basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS

GEOGRAPHY P1

2023

MARKS: 150

TIME: 3 hours

Stanmorephysics

This question paper consists of 20 pages.

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INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO SECTIONS.

   SECTION A
   QUESTION 1: CLIMATE AND WEATHER (60)
   QUESTION 2: GEOMORPHOLOGY (60)

   SECTION B
   QUESTION 3: GEOGRAPHICAL SKILLS AND TECHNIQUES (30)

2. Answer ALL THREE questions.
3. All diagrams are included in the question paper.
4. Leave a line between the subsections of questions answered.
5. Start EACH question at the top of a NEW page.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Do NOT write in the margins of the ANSWER BOOK.
8. Draw fully labelled diagrams when instructed to do so.
9. Answer in FULL SENTENCES, except when you have to state, name, identify or list.
10. Units of measurement MUST be indicated in your final answer, e.g. 1 020 hPa, 14 °C and 45 m.
11. You may use a non-programmable calculator.
12. You may use a magnifying glass.
13. Write neatly and legibly.

SPECIFIC INSTRUCTIONS AND INFORMATION FOR SECTION B

14. A 1 : 50 000 topographic map 2526CA ZEERUST and a 1 : 10 000 orthophoto map 2526 CA 2 ZEERUST are provided.
15. The area demarcated in RED/BLACK on the topographic map represents the area covered by the orthophoto map.
16. Marks will be allocated for steps in calculations.
17. You must hand in the topographic map and the orthophoto map to the invigilator at the end of this examination.

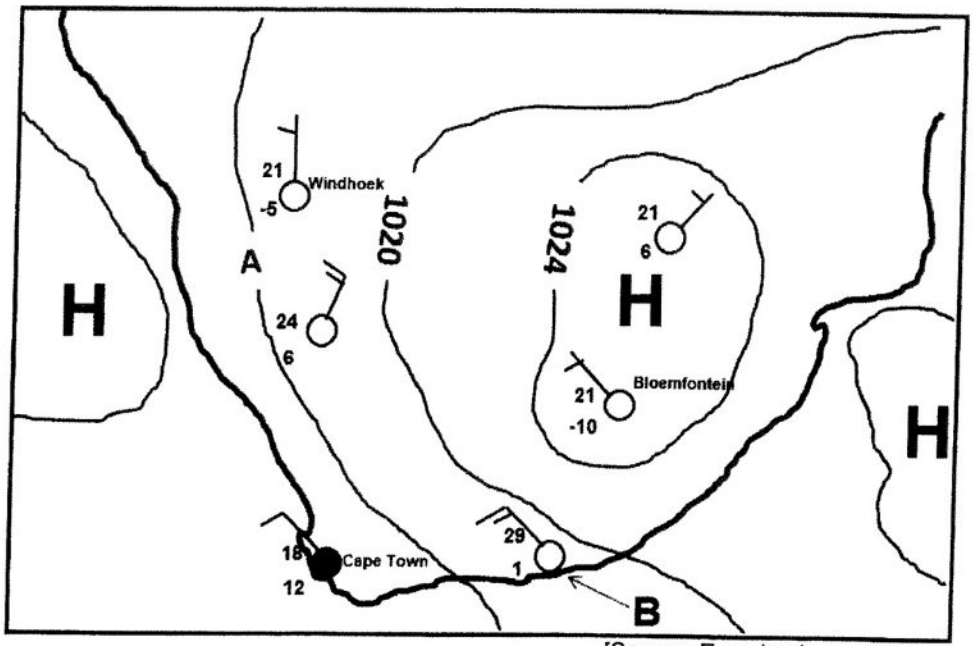
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SECTION A: CLIMATE AND WEATHER AND GEOMORPHOLOGY

QUESTION 1: CLIMATE AND WEATHER

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.8) in the ANSWER BOOK, e.g. 1.1.9 D.

Refer to the sketch below to answer QUESTIONS 1.1.1 to 1.1.5.



[Source: Examiner's own sketch]

1.1.1 The season represented on the synoptic weather map is …

A autumn.
B spring.
C summer.
D winter.

1.1.2 The isobaric interval of the isobars on the synoptic weather map is … hPa.

A 2
B 4
C 6
D 8

1.1.3 The air pressure reading at **A** is … hPa.

A 1016
B 1018
C 1022
D 1024

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1.1.4 The dew point temperature indicated at weather station **B** is ... °C.

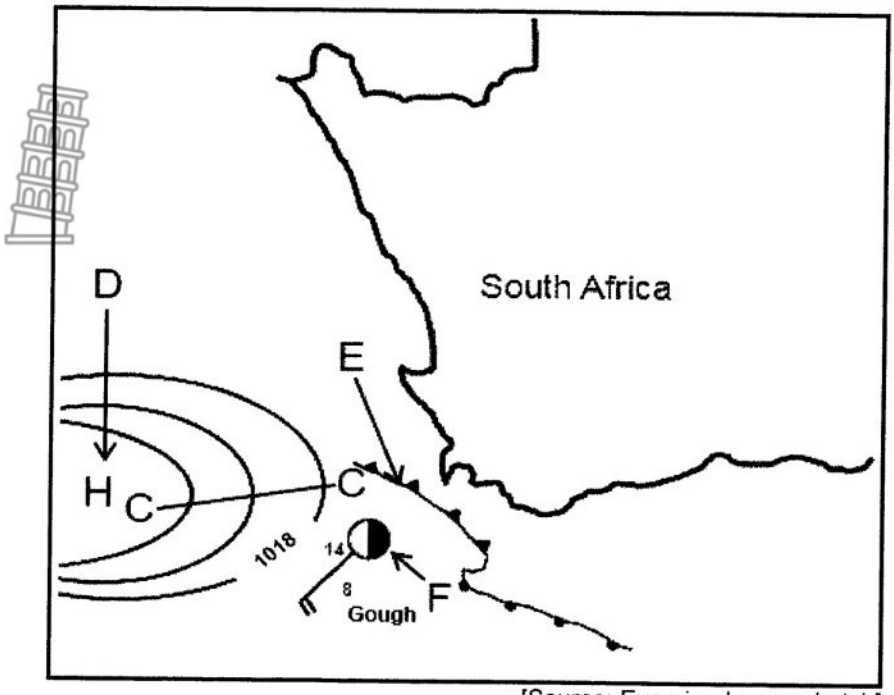
A 4
B 29
C 1
D 28

1.1.5 The weather stations around the interior high-pressure cell show clear skies due to ... air, and the anticlockwise circulation results in ... winds.

(i) subsiding
(ii) rising
(iii) south-easterly
(iv) north-westerly

A (i) and (iii)
B (i) and (iv)
C (ii) and (iii)
D (iii) and (iv)

Refer to the map below to answer QUESTIONS 1.1.6 to 1.1.8.



[Source: Examiner's own sketch]

1.1.6 Line **C-C** represents a …

A ridge.
B saddle.
C trough.
D depression.

1.1.7 The high-pressure cell at **D** will cause weather system **E** to move in a … direction.

A south-easterly
B north-easterly
C south-westerly
D north-westerly

1.1.8 The weather conditions at weather station **F**:

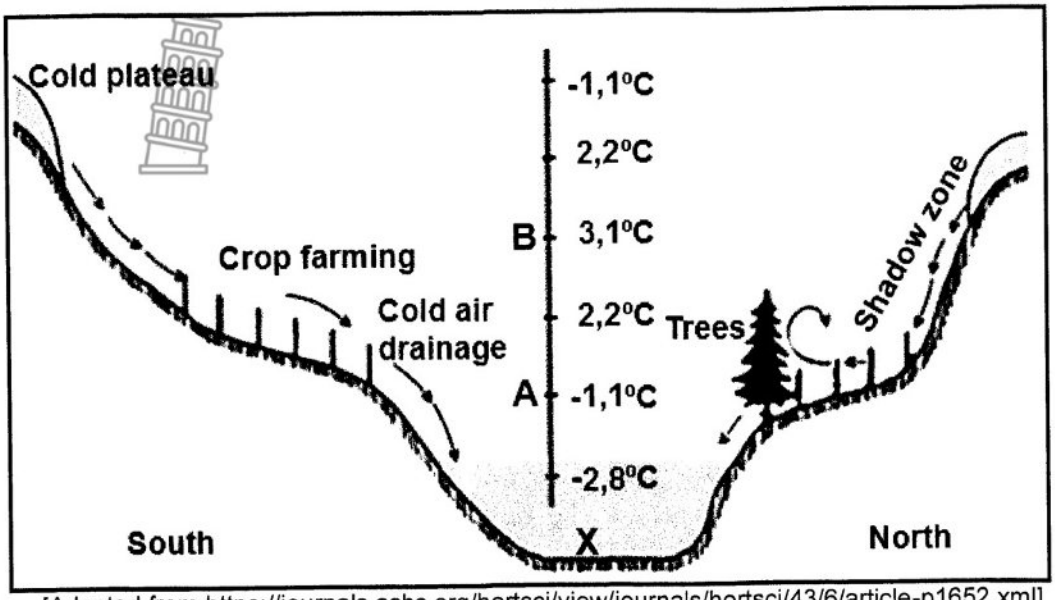
(i) Air temperature is 8 °C
(ii) Cloud cover is 4/8
(iii) South-westerly wind
(iv) Wind speed is 5 knots

A (i) and (ii)
B (ii) and (iii)
C (i) and (iv)
D (ii) and (iv)

(8 x 1) (8)

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1.2 Refer to the sketch below showing valley climates. Complete the statements in COLUMN A with the options in COLUMN B. Write down only **Y** or **Z** next to the question numbers (1.2.1 to 1.2.7) in the ANSWER BOOK, e.g. 1.2.8 Y.



[Adapted from https://journals.ashs.org/hortsci/view/journals/hortsci/43/6/article-p1652.xml]

	COLUMN A		COLUMN B
1.2.1	The direction in which the slope faces in relation to insolation is …	**Y** **Z**	orientation aspect
1.2.2	The sketch represents a valley in the … Hemisphere.	**Y** **Z**	Southern Northern
1.2.3	… wind occurs due to terrestrial radiation.	**Y** **Z**	Katabatic Anabatic
1.2.4	A temperature inversion occurs between **A** and **B** due to a/an … in temperature with height.	**Y** **Z**	decrease increase
1.2.5	The form of precipitation that could occur at **X** is …	**Y** **Z**	dew frost
1.2.6	… fog may form in the valley on clear, calm nights.	**Y** **Z**	Radiation Advection
1.2.7	The northern side of the valley is covered by trees because of … evaporation.	**Y** **Z**	high low

(7 x 1) (7)

1.3 Refer to the extract below on cold fronts.

TWO COLD FRONTS TO HIT WESTERN CAPE THIS WEEKEND – 'HEAVY RAINFALL' TO FOLLOW

Date: 10 June 2022

According to the South African Weather Service (SAWS), two cold fronts are expected to bring rain, strong winds, high waves and a significant drop in temperatures to South Africa.

The first cold front is expected to hit the Western Cape on Sunday evening 12 June. Ahead of this first cold front, strong north-westerly to westerly winds between 50–60 km/h, gusting up to 70–80 km/h, are expected over the southern parts of the Northern Cape and the interior of the Western and Eastern Cape from Sunday.

The second cold front is expected to reach the Western Cape by Monday evening 13 June, bringing continued high amounts of rainfall mainly to the south-western parts of the Western Cape, especially from Monday to Wednesday afternoon.

The wind direction associated with the cold front will change from north-west to south-west as the front moves over the Western Cape.

[Adapted from http//www.First cold front to hit Western Cape this weekend – 'heavy rainfall' to follow (thesouthafrican.com)]

1.3.1 In which season do the cold fronts mentioned in the extract influence the Western Cape? (1 x 1) (1)

1.3.2 Give evidence from the extract to support your answer to QUESTION 1.3.1. (1 x 1) (1)

1.3.3 Why do cold fronts have a greater impact on the Western Cape during this season (answer to QUESTION 1.3.1)? (1 x 2) (2)

1.3.4 The change in wind direction mentioned in the extract is known as (veering/backing) in the Southern Hemisphere. (1 x 1) (1)

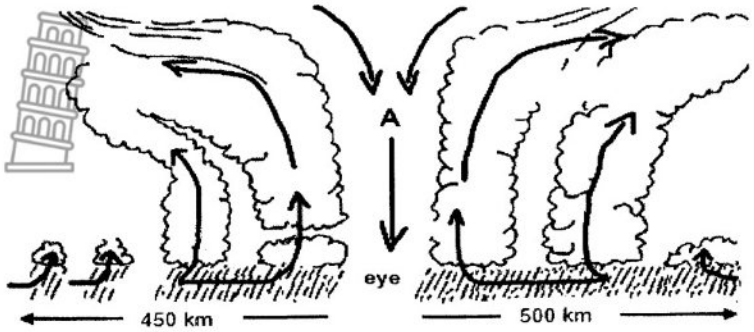
1.3.5 Give a reason from the extract for your answer to QUESTION 1.3.4. (1 x 2) (2)

1.3.6 In a paragraph of approximately EIGHT lines, suggest positive and negative impacts of heavy rainfall associated with the cold fronts on the physical (natural) environment of the Western Cape. (4 x 2) (8)

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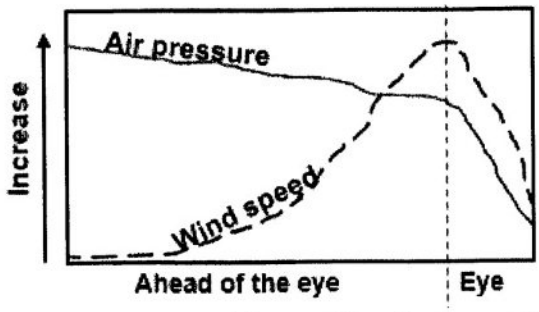
1.4 Refer to the infographic below on tropical cyclones.

CROSS-SECTION OF A TROPICAL CYCLONE



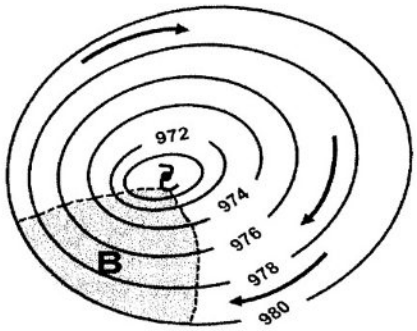
[Adapted from https://www.meteo.physik.unimuenchen.de/~roger/TCLecs/Tropical%20Cyclone]

GRAPH ASSOCIATED WITH A TROPICAL CYCLONE



[Source: Examiner's own drawing]

ISOBARIC REPRESENTATION OF A TROPICAL CYCLONE



[Source: https://www.google.com/search?q=isobars]

1.4.1 What evidence indicates that the tropical cyclone developed in the Southern Hemisphere? (1 x 1) (1)

1.4.2 Give TWO reasons from the infographic to indicate that the tropical cyclone is in its mature stage. (2 x 1) (2)

1.4.3 How will the descending air at **A** influence the cloud cover in the eye? (1 x 2) (2)

1.4.4 Give a reason for your answer to QUESTION 1.4.3. (1 x 2) (2)

1.4.5 What is the relationship between the wind speed and air pressure as indicated on the graph?

(a) Ahead of the eye (1 x 2) (2)

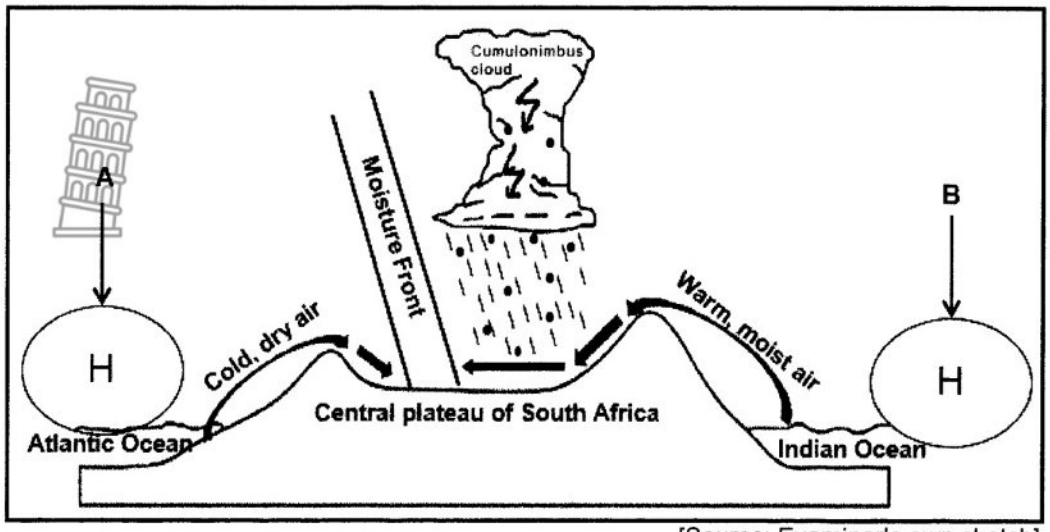
(b) Within the eye (1 x 2) (2)

1.4.6 Why is area **B** on the sketch of the isobaric representation referred to as the leading left quadrant (dangerous semicircle)? (1 x 2) (2)

1.4.7 How does the leading left quadrant (dangerous semicircle) develop in tropical cyclones? (1 x 2) (2)

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1.5 Refer to the sketch below on line thunderstorms.



[Source: Examiner's own sketch]

1.5.1 Identify high-pressure cells **A** and **B**. (2 x 1) (2)

1.5.2 Which season is represented by the sketch? (1 x 1) (1)

1.5.3 Give ONE reason from the sketch for your answer to QUESTION 1.5.2. (1 x 2) (2)

1.5.4 What is a *moisture front*? (1 x 2) (2)

1.5.5 Name TWO forms of precipitation associated with a line thunderstorm. (2 x 1) (2)

1.5.6 Describe the processes involved in the formation of line thunderstorms. (3 x 2) (6)

[60]

QUESTION 2: GEOMORPHOLOGY

2.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (2.1.1 to 2.1.8) in the ANSWER BOOK, e.g. 2.1.9 D.

2.1.1 A river and its tributaries is known as a …

A catchment.
B drainage basin.
C river system.
D surface run-off.

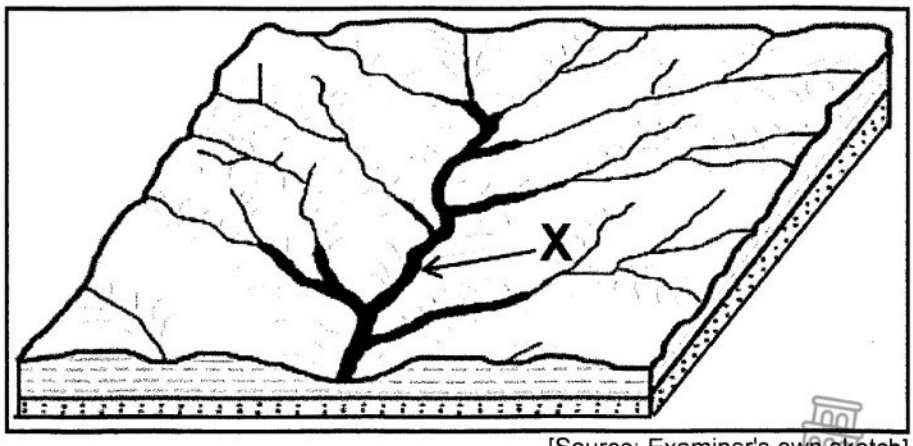
2.1.2 The high-lying area separating two drainage basins is a/an …

A watershed.
B interfluve.
C water table.
D source.

2.1.3 Where two or more rivers join it is known as a/an …

A interfluve.
B tributary.
C main stream.
D confluence.

Refer to the sketch below of the drainage basin to answer QUESTIONS 2.1.4 to 2.1.6.



[Source: Examiner's own sketch]

2.1.4 The sketch above represents a … drainage pattern.

A rectangular
B dendritic
C radial
D parallel

2.1.5 The stream order at **X** is … order.

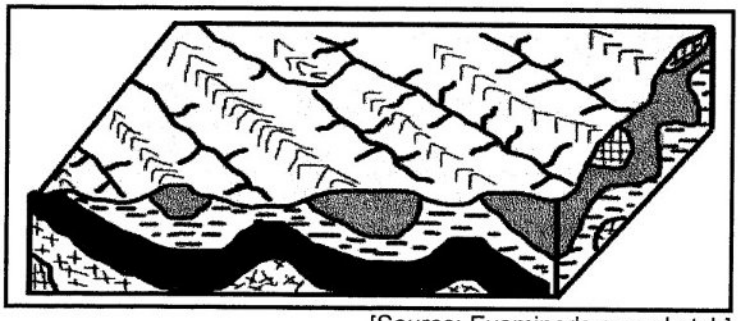
A 1st
B 2nd
C 3rd
D 4th

2.1.6 The drainage density of the drainage basin is high because it is influenced by the river flowing in areas of … and …

(i) less vegetation
(ii) high porosity
(iii) high rainfall
(iv) high permeability

A (ii) and (iv)
B (i) and (iii)
C (i) and (ii)
D (ii) and (iv)

Refer to the trellis drainage pattern below to answer QUESTIONS 2.1.7 and 2.1.8.



[Source: Examiner's own sketch]

2.1.7 The tributaries of a trellis drainage pattern …

A join the main stream at an acute angle.
B join the main stream at right angles.
C bends 90° along its course.
D flows away from a central point.

2.1.8 This drainage pattern is found in regions of … and …

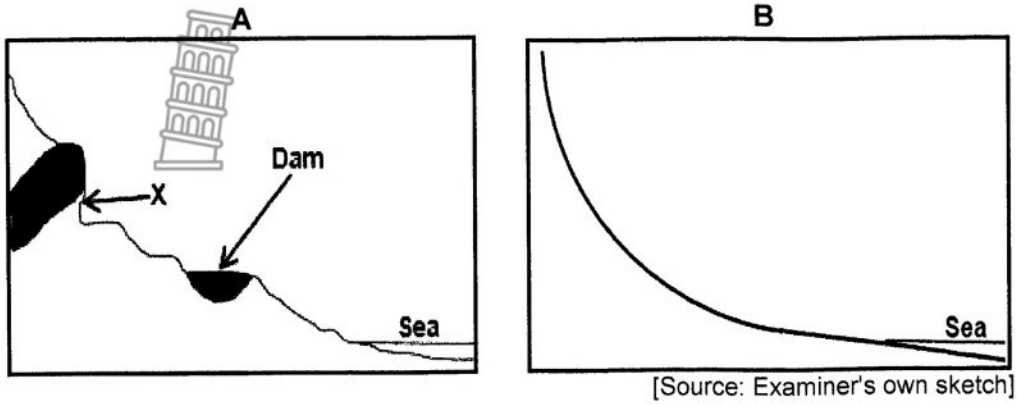
(i) inclined strata
(ii) jointed igneous rocks
(iii) uniform resistant rocks
(iv) folded strata

A (i) and (ii)
B (iii) and (iv)
C (i) and (iv)
D (ii) and (iv)

(8 x 1) (8)

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2.2 Refer to river profiles **A** and **B** below. Complete the statements in COLUMN A with the options in COLUMN B. Write down only **Y** or **Z** next to the question numbers (2.2.1 to 2.2.7) in the ANSWER BOOK, e.g. 2.2.8 Y.



[Source: Examiner's own sketch]

	COLUMN A		COLUMN B
2.2.1	Sketches **A** and **B** illustrate … profiles of a river.	**Y** **Z**	cross longitudinal
2.2.2	Temporary base levels of erosion are evident in sketch …	**Y** **Z**	A B
2.2.3	The profile of sketch **B** is …	**Y** **Z**	graded ungraded
2.2.4	The dominant process at **X** in sketch **A** is … erosion.	**Y** **Z**	headward lateral
2.2.5	The permanent base level of erosion is the …	**Y** **Z**	dam sea
2.2.6	In profile …, there is an equilibrium between erosion and deposition.	**Y** **Z**	A B
2.2.7	River profile **B** developed due to …	**Y** **Z**	erosion of temporary base levels. the lowering of the watershed.

(7 x 1) (7)

2.3 Refer to the photograph of a valley below to answer QUESTIONS 2.3.1 and 2.3.2.

VALLEY



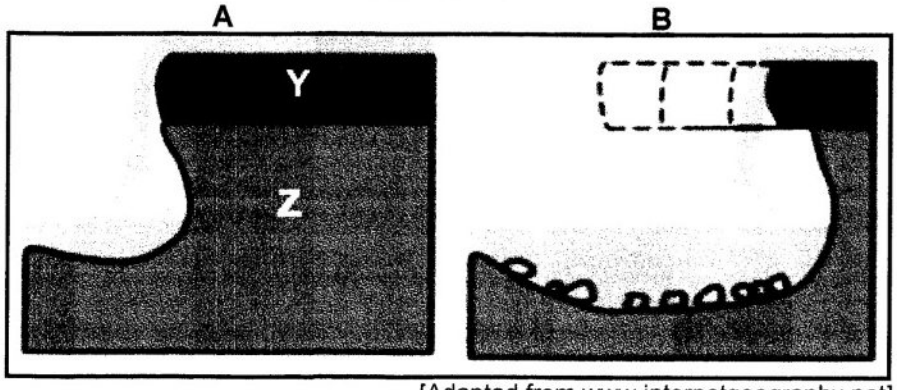
[Source: https://www.gettyimages.ac/valleys]

2.3.1 The valley in the photograph is generally found in the (upper/middle) course. (1 x 1) (1)

2.3.2 Identify TWO characteristics visible in the photograph to support your answer to QUESTION 2.3.1. (2 x 2) (4)

Refer to sketches **A** and **B** below of a waterfall to answer QUESTIONS 2.3.3 to 2.3.5.

WATERFALL



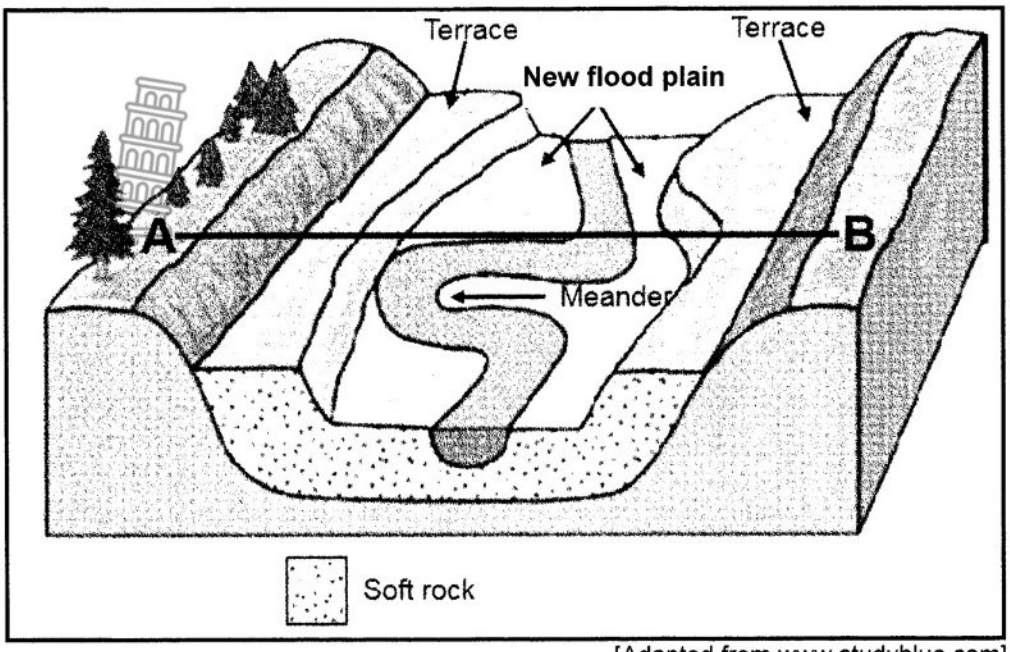
[Adapted from www.internetgeography.net]

2.3.3 What is a *waterfall*? (1 x 2) (2)

2.3.4 Match **Y** and **Z** in sketch **A** with the concepts resistant (hard) rock and less resistant (soft) rock. (2 x 1) (2)

2.3.5 How does erosion in sketch **B** cause the waterfall to retreat (move) upstream? (3 x 2) (6)

2.4 Refer to the sketch below on river rejuvenation.



[Adapted from www.studyblue.com]

2.4.1 What is *river rejuvenation*? (1 x 2) (2)

2.4.2 State TWO possible causes of river rejuvenation. (2 x 1) (2)

2.4.3 Draw a labelled free-hand cross-section from **A** to **B** of the illustrated river rejuvenation.

Marks will be allocated for:

(a) Shape of the rejuvenated valley (1 x 1) (1)

(b) Indication of the new flood plain (1 x 1) (1)

(c) Indication of terraces (1 x 1) (1)

2.4.4 How did the river terraces (illustrated in the sketch) form? (2 x 2) (4)

2.4.5 Explain how the illustrated landscape will negatively impact on infrastructure development. (2 x 2) (4)

2.5 Refer to the extract below on catchment and river management.

RIVER TURNS BLACK AFTER COAL MINE DAM COLLAPSES NEXT TO RURAL COMMUNITIES AND HLUHLUWE-IMFOLOZI GAME RESERVE

By Tony Carle, 11 January 2022

Large volumes of potentially toxic coal mine effluent (waste) have spilled into rivers flowing through rural communities and the Hluhluwe-Imfolozi Game Reserve.

According to the US-based Union of Concerned Scientists, mining and coal-washing operations produce high water pollution which can also contain toxic heavy metals such as arsenic copper, lead and manganese.

When the slurry dam* wall collapsed on 24 December, the residents of the affected communities were not warned about the potential hazards until two weeks later. Conservation managers in the neighbouring Hluhluwe-Imfolozi Game Reserve were also led to believe that the spill was under control, only to discover pitch-black water flowing through the reserve several days later.

By this stage, the black water had reached the confluence of the Black and White Imfolozi Rivers.

*slurry dam – a dam that is used to store by-products of mining operations after separating the ore

[Adapted from dailymaverick.co.za]

2.5.1 What caused the river to change its colour to black? (1 x 1) (1)

2.5.2 State TWO toxic heavy metals in the extract that could be found in polluted mine water. (2 x 1) (2)

2.5.3 Quote ONE phrase from the extract that indicates that the mining company did NOT disclose (make known) the pollution of the river. (1 x 2) (2)

2.5.4 What could have been the negative economic impact of non-disclosure (answer to QUESTION 2.5.3) on the community? (1 x 2) (2)

2.5.5 In a paragraph of approximately EIGHT lines, describe the environmental importance of managing the Imfolozi drainage basin AND suggest measures that the local municipality could implement to maintain the future quality of water. (4 x 2) (8)

[60]

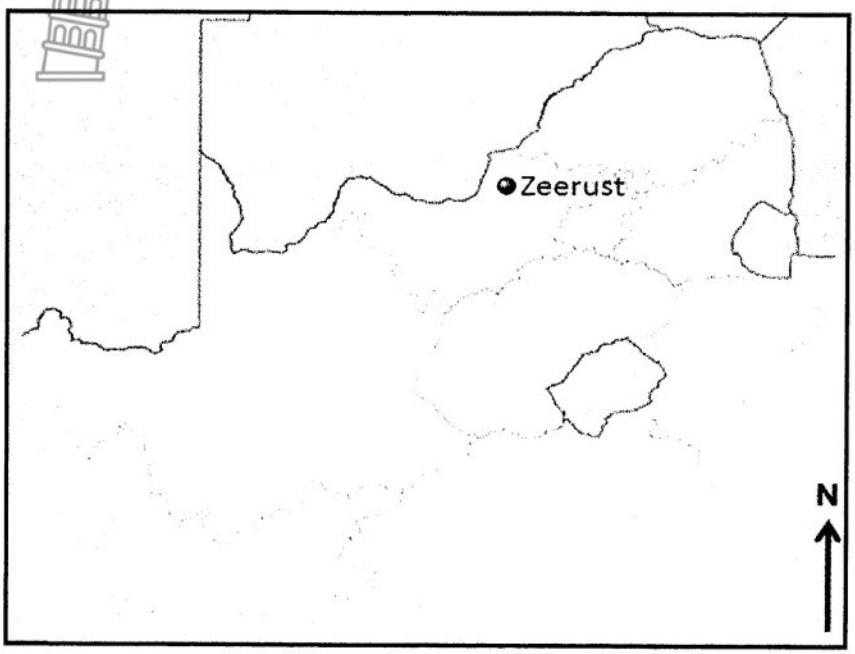
TOTAL SECTION A: 120



SECTION B

QUESTION 3: GEOGRAPHICAL SKILLS AND TECHNIQUES

GENERAL INFORMATION ON ZEERUST



Coordinates: 25°32'S; 26°05'E

Zeerust is a commercial town situated in the North West. It is situated in the Marico Valley, approximately 1 294 metres above sea level.

The town is 240 kilometres north-west of Johannesburg. It lies along the N4, the main road link between South Africa and Botswana.

The climate in this area is characterised by short cold and dry winters and long warm to hot summers. Rain is frequent during the summer months.

Two rivers flow through Zeerust: the Klein-Marico and the Karee Spruit. In Zeerust, there is a natural spring at the Marico Oog.

[Source: https://en.wikipedia.org/wiki/Zeerust]

The following English terms and their Afrikaans translations are shown on the topographic map:

ENGLISH	AFRIKAANS
Grave	Graf
River	Rivier
Rifle Range	Skietbaan

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3.1 MAP SKILLS AND CALCULATIONS

3.1.1 The grid reference of spot height 1315 in block **B4** on the topographic map is …

A 25°07'07"S; 26°31'26"E.
B 25°31'26"S; 26°07'07"E.
C 26°07'07"S; 25°31'26"E.
D 26°31'07"S; 25°07'26"E. (1 x 1) (1)

3.1.2 The straight-line distance from **1** in block **A1** to Kopfonteinnek on the orthophoto map is … kilometres (km).

A 4,0
B 0,4
C 104,0
D 100,4 (1 x 1) (1)

Refer to the topographic map.

3.1.3 Calculate the average gradient from spot height 1463 at **F** in block **A2** to the benchmark at **G** in block **C2**.

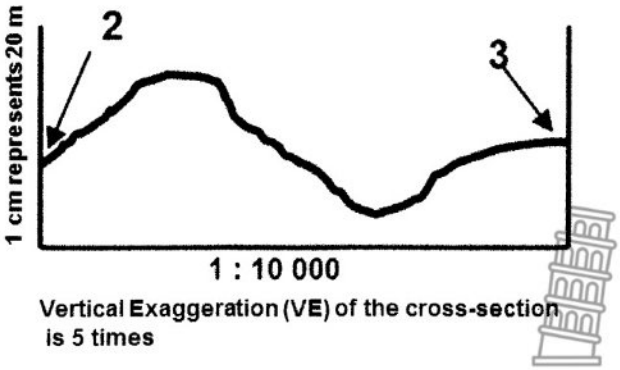
Use the following information:

Horizontal Equivalent (HE) is 3 000 m.

Formula: $\frac{\text{Vertical Interval (VI)}}{\text{Horizontal Equivalent (HE)}}$ (3 x 1) (3)

3.1.4 Use topographic map evidence and your answer to QUESTION 3.1.3 and give TWO reasons why it will be difficult to construct a road between **F** and **G**. (2 x 1) (2)

Refer to the rough cross-section below, which represents the area from **2** in block **A2** to **3** in block **A3** on the orthophoto map.



3.1.5 (a) Convert the Vertical Scale (VS) on the cross-section to a ratio scale. (2 x 1) (2)

(b) What does the Vertical Exaggeration (VE) of 5 times mean? (1 x 1) (1)

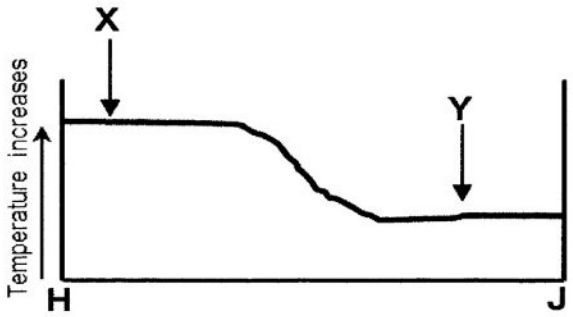
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3.2 MAP INTERPRETATION

3.2.1 The … in block **E2** on the topographic map is an indication that seasonal rainfall occurs in the area.

A row of trees
B perennial river
C non-perennial river
D cultivated land (1 x 1) (1)

Refer to the graph below indicating the average temperature of the area from **H** in block **C1** to **J** in block **C4** on the topographic map.

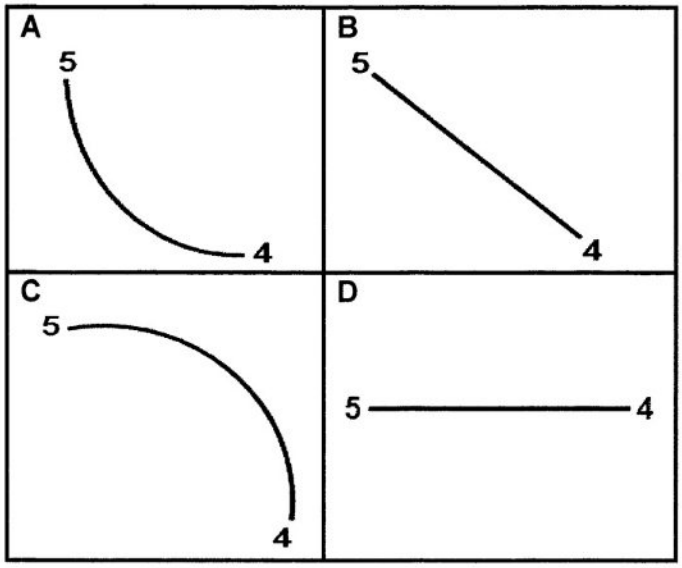


3.2.2 Identify the human-made feature that was responsible for the higher temperatures recorded at **X**. (1 x 1) (1)

3.2.3 Explain your answer to QUESTION 3.2.2. (1 x 2) (2)

3.2.4 Identify a natural feature that resulted in lower temperatures at **Y**. (1 x 1) (1)

3.2.5 Which sketch below represents the slope from **4** in block **C1** to **5** in block **B1** on the orthophoto map?



(1 x 1) (1)

Refer to the orthophoto map.

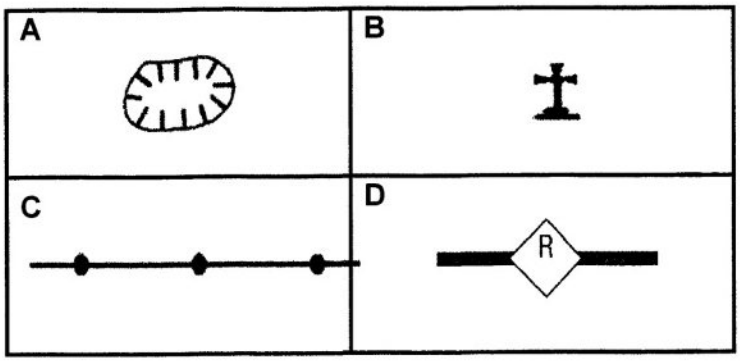
3.2.6 How did the topography (relief) of the area favour the location of the rifle range? (1 x 2) (2)

Refer to the topographic map.

3.2.7 Describe TWO factors on the topographic map that limited pollution of the Klein-Maricopoort Dam. (2 x 2) (4)

3.3 GEOGRAPHIC INFORMATION SYSTEMS (GIS)

3.3.1 Which ONE of the following is a standardised point symbol found on topographic maps?

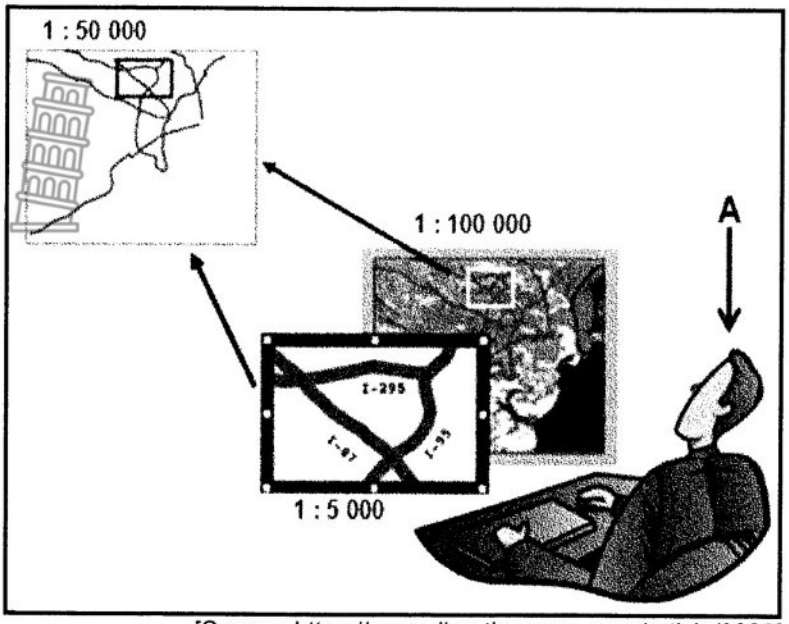


(1 x 1) (1)

3.3.2 Identify the alphanumeric block on the topographic map in which the point symbol (answer to QUESTION 3.3.1) is located. (1 x 1) (1)

3.3.3 Give ONE attribute data of the point symbol (answer to QUESTION 3.3.1) evident on the topographic map. (1 x 1) (1)

Refer to the sketch below.



[Source: https://www.directionsmag.com/article/3396]

3.3.4 Identify the GIS component at **A**. (1 x 1) (1)

3.3.5 Give ONE reason why the GIS component (answer to QUESTION 3.3.4) is important. (1 x 2) (2)

3.3.6 Data integration is illustrated in the sketch.

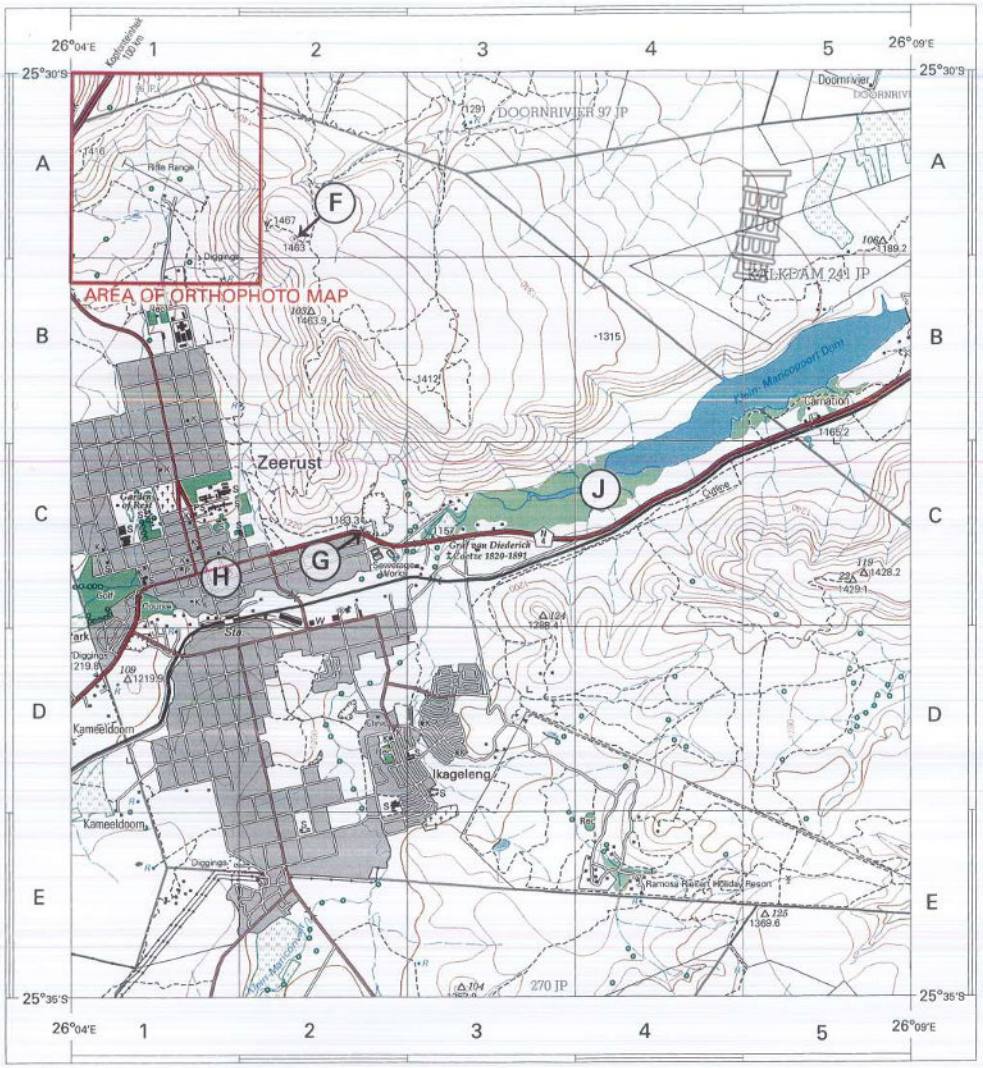
Give ONE reason to support the statement. (1 x 2) (2)

TOTAL SECTION B: 30
GRAND TOTAL: 150

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EXTRACT FROM 2526CA ZEERUST

1:50 000



Gemiddelde magnetiese deklinasie 16°57' Wes van Ware Noord (Augustus 2014).
Gemiddelde jaarlikse verandering 3' Weswaarts (Aug. 2014 - Julie 2015).

Mean magnetic declination 16°57' West of True North (August 2014.
Mean annual change 3' Westwards (Aug. 2014 - July 2015).

Metres 1000 0 1 2 3 4 5 Kilometres

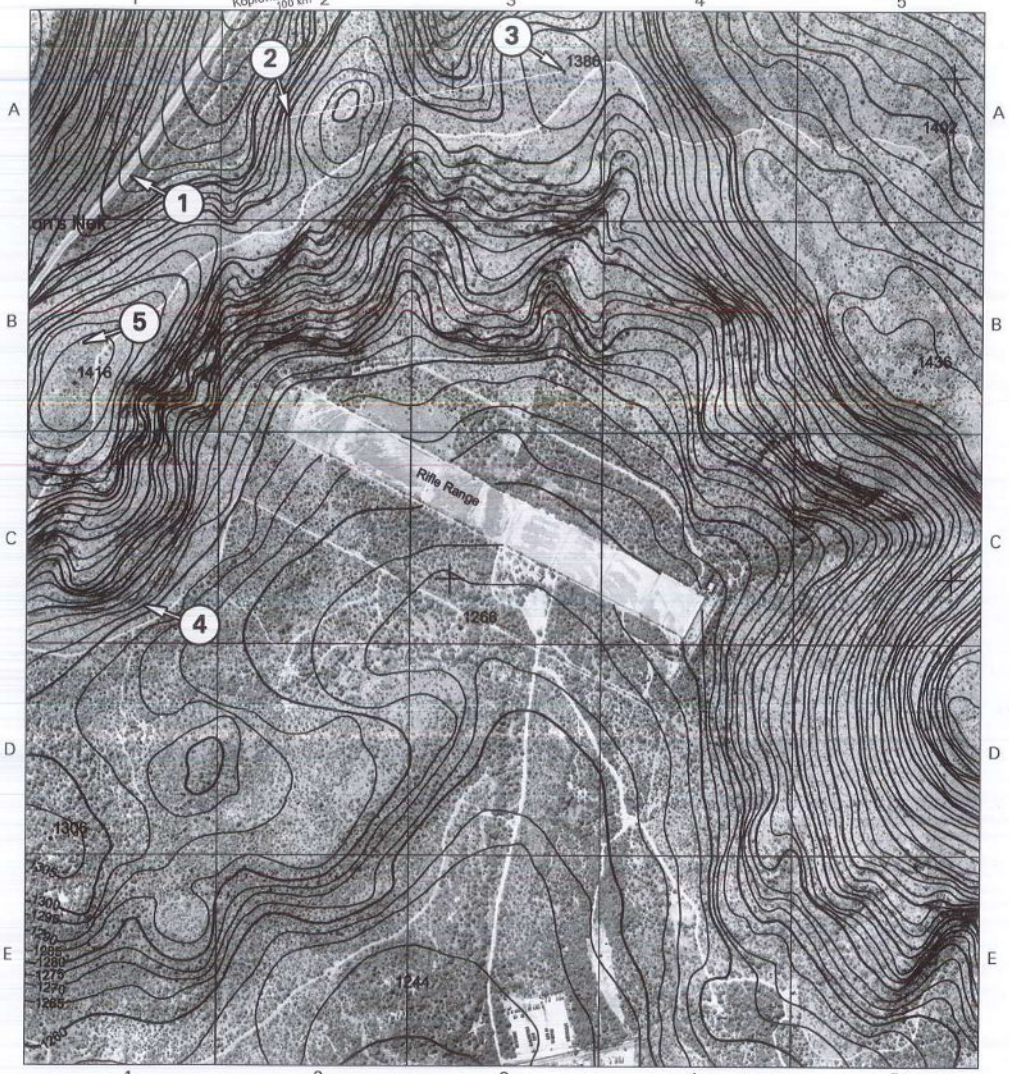
CONTOUR INTERVAL 20 METRES / KONTOERTUSSENRUIMTE 20 METER

REFERENCE

- National Freeway; National Route
- Arterial Route
- Main Road
- Secondary Road; Bench Mark
- Other Road; Bridge
- Track and Hiking Trail
- Railway; Station or Siding
- Other Railway; Tunnel
- Embankment; Cutting
- Power Line
- Built-up Area (High, Low Density)
- Buildings; Ruin
- Post Office; Police Station; Store
- Place of Worship; School; Hotel
- International Boundary and Beacon
- Provincial Boundary
- Protected Area
- Perennial River
- Perennial Water
- Non-perennial River
- Non-Perennial Water
- Dry Water Course
- Dry Pan
- Marsh and Vlei
- Pipeline (above ground)
- Water Tower; Reservoir; Water Point
- Coastal Rocks
- Prominent Rock Outcrop
- Fence; Wall
- Windpump; Monument
- Communication Tower
- Mine Dump; Excavation
- Trigonometrical Station; Marine Beacon
- Lighthouse and Marine Light
- Cemetery; Grave
- Erosion; Sand
- Woodland
- Cultivated Land
- Orchard or Vineyard
- Recreation Ground
- Row of Trees
- Original Farms

EXTRACT FROM 2527 CA 2 ZEERUST ortho - rectified image

1:10 000



0 km 200m 400m 600m 800m 1 km

CONTOUR INTERVAL 5 METRES - KONTOERTUSSENRUIMTE 5 METER

VERKLARING

- Nasionale Deurpad; Nasionale Roete
- Hoofverkeersroete
- Hoofpad
- Sekondêre Pad; Hoogtemerk
- Ander Pad; Brug
- Dowwe Pad en Voetslaanpad
- Spoorweg; Stasie of Sylyn
- Ander Spoorweg; Tonnel
- Opvulling; Deurgrawing
- Kraglyn
- Beboude Gebied (Hoë, Lae Digtheid)
- Geboue; Murasie
- Poskantoor; Polisiestasie; Winkel
- Plek van Aanbidding; Skool; Hotel
- Internasionale Grens en Baken
- Provinsiale Grens
- Bewarings Gebied
- Standhoudende Rivier
- Standhoudende Water
- Nie-standhoudende Rivier
- Nie-standhoudende Water
- Droë Loop
- Droë Pan
- Moeras en Vlei
- Pylpyp; Hoë spanning
- Waterdamp; Reservoir; Fontein
- Kuslynrotse
- Prominente Klipbank
- Draadheining; Muur
- Windpomp; Monument
- Kommunikasietoring
- Mynhoop; Uitgrawing
- Peilbaken; Seevaartbaken
- Vuurtoring en Seevaartlig
- Begraafplaas; Graf
- Erosie; Sand
- Beboste Gebied
- Bewerkte Land
- Oriëntasiegrens
- Rye Bome
- Oorspronklike Plase

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