Data manipulation in QGIS

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Lecture purpose

- To further introduce QGIS tools

Last time

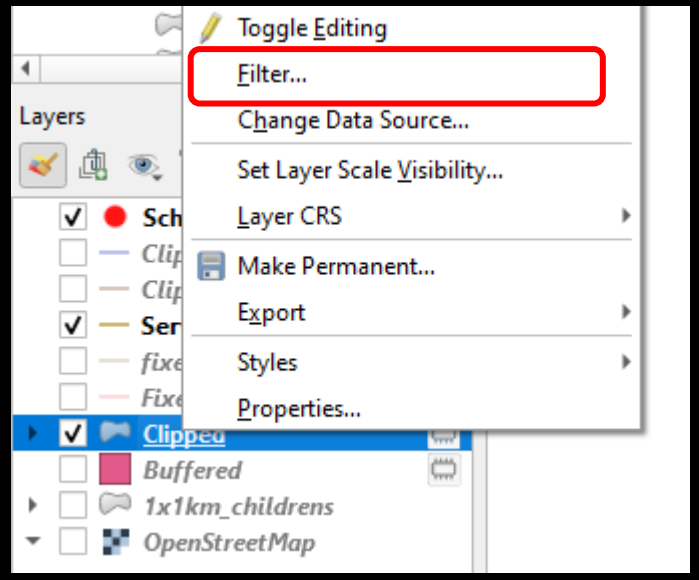
- We cutted out the **student population layer** around the schools
  - Based on 3 km buffers around schools
- Added **streets network layer**
  - Took from Google Drive folder
- Now let’s move on **with filtering**
  - Have to filter out home areas where a number of students are not meeting our criterias

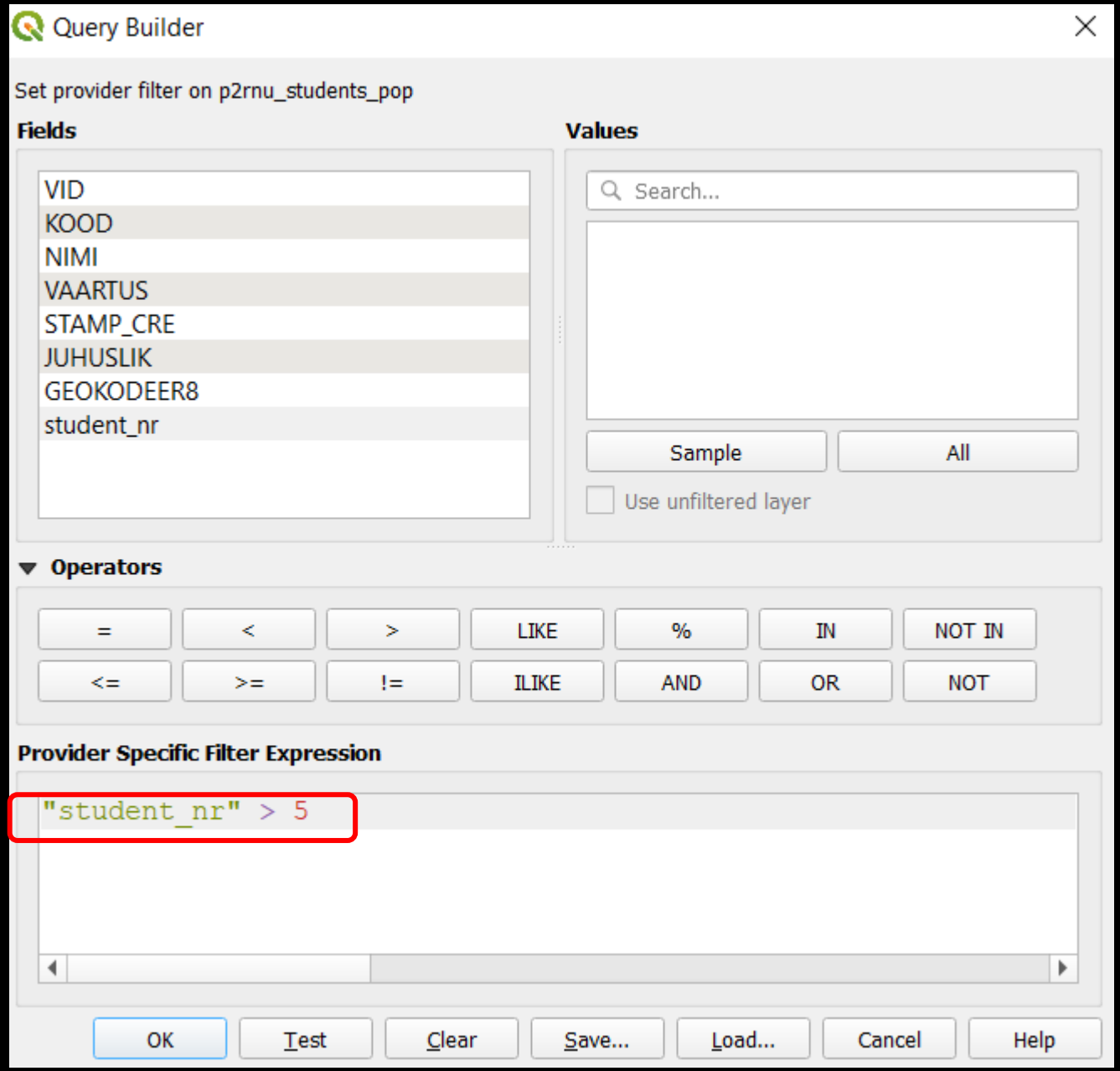
Filtering areas where "Origin„ is less than X

- It will filter out all home areas where number of students is less than X
- As it is not very practical to plan non motorized streets there due the potensial low using rate

Choose the value based on your own reasoning. It is not a traffic planning course, it would not be assessed

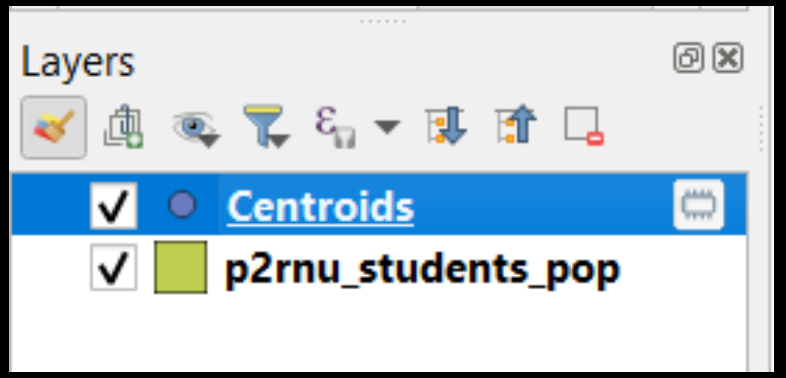
How to filter out



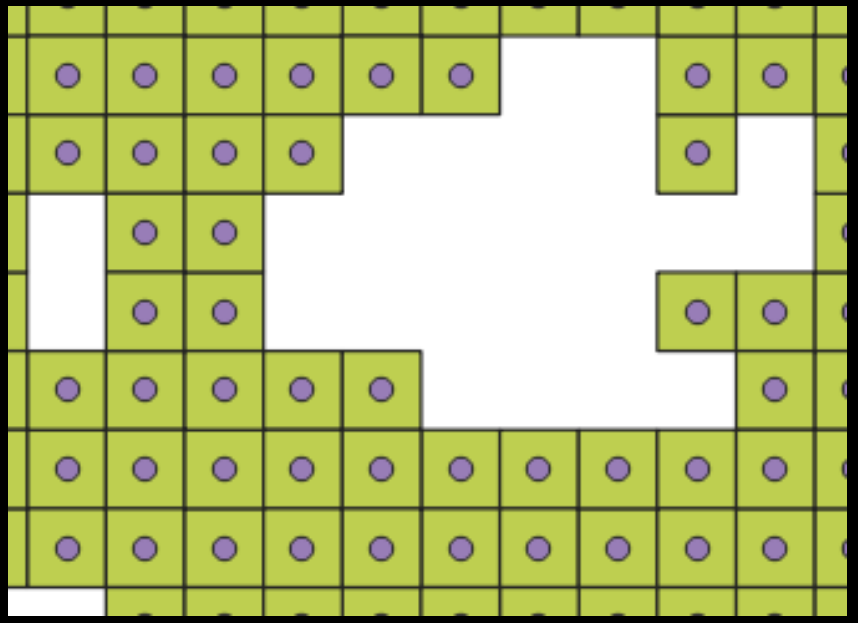


Task- Add centroids and Huff Gravity Model

- Going back to gravity model
  - We are going to use it in this project
- Add centroids to every polygon (home area)
- Find centroid algorithm by yourself from the toolbar

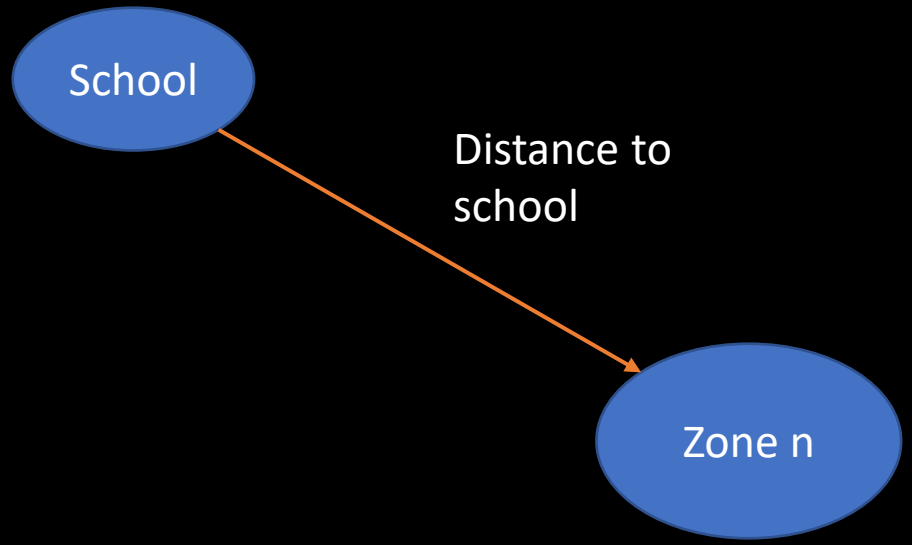


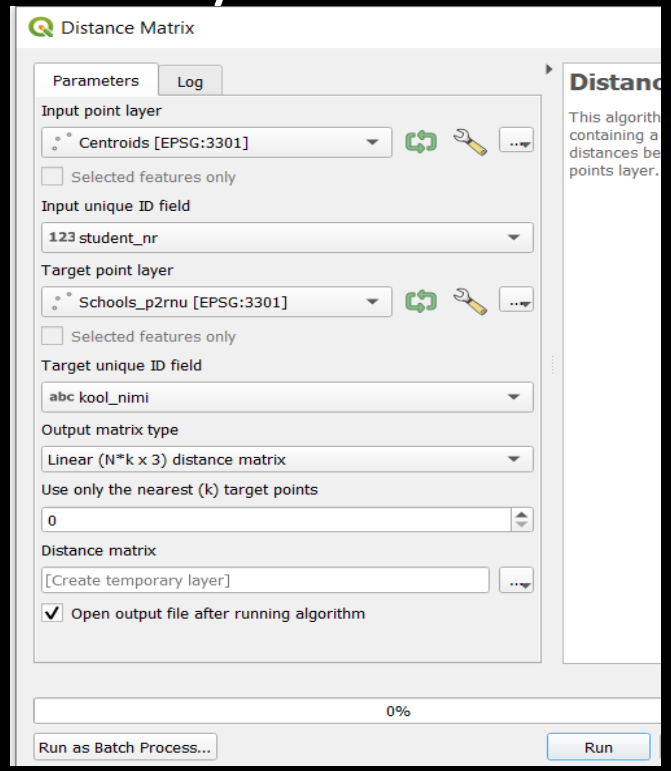
Centroids will decrease our problem as it concentrates information into the small area and prepares data for further analysis.



Task- how to find distance between schools and home centroids

- The Huff gravity model says that attractiveness will decrease in distance
- So we have to find distance from every centroid to every school





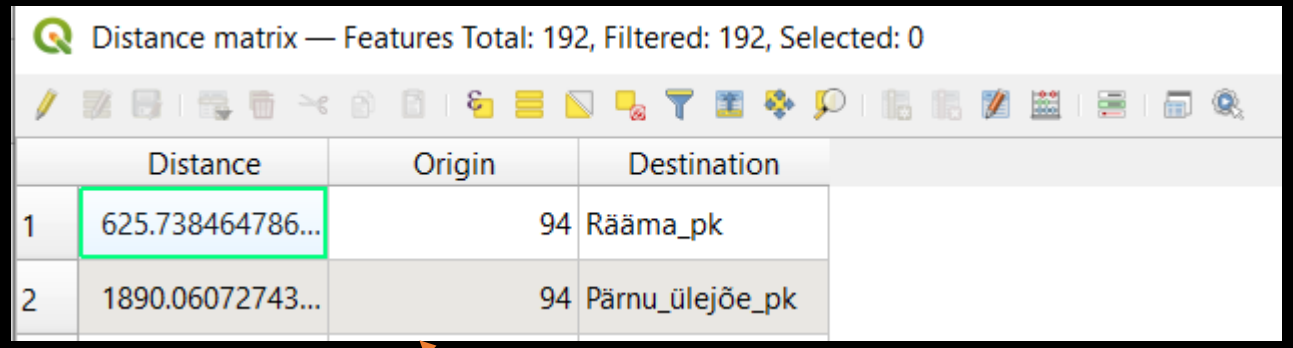
Next step is to develope OD matrix

- How could we make a attribute table so from each home zone (origin) it will give distance to every school (destination)?
- It should look like this:

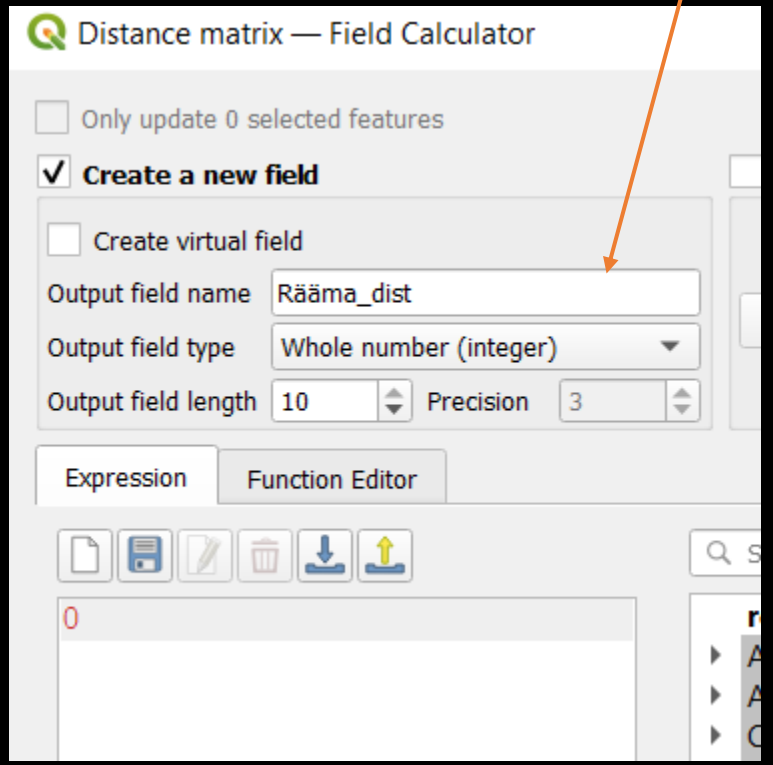
Origin	Dist to school 1	Dist to school 2	Dist to school 3	Dist to school n
100 students	1050	2300	590	N metres

Task- how to format attribute table

First let's add attributes



This is the initial view of attrubute table



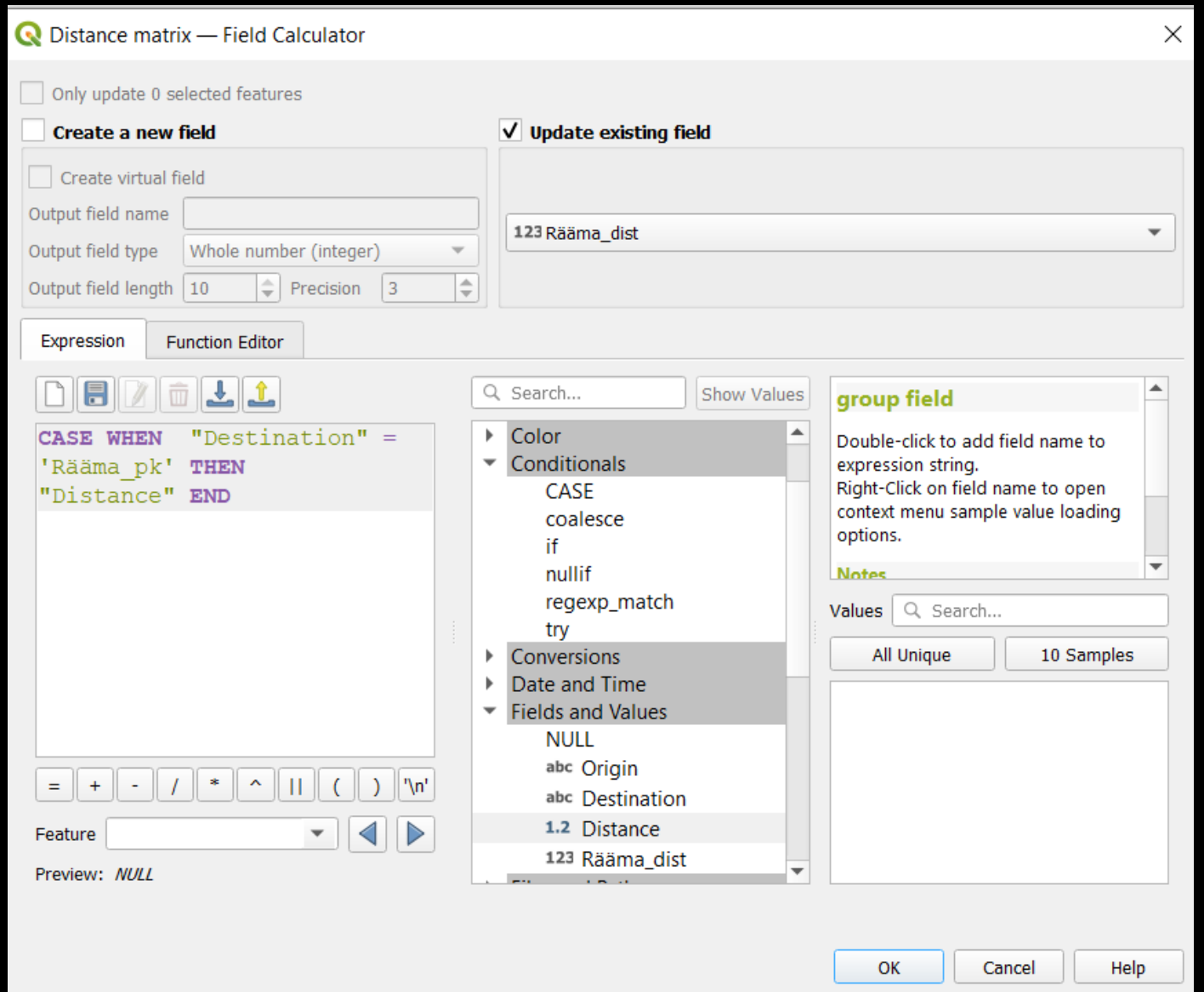
We will add following attributes:

School_1

School_2

School_3

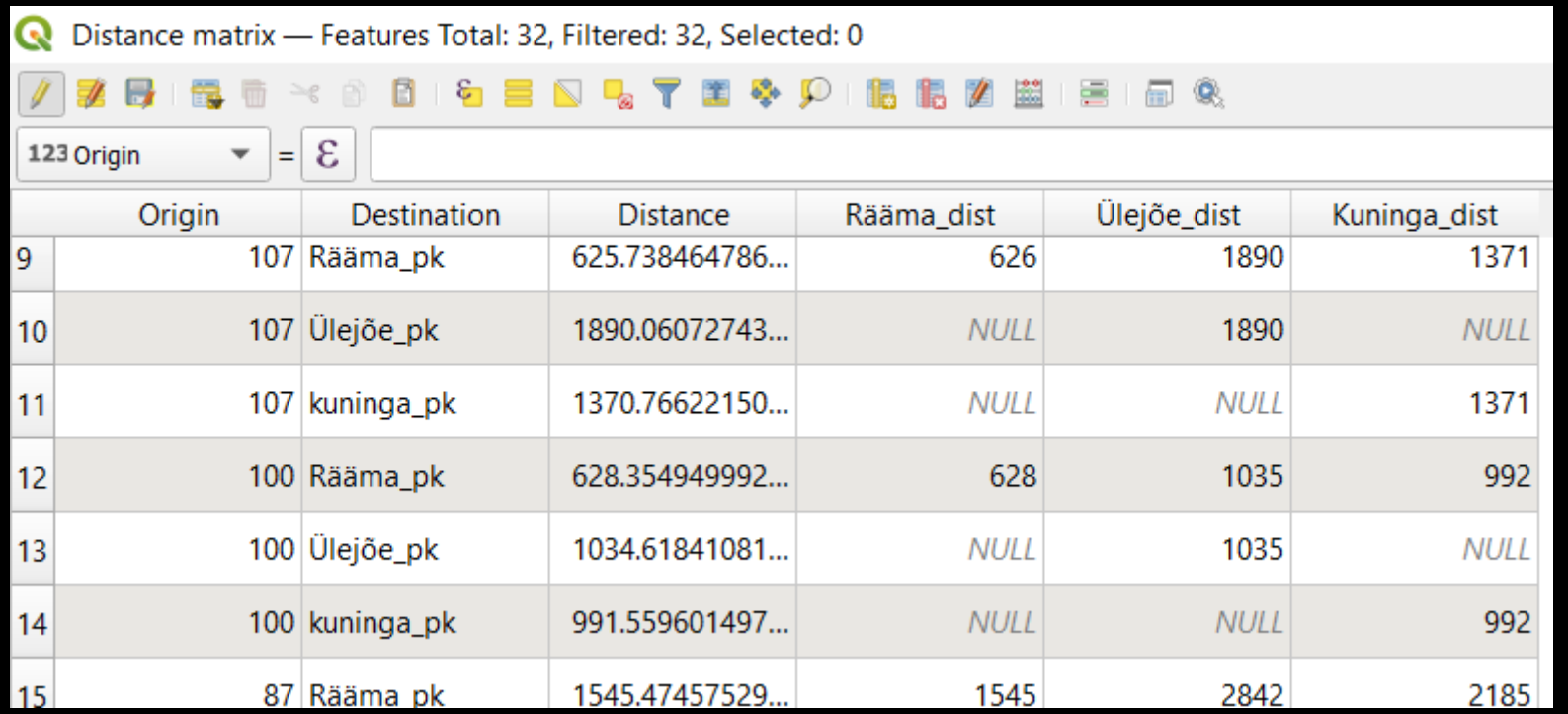
Task- how to add distance to attributes



The script could be interpreted as- when the cell content under *destination attribute* is *Rääma_pk* then add to *Rääma_dist* a value of *distance* of the same feature/object

Formating a attribute table

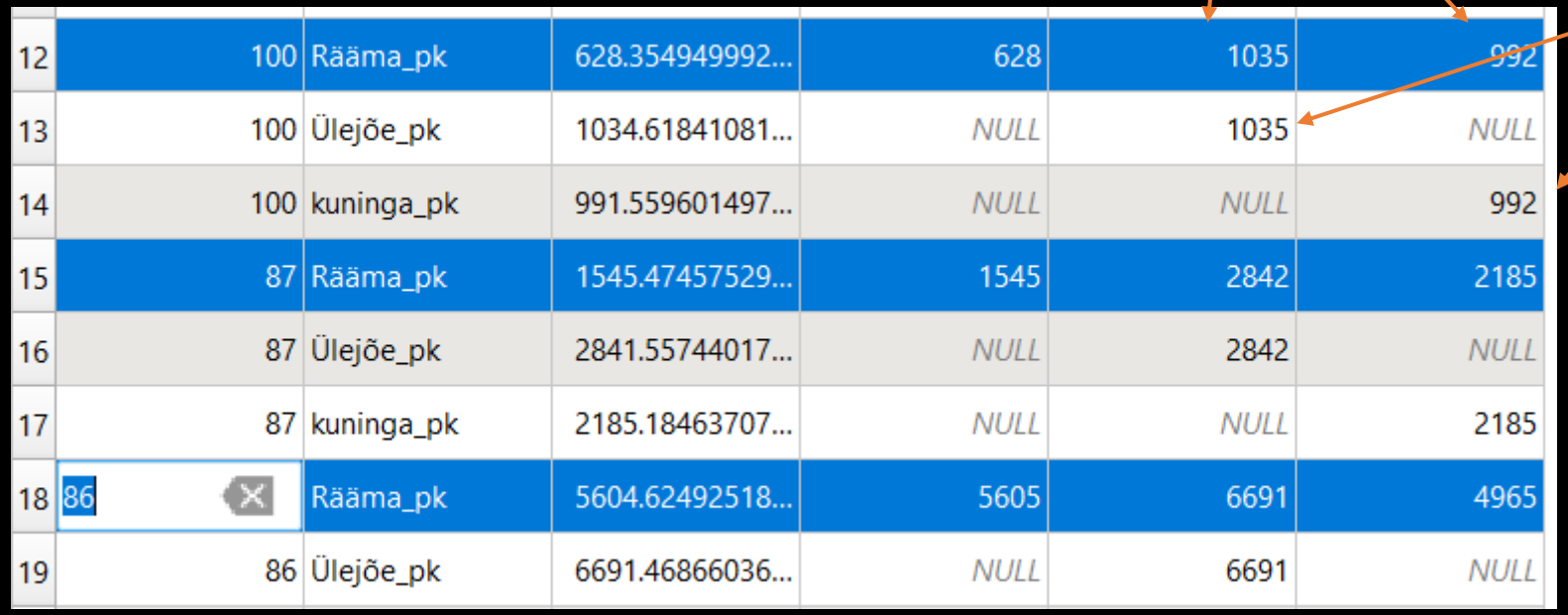
- You should end up something like this



	Origin	Destination	Distance	Rääma_dist	Ülejõe_dist	Kuninga_dist
9	107	Rääma_pk	625.738464786...	626	1890	1371
10	107	Ülejõe_pk	1890.06072743...	*NULL*	1890	*NULL*
11	107	kuninga_pk	1370.76622150...	*NULL*	*NULL*	1371
12	100	Rääma_pk	628.354949992...	628	1035	992
13	100	Ülejõe_pk	1034.61841081...	*NULL*	1035	*NULL*
14	100	kuninga_pk	991.559601497...	*NULL*	*NULL*	992
15	87	Rääma_pk	1545.47457529...	1545	2842	2185

Task- delete unnessesary records/objects

- Group first 3 rows. Now take the school's distance to the student home and add distance to the top row



12	100	Rääma_pk	628.354949992...	628	1035	992
13	100	Ülejõe_pk	1034.61841081...	NULL	1035	NULL
14	100	kuninga_pk	991.559601497...	NULL	NULL	992
15	87	Rääma_pk	1545.47457529...	1545	2842	2185
16	87	Ülejõe_pk	2841.55744017...	NULL	2842	NULL
17	87	kuninga_pk	2185.18463707...	NULL	NULL	2185
18	86	Rääma_pk	5604.62492518...	5605	6691	4965
19	86	Ülejõe_pk	6691.46866036...	NULL	6691	NULL

Now you have for every origin a distance to every destination arranged to the same row

Task- delete records II

- Now delete 2 last records from a group, we will not need them anymore

9	107	Rääma_pk	625.738464786...	626	1890	1371
10	107	Ülejõe_pk	1890.06072743...	*NULL*	1890	*NULL*
11	107	kuninga_pk	1370.76622150...	*NULL*	*NULL*	1371
12	100	Rääma_pk	628.354949992...	628	1035	992
13	100	Ülejõe_pk	1034.61841081...	*NULL*	1035	*NULL*
14	100	kuninga_pk	991.559601497...	*NULL*	*NULL*	992
15	87	Rääma_pk	1545.47457529...	1545	2842	2185
16	87	Ülejõe_pk	2841.55744017...	*NULL*	2842	*NULL*
17	87	kuninga_pk	2185.18463707...	*NULL*	*NULL*	2185

Select (CTRL + clikc) and delete

Finding potensial students for each school

- In this example I will use max number of students in schools as following:
  - 750
  - 600
  - 450

- You have your own set of schools and maximum numbers

Task- find schools attractivnes

- First let's find attractivnes of schools by the home area
- Divide max school students with squares of distance

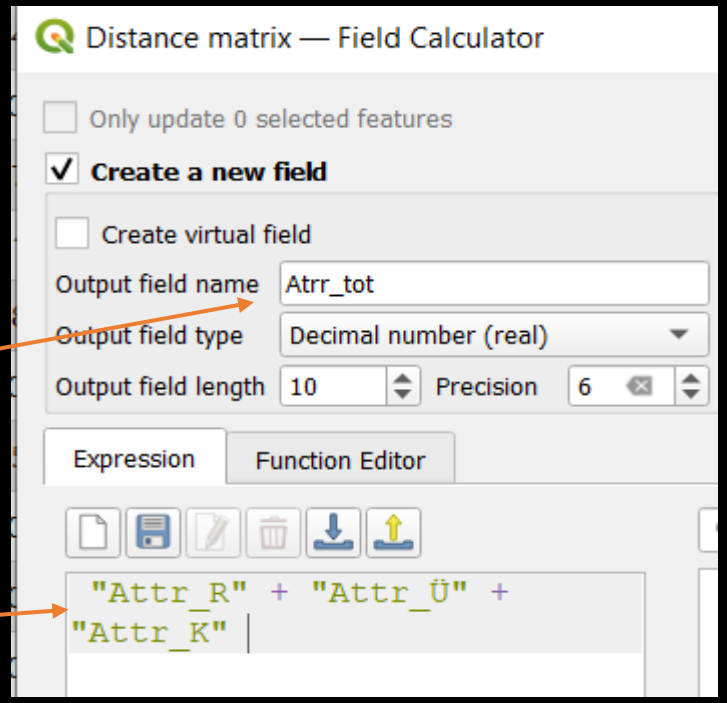
(From school to students home area)

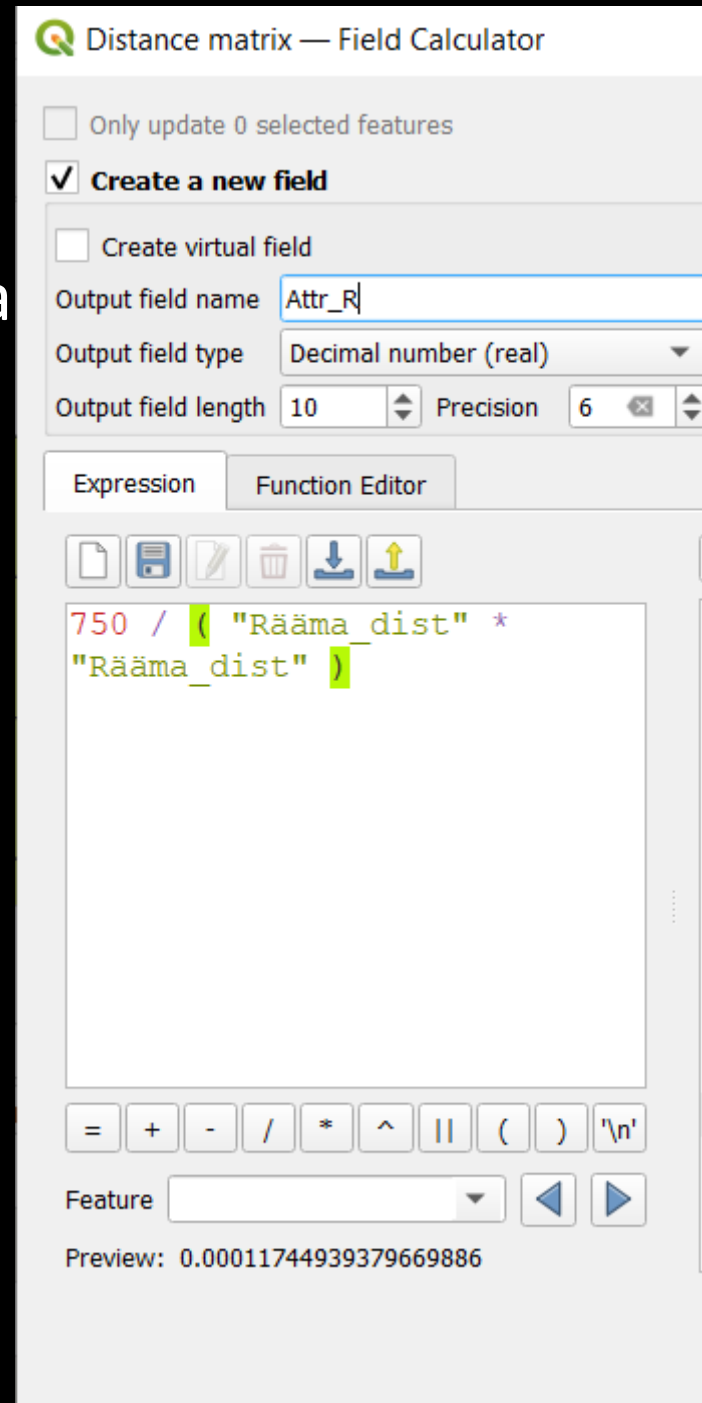
- Use decimal numbers and precision at least 6 places

You have a maximum nr of students in a given school found from the project initial data- Google Drive.

Next you should know how attractive is a school for a given home area to pull students

Add also total attractivnes atribute for schools





Task- calculate „marketshare“

- „Marketshare“ will result in **student numbers**
- Represent how much students will go to a given school from the home area
- Use integer type to add new attribute
- Divide **school attractiveness** with **total attractiveness** and **multiply with students number in given area**

„Marketshare“

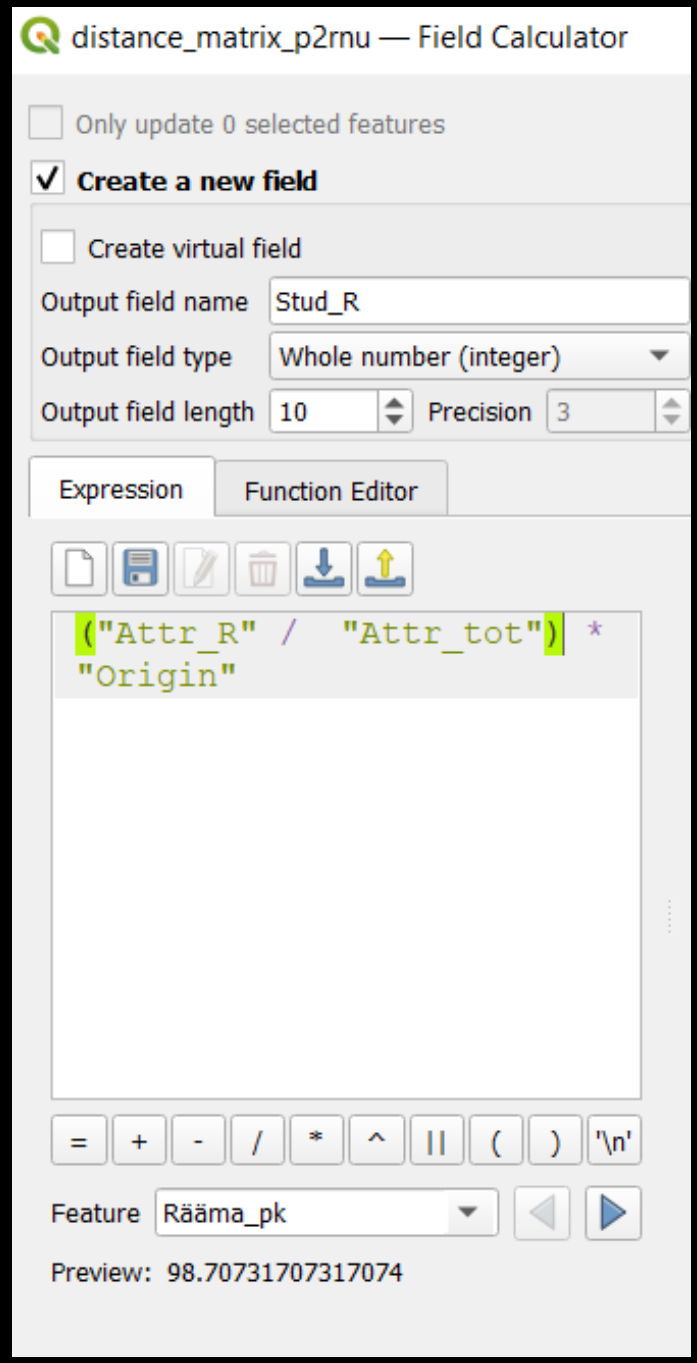
Stud_R means students to Rääma school in this example.

So we have the attractiveness of Rääma by taking the max number of students and dividing it with the distance from school to home area.

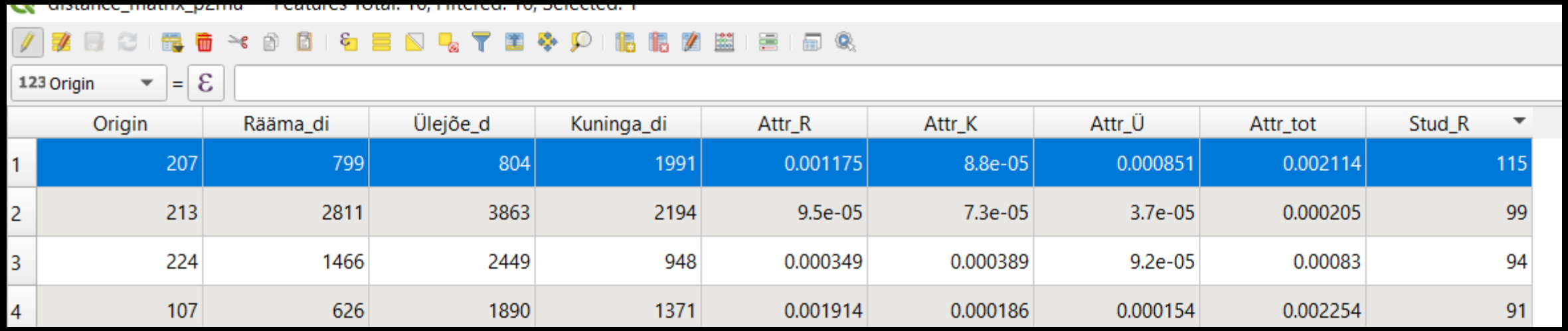
Next we divide school attractiveness with total attractiveness.

And multiply by the total students in a particular home area

Remember that „originID“ attributes hold a value of students from that area



How attribute table should look like

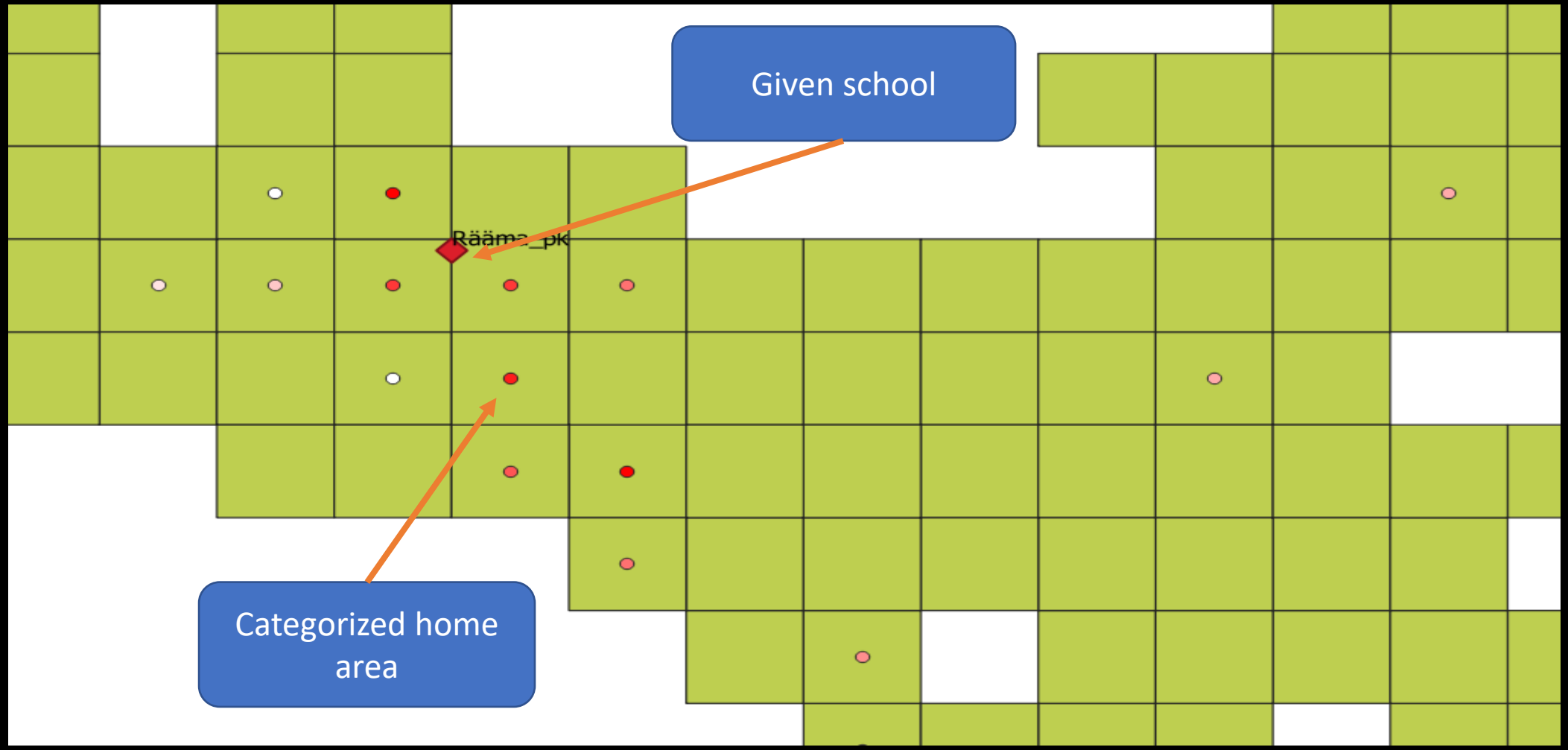


123 Origin = ε

	Origin	Rääma_di	Ülejõe_d	Kuninga_di	Attr_R	Attr_K	Attr_Ü	Attr_tot	Stud_R
1	207	799	804	1991	0.001175	8.8e-05	0.000851	0.002114	115
2	213	2811	3863	2194	9.5e-05	7.3e-05	3.7e-05	0.000205	99
3	224	1466	2449	948	0.000349	0.000389	9.2e-05	0.00083	94
4	107	626	1890	1371	0.001914	0.000186	0.000154	0.002254	91

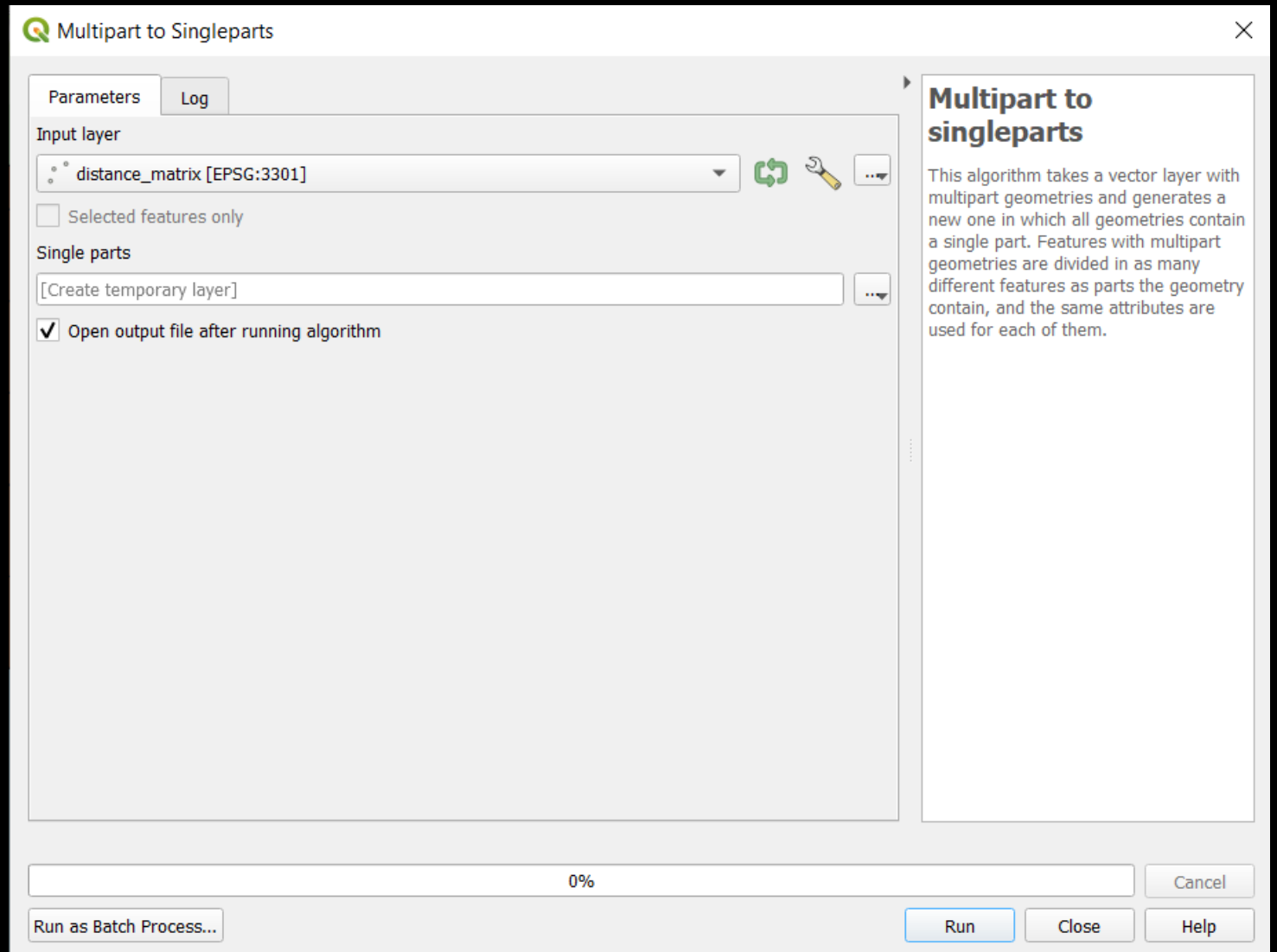
Here you will see the final view
of the attribute table

View of home area centroids categorized by student numbers against the attracted school



Task- how to bring multipoint layer to singlepoint

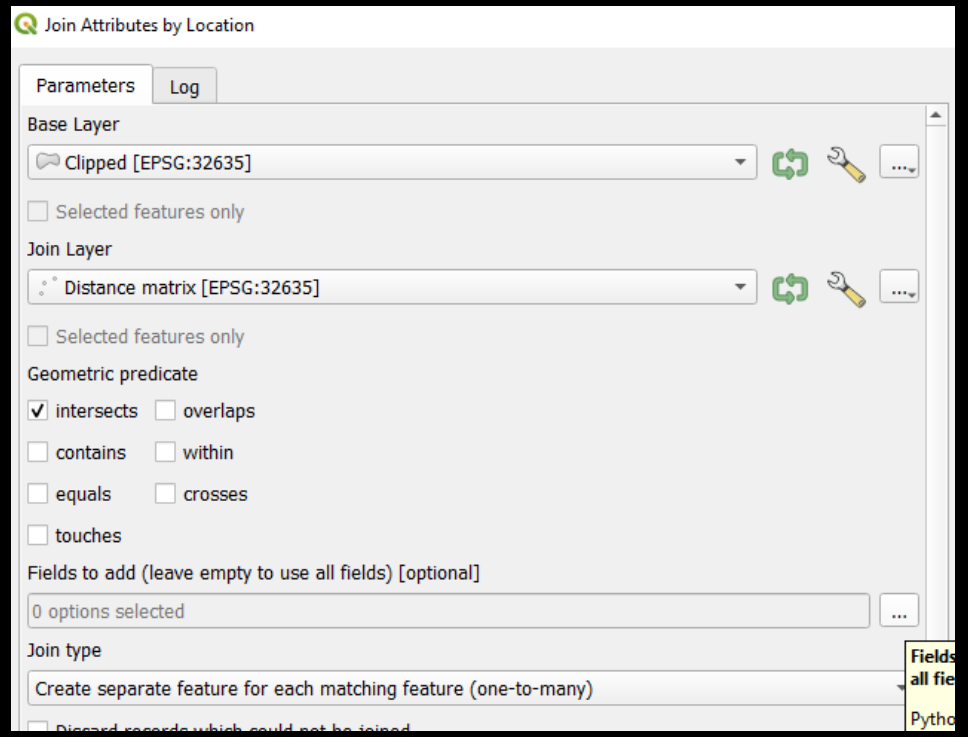
Need it to bring attractiveness back to the home areas grid



Task- how to join by location

- Join attributes by their location to bring students back to the home area layer
- To specify attributes for algorithm click on the „field to add“
- Fields to add „Stud_to_1, 2, 3“

We have a centroid with attributes of how much students will move to a given school.
But we want it to be a more clear view and we should bring those values back to area level



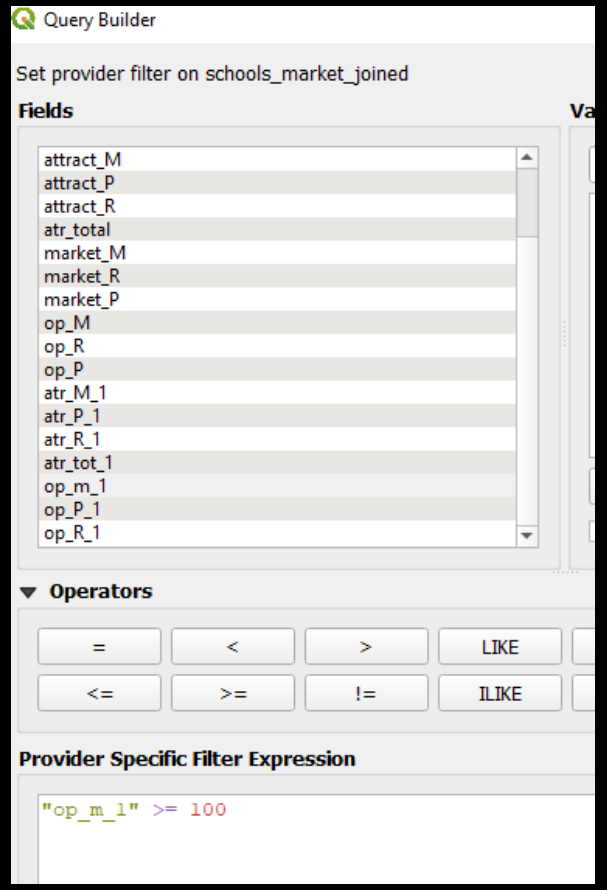
Results

In this example we are viewing how many students will go to Rääma school from each home area

You have to look at one school at the time, so you could have a view of how many students will move to a given school

Spatial analysis

- Let's take the first school and filter out all cells where the number of students moving is less than X
- You can choose it freely but i used 100



At the end of the course you team should submit following layers:

- Demand layer- students by area
- Offer layer- schools positions
- Gravity model of 3 objects
- Hot zone- where are the most mobility takes place
- Purposed non motorized traffic street layer

Thank you for your attention!

Interreg Central Baltic Project: INTELTRANS – Intelligent Transport and Traffic Management study module.