

**Question 2.2:** Fill in the provided code below to generate your sample plot for Total Property Value / GDP!

```
In [21]: fig = px.choropleth(data, # This is the name of your dataset
                             locations='Code', # Which column are the country codes stored in?
                             color=pd.cut(data['Total Property Value / GDP'],
                                             bins=[0, 0.015,0.05,0.1,0.2,1,140]).astype(str).fillna('No Data'),
                                             #These are our sample bins, feel free to mess around with them
                             hover_name = data.index, # Which column are the country names stored in?
                             hover_data={"Total Property Value / GDP":":.1f", "Rank":":",},
                             # Change the above line so we can see the ratio of property value to GDP t
                             color_discrete_sequence=px.colors.sequential.BuPu,
                             #Feel free to mess around with colors if you're interested
                             title = 'Total Property Value/GDP by Country', # Write an appropriate titl
                             height = 900
                             )
fig.update_layout(
    geo=dict(
        showframe=False,
        showcoastlines=False,
        projection_type='mercator'
    ),
    margin=dict(l=50, r=50, t=50, b=50),
)
fig.show()
```



**Question 2.3:** Using the code above, generate a similar plot for Total Property Values. Make sure the color bins and title are appropriate. However, make this plot 3D.

*Hint:* which line of code above references a 2D projection of the Earth? Here's a [list of supported projections](#).

```
In [22]: data['Rank'] = data['Total Property Values'].rank() # rank the data
fig = px.choropleth(data, #This is the name of your dataset
                    locations='Code', # Which column are the country codes stored in?
                    color=pd.cut(data['Total Property Values'],
                                bins=[0, 0.001*1000000000,0.01*1000000000,0.1*1000000000,0.5*1000000000],
                                #These are our sample bins, feel free to mess around with them
                                hover_name = data.index, # Which column are the country names stored in?
                                hover_data={"Total Property Values":":.1f", "Rank":":"},
                                # Change the above line so we can see the ratio of property value to 2 dec
                                color_discrete_sequence=px.colors.sequential.BuPu,
                                #Feel free to mess around with colors if you're interested
                                title = 'Total Property Values by Country', # Write an appropriate title
                                height = 900
                    )
fig.update_layout(
    geo=dict(
        showframe=False,
        showcoastlines=False,
        projection_type='orthographic'
    ),
    margin=dict(l=50, r=50, t=50, b=50),
)
fig.show()
```



**Question 3.2:** Write a function that takes in a column name and generates a 3D plot visualizing that column data. Name the function `plot_generator`. Feel free to assign the column name as the plot title.

```
In [28]: def plot_generator(col):
    data_new = data.copy()
    data_new['Rank'] = data_new[col].rank() # generate ranking
    fig = px.choropleth(data_new,
                        locations = data_new['Code'],
                        color=pd.cut(data_new[col],
                                    bins=data_new[col].quantile(q=[0.0,0.2,0.4,0.6,0.8,1.0]),d
                        hover_name = data_new.index,
                        hover_data={col:":.2f", "Rank":":"},
                        color_discrete_sequence=px.colors.sequential.BuPu,
                        title = f'{col} by country',
                        height = 900
                    )
    fig.update_layout(
        title_text=f'{col} by country',
        geo=dict(
            showframe=False,
            showcoastlines=False,
            projection_type= 'orthographic'
        ),
        margin=dict(l=50, r=50, t=50, b=50),
    )
    fig.show()
```



**Question 3.3:** Using the widget that you generate above. Name one country that has both a high total property value invested in Dubai and a high total property value / GDP. What does that potentially imply about income inequality in that country? This is an open-ended question.

Although the graphs are visually appealing – scrolling back and forward between multiple graphs is tedious, and I, therefore, start by looking at the countries in the top decile both in 'Total Property Values' and 'Total Property Value / GDP' with a regular table

```
In [32]: upper_decile = data['Total Property Values'].quantile(0.9)
TPV_upper_decile = data[data['Total Property Values'] > upper_decile].reset_index()
TPV_upper_decile = TPV_upper_decile[['Country', 'Total Property Values', 'GDP (current USD, 20

upper_decile = data['Total Property Value / GDP'].quantile(0.9)
TPVGDP_upper_decile = data[data['Total Property Value / GDP'] > upper_decile].reset_index()
TPVGDP_upper_decile = TPVGDP_upper_decile['Country']

merge = TPV_upper_decile.merge(TPVGDP_upper_decile, how='inner', on='Country').set_index('Country')
display(merge)
```

Total Property Values \	
Country	
Kuwait	3.795782e+09
Pakistan	1.063164e+10
Lebanon	3.398557e+09
Syria	2.976197e+09
Jordan	5.197686e+09
United Arab Emirates	2.872459e+11

  

GDP (current USD, 2018 or latest available - for coverage) \	
Country	
Kuwait	1.380000e+11
Pakistan	3.150000e+11
Lebanon	5.530000e+10
Syria	4.040000e+10
Jordan	4.290000e+10
United Arab Emirates	4.220000e+11

  

Total Property Value / GDP	
Country	
Kuwait	2.75
Pakistan	3.38
Lebanon	6.15
Syria	7.37
Jordan	12.11
United Arab Emirates	68.04

As the table above shows, six countries appear in the upper decile of both 'Total Property Values' and 'Total Property Value / GDP'. Unsurprisingly, one of them is the UAE itself, while the rest are Middle Eastern countries. A likely reason for the countries to be there is a relatively high inequality in respective

countries. To be on this list, they must have some really wealthy people who can afford expensive property in Dubai while maintaining a relatively low GDP.