

Geographic Information Systems

Grade 12

GIS

Designing
our future

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WHAT IS A GIS?

- a computer system of hardware, software and methods
- to capture, manage, manipulate, analyse, model, display
- spatial data (geographic objects) and
- non-spatial data (attribute data)

- **to solve planning and management problems.**

This is the main purpose of the GIS!

COMPONENTS OF GIS

CPU, screen,
keyboard, mouse,
scanner, printer,
digitizing tablet

Hardware

Application
programme
such as
ArcView

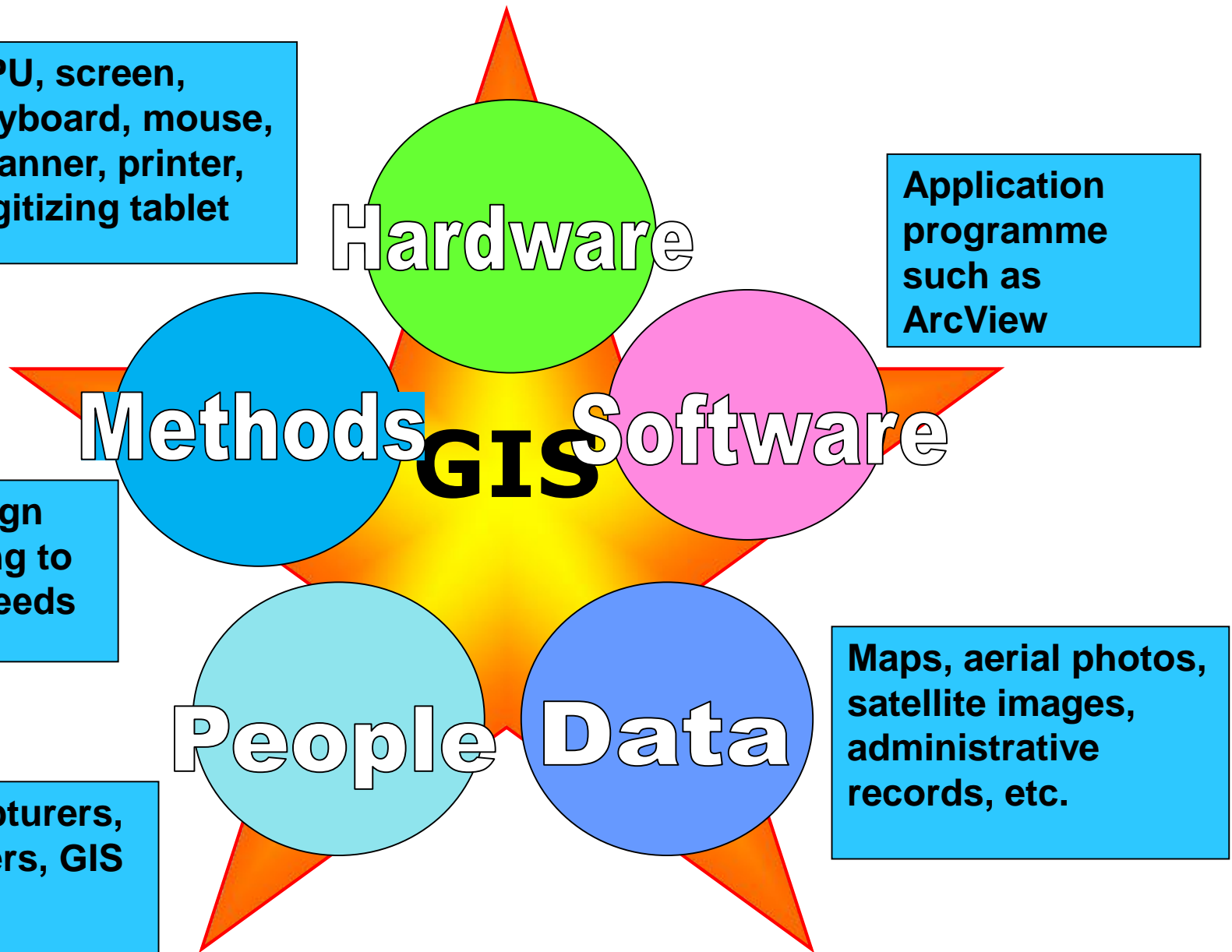
Methods **GIS** Software

GIS design
according to
user's needs

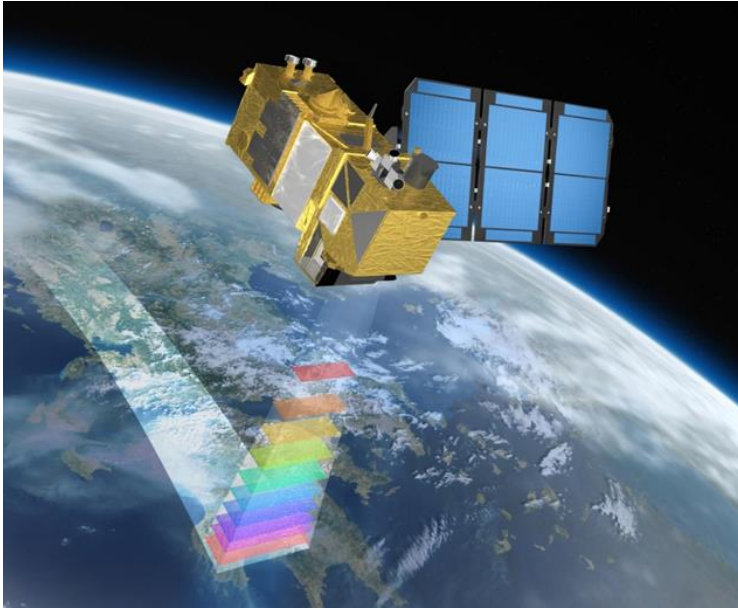
People Data

Maps, aerial photos,
satellite images,
administrative
records, etc.

Data capturers,
data users, GIS
analysts



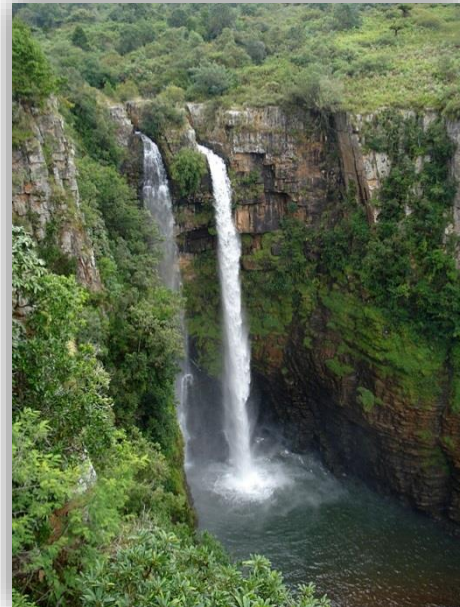
REMOTE SENSING



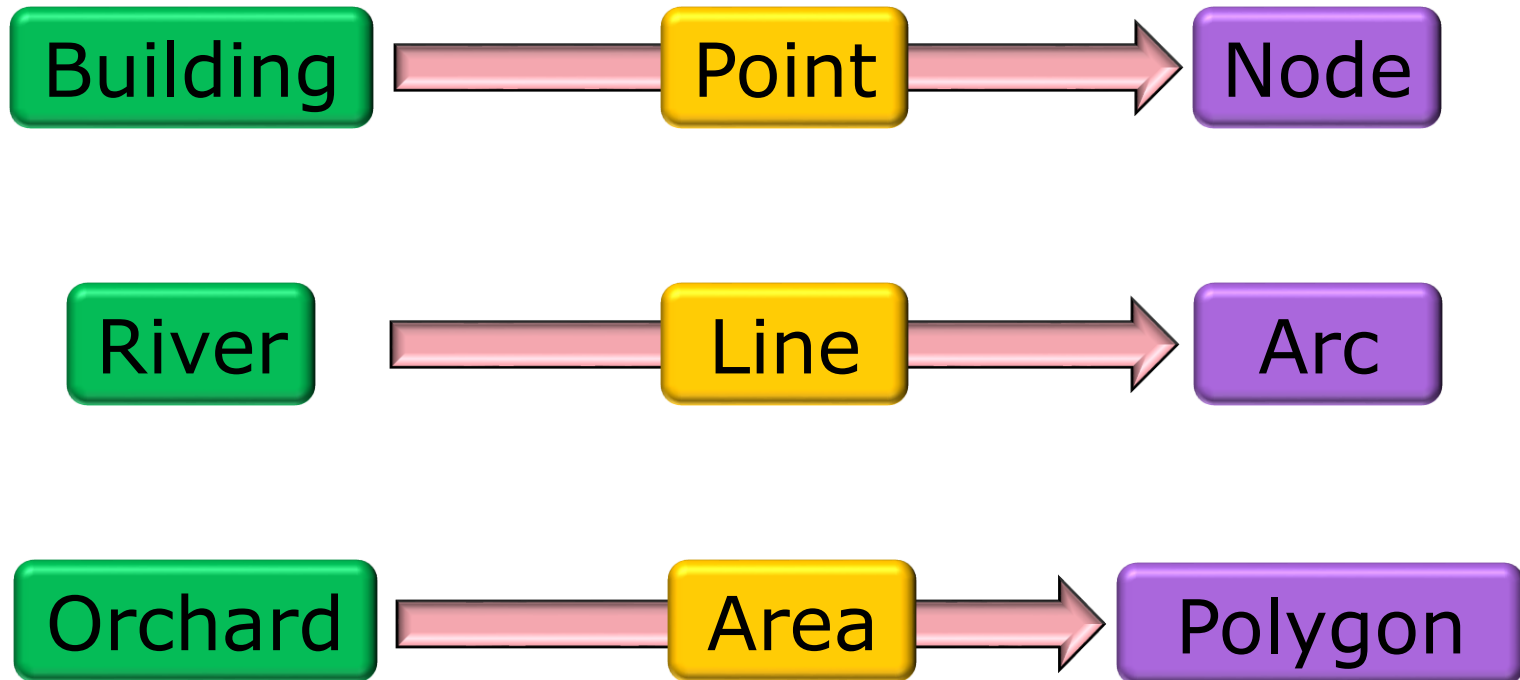
- The collecting of information
- about the earth's surface
- with sensors on platforms such as weather balloons, aeroplanes and satellites
- using energy reflected or radiated from the earth

without being in physical contact with the earth

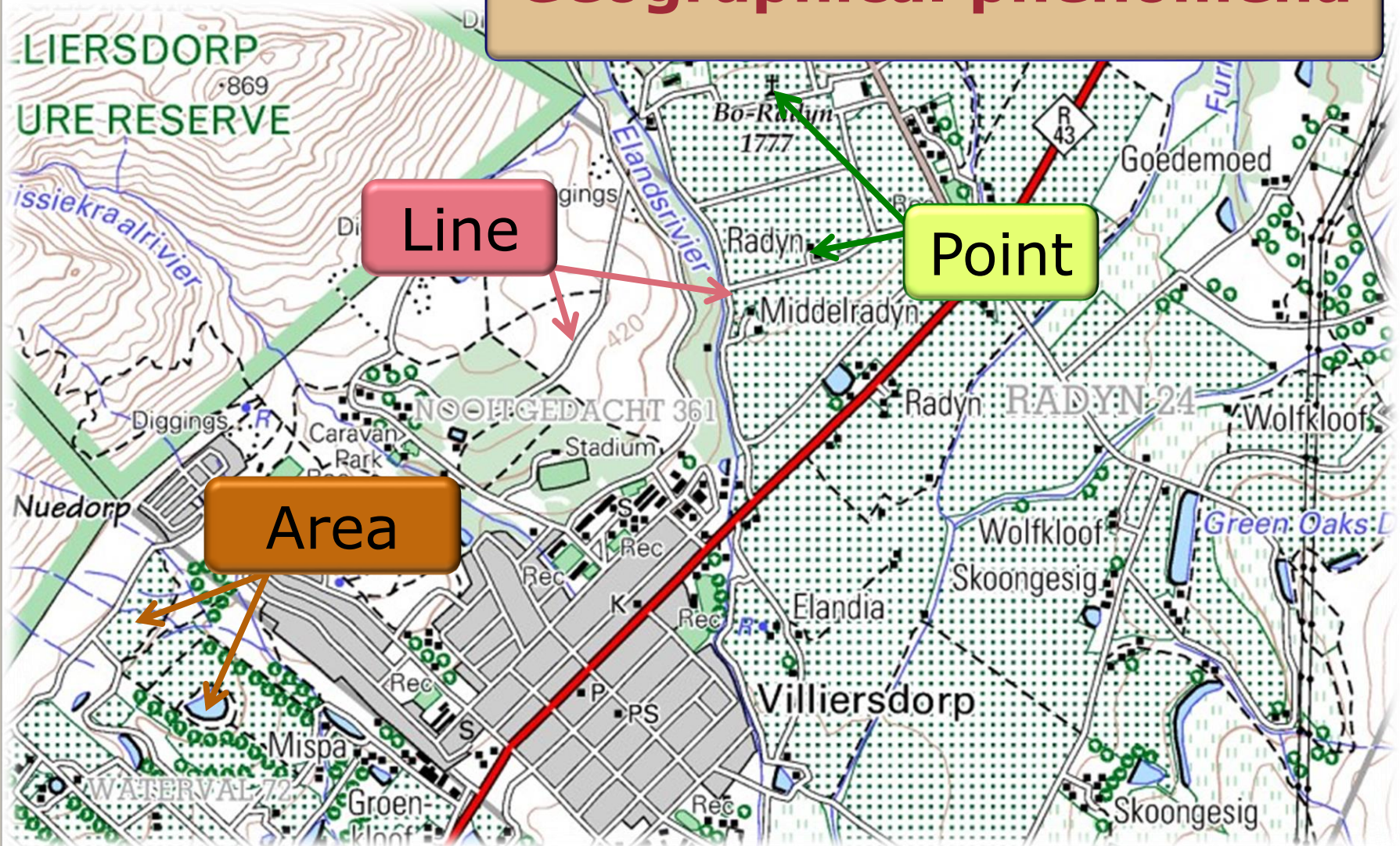
What is a spatial object?



Spatial objects



Spatial objects Geographical phenomena



What is resolution?



The ability of a remote sensing sensor to create a sharp and clear image

Spatial resolution



High

Many pixels
Small pixels
Objects easily recognised



Low

Less pixels
Larger pixels
Objects not easily recognised

GIS DATA TYPES

SPATIAL DATA

All geographic features/objects both natural and man-made
[Map data]

ATTRIBUTE DATA

Characteristics/description/information of the geographic objects

Spatial data structures



Raster

Pixels



Vector

Points, lines, areas
(Nodes, arcs, polygons)

Spatial data structures

Vector representation

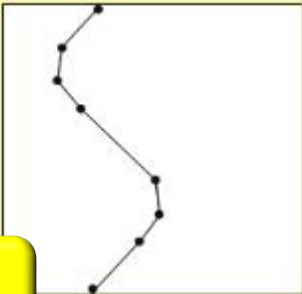
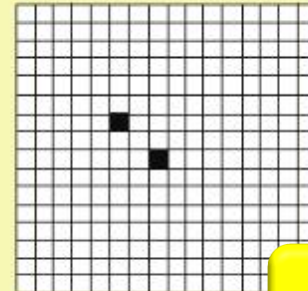


Real world spatial objects

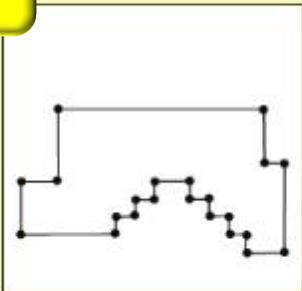
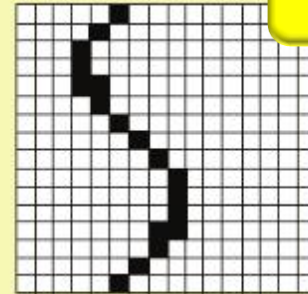


Point feature: houses

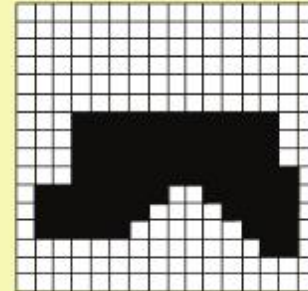
Raster representation



Line feature: road



Area feature:plantation



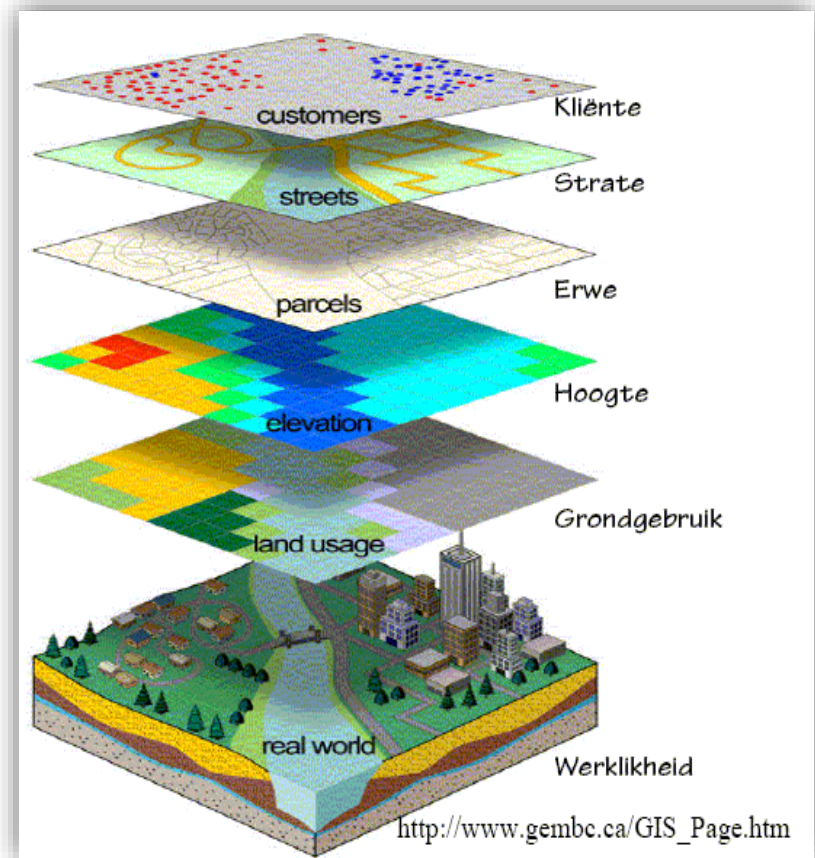
Vector

Raster

GIS DATA LAYERS

All spatial data whether it is vector data or raster data are shown in layers

Each layer represents a single entity/theme



It is this characteristic that enables a GIS to manipulate, integrate, and query data.

DATA MANIPULATION AND ANALYSIS

Data can be manipulated (edited and processed) and analysed by a GIS.

- Transforming from one map projection to another
- Converting data from raster to vector format and from vector to raster format
- Interpolation between points (eg. spot heights)

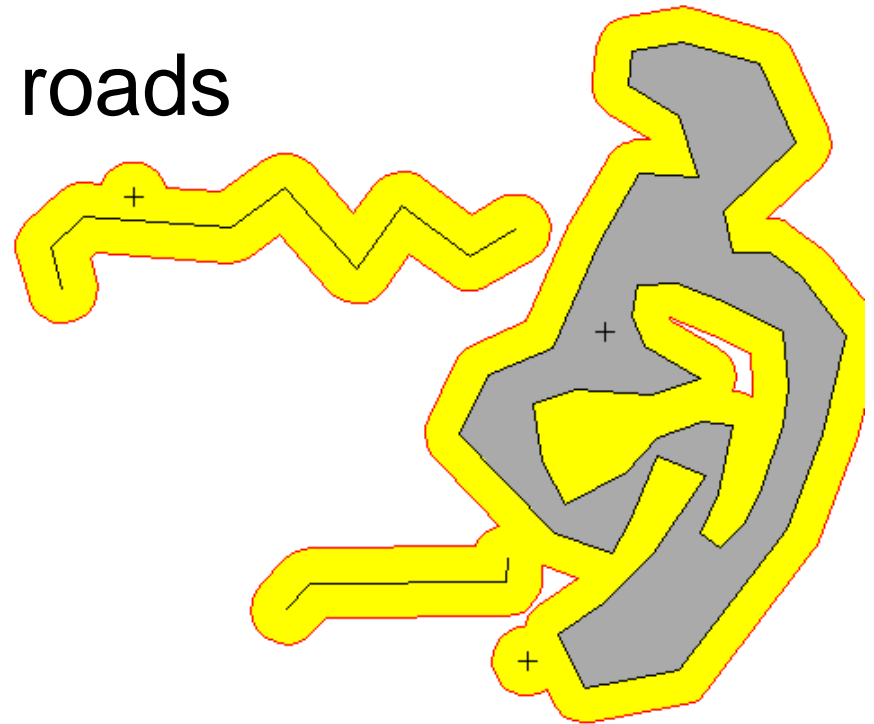
DATA INTEGRATION

The integration of data involves the combination of two or more data layers in order to create a new one

BUFFERING

It is sometimes necessary to identify zones at different distances from certain geographic features.

- noise buffers next to roads
- safety buffers for dangerous areas

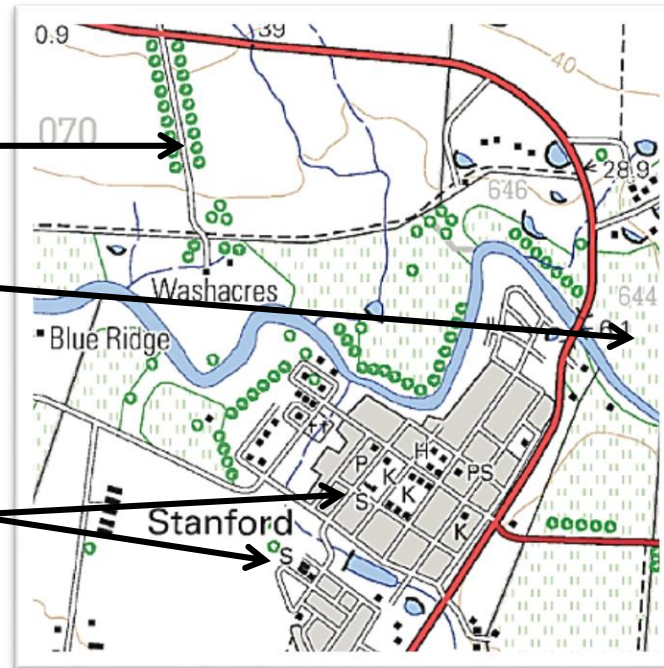


NOW LET'S GIS

Road

Cultivated
fields

Schools

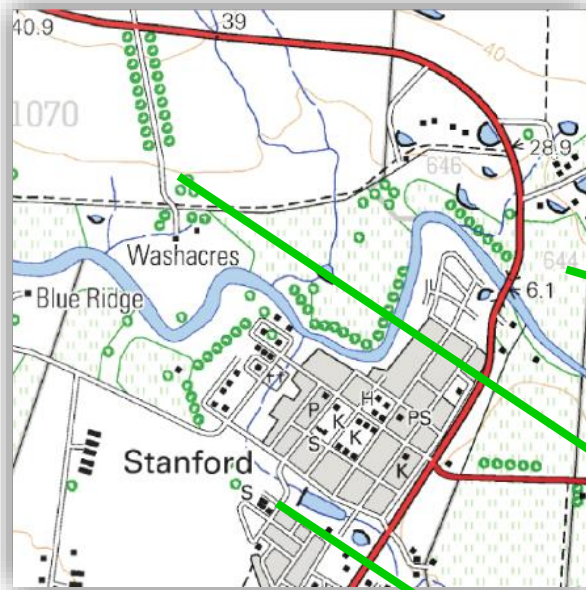


Examples of:

- Points/nodes
- Lines/arcs
- Areas/Polygons

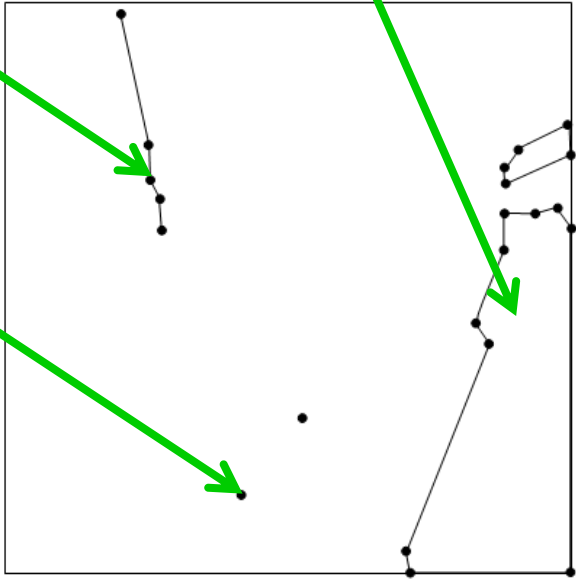
Using both the vector and raster data structure,
show a road, the two schools and the cultivated fields

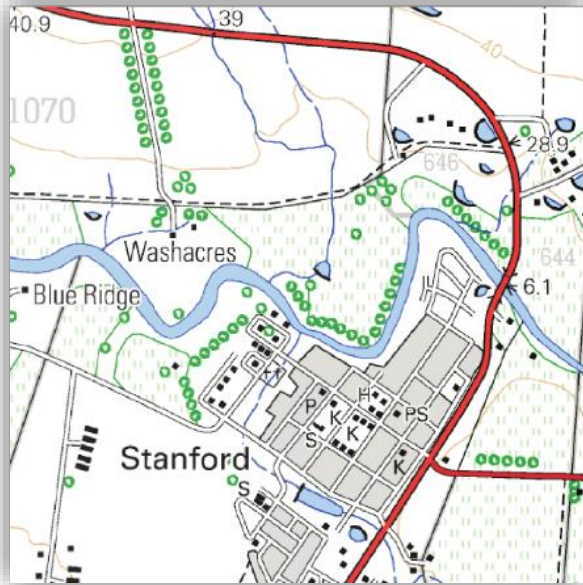
Create an attribute table for the hospital



Vector

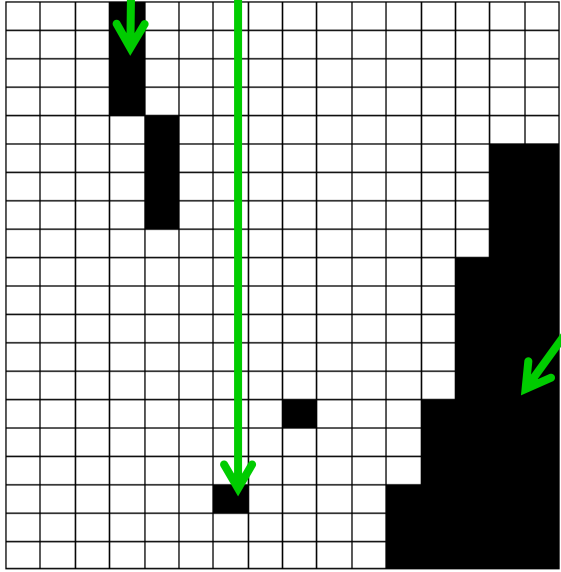
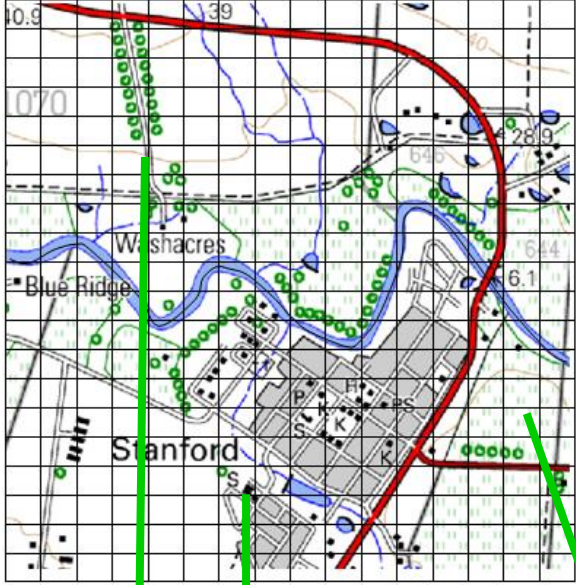
REMEMBER
Points, lines, areas
(Nodes, arcs, polygons)





Raster

**REMEMBER
Pixels**



POSSIBLE ATTRIBUTES

Name of hospital

Street address

Postal address

Geographical Coordinates

Number of beds

Number of doctors

Number of nursing
personnel

Intensive care unit

Paediatric centre

Number of operating
theatres

ATTRIBUTES FOR HOSPITAL

Name	Address	Number of doctors	Number of nursing staff	Number of beds
Seaview General Hospital	Kam Street Stanford	6	24	60

HOW TO USE GIS?

Grade 12 Paper 2 GIS Question recently asked questions relating to analysis

Determine/identify/name which data layers to use in solving a problem?

Without thinking about GIS identify factors/issues that play a role or relates to the problem

This will also be the data layers needed in the analysis to get the solution to the problem?

Shops

1. Available plots
2. Costs of plots
3. Distance to other shops
4. Client base
5. Client buying habits
6. Central place
7. Influence sphere

Floods

1. Relief (contours)
2. History
3. Rainfall figures
4. 50 year floodline
5. Development above 50yfl
6. Development below 50yfl
7. Bridges
8. Residential areas affected
9. Evacuation routes

Crime

1. Type
2. Location
3. Time
4. Frequency
5. Risk zones
6. Neighbourhood characteristics

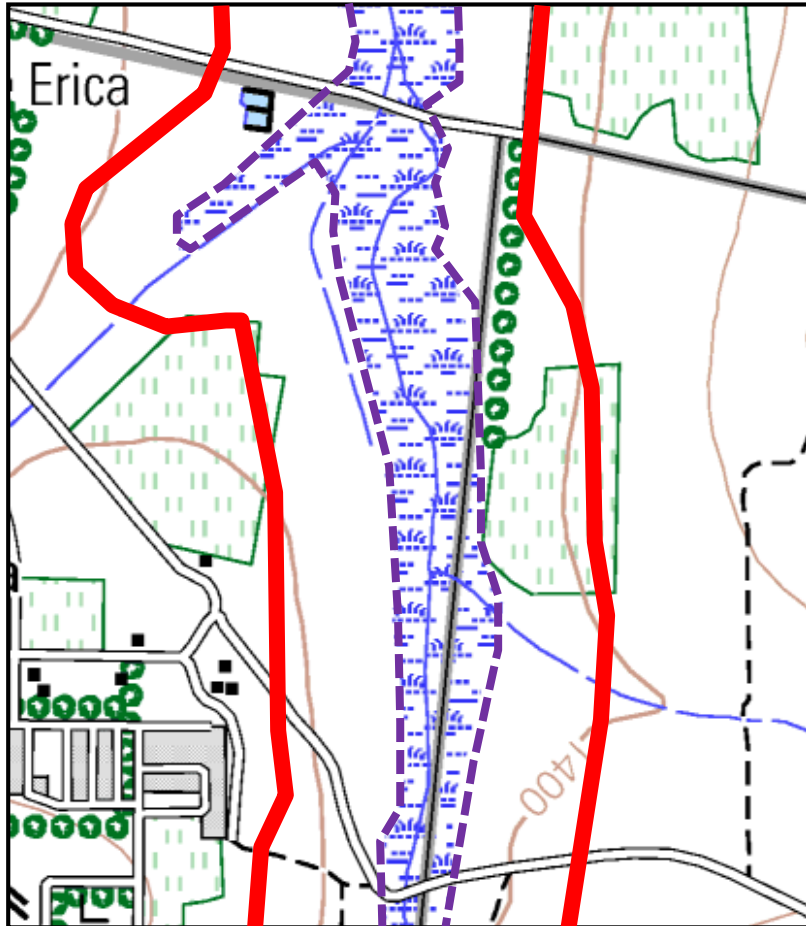
Telecom

1. Relief (contours)
2. Viewsheds
3. Intervisibility
4. Distance
between towers
5. Signal strength

Terrain Analysis

1. Vegetation type
2. Vegetation structure
3. Soil type
4. Soil texture
5. Soil moisture
6. Slopes
7. Aspect
8. Surface roughness

Application P2 Nov 2014



Create a bufferzone of 250m around marsh/vlei area

Remember that 250m in reality will be 5mm on a 1:50 000 map