Problem n.4

File `temperature.txt` contains the max temperature registered at 151 monitoring stations in Europe, during the 365 days of 2021. The dataset also reports the country of the measurement (*Italy* and *Germany*).

a) Perform a smoothing of the data through a projection over a Fourier basis with 21 basis elements. Report the first 3 Fourier coefficients obtained at the Stations 1 and 2.

b) Perform a functional principal component analysis of the smoothed data obtained at point (a). Report the variance explained along the first 5 functional principal components, the plot of the first 3 eigenfunctions and the screeplot. Interpret the principal components.

c) Having reported the plot of the scores along the first 2 functional principal components, use the categorical variable *country* to further enhance the interpretations.

d) Propose a possible dimensionality reduction for the data and discuss the results.

Upload your results here:
https://forms.office.com/Pages/ResponsePage.aspx?id=K3EXCvNtXUKAjjCd8ope6-9AS0GWf2lHjvGX24HiqF
VUQUkxMEFGTkZZMTVBMzBGSUhOQk9ITzVFMy4u