GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

SECONDARY SCHOOL IMPROVEMENT PROGRAMME (SSIP) 2019
GEOGRAPHY

GRADE 12

SESSION: MAPWORK

LEARNER BOOK

TABLE OF CONTENTS

STUDY TIPS

Paper 2 consist of the following sections:

- 15 Marks Multiple Choice (Info in margins, map code, direction etc.) (Done before)
- 20 Marks Calculations (Done before)
- 25 Marks map interpretation (This section)
- 15 Marks GIS (This section)
- Total: 75
- Duration: 1 ½ Hour

In this session we focus on the map interpretation part by studying map clips of different areas.

SESSION NO:

TOPIC : MAP WORK – Short Questions and Calculation

SECTION B: MAPWORK NOTES

Terminology / Definitions

Important concepts and explanations

Study tips: the more you practice map work the better you will get at it. Do as many as possible old exam papers. This section did not change much from the previous syllabus and thus you can still work out the previous old paper for practice.

The map work papers consist of 4 different parts namely

1. Multiple choice questions – 15 x 1 = 15 marks
2. Calculations - 20 marks
3. Interpretations of theory on the map – 25 marks
4. GIS – 15 marks

You need to know the conventional symbols of by heart. You must be able to identify them and understand the relationship between the occurrence of groups of these symbols. These symbols are like the alphabet to read maps.

The symbols represent real world features as either points, lines or polygons (areas). Therefore the legend / key can be seen as the layers of a GIS showing vector data.

CONVENTIONAL SYMBOLS:

Published by the Chief Directorate: Surveys and Mapping, Private Bag X10, Mowbray
Gepubliseer deur die Hoofdirektoraat: Opmetings en Kartering, Privaatsak X10, Mowbray

1000 Metres

REFERENCE		VERKLARING
National Freeway; National Route	N	Nasionale Deurpad; Nasionale Roete
Arterial Route	R	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	L	Geboue; Murasie
Post Office; Police Station; Store	•P •PS •W	Poskantoor; Polisiestasie; Winkel
Place of Worship; School; Hotel	•K •S •H	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

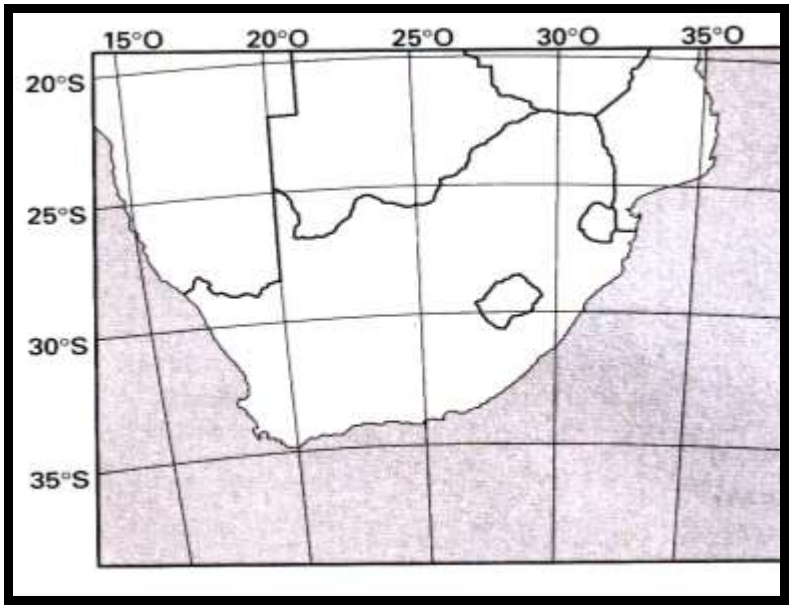
Cadastral information supplied by the Surveyor-General
Original Farms

REFERENCE		VERKLARING
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)	P	Pyplyn (bo die grond)
Water Tower; Reservoir; Water Point	•WT •R •F	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	Rec	Ontspanningsterrein
Row of Trees		Rye Bome

Kadastrale inligting verstrek deur die Landmeter-generaal
Oorspronklike Plase

MAP CODE – each map has a name and reference

- There is about 1916 1: 50 000 maps that cover South Africa
- South Africa is divided into 1º latitude by 1º longitude blocks. But this cover to large an area to draw a 1: 50 000 map
- The latitude longitude grid is further divided into big blocks and this is further divided into small blocks.
- Latitude and longitude is used to classify the maps and to identify specific maps
- Each map code consist of Latitude, Longitude, Big block, small block and the name of the largest settlement on the map, e.g. 2529CC Witbank

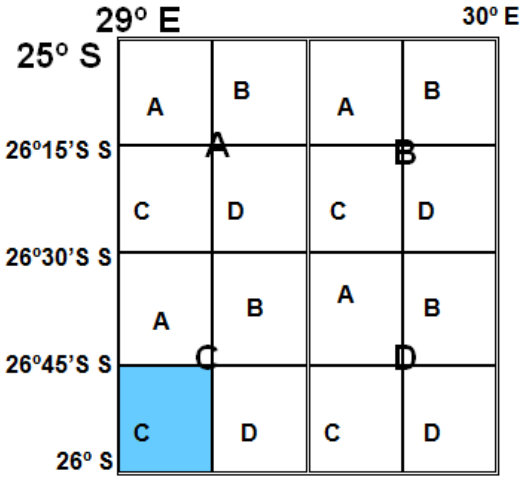


The latitudes in South Africa increase from the top to the bottom as one moves further away from the Equator. The Longitudes increases from left to right as one goes further east.

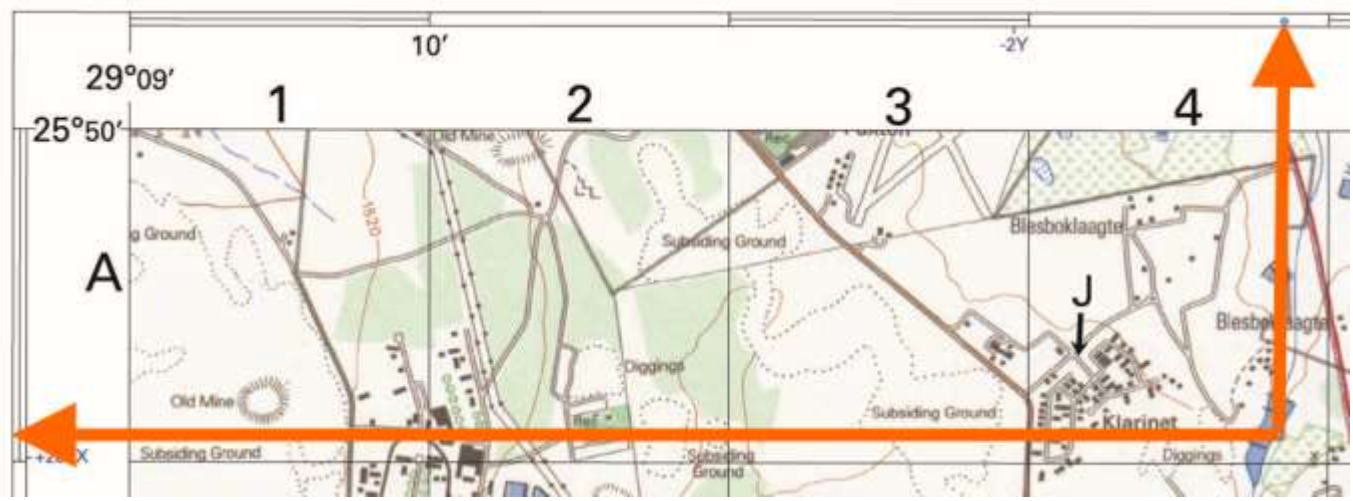
How is a map code or map reference number Compiled?

Example
2529CC Witbank

25º South – Latitude
29º East – Longitude
C – Big block - the bold A, B, C, D.
C – Small block
Witbank – settlement



GRID REFERENCE



25°50, 9'S ; 29°12,8'S
Or
25°50'54"S ; 29°12'48"S

CONTOUR LINES connect all places with the same altitude and on the 1:50 000 there is a 20m difference (contour interval) between one contour and the next. This map is at sea level and thus the first contour would be at 20m. Notice that the contours that are on intervals of 100m are printed slightly thicker. When contours are spaced near to each other it means that the slope is very steep. If the contours are far apart, the landscape is very gradual.

The smaller contours are usually higher and represent the hill tops of the area. When you look at a topographic map you should see the small contours as the highest areas. Compare the spot heights in the smallest contours to identify the highest areas.

SCALE

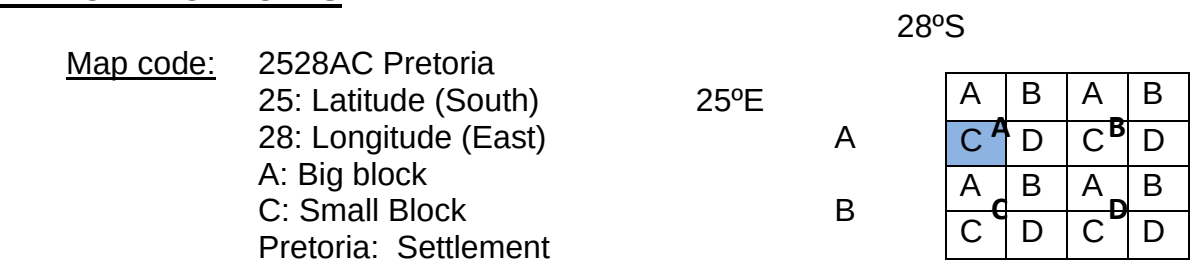
- Large scale maps
  - Cover a small part of reality
  - Show a lot of detail
  - Has less distortion on
  - Reality not reduced so much
  - Illustrate a city, province
  - E.g. 1 : 25 000 and 1 : 50 000 maps

- Small scale maps
  - Cover a large part of reality
  - Show little detail
  - Has a lot of distortion

- Reality has been reduced a lot
- Illustrate a country, continent or the World
- E.g. 1 : 1 000 000 and 1 : 25 000 000 maps

MAP WORK FORMULAS

1. Map code: 2528AC Pretoria
   25: Latitude (South)
   28: Longitude (East)
   A: Big block
   C: Small Block
   Pretoria: Settlement



2. Scale: Ratio scale 1: 50 000
   Line Scale:
   Word Scale: 1cm on the map represents 5km in reality

   Large scale: reality not reduced so much 1: 10 000
   Small scale: reality has been reduced a lot 1: 1 000 000

How to change distance units:

Km	hm	Dm	m	dm	cm	mm
1	10	100	1 000	10 000	100 000	1000 000
x multiply						y divide
0.000001	0.00001	0.0001	0.001	0.01	0.1	1

1mm = 0.1 cm
1cm = 10mm
1m = 1000mm

1km = 1 000 000mm
1km = 100 000cm
1km = 1000m

3. Distance: = map distance x scale *(50 000 on topographic map*
   = 12.4cm x 50 000 *or 10 000 or other on photo)*
   100 000 *(to change cm to km)*
   = 6.2km *(x 1 000 = 6200m)*

4. Area: = (map distance x scale) x (map distance x scale)
   = (3cm x 0.5) x (6cm x 0.5) *(it will be different on photo)*
   = 1.5 km x 3km *(never change km² to m² or vice versa)*
   = 4.5km² (1500m x 3000m = 4 500 000m²)

5. Gradient: = Height *(highest point – lowest point or contour)*
   Distance *(calculated in m because height is in m)*
   = 1520m – 1480m *(altitude always in m on maps)*
   1.6cm x 500 *(100 000 / 100 to cm to m)*
   = 40m ÷ 40 *(to get 1 because it is a ratio,*
   800m ÷ 40 *it is not a fraction!)*

= 1____ *(vertical)*
20 *(horizontal*
= 1: 20 *(1: 0 is a cliff, 1: 100 -gradual)*

6. Grid reference:
   - ☺ Latitude always first: put the ruler horizontally over the map and read the latitude of the side. In SA this is always South.
   - ☺ Longitude second: put the ruler vertically over the map and read the longitude at the top or bottom. In SA this is always East.
   - ☺ 27º15, 2'S; 28º45, 8'E

7. Direction:
   - ☻ We indicate the direction of rivers by identifying the direction that it flows toward.
   - ☻ We name winds from where they come.

8. Magnetic declination:

2011	*(the present year)*
- 1998	*(the first year mentioned on the map)*
16years	*(time that has elapsed)*
x 10'East	*(the annual change on the map)*
160'E = 2º40'E	*(if it is >/= 60' change it to º and ')*
	(Read the mag. dec. from the map for 1990
21º12'W	*change it if it is 21,2ºW ☺ ,2 x 6 = 12')*
- 2º40'E	*(W+W; angle larger, W – E; angle smaller)*
18º32'W	*(Present magnetic declination – the difference between North and mag. North)*

9. Magnetic Bearing: = True bearing *(angle from True north on map)*
   + Magnetic declination (*calculated by you)*
   MB = TB + MD
   = 301º + 18º32' *(remember if it is larger than 180º add 180º*
   = 319º32' *(leave out West, it is always clockwise from N)*

10. Vertical exaggeration: = Vertical scale *(given with Cross Section)*
    Horizontal Scale *(map or photo scale)*
    (First change the vertical scale that is usually in the form of a word scale 1cm: 20m *(20m x 100 to get cm)*
    1cm : 2 000cm *(cancel same units)*
    1: 2 000 *(ratio scale allow to a ration scale.)* *calculations)*

    VE = VS
    HS
    = 1/2 000
    1/50 000

    = 1 x 50 000
    2 000 1

    = the vertical scale is 25 times larger than the horizontal scale

11. Distance: = Speed x time

12. Speed: = Distance / Time

13. Time = Distance / Speed

14. Photo scale: = Photo distance / (Map distance x scale) *(the same distance on map and photo)* or the distance in reality

= 10cm / 5cm x 50 000 *(on photo) (distance calculation cm)*

= 10cm ÷ 10 / 250 000cm ÷ 10 *(to get 1) (do the same below the line)*

= 1: 25 000 *(round off - no decimals)*

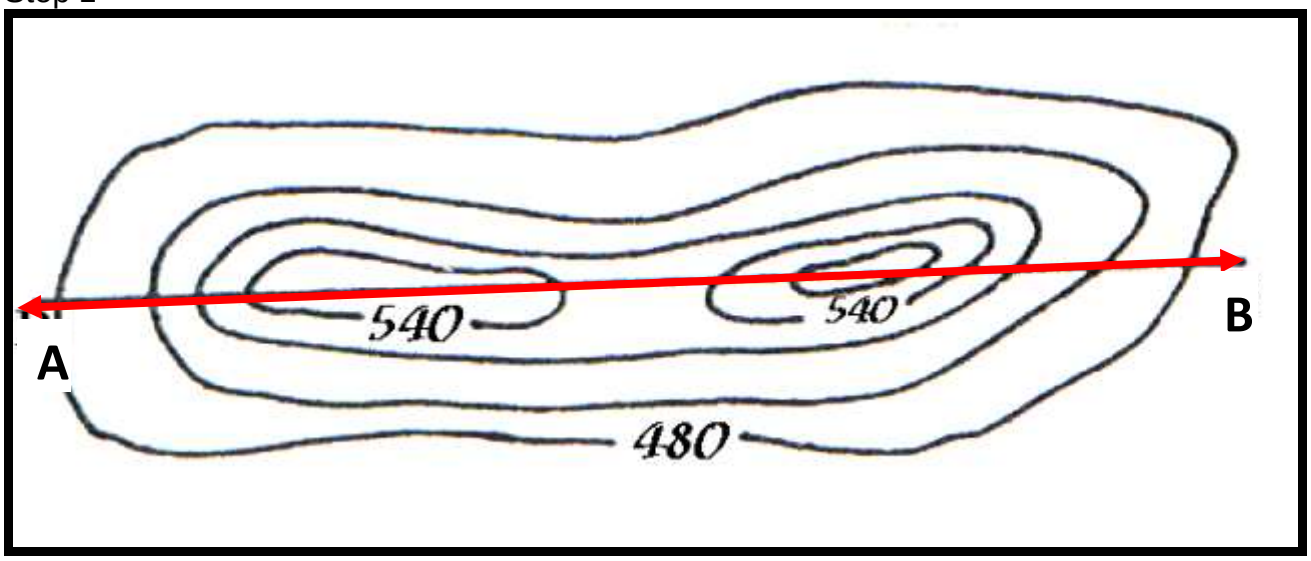
Map work improves with practice! You do not need to be a genius to do well in map work, just keep on trying and you will succeed.

1. Introduction

We draw cross section of the landscape to see what the relief or topography looks like. Distance on Earth is much more significant than altitude and to show the altitude we need to exaggerate the vertical scale of the cross sections. This means we reduce distance more than height on the cross sections. You must also be able to draw a freehand cross section from looking at the contours and then drawing the landform. You can refer back to the unit on slopes and land forms in this module.

2. Drawing Cross Sections

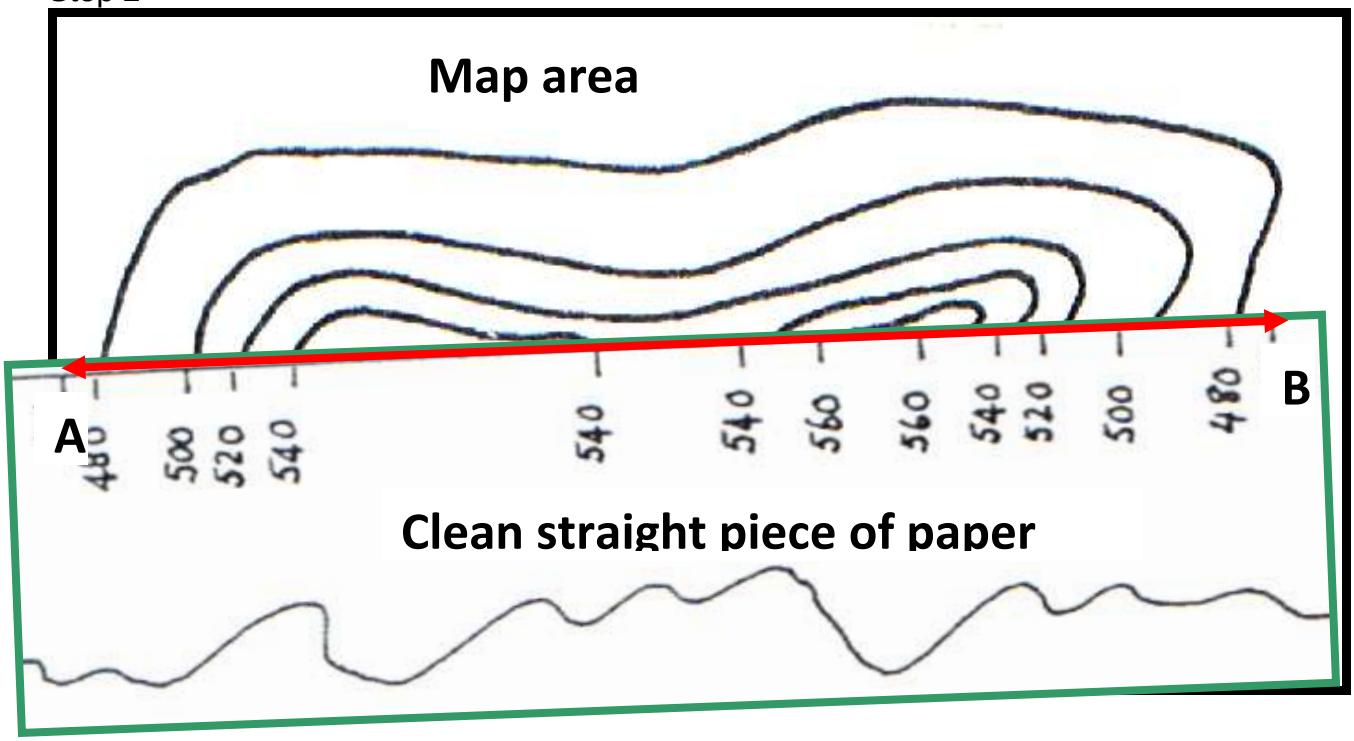
Step 1



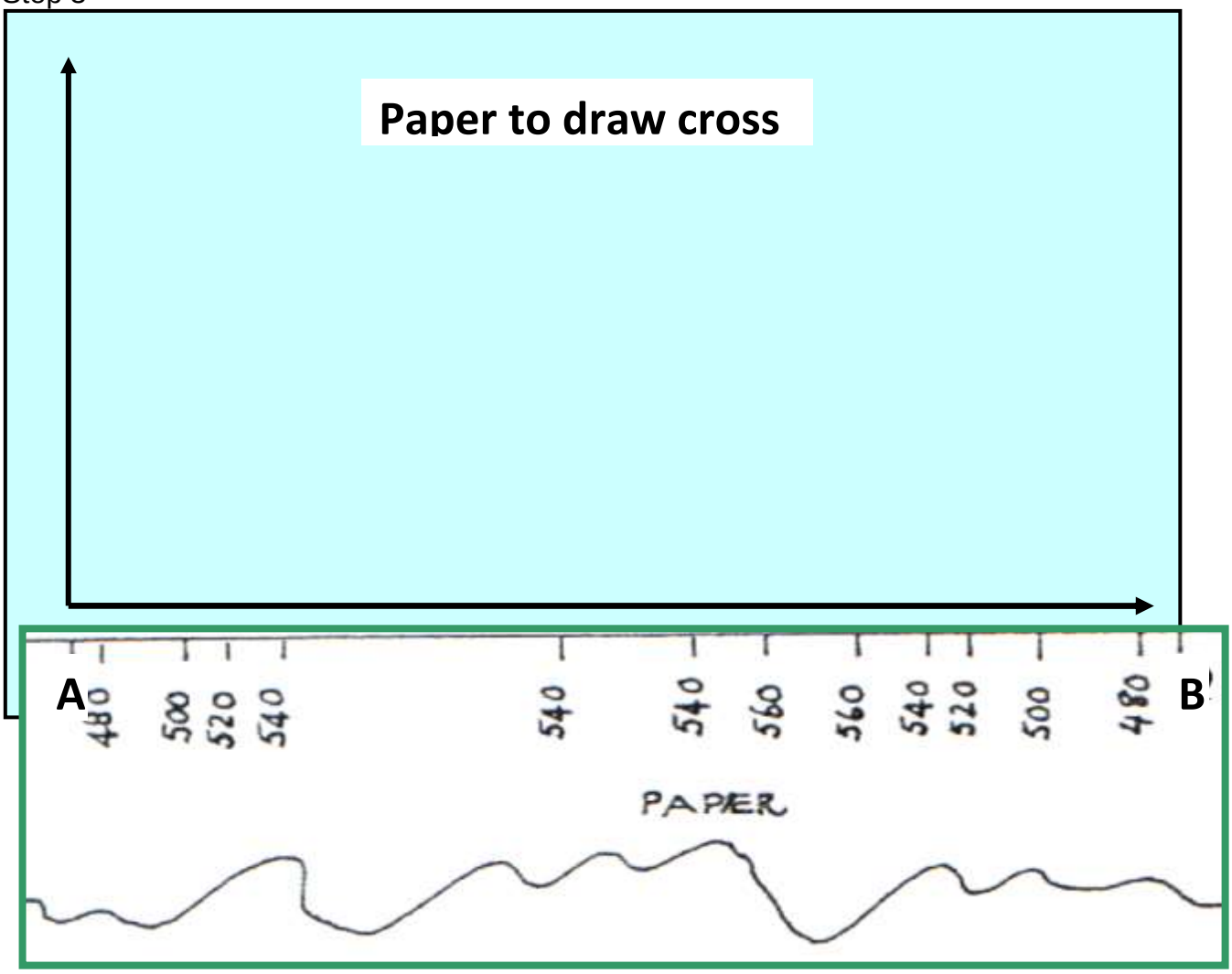
- **Step 1:** Locate the place from where and the place to where you must draw the cross section. (In this case From A to B)
- **Step 2:** Connect the 2 places with a pencil line and take paper (see green frame on map below) and put it from A to B along the line.

- Mark of where any contour lines disappear under the paper.
- Find the values of the contour lines you have marked. Look under the paper and further away to find the values of the contours. In this example all the values are under the paper. Compare the map above and below.
- **Step 3:** Then take the piece of paper and mark the contours and the values onto graph paper with a vertical axis (on the left of the paper) and a horizontal axis (at the bottom of the paper) already indicated on it.
- **Step 4**: Add in the vertical scale which will be given to you in the form of a word scale or on a half completed cross section and the map scale as the horizontal scale.
- Plot the values of the contours from the bottom of the sketch at the correct altitudes.
- Connect the points with your freehand. (Never with a ruler)
- Give the cross section a heading.

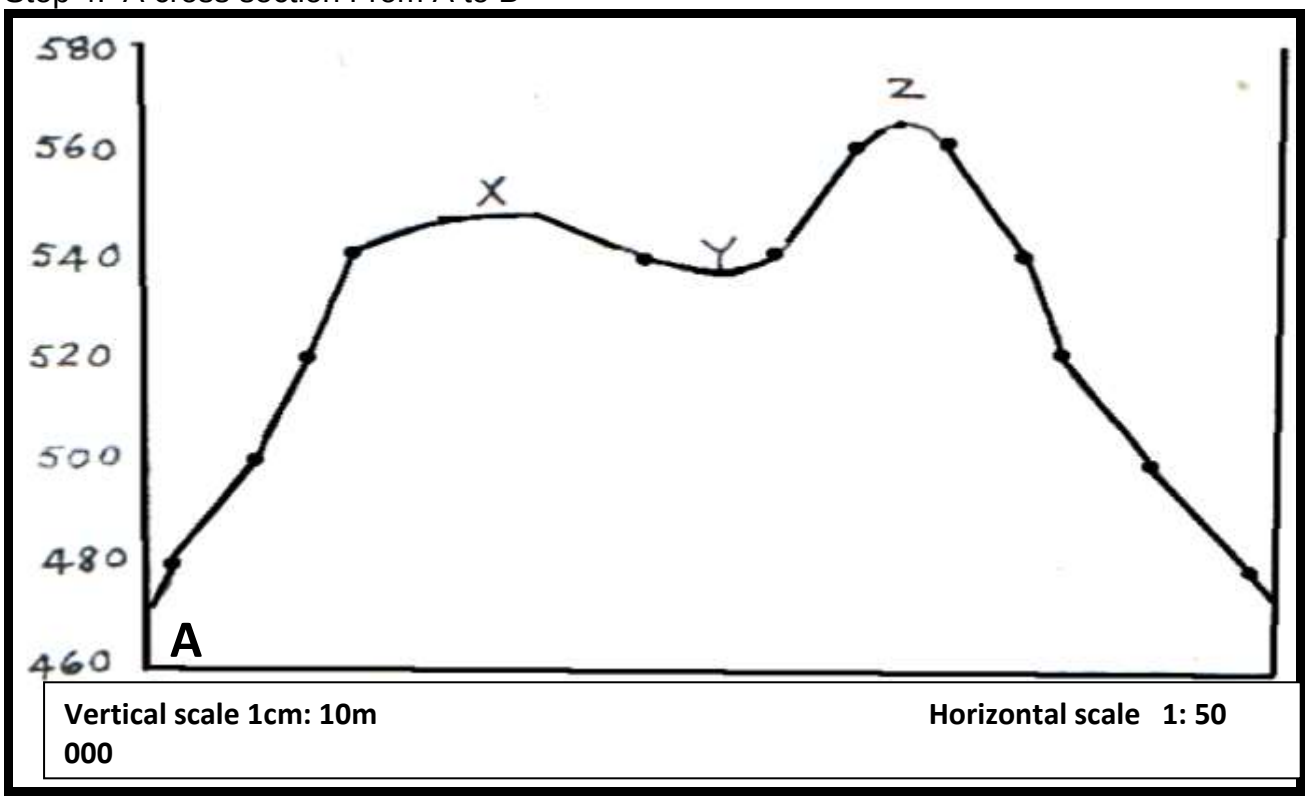
Step 2



Step 3



Step 4: A cross section From A to B



Use the map and the cross section to identify the landforms on the cross section.
Land forms X and Z are peaks on the ridge or watershed. Y is a neck or a saddle.

3. **Vertical exaggeration**

Calculate how much larger is the vertical scale than the horizontal scale.
First change the vertical scale into a ratio scale.

1cm: 10 m (change the m to cm)
1: 1000 (if the units on either side of the scale are the same it can be cancelled)

Vertical exaggeration = $\frac{\text{Vertical scale}}{\text{Horizontal scale}}$

$= \frac{1/\ 1000}{1/\ 50\ 000}$

$= \frac{1}{1000} \times \frac{50\ 000}{1}$

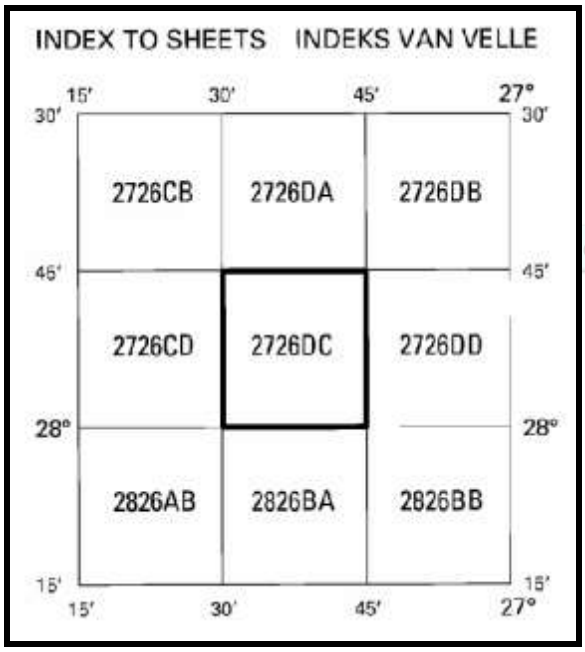
$= 50$

(The vertical scale is 50 x larger than the horizontal scale)

SECTION B: TYPICAL EXAM QUESTIONS

QUESTION 1: 10 minutes [12] (Adapted from DoE Exemplar 2008)
HINT: A lot of the short questions in map work comes from information in the margin
The following questions are based on the 1:50 000 topographical map, 2726DC, ODENDAALSRUS as well as the orthophoto map of the same area. Various possible options are provided as answers to the following questions. Choose the answer and write only the letter (A – D) in the block next to each question (1.1 – 1.12).

1.1 The number of the map to the west of map 2726DC ODENDAALSRUS is …

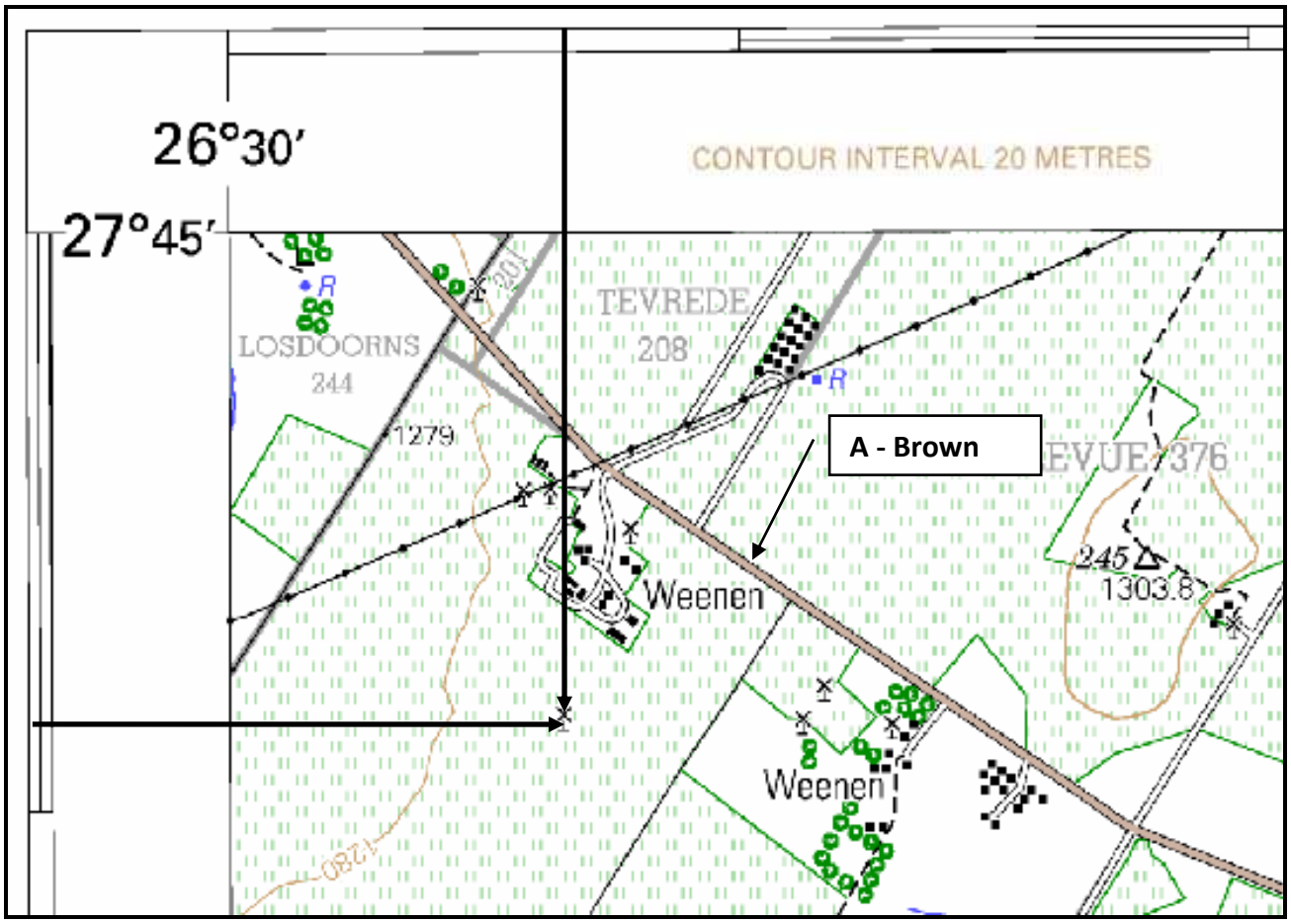


This is printed at the botom of the map and if the map is near any provincial boundaries it will be on this as well.

A 2726DA
B 2826BA
C 2726DD
D 2726CD

1.2. The exact location (coordinates) of the windmill at the indicate arrows are (Refer to map clip on next page to get the answer)
A 26°45′09″S 27°45′05″E
B 27°45′50″S 26°30′40″E
C 26°30′05″S 27°45′10″E

D 27°45′10″S 26°30′50″E



1.3. The altitude of the trig station on the topographic map clip above is …

A 376m
B 245m
C 1303,8mm
D 1279m

1.4 The direction of spot height 1279 from ▲245…

A South-west
B West North West
C South-east
D East South East

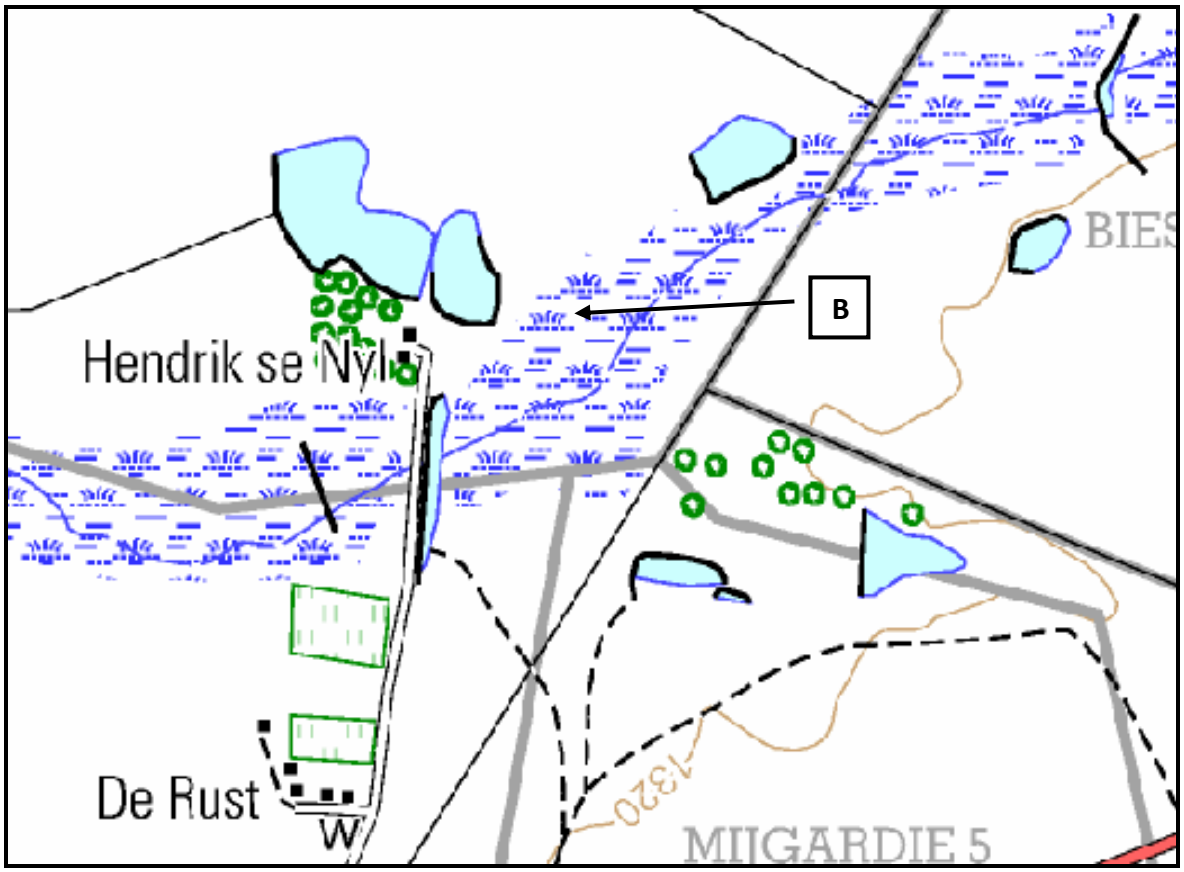
1.5 The man-made feature labelled A on the topographical map is a/an …

A main road
B arterial route
C secondary road
D national road

1.6 The contour interval of the topographical map is …

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

1.7 The natural feature marked B on the topographical map is a …



A dry pan
B perennial river
C non-perennial river
D marsh and vlei

1.8. The dams on the map clip above are used to … (which one does not fit)

A prevent flooding
B Store water for irrigation
C farm with fish
D supply households.

1.9 The map projection used on the orthophoto map is …
(The following is printed at the bottom of the map)

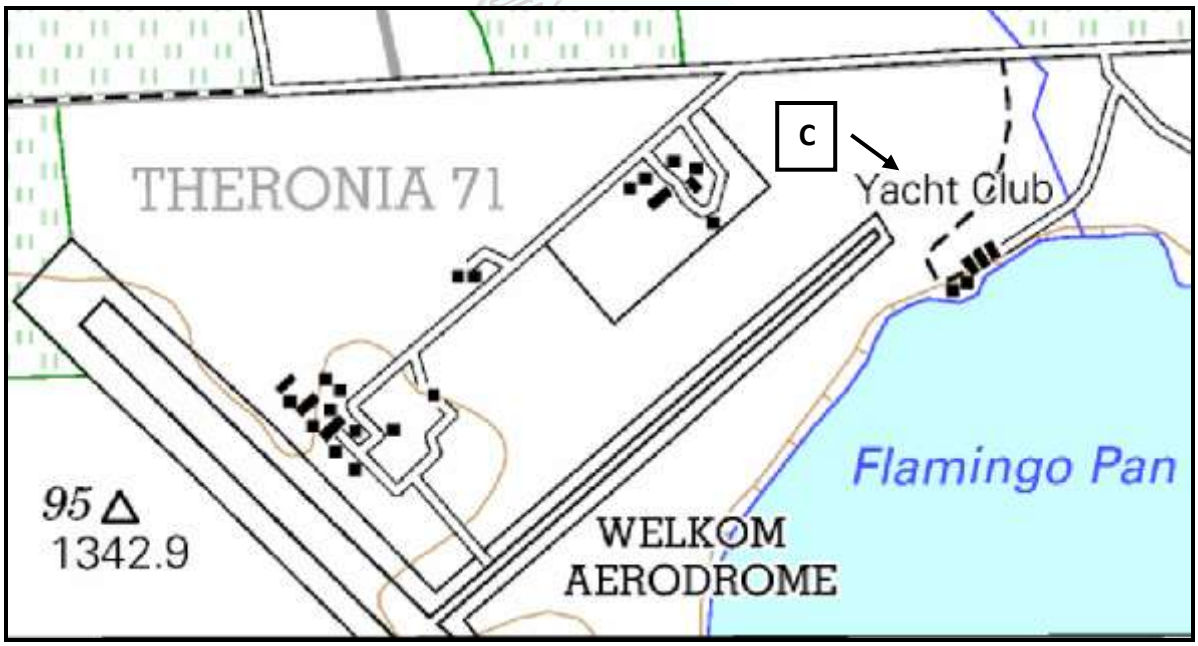
Gauss Conform Projection. Central Meridian 27° East.
Hartebeesthoek 94 Datum (WGS84 Ellipsoid).

A Mercator
B Lambert
C Gauss conform
D universal transverse

1.10 The orthophoto map with a scale of 1:10 000 depicts … part of the topographical map.

A 1/5 of the map
B ½ of the map
C ¼ of the map
D 1/25 of the map

1.11 Aeroplanes can land in a …. direction at the Welkom Aerodrome



A Northerly
B Southerly
C North Westerly
D Easterly

1.12 The area marked C map is (a) …

A mining area
B non-perennial water
C mine dump
D recreational area (12 x 1) (12)

QUESTION 2: 8 minutes [10] (Adapted from DoE November 2008)

HINT: You must be able interpret map symbols and what they imply about the area.

The following questions are based on the 1:50 000 topographical map, 3227DD, CAMBRIDGE, as well as the orthophoto map of a part of the same area. Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D) in the block next to each

2.1. The topographical map reference number represents …

A 32°N 27°W
B 32°S 27°E
C 32°W 27°N
D 32°E 27°S

2.2. The scale of the topographical map (1:50 000) is … than that of the orthophoto map (1:10 000).

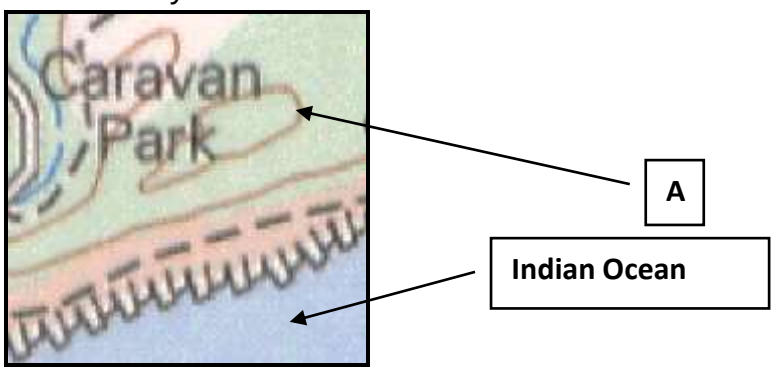
A 5 times smaller
B 5 times larger
C 40 times smaller
D 40 times larger

2.3. The contour interval of the orthophoto map is …

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

2.4. The coastline in block J7 depicted below on the topographical map is mainly ...

A smooth
B dry
C rocky
D sandy



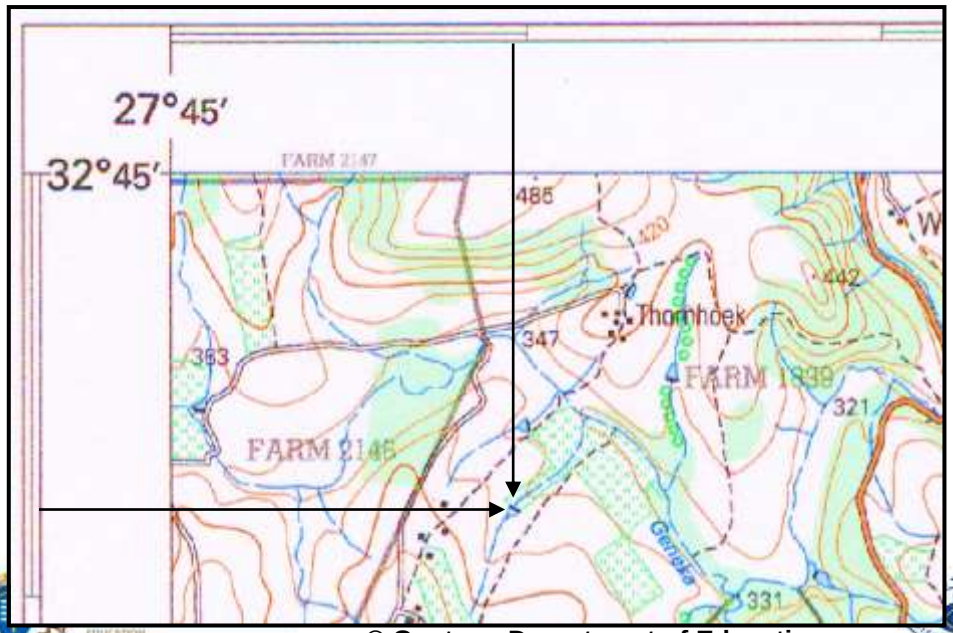
2.5. The altitude of the contour line labelled A in the map clip above is ….

A 0m
B 20m
C 40m
D 60m

2.6. The caravan park (above) will experience … winds during the night

A Sea breezes
B Katabatic winds
C Anabatic winds
D Land breezes

2.7. The location (coordinates) of the farm dam is ...



A 27°45'13"E 32°45'8"S / 27°45,2'E 32°45,2'S
B 32°45'29"S 27°46'23"E / 32°45,5'S 27°46,4'E
C 32°45'8"E 27°46'13"S / 32°45,2'E 27°46,2'S
D 27°46'13"S 32°45'8"E / 27°46,2'S 32°45,2'E

2.8. The direction of flow of the tributary of the Geneka river in Question 2.7 is

A West
B South
C East
D North

2.9. The function of the dam in Question 2.7 is …. (Which one does not fit?)

A Recreation
B Store water
C regulate flooding
D supply Cambridge with water

2.10 The highest altitude on the map clip in Question 2.7 is…. meters

A 347
B 485
C 442
D 1389 (10 x 1) (10)

Question 3 8 minutes (10) (Source: DoE November 2010)

The questions below are based on the 1:50 000 topographical map 3424BB HUMANSDORP, as well as the orthophoto map of a part of the mapped area. Various
options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D)

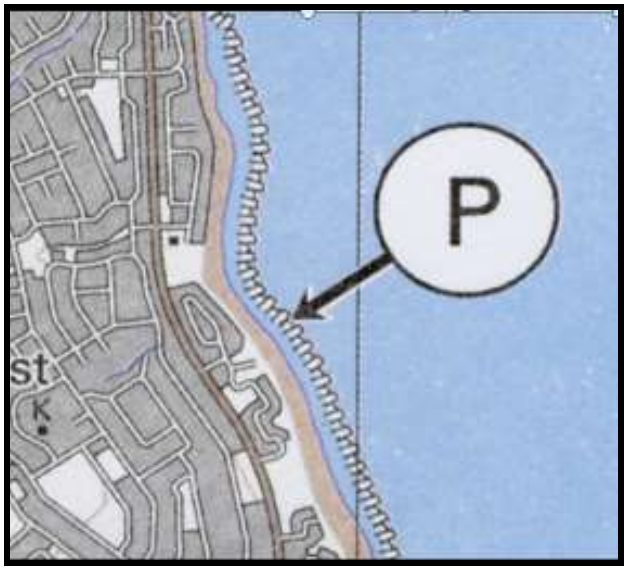
3.1 The earth's curved surface is represented on the topographical map through the … projection.

A Mercator
B Gauss Conform
C Lambert
D Transversal

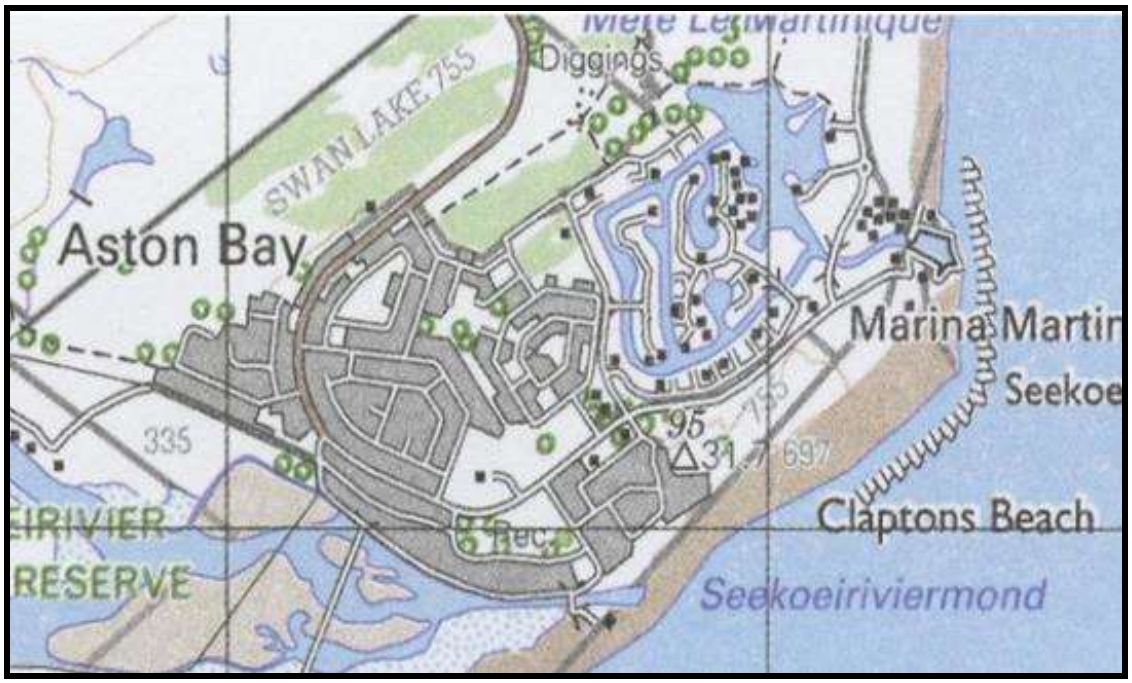
Gauss Conform Projection. Central Meridian 25° East.
Hartebeesthoek 94 Datum (WGS84 Ellipsoid).

3.2 The landform that is found at P (diagram below) in block B11, is a …

A rocky outcrop
B cape
C sandy beach
D coastal rock



3.3 Ashton Bay has a/an … street pattern.



A grid iron
B radial/cobweb
C planned irregular/free
D unplanned irregular

3.4. The slope south of Kwa Nomzamo (C2) is …

A gentle
B steep
C convex
D concave

3.5 An aerial photograph which shows contour lines, spot heights, trigonometrical stations and other labelled features, is called a/an …

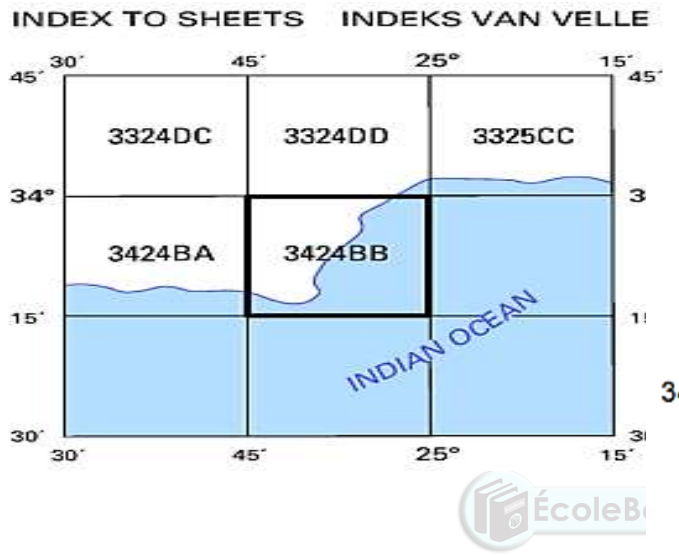
A oblique aerial photograph
B topographical map
C orthophoto map
D vertical aerial photograph

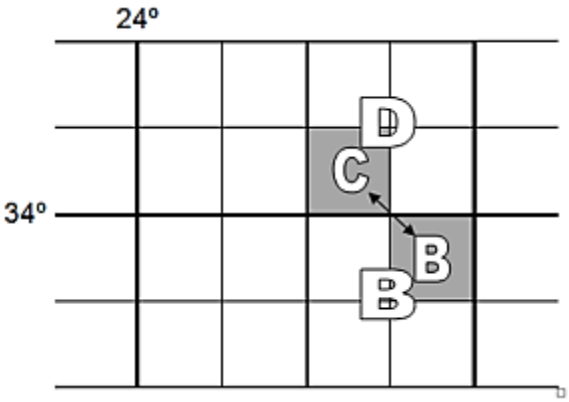
3.6 The mean magnetic declination of this map in 2011 was …

A 26°59′ east of true north
B 26°59′ west of true north
C 23°59′ west of true north
D 23°59′ east of true north

3.7 The index of the map sheet northwest of Humansdorp is …

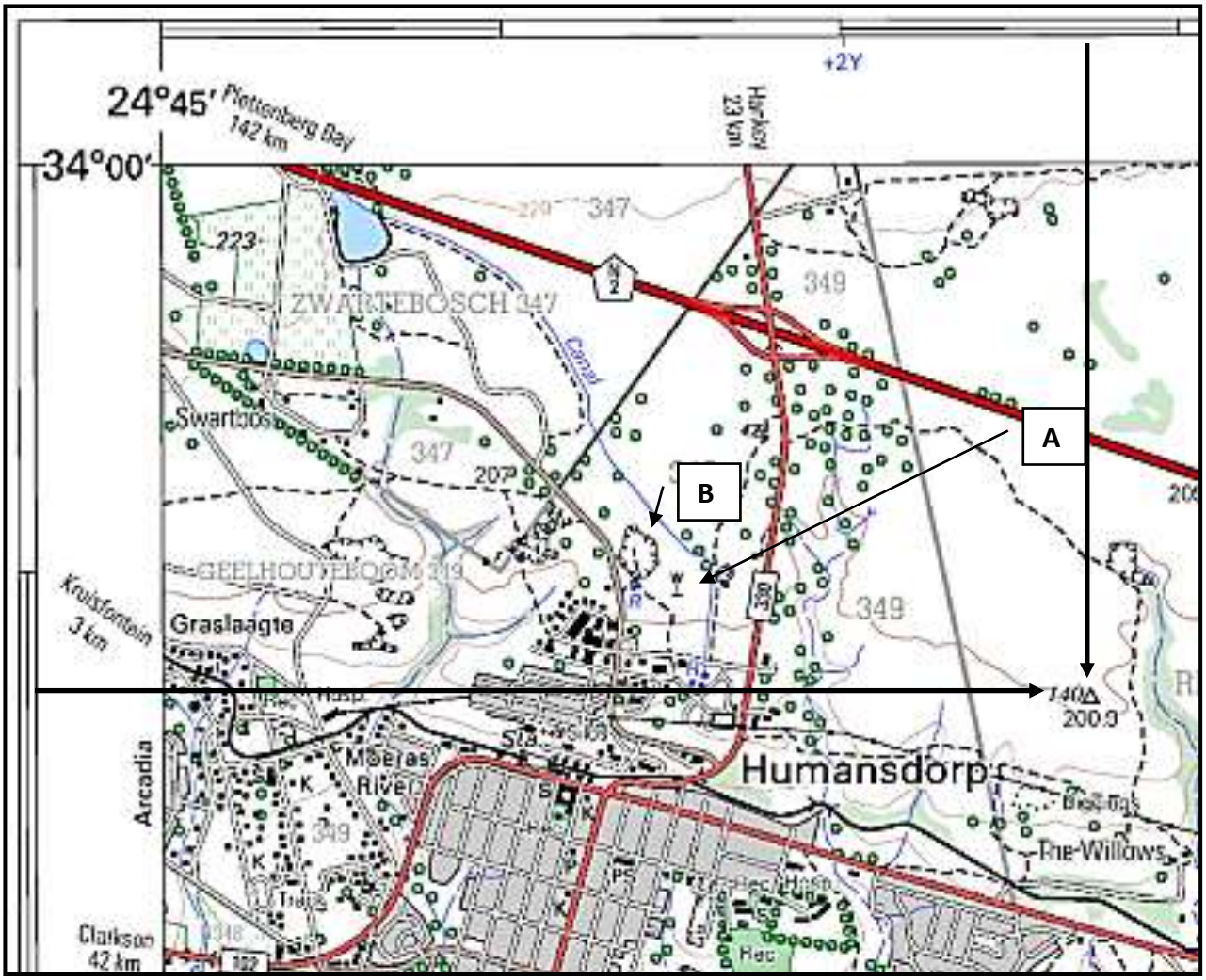
A 3324DC
B 3324DD
C 3325CC
D 3424BA





3.8 The co-ordinates of trigonometrical station **140** below are …

A 34°01′20″S24°47′44″E / 34°01,3′S24°47,7′E
B 34°02′40″S24°48′16″E / 34°02,7′S24°48,3′E
C 34°01′20″E24°47′44″S / 34°01,3′E24°47,7′S
D 34°02′40″E24°48′16″S / 34°02,7′E24°48,3′S



3.9 The feature numbered A on the map clip above is a …

A Wind pump
B Monument
C Communication Tower
D Grave site

3.10 The feature labelled B on the map clip above is a ….

A Excavation
B Mine dump
C Donga
D Dam (10 x 1) (10)

QUESTION 4: 45 minutes (Adapted November 2009 and March 2010)

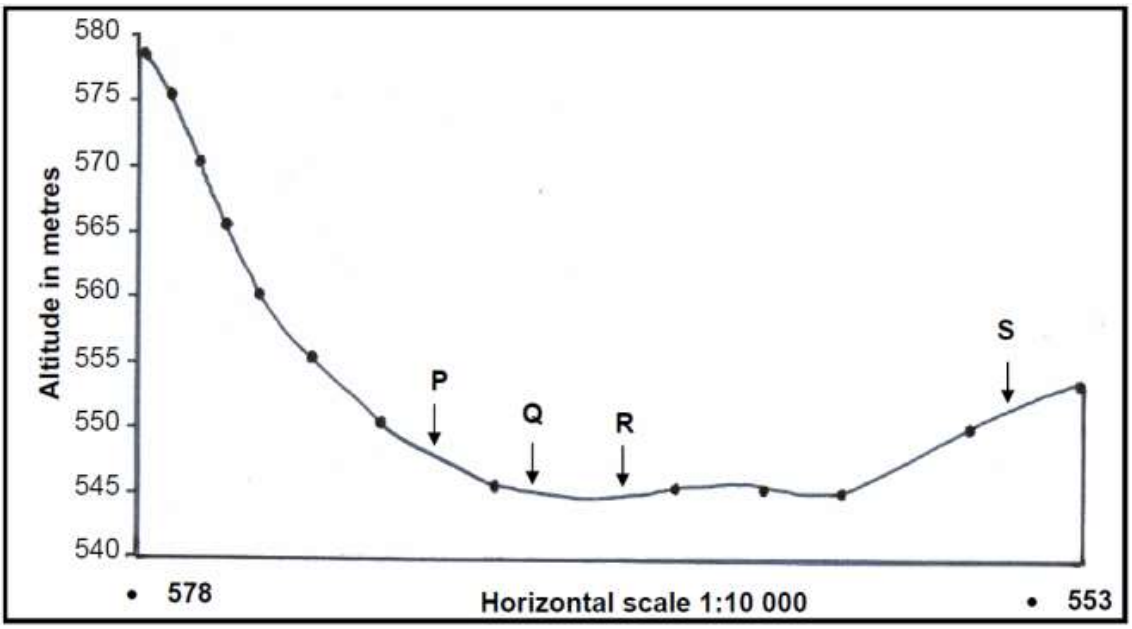
HINT: You must practice to use your equipment to make accurate measurements. Ask if you do not know how to measure or calculate. You must practice map work often as it a practical skill like kicking goals.

4.1. The diagram below is a cross-section from spot height 578 (A) to spot height 553 (B) on the orthophoto map.

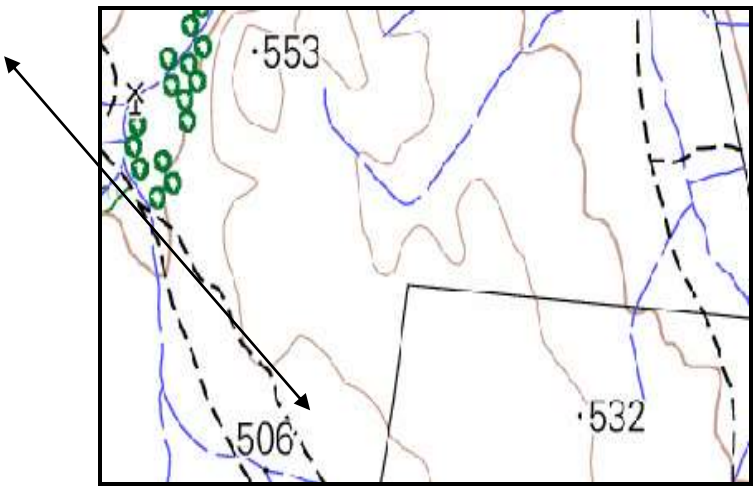
4.1.1. Are features P and R intervisible? (1)

4.1.2. Give ONE reason for your answer to QUESTION 1.1.1. (1)

4.1.3. Calculate the vertical exaggeration for the given cross-section.
Show ALL calculations.
The vertical scale is 1cm: 5m and the horizontal scale is 1:50 000.
(4)



4.2.1. Calculate the average gradient between spot height 532 (F3) and spot height 553 (E2) on the topographical map. Show ALL your calculations. (The distance should be 2.5cm but it can be wrong due to reduced notes.) (5)



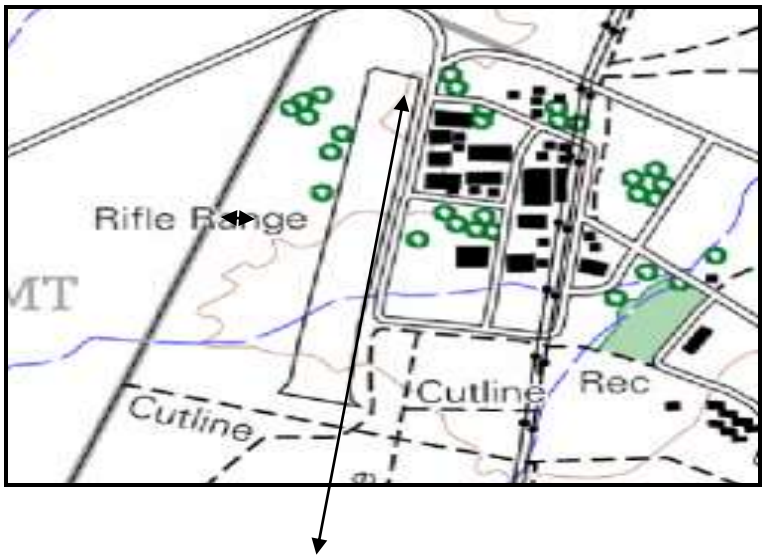
4.2.2. Would you consider the gradient that you have calculated in QUESTION4..2.1 to be steep or gentle? (1)

4.2.3 Explain your answer to QUESTION 4.2.2. (2)

4.2.4 Give evidence from the topographical map to support your answer to QUESTION 4.2.3. (1)

4.3. Calculate the area of the rifle range (E) (below) on the map in km². Show ALL your calculations. (6)

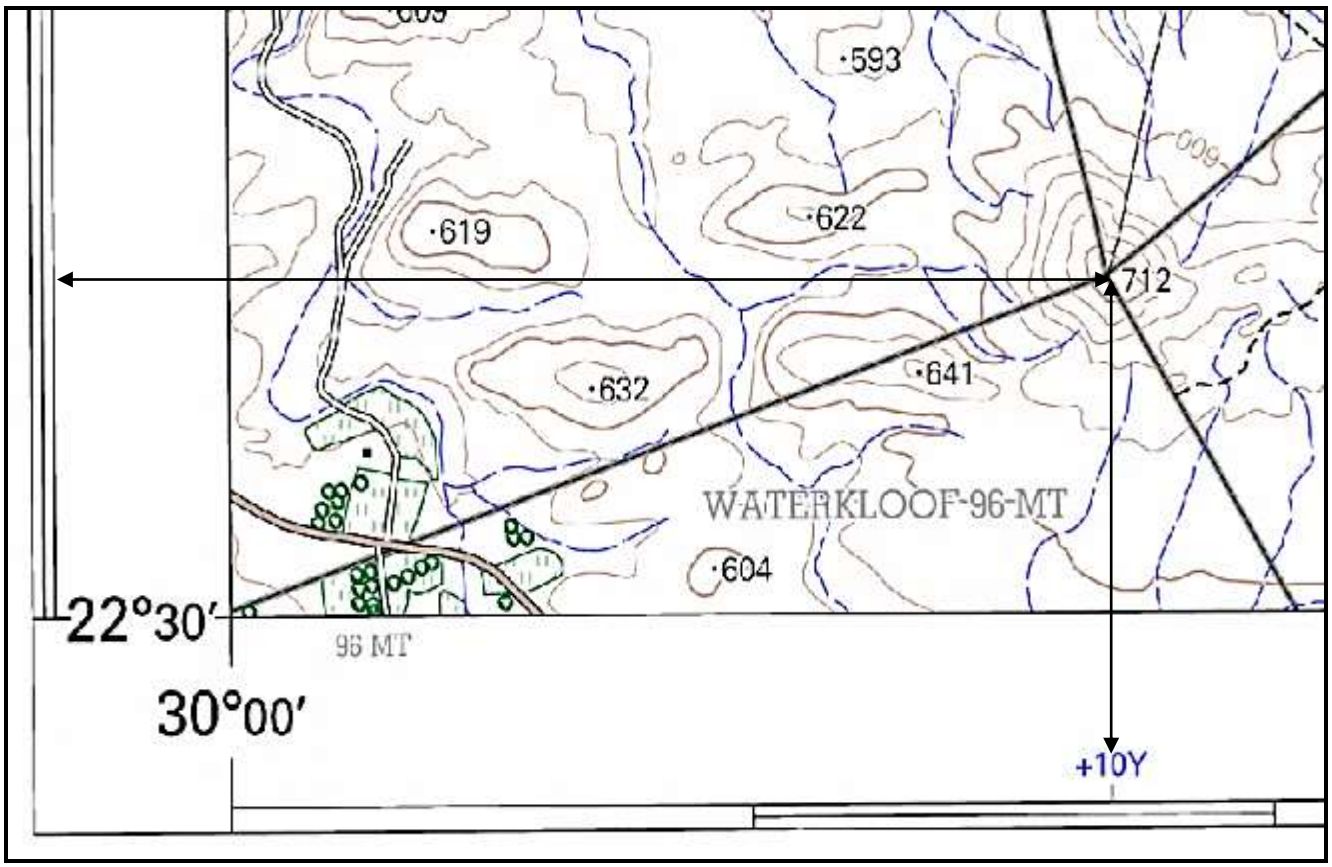
(This calculation will only be correct if the length is 2cm on the notes)



4.4. Which one, the topographical map (1: 50 000) or the orthophoto map (1: 10 000), has a larger scale? (1)

4.4.1. Motivate your answer in 4.4. (3)

4.5. Give the co-ordinates (fix the position) of spot height 712. (4)

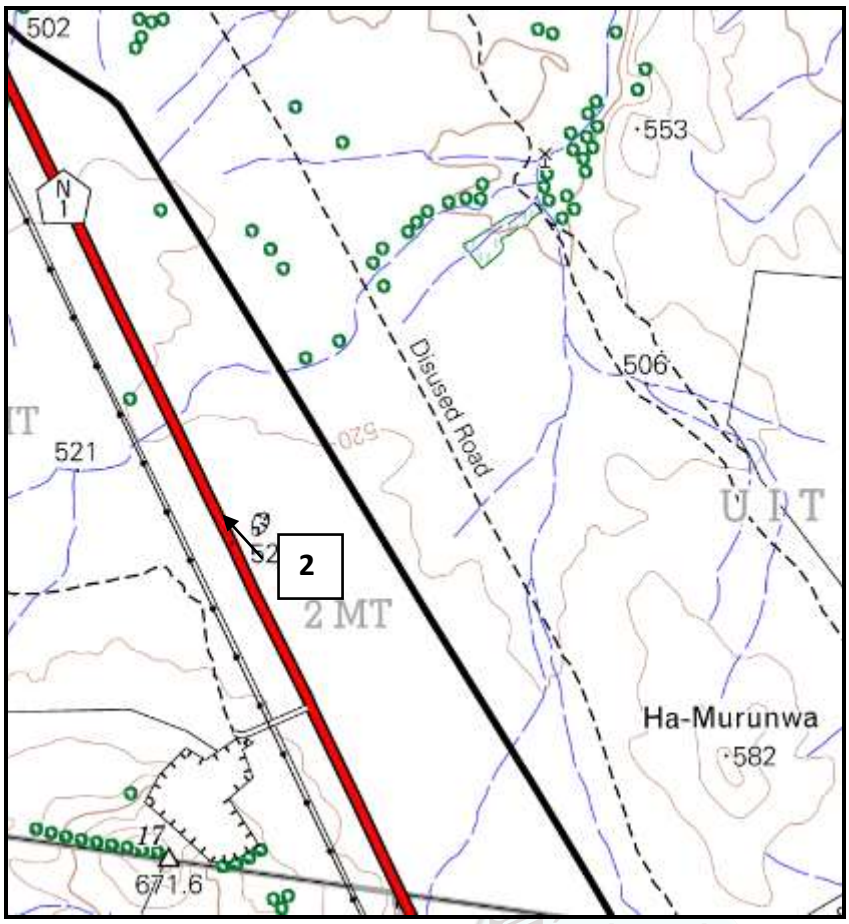


SECTION C: HOMEWORK QUESTIONS

QUESTION 1:13 minutes (16) (Adapted March 2010 & November 2009)
HINT: Practice, practice, practice, with a friend and on your own.

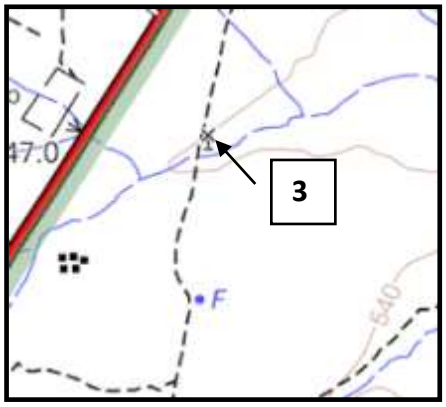
The following questions are based on the 1:50 000 topographical map 2230AA&AC MUSINA as well as the orthophoto map of a part of the mapped area.
Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D)

1.1 What is the altitude on the trig beacon on the next map clip…
- A 525 m
- B 521 m
- C 17 m
- D 671.6 m



1.2 The height of the N1 National Route at 2…

A 500 m
B 520 m
C 540 m
D 560 m

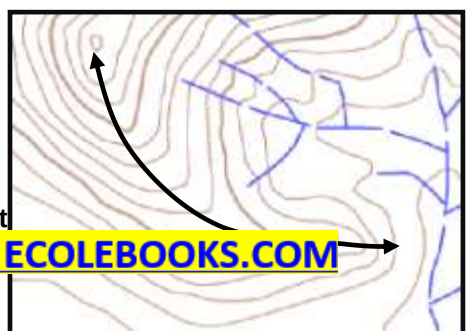


1.3 The feature numbered 3 is a …

A wind pump
B communication tower
C grave
D water tower

1.4 The word scale of the orthophoto map is: (The orthophoto scale is 1: 10 000)

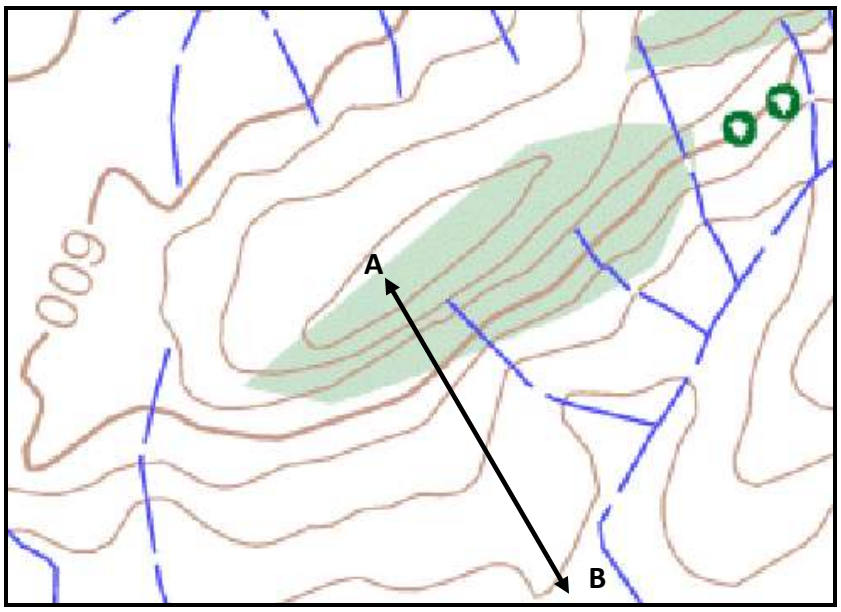
A 1 cm represents 10 000 m
B 1 cm represents 1 000 m
C 1 cm represents 100 m
D 1 cm represents 10 m



1.5 The landform in the map clip is a ... (arrow)

A cuesta
B valley
C spur
D mesa

1.6 The slope from A to B on the map is …



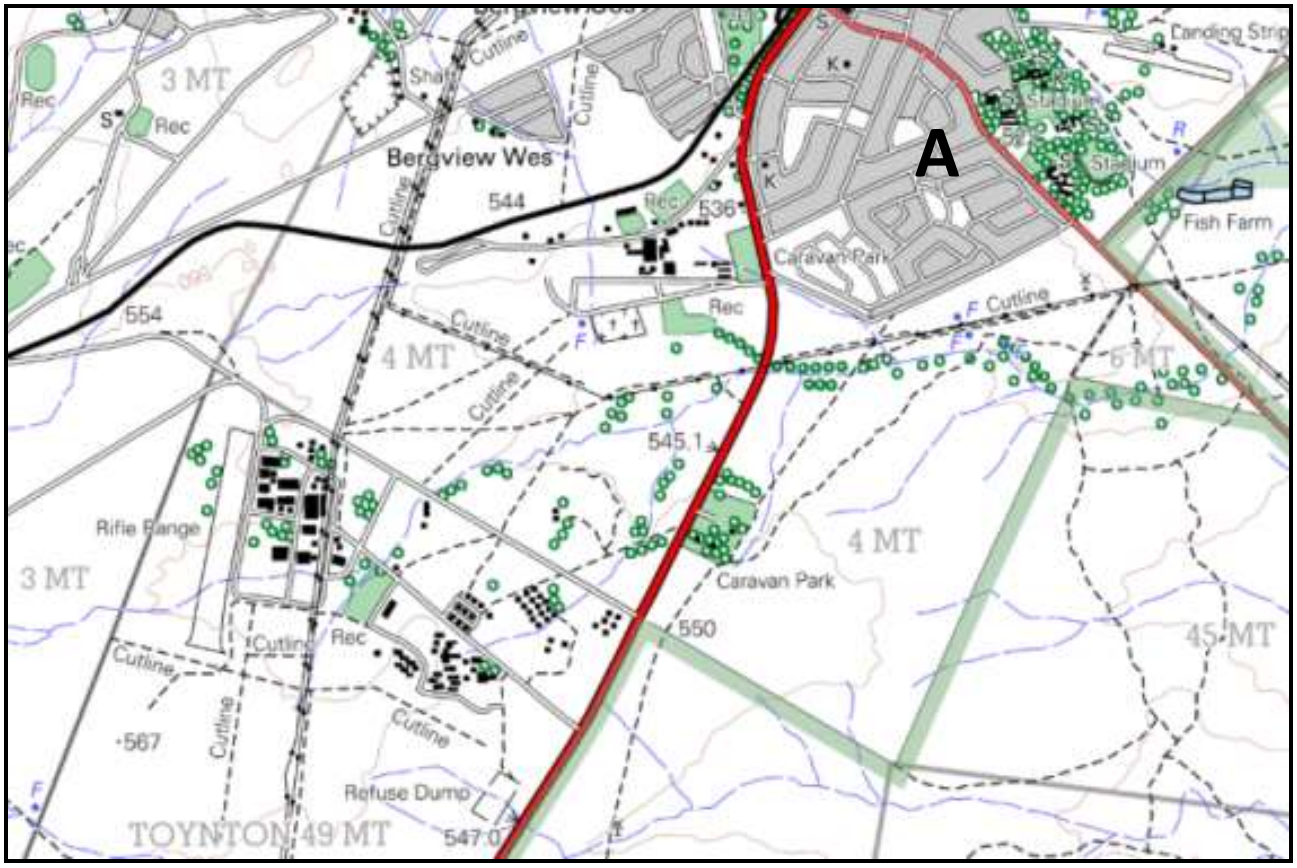
A convex
B concave
C gentle
D terraced

1.7 The direction from A to B on the map clip is …

A west-northwest
B north-northwest
C northwest
D southwest

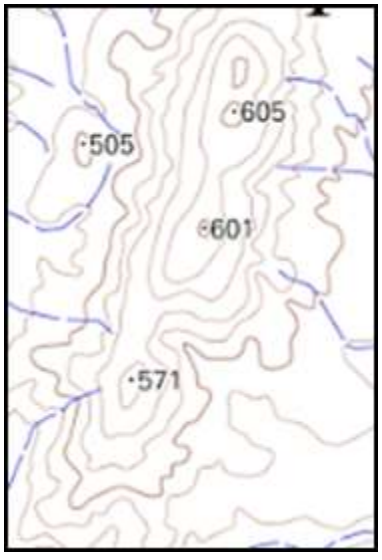
1.8 The refuse dump at N on the orthophoto map is mainly for … waste.

A industrial
B domestic
C agricultural
D mining



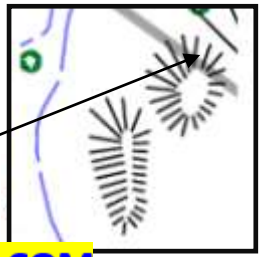
1.9 The landform found between spot height 605 and spot height 601 is a …

A poort
B saddle
C spur
D valley



1.10 The feature marked 1 on the topographical map is a/an …

A mine dump



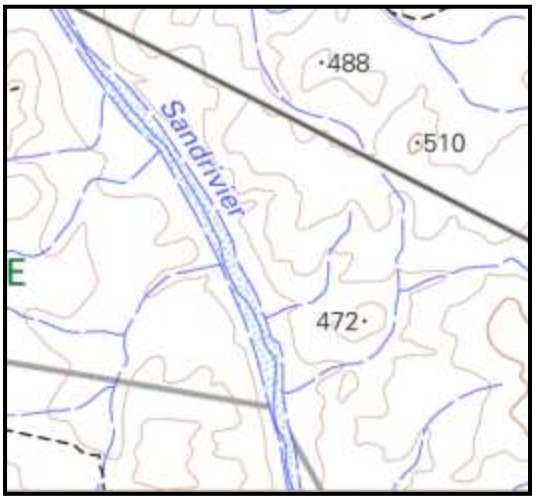
B cutting
C embankment
D excavation

1

1.11 An orthophoto map is a … photograph which has contour lines, spot heights, trigonometrical stations and other labelled features drawn onto it.
A high oblique
B low oblique
C horizontal
D vertical

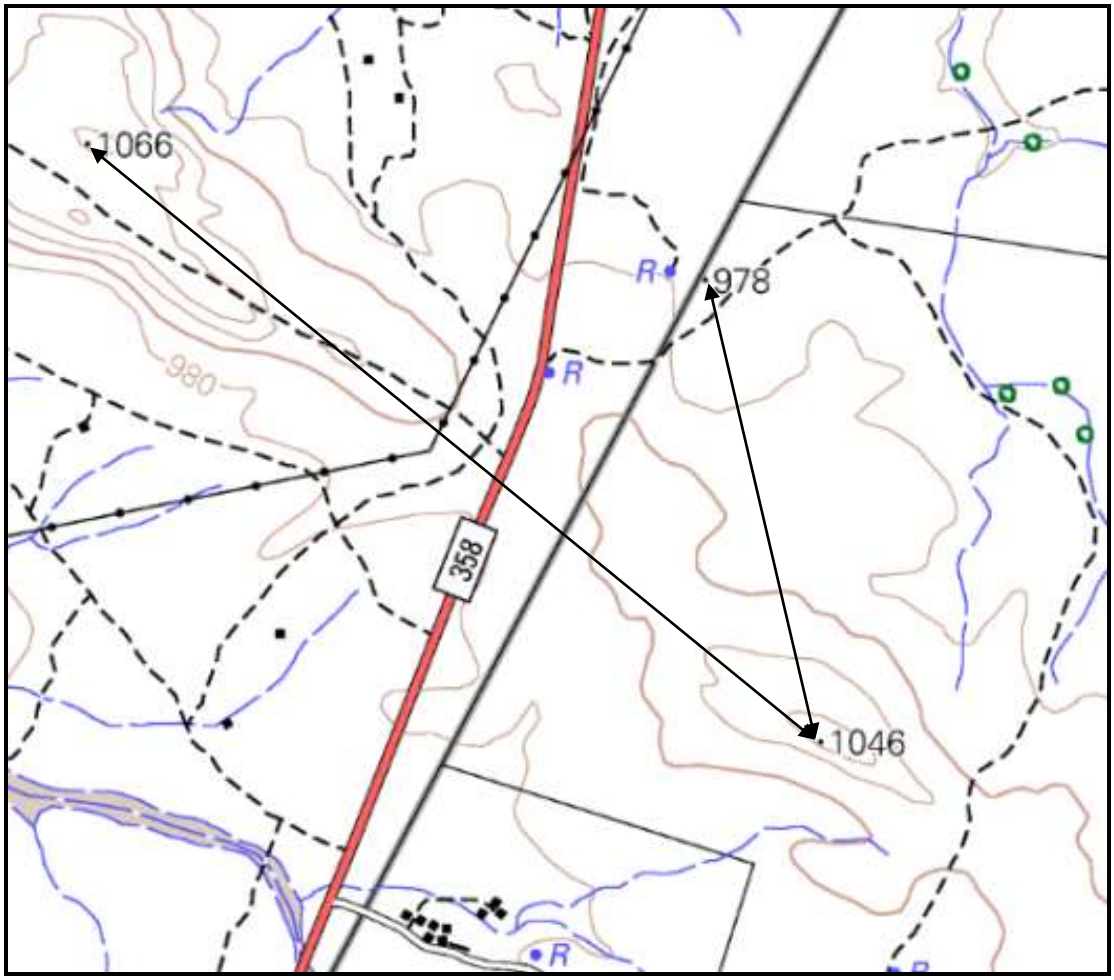
1.12 The R572 and 521Thinner red lines) on the map is a/an … roads.
A arterial
B main
C secondary
D other

1.13 The Sand River (Sandrivier) that flows in the mapped area is a/an … river.
A periodic
B episodic
C permanent/perennial
D exotic



(13 x 1) [13]

QUESTION 2: **30 minutes** (26) (Source: Adapted from November 2008)



2.1. Calculate the area covered by the map clip above if the scale is 1: 50 000 (4)
2.2. Calculate the gradient between spot height 978 and 1046. (5)
2.3.1. Draw an accurate cross section from spot height 1066 to 1046.
The vertical scale is 1cm represent 20m. (8)
2.3.2. Calculate the vertical exaggeration for the cross section (4)
2.3.3. Indicate the road and power line on the cross section. (2)
2.3.4. Identify the landform you have drawn on the cross section. (1)
2.3.5. Why does the road pass through this landform? (2)

TOPIC: MAPWORK INTERPRETATION AND GIS

SECTION B: CONTENT NOTES ON MAP INTERPRETATION AND GIS

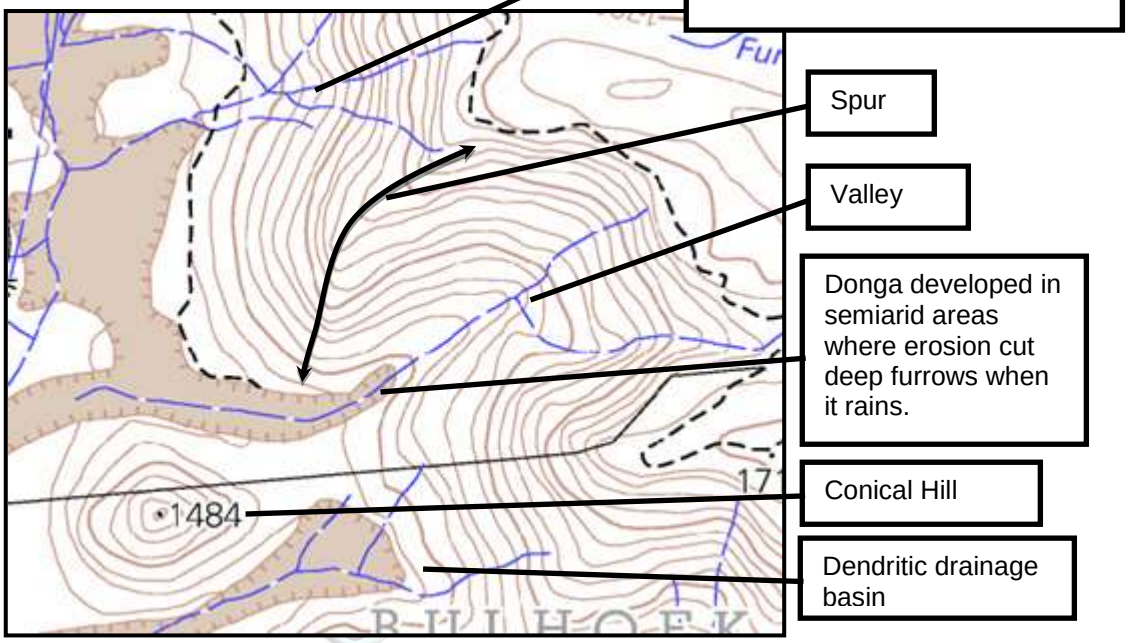
Terminology / Definitions for this section are dealt with in the text.
IMPORTANT CONCEPTS AND EXPLANATIONS

1. Topographic Map Application

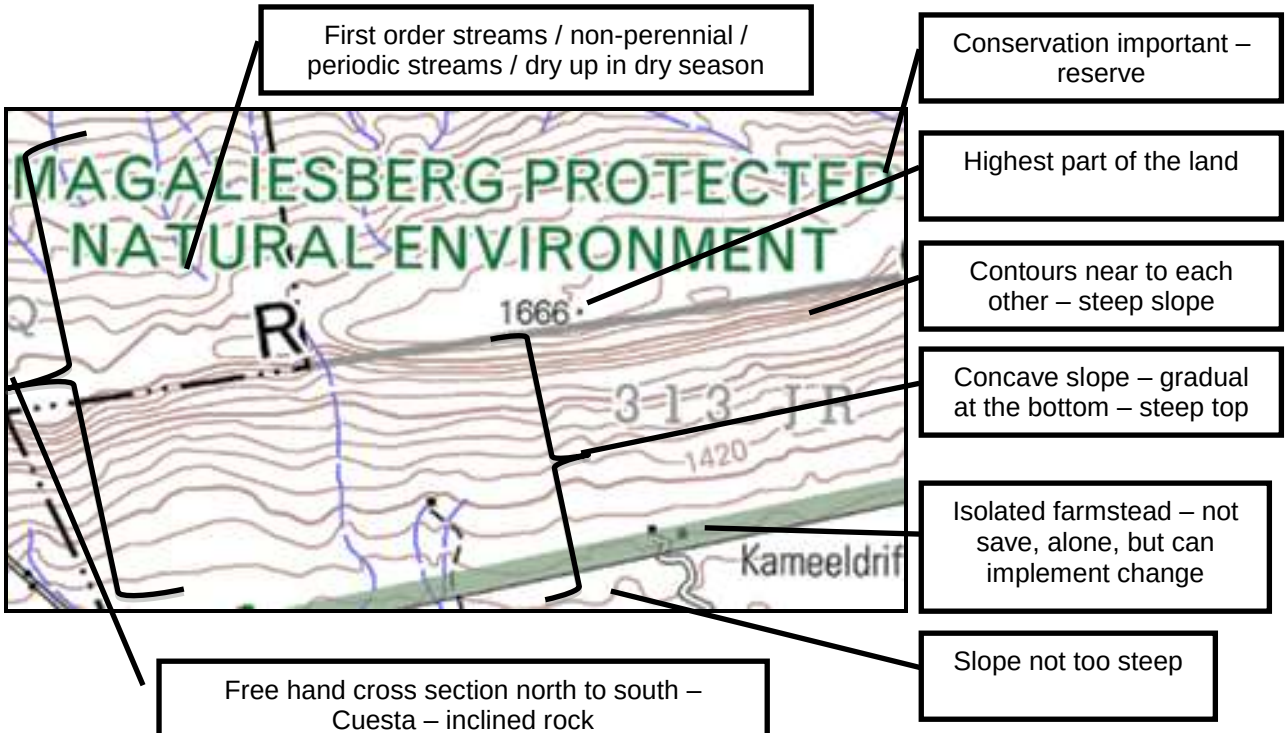
1.1. Interpretation of 1 : 50 000 topographic maps
- ✓ Interpreting physical features, e.g. relief, drainage, climate and vegetation
- ✓ Interpreting cultural features, e.g. settlement, land-use and transport networks

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

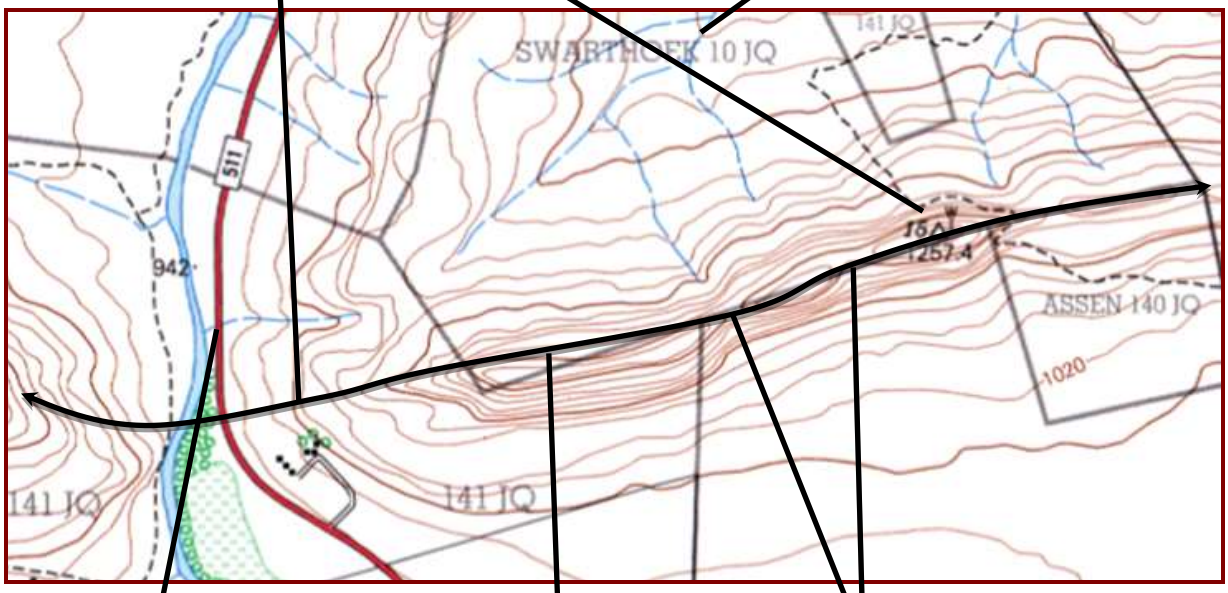
CLIP 1: Relief, drainage, Climate, landforms, slopes



CUESTA in Inclined strata



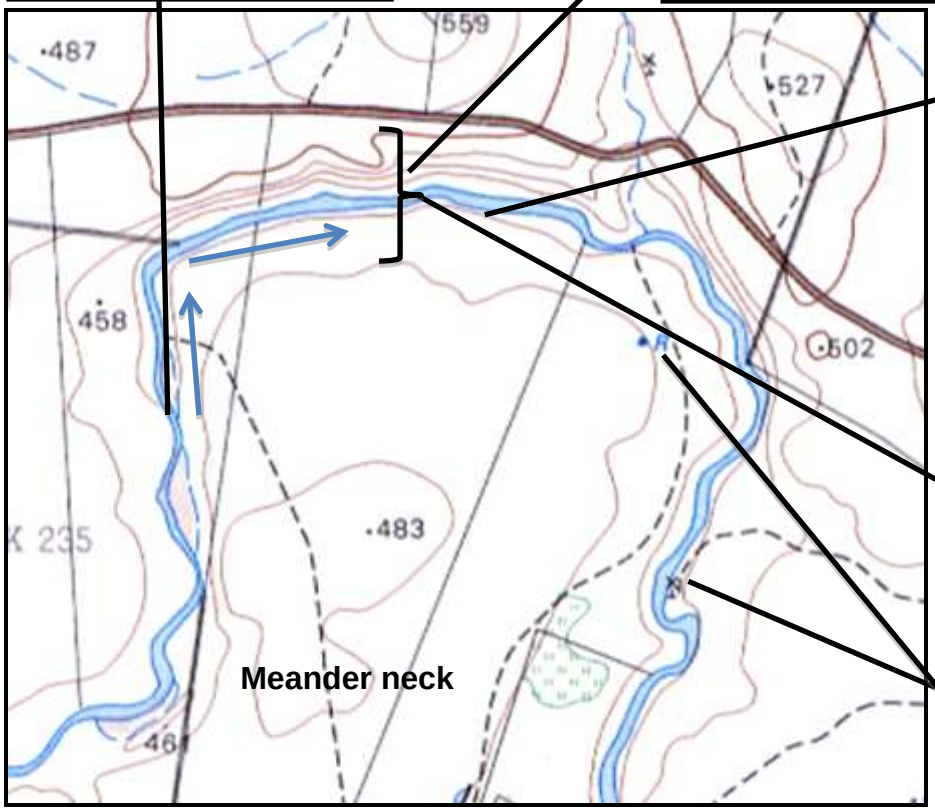
RIDGE / Inclined strata



River meander – River in mature stage; large meanders and well developed valleys

V-shaped contour points upstream

Cut bank of meander where erosion undercuts slope and widens valley through lateral / sideward erosion

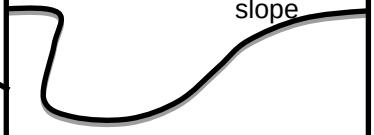


Slip-off slope where water runs slower and deposit material

Free hand cross section through meander from North to South

Cut bank

Slip-off slope



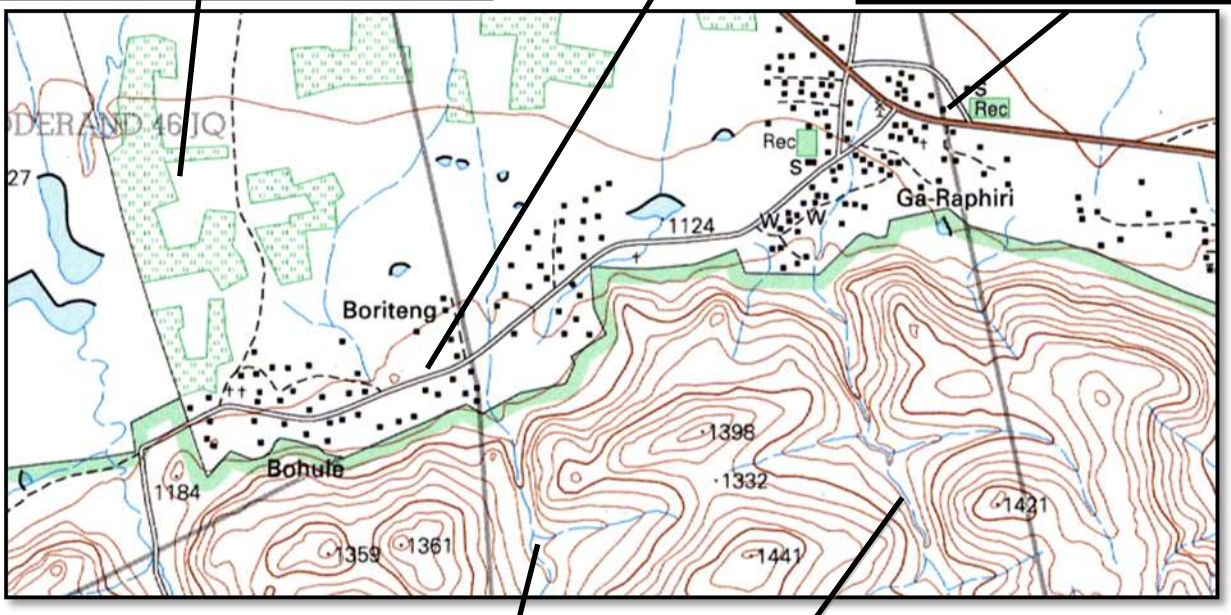
Wind pump indicate that there is underground water in the area. Reservoirs and wind pump are an indication of low rainfall in an area.

Nucleated rural villages next to mountain range

Small scale farming – supply local community with food and make them self-sufficient

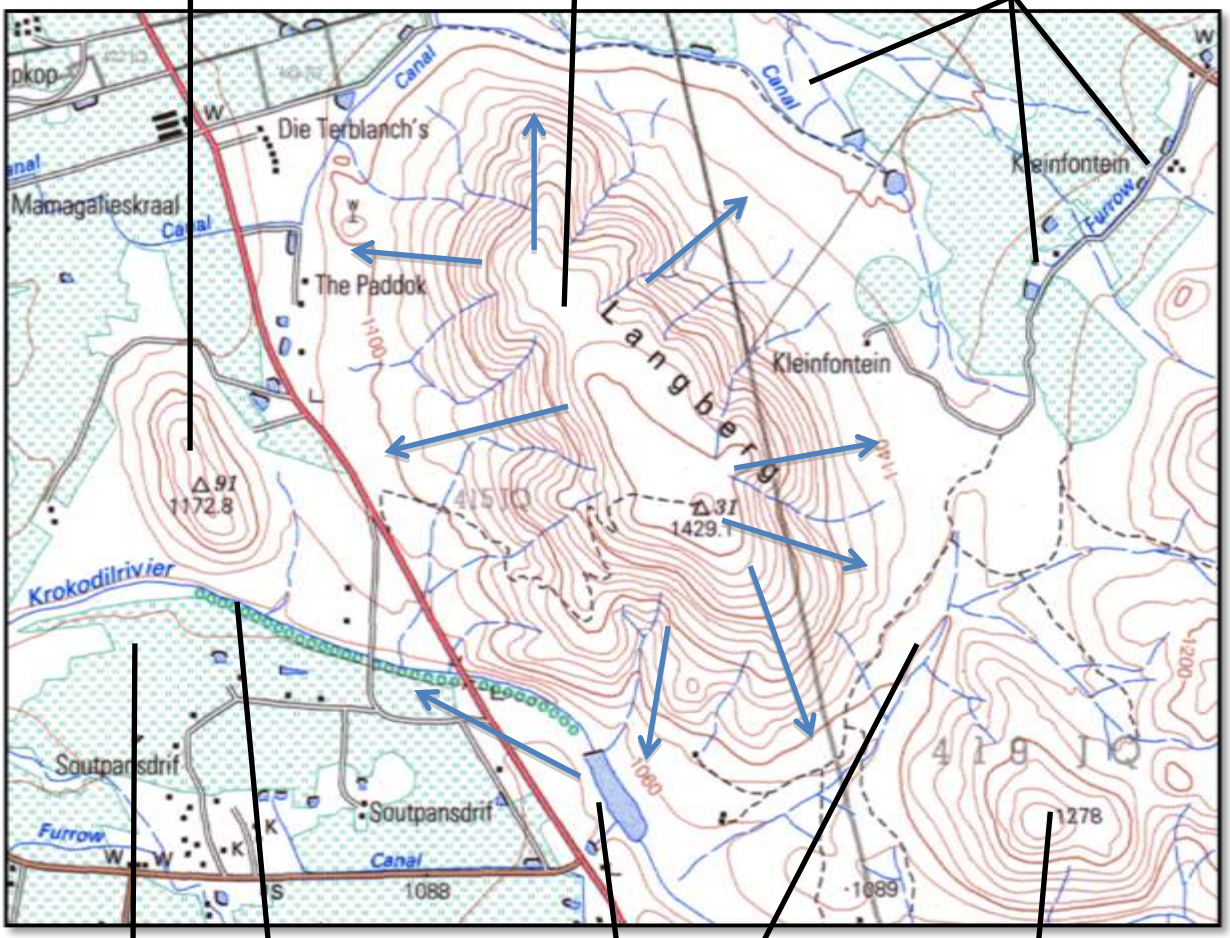
Linear village along mountain range

T-shaped nucleated rural village – developed along road



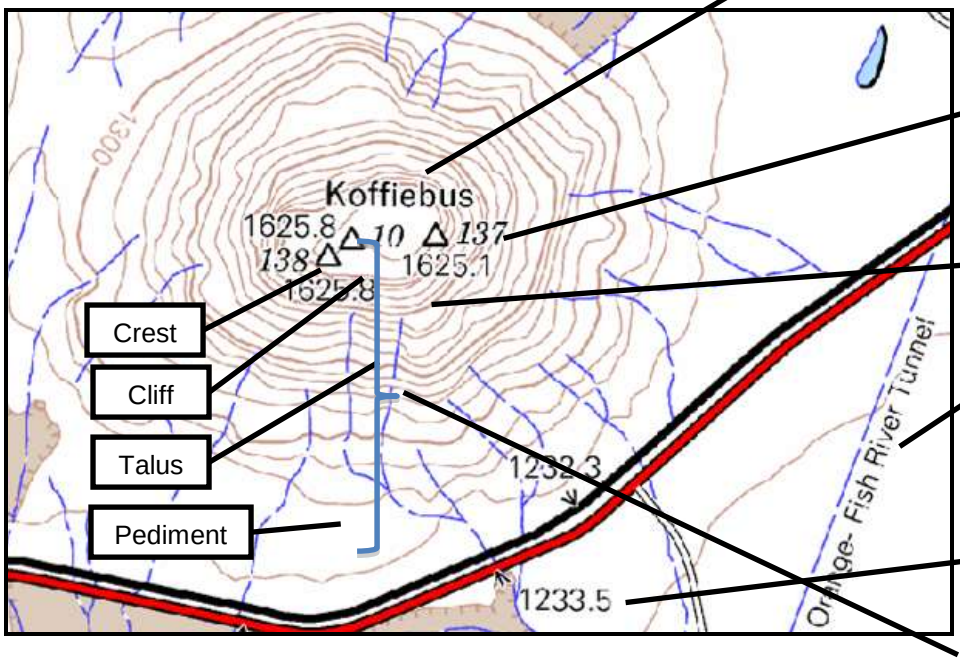
Trellis drainage pattern drains parallel hills and valleys. Short tributaries joining at right angles

LANDFORMS ASSOCIATED WITH HORIZONTAL STRATA
RADIAL DRAINAGE PATTERN – RIVERS FROM MESA OUTWARD



KAROO LANDSCAPE – BUTTE

Radial stream pattern from high central feature



Flat hard topped butte – narrower that its height

Trig station 137 is 1625.1 m above sea level

Concave Slope

Crest

Cliff

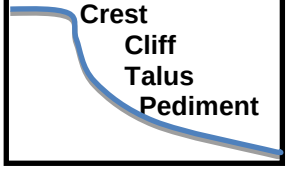
Talus

Pediment

Water transfer scheme between Orange and Fish River

Bench mark 1233.5 m above sea level

Cross section of slope N - S



RIVER IN THE OLD AGE STAGE

Wide river channel

Meandering

Gradual gradient

Large / wide level flood plain

Near to sea level

Braiding and sand banks

Marshes and swamps

1.2. Photographs

- ✓ Types of photographs
- ✓ Advantages and disadvantages of different types of photographs

Type	Characteristics	Advantages	Disadvantages
Terrestrial Photo	Taken from the ground Horizontal	Normal point of view Easy to identify features	Distorted scale – cannot do calculations Features in front obscure features in the back
Oblique Photo	Taken at an angle High - tilted more than 60º - see horizon Low – tilted less than 60º cannot see horizon	Near to normal point of view – form the side – easy to identify features	Distorted scale – cannot do calculations Features in front obscure features in the back
Vertical Aerial Photo	Taken from above – 90º Bird's eye view	Uniform scale Can be used to do calculations Used to draw maps from Used to develop orthophotos and 3D stereo pair photos	Strange point of view from the top – difficult to identify features Edges are distorted somewhat

- ✓ **Orthophoto maps:** vertical aerial photographs that have been ortho corrected to eliminate distortion. Some points, lines (vector spatial data) and labels (attribute data) have been added to make it easier to read. The scale is usually 1:10 000 (which is 5 times larger than the topographic map scale of 1:50 000)
- ✓ **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:** use the shaped of rivers and roads to on the photo and find the same shapes but smaller on the map to orientate the photo and the map.

- ✓ Compare orthophoto maps to topographic maps

Topographic maps	Orthophoto
Expensive to produce Smaller scale 1: 50 000 Less detail and symbols (points, lines, areas, represent features – Vector data Generalised through symbols Data based on remotely sensed data	Less expensive and easier to update Larger scale 1: 10 000 All detail are shown by pixels - Raster data Not generalised Remotely senesced data

- ✓ All techniques mentioned under map work techniques applicable to orthophoto maps

1.3. Orthophoto Map Application

- ✓ Interpretation of 1 : 10 000 orthophoto maps
- ✓ 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

This is the same as on the topographic maps

2. Concepts of

2.1. GIS – Geographic information systems

Definition: GIS is a collection of computer hardware, software, data, people and processes designed to capture, store, update, manipulate and analyse spatially referenced data.

2.2. Remote sensing: observations from a distance e.g. satellite images and aerial photographs

Resolution: The amount of pixels making up an image which determines the quality / detail for the image - the smaller the pixels the clearer the image.

Pixels: the small squares making up a photograph or image – arranged in a grid.

Spatial resolution: the size of the pixels in an image or the amount of features in a vector data set.

Spectral resolution: the number of bands of the electromagnetic spectrum captured in a satellite image. The spatial resolution increase if more band are captured. (Some sensors on satellites can capture wavelengths that are not visible to the naked eye.)

2.3 Spatial and attribute data

A GIS stores two types of date namely

Spatial data: the shape and the location of geographical features.

Attribute data: the characteristics of geographic features e.g. name, value, intensity, type, classification etc. The labels on the maps often show the attributes.

2.4.1. Vector and raster data is how spatial data can be stored in a GIS on a computer.

Raster data consist of pixels in a grid – images and aerial photographs are examples of raster data.

Vector data consists of point, line and area symbols illustrating geographical features in a GIS or a map.

- ✓ Spatial objects are geographical features with location and shape.
  - Points – a geographical feature that is stored as one set of coordinates in a GIS
  - Nodes – points that form the basis of a line or polygon. Nodes are connected by arcs to form lines and polygons.
  - Lines – a range of connected x,y coordinates representing a linear geographic feature like roads, railways and rivers.
  - Area/polygons: a range of connected x,y coordinates in a GIS where the first and last nodes are connected to encircle an area. This resemble features that take up areas e.g. dams, cultivated land etc.
  -

2.1. **Concept of layering of information –** this is when the different geographical features are place over each other to organise them in the GIS. Layering shows the relationship between different geographical features

2.6. Components of GIS: hardware, software, data, people and processes
Functional elements: capture, store, update, manipulate and analyse spatially referenced data

2.7. Sources of information for GIS:
Remote sensing – aerial photos and satellite images
Survey data – roads, railways, altitude
Census data
Measure data e.g. rainfall, temperature, air pressure ect.
Other maps

2.8. Data manipulation and analysis
- ✓ Concept of data manipulation – to change the data to make it more useful
- ✓ Data integration – to put a range of features or data set together in one GIS.
- ✓ Buffering; to draw an area around a geographic feature to show a zone of influence or exclusion.
- ✓ Querying: to investigate the data and find answers about specific parts of the dataset.
- ✓ Statistical analysis: this is when statistical data like population data is sorted and categorised to display spatial patterns which is not clear in the table or captured attributes. Statistical analysis is used to make patterns in number data visible on a map e.g. average rainfall maps are based on statistical analysis.

2.9. Data standardisation means to make the data similar to other data set so allow data sharing.

2.10. Data sharing: to make data available for other users to access. Data collection is a laborious and expensive task. Companies rather use data which was already captured by experts like land surveyors.

2.11. Data security: to ensure that data is safe from tampering and anybody do not have access to sensitive data or data that can be manipulated to obtain a different outcome to the GIS analysis. Backing up data for disaster recovery is also an important part of data security.

2.12 Application of GIS by the
- ✓ Government: census, elections, planning, budgeting, research, problem solving.
- ✓ Private sector: used to improve productivity and solve any geographical query.

PLEASE NOTE:
You are also expected to be able to do the following, but not in the exam.

• Developing a 'paper GIS' from existing maps, photographs and other sources of information on layers of tracing paper

You need to be able to apply the concepts to new situations:
• Identify and interpret concepts by using given data such as satellite images, topographic maps, orthophoto maps, aerial photographs, pictures and statistics indicated on graphs and tables

2. GIS (12 Minutes) [20] ***(From SBA task of 2013)***

2.1 Give a Definition of GIS. **(2 x 2 = 4)**

_____

_____

_____

_____

_____

_____

_____

2.2. State whether the following statements are true or false: **(6 x 1 = 6)**

2.2.1. Spatial data describes the shape and location of geographical features.

2.2.2. Vector and Raster data are examples of spatial data.

2.2.3. Attribute data is stored in related tables in a database and can be displayed as labels, intervals or classification symbols on a map.

2.2.4. Hardware is the programs you need for a GIS analysis

2.2.5. Raster data consist of pixels in a grid and each pixel has a unique value.

2.2.6. Satellite images and aerial photographs are examples of remote sensing.

2.3. Which one of the topographical map and orthophoto consist mostly of raster or mostly of vector data respectively? Motivate you answer.

Map: _____

_____(2)

Orthophoto: _____

_____(2)

2.4. Give TWO examples each of features below.

Points:_____

_____(2)

Lines:_____

_____(2)

Polygons:_____

_____(2)

Question 2: GIS ***(From SBA task 2013)***

2.1 Identify 2 components and 2 functional elements of GIS. (4 x 1 = 4)

Components: _____

_____

Functional Elements:

_____

_____

2.2. Which of the following 2 diagrams displays raster and vector data respectively? Motivate your answer. (4 x 1 = 4)

		
Raster / Vector		
Motivation		

SESSION NO: MAP WORK
CONSOLIDATION

MAPWORK CONSOLIDATION - KIMBERLEY

Refer to the extract of Kimberley (toposheet and orthophoto and answer the questions.

TERMINOLOGY / DEFINITIONS: The terminology for the map work can be found in the mapwork notes .

IMPORTANT CONCEPTS AND EXPLANATIONS: Refer back to notes

STUDY TIPS:
You need equipment to do map work: (You need to be able to use it as well)

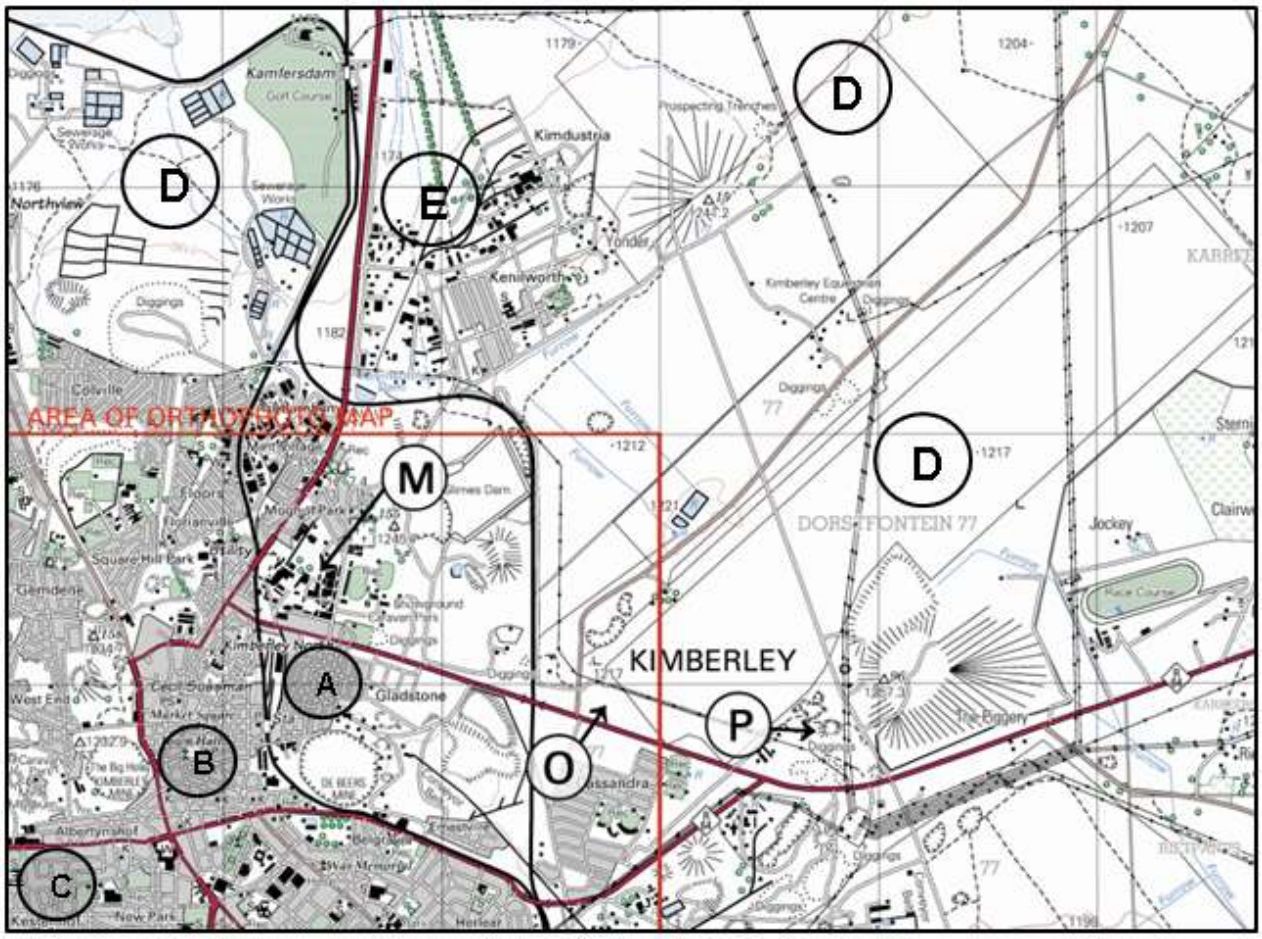
30 cm well-marked ruler in mm		Sharpened pencil	Triangle
String	Protractor	Calculator	

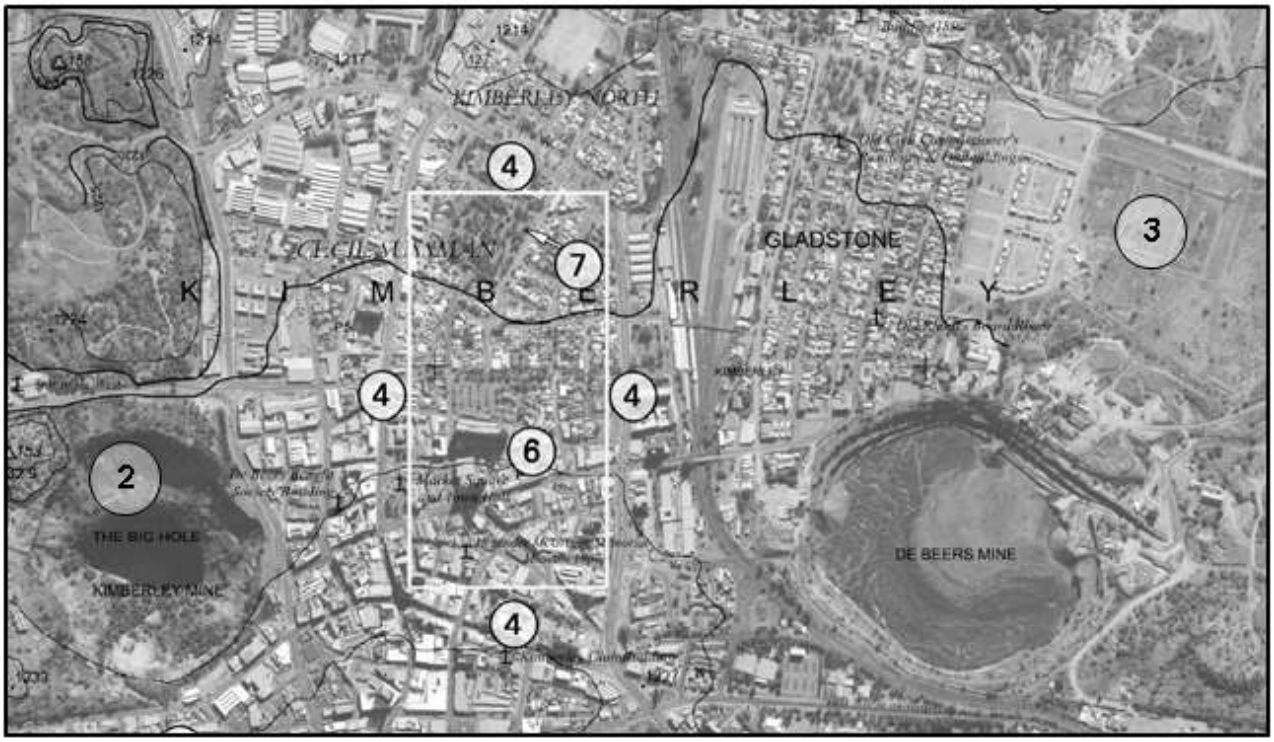
Mapwork is a practical skill (like riding a bicycle) - the more you do it the better you get at it. PRACTICE, PRACTICE, PRACTICE – GET a FRIEND to help you if you battle. Do not rush through the paper.

YOUR MOST IMPORTANT SKILL TO DO MAPWORK IS COMMON SENSE AND LOGIC (Bring it along - ☺)

MAPWORK ACTIVITY: KIMBERLEY

MAKE USE OF THE EXTRACTS OF THE 1:50 000 TOPOGRAPHIC MAP AND THE 1:10 000 ORTHOPHOTO MAP TO ANSWER THE FOLLOWING QUESTIONS.





****THE FOCUS IS ONLY ON CLIMATE, GEOMORPHOLOGY AND GIS FOR THIS TERM**

QUESTION 1 – CLIMATE

1.1 Does the mapped area receive a high or a low rainfall? Give TWO reasons to support your answer.

Rainfall: _____

(1x1)(1)

Reasons: _____

_____

_____

_____

(2 x2) (4)

1.2 The temperature at **3** on the orthophoto map is lower than at **7**.

1.2.1 What is this climatic phenomenon called?

_____

(1 x 2(2)

1.2.2 Provide TWO reasons from the orthophoto map to explain the climatic phenomenon mentioned in QUESTION 1.2.

_____

_____

_____

_____

(2 x 2) (4)

QUESTION 2 – GEOMORPHOLOGY

2.1 Provide evidence from the topographic map that the mapped area is flat.

_____

(1 x 1) (1)

2.2 Why is a flat area conducive for the development of infrastructure?

_____

_____

_____

(2 x 2) (4)

2.3 Give evidence from the orthophoto map that the mapped area has experienced intrusive volcanism in the distant past.

_____

(1 x 2) (2)

QUESTION 5 – GEOGRAPHIC INFORMATION SYSTEM

5.1 Which map is an example of vector data, and which one is an example of raster data?

Topographicmap: _____

(1x 1) (1)

Orthophoto map: _____

(1x1(1)

5.2 Does the orthophoto map have a high or a low resolution? Give ONE reason for your answer.

Resolution:

_____

(1x1(1)

Reason:

_____

_____

(1x2)(2)

5.3 Mention TWO layers of information that a developer has to take into account before considering the site selected for the industrial zone at Kimdustria (**E** on the topographic map).

_____

_____

(2 x 2) (4)

5.4 Mention how the scale of ONE of the two maps must be manipulated in order for both maps to have the same scale.

_____

_____

(1x2(2)

5.5 Explain how the Northern Cape Department of Education can implement GIS to establish the need for the development of a new high school at in Gladstone at **5**.

_____

_____

_____

_____

(2 x 2) (4)

[75]