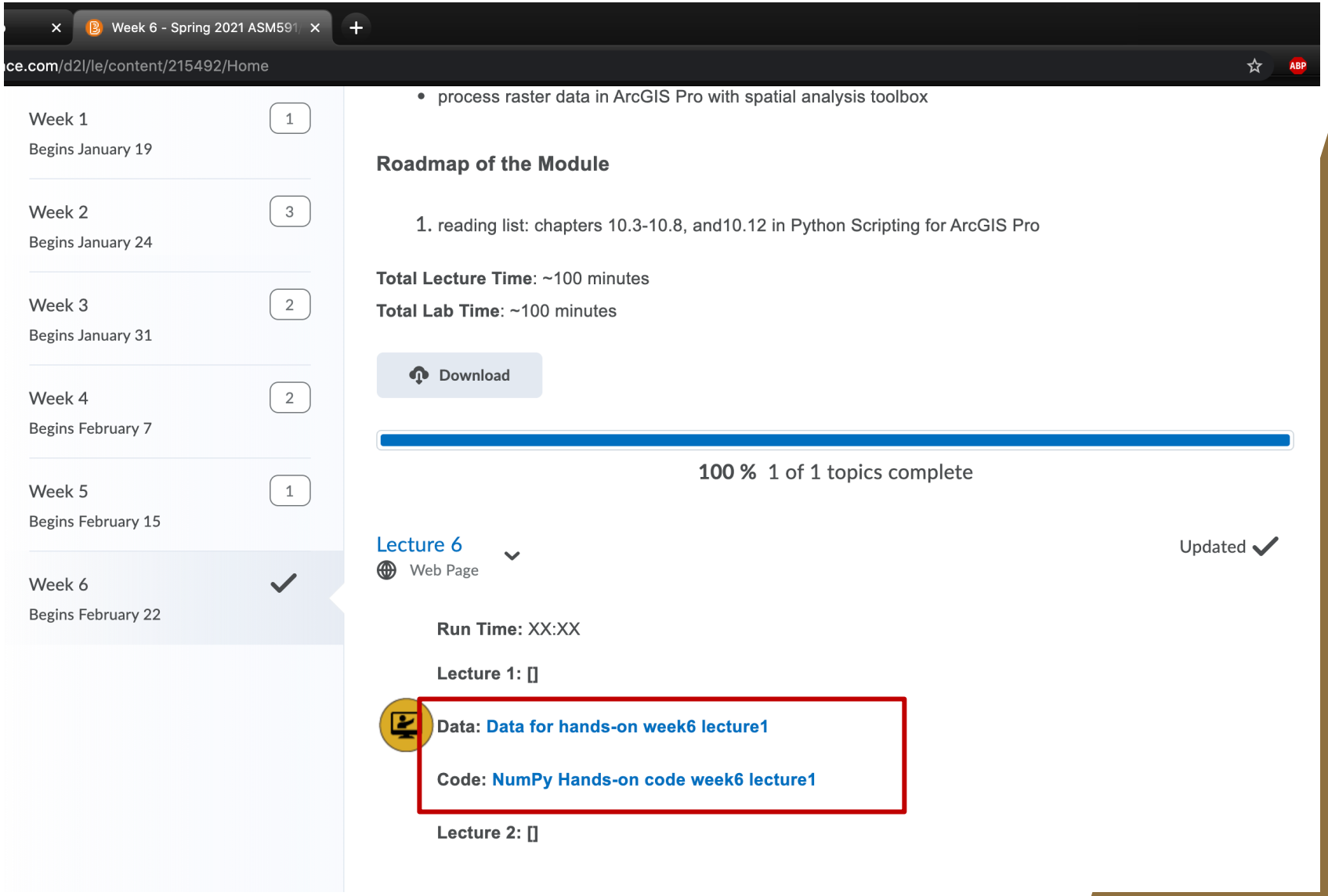
Please log onto Brightspace and download the data and code for today's lecture



PURDUE UNIVERSITY

ASM591/ILS595 GEOSPATIAL PROGRAMMING AND DATA SCIENCE

Introduction to Geospatial Data Science – Spatial Analysis and Statistics

Week 6 Lecture 1, Spring 2021

"*Information is the oil of the 21st century, and analytics is the combustion engine.*" – **Peter Sondergaard, Senior VP, Gartner Research**

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Gang Shao

Assistant Professor of Data Science

PLSIS, Purdue University

Content:

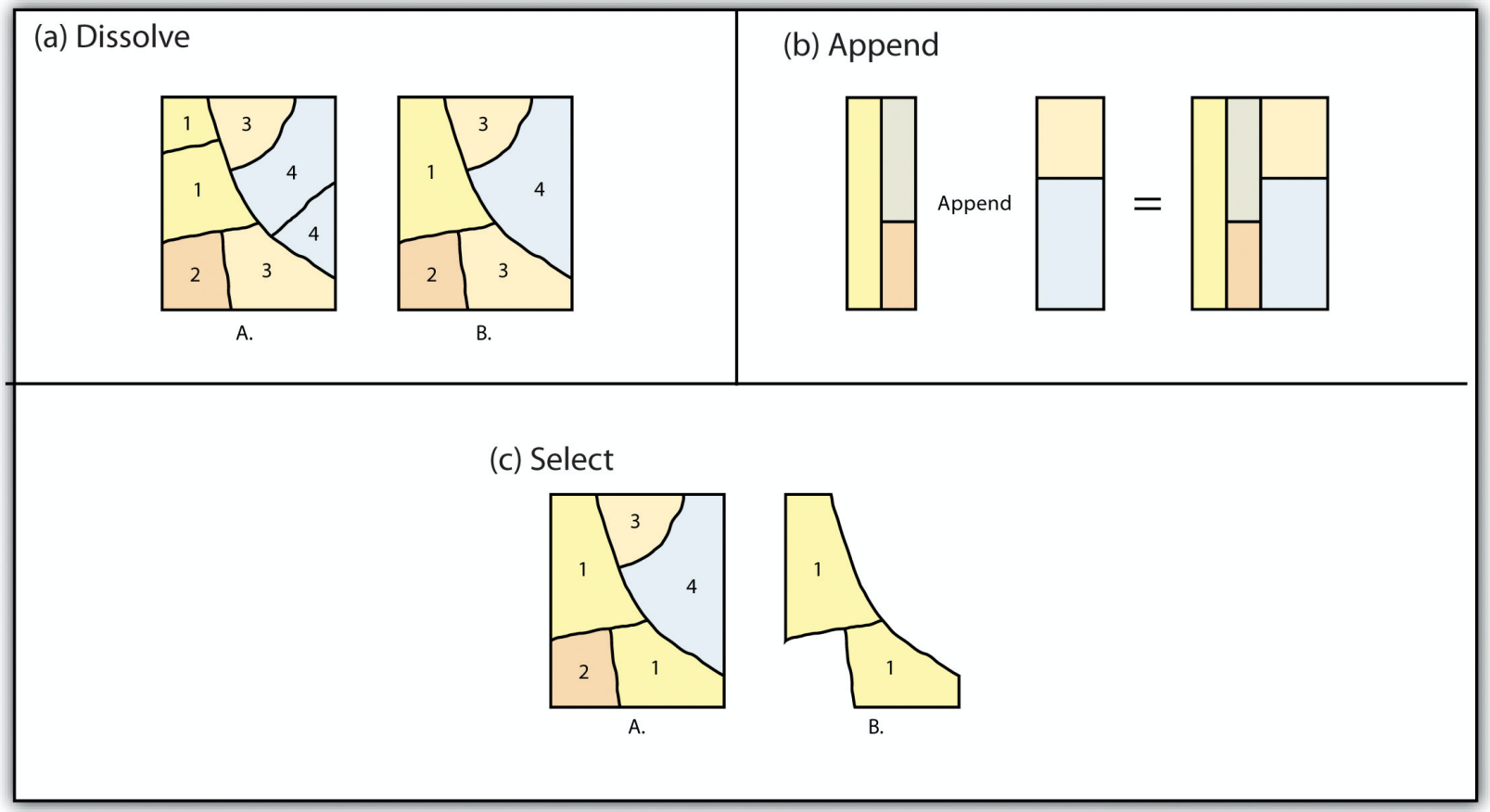
- Vector analysis (review)
- Raster analysis (part 1/2)
- Numpy Hands-on

Vector Analysis (Review)

Reference : https://ltb.itc.utwente.nl/498/concept/81774

Vector analysis

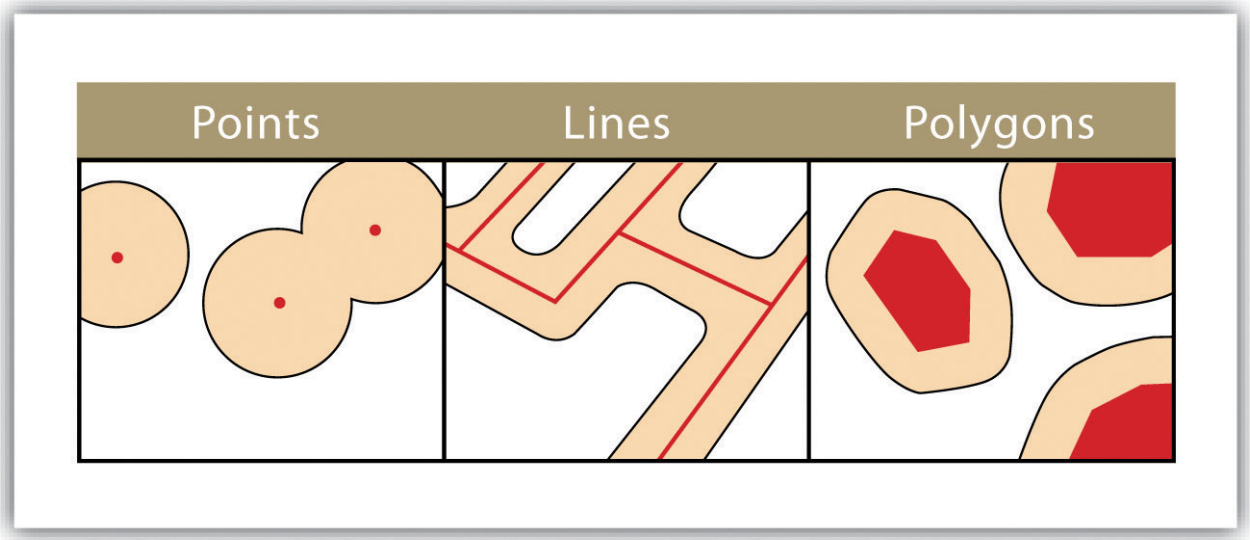
Single layer geoprocessing

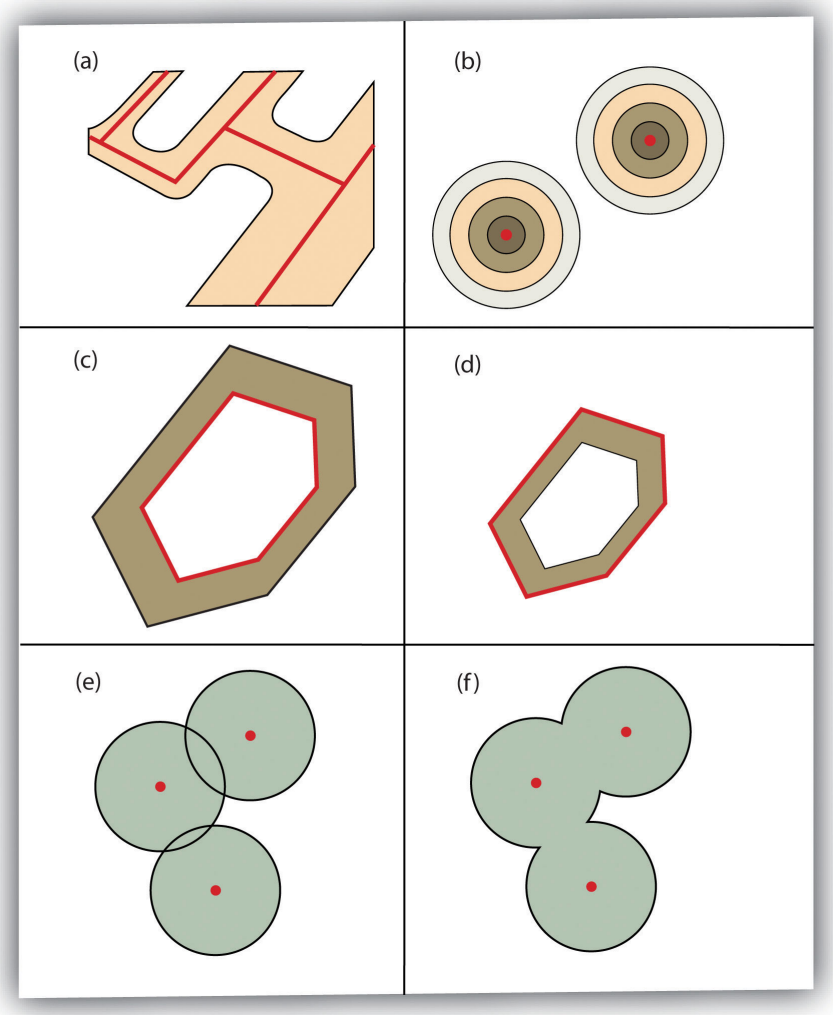


Reference : https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html

Vector analysis

Buffering





Additional Buffer Options around Red Features:
(a) Variable Width Buffers, (b) Multiple Ring Buffers,
(c) Doughnut Buffer, (d) Setback Buffer,
(e) Nondissolved Buffer, (f) Dissolved Buffer

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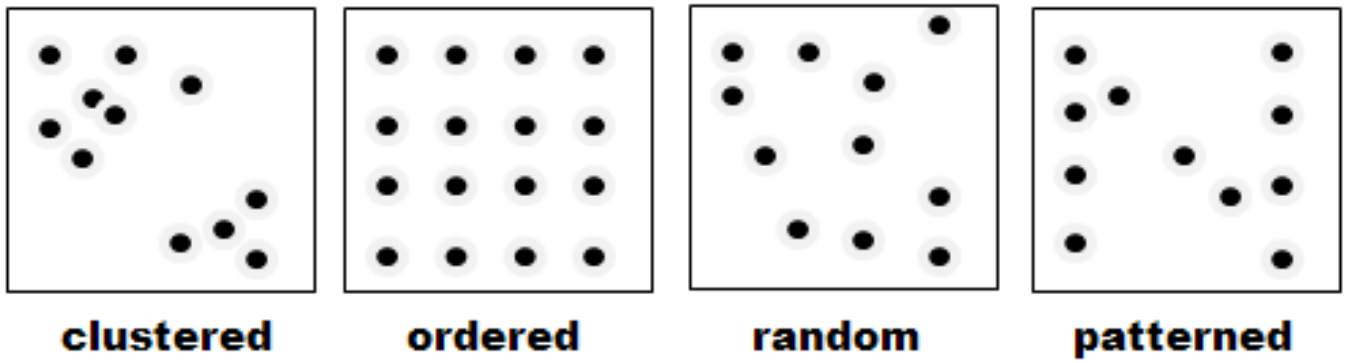
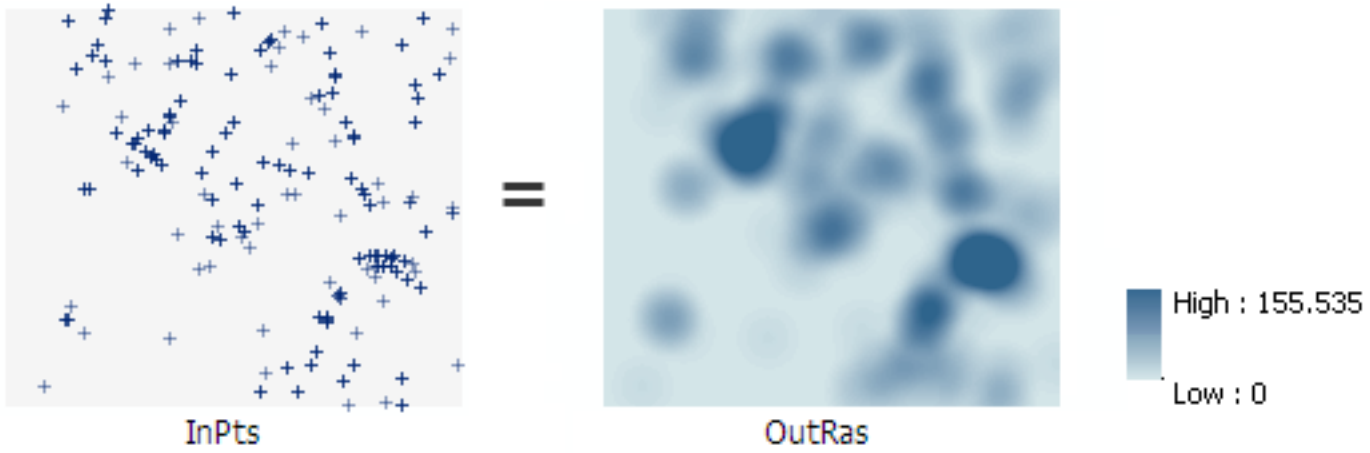
Reference : https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html

Vector analysis

Distributions



Kernel density



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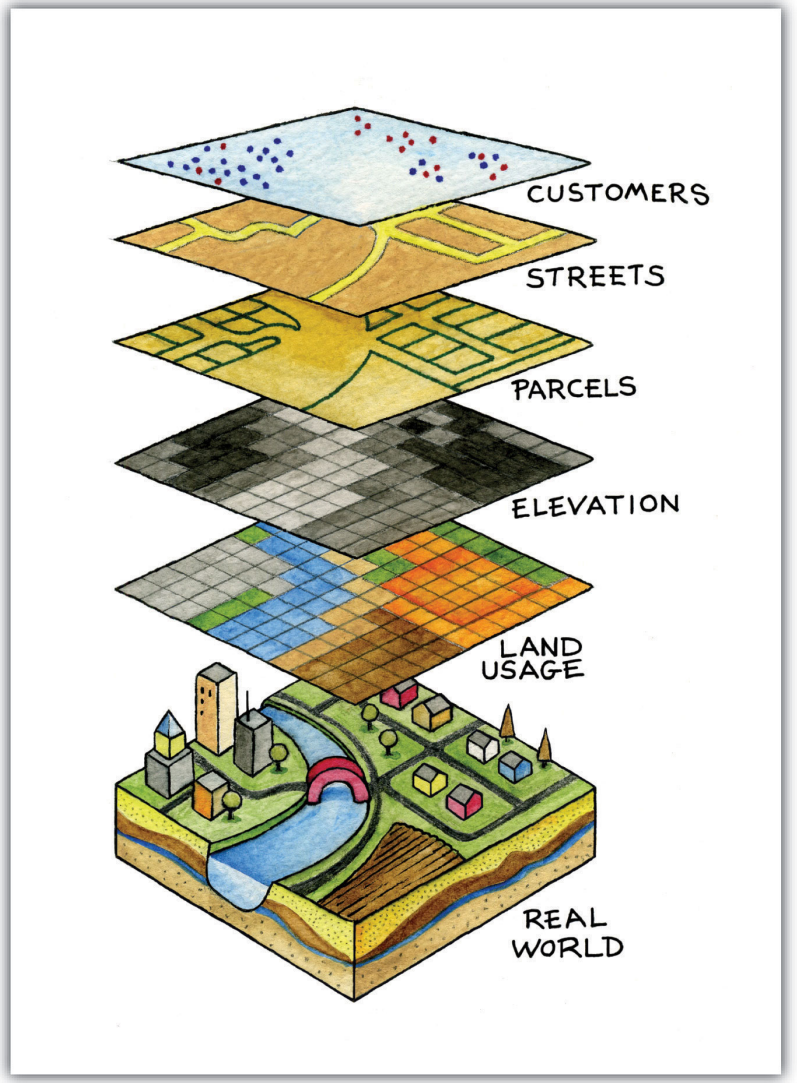
Reference : https://geol260.academic.wlu.edu/course-notes/shape-analyses/distribution-of-points-lines-and-polygons/ ' https://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-analyst-toolbox/kernel-density.htm

Vector analysis

Multiple layer processing

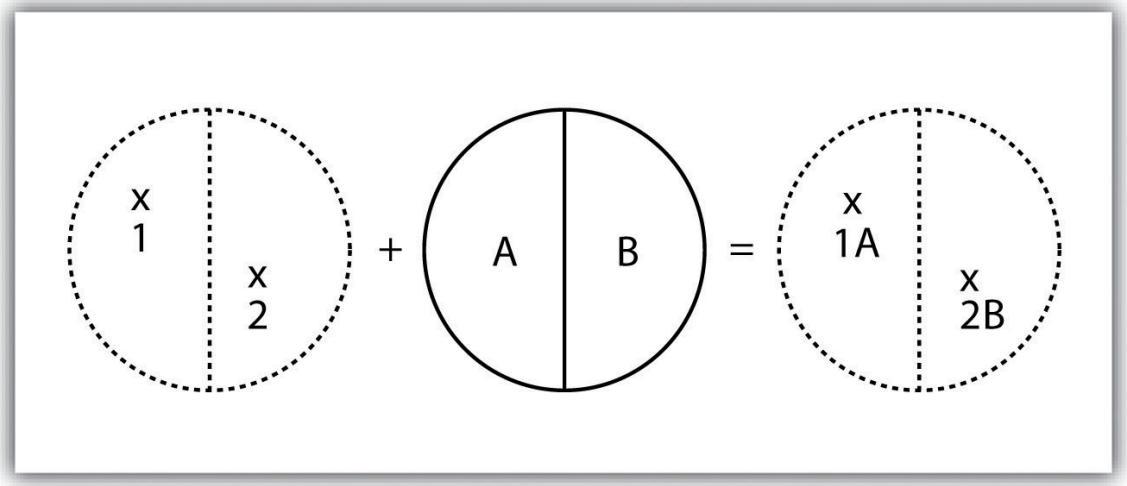


Reference : https://geol260.academic.wlu.edu/course-notes/shape-analyses/distribution-of-points-lines-and-polygons/

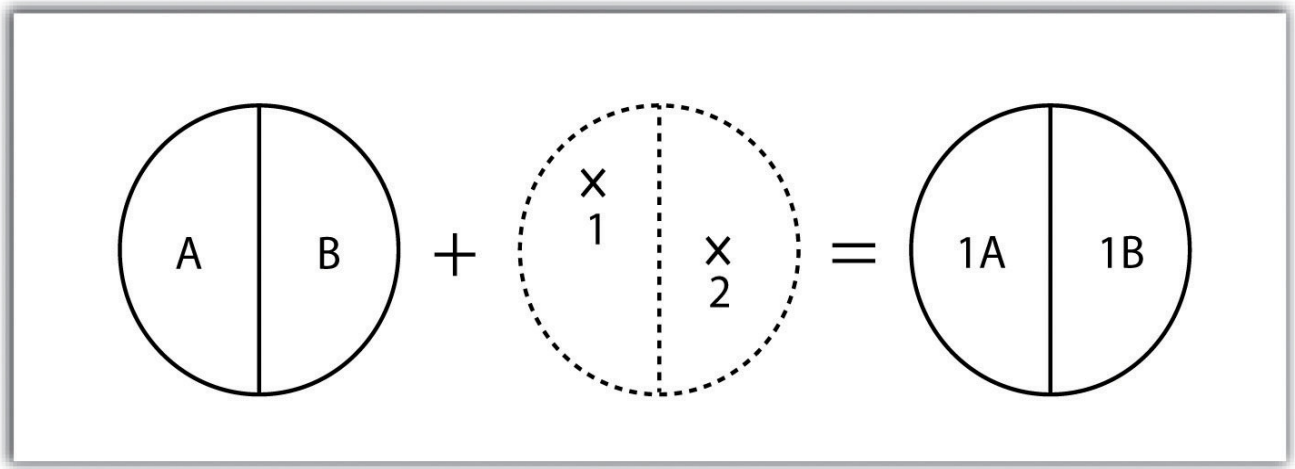
Vector analysis

Multiple layer processing

Input layer + **Overlay layer**



point-in-polygon overlay



polygon-on-point overlay

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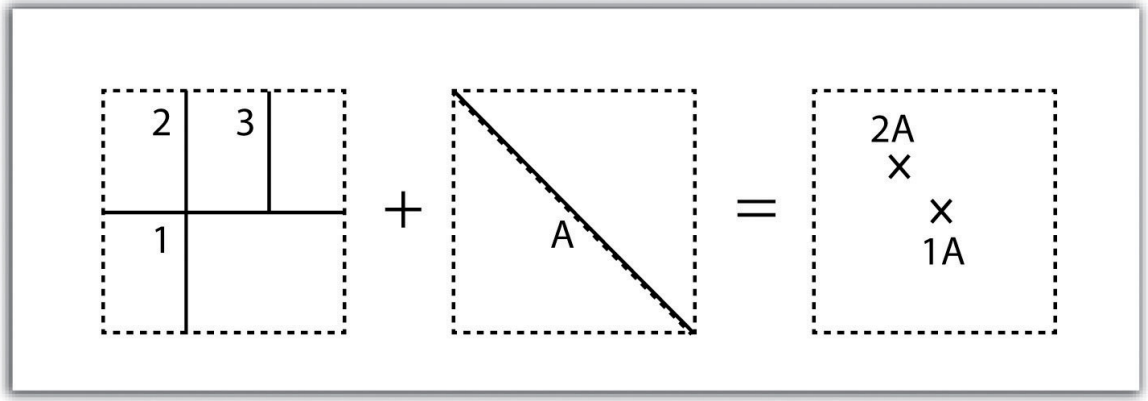
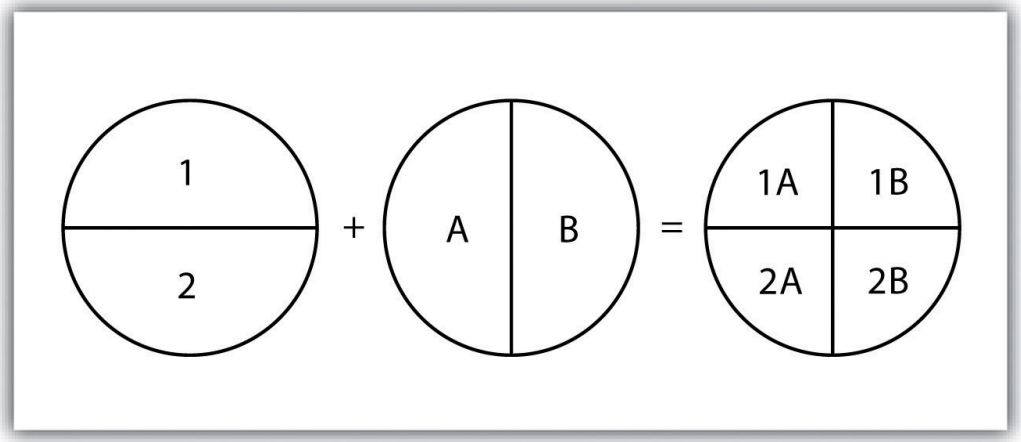
Reference : https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html

Vector analysis

Multiple layer processing



line-on-line overlay



polygon-in-polygon overlay

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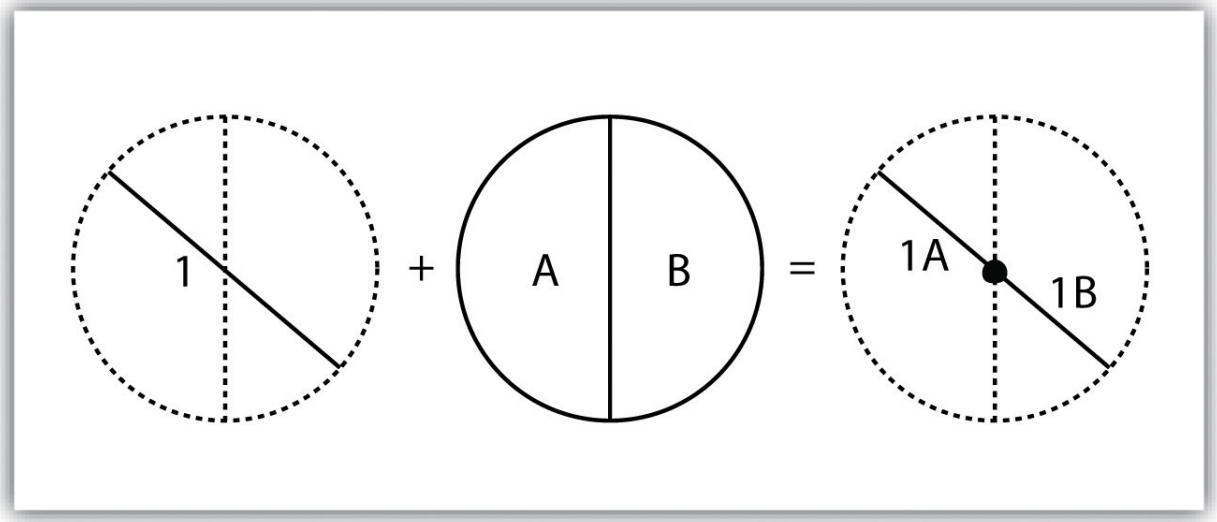
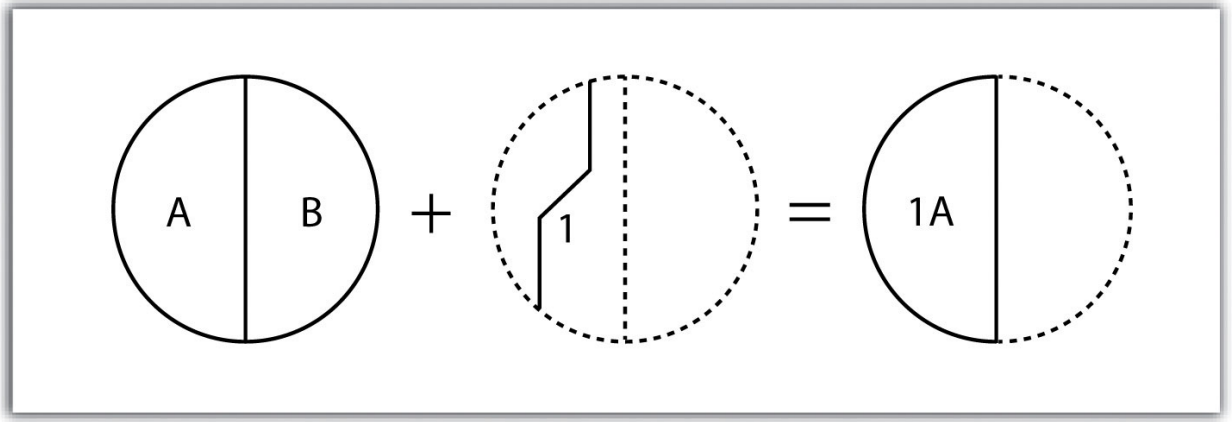
Reference : https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html

Vector analysis

Multiple layer processing



line-in-polygon overlay



polygon-on-line overlay

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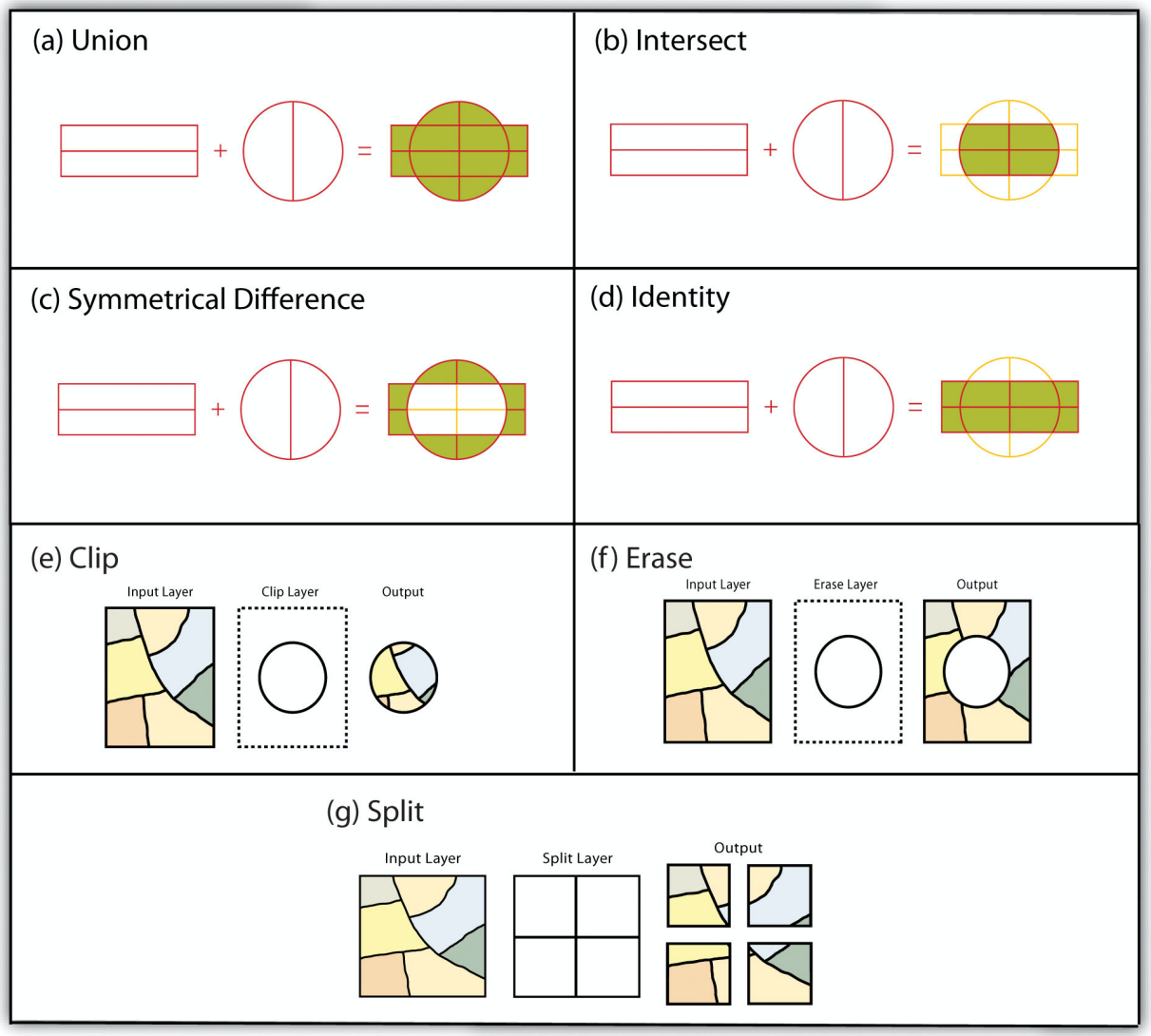
Reference : https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html

Vector analysis

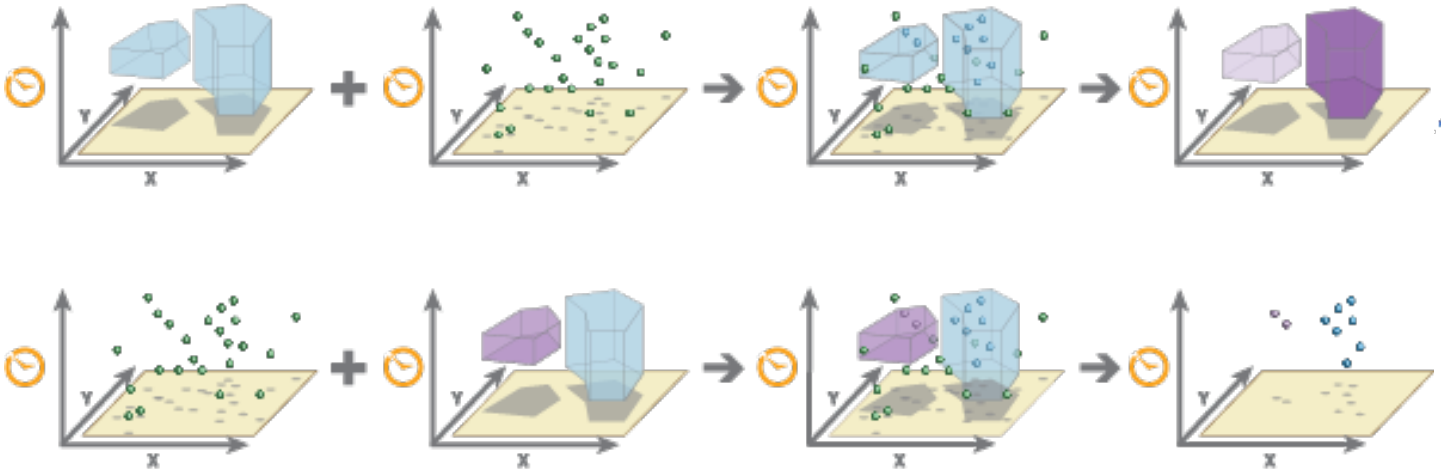
Multilayer Overlay



Reference : https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html

Vector analysis

Join features



Fields to match

Type	Key
Apartment	A
House	B
Commercial	C

Target Layer

Building_Type_ID	Building_Name	Occupants
A	Silverbirch Estates	130
A	Pine Ridge	8
A	Lake View	250
B	Yellow	3

Join Layer

Join one to **many**

Type	Key	Building_Name	Occupants
Apartment	A	Silverbirch Estates	130
Apartment	A	Pine Ridge	8
Apartment	A	Lake View	250
House	B	Yellow	3

Join one to **one**

Type	Key	Count
Apartment	A	3
House	B	1

Keep all target features = **False**

Type	Key	Count
Apartment	A	3
House	B	1
Commercial	C	0

Keep all target features = **True**

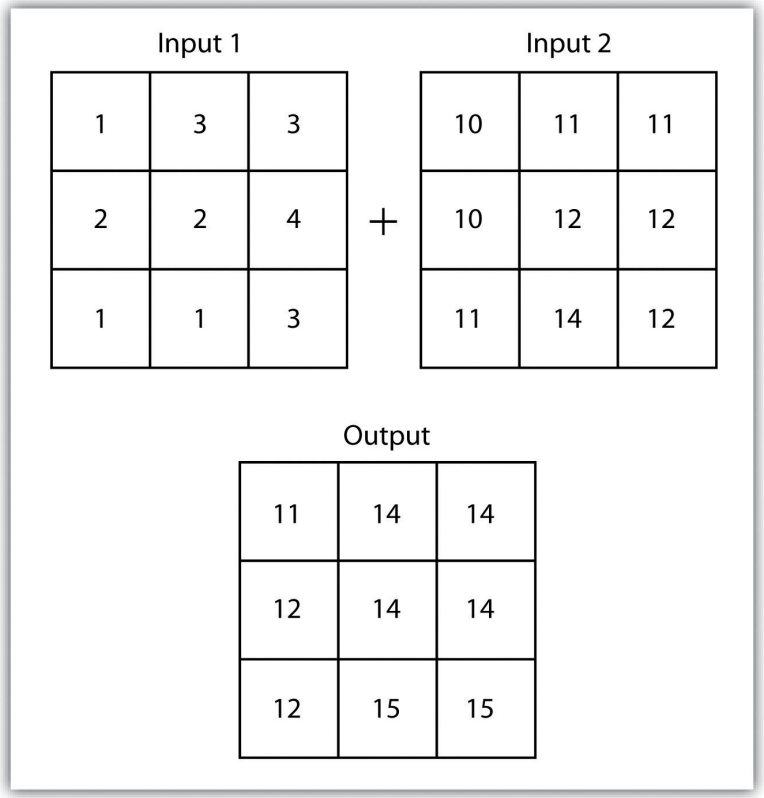
Reference : https://pro.arcgis.com/en/pro-app/latest/tool-reference/big-data-analytics/join-features.htm

Raster Analysis part 1/2

Reference : https://ltb.itc.utwente.nl/498/concept/81774

Raster analysis

Raster overlay (**A** + **B**)



scale (a x **A**)

Input Raster

456	416	364	326	243
448	364	315	276	218
359	325	268	234	164
306	296	201	133	44
274	231	184	65	5

↓

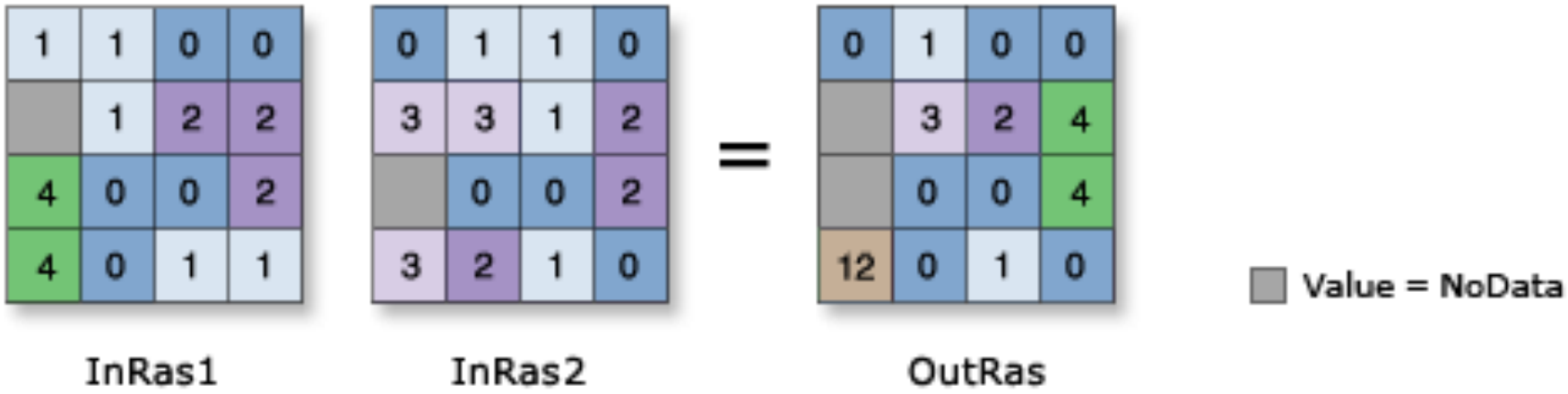
Output Raster (x10)

4560	4160	3640	3260	2430
4480	3640	3150	2760	2180
3590	3250	2680	2340	1640
3060	2960	2010	1330	440
2740	2310	1840	650	50

Reference : https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s12-geospatial-analysis-ii-raster-.html

Raster analysis

Raster Multiplication (**A** x **B**)

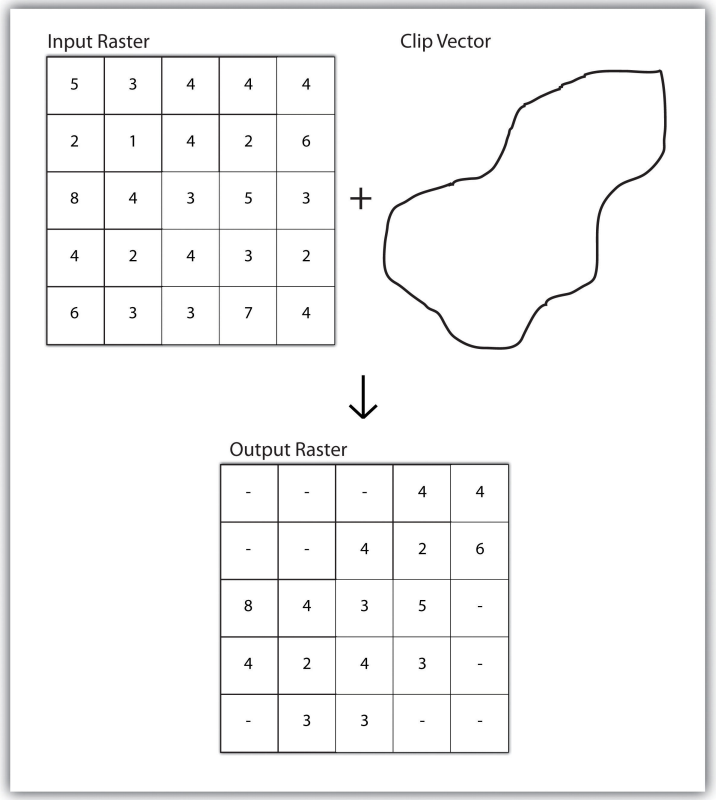


OutRas = Raster("InRas1") * Raster("InRas2")

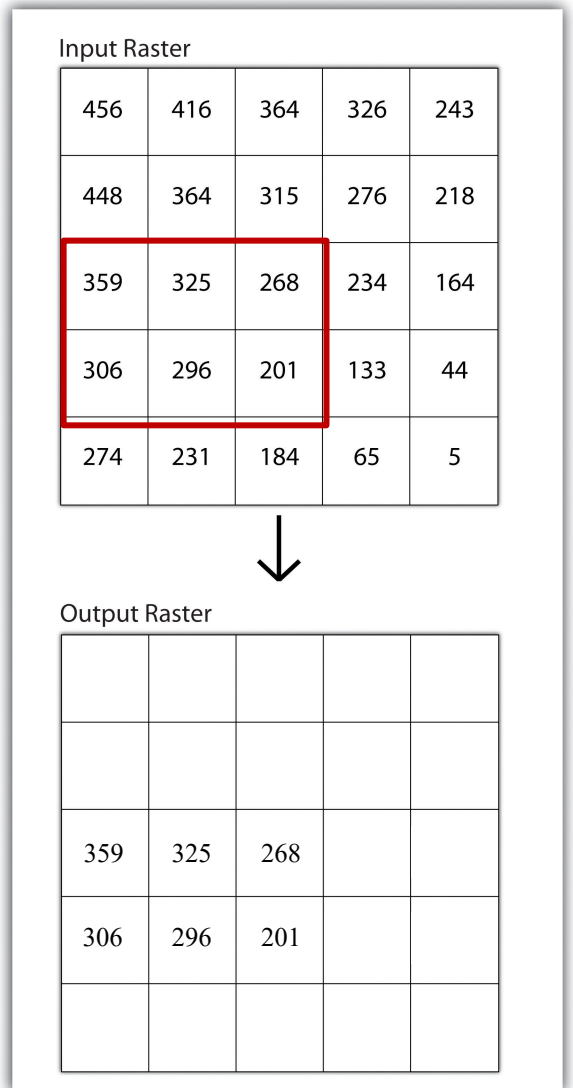
Reference : https://pro.arcgis.com/en/pro-app/latest/arcpy/spatial-analyst/arithmetic-times-operator.htm

Raster analysis

Raster clip



Slicing



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Reference : https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s12-geospatial-analysis-ii-raster-.html