basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

GEOGRAPHY

Grade 12

MAPWORK

TABLE OF CONTENTS **PAGE**

1. Foreword

Message from the Minister of Basic Education

2. How to use this Study guide

- The guide simply provides basic mapwork skills that cut across Grades 10-12.
- It should be used in conjunction with a relevant textbook, CAPS and exam guidelines specific for a particular grade.
- It explains important terms and key concepts.
- It develops key skills in reading, analysing and interpreting topographical and orthophoto maps.
- Theory and mapwork are integrated.
- Application of GIS concepts.

3. Study and Examination Tips

Some tips to approach the examinations

3.1 PAPER 2 (MAPWORK)

- This is a 1½-hour question paper and will be written second on the day of the Geography examination.
- The question paper consists of **four questions** that are **compulsory** and is comprised as follows:

  QUESTION 1: Multiple-choice questions – **15** (single marks) (cuts across the syllabus)

  QUESTION 2: Geographical techniques and calculations (includes cross-sections and application) – **20** (single marks)

  QUESTION 3: Application of theory/Map and photo interpretation – **25** (single marks for definitions and identification of features such as landforms, slopes, drainage patterns, settlement patterns, street patterns, etc. Double marks for providing reasons, application, interpretation, analysis and evaluation.)

  QUESTION 4: Geographical Information Systems – **15** (single marks for definitions. Double marks for providing reasons, application, analysis and evaluation.)

- The cognitive level rating of both question papers are as follows:

Low order:	**25%**
Middle order:	**50%**
High order:	**25%**

3.2 Topic specific

3.2.1 Topographic Maps (1: 50 000)

All the geographical skills and knowledge studied in Grades 10 and 11 are relevant to Grade 12.

Mapwork techniques

These concepts should be taught in an integrated fashion.

- Contour lines, contour interval and height and conventional signs
- Compass direction
- True/Geographic bearing
- Magnetic declination and bearing
- Map scale – types of scales and comparing the scales of topographic maps, orthophoto maps and aerial photographs
- Calculating straight-line distance in reality
- Calculating area of regular features
- Map reference numbers/Map index
- Alphanumeric reference/Grid reference
- Map coordinates/Fixing position – stating the coordinates
- Calculation and interpretation of gradient
- Cross-sections – drawing of cross-sections, indicating position of features on cross-sections and identifying features represented by cross-sections
- Intervisibility
- Calculating vertical exaggeration

Topographic map application

- Interpretation of 1 **:** 50 000 topographic maps: o Interpreting physical features, e.g. relief, drainage, climate and vegetation
- Interpreting cultural features, e.g. settlement, land-use and transport networks
- Application of all aspects of the syllabus covered in the theoretical section of Geography
- Interpreting of temperature, rainfall, climate zones and biomes, graphs and tables that are related to the 1 **:** 50 000 topographic map and the 1 **:** 10 000 orthophoto map being assessed

3.2.2 Photographs

- Types of photographs
- Advantages and disadvantages of different types of photographs
- Orthophoto maps
- Interpreting size, shape, tone, texture, shadow and patterns of vertical aerial photographs to identify features, landforms and activities on photographs and orthophoto maps
- Orientation of orthophoto map to topographic map
- Compare orthophoto maps to topographic maps
- All techniques mentioned under mapwork techniques are applicable to orthophoto maps

Orthophoto map application

- Interpretation of 1 **:** 10 000 orthophoto maps o Interpreting physical features, e.g. relief, drainage, climate and vegetation
- Interpreting cultural features, e.g. settlement, land-use and transport networks

- Application of all aspects of syllabus covered in the theoretical section of Geography

3.2.3 Types of Maps

- Reference maps
- Thematic maps – defining, identifying and interpreting different types of thematic maps with the aid of atlases

3.2.4 Geographical Information Systems (GIS)

- Concepts of:
    - GIS
    - Remote sensing
        - Resolution
        - Pixels

    - Spatial resolution
    - Spatial and attribute data
    - Vector and raster data
    - Spatial objects

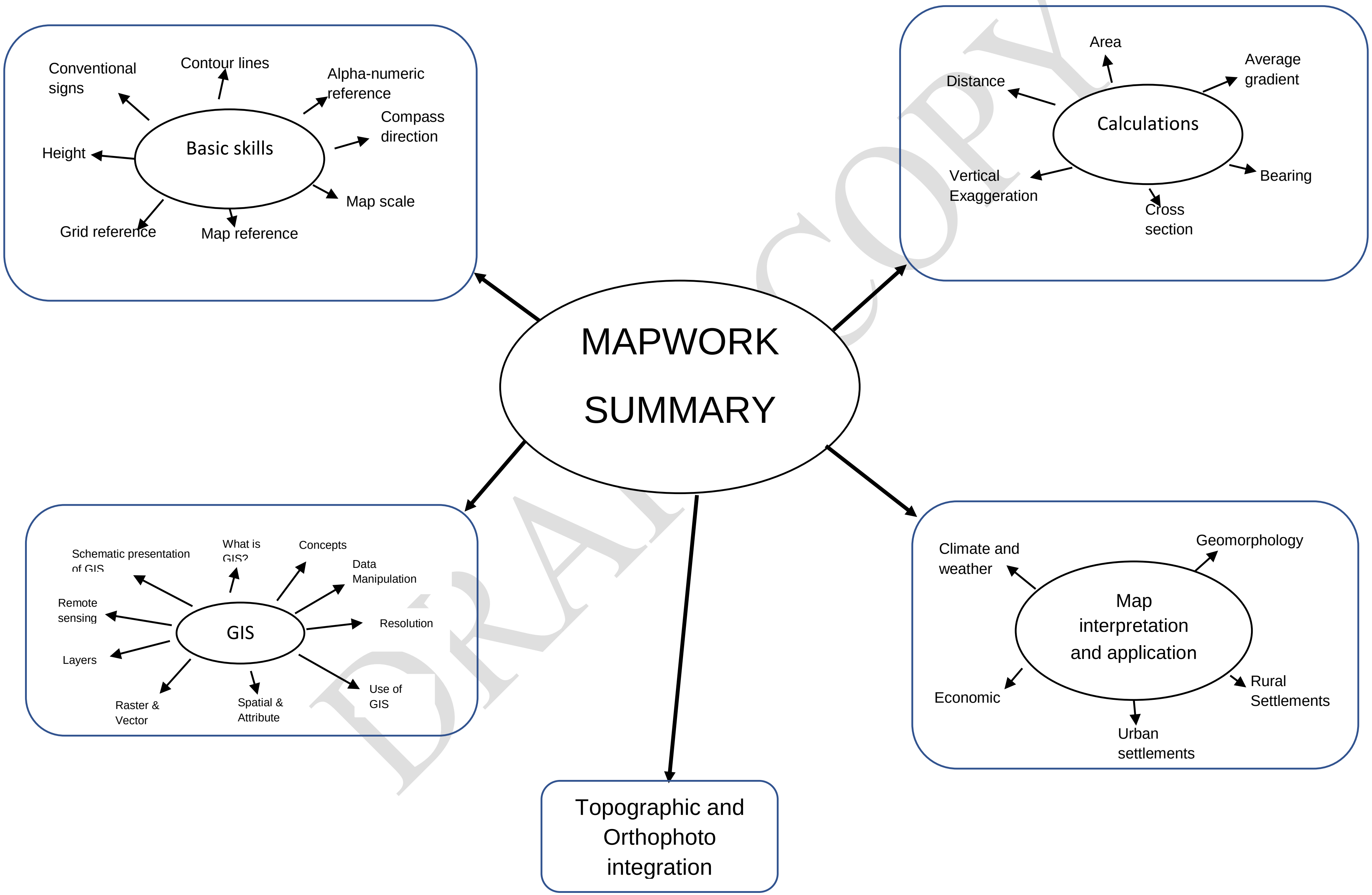
        - Points/Nodes
        - Lines

    - Area/Polygons
- Concept of layering of information
- Components of GIS
- Sources of information for GIS
- Data manipulation and analysis:
  - Concept of data manipulation
  - Data integration
  - Buffering
  - Querying
  - Statistical analysis

- Data standardisation
- Data sharing
- Data security
- Application of GIS by the:
  - Government
  - Private sector

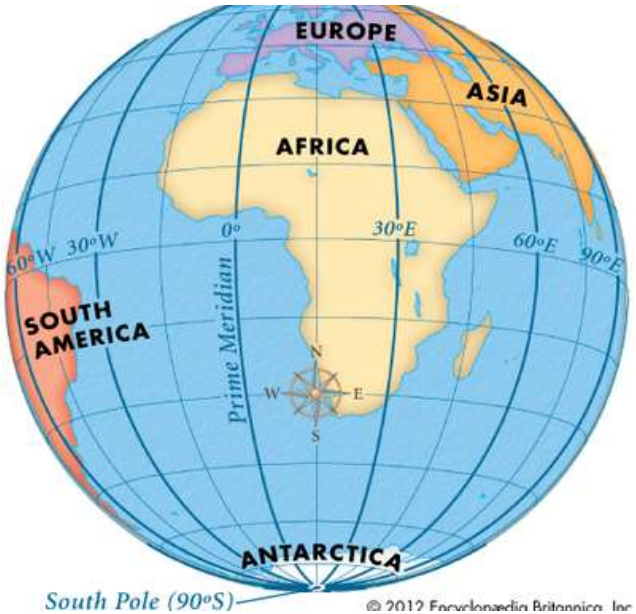
- Developing a 'paper GIS' from existing maps, photographs and other sources of information on layers of tracing paper
- Identifying and interpreting concepts using given data such as satellite images, topographic maps, orthophoto maps, aerial photographs, pictures and statistics indicated on graphs and tables

4. Overview of the Mapwork (Mind Map)



4.1 Mapwork skills and techniques

Lines of latitude and longitude



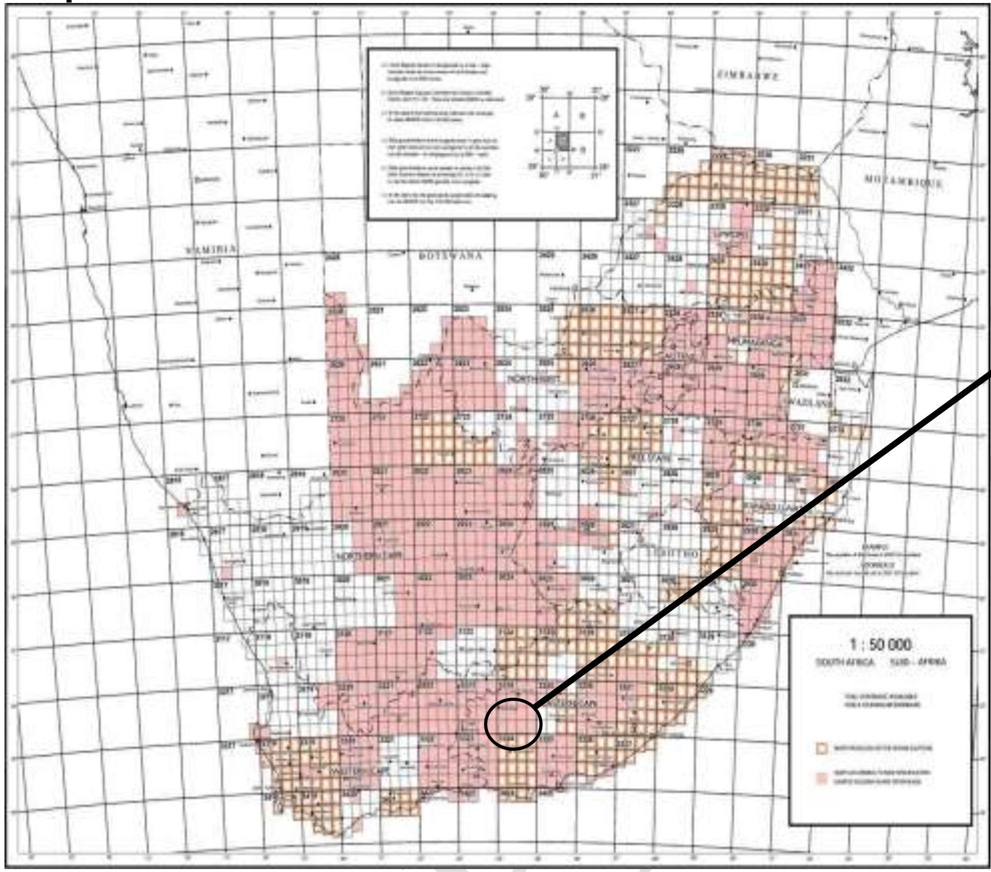
Location

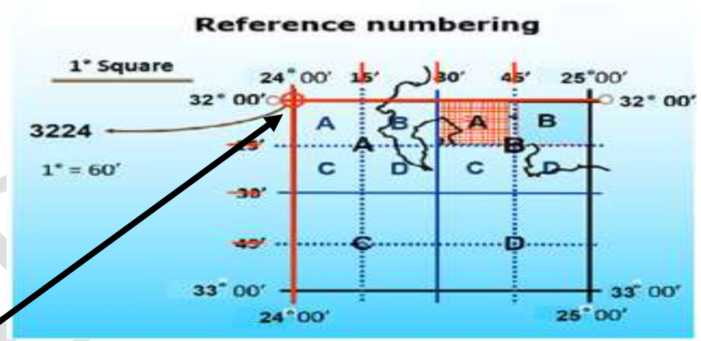
As a geographer it is important to determine the **exact location** of phenomenon on the earth's surface. To do this we make use of what is termed as **the coordinate system.**

Latitude and longitude

- Special imaginary lines are used to describe where places are found in the world.
- These imaginary lines are called lines of latitude and lines of longitude.
- Lines of latitude run parallel with the equator. The 0° line of latitude is the equator and goes all the way around the globe. It divides the earth into a northern and southern hemisphere.
- The 0° line of longitude runs parallel with the Greenwich meridian. The Greenwich meridian divides earth into a western and eastern hemisphere

Map Reference



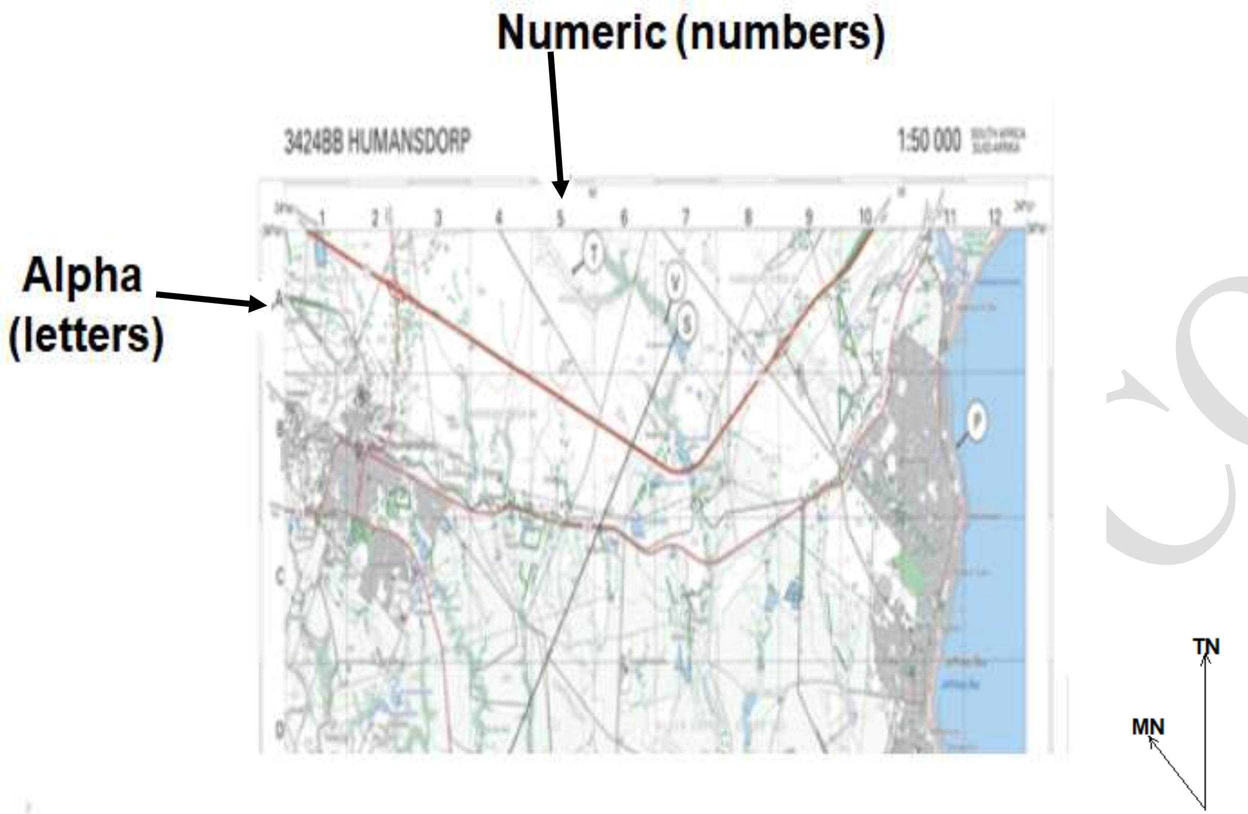


South Africa is located south of the equator and east of the Greenwich meridian.
Latitude is always represented first with a letter **S** and then followed by longitude which is always represented with the letter **E**.
The latitudinal values increase southwards and the longitudinal values increase eastwards

All topographical maps in South Africa are referenced according to their relevant latitudinal and longitudinal position on earth. In the diagrams the map reference is 3224BA, which stands for 32°S and 24°E.

Maps are divided into 16 sub areas between two latitude and longitude lines. The area between the latitude and longitude lines are divided into 4 equal blocks A to D.
The 4 blocks are further sub-divided into smaller blocks A to D. Therefore, 3224BA is in the bigger block B and the smaller block A, as indicated in the shaded area on the above diagram.

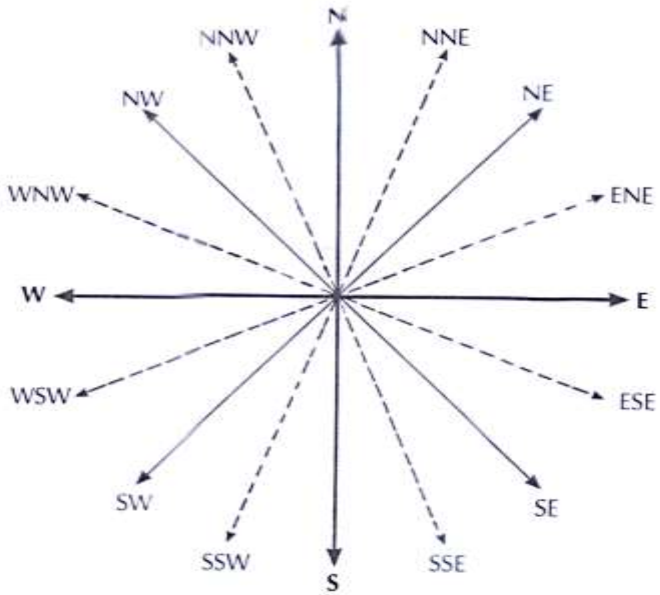
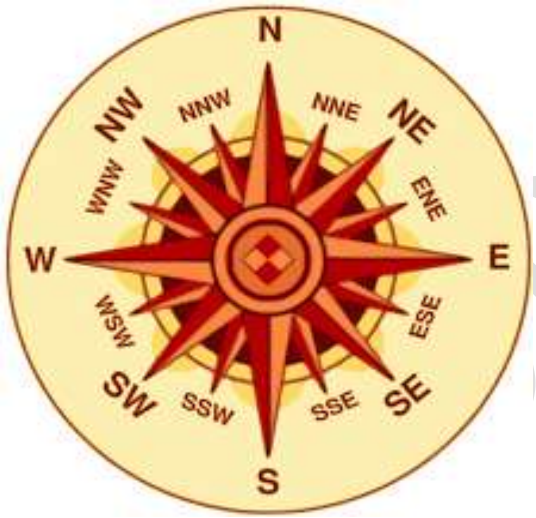
Coordinates: Alpha-numeric grid

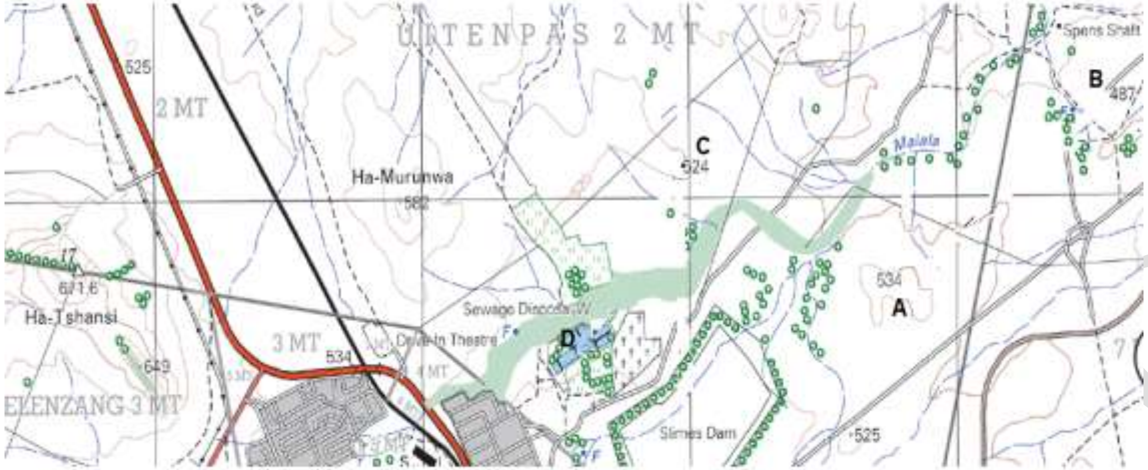


Alpha-numeric grid

The alpha numeric grid serves as the first step in understanding the concept of location.
Refer to the map on this page and:

- locate the **letter** (alpha) along the side of the map indicated by an arrow.
- locate the corresponding **number** (numeric) along the top of the map indicated by the downward arrow.
- The letters represent the latitude and
- The numbers represent the longitude

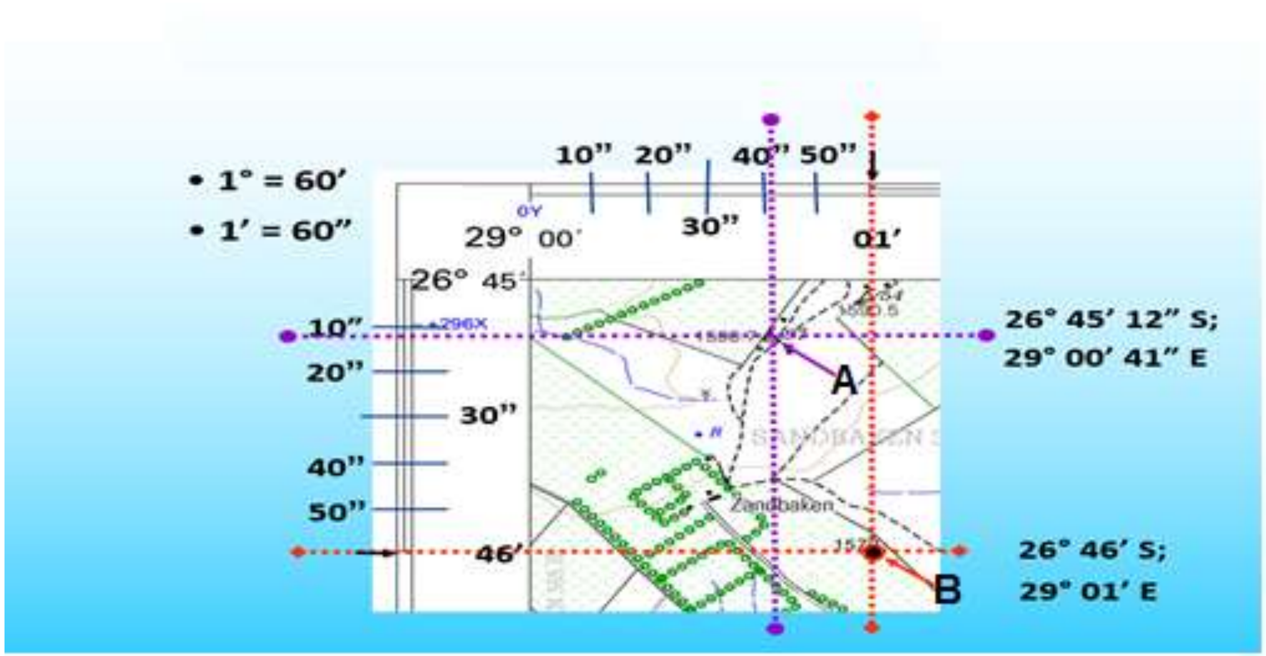
Compass direction	**Direction**
 	Describing the position of one place in relation to another. Direction uses 16 cardinal points, the four main ones being North, South, East and West. Note: There are always two points involved when giving direction. ● The place where one is calculating direction from, and ● The place which you want the direction of.

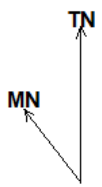


Examples:

- The direction from spot height 534 (at A) to spot height 487 (at B) is **North East**
- The direction from spot height 524 (at C) to the sewage disposal works (at D) is **South Southwest**

Geographic co-ordinates





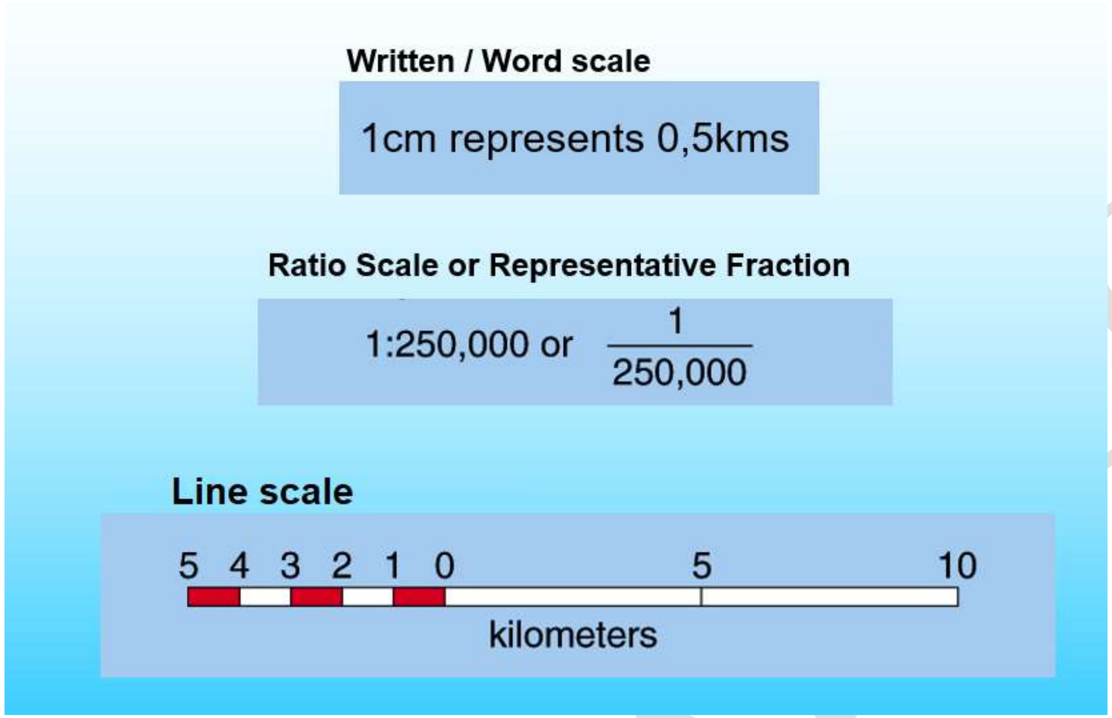
Geographic co-ordinates

- Lines of latitude and longitude are used to locate places on the map.
- The point where a line of latitude crosses a line of longitude is called a coordinate.
- A coordinate is named by its latitude expressed numerically in degrees **$(^0)$** minutes **(')** seconds **(")** S of the equator; and longitude in degrees **$(^0)$** minutes **(')** seconds **(")** E of Greenwich meridian. Such a location is also referred to as absolute location.

Examples:

- On the sketch the co-ordinates of A are 26°45'12"S; 29°00'41"E
- On the sketch the co-ordinates of B are 26°46'S; 29°01'E

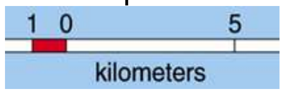
Type of scales



Scale

A scale denotes the relationship between distances on a map and distances in real life.
All South African topographic maps have a scale of 1:50 000. This means that 1cm on the map represents 50:000 cm on the ground.
Scale can be represented in three ways:

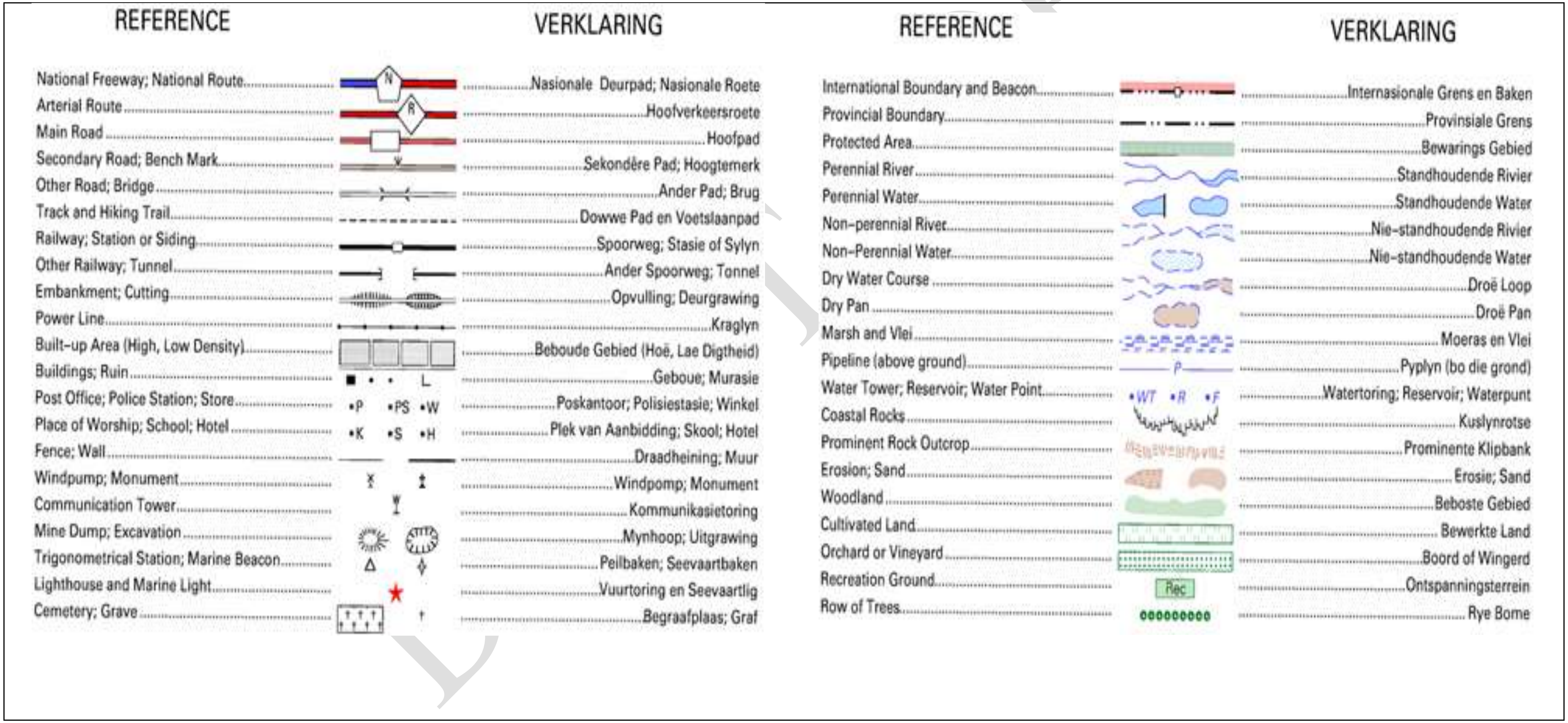
- Ratio scale (1:50 000) / representative fraction ($\frac{1}{50\ 000}$)
- Word scale expresses the scale in words OR 1cm represent 50:000 cm on the ground
- Linear scale is a straight line subdivided to represent ground distances.



CONVENTIONAL SIGNS

It is an internationally accepted letter or symbol indicating a real-life feature

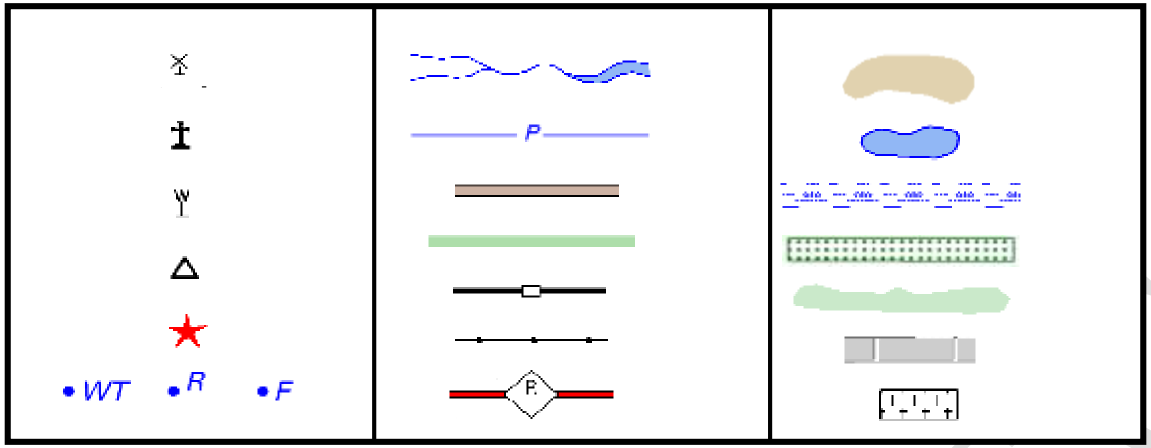
The following are standardized conventional signs on South African Topographic maps



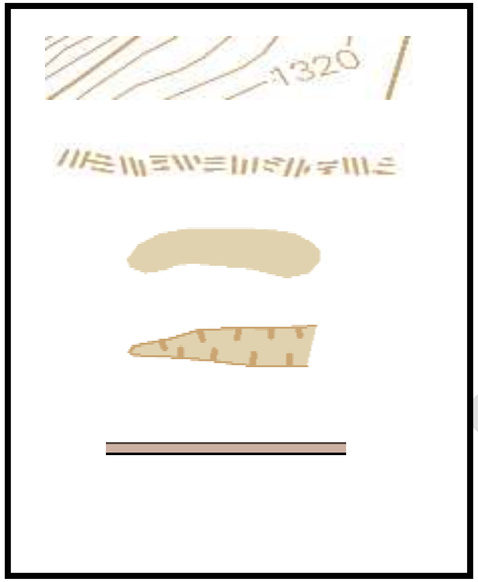
REFERENCE	VERKLARING
National Freeway; National Route	Nasionale Deurpad; Nasionale Roete
Arterial Route	Hoofverkeersroete
Main Road	Hoofpad
Secondary Road; Bench Mark	Sekondêre Pad; Hoogtemerk
Other Road; Bridge	Ander Pad; Brug
Track and Hiking Trail	Dowwe Pad en Voetslaanpad
Railway; Station or Siding	Spoorweg; Stasie of Sylyn
Other Railway; Tunnel	Ander Spoorweg; Tonnel
Embankment; Cutting	Opvulling; Deurgrawing
Power Line	Kraglyn
Built-up Area (High, Low Density)	Beboude Gebied (Hoë, Lae Digtheid)
Buildings; Ruin	Geboue; Murasie
Post Office; Police Station; Store	Poskantoor; Polisiestasie; Winkel
Place of Worship; School; Hotel	Plek van Aanbidding; Skool; Hotel
Fence; Wall	Draadheining; Muur
Windpump; Monument	Windpomp; Monument
Communication Tower	Kommunikasietoring
Mine Dump; Excavation	Mynhoop; Uitgrawing
Trigonometrical Station; Marine Beacon	Peilbaken; Seevaartbaken
Lighthouse and Marine Light	Vuurtoring en Seevaartlig
Cemetery; Grave	Begraafplaas; Graf
International Boundary and Beacon	Internasionale Grens en Baken
Provincial Boundary	Provinsiale Grens
Protected Area	Bewarings Gebied
Perennial River	Standhoudende Rivier
Perennial Water	Standhoudende Water
Non-perennial River	Nie-standhoudende Rivier
Non-Perennial Water	Nie-standhoudende Water
Dry Water Course	Droë Loop
Dry Pan	Droë Pan
Marsh and Vlei	Moeras en Vlei
Pipeline (above ground)	Pyplyn (bo die grond)
Water Tower; Reservoir; Water Point	Watertoring; Reservoir; Waterpunt
Coastal Rocks	Kuslynrotse
Prominent Rock Outcrop	Prominente Klipbank
Erosion; Sand	Erosie; Sand
Woodland	Beboste Gebied
Cultivated Land	Bewerkte Land
Orchard or Vineyard	Boord of Wingerd
Recreation Ground	Ontspanningsterrein
Row of Trees	Rye Bome

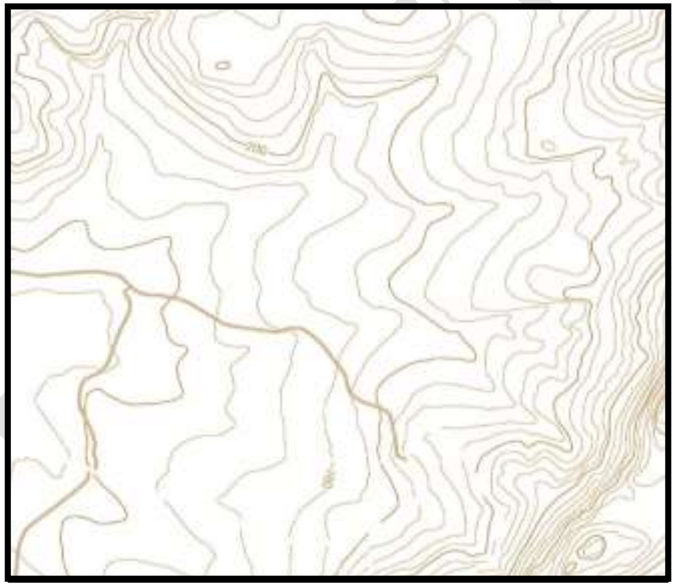
Standardised colours on a topographical map

Points **Lines** **Polygons**

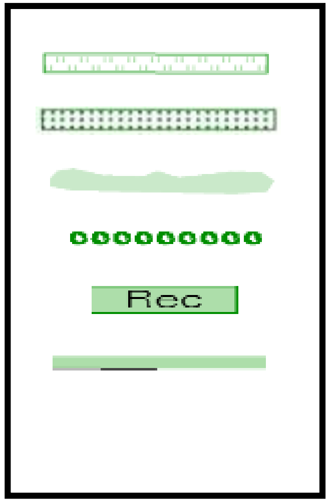


Symbol - Brown

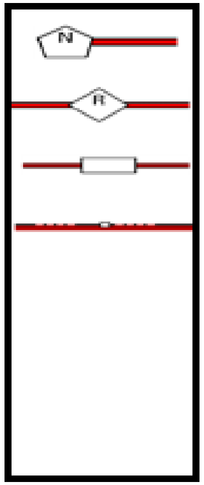




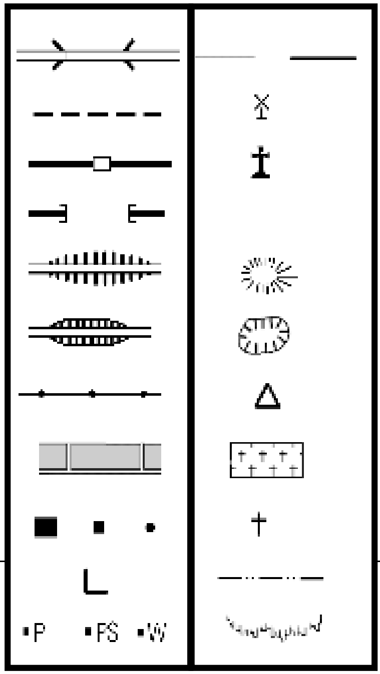
Symbol - Green

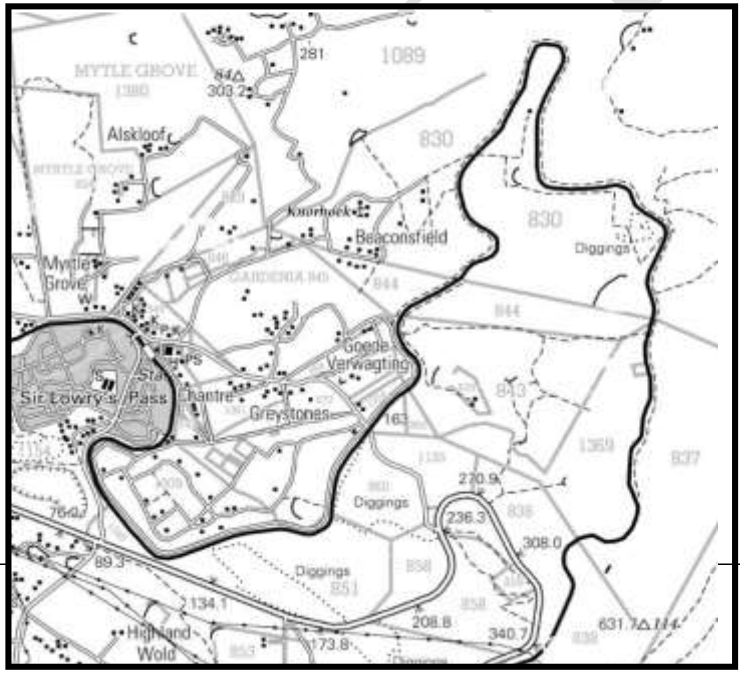


Symbol - Red

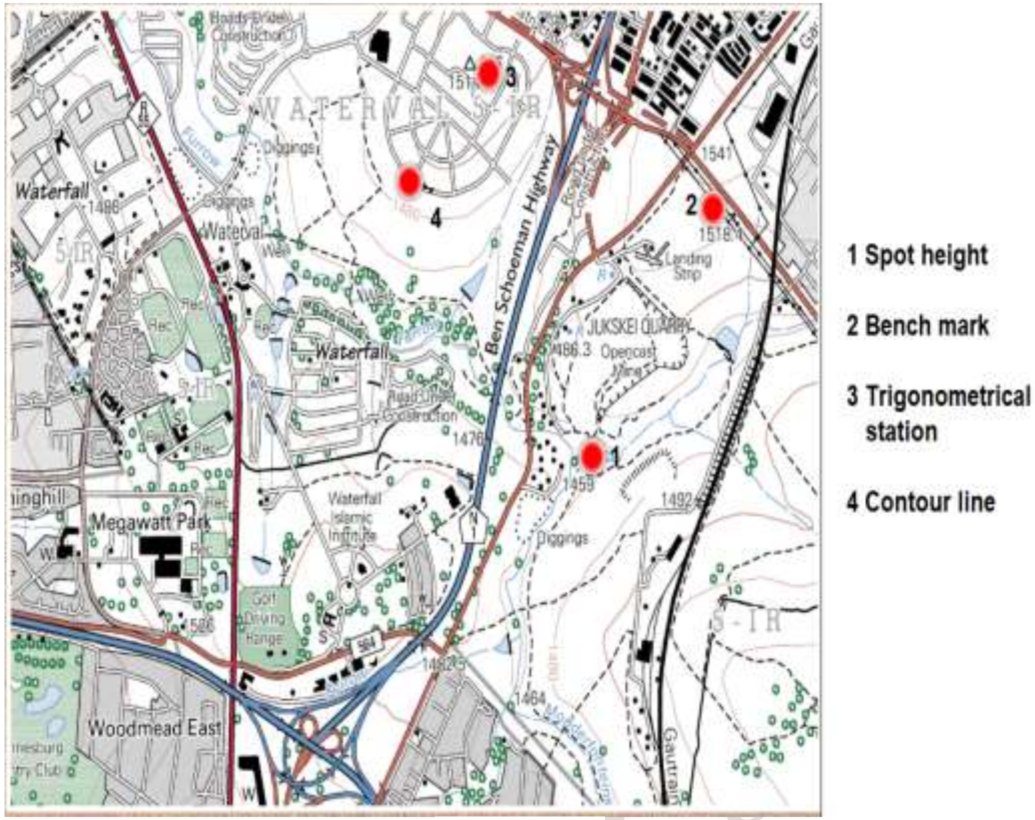


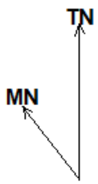
Symbol - Black





Indicators of height on a topographic map





Indicators of height on a topographic map

It is indicated in the following ways: Contour lines, spot heights, trigonometrical beacons, and bench marks.

Contour lines

Contour lines are lines on the map that join places of the same height above sea level.

- A contour line is a brown line on the topographic map.
- The contour Interval is the difference in height between two contour lines that are next to one another and its value does not change.
- The contour interval used on topographic maps is **20 meters**.
- They are one way of showing height above sea level.
- Contour lines connect places of equal altitude
- Contour lines do not cross each but can touch.
- Contour lines are continuous.
- Index contour lines are **thick** brown lines and are in multiples of 100m.
- Arrangement of contour lines depict various landforms and slopes on a map.

By "reading" the contour lines we can determine what the terrain in an area looks like.

Spot height

It is shown as a dot with the value of the height next to it.

Trigonometrical beacon

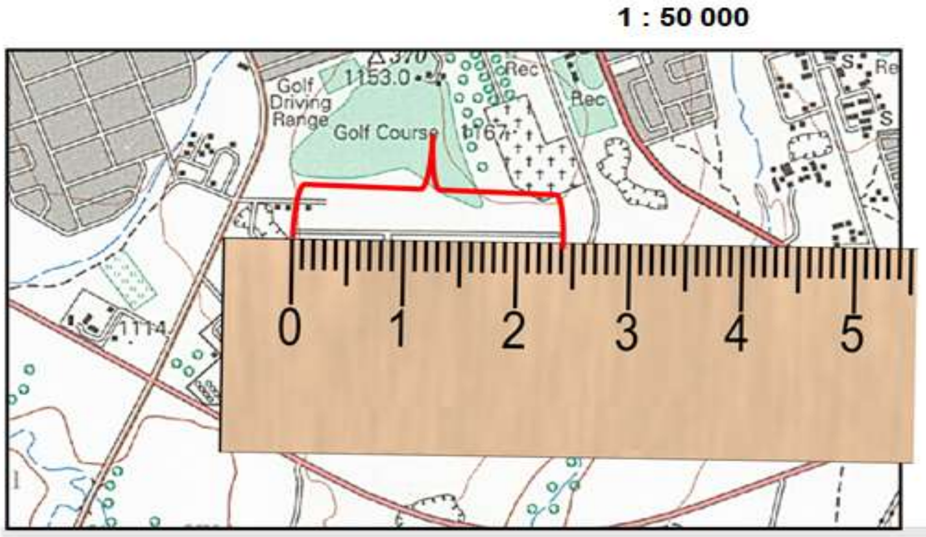
It is indicated by a triangle, with two values on the map.
The value below the triangle is the height and the value on the side is the number of the beacon.

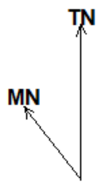
Bench marks

They are usually found along roads and rail ways and the height is indicated by a black arrow.

Calculations

Calculation of straight line distance





Measuring and calculating distance in km

- If you measured the distance between the two points in centimetres. In this case the distance is 2.4 cm.
- To get the actual distance in reality.
  - ✓ Multiply map distance by map scale

  E.g. 2.4cm X 50 000
  = 120 000 cm
  Convert to km: 120 000 / 100 000
  = 1.2 km

Converting cm to km

Km	h	dam	m	dm	cm	mm
1	0	0	0	0	0	

- If you measured the distance between the two points in millimetres. In this case the distance is 24 mm.
- To get the actual distance in reality.
  - ✓ Multiply map distance by map scale

  E.g. 24mm X 50 000
  = 1 200 000
  Convert to km: 1 200 000 / 1 000 000
  = 1.2 km

Converting mm to km

Km	h	dam	m	dm	cm	mm
1	0	0	0	0	0	0

- If you measured the distance between the two points in centimetres. In this case the distance is 2.4 cm.
- To get the actual distance in reality.
  - ✓ Multiply map distance by map scale

E.g. 2.4cm X 50 000
= 120 000 cm
Convert to km: $\frac{120\ 000}{100}$
= 1 200m

Converting cm to m

Km	**h**	**dam**	**m**	**dm**	**cm**	mm
			1	**0**	**0**	

- If you measured the distance between the two points in millimetres. In this case the distance is 24 mm.
- To get the actual distance in reality.
  - ✓ Multiply map distance by map scale

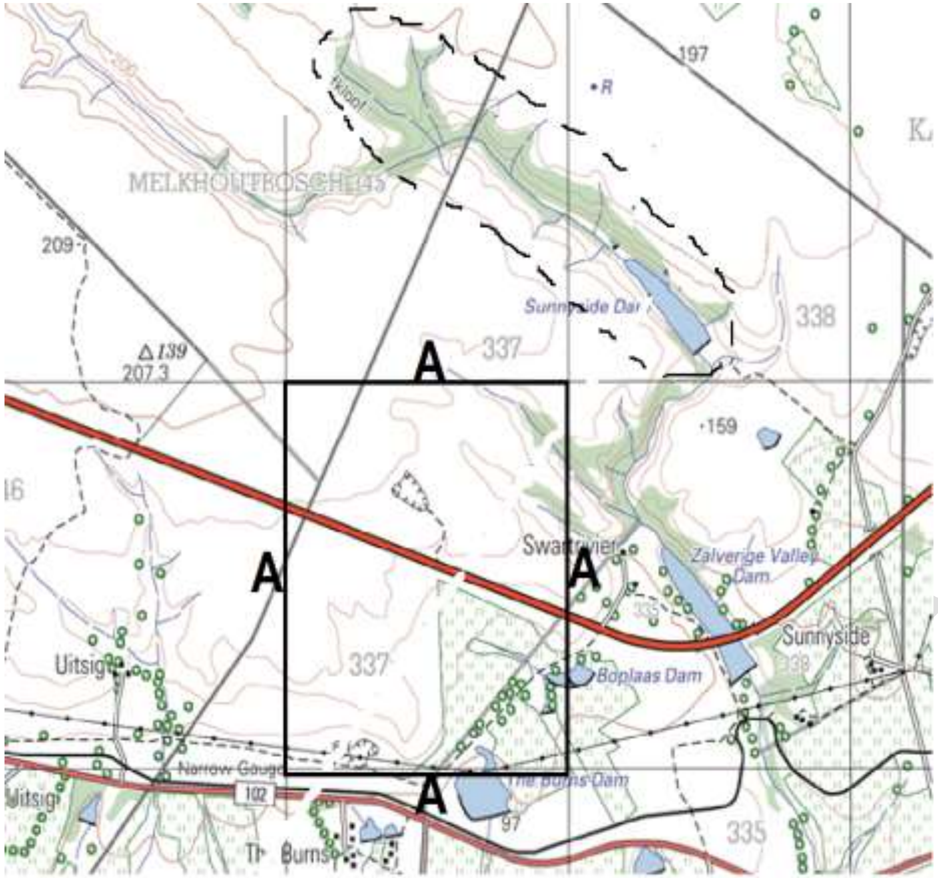
E.g. 24mm X 50 000
= 1 200 000
Convert to km: $\frac{1\ 200\ 000}{1\ 000}$
= 1.200 m

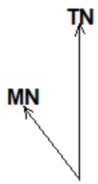
Converting mm to m

Km	h	dam	m	dm	cm	mm
			1	**0**	**0**	**0**

Area

1 : 50 000





Method of calculating area

- Measure the length and multiply by the scale of the map and convert to kilometres/metres.
- Measure the breadth and multiply by the scale of the map and convert to kilometres.
- Multiply the length and breadth (remember you final answer must be in km²/m².

Example of the calculation of area A on the topographic map in km²

Formula: **Area = length (L) × breadth (B)**

Length: 3.7 cm x 50 000

$= \frac{185\,000\text{cm}}{100\,000}$

= 1.85km

Breadth: 3.2 cm x 50 000

$= \frac{160\,000}{100\,000}$ cm

= 1.6km

Area = 1.85km x 1.6km = 2.96 km²

Example of the calculation of area A on the topographic map in m²

Formula: **Area = length (L) × breadth (B)**

Length: 37 mm x 50 000

$= \frac{1\,850\,000\text{mm}}{1\,000}$

= 1 850m

Breadth: 32 mm x 50 000

$= \frac{1\,600\,000}{100\,000}$ cm

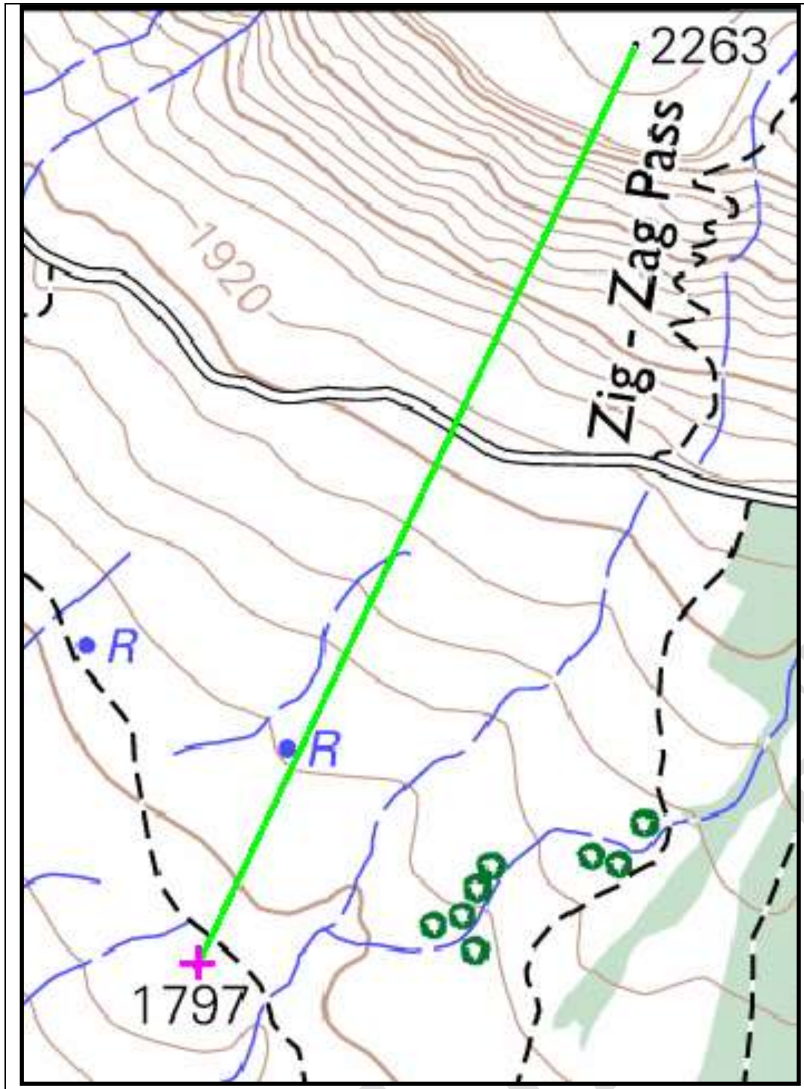
= 1 600m

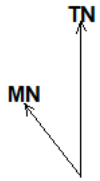
1850m x 1600m = 2 960 000 m²

Note: (When calculating the distances of the length and the breadth, refer to the metric scale for conversions as illustrated in the examples above. The length's value measured is always more than the breadth's value measured.)

Average Gradient

1 : 50 000	**Average Gradient** **The formula for gradient is** Gradient = $\frac{\textbf{Vertical interval}(VI)}{\textbf{Horizontal equivalent}(HE)}$ **How to calculate average gradient** • **Vertical Interval**: Measure the difference in height between the two points (A and B) • **Horizontal equivalent**: Measure the actual distance between the two points (A and C) **Step 1 – vertical interval** 2263m – 1797m = 466m **Step 2 - horizontal equivalent** $\frac{3.8 \text{ cm} \times 50\ 000}{100}$ = 1900 m Gradient = $\frac{VI}{HE}$ = $\frac{466m \div 466}{1900m \div 466}$





= 1: 4.07

(range 3.96 – 4.3)

In the example provided

Illustration 1 – The gradient is 1 : 66
Illustration 2 – The gradient is 1 : 15

The horizontal equivalent of illustration 1 is more than the horizontal equivalent of illustration 2, therefore the gradient of illustration 2 is steeper.

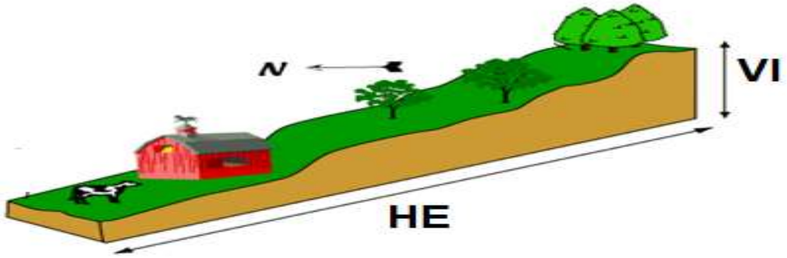
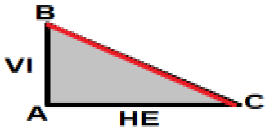
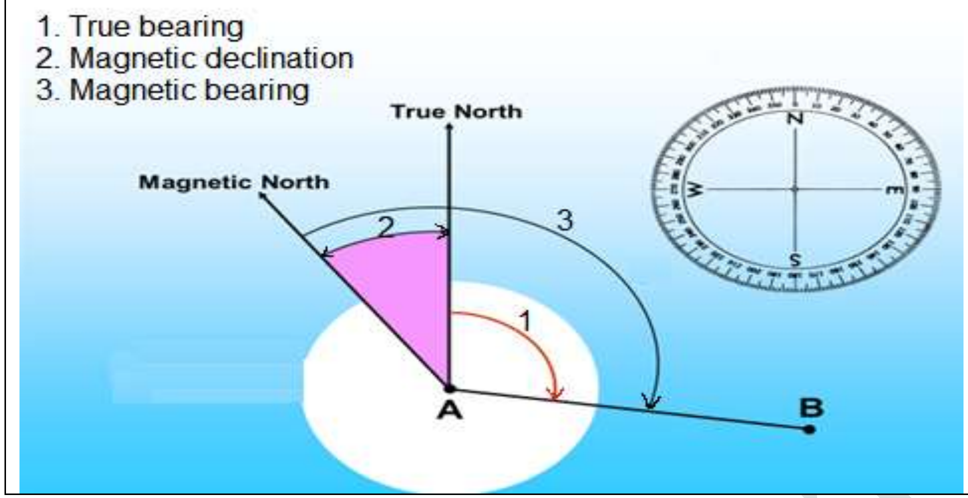


illustration 1

illustration 2



Bearing



Definition of bearing

1. True bearing is the angle between true north and a given point, measured in a clockwise direction.

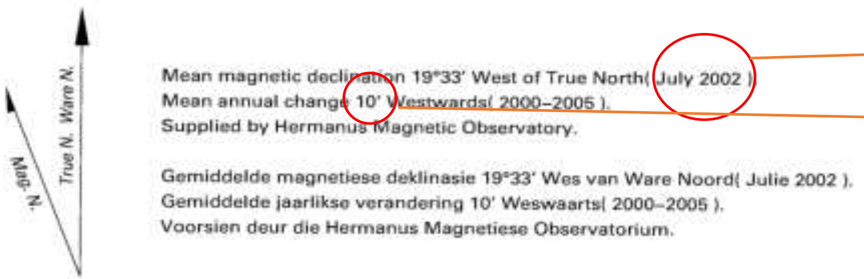
2. Magnetic bearing is the angle between magnetic north and a given point, measured in a clockwise direction.

3. Magnetic declination is the angle between magnetic north and true north

How to calculate true bearing

- Draw a north-south line across the place from which the measurement is to be taken.
- Draw a line between the two places (A-B/A-C/A-D) in question.
- Place your protractor along the true-north line with 0° at the north.
- Measure the angle from the true-north line clockwise. (Use the outside numbers on the protractor)
  - ✓ A-B = 143°
  - ✓ A-C = 217°
  - ✓ A-D = 283°

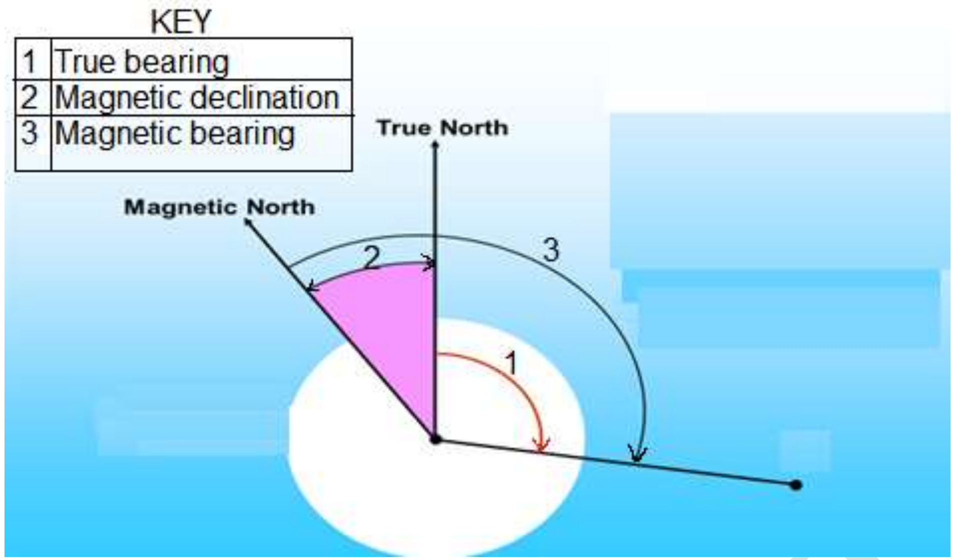
Calculating magnetic declination



How to calculate Magnetic declination (MD)

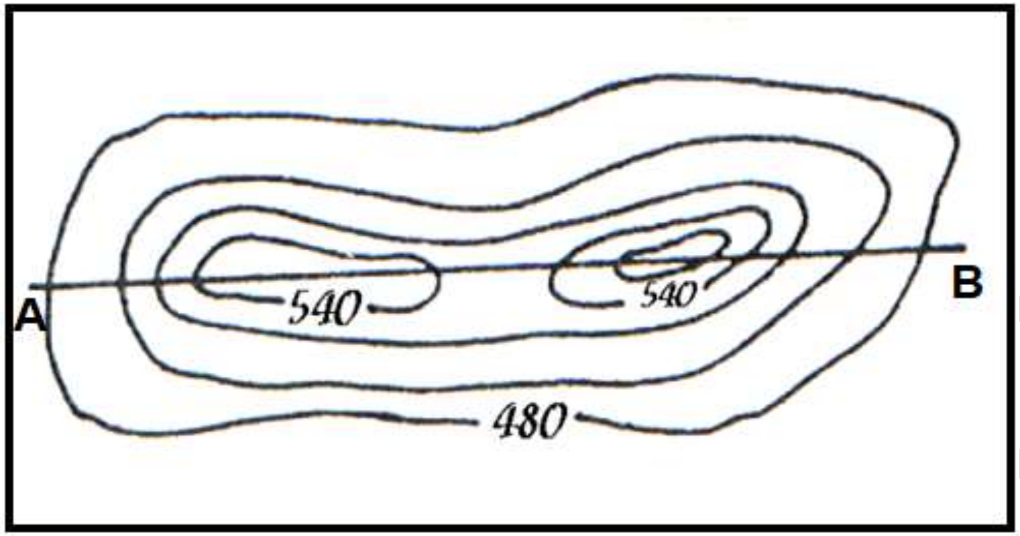
- **Calculate difference in years**: Current year **minus** The year the last MD was calculated
  2018 – 2002 = 16 years
- **Mean annual change**: Given in minutes - *10' W*
- **Total change**: Multiply the difference in years by the mean annual change to find the total annual change in minutes
  16 years x 10' = 160' [2°40'W]
- **Calculate the magnetic declination for the current year**: add the total annual change to the magnetic declination indicated on the map.
  - ✓ Magnetic declination is always west of true north

	✓ Mean annual change can either be westwards *19°33'W* *+ 2°40'W* *21°73'W = 22°13'W* *Whenever the minutes are 60 and more, these minutes should be converted into degrees, e.g. 160' = 2°40'* *1° = 60'*

Calculating magnetic bearing	How to calculate Magnetic bearing (MB)
	• Add the true bearing to the current magnetic declination Formula: **Magnetic Bearing = True bearing + Magnetic declination** Magnetic bearing from A to B (Above) 143° + 22°13'W = 165°13'W

Cross section and Vertical Exaggeration (VE)

Step 1

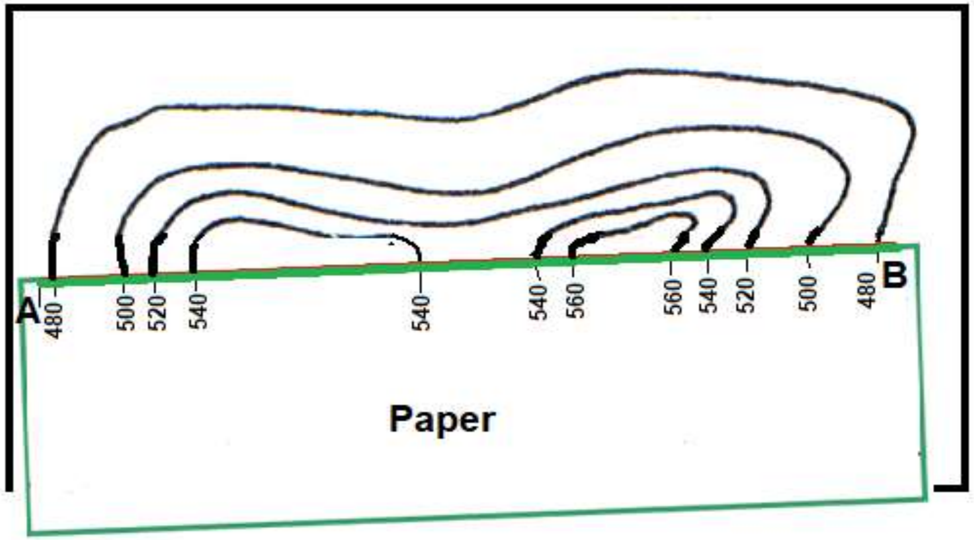


Step 2

Method to draw a cross section

Step 1

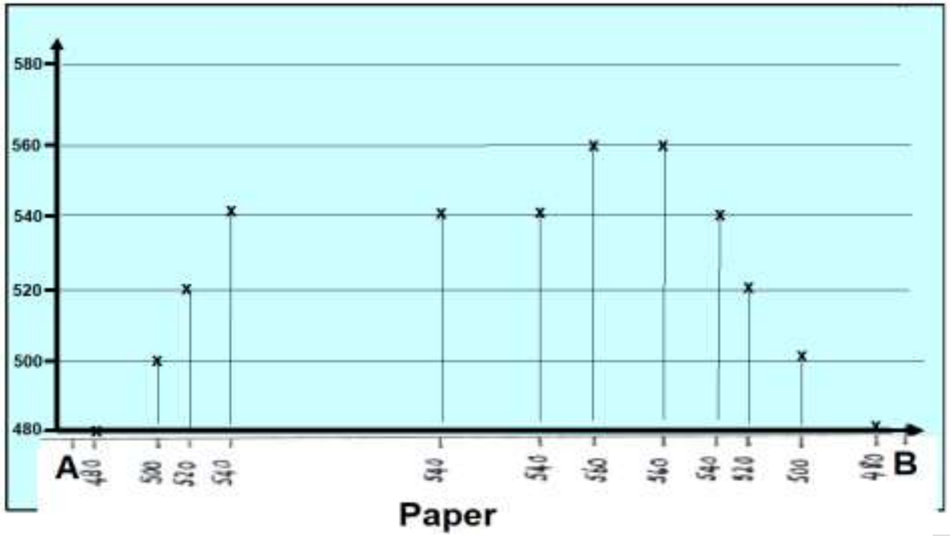
Find the two points on the map between which you will be drawing the cross section (Points A and B on the example)



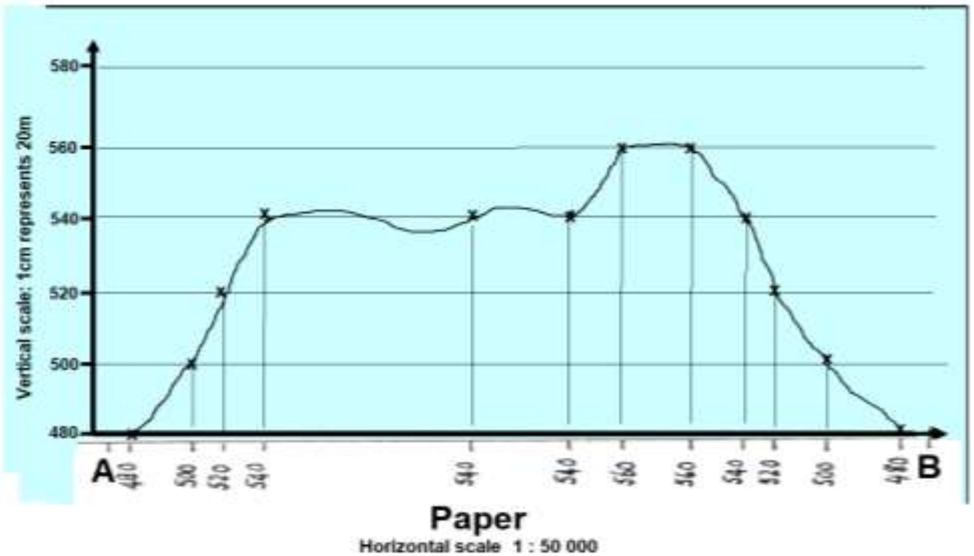
Step 3

Step 2

Use a piece of paper and mark off all the contours between the two points on the cross section onto the piece of paper. Work out the height of the contour lines and mark this on the strip of paper



Step 4



Step3

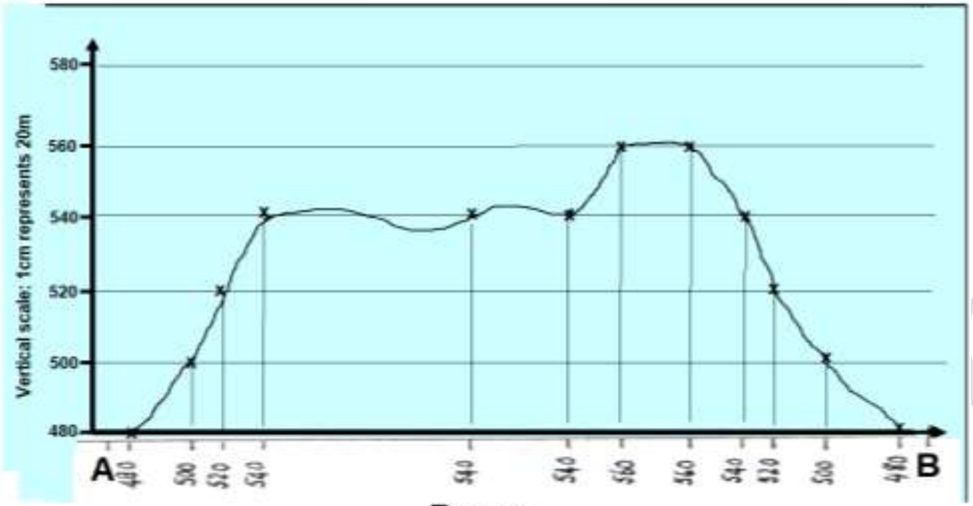
Draw the vertical and horizontal axis of the cross section by drawing two lines at 90° to each other on an A4 sheet of paper. Decide on the vertical scale. This is usually given to you, for example 1cm=20.

NOTE: The lowest contour line value that you've recorded, should be the first point on the vertical scale. The horizontal scale is labelled as the scale of the map you are using. e.g. 1:50 000.

Place the strip of paper on the horizontal line. Make a mark directly above the contour mark (on the blank page) in line with the correct height shown on the vertical scale.

Step 4

Join all your points on your graph free-hand. Keep checking your map, as there may be a river on your map that will require a dip between two points rather than just a straight line. Look out for hills that will



Paper
Horizontal scale 1 : 50 000

form a bump in your graph between two points of equal height

Remember to label your cross section correctly.

What is vertical exaggeration

Refers to the amount by which the vertical scale of a cross section is made bigger as compared to the map scale.

- If the vertical scale is not exaggerated then it will not be possible to see the relief feature clearly, as it will be flat.
- A vertical exaggeration of 25 is reasonable. If it is bigger the relief feature becomes distorted.
- The vertical and horizontal scale is required to calculate vertical exaggeration.

Calculating the vertical exaggeration

***NB**: both the vertical scale and horizontal scale must be a ratio.*

Therefore if the vertical scale is 1cm = 20m, the

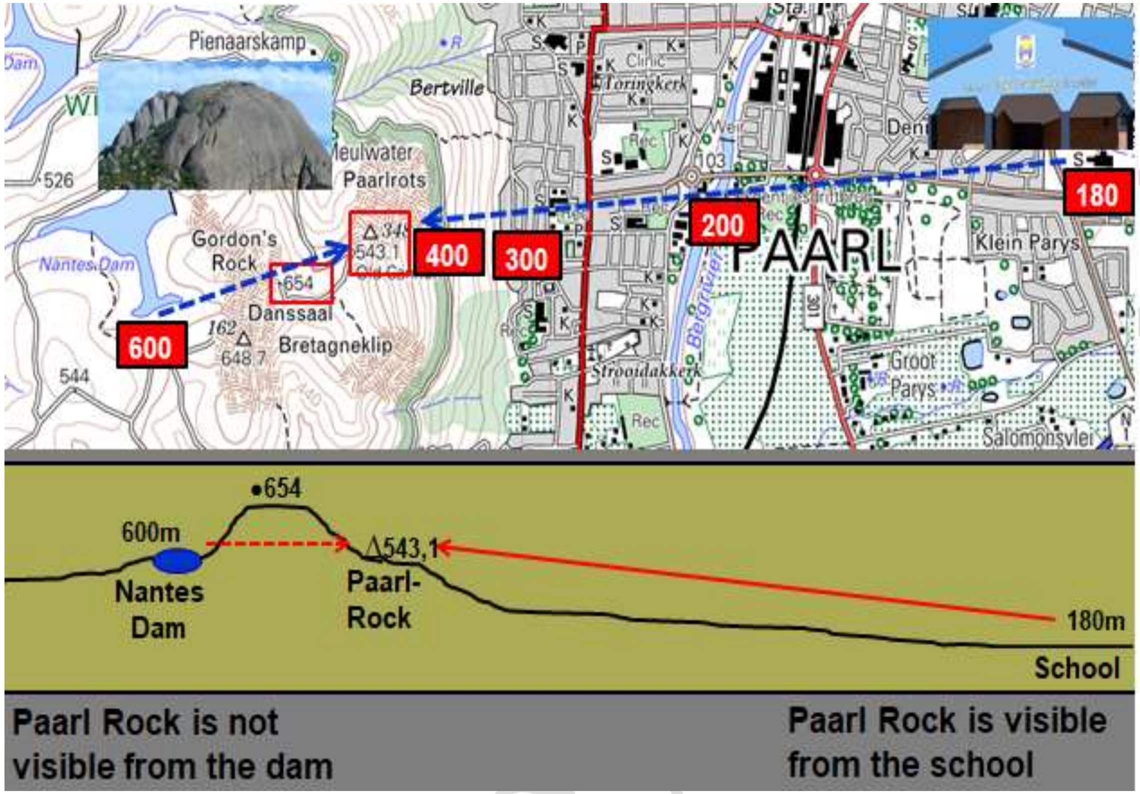
vertical scale must have converted into a ratio scale.

Formula: VE = Vertical Scale (cross section) / Horizontal Scale (map)

Step 1

Example – 1cm = 20m [100cm = 1m]

Intervisibilty



20 x 100 = 2000

Vertical scale = 1 : 2 000

Step 2

$$\frac{\frac{1}{2000}}{\frac{1}{50\,000}}$$

$$\frac{1}{2000} \times \frac{50\,000}{1}$$

25 times

Determining intervisibility

This refers to whether one point on a map is visible (can be seen) from another point.

In the diagram provided

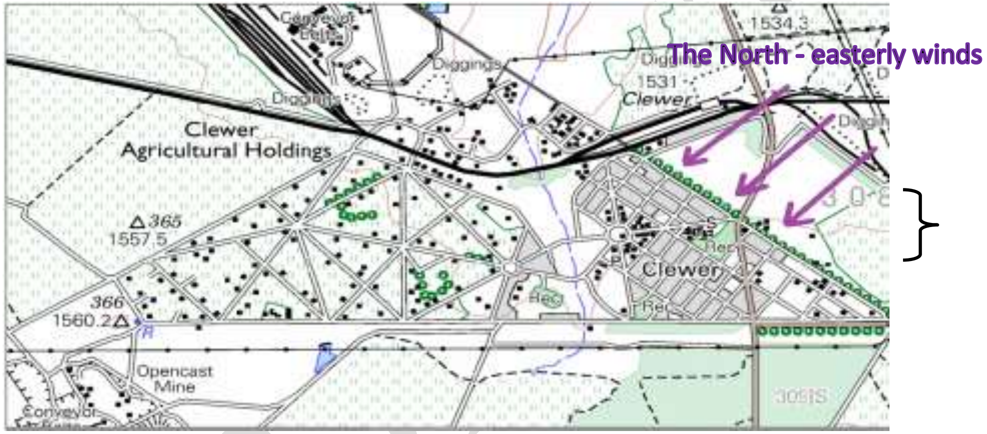
- Paarl rock is visible from the school, because there are no obstacles preventing you from seeing the rock from the school.

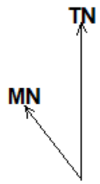
	• Paarl rock is not visible from the dam, because there is a high lying area between the dam and Paarl rock, which prevents you to see the dam or the rock.

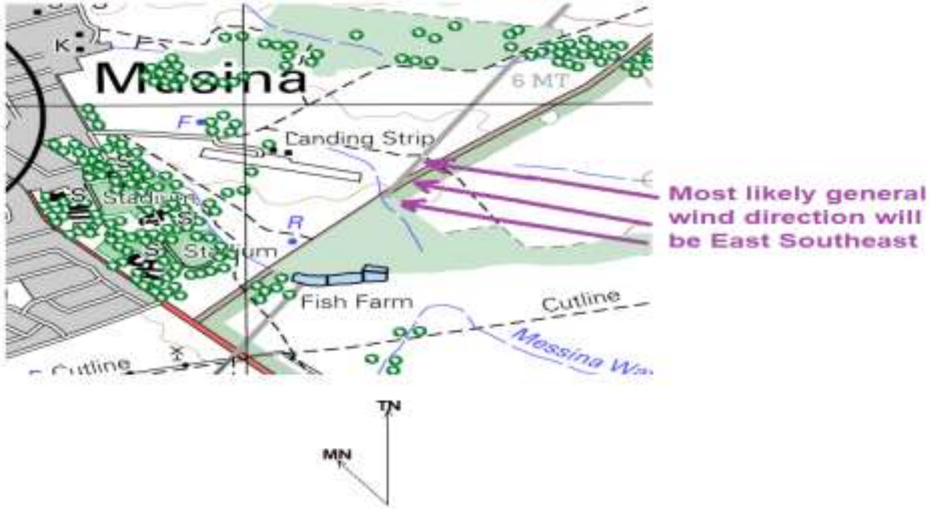
Map interpretation and application

Climate and Weather

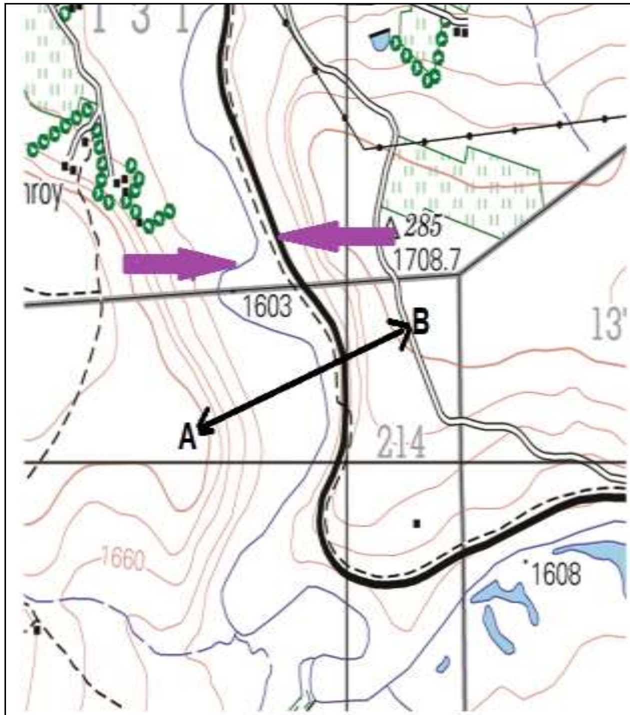
Interpreting wind direction: **Wind direction is not annotated (marked) on a map**. However, it is possible to interpret the general wind direction on topographic and orthophoto maps. The following will help to interpret the general wind direction.

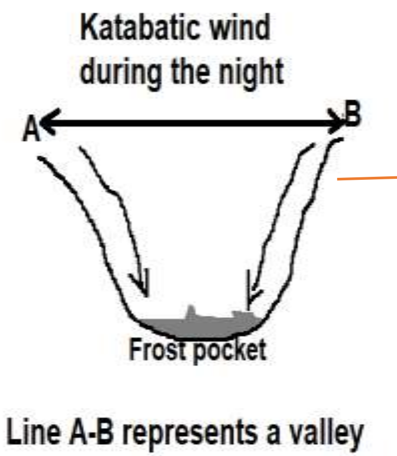
Row of trees  	On the map, the row of trees is planted on the north-eastern part of the settlement (Clewer). It is therefore deduced that the prevailing wind in this area comes from the north-east.

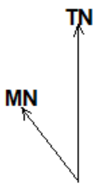
TN MN	

The way the Landing Strip is constructed  	The landing strip is where aircrafts land and take off. Generally, aircrafts take off against the wind. On this map extract the aircraft will most likely take off in an east southeasterly direction.

Katabatic wind during the night







How to read katabatic flow

On the diagram

- Line A-B represent a valley (according to contour line arrangement), as illustrated by the insert
- The arrows pointing towards each other is illustrating the air movement during the night
- This air movement is called katabatic winds

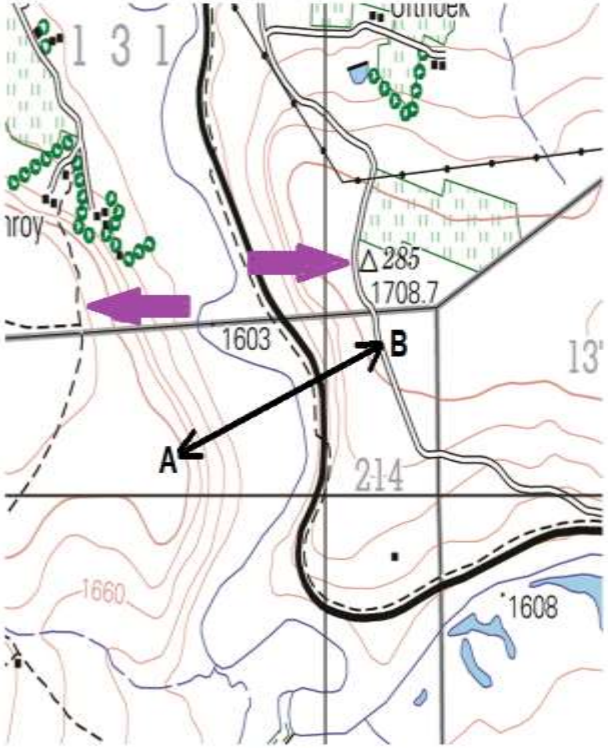
Katabatic winds have the following characteristics:

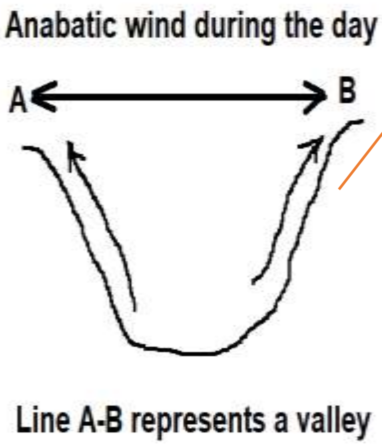
- Blows during the night
- It flows down slope
- It is a cold and heavy wind

Precipitation

- Frost pocket on the valley bottom due to inversion
- Radiation mist/fog on the valley bottom

Anabatic wind during the day





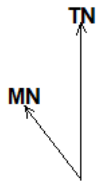
How to read anabatic flow

On the diagram

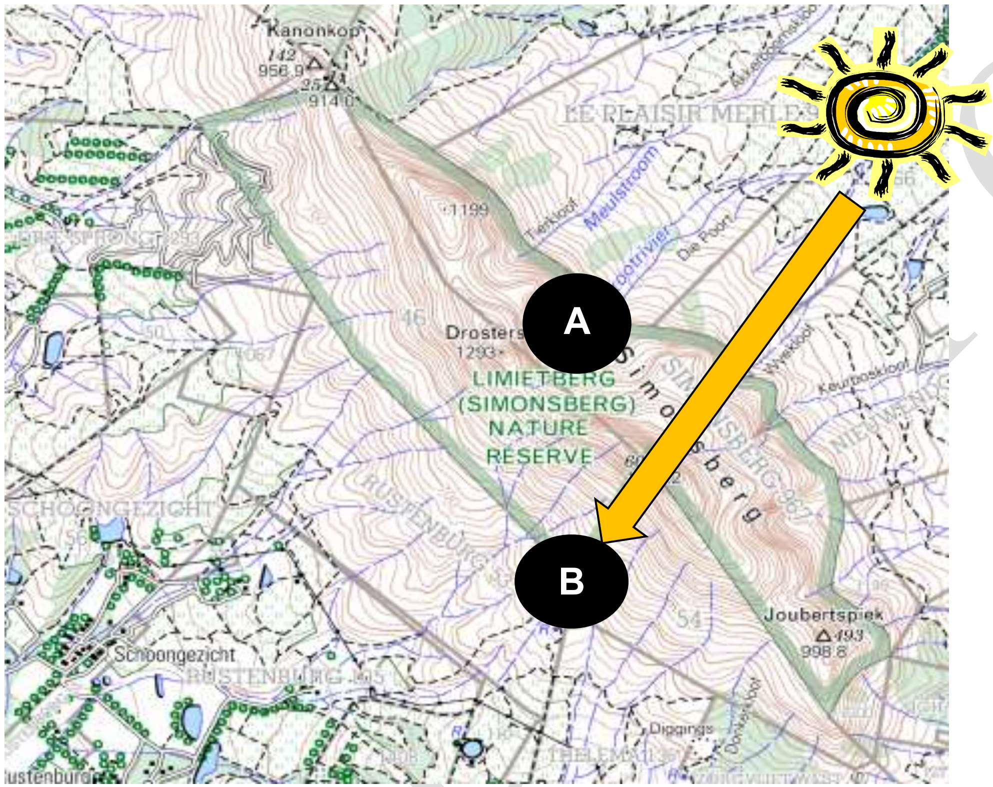
- Line A-B represent a valley (according to contour line arrangement), as illustrated by the insert
- The arrows pointing away from each other is illustrating the air movement during the day
- This air movement is called anabatic winds

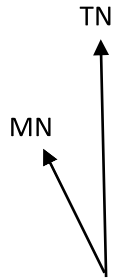
Anabatic winds have the following characteristics

- Blows during the day
- It flows up slope
- This wind is relatively warmer and lighter



Aspect/Slope direction





Identifying Aspect/Slope direction

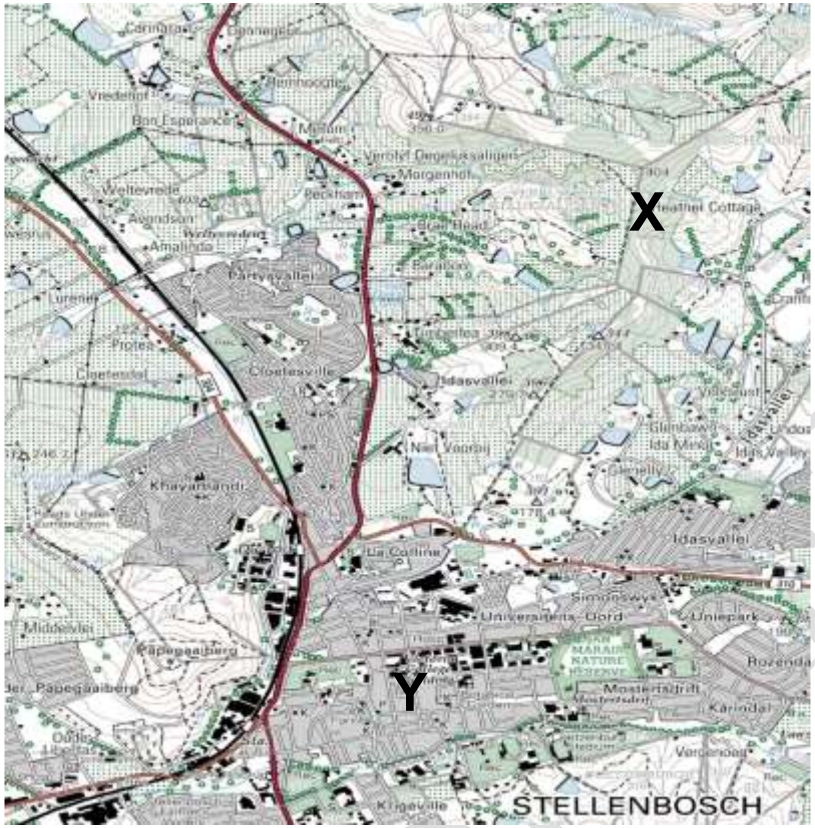
The north-facing slopes in the Southern Hemisphere (SH) are generally warmer than the south-facing slopes.

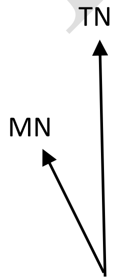
In the diagram

By reading the contour lines, letters A and B are situated on the valley slopes.

- B is the north-facing slope and will be generally warmer because of direct insolation.
- A is the south-facing slope and will be generally cooler because it's in the shadow zone (facing away from the direct insolation).

Urban vs Rural Temperatures





Identifying and interpreting urban vs rural temperatures

On the diagram:

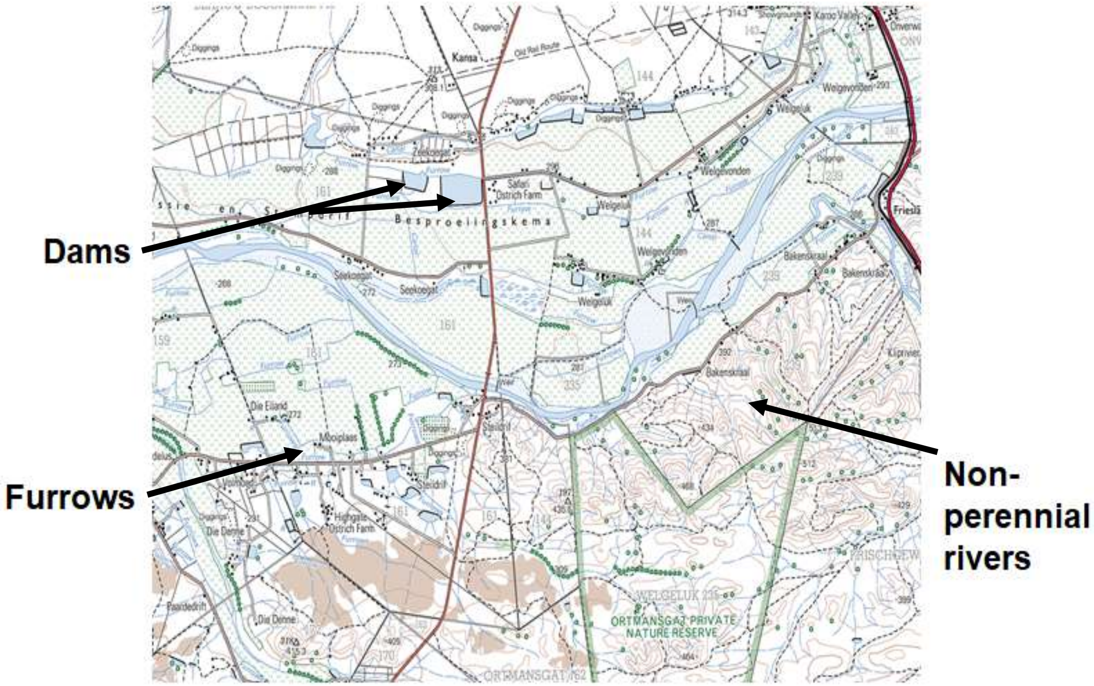
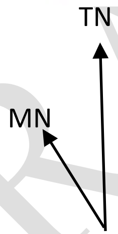
X is situated in the rural-urban fringe

Y is situated in the urban, built-up area

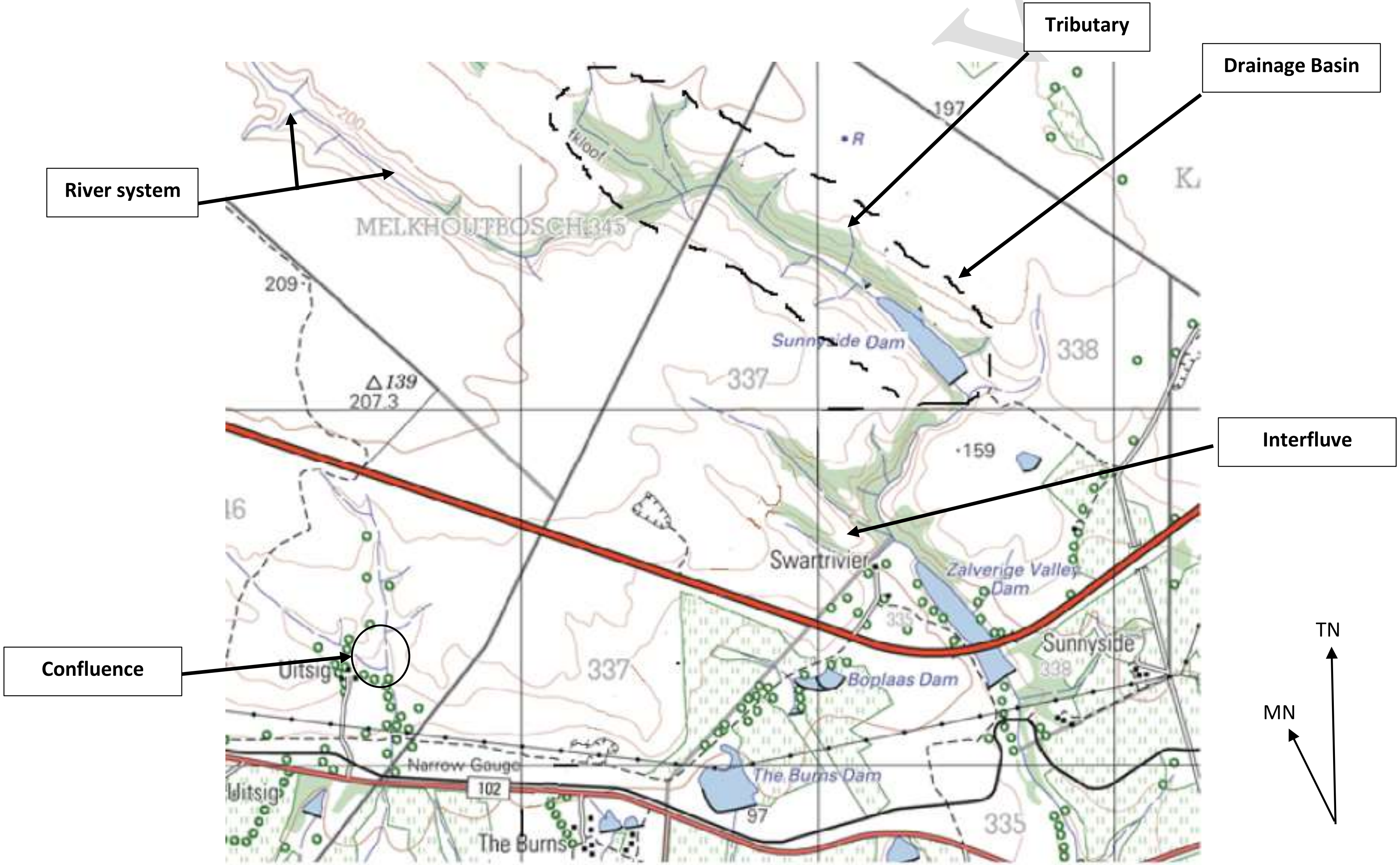
The temperature at Y is higher than the temperature at X.

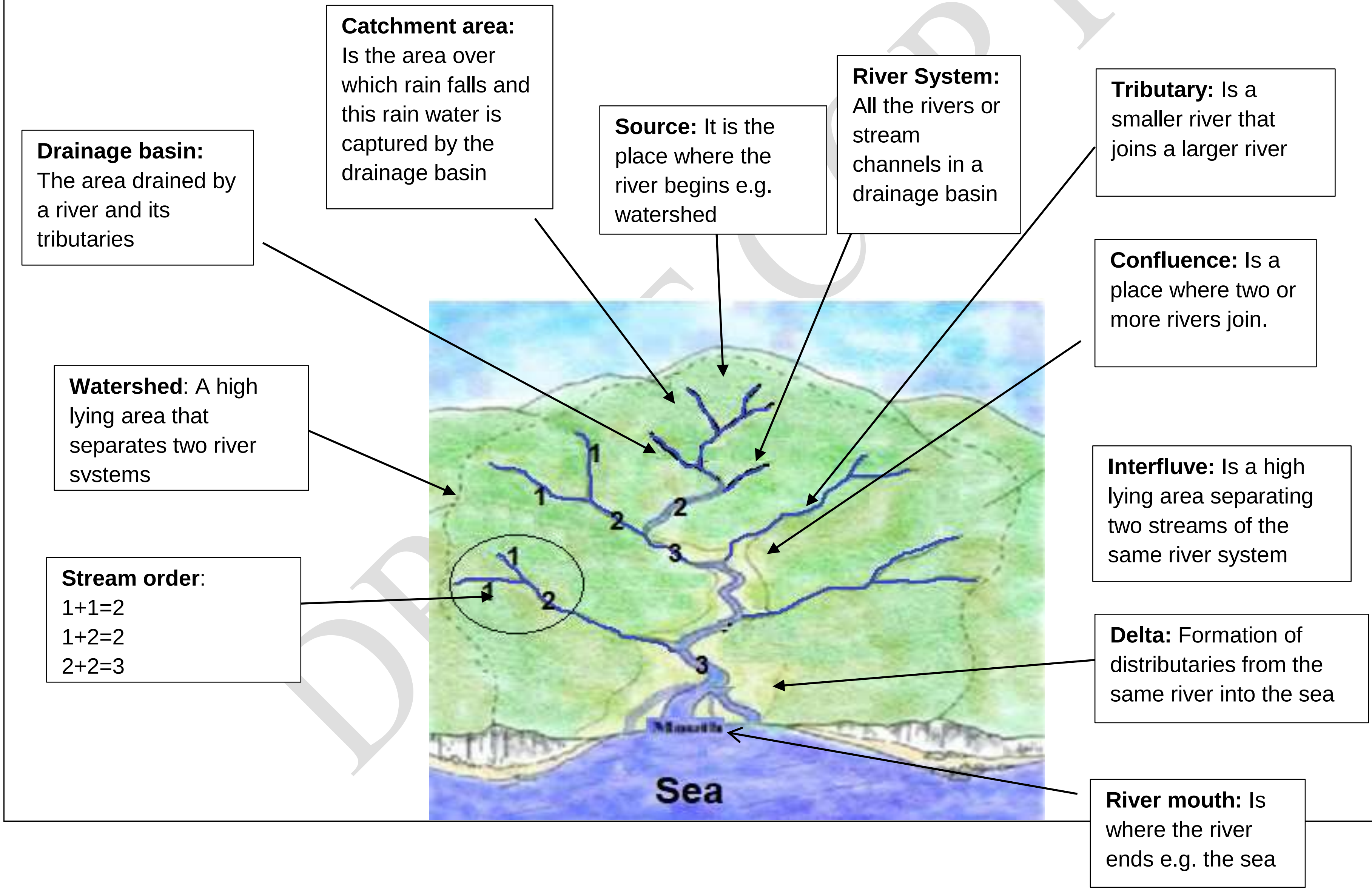
Reasons

Y – Urban, built-up area	X – Rural-urban fringe
At Y there is more artificial production of heat (more vehicles, more factories, ovens, etc.)	At X there is less artificial production of heat
At Y, there are more artificial surfaces (tar, cement, glass, etc.)	At X there is more natural surfaces (vegetation, soil, etc.)
At Y there are more high-rising (tall) buildings which trap heat.	At X there are no high-rising(tall) buildings.
The atmosphere is hot and dry because water is channeled away from the built-up area (less water therefore less evaporation)	The atmosphere is cool and humid because water is kept on the earth's surface. (more water therefore more evaporation)

Seasonal rainfall	**Indications of seasonal rainfall on this topographic map**
 	• Non-perennial rivers • Presence of dams • Furrows Other indications might be • Canals • Wind pumps • Dry pans • Sparse vegetation

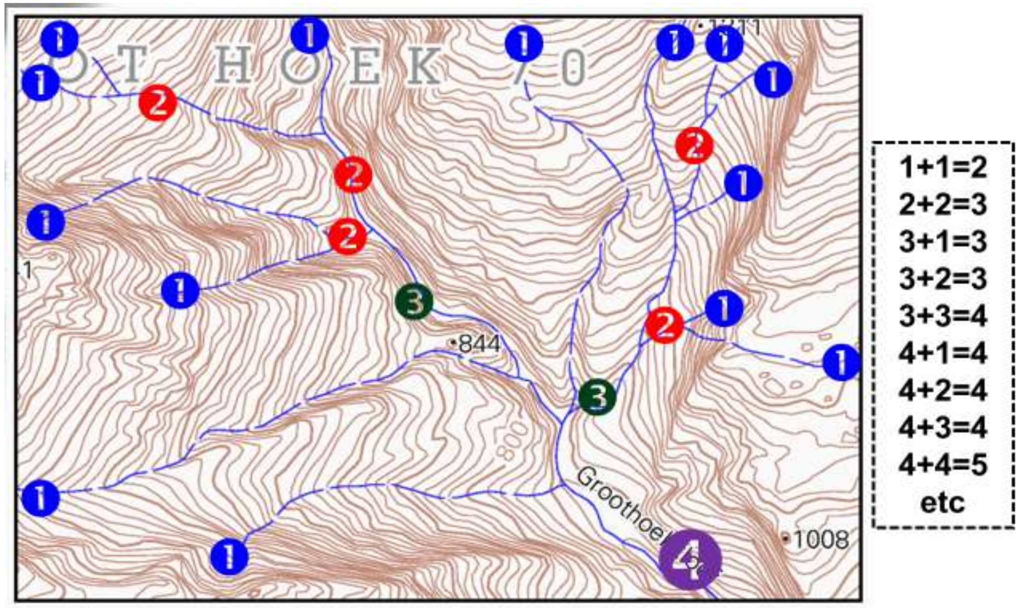
Concepts of Drainage Basins

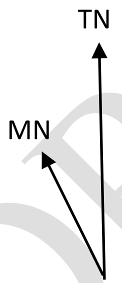




Catchment area: Is the area over which rain falls and this rain water is captured by the drainage basin
Drainage basin: The area drained by a river and its tributaries
Source: It is the place where the river begins e.g. watershed
River System: All the rivers or stream channels in a drainage basin
Tributary: Is a smaller river that joins a larger river
Confluence: Is a place where two or more rivers join.
Watershed: A high lying area that separates two river systems
Interfluve: Is a high lying area separating two streams of the same river system
Stream order:
1+1=2
1+2=2
2+2=3
Delta: Formation of distributaries from the same river into the sea
River mouth: Is where the river ends e.g. the sea
1
1
1
1
2
2
2
3
3
Sea

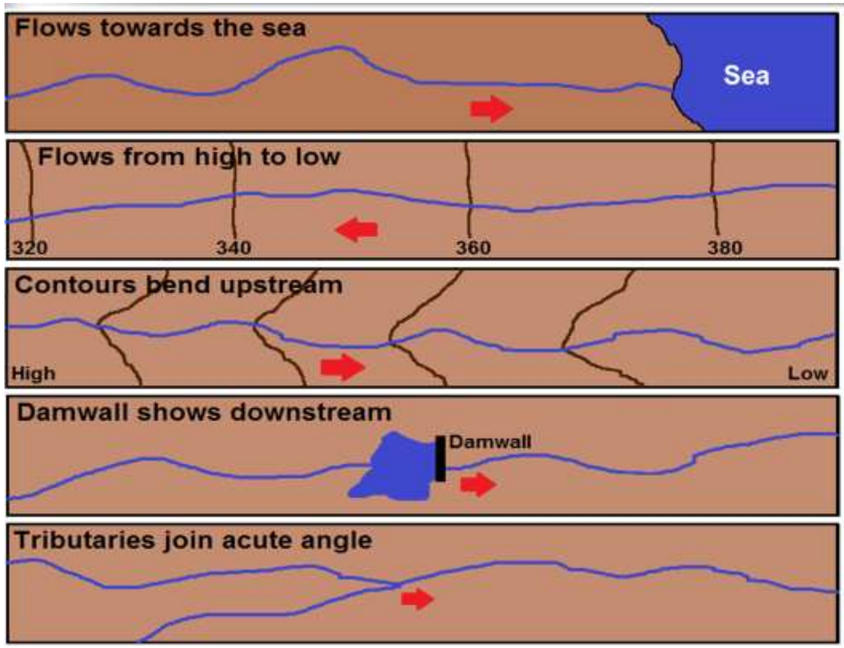
Stream orders

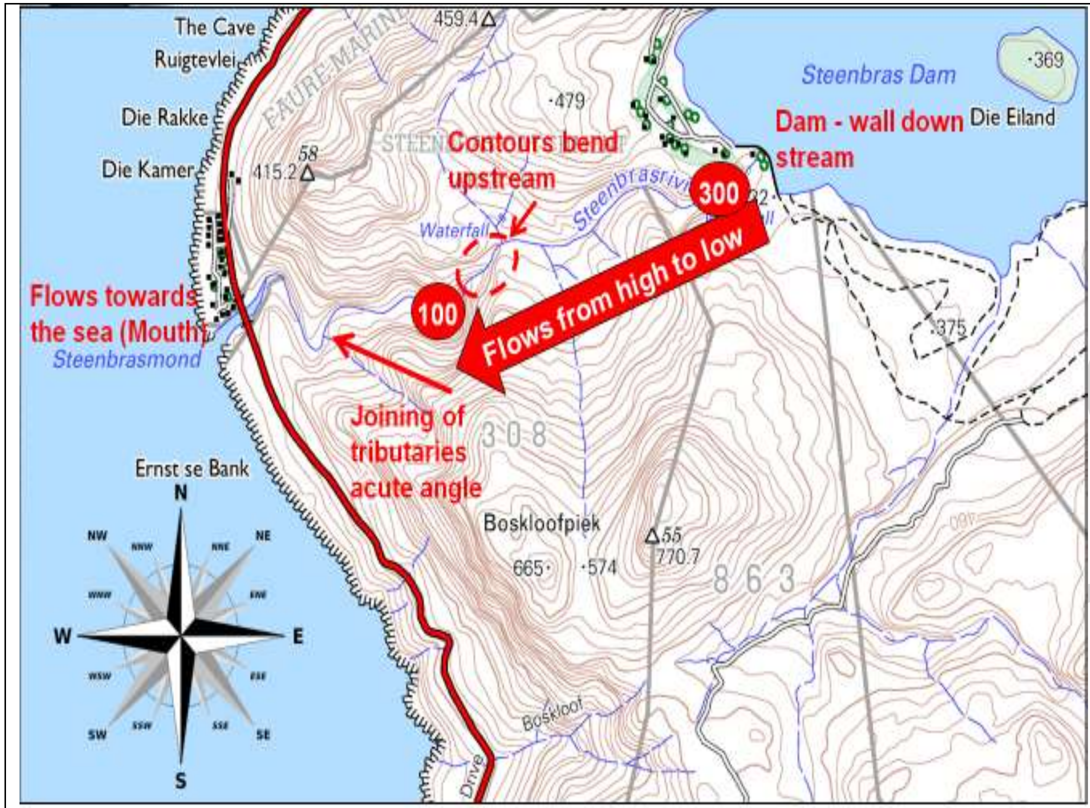


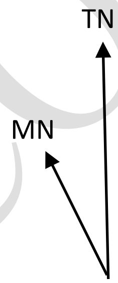


Determining stream order

- The smallest streams are classified as first order streams.
- When two first order streams meet at a confluence, they form a second order stream.
- When two second order streams meet, they form a third order stream.
- The order of the stream will continue to increase in the manner described above.
- When streams of different order meet, there is no increase in the order.

Flow direction of the river	How to determine the direction that the river flows
	• River flows towards the sea • The river flows from high area to low area • Contours bend upstream • Dam wall shows downstream • Tributaries joins acute angles

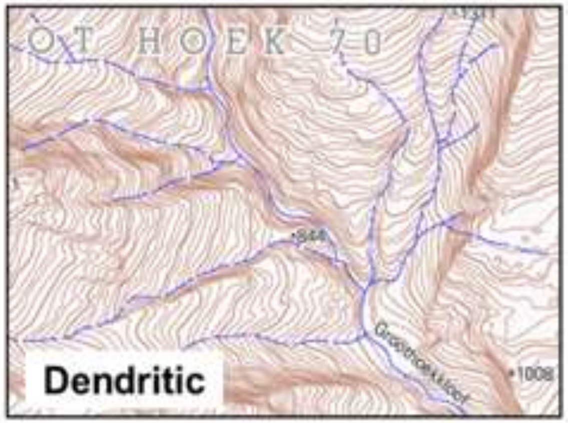


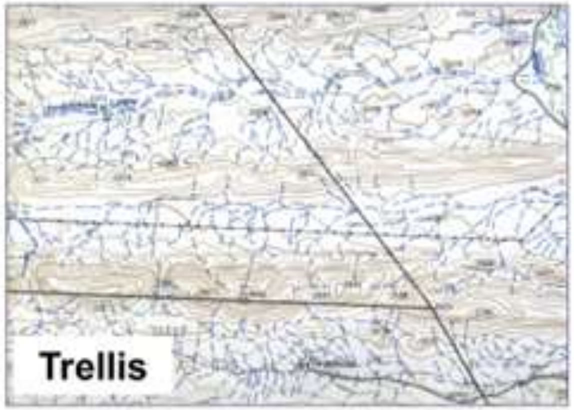


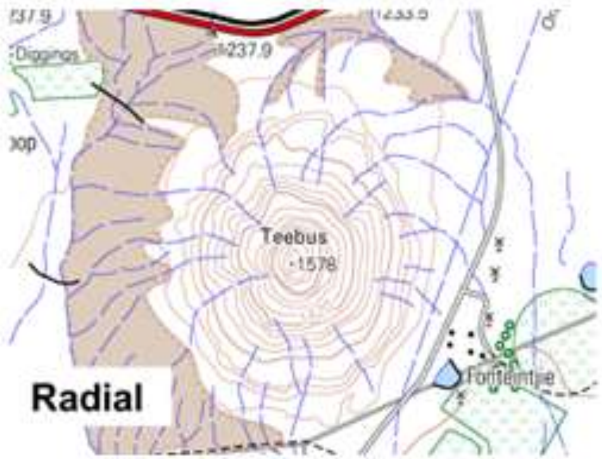
Flow direction of the Steenbras river indicated on the map

- This river is flowing in a WSW direction towards the sea
- The tributaries join at an acute angle
- It flows from a high to a low (contours)
- The contours bend upstream
- The dam wall is downstream

Drainage patterns







Types of drainage patterns

Dendritic

- Looks like the branches of a tree

Trellis

- Tributaries enter the main river at approximately 90 degree angle, causing a trellis-like appearance of the drainage system.
- Trellis drainage is characteristic of folded mountains

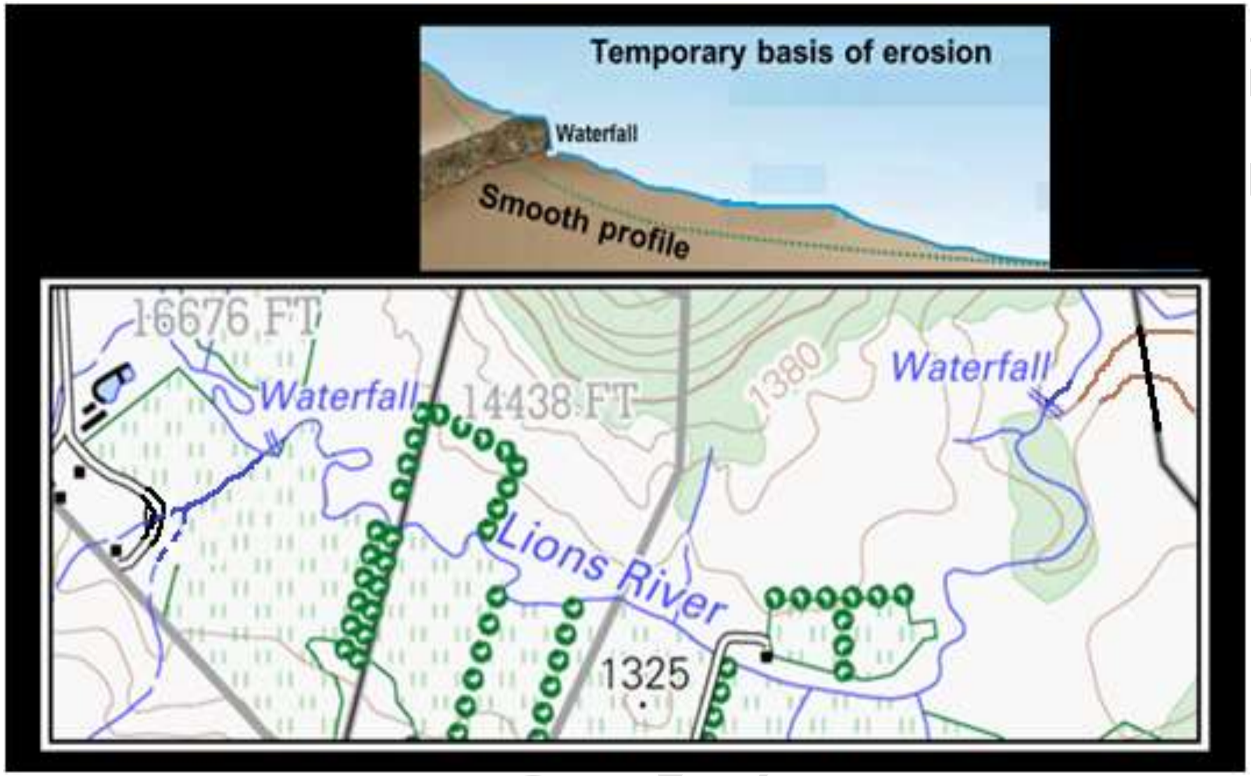
Rectangular

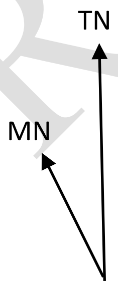
- The straight line stream with right angle bends and tributaries join larger streams at right angles

Radial

- River flows away/outwards from a central high point such as a dome

Fluvial landforms - Waterfalls





Identification of fluvial landforms

Waterfalls

- This landform is mostly found in the upper course of a river
- It is a temporary baseline of erosion

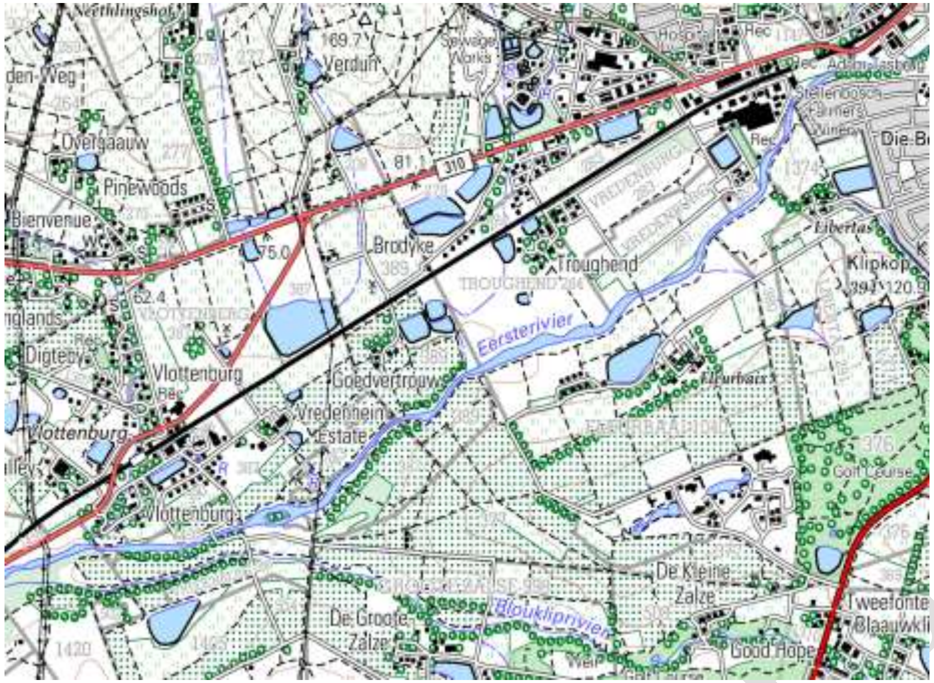
Identifying the different stages of a river

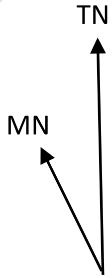
The upper course

Upper course

- The area is steep, with V-shaped valleys
- Fast flowing non-perennial rivers
- Downward/Vertical erosion
- Flow is turbulent
- Water falls, rapids, interlocking spurs can be found

Middle course

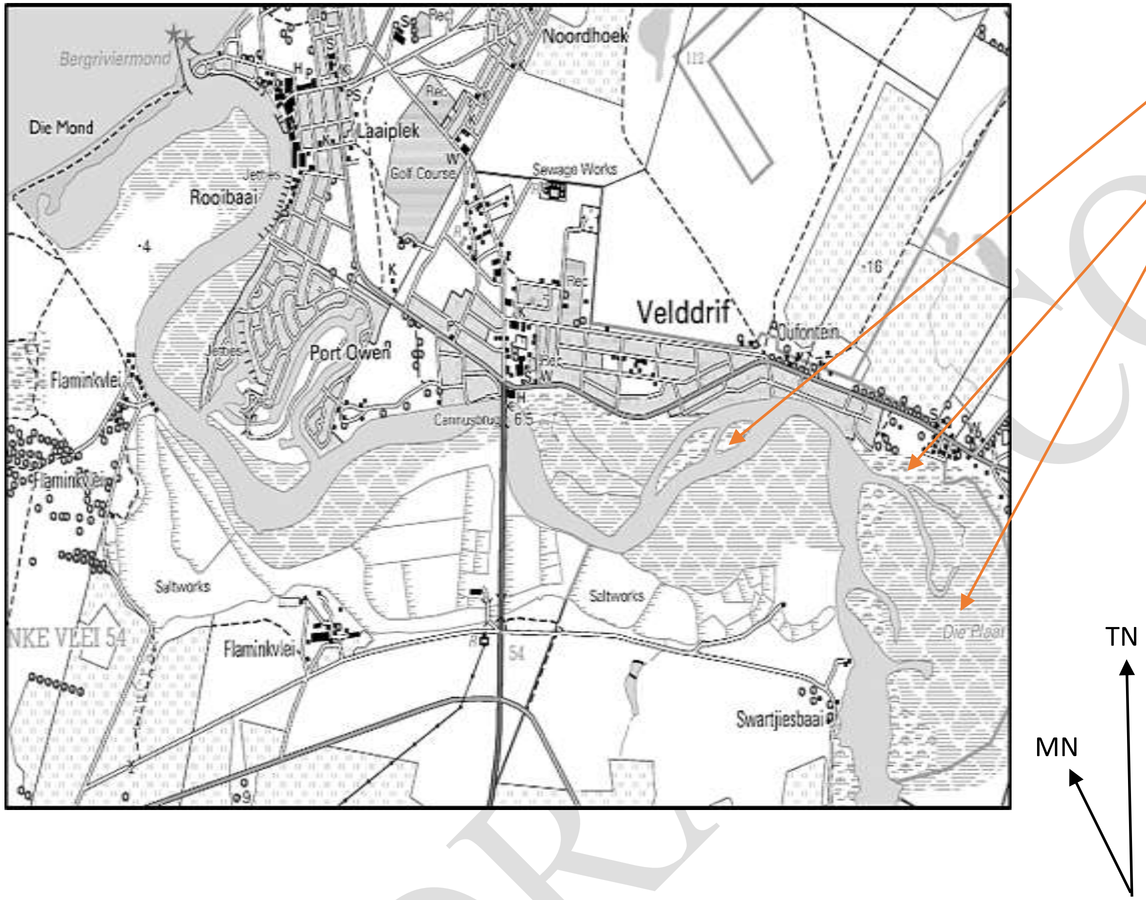




Middle course

- The area is gradual
- The river flows slower as it starts to meander
- Lateral erosion opens the area
- Meandering river and spurs can be found

Lower course



Identification of fluvial landforms and features

Flat and smooth – very few or no contour lines

Braided streams

Flood plains

Excessive Meandering

Marshes

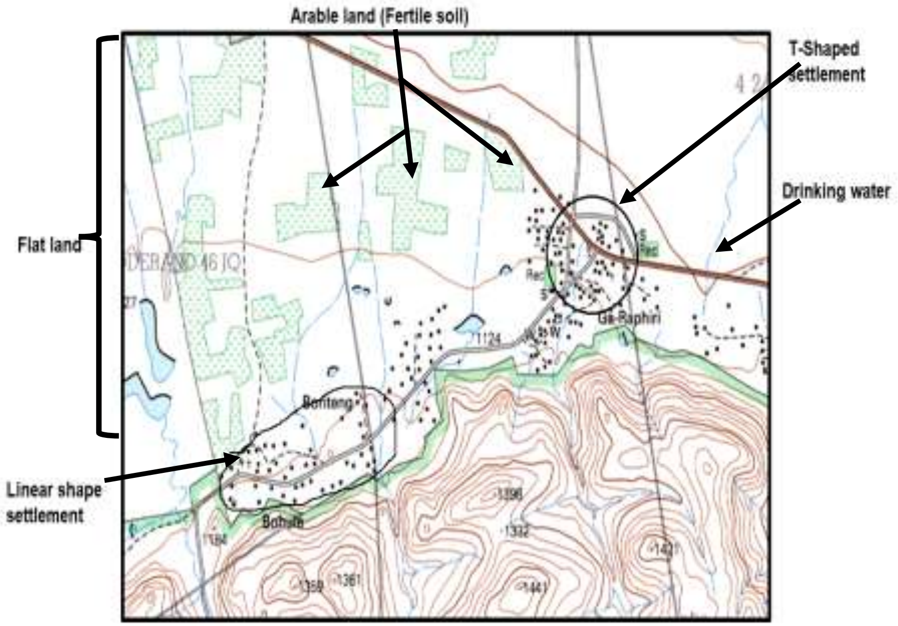
Sandbanks

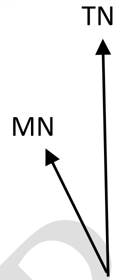
Mouth

Others:

Oxbow Lakes

Rural settlement: site and shape





The Site of a settlement describes the physical nature of where it is located.

Factors identifiable on the diagram

- Flat land – very few or no contour lines
- Quality of soil – arable land indicated by orchard and vineyards as well as cultivated land
- Fresh water supply – rivers, dams

Other factors

- building material
- climate – aspect
- shelter and defence

Shape is the external appearance of rural settlements as seen from above

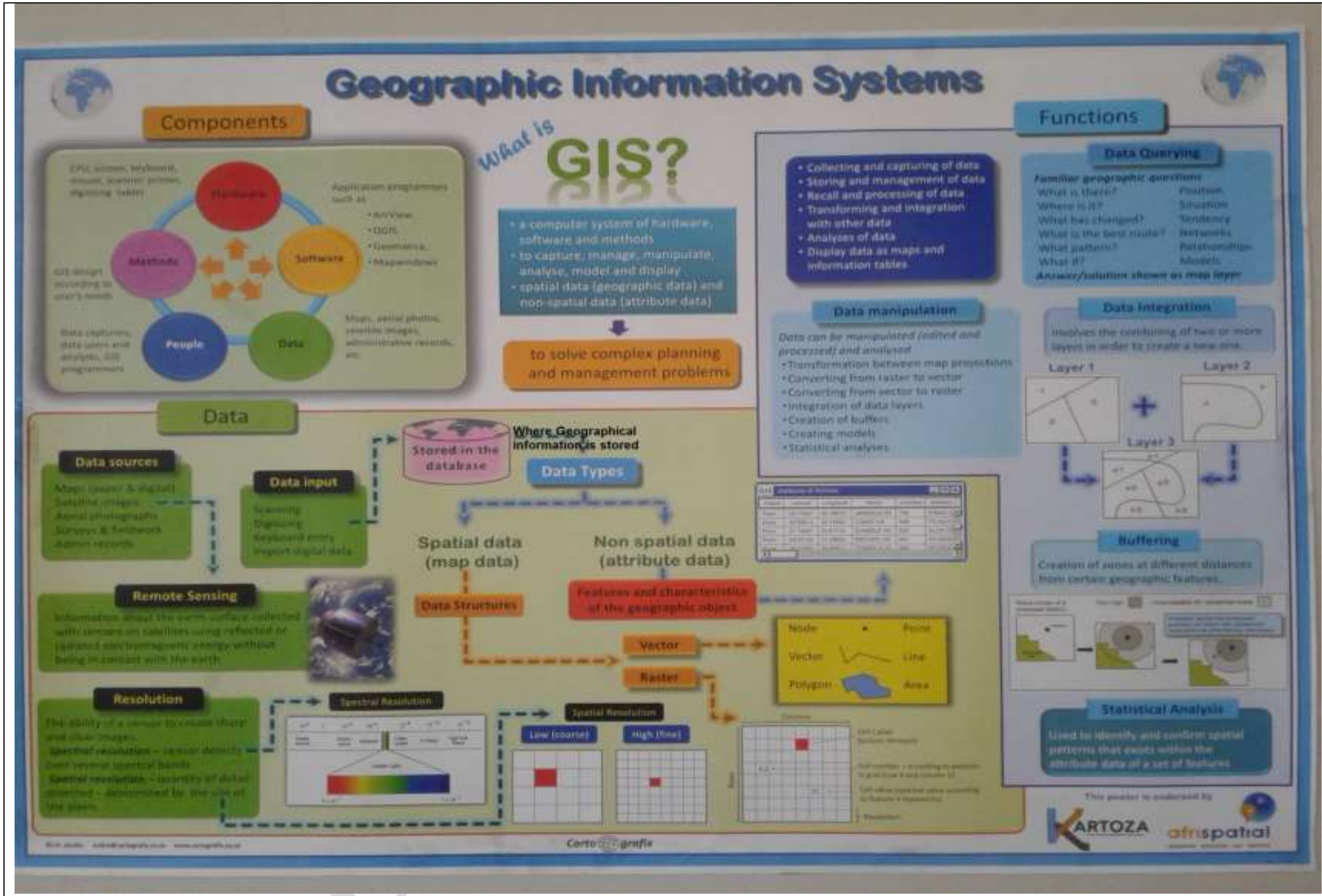
Types of shape and how it is identifiable on maps

- T-shaped – At T-junction of roads
- Linear shape – along transport routes, rivers and between physical features like mountains

Other shapes

- Round – around a central feature like a dam
- Cross road – Where important roads cross

Schematic representation of GIS content



Geographic Information Systems (GIS)

WHAT IS A GIS?

A GIS is a:

- computer-based set of procedures for assembling, storing, manipulating, analysing and displaying geographically referenced information.

- system that uses geographical data for a purpose, such as providing information that can be used for making decisions.

- complex computer system which can hold and use data describing places on the earth's surface.

COMPONENTS OF GIS

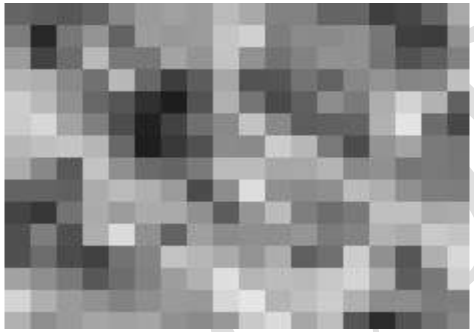
Hardware	CPU, screen, keyboard, mouse, scanner, printer, digitizing tablet.
Software	Application programme such as ArcView.
Data	Maps, aerial photos, satellite images, administrative records, etc.
People	Data capturers, data users, GIS analysts.
Methods	GIS design according to user's needs.

REMOTE SENSING

The collection of information on the earth's surface without actually being in contact with it**.** (weather balloons, aeroplanes and satellites)

RESOLUTION

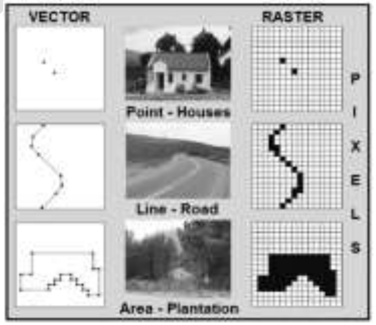
The ability of a remote sensing sensor to create a sharp and clear image.

HIGH RESOLUTION	LOW RESOLUTION
	
Many pixels; Small pixels; Objects easily recognised	Less pixels; Larger pixels Objects not easily recognised

There are two types of geographical information, namely, Locational (Spatial) data and Non-locational (Attribute) data.

Spatial data describes the location of, connections among, and relationships among point line and area features.
Attribute gives the characteristics of the point, line and area features in terms of certain attributes (attributes), which may be either qualitative, e.g. the type and names of roads in a given area or quantitative, e.g. the widths of roads.

RASTER AND VECTOR DATA



In **vector data** objects on the earth's surface is represented by using a **point**, a **line** or an **area** (polygon).

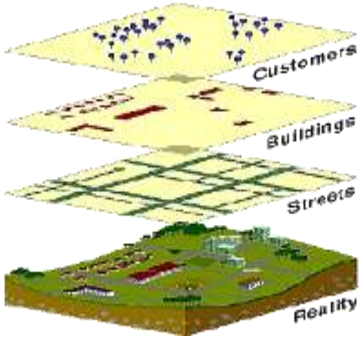
In **raster data** objects on the surface of the earth is represented by rows and columns of evenly sized blocks, called **pixels**. Pixels are the smallest unit of data storage

GIS 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

What is data manipulation?
Data manipulation involves getting the different data sources into a format that can be integrated

Explain why data manipulation is important in a GIS.
When all the data layers are in similar data files the data can be integrated (put together)
Statistical information must be manipulated into such a file format that it can be used in the GIS software and linked to specific spatial features errors in the database can be eliminated during manipulation

DATA INTEGRATION

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

WHY DOES GIS MATTER?

Geographical Information Systems are a special class of information systems that keep track not only of events, activities and things, but also of where these events, activities and things happen or exist.

Problems that involve an aspect of location, either in the information used to solve them, or in the solutions themselves, are termed geographical problems.

Here are some examples

- Health care managers solve geographical problems when they decide where to locate new clinics and hospitals;
- Delivery companies solve geographical problems when they decide the route and the schedules of their vehicles;
- Transportation authorities solve geographical problems when they select route for new highway;
- Forestry companies solve geographical problems when they determine how best to manage forests, where to cut, where to locate roads and where to plant new trees;
- Governments solve geographical problems when they decide how to allocate funds for building sea defenses;
- Travelers solve geographical problems when they find their way through airports, give and receive driving directions and select hotels in unfamiliar cities;
- Farmers solve geographical problems when they employ new information technology to make better decisions about the amounts of fertilizers and pesticide to apply to their fields.

Some examples of industries that use GIS in their planning, operation and decision making are

Industry	**How they use GIS**
Oil Industry	Planning and managing pipelines
Military	Planning troops movements or field study
Mobile phone companies	Positioning and managing existing and new masts
Mining	Locating the mineral reserves, i.e. geological mapping
Agriculture/Farming	Finding the most suitable location to grow particular crops, land use decisions, mapping soils, vegetation, etc.
Ambulance services	Planning quickest route to assist patients
Police services	Planning quickest route to combat crime

GIS can be done manually using transparency overlays (Paper GIS). This method is tedious and does not allow for changes in scale. The advantage of the modern GIS using computers is that it is faster and more efficient and can manage large volumes of data over large study areas.

BUFFERING

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

Definition: ***A line used to demarcate an area around a spatial feature***

Examples:

noise buffers next to roads

safety buffers for areas that is danger or is in danger of human exploitation.

5 Message to Grade 12 learners from the Writers

Every challenging and difficult time that you have gone through in your life has shaped you into a winner you are today. Hard times are not permanent but should be seen as part of your normal growth. Just make a decision that you are going to keep on moving and complete the race. **Portia January**

It is through hard work and sacrifices that you will one day look back with pride and satisfaction and say to yourself: "So has been the story of my life, falling and crying, but most importantly, rising again." Your triumph over those challenges should serve as an inspiration and assurance that you are certainly a winner. **Hettie Benjamin**

Remember that you are not alone, many have walked the same road before and succeeded. Do not give up, keep on believing in yourself. Just know that there is something in you that is greater than any challenge. With Geography you will always know where you are going. Just keep on pushing. **Jerome Meyer**

Human beings are interesting creatures, they tend to learn the most when they do not get their way through. Use whatever setbacks in your life to become a mentally stronger person. Every successful person has gone through ups and downs of life, but what is unique with them is that "they kept on believing in themselves," so keep the faith. **Mosebetsi Mofokeng**

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