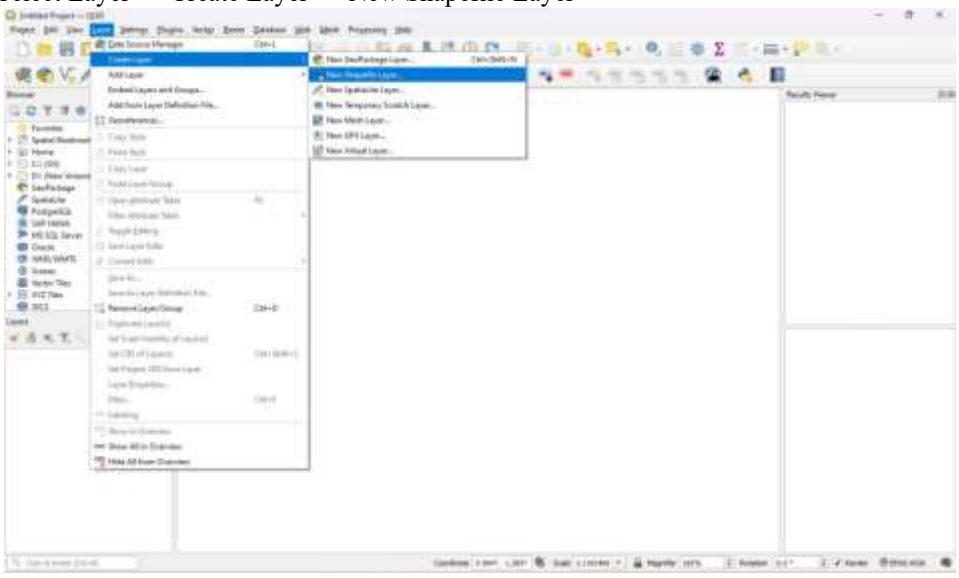
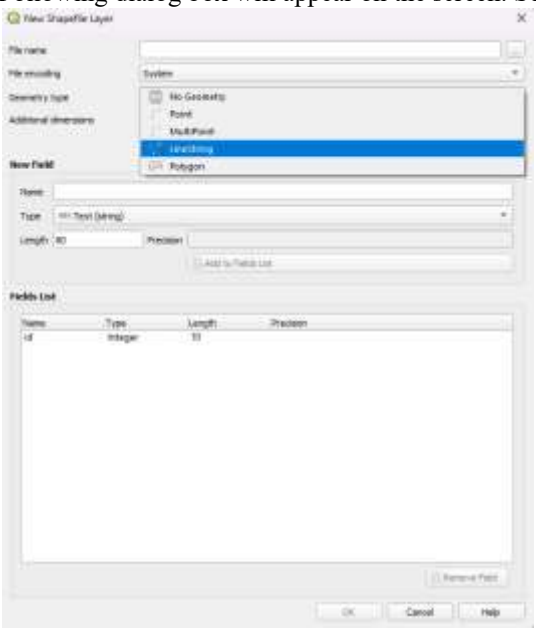
Practical – 1		Date:-19/07/2024
Aim:-	Creating and Managing Vector Data	

Steps:-	Select Project → New Select Layer → Create Layer → New Shapefile Layer  Following dialog box will appear on the screen. Select Polygon option from Geometry type.  Fill the appropriate information in each text box. Click on Add to Field List Button. Click Ok. Follow the steps to plot Polygon Features. Select the polygon Feature from layer panel. Click Toggle Editing Button → Click on Add Polygon →Now place the cursor at the location where you want to place the polygon. for polygon layer minimum 3 points should be selected Save the newly added polygon as follows Set style for polygon by using property window

Same way we can add one more polygon layer for ground.

Creating Line vector layer

Repeat the same steps as we have done for polygon layer.

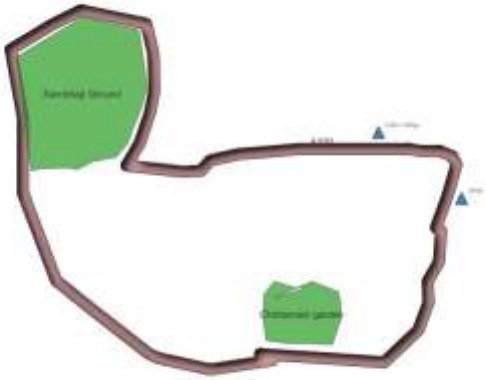
Select geometry type Line. **Road layer:**

To plot road, click on Add Line Feature

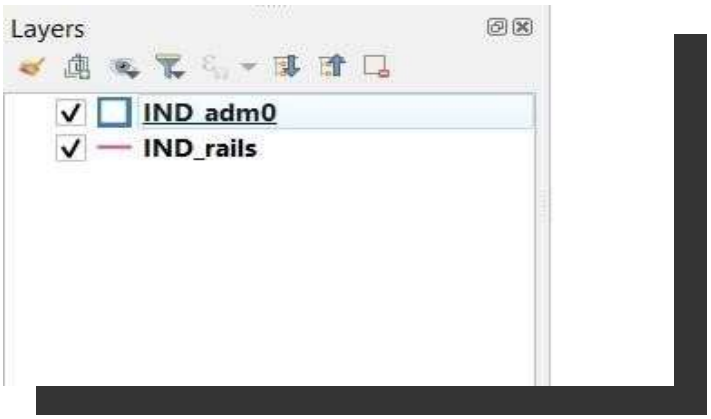
Click on the map where you want to draw line.

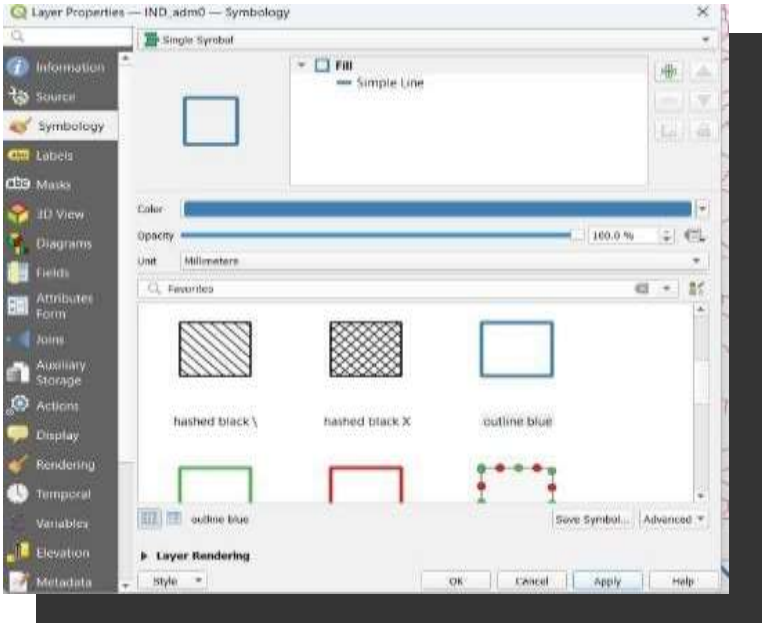
set style for Roads in the same way as we have done for polygon

Check Enable symbol levels option as soon as show the road appear as follows.

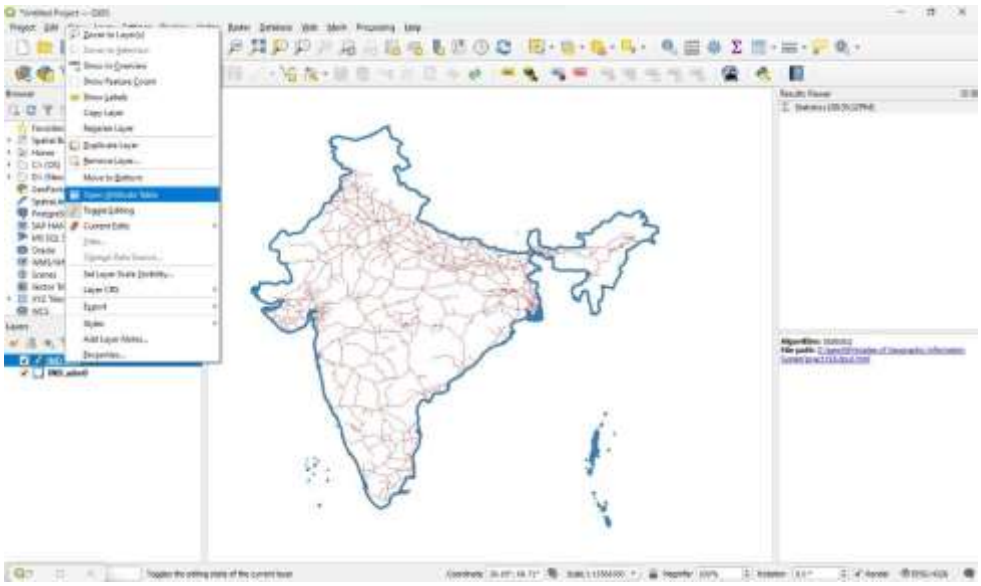
Final Output:-	

Practical(1b):-	**Calculating Line, Lengths and Statistics.**	Date:-
Steps:-	Go to Layer → Add Layer → Add Vector Layer Add the following file to project "\GIS_Workshop\Practicals\Practical_01\D\DATA\IND_rrd\IND_rails.shp" Press "ADD" Also add India Administrative Map "GIS_Workshop\Practicals\Practical_01\D\DATA\IND_adm\IND_adm0.shp" Double Click on IND_adm0	


Layers
IND_adm0
IND_rails

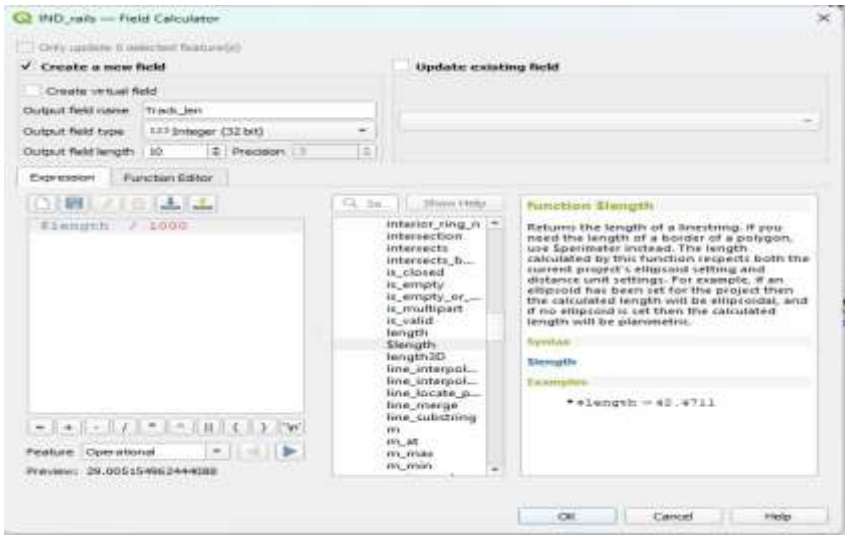

Layer Properties — IND_adm0 — Symbology
Single Symbol
Information
Source
Symbology
Labels
Masks
3D View
Diagrams
Fields
Attributes Form
Joins
Auxiliary Storage
Actions
Display
Rendering
Temporal
Variables
Elevation
Metadata
Fill
Simple Line
Color
Opacity
100.0 %
Unit
Millimeters
Favorites
hashed black \
hashed black X
outline blue
Save Symbol...
Advanced
Layer Rendering
Style
OK
Cancel
Apply
Help

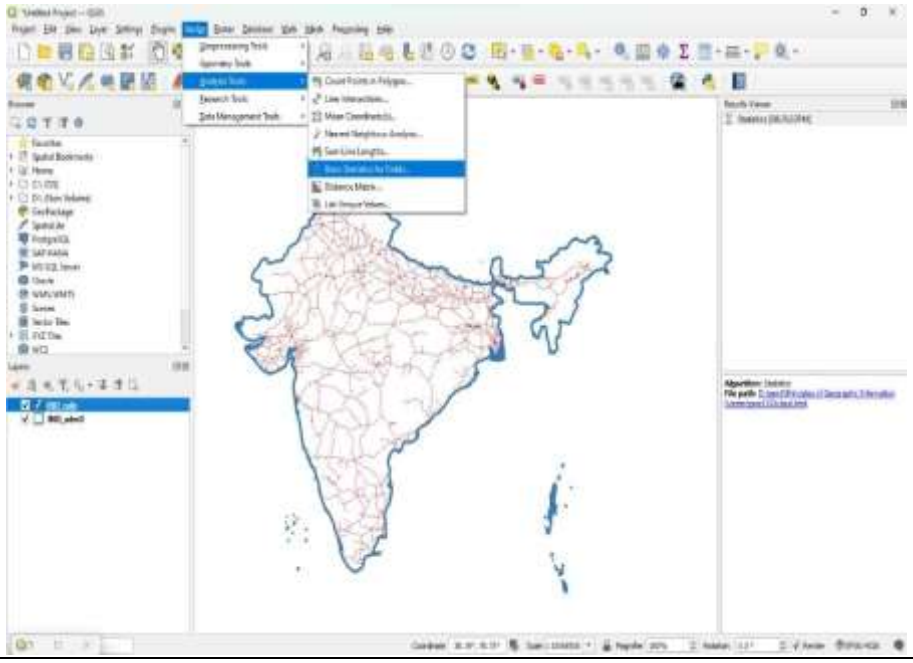
In Layer Pane, Right click on IND_rails → Open Attribute Table.



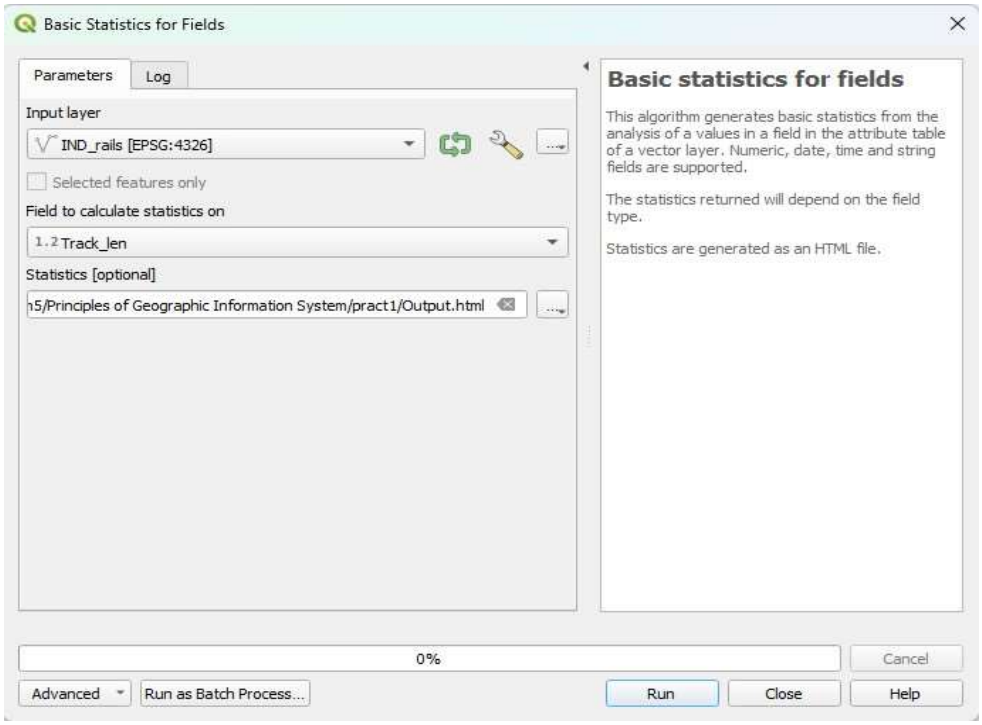
Press Toggle Editing button using button, on Attribute table window toolbar.

Press Open Field Calculator using button
Set the output field as “Track_Len”, field type to “Decimal Number”.

	From Function List search $length or go to Geometry → Select $length Set  expression as follows Press “OK” Press CTRL+S or click on Save Edits option on tool bar Close the attribute table window. For calculating the total length of Railway tracks in India. Select Vector→ Analysis Tools→ Basic Statics for Fields



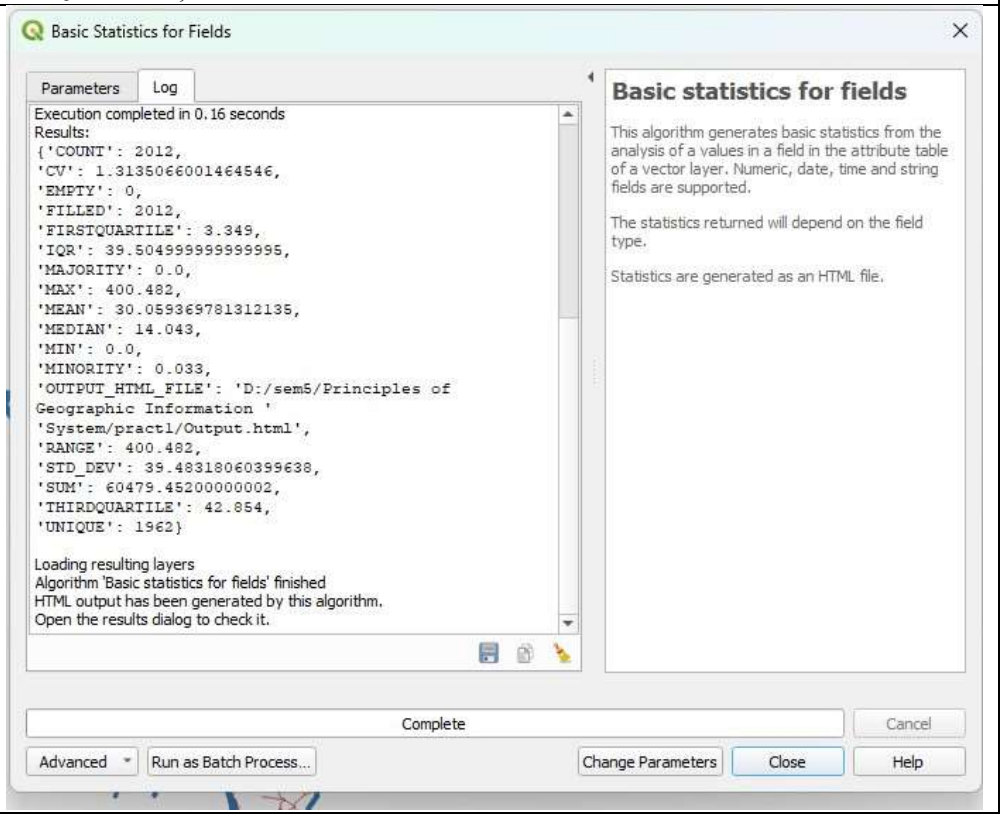
Select IND_rails layer from input layer. And select Track_Len in “Field to Calculate

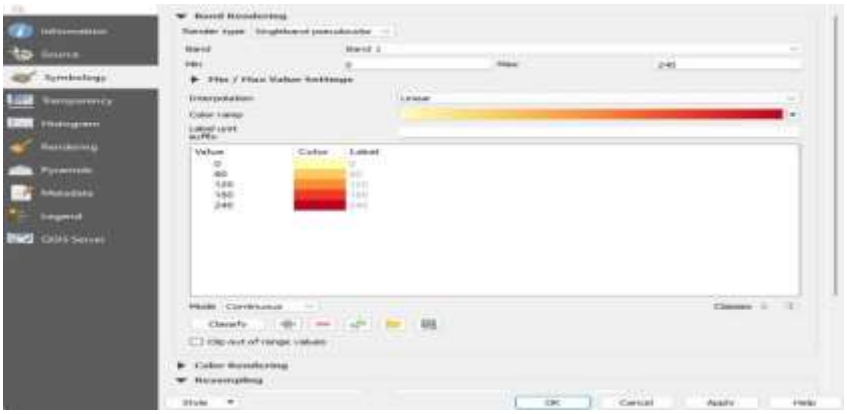


statistics on”

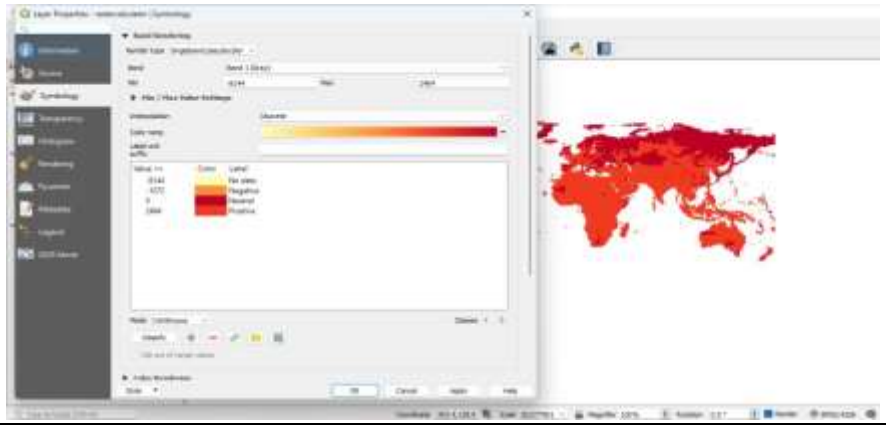
Press RUN
Open the “output.html” file to get the field statistics. Results:
{'COUNT': 2012,
'CV': 1.3135066001464546,
'EMPTY': 0,
'FILLED': 2012,

	'FIRSTQUARTILE': 3.349, 'IQR': 39.504999999999995, 'MAJORITY': 0.0, 'MAX': 400.482,

	'MEAN': 30.059369781312135, 'MEDIAN': 14.043, 'MIN': 0.0, 'MINORITY': 0.033, 'OUTPUT_HTML_FILE': 'D:/sem5/Principles of Geographic Information ' 'System/pract1/Output.html', 'RANGE': 400.482, 'STD_DEV': 39.48318060399638, 'SUM': 60479.45200000002, 'THIRDQUARTILE': 42.854, 'UNIQUE': 1962}
Final Output:-	

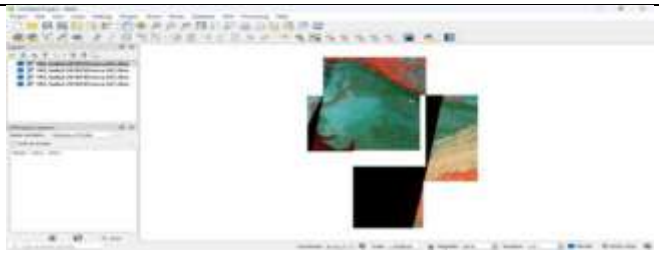
Practical 2	Date:-01/08/2024
Aim:	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping.
a)	Adding raster layer, raster styling and analysis.
Procedure :	1. Click layer -> Add Layer -> Add Raster Layer. 2. Browse to the location of the raster (glds90ag60 and glds00ag60) from dataset. 3. Add both raster. Then change the properties of the raster. Properties ->symbology -> render type = Singlebandpseudocolor, min = 0, max = 240. Press apply and ok. Repeat same for other raster.  4. Go to raster menu and open raster calculator and add the following expression and browse the location where you want to save the result file and click ok.

5. The result is added as a raster.
6. Now change the properties of the new raster
   Properties ->symbology -> render type = Singlebandpseudocolor, min = -20000, max = 6000, interpolation = discrete, change label of values as shown below, then click apply and ok.



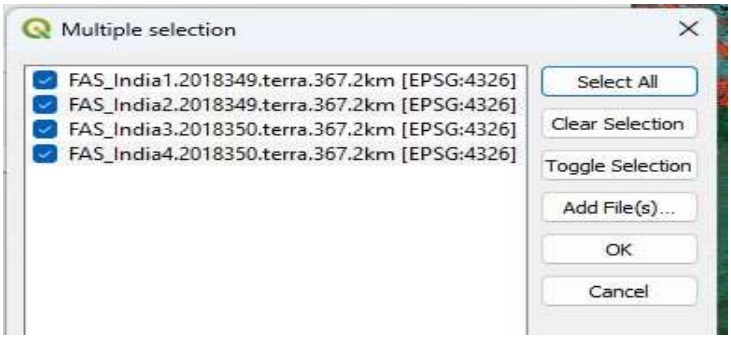
	 7. Output:
b)	Raster mosaicking and clipping.

Procedure :	1. Go to layer -> add layer -> add raster layer. Add the following .tif images from the data set. FAS_India1.2018349.terra.367.2km.tif, FAS_India2.2018349.terra.367.2km.tif, FAS_India3.2018350.terra.367.2km.tif, FAS_India4.2018350.terra.367.2km.tif. 2. Click open then add the raster

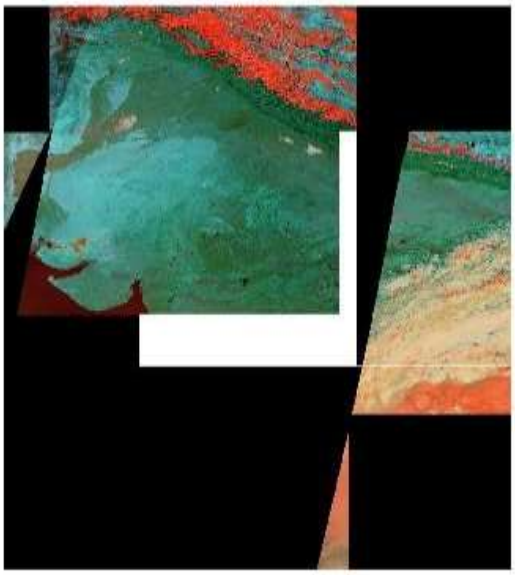


3. Go to raster -> miscellaneous -> merge.

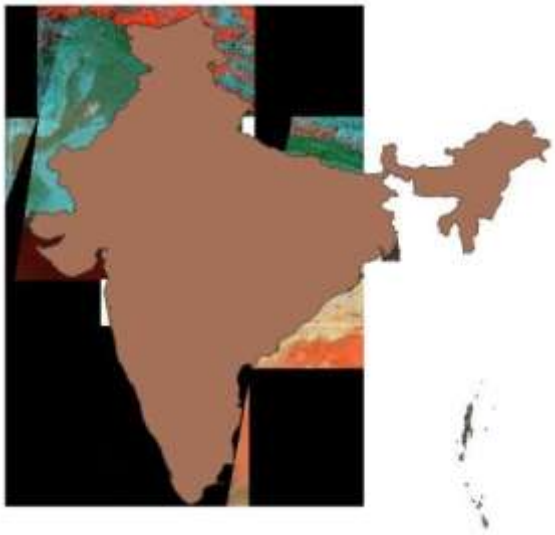
4. In the merge window, click on 3 dots beside input layer and select all 4 layers and click OK.



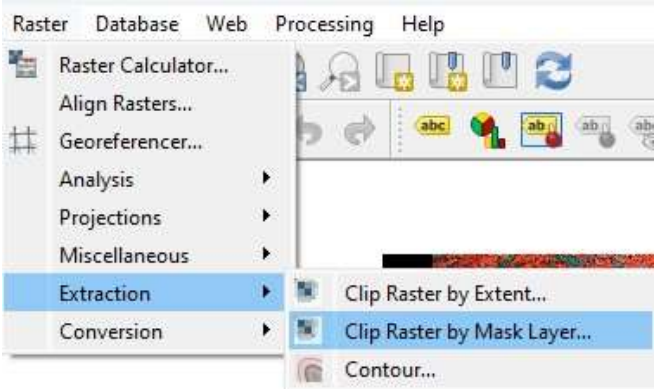
5. In the merge dialog window select a file name and location to save the file and click RUN.



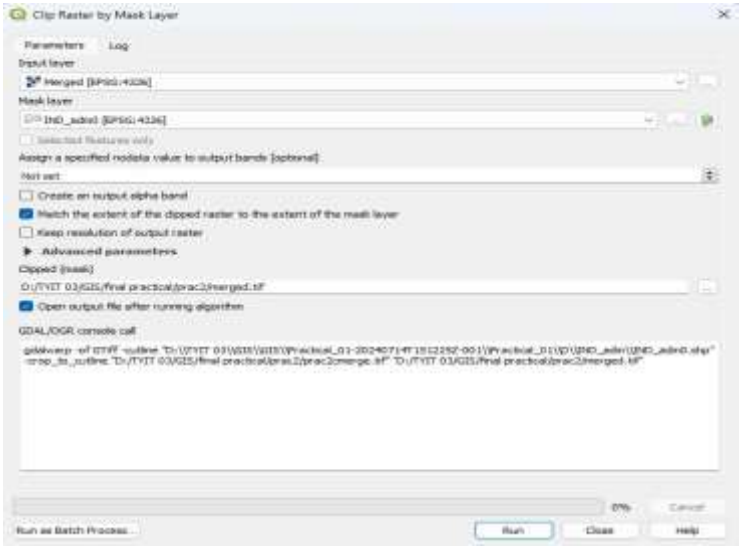
	6. Go to layer -> add layer -> add vector layer, and add the vector layer of India.



7. Go to properties of the vector and select any of the outlines and click OK.
8. Go to raster -> extraction -> clip raster by mask layer.

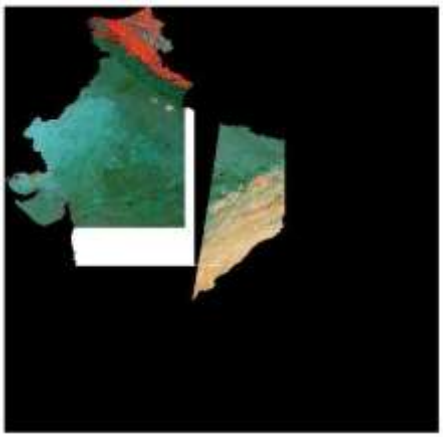


9. In clip raster by mask layer :
   Select the merged layer as input layer and save the file in your location and click RUN.

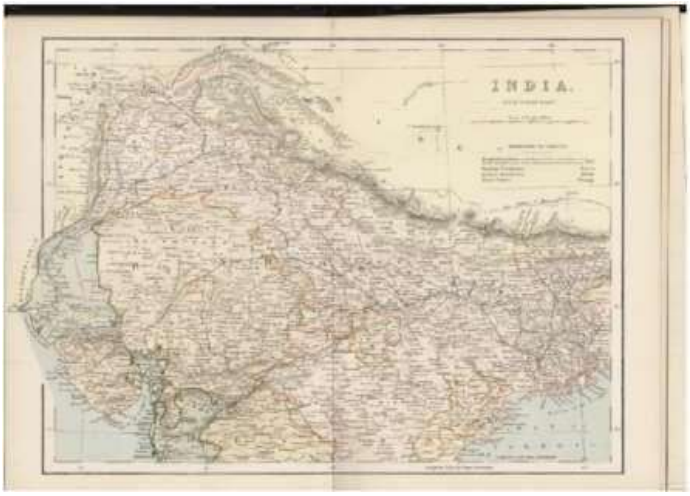
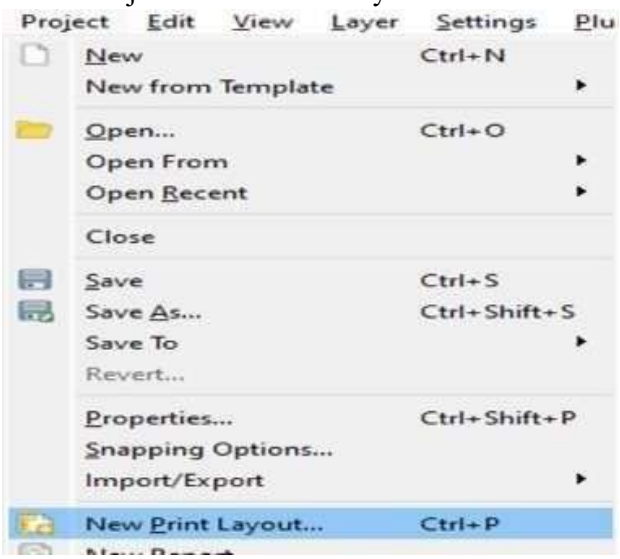


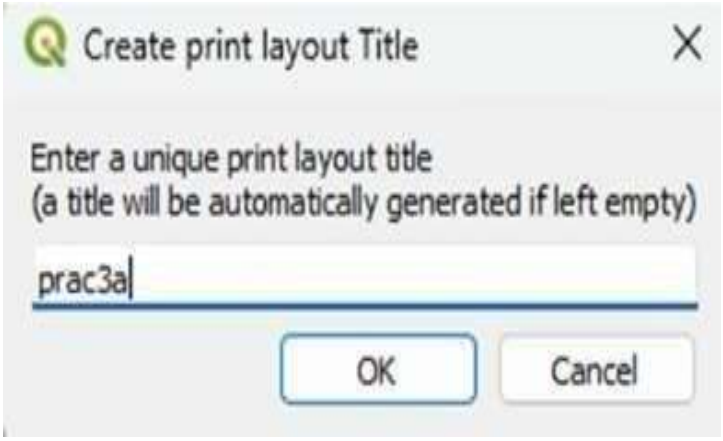
10. A new clipped raster gets added as the result. Output :

Roll No :-A064 Name :- Nikesh Punaji Sabale

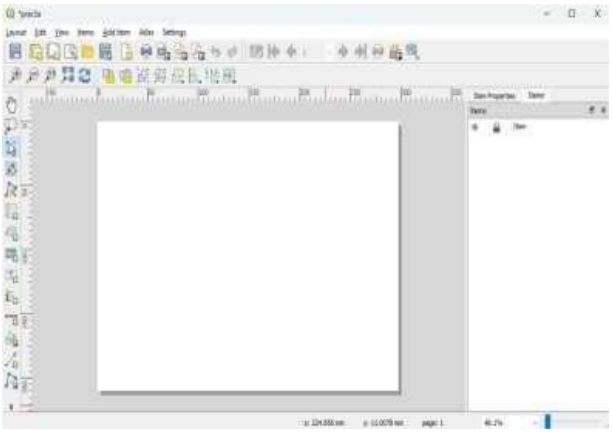
	

Roll No :-A064 Name :- Nikesh Punaji Sabale

Practical 3	Date:-22/07/2024
Aim:	Making a map, Working with attributes, Importing spreadsheets or CSV files, Using plugins, Searching and downloading OpenStreetMap data.
a)	Making a map, working with attributes.
Procedure :	1. Consider the following map as an example map.  2. Go to Project → New Print Layout.  3. Insert a suitable title and press "OK".

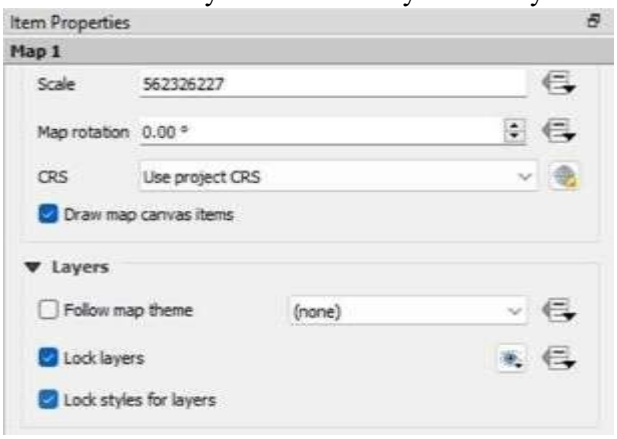


4. A new Print Layout window will open.



5. Select Add Item → Add Map.

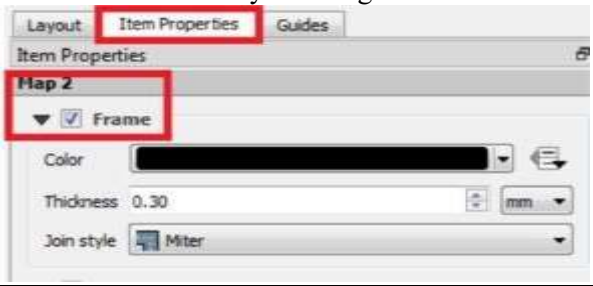
6. After adding map go to Item Properties → Map1→ Layers.
7. Check on Lock Layers and Lock Styles for Layers.



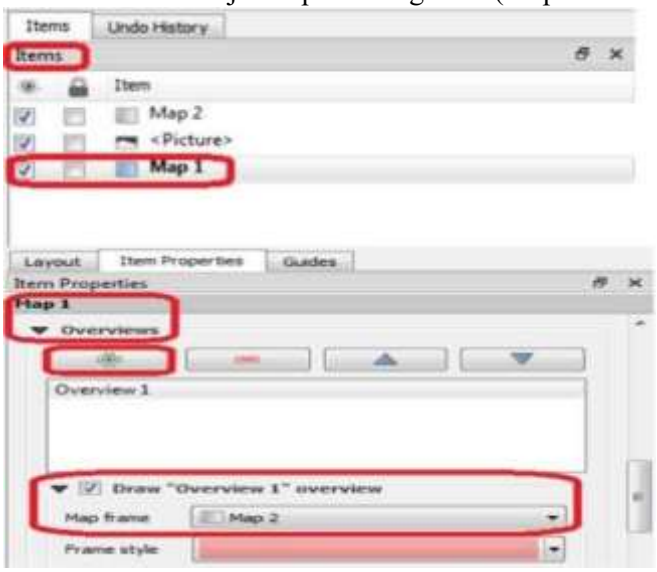
8. This will ensure that if any change in layers or change their styles, the Print Layout view will not change.
9. Go to Add Item → Add Picture → Place a picture box at appropriate location.

10. Also adjust Image Rotation to its appropriate value.
11. Item Properties → Image Rotation.

12. Add an inset Using Add Item → Add Picture → Select an area to be highlighted on main Map.
13. Set a frame for Inset by enabling the check box for Frame.



14. To highlight the area shown in Inset.
15. Select the Picture representing main Map from Items pane.
16. In Item Properties → Overviews → using icon add an overview.
17. Select the checkbox Draw Overview.
18. Name the Picture object representing inset (Map1 in our case).



19. Add Item → Add Label.
20. Change the Label text To "Mumbai Map", Set appropriate font size and color using Item Properties→ Main Properties

21. Add Item → Add Legend→ Place the legend indicator at appropriate location.

22. Uncheck auto update and use suitable legend indicator label 23. Add Item → Add Scale Bar.

24. Add Item → Add Label → Add a Label using HTML rendering.

Roll No :-A064 Name :- Nikesh Punaji Sabale

Practical 4		Date:-22/07/2024
Aim:	Working with attributes, terrain Data.	
a)	Working with map.	

Roll No :-A064 Name :- Nikesh Punaji Sabale

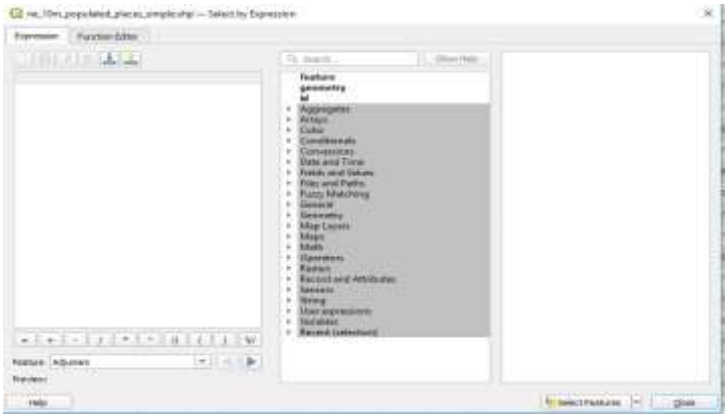
Procedure:

1. Start new project.
2. Go to Layer -> Add Layer -> Add Vector Layer.
3. Select G:\SEM_5\GIS\Practical_04\A\ne_10m_populated_places_simple.zip.

4. Right click on layer in Layer Panel -> Open Attribute table.
5. Explore various attributes and their values in attribute table.
6. To find the Place with the maximum population click on

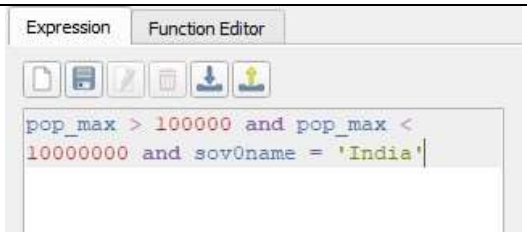
pop_max.

7. On clicking the Select feature using expression button, the



following window will appear.

8. Enter the expression as pop_max > 100000 and pop_max < 10000000 and sov0name = 'India'.

<table>
<tr>
<td></td>
<td>


9. After entering the expression click the select features button at the bottom.
10. The places matching the criteria will appear in different colour.

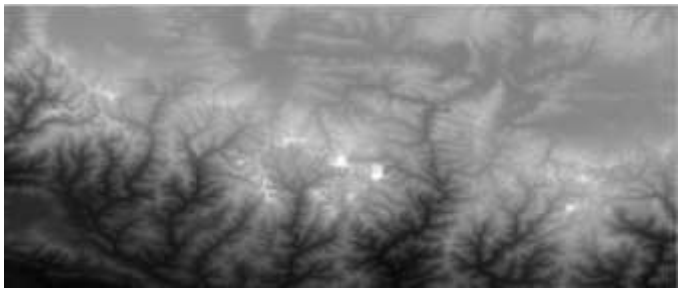
11. The output of the following will be:
</td>
</tr>
<tr>
<td>b)</td>
<td>Terrain data</td>
</tr>
</table>

Roll No :-A064 Name :- Nikesh Punaji Sabale

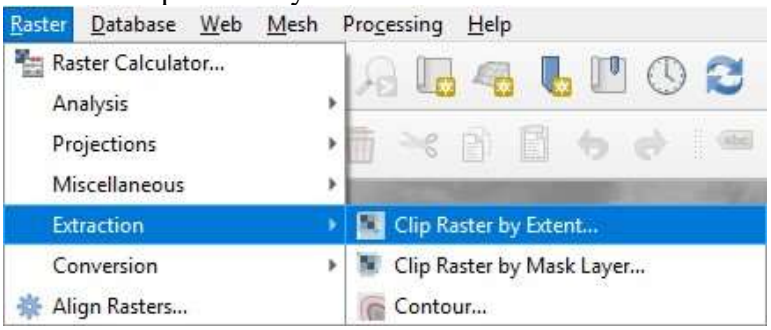
Procedure:

1. Go to Layer -> Add Layer -> Add Raster Layer. 2. Select G:\SEM5\GIS\Practical_04\B\10n060e_20101117_gmted_mea300.tif.
3. Click Add.
4. The lower altitude regions are shown using the dark color and higher altitude region using light shade as seen on top region containing Himalaya and Mt. Everest.

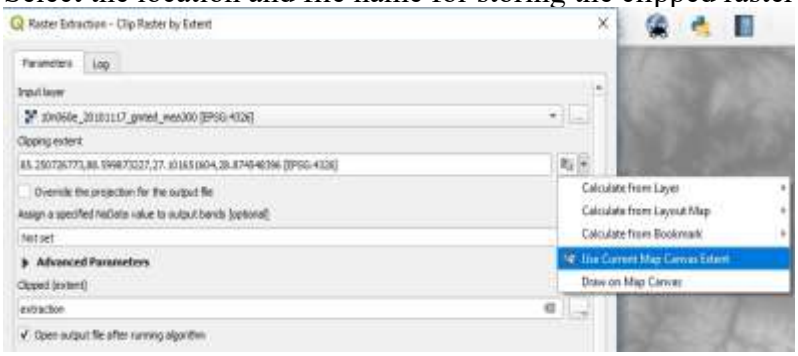
5. Mt. Everest is located at the coordinates 27.9881, 86.9253 and set scale to 1:1000000 and press Enter.



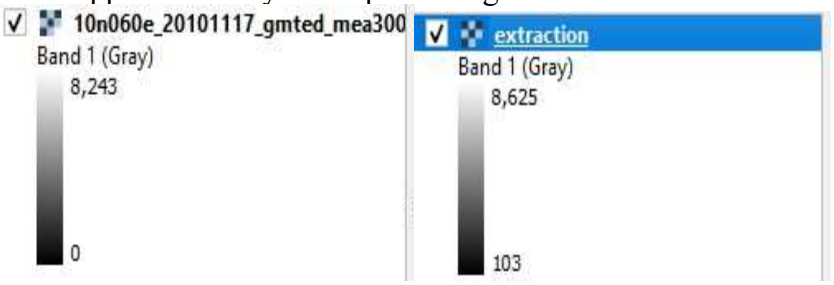
6. To crop the raster layer only for the region under study, Go to Raster ->Extraction -> Clip Raster by Extent.



7. Select the Raster layer as Input Layer, then Select the Clipping area by selecting the option Use Canvas Extent to select the visible part of the map.
8. Select the location and file name for storing the clipped raster layer.

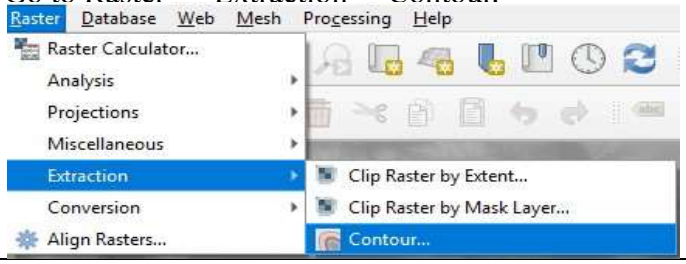


9. Click on Run.
10. Deselect the original layer and keep the clipped one.
11. The Clipped raster layer is representing altitude from 103 Meters.

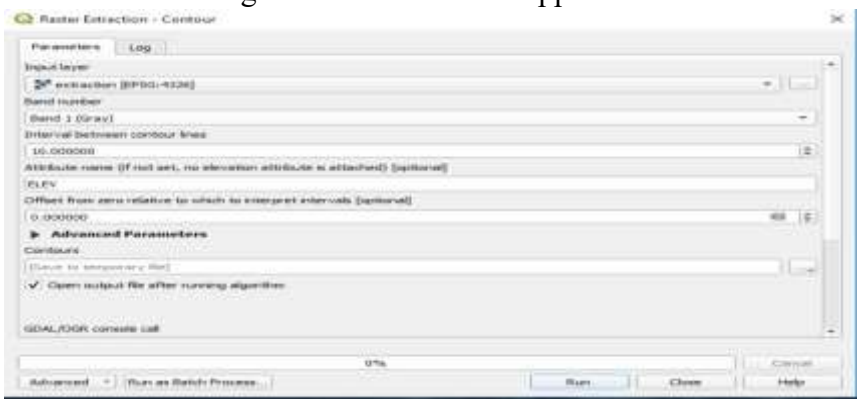


Original Raster Clipped Raster

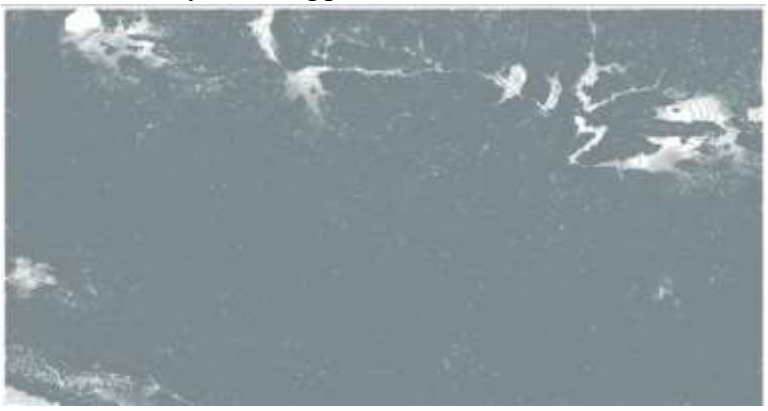
12. Counter lines are the lines on a map joining points of equal height above or below sea level. A contour interval in surveying is the vertical distance or the difference in the elevation between the two contour lines in a topographical map.
13. To derive counter lines from given raster.
14. Go to Raster → Extraction→ Contour.



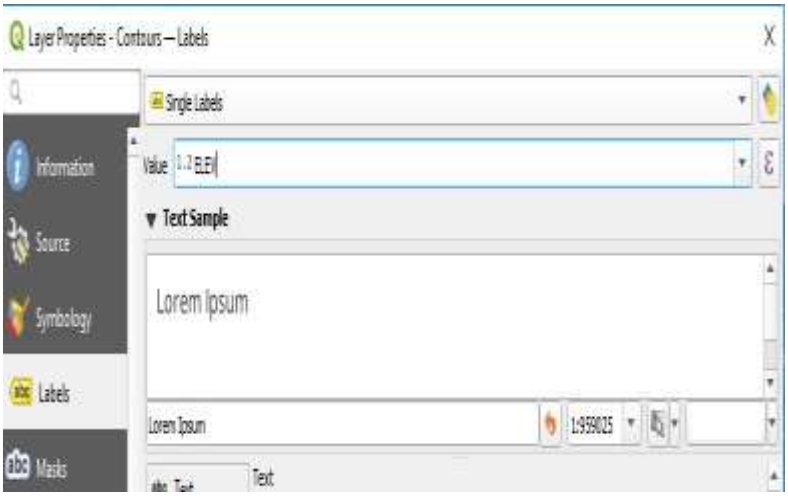
15. The Contour configuration window will appear.



16. Select the input raster layer name. Set contour interval 10.00 meters, select the output file name & location and check the option to add output file to project after processing.
17. Press "RUN".
18. The contour layer will appear like this.

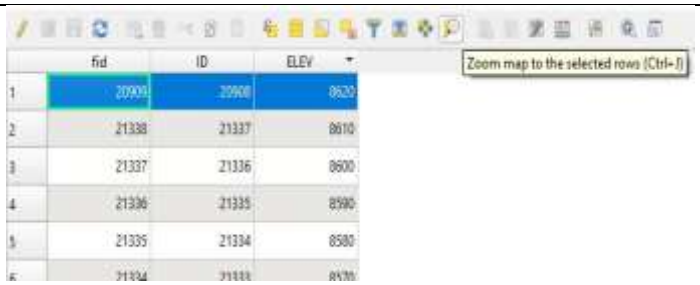


19. Label the layer using "ELEV" field and set appropriate symbols for

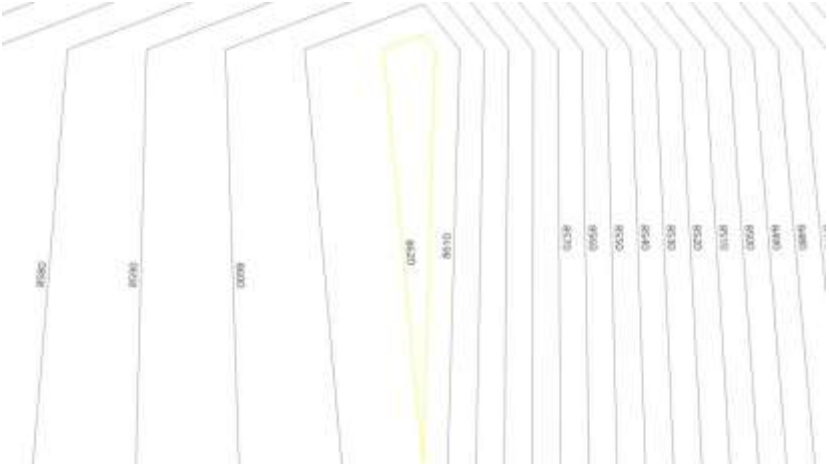


line.

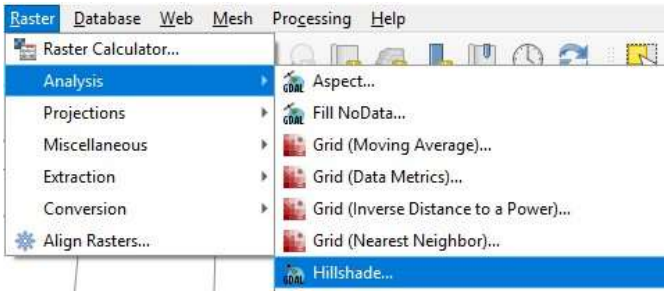
20. In the Layer panel right click on Contour Raster Layer and select "Open Attribute table".
21. Arrange the table in descending order based on the value of "ELEV" column.



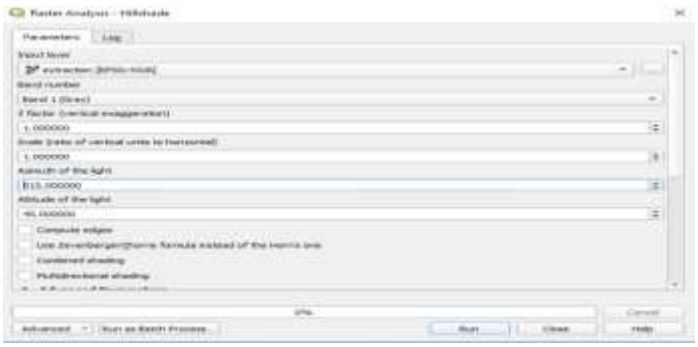
22. The layer appears like this:



23. For Hill Shade surface analysis.
24. Go to Plugin → Install Georeferencer GADL.
25. After successful installation of plugin Go to Raster → Analysis → Hill Shade.



26. Select the input raster layer, select file name and location for storing Hill Shade output file.



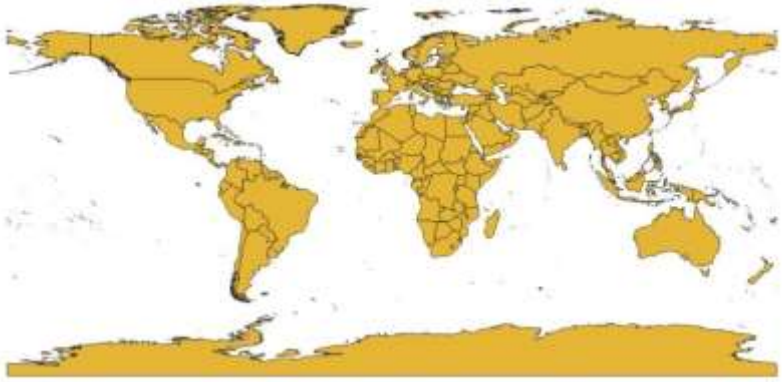
27. Press "RUN" and Close the Hill Shape Dialog window.
28. After Raster styling the Output will appear like this:

Practical 5	Date:-21/09/2024
Aim:	Working with Projections and WMS Data.

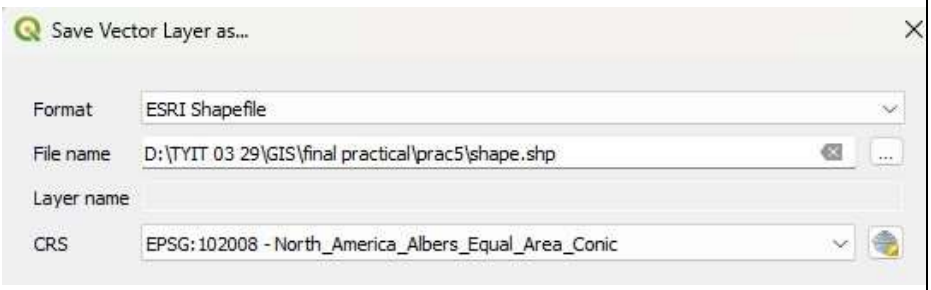
Roll No :-A064 Name :- Nikesh Punaji Sabale

Procedure:

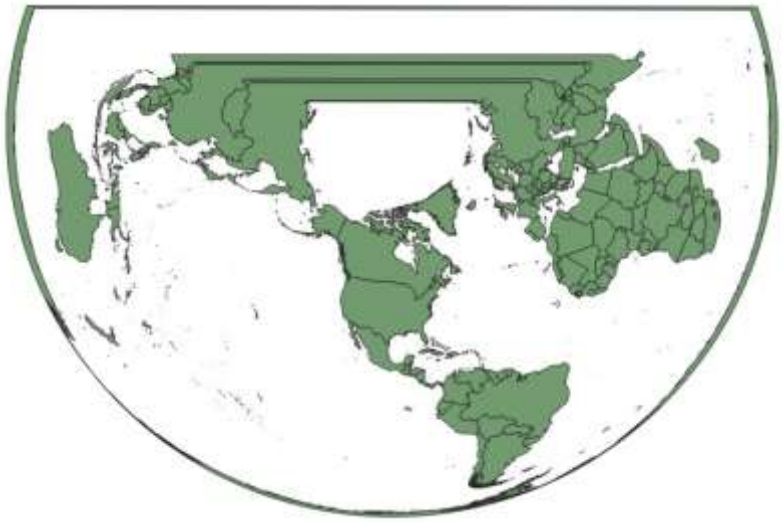
1. Start new project.
2. Go to Layer -> Add Layer -> Add Vector Layer.
3. Select D:\TYIT0329\GIS\GIS\Practical_0520240714T151340Z001\Practical_05\A\ne_10m_admin_0_countries\ne_10m_admin_0_countries.shp file.



4. Go to Layer -> Save as.
5. Select format as ESRI Shape File
6. Select folder location and file name

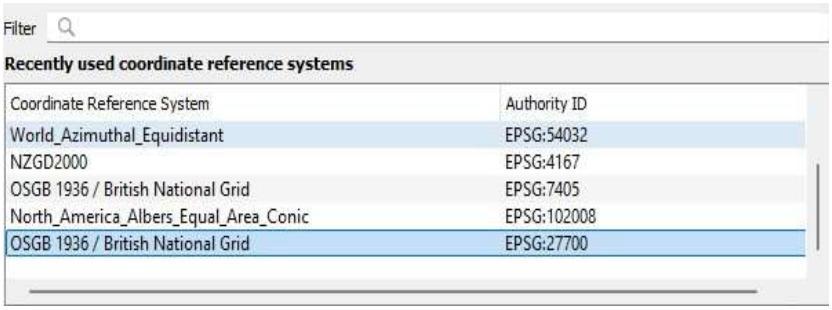


7. Set CRS North_America_Albers_Equal_Area_Conic EPSG: 102008.
8. Press "OK".
9. Deselect the original Image and keep the projected layer visible.



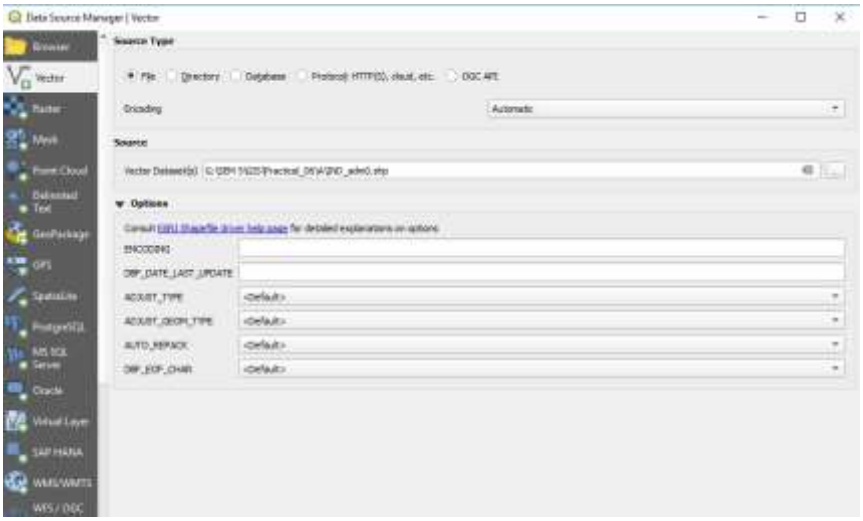
10. Select Layer → Add Layer → Add Raster Layer.

11. Select MiniScale_(standard)_R17.tif from Location. "GIS_Workshop\Practicals\Practical_05\DATA \minisc_gb\minisc_gb\data\RGB_TIF_compressed\MiniScale_(standard)_R17.tif" file.
12. The Layer appears on a different location than the location where Great Britain is shown on Map.
13. Open Layer Properties→ CRS → Select British National Grid EPSG 27700.



14. Processing may take some time.
15. Locate United Kingdom on Layer; the vector layer exactly coincides by the raster layer covering United Kingdom.

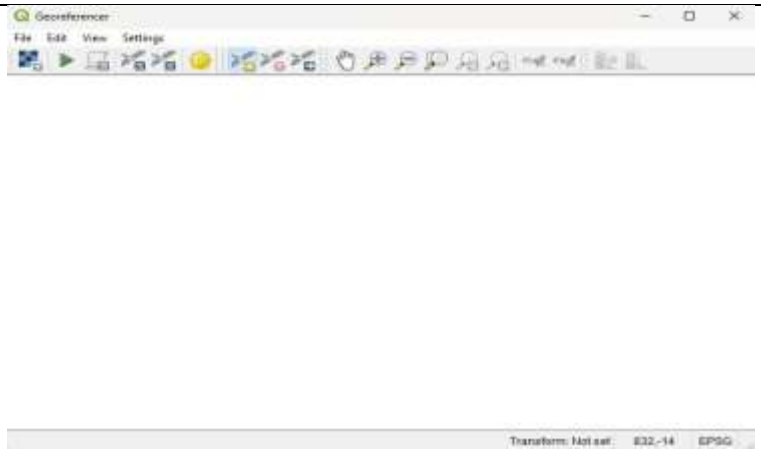
Roll No :-A064 Name :- Nikesh Punaji Sabale

Aim:	Georeferencing Topo Sheets and Scanned Maps Georeferencing.
Procedure:	1. Layers -> Add Layer -> Add Vector Layer.  2. Select GIS\GIS PRACTICALS\Practical_06\A\IND_adm0.shp file.

3. It will look like this:

4. Go to Raster -> Georeferencer.

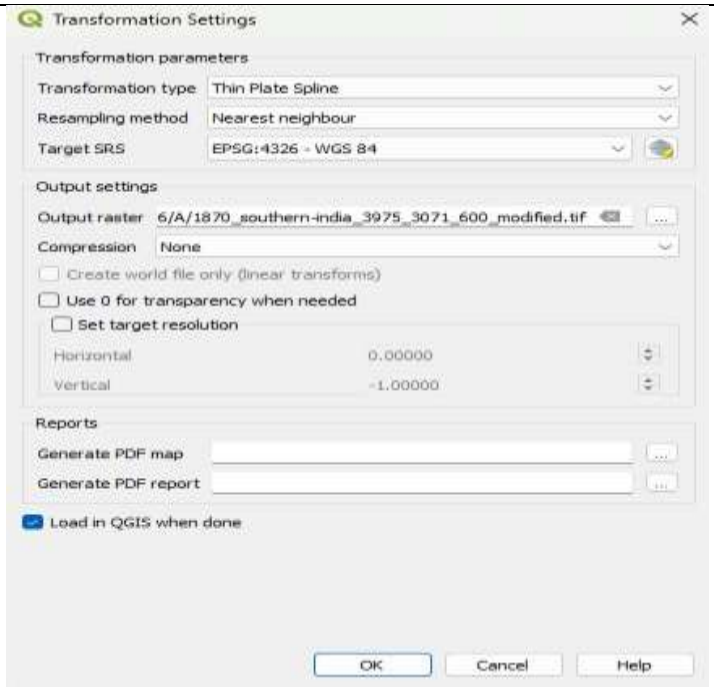
5. A new Georeferencer window will open.



6. File → Open Raster.
7. Select file "1870_southern-india_3975_3071_600.jpg" from project data folder.
8. Add points (70:15), (70:5), (80:5), (90:5), (85:15) on the raster.
9. It will look like this:

10. Then Go to Settings →Transformation Settings.
11. In the Transformation Settings:

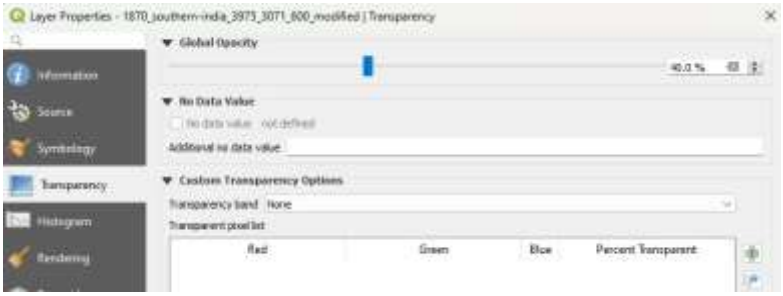
- Select Transformation type → Thin Plate Spline.
- Re-sampling Method → Nearest Neighbour.
- Target TRS → Everest 1830 datum: EPSG 4044.
- Select Output Raster Name and Location.
- Check the Load in QGIS When Done Option.
- Press "OK".



12. Then Go to File → Click Start Georeferencing.

13. The canvas area will now have the scanned map of Mumbai referenced with control points.

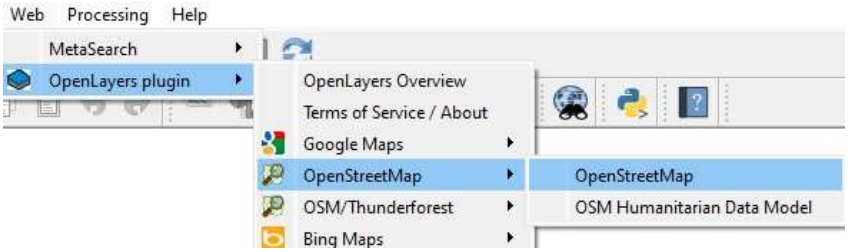
14. Select the newly added layer in Layer Panel Right click and go to property.



15. Final output will be like this:

b) Georeferencing Aerial Imagery

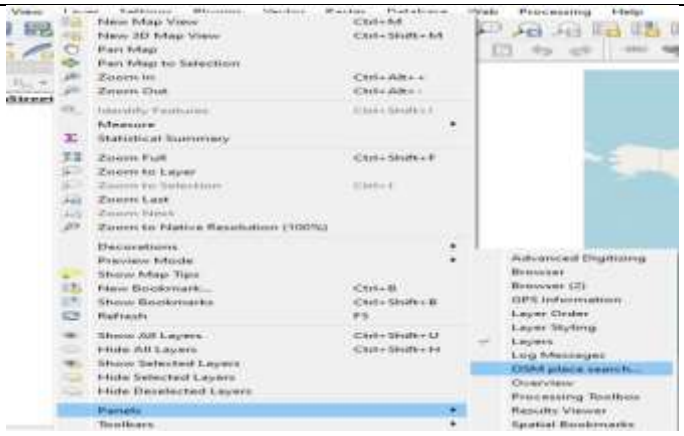
1. Install plug-in OpenStreetMap.
2. Go to Web Menu → OpenLayerPlugin → OpenStreetMap→



OpenStreetMap

3. Go to Project → Properties → Set CRS to EPSG 3857.

4. Go to View → Panels → select OSM Place search



5. The Gateway of India, Mumbai is located at 18.92°N 72.83°E.

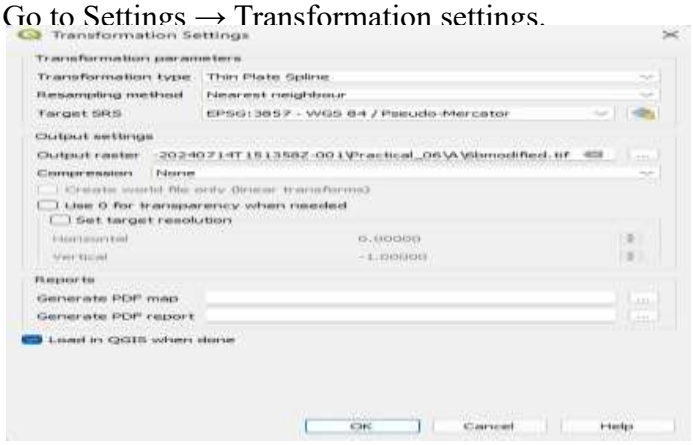
6. Search Gateway of India in OSM Search Panel.

7. Zoom in to appropriate level.

8. The map will appear like this.

9. Go to Raster → Georefrencer.
10. A new Georeferencer window will open.
11. File → Open Raster.
12. Select file "Gateway_Imagery.tif" from project data folder.
13. Go to Edit → Add Point.
14. Select control points from map (Indicated in red color).
15. Add points in following places:

16. Go to Settings → Transformation settings.



17. Go to File → Start Georeferencing or Press the button in Georeferencing Window.
18. The progress indicator will appear.
19. Observe that the aerial image of the Gateway of India is georeferenced on OSM in the map canvas.

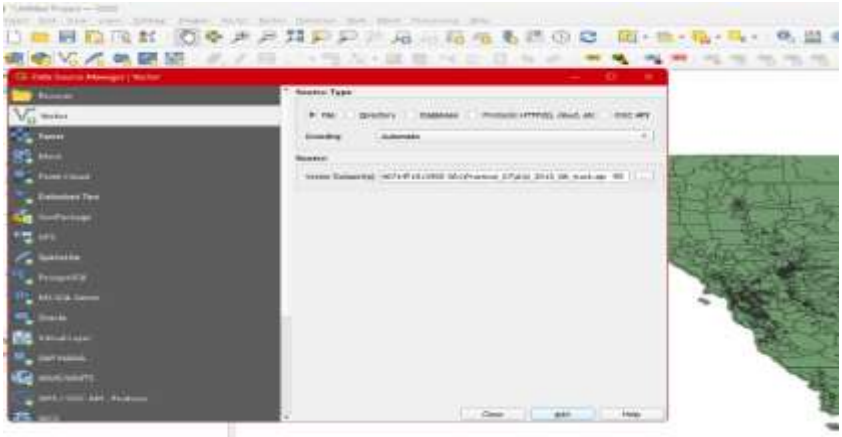
Roll No :-A064 Name :- Nikesh Punaji Sabale

Practical 7	Date: 05/09/2024
Aim:	Managing Data Tables and Spatial data Sets
a)	Table joins

Roll No :-A064 Name :- Nikesh Punaji Sabale

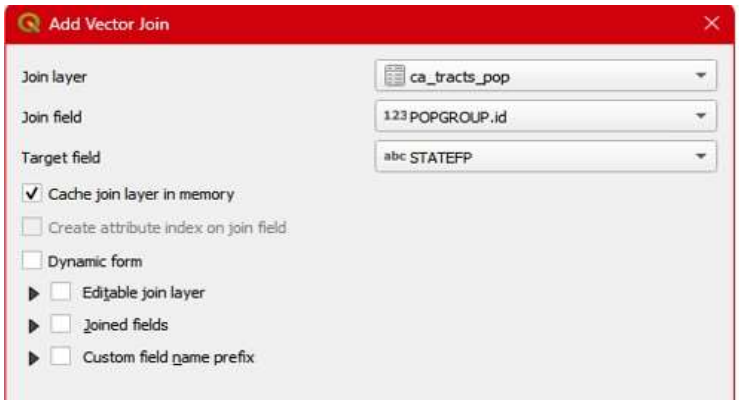
Procedure:

1. Start a new project.
2. Go to Layer -> Add Layer -> Add new Vector Layer.
3. Select "D: \GisPracticals\Practical_07\A\Data\tl_2013_06_tract.zip".



4. Again Go to Layer → Add Layer → Add Delimited Text Layer.
5. Add D:\GISPracticals\Practical_07\A\Data\ca_tacts_pop.csv".

6. In the layer panel, Right click on "tl_2013_06_tract", layer and select Properties.
7. Select the option in Properties, and click on button to add new table join.
8. In the Add Vector Join window set the following properties and click OK.



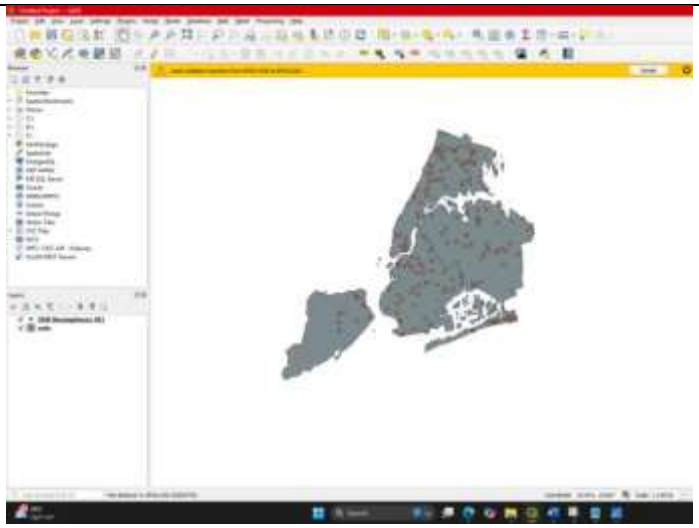
9. After performing join, for more clear output, select "tl_2013_06_tact" from Layer Panel, right click and select properties.
10. Go to Symbology and set the following properties:

11. The Final Output Will be:

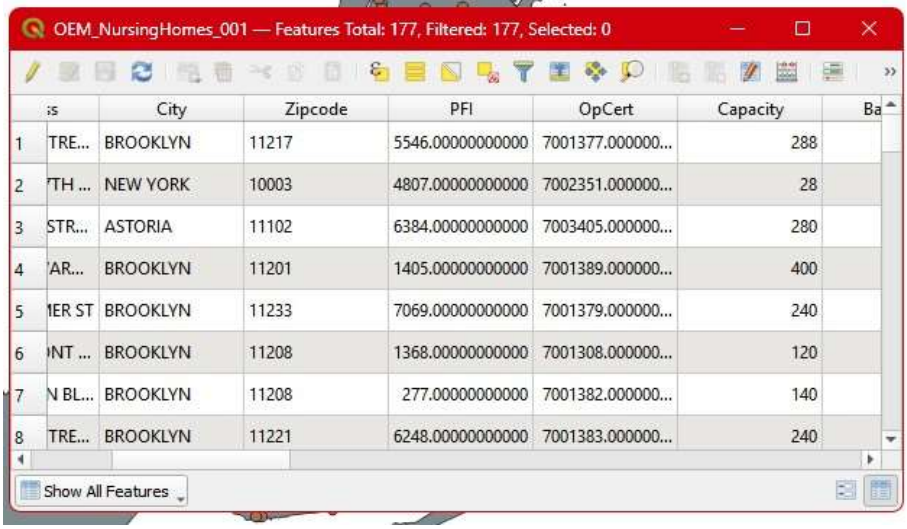
b)	Spatial Joins

Roll No :-A064 Name :- Nikesh Punaji Sabale

Procedure:	1. Go to Layer → Add Layer → Add Vector Layer. 2. Select 3. "E:\GISPractical\Practicals\Practical_07\B\Data\nybb_12c\nybb_13c_av\nybb.shp" and "E:005CGISPractical\Practicals\Practical_07\B\Data\OEM_NursingHomes_001\OEM_NursingHo mes_001.shp", from data folder.

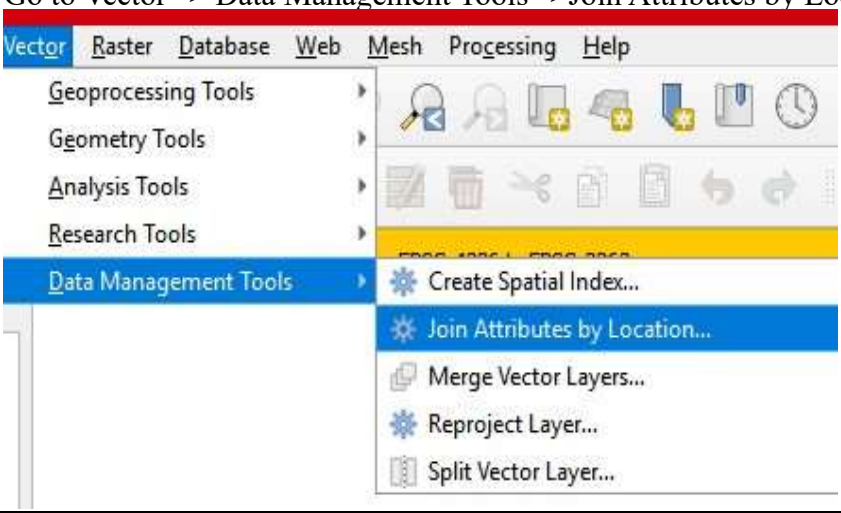


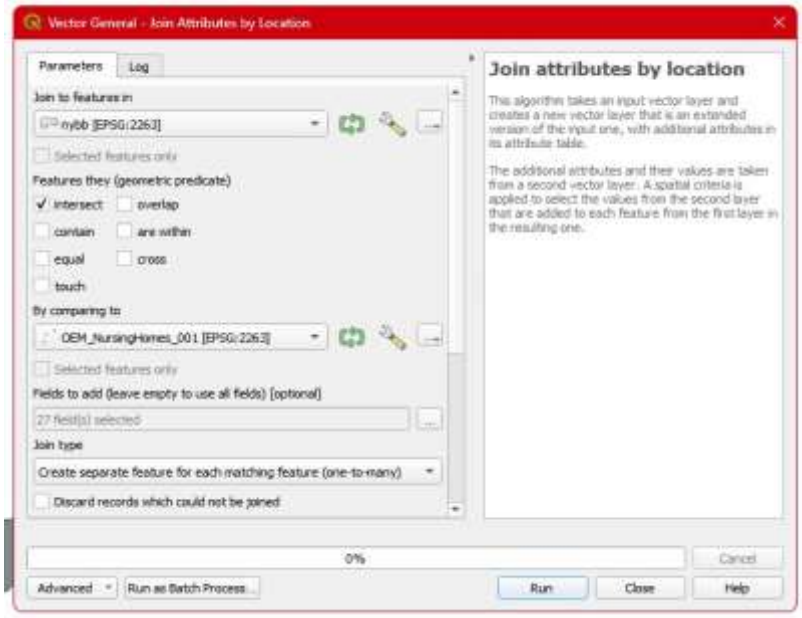
4. Go to attribute table and observe the data.
5. The Below Is the Table before performing Join



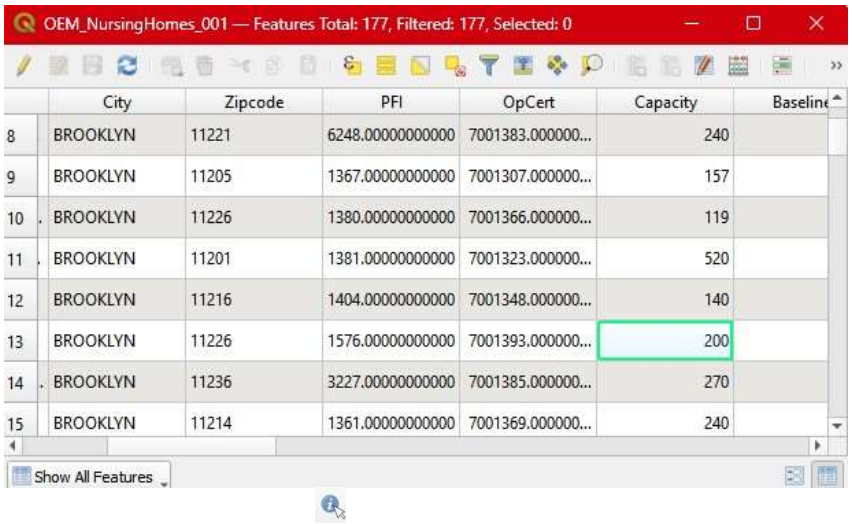
	:s	City	Zipcode	PFI	OpCert	Capacity	Ba
1	TRE...	BROOKLYN	11217	5546.00000000000	7001377.000000...	288	
2	TH ...	NEW YORK	10003	4807.00000000000	7002351.000000...	28	
3	STR...	ASTORIA	11102	6384.00000000000	7003405.000000...	280	
4	AR...	BROOKLYN	11201	1405.00000000000	7001389.000000...	400	
5	IER ST	BROOKLYN	11233	7069.00000000000	7001379.000000...	240	
6	NT ...	BROOKLYN	11208	1368.00000000000	7001308.000000...	120	
7	N BL...	BROOKLYN	11208	277.00000000000	7001382.000000...	140	
8	TRE...	BROOKLYN	11221	6248.00000000000	7001383.000000...	240	

6. Go to Vector -> Data Management Tools ->Join Attributes by Location.





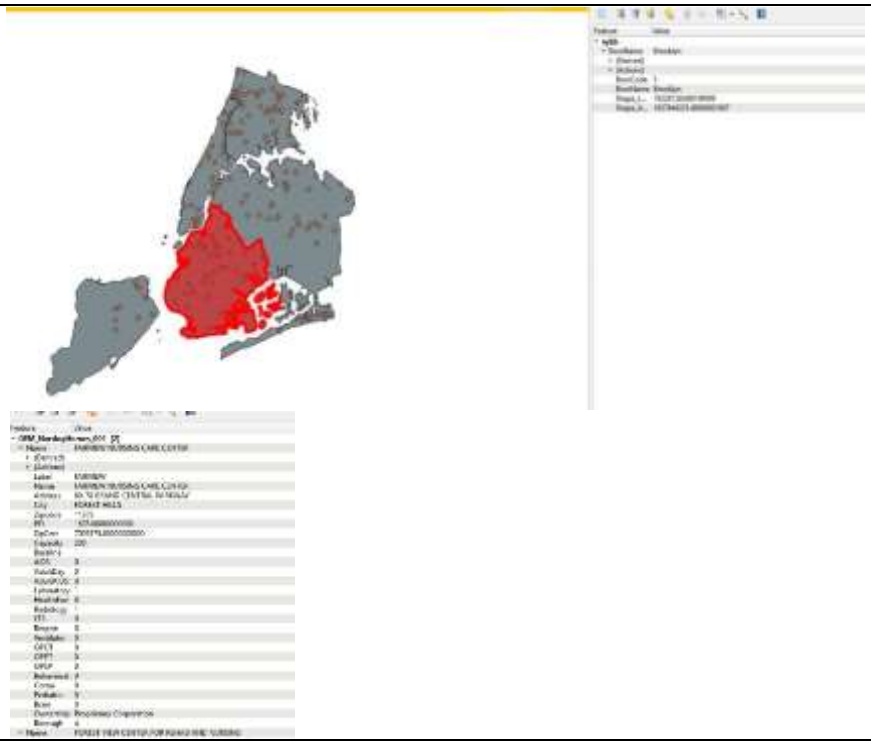
7. Now All Add Fields:

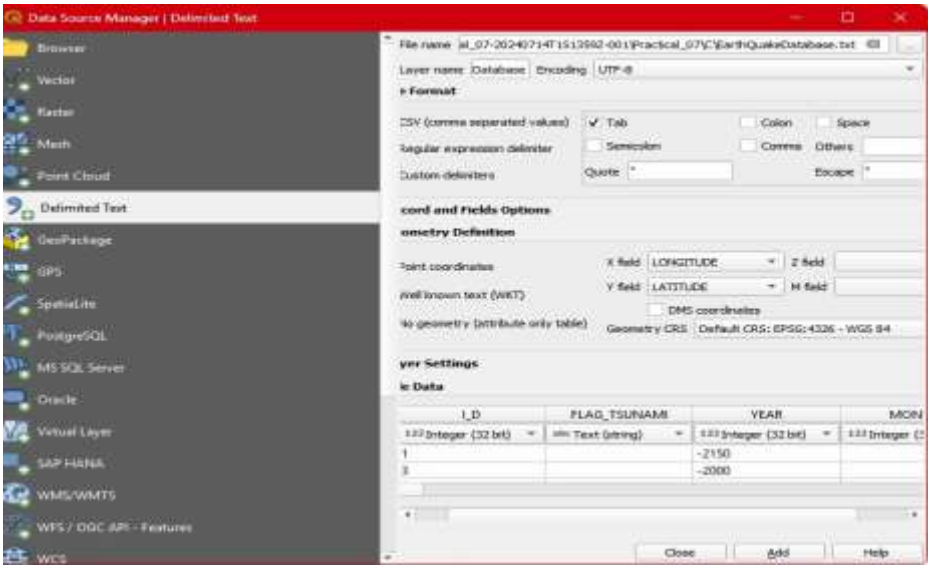


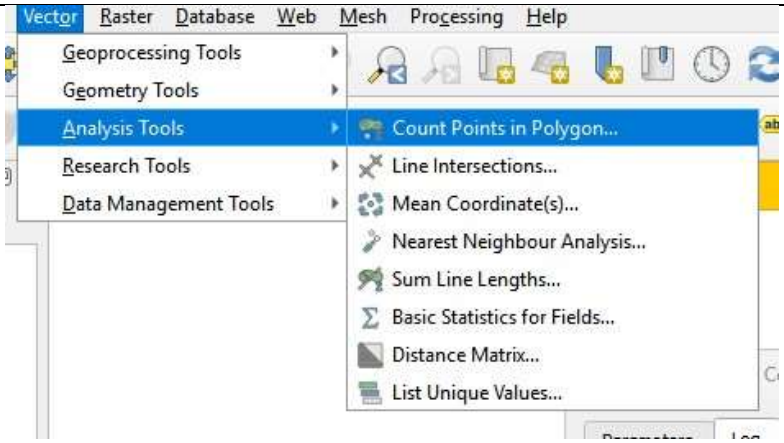
	City	Zipcode	PFI	OpCert	Capacity	Baseline
8	BROOKLYN	11221	6248.00000000000	7001383.000000...	240	
9	BROOKLYN	11205	1367.00000000000	7001307.000000...	157	
10	BROOKLYN	11226	1380.00000000000	7001366.000000...	119	
11	BROOKLYN	11201	1381.00000000000	7001323.000000...	520	
12	BROOKLYN	11216	1404.00000000000	7001348.000000...	140	
13	BROOKLYN	11226	1576.00000000000	7001393.000000...	200	
14	BROOKLYN	11236	3227.00000000000	7001385.000000...	270	
15	BROOKLYN	11214	1361.00000000000	7001369.000000...	240	

8. Attribute table after join:

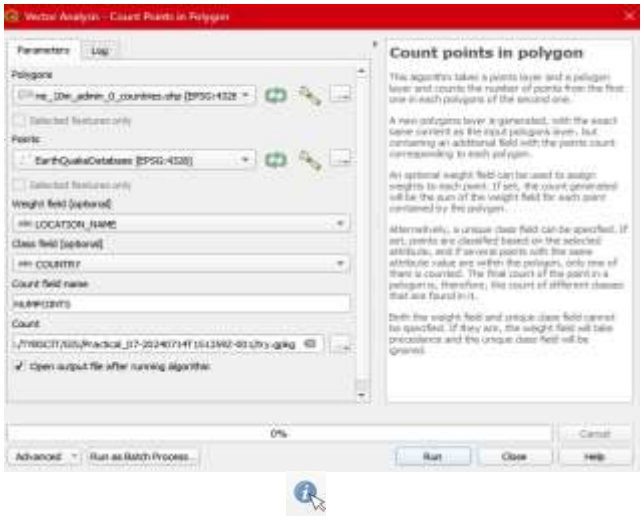
9. Use the Identify Feature Button to select a region to view join data on map Layer.



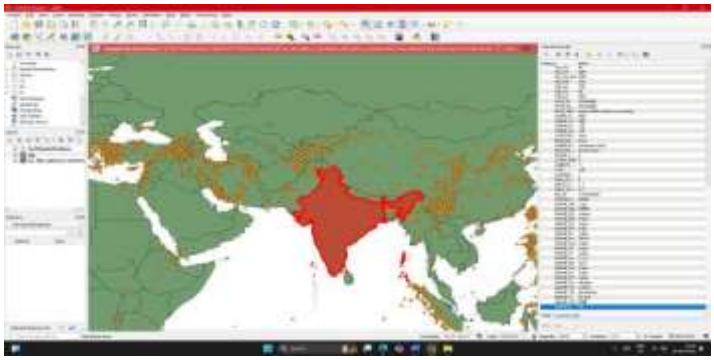
c)	Points in Polygon Analysis.
Procedure:	1. Go to Layer -> Add Layer -> Add Delimited Text Layer. 2. Select "EarthQuakeDatabase.txt. 3. Go to Layer → Add Layer → Add Delimited Text Layer. 4. Select "E:\GISPRacticals\Practicals\Practical_07\C\Data\ne_10m_admin_0_countries.zip".  5. Now go to:



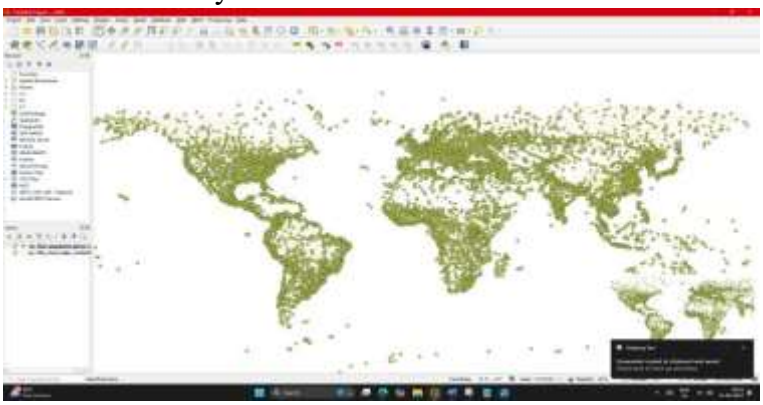
6. And Do this:

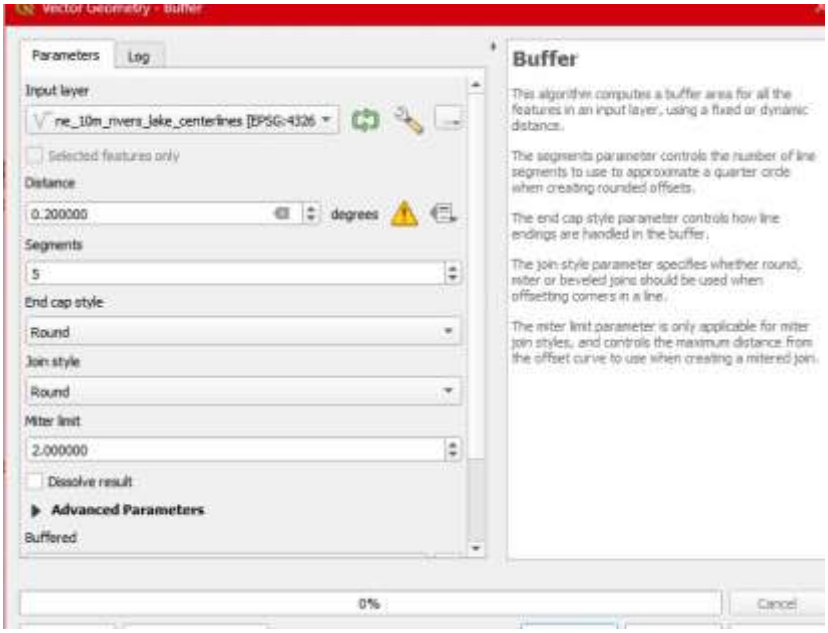


7. Use the select Feature button to check country wise counting of Earthquakes.

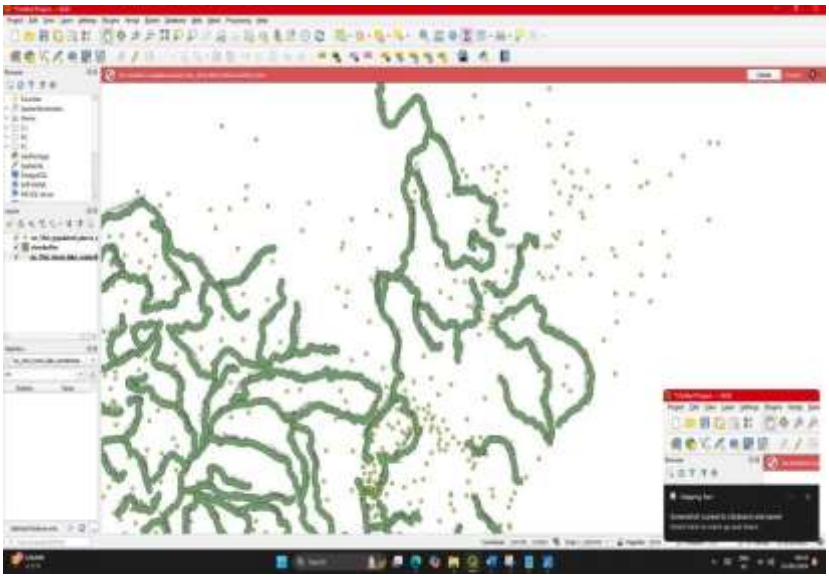


	8. Also a new column is added to attribute table "NumPoints" indicating number of earth quake points in each country.

d)	Performing Spatial Queries.
Procedure:	1. Go to Layer → Add Layer → Add Vector Layer. 2. Load "E:\GISPracs\Practicals\Practical_07\D\Data\ne_10m_populated_places _simple\ne_10m_populated_places_simple.shp". 3. And "I:\GISPracs\Practicals\Practical_07\D\Data\ne_10m_rivers_lake_centerlines\ne_10m_rivers _lake_centerlines.shp" from project data folder. 4. The added layers will look like:  5. Open project Properties → Set CRS "World_Azimuthal_Equidistant EPSG 54032" . 6. The map will be re-projected as:

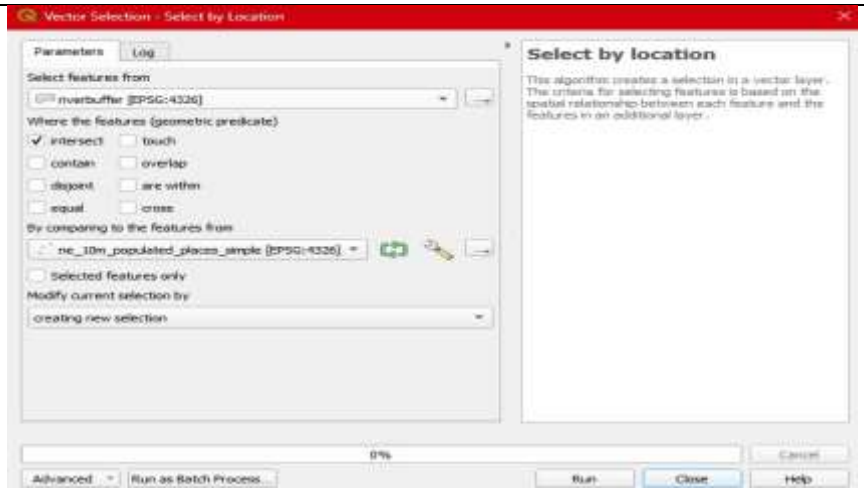


7. Go to Vector → Geoprocessing Tool → Buffer.

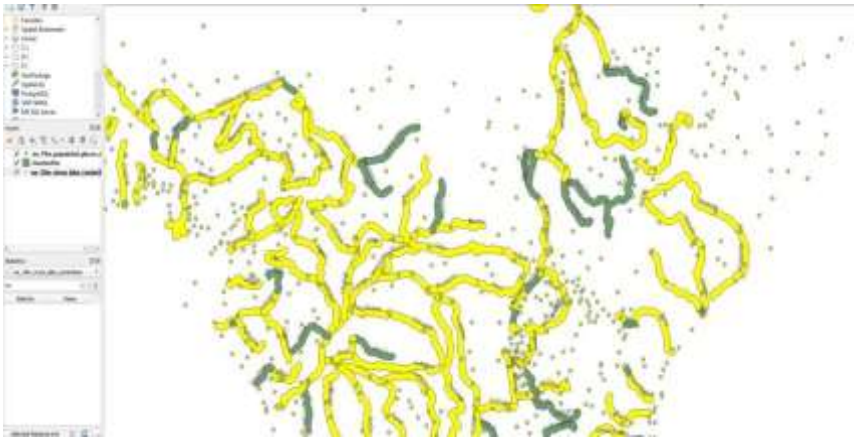


8. Create a buffer for River.

9. Go to Vector → Research Tool → Select By Location.



10. This will highlight only those rivers containing a populated place within 2 KM.



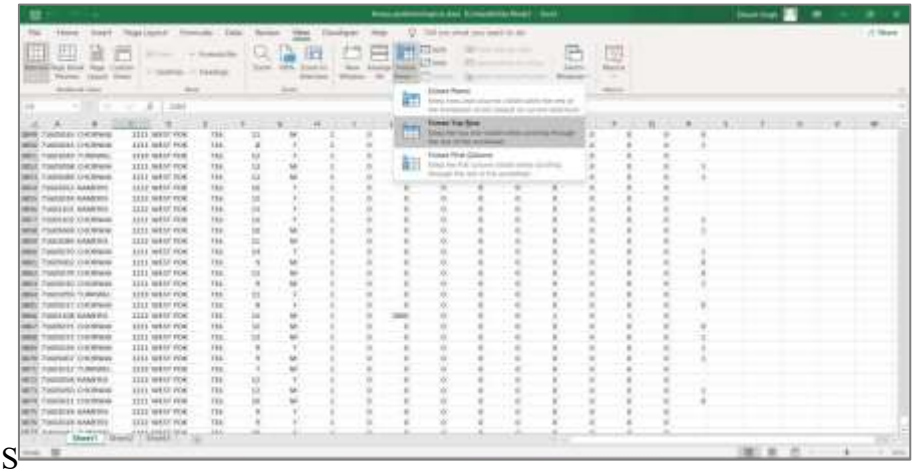
Practical 10	Date:-21/09/2024

a)	Validating Map Data

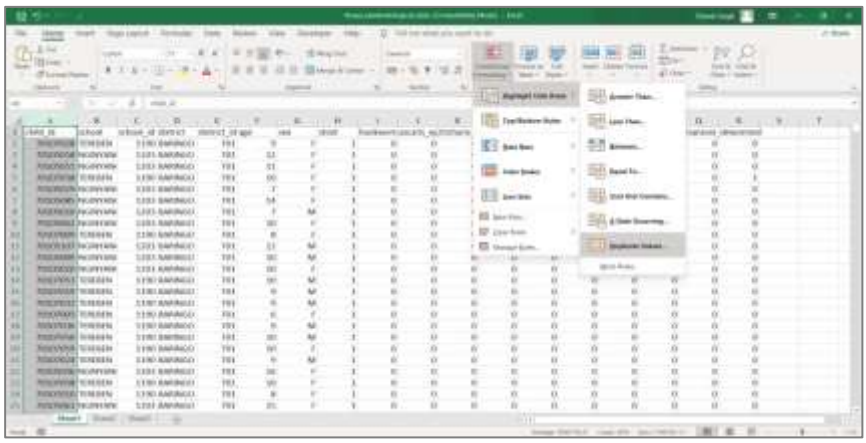
1. Performing Structural Data Checks: A.

Format of the Database:

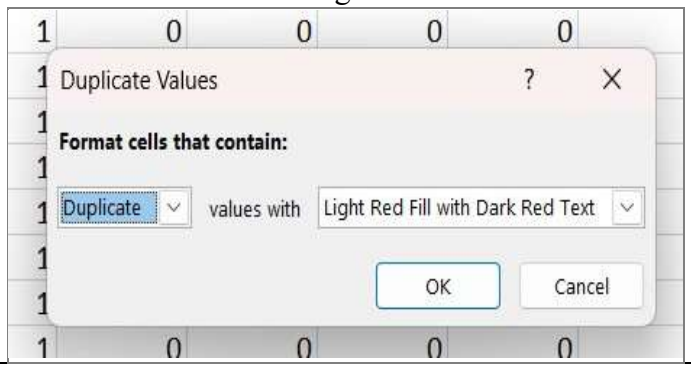
1. Open ***Kenya_epidemiological_data.xls*** *in excel.*
2. Go to ***View Tab***, Click ***Freeze Panes*** and Choose ***Freeze Top Row***



3. Select the entire "child_id"column(first column), Under Home Tab, click on **Conditional formatting** >**Highlight Cell Rules**> Select **Duplicate values**
4. Now select the first combo box and select

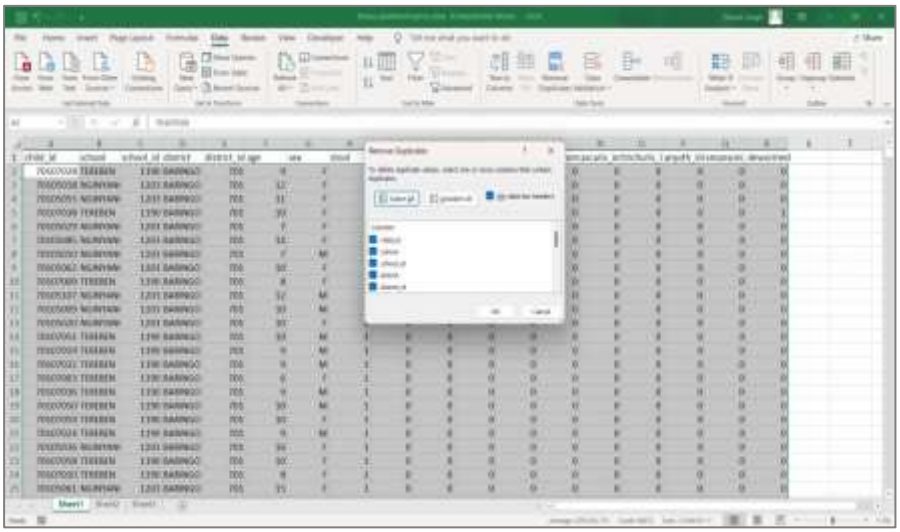


Duplicate and select **Light red fill with Dark red text** in the next combo box as shown in figure



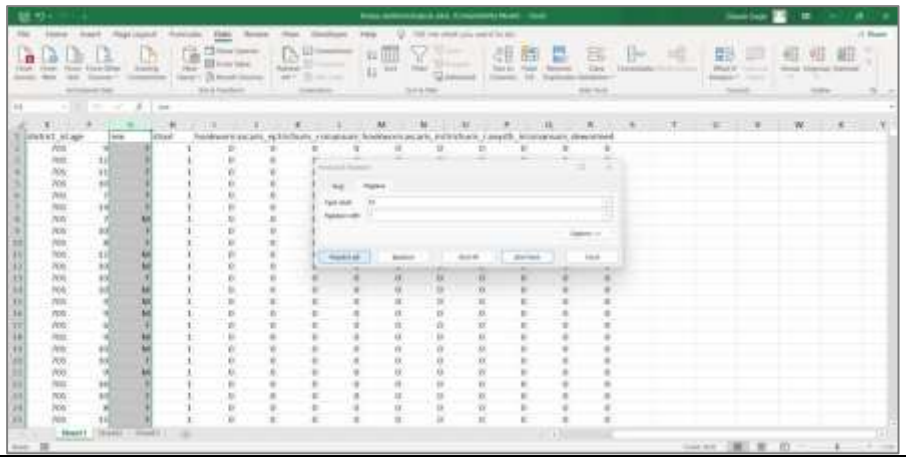
B. Removing Duplicates:

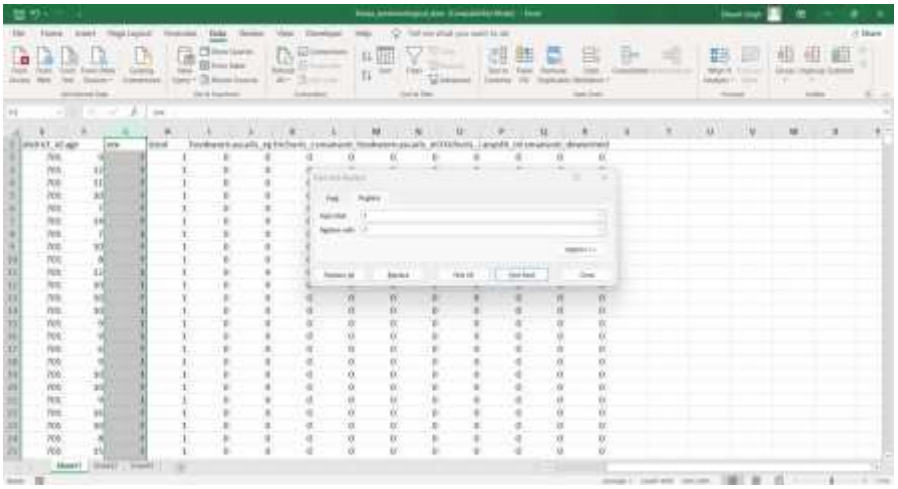
1. Select all the columns of existing worksheet Now go to Data Tab and select Remove Duplicates.



C. Coding of the Variables:

1. In the current worksheet, select the sex column.
2. Now type Ctrl + F and use Replace Function and Replace as follows
   M-1
   F-2

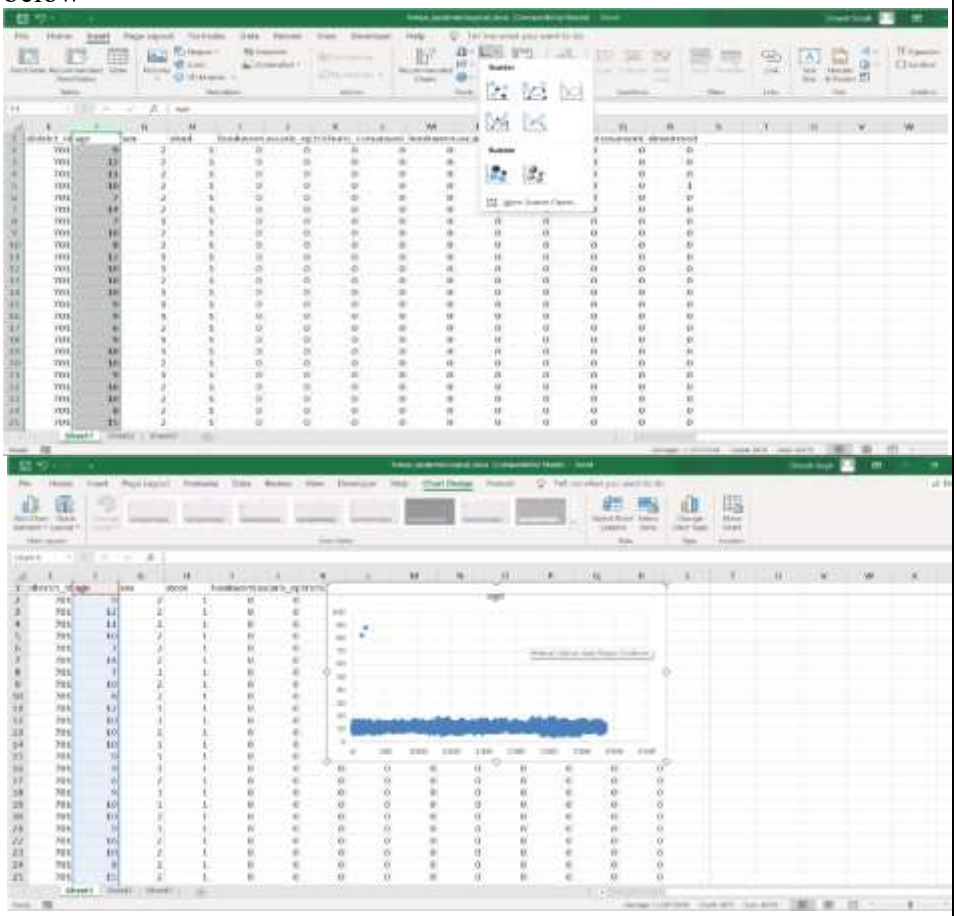




2. Verifying the plausibility of data: A.

Coding of variables:

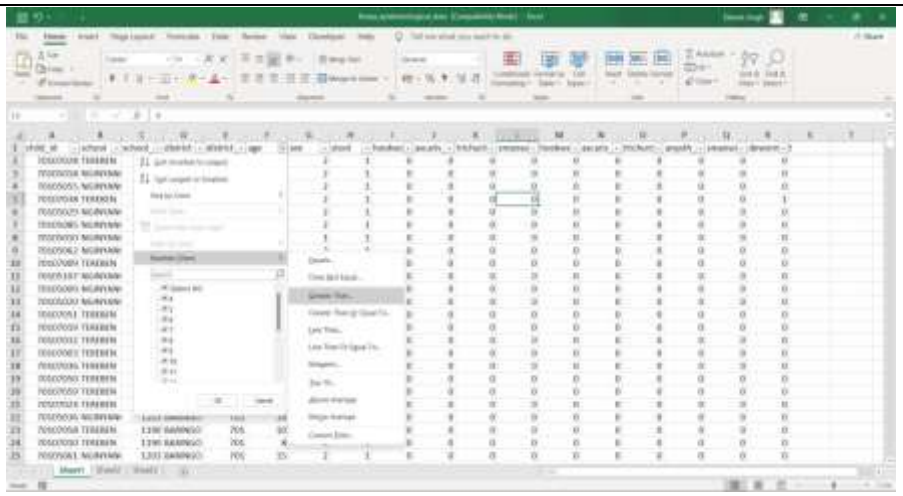
1. Select the age column in the existing worksheet.
2. Now go to Insert tab and select Scatter. You will set chart as shown below

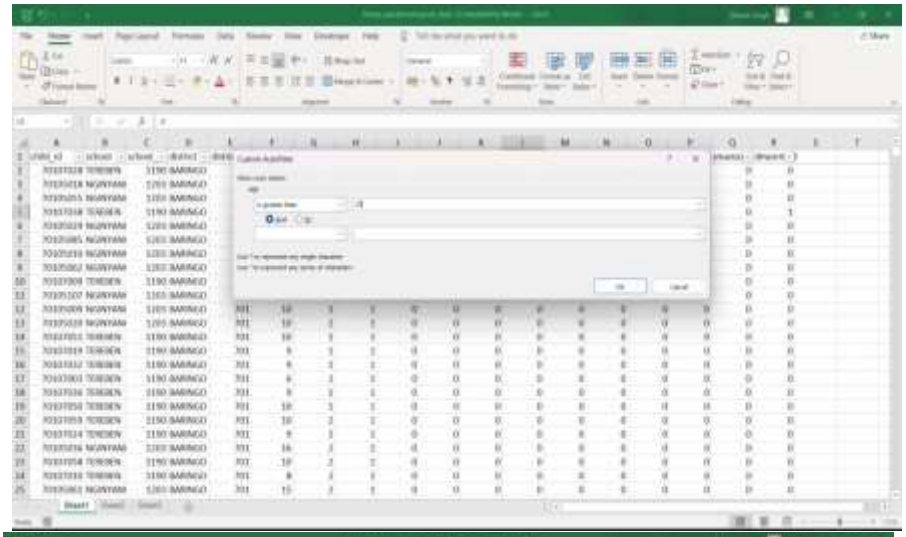


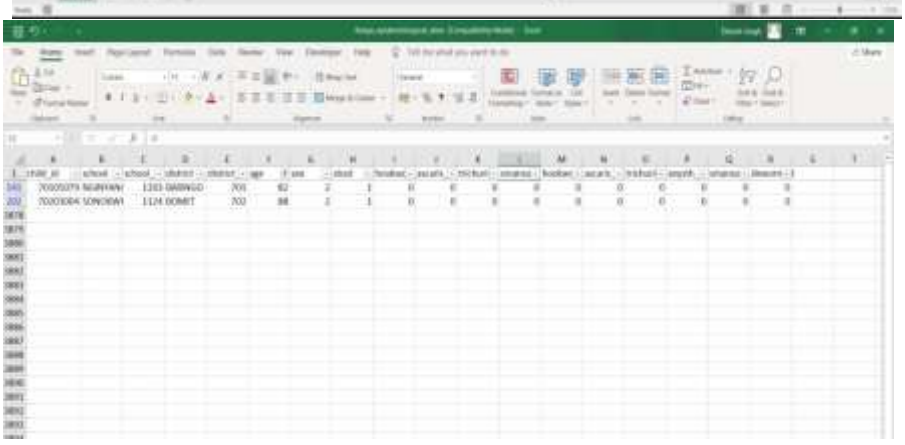
B. Using a filter to detect outliners

1. First go to the Home Tab > Sort and Filter > Filter.
2. Click and apply the filter to all the columns of the worksheet.

	3. Now click on age filter and click on Number Filter > Greater Than option and type the value 20 in greater than field.



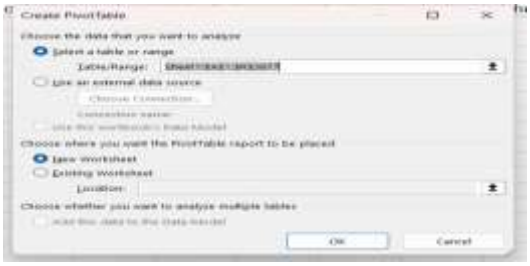




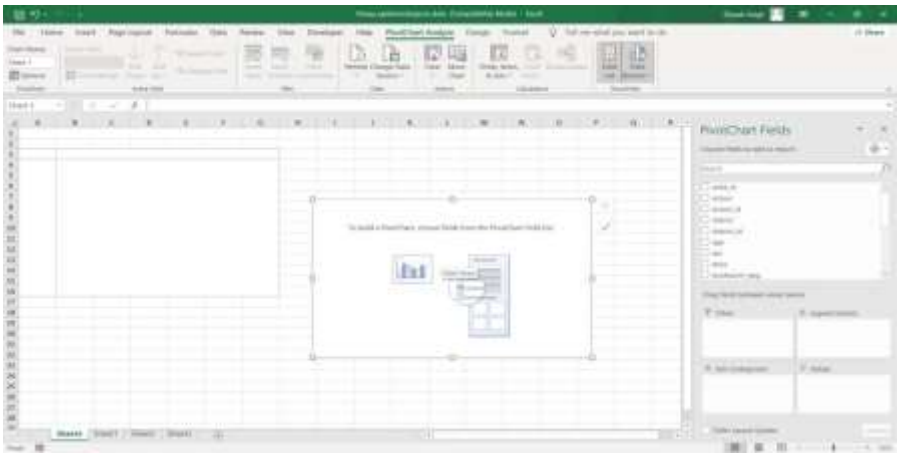
3. Logical Data Checks: A.

Cross Tabulations

i. Open the existing worksheet. Now go to Insert Tab and select Pivot table function.

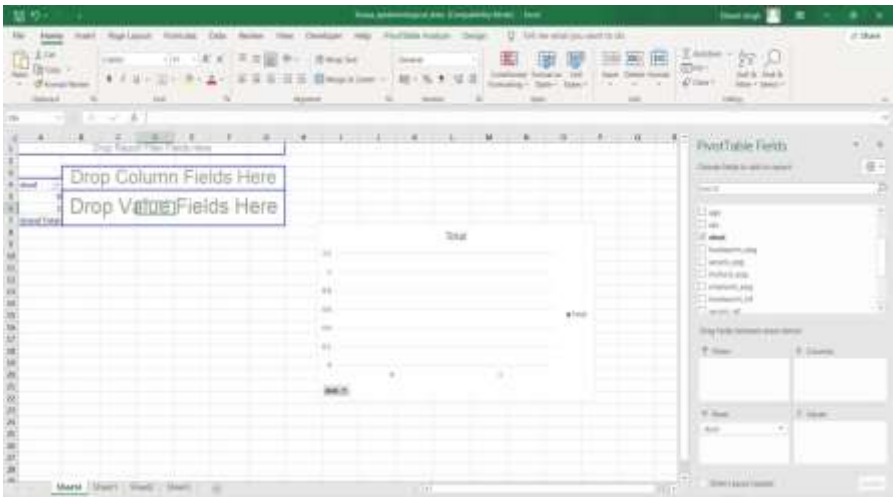
ii.  Select New Worksheet and click OK

• An empty table is inserted in a new sheet and a window will open on the

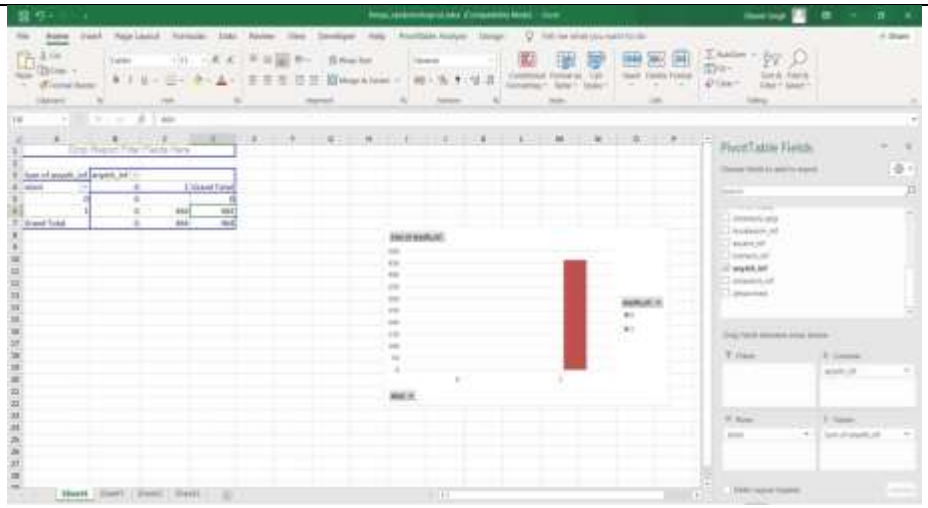


right hand side named PIVOT TABLE FIELD LIST.

iii. From the PivotTable Field List, drag the "stool" item and drop it into the "Row Label" field as show above.



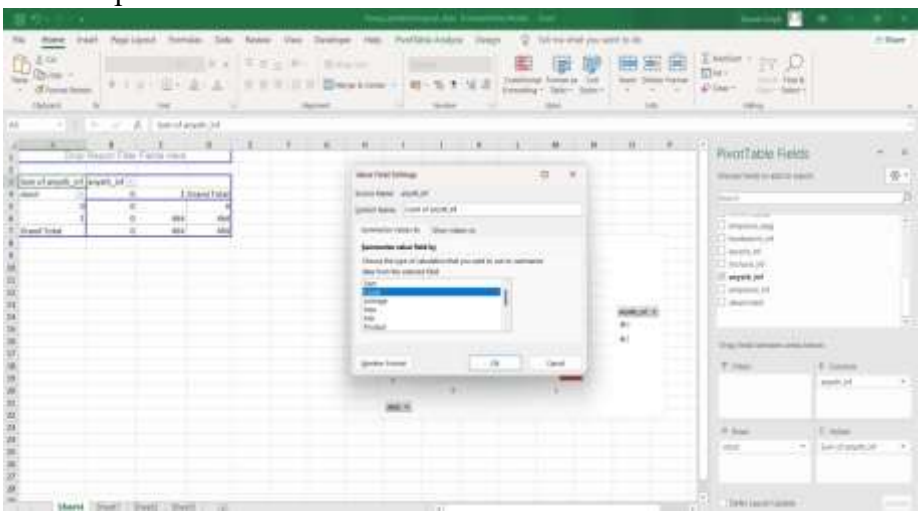
iv. Similarly, Click on *anysth_inf*and draw it into the "Column labels" and "Σ Values" field.

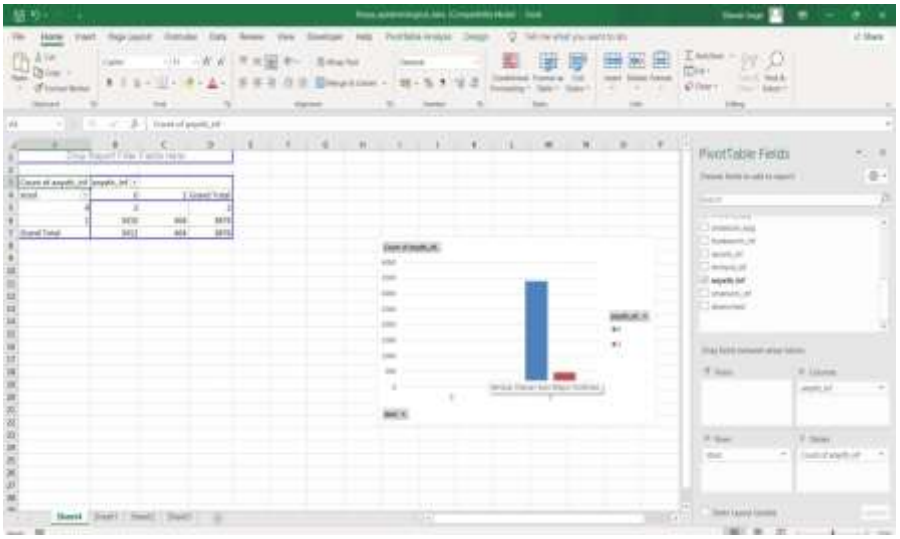


- To include the count of observations in the table you might need to change the value field settings to count.

v. Click on the combo box Sum of stools and Click on Value Field Settings.

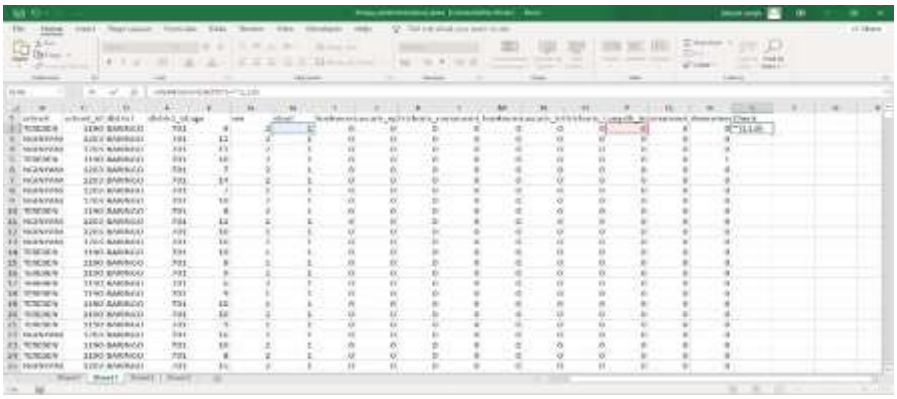
vi. Change the value in Summarize value filed by to Count and click OK. Table is updated with count values as shown below





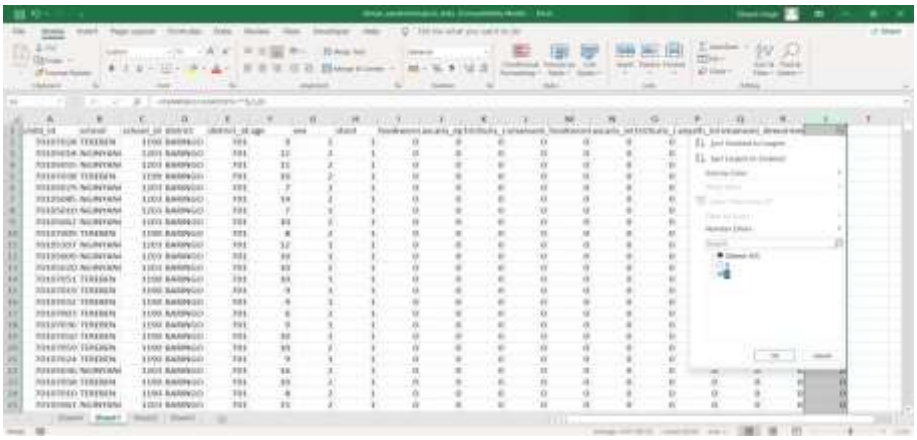
B. Formulas:

1. Open the existing worksheet
2. Create a new column with the variable called check
3. Type the following formula in S2 column of worksheet



=IF(AND(H2=0, NOT(P2="")),1,0)

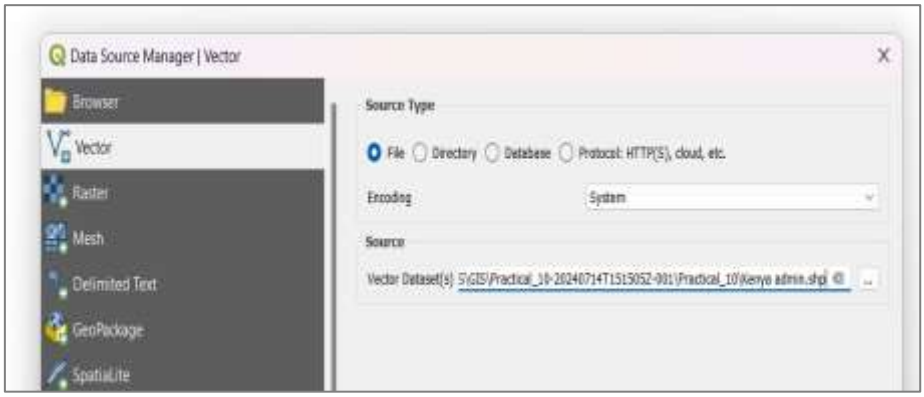
4. Copy the formula to all other cells (ensure that the formula is copied to all rows in your dataset).



5. Now use the filter to show only entries with a check value of 1.

4. Verifying the Co-ordinates of Mapping Data:

1. Create a New Project in QGIS
2. Navigate to **Add Vector Layer** and add file: **Kenya_admin.shp**
3. Similarly, navigate to



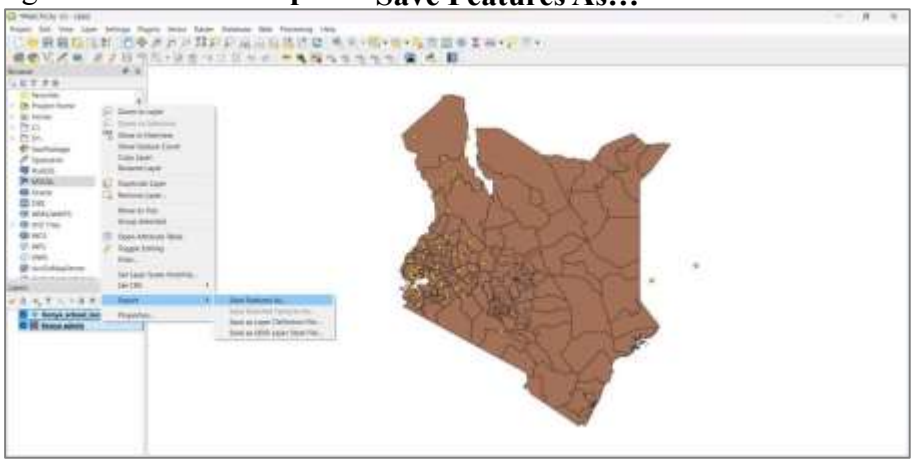
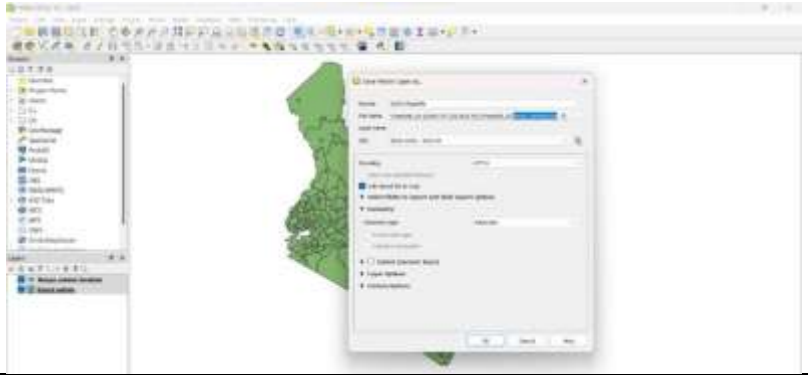
Add Delimited Text Layer and add file:**Kenya_school_location.csv**.

- In **the Geometry Definition section**, there is a field called **Geometry CRS**, in that we have to select **WGS84** as coordinate system.

- As you can see 2 points are not on the map.

To examine this, we need to save these layers as a Shapefile, to do that:

4. Select both the layers **Kenya_school_location**and **Kenya admin**, then right click on them **Export >Save Features As…**



5. In the menu that comes up, set **Format** as **ESRI Shapefile** and in**File Name** select **Kenya_schools.shp**
   After this is done you can uncheck the **Kenya_school_location** in the **layers section**.