KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

CURRICULUM GRADE 10 -12 DIRECTORATE

NCS (CAPS) SUPPORT

JUST IN TIME LEARNER REVISION DOCUMENT

GEOGRAPHY MAP WORK

GRADE 10-12

2025

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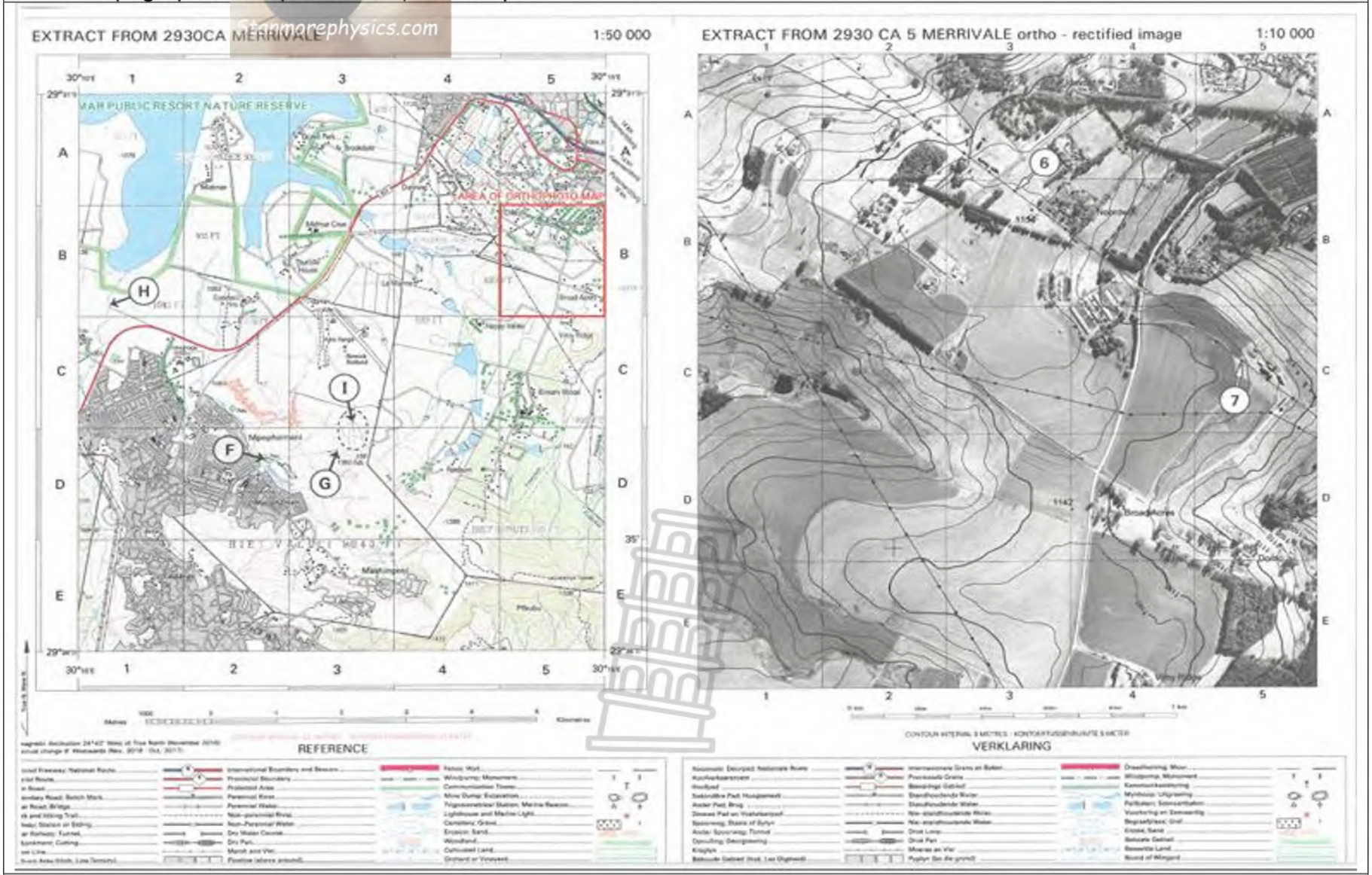
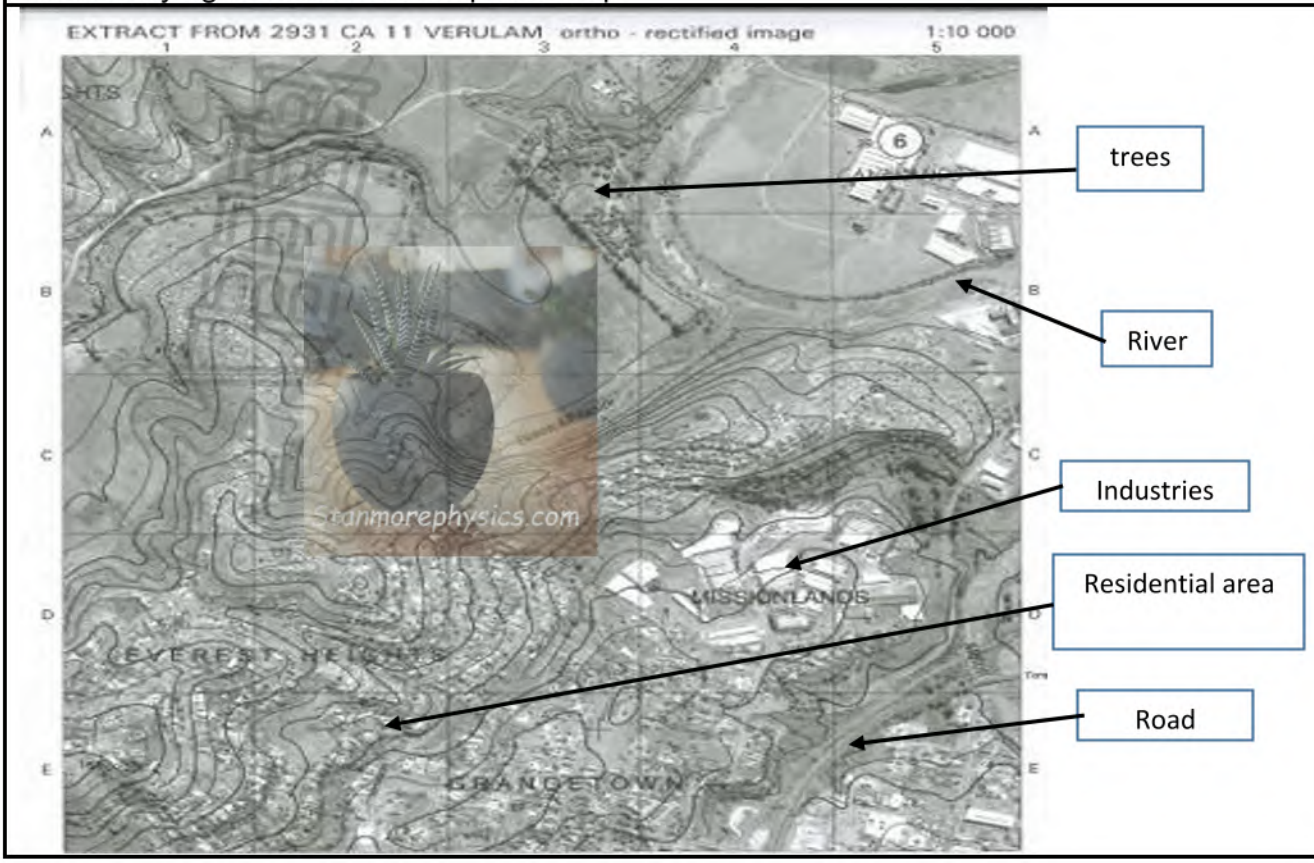


1.1 Difference between orthophoto and topographical maps	
Orthophoto map	Topographical map
• Map scale is 1:10 000 • 10 000 cm are equivalent to 100m or 0.1km • 1:10 000 is expressed in words as 1cm on the map represents 10 000cm or 100m or 0.1 km in reality • The scale of the orthophoto map is 5 times larger than the scale of the topographical map. Meaning that same features on the orthophoto map will appear larger than they are on the topographical map • The spaces between contour lines is referred to as a contour interval. Most orthophoto maps use contour interval of 5m. even though some uses contour interval of 10m. • Orthophoto map is an example of raster data	• Map scale is 1:50 000 • 50 000 cm are equivalent to 500m or 0.5km • 1:50 000 is expressed in words as 1cm on the map represents 50 000cm or 500m or 0.5km in reality • The scale of the topographical map is 5 times smaller than the scale of the orthophoto map. Meaning that same features on the topographical map will appear smaller than they are on the orthophoto map • The spaces between contour lines is referred to as a contour interval. Most topographical maps use contour interval of 20m. • Topographical maps are an example of vector data

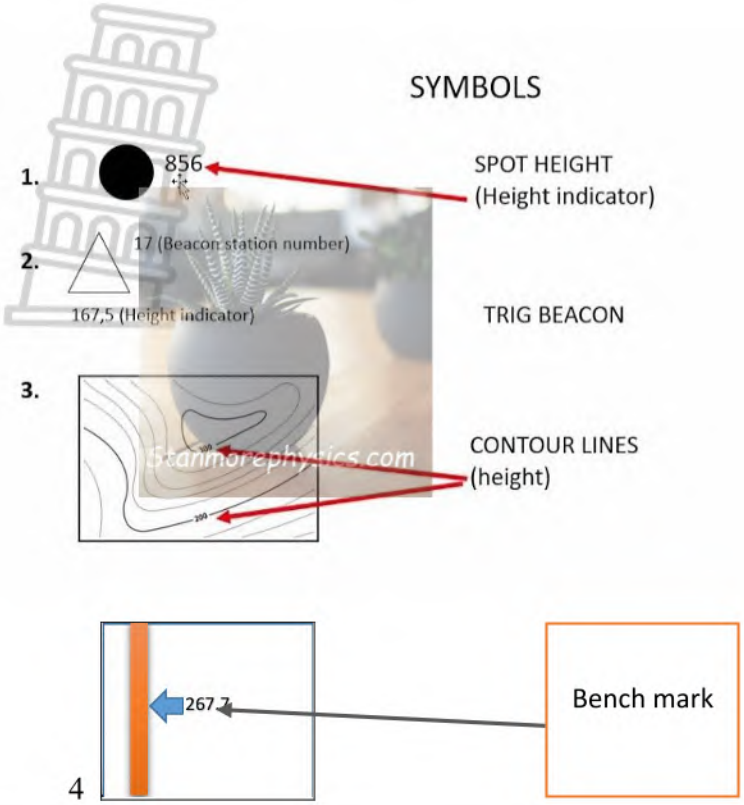
1.2 Identifying features on orthophoto map



1.2.1 Identifying features on an orthophoto map

- Identify objects by associating them with other objects. e.g. urban schools will be shown by a building and a sport field next to it
- Low income residential area can be identified by small buildings lying close to one another
- Dark shade of grey can indicate trees
- Industries will be shown by large buildings

1.3	Height indicators



1.3.1	Heights indication on the map
Trigonometrical beacon	• These are normally found at the highest points of hills and mountains • The number below the triangle is the height. (It is always in decimal) and the number on the side is the number of the beacon
Spot height	• Any prominent height is marked with a spot height • It is shown as a dot with a height next to it
Bench mark	• It is usually found along the roads or rail ways and is indicated by a black arrow
Contours	• These are lines on the map joining places of equal heights above sea level

1.4. Map scale

Maps are always smaller than the area of the ground they represent. The size by which actual distance on the ground have shrunk to draw proportionate maps is called a map scale.
The scale is shown in 3 ways.

(a) Ratio scale/represantative fraction

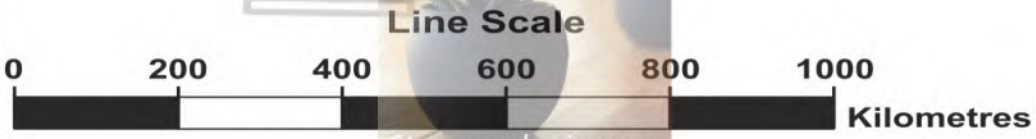
a fraction, e.g. $\frac{1}{50\,000}$

a ratio 1:50 000

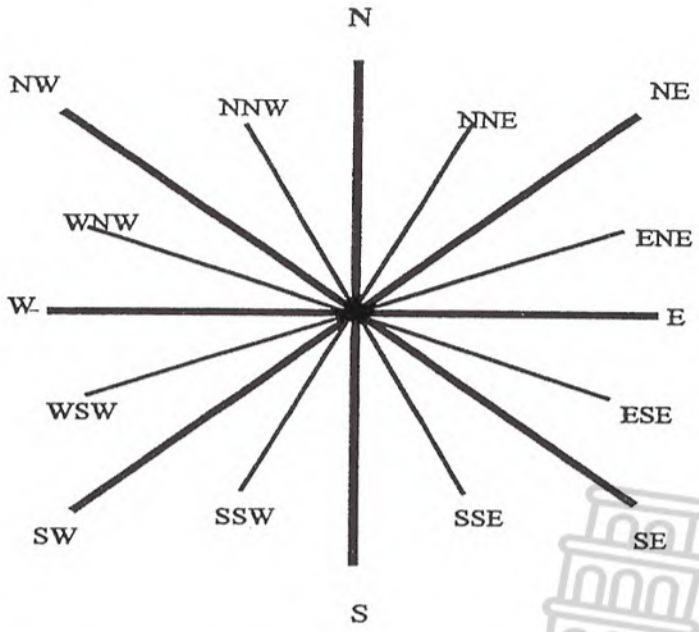
(b) Word scale

One centimetre on a map represents fifty thousand centimetres in reality/on the ground.

© Linear scale



1.5	CARDINAL POINTS



Source:https://www.researchgate.net/publication/221473202/figure/fig5/AS:667773822849043@1536221094822/The-Sixteen-Point-Compass-as-presented-to-the-participants.ppm

- The four **cardinal directions**, or **cardinal points**, are the four main compass directions: north, south, east, and west, commonly denoted by letters N, S, E, and W respectively. Relative to north, the directions east, south, and west are at 90 degree intervals in the clockwise direction.
- From the main points we then have Four sub-points which are North East, South East, South West and North West.
- To get another 8 cardinal points we take the main point and add the sub-point closest to that main point. E.g. North North East as illustrated in the diagram.

Example

What is the direction of spot height 1765 from spot height 1700?

Answer is North West

.1765

.1700

What is the direction of spot height 1620 from spot height 1600?

Answer is South East

.1600

.1620

1.6 GRID REFERENCE/CO-ORDINATES

Calculating Grid Co-ordinates

1. First write down the 'given' information:
   49°02'___"S, **24**°59'___"E

2. Now start to calculate the minutes for the **Latitude** answer:
   Measure (mm) from the top of the block
   to where the feature is. (middle of the feature)
   Measure (mm) from the top of the block
   where the feature is to the bottom of the block.

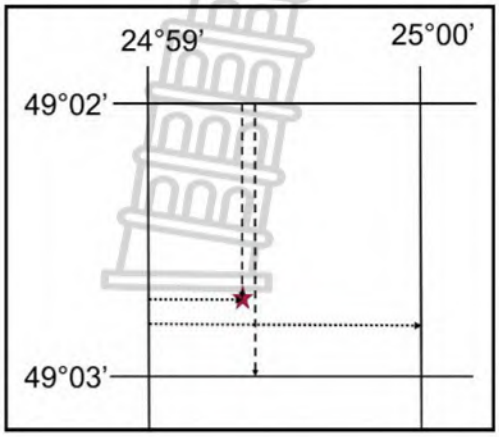
$$\frac{\text{mm}}{\text{mm}} \times 60 = \text{___"S}$$

3. Now calculate the minutes for **Longitude**:
   Measure (mm) from the left of the block
   to where the feature is. (middle of the feature)
   Measure (mm) from the left side of the block
   where the feature is to the right side of the block.

$$\frac{\text{mm}}{\text{mm}} \times 60 = \text{___"E}$$

Question:

Give the grid co-ordinates of the lighthouse (star symbol).



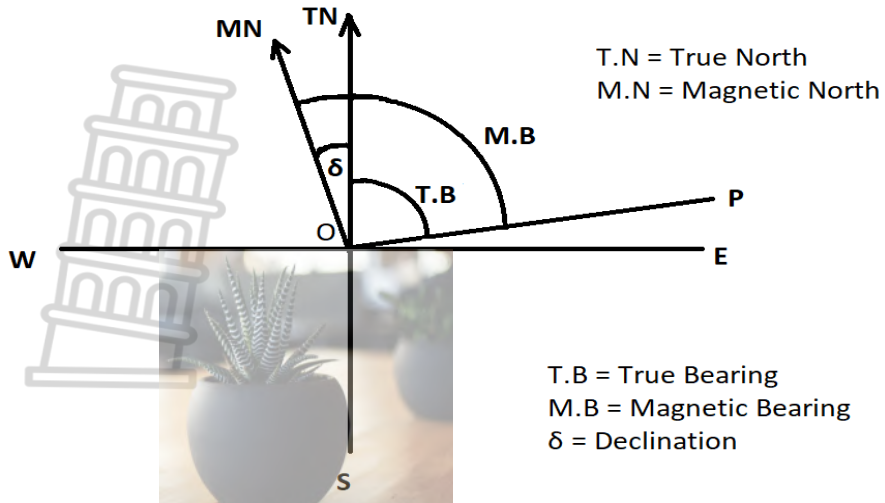
∴ **49**°02'__"S, **24**°59'__"E

NB:

ALL MINUTES ANSWERS NEED TO BE ROUNDED OFF TO THE NEAREST WHOLE NUMBER.

Degrees/Minutes/Seconds

2	CALCULATIONS
2.1	True bearing, magnetic declination and magnetic bearing



Source: https://civilnotepot.com/wp-content/uploads/2019/10/7abd6-ice_screenshot_20190604-2301262b252812529.png

2.2 Magnetic declination

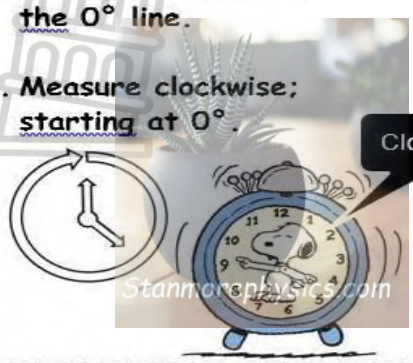
- Magnetic declination is shown on all topographical maps. It is calculated (updated) every year to get the correct current position of the true North so that user does not get lost.
- Steps to calculate Magnetic declination:
- **Difference in years:** current year and subtract the year at which it was last updated: Example magnetic declination 24°42' west of true North (November **2016**)
- **Mean annual change**. It is taken directly from the map as it is provided.
- **Total change**. difference in years multiply by mean annual change.
- **Magnetic declination plus** total change

Example:
Present year: 2025
Map year: 2016
Annual Change: 9'West of true North
Mean Mag. Declination 24°42'
Difference in years =2025 – 2016 = 9 years
Total change= 9' x 9 = 81' West of true North
24°42'W + 81' = 26°3'West of True North

2.3	True Bearing Formula:	Exercise

How to calculate/measure True North Bearing:

1. Draw a 0° line through the place you are starting at (line parallel to lines of longitude).
2. Join the two places (E.g. A and B)
3. Place protractor on the 0° line.
4. Measure clockwise; starting at 0°.



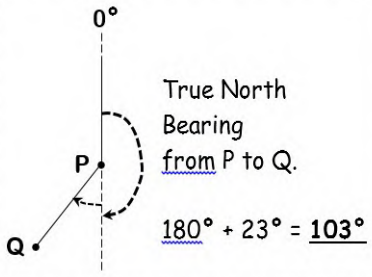
Let's calculate the True North Bearing from place A to place B.

•A

•B

NOTE:

If the angle is larger than 180° then the protrator must be rotated and we then calculate 180° + the rest of the angle



203°

2.4 Magnetic bearing

- Formula for calculating magnetic bearing: True bearing + Magnetic declination = magnetic bearing
- Calculate the magnetic declination and the true bearing first.
- NB only Add degrees of the True bearing with degrees of the magnetic declination.
- Minutes from the Magnetic declination remain unchanged.
- West of true north is not written in the final answer of magnetic bearing.

EXAMPLE

26°3’ + 203° = 229°3’

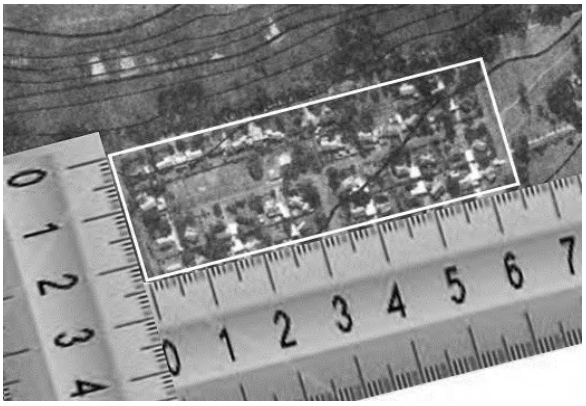
2.5	**Conversions when calculating distance**	
	Topographical map (1:50 000)	Orthophoto map (1:10 000)
	• cm to km x 0.5km	• cm to km x 0.1km
	• cm to mx 500	• cm to m x 100

2.6 Straight line distance

- It is calculated by measuring the distance between two points given.
- Usually we use centimeters (cm) and convert to either meters or kilometers depending on the question
- Formula: map distance x map scale

2.7 Calculating area

- The formula for calculating area is Area = Length x Breadth
- Measure the length and the breadth in centimeters from the map.
- N.B. Length will always be your longer side of the area
- If you are calculation from orthophoto map, you will convert by either 0.1 (for kilometers) or 100 (for meters)
- If you are calculating from topographical map, you will convert by 0.5 (for kilometers) or 500 (for meters)
- Substitute the formula by multiplying length by breadth to get your answer in m^2 or km^2



- e.g. Length = 6.5 cm and breadth = 2.3 cm. calculating the length in metres.
- 6.5cm x 100m = 650m
- 2.3cm x 100m = 230m
- L=650m x B= 230m
- Area = 149500m^2

2.8 Calculating average gradient

- Gradient is the steepness or gentleness of the slope.
- When you calculate gradient, you use the formula below
- $gradient = \frac{\text{Vertical interval}}{\text{Horizontal equivilant}}$ (G=$\frac{VI}{HE}$)
- Vertical interval is the difference in height between the two points,
- Horizontal equivalent is the distance in meters between the two points.
- You calculate VI and HE separately
- When calculating VI calculate difference in heights between the TWO points provided meters e.g. VI= 100-80 = 20m
- When calculating HE we measure the distance between two points provided in centimeters and convert to meters. e.g. (if the measured distance is 3.6cm) 3.6cm x 100 = 360m (if you are using orthophoto map) or 3.6 x 500 = 1800m if you are using topographical map)

  Gradient = $\frac{20m}{360m}$

  20 into 20 ($\frac{20m}{20m}$) = 1

  20 into 360 ($\frac{360m}{20m}$) = 18

  1: 18
- Your answer for gradient must always be in the form of a ratio

2.9 Vertical Exaggeration

Formula: vertical exaggeration = $\frac{\text{Vertical scale (VS)}}{\text{Horizontal scale (HS)}}$

- Vertical scale on a topographic map is 1cm:20m and Horizontal scale is 1cm:50 000cm.
- Vertical scale on an orthophoto map is 1cm:5m and Horizontal scale is 1cm: 10 000cm.
- Example:

Vs= $\frac{1cm:20m}{x\ 100}$
Hs=1cm:50 000cm

$\frac{1cm:2000cm}{1cm;50\ 000cm}$

$\frac{1cm\ x\ 50\ 000}{2000\ x\ 1}$

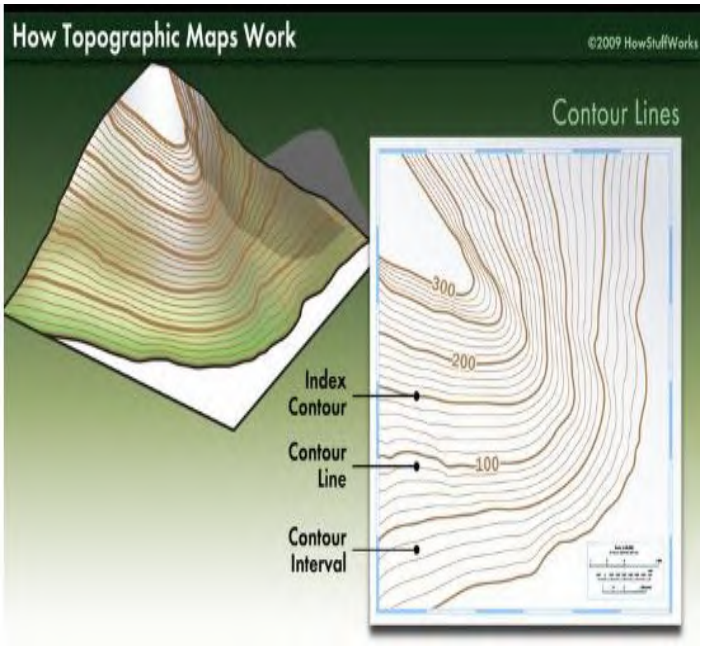
= 25 times

3	Application and interpretation
3.1	In this section, leaners are expected to use the knowledge they have acquired on theory practically.

Picture A

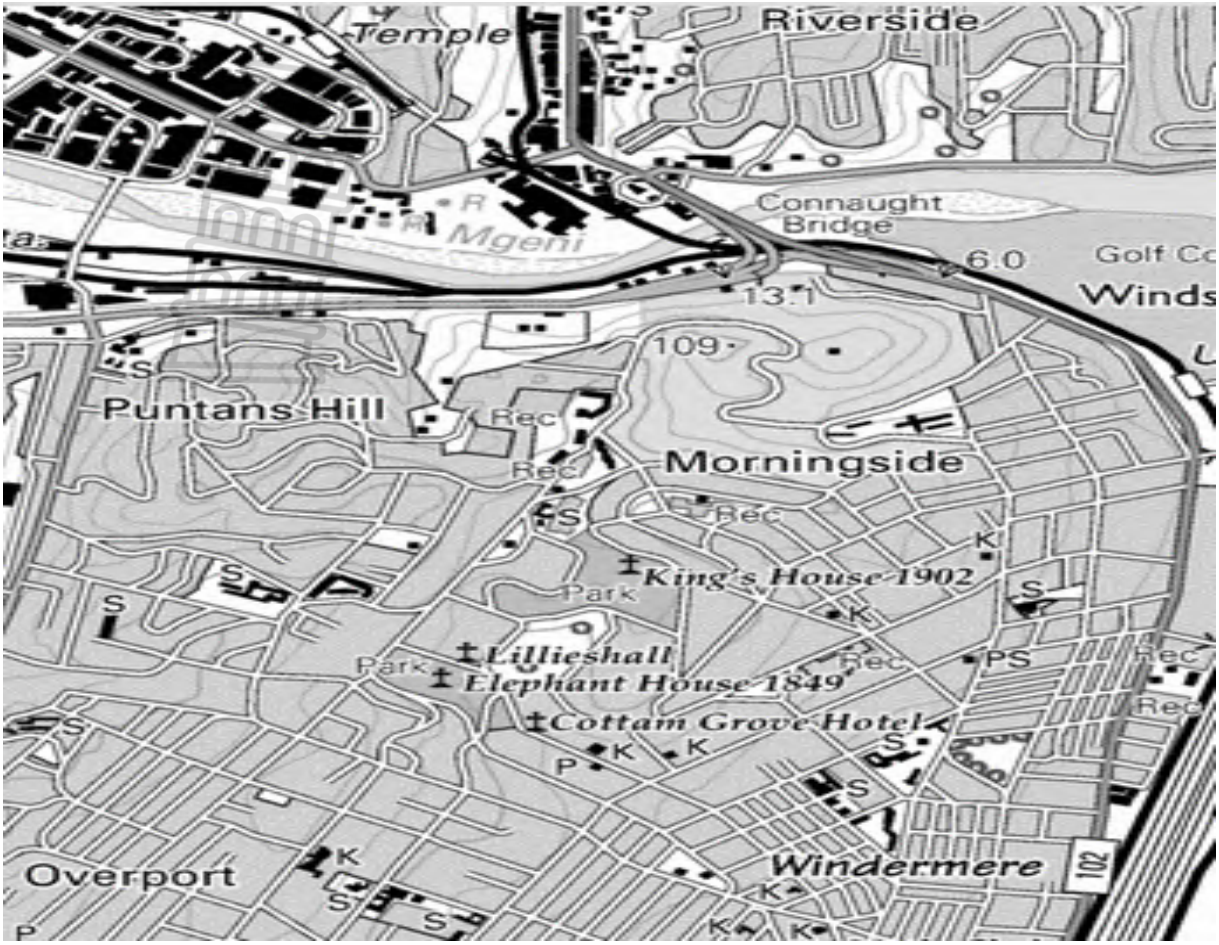
Source: https://www.startpage.com/av/proxy-image?piurl=https%3A%2F%2Fs-i.huffpost.com

Picture B



Source: https://media.hswstatic.com/eyJidWNrZXQiOiJjb250ZW50LmhzZ3N0YXRpY5jb20iLCJrZXkiOiJnaWZcL3RvcG9ncmFwaGljL W1hcC1jb250b3VyX3YyLmpwZyIsImVkaXRzIjp7InJlc2l6ZSI6eyJ3aWR0aCI6ODI4fX19

Picture C



Source: South Africa Topographic Map https://htonl.dev.openstreetmap.org/ngi-tiles/#9/-30.3433/30.0723

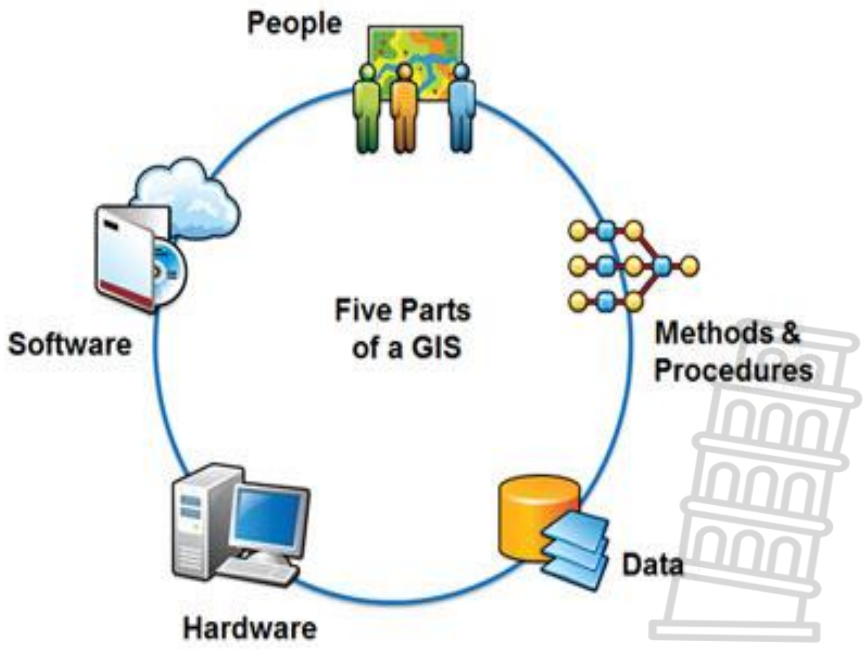
- In picture A grade 10 leaners might be required to identify the layer of the atmosphere in which this plane is flown and to provide reasons
- In picture B, grade 11 leaners might be required to use contour lines to identify gentle and steep slopes as well as to identify landforms such as butte, mesa or conical hill on a topographical map.
- In picture C, grade 12 leaners might be required to identify street patterns, drainage patterns or land use zone in a topographical map and provide reasons

4 Geographical information system

4.1

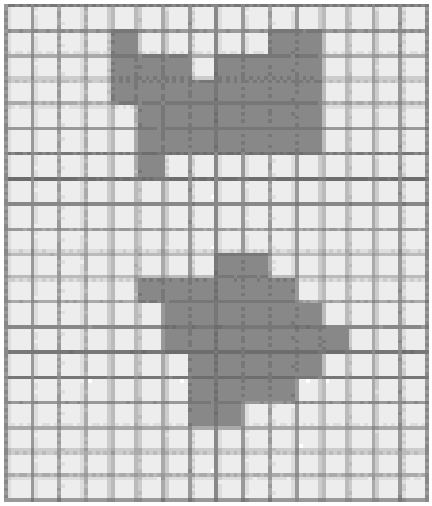
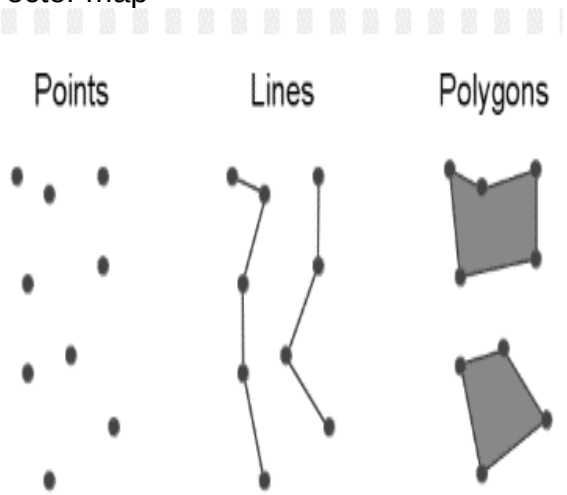
- In this section, learners have to firstly understand what is Geographical information system. It is not something that is very far from them. They see it done on daily basis in their schools
- Geographical information system is a computer system that it used to capture, analyze, store and display geographical information.
- Since GIS is a system, it has different parts that works together for a common goal. These parts are called components.
- Components of GIS are
  I. User/ people
  II. Software
  III. Hardware
  IV. Data
  V. Method/ procedures
- When they register at their schools, their information is captured by admin. It is then analyzed, stored in SASAMS and is displayed whenever it is needed
- A person (user) who needs to buy leaners school uniform can just go to admin and ask for the number of boys and girls which is stored on a computer
- When they write test, their marks are captured stored in a computer. The computer analyze their marks and is able to print reports.

4.2 Components of GIS



Source: http://www.esri.com/about/newsroom/wp-content/uploads/files/2012/08/value-1.jpg

Software	This is a computer program that stores and analyze geographical information
Hardware	These are physical equipment that GIS requires to operate
Data	This is the raw information which might include observations made from monitoring the real world. Data can be processed to provide meaning which is then referred to as information
User	Any person who uses GIS.
Method	A specific procedure or technique used to analyze, process or display geographical information.

4.3	Data on computers can be represented as raster or vector
Raster map 	Vector map 
• Real world features are represented by grid cells called pixels • The bigger the grid cells in a picture, the smaller the details • The fewer the grid cells, the lesser the quality will be on a feature • Raster map come up on screens very easily which is an advantage • Raster requires more storage space on computers which is a disadvantage	• The real world is represented by points, lines and polygons • Vector can be useful when describing features such as rivers, streets and other line features • For a feature to qualify to be a line feature, it must be a single unit not consisting of different parts. • Contour lines may not be regarded as line features as they are not visible in the real world • Vector maps are easy to update which is an advantage • Overlaying multiple vector maps can be time consuming. Which is a disadvantage

4.4	GIS terminology
Remote sensing	Remote sensing is capturing of information from a distance without physical contact (using digital devices such as satellites, drones etc.)
Spatial resolution	Spatial resolution the details with which a map shows the location and shape of a geographical feature
Spatial data	Spatial data refers to the location (position) of an object e.g. co-ordinates
Attribute data	Attribute data describe characteristics of a geographical feature
Vector map	Representation of information using points, lines and polygons
Raster map	Raster data is representation of geographical features using grid cells
Data layering	When different data layers are placed on top of each other
Data integration	Combining of different types of data on a single map
Buffering	Demarcation of an area around a specific feature.
Statistical analysis	It refers to interpreting various forms of data in relation to a query
Querying	Retrieving data
Data standardization	When data is brought into a pre-agreed (same) format
Data sharing	The practice of making data available to others
Data security	This refers to the practice of protecting digital data from unauthorized access.

4.5 GIS application

- GIS might be used by government in military defense to intelligence, terrain analysis, mission planning
- It might also be used for emergency situations such as fire or emergency medical service or in disaster management as government ca be able to efficiently plan and determine mitigation priorities, analyze historical events and predict future events
- Government ca use GIS in low enforcement as a crime fighting tool. Get police analysis to identify high crime areas, where to deploy police and to predict crime patterns
- GIS can be used in health department to locate resources and how to obtain them. They can also track public health indicators, identify disease clusters and to conduct research on possible vaccines
- Municipality can use GIS to see service delivery reports, highlight service delivery gaps and provide basic services.
- GIS can be used for planning road network and analysis as well as vehicle tracking.
- GIS can be used to determine the suitable location for malls based on population size

Leaner activity 1

1.1.1 The map index South East of 2930 CA 5 is …

A 2930 CA 9
B 2930 CA 4
C 2930 CB 6
D 2930 CB 1

1.1.2 30 in the map index of Merrivale is for …

A Longitude
B Latitude
C Minutes
D Seconds

1.1.3 The contour interval on the orthophoto is …

A 20m
B 10m
C 25m
D 5m

1.1.4 Merrivale is a town located in the province of …

A Eastern Cape
B Kwazulu Natal
C Gauteng
D Limpopo (4)

1.2 Refer to topographical map to answer the following questions

1.2.1 Calculate in km² the area of orthophoto map that is demarcated with red on the topographical map. Show all calculations. Length and breadth have been measured. It is 3.7cm and 3.2cm respectively. Use the formula below (3 x 1) (3)

Area = Length x breadth

1.2.2 Calculate magnetic declination for the current year (2025) use the steps below

Difference in years
Mean annual change
Total change
Magnetic declination (5 x 1) (5)

1.2.3 Why it is important to calculate magnetic declination (1 x 2) (2)

[14]

Learner activity 2

2.1 APPLICATION AND INTERPRETATION

2.1.1 The aerial photograph used to produce the orthophoto map was taken Between

A 08:00-10:00
B 10:00-12:00
C 12:00-14:00
D 14:00-16:00

2.2.2 The dominant primary activity in block A1 is

A Fishing
B Mining
C Farming
D Quarrying

2.2.3 Feature F in block D2 on the topographical map is …

A Dam
B Recreation
C Woodland
D Cemetery

(3)

2.2.4 Why is it ideal to take orthophoto map images between 10:00 and 14:00? (1 x 2) (2)

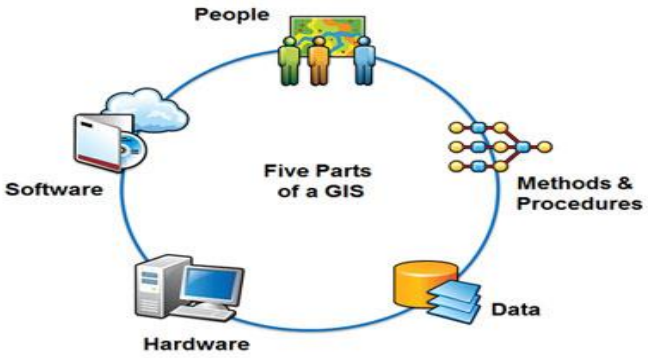
2.2.5 What is the dominant slope South of the topographical map? (1 x 1) (1)

2.2.6 Provide a reason for your answer in Question 2.2.7 (1 x 2) (2)

2.2.7 Explain the function for the rows of trees found in block B2/3 (1 x 2) (2)

[11]

3.2 ACTIVITY 3



3.2.1 Explain what is Geographical information system. (1 x 2) (2)

3.2.2 Identify GIS components A, B and C (3 x 1) (3)

3.2.3 Why component A is so important in GIS? (1 x 2) (2)

3.2.4 Provide one example for component B. (1 x 1) (1)

3.3 Look at the topographical map in block C1 and answer the questions

3.3.1 Identify line and point feature in this block (2 x 1) (2)

3.3.2 Draw this block and ad show the line, point and recreation as a polygon feature. (3 x 1) (3)