3. Spatial Analysis
(raster)

Raster Data Analysis

- Raster data has relatively simple structure that provides many types of data analysis
- Structure similar to a matrix → linear algebra
- Rasters should be similar (i.e. “fit”)
- Often implementation in GIS software as “Map Calculator”; can use arithmetic, logic, etc. operators.

Raster data analysis

- Single layer operations

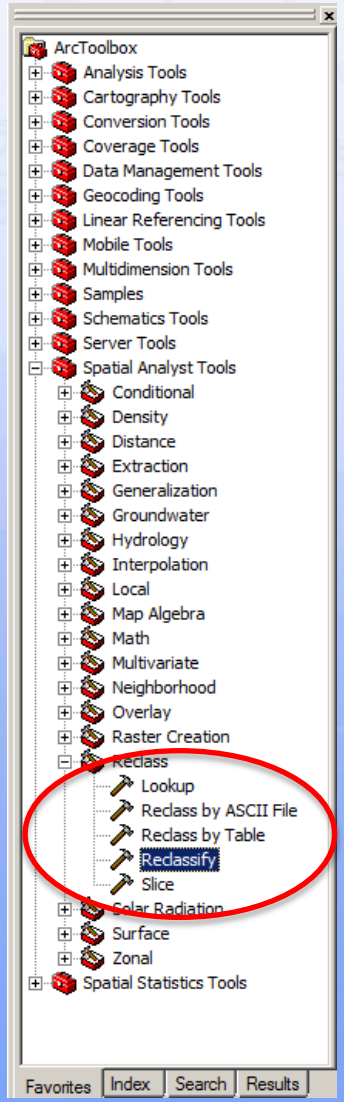
  →conversion of values in a single layer (usually saved into one new layer)

- Multiple layer operations

  →calculating new values from multiple layers (usually saved into one new layer)

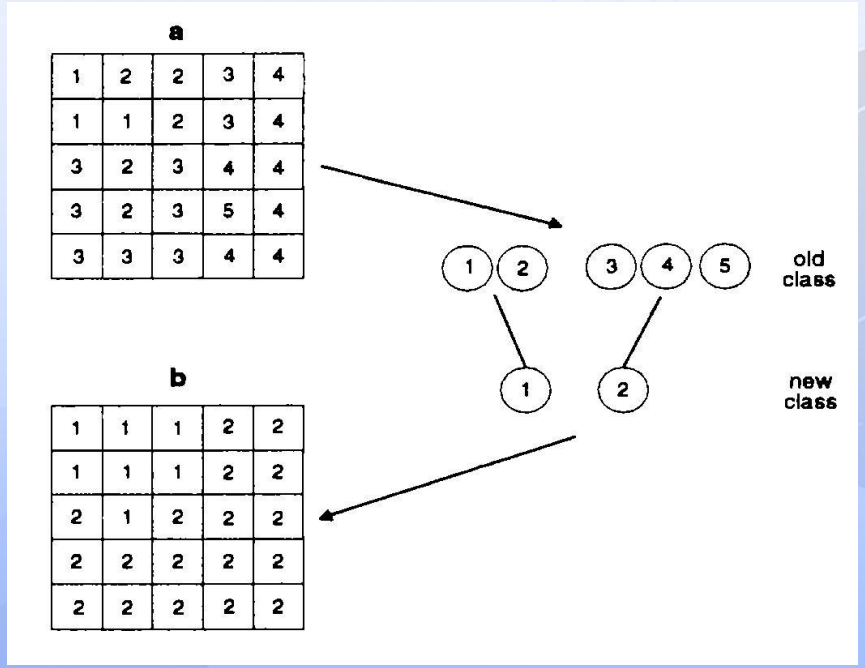
Some analysis can be applied both multi and single

Reclassify

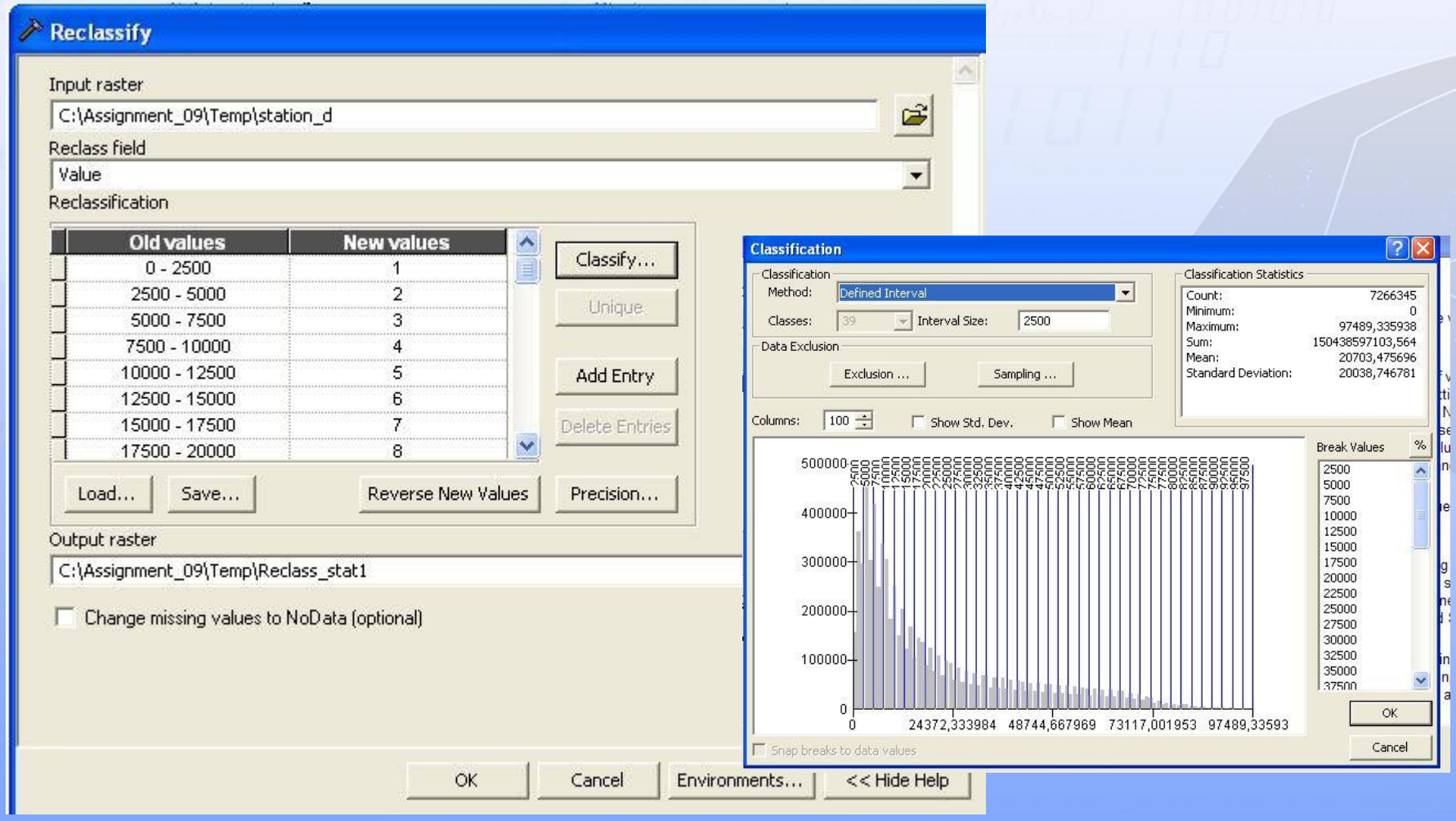


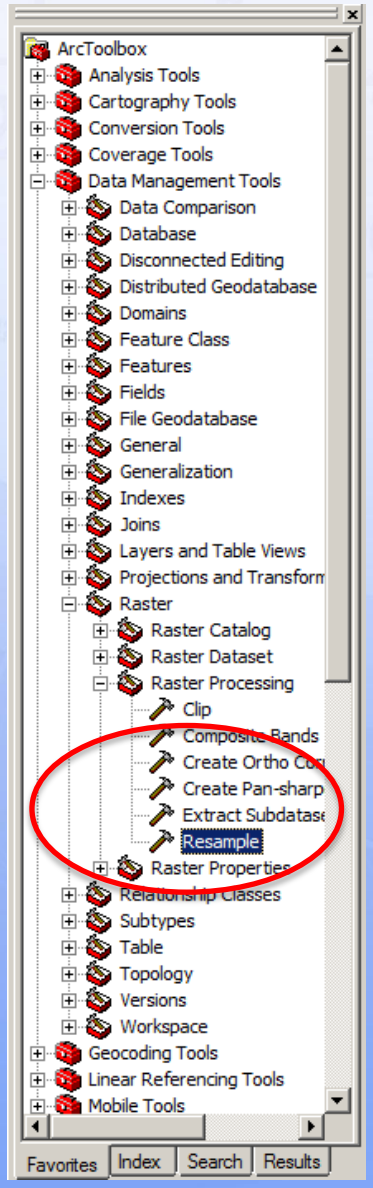
1 - industrial
2 - residential
3 - farmland
4 - moorland
5 - water

1 - urban
2 - rural



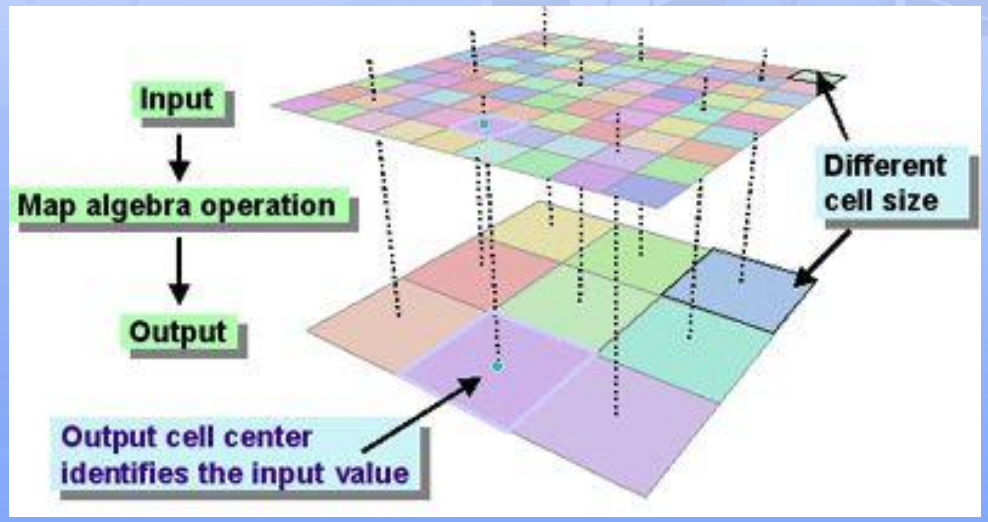
Reclassify


Reclassify
Input raster
C:\Assignment_09\Temp\station_d
Reclass field
Value
Reclassification
Old values
New values
0 - 2500
1
2500 - 5000
2
5000 - 7500
3
7500 - 10000
4
10000 - 12500
5
12500 - 15000
6
15000 - 17500
7
17500 - 20000
8
Classify...
Unique
Add Entry
Delete Entries
Load...
Save...
Reverse New Values
Precision...
Output raster
C:\Assignment_09\Temp\Reclass_stat1
Change missing values to NoData (optional)
OK
Cancel
Environments...
<< Hide Help
Classification
Classification
Method:
Defined Interval
Classes:
39
Interval Size:
2500
Data Exclusion
Exclusion ...
Sampling ...
Classification Statistics
Count: 7266345
Minimum: 0
Maximum: 97489,335938
Sum: 150438597103,564
Mean: 20703,475696
Standard Deviation: 20038,746781
Columns:
100
Show Std. Dev.
Show Mean
500000
400000
300000
200000
100000
0
0
24372,333984
48744,667969
73117,001953
97489,33593
Break Values
%
2500
5000
7500
10000
12500
15000
17500
20000
22500
25000
27500
30000
32500
35000
37500
OK
Cancel
Snap breaks to data values



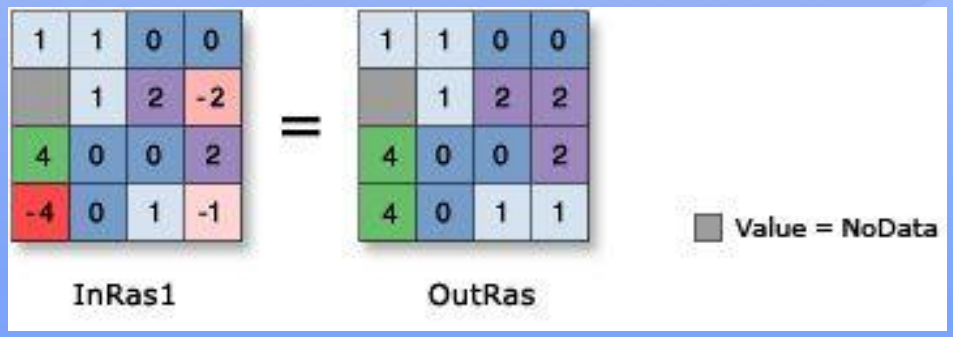
Resample

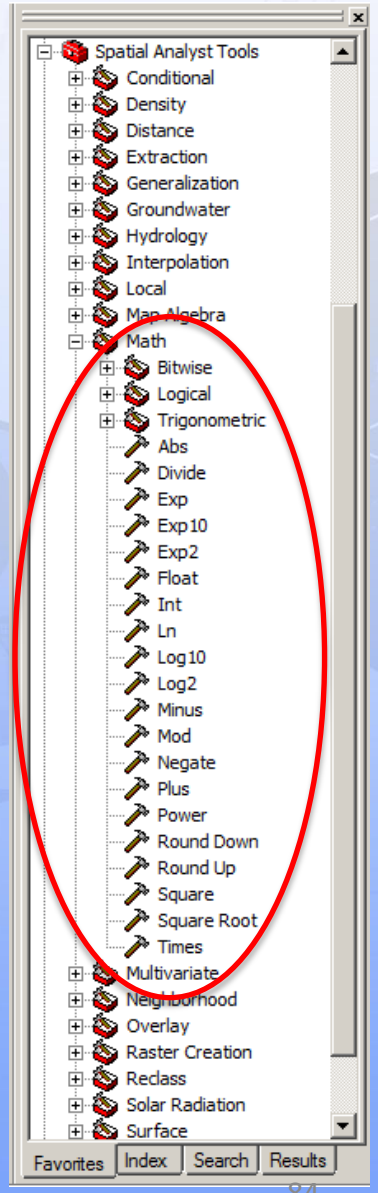
- With resample the cell size (resolution) of the raster can be changed



Math Functions

- ABS - Calculates the absolute value of cells in a raster
- Round up - Returns the next higher whole number for each cell in a raster
- Round down - Returns the next lower whole number for each cell in a raster
- Int - Converts each cell value of a raster to an integer by truncation
- Float - Converts each cell value of a raster into a floating-point representation
- Etc.





Map Algebra

1	2	1	1
1	2	1	2
1	1	1	3
1	1	1	4

+

1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	4

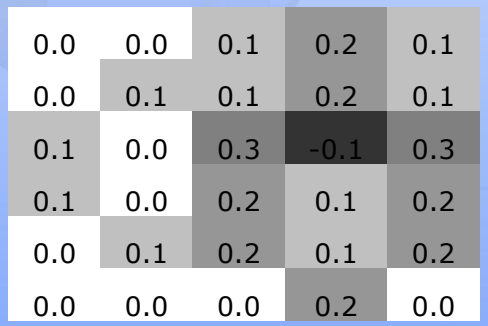
=

1	3	1	1
1	3	1	3
1	1	1	4
1	1	1	8

$$C_{x,y} = \max\left((C_{x,y} - C_{x1,y1})/10, (C_{x,y} - C_{x1,y1})/10, (C_{x,y} - C_{x1,y1}/10, (C_{x,y} - C_{x1,y1})/10\right)$$

elevation (m),
10 m grid cells

→



"slope"

Other common analysis

- Neighbourhood functions - can be used for averaging, smoothening or error correction
- Data tabulation - calculate (spatial) cell statistics, i.e. calculate areas by type of attribute

More advanced analysis

- Slope
- Aspect
- Hillshade
- Line-of-view

Specialised & Advanced Spatial Analysis

- Hydrology (sub)toolbox: flow direction, basin, watershed, etc.
- Groundwater (sub)toolbox
- Spatial regression analysis
- Spatial autocorrelation
- Etc.