Importing the packages

In [9]:

```
import numpy
import scipy
import pandas
import matplotlib.pyplot as plt
import sklearn
```

Let's read the data, which contains the immigration statistics of Canada

In [10]:

```
df = pandas.read_csv('immigration_Canada.csv')
df.head()
```

Out[10]:

	Type	Coverage	OdName	AREA	AreaName	REG	RegName	DEV	DevName	1980
0	Immigrants	Foreigners	Afghanistan	935	Asia	5501	Southern Asia	902	Developing regions	16
1	Immigrants	Foreigners	Albania	908	Europe	925	Southern Europe	901	Developed regions	1
2	Immigrants	Foreigners	American Samoa	909	Oceania	957	Polynesia	902	Developing regions	0
3	Immigrants	Foreigners	Andorra	908	Europe	925	Southern Europe	901	Developed regions	0
4	Immigrants	Foreigners	Angola	903	Africa	911	Middle Africa	902	Developing regions	1

5 rows × 43 columns

We will examine the statistics for the year 1984, getting rid of the other columns

In [11]:

```
df1984 = df.loc[:, ['OdName', '1984']]
df1984.head()
```

Out[11]:

	OdName	1984
0	Afghanistan	71
1	Albania	0
2	American Samoa	0
3	Andorra	0
4	Angola	4

We can use dataframe's built-in methods to access various statistics:

In [12]:
```
values = df1984['1984']  # to avoid calling df1984['1984'] every time
average = values.mean()
median = values.median()
mode = values.mode()
print(f"Average: {average:.2f}, median: {median}, mode: {mode}")
```

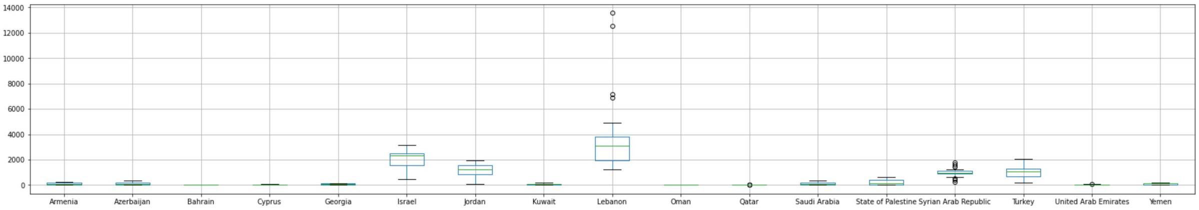
```
Average: 293.14, median: 8.0, mode: 0    0
dtype: int64
```

Mode is equal to 0, which makes sense since countries sharing the same immigration numbers is a rare event. Let's examine the immigration numbers of countries in Western Asia for the years between 1984-2013. It's easier to work with visualized data, so we'll use the built-in boxplot function of pandas.

On a side note, f-string, used in the print statement, is a really useful feature, more features can be found here (https://zetcode.com/python/fstring/).

In [13]:
```
years_to_analyze = [f'{year}' for year in range(1984, 2013)]
df_western_asia = df.loc[df['RegName'] == 'Western Asia']  # filter by column
 value
"""
Since we'll draw a boxplot for each country and use the columns as the values,
we'll
need to work with the transpose of the df
"""
df_western_asia.set_index('OdName')  # change indexing to country names
# df_western_asia.drop()
df_western_asia.set_index('OdName').loc[:, years_to_analyze].T.boxplot(figsize
=(30,5))
```

Out[13]:
```
<AxesSubplot:>
```



The other dataset is the weight and height data collected from 25,000 humans at age 18.

In [14]:

```
hw_df = pandas.read_csv('weight-height.csv')
hw_df.head()
```

Out[14]:

	Gender	Height	Weight
0	Male	73.847017	241.893563
1	Male	68.781904	162.310473
2	Male	74.110105	212.740856
3	Male	71.730978	220.042470
4	Male	69.881796	206.349801

The measurements are in inches and pounds, let's convert them to metric system and calculate the BMI for each data point.

In [15]:

```
hw_df['HeightCm'] = hw_df['Height'] * 2.54
hw_df['WeightKg'] = hw_df['Weight'] * 0.453592
hw_df['BMI'] = hw_df['WeightKg'] / hw_df['HeightCm'] ** 2 * 1e4
hw_df.head()
```

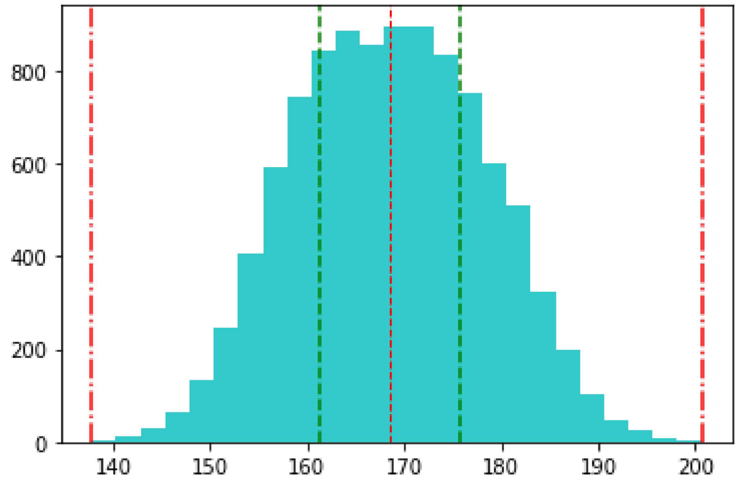
Out[15]:

	Gender	Height	Weight	HeightCm	WeightKg	BMI
0	Male	73.847017	241.893563	187.571423	109.720985	31.185761
1	Male	68.781904	162.310473	174.706036	73.622732	24.121044
2	Male	74.110105	212.740856	188.239668	96.497550	27.232906
3	Male	71.730978	220.042470	182.196685	99.809504	30.067059
4	Male	69.881796	206.349801	177.499761	93.598619	29.708033

Examining the height values:

```
In [28]: height_cm = hw_df['HeightCm']
         fig, ax = plt.subplots()
         ax.hist(height_cm, bins=25, color='c', alpha=0.8)  # histogram
         ax.axvline(height_cm.mean(), color='r', linestyle='dashed', linewidth=1)  # ad
         ding a mean line
         # including the quantiles
         ax.axvline(height_cm.quantile(0),color='r', linestyle='-.')
         ax.axvline(height_cm.quantile(0.25),color='g', linestyle='--')
         # ax.axvline(height_cm.quantile(0.50),color='y', linestyle='--')  # mean and m
         edian are too close, better to draw only one of them
         ax.axvline(height_cm.quantile(0.75),color='g', linestyle='--')
         ax.axvline(height_cm.quantile(1),color='r', linestyle='-.')
         height_cm.describe()
```

```
Out[28]: count    10000.000000
         mean       168.573602
         std          9.772721
         min        137.828359
         25%        161.304276
         50%        168.447898
         75%        175.702625
         max        200.656806
         Name: HeightCm, dtype: float64
```



Coefficient of variation:

```
In [31]: print(f"CV = {height_cm.describe()['std'] / height_cm.describe()['mean'] * 10
         0:.2f}%")
```

```
         CV = 5.80%
```