
[19]:
```
#Filter the data for a specific year
data_year = data[data['Year'] == year]
```

4 Creating a histogram

[20]:
```
plt.figure(figsize=(10,5))
plt.hist(data_year[variable],bins=20, edgecolor='k', alpha=0.7)

plt.title(f'Distribution of {variable} in {year}')
plt.xlabel(variable)
plt.ylabel('Frequency')
plt.show()
```

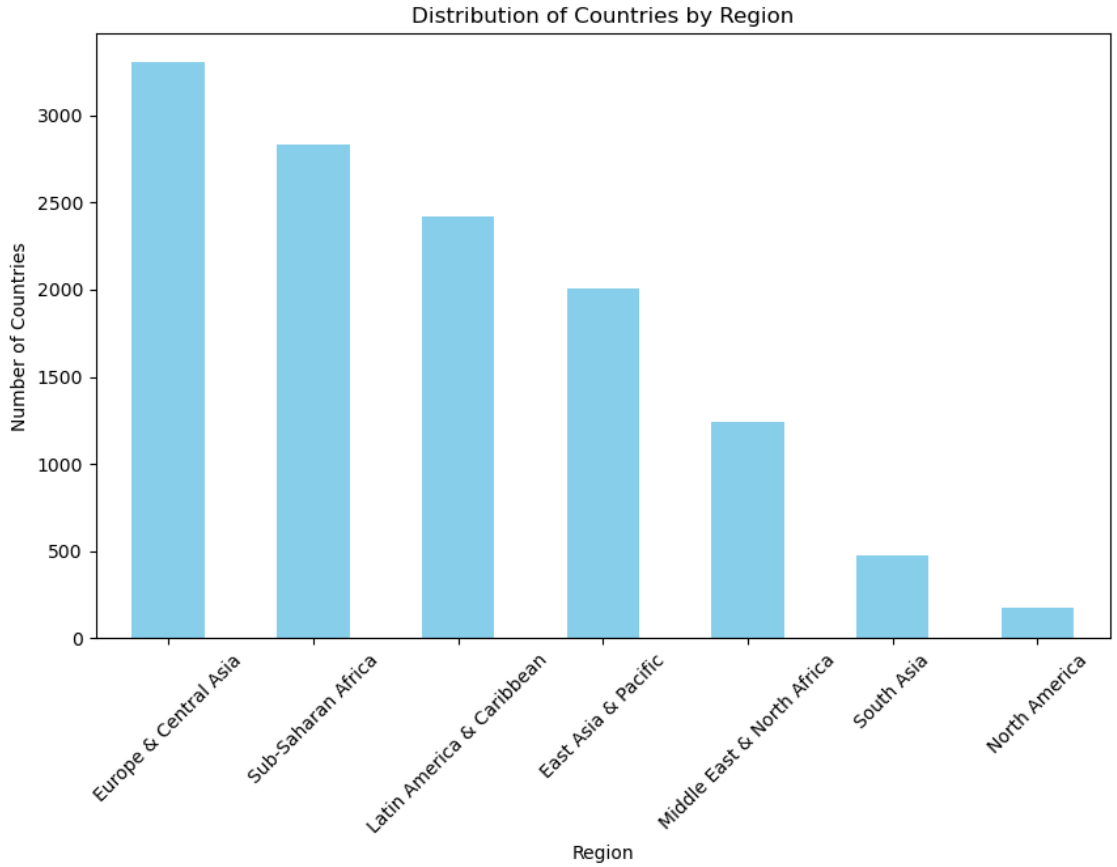


[21]:
```
# Customize the plot further
plt.title(f'Distribution of {variable} in {year}')
plt.xlabel(variable)
plt.ylabel('Frequency')

plt.grid(True, linestyle='--', alpha=0.7)

# Add labels for mean and median
mean_value = data_year[variable].mean()
median_value = data_year[variable].median()
plt.axvline(mean_value, color='red', linestyle='dashed', linewidth=2,␣
 ↪label=f'Mean: {mean_value:.2f}')
plt.axvline(median_value, color='green', linestyle='dashed', linewidth=2,␣
 ↪label=f'Median: {median_value:.2f}')
plt.legend()
plt.show()
```



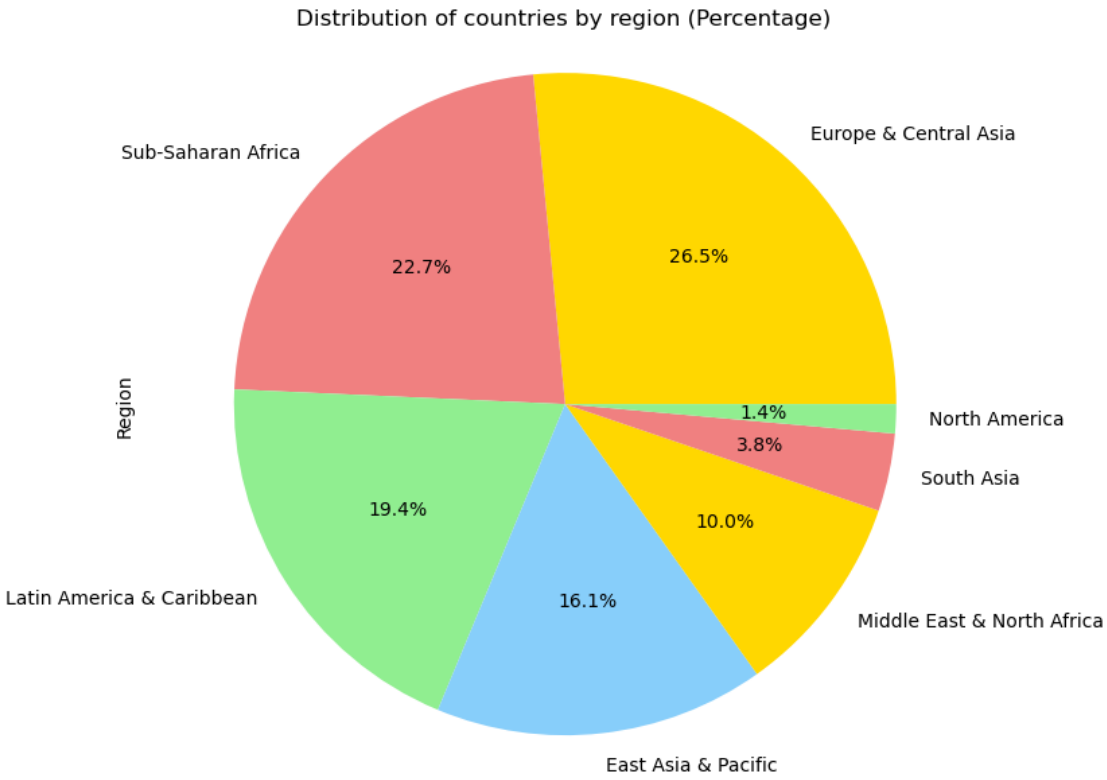
5 Bar Plot

[22]:
```
region_counts = data['Region'].value_counts()

# Create a bar chart
plt.figure(figsize=(10, 6))
region_counts.plot(kind='bar', color='skyblue')
plt.xlabel('Region')
plt.ylabel('Number of Countries')
plt.title('Distribution of Countries by Region')
plt.xticks(rotation=45)
plt.show()
```



6 Pie Plot

[23]:
```
plt.figure(figsize=(15,6))
plt.subplot(1,2,2)
region_percentage = (region_counts / region_counts.sum())*100
colors = ['gold', 'lightcoral', 'lightgreen', 'lightskyblue']

region_percentage.plot(kind='pie', autopct='%1.1f%%', colors=colors)
plt.axis('equal')
plt.title("Distribution of countries by region (Percentage)")

plt.tight_layout()
plt.show()
```


Distribution of countries by region (Percentage)
Sub-Saharan Africa
Europe & Central Asia
22.7%
26.5%
Region
1.4%
North America
3.8%
South Asia
19.4%
10.0%
Latin America & Caribbean
16.1%
Middle East & North Africa
East Asia & Pacific

[ ]: