



education

Department:
Education
PROVINCE OF KWAZULU-NATAL

ILEMBE DISTRICT

MATHEMATICAL LITERACY

MAPS & PLANS

GRADE10 - 12

2020

MAPS AND PLANS

1. TERMINOLOGY/VOCABULARY

| | |
|--------------------------------|--|
| Bar scales: | Presented as a picture, it means that if you placed a ruler next to this scale, you could determine how many centimetres represent the specified kilometers. |
| Elevation map: | Information about the profile of a route as seen from the side. |
| Elevation plans: | Shows the design and dimensions of the outside of a building from a side view. |
| Floor plans: | Shows the design and dimensions of the inside of a building, from a top view. |
| Number scale: | A number scale such as 1 : 50 000 means that 1 unit on the map represent 50 000 units in real life. |
| Route map: | Shows a specific route, for instance for an event, as seen from above. |
| Scale: | Determines how many times smaller an object shown on a plan or map is that its actual size. |
| Scale drawing: | A diagram of a real-life object drawn in proportion. |
| Scaled elevation plans: | Show the design and dimensions of the outside of a building from aside view using a specific scale. |
| Street map: | A map of a small area such as a town or city. |
| Strip map: | A map of a section of a travelling route. |

TOPIC: MAPS, PLANS AND OTHER REPRESENTATIONS OF PHYSICAL WORLD

1.1. Application of Maps and Scales:

- A proposed travel route in relation to distance, estimated travelling times, etc. and suggest and justify possible alternative routes.
- Using maps in conjunction with other travel resources (e.g. exchange rate information; distance chart; bus timetable; etc.) and financial information (e.g. fare tables; petrol price; etc.) the cost of a trip.
- Decisions made during a journey based on considerations of fatigue, petrol consumption travelling time, etc.
- Determining the dimensions of a room in order to make decisions, for example, establish the amount of carpet needed for the floor of the room.

1.2. Scales

Types of Scales

| | |
|---------------------|--|
| Number scale | Ratio of unit representing the actual measurement of an object on the map. |
| Bar scale | Measured segment of a bar representing the actual measurement of an object on the map. |

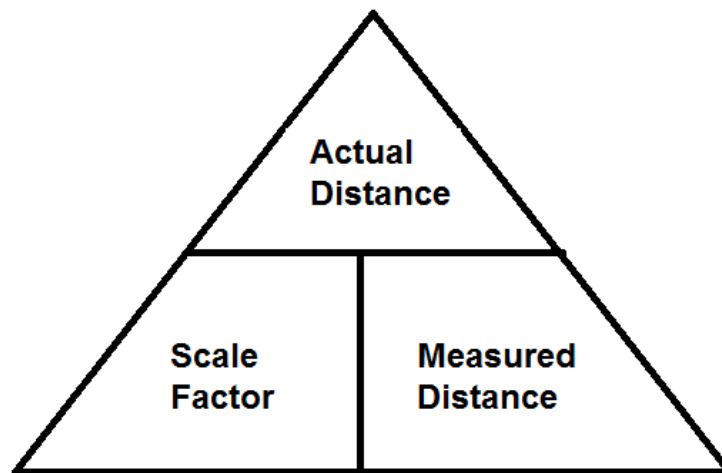
1.2.1. Number Scale

- It is expressed as a ratio like 1:500
- Which means 1 unit on the map: 500 units on the ground
- This means 1 unit on the map represents 500 units on the ground.
- E.g. 1cm measured on the map will represent 500cm on the ground.

Using a number scale:

- Multiply the given distance by the scale factor.
- If the distance was not given, use a ruler to measure the distance on the map
- Multiply the scale factor by the distance measured to get the real distance
- E.g. If you measured 500mm , to get the real distance multiply 500 by 100 and convert to the required units

The following triangle may be used to determine the unknown value.



Take Note:

- The horizontal line($_$) represents division
- The vertical line ($\left|$) represents multiplication.
- To calculate the Actual distance, multiply the measured distance by the scale factor.
- To calculate the measured distance, divide the actual distance by the scale factor.
- To calculate the scale factor, divide the actual distance by the measured distance.

Using a bar scale:

Method 1:

- Calculating the actual distance in km:
- Measure the bar in cm.
- Convert the units of the bar to cm.
- Write the value of the bar scale to distance on the scale in the simplest ratio form to get the scale factor.
- Measure the distance on the map with a ruler in cm
- Multiply the measured distance by the scale factor
- Convert the answer to km

Method 2

- Measure the size of one segment or the whole bar with a ruler in centimetres
- If you measured the whole bar, simplify the scale before doing any calculations.
- Measure the distance on the map in centimetres
- Calculate how many segments of the bar graph it works out to be ; i.e. divide the total distance measured and divide it by the length of one segment or simplified size of the bar
Multiply the distance by measurement indicated on one

Points to consider when working with maps

- Reading the key
- Identify labels/names of national and provincial roads.
- Identifying the names of towns on the route between two locations.
- Identify the scale of a map.
- Interpret a given set of directions and describe what location the directions lead to.

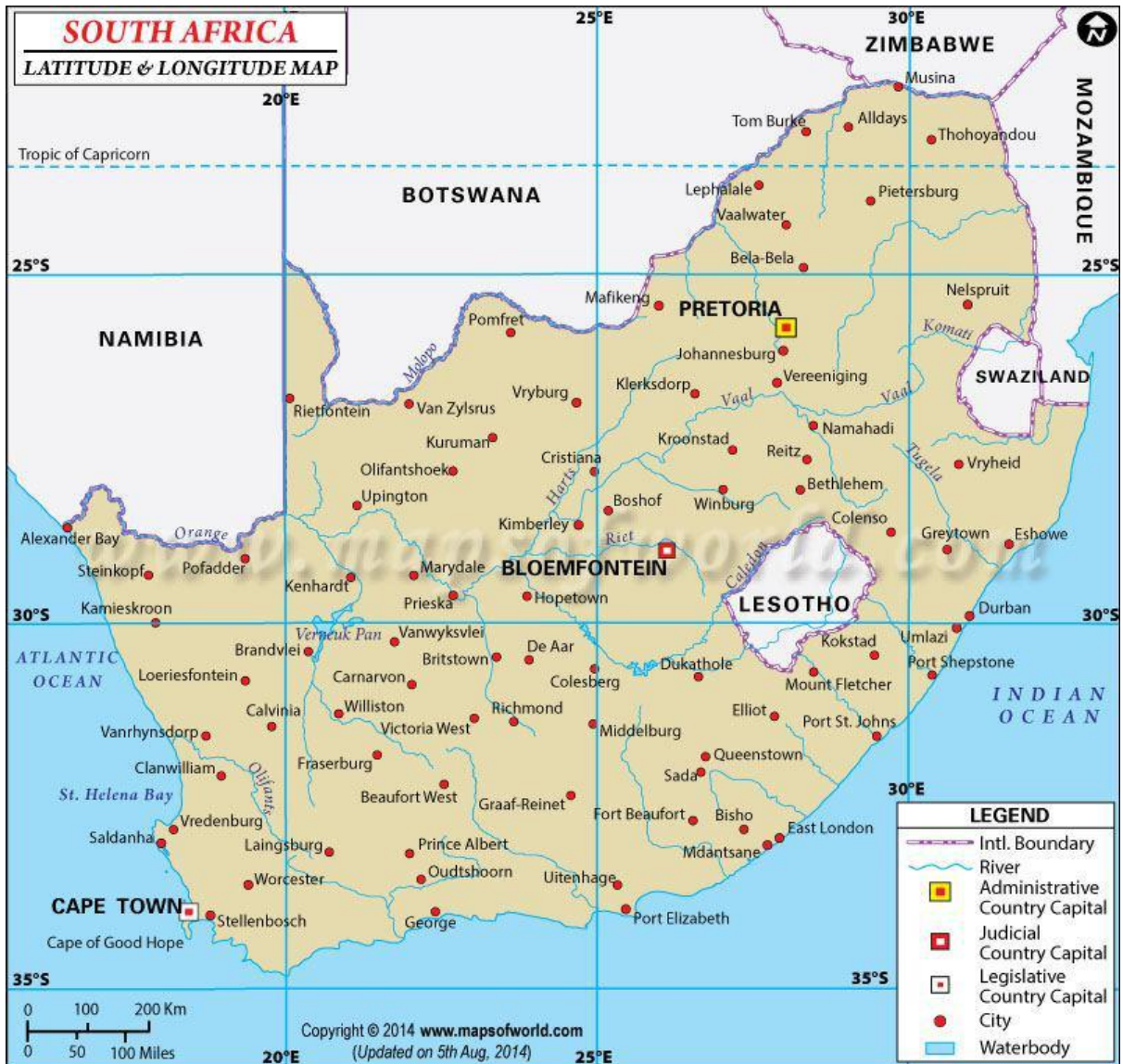
- Advantages and Disadvantages of each kind of scale

| Type | Advantages | Disadvantages |
|---|---|---|
| <ul style="list-style-type: none"> • Number Scales | <ul style="list-style-type: none"> • We only have to measure one distance. • More convenient to work with | <ul style="list-style-type: none"> • With digital printing number scales become inaccurate. |
| <ul style="list-style-type: none"> • Bar Scales | <ul style="list-style-type: none"> • Bar scales are quick and easy to use. • With digital printing bar scales will be resized with the map and therefore it will remain accurate. | <ul style="list-style-type: none"> • Measurements obtained using bar scales tend to be less accurate. • It requires more work than a number scale. You will have to determine the relationship of the length measured on the bar and actual distance before using the scale to calculate actual distance. |

EXAMPLES OF MAPS

. National Map

This kind of map usually shows the demarcation of provinces, the national roads and regional roads.



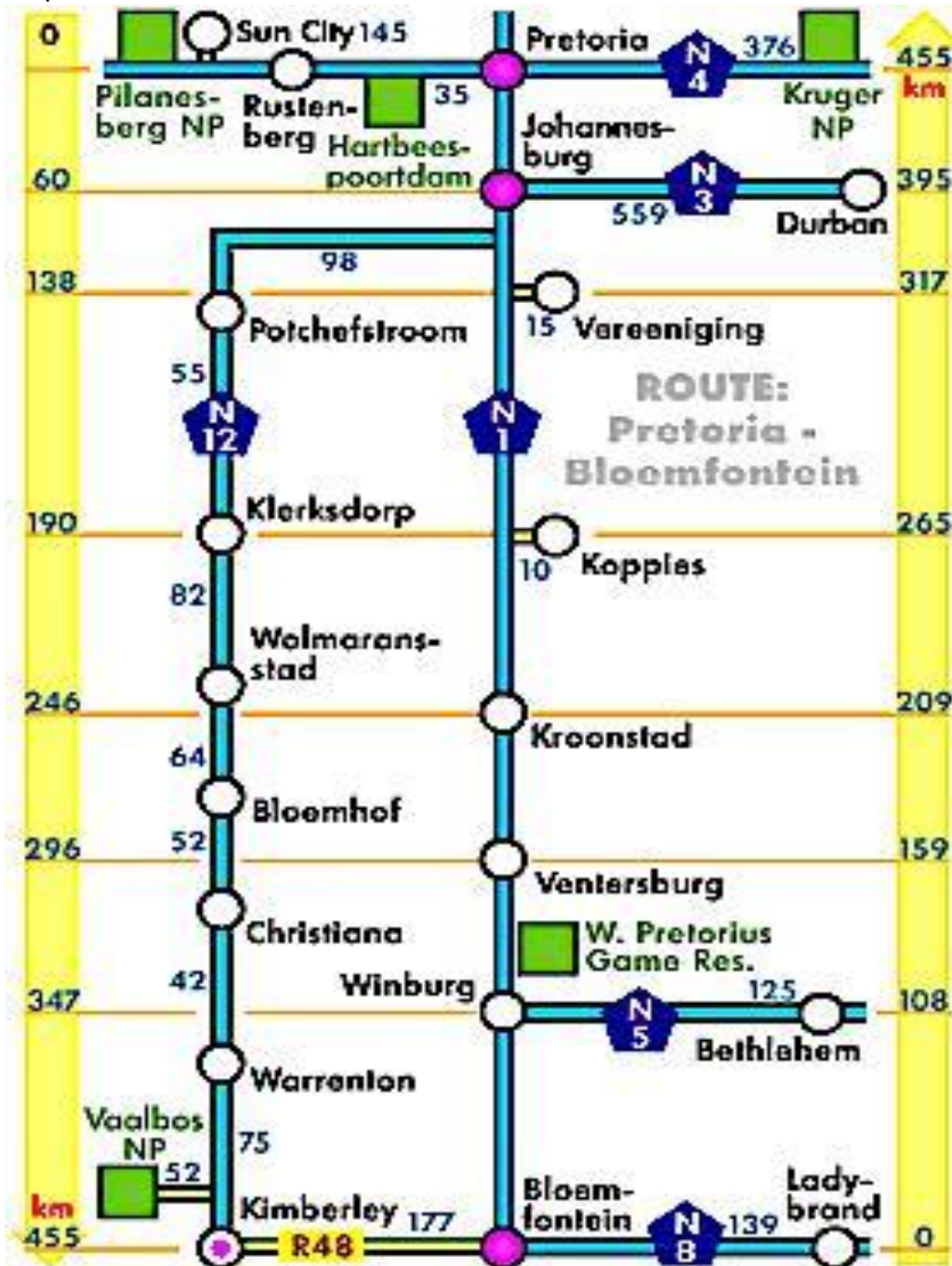
Provincial Map

This kind of map usually shows the towns, regional roads and important landmarks in the province



Strip Chart

This is also called a road map or route map. It is a map that primarily displays roads and transport links rather than natural geographical information. It is a type of navigational map that commonly includes political boundaries and labels, making it also a type of political map.



Street Map

This map usually gives an in-depth view of the city, showing streets, the scale and sometimes with grid references.

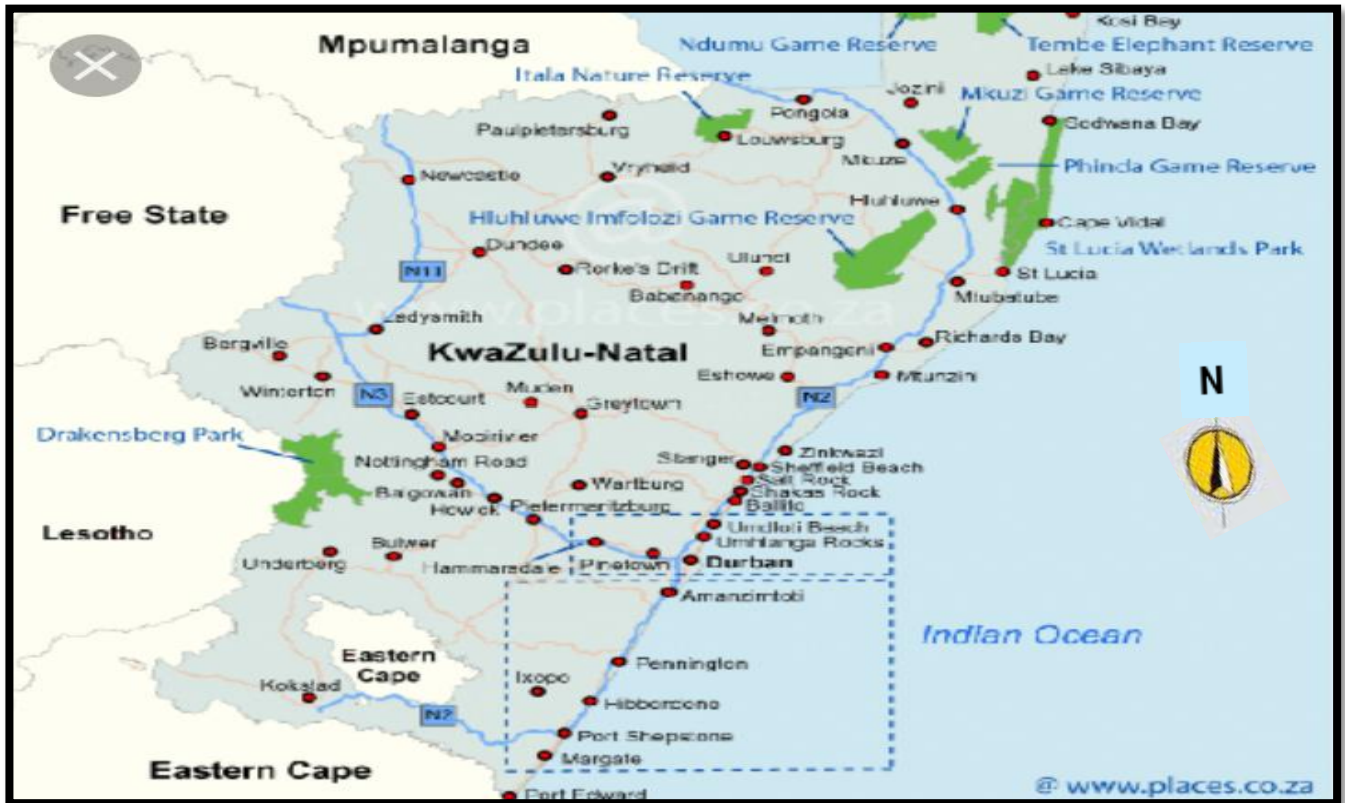


Street map of the city of Johannesburg

NATIONAL AND PROVINCIAL ROAD MAP

ACTIVITY 1

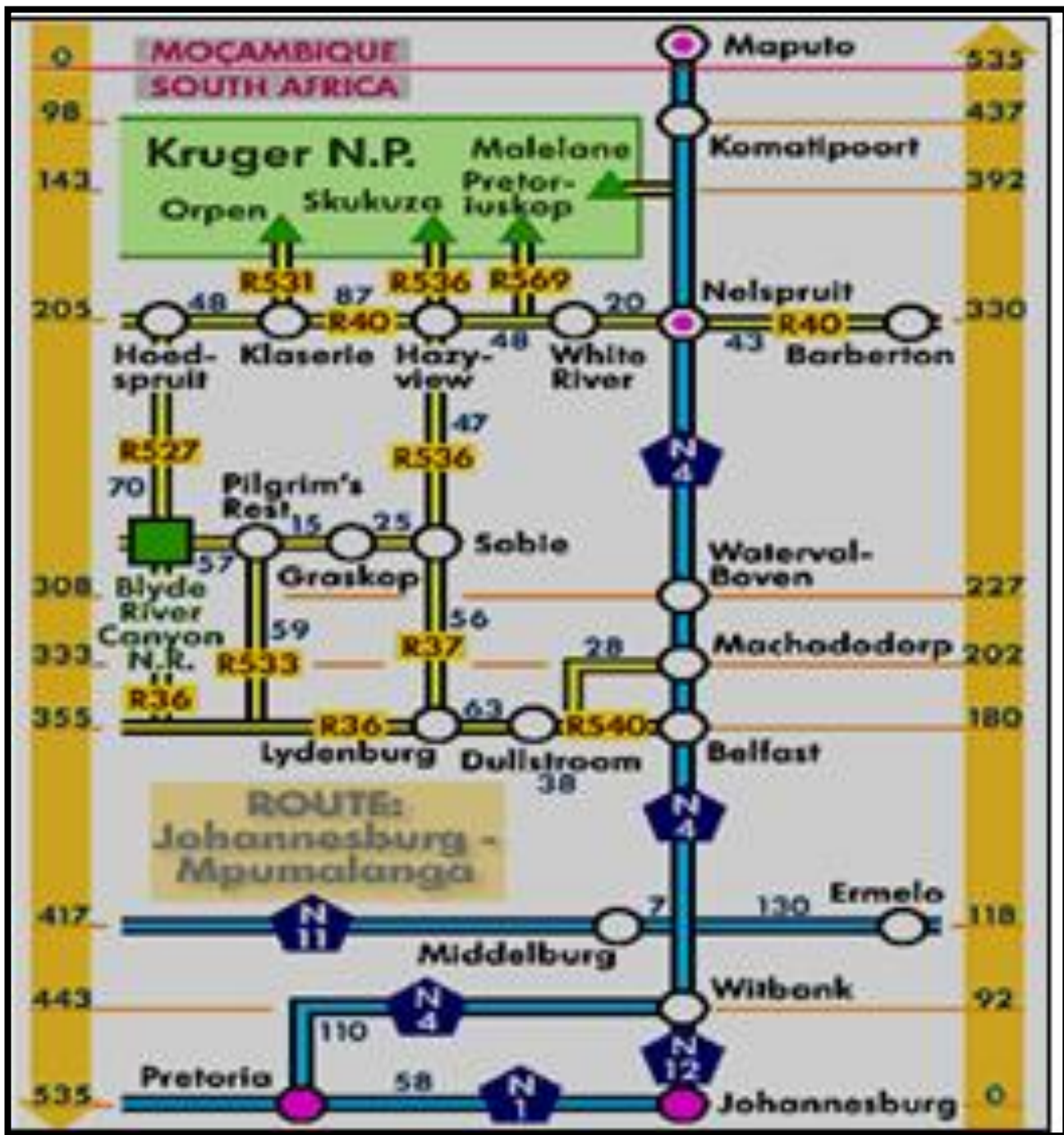
Use the map below to answer the questions that follow.



1. The distance from Vryheid to Pongola is 210km. What is the scale of this map? Round off your answer to the nearest 1 000.
2. If a bus left Ladysmith and travelled in a south-easterly direction, where would the bus be heading?
3. The cost of a journey during low season is R430 from Vryheid to Phongola. On average, how much is the cost per kilometre travelled?
4. Which city (s) will Mr T.W. Nhlengethwa pass if he is travelling from Empangeni to Pongola?
5. Which province is on the North West of KwaZulu Natal?
6. Identify the national road/s in the map.

STRIP MAP

Activity 2.



1. Mr Buthelezi travels from Maputo to Belfast. Use the map to calculate her total distance travelled.
2. Calculate how long it will take him to arrive at her destination if he drives at 110 km/h
3. Mr Buthelezi drives a car that has a tank that can hold 60 litres of petrol. His car travels 7,5 km/l. How much will it cost him for a full tank if the price of petrol is R13, 10 per litre?
4. Calculate Buthelezi’s petrol cost for the return trip.
5. How many full tank (s) will he need to cover his distance from Maputo to Belfast. Give your answer by showing all your calculations.

ACTIVITIES

QUESTION 1

Mr Ramafole and his family decided to visit Sodwana Bay to relax during the upcoming Easter holidays
Use the map below to answer the following questions.



- 1.1. Define the given scale on the map in words (2)
- 1.2. Give the names of game reserves situated in Sodwana in this map (2)
- 1.3. Measure the distance from Vryheid to Sodwana Bay, use the given scale to calculate the actual distance from Vryheid to Sodwana Bay in km (4)
- 1.4. Give the general direction of Sodwana Bay from Vryheid? (2)
- 1.5. Suppose the distance from Vryheid to Sodwana Bay via Jozini is 295km .Calculate the time in hours and minutes if the travelling speed is 97,3km/h. (5)

May use formula: $Time = \frac{distance}{speed}$

TOTAL [15]

QUESTION 2

Two Oceans is one of the best worldwide marathon which takes place annually. The map below shows this Two Oceans marathon. Study the map below and answer the following questions:



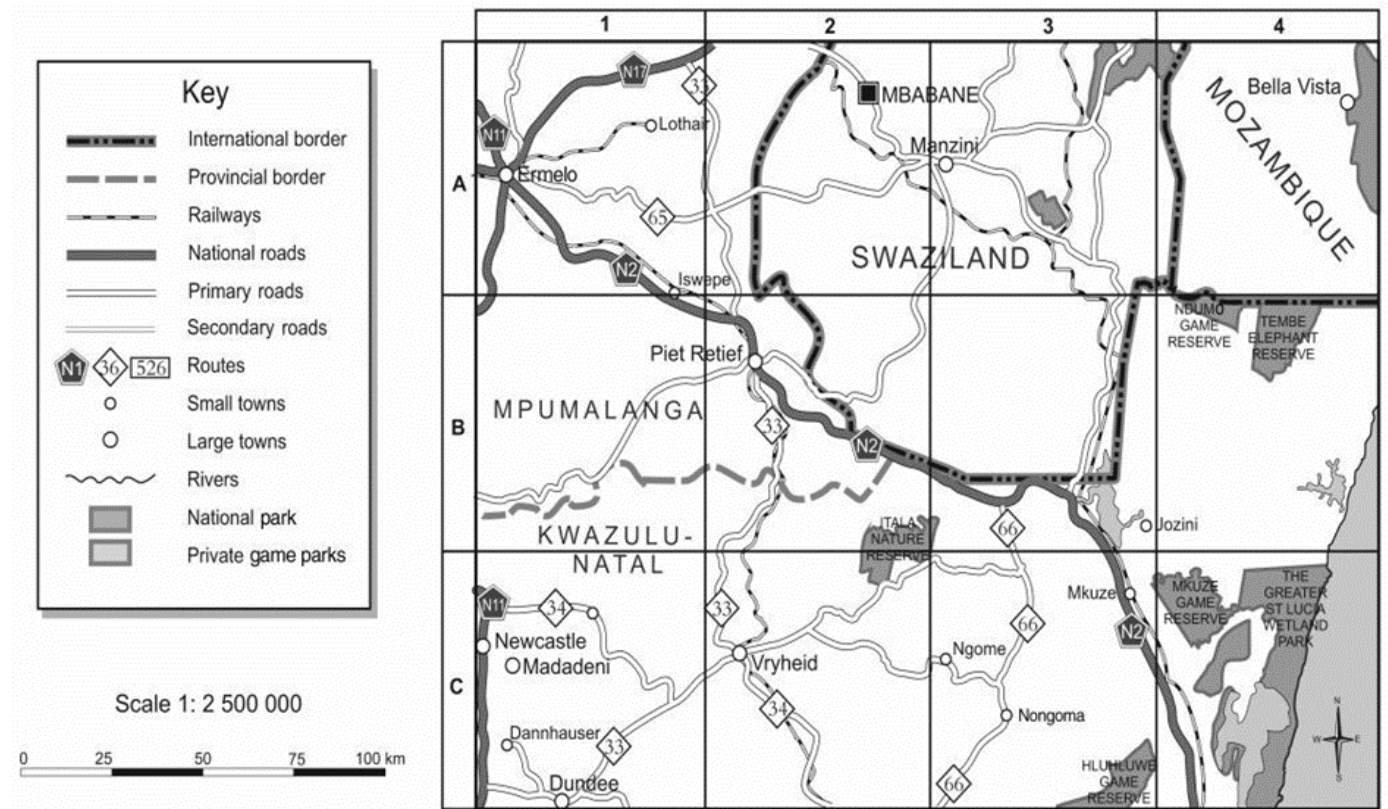
- 2.1. How many water points are present in this map? (2)
- 2.2. What is the difference in kilometres between the second water point and the finishing point (3)
- 2.3. Explain why this type of map is regarded as an elevation map. (2)
- 2.4. How many metres is the Two Ocean marathon. (3)
- 2.5. Give a reason why there are medics available in this map (3)
- 2.6. George Ntshiliza is one of South African runners who broke the record in the Two Oceans Marathon finishing the race in a time of **3:38:58**. Calculate George's speed. (4)

Use the formula $Time = \frac{Distance}{Speed}$

TOTAL [17]

QUESTION 3

Miss Dlodla , an educator from Nongoma decided to use the map which shows the part of Kwazulu Natal and Mpumalanga to let her learners understand different types of maps. Study the map and answer the following questions.



- 3.1 Write down the Grid reference of Vryheid (2)
- 3.2 Use both of the given scales to calculate the actual distance from Ermelo to Manzini. (3)
- 3.3 What is the difference between the two scales given and which one is more reliable and why? (4)
- 3.4 On a particular month ,Miss Dlodla used the same map to travel from Nongoma to Ermelo to go Mr Ramafole’s wedding. Give the shortest route to arrive at the wedding on time. (4)

TOTAL [13]

QUESTION 4

The map below was used Lekhanyane Church to travel around South Africa to visited some of the church members across the Country

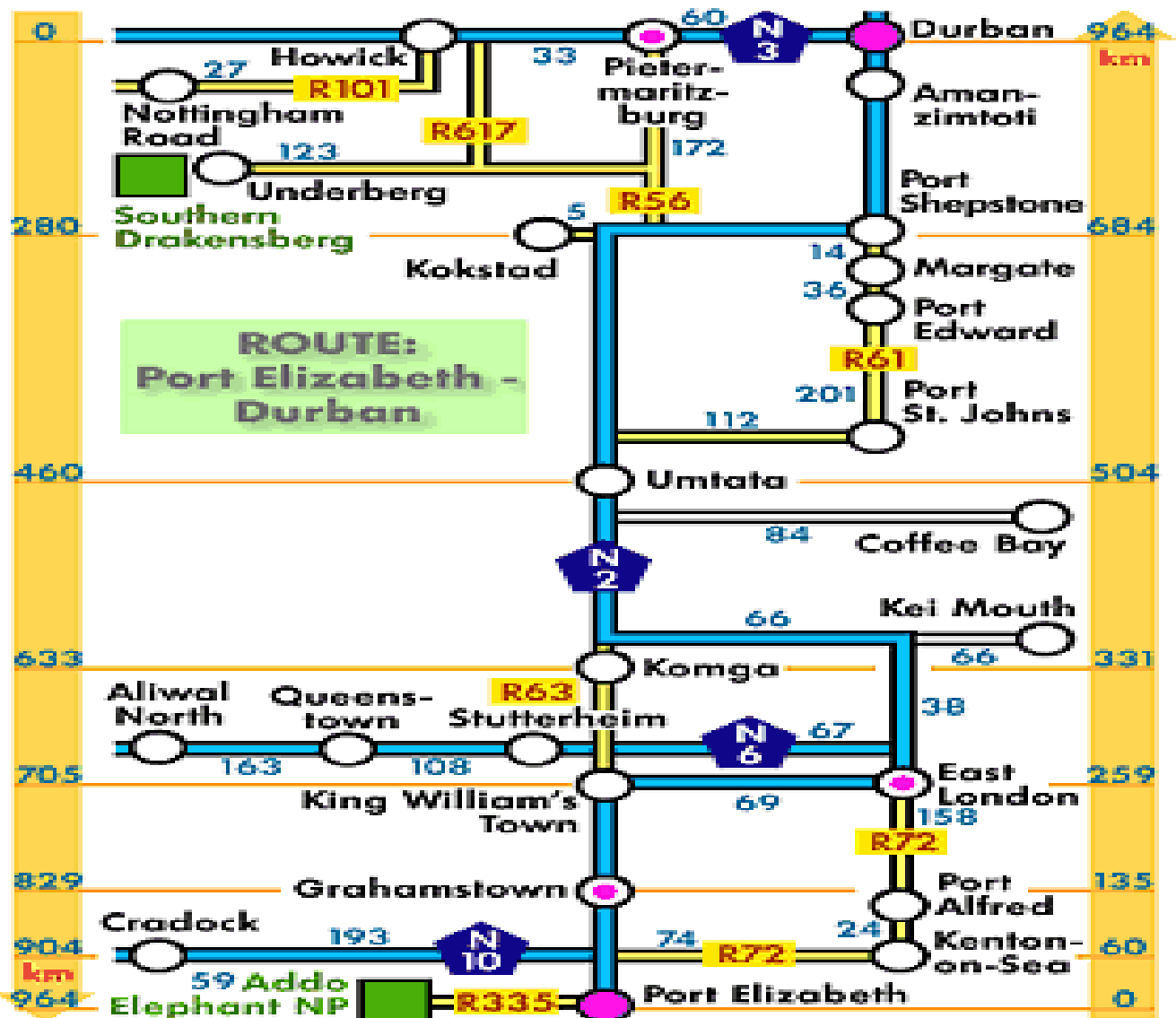


- 4.1 Write down the two cities or town on the N2 linking Durban and East London. (2)
- 4.2 What type of the scale is used on this map? (2)
- 4.3 Name one advantage of using this type of scale. (2)
- 4.4 Write the scale of the map as a number scale in the form of 1:..... (3)
- 4.5 Calculate the actual distance between Mossel bay and Port Elizabeth (3)

TOTAL [12]

QUESTION 5

Mr Madiba is going to drive from Durban to Port Elizabeth for the family wedding .He finds the strip map to help him plan his trip to Port Elizabeth. Use the strip map to answer the following questions

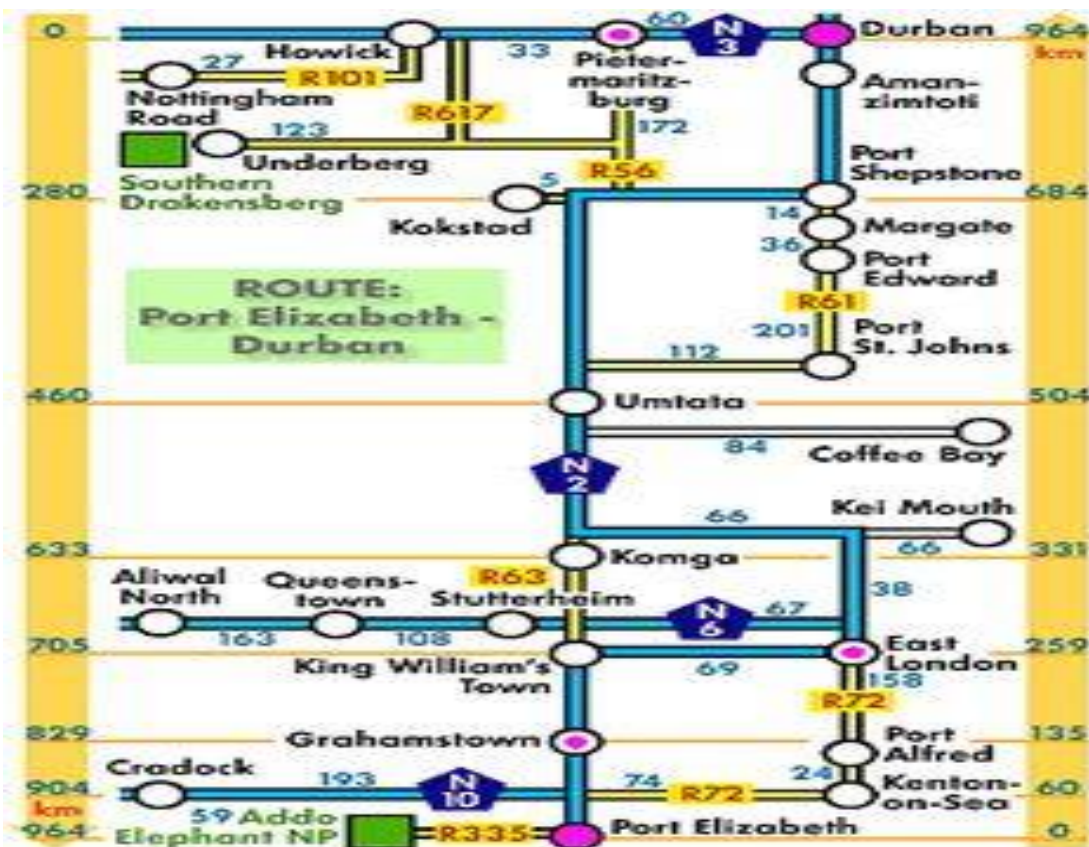


- 5.1 How many national are present in map (2)
- 5.2 Calculate the distance from Durban to Umtata (2)
- 5.3 Give the name of the national from Durban to Port Elizabeth (2)
- 5.4 Mr Madiba wanted to visit a friend .He then drove in the southerly direction from Durban along the N2
 - At Komga, he travelled 104km in the easterly direction to East London
 - Then he continued for **158 km** in the south direction to his destination.
- 5.4.1 What is the name does his friend live? (2)
- 5.4.2 What is the general direction of Madiba's friend place from Underberg (2)

TOTAL [10]

QUESTION 6

Mr Rankhakile’s family, his wife and two children lives in Port Elizabeth and he planned to take his family on holiday trip to Durban that will last for the weekend. The following questions are based on the strips map that shows the distance between Durban and Port Elizabeth and national roads map given below.

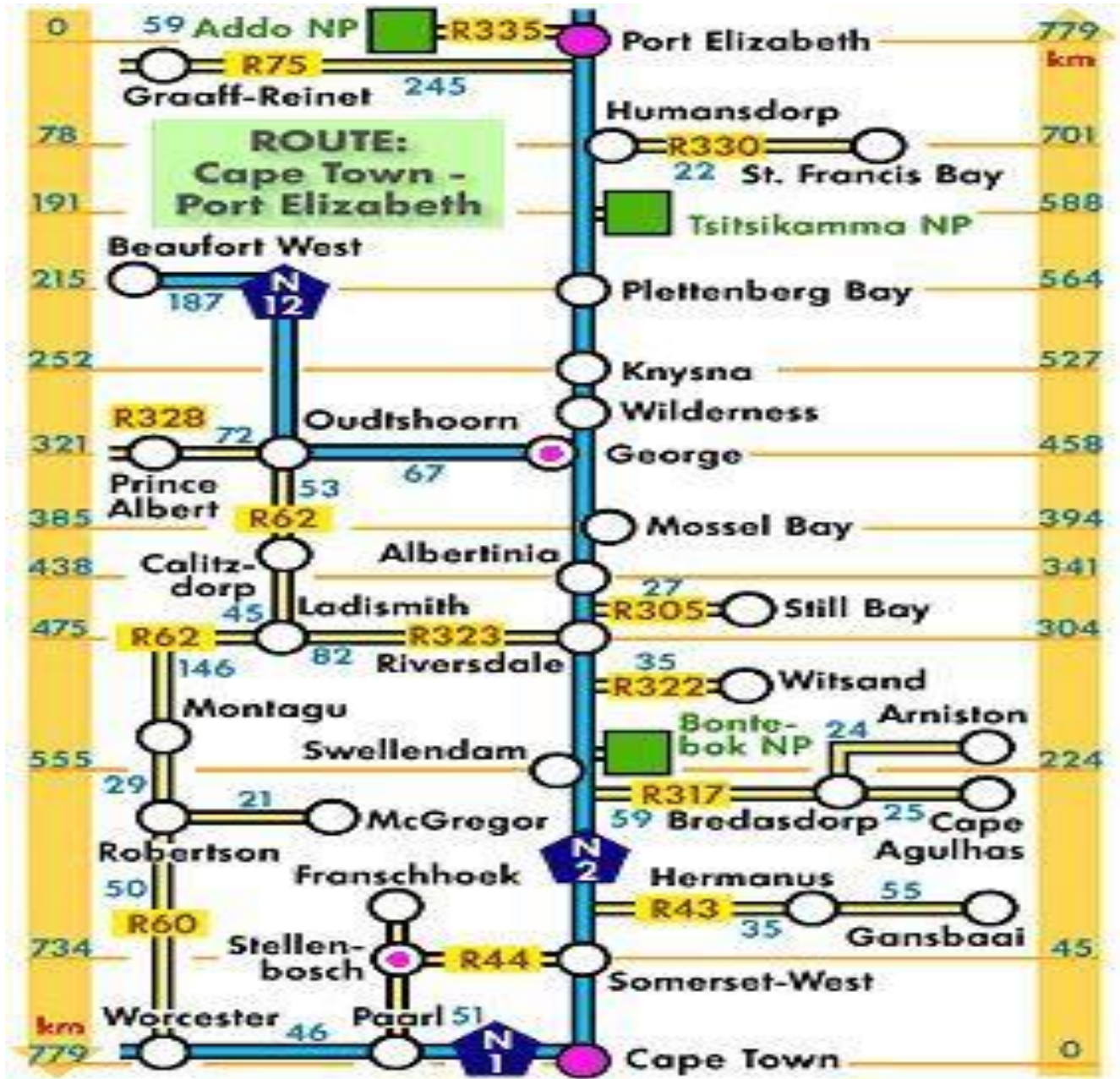


- 6.1 How many members does Mr Rankhakile’s family have (2)
- 6.2 Mr Rankhakile lives in Port Elizabeth town, how many km are they going to travel to Durban? (2)
- 6.3 Name the route that they will use to travel from Umtata via Port St John’s (2)
- 6.4 Use the national roads map below the strip in the annexure A to answer the following questions
- 6.4.1 How many national roads are shown on the map (2)

- 6.4.2 Which national road is the longest? (2)
- 6.5 There is one national park close to where Mr Rankhakile lives, give the name of the National park (2)
- 6.6 If the family intends to have a break after every two hundred kilometres, how many times are they going to stop before they get to Durban (4)
- 6.7 On their to Durban, they travelled 84km from the national road, just to take a quick short break besides the one they planned for every two hundred kilometres. Mention the national road they were on and their destination after 84km (2)
- 6.8 Calculate the distance in km between Cradock and Durban (2)
- 6.9 If they left Port Elizabeth at 04:30 and arrived at 15:45, at what average speed were they travelling? Give your in km/hour
You may use the formula: ***distance = speed × time*** (5)
- 6.10 Write their departure and the arrival times in the 12 hour format. (2)
- 6.11 Give a possible explanation why the distances between Port Shepstone, Margate and Port Edward are not equal whereas they appear to be equal on the map. (2)
- 6.12 The vehicle they using has an average fuel consumption of ***8litres per 100km***, if their car has a fuel tank of 60litres how many km will they travel in a full tank? (3)
- 6.13 If the petrol price of the coastal regions is R15,80 per litre, calculate how much is he going to need for the number of litres of petrol he needs to fill in the car to get to Durban. (6)
- TOTAL [43]**

QUESTION 7

Use the strip map of the that shows the cape town to port Elizabeth route below to answer the questions that follow.

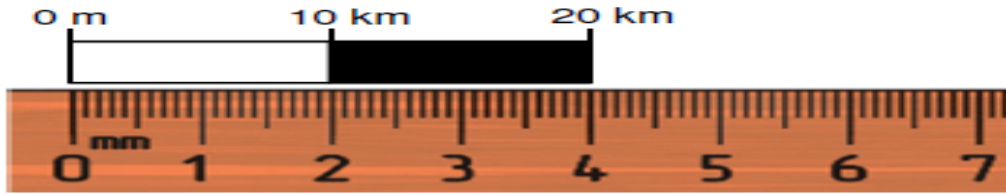


- 7.1 How many national roads are shown on the map? (2)
- 7.2 Name two national parks from the map, which are closer to N2. (2)
- 7.3 If you travel 458km from cape town on the N2, then travel 360km on the N12 in which city or town are you? (2)
- 7.4 You stay in Ladysmith and you meet a lost tourist in your town, he wants to ADDO NATIONAL PARK. Give the tourist the directions that will take him to the park. (5)
- 7.5 If you travelling from Paarl to Ladysmith, which of the following routes is the shortest, Paarl via Worcester or Paarl via cape town? Show calculations to support the decision. (5)

TOTAL [16]

QUESTION 8

8.1 Mr Ramafole, mathematical literacy educator used the picture below to explain the advantage of using the below scale.



- 8.1.1 Name type of scale illustrated above? (2)
- 8.1.2 Convert the given scale to number scale (3)
- 8.1.3 What is the difference between above scale and the one calculated. (4)
- 8.2 Mr Ramafole was invited to a wedding which was held recently in Waterwheel, a popular wedding place in Vryheid. Below is the picture of the trouser he bought from **Twizz Boutique**.



1:50

- 8.2.1 Measure the length of the trouser in mm. (2)
- 8.2.2 How many pockets does this trouser have? (2)
- 8.2.3 Calculate the actual length of the trouser. Express your answer in metres (3)

TOTAL [16]

PLANS AND OTHER REPRESENTATIONS

1.1. Plans

- A plan is 2-dimensional picture that shows a scaled down version of a 3-dimensional life-size object
- Every plan has a scale attached to it to show by how much (what factor) the picture on the plan had been reduced or scaled down from the original structure

What the learner is expected to know and be able to do in terms of the CAPS document

LEVEL 1: KNOWING

- **Identify the scale of a plan.**
- **Define terms (e.g. floor plan; elevation plan; layout plan; etc.)**
- **Read off the value(s) of given dimensions on the plan (e.g. the length of the wall is 4m).**

LEVEL 2: APPLYING ROUTINE PROCEDURES IN FAMILIAR CONTEXTS

- **Use a given key to identify the number of windows/doors/rooms shown on a plan for a building.**
- *Identify on which plan a particular structure is shown (e.g. the door is shown on the North elevation plan)**

LEVEL 3: APPLYING MULTI-STEP PROCEDURES IN A VARIETY OF CONTEXTS

- Measure dimensions on a plan and use a given scale to determine actual dimensions.**
- **Use plans in conjunction with other content, skills or applications to complete a project (e.g. interpret plans to determine the dimensions of a room in order to establish the amount of carpet needed for the floor of the room).**

LEVEL 4: REASONING AND REFLECTING

- Describe an item represented in a plan.**
- Critique the design of a structure shown on a plan.**
- **Decide on an appropriate scale in which to draw a plan and then draw the plan.**
- **Make connections between plans showing different views of the same structure (e.g. explain which wall shown on a floor plan is represented on a particular side view plan).**

1.2. Types of Plans

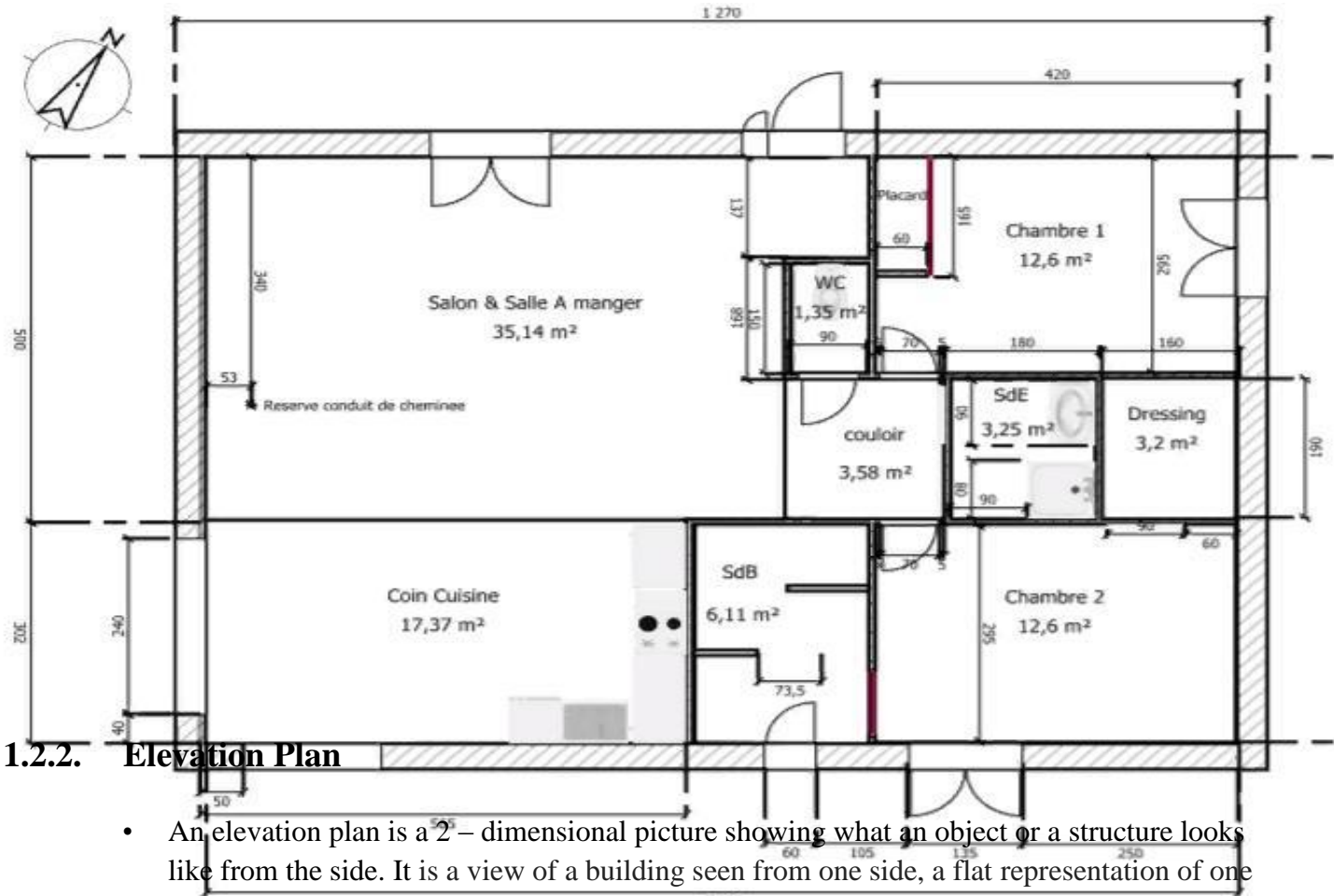
- **Floor or Layout Plans**
- **Elevation Plans**
- **Design Plans.**

Kitchen and Dining Room

| | | | | | | | |
|------------|-----------------|----------------|--------------|---------------|-------------------|-----------------|--------------|
| | | | | | | | |
| Closet | Closet 2 | Closet 3 | Closet 4 | Gas stoves | Gas stoves 2 | Gas stoves 3 | Gas stoves 4 |
| | | | | | | | |
| Sink 1 | Sink 2 | Sink 3 | Basin | Double basin | Pedestal sink | Countertop sink | Dispenser |
| | | | | | | | |
| Towel rack | Circular dining | Circular table | Dining table | Oblong dining | Oval dining table | Square table | Ref |

| | | | |
|--|----------------------|--|------------------|
| | Sofa | | Desk |
| | Arm Chair | | Shower |
| | Coffee Table | | Bathtub |
| | Dining Table | | Bathroom Sink |
| | Dining Table | | Toilet |
| | Entertainment Center | | Upright Piano |
| | Double Bed | | Baby Grand Piano |
| | Single Bed | | |

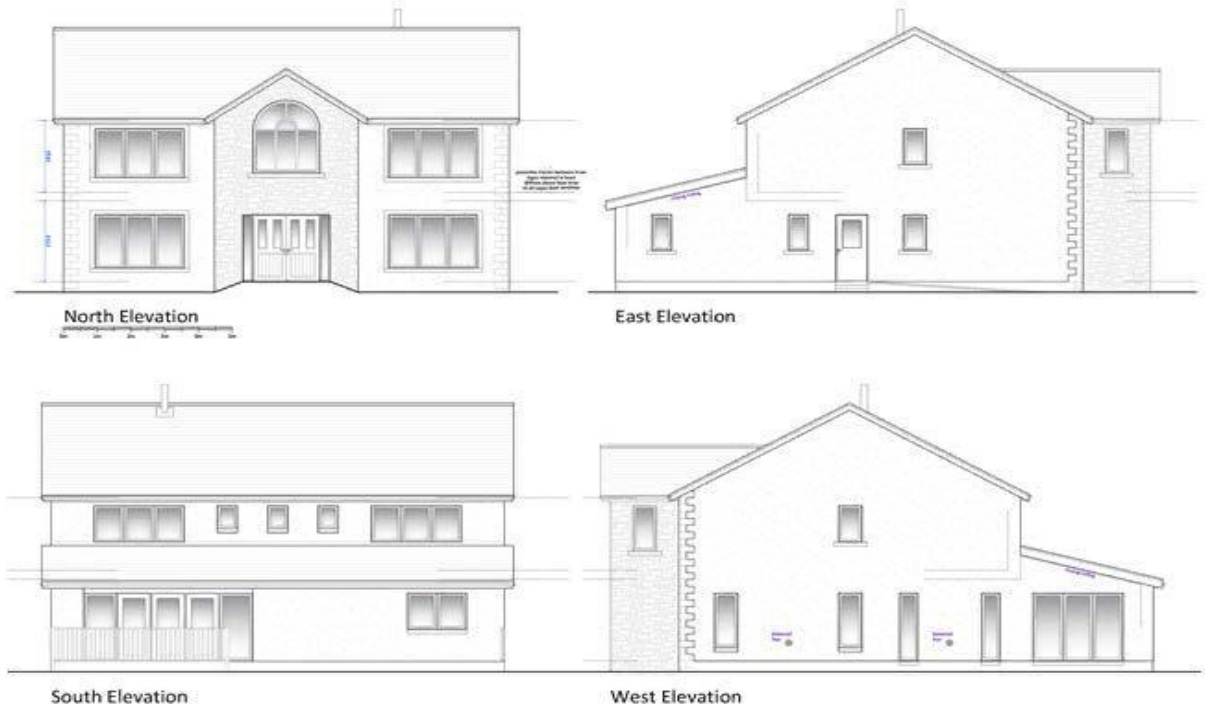
Sample floor plan



1.2.2. Elevation Plan

- An elevation plan is a 2^d – dimensional picture showing what an object or a structure looks like from the side. It is a view of a building seen from one side, a flat representation of one [façade](#). This is the most common view used to describe the external appearance of a building. Each elevation is labelled in relation to the compass direction it faces, e.g. looking toward the north you would be seeing the southern elevation of the building
- Elevation plans show the design of the ***outside*** of a building
- In other words, an elevation is a side-view as viewed from the front, back, left or right
- Elevation plans are usually labelled:
 - North Elevation, is the side of the house that you are facing when you are facing towards North
 - South Elevation
 - East Elevation, is the side of the house that you are facing when you are facing Eastwards
 - West Elevation

Examples of elevation



1.2.3 Design Plans

- Design Plans are commonly used in the fashion and design industry
- The plans are often of clothing items that will be sent to the manufacturers
- The design plan may depict an entire building, one floor of a building, or a single room. It may also include measurements, furniture, appliances, or anything else necessary to the purpose of the plan. It is important to learn how to describe what is being represented on a plan, to analyze the layout of the structure shown on the plan and suggest alternative layouts

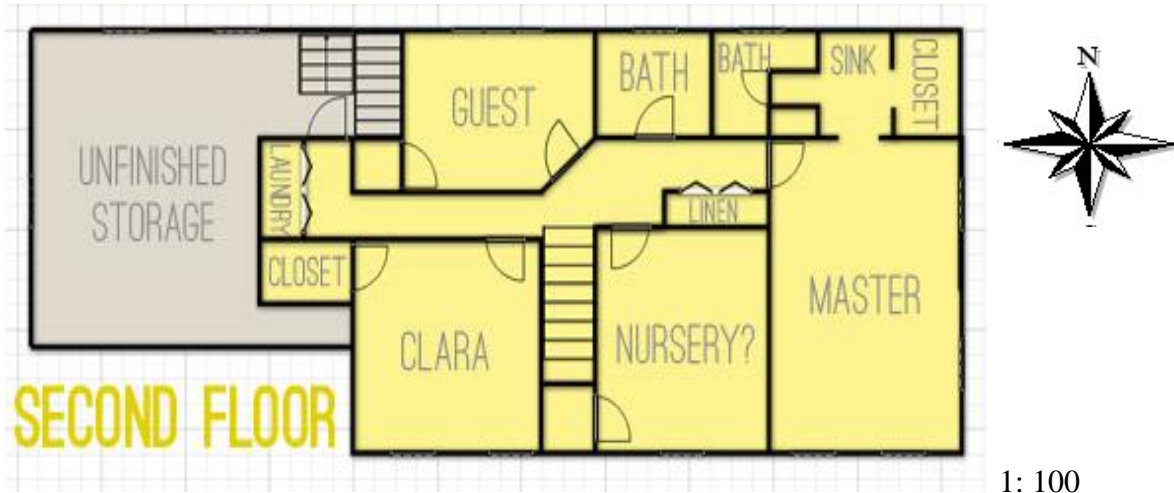
EXAMPLE OF DESIGN PLAN



ACTIVITIES

QUESTION 9

Miss Dlodla is interested in building a new house for herself. The architect gave her number of floor plans to help decide. She chose the below floor plan. Use the floor plan above to answer the following questions.

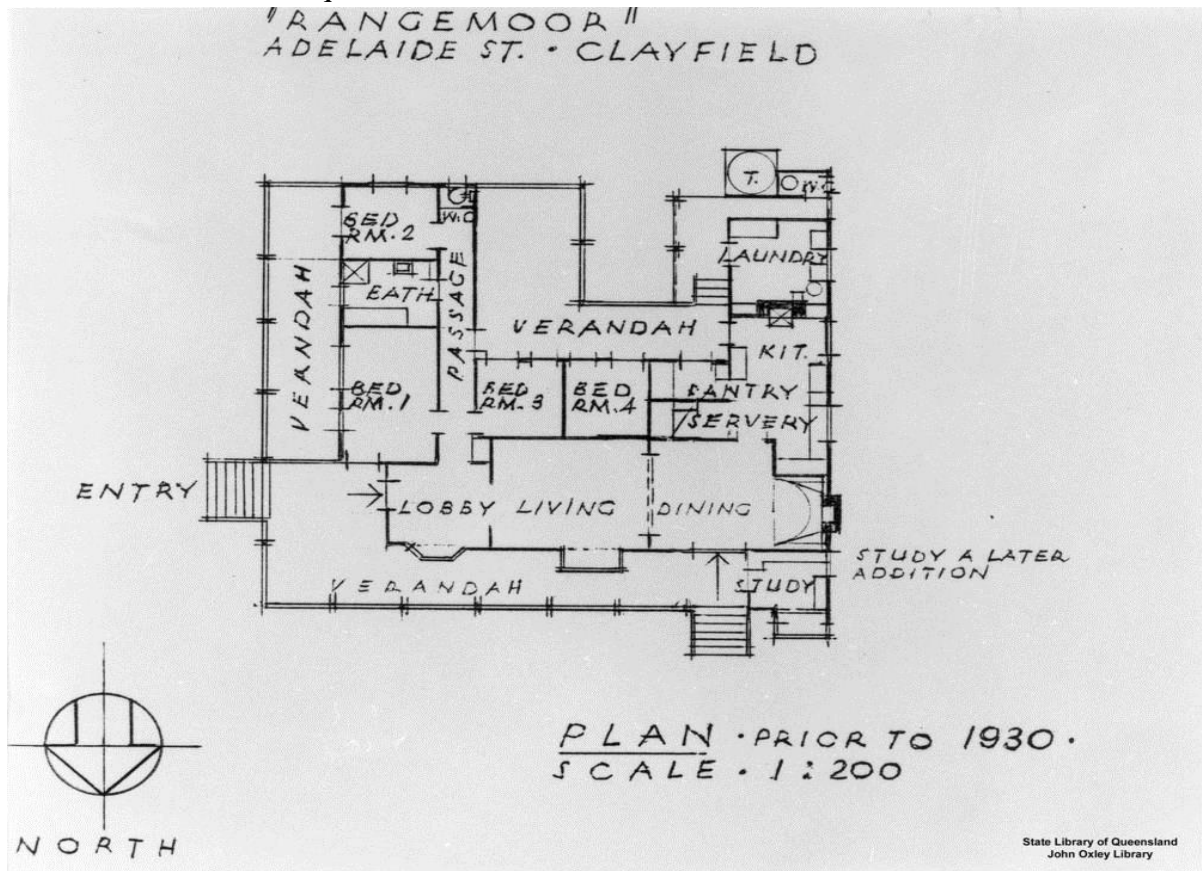


- 9.1 Define the term floor plan? (2)
- 9.2 Write down the compass direction of guest from the master bed room. (2)
- 9.3 Identify the scale of the floor plan. (2)
- 9.4 Explain what the scale means in terms of the measurements on the plan and actual dimensions. (2)
- 9.5 Calculate the actual length of the north side of the house (3)

TOTAL [11]

QUESTION 10

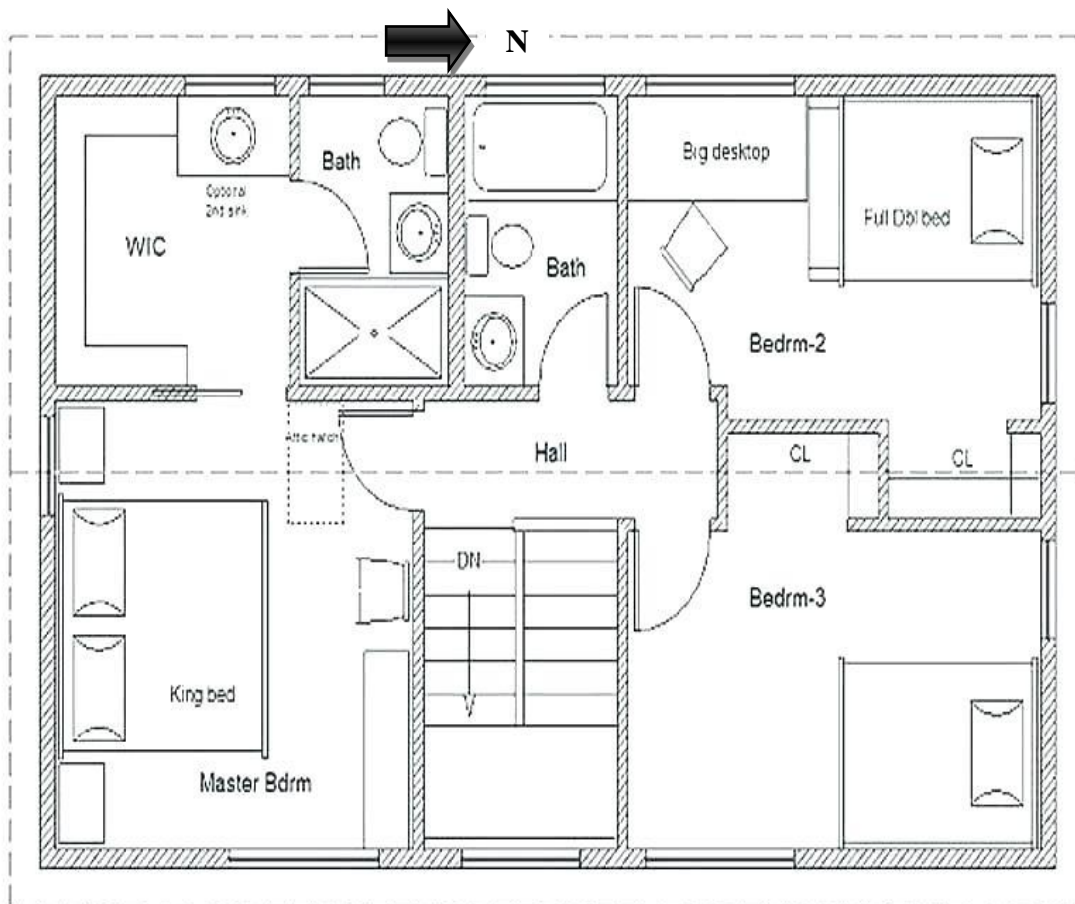
Study the following diagram which shows the top view for an old styled plan of the house and use it to answer the questions that follow



- 10.1 Identify the type of scale used in the above given plan (2)
 - 10.2 Explain what is meant by the scale outlined in question 10.1 (2)
 - 10.3 How many rooms does the plan have including the pantry and server but exclude the passage? (2)
 - 10.4 Give the general direction of the bedroom 2 from study (2)
 - 10.5 What is the probability that the kitchen will receive the sunlight during the sunrise? (2)
- TOTAL [10]**

QUESTION 11

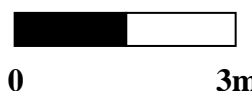
Study the following diagram which shows the top view for an modernised plan of the house and use it to answer the questions that follow



KEY:

Door:

Window:



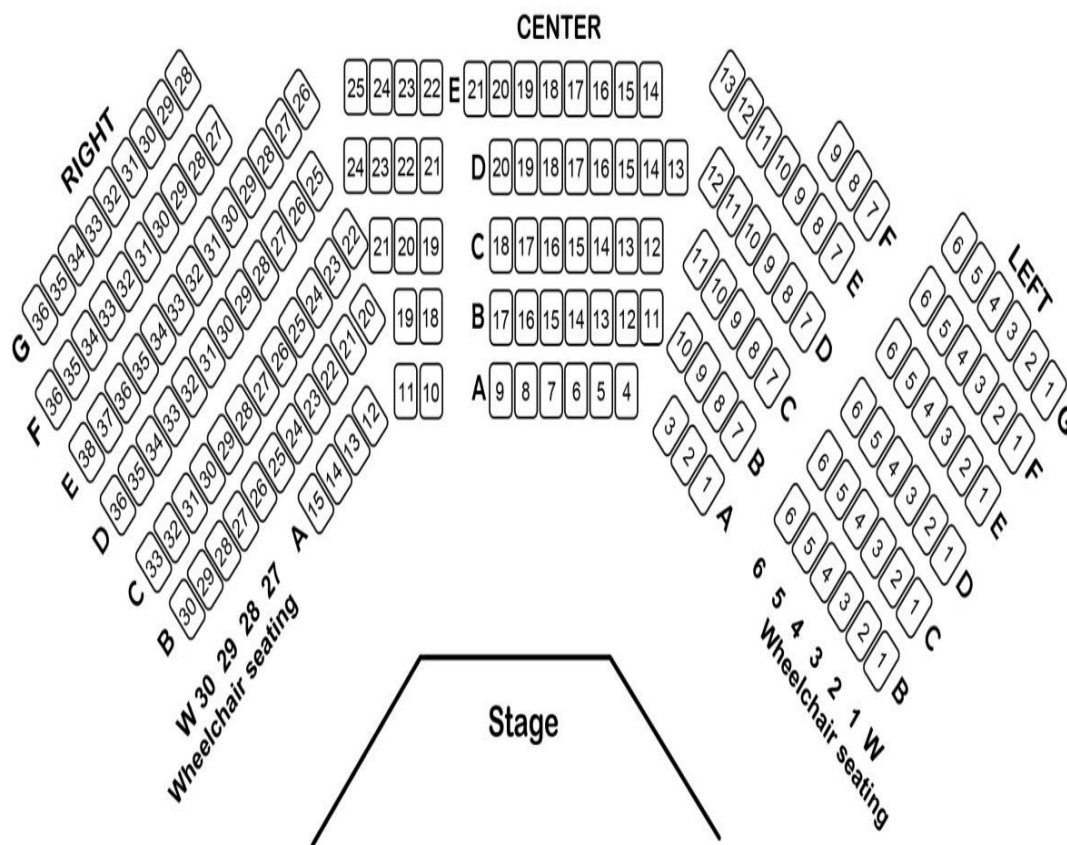
- 11.1 Identify the type of the scale used and give one advantage of the identified scale (2)
- 11.2 What length does the above mentioned scale represent? (2)
- 11.3 Which bedrooms will receive the sunlight or sunrays when the sun is about to set? (2)
- 11.4 How many doors and windows does the plan have? (2)
- 11.5 Is the door of bedroom 3 a left-hand or right-hand? Explain. (3)
- 11.6 Write down the ratio of the bathrooms to the bedrooms (2)
- 11.7 If the length of the east-facing wall is measured to be 8cm on the plan, use the given scale to calculate the length of the east-facing wall in reality (4)

TOTAL [17]

QUESTION 12

Thato and his friends decided to go out to have fun and they visited a playhouse theatre. The following is the seating plan of the play house theatre which shows how the spectators are allocated seats. Study the plan and answer the questions that are based on it.

McAninch Arts Center
Playhouse Theatre

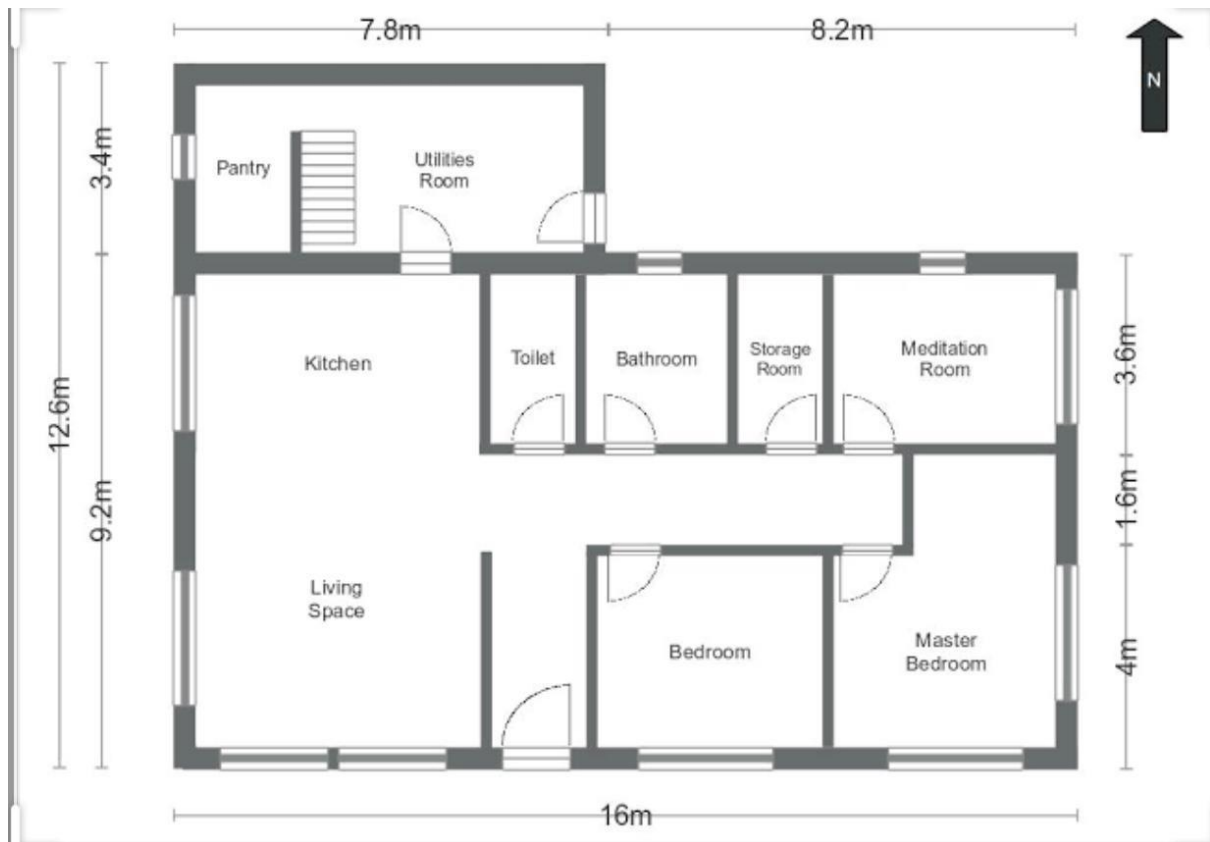


- 12.1 How many seats are reserved for disabled people (2)
- 12.2 Determine the maximum number of people who can be accommodated in the theatre if all seats are occupied. (2)
- 12.3 If Thato short sighted and prefers to sit nearer and directly to the stage, write down ANY 2 seats that are likely to be chosen by Thato? (2)
- 12.4 All disabled were occupied on the day Thato and his friends visited the theatre. Calculate the probability (as a percentage) of picking up the disabled person from the front row if five of the front seats were not occupied. (3)
- 12.5 One of Thato's friends was seating at seat number E22 wanted to be close to Thato. He moved 3 rows down the aisle and 2 seats to the left. Give the row and the seat number of his new position. (2)

TOTAL [11]

QUESTION 13

The floor plan of Mr Khoza’s house is shown below.



- 13.1 How many rooms are shown in the floor plan? (2)
- 13.2 How many windows are shown on the plan? (2)
- 13.3 How many doors are shown on the plan? (2)
- 13.4 Give the general direction of the master bedroom from the toilet. (2)
- 13.5 Give the name of the room(s) that will receive the sunshine as the sun rises. (2)
- 13.6 If the measured distance of the southern wall is 92mm and the actual distance is 16m, determine the scale. (3)
- 13.7 What is the probability of finding a door that opens towards the right in the plan from the outside? Give your answer as a decimal. (3)

TOTAL [16]

Question 14

The **New England Patriots** are a professional [American football](#) team based in the [Greater Boston](#) region in the USA. The team plays its home games at [Gillette Stadium](#) shown below

Study the information given and **stadium seating plan** below and answer the questions that follow:



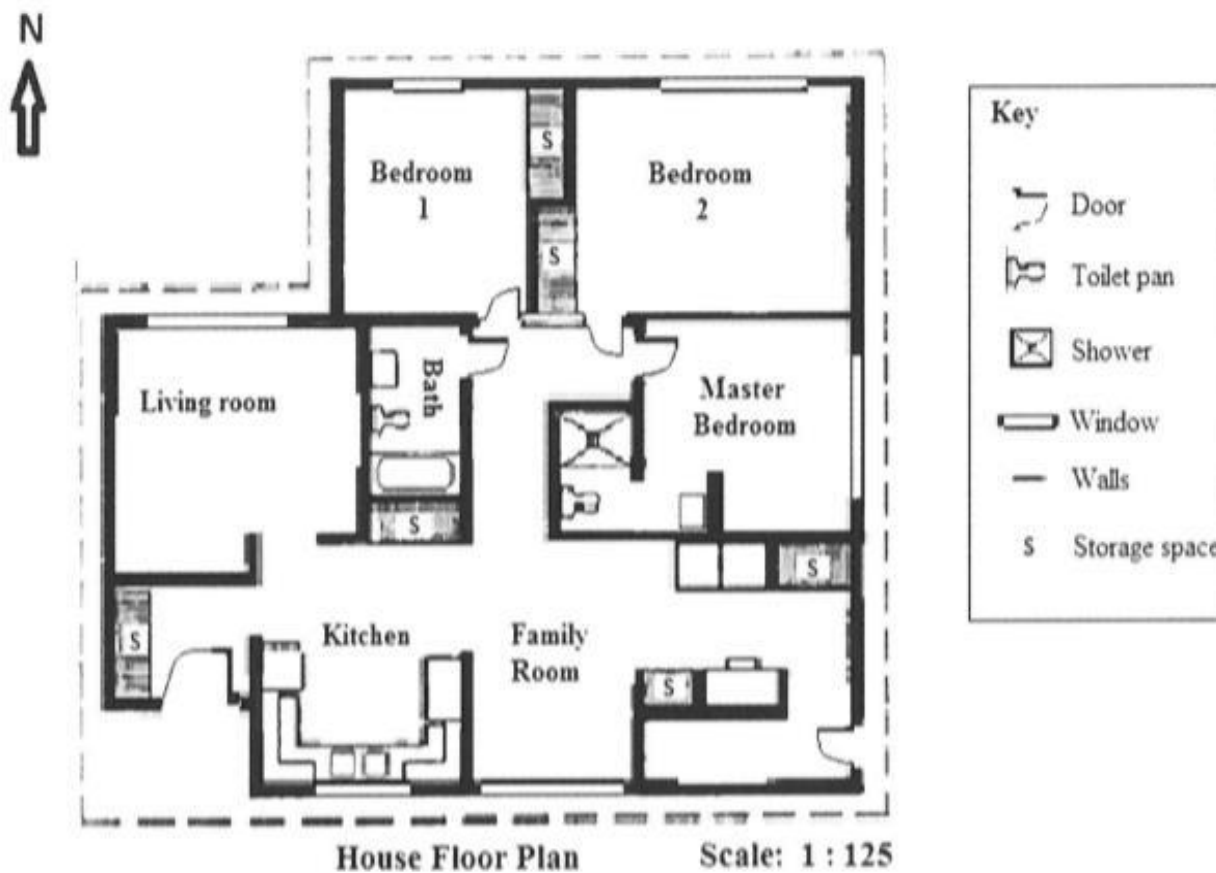
- 14.1. Give the general direction of seat 330 with respect to seat 203.
- 14.2. Determine the total number of seats in the stadium as shown in the diagram.
- 14.3. The *stadium has four levels of seating with level 0 seats being closest to the turf.* Each level has different seating zones.

Determine the simplified ratio of the number of level 0 seats (blue colour) to level 3 (yellow) seats as seen from the diagram

- 14.4. A spectator is seated at seat 319. Give a detailed description of the route the friend will take to walk to CL13.

Question 15

Below is a basic plan found on an Internet.



Andile wants to build a house similar to the one above. He consulted an architect to comment on the plans. The architect made some comments including the following:

1. the toilet pans are not correctly positioned
2. some of the doors open the wrong way

- 15.1. Explain, giving TWO reasons each why the architect made two comments
- 15.2. The side elevation plan shows two windows and a door. Which rooms on the plan are represented by these windows?
- 15.3. On the plan the dimensions of the floor of Bedroom 2 are as follows:

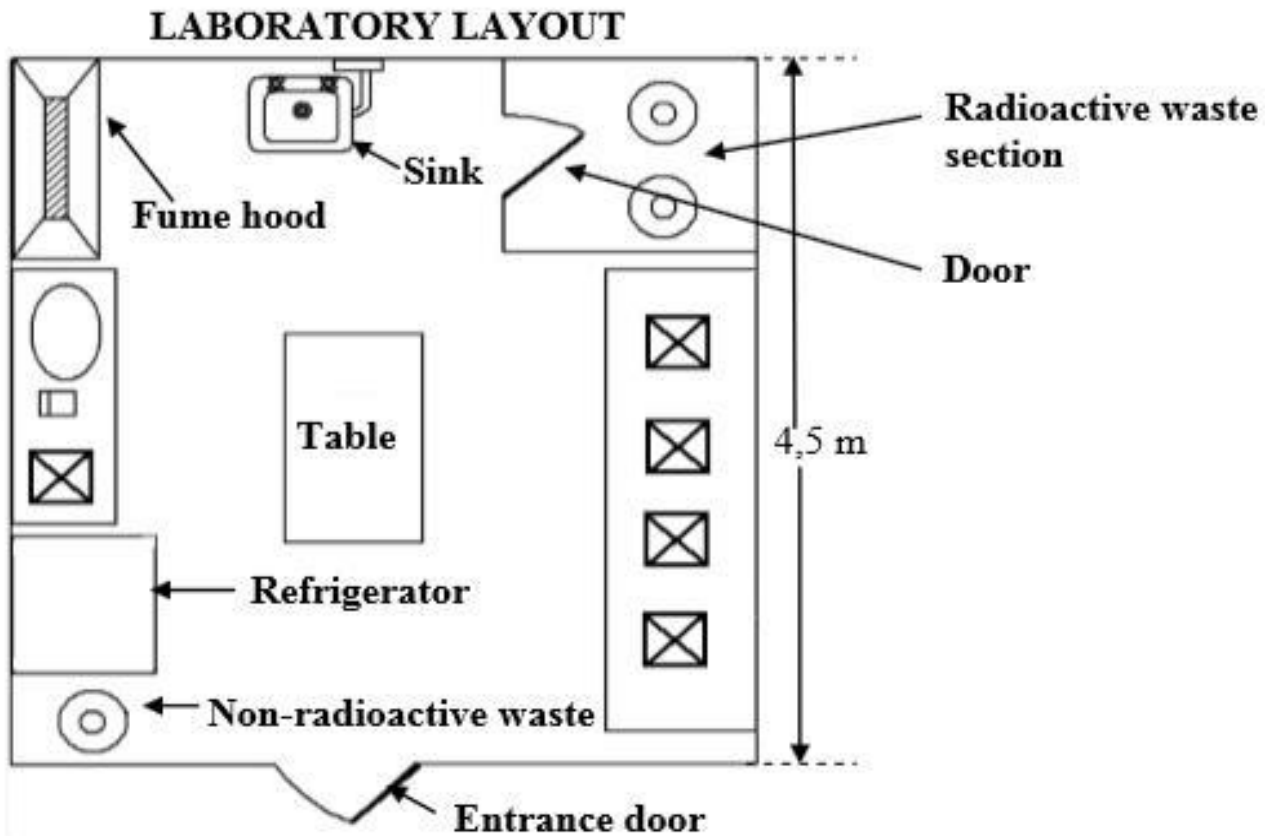
Length = 33 mm and width = 28 mm.


According to the building regulations of the local municipality the area of window must be at least 11,5% of the floor area of the room.

The actual window is 220 cm wide. Calculate (to the nearest cm) the minimum, height of the window. You may use the formula: **Area of a rectangle = length x width.**

Question 16

Study the diagram below and answer the questions that follow:



KEY:  = Microscope

- 16.1. Which item is located at the far left-hand corner of the laboratory as a person enters the laboratory?
- 16.2. Hloni is in the radioactive waste section and sends a visually impaired person to fetch something from the refrigerator in the laboratory.
How would Hloni clearly direct the person to get to the refrigerator after going out of the door of the radioactive waste section?
- 16.3. Calculate the width of the laboratory if the total floor area is 18,9 m².

Use the formula: **Width = $\frac{\text{total floor area}}{\text{length}}$**

The scale used on the layout plan is 1 : 58.

Calculate the actual length of the table on the layout plan if its scaled length is 2,26 cm

