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Mind the Gap!

Geography STUDY GUIDE

GRADE 12

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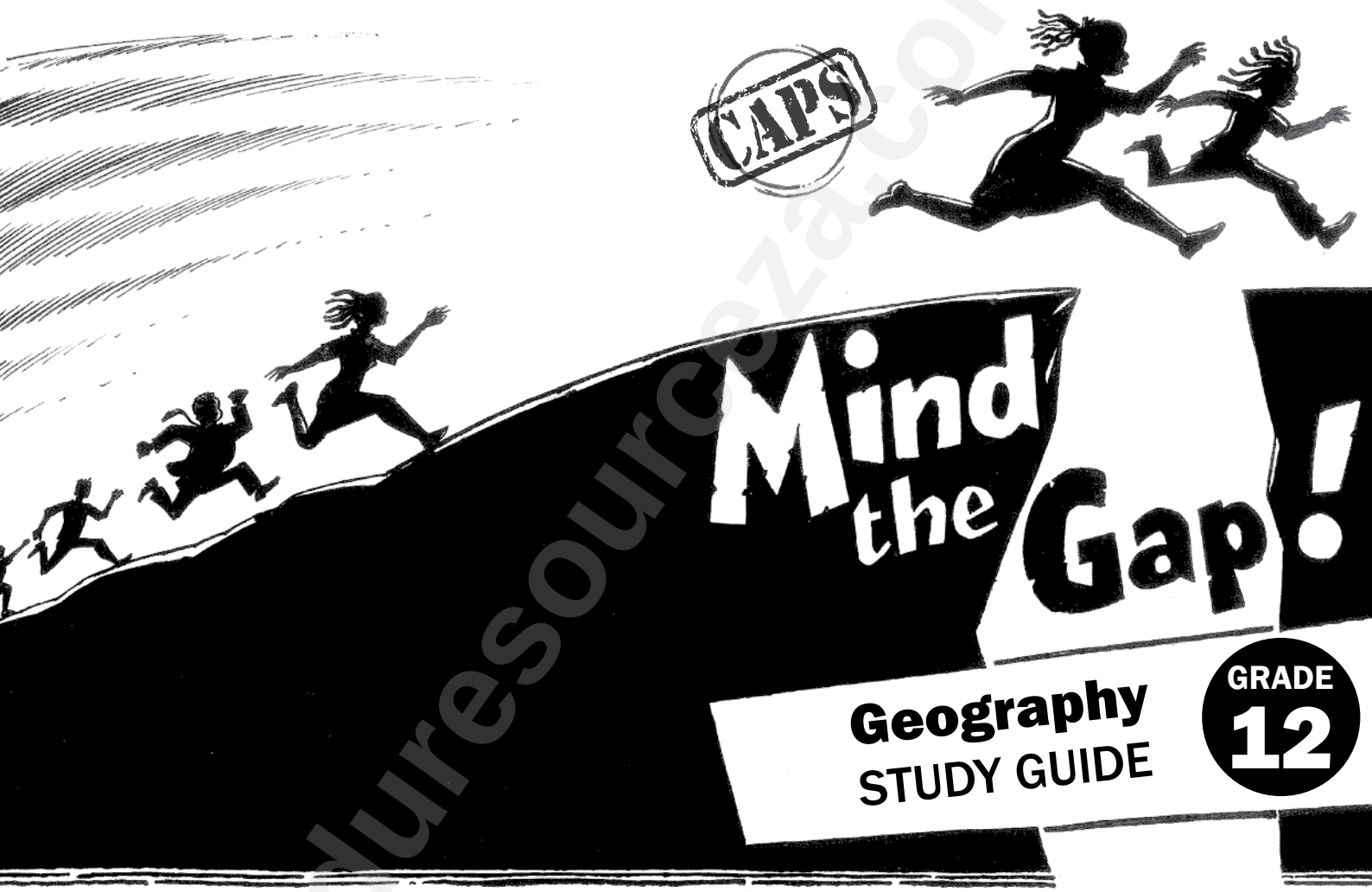

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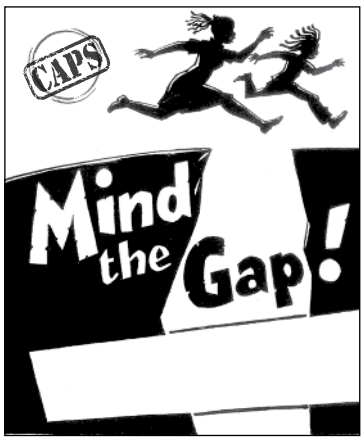

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Curriculum and Assessment Policy Statement (CAPS) Mind the Gap Grade 12 Study Guide Geography
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Ministerial foreword

Matsie Angelina Motshekga, MP
Minister of Basic Education

The Department of Basic Education has pleasure in releasing the second edition of *Mind the Gap* study guides for Grade 12 learners. These study guides continue the innovative and committed attempt by the Department of Basic Education to improve the academic performance of Grade 12 candidates in the National Senior Certificate (NSC) examination.

The study guides have been written by subject expert teams comprised of teachers, examiners, moderators, subject advisors and subject co-ordinators. Research started in 2012 shows that the Mind the Gap series has, without doubt, had a positive impact in improving grades. It is my fervent wish that the *Mind the Gap* study guides take us all closer towards ensuring that no learner is left behind, especially as we move forward in our celebration of 20 years of democracy.

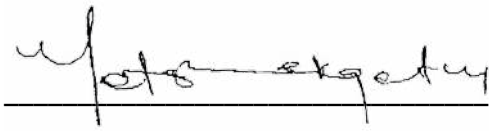
The second edition of *Mind the Gap* is aligned to the 2014 Curriculum and Assessment Policy Statement (CAPS). This means that the writers have considered the National Policy pertaining to the programme, promotion requirements and protocol for assessment of the National Curriculum Statement for Grade 12 in 2014.

The Mind the Gap CAPS study guides take their brief in part from the 2013 National Diagnostic report on learner performance and draws on the 2014 Grade 12 Examination Guidelines. Each of the Mind the Gap study guides provides explanations of key terminology, simple explanations and examples of the types of questions that learners can expect to be asked in an exam. Marking memoranda are included to assist learners in building their understanding. Learners are also referred to specific questions in past national exam papers and examination memos that are available on the Department's website – www.education.gov.za.

The CAPS edition include Accounting, Economics, Geography, Life Sciences, Mathematics, Mathematical Literacy and Physical Sciences. The series is produced in both English and Afrikaans. There are also nine English First Additional Language study guides. They include EFAL Paper 1 (Language); EFAL Paper 3 (Writing); and a study guide for each of the Grade 12 prescribed literature set works.

The study guides have been designed to assist those learners who have been underperforming due to a lack of exposure to the content requirements of the curriculum and aims to mind-the-gap between failing and passing, by bridging the gap in learners' understanding of commonly tested concepts so candidates can pass.

All that is now required is for our Grade 12 learners to put in the hours preparing for the examinations. Learners make us proud – study hard. We wish each and every one of you good luck for your Grade 12 examinations.



Matsie Angelina Motshekga, MP
Minister of Basic Education
May 2014

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Dear Grade 12 learner

This *Mind the Gap* study guide helps you to prepare for the end-of-year CAPS Geography Grade 12 exam.

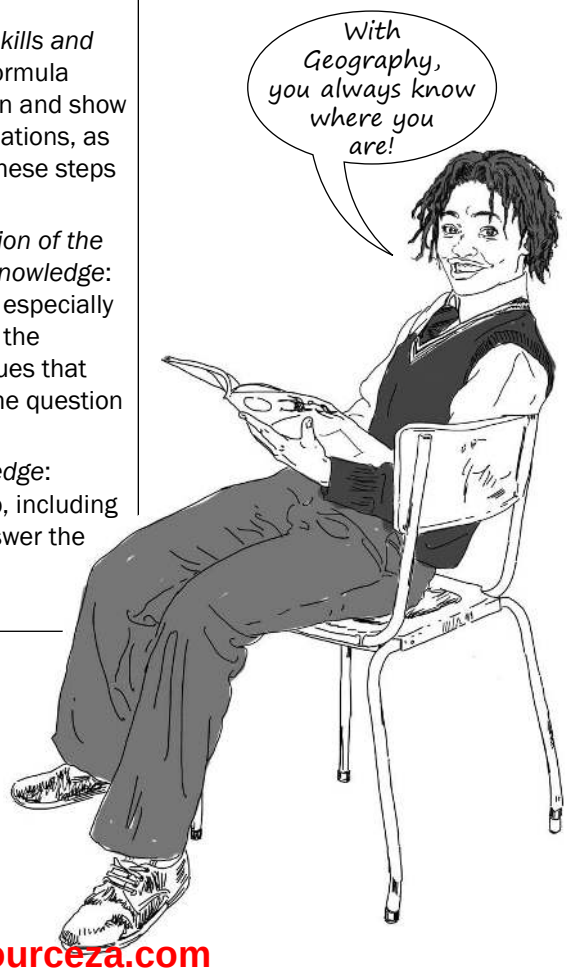
The study guide does NOT cover the entire CAPS curriculum, but it does focus on core content of each knowledge area and **points out where you can earn easy marks**.

You must work your way through this study guide to improve your understanding, identify your areas of weakness and correct your own mistakes. To ensure a high-quality pass, you should also cover the remaining parts of the curriculum using other textbooks and your class notes.

We are confident that this *Mind the Gap* study guide can help you to prepare well so that you pass the end-of-year exams.

Overview of the exam for CAPS Geography Grade 12

Paper 1 (Theory exam) 225 Marks	Paper 2 (Mapwork exam) 75 Marks
• You are given **four** questions of **75 marks each in Paper 1**. You are expected to answer **only three** questions. Make sure you don't repeat a question. • Carefully read through all the questions on a topic, including referring to the diagrams in the addendum, before you start to answer the sub-questions. Look out for clues (hints) that could help you to answer the questions. • Use a blue pen to write your answers. Diagrams should be done in **pencil only**. • Always use point form when answering questions, except if you are asked to write a paragraph, e.g. if a question says: 'Write a paragraph of no more than 12 lines...'	• *Question 1 – Multiple-choice (mapwork calculations and some interpretation)*: Read each option carefully to avoid careless mistakes (15 marks). • *Question 2 – Mapwork skills and calculations*: Write the formula down for each calculation and show all workings for all calculations, as marks are awarded for these steps (20 marks). • *Question 3 – Interpretation of the map using your theory knowledge*: Study the map carefully, especially the blocks mentioned in the question (e.g. D3), for clues that could help you answer the question (25 marks). • *Question 4 – GIS knowledge*: Carefully study your map, including the reference key, to answer the questions in this section (15 marks).



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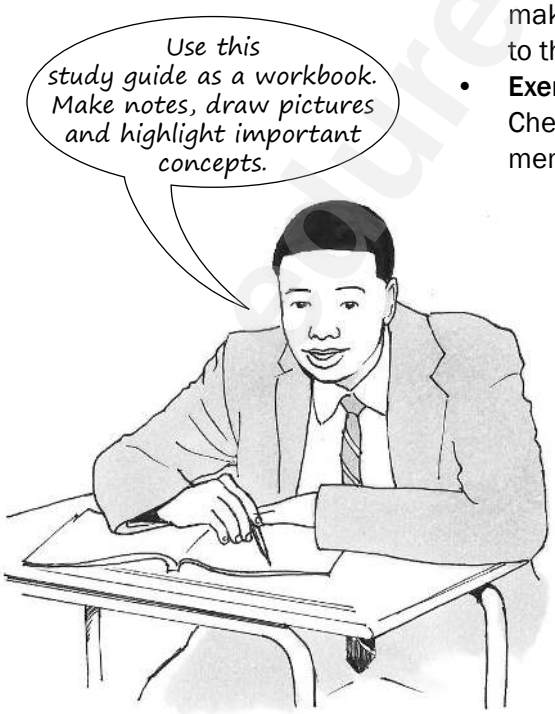
How to use this study guide

This study guide covers **selected aspects** of the different topics of the Grade 12 Geography curriculum in the order that it is usually taught during the year. The selected aspects of each topic are presented in the following way:

- An explanation of terms and concepts
- Worked examples to explain and demonstrate
- Activities with questions for you to answer
- Answers for you to use to check your own work

NB	Pay special attention	hint	Hints to help you remember a concept or guide you in solving problems	e.g.	Worked examples
	Step-by-step instructions	exams	Refers you to exam questions		Activities with questions for you to answer

- We have provided you with a **chapter organogram** at the beginning of each section to focus your thinking and give you an overview of each section.
- The study guide includes a table of **key concepts with definitions** which need to be learnt off by heart. You can gain easy marks for the recall of definitions in the single mark questions.
- A **checklist from the exam guidelines** for Geography has been provided on pages xv to xviii for you to keep track of your progress. Once you have mastered the core concepts and have confidence in your answers to the questions provided, tick the last column of the checklist.
- The **activities are based on exam-type questions**. Cover the answers and do the activity on your own. Then check your answers. Reward yourself for the things you get right. If you get any incorrect answers, make sure you understand where you went wrong before moving on to the next section.
- **Exemplar Exam paper** is included in the study guide for you to do. Check your answers by looking back at your notes and the exam memoranda.



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Top 10 study tips

1. Have all your materials ready before you begin studying – pencils, pens, highlighters, paper, etc.

2. Be positive. Make sure your brain holds on to the information you are learning by reminding yourself how important it is to remember the work and get the marks.

3. Take a walk outside. A change of scenery will stimulate your learning. You'll be surprised at how much more you take in after being outside in the fresh air.

4. Break up your learning sections into manageable parts. Trying to learn too much at one time will only result in a tired, unfocused and anxious brain.

5. Keep your study sessions short but effective and reward yourself with short, constructive breaks.

6. Teach your concepts to anyone who will listen. It might feel strange at first, but it is definitely worth reading your revision notes aloud.

7. Your brain learns well with colours and pictures. Try to use them whenever you can.

8. Be confident with the learning areas you know well and focus your brain energy on the sections that you find more difficult to take in.

9. Repetition is the key to retaining information you have to learn. Keep going, don't give up.

10. Sleeping at least 8 hours every night, eating properly and drinking plenty of water are all important things you need to do for your brain. Studying for exams is like strenuous exercise, so you must be prepared physically.

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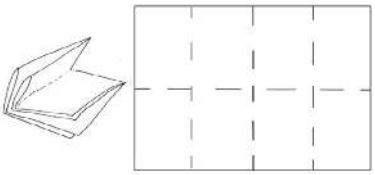
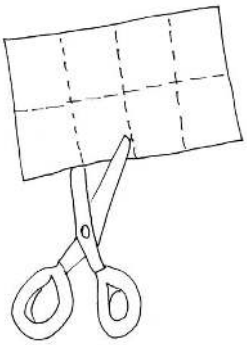
Study skills to boost your learning

This guide makes use of three study techniques you can use to help you learn the material:

- Mobile notes
- Mnemonics
- Mind maps

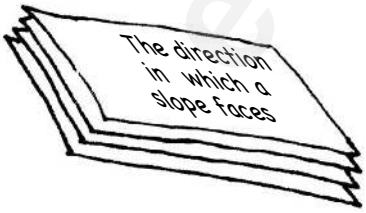
Mobile notes





1. Fold an A4 paper into 8 squares. Cut or tear neatly along the folded lines.

2. Write the basic concept on one side of a bit of paper.



3. Write the definition of the basic concept on the back of the piece of paper.

Mobile notes are excellent tools for learning all the key concepts in the study guide. Mobile notes are easy to make and you can take with them with you wherever you go:

1. Fold a blank piece of paper in half. Fold it in half again. Fold it again.
2. Open the paper. It will now be divided into 8 parts.
3. Cut or tear neatly along the folded lines.
4. On one side, write the basic concept.
5. On the other side, write the meaning or the explanation of the basic concept.
6. Use different colours and add pictures to help you remember.
7. Take these mobile notes with you wherever you go and look at them whenever you can.
8. As you learn, place the cards in three different piles:
   - I know well
   - Getting there
   - I need more practice
9. The more you learn them, the better you will remember them.

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Mnemonics

A **mnemonic** code is a useful technique for learning information that is difficult to remember. This is an example of a word mnemonic using the word MAPPING where each letter of the word stands for something else:

M – Make an effort

A – Apply yourself to your studies

P – Practise, practise, practise your mapwork

P – Prepare well for the exams

I – Ignite your passion for Geography

N – Notice your subject around you

G – Go for it – the stars are the limit!

Mnemonics code information and make it easier to remember.

The more creative you are and the more you link your 'codes' to familiar things, the more helpful your mnemonics will be.

This guide provides several ideas for using mnemonics. Be sure to make up your own.

Geography brings us all down to Earth!

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Mind maps

There are several mind maps included in this guide, summarising some of the sections.

Have a look at the following pictures of a brain cell (neuron) and a mind map:

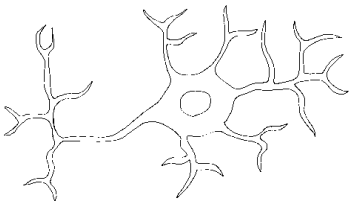


Figure 1: Brain cell or neuron

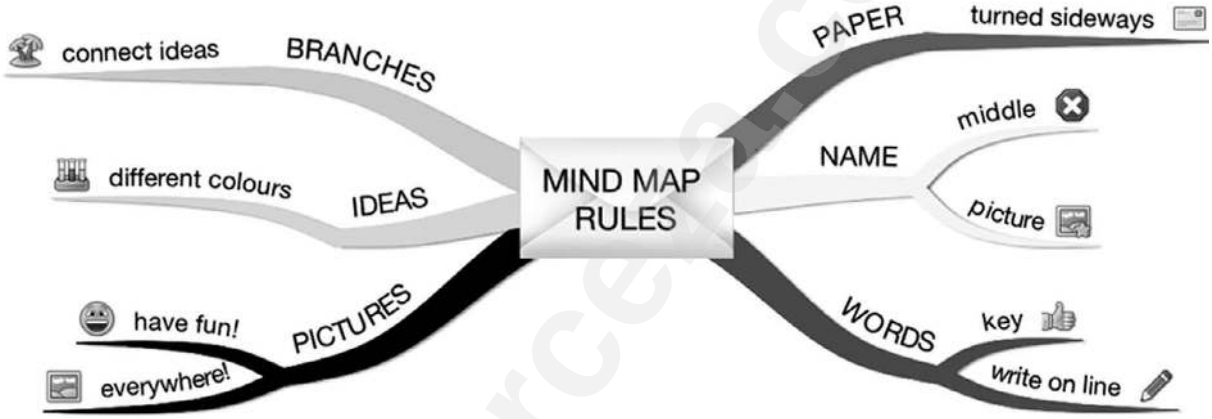
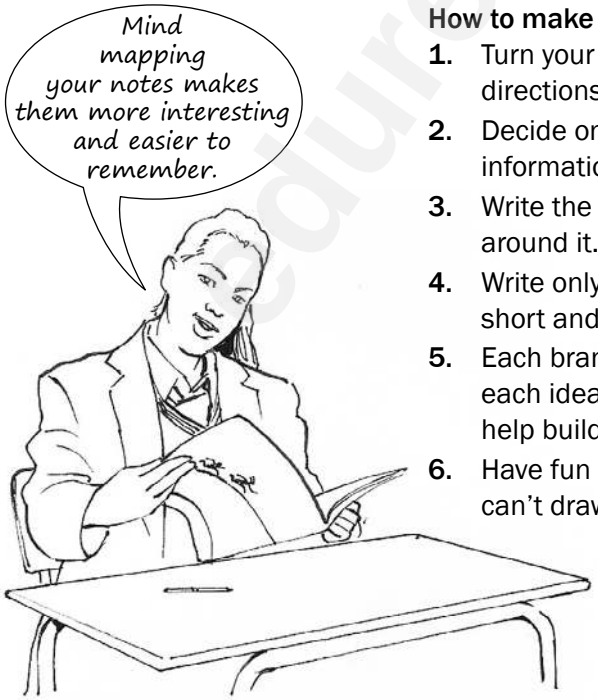


Figure 2: Mind map rules

Mind maps work because they show information that we have to learn in the same way that our brains 'see' information.

As you study the mind maps in the guide, add pictures to each of the branches to help you remember the content.

You can make your own mind maps as you finish each section.



How to make your own mind maps:

1. Turn your paper sideways so your brain has space to spread out in all directions.
2. Decide on a name for your mind map that summarises the information you are going to put on it.
3. Write the name in the middle and draw a circle or bubble or picture around it.
4. Write only key words on your branches, not whole sentences. Keep it short and simple.
5. Each branch should show a different idea. Use a different colour for each idea. Connect the information that belongs together. This will help build your understanding of the learning areas.
6. Have fun adding pictures wherever you can. It does not matter if you can't draw well.

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On the day of the exam …

1. Make sure you have all the necessary stationery for your exam, i.e. pens, pencils, eraser, protractor, compass, **calculator (with new batteries)**, 30 cm ruler as well as your ID document and exam admission letter.

2. Arrive on time, at least one hour before the start of the exam.

3. Go to the toilet before entering the exam room. You don't want to waste valuable time going to the toilet during the exam.

4. Use the 10 minutes reading time to read the instructions carefully. This helps to 'open' the information in your brain. Start with the question you think is the easiest to get the flow going. In the mapwork exam, use this time to look carefully at the whole map.

5. Break the questions down to make sure you understand what is being asked. If you don't answer the question properly you won't get any marks for it. Look for the key words in the question to know how to answer it. A list of these words is on page ix of this study guide.

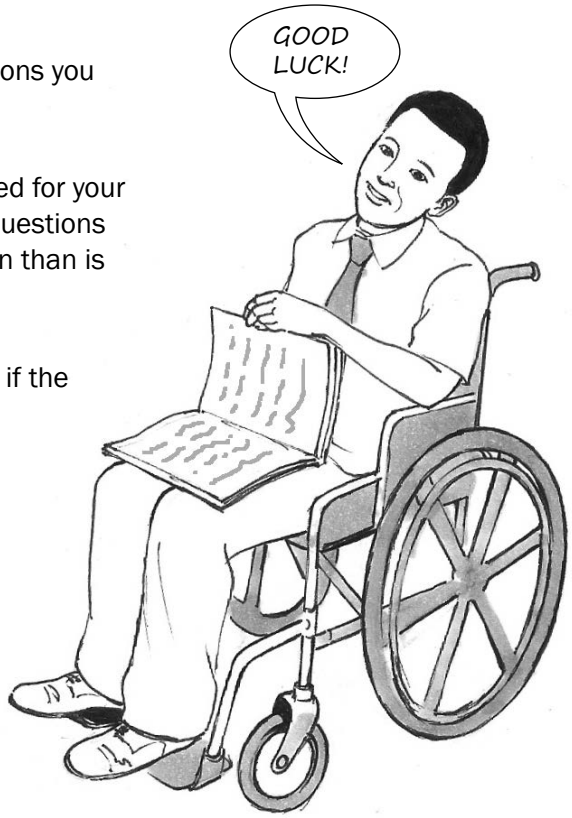
6. Try all questions. Each question has some easy marks in it so make sure that you do all the questions in the exam.

7. Never panic, even if the question seems difficult at first. It will be linked with something you have covered. Find the connection.

8. Manage your time properly. Don't waste time on questions you are unsure of. Move on and come back if time allows.

9. Check weighting – how many marks have been allocated for your answer? Take note of how marks are allocated to the questions in this study guide. Do not give more or less information than is required.

10. Write big and bold and clearly. You will get more marks if the marker can read your answer clearly.



If you can dream it, you can do it.

Walt Disney

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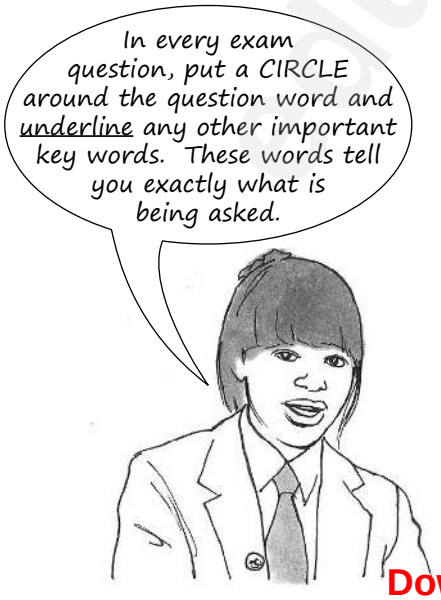
Question words to help you answer questions

It is important to look for the question words (the words that tell you what to do) to correctly understand what the examiner is asking. Use the words in the following table as a guide when answering questions.

Question word	What is required of you
Account for	Explain the cause of; explain why; give reasons for
Analyse	Separate; examine and interpret critically; positives and negatives; pros and cons
Annotate	To add explanatory notes to a sketch, map or drawing
Argue	Put forward reasons in support of or against a statement
Classify	Place things with similar characteristics in the same group; to arrange according to type or sort
Comment	Give your opinion, based on facts
Compare	To list both similarities and differences
Contrast	Stress the differences between things, events or problems
Define	Give a concise and clear meaning
Demonstrate	Show or make clear; illustrate or explain; prove by reasoning and evidence (note that you can give examples)
Describe	List the main characteristics of something; give an account of (note that a diagram or map may be part of a description)
Discuss	Give the reasons for your statement; present both sides and reach a conclusion
Evaluate	Express an opinion, using evidence, of how good/bad, negative/positive, successful/ unsuccessful something is
Explain	Make clear, interpret, and spell out the material you present. Give reasons for differences of opinion or of results
Give	To state facts without discussions or explanations (note that you may be asked to 'Give a reason')
Identify	Name a feature from the source material
Interpret	To give an explanation of; to give the meaning of



e.g. Examples of question words

1. Draw a longitudinal profile of a river (from source to mouth) and show the upper, middle and lower course. (4 × 1 = 4)
2. List two features of the upper course of a river. (2 × 2 = 4)
3. Describe a river in its lower course. (2 × 2 = 4)
4. Describe one difference between the river channel in the upper course and the lower course. (2 × 2 = 4)

[16]

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Learner's checklist

Use this checklist to monitor your progress when preparing for the exam. **The ticks (✓) tell you which parts of the curriculum are covered in this study guide. The stars (*) tell you to go to textbooks and class notes.**

Aspect of the curriculum		Covered in study guide	I do not understand	I understand
CLIMATE AND WEATHER				
1. Mid-latitude cyclones	General characteristics	✓		
	Areas where mid-latitude cyclones form	✓		
	Stages of development	*		
	Cold front conditions	✓		
	Warm front conditions	*		
	Occluded fronts	*		
	Identification on synoptic charts and on a satellite image	✓		
2. Tropical cyclones	General characteristics	✓		
	Factors causing tropical cyclones	✓		
	Areas where tropical cyclones form	✓		
	Stages in formation	*		
	Associated weather patterns	*		
	Identification on synoptic charts and satellite images	✓		
	Impact on human activities and the environment	*		
	Possible precaution and management of the effects	*		
3. Subtropical anticyclones and associated weather conditions	Factors affecting South African climate	✓		
	Location of the high pressure systems	*		
	General characteristics of the high pressure systems	*		
	Anticyclonic circulation	*		
	Travelling disturbances: Mid-latitude and tropical cyclones, line thunderstorms, berg winds	*		
	Reading and interpreting satellite images and synoptic weather maps			
4 Valley climates	Slope aspect	✓		
	Anabatic winds	✓		
	Katabatic winds	✓		
	Inversions	✓		
	Frost pockets	✓		
	Influence on human activities (settlement and farming)	✓		

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5. City climates	Reasons for differences between rural and urban climates	✓		
	Urban heat islands	✓		
	Pollution dome	✓		
	Ways to reduce the urban heat island effects	✓		
GEOMORPHOLOGY				
Drainage systems of South Africa				
	1. Drainage basins	✓		
	2. Drainage patterns	✓		
	3. Drainage density	✓		
	4. Types of rivers	✓		
5. Discharge of rivers	Hydrographs Laminar flow Turbulant flow	✓		
6. River profiles	Cross profile Longitudinal profile	✓		
7. Fluvial landforms		✓		
8. River grading		✓		
9. Rejuvenation	Reasons Landforms	✓		
10. River capture/Stream piracy		✓		
11. Catchment and river management		✓		
RURAL SETTLEMENT AND URBAN SETTLEMENT				
1. Study of settlements	Concept of settlement Site and situation	✓		
2. Study of settlements	Patterns Size Complexity Functions	✓		
3. Rural settlement				
3.1 Site and situation of the rural settlements		✓		
3.2 Classification of rural settlements	Patterns Shape	✓		
4. Land use in rural areas		✓		
5. Rural settlement issues		✓		
5.1 Rural-urban migration		✓		

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5.2 Rural depopulation and its consequences on rural areas		*		
5.3 Ways to address rural depopulation		✓		
5.4 Social justice issues in rural areas		✓		
URBAN SETTLEMENT				
6. The origin of urban settlements		*		
7. Site and situation of the urban settlements		✓		
8 Classification of urban areas		✓		
8.1 Function	Central place towns Trade and transport Specialised cities	✓		
9. Urban Hhierarchy		✓		
10. Urban structures and patterns		✓		
11. Land use zones		✓		
12. Morphological structure of a city		✓		
13. Models of the urban structures		✓		
14. Urban settlement issues 14.1 Problems in the urban settlements		✓		
15. Environmental, economic and social injustice		✓		
ECONOMIC GEOGRAPHY OF SOUTH AFRICA				
1. Structure of the economy		✓		
1.1 Economic sectors	Primary Secondary Tertiary Quaternary	✓		
1.2 Contribution of the economic sectors	Primary	✓		
2. Agriculture/Farming		✓		
2.1 The role of small and large scale farmers	Importance of farming	✓		

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2.2 Main products		*		
2.3 Factors influencing farming in South Africa	Promote/Favour Hinder/Restrict/Limit	✓		
2.4 Food security and insecurity		✓		
3. Mining		✓		
3.1 Contribution of mining/Role of mining		✓		
3.2 Factors influencing mining in South Africa	Promote/Favour Hinder/Restrict/Limit	✓		
4. Secondary and tertiary sectors		✓		
4.1 Contribution of secondary and tertiary sector	Secondary sector	✓		
Types of Industries		*		
Factors influencing industrial development and their location	Promote/Favour Hinder/Restrict/Limit	✓		
South Africa's industrial regions	Gauteng (PWV) Ethekwini (Durban-Pinetown) Nelson Mandela Metro (Port Elizabeth-Uitenhage South Western Cape	✓		
Strategies for industrial development	Post-apartheid industrial development Spatial development initiatives Industrial development zones	✓		
Informal sector	Characteristics	✓		
	Reasons for development	✓		
	Challenges facing Informal Sector	✓		
5. Quartenary economic activiites		✓		
GEOGRAPHICAL SKILLS AND TECHNIQUES				
1. Mapwork techniques		✓		
2. Application		✓		
Photographs				
3. Photographs used in mapwork		*		
4. Application		✓		
5. GIS		✓		

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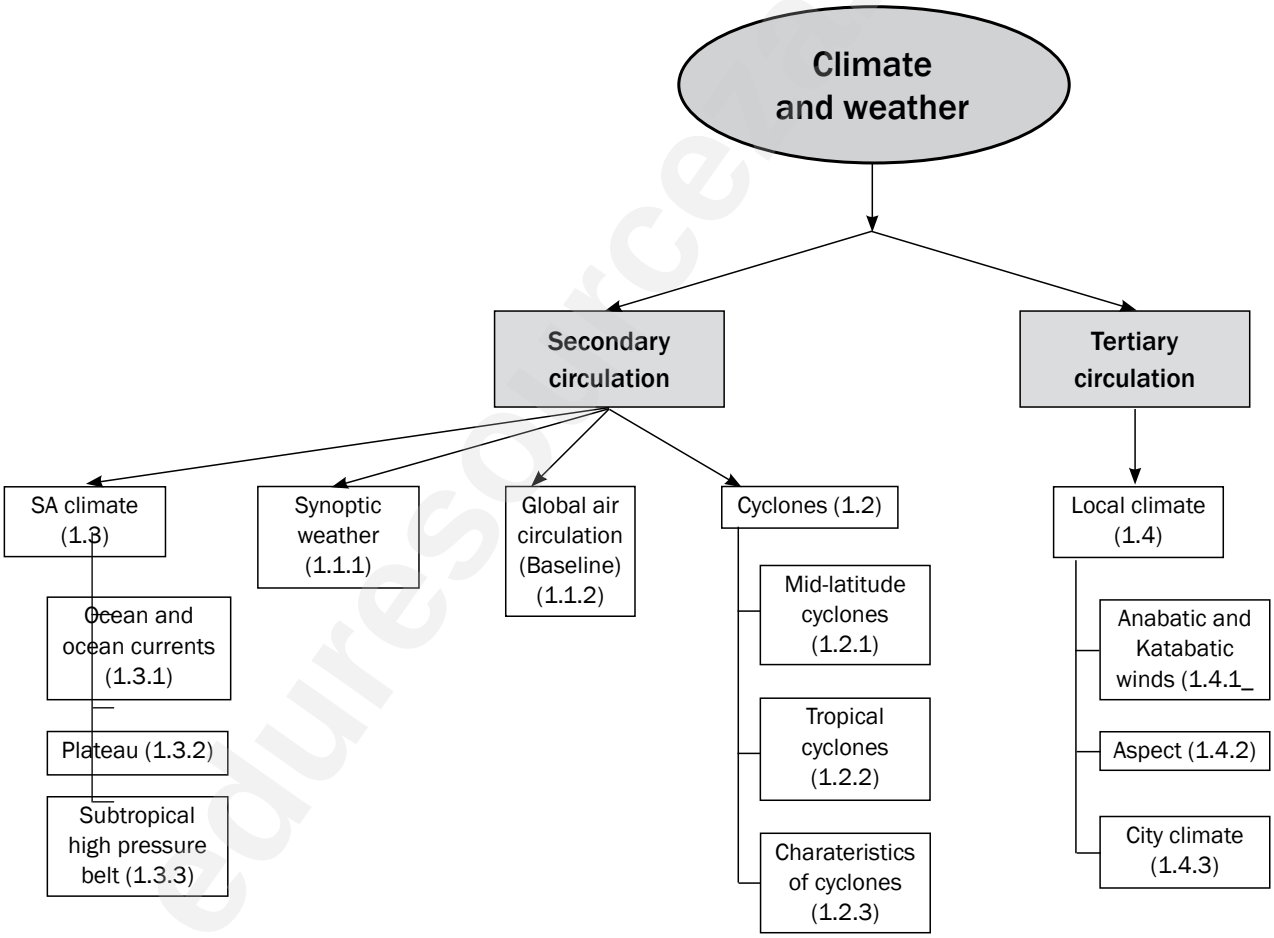
Chapter 1

Climate and weather

This chapter covers **secondary** (regional) and **tertiary** (local) **circulations** or **weather patterns.** This knowledge will enable you to analyse weather patterns and the microclimate of cities and valleys in the exam.



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Key concepts

NB

If you know and understand the definitions in this chapter, you will be able to answer most of the questions in the climate and weather (climatology) section of the final exam. Use your mobile notes to learn these concepts well (see page x for instructions on how to make them). Adding pictures to your mobile notes will help you remember the concepts.

CONCEPT	DEFINITION
Anabatic winds	Warm winds that blow up a valley slope during the day.
Anticyclone (high pressure)	Forms as a result of sinking air. Air movement is anticlockwise, divergent (outwards), subsiding (sinking) in the southern hemisphere, e.g. South Atlantic High, South Indian High and Kalahari High.
Aspect	The direction in which a slope faces.
Berg winds	Hot, dry winds that blow from the interior of South Africa to coastal areas.
Climate change	Long-term changes to the global climate, resulting in unusual and extreme (stronger) weather conditions.
Cyclone (low pressure)	Forms as a result of rising air. Air movement is clockwise, convergent (inwards), rising (convection) in the southern hemisphere, e.g. coastal low, tropical cyclone, mid-latitude cyclone.
Heat island	Higher temperatures in urban areas than the surrounding rural area. There are many causes of heat island including pollution.
Inversion layer	Zone where sinking cold air meets with the rising warm air. A layer of the atmosphere in which temperature increases with height.
Inter-tropical convergence zone (ITCZ)	An area along the equator where the tropical easterlies from both hemispheres meet.
Katabatic winds	Cold winds that blow down a valley slope at night.
Polar Easterlies	Winds that blow from the pole towards subpolar low pressure belts (90° to 60°).
Temperature inversion	Temperature increasing with height.
Thermal belt	Zone of warmer temperature above the valley floor.
Tropical easterlies/trade winds	Winds that blow from the subtropical high belts towards the equatorial low pressure belt (0° to 30°).
Westerlies	Winds that blow from the subtropical high pressure belts to the subpolar low pressure belts (30° to 60°).

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1.1 Introduction

Our focus will be on the South African climate, mid-latitude cyclones, tropical cyclones, sub-tropical anticyclones and local climate (valley and city climate). But first we need to understand synoptic weather charts (maps), and satellite images.

1.1.1 Synoptic weather map interpretation

Synoptic weather maps are very often tested in the exam.

To better understand weather patterns and weather phenomena you need to be able to interpret the synoptic weather map. A **synoptic weather map** shows weather conditions and phenomena (temperature, precipitation, wind speed and direction, atmospheric pressure and cloud coverage) over a wide area at a given time based on worldwide observations recorded at the same time (from weather stations, airplanes, weather balloons and satellites).

On a synoptic weather map there are lines called **isobars**:

- These lines join points of equal pressure (all along one isobar the pressure is the same).
- The pressure is measured in hectopascals (hpa)/millibars (mb).
- The isobars form patterns (shapes formed by many isobars). Figures 1.1.1A and B show a low pressure and a high pressure cell.

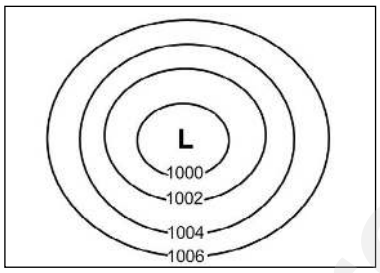

Figure 1.1.1A: Low pressure cell as seen on a synoptic weather chart

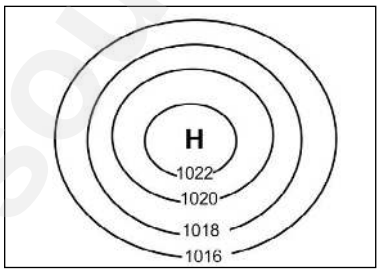

Figure 1.1.1B: High pressure cell as seen on a synoptic weather chart

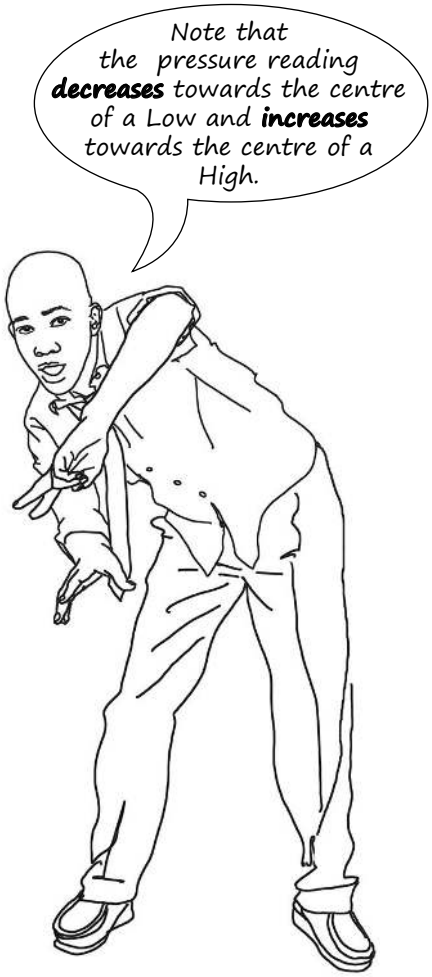

Figure 1.1.1C on page 4 shows a simple **weather station**. It describes the weather of a particular place that is found on a synoptic weather map.

In the exam, you may be asked to describe the weather of a particular place on the synoptic weather map by referring to the weather station. You will need to comment on the following weather elements:

- Cloud cover
- Wind direction
- Wind speed
- Air temperature
- Dew point temperature
- Precipitation (any form of water falling from the sky, e.g. rain, hail, snow and ice)

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Note the following weather conditions for this weather station:	
Wind speed	15 knots
Wind direction	NW
Air temperature	27 °C
Precipitation	rain
Dew point temperature	24 °C
Cloud cover	overcast

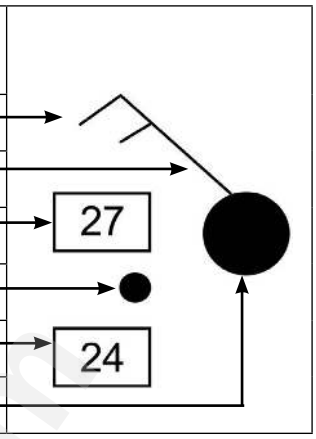
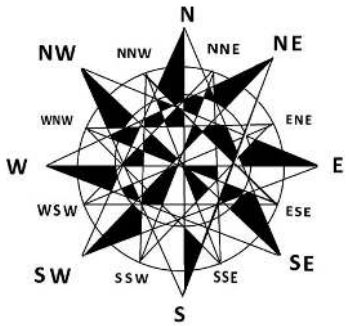


Figure 1.1.1C: An example of a weather station

Make sure you know the weather symbols shown in Figure 1.1.1D (right). They will help you to write this type of question.

Cloud cover	Wind speed	Precipitation
clear	5 knots	rain
¾ cloudy	10 knots	drizzle
overcast	15 knots	showers
	20 knots	snow
		hail
		fog
		mist
		thunderstorms
		thunderstorms with hail

Figure 1.1.1D Weather symbols used on a synoptic weather chart



When answering questions based on a synoptic weather chart in the exam, you will be given either a summer synoptic chart (see Figure 1.1.1E) or a winter synoptic chart (see Figure 1.1.1F). Make sure you know which features to look out for on the chart you are given.

Summer synoptic chart

Figure 1.1.1E shows a typical **summer synoptic weather** chart of South Africa. The features of a summer synoptic chart to note are:

1. Tropical cyclone (look for the symbol on the synoptic chart)
2. Low pressure over the land (see the low pressure cell in Figure 1.1.1E)
3. The date
4. South Indian high pressure found south east of South Africa is further south (see the high pressure cell in Figure 1.1.1E)
5. Generally high temperatures over the land

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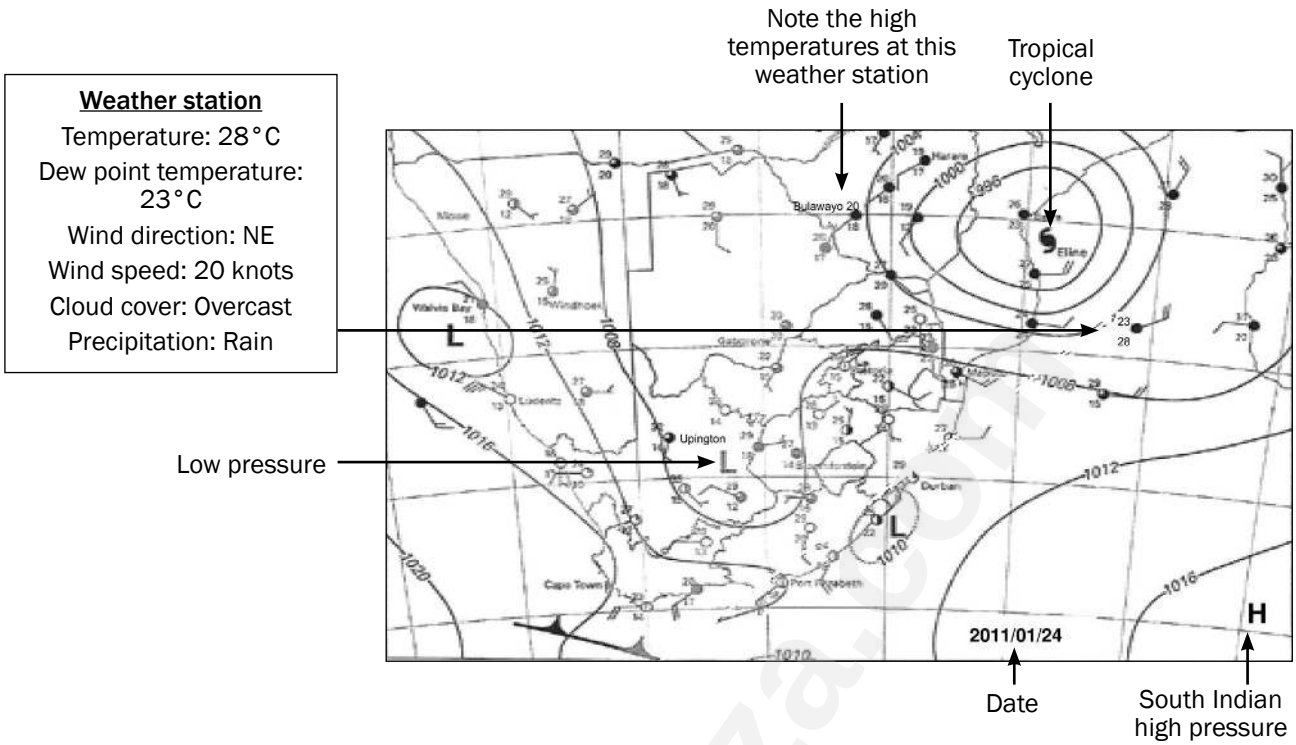

Figure 1.1.1E: A typical summer synoptic weather chart of South Africa

Winter synoptic weather chart

Figure 1.1.1F shows a typical winter synoptic weather chart of South Africa.
The features of a winter synoptic weather chart to note are:

1. Cold fronts moving over the land
2. Dominant Kalahari high pressure over the land (look for a large high pressure cell over the land)
3. The date
4. South Indian high pressure and the South Atlantic high pressure are closer to the land and further north
5. Generally low temperatures over the land

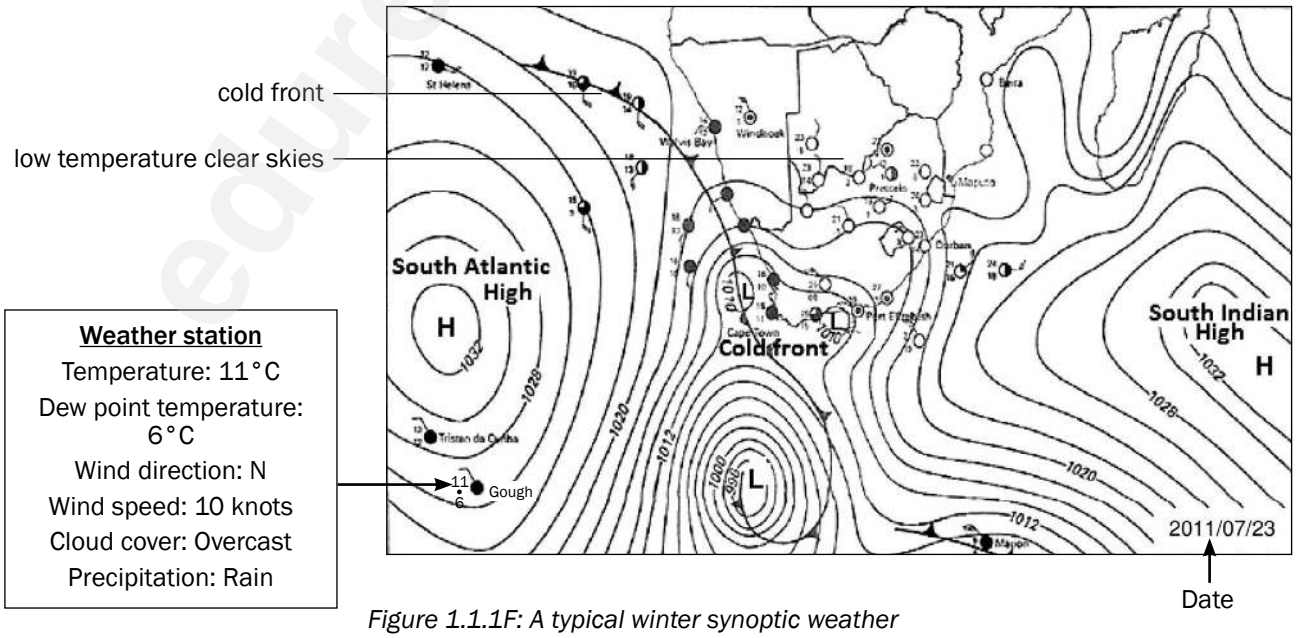

Figure 1.1.1F: A typical winter synoptic weather chart of South Africa

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1.1.2 Global air circulation

These are winds that cover large areas over the Earth's surface. There are **three global wind systems**:

- The tropical easterlies
- The westerlies
- The polar easterlies

NB

Learn to redraw Figure 1.1.2 and label it from memory.

A force called **Coriolis force** causes global winds to move to the left in the southern hemisphere and to the right in the northern hemisphere.

The tri-cellular arrangement, the pressure belts and the global winds together form the **global air circulation**. This is shown in Figure 1.1.2 below.

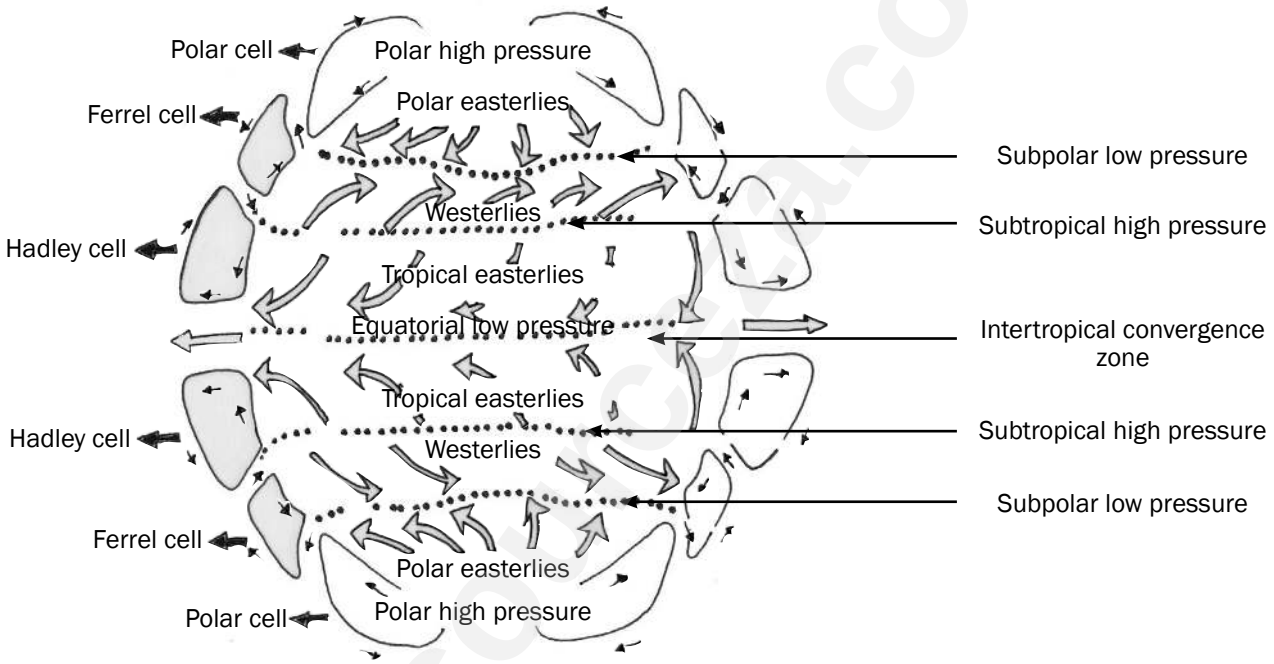

Figure 1.1.2: Global air circulation

1.2 Cyclones

1.2.1 Mid-latitude cyclones

In this section, we look at **mid-latitude cyclones** in more detail. We will focus on the cross-section through a mature mid-latitude cyclone and the weather that occurs as a result of the cold front. This is the most frequently tested section as South Africa is mostly affected by the passage of cold fronts.

Figure 1.2.1A shows a cross-section through a mid-latitude cyclone. You must be able to label and sketch the cross-section from a synoptic view, as shown in Figure 1.2.3A (see page 10, table 1.1).

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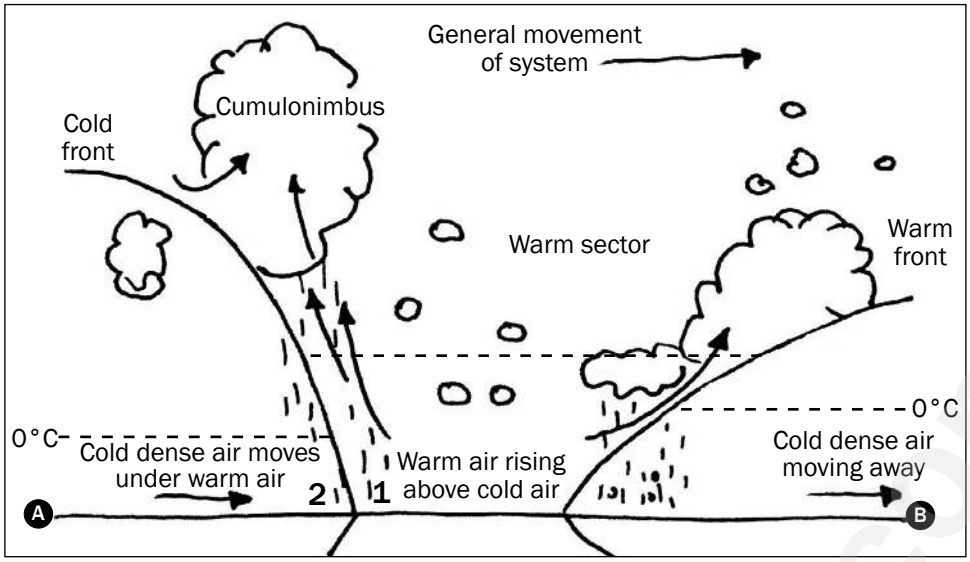

Figure 1.2.1A: Cross-section from A to B through a mature mid-latitude cyclone (from synoptic view in Figure 1.2.3A)

As a mid-latitude cyclone moves towards South Africa, it is the **cold front** that mostly affects our weather (see Figure 1.2.1C on page 8).

Weather in front of the cold front (see point 1 in Figure 1.2.1A above):

- Cool temperatures
- Very low pressure
- Overcast conditions, cumulonimbus clouds
- Thunderstorms

Weather behind the cold front (see point 2 in Figure 1.2.1A above):

- Cold temperatures
- High pressure
- Partly cloudy conditions, cumulus clouds
- Light rain

Note that as a mid-latitude cyclone moves from west to east, we experience the warm air mass in front of the cold front first, then the air behind the cold front. This can be seen in Figure 1.2.1A (above) as you move over from point 1 to 2.

Figure 1.2.1B (below) shows the weather conditions before and after the cold front.

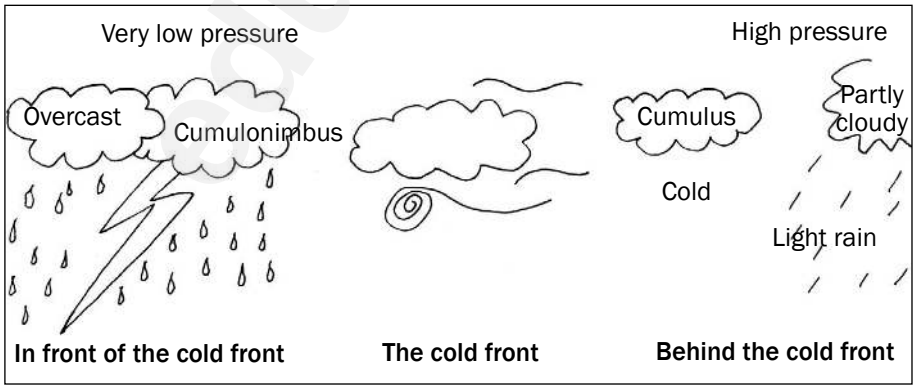

Figure 1.2.1B: Weather conditions before and after the cold front

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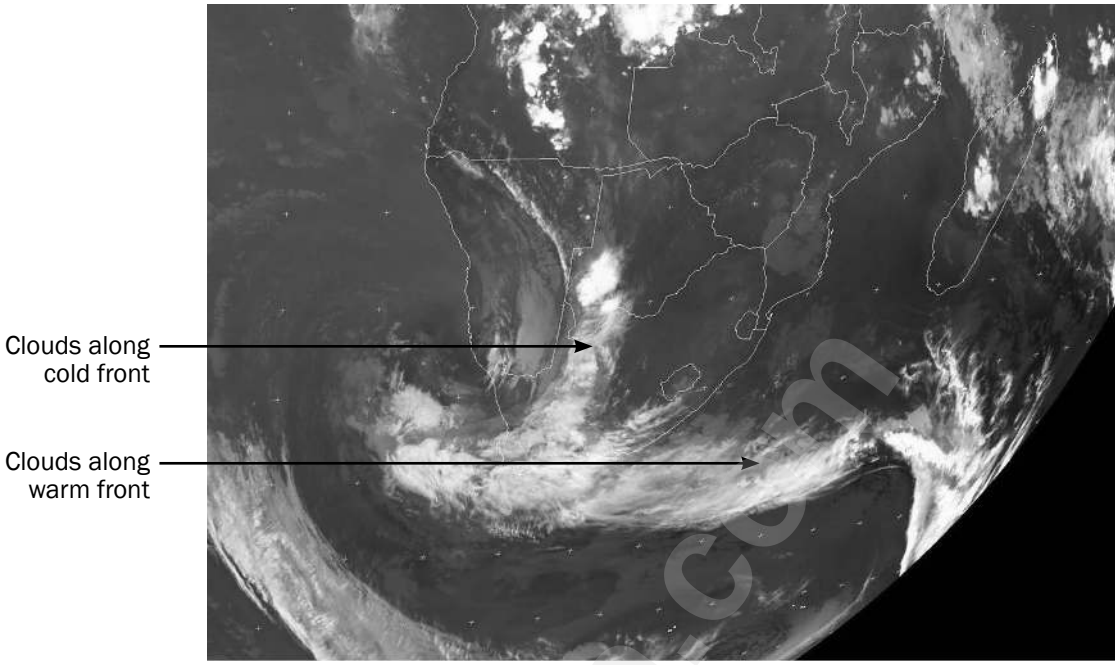
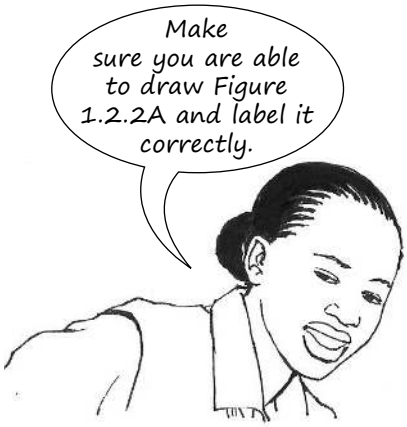


Figure 1.2.1C Satellite image of a mid latitude cyclone



1.2.2 Tropical cyclones

A **tropical cyclone** is a type of low pressure system which generally forms in the tropics (between 5 °C and 30 °C North and South). It is accompanied by thunderstorms and a circulation of winds near the Earth's surface, which is clockwise in the southern hemisphere and counter-clockwise in the northern hemisphere. Tropical cyclones are also known as hurricanes in America; typhoons in China and Japan; and willywillies in Australia. Tropical cyclones are given names alphabetically within the season in which they occured. For example, 'Alfred' will denote that it is the first tropical cyclone to occur in that season.

We will now look at **tropical cyclones** in more detail by focusing on the cross-section through a mature tropical cyclone.

In order for the tropical cyclone to occur there should be:

- temperature of 27 °C and more
- Coriolis force
- enough moisture
- less function

Figure 1.2.2A shows a cross-section through a tropical cyclone. You must be able to label and sketch the cross-section from a synoptic view as shown in Figure 1.2.3A (see page 10, table 1.1).

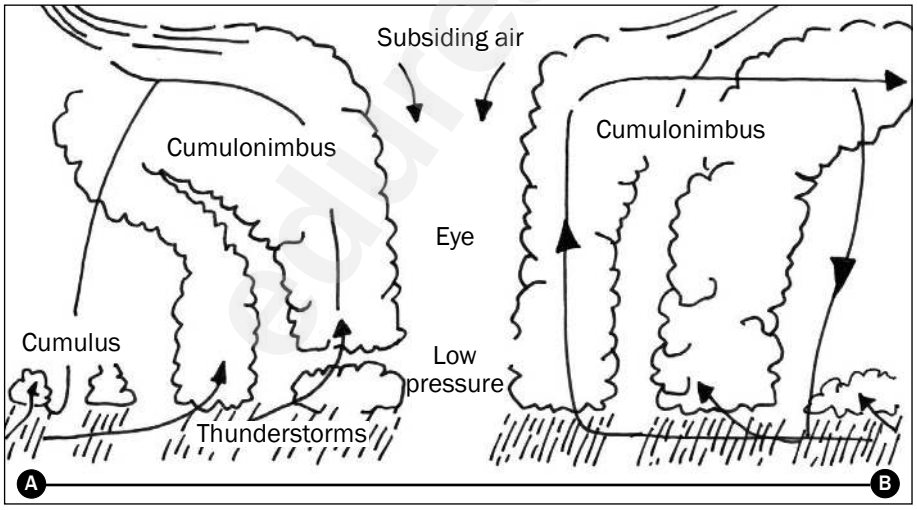


Figure 1.2.2A: Cross-section from A to B through a tropical cyclone (from synoptic view in Figure 1.2.3B) (page 10, table 1.1)

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1.2.3 Characteristics of mid-latitude cyclones and tropical cyclones

1. Multiple-choice questions

Example:

Another name for a mid-latitude cyclone is:

1. **Temperate cyclone**
2. Tropical storm
3. Typhoon
4. Tropical cyclone

(Correct answer is **underlined**)

2. Short answer questions

Example:

List two characteristics of a tropical cyclone.

Answer:

1. Accompanied by thunderstorms
2. Eye in the centre

3. Draw a cross-section from A to B

For example, see Figures 1.2.2A and 1.2.3B.

Table 1.1 compares the characteristics of mid-latitude cyclones and tropical cyclones.

	CHARACTERISTICS	
	Mid-latitude cyclone	**Tropical cyclone**
Other names	Frontal depression, temperate cyclone, extra tropical cyclone	Hurricane, typhoon, Willywillies (named alphabetically at the beginning of each season)
Formation	40–60° N and S	around 5° N and S
Occurrence	30–60° N and S	Over tropical oceans 5–30° N and S
Movement	West to east (driven/pushed by Westerlies)	East to west (driven/pushed by Easterlies)
Season	All year round in both hemispheres; affects South Africa in winter	Mid- to late summer, early autumn
Identifying features	Warm front, warm sector, cold front, cold sector	Stormy weather in the vortex; the **eye** is a calm, intense low pressure area
Weather	Weather associated with a cold front: overcast, low temperatures, strong winds, heavy rain	Warm to hot, violent winds; intense thunderstorm activity
Areas affected	Western side of continents in mid-latitudes	Eastern side of continents in tropical latitudes

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Synoptic representation of the cyclones on a weather map

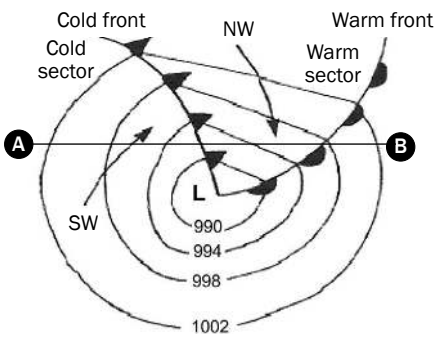


Figure 1.2.3A: Synoptic view of mid-latitude cyclone

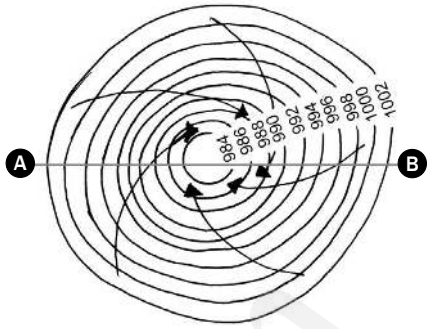
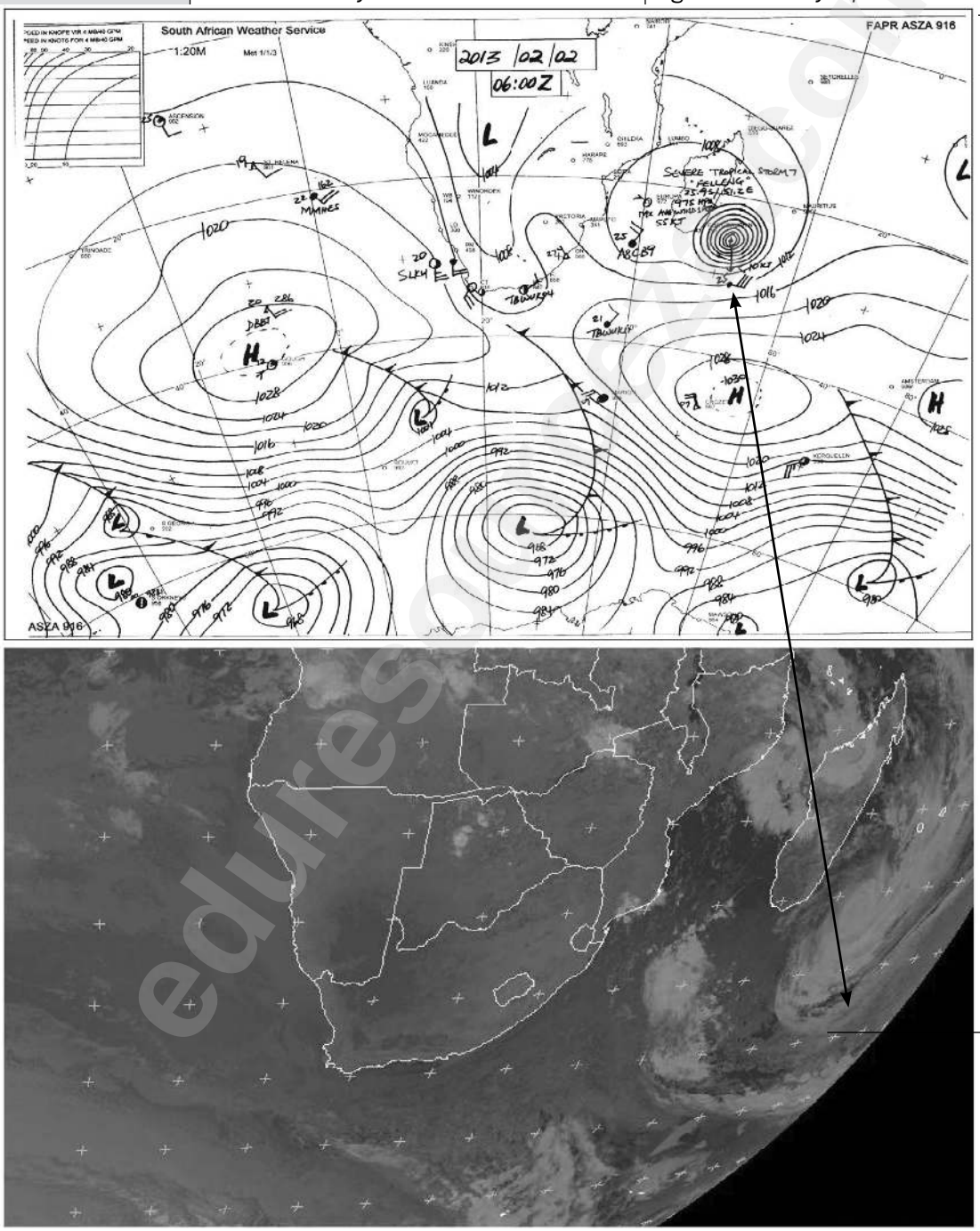


Figure 1.2.3B: Synoptic view of tropical cyclone



Notice the clouds spiralling in clockwise pattern

Figure 1.2.3C Satellite image and a synoptic weather chart of the same day

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1.3 Factors affecting the South African climate

There are three factors that have the greatest impact on South Africa's climate:

- South Africa is surrounded by oceans and ocean currents.
- South Africa is mostly found on a plateau.
- South Africa is affected by the **subtropical high pressure belt**.

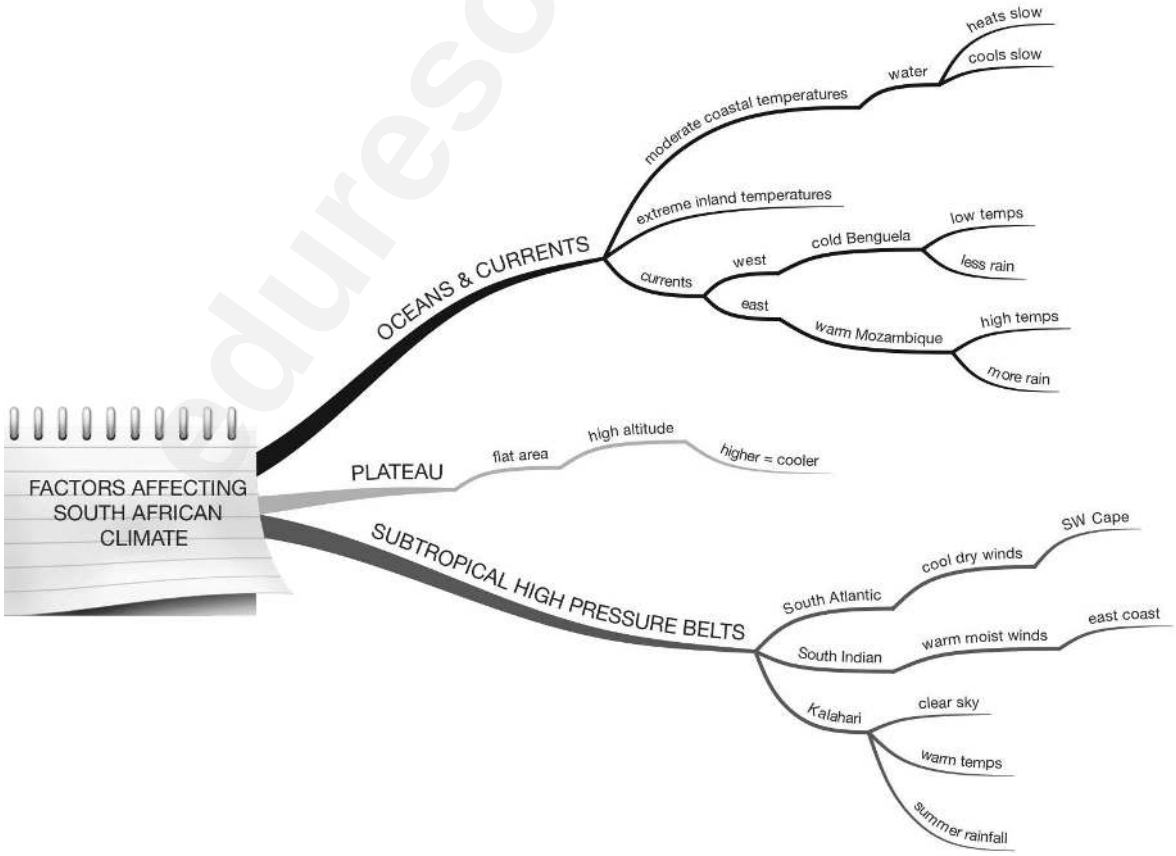
These three factors cause the typical weather we experience in each season. Let us look at each factor in more detail.

1.3.1 The impact of the ocean and the ocean currents on South Africa's climate

Much of South Africa is surrounded by **oceans**. The oceans affect the temperature at the coast and inland as follows:

- Water heats up slowly and cools down slowly.
- This moderates temperatures along the coastline (i.e. the minimum and maximum temperatures are not very far apart) – also known as maritime.
- This causes temperatures inland to be extreme (i.e. the minimum and maximum temperatures are very far apart) – also known as continental.

For example, in winter the temperature in Johannesburg is a maximum of 25 °C and a minimum of 1 °C (extreme), whereas in Durban the maximum is 24 °C and the minimum is 15 °C (moderate).



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The **ocean currents** also affect the temperatures and rainfall:

- The currents on our east and west coasts have the greatest impact on South Africa's climate.
- The warm Mozambique current flows along our east coast.
- The cold Benguela current flows along our west coast.
- The warm Mozambique current causes high temperatures and more rain on the east coast.
- The cold Benguela current causes low temperatures and less rain on our west coast.

Because of the influence of these currents, temperatures are higher on the east coast than on the west coast. Figure 1.3.1A shows the ocean currents that affect South Africa's climate and the resultant minimum temperatures.

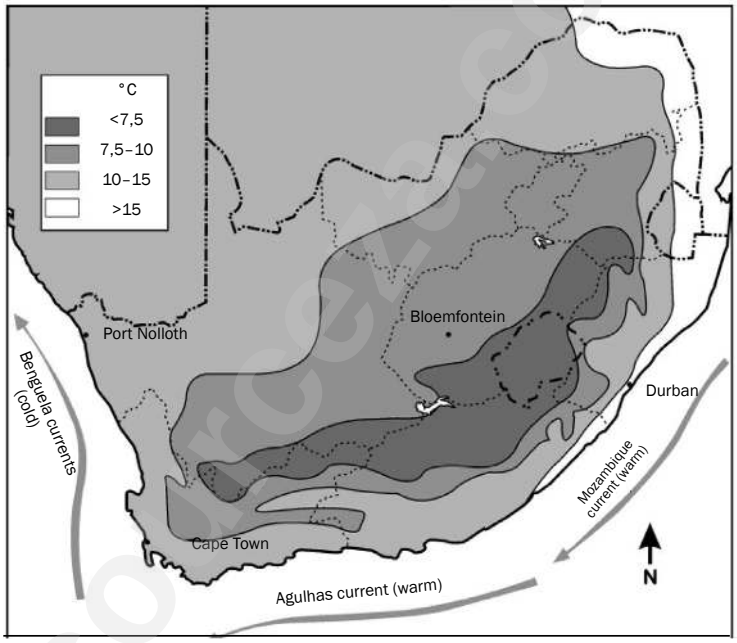

Figure 1.3.1A: The three ocean currents and their effect on minimum temperatures.

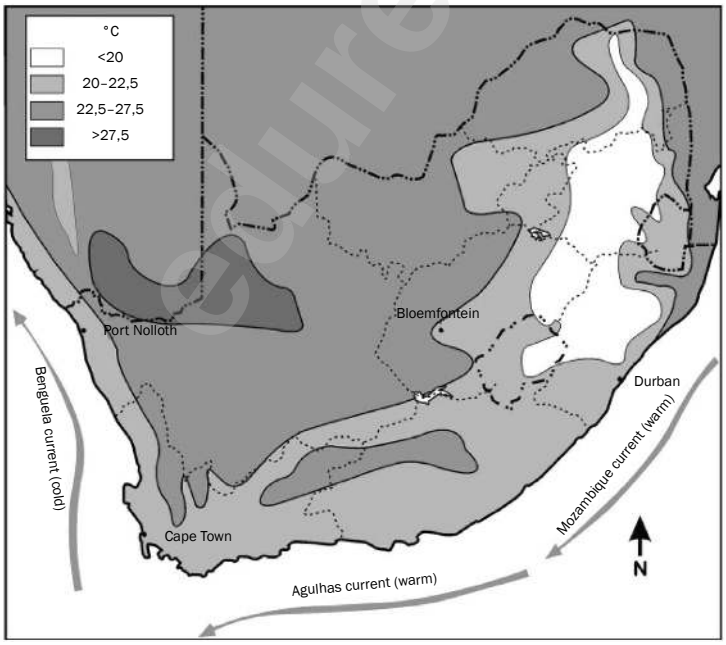

Figure 1.3.1B: The three ocean currents and their effect on maximum temperatures

Figure 1.3.1B shows the ocean currents that affect South Africa's climate and the resultant maximum temperatures.

Figure 1.3.1C shows the seasons in which rainfall is received in South Africa. The black arrow shows how rainfall **decreases** from east to west across the country mainly due to the Mozambique and Benguela currents.

- The east coast gets rain all year round, so it will have a higher rainfall.
- The west coast is an arid (desert) region so it receives very little rain.

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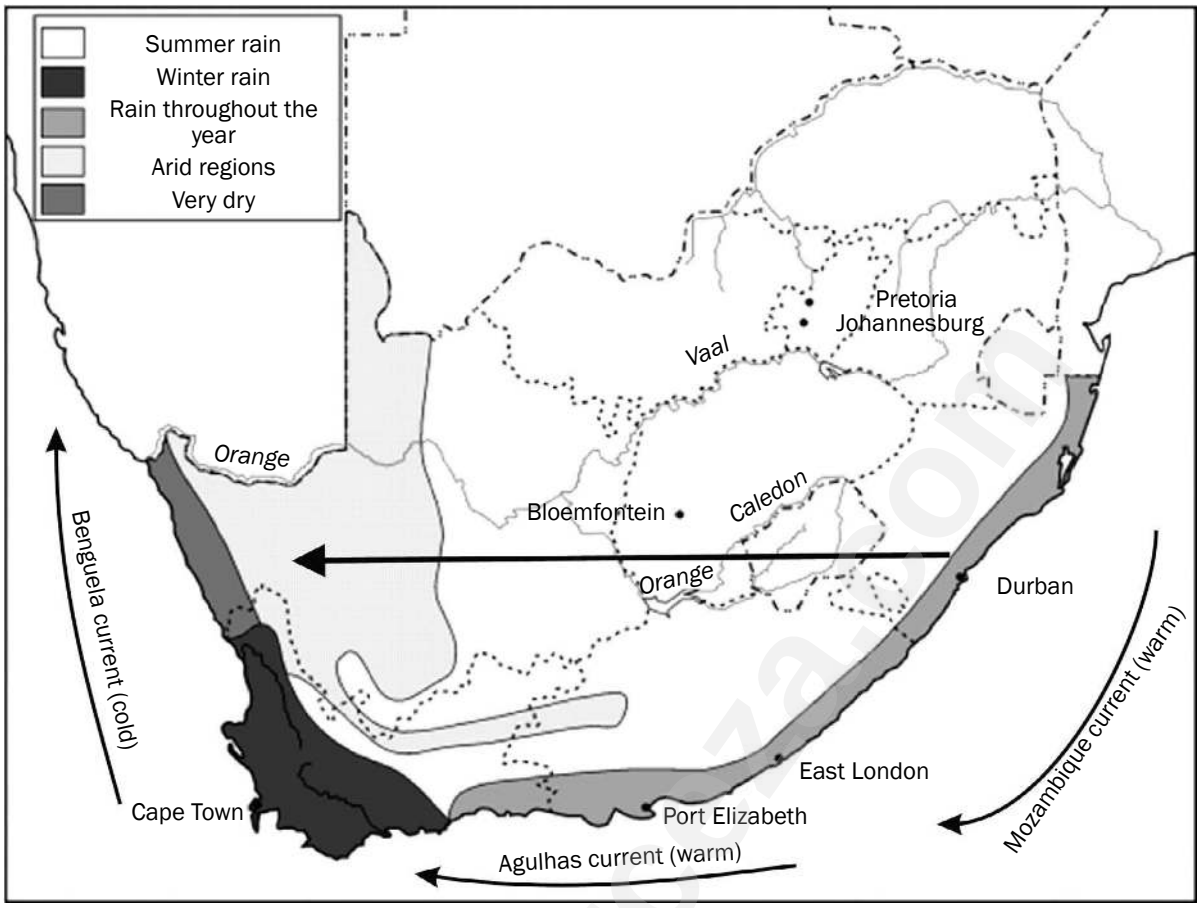

Figure 1.3.1C Rainfall seasons in South Africa

1.3.2 The impact of the plateau on South Africa's climate

South Africa is situated mostly on a **plateau** (a flat area found at a high altitude).

Figure 1.3.2A below is a cross-section of South Africa from west to east showing the relief (landscape) of the country.

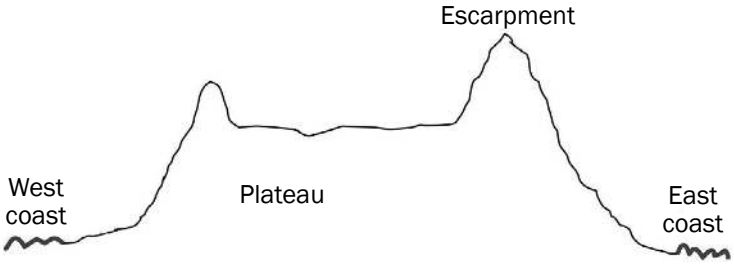

Figure 1.3.2A: Cross-section of South Africa from west to east showing the relief of the country

The higher you go, the cooler it gets. Therefore, places on the plateau (high altitude) will experience lower temperatures than places at a lower altitude.

Places in the Lowveld (Mpumalanga) have higher temperatures than places on the Highveld (Gauteng and Free State).

1.3.3 The impact of the subtropical high pressure belt on South Africa's climate

South Africa is affected by **three high pressure cells**:

- South Atlantic high pressure (SAHP)
- South Indian high pressure (SIHP)
- Kalahari high pressure (KHP)

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Figure 1.3.3A below shows the position of the three high pressure cells in and around South Africa.

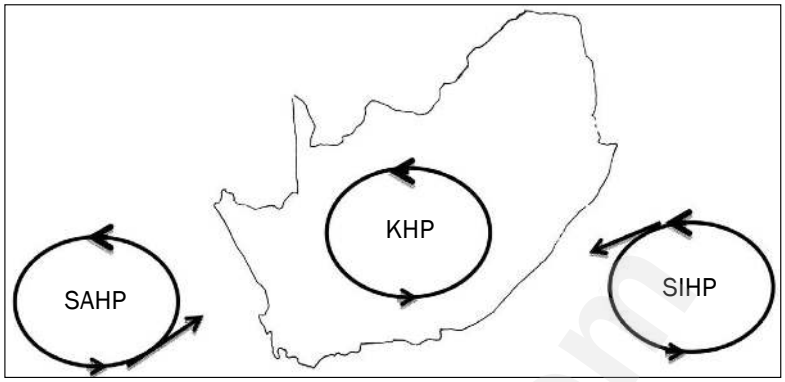

Figure 1.3.3A

- The **South Atlantic high pressure** causes cool, dry winds to blow onto the south-western Cape.
- The **South Indian high pressure** causes warm, moist winds to blow onto the east coast.
- The **Kalahari high pressure** has the greatest impact on South Africa's climate:
  - It causes generally clear skies and warm temperatures because the air is descending and dry (in winter).
  - It results in only summer rainfall occurring on the plateau.

Activity 1

Study the synoptic weather chart in Figure 1.3.3B below and answer the questions that follow.

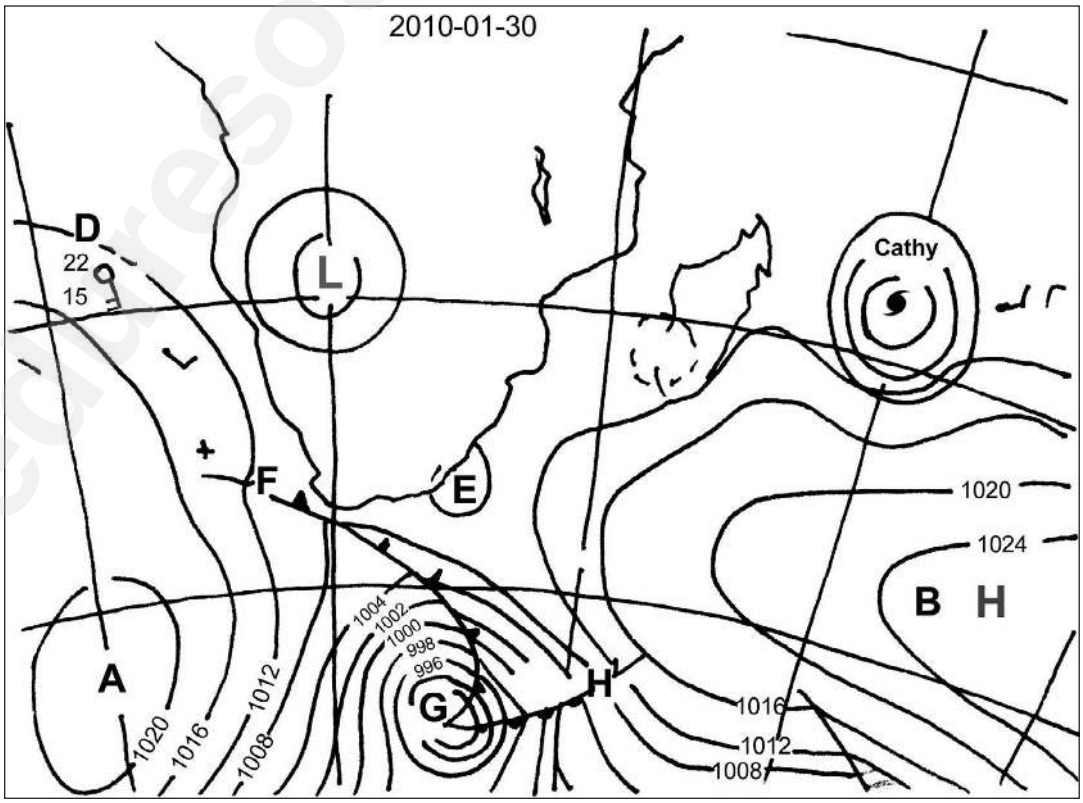

Figure 1.3.3B

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1. Name the high pressure cells labelled A and B. (2 × 2 = 4)
2. Give TWO pieces of evidence from the map that this is a summer map. (2 × 2 = 4)
3. Identify the low pressure cell labelled E. (1 × 2 = 2)
4. The letter G indicates a mid-latitude cyclone.
   a) Name the fronts labelled F and H. (2 × 2 = 4)
   b) In which direction does this cyclone generally move? (1 × 2 = 2)
   c) Describe how front F will affect the weather of Cape Town. (3 × 2 = 6)
5. Refer to the cyclone named Cathy.
   a) What type of cyclone is Cathy? (1 × 2 = 2)
   b) State how many cyclones have occurred for this season, including Cathy. (1 × 2 = 2)
   c) In which direction does this cyclone move? (1 × 2 = 2)
   d) List TWO conditions necessary for this cyclone to form. (2 × 2 = 4)
6. Refer to the weather station labelled D and describe the weather in terms of: cloud cover, wind speed, wind direction, air temperature, dewpoint temperature. (4 × 2 = 8)

[40]

Answers to activity 1

1. **A** – South Atlantic high pressure✓✓
   B – South Indian high pressure✓✓ (4)
2. A tropical cyclone can be seen on the map.✓✓
   Mid-latitude cyclones are seen south of South Africa.✓✓
   The South Indian and South Atlantic high pressures are south of South Africa.✓✓
   A low pressure cell can be seen over the centre of South Africa.✓✓
   The date: 30/01/2010✓✓ (any 2) (4)
3. Coastal low pressure✓✓ (2)
4. a) F – Cold front✓✓; H – Warm front✓✓ (4)
   b) In an easterly direction/from west to east✓✓ (2)
   c) Temperatures will decrease✓✓; pressure will increase✓✓; Cumulonimbus clouds and thunderstorms will occur✓✓ (6)
5. a) Tropical cyclone✓✓ (2)
   b) Three✓✓ (2)
   c) Westerly/from east to west✓✓ (2)
   d) Temperature must be above 27 °C✓✓; Humidity must be high✓✓; There must only be light and variable wind✓✓; The atmosphere must be unstable✓✓; There must be a wide area of low pressure with closed isobars✓✓; It must be between 5 °S and 25 °S (needs Coriolis force)✓✓; Little surface friction✓✓ (any 2) (4)
6. Cloud cover: Clear skies✓✓; Wind speed: 10 knots✓✓; Wind direction: SSE✓✓; Air temperature: 22 °C✓✓; Dewpoint temperature: 15 °C✓✓ (8)

[40]

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1.4 Local climate (valley and city climate)

Valley climate occurs on a local scale and lasts for a few hours. In this section we will focus on:

- Anabatic and katabatic winds
- Aspect

1.4.1 Anabatic and katabatic winds

The structure of a valley and the heating and cooling that occurs during a day cause **anabatic and katabatic winds** to occur. This is shown in Figures 1.4.1A and 1.4.1B.

In the exam, you may be asked to draw, label or describe how anabatic or katabatic winds form in valleys. Learn to redraw and label Figures 1.4.1A and 1.4.1B below.

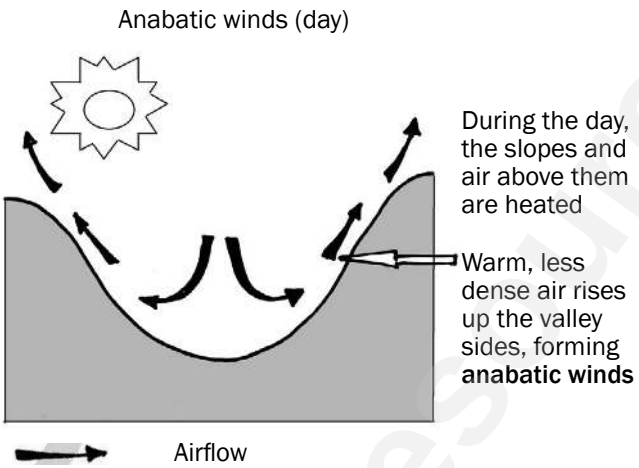

Figure 1.4.1A: Anabatic winds

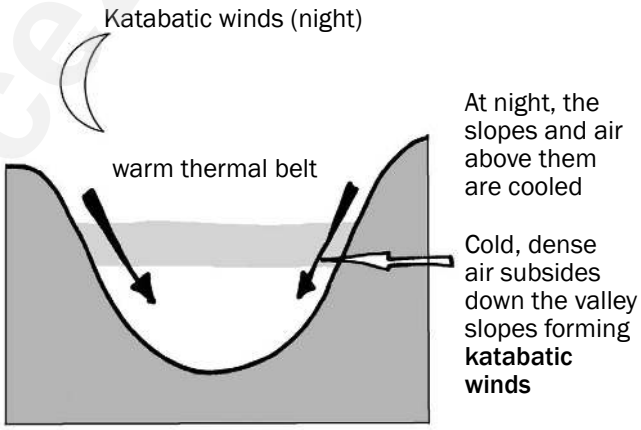

Figure 1.4.1B: Katabatic winds

Effect of anabatic winds on settlements

- Anabatic winds take pollution out of the valley.

Effects of katabatic winds on settlements

- Katabatic winds trap pollution in the valley.
- Katabatic winds bring cold temperatures to the valley.

Katabatic winds lead to the development of the thermal belt (zone of warmer temperature above the valley floor) and a frost pocket (an area of very cold temperatures at the bottom of a valley where frost occurs) in a valley at night. This is shown in Figure 1.4.1C.

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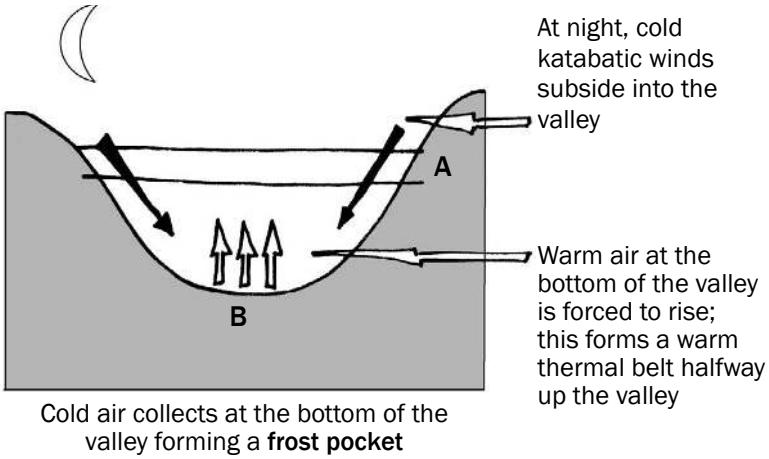

Figure 1.4.1C: Inversion layer and the development of frost pockets in a valley

NB

In the exam, you may be asked to draw, label or describe how the thermal belt and a frost pocket form in valleys. Learn to redraw and label Figure 1.4.1C.

Figure 1.4.1D below shows the impact of an inversion layer on pollution in a valley.

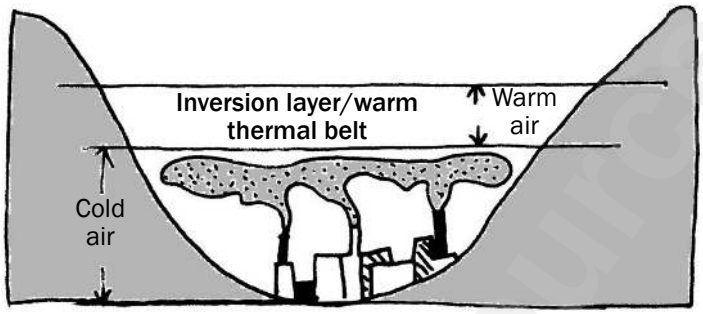

Figure 1.4.1D

Effects of warm thermal belt on settlement and farming

- People will build their houses halfway up the slope of a valley to be in the warmer thermal belt (point A on Figure 1.4.1C).
- Crops which need warm, frost-free conditions will be planted in the thermal belt, for example sugar cane (point A on Figure 1.4.1C).

Effects of frost pockets on settlement and farming

- Crops which can withstand cold conditions (such as frost) can be planted at the bottom of the valley, for example potatoes (point B on Figure 1.4.1C).
- Pollution is trapped in the cold air below the temperature inversion at night, as shown in Figure 1.4.1D.

1.4.2 Aspect

Aspect refers to the direction in which a slope faces. This determines whether the Sun's rays will hit the side of the valley directly or indirectly (obliquely). We will focus on how aspect influences the temperatures of north- and south-facing slopes in the southern hemisphere.

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NB In the exam, you may be asked to draw, label or describe how aspect affects the temperature on a north- or south-facing slope in the southern hemisphere. Learn to redraw and label Figure 1.4.2A.

Let us look at how the Sun's rays affect slope temperatures in the southern hemisphere:

- North-facing slopes receive the direct rays of the Sun, making them warmer.
- South-facing slopes receive the indirect rays of the Sun, making them cooler.

Figure 1.4.2A shows how aspect influences the temperatures of north- and south-facing slopes in the southern hemisphere.

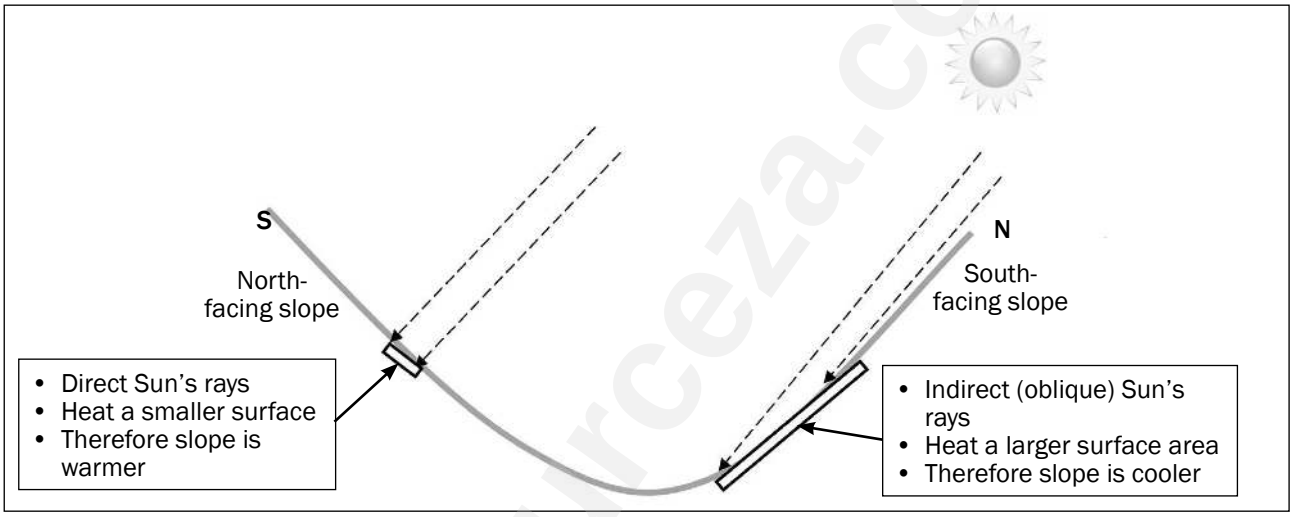

Figure 1.4.2A: The impact of aspect on the temperatures of north- and south-facing slopes in the southern hemisphere

Activity 2

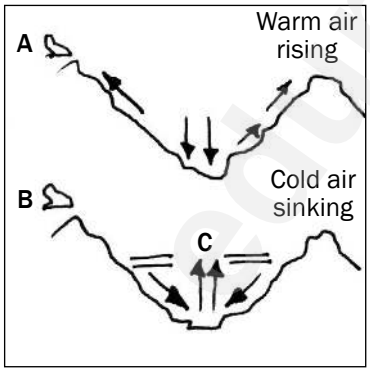

Figure 1.4.2B: Valley climates

Figure 1.4.2B (left) illustrates valley climates. Study the diagram and answer the questions that follow.

1. Name the valley winds depicted in A and B. (2 × 2 = 4)
2. State ONE advantage of the wind labelled A. (1 × 2 = 2)
3. Name the layer labelled C. (1 × 2 = 2)
4. Explain how the wind labelled B influences:
   a) Farming in the valley (2 × 2 = 4)
   b) Industry in the valley (2 × 2 = 4)

[16]

Answers to activity 2

1. A – Anabatic wind/upslope wind✓✓
   B – Katabatic wind/downslope wind/gravity wind✓✓ (4)
2. It can carry pollution out of the valley.✓✓ (2)
3. Inversion layer/thermal belt✓✓ (2)

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Answers to activity 2 continued

4. a) Winds bring cold air into the valley.✓✓
These winds cause a frost pocket to form.✓✓
The frost can kill the crops.✓✓ (4)

b) Cold conditions make working conditions in the industry difficult.✓✓
Pollution produced by the industry will be trapped in the valley.✓✓ (4)

[16]

1.4.3 City climates

Urban areas (cities) experience a different climate compared to the surrounding rural areas. This results in the formation of a heat island over the city. In this section, we will focus on the causes of a heat island. An **urban heat island** is when the city has warmer temperatures than the surrounding rural areas.

In the exam, you may be asked how the temperatures change as you move towards the centre of the city. Figure 1.4.3A shows how the temperatures increase the closer you get to the city centre (also called the Central Business District, or CBD). Note also the lower temperatures over the park.

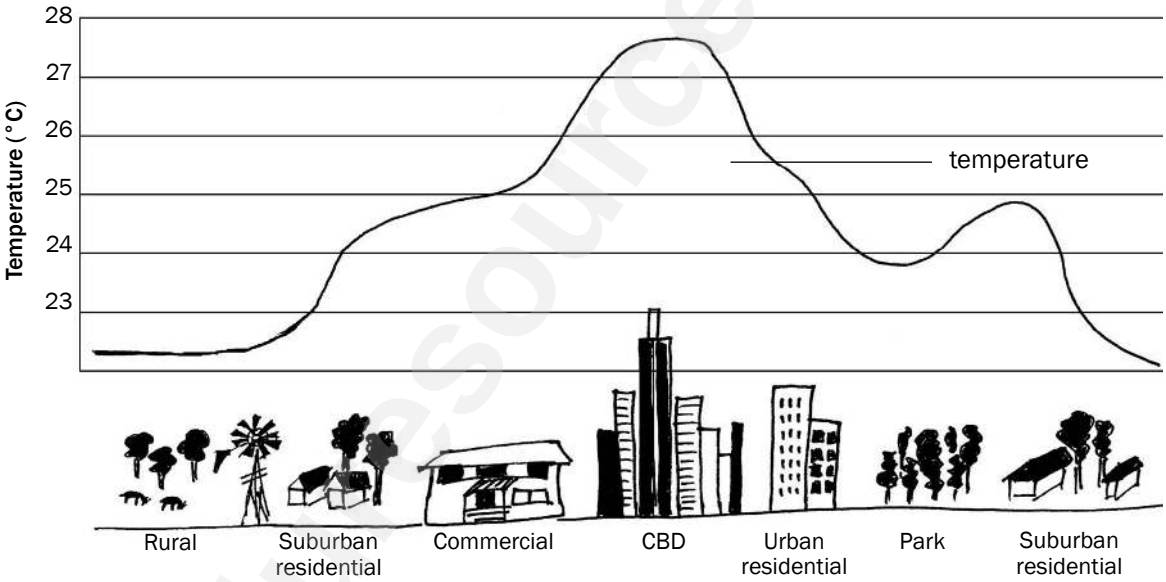

Figure 1.4.3A: An urban heat island profile

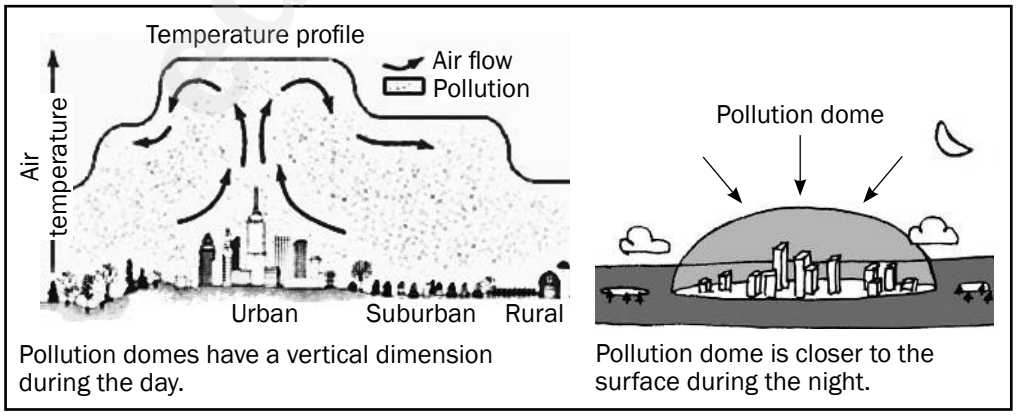

Figure 1.4.3B: Pollution dome: Pollution dome is a layer of pollution trapped over the city.

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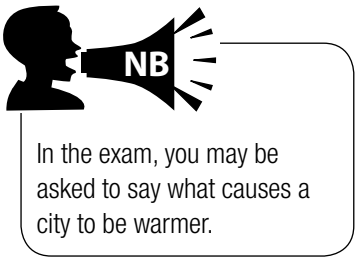

Table 1.2 below lists the factors that cause higher temperatures in the city.

Factors that cause heat island	Explanation
Artificial (human-made) surfaces	Surfaces like tar absorb more heat.
Surface area (the sides of the buildings add to the surface area)	With a greater area, more heat is absorbed.
Pollution	More factories and cars release more pollution, which traps the heat.
Artificial heat sources (not from the sun, human-made sources)	Factories, cars and air conditioners release heat into the air.

Table 1.2: Factors that cause a heat island

Sustainable ways to reduce the urban heat island effects

- Promote greenbelts (plan and have more parks or recreational areas with trees and plants).
- Plant more trees in the city.
- Increase vegetation cycles by planting rooftop gardens.
- The new buildings should not be built with material like glass or any reflecting material.
- The height of the buildings should have a limit.
- Have laws that force the factories to reduce the amount of pollution they produce.
- Improve and encourage people to use public transport.
- Promote lift clubs to work or to school.

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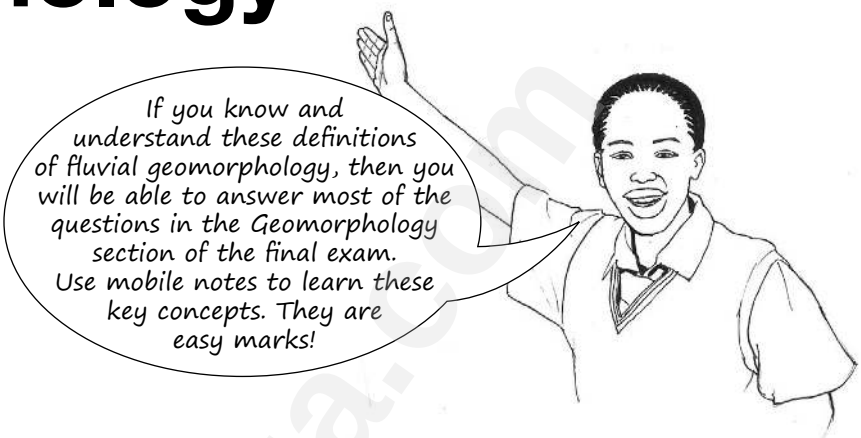
Chapter 2

Geomorphology

Geomorphology is the study of the landforms found on the Earth's surface and the processes that create them. In this chapter, fluvial geomorphology is covered.

The following table of key concepts covers fluvial geomorphology.



Key concepts

Concept	Definition
Base flow	The flow of groundwater in the same direction as the river.
Base level	The lowest level to which a river can erode.
Condensation	When water vapour reaches dew point temperature and changes into water droplets.
Deposition	When a river deposits (lays down) the sediment it is carrying on the river bed.
Drainage basin	An area drained by a river system.
Erosion	The removal of soil and wearing away of rocks by wind, water or ice.
Evaporation	When water in the liquid form is converted (changed) into water vapour (gas).
Fluvial hydrographs	Show runoff of a river at particular time at a point on a river.
Groundwater	Water stored below the ground in soil and rock.
Headward erosion	When a river cuts back towards its source.
Infiltration/percolation	A process whereby water seeps into the soil or rock.
Interception	The process by which raindrops are prevented from falling to the ground by plant leaves, stems and branches.

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Concept	Definition
Perennial river/permanent river	River that flows throughout the year.
Precipitation	Any form of water falling from the sky (e.g. rain, hail, snow).
Rejuvenation	The renewal of erosion activity in a river.
River/channel flow	Water that flows within a river channel.
River discharge	The volume of water that flows past a point in a river in a given time.
River meander	A series of bends in a river as it moves along the floodplain.
River source	This is where a river starts; normally high up in mountainous areas.
River mouth	This is where a river ends; normally when it reaches the sea or ocean.
Runoff/overland flow	Rainwater which runs overland towards a river, lake or the sea.
Seasonal/periodic/non-perennial river	River that only flows during the rainfall season.
Stream capture/piracy	When one river 'robs' another of its water.
Stream channel	Where the water flows in a river (river bed).
Throughflow	The movement of groundwater through the soil due to gravity.
Transpiration	Water vapour is released from leaves in trees and plants.
Tributary	A smaller river which flows into (joins) a larger river.
Watershed/Drainage divide	High-lying land separating drainage basins.
Water table	The level below which the ground is saturated (it can hold no more water).

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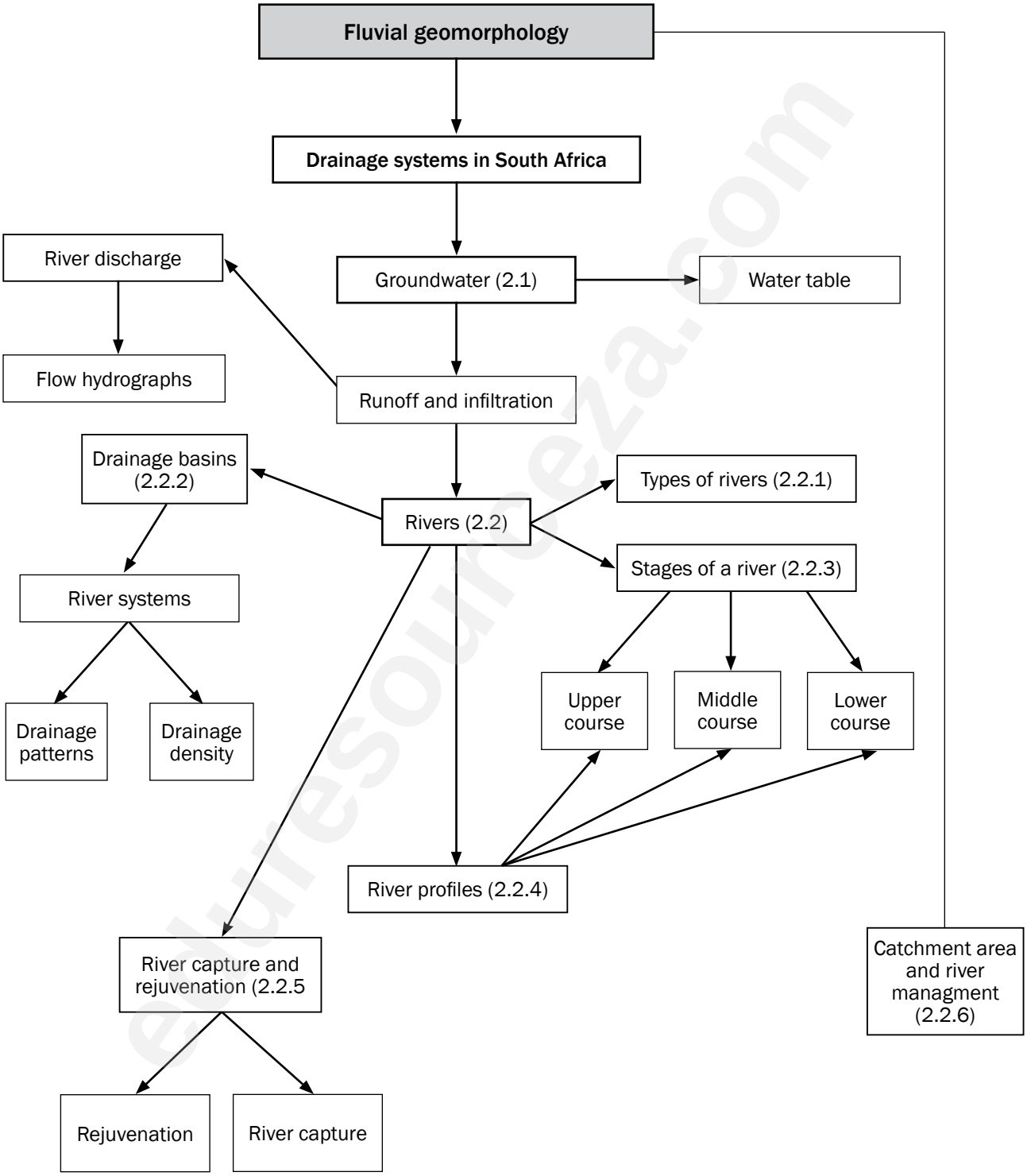
Fluvial geomorphology

This chapter deals with the action of water on the Earth's surface. The word **fluvial** refers to the action of running water.



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2.1 Groundwater

Groundwater is water stored beneath the Earth's surface. When precipitation (rain) falls to the surface of the Earth, it either flows over the surface (runoff) or it is absorbed (infiltrates) into the groundwater supply. This section studies how the infiltration, runoff and groundwater systems work and lead to the formation of rivers. Refer to Figure 2.1A below of the water cycle (this was studied in Grade 10).

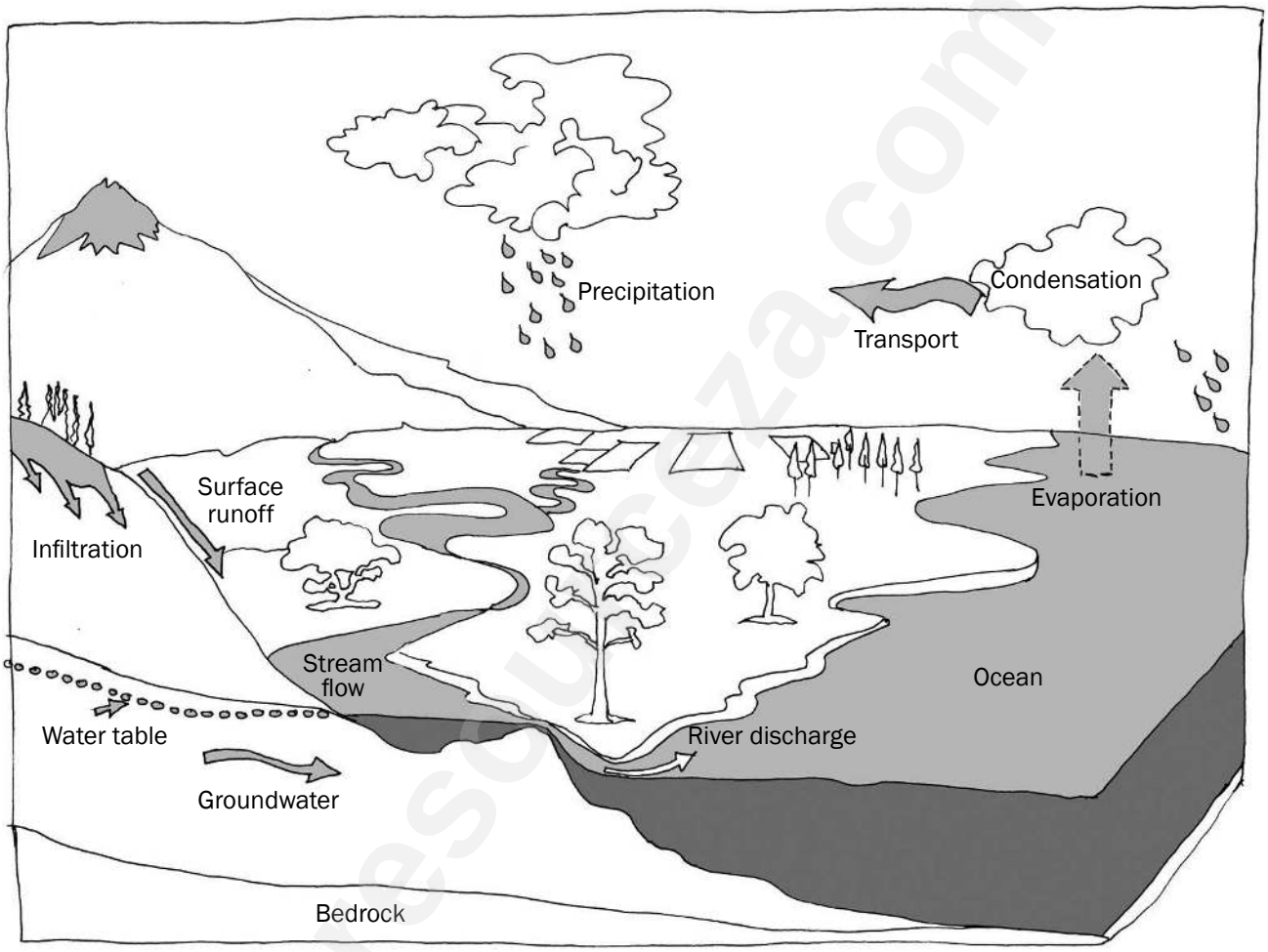

Figure 2.1A: The water cycle

Groundwater supplies are replenished (filled up) when water **infiltrates** into the ground. For water to infiltrate into the soil, three important aspects should be present:

1. Enough **porous soil or rock** to allow the water to infiltrate through it.
2. **Time** for the surface water to be absorbed into the ground. This is affected by the steepness of the slope and the nature of the rain.
3. **Vegetation** (plants) to slow down the speed of runoff, making it easier for infiltration to happen.

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To see how these three aspects affect runoff and infiltration study Table 2.1 below.

Factor	Impact on groundwater
Porous rock	More infiltration, less runoff and more groundwater
Rock is not porous	Less infiltration, more runoff and less groundwater
More time (gentle slope)	More infiltration, less runoff and more groundwater
Less time (steep slope)	Less infiltration, more runoff and less groundwater
More vegetation	More infiltration, less runoff and more groundwater
Less vegetation	Less infiltration, more runoff and less groundwater

Table 2.1: Factors affecting runoff and infiltration

NB

Run-off and infiltration factors are the same as drainage density factors.

Figure 2.1B below shows the impact of rock type, time and vegetation on groundwater. From the diagram we can see how the amount of groundwater affects the height of the water table. This is the level below which the ground is saturated (when it can hold no more water).

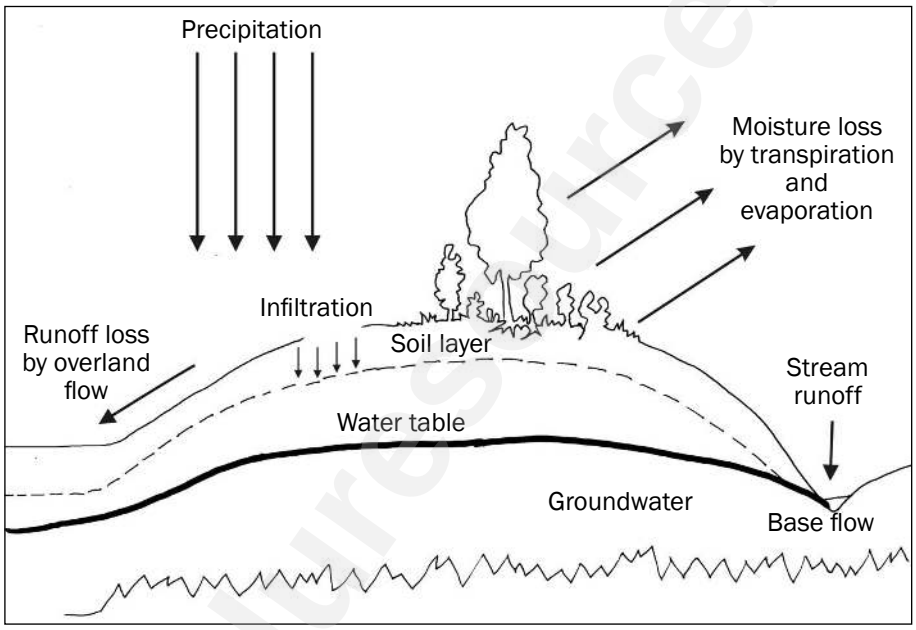

Figure 2.1B: Factors that affect groundwater and movement of water on the surface

NB

In the exam, you may be given a diagram and asked to identify which aspect or factor has affected the runoff or infiltration.

Activity 2.1

1. List three important things that should be present for water to infiltrate into the soil. (3 × 2 = 6)
2. Describe how groundwater supplies are replenished (filled up). (1 × 2 = 2)
3. Why is it important to manage (look after) groundwater? (1 × 2 = 2)

[10]

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Answers to activity 2.1

1. Porous rock✓✓, time for water to infiltrate (steepness of the slope) ✓✓, more vegetation✓✓ (6)
2. Groundwater supplies are replenished by precipitation✓✓. (2)
3. South Africa has a shortage of water✓✓.
   To ensure we have a sustainable supply of water✓✓. (2)

[10]

2.2 Rivers

When there is less infiltration, more runoff takes place. This starts as sheet flow but very soon the water flows in a path called channel flow.

When we study rivers we look at them in different ways:

- Types of rivers
- River discharge
- Drainage basins
- Stages and profiles of rivers

NB

In paper 2 you may be asked to identify the types of rivers.

2.2.1 Types of rivers

The water table refers to the surface of the water-saturated part of the ground. The height of the water table changes each season. This gives rise to different types of rivers. Rivers are classified depending on when (or if) the river valley cuts into the water table.

There are **three types of rivers**:

- **Permanent rivers** flow all year round and are always in contact with the water table.
- **Periodic rivers** only flow during the rainy season. They are in contact with the water table only in the rainy season.
- **Episodic rivers** only flow after heavy rainfall when runoff flows into the river. They do not come into contact with the water table.

NB

In the exam, you may be given a diagram of a cross section of a river and asked to identify the type of river. Learn to identify the different river types by redrawing and labelling Figure 2.2.1A.

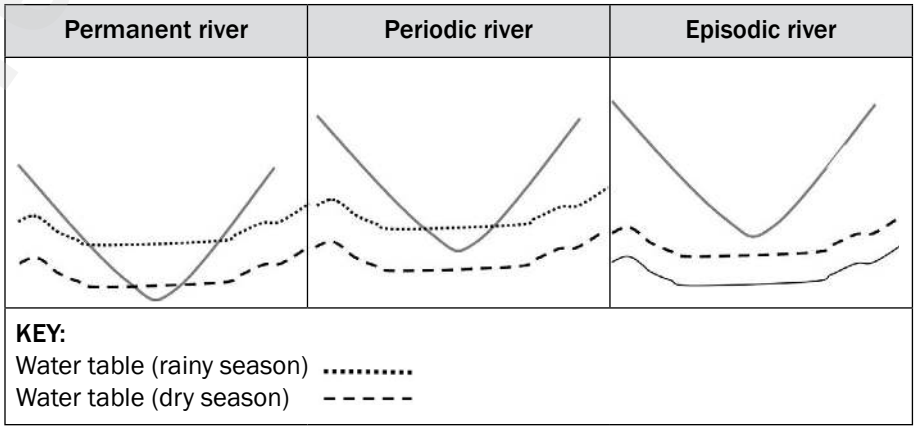

Figure 2.2.1A: Cross section of the three different types of rivers

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River discharge

The amount of water flowing out of a river shows many aspects of a river. One way to study this discharge or runoff is by looking at a **flow hydrograph.**

When runoff enters a river, the amount of water flowing in the river increases. A hydrograph records how quickly the water level increases (**time**) and how high the water level reaches (**peak flow discharge**).

A flow hydrograph combines two graphs:

- A **bar graph** showing the amount of **precipitation**
- A **line graph** showing how the **water level** increases and decreases over time

Figure 2.2.1B below shows an example of a flow hydrograph. Study the graph and then read the explanation alongside.

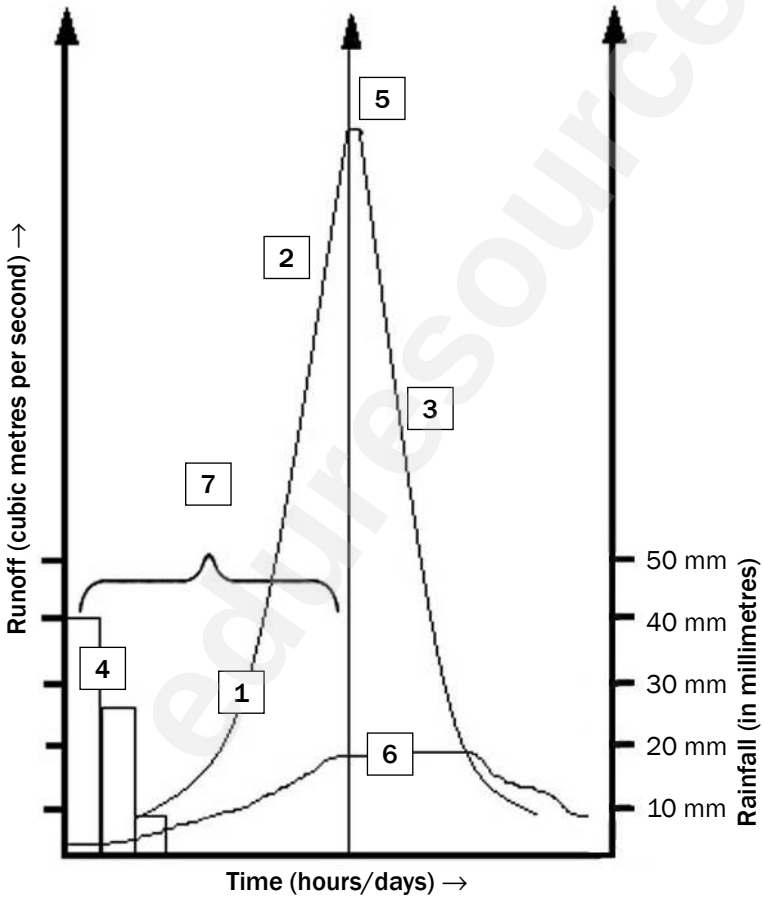

Figure 2.2.1B: The different parts of a flow hydrograph

Explanation of the elements in Figure 2.2.2B(left):

1. The **line graph** shows the volume of the river over time. The horizontal axis shows time in hours and the vertical axis shows runoff in cubic metres per second (^{m3}/sec).
2. The **rising segment** shows the rate at which the water in the river is increasing. It is steep if infiltration is rapid. It is gentle if infiltration is slow as water takes longer to reach the river.
   - **Urban areas** have a rapid rising segment as the water reaches the river quickly.
   - **Naturally vegetated areas** allow for infiltration and the rising segment is less steep.
3. The **falling segment** shows the rate at which the water in the river is decreasing. It may be less steep than the rising segment.
   - In **urban areas** the segment falls rapidly as less water has been added as base flow due to lower infiltration.
   - **Natural areas** show a slower decrease due to added base flow from infiltrated water.
4. The **bar graph** shows the amount of rainfall (precipitation) that occurs in the drainage basin over time. This is shown on the vertical axis in millimetres (mm).
5. **Time lag** (also called lag time) is the time that it takes from the heaviest rainfall to the fullest amount of water in the river (peak flow). It is calculated by establishing the time difference between the heaviest rainfall and the peak flow of the river.
6. **Base flow** is the groundwater contribution to the discharge of a river.
7. The highest point on the line graph is the **peak flow discharge**. This is when the river reaches its highest volume.

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The flow hydrograph in Figure 2.2.1B can be interpreted as follows:

The slope of the line graph indicates the increase in the river's volume (discharge). If the slope of the line graph is steep, there is more runoff than infiltration. If the slope is gentle, there is more infiltration than runoff. The graph in Figure 2.2.1B has a steep slope, so there is more runoff than infiltration.

The highest point on the line graph is the **peak flow discharge**. This is when the river reaches its highest volume. The difference in time between when it rains and when the peak flow discharge occurs is called the time lag. The time lag is affected by the amount of runoff and infiltration that occurs. More runoff causes a shorter time lag and more infiltration causes a longer time lag.

NB

In the exam, you may be asked to determine the impact on time lag if an area that has a lot of vegetation (natural catchment) becomes urbanised (is covered by a city).

The following factors influence the time lag:

- Amount of vegetation (increased vegetation reduces runoff and causes a longer time lag)
- Steepness of slope (a steeper slope increases runoff and causes a shorter time lag)
- Amount of rainfall (lots of rainfall increases runoff and causes a shorter time lag)
- Nature of rainfall (heavy rainfall increases runoff and causes a shorter time lag)

Figure 2.2.1C below shows the difference in the time lag between a natural catchment and an urbanised catchment.

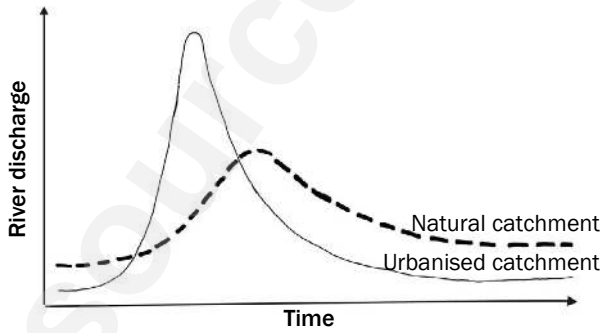

Figure 2.2.1C: Flow hydrographs and the impact of the type of surface of the area surrounding the river

NB

Study Table 2.2 (right) and make sure you know the difference between a natural catchment and an urbanised catchment so that you can interpret flow hydrographs in the exam. Remember, the catchment area refers to the area from which rainfall flows into a river, lake or reservoir.

We can interpret the flow hydrograph in Figure 2.2.1C as follows:

- The line graph for the urbanised catchment area is much steeper than the line graph for the natural catchment as there is more runoff and less infiltration in the urbanised catchment.
- This is because the urbanised catchment has less vegetation which results in more runoff.

Natural catchment (more vegetation)	Urbanised catchment (less vegetation)
More infiltration	Less infiltration
Less runoff	More runoff
Longer time lag	Shorter time lag
Lower peak discharge	Higher peak discharge

Table 2.2: The difference between natural catchment and urbanised catchment

The amount of runoff on the surface leads to the development of rivers, which together form a river system within a drainage basin.

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Flow characteristics

The nature of the landscape over which the rivers flow will determine how the water moves in the river systems. Figure 2.2.1D (right) shows the two types of flow, namely laminar and turbulent flow.

A smooth channel causes a laminar flow of water and is more efficient. Less of the available energy is used to overcome friction (found on the lower course of a river).

A rough channel causes a turbulent flow of water. An uneven rocky bed causes an uneven flow of water. This increases the surface area for friction. This type of flow is very inefficient (found on the upper course of a river).

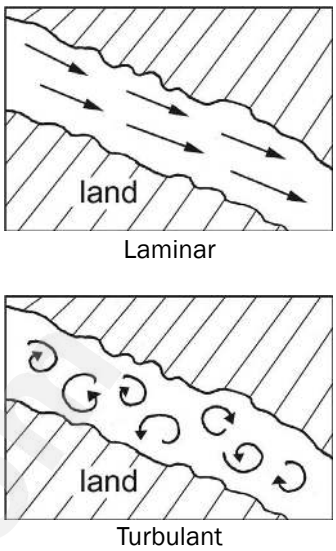

Figure 2.2.1D Turbulent and Laminar flow

2.2.2 Drainage basins

A **drainage basin** is an area drained by a river system. You need to know the different parts of a drainage basin to understand the other aspects of rivers, such as a river's source, river mouth, watershed and tributaries. Figure 2.2.2A (right) shows the different parts of a drainage basin.

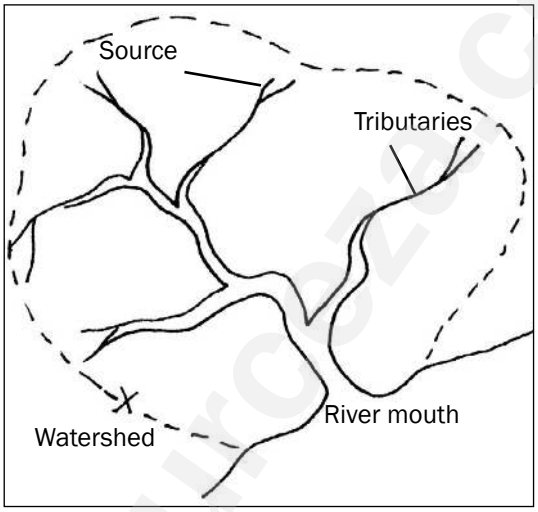

Figure 2.2.2A: The different parts of a drainage basin

A river does not flow by itself but is part of a river system (a main river and all its tributaries).

We will now look at two aspects of river systems: drainage density and drainage patterns.

NB

Learn Figure 2.2.2A in order to label a similar diagram in an exam question.

Drainage density

Drainage density describes how many streams there are in a drainage basin. Drainage density is affected by the same factors that affect runoff and infiltration:

- More infiltration will cause fewer rivers to occur, causing a low drainage density.
- More runoff will cause more rivers to occur, causing a high drainage density.

Figure 2.2.2B (i) (right) shows a low drainage density and Figure 2.2.2B (ii) (right) shows a high drainage density.

NB

You may be asked in an exam to give reasons for an area having a high or low drainage density.

Interpretation of Figure 2.2.2B (i):

Drainage basin (i) has fewer tributaries so it has a low drainage density. Some reasons for low drainage density are:

- Soft rainfall causing more infiltration
- Gentle slopes causing more infiltration
- Lots of vegetation causing more infiltration
- Very little rain so the ground can still hold more water causing more infiltration

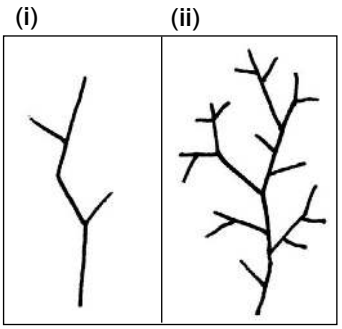

Figure 2.2.2B: Low drainage density (i) and high drainage density (ii)

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Interpretation of Figure 2.2.2B (ii):

Drainage basin (ii) has more tributaries so it has a high drainage density. Some reasons for high drainage density are:

- Heavy rainfall causing more runoff
- Steep slopes causing more runoff
- Very little vegetation causing more runoff
- Lots of rain so the ground cannot hold any more water causing more runoff

Activity 2.2

Refer to drainage basins A and B in Figure 2.2.2C and the flow hydrograph showing line graphs D and E after a period of rainfall, to answer the following questions.

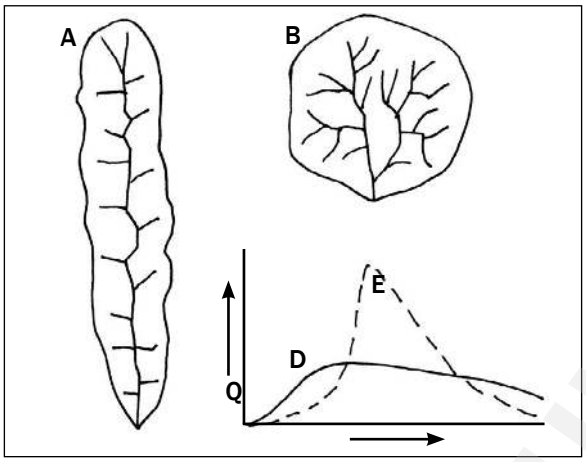

Figure 2.2.2C: Drainage basins and flow hydrograph

1. The rivers in drainage basin A flow all year round. What type of river would this be classified as? (1 × 2 = 2)
2. Graph D in the flow hydrograph shows the runoff of drainage basin A after a period of rain.
   a) Define the term 'lag time'. (1 × 2 = 2)
   b) How would the lag time change if massive deforestation were to occur in drainage basin A where D was recorded? (1 × 2 = 2)
   c) Justify your answer in question b). (2 × 2 = 4)
   d) Name another factor which could occur and have the same impact on the lag time as mentioned in question b). (1 × 2 = 2)
3. a) State the drainage density of drainage basin B. (1 × 2 = 2)
   b) Describe THREE possible causes for the drainage density found in drainage basin B. (3 × 2 = 6)

[20]

Answers to activity 2.2

1. Permanent river✓✓ (2)
2. a) The difference in time between when it rains and when the peak flow discharge occurs.✓✓ (2)
   b) Lag time will be shorter✓✓ (2)
   c) There is less vegetation✓✓, so there is more runoff✓✓. (4)
   d) Steep slope✓✓/Heavy rainfall✓✓/Lots of rain✓✓ (any 1)(2)
3. a) High drainage density✓✓ (2)
   b) Heavy rainfall causing more runoff✓✓
   Steep slopes causing more runoff✓✓
   Very little vegetation causing more runoff✓✓
   Lots of rain so the ground cannot hold any more water causing more runoff✓✓ (any 3)(6)

[20]

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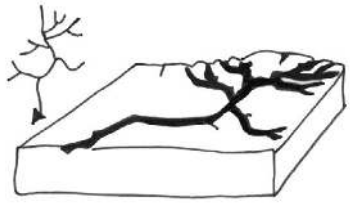
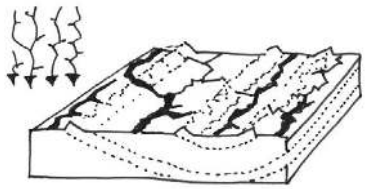
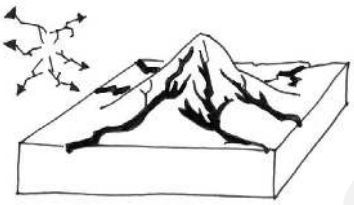
Drainage patterns

In a river system, individual streams flow over the surface in stream channels. These channels will cut into the rock surface where it is easiest to erode the rock. These channels form patterns known as **drainage patterns**. Figure 2.2.2D, E, F below show three types of drainage patterns.

NB You may be asked in an exam to identify the drainage pattern, describe the pattern (what it looks like) or explain what caused the pattern to occur. When you are asked to explain the cause of the drainage pattern, you may be required to name the underlying rock structure in the area.

 *Figure 2.2.2D: Dendritic pattern*	**Name:** Dendritic **Description:** Looks like the branches of a tree with tributaries joining the main river at acute angles **Explanation:** Occurs where the underlying rock is of homogenous (equal) resistance, namely either horizontal (flat) sedimentary rock, massive igneous or metamorphic rock
 *Figure 2.2.2E: Trellis pattern*	**Name:** Trellis **Description:** Parallel streams with short tributaries joining at right angles (90°) **Explanation:** Occurs where the surface rock is of alternate resistance (strong and weak rock), or where sedimentary rock is folded
 *Figure 2.2.2F: Radial pattern*	**Name:** Radial **Description:** Streams flow outwards from one raised central point (dome or volcano) **Explanation:** Rivers flow downhill and away from the highest central point.

Activity 2.3

Identify and briefly describe the drainage patterns in Figure 2.2.3G below.

(3 × 4 = 12)

[12]

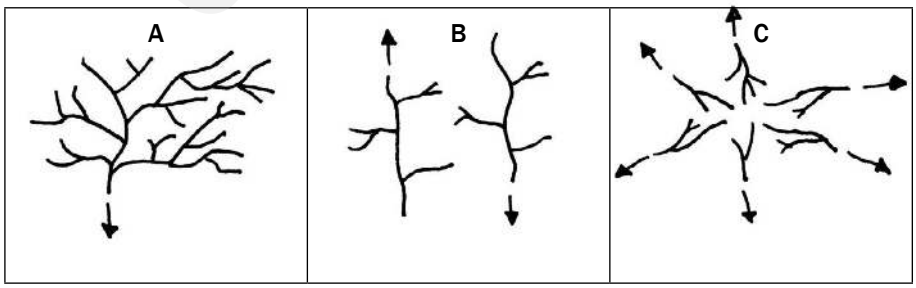


Figure 2.2.3G: Drainage patterns

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Answers to activity 2.3

A **Dendritic:** Looks like the branches of a tree with tributaries joining the main river at acute angles. ✓✓✓✓ (4)

B **Trellis:** Parallel streams with short tributaries joining at right angles (90°). ✓✓✓✓ (4)

C **Radial:** Streams flow outwards from one raised central point (dome or volcano). ✓✓✓✓ (4)

[12]

2.2.3 Stages of a river

As a river flows from the mountains (source) to the sea (mouth), the amount of erosion and deposition changes. This changes what the river looks like from its source to its mouth:

- In its **upper course**, a river erodes vertically (downwards) creating steep valleys.
- In the **middle course**, lateral erosion and a little bit of deposition occur. The lateral erosion occurs unequally (unevenly) on the sides of the river. This causes the river to start meandering (flowing or bending from side to side).
- By the time the river reaches its **lower course**, the eroded material (sediment) carried by the river begins to be deposited onto the floodplains. A floodplain is a wide, flat area alongside a river.
- Floodplains are formed by the river eroding laterally (sideways). In the lower course the meanders may be cut off when the river flows straight, forming an ox-bow (U-shaped) lake.

Figure 2.2.3A (see page 33) shows the stages of a river in plan view.

Figure 2.2.3B (see page 33) shows the stages of a river in oblique view.

Table 2.3 (see page 33) summarises the features of a river at each stage.

You may be asked in an exam to identify the stage of a river from a plan view, an oblique view or a cross section diagram. You may also be asked to draw a river in a plan view or a cross section diagram of a river at a particular stage. To do this, learn the characteristic features of each stage. This is also useful for identifying the stage of a river on a topographic map.

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Upper course	Middle course	Lower course

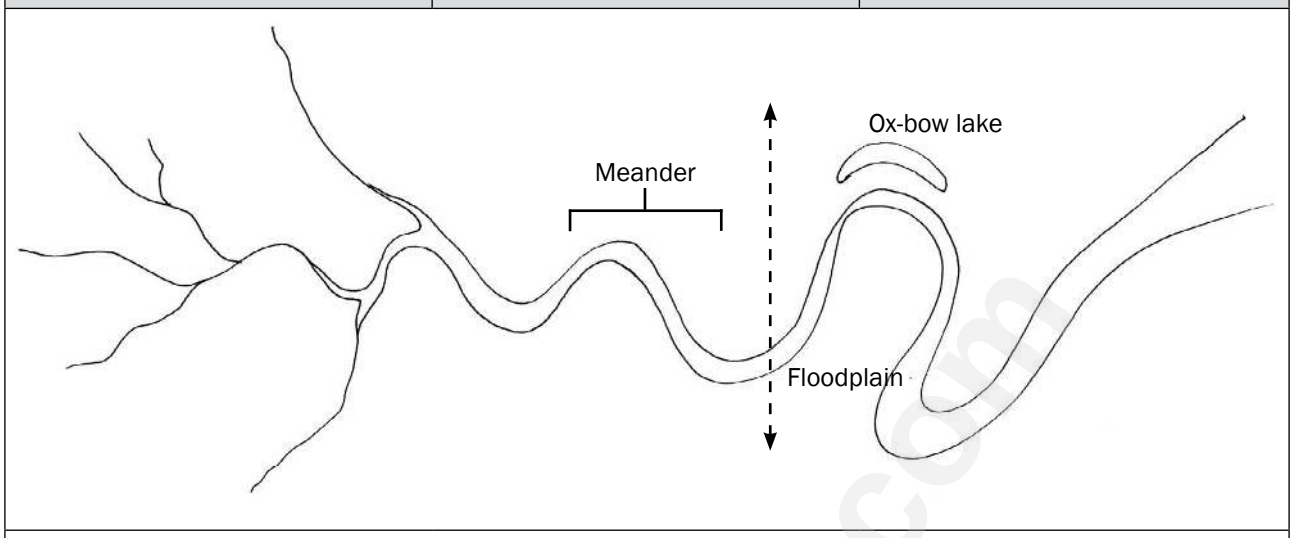

Figure 2.2.3A: Plan view of upper course, middle course and lower course

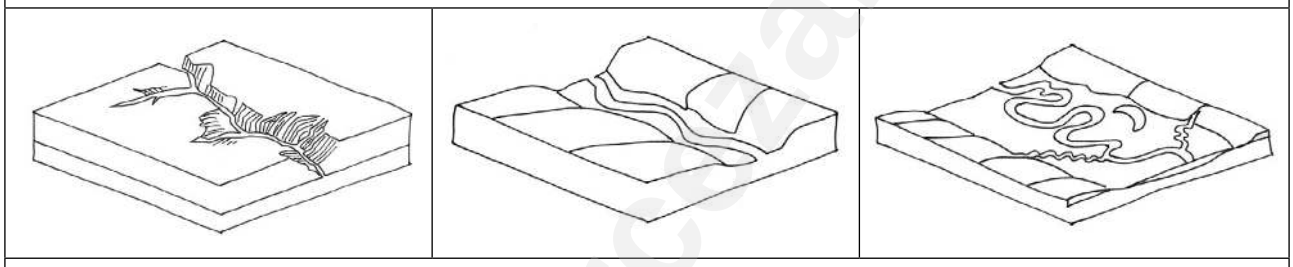

Figure 2.2.3B: Oblique view of upper course, middle course and lower course

Typical features at each stage		
• Steep, V-shaped valley • Narrow channel • Waterfalls • Gorges (steep, narrow valley)	• Open, gentle sloping valley with floodplain • Wider channel • Meanders (slip-off and undercut slopes)	• Wide, flat floodplain • Wide valley • Very wide channel • Oxbow lakes

Table 2.3: Typical features of a river at each stage

2.2.4 River profiles

When we look at a river from the side (profile view) we can study it from two sides:

- **Longitudinal profile:** The profile from the river's source to its mouth.
- **Cross profile**: The profile from one side of the river valley to the other side, through the river channel (depth and width).

Figures 2.2.4A and 2.2.4B (i) to (iii) on the next page show the profiles of a river. These figures are drawn as cross–sectional views. A cross section can be drawn as a longitudinal profile and as a cross profile.

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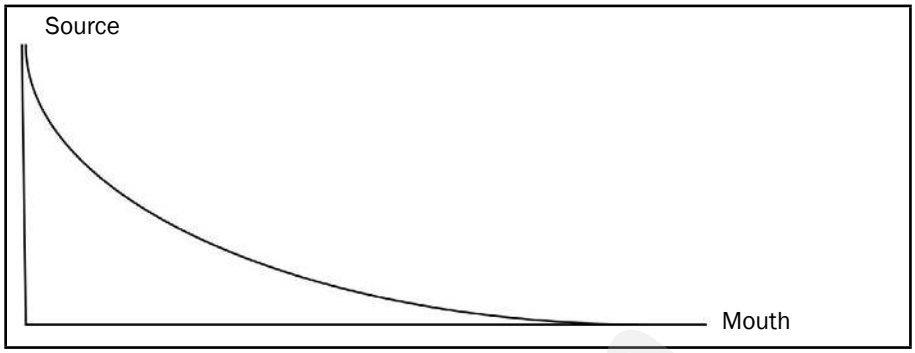


Figure 2.2.4A: Cross sectional view of a longitudinal profile

(i) Cross profile of upper course *(ii) Cross profile of middle course* *(iii) Cross profile of lower course*

Figure 2.2.4B: Cross-sectional views of a cross profile at different stages in a river

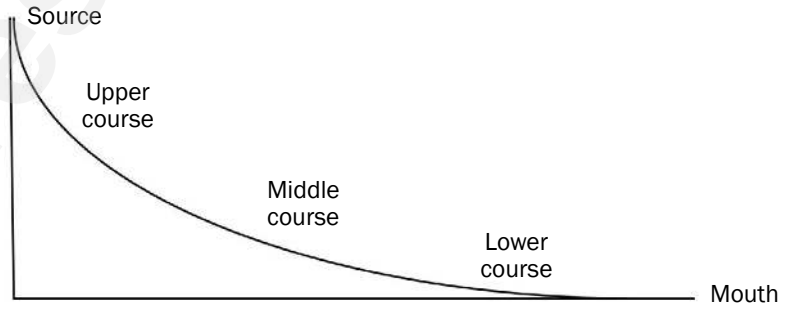
Activity 2.4

1. Draw a longitudinal profile of a river (from source to mouth) and show the upper, middle and lower courses. (1 × 4 = 4)
2. List two features of the upper course of a river. (2 × 2 = 4)
3. Describe a river in its lower course. (2 × 2 = 4)
4. Describe one difference between the river channel in the upper course and the lower course. (2 × 2 = 4)

[16]

Answers to activity 2.4

1.



(4)

2. Steep V-shaped valley ✓✓
   Narrow channel ✓✓
   Interlocking spurs ✓✓
   Waterfalls ✓✓
   Gorges ✓✓ (any 2) (4)
3. Wide flat floodplain ✓✓
   Wide valley ✓✓
   Very wide channel ✓✓
   Ox-bow lakes ✓✓ (any 2) (4)
4. Narrow channel in the upper course ✓✓
   Wide channel in the lower course ✓✓ (4)

[16]

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2.2.5 River capture and rejuvenation

The longitudinal profile of a river has a concave shape. Changes can occur to a river's longitudinal profile because of two processes:

- **Rejuvenation**: We will focus on the causes of rejuvenation and the changes to the cross profiles of each stage in a river.
- **River capture**: We will focus on the features that occur as a result of river capture.

Rejuvenation

When a river gets more energy it is said to be rejuvenated. It has more energy to erode downwards and laterally (sideways).
The causes of river rejuvenation are:

- An increase in the volume of the river, giving the river more energy.
- A drop in sea level due to uplift of land makes the longitudinal profile steeper, giving the river more energy.

Let us now look at the changes in the cross profiles of a river due to rejuvenation:

- **Upper course:** The valley becomes steeper and more V-shaped. This is shown in Figure 2.2.5B (below right).

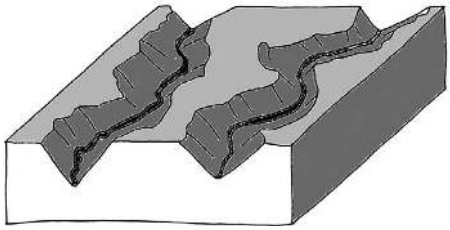

Figure 2.2.5A: An oblique view of a river valley in the upper course before river rejuvenation has occurred

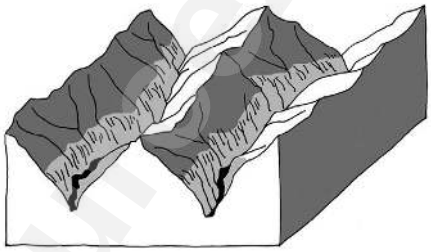

Figure 2.2.5B: An oblique view of a river valley in the upper course after river rejuvenation has occurred

Figure 2.2.5C: A cross profile of a river valley in the middle course after rejuvenation has occurred

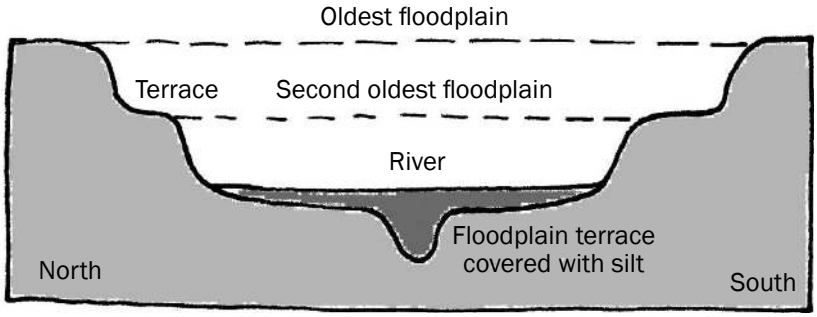

Figure 2.2.5D: A cross profile of a river valley in the lower course after rejuvenation has occurred

Middle course: Downward erosion results in a second U-shaped valley forming. This results in a valley within a valley. This is shown in Figure 2.2.5C (above).

Lower course: Downward and lateral (sideways) erosion cause a second valley to form. Because floodplains occur in this stage of a river, the valleys have a step-like (terraced) appearance. This is shown in Figure 2.2.5D (above). If meanders occur, they will be eroded downwards (incised) forming steep-sided meanders.

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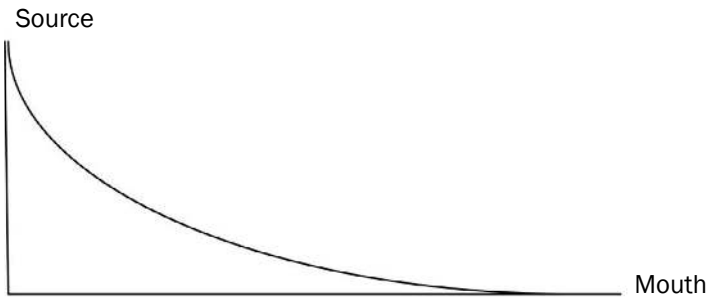

Figure 2.2.6E: Graded longitudinal profile of a river before rejuvenation

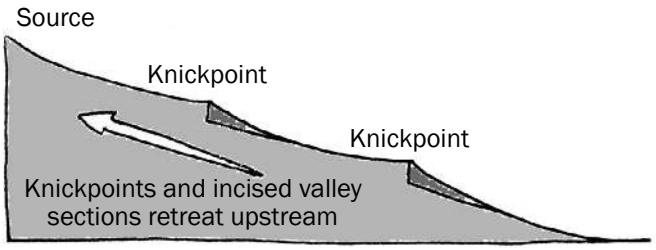

Figure 2.2.5F: Ungraded longitudinal profile of a river after rejuvenation

Let us now look at the changes in the longitudinal profile of a river due to rejuvenation:

The concave shape of a longitudinal profile is called a **graded profile**. When rejuvenation occurs, there is a sudden drop in the profile, causing the profile to no longer be concave. The profile is now an **ungraded profile.** The sudden drop in the profile is called a **knickpoint**. Rejuvenation can occur more than once along a river's profile forming knickpoints along the way. Figure 2.2.5E (left) shows a graded (concave) longitudinal profile of a river before rejuvenation. Figure 2.2.5F (left) shows an ungraded (not concave) longitudinal profile of a river after rejuvenation.

The river wants to regain its concave profile so it will erode the knickpoints, making them less visible over time.

NB

You may be asked in an exam to identify if rejuvenation has occurred. Knickpoints occur during rejuvenation. After rejuvenation, knickpoints wear away, making the profile smooth once again (graded).

River capture

A river is rejuvenated when it gets more energy. A river which has more energy can lead to more erosion, especially headward erosion. Headward erosion is when the source of a river erodes backwards towards the watershed. The headward erosion eventually leads to the river capturing the water of another river. River capture is sometimes called river piracy. This is because one river 'robs' another river of its water.

Headward erosion occurs because a river has more energy. Reasons for the increased energy are:

- A river flowing over a steeper gradient will flow faster
- A river with a larger volume will flow faster
- A river flowing over less resistant rock will flow faster

In Figures 2.2.5G and H (see page 37) you can see how river A erodes back (headward erosion) towards river B. River A 'captures' extra water from river B. River A is rejuvenated.

Study Figures 2.2.5I and J (see page 37) of stream capture and note the different features formed as a result of river capture.

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Once river capture has occurred, various features are visible in the drainage basin.

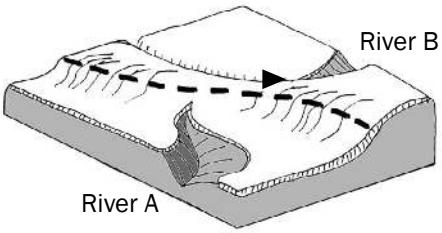

Figure 2.2.5G: Oblique view of the area before river capture

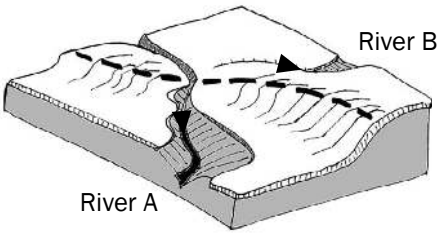

Figure 2.2.5H: Oblique of the area after river capture

NB

You may be asked in an exam to identify the features of river capture on a diagram or you may be asked to describe the features in detail. Use mobile notes to help you learn the features of river capture provided in Table 2.4.

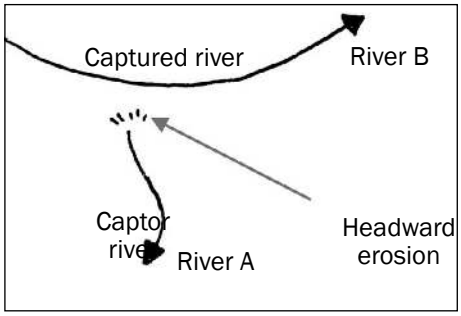

Figure 2.2.5I: Plan view of the area before river capture

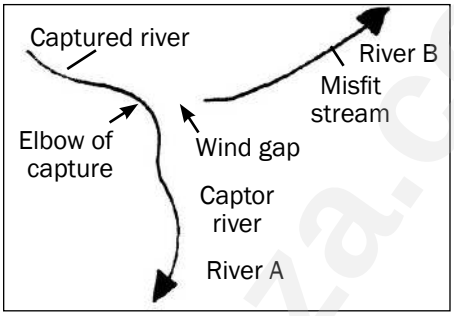

Figure 2.2.5J: Plan view of the area after river capture

Study Figures 2.2.5 I and J (above) and take note of the different features formed as a result of river capture.

Feature	Explanation
Captor river	The energetic stream that cuts back and intercepts (takes) the water of the other river.
Captured river	The river which has its water intercepted (taken) by the captor river.
Misfit stream	The river that has lost its source water as a result of capture. It is also called the beheaded stream.
Elbow of capture	The point of capture where a change of flow direction occurs.
Wind gap	The area between the elbow of capture and the misfit stream where water stops flowing and dry deposited gravels are exposed.
Waterfall	This may form at the point where the captured river flows into the captor river.

Table 2.4: Features of river capture

e.g.

Example of a description of river capture

River capture takes place when the energetic stream (captor stream) cuts back and intercepts (takes) the water from the other river (captured/beheaded river). The captured river turns into a misfit stream and a wind gap forms (where water stops flowing altogether). An elbow of capture is formed at the point of capture. Sometimes a waterfall may be formed at the elbow of capture. The captor stream is rejuvenated.

NB

You may be asked in an exam to describe how river capture occurs. Learn the description given in the box (left).

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Activity 2.5

Figure 2.2.5K (right) shows a plan view of an area before river capture has occurred.

Redraw the rivers **after** river capture has occurred.

On the diagram you have drawn, label the resultant features of river capture.

[6]

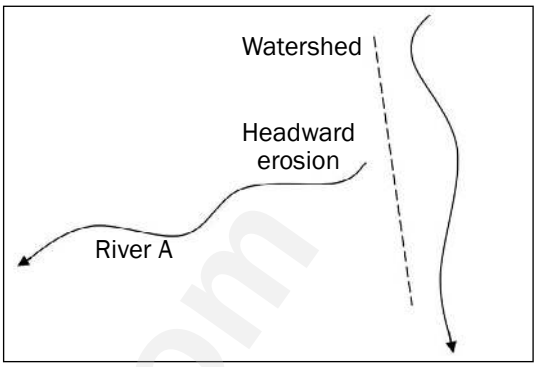

Figure 2.2.5K

Answer to activity 2.5

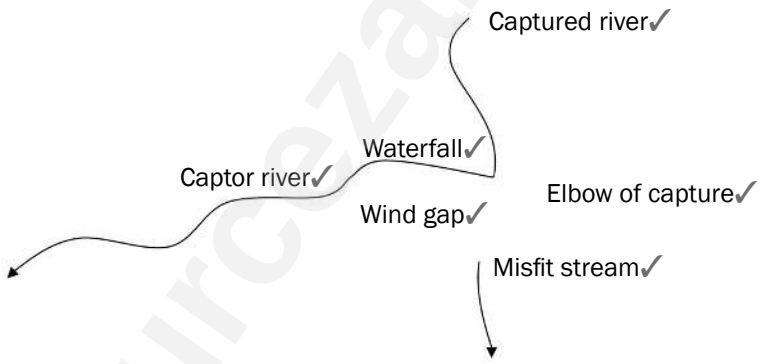

Figure 2.2.5L [6]

2.2.6 Catchment area and river management

exams

This may be examined as a case study.

Importance of managing drainage basins and catchment areas

- South Africa is not a water rich country.
- Our river systems are a resource.
- Like all other natural resources, rivers are shared.
- Water is essential for our survival and well-being, as well as for social and economic development.
- Water resources are used for agriculture, industry, domestic use, hydro electric power and recreation.
- River systems are part of the water cycle.
- All water bodies are linked.
- The way we use the land has a dramatic impact on the water cycle.
- Our river systems are a habitat and function as ecosystems.
- A river links together many ecosystems in a catchment.

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Impact of people on drainage basins and catchment areas

- Landfills, mining and agriculture pollute groundwater.
- Industries and sewage works discharge water waste into rivers.
- Agricultural run-off contains fertilizers and pesticides, which pollute rivers.
- Domestic use of rivers in informal settlements pollutes and litters rivers.
- Boreholes reduce the amount of groundwater that feeds rivers.
- Alien vegetation consumes large quantities of water very quickly in the river zone.
- Overgrazing and removal of vegetation reduce groundwater and increase run-off.
- Dams change the flow of a river.
- Draining of wetlands causes increased flooding.
- Flood control methods restrict the path of a river.

Activity 2.6

Use the topographical map of **Nelspruit 2530BD** at the back of this study guide to answer the following questions.

1. The contour interval of this topographical map is...

A. 1000 metres **B.** 50 000 metres
C. 25 metres **D.** 20 metres

2. The Crocodile River is a/an...

A. Periodic river **B.** Exotic river
C. Permanent river **D.** Seasonal river

(2 × 2 = 4)
[4]

Answers to activity 2.6

1. D ✓✓
2. C ✓✓ **[4]**

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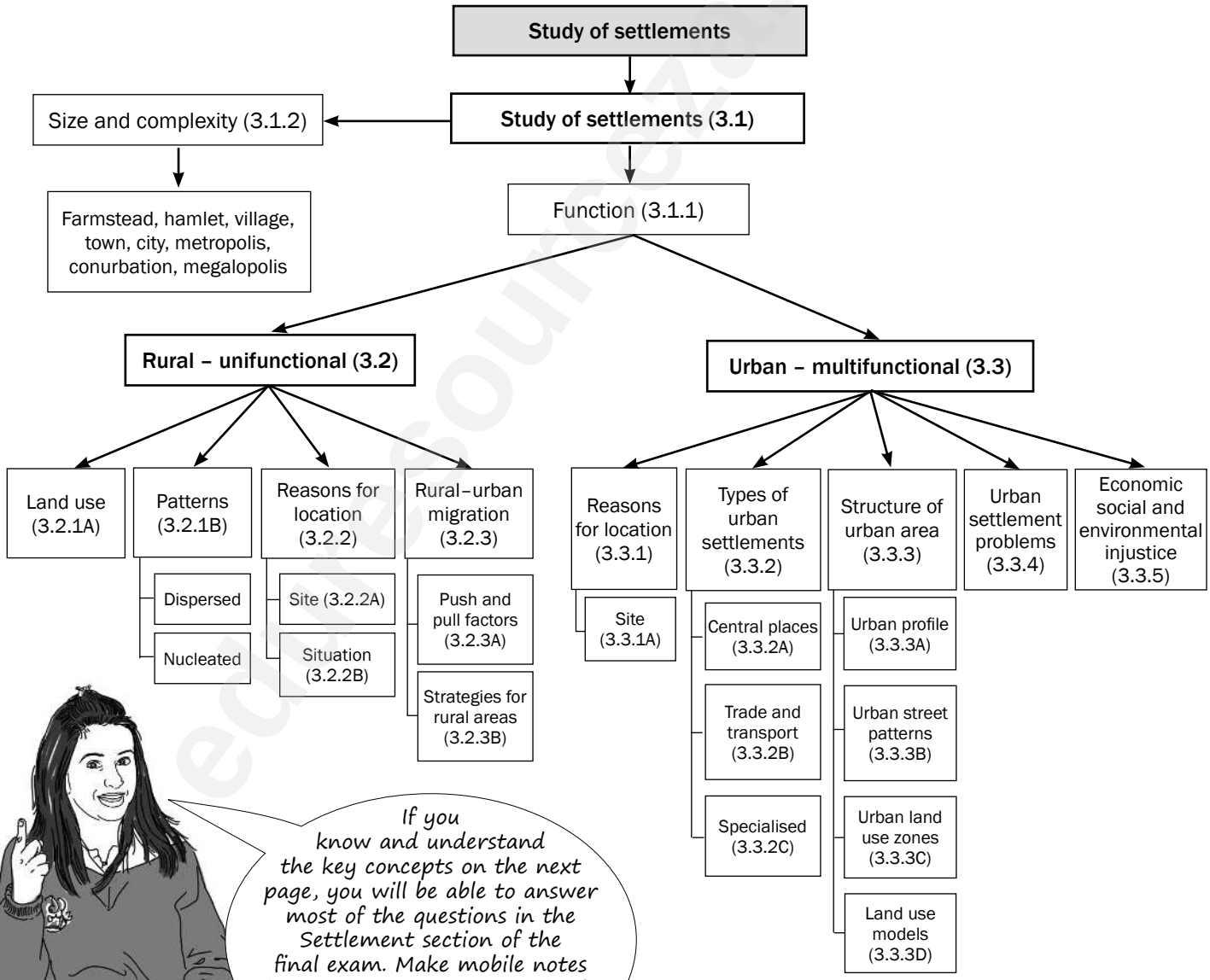
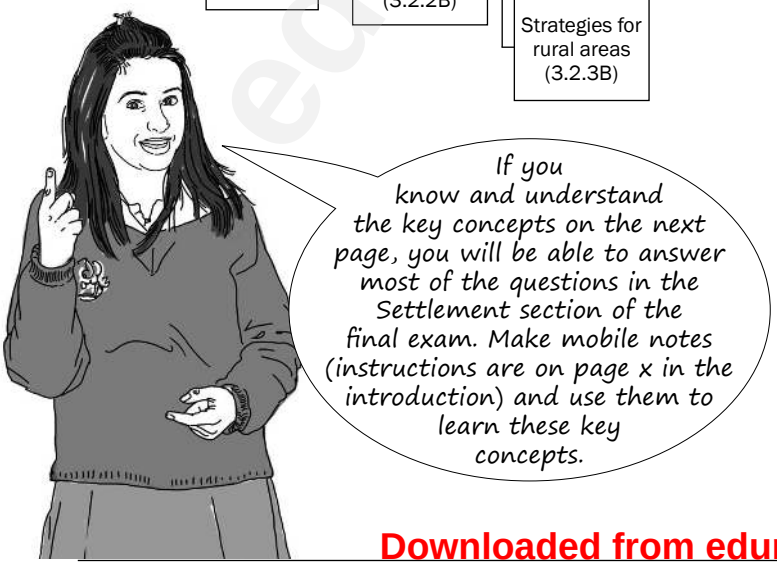
3 Chapter

Rural settlement and urban settlement

Settlement geography is the study of where people live and the reasons why they live where they do.





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Key concepts

Concept	Definition
Agenda 21 (local)	A plan of action or process to ensure sustainable development by: • Including local communities in all decisions made. • Using local resources wisely. • Including indigenous knowledge. • Developing the local community and improving the quality of life of people alongside conservation strategies.
Break-of-bulk town/city	Where one type of transport is replaced by another type, e.g. a harbour or port.
Central place town/city	Provides urban services to surrounding rural area.
Dispersed pattern/ isolated pattern	Buildings are arranged far apart from one another.
Dormitory town/city	A settlement which is mostly residential, as people work in a nearby city.
Dry-point settlement	A settlement in a wet area which could be flooded and so is situated away from the water source.
Function	Refers to the activities (primary, secondary or tertiary) that take place in settlements.
Gap town/city	A town or city situated at a point of access over or through a physical barrier, e.g. at a mountain pass.
Hierarchy	Ranking of places from villages to megalopolis **OR** ranking of functions or orders within an urban centre.
Informal settlement	An informal or unplanned area that is occupied by people who do not have access to formal housing and who erect dwellings on open land, usually on the outskirts of a town. Buildings are made of cardboard, zinc, plastic or wood, or any available materials. It is also sometimes called a squatter camp or shanty town.
Junction town/city	Where two major transport routes meet. This can be roads or railway lines.
Land use zones	Areas in an urban area that have a specific purpose or function.
Minimum service area	The minimum area needed to maintain a settlement, service or function.
Multifunctional	This is classified as urban because it has both secondary and tertiary activities.
Nucleated pattern/ clustered pattern	Buildings are arranged close to one another.
Pull factors (positive factors)	The qualities of an area that make people want to move there.
Push factors (negative factors)	Problems experienced in an area that make people move away.
Range	The maximum distance people are prepared to travel to a settlement or a function.
Rate of urbanisation	The speed at which urbanisation is taking place.
Rural depopulation	A decrease in the number of people living in rural areas as the population ages because young people are leaving.
Rural–urban migration	People move from the rural areas in search of better opportunities in cities.

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Concept	Definition
Settlement	A group of people living on a day-to-day basis in an area that has buildings, communication networks and functions.
Settlement pattern	This refers to a settlement being arranged either in a nucleated or dispersed manner.
Site	The actual piece of land that a settlement is found on.
Situation	The settlement in relation to its surrounding environment.
Specialised town/city	A town or city with one main dominant function.
Sphere of influence	The maximum area served by a settlement or function.
Threshold population	The minimum number of people needed to maintain a settlement or function or to keep it profitable.
Trade and transport town/city	Town or city found near to or on transport routes.
Types of towns/cities	There are three main types of towns/cities: • Central place towns/cities. • Trade and transport towns/cities. – Break-of-bulk towns/cities. – Junction towns/cities. – Gap towns/cities. • Specialised towns/cities.
Types of settlements	These are classified as either rural or urban according to function.
Unifunctional	This is classified as rural because it has mainly primary activities.
Urban expansion	The area that an urban area uses (physical area) increases over time, e.g. new buildings and infrastructure.
Urban growth	The number of people living in an urban area increases by natural increase (births minus deaths) as well as rural–urban migration.
Urban profile	The view of an urban area from the side to indicate the different land use zones.
Urbanisation	An ever increasing percentage of the total population living in urban areas.
Village shapes	Rural villages are classified as linear, round/square or crossroads.
Wet-point settlement	A settlement in a dry area situated near to a water source.

3.1 Study of settlements

In this chapter we learn that settlements are classified according to function, or size and complexity.

3.1.1 Function

- **Rural settlements** are mainly **unifunctional** (they have one main function) with only **primary** economic activities occurring, e.g. farming or forestry.
- **Urban settlements** are **multifunctional** (they have many functions), i.e. they have both **secondary** activities (factories/manufacturing) and **tertiary** activities (services).

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3.1.2 Size and complexity

- Settlements are classified from the smallest to the largest.
- A farmstead, hamlet and village are **rural settlements**.
- A town, city, metropolis, conurbation and megalopolis are **urban settlements**.

Study Figure 3.1.2 below to understand the differences in size and complexity of rural and urban settlements.

Rural	**Farmstead** A single farm and outbuildings ⇩ **Hamlet** A loose grouping of a few farmsteads ⇩ **Village** A denser grouping of many farmsteads
Urban	⇩ **Town** A densely populated urban area, e.g. Harrismith or Beaufort West ⇩ **City** A large town where many people live and work, e.g. East London, Bloemfontein ⇩ **Metropolis** A main city in a region which is surrounded by dependent towns, e.g. Cape Town, Durban, Port Elizabeth ⇩ **Conurbation** A large urban area formed by the growth and coalescence of a number of cities and towns, e.g. Witwatersrand ⇩ **Megalopolis** A gigantic urban complex formed when a number of conurbations join, e.g. Boston, New York and Washington (Bonywash)

Figure 3.1.2: Size and complexity of settlements

It is important to be able to classify settlements according to their function, size and complexity, and pattern.

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Activity 3.1

Complete the table to illustrate your understanding of the classification of settlements as either rural or urban.

	Rural	Urban
Function (activity)	(1 × 2 = 2)	(1 × 2 = 2)
Size and complexity (smallest to largest settlements)	(3)	(5)

[12]

Answers to activity 3.1

	Rural	Urban
Function (activity)	Unifunctional (primary activities)✓✓ (2)	Multifunctional (secondary and tertiary activities)✓✓ (2)
Size and complexity (smallest to largest settlements)	Farmstead, hamlet and village✓✓✓ (3)	Town✓, city✓, metropolis✓, conurbation✓, megalopolis✓ (5)

[12]

3.2 Rural settlements

Rural settlements are the smallest settlements which are unifunctional. They are farmsteads, hamlets or villages, where primary activities (farming, fishing, forestry or mining) take place. Figure 3.2.A illustrates a rural settlement.

Land use in rural settlements

The largest land use in South Africa is agriculture. Approximately 12, 1% of the land is used for both **commercial** and **subsistence** cultivation of crops.

Although rural communities focus on primary economic activities (farming and forestry), there are a number of different ways in which the land in these settlements can be used.

Subsistence farming involves using the land to grow crops and breed animals that are a source of food for the family living on the farm. The aim is not to sell the goods, but to consume them.

Commercial farming is practised where the land is used to grow crops or breed animals that are then sold as food sources to other markets. The main aim of this rural land use is to generate income for the farmers. Commercial farming can be either intensive or extensive.

Commercial farming can be divided into:

- **Stock farming:** Animals, for example, cows, chicken, sheep, pigs.
- **Crop farming:** Cultivation of land, for example, maize, wheat, fruit, vegetables.
- **Mixed farming:** A combination of stock and crop farming.

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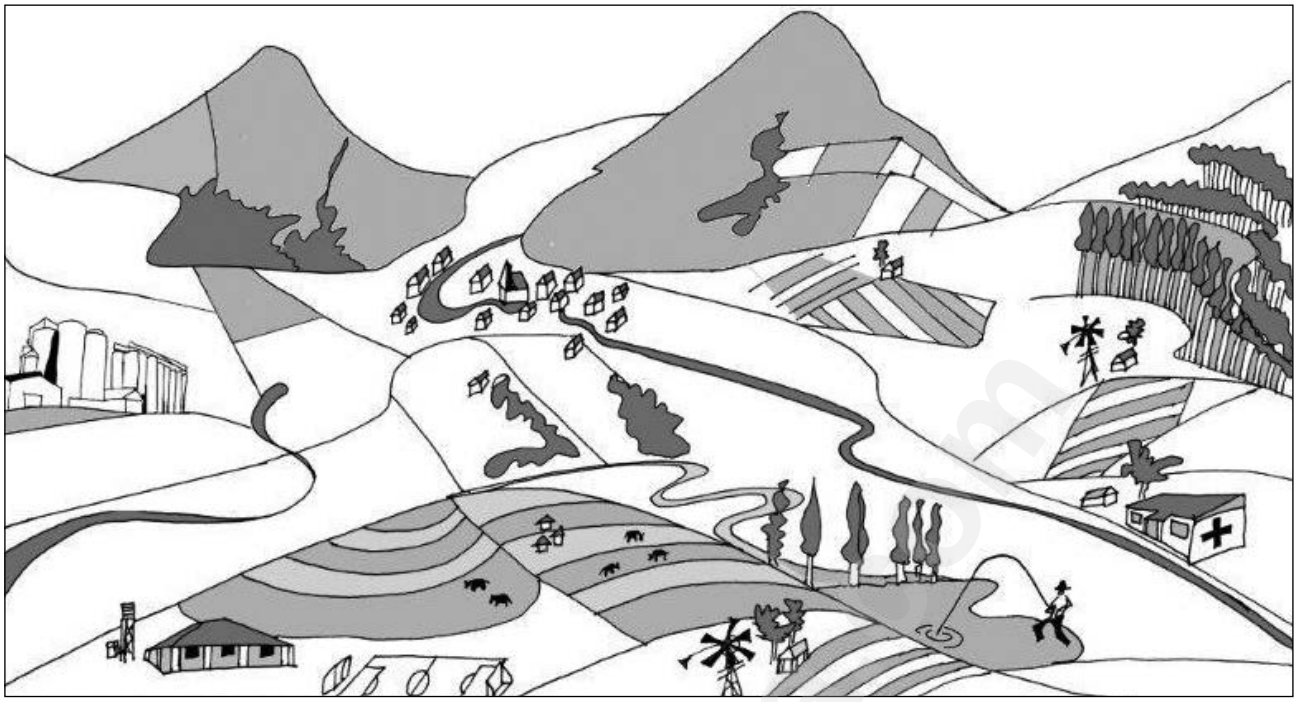


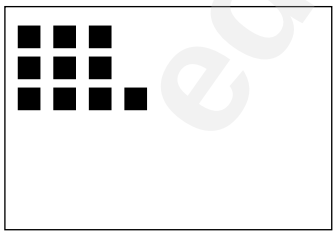
Figure 3.2A: Rural settlement

Rural settlement patterns

A rural settlement pattern refers to whether the farmsteads are grouped together or not. There are two rural settlement patterns:

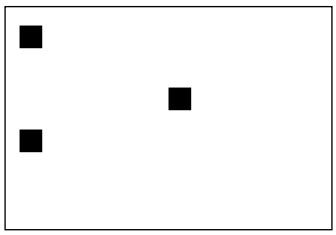
- **Nucleated pattern**: Farmsteads are arranged close to one another. Figure 3.2.B (below left) shows a nucleated pattern. These buildings are rural, so they cannot be classified as being larger than a hamlet or village.
- **Dispersed pattern**: Farmsteads are arranged far apart from one another. Figure 3.2.C (below right) shows a dispersed pattern. This can only be an isolated farmstead – this is one farm house, stables or sheds or kraals, and surrounding fields.

NB In an exam you may be asked to identify the pattern of settlement (nucleated or dispersed). Learn Figures 3.2B and 3.2C below to enable you to answer this question.



Key: ■ = buildings

Figure 3.2B: Nucleated rural pattern



Key: ■ = buildings

Figure 3.2C: Dispersed rural pattern

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Nucleated rural settlement	
Advantages	***Disadvantages***
• More interaction with people • Safer as there are more people • Can share ideas on how to solve a problem • Can share the cost of tools and machinery	• Not enough privacy • There may be arguments as you have to agree on how to solve a problem • Have to share the profits • Cannot use tools or machinery when you want to
Dispersed rural settlement	
Advantages	***Disadvantages***
• More privacy • Can make your own decisions • All the profit is your own • Better use of machinery and tools	• Not enough interaction with people • Not as safe as it is far from other people • Have to pay for all costs by yourself • Difficult to share ideas when you have a problem

Table 3.1: Advantages and disadvantages of living in a dispersed or nucleated rural settlement

hint

When you learn these advantages and disadvantages remember that:
- If it is an advantage for nucleated it will be a disadvantage for dispersed.
- If it is a disadvantage for dispersed it will be an advantage for nucleated.

3.2.1 Reasons for the location of rural settlements

Where a settlement occurs is referred to as its **location**. We will discuss the location of settlements under the headings **site** and **situation**.

- The **site** of a rural settlement refers to the exact piece of ground the settlement is found on.
- The **situation** of a settlement refers to the settlement in relation to its surrounding environment.

Figure 3.2.1A below illustrates the relationship between the site and the situation of a settlement.

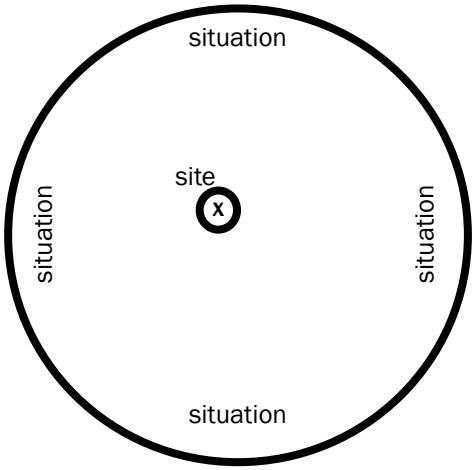

Figure 3.2.1A: Site and situation of a settlement

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Site of a rural settlement

When choosing a site for rural settlements, the following factors are considered:

- Availability of water
- Arable (fertile) land
- Pastoral (grazing) land
- Building materials
- Fuel such as wood from a forest

Situation of a settlement

When choosing a situation for rural settlements the following factors are considered:

- Above the flood line away from a river
- On the north-facing slope for warmer temperatures
- In the thermal belt for warmer night time temperatures
- Next to a road for accessibility

NB In an exam you may be asked to identify factors that affected the choice of the site of a particular settlement in a diagram. In this type of question if a key is given, study it carefully to help you answer the question. Learn the information above to help you answer this question.

Activity 3.2

Study the two rural settlement diagrams in Figures 3.2.1B and 3.2.1C and complete the table.

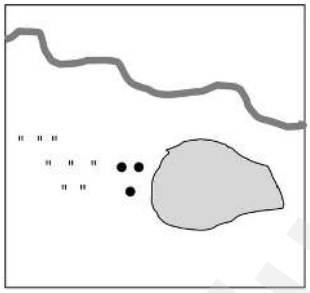

Figure 3.2.1B

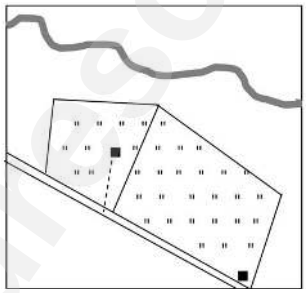

Figure 3.2.1C

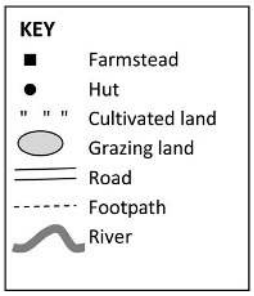

	Figure 3.2.2B	Figure 3.2.2C
Function	(1 × 2 = 2)	(1 × 2 = 2)
Settlement pattern	(1 × 2 = 2)	(1 × 2 = 2)
Factors affecting the site	(1 × 2 = 2)	(1 × 2 = 2)
Factors affecting the situation	(1 × 2 = 2)	(1 × 2 = 2)

[16]

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Answers to activity 3.2

	Figure 3.2.2B	Figure 3.2.2C
Function	Rural/unifunctional✓✓ (2)	Rural/unifunctional ✓✓ (2)
Settlement pattern	Nucleated✓✓ (2)	Dispersed/isolated✓✓ (2)
Factors affecting the site	Arable land✓✓ Drinking water✓✓ (any 1) (2)	Arable land✓✓ Drinking water✓✓ Grazing land ✓✓ (any 1) (2)
Factors affecting the situation	Away from water✓✓ Dry point settlement✓✓ (any 1) (2)	Away from water✓✓ Dry point settlement✓✓ Near a road for transport✓✓ (any 1) (2)

[16]

3.2.2 Rural-urban migration

As countries develop and urban areas expand, more and more people move from the rural areas to cities and towns. This movement of people from a rural area to an urban area is called **rural-urban migration.**

In this section we look at the factors that cause people to leave the rural areas (**push factors**) and move to the urban areas (**pull factors**). We will also look at what governments do to keep people in the rural areas.

Push and pull factors causing people to leave the rural areas

Table 3.2 below summarises the factors that make people want to leave the rural areas and move to cities.

Push factors *Remember, these make you want to leave rural areas. They **push** you away.*	Pull factors *Remember, these make you want to move to urban areas. They pull you in.*
Natural disasters, such as drought or floods, have a greater impact in rural areas.	Natural disasters have a smaller impact; government provides more help to urban areas during droughts and floods.
Lack of facilities in rural areas, e.g. fewer schools, colleges or universities, and fewer hospitals or clinics in rural areas	Better and more access to education and medical facilities in urban areas

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Lack of services in rural areas, e.g. water, electricity, transport	Better access to services in urban areas, e.g. water, electricity, transport
Lack of employment in rural areas – few jobs are available and there is little variety in the types of jobs available	More jobs and more types of jobs available in urban areas
Lack of housing in rural areas	More housing and better housing available in urban areas
Lack of recreational facilities, entertainment and social interaction in rural areas	More recreational facilities, entertainment and social interaction in urban areas
Poverty in rural areas, which limits people's chances of improving their standard of living.	Better standard of living possible in urban areas

Table 3.2: Push and pull factors

Strategies for getting people to stay in rural areas

Rural to urban migration causes many problems in rural and urban areas. Because of this, the government has various solutions or strategies (plans) to keep people in rural areas and to attract people back to rural areas. **Agenda 21 is a broad strategy to develop rural areas**. Some of the basic ideas are included in the list below:

- Before you can implement a solution, it is important to speak to the local people and get their ideas on how to improve the area.
- Solutions should look to use the skills and talents of the local people.
- Basic needs (food, shelter, clothing and clean running water) must be satisfied before other development can happen.
- Improve services (like electricity and roads) and facilities (like hospitals and schools) to encourage people to stay in the area.
- When providing for these basic needs, such as building roads or clinics, use local labour and train people so they can use their new skill or trade to earn a living in the area.
- Improve food security by educating farmers in the use of better farming methods, tools and seeds.
- Attract secondary activities, like factories, to rural areas. Encourage these industries to use local raw materials and skills to ensure rural people are employed.

Rural depopulation does not only affect rural areas but also small towns. Many people are leaving small towns to move to the big cities. Below are some basic ideas to consider when **improving small towns**:

- Improve roads to and from the small town.
- Upgrade facilities in the small town.
- Town councils must find ways to advertise their town to attract tourists or people to come and live there, for example:
  - Build old age homes and offer services specifically for older people. This would attract older people to retire to the small town.
  - Develop a holiday resort, or attract people for weekend getaways to the small town.

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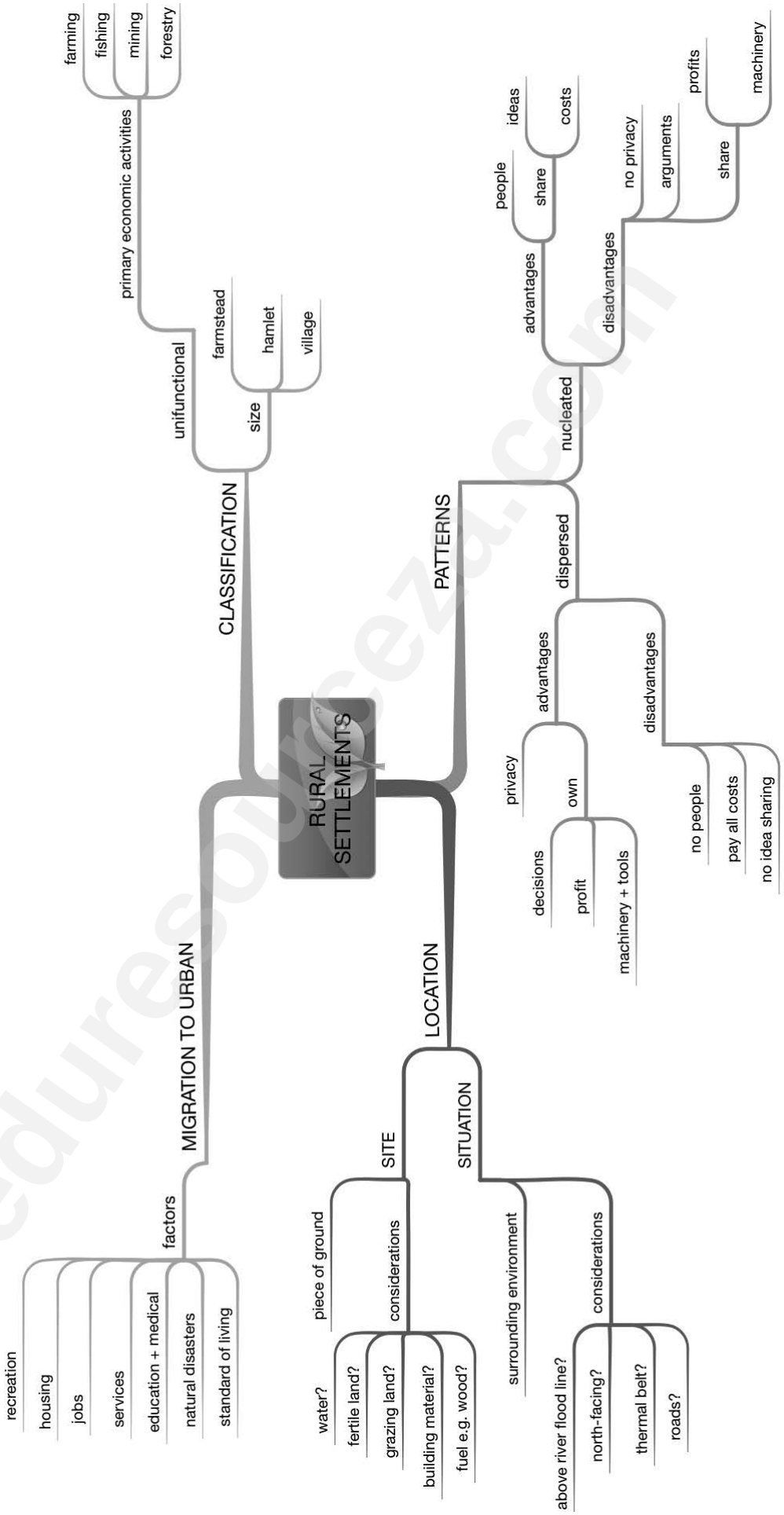
Summary of rural settlements



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3.3 Urban settlements

Urban settlements are towns or cities where secondary and tertiary activities take place. More and more people are living in urban areas so towns are growing larger and more complex all the time. Figure 3.3A below shows an urban settlement.

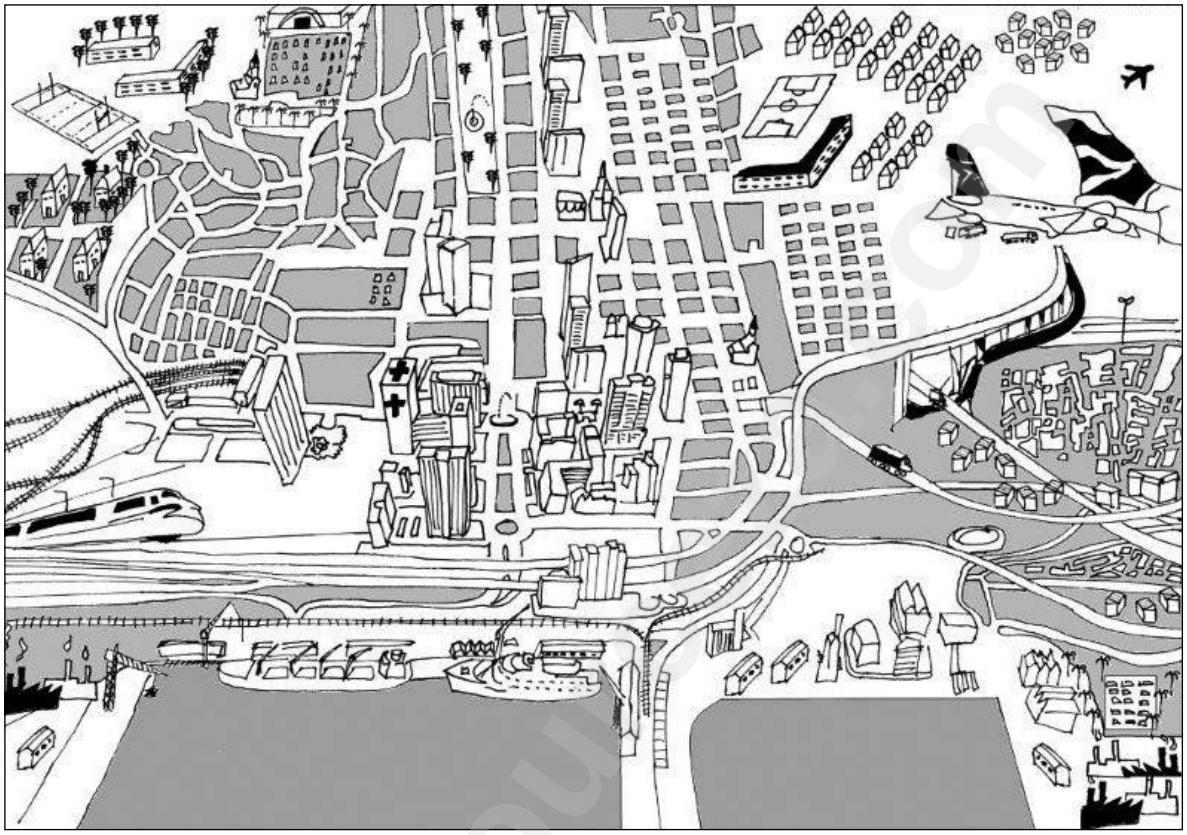

Figure 3.3A: An urban settlement

3.3.1 Reasons for the location of urban settlements

Where a settlement is found or occurs is referred to as its **location**.

Site of an urban settlement

When choosing a site for urban settlements, the following factors are considered:

- **Availability of water**: This is no longer as relevant, since water can be piped over long distances.
- **Soil**: People prefer to build on soil which allows water to drain through it. It is difficult to build on clay because water collects on top of this type of soil.
- **Rock structure**: Sites which are far from sinkholes, fault lines and volcanoes are better to build on.
- **Relief**: Sites with gentle gradients are preferred, as building costs are cheaper.
- **Transport and trade**: Development often occurs at a river crossing.
- **Human factors**: Sites with historical, cultural or social value attract people to live in the area.

In an exam you may be asked to identify factors that affected the choice of a particular settlement in a diagram. In this type of question, if a key is given look at it carefully to help you answer the question. Learn the information (left) to help you answer this question.

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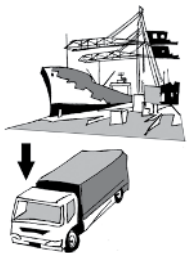
3.3.2 Types of urban settlements

Urban areas are classified according to their **function** (the main reason why they are there). There are **three main types** of urban areas:

- Central places
- Trade and transport towns or cities
- Specialised town or cities

Table 3.3 summarises the three types of urban areas.

1. Central places	
Small towns supplying urban goods and services to surrounding rural areas	
Low order good/service • Need often (bread, milk, doctor) • Smaller threshold population • Several shops/services	***High order good/service*** • Don't need or need less often (e.g. TV, health spa) • Larger threshold population • Few shops/services

2. Trade/transport towns or cities		
Develop where transport routes meet		
Break of bulk Transport changes, e.g. from sea to land  Example: Durban	***Junction*** Intersection of two main transport routes Example: De Aar (Touws River)	***Gap*** Point of access at physical barrier (e.g. mountain pass) Example: De Doorns (Hex River Pass)

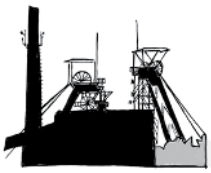
3. Specialised towns or cities				
Develop because of one main function in the area				
Mining  Example: Welkom	**Education** Example: Grahamstown	**Industrial** Example: Secunda	**Resort** Example: Margate	**Commuter/dormitory** Example: Soweto

Table 3.3: The three types of urban areas

Use the word CRIME to help you remember the different types of specialised towns:

C	**C**ommuter
R	**R**esort
I	**I**ndustrial
M	**M**ining
E	**E**ducation

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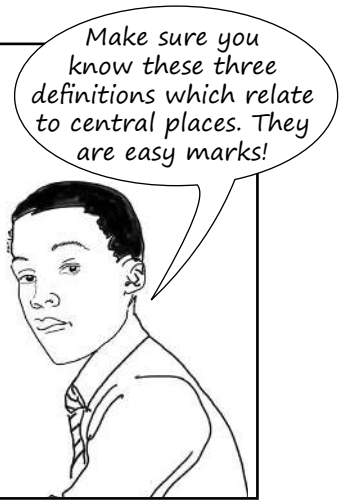
Central places

Central places are small towns that supply urban services to the surrounding rural area. They have shops that sell basic goods or provide basic services to people who live and work on the farms in the area. Goods or services may be classified as low or high order. Study Table 3.4 below to learn the differences between low and high order goods or services.

	Low order goods/services	High order goods/services
Definition	A function or good you need or buy often	A function or good you buy less often or do not need on a regular basis
Examples	Low order goods: bread, milk, petrol Low order services: doctors, mechanics	High order goods: television, designer shoes High order services: specialist doctors, health spas
Threshold population	**Smaller** number of people	**Larger** number of people
Number of these shops or services	Many – people want to buy low order goods and services on a regular basis	Few – people do not need high order goods and services very often

Table 3.4: Low and high order goods or services

- **Threshold population**: The number of people a function must serve in order to be profitable, or the number of people needed to support a function or town. Threshold population refers to how many customers a shop or service must have in order to be profitable.
- **Range**: The distance a person will travel to obtain a particular good or service. Range refers to how far someone will travel to buy a particular product or access a particular service.
- **Sphere of influence or service area**: The area served by a business selling a particular good or service. This is the area where people live who buy goods from a particular shop or use a particular service.



Activity 3.3

1. Expand the blank diagram in Figure 3.3.2A below and use the following terms to add a key to the diagram:
   a) Threshold population (1 × 2 = 2)
   b) Range (1 × 2 = 2)
   c) Sphere of influence (1 × 2 = 2)

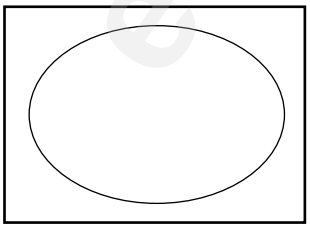


Figure 3.3.2A

2. Write definitions to show your understanding of the terms in a), b) and c). (3 × 2 = 6)

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Answers to activity 3.3

1.

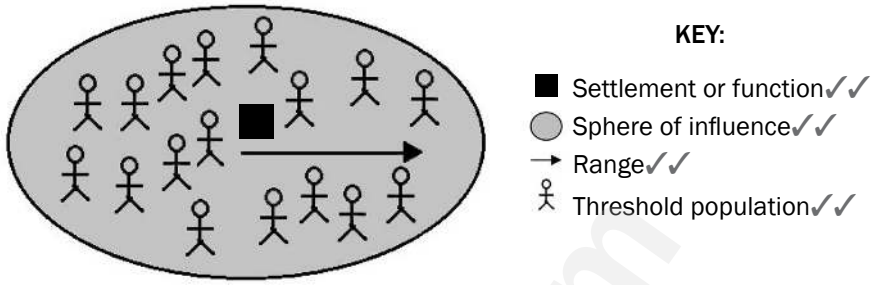

Figure 3.3.2B

2. **a)** The minimum number of people needed to maintain a settlement or function✓✓ (2)

b) The maximum distance people are prepared to travel to a settlement or a function✓✓ (2)

c) The maximum area served by a settlement or function✓✓ (2)

[12]

Trade and transport towns or cities

These are towns or cities which develop at a point where transport routes meet. Easy access to trade and transport in the area is the reason why people settle there.

There are three types of trade and transport cities:

- **Break-of-bulk towns or cities**: They develop at a point where the type of transport changes. This is most often at a harbour where the transport changes from sea to land.
- **Junction towns or cities**: They develop at an intersection of two major transport routes, for example a railway junction.
- **Gap towns or cities**: They develop at a point of access through or over a physical barrier, for example at a mountain pass.

Specialised towns or cities

In an exam, you may be asked to identify the type of trade and transport city in a diagram. If a key is given, look at it carefully to help you answer the question. Learn the information above to help you answer this question.

These are towns or cities which have developed because of one main or dominant function occurring in the area. If the function were to stop then the city would be at risk of becoming a ghost town (a deserted town). Examples of specialised towns or cities are:

- Mining towns or cities, e.g. Welkom
- Education towns or cities, e.g. Grahamstown
- Industrial towns or cities, e.g. Secunda, Sasolburg
- Resort towns or cities, e.g. Margate
- Dormitory or commuter towns or cities, e.g. Soweto

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3.3.3 Structure of an urban area

The study of an urban area involves focusing on the following three aspects:

- Urban profile
- Urban street patterns
- Urban land use zones

Urban profile

An **urban profile** is a view of the urban area from the side, like looking at the side view of a person's face. We call the side view a profile. A profile is seen in cross section drawings.

Figure 3.3.3A below shows a cross section of an urban profile.

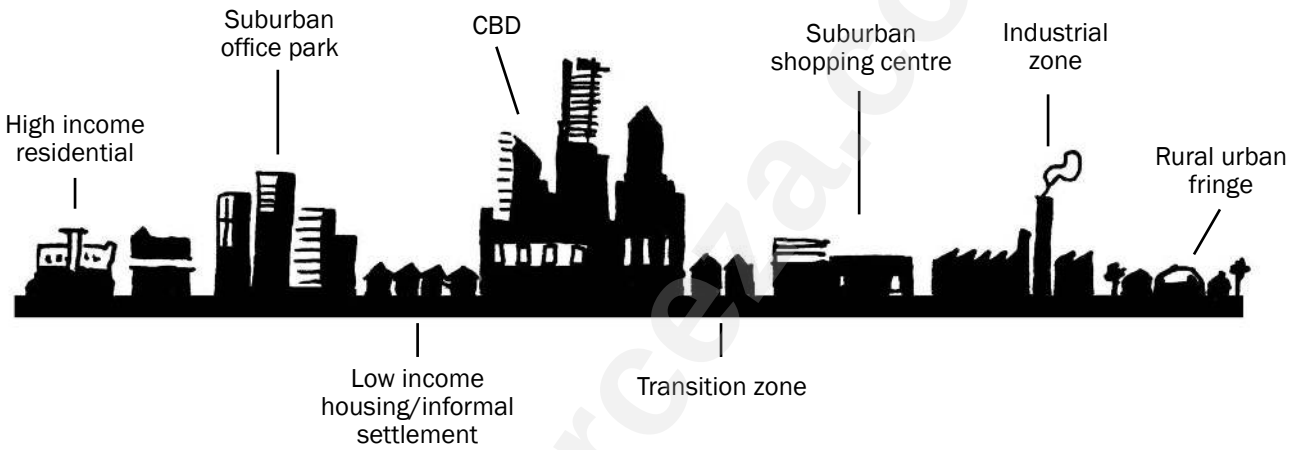

Figure 3.3.3A: An urban profile

When we study an urban profile we take note of the **height**, the **density** of the buildings, and **land value**.

- **Looking at the city from the centre towards the outskirts**
  The height of the buildings decreases the further away you go from the centre of the city. The density (how many buildings there are in an area) also decreases the further you go from the city centre. The reason for the decrease in density and height is because land value decreases as you move away from the centre of the city.

- **Looking at a city from the outskirts towards the centre**
  The height of the buildings increases the closer you get to the city centre. The density of the buildings also increases the closer you get to the city centre.

- **Thinking about land value**
  Land value in the centre of the city is very high because it is in high demand (lots of people value it and want to live or work there). The land value decreases the further you go from the city centre.
  The density and height in the centre of the city is highest because of the high land value. People must make maximum use of the land. This is why there are many high-rise buildings in the city centre.
  Due to the high land value in the city centre, certain functions will move to the outskirts of the city, such as factories, businesses and residential (houses). Factories and business are often located in specific areas known as industrial or office parks. Houses are located in residential suburbs.

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Figure 3.3.3B below shows the urban profile and how the land value decreases from the central business district (CBD) towards the outskirts of the urban area.

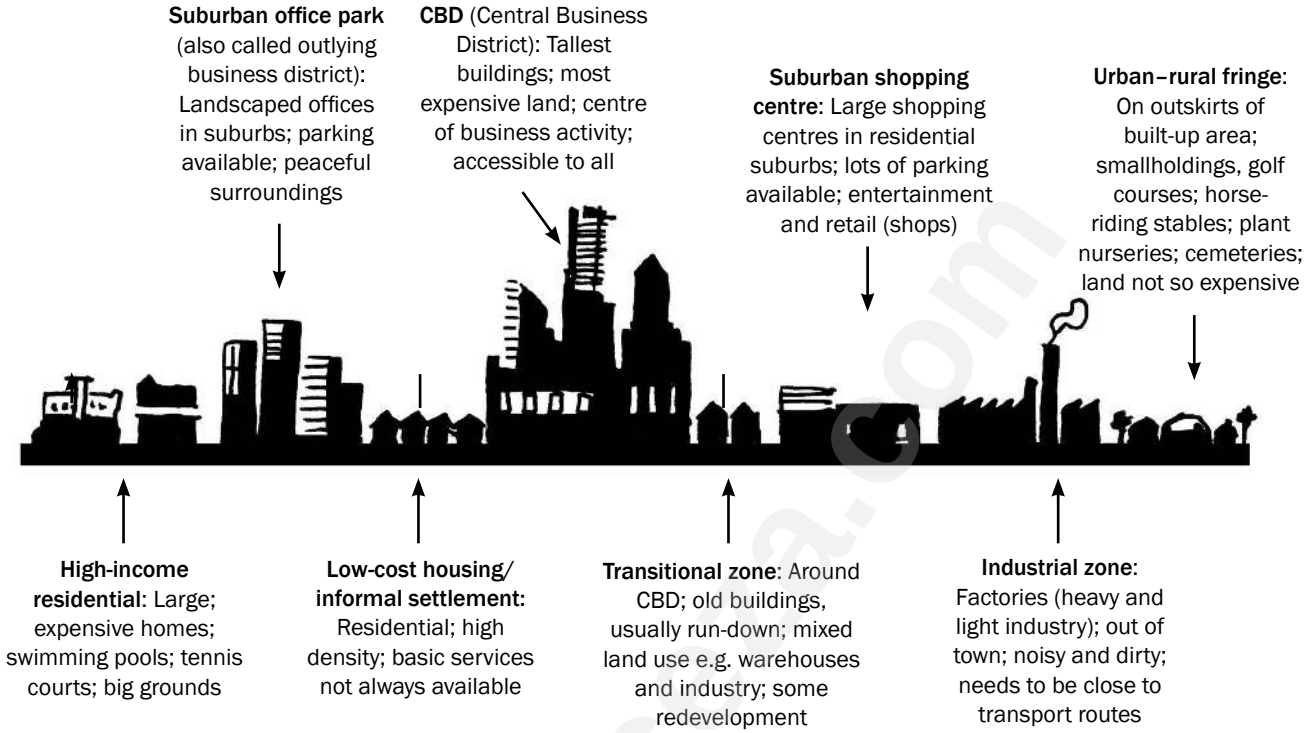

Figure 3.3.3B: Urban profile showing decrease in land value from the CBD towards the outskirts of the urban area

NB In an exam you may be asked to describe how the building density or buildings might change as you move away from the CBD. You may also be asked to explain why the height or density of buildings changes. Learn the information above to help you answer this question.

Activity 3.4

1. On the urban profile shown in Figure 3.3.3B on page 56 draw a line graph to show how land value changes as you move towards the CBD. (1 × 2 = 2)
2. How does building density change as you move towards the centre of the city? (1 × 2 = 2)
3. Explain your answer in question 2. (2 × 2 = 4)
4. Why would an office park move away from the Central Business District? (2 × 2 = 4)

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Answers to activity 3.4

1.

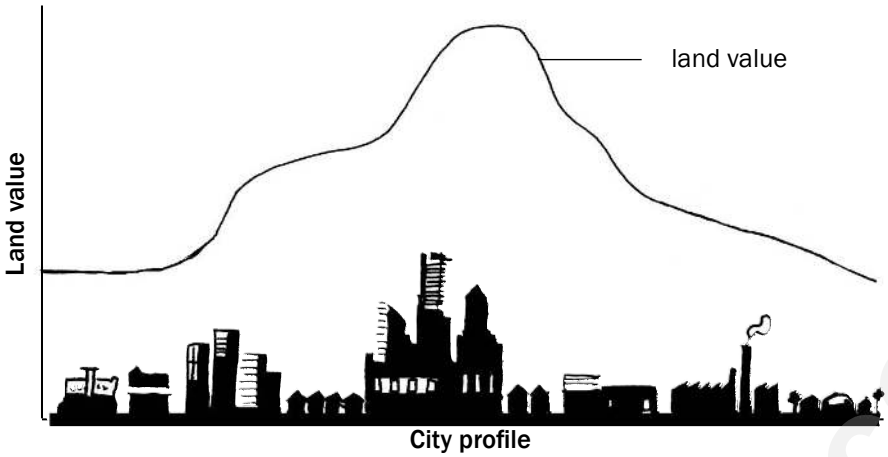

Figure 3.3.3C

2. The density of the buildings increases. ✓✓ (2)
3. The land is very expensive in the CBD so many buildings are built closer together and on smaller pieces of land. ✓✓ (4)
4. Land value is cheaper ✓✓/There is less traffic congestion ✓✓/ It is closer to clients ✓✓/There is less noise ✓✓/There is more parking✓✓ (any 2) (4)

[12]

Urban street patterns

The structure of an urban area can be studied from above by looking at the patterns formed by the streets of the urban area. The layout or arrangement of the roads is called the **street pattern**. In this section we focus on four street patterns:

- Gridiron
- Radial
- Planned irregular
- Unplanned irregular

Study Figures 3.3.3A to D to G (below and on page 58) to understand the four street patterns.

Gridiron street pattern

- The roads intersect at right angles, forming rectangular blocks.
- Found in the CBD and older cities

Advantages of the gridiron street pattern

- Easy to find way around (cannot get lost)
- Land can be divided up easily
- Can be converted into one-way streets to ease traffic congestion
- Shorter distance to travel
- Little wastage of land

Disadvantages of the gridiron street pattern

- Traffic congestion as traffic stops at every intersection
- More accidents because of intersections
- Monotonous (boring) suburb layout

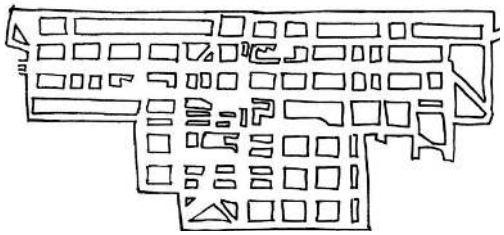

Figure 3.3.3D: Gridiron street pattern

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NB In Paper 1 or Paper 2 you may be asked to identify the street pattern and state the advantages and disadvantages of the street pattern. You may also be asked to give the age of a settlement based on the street pattern in the settlement.

Radial street pattern

- The roads spread out from a central point, similar to a spider's web.
- Found in very old cities like Paris in Europe or Kimberley in South Africa. It is also found in more recently planned cities like Sasolburg in South Africa.

Advantages of the radial street pattern

- Easier flow of traffic
- All roads lead to central point in town, for example a place of worship, monument, town square, etc.

Disadvantages of the radial street pattern

- Traffic jams are common as all roads lead to the centre
- Traffic is slow as there are no shortcuts
- Space is wasted

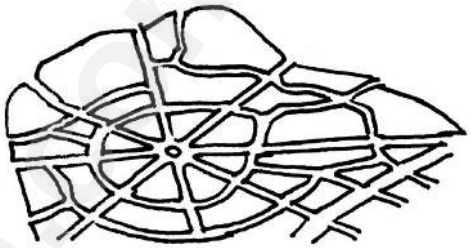

Figure 3.3.3E: Radial street pattern

Planned irregular street pattern

- The roads have few intersections and curve a lot.
- Found in modern cities and newer suburbs

Advantages of the planned irregular street pattern

- Improves the flow of traffic
- Roads are quieter because there are fewer intersections and less through-traffic
- Interesting suburb layout because of unexpected turns in the road
- Accommodates the nature of the topography

Disadvantages of the planned irregular street pattern

- It is easy to get lost.
- It is not easy to subdivide or expand.

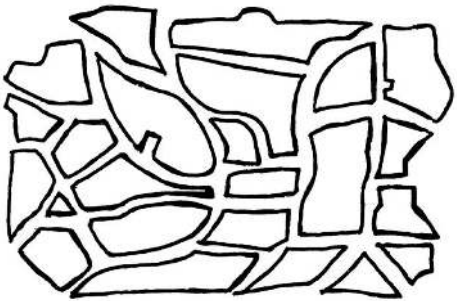

Figure 3.3.3F: Planned irregular street pattern

Unplanned irregular street pattern

- There is no clear design or plan to these roads.
- Typical of informal settlements

Advantages of the unplanned street pattern

- One of a kind (unique) pattern

Disadvantages of the unplanned street pattern

- Traffic congestion
- Unplanned/no order
- Get lost easily

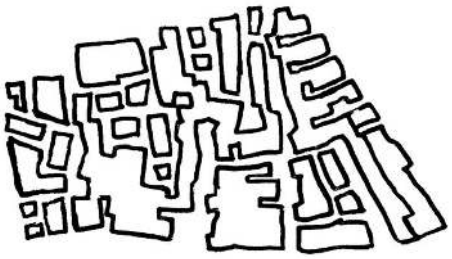

Figure 3.3.3G: Unplanned irregular street pattern

Urban land use zones

The structure of an urban area can be studied by looking at the different land use zones in a city. A land use zone is an area which has features that define its function. For example, a residential area is made up of houses or flats, recreational areas, schools and shops. These features tell us that people live in the area. Another example is an industrial area, which is made up of many large buildings (factories), major transport routes and few open or green areas.

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The photographs and some orthophotos in Figures 3.3.3H (i)–(xiv) below show different land use zones and their features. An orthophoto is an aerial photograph that has been geometrically corrected so that the scale is uniform and there is no visual distortion. Remember, aerial means 'seen from above'.

Description	Photograph	Orthophoto
Central Business District (CBD) • In the city centre • Highest land values • Most accessible • Highest building density • Tallest buildings	 *(i)*	 *(ii)*
Transition zone • Zone of mixed and changing land use, e.g. residential becoming commercial • Often a zone of decay • Landlords are not maintaining the area or buildings. • Working class residents live here, in high-density flats or small houses.	 *(iii)*	
Light industry • Often near the CBD or in planned industrial estates (areas where government plans to provide needed power and transport for factories) • Found near road transport as raw materials are often transported more easily in this way • Little noise and air pollution created by these industries	 *(iv)*	 *(v)*

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Description	Photograph	Orthophoto
Heavy industry • Found on the outskirts of the city where land is cheapest • Found near major road and rail networks for transport of raw materials and finished products • Often low-income housing is found nearby • Heavy air and noise pollution • Needs to be on flat land, near a water source	 *(vi)*	
Middle- to high-income residential/upper class residential • Found away from the CBD • Often has a good view • Townhouses and big houses • Larger properties as more space is available • Good services and facilities, including recreation areas	 *(vii)*	 *(viii)*
Low-income residential/working class residential • Buildings very close together • Close to business area • Fewer facilities and poor services • Small blocks • Buildings look the same	 *(ix)*	
Informal settlement • Found on the city outskirts • No service delivery (no roads, sanitation, water, electricity or schools) • High poverty levels • High crime rates • Houses are built out of plastic, wood, zinc, etc • Unhealthy conditions • Very dense housing with unplanned street patterns	 *(x)*	

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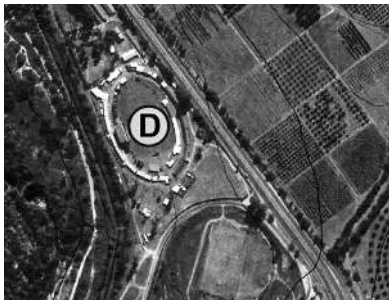
Description	Photograph	Orthophoto
Green belt/recreation • No buildings in this area • Used for public gardens, parks and sports fields. Area has many trees and lawns. • Helps to clean the air in urban areas • Calms traffic and reduces noise levels	 *(xi)*	 *(xii)*
Rural urban fringe • Mixed land use with both urban and rural functions • Urban functions like rubbish dumps, airports, cemeteries and golf courses • Land use starting to change from rural to urban as city expands • Large properties because land here is often cheaper • Less developed areas • Plots and smallholdings	 *(xiii)*	 *(xiv)*

Figure 3.3.3H: Land use zones

Land use models

Land use models are simplified diagrams which are used to represent the pattern of land use functions within a city or a town. It should be remembered that these are a simplification of reality and it is unlikely that any model will fit every town or a city well.

The urban models listed below are a few examples of the currently used urban models in the world.

They are:
- Multiple nuclei model
- The modern American-Western city model
- Third world city model
- South African city model.

As cities developed and changed over time, people designed land use models to represent the patterns of land use at that time. Today most cities fit the multiple nuclei model.

In developing countries cities have a different pattern, with sections that are well developed and defined (for example, areas where the colonial

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powers lived), and sections that are unplanned and irregular (for example, areas where the indigenous people lived). The irregular sections have grown due to rural-urban migration.

South African cities have a completely different pattern due to apartheid laws like the Group Areas Act. Our cities have a multiple nuclei pattern with some additions – see Figure 3.3.3K.

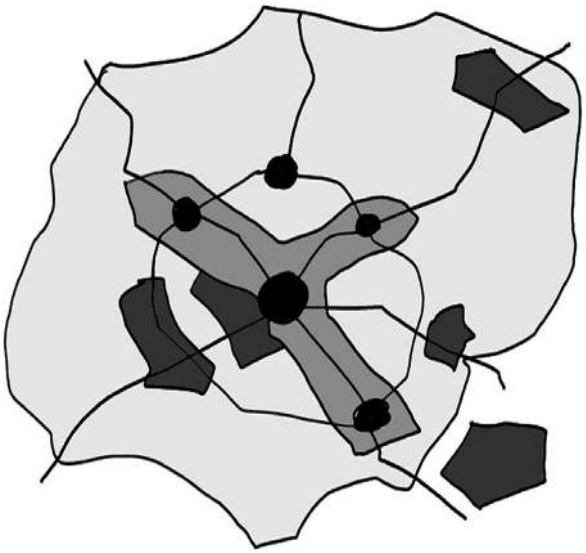


Figure 3.3.3I : An example of the American-Western city model

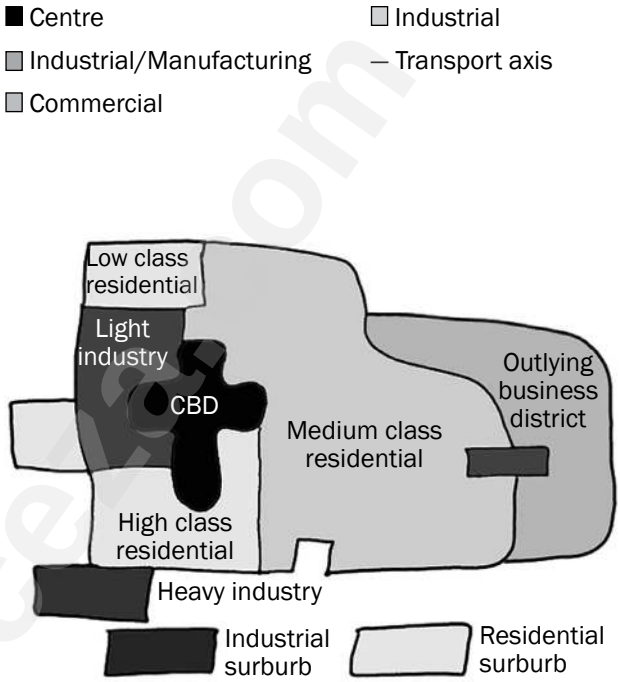
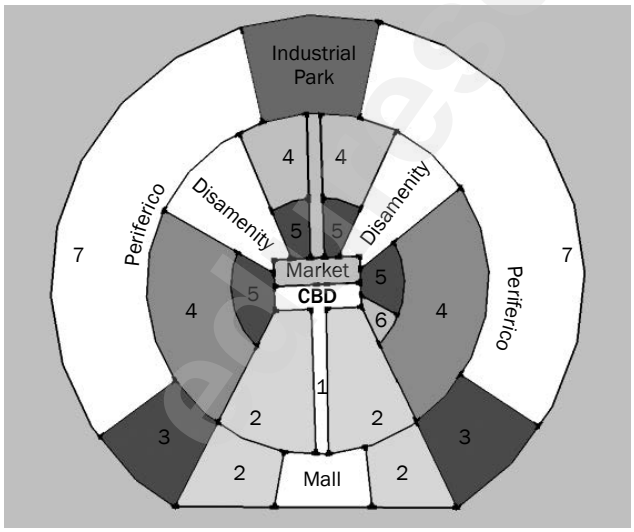


Figure 3.3.3J: Multiple nuclei city model



1. Commercial
2. Elite residential sector
3. Middle-class residential
4. Zone of in situ accretion
5. Zone of maturity
6. Gentrification
7. Zone of peripheral squatter settlements

Figure 3.3.3K: An example of a third world city model (Latin American city)

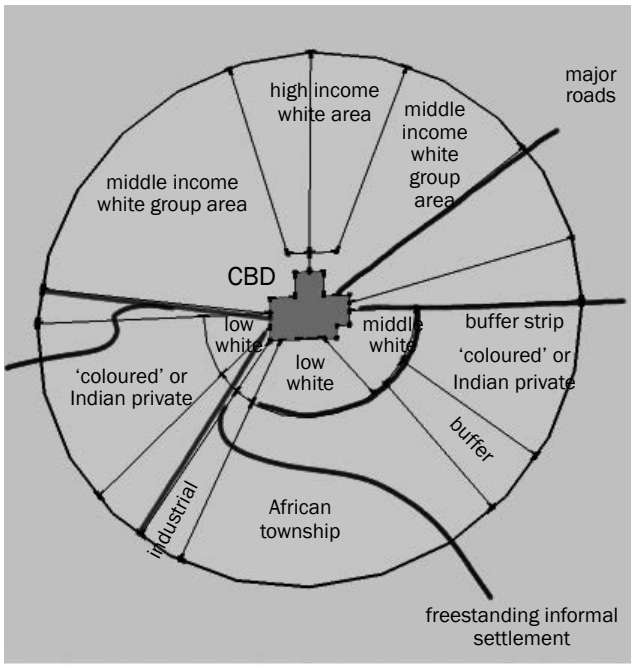


Figure 3.3.3L: An example of an apartheid city model

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Land use zones and mapwork interpretation

It is important that you understand how to identify land use zones on a topographic map or orthophoto, as this is a frequently asked question in the Mapwork section of the exam (Paper 2).

Central Business District

- In the centre of the town
- Has a gridiron pattern
- Transport routes meet here

Working class residential zone

- Near CBD or industrial area or sewage disposal works or railway line
- Very small blocks (grey blocks on a map show built-up areas)

Upper class residential areas

- On outskirts of town (but not near factories or sewage works)
- Near to golf courses or the sea
- Large grey blocks

Heavy industry

- On outskirts of town
- Next to main transport routes (highway or railroad)
- Near a river
- Indicated by large black blocks on the map

NB

In Paper 1 and Paper 2 you may be asked to identify the land use zones seen in diagrams, cartoons, photographs and on a topographic map or on an orthophoto. You may also be asked to describe the characteristics of the land use zone. Learn the above information to help you answer the question.

Activity 3.5

This activity is a mapwork interpretation of a settlement. Refer to the topographic map 2530BD Nelspruit and the orthophoto map extract at the back of this study guide and answer the following questions.

1. Nelspruit/Mbombela is the capital of which South African province? (1 × 2 = 2)
2. a) What factors influenced the site of Nelspruit/Mbombela? (4 × 2 = 8)
   b) Discuss the situation of Nelspruit/Mbombela. (3 × 2 = 6)
3. a) Identify the settlement pattern in block C2. Give a reason to support your answer. (2 × 2 = 4)
   b) What is the shape of the settlement in block B3? Why do you think it has taken this shape? (2 × 2 = 4)
4. Classify the type of farming in block C3 as fully as possible, explaining your answer. (3 × 2 = 6)
5. a) What is different about the farm Friedenheim in block C5? (1 × 2 = 2)

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b) How could this farm help to prevent rural–urban migration? (1 × 2 = 2)

6. What type of city would Nelspruit/Mbombela be classified as? Explain your answer. (2 × 2 = 4)

7. a) Give the block reference of the land use zone known as the CBD. (1 × 2 = 2)

   b) Draw a simple cross section sketch to illustrate the urban profile of the land use zone in question a). (2 × 2 = 4)

   c) What type of street pattern is found in this zone? Give two advantages and two disadvantages for this street pattern. (5 × 2 = 10)

8. West Acres is an example of an upper income residential area. Give two reasons from the map to support this statement. (2 × 2 = 4)

Study the orthophoto at the back of the study guide.

9. What land use is found at A, B, C and D? (4 × 2 = 8)

10. The residents of West Acres do not like travelling to the centre of Nelspruit/Mbombela to do their shopping as it has become so congested. Where would you suggest that they build a new shopping mall? Explain why you have chosen this site to build on. (3 × 2 = 6)

[70]

Answers to activity 3.5

1. Nelspruit/Mbombela is the capital of Mpumalanga province.✓✓ (2)

2. a) Analysis of the site of Nelspruit/Mbombela:
   - Near water from the river✓✓
   - Arable land from the river valley✓✓
   - Possible building material from the surrounding hills✓✓
   - Possible fuel from the vegetation on the slopes✓✓ (8)

   b) Discussion of the situation of Nelspruit/Mbombela:
   - i) Topography: It is on the valley floor so easy to establish✓/ Gap city between the mountains✓
   - ii) Gradient: The city is built on flat land for the large buildings✓/Residential areas are more on the slopes✓
   - iii) River: Buildings on the inner bank away from possible flooding✓
   - iv) Transport: On the main road to Mozambique on N4✓/ Links to the west–east and north–south✓/Part of Maputo Corridor✓ (any 3 facts) (6)

3. a) Block C2 is a nucleated settlement pattern.✓✓ The buildings are close to one another.✓✓ (4)

   b) The settlement in block B3 has a linear shape.✓✓ It lies along the road/along a contour so that it is easy to build on the same height above sea level/altitude.✓✓ (4)

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Answers to activity 3.5 (continued)

4. The type of farming in block C3 is commercial farming.✓✓ The farm is large✓✓/The farmer lives on his farm and has maximum control✓✓/The farm is near to the road for easy transport.✓✓ (any 3 facts) (6)

5. **a)** The farm Friedenheim in block C5 is an experimental farm. It has a research/education function.✓✓ (2)

b) This farm can help to prevent rural–urban migration because: It creates work for the people living in the area and people can migrate back to the area✓✓/It supports Agenda 21, enabling people to become more independent or able to make a living.✓✓ (any 1 fact) (2)

6. Nelspruit (Mbombela) can be classified as any one of the following:

Central place – there is a lot of farming in the area so Nelspruit offers urban services to the surrounding rural area, e.g. market for farm produce, schools for rural children to attend.✓✓✓✓

Trade and transport city – it is built where two major roads meet✓✓✓✓.

Gap city – it is built in the valley between mountains.✓✓✓✓

(any 1) (4)

7. **a)** The land use zone known as the CBD is in block E4 on the map.✓✓ (2)

b) Simple cross section sketch to illustrate the urban profile of this land use zone:

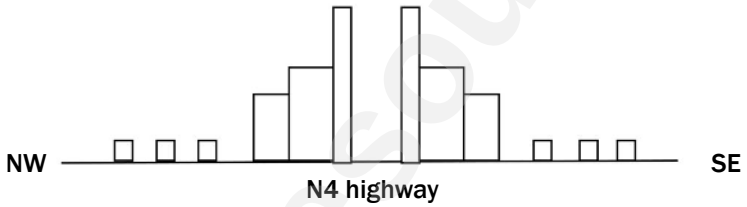

Figure 3.3.3M (4)

c) This zone has a gridiron street pattern.✓✓

Advantages (any 2)	Disadvantages (any 2)
• Easy to find your way around (cannot get lost)✓✓ • Land can be divided up easily✓✓ • Can be converted into one-way streets to ease traffic congestion✓✓ • Shorter distance to travel✓✓ • Little wastage of land✓✓	• Traffic congestion as traffic stops at every intersection✓✓ • More accidents because of intersections✓✓ • Heavy traffic causes road rage ✓✓ • More pollution from cars✓✓ • Monotonous (boring) town layout✓✓

(10)

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Answers to activity 3.5 (continued)

8. West Acres is an example of an upper income residential area. Two reasons are evident on the map to support this statement:

- Away from the CBD✓✓
- It has large blocks of land between the roads.✓✓
- Street pattern plan is irregular✓✓
- It is on the warmer, north-facing slope so land will be more expensive.✓✓
- Away from pollution and noise✓✓ (any 2) (4)

Questions based on the orthophoto:

9. Land use found at A, B, C and D:

A = Transport (railway station)/Industrial✓✓
B = Commercial/Business – CBD✓✓
C = Residential✓✓
D = Recreation/Showground✓✓ (8)

10. The best place for a shopping mall for the residents of West Acres would be near E on the orthophoto. The reasons are as follows:

- The land is not being used for other purposes.✓✓
- It is near a road so people living nearby can get there easily.✓✓
- It is close to the suburb West Acres.✓✓
- The land here is quite flat (as indicated by the contours that are far apart).✓✓ (any 3 reasons) (6)

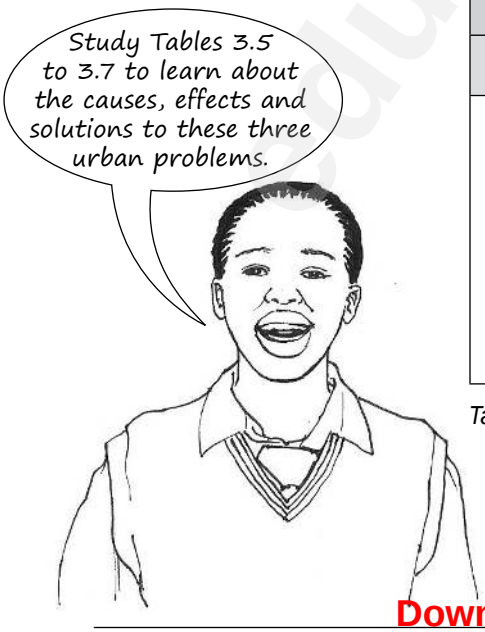
[70]

3.3.4 Urban settlement problems

As an urban area grows and more people move into the area, certain problems are created and get worse as the city gets bigger. These problems are often worse in the CBD.

In this section we focus on the following three urban problems:

- Congestion
- Urban decay
- Centralisation



Problem: Congestion (too many cars on the roads)		
Causes	**Effect**	**Solution**
• Too many people using own cars • Not enough public transport • Old street planning	• Increased air pollution • More accidents • More stress and health problems; road rage	• Improve public transport • Have lift schemes • Encourage some businesses to move out of the CBD • Synchronize traffic lights

Table 3.5: Causes, effects and solutions to the urban problem of congestion

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Problem: Urban decay (where parts of the city are not looked after or are over-used)		
Causes	**Effect**	**Solution**
• CBD moving into residential areas • Too many people living in the city • Unoccupied/empty buildings	• Slums develop • Services and facilities decline • Increased pollution • Area becomes dirty and neglected (not looked after)	• Get people in slums to help fix up their area, increase their ownership of buildings • Improve and upgrade services and facilities

Table 3.6: Causes, effects and solutions to the urban problem of urban decay

Problem: Centralisation (too many people and activities moving into the city, close to centre)		
Causes	**Effect**	**Solution**
• High demand for land in the city • Too many people living in the city	• Increased pollution • Increase in health problems • Increased destruction of the environment • Overuse of resources • Production of too much waste	• Move certain functions out of the city • Stricter controls on all types of pollution • Develop more green belts

Table 3.7: Causes, effects and solutions to the urban problem of centralisation

NB

In an exam you may be asked to state the causes or effect or solution to an urban problem. You may also be asked to describe the causes or effect or solution to an urban problem in a paragraph.

3.3.5 Economic, social and environmental injustice

In geography you are often asked to describe, explain, or discuss the effect, impact, or injustice of particular phenomena. To do this, we first need to understand the meanings of these words.

- **Injustice**: inequity, unfairness, unjustness, wrong, grievance; means an act that inflicts undeserved hurt. Injustice applies to any act that involves unfairness to another or violation of one's rights
- **Opposite of injustice:** equity, fairness, justice.
- **Economic injustice:** when different people have different levels of income in a society.
- **Social Injustice:** the distribution of advantages and disadvantages within a society.
- **Environmental injustice:** the unfair distribution of environmental benefits and burdens. Environmental justice is the fair treatment and meaningful involvement of all people regardless of race,

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colour, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.
- **Impact:** the effect or impression of one thing on another.
- **Effect:** something brought about by a cause or agent; a result or outcome.

In Geography when a question refers to economic, social and environmental factors, impacts or injustices the term relates to the following:
- **Economic:** this term deals with the making of or losing money by business, countries, and individuals. It includes economic activities (primary, secondary, and tertiary activities). It is concerned with the human-made environment; the infrastructure and buildings.
- **Social:** this term relates or deals with people, demographic factors (birth rates, death rates, income, literacy levels and employment), and basic needs.
- **Environmental:** of, relating to, or associated with the environment.

In a test or exam the question would be as shown below. Possible answers are given.

Discuss the economic, social, and environmental injustices of the following:
Or
Discuss the economic, social, and environmental impacts or effects of the following:

1. Flooding (Mid-latitude cyclones, tropical cyclones)
2. Drought (HP cells)
3. Global warming
4. Mining
5. Zone of decay/Overpopulation or overcrowding
6. Rural depopulation
7. Globalisation/Increased trade

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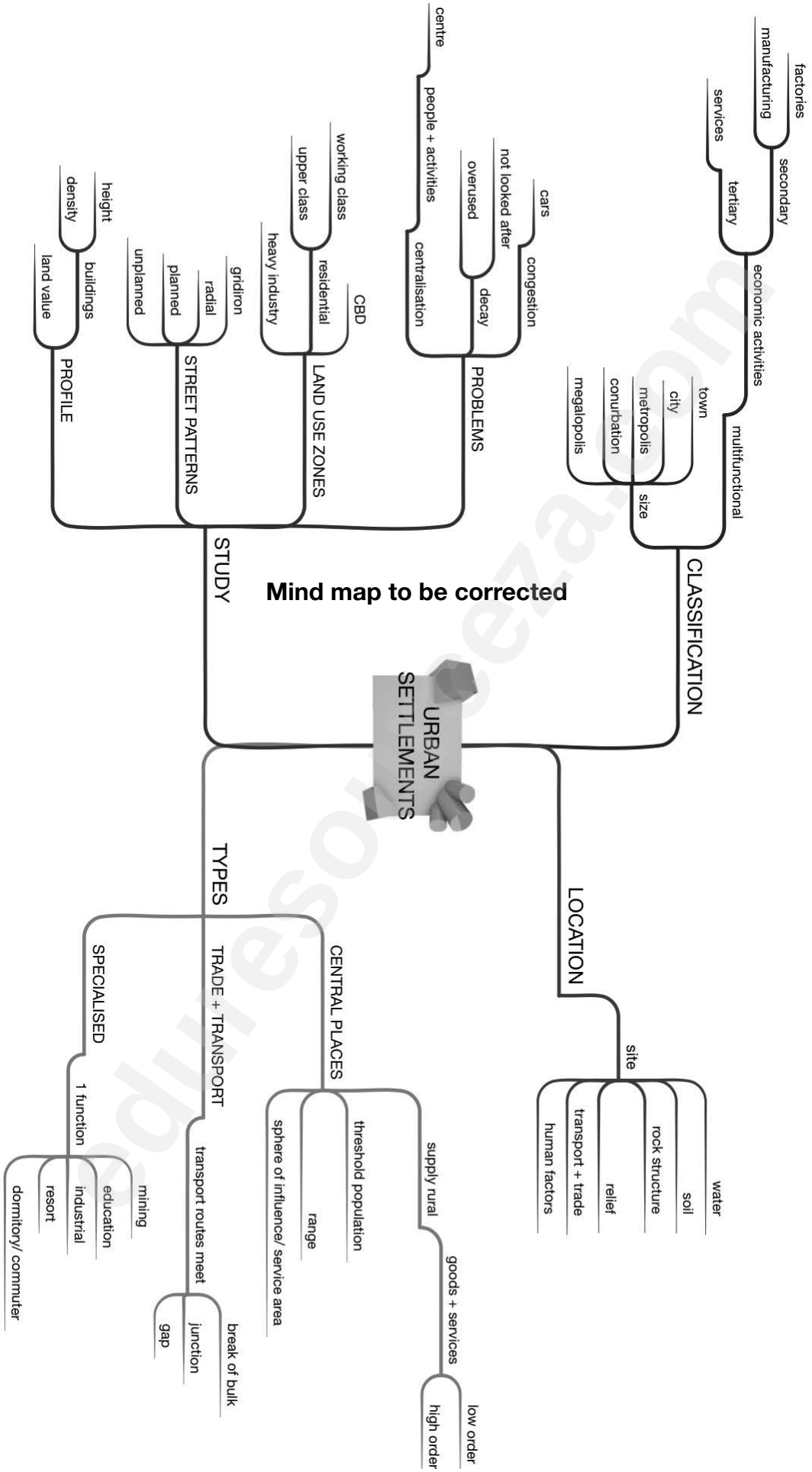
Summary of urban settlements



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Activity 3.6

Refer to Figure 3.3.5A below, which shows a settlement typical of the South African urban landscape. It shows urban functions or services of a low and a high order.

Figure 3.3.5A

1. a) What is a settlement? (1 × 2 = 2)
   b) Is the settlement shown in Figure 3.3.5A a rural or an urban settlement? (1 × 2 = 2)
   c) Give one reason for your answer to question b) above. (1 × 2 = 2)
2. a) Distinguish between a low-order function and a high-order function. (2 × 2 = 4)
   b) From Figure 3.3.5A, identify one low-order function and one high-order function. (1 × 2 = 2)
   c) Explain the meaning of the term sphere of influence of a function or service. (1 × 2 = 2)
   d) Will the hospital or the café have a larger sphere of influence? (1 × 2 = 2)
   e) Explain your answer to question d) above. (2 × 2 = 4)
3. a) The bakery is an example of a light industry. What is a light industry? (1 × 2 = 2)
   b) Unlike a heavy industry, the bakery can be located close to the hospital. Explain why this bakery does not have to be located outside the city. (2 × 2 = 4)
   c) Why is it important for the bakery to have a central location? (2 × 2 = 4)
4. a) With reference to Figure 3.3.5A, explain why many people from the surrounding rural areas are attracted to this settlement. (2 × 2 = 4)
   b) Explain why it is important for the illustrated settlement to slow down the movement of people from rural areas to this settlement. (2 × 2 = 4)

[38]

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Answers to activity 3.6

1. a) A settlement is a grouping of people, buildings, communication networks and activities that function as a single, integrated system on a regular, daily basis. ✓✓ (2)
   b) It is an urban settlement. ✓✓ (2)
   c) It is multifunctional✓✓/Secondary and tertiary functions are shown.✓✓ (any 1) (2)
2. a) Low-order function: Needed on a daily basis; has a small sphere of influence, small range and small threshold population✓✓ (2)
   High-order function: Needed less often; has a large sphere of influence, large range and large threshold population.✓✓ (2)
   b) Low-order: Bakery/Café/Flour mill✓✓
   High order: SABC/Hospital/Bank/Chem-Lab Research ✓✓ (any 1) (2)
   c) Sphere of influence is the area served by a function or service ✓✓ (2)
   d) Hospital ✓✓ (2)
   e) A hospital has a high-order function and people are prepared to travel great distances to use this service.✓✓ (2)
   A hospital needs a large threshold population and therefore a large sphere of influence is needed.✓✓ (2)
3. a) A light industry is an industry that uses small quantities of raw materials and causes little pollution.✓✓ (2)
   b) Reasons why the bakery does not have to be located outside the city:
   - Little air pollution ✓✓
   - Little noise pollution ✓✓
   - No bad odours (bad smells) ✓✓
   - No dangerous activities ✓✓
   - Only needs a small piece of land ✓✓ (any 2) (4)

   c) Reasons why it is important for the bakery to have a central location:
   - Products are perishable (can go bad) ✓✓
   - Must be close to the consumers ✓✓
   - More accessible ✓✓ (any 2) (4)
4. a) Reasons why people are attracted to the settlement:
   - Variety of services (e.g hospital, bank, transport) ✓✓
   - Job opportunities in many different economic activities✓✓
   - Higher paid jobs in secondary and tertiary sectors ✓✓
   - Good infrastructure ✓✓
   - Entertainment✓✓ (any 2) (4)

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Answers to activity 3.6 (continued)

b) Slowing down the rural-urban migration must happen so that it can:

- Avoid overcrowding ✓✓
- Reduce traffic congestion ✓✓
- Reduce pressure on resources ✓✓
- Reduce the unemployment caused by too many people coming to the city ✓✓
- Reduce the problem of lower standards of living ✓✓
- Reduce the problem of informal settlements being built ✓✓
- Prevent a possible increase in crime ✓✓
- Prevent urban decay ✓✓
- Prevent the development of social problems ✓✓ (any 2) (4)

[38]

Activity 3.7

Refer to Figure 3.7 and read the following extract (Cape Peninsula) before you answer the questions that follow.

> The Cape Peninsula stretches from the Cape of Good Hope and Cape Point northwards to Table Mountain and the city of Cape Town. It comprises, for the most part, strikingly beautiful mountains, including the well-known Table Mountain which overlooks the bay and city. Its western and eastern shorelines are graced by attractive residential and resort centres that are a magnet for holiday-makers.
>
> (Adapted from *Traveller's Guide to South Africa*)

Question 1

Refer to the wine farms located in the area of Constantia. Wine farm estates are examples of isolated farmsteads.

1.1 Define the term isolated farmstead. (1 × 2 = 2)

1.2 State two economic advantages of this settlement pattern. (2 × 2 = 4)

1.3 Describe two social disadvantages of this settlement pattern. (2 × 2 = 4)

1.4 Wine farms in South Africa form part of all three economic activities: primary, secondary and tertiary activities. Explain this statement in a short a paragraph (no more than 12 lines). (6 × 2 = 12)

[22]

Question 2

Study the city of Cape Town in the centre of Figure 3.7 to answer the following questions.

2.1 Define the term site. (1 × 2 = 2)

2.2 What two factors were responsible for the site chosen for the development of Cape Town? (2 × 2 = 4)

2.3 Why is Cape Town classified as a break-of-bulk point? (1 × 2 = 2)

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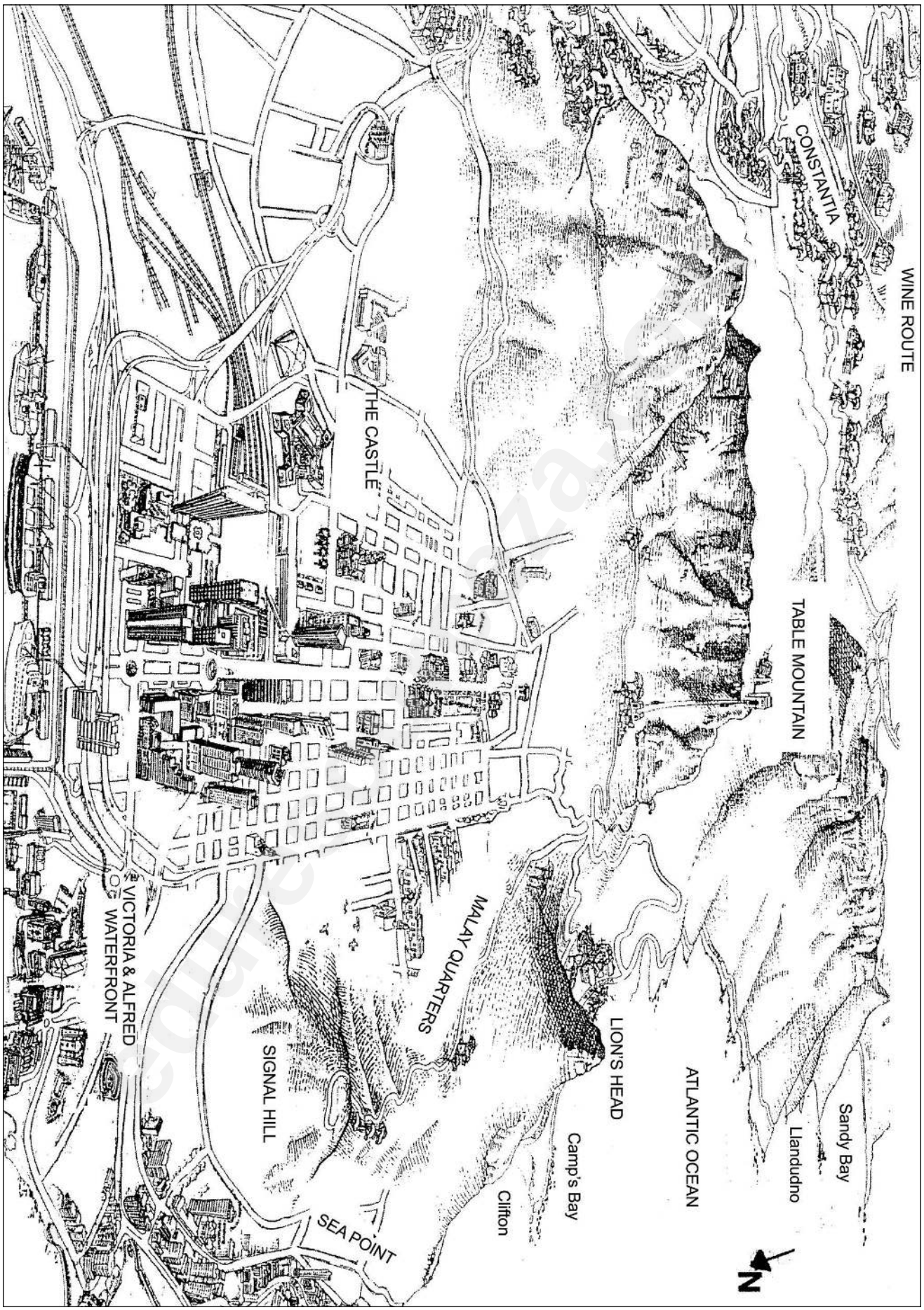

Figure 3.3.5B: Cape Peninsula

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2.4 **a)** What do the letters CBD stand for? (1 × 2 = 2)

b) Identify the street pattern of the CBD of Cape Town. (1 × 2 = 2)

c) Provide one advantage and one disadvantage of this street pattern. (2 × 2 = 4)

d) With reference to Figure 3.7, identify one characteristic of the CBD's profile. (1 × 2 = 2)

e) Explain why the CBD has the characteristic you identified in question d). (2 × 2 = 4)

2.5 What evidence is there that the CBD of Cape Town is the most accessible land use zone? (1 × 2 = 2)

[24]

Question 3

Refer to the residential areas of Sea Point and the Malay Quarters.

3.1 **a)** Classify the two areas as low- or high-income areas respectively. (2 × 2 = 4)

b) Explain your classification of Sea Point in question a) by referring to evidence from Figure 3.7. (2 × 2 = 4)

3.2 The open space around the Malay Quarter may attract migrants from the rural areas.

a) What is likely to develop here as a result of this migration? (1 × 2 = 2)

b) Explain the occurrence of this development. (2 × 2 = 4)

c) State two reasons for these migrants leaving the rural areas. (2 × 2 = 4)

d) What problems are associated with this development? (2 × 2 = 4)

e) You are part of a task team set up by the government to provide suggestions on how to slow the movement of people from the rural areas, as well as attract people back to small towns. In a short paragraph (no more than 12 lines), discuss some of your suggestions. (6 × 2 = 12)

[34]

Question 4

4.1 Provide the correct term for the following phrases:

a) A settlement where only primary activities occur (1 × 2 = 2)

b) An urban settlement which consists of a main city with surrounding dependent towns (1 × 2 = 2)

c) The increase in the number of people living in an urban area (1 × 2 = 2)

d) A resource from the earth which cannot be replenished. (1 × 2 = 2)

e) The economic sector which involves the accessing and distribution of information. (1 × 2 = 2)

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4.2 Match the columns. Simply write the number of the term in Column A next to the letter of the correct phrase from Column B.

Column A	Column B
a) Junction town	**i)** Plans to provide basic needs to all areas
b) Zone of decay	**ii)** Farmland with a high carrying capacity
c) Centrifugal forces	**iii)** Reasons why people leave a CBD or city
d) Intensive farming	**iv)** Plans to improve the peripheral areas
e) Spatial development initiatives	**v)** An old area in the CBD
	vi) A town formed where two rivers meet
	vii) An area around the CBD with mixed functions
	viii) A town formed at a point where two major transport routes meet

(5 × 2 = 10)
[20]

Answers to activity 3.7

Question 1

1.1 An individual farmstead on its own piece of land. ✓✓ (2)

1.2 All profit is your own ✓✓/Make own decisions ✓✓/ Make effective use of machinery ✓✓/Less time wasted travelling to work. ✓✓ (any 2) (4)

1.3 Little social interaction ✓✓/Less help in times of trouble ✓✓/ No sharing of ideas. ✓✓ (any 2) (4)

1.4 Primary activities refer to the extraction of raw material from the Earth. The growing of grapes is a primary activity. ✓✓✓✓

Secondary activities refer to the manufacturing of raw material into processed goods. Making wine from grapes is a secondary activity. ✓✓✓✓

Tertiary activities refer to the provision of services and selling of goods. Wine farms sell wine/have restaurants and wine tasting which attracts tourists. ✓✓✓✓ (12)

[22]

Question 2

2.1 A site is the exact piece of land a settlement is found on.✓✓ (2)

2.2 Available flat land ✓✓/Natural harbour providing access to the ocean✓✓ (4)

2.3 It has a harbour where the mode of transport changes, e.g from land to sea. ✓✓ (2)

2.4 **a)** Central Business District✓✓ (2)

b) Gridiron street pattern✓✓ (2)

c) Advantage: Easy to find your way ✓✓/Easy to extend ✓✓/ Easy to subdivide✓✓ (any 1)

Disadvantage: Causes traffic congestion ✓✓/Monotonous (boring) layout ✓✓ (any 1) (4)

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Answers to activity 3.7 (continued)

d) Tall buildings/Skyscrapers✓✓ (2)

e) Land is in demand so price increases ✓✓/Cheaper to build upwards✓✓ (any 1) (4)

2.5 All transport routes converge in the CBD. ✓✓ (2)

[24]

Question 3

3.1 a) Sea Point – high income ✓✓; Malay Quarter – low income ✓✓ (4)

b) Has sea view, which increases land value ✓✓/On outskirts city; residents can afford transport costs✓✓ (any 1) (4)

3.2 a) Informal settlement (squatter settlement)✓✓ (2)

b) Migrants are uneducated so they cannot find a job✓✓ They cannot afford rent or to buy a house✓✓ (4)

c) Family land not big enough to divide among children ✓✓/ Traditional farming methods so low food output ✓✓/ Inadequate services and facilities ✓✓/Droughts and floods have greater impact ✓✓/Farm workers evicted ✓✓/ Job losses due to increased mechanisation✓✓ (any 2) (4)

d) High degree of unemployment ✓✓/Social problems, such as violence and crime, more common ✓✓/ Increase in litter and pollution ✓✓/Waterborne diseases common ✓✓/Increased spread of diseases✓✓ (any 2) (4)

e) Need to speak to community and find out their needs ✓✓/ Find out skills and talents in area ✓✓/Need to set up industry in area based on local skills or raw materials or products ✓✓/ Improve farming methods of subsistence farmers ✓✓/Possibly change to commercial cash crops✓✓/Small towns advertise attractions in their town✓✓/Find ways to attract tourists, for example lodges, casinos, holiday resorts, etc. ✓✓/ Develop or market the town as a commuter or retirement town ✓✓/ Petition government to maintain services and facilities ✓✓ (any 6 facts; include points for both rural areas and towns) (12)

[34]

Question 4

4.1 a) Rural

b) Metropolis

c) Urban growth

d) Natural, non-renewable resource

e) Quaternary (10)

4.2 a) – viii)

b) – vii)

c) – iii)

d) – ii)

e) – iv) (10)

[20]

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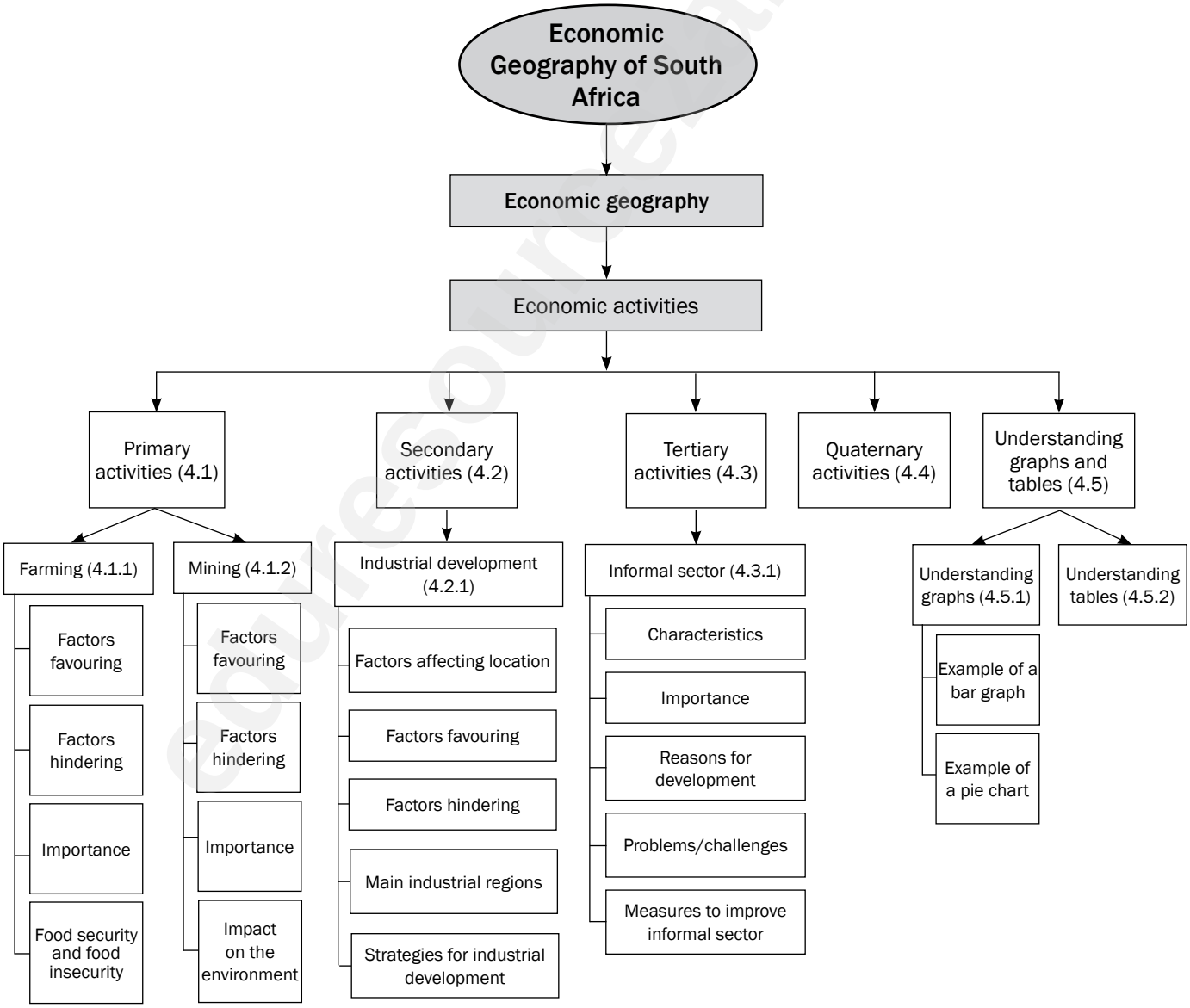
Chapter 4

Economic Geography of South Africa

This chapter covers South Africa's **economic activities**, as well as **food security**.



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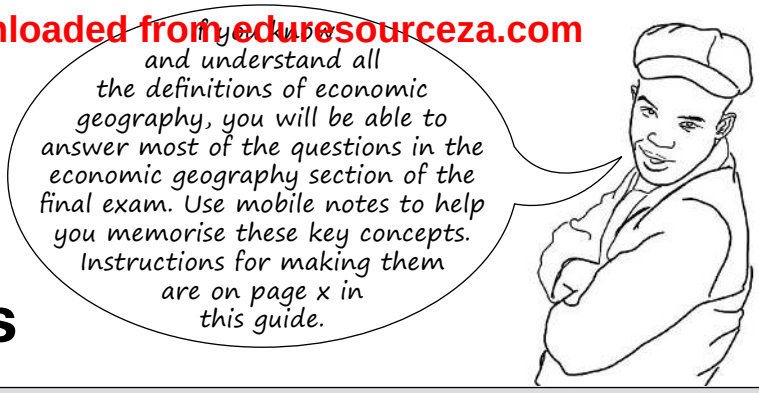

Key concepts

Concept	Definition
Balance of payment	A country's financial statement showing its transactions with the rest of the world
Balance of trade	The value of exports minus the value of imports
Bridge industries	Industries that are located between the source of raw materials and the customer, e.g. oil refineries
Centralisation	Movement of industries into core areas
Decentralisation	Movement of activities away from over-centralised areas
Economic activities	Activities that people practise to meet their needs or earn a living
Exports	Goods and services that are sold to foreign countries
Favourable trade balance	Occurs when the value of exports is greater than the value of imports
Food insecurity	When not all the people have enough food to meet their needs for a healthy and productive life
Food security	When all the people have enough food to meet their needs for a healthy and productive life
Footloose industries	Industries that can be located in any place without being affected by factors such as resources or transport, e.g. diamond processing and computer chip manufacturing
Foreign exchange	The money paid to South Africa by other countries, e.g. dollars and pounds, in exchange for goods and services
Formal sector	Registered businesses that are licensed to sell goods or provide services
Globalisation	The way in which the economic, social, political and cultural activities of countries across the world are interconnected (working together)
Gross Domestic Product (GDP)	The total value of goods and services produced within the borders of the country in a year
Gross National Product (GNP)	The total value of goods and services produced by the permanent citizens of a country in one year (note that permanent citizens may work out of the country)
Hawker	An informal street trader
Imports	Goods and services that are bought from foreign countries
Industrial Development Zone (IDZ)	Industrial estates or areas aimed at economic growth and new investment; used by developing countries to attract investment, create jobs and boost exports
Informal sector	Activities by small, unregistered businesses that sell goods or provide services without being licensed, e.g. petty trade, casual employment, spaza shops and street hawkers or traders
Infrastructure	Transport network (roads, railways) and services (electricity, telecommunication, water and sewerage) that are in place

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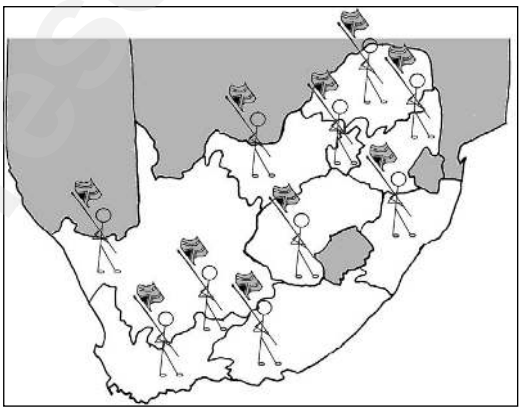
Concept	Definition
Primary activities	Activities that involve taking natural resources from the earth, e.g. farming (livestock, crops), forestry, mining, fishing
Quaternary activities	Activities that deal with information and research
Secondary activities	Activities that involve the processing of raw materials and manufacturing of goods, e.g. factories and industries
Semi-skilled worker	A worker who does routine tasks (simple tasks that are done on a regular basis); someone who is not skilled or trained to do specialised work (difficult tasks that need special training)
Skilled worker	A worker who has a specific set of skills or specialised knowledge that has usually been obtained through some kind of formal training
Spatial Development Initiatives (SDI)	Programme aimed at improving infrastructure and attracting business investments in rural areas that were neglected and underdeveloped
Tertiary activities	Activities that deal with the supply of services, e.g. banking, trade and transport
Trade	The flow of goods and services from producers to consumers across the world
Trading bloc	A group of countries that have common markets or trade agreements
Unskilled worker	A worker who performs simple duties that do not require any specific skills, training or previous experience; usually involves hard physical labour

NB

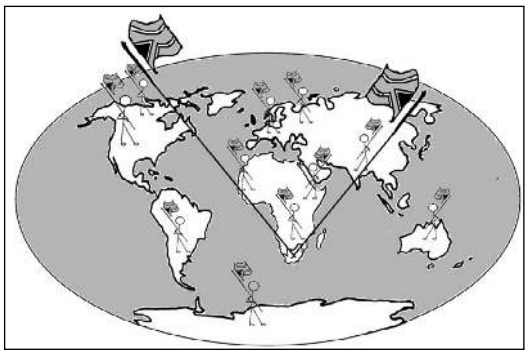
In an exam you may be asked to test your understanding of terms by matching the key concept with the definitions provided. An example of this kind of question is provided in activity 4.1 on page 80. Practise this by completing the activity.

comment Take care not to confuse the terms **gross domestic product (GDP)** and **gross national product (GNP)** with one another.

GDP refers to the total value of goods and services produced in one year within the borders of South Africa.



GNP refers to the total value of goods and services produced in one year by the permanent citizens of a country (even if they live and work in another country).



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Activity 4.1

Choose a term from Column B that matches a statement in Column A. Write only the letter (A to F) next to the question number (1 to 5), for example 6 – G.

Column A	Column B
1. Obtaining raw materials from the earth **2.** Total value of goods and services produced by the permanent citizens of a country in one year **3.** Provision of services **4.** Processing of raw materials **5.** Value of all goods and services produced in a country in one year	**A.** Gross domestic product **B.** Tertiary activity **C.** Gross national product **D.** Primary activities **E.** Economic activities **F.** Secondary activities

[10]

Answers to activity 4.1

1	D (Primary activities) ✓✓	(2)
2	C (Gross National Product) ✓✓	(2)
3	B (Tertiary activities) ✓✓	(2)
4	F (Secondary activities) ✓✓	(2)
5	A (Gross Domestic Product) ✓✓	(2)
		[10]

In the next section we focus on **primary, secondary** and **tertiary** economic activities. These economic activities are important to the economy and the country's development, and are interdependent. Primary activities stimulate secondary activities which, in turn, stimulate job creation in the tertiary sector.

4.1 Primary economic activities

Primary activities involve extracting (removing) raw materials from the earth, for example farming, fishing, forestry and mining. We focus on farming and mining as they are the two primary activities that contribute the most to South Africa's economy.

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4.1.1 Farming in South Africa

In this section we focus on factors that favour and hinder farming. There are different types of farming: **crop farming**, **stock farming** and **mixed farming** (both crop and stock). The word 'agriculture' is used to refer to all types of farming. Firstly, pay attention to Table 4.1, where the differences between a large scale farmer and small scale farmer are explained.

Table 4.1 The differences between a large scale farmer and a small scale farmer

Small scale farmer	Large scale farmer
• Farmers with limited resources • Hobby farmers, retirement farmers, lifestyle farmers • Those who sell directly to consumers — through farmers markets, CSAs and other marketing channels which are not part of the traditional, wholesale distribution chain • Those who grow vegetables or fruits while also raising livestock	The modern trend to enlarge farms to reach optimal size as a business enterprise rather than as a unit size suited to single family management.

Factors favouring (promoting) farming

These factors make farming more productive and profitable:

- There is a high **demand** (market) for farming products so farmers sell their crops more easily. Farmers' profits rise when they can sell for a higher price to overseas markets with a demand for their crops or stock.
- The **fertile floodplains** of rivers allow farmers to produce more crops or grazing land (pastures) in these areas. This supports farming and increases profits.
- The eastern half of the country gets more than 500 mm of **rain** a year. This makes it possible to produce more crops and ensures greener pastures for stock farming, therefore increasing profits.
- The relatively high summer **temperatures** help crops to grow and increase crop production. It also ensures greener pastures for stock farming.
- Availability of labour (workers)

Use the following word mnemonic to help you remember the factors that favour farming in South Africa:

F = Fertility → **F**armer
D = Demand → **D**aniel
R = Rain → **R**eaps
T = Temperatures → **T**omatoes

Factors hindering (restrict/limit) farming

These factors make farming difficult and therefore less productive and less profitable:

- **Rainfall** is low and unreliable on the plateau, which limits crop production and decreases available pastures for stock farming.
- **Soil erosion** due to incorrect farming methods increases farming costs and decreases profits.
- Natural **hazards** such as droughts, floods and hail storms damage crops and stock and decrease production and profits.
- HIV and AIDS have a negative impact on the **health** and productivity of farm workers.
- **Price fluctuations** (when prices go up and down) make it difficult for farmers to stay in business and make a profit.
- **Pests** which affect crops and stock are costly to control and cause a decrease in production and profits.

Use the following word mnemonic to help you remember the factors that hinder farming in South Africa:

H = Hazards → **H**ungry
P = Price → **P**eople
S = Soil → **S**eek
H = Health → **H**ealthy
R = Rainfall → **R**ound
P = Pests → **P**otatoes

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Importance of farming in South Africa (role of farming in SA)

NB

In an exam you may be asked to state the factors that favour or hinder farming. You may also be asked to explain the importance of farming to South Africa.

Farming benefits the economy and people in these ways:

- Farming provides jobs to people and so decreases unemployment.
- Farming provides food to the country so less food needs to be imported. Food that is supplied locally is less expensive than imported food.
- Farming equipment is expensive because much of it is imported, but South Africa has reduced these costs by manufacturing some equipment locally, for example irrigation systems.
- Farming involves moving crops to the markets, which in turn leads to improving the country's infrastructure (roads, railways and communication systems).
- South African farming products are exported to other countries earning us foreign exchange. This improves the country's economy.

Food security and insecurity

NB

In an exam you may be asked to define the terms food security and food insecurity and state the factors that lead to food security and food insecurity. Learn this information to answer this question.

Food security is when all the people have enough food to meet their needs for a healthy and productive life. Some of the factors (reasons) why people have enough food (food security) are:

- Commercial farms are able to produce enough food due to favourable climatic factors.
- People can afford to buy the food. In other words, farmers have a market.
- The need to import food from other countries at high costs is reduced because food is grown locally.
- Genetically modified crops are more resistant to diseases, pests and viruses so more crops can be produced.

Food insecurity is when not all the people have enough food to meet their needs for a healthy and productive life. Food insecurity affects poor people, many of whom live in rural areas. These people try to survive by growing their own food. This is called **subsistence farming**. This type of farming provides only enough food for the farmer's own family.

Some of the factors (reasons) why people do not have enough food (food insecurity) are:

- There is a lack of fertile (arable) land on which to grow food.
- Climate change increases natural disasters (droughts and floods) that damage crops.
- When you are poor it is more difficult to buy the things you need to farm, such as enough land, equipment, seeds and irrigation systems.
- Subsistence farmers are often uneducated about ways to improve crop production so land is often overused for crops or overgrazed by cattle.

Some of the measures (ways) to **prevent food insecurity** are:

- Prevent soil erosion by practising better farming methods, for example crop rotation or rotational grazing (putting cattle in different fields or camps).
- Use efficient ways of storing food, especially when more crops are produced in high-rainfall seasons.
- Improve ways of storing and using water supplies to reduce water wastage.

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Activity 4.2

The cartoon in Figure 4.1.1 below shows how environmental problems can affect food security.

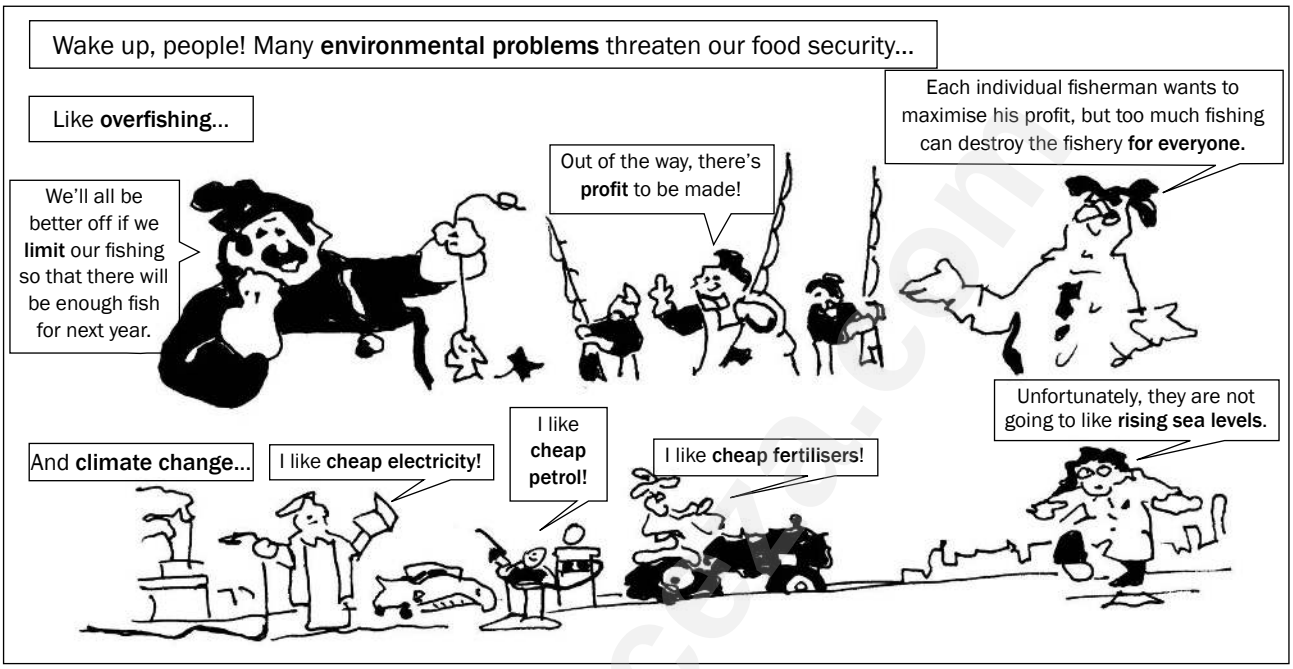

Figure 4.1.1: Factors contributing to food insecurity

1. How has the use of fossil fuels and fertilisers caused climate change? (3 × 2 = 6)
2. How does climate change link to rising sea levels? (2 × 2 = 4)
3. How would rising sea levels affect food security? (1 × 2 = 2)
4. Explain your answer in question 3. (1 × 2 = 2)
5. Name another factor in the cartoon that would affect food security. (1 × 2 = 2)

[16]

Answers to activity 4.2

1. Fossil fuels and fertilisers release greenhouse gases like carbon dioxide and methane into the air. ✓✓ These gases trap heat in the atmosphere. ✓✓ This increases the Earth's temperature, which leads to changes in Earth's climate and weather. ✓✓ (6)
2. The increase in the Earth's temperature causes the polar icecaps to melt. ✓✓ This leads to increasing sea levels. ✓✓ (4)
3. It would decrease food security/cause food insecurity. ✓✓ (2)
4. Land would be flooded, so there is less land to use for agriculture or food production. ✓✓ (2)
5. Overfishing✓✓ (2)

[16]

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4.1.2 Mining in South Africa

In this section we focus on factors favouring and hindering mining. There are different types of mining: **open cast** and **shaft** mining.

Factors favouring (promoting) mining

Use the following word mnemonic to help you remember the factors that favour mining in South Africa:

M = Minerals	→	**M**iners
L = Labour	→	**L**ove
F = Foreign	→	**F**inding
I = Investment	→	**I**mportant
I = Infrastructure	→	**I**rons

These factors make mining more productive and profitable:

- South Africa has many different **minerals** which can be mined and used in factories or exported so the country earns foreign exchange.
- South African mines benefit from having lots of local unskilled **labour**. This results in lower labour costs and therefore higher profits.
- **Foreign** skilled miners come to work in South African mines and the mines benefit from their knowledge and skills.
- Many countries **invested** money in our mines, which assisted with further development of the mines and a lowering of costs.
- A well-developed **infrastructure** (roads and railway lines, water and electricity) assists mines to do business.

Factors hindering (restrict/limit) mining

Use the following word mnemonic to help you remember the factors that hinder mining in South Africa:

S = Safety	→	**S**ometimes
W = Water	→	**W**orkers
C = Costs	→	**C**an
D = Distances	→	**D**ig
T = Temperatures	→	**T**oo
S = Strikes	→	**S**lowly

These factors make mining less productive and less profitable:

- The high **temperatures** in some underground mines create difficult working conditions and this decreases productivity.
- Large **distances** between the mines and the harbours or towns increase the cost of transporting the minerals to the markets.
- There are high **costs** involved in training and housing mine workers.
- Mine worker **strikes** decrease productivity and profits.
- **Water** shortages and underground flooding of mines are a serious problem. It is expensive to fix the problem and this decreases profits.
- Ensuring **safety** on the mines is costly, especially when tunnel roofs collapse.

The importance of mining to the South African economy (role of mining in SA)

Mining benefits the economy and people in these ways:

- The mining sector provides many jobs, which decreases unemployment.
- Mines supply raw materials to secondary activities such as factories and industries. This in turn stimulates industrial development.
- When mines start up, new towns and transport networks develop around the mines.
- Mining stimulates other sectors of the economy, such as farming, building and trade, to meet the needs of the growing number of people who live and work in mining towns.
- Harbours, like those at Saldanha Bay (Western Cape) and Richards Bay (KwaZulu-Natal), expand (grow bigger) to cope with increased mineral exports to other countries. This creates more jobs and also helps other sectors of the economy to grow.
- The export of mining products increases the profits of the mines because they earn foreign exchange.

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Impact of mining on the environment

The processes involved in removing minerals from the earth create waste products and have a negative effect on the environment. Some of the negative effects of mining are:

- The natural vegetation is removed to clear the ground for mining activities. This leads to an increase in soil erosion in these areas.
- When vegetation is removed it destroys natural habitats and damages ecosystems, which can lead to the extinction of plants and animals in the area.
- The land is destroyed when mine dumps and slimes dams are built to store waste.
- Chemicals that leach (wash off) from the mine dumps when it rains cause water and land pollution.
- Sinkholes are a danger in areas where mining takes place.
- Coal is a major mining product in South Africa. Power stations burn coal to make electricity. The carbon dioxide that is released during this process contributes to global warming and climate change.

NB

In an exam you may be asked to state the factors that favour or hinder mining. You may also be asked to explain the importance of mining to South Africa and the impact of mining on the environment.

4.2 Secondary economic activities

Secondary activities involve the processing of raw materials and manufacturing of goods. We use the word '**industries**' for secondary activities. For example, sugar cane is turned into sugar at an industry called a sugar refinery; trees are turned into wood shavings and then paper at an industry called a sawmill; cowhides are turned into leather to make handbags and shoes at an industry called a tannery.

Secondary activities can be divided into **heavy and light industries**. Learn the information in Table 4.2 below to understand the differences between these two types of industries.

NB

In an exam you may be asked to identify a heavy or light industry from a picture or on a topographic map. You may also be asked to state the characteristics of heavy or light industries. Learn the information in Table 4.2 to help you answer these questions.

	Light industry	Heavy industry
Example	Jewellery making, clothes factory, computer manufacturer, food and beverages	Power stations, iron and steel factory, motor vehicle factory, paper mill
Location	In a city in the CBD; in the zone of decay; in an industrial estate	On the outskirts of a city; in rural areas near the raw material source
Raw material	Small, may be partially processed	Large, bulk, not processed
Land requirements	No specific needs, may be in a multi-storey building	Needs a large area of flat land, single-storey buildings
Infrastructure	Uses existing road network and local power supply	Needs access to major roads or railways, water supply and power supply
Environmental impact	Has little to no impact on the surrounding area	Utilises a large amount of water and causes air and noise pollution

Table 4.2: The differences between heavy and light industries

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In the next sections we focus on factors that affect the location of industries and the factors that favour or hinder the development of secondary economic activity. We look at the development of the four main industrial regions in South Africa:

- Pretoria–Witwatersrand–Vereeniging complex (PWV) (Gauteng)
- Durban–Pinetown (Ethekwini)
- Port Elizabeth–Uitenhage (Nelson Mandela Bay)
- Southwestern Cape

4.2.1 Industrial development in South Africa

The availability of raw materials in South Africa has led to the development of large industries (factories) that process the raw materials or use semi-finished products to manufacture final products.

Factors affecting the location of an industry

When deciding where to site an industry, the following two factors are the most important:

- **Raw materials**: How close are the natural resources or raw materials the industry needs to make its product?
- **Markets**: How close is the industry to the market where it sells its product? In other words, how close are the consumers (the people that buy the product)?

An industry will locate itself close to either the raw materials or the market. If the raw material is large and difficult to transport, the industry will locate close to the raw material. This industry would be called **raw-material orientated**.

If the raw material is smaller and easier to transport, the industry will locate close to the market. The industry would be called **market orientated**.

The following factors can also affect the location of an industry:

- **Transport**: Access to major transport routes between the industry, the raw material source and the market.
- **Energy**: A reliable supply of electricity is needed to be able to process raw materials or manufacture goods.
- **Labour**: A skilled and unskilled work force must live in the area where the industry is located.
- **Link industries**: These are industries that you sell your product to. How close the industry is to its link industries will affect its transport costs.
- **Government policies**: Government may offer subsidies or tax incentives to industries that locate in certain areas, which may help to decrease costs.

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Factors favouring (promoting) industrial development in South Africa

These factors make industries more productive and more profitable:

- South Africa has a wide range of industries because there is a wide range of raw materials to support production.
- A well-developed infrastructure (roads and railway lines, water and electricity) assists industries to do business.
- The availability of cheap, level (flat) land makes it cheaper to develop industries in South Africa.
- The availability of a large skilled and unskilled labour force in the areas where industries are located decreases the costs of training and worker accommodation and transport.

Factors hindering (restricting/limiting) industrial development in South Africa

These factors make industries less productive and less profitable:

- The large distances between South Africa and its foreign markets increase transport costs and make it more difficult to compete with industries in those countries.
- There is a shortage of skilled labour in South Africa. This increases labour costs because industries have to attract foreign skilled labour and pay high salaries to retain skilled workers.
- Labour strikes decrease the productivity of industries in South Africa and this increases costs and limits further industrial development.
- Water and electricity shortages and price increases limit further industrial development.

Importance of industrial development in South Africa

- When we export processed goods we earn more foreign exchange than if we exported the raw material.
- Industries provide more and higher paid employment to the population, this in turn leads to an increase in the standard of living of the population. This increases their buying power which further stimulates industrial development. It also increases the money made from rates and taxes, so the government has more money to spend on improving infrastructure and other facilities.
- The employment of people in industries leads to the development of more skills and experience; this in turn leads to the development of new technology.
- Industrial growth stimulates the development of all other services and facilities.

Main industrial regions in South Africa

Figure 4.2.1A on page 88 shows the four main industrial regions in South Africa.

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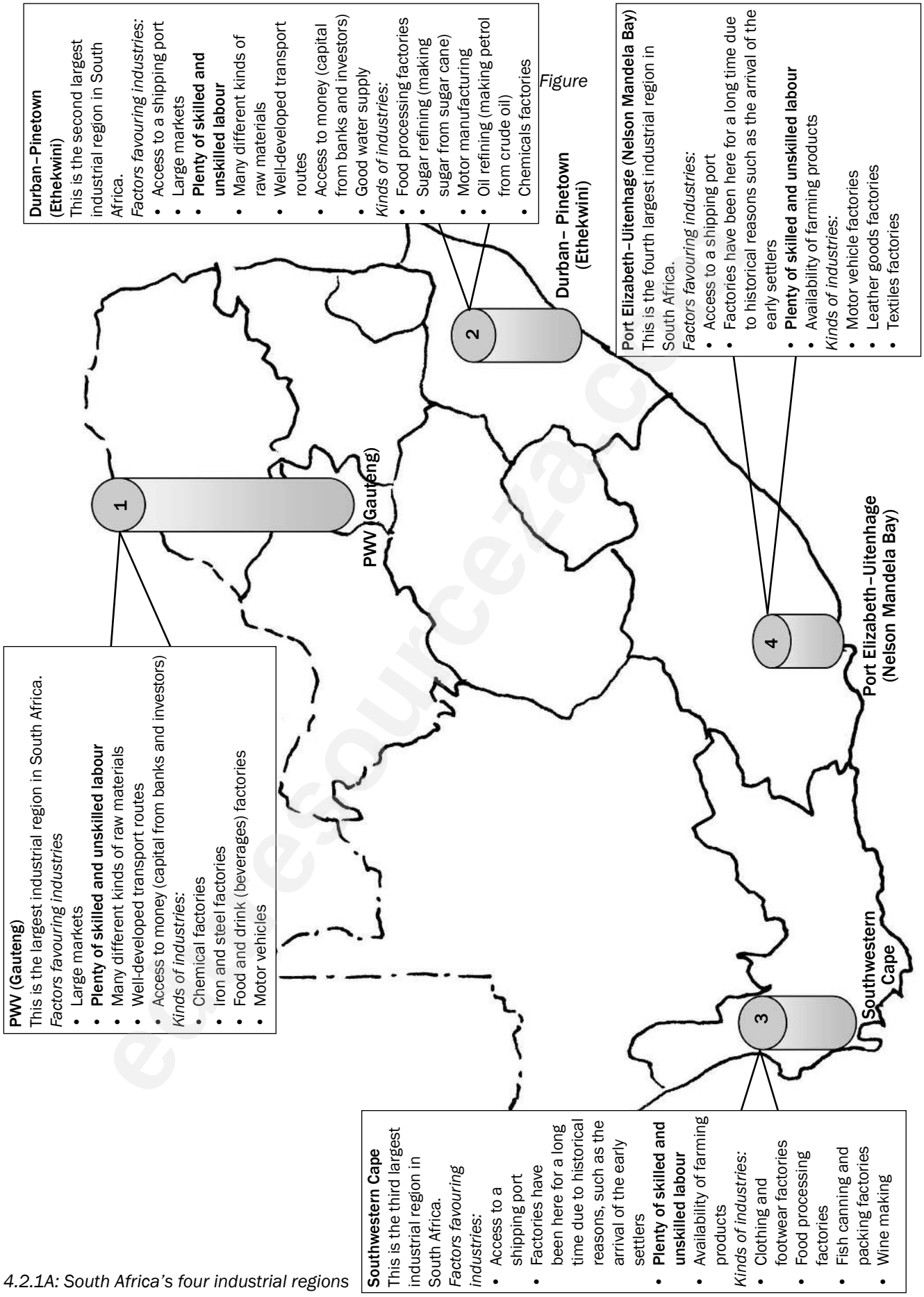

Figure 4.2.1A: South Africa's four industrial regions

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Activity 4.3

Choose a term from the box that matches the descriptions that follow.

heavy industries; footloose industries; market-orientated industries; centralisation; decentralisation; Durban–Pinetown; Gauteng/Pretoria–Witwatersrand–Vereeniging

1. Over-concentration of industries in a few core areas
2. The largest industrial core area in South Africa
3. Industries that can locate anywhere due to improved technology
4. Industries that must be close to the consumers
5. These industries are associated with high noise and air pollution

(5 × 2 = 10)

Answers to activity 4.3

1. Centralisation ✓✓ (2)
2. Gauteng/Pretoria–Witwatersrand–Vereeniging ✓✓ (2)
3. Footloose industries ✓✓ (2)
4. Market-orientated industries ✓✓ (2)
5. Heavy industries ✓✓ (2)

[10]

Strategies for industrial development

As part of the development plan for underdeveloped regions, the South African Government (Department of Trade and industry in partnership with the Department of Transport) introduced TWO development plans:

- Spatial Development Initiative (SDI)
- Industrial Development Zones (IDZ)

Spatial Development Initiative	Industrial Development Zones
• Is a development corridor, that is, development along a major transport route, for example, a major highway. • Connects major industrial or mining areas. • Government improves infrastructure all along the development corridor to stimulate development and access to areas along the route. • Small towns and activities such as farming and tourism are developed along the route.	• Usually close to harbours or airports • Include already existing factories in a town • Government plans upgrade of infrastructure and services to attract further development • IDZs are linked to each other or other major cities by SDIs

Table 4.3

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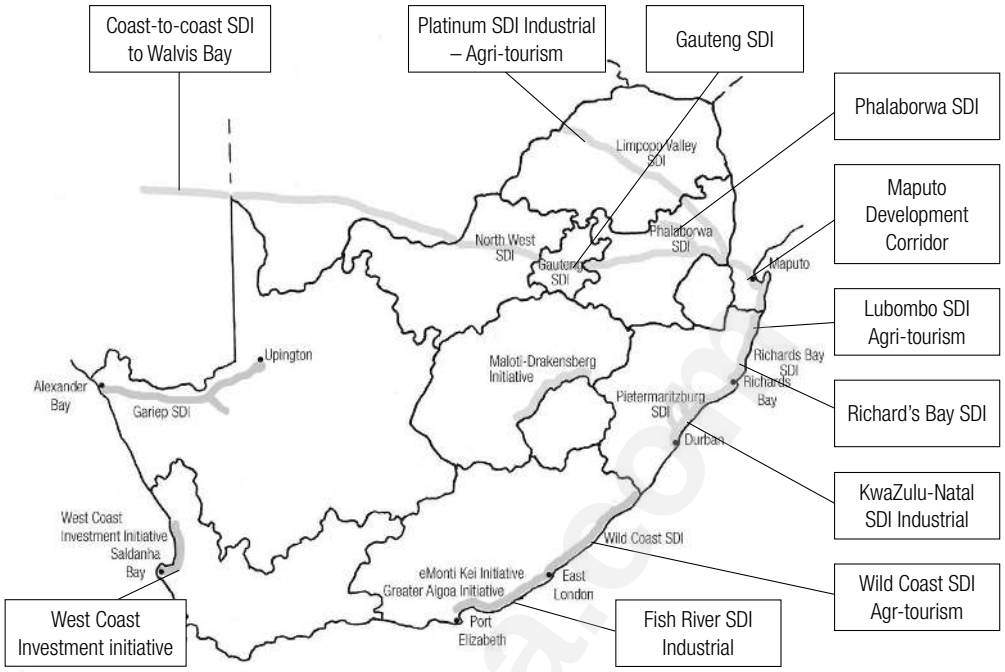

Figure 4.2.1B: Spacial Development Initiatives

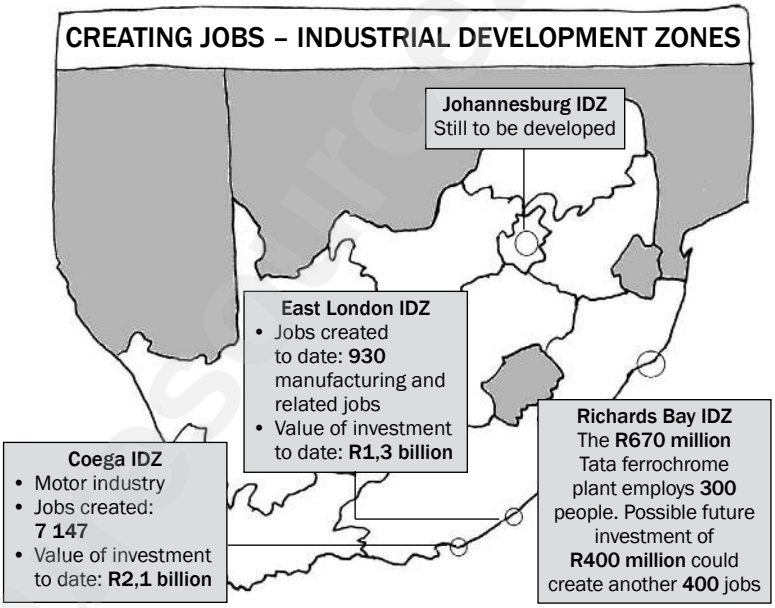

Figure 4.2.1C: Industrial Development Zones

4.3 Tertiary economic activities

Tertiary economic activities involve the selling of goods and provision of services. For example, the selling of **goods** would include any supermarket, car dealer or clothes shop. Examples of **services** are hairdressers, doctors, internet cafes, and repair and maintenance companies.

Tertiary economic activities are divided into the formal sector and informal sector. In this section we will focus on the **informal sector** in South Africa, its characteristics and the reasons for its development. We will also look at the challenges facing this sector and how the informal sector can be improved.

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4.3.1 The informal sector in South Africa

Examples of people who work in the informal sector are hawkers, parking guards and casual labourers (painters, tilers, gardeners, cleaning staff).

- If not registered, then they don't pay income tax.

Characteristics of the informal sector

The informal sector has the following characteristics:

- Workers are self-employed.
- Women and children are mainly involved in this sector.
- It is associated with casual labour.
- It employs unskilled or semi-skilled workers.

Importance of the informal sector

The informal sector benefits the economy and people in the following ways:

- It provides an income to many people and decreases unemployment.
- Informal traders are more accessible to working class consumers.
- Consumers can buy goods in smaller quantities and at a lower price.
- It provides opportunities for people to grow and apply their entrepreneurial skills.

Reasons for the development of the informal sector

- Large scale job losses in the formal sector increase the number of people who make work for themselves in the informal sector.
- Greater mechanisation (use of machinery) on farms and in industry results in more workers being unemployed and needing to make work for themselves in the informal sector.
- People who lack formal qualifications are less likely to be employed in the formal sector, causing them to make work for themselves in the informal sector.
- Immigrants who are not able to find legal employment in the formal sector turn to the informal sector to make an income.

NB

Do not confuse the terms informal sector and informal settlement with one another:

- **Informal sector** is the economic term for people not employed in the formal sector.
- **Informal settlement** refers to 'squatter' areas, where people live.

Problems or challenges facing the informal sector

These factors make informal trading less productive and less profitable:

- Traders are frequently harassed by local authorities.
- Traders do not have access to proper trading facilities.
- Traders and their goods are exposed to the weather.
- Banks do not like to give loans to informal traders.
- The sector is unpredictable and the income unreliable.

Measures to improve the informal sector

These are some of the things that can be done to help informal traders:

- Local authorities can provide specific areas for informal trading.
- Local authorities can provide infrastructure, such as hawker stalls.
- Banks can make access to bank loans easier.

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- Local authorities can provide training to teach people the necessary skills to develop their businesses.

4.4 Quaternary economic activities

Quaternary economic activities deal with communication, technology and research. Examples of quaternary activities are new product development, medical research, customer surveys and market research, call centres, facebook, Google and other information age businesses.

Activity 4.4

Choose a description from Column B that matches a term in Column A. Write only the letter (A-L) next to the question number (1-10), e.g. 11.L

Column A	Column B
1. Trade	**A.** Groups of countries that have common markets or trade agreements
2. Import	**B.** Industrial estates aimed at economic growth and new investment
3. Decentralisation	**C.** Buying and selling of goods and services
4. Trading blocs	**D.** Movement of activities away from over- centralised areas
5. Industrial Development Zones	**E.** Commodity brought into a country
6. Informal sector	**F.** Movement of industries into core areas
7. MEDCs	**G.** The way in which activities of countries across the world are interconnected
8. Multinational corporation	**H.** Countries that are less developed in the world
9. LEDCs	**I.** The trade involving businesses not registered with the government and occupying premises illegally
10. Globalisation	**J.** Company that has factories, offices or shops in different countries
	K. Countries that are more developed than others
	L. Value added to raw materials

(10 × 2 = 20)

Answers to activity 4.4

1. C ✓✓
2. E ✓✓
3. D ✓✓
4. A ✓✓
5. B ✓✓
6. I ✓✓
7. K ✓✓
8. J ✓✓
9. H ✓✓
10. G ✓✓ (10 × 2 = 20)

[20]

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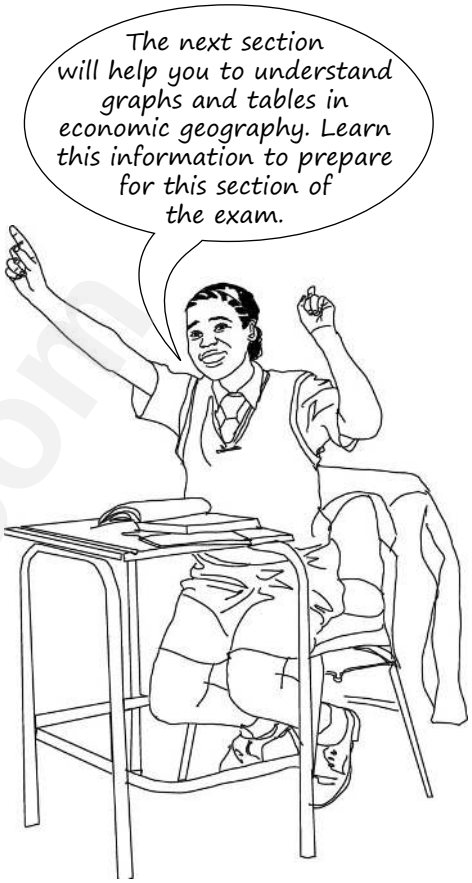
NB The economic geography section will appear in Section B of the theory paper in Questions 3 and 4. Note that you will be asked to answer questions based on information contained in texts, graphs and tables. The answers can be found in the information given, so read the information carefully to find the answer.



4.5 Understanding graphs and tables

In the exam, economic concepts are often tested using tables or graphs. It is important that you understand how to get information from a graph or table to answer such questions.

NB When a question in the exam refers to a table or graph, it is important that you study the table or graph before you read the questions. This is similar to reading a comprehension text before answering the questions. You will need to UNDERSTAND the table or graph in order to answer the questions.

4.5.1 Understanding graphs

In this section we look at two types of graphs: **bar graphs** and **pie charts**. Follow these steps when you read a graph:

hint Here are some helpful guidelines that show you to how to read and understand graphs.

Steps to reading a bar graph

Step 1: The heading of a graph will tell you what the graph shows and what is being compared. It will tell you how the two or more factors shown on the graph are connected. In other words, it will tell you what the relationship is between the factors shown.

Step 2: Look at the labels on the different axes to see what factors are being compared on the graph. These should be the same factors mentioned in the heading.

Step 3: Look at the units of measurement on the different axes, for example percentage and time, or amount of money compared across economic sectors.

Step 4: Look at what is being compared and how the factors affect one another. In other words, try and understand the relationship between the different factors. For example, as the one factor increases so the other factor may decrease, or as one factor increases so the other factor may stay the same.

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Step 5: Look for anything that is unusual on the graph. See if there is anything that does not fit the relationship between the factors. In other words, if the relationship shown is that one factor increases and all the other factors except for one factor decrease, we will have something to say about the exception. For example, on a graph it could be shown that the contribution of primary economic activities increased production over time, except for mining whose production decreased.

Step 6: Now read the questions set. Circle the question word to understand what is asked. Set about answering the questions. You will find the answers by reading the information in the graph.

Example of a bar graph

Carefully study the bar graph in Figure 4.5.1A below which shows the contribution of different economic sectors to South Africa's GDP (Gross Domestic Product).

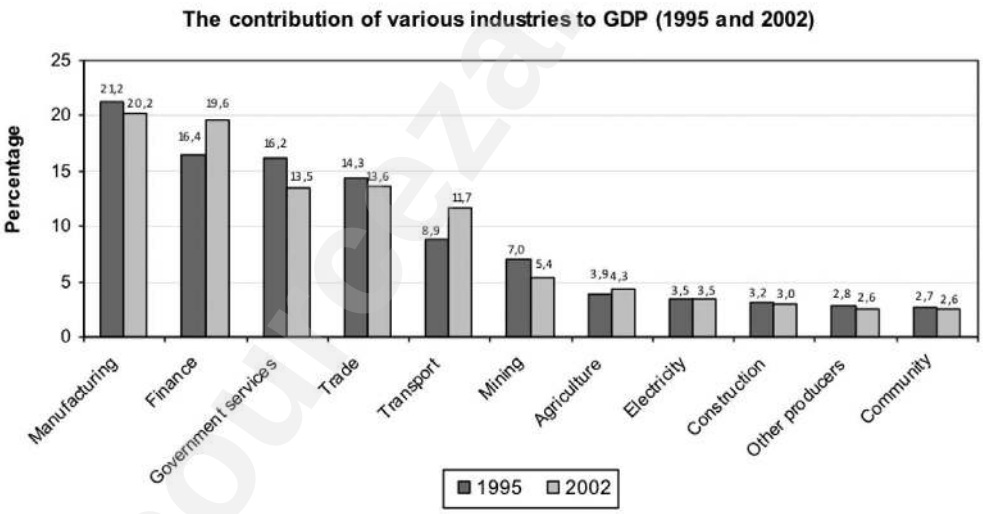

Figure 4.5.1A: Example of a bar graph

Follow these steps to read the graph

1. The heading – the graph shows GDP (factor 1) in relation to different industries (factor 2), and time (factor 3).
2. The axes – the vertical axis shows factor 1 (the GDP). The horizontal axis shows factor 2 (different industries) and factor 3 (time).
3. Units of measurement – on the vertical axis factor 1 (GDP) is shown as a percentage of total GDP. The horizontal axis lists factor 2 (industries) by name and factor 3 (time) in years.
4. Look at whether the GDP trend goes up or down from 1995 to 2002 in each industry. For example, manufacturing goes down from 1995 to 2002. The amount it decreases is calculated by subtracting the lower amount from the higher amount: 21,2% – 20,2% = 1%.
5. Look at what is unusual – the contribution of finance and transport is much higher in 2002.
6. Now read the questions in activity 4.5 on page 95.

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Activity 4.5

The following questions refer to the graph in Figure 4.5.1A on page 94.

1. What do the letters GDP stand for? (1 × 2 = 2)
2. Which industry contributes the most to the GDP? (1 × 2 = 2)
3. To what economic activity does mining and agriculture belong to? (1 × 2 = 2)
4. Mining and agriculture contribute less to the GDP than manufacturing, which is a secondary activity. Explain the reason for this observation. (2 × 2 = 4)
5. The contribution of transport to the GDP increased from 1995 to 2002. Give a possible reason for this. (1 × 2 = 2)

[12]

Answers to activity 4.5

1. Gross domestic product. ✓✓ (2)
2. Manufacturing ✓✓ (2)
3. Primary ✓✓ (2)
4. Mining and agriculture produce raw materials which are sold for less money than processed goods sold by manufacturing industries. ✓✓ (2)
5. Increased government spending on infrastructure development ✓✓/ Increased use of public transport generating more revenue for the state. More purchases and use of private vehicles. ✓✓ (2)

[12]

Example of a pie chart

Carefully study the pie chart or pie graph below (Figure 4.5.1B) illustrating the contribution of different provinces to the national GDP.

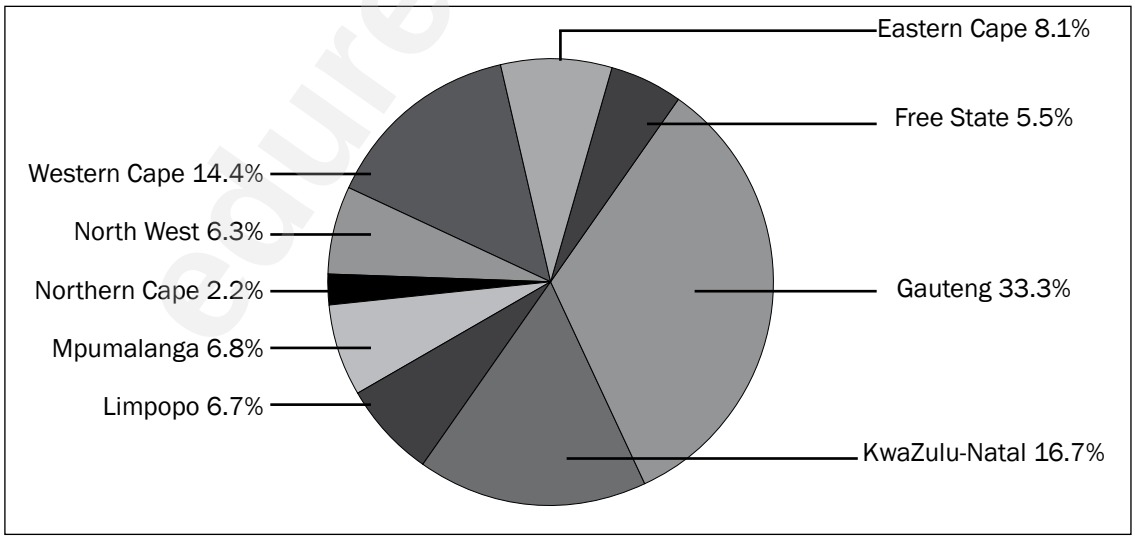

Figure 4.5.1: Contribution of different provinces to the national GDP

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Follow the steps to read the graph

1. **The heading** – the graph shows GDP (factor 1) in relation to different provinces (factor 2).
2. **The sectors** (pieces or slices) of the pie graph show factor 1 – the contribution of each province to the GDP.
3. **Units of measurement** – the sectors of the pie graph show factor 1 (GDP) in percentage.
4. **The relationship between the different factors** – because a pie chart compares parts of a whole, you need to note the different sizes of the sectors. This tells you how much each province contributes to the total GDP.
5. **Look for anything that is unusual** – for example, which is the largest piece of the pie (Gauteng) and which is the smallest piece of the pie (Northern Cape).
6. Now read the questions in activity 4.6.

Activity 4.6

The following questions refer to Figure 4.5.1B on page 95.

1. Rank the top three provinces in terms of their contribution to the GDP from largest to smallest contribution. (1 × 2 = 2)
2. Give two reasons why the province ranked first in your answer in question 1 holds that position. (2 × 2 = 4)
3. The following questions refer to the province which contributes the least to the national GDP.
   a) Name the province which contributes the least to the national GDP. (1 × 2 = 2)
   b) Name the ocean current that flows alongside this province. (1 × 2 = 2)
   c) What impact does this ocean current have on the rainfall in this province? (1 × 2 = 2)
   d) Explain how your answer in question c) affects the province's contribution to the GDP. (2 × 2 = 4)

[16]

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Answers to activity 4.6

1. Gauteng, KwaZulu-Natal, Western Cape ✓✓ (2)
2. Gauteng has the most industries ✓✓/many tertiary activities ✓✓/ a large population which creates large market ✓✓/many companies have main branches or headquarters there ✓✓. (any 2) (4)
3. a) Northern Cape ✓✓ (2)
   b) Benguela ✓✓ (2)
   c) Decreases rainfall ✓✓ (2)
   d) Less rainfall lowers productivity on farms so less produce to sell ✓✓/Less rainfall causes poor water supply which limits industrial development. ✓✓ (4)

[16]

4.5.2 Understanding tables

In this section we look at how to read and understand the information in a table. Follow these steps when you read a table:

Steps to read a table

Step 1: Look at the **heading** for the table to see what is shown

Step 2: Look at the **labels** in the different columns

Step 3: Look at the **relationship between what is compared**

Step 4: Now read the **questions**

Carefully study Table 4.4 below and then follow the steps to read the table.

South Africa's mineral production and relative ranking in the world		
Mineral	***SA's percentage of world production***	***World position***
Asbestos	6	4
Chromium	76	1
Coal	11	4
Diamonds	24	2
Iron	7	5
Manganese	78	1
Platinum group	79	1

Table 4.4

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Steps

1. **The heading** – the table shows which minerals (factor 1) South Africa produces, how much we produce (factor 2), and where we are ranked in the world of production (factor 3).
2. The **first column** lists factor 1 (minerals), the **second column** shows factor 2 (percentage of world production), and the **third column** shows factor 3 (the country's ranking in world production).
3. What mineral do we produce most of (Platinum) and where are we ranked in the world for manganese (first)? For how many minerals do we rank in first or second place? (three – chromium, manganese and platinum group)
4. Now read the questions in activity 4.7.

Activity 4.7

The following questions refer to Table 4.4 on page 97.

1. What economic activity does the extraction of minerals fall into? (1 × 2 = 2)
2. a) South Africa is a major mineral producer in the world. State three factors that favour mining in South Africa. (3 × 2 = 6)
   b) State the two reasons why mining is important to South Africa. (2 × 2 = 4)
3. What major mineral mined in South Africa is not listed in table 4.4? (1 × 2 = 2)
4. The price for platinum increased dramatically, but has now decreased again. What problem does this price fluctuation cause for the platinum mines? (2 × 2 = 4)

[18]

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Answers to activity 4.7

1. Primary✓✓ (2)
2. a) The country has many different minerals ✓✓/It has lots of local unskilled labour ✓✓/It has access to many foreign skilled miners ✓✓/Many countries invested money in our mines ✓✓/The country has a well-developed infrastructure (roads and railway lines, water and electricity). ✓✓ (any 3) (6)

   b) Mines provide employment to many South Africans ✓✓/ Mines supply raw materials to factories ✓✓/When mines start up, new towns and transport networks develop ✓✓/ Other economic activities, such as farming and trade, increase to meet the needs of the new mining towns ✓✓/ Harbours grow bigger ✓✓/Export of mining products increases the profits of the mines. (any 2) (4)
3. Gold✓✓ (2)
4. It will cause productivity to increase and decrease. ✓✓
   As productivity decreases, costs increase and profits fall. ✓✓
   It will cause the mine's profits to increase and decrease. ✓✓
   As profits decrease, mine workers may lose their jobs. ✓✓
   (any 2 facts; or any other logical answer) (4)

[18]

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5 Chapter

Mapwork

5.1 Introduction

Mapwork is a practical section of Geography where you are required to apply all the different skills, techniques and the theory that you have learnt. It consists of the following sections:

- Mapwork calculations
- Reading, interpretation and analysis of theory
- Geographical Information Systems (GIS)

Maps tell you a story about a place. Look at all the **information given on the map** to interpret it:

- What is the name on the top of the map?
- Look at the latitude and longitude. Get an idea where the map is. For example, 20°S would indicate it is in Limpopo.
- Look at all the information provided (magnetic declination information, scale of the map, contour interval, map projection used) in the 'margins' of the map.
- Look at the bottom of the map, for the diagram showing the map sheet reference. It may show additional information such as oceans or borders.
- Notice where roads or railways go off the map. The town they lead to may give you clues.
- Make use of the key/reference list to identify features. Remember, the first word in the reference list refers to the first picture and not both pictures.

Look for the following **aspects on the map**:

- Is this a high or low rainfall area? Is the rainfall seasonal?
- What kinds of rivers are visible and how many are there?
- Identify the urban and rural areas.
- Identify the different land uses in the mapped area, for example, agricultural/industrial/built-up areas.
- What factors may have affected the location of various land uses? For example, industry alongside a perennial river.
- Identify the type of farming – is it commercial or subsistence?
- Look at the relief – is it flat or hilly, are the slopes steep or gentle? Look at the contour lines to determine this.

Look at the **information given in the orthophoto**:

- Is the orthophoto labelled? If not, check the numbers or letters in the question, for example: 'Identify land use labelled G on orthophoto' – G will only be on one of the photos.
- Is a rectangle drawn around the area covered by the orthophoto? If not, orientate the photo to the map.
- Read the instructions carefully as you may need to use both the map and the photograph to answer a question.
- Make use of all the information on the orthophoto, for example, road names, heights, etc.

hint

A **topographic map** is a way to show mountains, valleys and aspects of a landscape by means of contour lines and intervals.

An **orthophoto map** is a corrected aerial photograph. Human-made and other features that are not clear are labelled on the orthophoto.

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5.2 Some basic mapwork concepts

1. **Direction** is expressed using the points on a compass – North, South, East and West, and the points between them. These are known as the 16 cardinal points.

Use the following mnemonic to remember the order of the compass points:

N – **N**ever	North
E – **E**at	East
S – **S**ilk	South
W – **W**orms	West

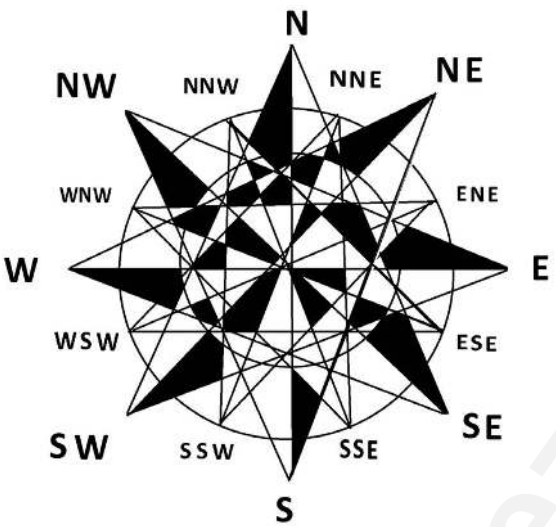

Figure 5.2.1: The 16 cardinal points of a compass

2. The **three main lines of latitude** that run across the surface of the Earth are the equator, the Tropic of Cancer and the Tropic of Capricorn. The **equator** is the longest line of latitude (where the Earth is widest in an East–West direction). It is located at 0 degrees latitude. The equator divides the planet into the northern and southern hemispheres. The **Tropic of Cancer** is located at $23\frac{1}{3}°$ north of the equator. The **Tropic of Capricorn** lies at $23\frac{1}{3}°$ south of the equator. The Tropic of Capricorn runs through northern South Africa.

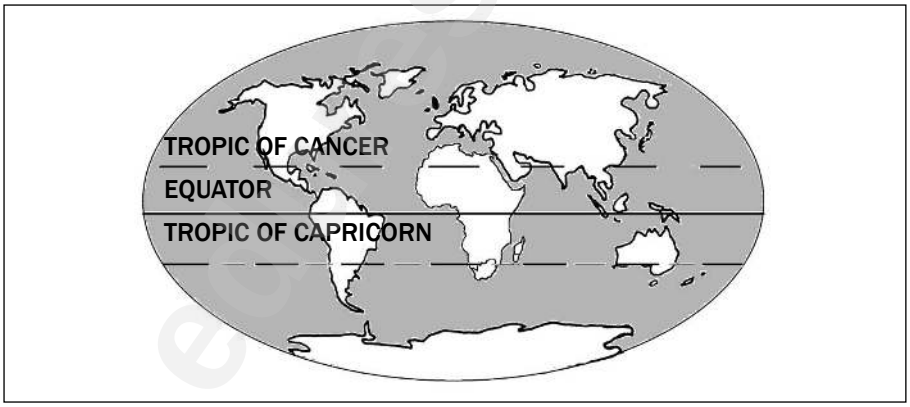

Figure 5.2.2: The three main lines of latitude

3. Reading a map is as easy as reading a book but, instead of using the alphabet, you have to know the **conventional signs** used in maps. These help you to see the landscape (relief, drainage, vegetation and huhuman-made features). Conventional signs are used to show particular features. They may be letters of the alphabet or symbols. Many symbols look like the features they represent.

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The following table lists some of the symbols you may find on a map:

Symbol	What it looks like
Weir	Represented as a black line across a river, like a dam wall. It is a barrier or mini dam wall which slows down the flow of water.
Furrow and canal	Represented as a solid blue line and labelled as furrow or canal. It is used to transport water from source (dam/river) to where it is needed.
Aerodrome	A small airport
Slimes dam	Represented as a solid black line forming a geometric shape, often rectangular. It stores liquid waste from the mining process.
Mine dump	Represented as solid lines radiating out from a central point. It is a small mountain-like feature, often yellowish in colour. It consists of solid waste from the mining process.
Rifle range/ shooting range	These are enclosed by a solid black line. This is a place where people practise shooting.

Table 5.1: Symbols found on maps

Colours are often used to make symbols clearer. There are six colour groups:

Colour	What it is used for
Brown	**Land or earth features**: Contours, eroded areas, prominent rocky outcrops, sandy areas and dunes, secondary roads
Blue	**Water features**: Aqueducts, canals, furrows, coastlines, dams, lakes, marshes, swamps and vleis, pans, rivers, water-towers. National freeways are also shown in dark blue
Green	**Vegetation features**: Cultivated fields, golf courses, nature and game reserve boundaries, state forest boundaries, orchards and vineyards, recreation grounds, woodland/plantations
Black	**Construction features**: Roads, tracks, railways, buildings, bridges, cemeteries, communication towers, dam walls, excavations and mine dumps, telephone lines, power lines, wind pumps, wrecks, ruins, trigonometrical station, boundaries
Grey	**Construction features**: Built-up areas
Red	**Construction features**: National, arterial and main roads, lighthouses and marine lights. Pink also shows international boundaries

Table 5.2: Colours used on maps

4. **Contour lines** on a map show the area's relief (the difference in elevation) or altitude (height in metres of the land above sea level). The closer together the contour lines are, the steeper the slope is. The lines are labelled so that you read **up** the slope.

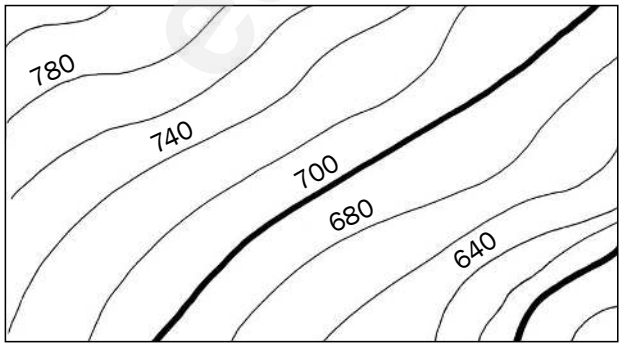

Figure 5.2.3: Countour lines of a steep slope

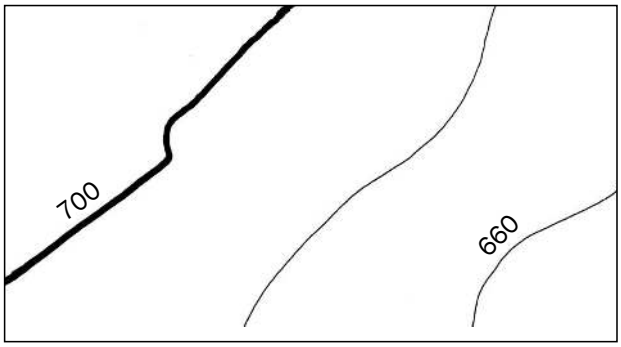

Figure 5.2.4: Contour lines of gentle slope

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5.3 Mapwork calculations

5.3.1 Introduction to mapwork calculations

In this section you will learn how to do various mapwork calculations on a **topographic map** and an **orthophoto**. These calculations will be explained by means of examples.

When doing calculations, you will be required to give an answer in kilometres or metres. Always take note of whether the calculation is to be done from a topographic map or an orthophoto, as this will change your scale. The orthophoto scale is larger and provides more detail. Use the conversion table below (Table 5.3).

TOPOGRAPHIC MAP
1 cm : 50 000 cm
1 cm = 500 m
1 cm = 0,5 km

ORTHOPHOTO MAP
1 cm: 10 000 cm
1 cm: 100 m
1 cm: 0,1 km

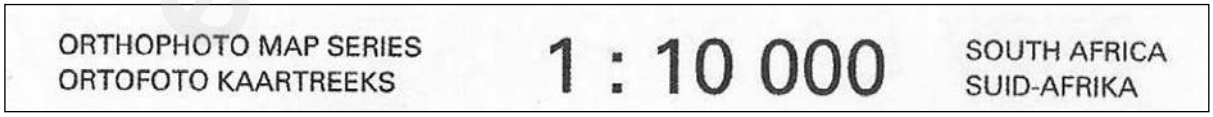
Scale	If the answer must be in kilometres (km)	If the answer must be in metres (m)
Topographic map 1:50 000 →	Multiply by 0,5 on a topographic map	Multiply by 500 on a topographic map
Orthophoto map 1:10 000 →	Multiply by 0,1 on an orthophoto	Multiply by 100 on an orthophoto

Table 5.3: Converting a given scale to kilometres or metres

Topographic map extract

comment A 1 : 10 000 scale is 5 times larger than a 1 : 50 000 scale.

Orthophoto map extract



Calculations in mapwork need a good understanding of **difference in height** and **straight line distance** to calculate distance, gradient and area. Look at the example and revise these calculations.

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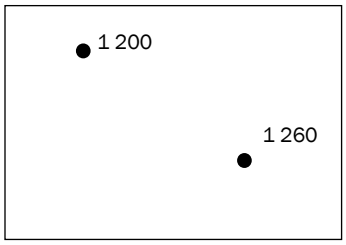
Example

On a 1:50 000 map



Difference in height (vertical)

Simply subtract the smaller height from the greater height.

For example, to calculate the difference in height between spot height 1 260 and spot height 1 200:

1 260 − 1 200 = 60 m

Straight line distance (horizontal)

Measure the distance on the map in centimetres and multiply by the scale. For example, to calculate the distance between spot height 1 200 and spot height 1 260 in kilometres:

Map distance = 2,4 cm

Scale: 1 cm represents 0,5 km

2,4 × 0,5 = 1,2 km

5.3.2 Mapwork calculations: distance, area and gradient

In the exam you may be asked to do distance, area and gradient calculations on a topographic map or an orthophoto. The following are examples of these calculations for both topographic maps and orthophotos. The method and formulae are the same for both kinds of maps, but remember to use the correct conversion calculation on page 103.

Distance

This is the **straight line distance** from one point to another or the **actual distance**, e.g distance along a road, railway, hiking trail, etc.

We calculate distance to find out how far one place is from another.

Formula

Actual distance = map distance × scale

AD = MD × S

Method for calculating distance

Follow these steps:

Step 1: Measure the map distance in centimetres.

Step 2: To convert to kilometres, multiply the map distance by 0,5 if on a topographic map, or by 0,1 if on an orthophoto to get km. To convert to metres, multiply the map distance by 500 if on a topographic map or by 100 if on an orthophoto.

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Worked example 1 – straight line distance

Calculate the distance from point A to point B.

Topographic map calculation:	Orthophoto calculation:
A ——— B 1: 50 000	A ——— B 1: 10 000
Map distance: 4,6 cm Scale: 1 cm represents 0,5 km Distance: 4,6 cm × 0,5 = 2,3 km	Map distance: 4,6 cm Scale: 1 cm represents 0,1 km Distance: 4,6 cm × 0,1 = 0,46 km

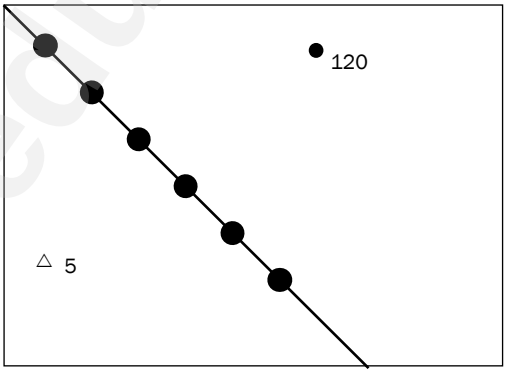
Worked example 2 – actual distance

Calculate the distance along the road from point A to point B.

Topographic map calculation:	Orthophoto calculation:
A 1: 50 000 B	A 1: 10 000 B
Map distance: 3 cm Scale: 1 cm represents 0,5 km Distance: 3 cm × 0,5 = 1,5 km	Map distance: 3 cm Scale: 1 cm represents 0,1 km Distance: 3 cm × 0,1 = 0,3 km

Activity 5.1

Calculate the following distances which are shown on a topographic map.



1. Calculate the distance from trig. station 5 to spot height 120 in metres. (3)
2. Calculate the distance along the powerline in kilometres. (3)

[6]

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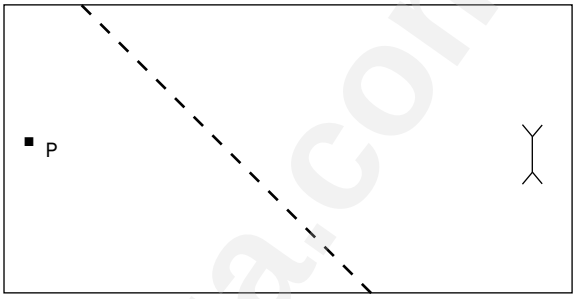
Answers to activity 5.1

1. Distance = 4,4 cm✓ × 500✓ = 2 200 m✓ (3)
2. Distance = 6,8 cm ✓× 0,5✓ = 3,4 km✓ (3)

[6]

Activity 5.2

Calculate the following distances which are shown on an orthophoto.



1. Calculate the distance from the post office to the dipping tank in metres. (3)
2. Calculate the distance along the track in kilometres. (3)

[6]

Answers to activity 5.2

1. Distance = 6,6 cm✓ × 100✓ = 660 m✓ (3)
2. Distance = 5,4 cm✓ × 0,1✓ =0,54 km✓ (3)

[6]

Area

Area is the amount of surface a two-dimensional shape covers. (A two-dimensional shape has length and breadth.)

We calculate area to find out how much land is covered (e.g. by a maize field) or how much space we have to build on.

Formula for area

Area = Length × Breadth

A = L × B

Method for calculating area

Follow these steps:

Step 1: Measure the length in cm and convert to km or m.

Step 2: Measure the breadth in cm and convert to km or m.

Step 3: Apply the formula A = L × B.

Step 4: Write the answer in kilometres squared (km^2) or metres squared (m^2).

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e.g. Worked example

Topographic map calculation:	Orthophoto calculation:
Length 4,4 cm 3,6 cm Breadth 1: 50 000	Length 4,4 cm 3,6 cm Breadth 1: 10 000
Answer in km² A = L × B L: 4,4 cm × 0,5 = 2,2 km B: 3,6 cm × 0,5 = 1,8 km A: 2,2 × 1,8 = 3,96 km²	**Answer in km²** A = L × B L: 4,4 cm × 0,1 = 0,44 km B: 3,6 cm × 0,1 = 0,36 km A: 0,44 × 0,36 = 0,1584 km²
Answer in m² A = L × B L: 4,4 cm × 500 = 2 200 m B: 3,6 cm × 500 = 1 800 m A: 2 200 × 1 800 = 39 600 m²	**Answer in m²** A = L × B L: 4,4 cm × 100 = 440 m B: 3,6 cm × 100 = 360 m A: 440 × 360 = 158 400 m²

Activity 5.3

1. The block below is shown on a topographic map. Calculate the area of the block in metres squared. (5)

2. The block below is shown on a topographic map. Calculate the area of the block in kilometres squared. (5)

[10]

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Answers to activity 5.3

1. $A = L \times B$✓
   L: 3,7 cm × 500 = 1 850 m✓
   B: 1,1 cm × 500 = 550 m✓
   A: 1 850 × 550 = 1 017 500 m²✓✓ (5)
2. $A = L \times B$✓
   L: 4,4 cm × 0,5 = 2,2 km✓
   B: 2,3 cm × 0,5 = 1,15 km✓
   A: 2,2 × 1,15 = 2,53 km²✓✓ (5)

[10]

Activity 5.4

1. The block below is shown on an orthophoto. Calculate the area of the block in metres squared. (5)

2. The block below is shown on an orthophoto. Calculate the area of the block in kilometres squared. (5)

[10]

Answers to activity 5.4

1. $A = L \times B$✓
   L: 4,4 cm × 100 = 440 m✓
   B: 1,1 cm × 100 = 110 m✓
   A: 440 × 110 = 48 400 m²✓✓ (5)
2. $A = L \times B$✓
   L: 1,1 cm × 0,1 = 0,11 km✓
   B: 1,1 cm × 0,1 = 0,11 km✓
   A: 0,11 × 0,11 = 0,0121 km²✓✓ (5)

[10]

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Gradient

Gradient is the relationship between height and distance. The gradient tells us how **steep** a straight line is.

We calculate gradient to find out how steep or gentle a slope is.

Formula for gradient

$$\text{Gradient} = \frac{\text{Height (vertical)}}{\text{Distance (horizontal)}}$$

OR

$$G = \frac{H}{D}$$

Method for calculating gradient

Follow these steps:

Step 1: **Calculate** the difference in height by subtracting the lowest height from the highest height. The answer must be in metres.

Step 2: **Measure** the distance in cm.

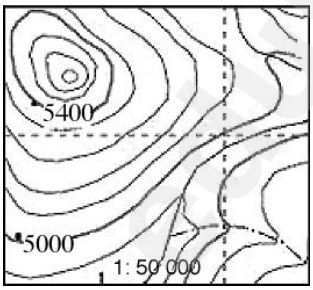
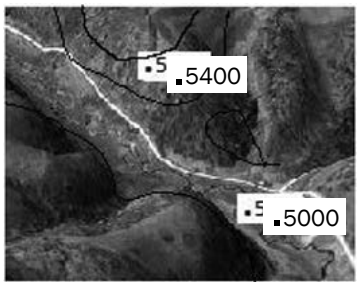
Step 3: **Convert** to metres by multiplying by 500 (if you are working with a topographic map) or by 100 (if you are working with an orthophoto).

Step 4: **Write** the two answers as a ratio.

Step 5: **Divide** both sides of the ratio by the height. This is so we can get a ratio of 1 to a relative number, in other words, distance.

Step 6: Your answer is the gradient written as a ratio.

e.g. Worked example

Topographic map calculation:	Orthophoto calculation:
Calculate the gradient between ·5400 and ·5000	Calculate the gradient between ·5400 and ·5000
	
$G = \frac{H}{D}$	$G = \frac{H}{D}$
H: 5 400 – 5000 = 400 m	$\frac{5\,400 - 5\,000}{11\text{ cm} \times 100} = \frac{400}{1\,100}$
D: 2,2 cm × 500 = 1 100 m	$\frac{400:1\,100}{400}$
G: $\frac{400:1\,100}{400:400}$	= 1:2,75
= 1:2,75	

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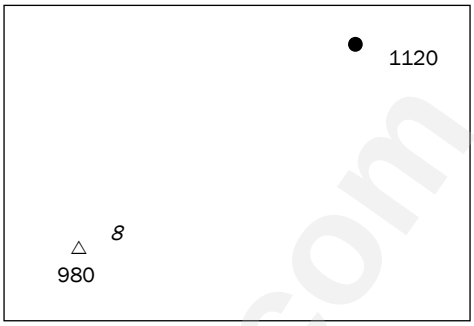
Activity 5.5

Calculate the gradient from trig. station 8 to spot height 1120, which are shown on a topographic map.



[5]

Answer to activity 5.5

$G = \frac{H}{D}$ ✓

H: 1 120 − 980 = 140 m✓

D: 4,4 cm × 500 = 2 200 m✓

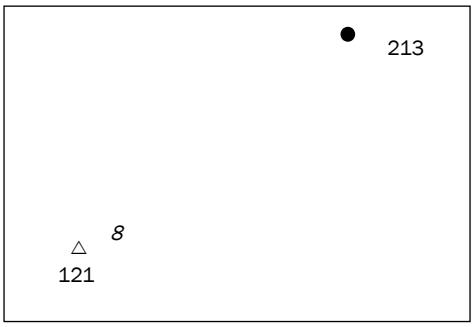
$G: \frac{140}{140} : \frac{2\,200}{140}$ ✓

= 1:15,71✓

[5]

Activity 5.6

Calculate the gradient from trig. station 8 to spot height 213, which are shown on an orthophoto. [5]



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Answer to activity 5.6

$G = \frac{H}{D}$ ✓

H: 213 − 121 = 92 m ✓

D: 4,4 cm × 100 = 440 m✓

$G: \frac{92}{92} : \frac{440}{92}$ ✓

= 1:4,78✓

[5]

5.3.3 Mapwork calculations: True bearing, magnetic declination, magnetic bearing, position, map sheet reference, vertical exaggeration

Note that **true bearing**, **magnetic declination**, **magnetic bearing** and **position**, and map sheet reference calculations can only be done on a topographic map. **Vertical exaggeration** calculations can be done on both a topographic map and an orthophoto.

True bearing

True bearing is the angle measured clockwise from true north (0°).

We calculate true bearing, magnetic declination and magnetic bearing to help us determine in which direction we are going or to help us find our way.

Method for measuring the true bearing from A to B

Follow these steps:

Step 1: Draw a straight line joining A and B.

Step 2: Draw a north line through A (the point of measurement).

Step 3: Place the 0 of your protractor at the top of the north line.

Step 4: Moving in a clockwise direction from 0, read off where the line joining A and B touches the protractor.

The true bearing from A to B is 138°. (In the exam, a degree either way will be accepted, i.e. the answer can be 137° to 139°.)

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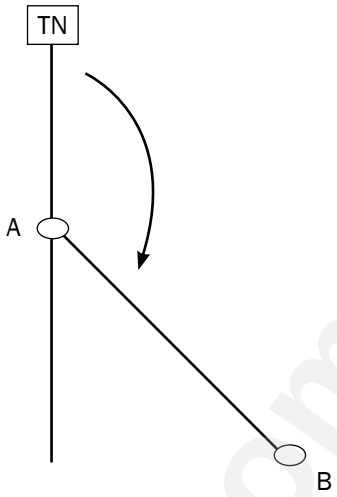
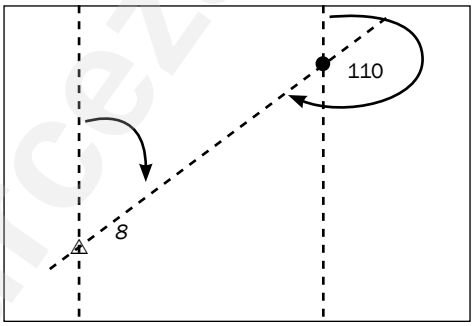


Activity 5.7



1. Calculate the true bearing **from** trig. station 8 **to** spot height 110. (2)
2. Calculate the true bearing **of** trig. station 8 **from** spot height 110. (2)

[4]

Answers to activity 5.7

1. 58° (57° – 59°)✓✓ (2)
2. 238° (237° – 239°) ✓✓ (2)

[4]

Magnetic declination

Magnetic declination is the angle between true north and magnetic north. This angle is calculated when the map is drawn, but the position of magnetic north changes, so the angle between true north and magnetic north (the magnetic declination) will also change. You will need to calculate what the magnetic declination is for the current year.

You will find the magnetic declination for the year the map was drawn on the map. This information appears on a map on the left-hand side or at the bottom of the map. You need this information to do the magnetic declination calculation. Look at the following example:

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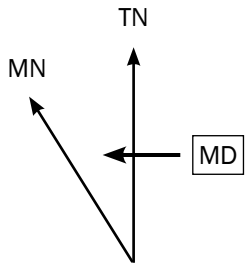
Example

Mean magnetic declination (MD) 20º 10' west of true north (1990.01)

Mean annual change (AC) 2' westwards (1985–1995)



Note the following:

- TN is true north. This is found at the North Pole.
- MN is magnetic north. This is the direction in which a compass would point.
- MD is the magnetic declination. It is the angle you are calculating.
- 1990.01 refers to the year and the month that the declination was recorded.
- 1985–1995 refers to the years the mapmaker used to get the mean (average) magnetic declination. You will not need these years.
- Mean annual change refers to how much the magnetic declination changes by each year. The change is in minutes (this is shown by the symbol ').
- The declination can change in a westerly (angle increases) or easterly (angle decreases) direction.

Method for calculating magnetic declination

Follow these steps:

Step 1: Work out the difference in years between the current year and year given on the map. Your answer must be in years. (Use the year that is printed straight after the words 'true north'. You can ignore the month that is shown.)

Step 2: Multiply the number of years with the mean annual change (this is given on the map) to get the change since the declination was recorded.

Step 3: If the mean annual change is **eastwards**, then you have to **subtract** the change from the magnetic declination given. If the mean annual change is **westwards**, then you must **add** it to the given magnetic declination.

Step 4: Your answer is the magnetic declination for the current year. Magnetic declination is always west of true north.

hint

(–)
(–)
ast means (–)
minus from left to right.

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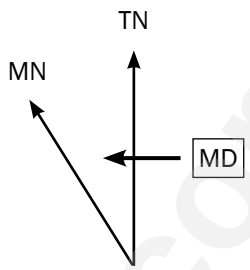
Worked example 1: If the annual change is westwards

Mean magnetic declination (MD) 20º 10' west of true north (1990.01)
Mean annual change (AC) 2' westwards (1985–1995)



Calculating magnetic declination for 2012

MD = 20° 10' W of TN

AC = 2' W

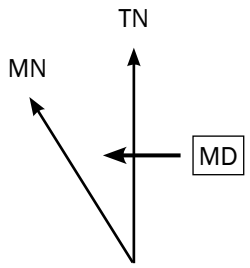
2012 – 1990 = 22 years

22 × 2' W = 44' W

MD = 20° 10' W + 44' W = **20° 54' W of TN**

Worked example 1: If the annual change is eastwards

Mean magnetic declination (MD) 18º 50' west of true north (1985.01)
Mean annual change (AC) 1' eastwards (1980–1990)



Calculating magnetic declination for 2012

MD = 18° 50' W of TN

AC = 1' E

2012 – 1985 = 27 years

27 × 1' E = 27' E

MD = 18° 50' W – 27' E = **18° 23' W of TN**

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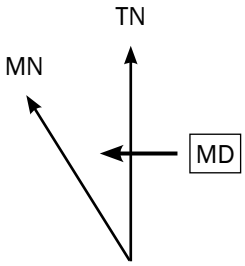
Worked example 3: If the magnetic declination is given with a decimal place instead of minutes

If the MD given on the map is recorded as a decimal, for example 23°,5 W, you must **multiply the number after the comma by 6** to convert it to minutes. For example: 5 × 6 = 30'. So, the MD is now 23°30' W. The decimal comma has been removed and you have a MD in degrees and minutes.

Now look at the following worked example:

Mean magnetic declination (MD) 18º,3 west of true north (1985.01)

Mean annual change (AC) 1' westwards (1980–1990)



Calculating magnetic declination for 2012

MD = 18°,3 W of TN = 18° 18' W of TN

AC = 1' W

2012 – 1985 = 27 years

27 × 1' W = 27' W

MD = 18° 18' W + 27' W = **18° 45' W of TN**

Worked example 4: If the magnetic declination answer has the minutes greater than 59'

Once you have done your calculation, if the magnetic declination for the current year has minutes greater than 59' you need to convert the minutes to degrees.

For example: MD = 23° 76'

76' – 60' leaves 16'. The 60 minutes you subtracted equal 1 degree, which you add to the 23° to get 24° 16'.

Now look at the following worked example:

Mean magnetic declination (MD) 31º 33' west of true north (1990.08)

Mean annual change (AC) 2' westwards (1987–1993)

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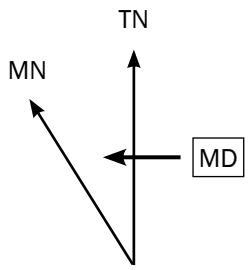


Calculating magnetic declination for the current year

MD = 31° 33' W of TN

AC = 2' W

2012 – 1990 = 22 years

22 × 2' W = 44' W

MD = 31° 33' W + 44' W

= 31° 77' W of TN

= **32° 17' W of TN**

e.g. Worked example 5: When the change is eastwards and the change is greater than the minutes in the MD

If the mean annual change has minutes greater than the minutes in the magnetic declination, you need to borrow a degree in the magnetic declination and convert it into minutes. Look at the following example:

MD = 20° 10' W – 44' E

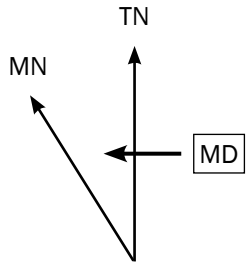
Before you can subtract the mean annual change of 44' E from the given magnetic declination, you need to borrow 1° from 20° and convert it to minutes. This leaves you with 19°. Now take the 1° and convert it to 60' (remember that 1° = 60'). Now add the 60' to the 10'. This gives you 70'. Now you can continue with the calculation:

19° 70' – 44' E = 19° 26' W

Now look at the following worked example:

Mean magnetic declination (MD) 25º 32' west of true north (1986.04)

Mean annual change (AC) 2' eastwards (1983–1992)



hint

- Always add degrees to degrees and minutes to minutes. **Never** add degrees to minutes.
- Always subtract degrees from degrees and minutes from minutes. **Never** subtract minutes from degrees!

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Calculating magnetic declination for 2012

MD = 25° 32' W of TN

AC = 2' E

2012 – 1986 = 26 years

26 × 2' E = 52' E

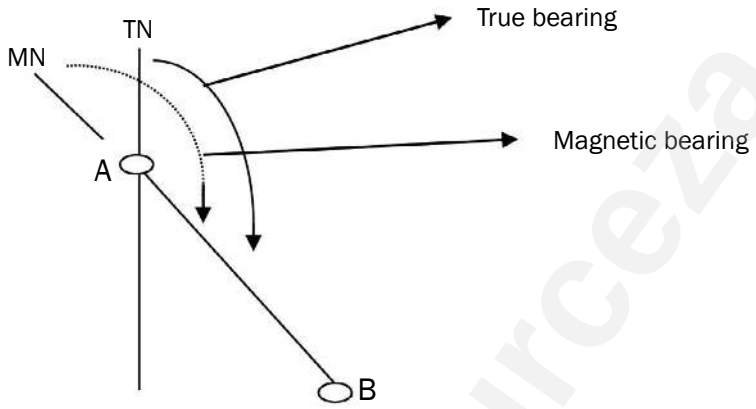
MD = 25° 32' W – 52' E

= 24° 92' – 52'

= 24° 40' W of TN

Magnetic bearing

Magnetic bearing is the angle measured clockwise from magnetic north. Here the **magnetic north line is taken as 0°** whereas in true bearing, true north is taken as 0°.



Formula for magnetic bearing

Magnetic bearing = true bearing + magnetic declination

MB = TB + MD

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Method for calculating magnetic bearing

To get the true bearing and the magnetic declination we use the same methods applied in 5.3.3A (on page 111) and 5.3.3B (on page 112).

These methods are provided again below. Follow these steps:

Step 1: *Measure the true bearing from A to B (as described in 5.1.3A)*

Step 1a: Draw a straight line joining A and B.

Step 1b: Draw a north line through A (the point of measurement).

Step 1c: Place the 0 of your protractor at the top of the north line.

Step 1d: Moving in a clockwise direction from 0, read off where the line joining A and B touches the protractor.

Step 2: *Calculate the magnetic declination (as described in 5.1.3B)*

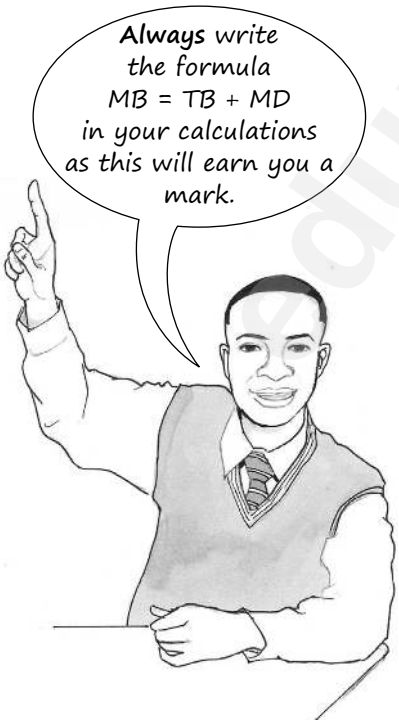
Step 2a: Work out the difference in years between the current year and year given on the map. Your answer must be in years. (Use the year that is printed straight after the words 'true north'. You can ignore the month that is shown.)

Step 2b: Multiply the number of years with the mean annual change (this is given on the map) to get the change since the declination was recorded.

Step 2c: If the mean annual change is **eastwards**, then you have to **subtract** the change from the magnetic declination given. If the mean annual change is **westwards**, then you must **add** it to the given magnetic declination.

Step 2d: Your answer is the magnetic declination for the current year. Magnetic declination is always west of true north.

Step 3: Now add the true bearing to the magnetic declination. Your answer must not have a direction (north, south, east or west) because it is an angle measured only in degrees and minutes.



Example

MD = 18°,8 W = 17° 48' W

Change in years = 2012 – 1988 = 24 years

Change since 1989 = 24 × 4' = 96' W = 1° 36' W

MD = 17° 48' + 1° 36'

= 18° 84' W = **19° 24' W**

TB = between 299° and 303°

MB = TB + MD

= 301° + 19° 24'

MB = 320° 24'

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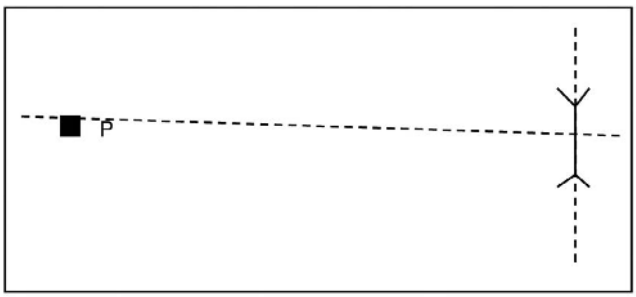
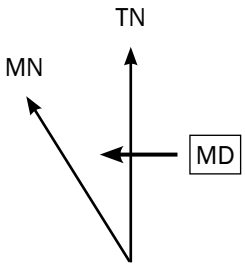
Worked example 1



Mean magnetic declination (MD) 20º, 2' west of true north (2001.09)

Mean annual change (AC) 1' westwards (1998–2004)



Calculate the magnetic bearing of the post office from the dipping tank for 2012.

MB = TB + MD

TB = 272° (271°– 273°)

MD = 20°, 2 W of TN = 20°12' W of TN

AC = 1' W

2012 – 2001 = 11 years

11 × 1' W = 11' W

MD = 20° 12' W + 11' W = 20° 23' W of TN

MB = 20° 23' + 272°

= 291° 23'– 293° 23'

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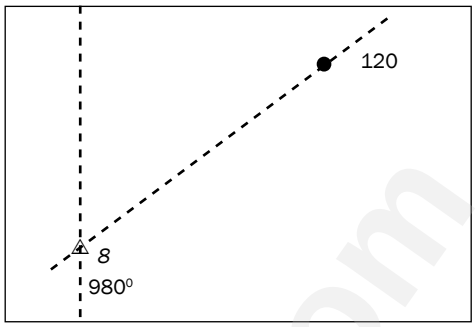
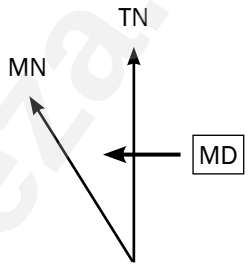
e.g. Worked example 2



Mean magnetic declination (MD) 20º 31' west of true north (1998.10)

Mean annual change (AC) 4' westwards (1995–2001)



Calculate the magnetic bearing from trig. beacon 8 to spot height 120 for 2012.

MB = TB + MD

TB = 57° (56°– 58°)

MD = 20°31' W of TN

AC = 4' W

2012 – 1998 = 14 years

14 × 4' W = 56' W

MD = 20° 31' W + 56' W

= 20° 87' W of TN

= 21° 27' W of TN

MB = 21° 27' + 57°

= 77° 27' – 79° 27'

Position/co-ordinates

Co-ordinates are a set of two numbers that indicate the exact position of any point on Earth. **Latitude** is the co-ordinate that specifies the north–south position of a point on the Earth's surface. **Longitude** is the co-ordinate that specifies the east–west position of a point on the Earth's surface.

Co-ordinates are useful as they tell us exactly where a place or landform is.

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Example of position/co-ordinates

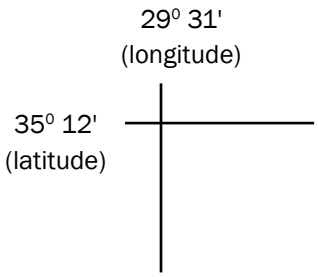
If you wanted to locate a house and only had the co-ordinates 35°S 29°E, you would have to search an area of 6 084 km². You would need to be more specific when giving the location of a place.

Think of latitude and longitude in the following way:

L A T I T U D E
O
N
G
I
T
U
D
E

Note the following about position/co-ordinates:

- On a 1:50 000 map the numbers in the top left corner indicate latitude and longitude. Latitude and longitude are measured in degrees and minutes.



- Each line drawn on a map is 1' of latitude or longitude (' is the sign for a minute).
- Each fifth minute on a map is labelled. This helps you to count accurately.
- Latitude minutes increase as you move south (down the map).
- Longitude minutes increase as you move east (to your right along the map).
- The **correct format** for writing position is as follows:
  _____° ____,___' S
  _____° ____,___' E

Method for finding the position of an object

You can calculate the position of spot height 501 using the diagram in Figure 5.3.1.

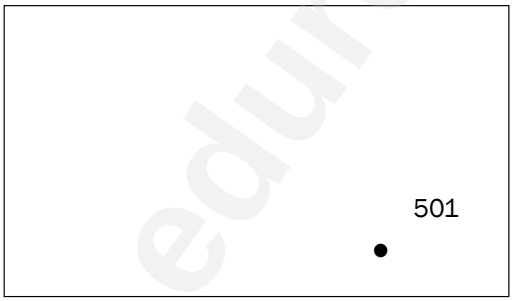


Figure 5.3.1

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Use the following steps

Step 1: Write the format for position like this (leaving the blanks for you to fill your answer in later).

_____° ____,___' S

_____° ____,___' E

Step 2: Work out the degrees for latitude and longitude for the map. They are written in the top left-hand corner of the map. Write the degrees down on your format.

24° ____,___' S

31° ____,___' E

Step 3: Work out the minutes for latitude and longitude. The spot height is in the 10' block for latitude (not the 11' block for latitude) and the 28' block for longitude (not the 29' block for longitude). Write the minutes down in the blank spaces of your position format.

24° 10',___' S

31° 28',___' E

Step 4: Measure the distance between 10' and 11' and divide it by 2. Then make a mark on the line between 10' and 11' where 3 cm is.

Step 5: Measure the distance between 28' and 29' and divide it by 2. Make a mark on the line between 28' and 29' where 4,7 cm is.

Step 6: The space between 10' and 11' is divided into 10 decimal places, in other words, 10,1'; 10,2'; 10,3'; 10,4'; 10,5'; 10,6'; 10,7'; 10,8' and 10,9'.

As the spot height is in the bottom half of the block, we are only concerned with the 10,5' to 10,9' part of the block.

Once you have divided the block in half, divide the half you are interested in equally with 4 lines. This can be done freehand (without a ruler), but judge carefully so that the spaces are equal.

After 10,9' it becomes 11', so you can never have 10,10'.

After 28,9' it becomes 29', so you can never have 28,10'

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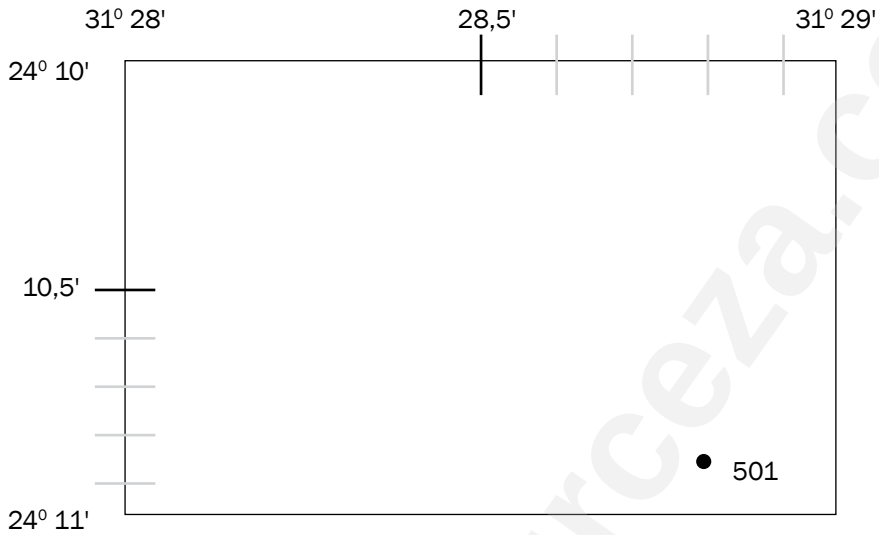
Step 7: The space between 28' and 29' is divided into 10 decimal places, in other words, 28,1'; 28,2'; 28,3'; 28,4'; 28,5'; 28,6'; 28,7'; 28,8' and 28,9'.

As the spot height is in the right-hand half of the block, we are only concerned with the 28,5' to 28,9' part of the block.

Once you have divided the block in half, divide the half you are interested in equally with 4 lines. This can be done freehand (without a ruler), but judge carefully so that the spaces are equal.

Steps 6 and **7** are shown below:

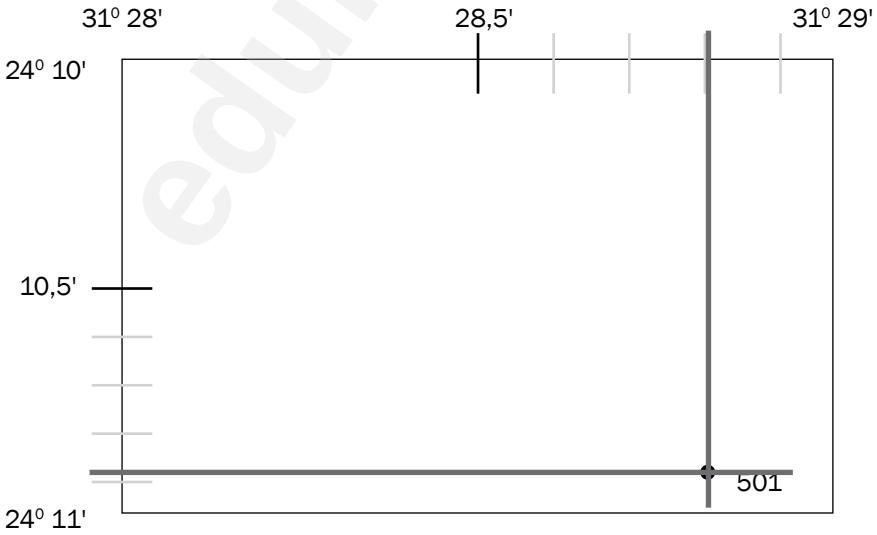


Step 8: Line up your ruler with the spot height and the line for latitude (on the left of the map). Make a mark. Read off the decimal place for latitude and write it down on your position format.

24° 10,**8**' S or 24° 10,**9**' S (both answers are acceptable)

Step 9: Line up your ruler with the spot height and the line for longitude (at the top of the map). Make a mark. Read off the decimal place for longitude and write it down on your format.

31° 28,8' E



hint

Make sure your ruler is straight by lining up the markings on the ruler with any of the lines on the map.

NB

In the exam, position is often asked in the multiple-choice section of the paper. Be careful, as an answer may look correct – but longitude is written first! You should know this is wrong because **latitude** is always written first!

Example

The position of spot height 501 in Figure 5.1 is…

A. 31° 28,8' S; 24°10,8' E
B. 31° 28,8' E; 24° 10,8' S
C. 24° 10,8' S; 31° 28,8' E
D. 24°11,8' S ; 31° 29,8' E

(The correct answer is C.)

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Your answer is now complete:
24° 10,8' S or 24° 10,9' S (both answers would be accepted)
31° 28,8' E

Map sheet references/map code

The **map sheet reference** is the title of the map and refers to the area that the map covers. The sheet reference links one South African map to all the maps of South Africa.

An example of a map sheet reference is **3318CD**. The digits (numbers) and letters have specific meaning:

The numbers in the map sheet reference refer to the **intersection of the lines of latitude and longitude** (3318CD). The first two numbers refer to latitude (33) and the last two numbers refer to longitude (18). The letters CD refer to the blocks.

The area within these lines of latitude and longitude is divided into four squares, labelled A, B, C and D (big blocks).

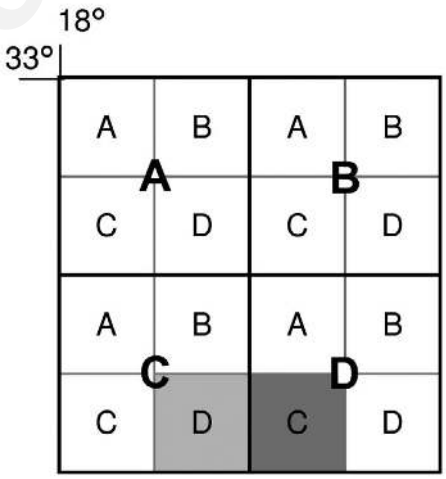
Each of the big blocks is then subdivided into four smaller squares, also labelled A, B, C and D (small blocks).

NB In the exam, you may be asked two types of questions based on the map sheet reference:

- **Typical question 1:** What is the map sheet reference of the map? (You will find the answer at the top of the map in front of the name of the place shown on the map.)
- **Typical question 2:** Name the map sheet reference in any direction from the given map sheet reference. (This is explained in Examples 1 and 2 below.)

Example 1

For the map title 3318CD Cape Town:



Give the map sheet reference to the east of 3318CD.

- The block to the east of 3318CD (light shading) is block C (darker shading).

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- This block is still within the 33° latitude and 18° longitude area, so the numbers (3318) stay the same.
- But it is now in big block D, so the letters change to DC.
- The map sheet to the east of 3318CD is **3318DC**.

Practise this type of question by trying the following:

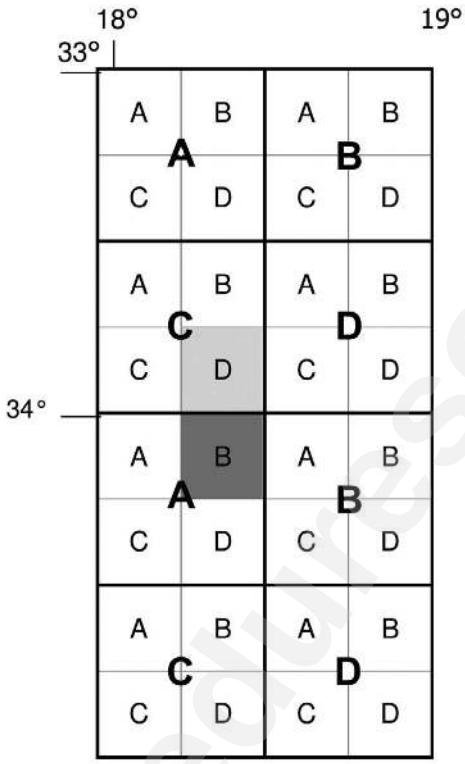
1. Give the map sheet reference for the map to the north of 3318CD.
2. Give the map sheet reference for the map to the north-east of 3318CD.
3. Give the map sheet reference for the map to the north-west of 3318CD.

Answers:

1. 3318CB
2. 3318DA
3. 3318CA

Example 2

For the map title 3318CD Cape Town.



hint

Always look for a grid showing the map sheet reference at the bottom of a map sheet. It may also provide you with information to help you answer other questions.

Give the map sheet reference to the south of 3318CD.

- The block to the south of 3318CD (light shading) is the block B (darker shading).
- This block is out of the 33° latitude area and in the 34° latitude area. However, the block is still within the 18° longitude area. The latitude changes but the longitude stays the same (3418).
- It is now in big block A, so the letters change to AB.
- The map sheet to the south of 3318CD is 3418AB.

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Practise this type of question by trying the following:

1. Give the map sheet reference for the map to the south-east of 3318CD.
2. Give the map sheet reference for the map to the south-west of 3318CD.

Answers:

1. 3418BA
2. 3418AA

NB

When answering this type of question, take note of the following:

- If you are asked for the grid reference north and you go north (up) out of the big block, the latitude must decrease by 1°.
- If you are asked for the grid reference south and you go south (down) out of the big block, the latitude must increase by 1°.
- If you are asked for the grid reference east and you go east (right) out of the big block, the longitude must increase by 1°.
- If you are asked for the grid reference west and you go west (left) out of the big block, the longitude must decrease by 1°.

Vertical exaggeration

In mapwork, we draw a cross section (view from the side) of an area or landform to better understand what the area or landform looks like.

A cross section is when we 'cut' through a landform, to see what it looks like from the side. Figure 5.3.2 below shows a cross section through a tap.

Figure 5.3.2: A cross section through a tap

To draw a cross section of a landform, we need to look at the contour lines. These are the brown lines we see all over a topographic map. Contour lines show the height of the area. Along one contour line, the height is the same.

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Figure 5.3.3 below is a contour map of a landform. If we had to draw a cross section from A to B on Figure 5.3.3 we would first imagine we were walking from A to B:

- Looking at the heights on the contours we see we are walking uphill;
- Then we go downhill a little bit;
- Then uphill again; and
- Then downhill to B.

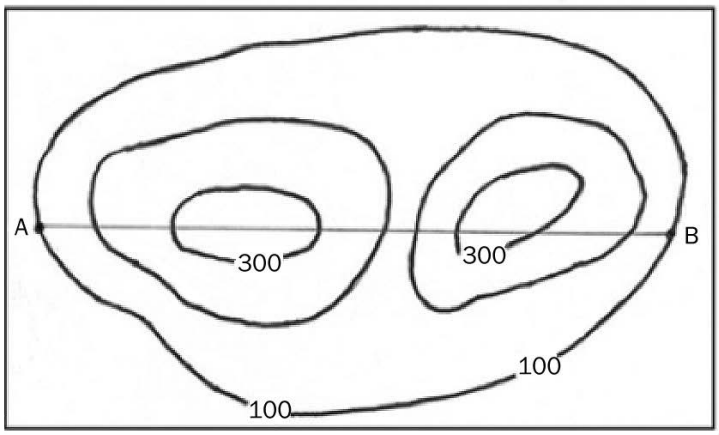

Figure 5.3.3: A contour map of a landform

A cross section is drawn on a graph. We use the vertical axis to show the height and horizontal axis to show the distance.

If the vertical and horizontal scales are the same, it is not easy to see the differences in slope.

Figure 5.3.4 below shows the cross section from A to B (in Figure 5.3.3). Because the vertical and horizontal scales are the same (1:10 000), we do not really get a good idea of the differences in slope.

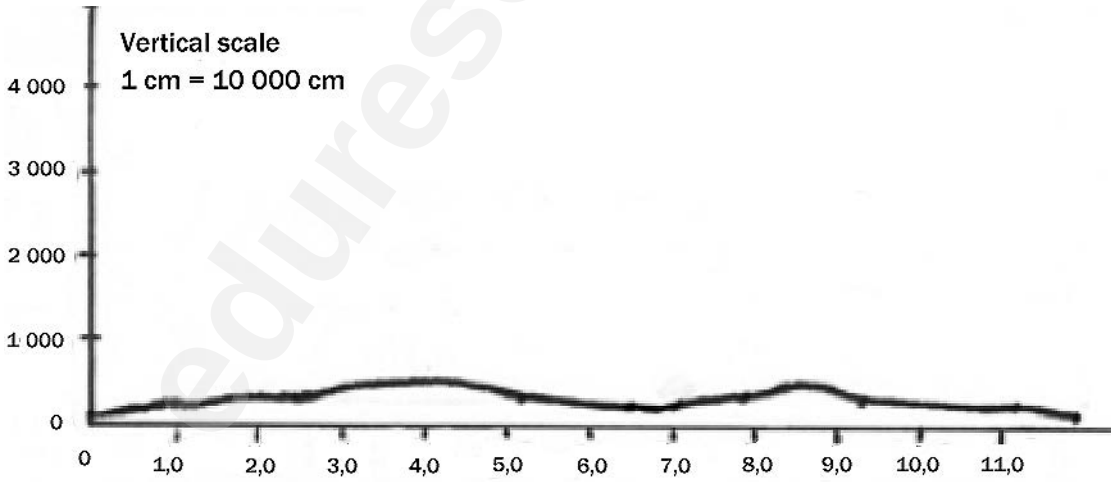

Figure 5.3.4: Cross section from A to B (vertical and horizontal scales the same)

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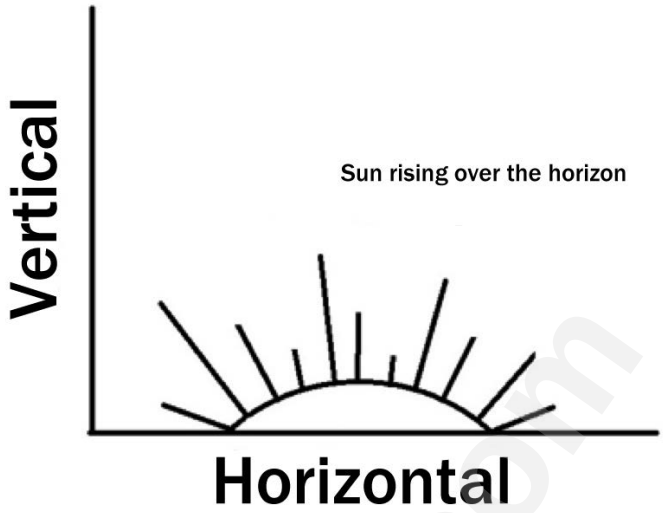

To overcome this problem, we **exaggerate** (make it more obvious or clear) the profile vertically by using a different vertical scale from the horizontal scale. This is shown in Figure 5.3.5.

Figure 5.3.5 uses a vertical scale where 1 cm represents 20 m for the same map. It is much easier to see the changes in slope along the profile.

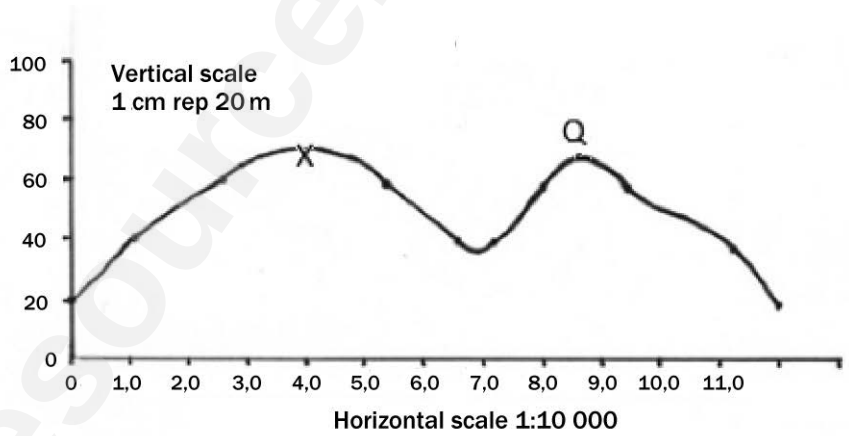

Figure 5.3.5: Cross-section from A to B (vertical and horizontal scales differ)

We therefore say the cross-section has been exaggerated, and we need to calculate how many times it has been made steeper or exaggerated. This is called the **vertical exaggeration.**

Formula to calculate vertical exaggeration

Vertical exaggeration = Vertical scale divided by Horizontal scale

VE = VS ÷ HS

or

$$VE = \frac{VS}{HS}$$

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Method for calculating vertical exaggeration

Follow these steps:

Step 1: Change the vertical scale from a word scale to a number scale. The vertical scale will be given to you in the question, e.g. 1 cm = 40 m.

You must have the same units on both sides of the vertical scale in order to write it as a number scale. We need to convert 40 m into cm. To do this you multiply the 40 m by 100 (1 m = 100 cm). Our scale becomes 1 cm = 4 000 cm or $\frac{1}{4\,000}$.

Step 2: The horizontal scale is already written as a number scale. On a topographic map the scale is 1:50 000 and on an orthophoto the scale is 1:10 000.

Step 3: Write both scales as fractions and divide the vertical scale by the horizontal scale:

$$VE = \frac{1}{4000} \div \frac{1}{50\,000}$$

Step 4: Now 'tip and times' the two fractions. You do this by swopping the top and bottom numbers of the horizontal scale fraction and then multiplying the top of each fraction together and the bottom of each fraction together.

$$VE = \frac{1}{4000} \times \frac{50\,000}{1}$$

Step 5: You are now left with one fraction. Divide the top by the bottom. (Use your calculator to divide 50 000 by 4 000.)

$$VE = \frac{50\,000}{4\,000}$$

hint An easy way to remember that the horizontal scale goes on top is that 'H' comes before 'V' in the alphabet.

Step 6: Write the answer as follows:
VE = 12,5 times

This means the cross section has been exaggerated 12,5 times in order to see the changes in the landscape more easily.

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Example of a topographic map calculation:	Example of an orthophoto calculation:
Calculate the vertical exaggeration for a cross section drawn on a topographical map with a vertical scale of 1 cm = 20 m. VE = VS ÷ HS	Calculate the vertical exaggeration for a cross section drawn on an orthophoto with a vertical scale of 1 cm = 20 m. VE = VS ÷ HS
Step 1: VS: 1 cm = 20 m 1 cm = 20 × 100 cm = 2000 cm VS 1:2000 VS $\frac{1}{2\,000}$	**Step 1 :** VS: 1 cm = 20 m 1 cm = 20 × 100 cm = 2000 cm VS 1:2000 VS $\frac{1}{2\,000}$
Step 2: HS 1:50 000 HS $\frac{1}{50\,000}$	**Step 2:** HS 1:10 000 HS $\frac{1}{10\,000}$
Step 3: VE = $\frac{1}{2\,000} \div \frac{1}{50\,000}$	**Step 3:** VE = $\frac{1}{2\,000} \div \frac{1}{10\,000}$
Step 4: VE = $\frac{1}{2\,000} \times \frac{50\,000}{1}$	**Step 4:** VE = $\frac{1}{2\,000} \times \frac{10\,000}{1}$
Step 5: VE = $\frac{50\,000}{2\,000}$	**Step 5:** VE = $\frac{10\,000}{2\,000}$
Step 6: Answer: VE = 25 times	**Step 6:** Answer: VE = 5 times

e.g. Worked example 1

Calculate the vertical exaggeration for a cross section drawn on a topographical map with a vertical scale of 1 cm = 50 m.

Answer

VE = VS ÷ HS

VS: 1 cm = 50 m

1 cm = 50 × 100 cm = 5000 cm

VS 1:5 000

VS $\frac{1}{5\,000}$

HS 1:50 000

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

VE = $\frac{1}{5\,000} \div \frac{1}{50\,000}$

VE = $\frac{1}{5\,000} \times \frac{50\,000}{1}$

VE = $\frac{50\,000}{5\,000}$

VE = 10 times

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Worked example 2

Calculate the vertical exaggeration for a cross section drawn on an orthophoto map with a vertical scale of 1 cm = 25 m.

Answer

VE = VS ÷ HS

VS: 1 cm = 25 m

1 cm = 25 × 100 cm = 2 500 cm

VS 1:2 500

VS $\frac{1}{2\,500}$

HS 1:10 000

HS $\frac{1}{10\,000}$

$$VE = \frac{1}{2\,500} \div \frac{1}{10\,000}$$

$$VE = \frac{1}{2\,500} \times \frac{10\,000}{1}$$

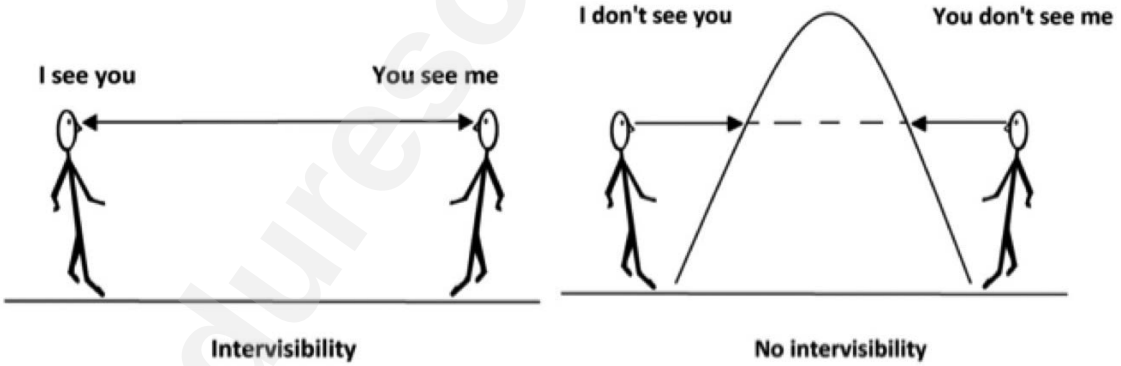
$$VE = \frac{10\,000}{2\,500}$$

VE = 4 times

Intervisibility

Intervisibility is used to determine whether one place is visible from another place, in other words, whether you can see one place from another place.

Imagine a person at each of the points. Can they see each other? If they can, we say that there is **intervisibility** between the two points. If they cannot see each other, we say that there is no **intervisibility** between the two points.



Method to determine intervisibility

To work out whether two places are intervisible, follow these steps:

Step 1: Draw a line joining the points between the two places.

Step 2: Look to see if the line you have drawn cuts through any part of the cross section. If it does cut through, then there is **no** intervisibility between the two points. If it does not cut through, then there **is** intervisibility between the two points.

NB

In the exam, you may be given a cross section and asked to determine if two places are intervisible.

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Example 1

In Figure 5.3.6 below, is point Q intervisible from point P?

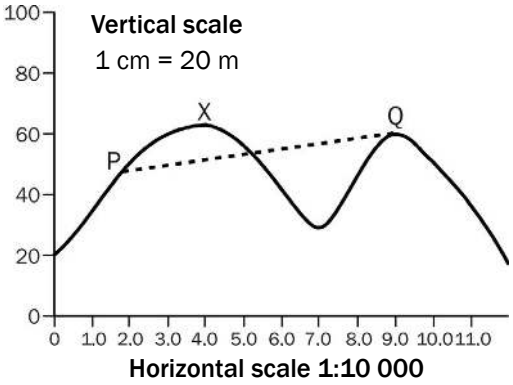

Figure 5.3.6: Determining intervisibility between points P and Q

The answer is that there is no intervisibility between P and Q, as the line cuts through the cross-section (goes through the mountain). This means you cannot see point Q from point P, and you cannot see point P from point Q.

Example 2

In Figure 5.3.7 below, is point X intervisible from point Q?

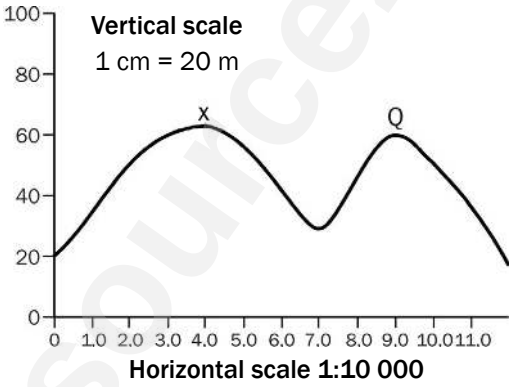

Figure 5.3.7: Determining intervisibility between points X and Q

The answer is there is intervisibility between X and Q, as the line does not cut through the cross-section. This means you can see point X from point Q, and you can see point Q from point X.

Activity 5.8

Refer to the topographical map and orthophoto of Nelspruit at the back of this study guide to answer the following questions:

1. Calculate the area covered by block B3 on the Nelspruit topographical map in kilometres squared. (5)
2. Calculate the magnetic bearing for 2012 from trig. beacon 101 (C3) to spot height 676 (C4) on the topographical map. Show all steps followed (calculations). Marks will be allocated for calculations. (10)
3. Calculate the gradient between trig. beacon 101 in block C3 and spot height 676 in block C4. (5)

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Answers to activity 5.8

1. Area = length × breadth✓
   = (3,7 cm × 0,5) km✓ × (3,3 cm × 0,5) km✓
   = 1,85 km × 1,65 km✓
   = 3,05 km²✓ (5)
2. Magnetic declination: 15°02' west of true north
   Annual change: 03' E✓
   Number of years: 2012 – 1986 = 26 years✓
   26 × 3' = 78' E✓ = 1° 18' E✓
   Magnetic declination: =15°02' W – 1°18' E✓
   = 14° 62' W – 1° 18' E✓
   = 13°44' W✓
   Magnetic bearing = True bearing + Magnetic declination✓
   = 102° + 13° 44' W✓
   = 115° 44'✓ (10)
3. Gradient = $\frac{\text{Height}}{\text{Distance}} = \frac{H}{D}$ ✓
   H = 754,4 – 676 = 78,4 m✓
   D = 5,6 cm × 500 = 2 800 m✓
   $G = \frac{78,4}{78,4} : \frac{2\,800}{78,4}$ ✓
   G = 1:35,7✓ (5)

[20]

5.4 Application of theory to a topographic map and an orthophoto

In this section we look at how the theory that you have learnt in previous chapters can be applied to a topographic map or an orthophoto.

5.4.1 Climatology

In the exam, you may be asked questions such as:

1. Which slopes are the warmest?

hint: Determine which slope faces north. North-facing slopes are the warmest.

2. Which slopes are the coldest?

hint: Determine which slope faces south. South-facing slopes are the coldest.

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3. Why are there more houses and plantations on a slope in a valley?

> **hint** Determine which slope faces north. North-facing slopes are the warmest and people choose to live there. Plants also grow better there.

4. Where will the thermal belt occur?

> **hint** Determine where the valley is and where halfway up the valley would be. This is where you will find the thermal belt (temperature inversion).

5. Where will frost occur?

> **hint** Determine where the bottom of the valley is. Frost pockets occur at the bottom of a valley.

6. Does the area experience high rainfall?

> **hint** Determine the amount of cultivated land, the number of perennial rivers (flow all year round) and the total number of rivers in an area (drainage density). High-rainfall areas have lots of cultivated land, many perennial rivers indicate high drainage density.

7. Does the area experience low rainfall?

> **hint** Determine the amount of cultivated land, the number of perennial rivers (flow all year round) and non-perennial rivers (only flow in the rainy season), and the total number of rivers in an area (drainage density). Low-rainfall areas have very little cultivated land; few, if any, perennial rivers and many non-perennial rivers; and few rivers, indicating low drainage density.

8. Does the area experience seasonal rainfall?

> **hint** Determine the number of non-perennial streams, dams, furrows and whether the cultivated land is next to a river. Seasonal rainfall areas have mostly non-perennial rivers, many dams, furrows and the cultivated land is next to the perennial rivers.

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5.4.2 Geomorphology

In the exam, you may be asked questions such as:

1. In which direction does the river flow?

> **hint** Determine the height of the river at each point where it starts and ends on the map. A river flows downhill, so it flows from the highest point to the lowest point.
>
> Look at the tributaries that join the main river. The direction in which tributaries join the main river follows the same direction in which the river is flowing.

2. Identify the drainage pattern of the river.

> **hint** Determine the pattern of the river system. Is it a dendritic, radial or trellis pattern? Refer to Figure 2.2.3 C to E on page 31 showing drainage patterns in Chapter 2: Geomorphology.

3. Determine the underlying rock structure of an area.

> **hint** Determine the drainage pattern in the area. The causes of a drainage pattern tell you the kind of rock in the area. For example, if there is a dendritic drainage then the underlying rocks are either horizontal sedimentary rock, igneous or metamorphic rock. Refer to Figure 2.2.3 C to E showing drainage patterns in Chapter 2: Geomorphology.

4. In which stage (course) is the river?

> **hint** Determine the steepness of the sides of the valley and the steepness of the river course. A very steep valley is V-shaped and has a steep gradient. This is where the upper course of a river is found. In contrast, if you find a wide floodplain (flat area alongside a river), meanders, marshes or vleis, and oxbow lakes, this is where the lower course of a river is found.

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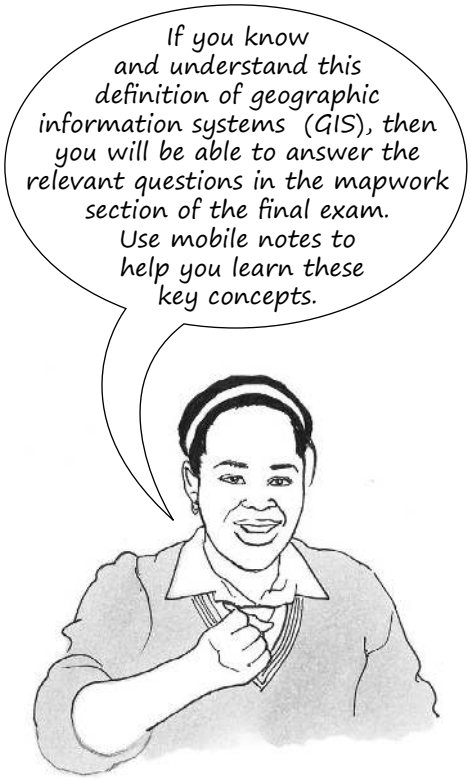
5.5 Geographical information systems – GIS

GIS is an organised collection of computers, computer programmes, geographic data and people. This definition gives you the components that make up GIS: People who know how to use computers (hardware) and programmes (software) to provide information (from geographic data) are able to solve a problem or answer a specific question.



Key concepts

Concept	Definition
Components of GIS	Hardware (computers), software (computer programmes), data (information), people, procedures (how to solve a problem or answer a question), network (where to get the information from).
Spatial data	Spatial data refers to the position of an object, in other words, its co-ordinates. For example, the spatial data for a tree could be: 29°30,3' S; 19°10,8' E
Attribute data	Attribute data is information that describes or gives the characteristics of an object. For example, the attribute data for a tree could be: It is an acacia tree, which is 5 m tall.
Vector data	Spatial data stored in the form of co-ordinates, shown as point, line or polygon features.
a) Point features	Point features on a map include spot height, buildings and trig. stations. P
b) Line features	Line features on a map include rivers, roads and walls.
c) Polygon features	Polygon features on a map include cultivated land, built-up areas and dams.

NB

In a mapwork exam, you may be asked to identify a point, line or polygon feature on a map. Look at the conventional signs shown in the block (referred to in the question).

- Point features are indicated by a circle (e.g. spot height), triangle (e.g. trig. station), square (e.g. building, post office), rectangle (e.g. factory) or a single object (wind pump, dipping tank).
- Line features are indicated by a straight line (e.g. farm boundary, wall) or a curved line (e.g. rivers, roads and railways).
- A polygon feature is any sign that takes up more space than a single feature, for example, a dam, cultivated land, built-up area or golf course.

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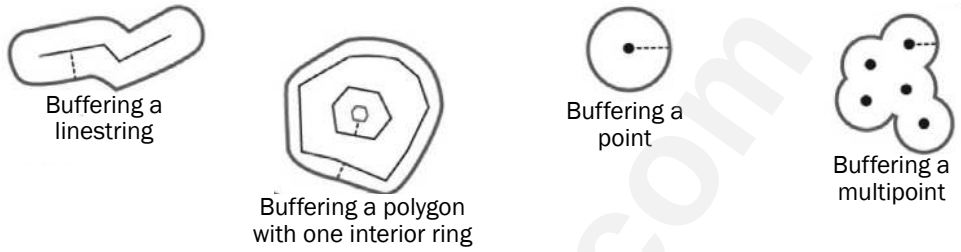
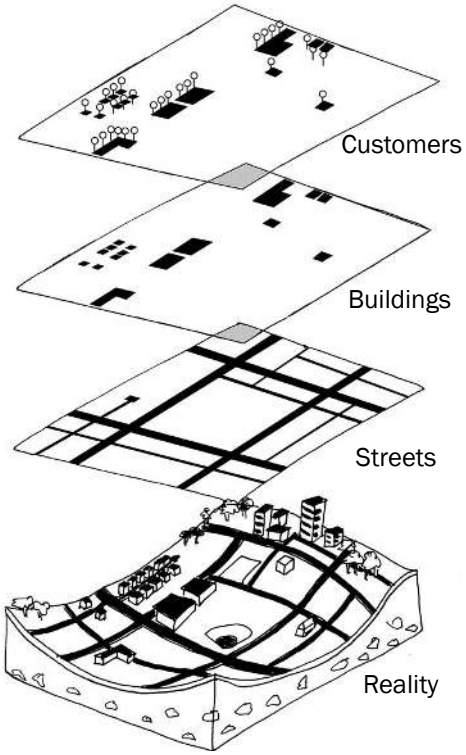
Buffering	To demarcate (mark off) an area around an object. The marked-off area is the buffer zone. Buffer zones often protect people from living in a dangerous area. For example, along a river people should live above the 50-year flood line. The 50-year flood line is the height below which the river floods. The area below the 50-year flood line is the buffer zone for this area. If you live in the buffer zone your home is likely to be affected when the river floods. If you take notice of the buffer zone and live above the 50-year flood line, your home is likely to be safe when the river floods. Figure 5.5.1 below shows how point, line and polygon features have buffer zones placed around them.  *Figure 5.5.1: Buffer zones*
Raster data	Spatial data stored in the form of pixels. Pixels are similar to the blocks found on a topographic map (e.g. block A3). The size of the pixel (block) will determine in how much detail an area will be shown. Smaller pixels show more detail. Larger pixels show less detail.
Remote sensing	Taking a picture of something from far away, for example from a satellite.
Spatial resolution	How clear and easy the detail is to see.
Data or thematic layering	When different kinds of information are placed one on top of the other to see the overall picture. For example, on the Nelspruit map, the layers of data needed to draw block D1 are: • Vegetation • Contour lines • Roads • Power lines • Built-up areas • Water Figure 5.5.2 illustrates the idea of data layering.  *Figure 5.5.2: Data layering*
Data sharing	Data sharing is the practice of making data used for scholarly research available to other investigators.
Data standardisation	It is the process of achieving agreement on common data definitions, representation and structures to which all data layers must conform.
Data security	This means protecting a database from destructive forces and the unwanted actions of unauthorised users. This may be done by encryption, firewall or password.
Data querying	This is a process used to retrieve or get data from the data base.
Statistical analysis	The collection of methods used to process large amounts of data and report overall trends.

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Activity 5.9

Refer to the topographic map 2530BD Nelspruit and the orthophoto map extract at the back of this study guide to answer the following questions.

1. Underline the correct term that matches the description below:
   a) Data that refers to the actual position of an object is vector/raster data. (1 × 2 = 2)
   b) Data that is stored in pixels is vector/raster data. (1 × 2 = 2)
2. Refer to block B1 on the 2530BD Nelspruit topographic map. Give an example from this block of the following:
   a) Point feature (1 × 2 = 2)
   b) Line feature (1 × 2 = 2)
   c) Polygon feature (1 × 2 = 2)
3. List any four layers that were used to draw this topographic map. (4 × 2 = 8)

[18]

Answers to activity 5.9

1. a) Data that refers to the actual position of an object is vector✓/ raster data. (2)
   b) Data that is stored in pixels is vector/raster✓ data. (2)
2. a) Point feature: spot height✓/farmstead✓/tree✓ (any 1) (2)
   b) Line feature: contour✓/power line✓/track or hiking trail✓/ road✓/dam wall✓/river (perennial or non- perennial)✓/ furrow✓ (any 1) (2)
   c) Polygon feature: woodland✓/cultivated land✓/orchards✓/ excavations✓ (any 1) (2)
3. The following layers were used to draw the topographic map:
   - Woodland – all the farming land and woodland areas✓✓
   - Height – the brown contour lines✓✓
   - Water – all the rivers and the perennial water and furrows✓✓
   - Transport – roads and track/hiking trail✓✓ (8)

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Appendix: Exemplar exam paper

The 2014 Geography exams have a new format in line with CAPS. The Department of Basic Education has offered an example of Geography Paper 1 and Paper 2 with marking memoranda.

Use these exam papers, marking memoranda and maps to help you prepare for your exams:

1. **Answer the questions** in each of the four exams (one Geography Theory and three Geography Mapwork exams). Make sure you have enough of a break between each one so that you are not too tired to think properly.
2. Treat each one as a '**real**' exam by making sure **you have all the materials you need** (pens, pencils, eraser, protractor, compass and calculator). **Time yourself** so you complete Geography Paper 1 within 3 hours; and each of the Geography Paper 2 exams within 1 ½ hours.
3. This exercise is meant to test your knowledge – **so don't cheat** yourself by looking up the answers provided in the marking memoranda before you've finished each exam.
4. Use the memoranda to check whether or not your answers are correct. Note where you have got answers wrong – these are the sections of the curriculum that you need to do more work on. Go back to your textbooks and to the relevant sections of this study guide. **Spend time learning** the sections for which you got the lowest marks.
5. Remember: success at Mapwork depends on **practise, practise, practise, and then more practise**! That is why you have been provided with three Mapwork exams (Paper 2). Complete each one of them over and over again, until you get most of the questions rights. That way you will fly in your year-end exams!

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Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

GEOGRAPHY P1

EXEMPLAR 2014

MARKS: 75

TIME: 3 hours

This question paper consists of 13 pages and a 12-page annexure.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of four questions.
2. Answer ANY THREE questions of 75 marks each.
3. All diagrams are included in the ANNEXURE.
4. Number the answers correctly according to the numbering system used in this question paper. Number all your answers in the CENTRE of the line.
5. Leave a line between subsections of questions answered.
6. Start EACH question on a NEW page.
7. Do NOT write in the margins of the ANSWER BOOK.
8. Illustrate your answers with labelled diagrams, where possible.
9. Write neatly and legibly.

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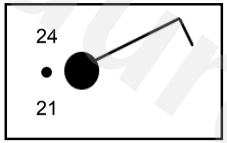
SECTION A: CLIMATE, WEATHER AND GEOMORPHOLOGY

Answer at least ONE question from this section. If you answer ONE question from SECTION A, you MUST answer TWO questions from SECTION B.

QUESTION 1

1.1 Answer the following questions based on the weather station model below:



1.1.1 Write down the air temperature at the weather station.

1.1.2 From which direction is the wind blowing?

1.1.3 What is the wind speed in knots?

1.1.4 Does the cloud cover indicate OVERCAST or CLEAR skies?

1.1.5 Name the precipitation shown on the weather station model.

1.1.6 Write down the dew point temperature at the weather station.

1.1.7 Is the probability of rain HIGH or LOW at this weather station? (7 x 1) (7)

1.2 Study the drainage patterns in FIGURE 1.2. Indicate to which drainage pattern each of the following descriptions refers. Write only the answer next to the question number (1.2.1–1.2.8) in the ANSWER BOOK. You may use the same answer more than once.

1.2.1 Resembles the branches of a tree

1.2.2 Forms on rocks that have many joints and faults

1.2.3 The main stream has many 90º angles along its course

1.2.4 This pattern forms on rocks that have a uniform resistance to erosion

1.2.5 Streams flow away from a central point

1.2.6 The tributaries join the main stream at acute (small) angles

1.2.7 Only forms on massive igneous rocks

1.2.8 The tributaries join the main stream at a 90º angle (8 x 1) (8)

1.3 Study the information and satellite image on tropical cyclone Haruna in FIGURE 1.3 and answer the questions that follow.

1.3.1 Name the centre of the tropical cyclone labelled **A** on the satellite image. (1 x 1) (1)

1.3.2 State the direction in which the clouds are turning/rotating around the centre of the tropical cyclone. (1 x 1) (1)

1.3.3 What was the lifespan (time of existence) of tropical cyclone Haruna? (1 x 1) (1)

1.3.4 How many tropical cyclones, including Haruna, have Mozambique already experienced for the season? (1 x 2) (2)

1.3.5 Give ONE reason why tropical cyclone Haruna weakened when it moved over Madagascar. (1 x 2) (2)

1.3.6 Evaluate why the impact of a tropical cyclone is more severe in a country like Mozambique than in developed countries. (4 x 2) (8)

1.4 Study FIGURE 1.4 which shows the microclimate of a city.

1.4.1 Which areas in the city experience the highest and lowest temperatures respectively? (2 x 1) (2)

1.4.2 Define the term *urban heat island.* (1 x 1) (1)

1.4.3 State ONE difference between an urban heat island and a pollution dome. (1 x 2) (2)

1.4.4 Give ONE reason why a pollution dome forms. (1 x 2) (2)

1.4.5 Discuss TWO factors, evident in FIGURE 1.4, that cause cities to record higher temperatures than the surrounding rural area. (2 x 2) (4)

1.4.6 If you were an urban planner, describe how you would sustainably decrease the impact of urban heat islands. (2 x 2) (4)

1.5 FIGURE 1.5 is a sketch of a river system.

1.5.1 Name the high ridge labelled **A**. (1 x 1) (1)

1.5.2 What purpose does the high ridge (**A**) serve? (1 x 2) (2)

1.5.3 Explain TWO natural factors that could influence the stream flow of the river system. (2 x 2) (4)

1.5.4 Explain the formation of the delta at **B** in FIGURE 1.5. (2 x 2) (4)

1.5.5 State TWO advantages of farming in area **C**. (2 x 2) (4)

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1.6 Read the case study on the Umgeni River in FIGURE 1.6.

1.6.1 Name the human activity that is polluting the Umgeni River. (1 x 1) (1)

1.6.2 What evidence suggests that the Umgeni River is dirty? (1 x 2) (2)

1.6.3 State the negative impact of the dirty water on the quality of life of people living in the area. (2 x 2) (4)

1.6.4 Suggest strategies that could be put in place to reduce the negative impact of humans on the Umgeni River. (4 x 2) (8)

[75]

QUESTION 2

2.1 Refer to FIGURE 2.1 showing two pressure cells in the Southern Hemisphere. Indicate whether the descriptions below refer to pressure cell **A** or **B**. Write only the answer next to the question number (2.1.1–2.1.8) in the ANSWER BOOK. You may use the same answer more than once.

2.1.1 An example of a high-pressure cell

2.1.2 Air converges into the pressure cell

2.1.3 This pressure cell dominates the land in winter over South Africa

2.1.4 Air diverges from this cell

2.1.5 Associated with clear skies and stable weather

2.1.6 Also known as a cyclone

2.1.7 Associated with warm, rising air

2.1.8 Associated with the Tropical Pressure Belt (8 x 1) (8)

2.2 Refer to FIGURE 2.2 showing fluvial landforms and answer the questions that follow.

2.2.1 Name the outer bank of the river labelled **A**. (1 x 1) (1)

2.2.2 Does the inner bank (**B**) of a river experience more EROSION or more DEPOSITION? (1 x 1) (1)

2.2.3 Name the fluvial feature labelled **C**. (1 x 1) (1)

2.2.4 What is feature **D** called after it dries up? (1 x 1) (1)

2.2.5 Name the stream channel pattern labelled **E**. (1 x 1) (1)

2.2.6 Is feature **E** formed by EROSION or DEPOSITION? (1 x 1) (1)

2.2.7 Is feature **C** generally found in the UPPER or LOWER course of a river? (1 x 1) (1)

2.3 Study the synoptic weather map in FIGURE 2.3 and answer the questions that follow.

2.3.1 Identify the THREE pressure systems labelled **A**, **B** and **C** respectively. (3 x 1) (3)

2.3.2 Explain why high-pressure cell **A** limits rainfall over the interior of the country during winter months. (2 x 2) (4)

2.3.3 What evidence on the synoptic weather map suggests that high-pressure cell **B** is ridging? (1 x 2) (2)

2.3.4 Evaluate the negative impact of the cyclone labelled **C** on the economy of South Africa. (4 x 2) (8)

2.4 FIGURE 2.4 is based on valley climates.

2.4.1 Name the wind labelled **A**. (1 x 1) (1)

2.4.2 Explain why wind **A** occurs at night. (2 x 2) (4)

2.4.3 A temperature inversion has formed at **B**. With reference to FIGURE 2.4, assess the impact that this is likely to have on the health of people living in the valley. (2 x 2) (4)

2.4.4 Give TWO reasons why area **C** is not suitable for the planting of all types of crops. (2 x 2) (4)

2.5 FIGURE 2.5 illustrates two drainage basins.

2.5.1 Define the term *drainage basin.* (1 x 1) (1)

2.5.2 Define the term *drainage density.* (1 x 1) (1)

2.5.3 Which drainage basin, **X** or **Y**, has a greater drainage density? (1 x 2) (2)

2.5.4 Give ONE reason for your answer to QUESTION 2.5.3. (1 x 2) (2)

2.5.5 Discuss TWO factors that could result in a drainage basin having a high drainage density. (2 x 2) (4)

2.5.6 Explain the impact of urban development at points **A**, **B** and **C** on the drainage density of drainage basin **X**. (2 x 2) (4)

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2.6 FIGURE 2.6 illustrates river capture.

2.6.1 Is river **S** or river **T** the captor stream? (1 x 1) (1)

2.6.2 Name the features of river capture that developed at points **A**, **B** and **C**. (3 x 1) (3)

2.6.3 Give TWO possible reasons why the tributary of river **T** eroded through the watershed. (2 x 2) (4)

2.6.4 Write a short paragraph in which you explain the impact of river capture on the sustainability of the river as an ecosystem. (4 x 2) (8)
[75]

SECTION B: RURAL AND URBAN SETTLEMENTS AND ECONOMIC GEOGRAPHY OF SOUTH AFRICA

Answer at least ONE question from this section. If you answer ONE question from SECTION B, you MUST answer TWO questions from SECTION A.

QUESTION 3

3.1 Refer to settlements **A** to **E** in FIGURE 3.1. Indicate to which settlement each of the following descriptions refers. Write only the letter (A–E) next to the question number (3.1.1–3.1.7) in the ANSWER BOOK. You may use the same answer more than once.

3.1.1 Settlements located close to a source of water because water is scarce

3.1.2 Farmsteads that are dispersed/isolated

3.1.3 Farmsteads that follow a linear shape

3.1.4 Farmsteads that have a roughly circular shape

3.1.5 An isolated settlement most likely associated with subsistence farming

3.1.6 Associated with large commercial farms that are profit driven

3.1.7 Farmsteads associated with intensive commercial farming (7 x 1) (7)

3.2 Choose a term from COLUMN B that matches the description in COLUMN A. Write only the letter (A–I) next to the question number (3.2.1–3.2.8) in the ANSWER BOOK. You may use each answer only ONCE.

COLUMN A		COLUMN B	
3.2.1	Goods sold within South Africa's borders	A	trade
3.2.2	The extraction of raw materials from nature	B	secondary sector
3.2.3	Linked to innovation, research and development	C	gross domestic product
3.2.4	Exchange of goods and services	D	infrastructure
3.2.5	Goods sold outside South Africa's borders	E	primary sector
3.2.6	Value of goods and services produced locally	F	export market
3.2.7	Refers to services such as roads and communication networks	G	tertiary activities
3.2.8	Provision of services	H	home market
		I	quaternary sector

(8 x 1) (8)

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3.3 FIGURE 3.3 shows a simple urban land-use model.

3.3.1 Which urban land-use model does FIGURE 3.3 show? (1 x 1) (1)

3.3.2 Identify the land-use zone at **A**. (1 x 1) (1)

3.3.3 Discuss TWO factors that would have influenced the location of land-use zone **A**. (2 x 2) (4)

3.3.4 Describe the location of the rural-urban fringe. (1 x 2) (2)

3.3.5 Although the inner city area is dilapidated (buildings are in a poor state), it still has very high property values. Explain why the dilapidation does not impact on property values. (4 x 2) (8)

3.4 Refer to the case study in FIGURE 3.4, based on urbanisation in South Africa.

3.4.1 Define the term *urbanisation*. (1 x 1) (1)

3.4.2 What proportion of South Africans lived in urban areas in 2011? (1 x 1) (1)

3.4.3 Give TWO possible reasons for the high growth rate in urbanisation in South Africa as mentioned in the case study. (2 x 2) (4)

3.4.4 What is the term used to describe the decreasing number of people left in rural areas? (1 x 2) (2)

3.4.5 Briefly discuss the negative aspects of urbanisation for cities in South Africa. (3 x 2) (6)

3.5 Refer to FIGURE 3.5 showing the contribution of economic activities to the GDP.

3.5.1 Which economic activity contributed the highest percentage to the GDP? (1 x 1) (1)

3.5.2 What was the percentage contribution of the activity mentioned in QUESTION 3.5.1 to the GDP? (1 x 1) (1)

3.5.3 Discuss any TWO natural factors that limit agricultural development in South Africa. (2 x 2) (4)

3.5.4 Discuss the importance of agriculture for economic development in South Africa. (2 x 2) (4)

3.5.5 Incorrect farming methods have a negative impact on food security in South Africa. Explain this statement. (2 x 2) (4)

3.6 Read the extract on the Maputo Development Corridor in FIGURE 3.6 and answer the questions that follow.

3.6.1 What does the abbreviation *SDI* stand for? (1 x 1) (1)

3.6.2 Name ONE development project associated with the Maputo Development Corridor. (1 x 1) (1)

3.6.3 How does the Maputo Development Corridor contribute to the economy of South Africa? (1 x 2) (2)

3.6.4 The establishment of the Maputo Development Corridor will address the problem of industrial centralisation in Gauteng. Explain this statement. (2 x 2) (4)

3.6.5 Outline the economic advantages for communities living along the Maputo Development Corridor. (4 x 2) (8)
[75]

QUESTION 4

4.1 Refer to the settlement hierarchy in FIGURE 4.1 that shows the classification of different types of settlements. Choose the correct answer from those given in brackets in the statements below. Write only the answer next to the question number (4.1.1–4.1.8) in the ANSWER BOOK.

4.1.1 The isolated farmhouse is (a single/multiple) building(s).

4.1.2 The number of settlements (increases/decreases) as you move up the settlement hierarchy from the isolated farmstead to the conurbation.

4.1.3 The size of the population (increases/decreases) as you move down the settlement hierarchy from a conurbation to an isolated farmstead.

4.1.4 A large city can also be called a (megalopolis/metropolis).

4.1.5 The settlement hierarchy in FIGURE 4.1 is a South African example of a settlement hierarchy as the (largest/smallest) of all settlements is not included.

4.1.6 The only example of a conurbation in South Africa is found in the (PWV/Durban-Pinetown) Industrial Region.

4.1.7 The relationship between the size of the population and the number of settlements is (directly/indirectly) proportional.

4.1.8 The (hamlet/small town) is an example of a rural settlement. (8 x 1) (8)

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4.2 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (4.2.1–4.2.7) in the ANSWER BOOK.

4.2.1 Which ONE of the following economic activities is associated with the tertiary sector?

A Mining
B Forestry
C Retail
D Agriculture

4.2.2 Industries that are service-orientated are known as … industries.

A market-orientated
B raw materials orientated
C footloose
D bridge

4.2.3 The clustering of economic activities that are similar and rely on each other is referred to as …

A agglomeration.
B centralisation.
C decentralisation.
D nationalisation.

4.2.4 Designated areas that do not have traditional trade barriers are called …

A industrial development zones.
B free-trade zones.
C spatial development initiatives.
D special economic zones.

4.2.5 The sector of the economy that is not regulated and registered for taxes is the ... sector.

A formal
B tertiary
C informal
D primary

4.2.6 Intensive farming for local and export markets is called … farming.

A small-scale
B commercial
C subsistence
D livestock

4.2.7 The provision of electricity is a … activity.

A primary
B secondary
C tertiary
D quaternary (7 x 1) (7)

4.3 Refer to FIGURE 4.3 which shows an informal settlement.

4.3.1 Informal settlements are known by different names throughout the world. Give an example of ONE such a name. (1 x 1) (1)

4.3.2 State the trend in the development of informal settlements. (1 x 1) (1)

4.3.3 Give ONE reason for the trend mentioned in QUESTION 4.3.2. (1 x 2) (2)

4.3.4 Excluding the trend stated in QUESTION 4.3.2, discuss any TWO problems associated with informal settlements. (2 x 2) (4)

4.3.5 Most of the municipalities in South Africa have not had much success in stopping the development of informal settlements. Advise the municipalities on how this problem can be solved sustainably. (4 x 2) (8)

4.4 Read the article on a social justice issue in FIGURE 4.4.

4.4.1 Explain what is meant by the term *social justice*. (1 x 1) (1)

4.4.2 Name the social justice issue that the story captures. (1 x 1) (1)

4.4.3 Why is the word 'new' emphasised in the article? (1 x 2) (2)

4.4.4 Name the law that secures the rights of people who live under insecure conditions on land owned by others. (1 x 2) (2)

4.4.5 Excluding the social justice issue mentioned in QUESTION 4.4.2, discuss TWO other social justice issues experienced in rural areas. (2 x 2) (4)

4.4.6 Discuss any TWO problems that the government experiences with land reform. (2 x 2) (4)

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4.5 Refer to FIGURE 4.5 on informal trade.

4.5.1 When is trade considered to be informal? (1 x 1) (1)

4.5.2 Give ONE point of evidence from FIGURE 4.5 that it represents informal trade. (1 x 1) (1)

4.5.3 State TWO negative conditions that informal traders have to cope with on a daily basis. (2 x 2) (4)

4.5.4 With reference to FIGURE 4.5, describe how local authorities can improve the working space of informal traders. (2 x 2) (4)

4.5.5 Name ONE negative implication of the informal sector for the South African economy. (1 x 2) (2)

4.5.6 Despite the negative implication named in QUESTION 4.5.5, the South African government and local authorities tolerate the presence of informal traders. Explain why this is the case. (2 x 2) (4)

4.6 Refer to FIGURE 4.6, a map showing the Gauteng (PWV) Industrial Region.

4.6.1 Refer to insert **A** and select the letter (**B**, **C**, **D** or **G**) that represents the Gauteng (PWV) Industrial Region. (1 x 1) (1)

4.6.2 Name the main primary activity that stimulated the growth of Gauteng (PWV) as the major industrial region in South Africa. (1 x 1) (1)

4.6.3 Discuss THREE problems that developed as a result of an over-concentration of industries in the Gauteng (PWV) Industrial Region. (2 x 2) (4)

4.6.4 Despite the problems associated with industrial development in the Gauteng (PWV) Industrial Region, industrial development in this region is important for economic development in South Africa as a whole. Discuss this statement. (4 x 2) (8)
[75]

TOTAL: 225

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GRADE 12

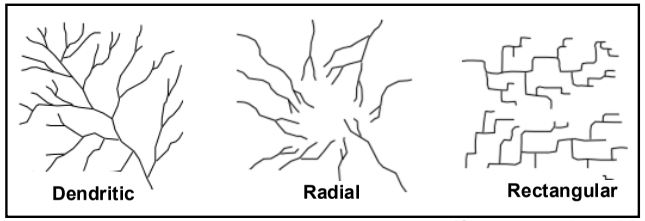
GEOGRAPHY P1

EXEMPLAR 2014

ANNEXURE

This annexure consists of 12 pages.

FIGURE 1.2: DRAINAGE PATTERNS

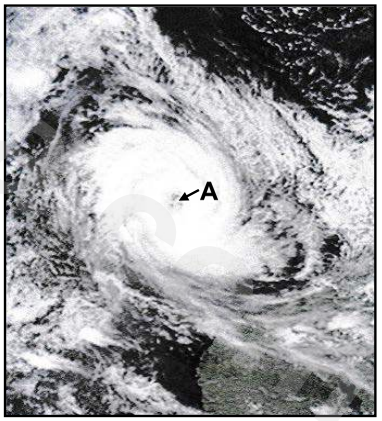


[Source: www.tulane.edu]

FIGURE 1.3: TROPICAL CYCLONE

TROPICAL CYCLONE HARUNA

Tropical cyclone Haruna developed in the Mozambique Channel on 18 February 2013. It reached a peak wind speed of 150 km per hour. It weakened significantly when it reached land, where a previous system had already flooded the land. When Haruna arrived, 7 402 houses were destroyed, rice and maize crops were damaged, 26 people were killed, 127 injured and there was an outbreak of diseases after the tropical cyclone dissipated. It dissipated on 24 February 2013.



[Source: South African Weather Service]

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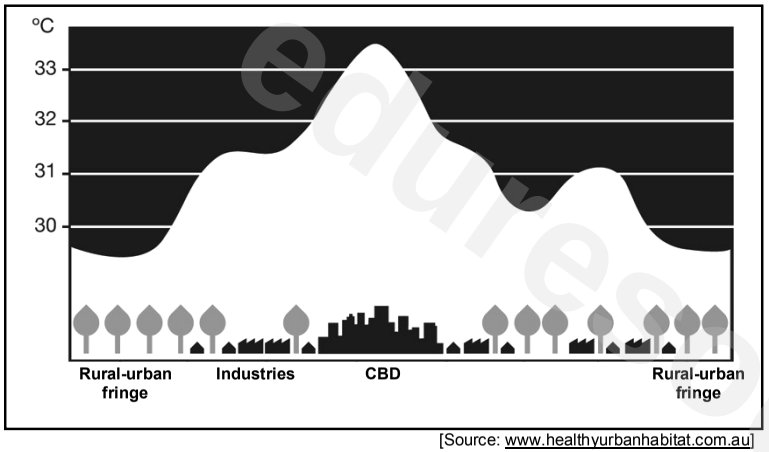
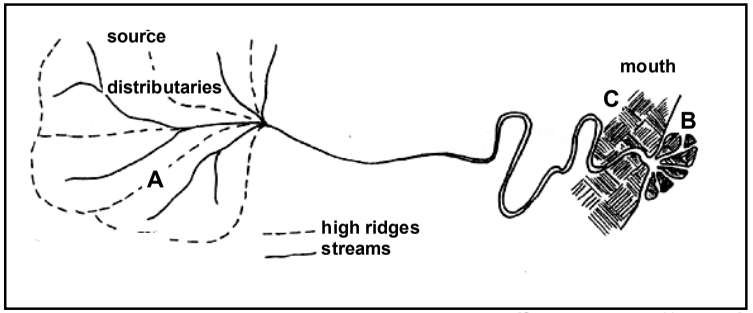
FIGURE 1.4: URBAN MICROCLIMATE



[Source: www.healthyurbanhabitat.com.au]

FIGURE 1.5: RIVER SYSTEM



[Source: www.stevekluge.com]

FIGURE 1.6: RIVER MANAGEMENT

UMGENI RIVER 'ONE OF DIRTIEST' IN SA

7 June 2013
By Tony Carnie

Durban – The Umgeni River is one of the dirtiest rivers in the country, with recent studies showing proof of cholera, shigella, salmonella and other harmful viruses and bacteria at every sampling point between the Inanda Dam and Blue Lagoon in Durban.

The release of the study comes after the city's health unit has raised the alarm over a suspected outbreak of diarrhoea in Durban after two children died and more than 150 people were hospitalised in the past three months.

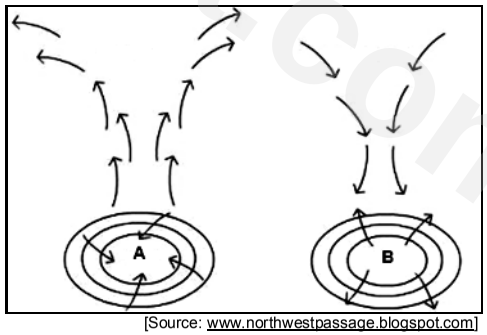
Though they do not pinpoint the exact pollution sources, the researchers suggest that the most likely sources of the viruses and bacteria in the Umgeni are inadequate municipal sewage treatment and run-off from informal houses close to the river.

'No wastewater treatment is provided and raw sewage enters the rivers and streams directly. Because of a lack of infrastructure in some settlements, the residents are often forced to inhabit river banks … People living in these areas often utilise the contaminated surface water for crop irrigation, recreation and domestic and personal use such as for washing, drinking water and cooking without prior treatment.'

The 230 km Umgeni River had been chosen for the study because it is the primary source of water for more than 3,5 million people in an area which generates almost 65 per cent of the provincial gross domestic product.

[Source: *Mercury*]

FIGURE 2.1: PRESSURE CELLS



[Source: www.northwestpassage.blogspot.com]

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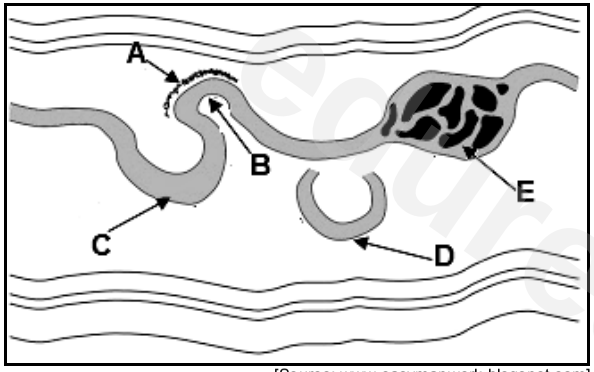
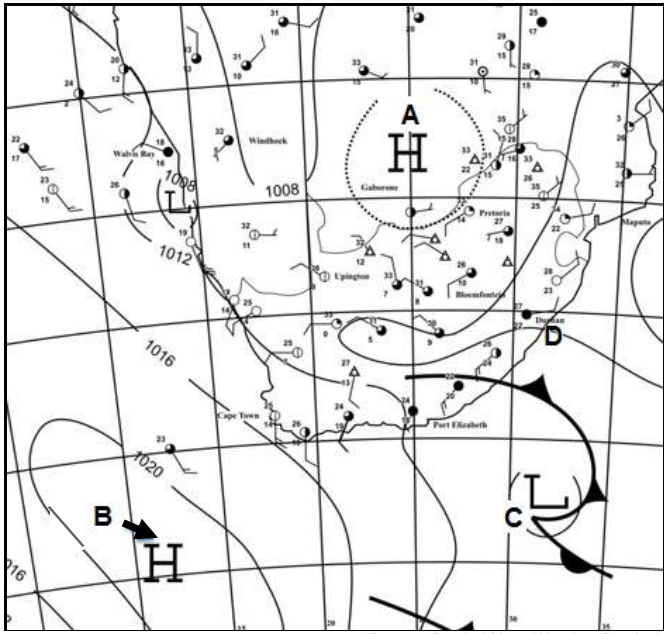
FIGURE 2.2: FLUVIAL LANDFORMS



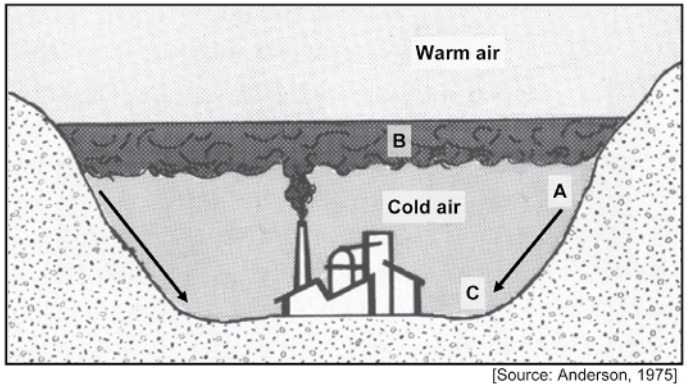
[Source: www.easymapwork.blogspot.com]

FIGURE 2.3: SYNOPTIC WEATHER MAP



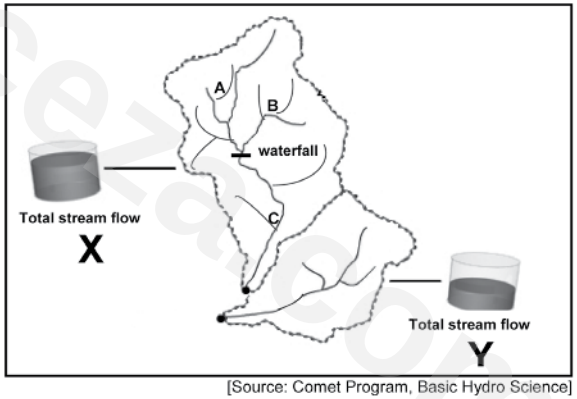
[Source: South African Weather Service]

FIGURE 2.4: VALLEY CLIMATES



[Source: Anderson, 1975]

FIGURE 2.5: DRAINAGE BASINS



[Source: Comet Program, Basic Hydro Science]

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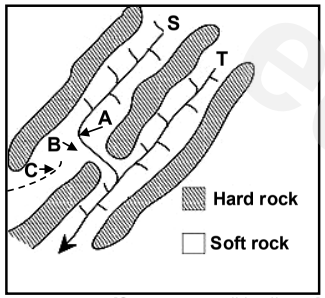
FIGURE 2.6: RIVER CAPTURE



[Source: www.wikipedia.org]

FIGURE 3.1: RURAL SETTLEMENTS

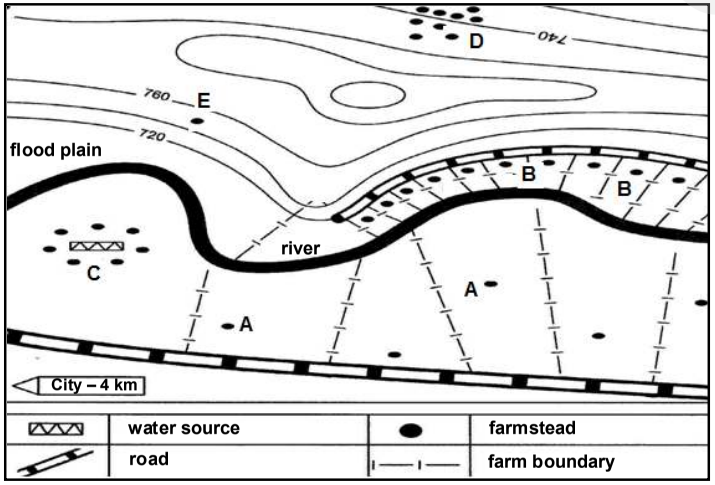
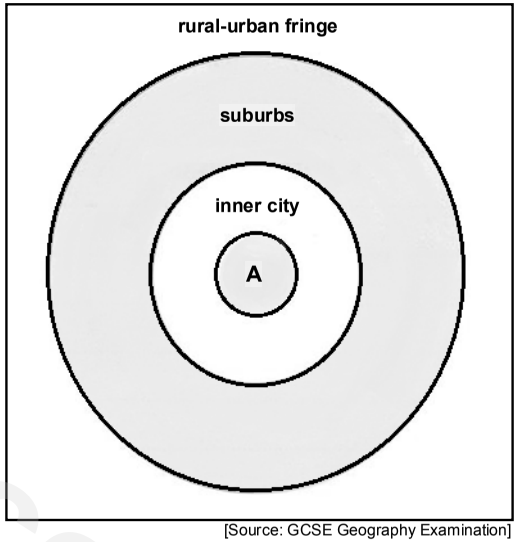


FIGURE 3.3: URBAN LAND-USE ZONES



[Source: GCSE Geography Examination]

FIGURE 3.4: URBANISATION

SOUTH AFRICA GOES WITH THE URBANISATION FLOW

Two-thirds of people in South Africa now live in urban areas as a result of growing urbanisation over the last few decades. The proportion of people living in urban areas increased from 52% in 1990 to 62% in 2011. The share of those living in rural areas dropped from 48% to 38% over the same period.

South Africa's long-term urbanisation trend is partly the result of freer movement of people after apartheid. Higher economic growth in urban areas has also drawn people to cities in search of employment, including immigrants from outside the country.

[Source: www.sairr.org.za/media/media-releases/Urbanisation%2520-%252022_Jan_2013.pdf]

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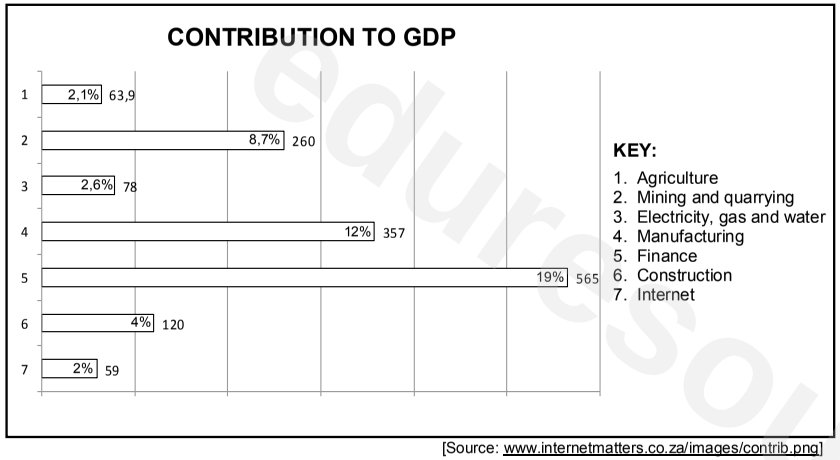
FIGURE 3.5: CONTRIBUTION OF ECONOMIC ACTIVITIES TO THE GDP



[Source: www.internetmatters.co.za/images/contrib.png]

FIGURE 3.6: THE MAPUTO DEVELOPMENT CORRIDOR

THE MAPUTO DEVELOPMENT CORRIDOR SDI

The Maputo Development Corridor runs from Witbank in Mpumalanga, through Nelspruit, to the capital of Mozambique, Maputo. The transport route offers the shortest link from Gauteng, the industrial heart of South Africa, to an export harbour. One hundred and thirty investment opportunities have been identified for infrastructure provision and for agriculture, mining, energy, chemicals and manufacturing.

The main infrastructure projects are the N4 Maputo Corridor toll road, costing R1,5 billion, the upgrading of the railway line from Ressano Garcia to Maputo, the upgrading of the Maputo port (including the dredging of the harbour to make it deeper) and the upgrading of telecommunication.

FIGURE 4.1: SETTLEMENT HIERARCHY

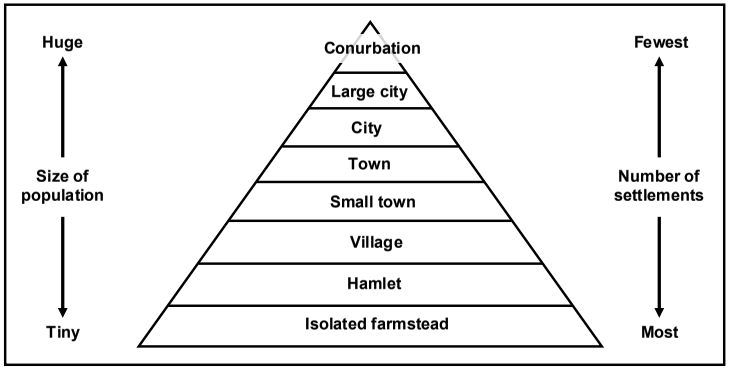
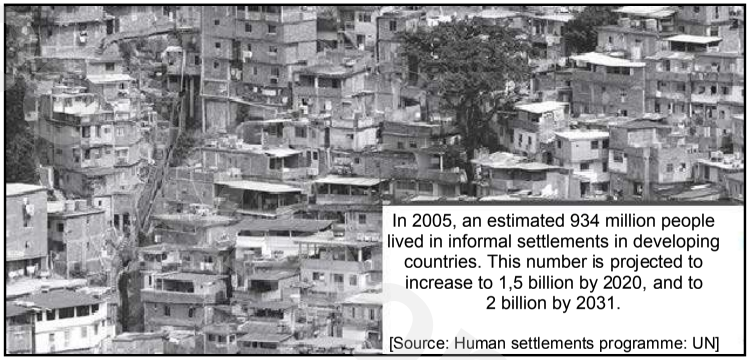


FIGURE 4.3: INFORMAL SETTLEMENTS



In 2005, an estimated 934 million people lived in informal settlements in developing countries. This number is projected to increase to 1,5 billion by 2020, and to 2 billion by 2031.

[Source: Human settlements programme: UN]

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FIGURE 4.4: SOCIAL JUSTICE ISSUES IN RURAL AREAS

TELLING THE STORY ABOUT SOUTH AFRICA'S RURAL POOR

by Gara LaMarche

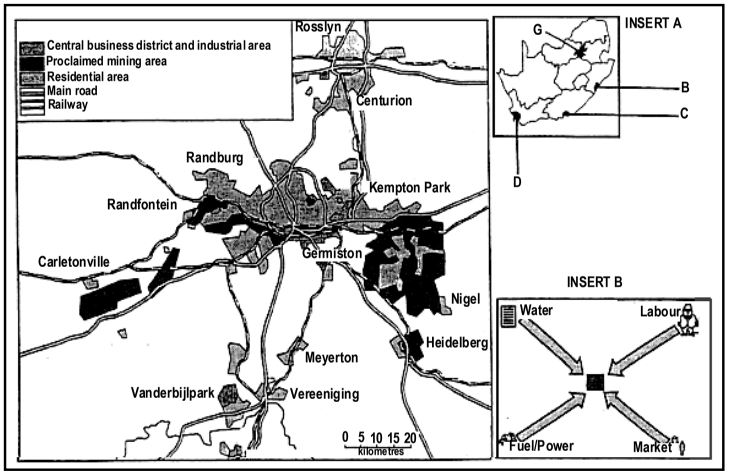
This is a story about the Skhosanas, interviewed by Social Surveys Africa:

Until 2001, they survived relatively well on the farm. They had a tap for water; they had firewood. Then the farm was sold to a new owner who wanted the Skhosanas off the land. For two years, they fought eviction. After all, this was the 'new' South Africa, and, for the first time, they had rights. But the farm owner shut down their water tap and ordered them to stop gathering wood on his land. Finally, the owner came early one morning when the children were still asleep, broke down the door, and threw the family's furniture and belongings onto the road. The children were afraid they would have nowhere to sleep. Mr Skhosana was ill and could not work anymore. Mrs Skhosana says she will never forget the experience of 'being thrown out like rubbish'.

FIGURE 4.5: INFORMAL TRADE

Informal means something relaxed, casual, flexible and without rules and regulations. If we talk about an informal economy, then we refer to an economy which does not have rules and regulations. A business in the informal economy, for example, doesn't pay tax. It does not follow the laws which control bigger, formal businesses.

FIGURE 4.6: THE GAUTENG (PWV) INDUSTRIAL REGION



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GRADE 12

GEOGRAPHY P1

EXEMPLAR 2014

MEMORANDUM

MARKS: 225

This memorandum consists of 13 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	24 °C (1)		
	1.1.2	East North-East (1)		
	1.1.3	10 knots (1)		
	1.1.4	Overcast skies (1)		
	1.1.5	Rain (1)		
	1.1.6	21° C (1)		
	1.1.7	High (1)	(7 x 1)	(7)
1.2	1.2.1	Dendritic (1)		
	1.2.2	Rectangular (1)		
	1.2.3	Rectangular (1)		
	1.2.4	Dendritic (1)		
	1.2.5	Radial (1)		
	1.2.6	Dendritic (1)		
	1.2.7	Radial (1)		
	1.2.8	Rectangular (1)	(8 x 1)	(8)
1.3	1.3.1	The eye (of the storm) (1)	(1 x 1)	(1)
	1.3.2	Clockwise (1)	(1 x 1)	(1)
	1.3.3	7 days (18 to 24 February 2013) (1)	(1 x 1)	(1)
	1.3.4	Eight (2)	(1 x 2)	(2)
	1.3.5	Increased friction from moving over land caused it to lose momentum (2) Cut off from water which is its source of energy (2) Condensation and the release of latent heat is reduced (2) [Any ONE]	(1 x 2)	(2)
	1.3.6	Mozambique is a poorer (less developed) country and has fewer resources to effectively deal with a tropical cyclone (2) Their early warning systems are not as effective as in developed countries (2) Lack of media coverage to warn people, e.g. TV, radio and the Internet (2) Many people are not aware of dangers associated with a tropical cyclone (2) Mozambique's disaster management policies and techniques are not as sophisticated as those of developed countries (2) Mozambicans often build their houses from less weather resistant materials (2) Collapsing of poorly built houses cause more damage and loss of lives (2) Many people don't know what to do when a tropical cyclone hits (2) Many do not evacuate or leave their villages and homes in time (2)		

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People are too poor to stock up on necessities for an emergency (2)
Lack of emergency evacuation services (2)
Poorly developed infrastructure makes it difficult for emergency services to reach people (2)
Poorly equipped health services cannot provide medication to prevent outbreak of diseases (2)
[Any FOUR. Accept other reasonable answers] (4 x 2) (8)

1.4 1.4.1 Highest – CBD (1)
Lowest – Rural-urban fringe (1) (2 x 1) (2)

1.4.2 An urban area with higher temperatures surrounded by lower temperatures of the rural areas (1)
[Concept] (1 x 1) (1)

1.4.3 As a result of convection, the urban heat island extends vertically during day time dispersing pollution particles to the upper troposphere (2)
At night time, the cooler atmosphere subside pushing pollution particles downward, resulting in a concentration closer to the Earth's surface (2)
The heat island during the day has a greater vertical dimension while the pollution dome at night is compressed over the city (2)
The heat island is well-developed during the day and the pollution dome is well developed at night time (2)
[CONCEPT – Any ONE] (1 x 2) (2)

1.4.4 Pollution domes are caused when a temperature inversion forms, which traps air pollutants (dust and soot) over the urban area (2)
(1 x 2) (2)

1.4.5 More artificial surfaces (like glass and dark paving) absorb more heat (2)
Buildings increase surface area which can absorb heat (2)
High density of buildings traps heat in city (2)
Fewer plants to assist with cooling processes (evapotranspiration) in city (2)
The presence of industries emitting greenhouse gases will contribute to higher temperatures in the cities (2)
[Any TWO. Accept other reasons visible in diagram] (2 x 2) (4)

1.4.6 Plant more trees and have more vegetated areas/green belts (2)
Rooftop gardens (2)
Develop water bodies (like fountains/ponds) in urban areas to decrease the air temperatures through higher levels of evaporation and transpiration (2)
Use light building material to reflect more heat rather than absorb heat (2)
Control number of vehicles entering the city (2)

Restrict industrial activities to daytime when less pollutants/heat will be trapped (2)
Build chimneys/stacks that release pollutants above inversion layer (2)
Filters in chimneys to trap pollutants (2)
Decentralisation of industries (2)
[Any TWO. Accept other sustainable measures] (2 x 2) (4)

1.5 1.5.1 An interfluve (1) (1 x 1) (1)

1.5.2 Separates water between two streams in the same drainage basin (2) (1 x 2) (2)

1.5.3 High rainfall leads to a higher stream discharge/Low rainfall leads to a lower stream discharge (2)
Saturated soil leads to a higher stream discharge/Unsaturated soil leads to a lower stream discharge (2)
Low permeability leads to a higher stream discharge/High permeability leads to a lower stream discharge (2)
Sparse vegetation leads to a higher stream discharge/Dense vegetation leads to a lower stream discharge (2)
Steep slope leads to a higher stream discharge/Gradual slope leads to a lower stream discharge (2)
[Any TWO] (2 x 2) (4)

1.5.4 River flows over level ground close to coastline (2)
River loses energy and slows down (2)
Heavier material of the bed load is dumped, causing sediments to build up on the sea floor (2)
Main stream splits into small distributaries as it flows through deposited material (2)
[Any TWO] (2 x 2) (4)

1.5.5 The soils are rich in nutrients/fertile (2)
A water source is close by/river provides water (2)
Land is flat/gentle gradient (2)
[Any TWO] (2 x 2) (4)

1.6 1.6.1 Inadequate municipal sewage treatment (1) (1 x 1) (1)

1.6.2 Studies show the presence of harmful viruses in river (2) (1 x 2) (2)

1.6.3 An outbreak of diarrhoea in Durban (2)
Two children died (2)
People are hospitalised (2)
It could cause an outbreak in cholera (2)
People cannot go to work (2)
Loss of income (2)
People cannot afford high cost of health care (2)
[Any TWO] (2 x 2) (4)

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1.6.4 Stricter control and enforcement of legislation which monitors effluents from factories (2)
More hefty fines to punish polluters (2)
Improved waste treatment facilities (2)
Have a buffer so that people cannot live close to rivers (2)
Provide running water in or close to homes (2)
Regular testing of water quality (2)
Increased awareness of and education on the problems which people cause by living so close to rivers (2)
[Any FOUR. Accept other reasonable solutions] (4 x 2) (8)
[75]

QUESTION 2

2.1	2.1.1	B (1)		
	2.1.2	A (1)		
	2.1.3	B (1)		
	2.1.4	B (1)		
	2.1.5	B (1)		
	2.1.6	A (1)		
	2.1.7	A (1)		
	2.1.8	A (1)	(8 x 1)	(8)
2.2	2.2.1	Cutback/Undercut bluff (1)		
	2.2.2	Deposition (1)		
	2.2.3	Meander (1)		
	2.2.4	Meander scar (1)		
	2.2.5	Braided stream (1)		
	2.2.6	Deposition (1)		
	2.2.7	Lower course (1)	(7 x 1)	(7)
2.3	2.3.1	**A** Kalahari/Continental High-pressure Cell (1) **B** South Atlantic/St Helena High-pressure Cell (1) **C** Mid-latitude cyclone (1)	(3 x 1)	(3)
	2.3.2	Consists of cold descending air that forms an inversion layer lower than the Escarpment (2) Prevents moist air from moving into the interior from the ocean (2) Stable weather conditions, therefore no cloud formation (2) [Any TWO]	(2 x 2)	(4)
	2.3.3	Isobars elongate away from the high-pressure cell (2)	(1 x 2)	(2)
	2.3.4	Damage to property which has to be repaired (2) Higher food prices because crops are damaged/destroyed (2) Damage to infrastructure makes it difficult to transport farm produce (2) Food has to be imported at a higher rate (2) Water pipes and electricity poles have to be replaced (2)		(8)

Impact on subsistence farmers is greater and they may not be able to recover (2)
Snow associated with the cold front causes the death of livestock (2)
Poor weather conditions increase accident risk (2)
Costly to provide emergency food/water/shelter supplies (2)
[Any FOUR. Accept any other reasonable answers] (4 x 2)

2.4	2.4.1	Katabatic/downslope/mountain wind (1)	(1 x 1)	(1)
	2.4.2	Upper slopes cool down rapidly (2) Air cools down rapidly and becomes heavy and dense (2) Air moves down the slope (2) [Any TWO. Accept any other reasonable answer]	(2 x 2)	(4)
	2.4.3	Polluted air trapped below the inversion (2) Causes respiratory diseases such as asthma (2) Poisonous gases that pollute the air cause skin irritations (2) Eye irritation which affects the comfort of people (2) [Any TWO. Accept any other reasonable answer]	(2 x 2)	(4)
	2.4.4	Night temperatures are very low and falls below freezing point (2) Frost develops (frost pocket) and not all crops are frost resistant (2)	(2 x 2)	(4)
2.5	2.5.1	The total area drained by a river and its tributaries (1) [CONCEPT]	(1 x 1)	(1)
	2.5.2	Total length of all the streams in relation to the size of the drainage basin it drains (1) [CONCEPT]	(1 x 1)	(1)
	2.5.3	**X** (2)	(1 x 2)	(2)
	2.5.4	Many streams to cover the greater part of the drainage basin (2) [CONCEPT]	(1 x 2)	(2)
	2.5.5	An increase in precipitation will increase the number of streams (2) Saturated soil increases run-off, forming more streams (2) Low permeability results in run-off and the development of streams (2) Sparse vegetation increases run-off and more streams form (2) Steep gradients increase run-off and more streams develop (2) [Any TWO]	(2 x 2)	(4)
	2.5.6	Drainage density will increase (2) More artificial surfaces and storm water drainage increase run-off outside urban developments (2) More small streams develop (2) [Any TWO]	(2 x 2)	(4)

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2.6	2.6.1	**T** (1)	(1 x 1)	(1)
	2.6.2	**A** elbow of capture (1) **B** dry gap/wind gap/river gravels (1) **C** misfit stream (1)	(3 x 1)	(3)
	2.6.3	Stream flows down steeper gradient (2) Higher precipitation promoting greater run-off and more erosive power (2) Soft bedrock through which it is flowing (2) The presence of faults and joints (2) [Any TWO]	(2 x 2)	(4)
	2.6.4	Increased volume of water in the captor stream (2) Downward erosion increases (2) Increase in stream load changes ecosystem of river (2) Volume of water decreases in the misfit stream (2) The carrying capacity of the misfit stream is reduced, affecting plant and animal life (2) Ecosystems are disrupted and change (2) Sustainability of captor stream is maintained (2) Sustainability of misfit stream is reduced (2) [Any FOUR. Accept other reasonable answers]	(4 x 2)	(8)
				[75]

SECTION B

QUESTION 3

3.1	3.1.1	C (1)		
	3.1.2	A/E (1)		
	3.1.3	B (1)		
	3.1.4	C (1)		
	3.1.5	E (1)		
	3.1.6	A (1)		
	3.1.7	B (1)	(7 x 1)	(7)
3.2	3.2.1	H (1)		
	3.2.2	E (1)		
	3.2.3	I (1)		
	3.2.4	A (1)		
	3.2.5	F (1)		
	3.2.6	C (1)		
	3.2.7	D (1)		
	3.2.8	G (1)	(8 x 1)	(8)
3.1	3.3.1	Burgess/Concentric Zone Model (1)	(1 x 1)	(1)
	3.3.2	CBD (1)	(1 x 1)	(1)
	3.3.3	Land-use zone A is the most accessible part of the city (2) Functional prestige attracts services (2) Functional convenience attracts services (2) Large sphere of influence of land-use zone A (2) [Any TWO. Accept other reasonable answers]	(2 x 2)	(4)
	3.3.4	Located on the outskirts of the city/urban area (2)	(1 x 2)	(2)
	3.3.5	This is the zone into which the CBD will expand (2) This land-use zone is therefore in demand (2) Competition to purchase the land is high (2) This zone is where urban renewal projects will take place (2) New owners will demolish the buildings (2) No need for current owners to renovate/fix buildings (2) [Any FOUR. Accept other reasonable answers]	(4 x 2)	(8)
3.4	3.4.1	The process whereby the percentage of people living in an urban area increases (1) [CONCEPT]	(1 x 1)	(1)
	3.4.2	62% (1)	(1 x 1)	(1)

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	3.4.3	In post-apartheid South Africa people are allowed to move freely in all urban areas (2) Higher economic growth in urban areas creates opportunities for employment (2) Immigrants from outside the country (2) [Any TWO]	(2 x 2)	(4)
	3.4.4	Rural depopulation (2)	(1 x 2)	(2)
	3.4.5	Higher rates of urban growth means pressure on existing services (2) Higher rates of land pollution due to increase in waste disposal (2) Increase in the number of informal settlements and population growth in informal settlements (2) More unemployed people are forced to become economically active in the informal economic sector (2) Crime rates increase (2) Infrastructure e.g. roads can no longer cope with demands (2) Increasing pollution (air, water, noise) Litter increases (2) [Any THREE. Accept other reasonable answers]	(3 x 2)	(6)
3.5	3.5.1	Finance (1)	(1 x 1)	(1)
	3.5.2	19% (1)	(1 x 1)	(1)
	3.5.3	**Climate:** Most of South Africa is drought prone and rainfall is unreliable (2) **Soil:** There is limited arable land available for agriculture (2) Due to climatic conditions there is a higher rate of soil erosion (2) **Climate change:** As weather conditions become hotter and drier there is a higher rate of crop loss (2) **Climate hazards:** Hailstorms can destroy crops (2) Lightning sets crops/grazing fields alight (2) Floods cause destruction of plants and animals (2 **Diseases:** Foot and mouth disease causes the loss of livestock (2) Avian flu has impacted on the poultry industry (2) [Any TWO. Accept other natural/physical causes]	(2 x 2)	(4)
	3.5.4	An important source of employment in the primary economic sector (2) Promotes development of secondary activities (2) Food exports provide foreign capital (2) Promotes development of towns/markets (2) Promotes development of infrastructure (2) [Any TWO. Accept other reasonable answers]	(2 x 2)	(4)

	3.5.5	Incorrect farming results in soil erosion (2) Soil becomes infertile (2) Loss of water due to incorrect farming methods (2) Irrigation decreases (2) Yields decrease (2) Not enough food to feed growing population (2) [Any TWO. Accept other reasonable answers]	(2 x 2)	(4)
3.6	3.6.1	Spatial Development Initiative (1)	(1 x 1)	(1)
	3.6.2	N4 toll road (1) Upgrading of railway line from Ressano Garcia to Maputo (1) Upgrading of Maputo port (1) Upgrading of telecommunication (1) [Any ONE]	(1 x 1)	(1)
	3.6.3	Good transport network to transport raw material and/or finished goods (1) Well-developed harbours to export goods (1) Good transport network to transport workers to their places of work (2) Generate employment opportunities (2) Promotes international trade (2) Promotes domestic trade (2) Well-developed harbours to export and/or import goods (2) [Any ONE]	(1 x 2)	(2)
	3.6.4	Industrial development promoted along the SDI (2) Industries move out of PWV/Gauteng to peripheral areas along the corridor (2) Establishment of more industries in PWV/Gauteng slowed down (2) [Any TWO]	(2 x 2)	(4)
	3.6.5	Establishment of industrial growth nodes along the corridor (2) Employment opportunities created (2) Improved infrastructure attracts tourists (2) Income provided by selling arts and crafts (2) Improve standards of living (2) Improved accessibility to services (2) Greater accessibility to employment opportunities (2) [Any FOUR points or TWO explained in detail. Accept any other reasonable answers]	(4 x 2)	(8) **[75]**

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QUESTION 4

4.1	4.1.1	single (1)		
	4.1.2	decreases (1)		
	4.1.3	decreases (1)		
	4.1.4	metropolis (1)		
	4.1.5	largest (1)		
	4.1.6	PWV (1)		
	4.1.7	indirectly (1)		
	4.1.8	hamlet (1)	(8 x 1)	(8)
4.2	4.2.1	C (1)		
	4.2.2	C (1)		
	4.2.3	A (1)		
	4.2.4	B (1)		
	4.2.5	C (1)		
	4.2.6	B (1)		
	4.2.7	C (1)	(7 x 1)	(7)
4.3	4.3.1	Squatter camps/Bustees/Favelas (1) [Any ONE. Accept other alternate names]	(1 x 1)	(1)
	4.3.2	Increasing trend (1)	(1 x 1)	(1)
	4.3.3	People migrate from rural areas to urban areas in search of employment (2) Not enough housing and people build shacks to live in (2) [Any ONE]	(1 x 2)	(2)
	4.3.4	Poor infrastructure/examples (2) Poor service delivery/examples (2) Inadequate housing (2) Lack of medical/educational services (2) Overcrowding (2) Lack of open spaces (2) High crime rate (2) High levels of pollution (2) Social problems (2) [Any TWO. Accept other]	(2 x 2)	(4)
	4.3.5	More low-cost housing needs to be built to accommodate people without homes (2) Improve facilities and services in rural areas to stem the movement of people to urban areas (2) To provide more job opportunities in outlying areas (2) To have stricter laws concerning the occupation of vacant land (2) To relocate existing people living in informal settlements (2) To subsidise people to build proper homes (2) Use of the site and service scheme where people are given plots of land and encouraged to use their own skills to build homes (2) [Any FOUR. Accept other reasonable answers]	(4 x 2)	(8)

4.4	4.4.1	Ensuring that people are treated fairly and that all their socials needs are provided for (1) [CONCEPT]	(1 x 1)	(1)
	4.4.2	Being denied access to a home (1)	(1 x 1)	(1)
	4.4.3	It shows that although we are living in a democratic country some things have not changed (2)	(1 x 2)	(2)
	4.4.4	Land tenure reform (2)	(1 x 2)	(2)
	4.4.5	No access to piped water (2) No electricity (2) No access to basic services such as clinics, schools, proper infrastructure (2) Insufficient job opportunities, underpaid (2) [Any TWO. Accept other reasonable answers]	(2 x 2)	(4)
	4.4.6	The willing buyer/seller principle takes time to settle (2) It takes time to mediate disputes and resolve issues (2) Huge costs are involved (2) Political interference (2) Distrust in government's reasoning (2) Eviction of farm workers despite the new land tenure laws (2) Lack of support from government (2) Disagreement between government and traditional leaders about the extent of land to be restored (2) People having no interest in farming or agricultural knowledge and therefore not utilising the redistributed land (2) [Any TWO. Accept other reasonable answers]	(2 x 2)	(4)
4.5	4.5.1	When there is no formal structure governing the trade, e.g. no taxes are paid, traders are not registered etc. (1) Trade that is relaxed, casual, flexible, without rules or regulations (1) [CONCEPT]	(1 x 1)	(1)
	4.5.2	No formal structure from which the business is operated/selling goods on the pavement (1)	(1 x 1)	(1)
	4.5.3	No shelter (2) No storage facilities (2) No ablution facilities/toilets (2) Exposed to weather elements (2) Unhygienic working conditions (2) Abuse by local authorities/police [Any TWO. Accept other reasonable answers]	(2 x 2)	(4)
	4.5.4	Provide shelter (2) Provide storage facilities (2) Provide toilets (2) Provide water (2) [Any TWO. Must give answer from sketch]	(2 x 2)	(4)

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	4.5.5	No taxes paid (2) No income for country (2) GDP cannot be correctly determined (2) Costly to provide proper facilities for informal traders (2) [Any ONE. Accept other reasonable answers]	(1 x 2)	(2)
	4.5.6	The informal sector has absorbed a lot of unemployed people (2) People learn entrepreneurial skills that are transferable to the formal business sector (2) The informal sector boosts the local fruit and vegetable markets as they stock from these centres, e.g. Johannesburg and Tshwane Fresh Produce Markets (2) The poor people involved in this sector use it as a means of survival rather than resorting to criminal activities (2) [Any TWO. Accept other reasonable answers]	(2 x 2)	(4)
4.6	4.6.1	**G** (1)	(1 x 1)	(1)
	4.6.2	Mining (1)	(1 x 1)	(1)
	4.6.3	Higher rate of influx of population due to employment opportunities (2) Contaminated ground water has led to AMD (acid mine drainage) (2) More air/noise pollution (2) The limited provision of water results in lower production rates (2) Pressure on resources such as coal for energy (2) Development of informal settlements (2) Increase in crime and other social problems (2) Strain on ageing infrastructure (2) Gauteng becomes strategically vulnerable (2) [Any TWO. Accept other reasonable answers]	(2 x 2)	(4)
	4.6.4	Provide employment (2) Finished products exported (2) Provides government with income (2) Improves South Africa's balance of trade (2) Attracts foreign investments (2) Build trade relationships (2) Taxes paid by industries provide income to government (2) Development of infrastructure which improves export ability (2) Development of urban settlements/markets (2) The upgrading of OR Tambo International Airport in this industrial hub has made the airport to be a gateway to Africa and the rest of the world, thereby facilitating economic growth (2) [Any FOUR. Accept other reasonable answers]	(4 x 2)	(8) **[75]**
			TOTAL:	**225**

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GRADE 12

GEOGRAPHY P2

EXEMPLAR 2014

MARKS: 75

TIME: 1½ hours

NAME:

GRADE/CLASS:

MARK SCORED	Q1	Q2	Q3	Q4	TOTAL
MARKER					
SENIOR MARKER					
CHIEF MARKER					
MODERATOR					
TOTAL	15	20	25	15	75

This question paper consists of 12 pages and 1 page for rough work and calculations.

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RESOURCE MATERIAL

1. An extract from topographical map 3424BB HUMANSDORP
2. Orthophoto map 3424BB 1 HUMANSDORP
3. **NOTE:** The resource material must be collected by schools for their own use.

INSTRUCTIONS AND INFORMATION

1. Write your name and class/grade in the spaces on the cover page.
2. Answer ALL the questions in the spaces provided in this question paper.
3. You are supplied with a 1 : 50 000 topographical map 3424BB of HUMANSDORP and an orthophoto map of a part of the mapped area.
4. You must hand the topographical map and the orthophoto map to the invigilator at the end of this examination session.
5. You must use the blank page at the back of this question paper for all rough work and calculations. Do NOT detach this page from the question paper.
6. Show ALL calculations and formulae, where applicable. Marks will be allocated for these.
7. You may use a non-programmable calculator.
8. The following English terms and their Afrikaans translations are shown on the topographical map:

ENGLISH	AFRIKAANS
Brick works	Steenmakery
Caravan park	Karavaanpark
Diggings	Uitgrawings
Golf course	Gholfbaan
River	Rivier
River mouth	Riviermond
Sewage works	Rioolwerke
Wetland	Vlei

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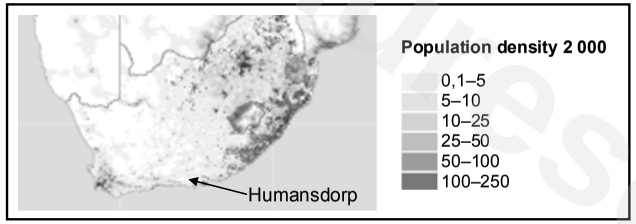
GENERAL INFORMATION ON HUMANSDORP

Humansdorp is a small town in the Eastern Cape with a population of around 35 000. This town is the centre of the Cacadu municipal district's industry and farming. It is also considered the gateway to the coastal town of Jeffreys Bay, which is 16 kilometres away. Humansdorp is a 50-minute drive away from Port Elizabeth. It is eco-friendly and maintains its small-town charm with various hiking trails and forest walks.

FIGURE 1



QUESTION 1: MULTIPLE-CHOICE QUESTIONS

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) in the block next to the question.

1.1 The scale of the topographical map is … than the scale of the orthophoto map.

A 10 times larger
B 5 times larger
C 5 times smaller
D 10 times smaller

1.2 The town of Jeffreys Bay is a/an …

A recreational town.
B industrial town.
C educational town.
D gap town.

1.3 The shape of the town of Humansdorp is …

A circular.
B linear.
C T-shaped.
D Y-shaped.

1.4 Wavecrest in block **B11** has a/an ... street pattern.

A grid
B planned irregular
C radial
D unplanned irregular

1.5 The major primary activity visible in the mapped area is …

A fishing.
B mining.
C forestry.
D crop farming.

1.6 The general flow direction of the river in block **D8** on the topographical map is ...

A southerly.
B northerly.
C easterly.
D north-westerly.

1.7 Primary activities are limited at **X** owing to ...

A a lack of transport.
B non-perennial streams.
C marshes.
D distance from markets.

1.8 The feature found at **P** in block **B11** is a …

A sand island.
B sandy beach.
C bay.
D coastal rock.

1.9 The province that Humansdorp is located in is (the) …

A Western Cape.
B Eastern Cape.
C KwaZulu-Natal.
D North West.

1.10 The feature labelled **1** on the orthophoto map is …

A diggings.
B a dry pan.
C perennial water.
D sewage works.

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1.11 The slope formed between **5** and **6** on the orthophoto map is a/an … slope.

A concave
B terraced
C convex
D even

1.12 The natural feature marked **5–6** on the orthophoto map is a …

A saddle.
B hill.
C ridge.
D valley.

1.13 The index number of the map sheet northeast of Humansdorp is …

A 3424BB.
B 3324DC.
C 3424DD.
D 3325CC.

1.14 The grid reference/coordinates/position of trigonometrical station 140 in block **B3** is …

A 34°01'20"S 24°47'44"E/34°01,3S 24°47,7E.
B 34°02'40"S 24°48'16"E/34°02,7S 24°48,3E.
C 34°01'20"E 24°47'44"S/34°01,3E 24°47,7S.
D 34°02'40"E 24°48'16"S/34°02,7E 24°48,3S.

1.15 The city/town located 68 km from the mapped area is …

A Clarkson.
B Port Elizabeth.
C Hankey.
D Plettenberg Bay.

(15 x 1) **[15]**

QUESTION 2: MAP CALCULATIONS AND TECHNIQUES

2.1 Calculate the straight-line distance, in kilometres, between trigonometrical station 294 in block **F1** and trigonometrical station 94 in block **E1**. Show ALL calculations.

(3 x 1) (3)

2.2 Determine the present magnetic bearing of trigonometrical station 290 in block **F8** from trigonometrical station 292 in block **D9**.

Formula: Present magnetic bearing = **true bearing** + **present magnetic declination**

(6 x 1) (6)

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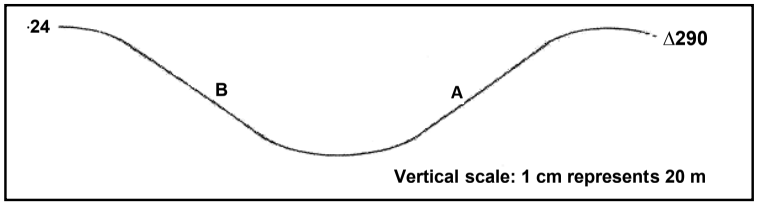
2.3 Calculate the average gradient between trigonometrical station 290 in block **F8** and trigonometrical station 292 in block **D9**. Show ALL calculations.

Formula: **Gradient** $= \dfrac{\textbf{vertical interval}}{\textbf{horisontal equivalent}}$

_____ (6 x 1) (6)

2.4 Refer to the cross-section from spot height 24 in block **F7** to trigonometrical station number 290 in block **F8** below and answer the questions that follow.



2.4.1 If you stand at **A**, will you be able to see a person at **B**?

_____ (1 x 1) (1)

2.4.2 Give ONE reason for your answer to QUESTION 2.4.1.

_____ (1 x 1) (1)

2.4.3 Calculate the vertical exaggeration of the cross-section. Show ALL calculations.

Formula: **Vertical exaggeration** $= \dfrac{\textbf{vertical scale}}{\textbf{horisontal scale}}$

_____ (3 x 1) (3)
[20]

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QUESTION 3: APPLICATION AND INTERPRETATION

3.1 Refer to points **3** and **4** on the orthophoto map.

3.1.1 Name the landform that is found between points **3** and **4** on the orthophoto map.

_____ (1 x 1) (1)

3.1.2 Name the type of wind that will occur at this landform during the night.

_____ (1 x 2) (2)

3.1.3 Draw a simple, labelled free-hand cross-section to show the wind identified in QUESTION 3.1.2.

(1 x 2) (2)

3.2 In which stage of development is Krom River in block **I5**? Give a reason for your answer.

Stage: _____

Reason: _____

_____ (1 + 2) (3)

3.3 Give a possible explanation why so many marshes developed in the mapped area.

_____

_____

_____ (1 x 2) (2)

3.4 Study the table below showing the average annual midday temperatures for areas **5** and **11** on the orthophoto map and answer the question that follows.

Area **11**	Area **5**
24,5 °C	19 °C

Area **11** has a higher average temperature than area **5**. Give ONE possible reason for this difference in temperature.

_____

_____ (1 x 2) (2)

3.5 Find residential area **12** on the orthophoto map. Also refer to the topographical map. Is residential area **12** a high- or low-income residential area? Give a reason for your answer.

Income area: _____

Reason: _____

_____ (1 + 2) (3)

3.6 State whether zone **10** on the orthophoto map is a light or heavy industrial area. Give a reason for your answer.

Type of industrial area: _____

Reason: _____

_____ (1 + 2) (3)

3.7 Jeffreys Bay has a roughly linear shape. Explain why this is the case.

_____

_____

_____

_____ (2 x 2) (4)

3.8 Refer to FIGURE 1 on page 3. Is FIGURE 1 a political or thematic map? Give a reason for your answer.

Type of map: _____

Reason: _____

_____ (1 + 2) (3)

[25]

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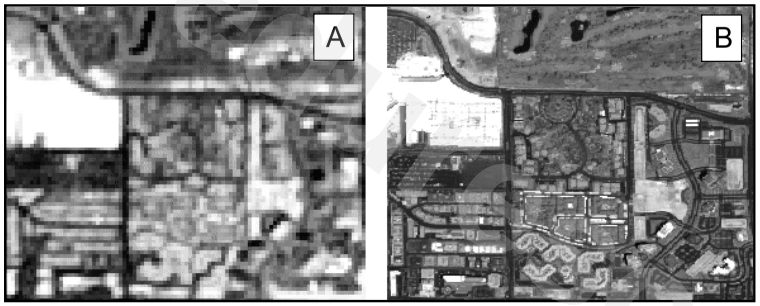
QUESTION 4: GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

4.1 Refer to the images below illustrating spatial resolution and answer the questions that follow.



4.1.1 Define the term *spatial resolution*.

_____

_____

_____ (1 x 1) (1)

4.1.2 Which image, **A** or **B**, has a better spatial resolution? Give a reason for your answer.

Image: _____

Reason: _____

_____ (1 + 2) (3)

4.2 Buffering plays an important role in flood prevention at Kleinriviermond (Klein River mouth) in block **I6**.

4.2.1 Define the term *buffering*.

_____

_____

_____ (1 x 1) (1)

4.2.2 You want to build a holiday resort near Kromriviermond (Krom River mouth), but you are concerned about the Krom River flooding. Explain how you could use buffering to assist you with this problem.

_____

_____

_____ (1 x 2) (2)

4.3 Refer to block **E7** on the topographical map.

4.3.1 Identify the following in block **E7**:

(a) A point feature: _____ (1 x 1) (1)

(b) A line feature: _____ (1 x 1) (1)

(c) An area/polygon feature: _____

_____ (1 x 1) (1)

4.4 You are asked to do a paper GIS to determine the accessibility of Humansdorp. Name the main data layer you would use in your investigation and give a reason for your answer.

Main layer: _____

Reason: _____

_____ (1 + 2) (3)

4.5 Explain why data manipulation is important in a GIS.

_____

_____

_____

_____ (1 x 2) (2)

[15]

TOTAL: 75

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ROUGH WORK AND CALCULATIONS

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GRADE 12

GEOGRAPHY P2

EXEMPLAR 2014

MEMORANDUM

MARKS: 75

This memorandum consists of 12 pages.

RESOURCE MATERIAL

1. An extract from topographical map 3424BB HUMANSDORP
2. Orthophoto map 3424BB 1 HUMANSDORP
3. **NOTE:** The resource material must be collected by schools for their own use.

INSTRUCTIONS AND INFORMATION

1. Write your name and class/grade in the spaces on the cover page.
2. Answer ALL the questions in the spaces provided in this question paper.
3. You are supplied with a 1 : 50 000 topographical map 3424BB of HUMANSDORP and an orthophoto map of a part of the mapped area.
4. You must hand the topographical map and the orthophoto map to the invigilator at the end of this examination session.
5. You must use the blank page at the back of this question paper for all rough work and calculations. Do NOT detach this page from the question paper.
6. Show ALL calculations and formulae, where applicable. Marks will be allocated for these.
7. You may use a non-programmable calculator.
8. The following English terms and their Afrikaans translations are shown on the topographical map:

ENGLISH	AFRIKAANS
Brick works	Steenmakery
Caravan park	Karavaanpark
Diggings	Uitgrawings
Golf course	Gholfbaan
River	Rivier
River mouth	Riviermond
Sewage works	Rioolwerke
Wetland	Vlei

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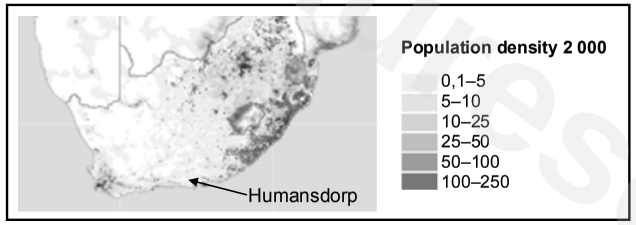
GENERAL INFORMATION ON HUMANSDORP

Humansdorp is a small town in the Eastern Cape with a population of around 35 000. This town is the centre of the Cacadu municipal district's industry and farming. It is also considered the gateway to the coastal town of Jeffreys Bay, which is 16 kilometres away. Humansdorp is a 50-minute drive away from Port Elizabeth. It is eco-friendly and maintains its small-town charm with various hiking trails and forest walks.

FIGURE 1



QUESTION 1: MULTIPLE-CHOICE QUESTIONS

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) in the block next to the question.

1.1 The scale of the topographical map is … than the scale of the orthophoto map.

A 10 times larger
B 5 times larger
C 5 times smaller
D 10 times smaller

C

1.2 The town of Jeffreys Bay is a/an …

A recreational town.
B industrial town.
C educational town.
D gap town.

A

1.3 The shape of the town of Humansdorp is …

A circular.
B linear.
C T-shaped.
D Y-shaped.

B

1.4 Wavecrest in block **B11** has a/an ... street pattern.

A grid
B planned irregular
C radial
D unplanned irregular

B

1.5 The major primary activity visible in the mapped area is …

A fishing.
B mining.
C forestry.
D crop farming.

D

1.6 The general flow direction of the river in block **D8** on the topographical map is ...

A southerly.
B northerly.
C easterly.
D north-westerly.

A

1.7 Primary activities are limited at **X** owing to ...

A a lack of transport.
B non-perennial streams.
C marshes.
D distance from markets.

C

1.8 The feature found at **P** in block **B11** is a …

A sand island.
B sandy beach.
C bay.
D coastal rock.

D

1.9 The province that Humansdorp is located in is (the) …

A Western Cape.
B Eastern Cape.
C KwaZulu-Natal.
D North West.

B

1.10 The feature labelled **1** on the orthophoto map is …

A diggings.
B a dry pan.
C perennial water.
D sewage works.

C

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1.11 The slope formed between **5** and **6** on the orthophoto map is a/an … slope.

A concave
B terraced
C convex
D even

A

1.12 The natural feature marked **5–6** on the orthophoto map is a …

A saddle.
B hill.
C ridge.
D valley.

C

1.13 The index number of the map sheet northeast of Humansdorp is …

A 3424BB.
B 3324DC.
C 3424DD.
D 3325CC.

D

1.14 The grid reference/coordinates/position of trigonometrical station 140 in block **B3** is …

A 34°01'20"S 24°47'44"E/34°01,3S 24°47,7E.
B 34°02'40"S 24°48'16"E/34°02,7S 24°48,3E.
C 34°01'20"E 24°47'44"S/34°01,3E 24°47,7S.
D 34°02'40"E 24°48'16"S/34°02,7E 24°48,3S.

A

1.15 The city/town located 68 km from the mapped area is …

A Clarkson.
B Port Elizabeth.
C Hankey.
D Plettenberg Bay.

B

(15 x 1) **[15]**

QUESTION 2: MAP CALCULATIONS AND TECHNIQUES

2.1 Calculate the straight-line distance, in kilometres, between trigonometrical station 294 in block **F1** and trigonometrical station 94 in block **E1**. Show ALL calculations.

Actual Distance = Map Distance x Map Scale
= 4,8 cm ✓ x 0,5 km ✓
= 2,4 km ✓
Range [2,3 km to 2,5 km] (3 x 1) (3)

2.2 Determine the present magnetic bearing of trigonometrical station 290 in block **F8** from trigonometrical station 292 in block **D9**.

Formula: Present magnetic bearing = true bearing + present magnetic declination

True bearing = 203° (201° – 205°) ✓
Difference in years = 2014 – 2001
= 13 years ✓
Mean annual change = 9'W
Total change = 13 x 9'W
= 117'W
= 1°57'W ✓
Magnetic declination in 2014 = 25°29'W +1°57'W ✓
= 26°86'W
= 27°26'W ✓
Magnetic bearing = 203° + 27°26'
= 230°26' ✓
Range [228°26' to 232°26'] (6 x 1) (6)

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2.3 Calculate the average gradient between trigonometrical station 290 in block **F8** and trigonometrical station 292 in block **D9**. Show ALL calculations.

Formula: **Gradient** = $\frac{\textbf{vertical interval}}{\textbf{horisontal equivalent}}$

VI = 47,3 m – 26,5 m ✓
= 20,8 m ✓

HE = $\frac{5,9\text{ cm}}{100}$ ✓ x 500 m
= 2 950 m ✓

Gradient = $\frac{20,8}{2\,950}$ ✓
= $\frac{1}{141,8}$
= 1:141,8 ✓

OR

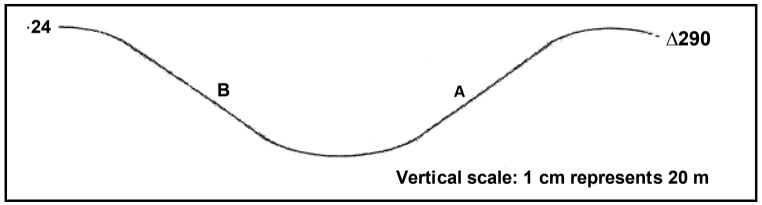
VI = 47,3 m – 26,5 m ✓
= 20,8 m ✓

HE = $\frac{5,9\text{ cm}}{100}$ ✓ x 10 000 cm
= 2 950 m ✓

Gradient = $\frac{20,8}{2\,950}$ ✓
= $\frac{1}{141,8}$
= 1:141,8 ✓

Range [1:139 to 1:144,2] (6 x 1) (6)

2.4 Refer to the cross-section from spot height 24 in block **F7** to trigonometrical station number 290 in block **F8** below and answer the questions that follow.



2.4.1 If you stand at **A**, will you be able to see a person at **B**?

Yes ✓ (1 x 1) (1)

2.4.2 Give ONE reason for your answer to QUESTION 2.4.1.

No obstructions/high lying areas between the two points. ✓
[Concept] (1 x 1) (1)

2.4.3 Calculate the vertical exaggeration of the cross-section. Show ALL calculations.

Formula: **Vertical exaggeration** = $\frac{\textbf{vertical scale}}{\textbf{horisontal scale}}$

Vertical Exaggeration = $\frac{\text{Vertical Scale}}{\text{Horizontal Scale}}$

= $\frac{1:2\,000}{1:50\,000}$ ✓

= $\frac{1}{2\,000}$ x $\frac{50\,000}{1}$ ✓

= $\frac{25}{1}$

= 25 times ✓ (3 x 1) (3)
[20]

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QUESTION 3: APPLICATION AND INTERPRETATION

3.1 Refer to points **3** and **4** on the orthophoto map.

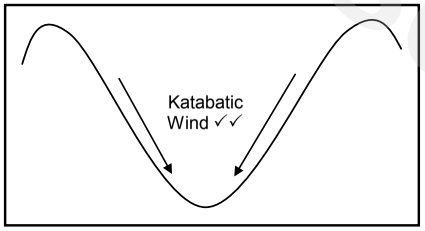
3.1.1 Name the landform that is found between points **3** and **4** on the orthophoto map.

(River) valley ✓ (1 x 1) (1)

3.1.2 Name the type of wind that will occur at this landform during the night.

Katabatic/downslope/mountain breeze ✓✓ (1 x 2) (2)

3.1.3 Draw a simple, labelled free-hand cross-section to show the wind identified in QUESTION 3.1.2.



(1 x 2) (2)

3.2 In which stage of development is Krom River in block **I5**? Give a reason for your answer.

Stage: *Plain stage/old age stage/lower course* ✓

Reason: *There are braided streams* ✓✓
Wide flood plain ✓✓
It is next to the ocean ✓✓
[Any ONE] (1 + 2) (3)

3.3 Give a possible explanation why so many marshes developed in the mapped area.

Area flat/gentle slope ✓✓
Water does not drain away easily ✓✓
Soil is saturated/waterlogged ✓✓
[Any ONE. Accept other suitable explanation] (1 x 2) (2)

3.4 Study the table below showing the average annual midday temperatures for areas **5** and **11** on the orthophoto map and answer the question that follows.

Area **11**	Area **5**
24,5 °C	19 °C

Area **11** has a higher average temperature than area **5**. Give ONE possible reason for this difference in temperature.

*Area **11** is an urban area and area **5** is a rural area* ✓✓
*Area **11** is made up of artificial surfaces (concrete, steel, tar) and area **5** of vegetation* ✓✓
*Natural processes e.g. evapotranspiration occurs at **5**, but are limited at **11*** ✓✓
*More pollution at **11** to trap heat than at **5*** ✓✓
*More artificial heating at **11** than at **5*** ✓✓
[Any ONE- Accept other answers related to urban heat islands] (1 x 2) (2)

3.5 Find residential zone **12** on the orthophoto map. Also refer to the topographical map. Is residential area **12** a high- or low-income residential area? Give a reason for your answer.

Income area: *Low-income residential area* ✓

Reason: *It has small plots* ✓✓
It has high density housing ✓✓
[Any ONE. Accept other suitable reasons] (1 + 2) (3)

3.6 State whether zone **10** on the orthophoto map is a light or heavy industrial area. Give a reason for your answer.

Type of industrial area: *Heavy industry* ✓

Reason: *It is found on the outskirts of town* ✓✓
Flat land ✓✓
Space for expansion ✓✓
[Any ONE. Accept other suitable reasons] (1 + 2) (3)

3.7 Jeffreys Bay has a roughly linear shape. Explain why this is the case.

Follows the shape of the coastline ✓✓
Suburbs develop as close as possible to the coastline ✓✓
Residents prefer a sea view ✓✓
Settlement wants to take advantage of the cooling effect of the sea breeze ✓✓
[Any TWO] (2 x 2) (4)

3.8 Refer to FIGURE 1 on page 3. Is FIGURE 1 a political or thematic map? Give a reason for your answer.

Type of map: *Thematic map* ✓

Reason: *Focuses on a specific theme and that is population density* ✓✓
[Concept] (1 + 2) (3)
[25]

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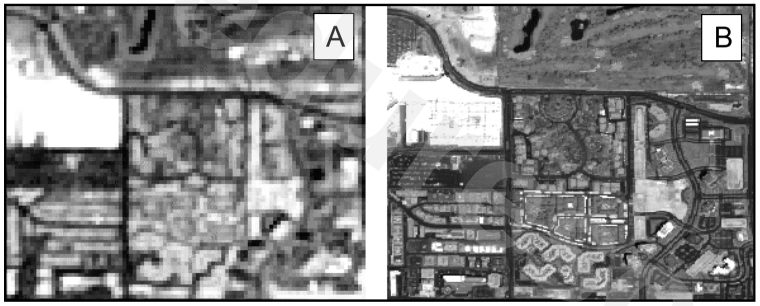
QUESTION 4: GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

4.1 Refer to the images below illustrating spatial resolution and answer the questions that follow.



4.1.1 Define the term *spatial resolution*.

It describes the amount of detail shown by a map or image ✓
[Concept] (1 x 1) (1)

4.1.2 Which image, **A** or **B**, has a better spatial resolution? Give a reason for your answer.

Image: ***B*** ✓

Reason: *It has smaller and more pixels* ✓✓
It has more detail ✓✓
[Any ONE reason] (1 + 2) (3)

4.2 Buffering plays an important role in flood prevention at Kleinriviermond (Klein River mouth) in block **I6**.

4.2.1 Define the term *buffering*.

A line used to demarcate an area around a spatial feature ✓
[Concept] (1 x 1) (1)

4.2.2 You want to build a holiday resort near Kromriviermond (Krom River mouth), but you are concerned about the Krom River flooding. Explain how you could use buffering to assist you with this problem.

One could use buffering to demarcate the area around the river where flooding could occur and build outside this area ✓✓ (1 x 2) (2)

4.3 Refer to block **E7** on the topographical map.

4.3.1 Identify the following in block **E7**:

(a) A point feature: *Reservoir* ✓
Windmill ✓
[Any ONE] (1 x 1) (1)

(b) A line feature: *Secondary road* ✓
Other road ✓
River/stream ✓
Dam wall ✓
Contour line ✓
[Any ONE] (1 x 1) (1)

(c) An area/polygon feature: *Dam* ✓
Perennial water ✓
Non-perennial water ✓
[Any ONE] (1 x 1) (1)

4.4 You are asked to do a paper GIS to determine the accessibility of Humansdorp. Name the main data layer you would use in your investigation and give a reason for your answer.

Main layer: *Transport/roads* ✓

Reason: *Accessibility determined by transport infrastructure as transport networks are needed to reach Humansdorp* ✓✓
[Concept] (1 + 2) (3)

4.5 Explain why data manipulation is important in a GIS.

Data manipulation involves getting the different data sources into a format that can be integrated ✓✓
When all the data layers are in similar data files the data can be integrated (put together) ✓✓
Statistical information must be manipulated into such a file format that it can be used in the GIS software and linked to specific spatial features ✓✓
Errors in the database can be eliminated during manipulation ✓✓
[Any ONE. Concept] (1 x 2) (2)

TOTAL: 75

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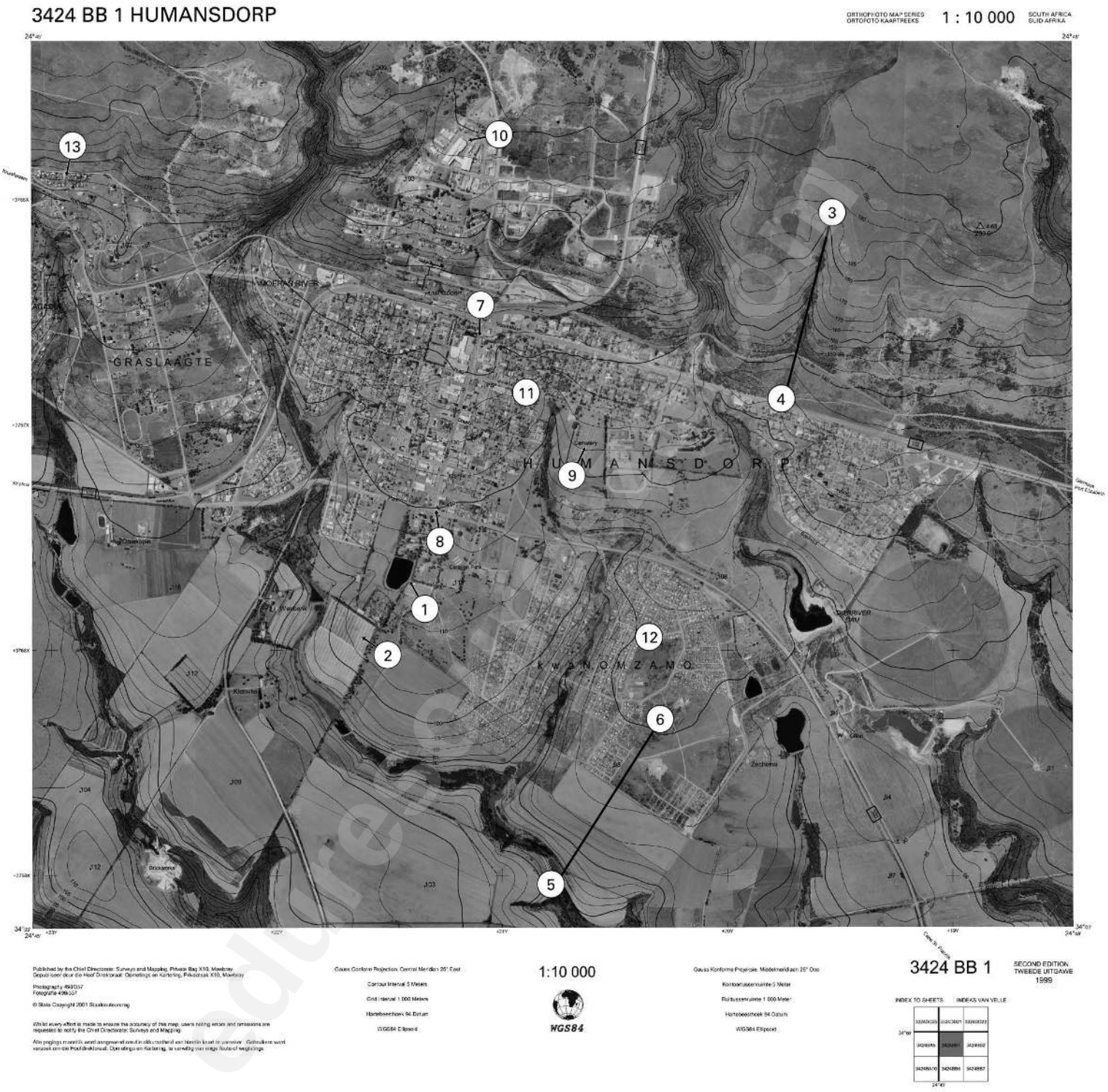

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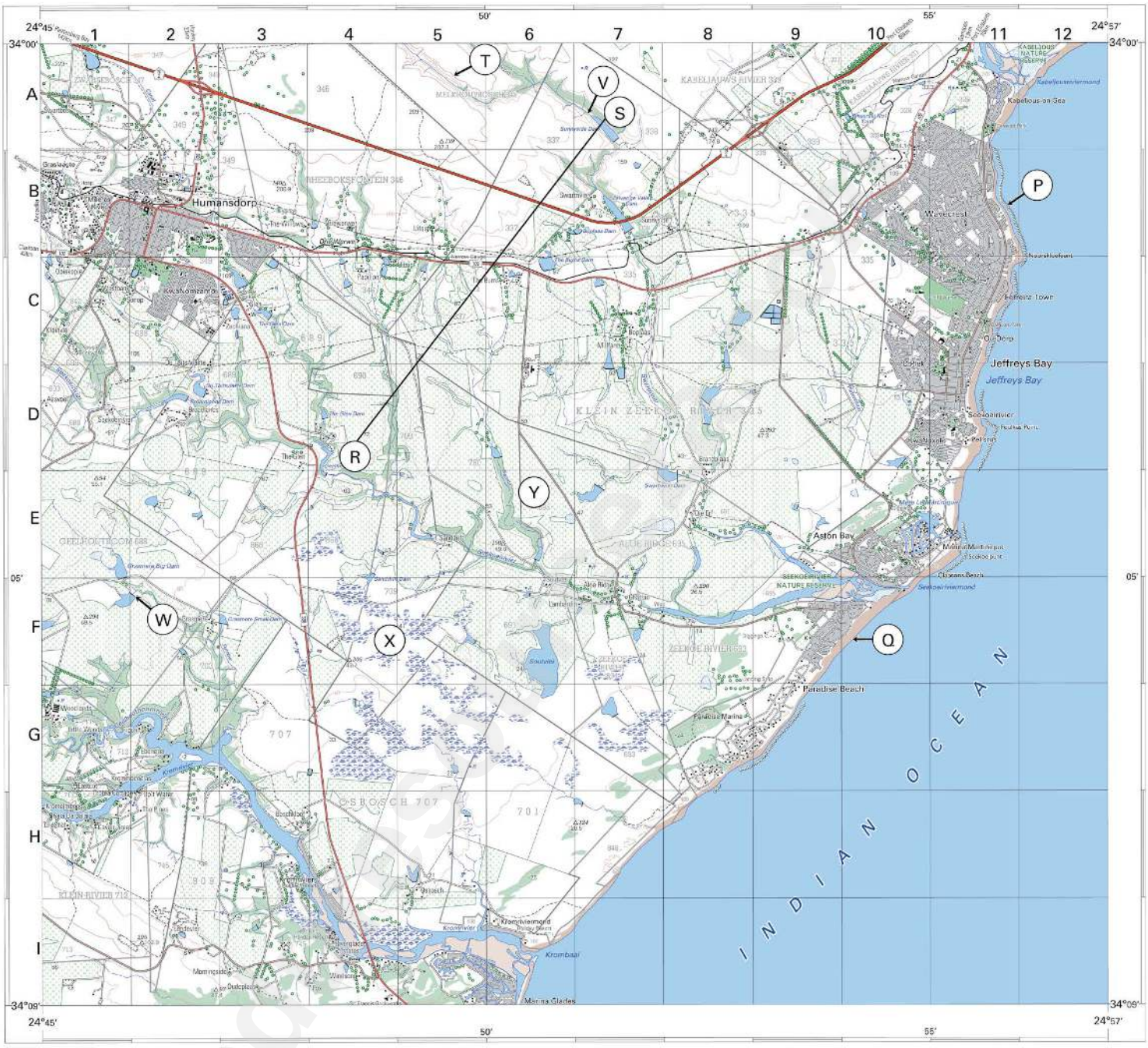
3424BB HUMANSDORP

1:50 000 SOUTH AFRICA SUID-AFRIKA



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Metres 1000 0 1 2 3 4 5 6 7 8 9 Kilometres

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Heights are in metres above mean sea level
Hoogtes is in meter bo gemiddelde aaspeil

CONTOUR INTERVAL 20 METRES KONTOURTUSSENRUIMTE 20 METER

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

REFERENCE VERKLARING

National Freeway; National Route	Nasionale Deurpad; Nasionale Roete
Arterial Route	Hoofverkeersroete
Main Road	Hoofpad
Secondary Road; Bench Mark	Sekondêre Pad; Hoogtemerk
Other Road; Bridge	Ander Pad; Brug
Track and Hiking Trail	Dowwe Pad en Vooltoiaanpad
Railway; Station or Siding	Spoorweg; Stasie of Sidwe
Other Railway; Tunnel	Ander Spoorweg; Tunnel
Embankment; Cutting	Opvulling; Deurgrawing
Power Line	Kraglyn
Built-up Area (High, Low Density)	Bebouste Gebied (Hoe, Lae Digtheid)
Buildings; Ruin	Gebouts; Mariasie
Post Office; Police Station; Store	Poskantoor; Polisiestasie; Winkel
Place of Worship; School; Hotel	Plek van Aanbidding; Skool; Hotel
Fence; Wall	Draadheining; Muur
Windpump; Monument	Windpomp; Monument
Communication Tower	Kommunikasietoring
Mine Dump; Excavation	Mynhoop; Uitgrawing
Trigonometrical Station; Marine Beacon	Peilbaken; Seevaartbaken
Lighthouse and Marine Light	Vuurtoring en Seevaartlig
Cemetery; Grave	Begraafplaas; Graf

Cadastral information supplied by the Surveyor-General
Original Forms

Mean magnetic declination 25°25' West of True North(July 2001).
Mean annual change 9' Westwards(1995–2000).
Supplied by Hermanus Magnetic Observatory.

Gemiddelde magnetiese deklinasie 25°25' Wes van Ware Noord(Julie 2001).
Gemiddelde jaarlikse verandering 9' Weswaarts(1995–2000).
Voorsien deur die Hermanus Magnetiese Observatorium.

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3324DC 3324DD 3325DD
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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)	Pyp-yn (bo die grond)
Water Tower; Reservoir; Water Point	Watertoring; Reservoir; Waterpunt
Coastal Rocks	Kaalyntoe
Prominent Rock Outcrop	Prominente Klipbank
Erosion; Sand	Erosie; Sand
Woodland	Bebouste Gebied
Cultivated Land	Bewerkte Land
Orchard or Vineyard	Boord of Wingerd
Recreation Ground	Ontspanningsterrein
Row of Trees	Rye Bome

Kadastrale inligting verstrek deur die Landmeter-generaal
Compromise Plan

3424BB HUMANSDORP THIRD EDITION DERDE UITGAWE 1999

While every effort is made to ensure the accuracy of this map, users noting errors and omissions are requested to notify the Chief Directorate: Surveys and Mapping.

WGS84

Alle pogings moontlik word aangewend om die akkuraatheid van hierdie kaart te verseker. Gebruikers word versoek om die Hoofdirektoraat: Opmetings en Kartering, te verwittig van enige foute of weglatings.

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