What are the 3 basic spatial entities and how are these used to portray geographical features on paper maps and in GIS? 6 points

Point, lines and areas (or polygons).

Point are used to represent features that are too small to be an area in the map at the scale being used. They are represented by a pair of coordinates (x,y) and can store attributes giving additional information of the feature (what it is, status, etc).

Lines are used to represent features that area linear in nature (such as roads, rivers, etc). a line is an ordered set of coordinate pairs joined together by straight lines.

Area (often called polygons) represent a closed set of lines in which the inside represents the phenomena (such as a lake or a field or a municipality).

True or false? (3 points)

NB: correct answer 1 points, no answer 0 points, **wrong answer -0.5 point**.

	True	False
Scale is the size of objects displayed on a map as a fraction of their real world sizes.	x	☐
Geo data usually has two components a position and attribute information	x	☐
Extent is the sum of the lengths of the data	☐	x

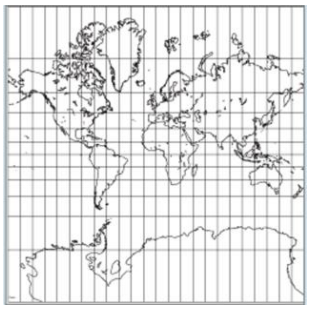
…

Describe whether you prefer a vector or raster data model for representing the following features/phenomena. Briefly motivate your answer. (6 points)

	Vector	**Raster**	**Motivation**
Addresses	☐	☐	
Temperature	☐	☐	
Aerial photos	☐	☐	

	Vector	Raster	Motivation
Addresses	x	☐	*Discrete phenomena, best represented with vector point data.*
Temperature	☐	x	*Continuous phenomena with variation across space.*
Aerial photos	☐	x	*Photos contain pixels covering the whole extent with continuous information.*

The Mercator projection is a commonly used global map projection that generates a map like this.



But as you know, all projections have pro's and con's. explain in your words one advantages and one disadvantages of the Mercator projection.

Adv:

continuous picture of the world (the whole world can be represented) while in other projections only a part of the world is visible.

Dis:

Zones closer to the poles are distorted.

Suggest 2 different applications for buffering and justify your choice.

1000meter Buffer around a hospital data set (points) to determine the areas of a city within 1km of a hospital for analyzing people at risk (from a certain health issue) by being too far from a hospital.

100m Buffer around river (lines) to determine which houses are within a 100m of a river in order to determine if houses close by are more expensive than houses outside the 100m distance.

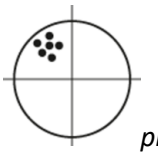
How does reclassify work and why/how would you use it?

Reclassify turns a raster data of many values (or classes) to a new raster of other values classes (usually less, by combining some old values to a new class). It doies this by applying a table mapping old values to new values.

We could use this in reclassifying a land use dataset with many different types of vegetation (grass, forest, shrubs, etc) into one class green.

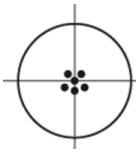
What is the difference between accuracy and precision? Give examples of both in a GIS context explaining position errors of a location of a point.

Precision is the standard deviation: The spread of repeated data around their average value (unrelated with the true value).
For a positional accuracy, how the locations are close to each other.



precise (but not precise by the way)!

Accuracy is the average error: The spread of data around the true value (it is actually a composite of bias and precision).



accurate!

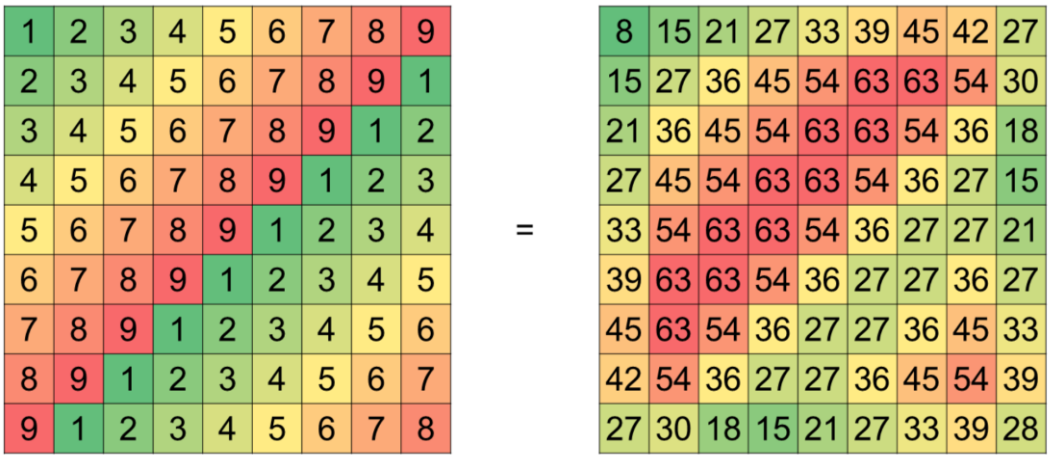
You have classified an image and obtained the following accuracy matrix.

		Reference				
		Class A	**Class B**	**Class C**	**Class D**	**Class E**
Classification	**Class A**	**10**	**5**			
	Class B	**2**	**10**			
	Class C			**15**	**2**	
	Class D			**5**	**30**	
	Class E				**1**	**20**

1. **Calculate the overall accuracy and Show your calculation (6 points).**

(10 + 10 + 15 + 30 + 20) / (10 + 5 + 2 + 10 + 15+ 2 + 5 + 30 + 1 + 20) = 85 / 100 = 0.85

In class and in the assignments, we discussed a powerful tool of single layer raster analysis, called focal statistics. In the figure below, on the left is the input raster layer. And on the right the resulting layer. Which statistics was used? And give an example of why you would use this tool.

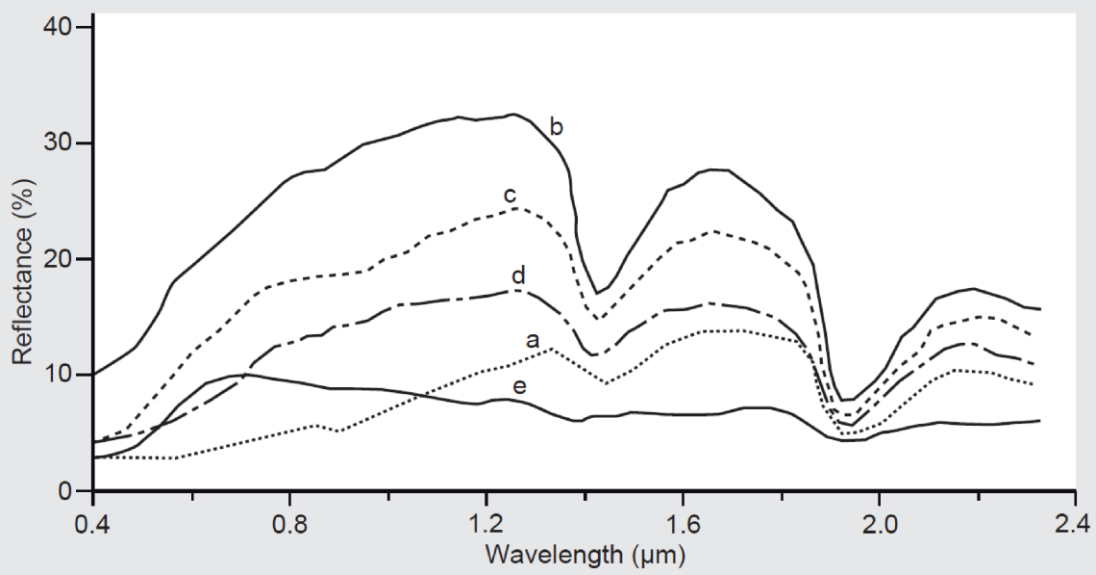


Answer:

Sum was used.

Focal statistics sum can be used to calculate the potential of a neighborhood. For example, on a population dataset(each cell contains the amount of people in the cell), using focal statistics sum, one can calculate for each cell the amount of people that live within a certain radius. This is interesting if you want to find out not just how many people live in a certain cell, but how many people are contained within a certain neighborhood of that cell (for studying the most suitable location of a shop for example).

The following figure shows the different reflectance curves for different types of bare soil.



You would like to discriminate between types "e" and "d" in a RS image data set. Which sensor data would be most suitable.

- O Measuring spectral bands 0.4 µm
- O Measuring spectral bands 0.8 µm
- O Measuring spectral bands 1.2 µm
- O Measuring spectral bands 1.6 µm
- O Measuring spectral bands2.0 µm

Both 1.2 and 1.6 are correct as they provide max separation between reflectance values and therefore maximizes chances of successfully discriminating the soil types in an image.

In out text book you became familiar with the cartographic modelling concept. Where a flow diagram is used to represent the data analysis of a problem.

Imagine you have the following datasets and criteria to determine a suitable map for locating a nuclear waste repository:

Data:	**Criteria**
Geology	**Chosen site must be in an area of suitable geology**
Accessibility	**chosen site must be easily accessible**
Population	**chosen site must be away from areas of high population density.**
Conservation	**site must be outside any conservation area.**

Please draw the flow diagram representing the analysis steps for identifying areas suitable for a nuclear waste repository.