



JENN

Training and Consultancy

The path to enlightened education

SUBJECT: MATHEMATICAL LITERACY

GRADE 12

WINTER CLASSES

TEACHER AND LEARNER CONTENT MANUAL

Topic

FINANCE

DATA HANDLING

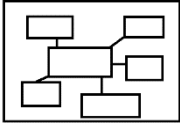
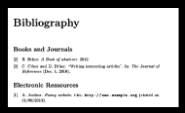
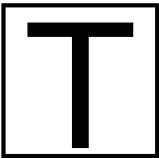
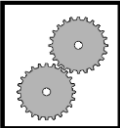
MEASUREMENTS

PLANS AND SCALE

GUIDELINES Icon descriptions	4
SECTION 1: Income and expenditure - Important terms and definitions - Outlining the key concepts - Worked examples. - Activities	5 - 11
SECTION 2: interest - Important terms and definitions - Outlining the key concepts - Worked examples. - Activities	12 – 17
SECTION 3: Growth Charts and BMI - Important terms and definitions - Outlining the key concepts - Worked examples. - Activities	18 – 22
SECTION 4: Conversions and Time - Outlining the key concepts - Worked examples. - Activities	23 – 31
SECTION 5: Perimeter and Area - Important terms and definitions - Outlining the key concepts - Worked examples. - Activities	32 – 45
SECTION 6: Surface Area - Important terms and definitions - Outlining the key concepts - Worked examples. - Activities	46 – 47
SECTION 7: Volume - Important terms and definitions - Outlining the key concepts - Worked examples. - Activities	48 – 52

SECTION 8: Maps and Scales • Important terms and definitions • Outlining the key concepts • Worked examples. • Activities	53 – 64
SECTION 9: PLANS • Important terms and definitions • Outlining the key concepts • Worked examples. • Activities	65 – 76
REFERENCES	77

ICON DESCRIPTION

 MIND MAP	 EXAMINATION GUIDELINE	 CONTENTS	 ACTIVITIES
 BIBLIOGRAPHY	 TERMINOLOGY	 WORKED EXAMPLES	 STEPS

SECTION: INCOME AND EXPENDITURE

Learners must know how to:

- Identify and perform calculations involving income, expenditure, profit and loss values, including fixed, variable and occasional income values and fixed, variable, occasional, high-priority and low-priority expenditure values.
- Calculate profit/loss
- Calculate the profit margin
- Identify whether a profit or loss was incurred
- Know the difference between a budget and an income and expenditure statement
- State whether a budget is adequate to cover expenses
- Know how to identify the types of income within a particular context
- Provide examples of the three types of income and expenditure
- Compare income and expenditure in terms of fundraising projects for large organisations such as schools, Non-Profit Organisations etc.

The following contexts can be used when assessing file:

- Food, clothing, entertainment Accounts
- Accounts
- School Fees
- Car, households and medical aid
- Personal Taxes

For Grade 12 focus is on:

- Income and Expenditure for larger organisations (e.g. taxes for a government)
 - A comparison of income/expenditure/profit values over two years

budgets showing a comparison of projected vs actual income, expenditure and profit/loss values

IMPORTANT TERMS AND DEFINITIONS

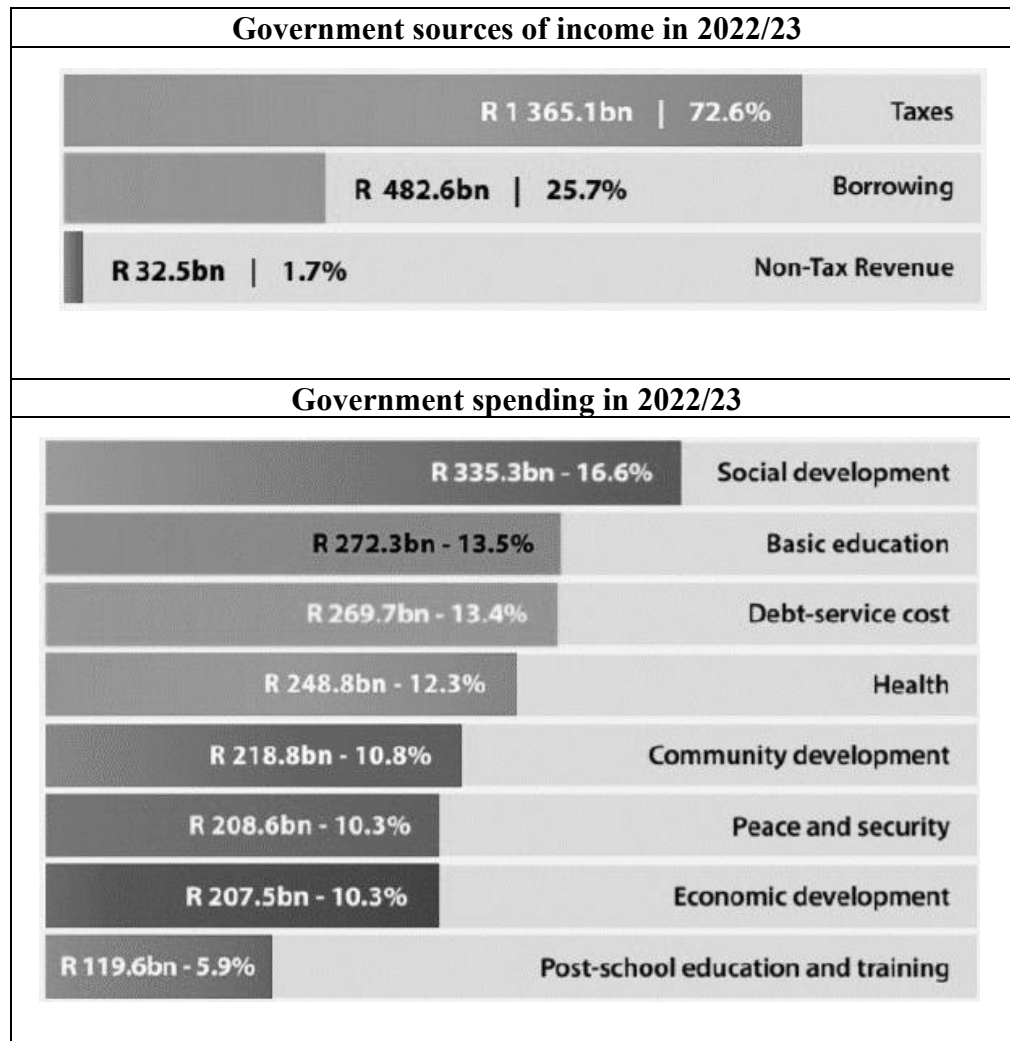
INCOME AND EXPENDITURE

Account	A record of income and expenditure.
Bank Statement	The details of all the transactions made from one bank account in each period.
Opening Balance/Balance brought forward	The amount of money that appears in the bank statement at the beginning of the financial period.
Closing Balance	The amount of money that appears in the bank statement at the end of the financial period.
Credit	The amount of money that shows a payment made into the account and ready to spend.
Debit	The amount of money in an account removed from an account.
Debit order	An agreement between you and a company or individual take funds/money from your account.
Stop order	An agreement between you and your bank to make a of future-dated repeat payments on your behalf.
Service Fee	A fee collected to pay for services that relate to a product or service that is being purchased or rendered.
Salary	An amount of money paid for the work you do. (This is normally paid monthly.)
Overdraft	The amount of money in your account given by a bank to withdraw or cover transactions in case you don't have enough or sufficient money/funds.
Bank Charges	Amount of money paid by a customer for a bank's services.
Withdrawal	Money taken out of a bank account.
Deposit	A payment made into a bank account
Budget	A plan of how to spend money or an estimate of income and expenditure
Income	The amount of money received for work done, investments or providing services as well as products.
Fixed Expenses	These are amounts that must be paid every month and stays the same for a period, like rent, school fees and transport costs.
Variable Expenses	Expenses that change over time or from one week/month to the other but the amount changes e.g. telephone and electricity costs.
Variable Income	an amount of money a person receives, and it changes over time, or changes according to the situation
Fixed Income	An amount of money a person receives, which does not change with time. Salaries and wages are examples of fixed income
Expenditure	The total amount of money that an institution/individual or person spends.
Profit	A financial gain, especially the difference between the amount earned and the amount spent in buying, operating, or producing something.

Surplus	An excess of something, or an amount remaining once the demand for the item has been met
Loss/Deficit	The difference between total income and total expenditure (where expenses are higher than income)
EFT	Electronic Funds Transfer
ATM	Automated Teller Machine, you can withdraw money, check your balance, or even transfer funds at an ATM.
Salary	A fixed amount of money paid by an employer to an employee for work done over some longer period – usually per month or per year. .
Gross Income	The total amount of all an individual's income before deductions.
Nett Income	The amount an employee “takes home” after income tax has been deducted
Break-even point	Break-even point is where the business is at an activity level (doing business) at which total cost = total sales,
Budget	A plan of how to spend money. An estimate of income and expenditure.
Capital	Money that is owned by someone and used for the purpose of investing or lending.
Cost rate	The price of a product per mass, volume, length or time unit.
Deposit	A payment made into a bank account.
Fixed Deposit	A single deposit invested for a fixed period at a fixed interest rate.
Gross Income	The total amount of all an individual's income before deductions.
Nett Income	The amount an employee “takes home” after income tax has been deducted.
Invoice	A comprehensive document that details all the work done or items sold, and what costs are due.

Worked Example

1. The Minister of Finance, Mr. Enoch Godongwana delivers his budget speech at the beginning of the new financial year. The financial year starts on the 1st March of the current year and ends on the last day of February the following year. A summary of the 2022/2023 National budget is shown below.



Use the information above to answer the questions that follow.

- 1.1 Define the term “Budget” according to the given context.

(2)

Possible answer:

A list of expected income and expenditure for a set period of time.

OR

An estimate of income and expenditure for a set period of time.

OR

Projections of future income and expenditure

- 1.2 Write down the government's main source of income in the 2021/2022 National budget. (2)

Possible answer:
Taxes

- 1.3 Calculate the total income received by the National Treasury in 2021/2022. (2)

Possible answer:
Total income = (R 1 365,1 + R 482.6 + R 32.5) billion
= R 1 880.2 billion

OR

Total income = R13 651 000 000 + R4 826000 000 + R 32 5000 000
= R 18 802 000 000

- 1.4 Write down the number of days for this financial year. (2)

Possible answer:
12 months

- 1.5 Write down the name of the Department with the least allocation of spending. (2)

Possible answer:
Post-school education and training

- 1.6 Calculate the difference between the amount allocated to Basic Education and the amount allocated to Post School education and training. (2)

Possible answer:
Difference = R 272.3 billion – R 119.6 billion
= R152.7billion

OR

Difference = R 272 3000 000 – R 119 6000 000
= R 152 7000 000

ACTIVITY 1

1. Zenzile Secondary School compared the income from school fees over the past two years. The school fee per learner is R16 580 per year. The amount is paid in 10 even monthly payments throughout the year. The first two months must be paid in full before school reopens for the year.

TABLE 4: INCOME FROM SCHOOL FEES FOR 2020 AND 2019

Month	2020		2019	
	No of learners enrolled per month	Amount received per month	No of learners enrolled per month	Amount received per month
January	736	R 1 220 288	725	R 1 202 050
February	736	R 1 220 288	726	R 1 203 708
March	734	R 1 192 632	730	R 1 198 236
April	733	R 1 178 854	730	R 1 186 133
May	730	R 1 137 719	730	R 1 186 133
June	724	R 1 128 368	729	R 1 172 421
July	721	R 1 061 531	733	R 1 191 007
August	723	R 1 102 835	733	R 1 191 007
September	722	R 1 137 222	734	R 1 204 802
October	716	R 1 127 771	736	R 1 208 085
TOTAL PER ANNUM	7275	R 11 507 508	7306	R 11 943 582

Use the table above and answer the following questions.

- 1.1 Write down the total per annum amount received in 2020 in words. (2)
- 1.2 Determine the total amount received for January, February and March in 2019. (3)
- 1.3 Show how the amount received for January 2020 was determined if all the learners' school fees were paid in full. (3)
- 1.4 Determine the percentage difference between the actual total income for 2019 and 2020. You may use the following formula: (3)

$$\% \text{ difference} = \frac{\text{2020 income} - \text{2019 income}}{\text{2019 income}} \times 100\%$$
- 1.5 The principal predicted that the school received 13% less school fees than what was expected for July 2020. Verify, showing ALL calculations if the prediction was correct. (6)
- 1.6 Explain the trend of the number of learners enrolled in 2020. Give ONE reason for the impact observed in both years. (4)

ACTIVITY 2

Goitsemodimo is an insurance saleslady and earns a basic salary of R12 000 per month plus a commission. In September 2024 she expects to make R22 000 in commission plus R8 120 bonus.

Her monthly expenses are as follows:

- ☐ Rent = R 8 500
- ☐ Fuel = R2 500
- ☐ Electricity = R800
- ☐ Monthly gym membership = R350
- ☐ Car payment = R 4 600
- ☐ Insurance = R1 975
- ☐ Cell phone = R800
- ☐ Groceries = R3 000
- ☐ Entertainment = R1 700
- ☐ Water usage = R400

Use the information above to answer the questions that follow.

- 1.1 Use the ANSWER SHEET provided below to construct Goitsemodimo's September 2024 budget.

INCOME in Rand (R)		EXPENSES in Rand (R)	
TOTAL =		TOTAL =	

(6)

- 1.2 Express Goitsemodimo's:

(a) ratio of entertainment expenses to rent expenses in the form 1: ...

(2)

(b) variable expenses as a percentage of her basic salary.

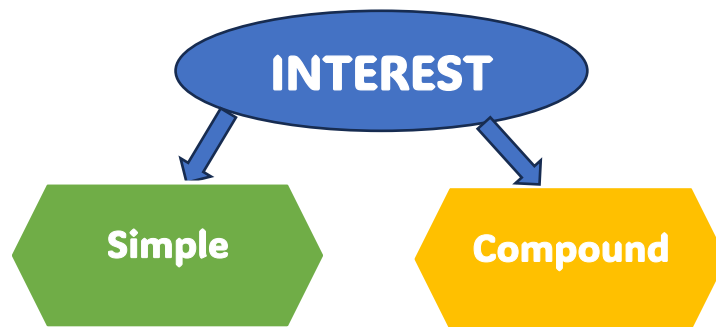
(4)

SECTION: INTERESTS

LESSON OBJECTIVES

Learners must know how to:

- The difference between **simple** and **compound** interest.



Simple Interest:

- Calculated only on the principal amount and is the same each time it is paid.
- If we know what the interest rate is, we can calculate the amount of interest quite simply.
- The amount of interest payable depends on the interest rate.
- The lower the interest rate, the lesser the payment and,
- The higher the interest rate, the more the payment.

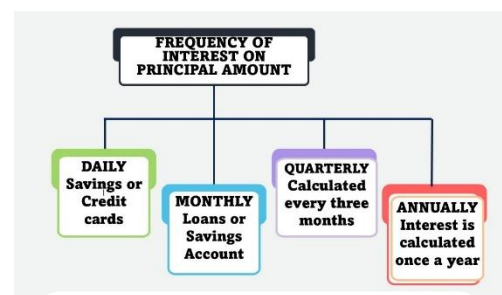
Principal
the original amount
of money invested or
borrowed.

Compound Interest:

- Unlike simple interest, Compound interest is
- Calculated on the total/accumulated amount.
- Interest increases constantly.
- It yields more interest over time than simple interest.

Key concepts of simple and compound interest:

- Principal Amount
- Interest Rate



Compounding Frequency
How often interest is calculated and added to the principal

IMPORTANT TERMS AND DEFINITIONS	
INTEREST	
Interest	The actual rand amount of interest that will be added to your loan or investment.
Interest rate	This is the % rate of interest that will be charged on your loan amount, i.e. a percentage value of the original loan amount.
Fixed Deposit	A single deposit invested for a fixed period at a fixed interest rate.
Investment	Something in which you have invested money. Money invested for specific period.
Loan	A sum of money borrowed from a lender, typically a bank or financial institution, with the agreement to pay it back in instalments, usually with interest, within a set timeframe.
Simple Interest	Interest earned only on the principal amount.
Compound interest	Interest earned on both principal and accrued interest.
Compounding Frequency	How often interest is calculated and added to the principal
Secured Loans	Backed by collateral, such as a house or car, which can be seized by the lender if repayments aren't met. Examples include mortgages and auto loans.
Unsecured Loans	Don't require collateral but often have higher interest rates. Examples include personal loans, credit card debt, and student loans.
Effective rate	Actual interest rate paid or earned, considering compounding.
APR	(Annual Percentage Rate): Total interest rate charged on a loan over a year.

- Time Period
- Compounding Frequency

Worked Example

- 1.1 Miss Matsheka wants to invest R12 000,00 into her saving account for 5 years. She will earn 10% simple interest per annum.

Use the information above and answer the questions that follow.

- 1.1.1 Identify the interest rate for the investment.

Possible solution

10%

(2)

- 1.1.2 How much will Miss Matsheka have in total after 5 years?

Possible solution

$$\frac{10}{100} \times R12\,000,00$$

$$= R1\,200,00$$

$$R1\,200 \times 5 \text{ years}$$

$$= R6\,000,00$$

$$\text{Total amount} = R6\,000,00 + R12\,000,00$$

$$= R18\,000,00$$

(5)

- 1.2 Mr. Mbhele will not be able to pay his society fee in November due to his financial commitments. The society charges 10% interest rate for any member who fail to pay his/her contribution.

NOTE: A society is like a stokvel to which people belong to save money for future use

- 1.2.1 What is the difference between interest and interest rate?

Possible solution

- **Interest – extra money you earn from the savings.**
- **Interest rate – the rate at which interest is calculated**

(2)

- 1.2.2 Mr Mbhele claims he could have saved R300,00 if he did pay for his Society. Verify with calculation whether his claim is valid or not.

Possible solution

$$R3000 \times \frac{10}{100}$$

$$= R300$$

Statement is valid

(3)

- 1.3 Namhla and Grace do not have money to fund their “Thanksgiving” ceremony. They approached their uncle who owns a registered cash loan shop to lend them a total amount of R9000, 00. Their uncle agreed to offer them the loan on conditions that they pay it back in 3 years at a rate of 3% simple interest per annum

- 1.3.1 Explain the difference between “interest rate” and “interest” values.

(4)

Possible solution

Interest rate – the rate at which interest is calculated. OR: Accept also: The percentage at which interest is paid.

Interest – money paid at a particular (interest) rate for the use of money lent/borrowed

- 1.3.2 Calculate the total amount Namhla and Grace will have to pay to their uncle at the end of the 3 year term, if the interest payable per year is R270

Possible solution

$$\text{R270} \times 3 = \text{R810}$$

$$\text{R9 000} + \text{R810} = \text{R9 810}$$

(4)

- 1.4 Miss De Waal decided to take a personal loan in order to buy the dining room suite in cash. She went to two Banks and was offered the following:

Bank A: R20 000 at 10% p.a. Simple interest for 3 years.

Bank B: R20 000 at 11,5% p.a. Compound interest for 2 years.

Determine, showing ALL calculations, which option will be cheaper for Miss De Waal.

Possible solution

Simple interest - Bank A

$$\begin{aligned}\text{Interest} &= \text{R20 000} \times \frac{10}{100} \\ &= \text{R2 000}\end{aligned}$$

$$\begin{aligned}\text{Total interest} &= \text{R2 000} \times 3 \\ &= \text{R6 000}\end{aligned}$$

$$\begin{aligned}\text{Total amount} &= \text{R20 000} + \text{R6 000} \\ &= \text{R26 000}\end{aligned}$$

Compound interest – Bank B

$$\begin{aligned}\text{1st year} &= \text{R20 000} \times \frac{11,5}{100} \\ &= \text{R2 300} \\ &= \text{R20 000} + \text{R2 300} \\ &= \text{R22 300}\end{aligned}$$

$$\begin{aligned}\text{2nd year} &= \text{R22 300} \times \frac{11,5}{100} \\ &= \text{R2 564,50} \\ &= \text{R22 300} + \text{R2 564,50} \\ &= \text{R24 864,50}\end{aligned}$$

Bank B is cheaper.

(8)

ACTIVITY 1:

Debbie wants to buy a water purifying system for her drinking water. The following options are available for her.

PAYMENT OPTIONS	PICTURE OF A WATER PURIFYING SYSTEM
Option 1: The cash price is R2 299 Option 2: • R216 per month • The amount includes insurance and service fee • 24 months to pay • Interest 17,25% p.a. Option 3: • R211 per month • Amount excludes insurance and service fee • 12 months • Interest 17,5% p.a.	 The image shows a Reverse Osmosis System. It consists of three large, cylindrical water filters arranged in a row. Above them is a horizontal component, likely a pump or a pressure tank. To the right of the filters is a large, white, rectangular storage tank. The entire system is connected by various pipes and hoses. The text 'Reverse Osmosis System' is visible on the horizontal component.

Use the information above to answer the questions that follow.

- 1.1 Write the acronym *p.a.* in full. (2)
- 1.2 Calculate the amount of interest p.a. charged in option 3. (3)
- 1.3 Debbie told her domestic worker that she would pay more than double the cash price if she chose to buy using option 2. (5)

Verify, showing all calculations, if Debbie's statement is correct.

ACTIVITY 2:

- 1.1 Mr Lambert is planning to buy a house and he realizes that the 105% home loan from the bank will not be enough to cover all the costs. His friend is willing to give him a loan of R7 000 to be paid back in full after 2 years with the following conditions:
- Simple interest at 11,75% p.a for the first year.
 - 12% p.a compounded half yearly for the second year.

Use the information above to answer the following questions

1.1.1 Calculate the compounded half yearly interest rate for 6 months (2)

1.1.2 Manually calculate the total amount Lambert will have to pay his friend at the end of 2 years (6)

- 1.2 Niel owns a panel beating business. He specialises in buying accident-damaged cars which he refurbishes (repairs, repaints, valets) for resale.

He invests R15 000 of his total profit in a bank which offers him the following interest rates:

6,25% interest compounded yearly for the first year and an interest rate of 6,95% compounded yearly for the second year.

- 1.2.1 Calculate the total interest that Niel's investment would earn at the end of the second year. (6)

BODY MASS INDEX (BMI) AND GROWTH CHARTS

Introduction:

Body Mass Index (BMI):

- Is a measure of body weight, based on a person's weight and height.
- The BMI can then be used to classify a person's weight status, as underweight, normal, overweight or obese.
- Percentiles are used to categorize BMI in children and adolescents, while adults are categorized based on BMI ranges.

The following table is based on the BMI classification table. The following table is based on the BMI classification table.

BMI-for-Age Percentiles for Children and Adolescents			
Underweight • BMI < 5th percentile	Normal Weight • BMI = 5th-84th percentile	Overweight • BMI = 85th-94th percentile	Obese • Obese: BMI ≥ 95th percentile

BMI Categories for Adults			
Underweight • BMI < 18.5	Normal Weight • BMI = 18,5-24,9	Overweight • BMI = 25-29,9	Obese • Obese: BMI ≥ 30

Importance of monitoring BMI:

1. Health risks: BMI can indicate potential health risks associated with weight.
2. Monitoring growth: BMI-for-age percentiles help track growth and development in children and adolescents.
3. Public health: BMI data inform public health initiatives and policies.

NB: Keep in mind that BMI has limitations, such as not accounting for muscle mass or body composition.

Measurement

BMI and Growth chart

WORKED EXAMPLE.

1. The 2023 Rugby world cup was played in France; South Africa defended their title and won the trophy for the fourth time. The Finals were played in Paris at Stade de France stadium which has the capacity of 81 338. The dimensions of the rugby field are $119\text{m} \times 75\text{ m}$

Picture of South African Rugby team (affectionately known as the Springboks)



[source:www.bing.com]

Use the information above to answer the questions that follow.

1. Define the term capacity in the given context. (2)

Possible solution:

Capacity is the maximum amount of people that can be accommodated inside Stade de France.

2. Write 81 338 in words. (2)

Possible solution:

Eight – one thousand three hundred and thirty-eight people.

3. Siya Kolisi the captain of the Springboks has a BMI of $29,8\text{ kg/m}^2$ and weighs 103 000 g. calculate his height in cm. (4)

You may use the following formal:

$$\text{BMI} = \frac{\text{weight in kg}}{(\text{height})^2}$$

Possible solution:

$$H^2 = \frac{103}{29,8}$$

$$H = \sqrt{\frac{103}{29,8}}$$

$$H = 1,5591.... \quad \text{MH} = 1.86 \text{ m}$$

$$H = 186 \text{ cm}$$

ACTIVITY 1

1. Carlos has a mass of 149 pounds and the height of 1,52 m.

Hint: 1 pound = 0,454 kg

TABLE 2 below shows the weight status of an adult according to their BMI

TABLE 2: WEIGHT STATUS OF AN ADULT

BMI (kg/m ²)	WEIGHT STATUS
<18, 5	Underweight
18,5 – 24,5	Normal or healthy
25 – 30	Overweight
>30	Obese

Use the information above to answer the questions that follow.

- 1.1 Calculate the mass (to the nearest kg) of Carlos. (3)

- 1.2 Calculate Carlos's BMI (in kg/m²)

You may use the formula:

$$\text{BMI} = \frac{\text{Weight in kg}}{(\text{height in m})^2} \quad (2)$$

- 1.3 Determine Carlos weight status. (2)

2. Ruth is a mother to twins Nick and Nicolene. She is very health conscious and regularly monitor their Body Mass Index (BMI). On a particular day, she recorded the twins mass and height as follows.

TWIN	MASS	HEIGHT
NICK	56 kg	1,65 m
NICOLENE	45 kg	60 inches

NOTE: 1 cm – 0,3937 inches

Use the information above to answer the questions that follow.

2.1 Convert, rounded off to TWO decimal places, Nicolene's height to metres. (3)

2.2 Ruth states that, the difference between the twin's BMI is less than 1 kg/m^2

Verify, showing ALL calculation, whether her statement is CORRECT.

You may use the following formula:

$$\text{BMI} = \frac{\text{Mass in kg}}{(\text{Height in m})^2} \quad (6)$$

ACTIVITY 2

1. Queen wants to lose weight to achieve a normal BMI. She is currently weighing 89 kg and is 160 cm tall. In table 3 the BMI categories for adults are shown.

TABLE 3: BMI CATEGORIES FOR ADULTS

Status	BMI range (kg/m^2)
Underweight	$>18,5$
Normal weight	$18,5 - 24,9$
Overweight	$25 - 29,9$
Obese	≥ 30

Use the information above to answer the questions that follow.

1.1 Write the acronym BMI in full. (2)

1.2 Determine the weight Queen must lose to achieve a BIM of $24,9 \text{ kg/m}^2$.

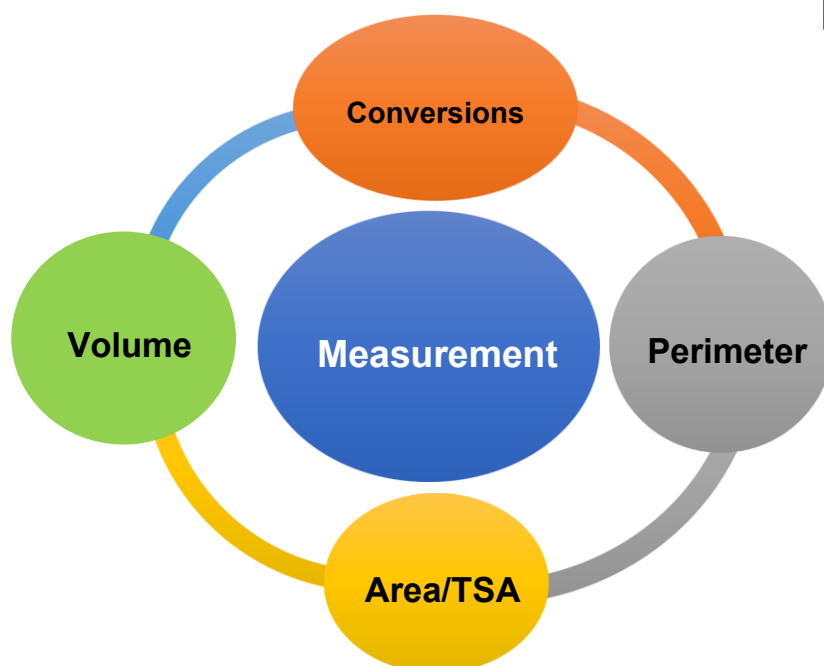
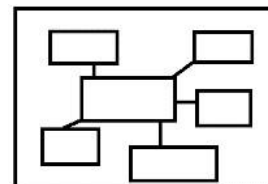
Round your answer to the nearest whole number.

You may use the formula:

$$\text{Weight} = [\text{height (m)}]^2 \times \text{BMI} \quad (6)$$

1.3 Identify the weight status of a person with a BMI of $27,6 \text{ kg/m}^2$. (2)

MEASUREMENT: LIST OF SECTIONS



TERMINOLOGY

Measurement	
Distance	Length of a line joining any two points.
Actual/true/real distance	Real distance between any two points.
Radius	A straight line from the centre to the circumference of a circle or sphere
Diameter	A straight line passing from side to side through the centre of a body or figure, especially a circle or sphere.
Circumference	The distance around the edge of a circle (or any curvy shape).
Two-dimensional shape	It is a shape with length and width (breadth), without height. Examples of such shapes are, <i>a page of a book or ordinary page, a floor of a room, a circle.</i>
Area	The amount of space inside the boundary of a flat (2-dimensional) object (It is measured in square units e.g., m^2 , cm^2 , etc.)

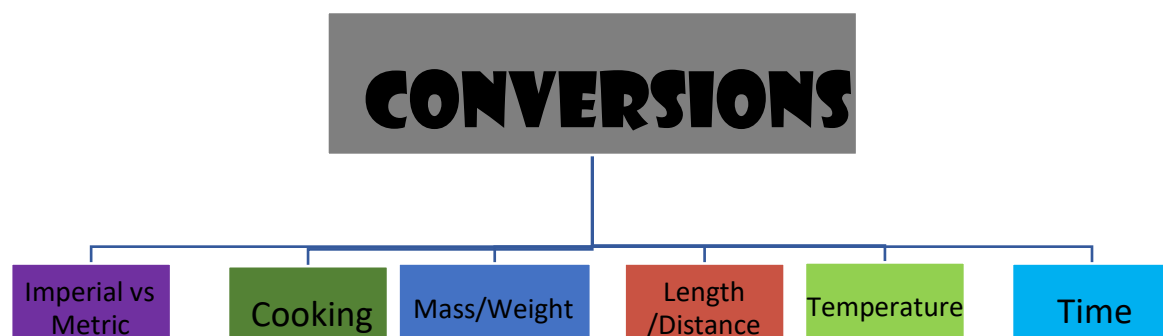
Perimeter	is the total length/distance around a shape or around the boundary. Perimeter of a circle is called the circumference.
Prism	A 3-dimesional shape that has the same shape (and size) on both ends an the same thickness along the entire shape.
Surface Area	It is the sum of the areas of all faces of the shape. By calculating the surface area you can be able to know the amount of material needed to build or make the particular shape or object.
Volume	is the amount of space that an object or substance occupies.

Conversion

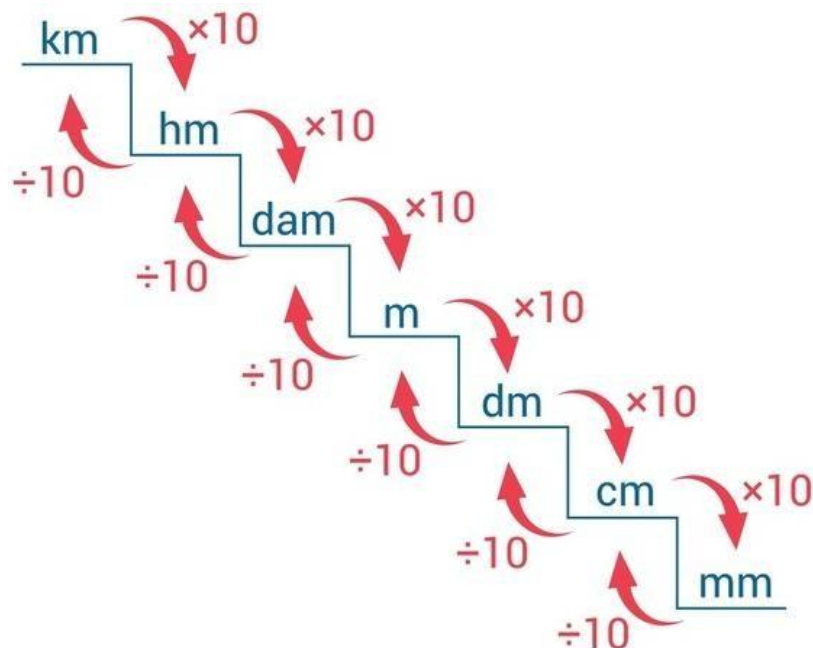
- Being able to convert measurements is important for many household tasks including cooking and baking.
- You need to understand why and when we use different measurement units in different contexts.

For exam purpose, as a learner you must be able to

- convert metric units of length, volume and weight from memory.
- convert cooking units using a given table.
- read, calculate and convert different time units and formats.
- use timetables and calendars for personal planning and time management



Basic Conversions (Not given in the exam, learners must know)



Imperial to Metric (Always given in the exam)

1 inch (in) = 2,54 cm
 1 yard (yd.) = 0,9144 m
 1 mile (mi) = 1,6093 km
 1 foot (ft.) = 0,3048 m
 1 ounce(mass) = 28,35g
 1fluid ounce = 29,57ml
 1 gallon= 3,8 litres

Cooking conversions

- 1 cup = 250 ml
- 1 tablespoon (tbsp.) = 15 ml
- 1 teaspoon (tsp) = 5 ml
- 1 dozen = 12 units



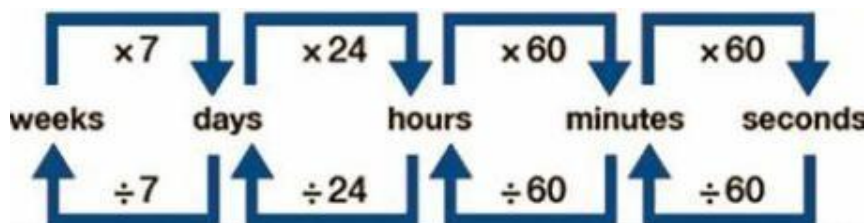
Conversions with time

Equivalent units:

60 mins = 1 hour (hr)
 24 hrs = 1 day
 7 days = 1 week
 52 weeks = 1 year
 12 months = 1 year
 365,25 days = 1 year
 366 days = 1 leap year (a leap year occurs after 4 years, the 4 quarters make up an extra day)



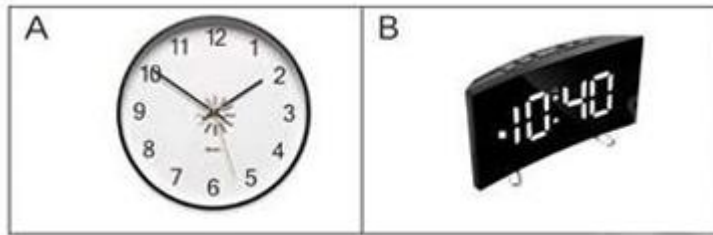
Conversions with time



Measurements Conversions and Time

WORKED EXAMPLE

1. During the check- up visit, the doctor advised Eunice that having a regular schedule during the day can help her child's sleep stay on track. Eunice uses the two types of clocks shown below to monitor the time.



Use the information above to answer the questions that follows.

- 1.1 Write down the time displayed on clock B in words if the time format for the clock is 24 – hour time. (2)

Possible solution:
Twenty to Eleven in the morning

- 1.2 The child slept at the time displayed on clock A in the afternoon. Write down the time in 24 – hour format. (2)

Possible solution:
13:50

- 1.3 Eunice went to Heilbron with the child to visit her mom. She left home at the time displayed on clock B and arrived in Heilbron at 14:10.

Determine the time, in hours, taken to reach her home. (2)

Possible solution
14:10 – 10:40
= 3 hour 30 minutes
= 3,5 hours

2. Adam also intends painting the two walls using the Ultra Zerovoc interior latex paint. The information about the latex paint is given below.

INFORMATION	
Latex paint • Dry to the touch in about 1 hour, and there after you can safely recoat in 4 hours. • 1 ℓ paint will cover 6 metres squared (m²) of wall.	
NOTE: 1 gallon = 3,785 ℓ	
[Adapted from https://www.dulux.ca/pro/products/interior-paint/ultra-zero-cov]	
NOTE 1 gallon = 3,785 ℓ	

Use the information above to answer the questions that follow.

- 2.1 Convert 3,785 litres (ℓ) to millilitres (mℓ). (2)

Possible solution:

$$3,785 \text{ ℓ} \times 1\,000$$

$$= 3\,785 \text{ mℓ}$$

- 2.2 It will take Adam 60 minutes to paint the two walls.

Determine the time that Adam must start painting if he wasn't to apply the second coat at 11:30. (3)

Possible solution:

Starting time

$$= 11:30 - 1 \text{ hour} - 4 \text{ hours}$$

$$= 06:30$$

- 2.3 Adam rounded the total surface area up to 35 m², in case he needs more paint.

Calculate the amount of paint Adam will use to paint the garage walls.

Round the amount of paint needed up to the nearest 5 ℓ. (3)

Possible solution:

Total number of litres needed

$$= \frac{35 \text{ m}^2}{6 \text{ m}^2}$$

$$= 3,83333333333333 \text{ ℓ}$$

ACTIVITY 1

1. Thami started baking the cake at 19:48 and the cake was ready at the time displayed on the clock below due to load shedding interruptions.



[Source: www.freepik.com]

Use the information above to answer the questions that follow.

- 1.1 Express the time displayed on the clock in 24 – hour format. (2)
- 1.2 Determine the time take for the cake to be baked. Express your answer in hours. (3)
- 1.3 Suggest an alternative source of power that can be used to beat loadshedding. (2)

- 2 Below are some of the ingredients used in the malva pudding recipe.

Ingredients	Picture of malva pudding
$1\frac{1}{2}$ cup of brown sugar 90 ml of apricot jam 375 g of flour 75 g of baking powder	

[From <https://www.eatout.co.za>]

NOTE: 1 tablespoon = 15 ml
1 cup = 250 g

Use the information above to answer the questions that follow.

- 2.1 Determine the number of tablespoons of apricot jam needed for the recipe. (2)
- 2.2 Write down the unit ratio of baking powder to flour. (3)
- 2.3 Express the amount of brown sugar in kg. (3)

ACTIVITY 2

1. Phindi bought the following ingredients to prepare a ginger drink.
 - 25 g of ginger (powder)
 - 12,5 g tartaric acid
 - 1 kg brown sugar
 - A bucket with a capacity of 10 000 cm³

This drink serves 40 people.

NOTE:

1 teaspoon = 5 g

1 litre = 1 000 litre

- 1.1 Define the term capacity in this context. (2)
- 1.2 Express ginger to tartaric acid as a simplified ratio. (2)
- 1.3 How many teaspoons of tartaric acid are required to prepare ginger drink? (2)
- 1.4 Convert 10 000 cm³ to litres. (2)
- 1.5 Determine the amount of sugar that is required to prepare a ginger drink that can serve 200 people. (2)

2. Mr Modise stays in Horizon View. He works in Rosebank and travels by bus to and from work daily. ANNEXURE C shows different bus timetables. It is only valid during the week.

ANNEXURE C

BUS TIMETABLE FROM WESTGATE CENTRE			
 430 Westgate Centre Sandton Square via ROSEBANK			
	BUS 1	BUS 2	BUS 3
FROM WESTGATE CENTRE	6:00	6:15	6:30
Horison View	6:02	6:17	6:32
Horison	6:05	6:20	6:35
Rooდეpoort-North	6:10	6:25	6:40
Discovery	6:20	6:35	6:50
Florida	6:30	6:45	7:00
Maraisburg	6:40	6:55	7:10
Delarey	6:50	7:05	7:20
Newlands	6:55	7:10	7:25
Sophiatown	6:57	7:12	7:27
Greymont	6:59	7:14	7:29
Montgomery Park	7:04	7:19	7:34
Parktown-North	7:12	7:27	7:42
Rosebank	7:17	7:32	7:47
Illovo	7:20	7:35	7:50
Sandton Square	7:30	7:45	8:00
Rivonia			8:10
Sunninghill			8:25

[Source: <https://www.gapbs.co.za>]

Use the bus timetables on ANNEXURE C to answer the questions that follow.

- 2.1 Calculate the time taken to travel with BUS 1 from Horizon View to Rosebank. (3)

- 2.2 Mr Modise gets off the bus at 07:17 and walks for 15 minutes to his workplace. He rests for 10 minutes before he starts to work. He works for 9 hours and 45 minutes including breaks per day.

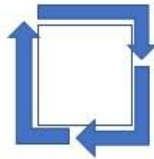
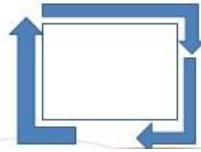
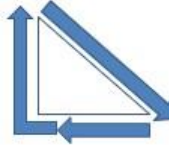
Verify, showing ALL calculations, whether Mr Modise will knock off at 17:00. (4)

What is Perimeter?

- Is the total length/distance around a shape or around the boundary.

Understanding Perimeter

- It is a distance around a shape.
- Measured units are mm, cm, m and km.
- Perimeter of a circle is called the circumference.
- Shapes are one dimensional.

Square	Rectangle	Triangle	Circle
			

How to calculate Perimeter

- For any shape with straight lines: Add the lengths of all the sides.
- For specific shapes like, square, rectangle and circle: A formula will always be provided.

Note: Make sure that all units are the same before you start with your calculations.

Rectangle



162 cm

mm
800

$$\text{Perimeter} = 2 \times (\text{length} + \text{width})$$

$$\text{✗} \quad = 2 \times (162 \text{ cm} + 800 \text{ mm})$$

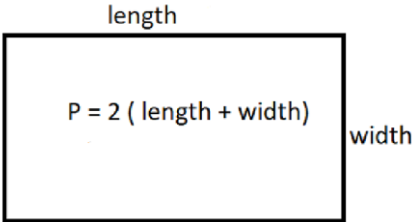
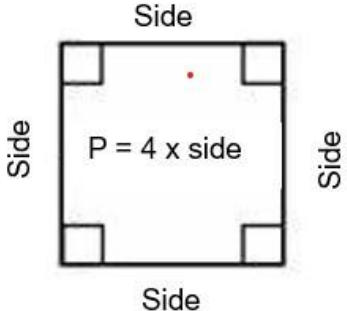
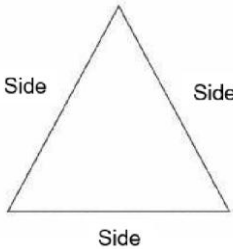
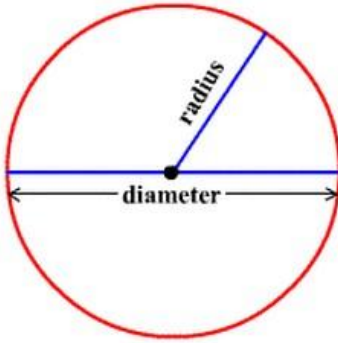
$$= 1924 \text{ mm}$$

$$\text{Perimeter} = 2 \times (\text{length} + \text{width})$$

$$\text{✓} \quad = 2 \times (1620 \text{ mm} + 800 \text{ mm})$$

$$= 4840 \text{ mm}$$

Shapes involved when calculating Perimeter:

Shape	Perimeter Formula	
Rectangle	Perimeter $= 2 \times \text{length} + 2 \times \text{width}$	
Square	Perimeter = $4 \times \text{length}$ OR Perimeter = $4 \times \text{sides}$	
Triangle	Perimeter = Length 1 + length 2 + length 3	
Circle	Perimeter (Circumference) $= \pi \times (2 \times \text{radius})$ OR Perimeter (Circumference) $= \pi \times \text{diameter}$ Note $\pi = 3,142$	

Area

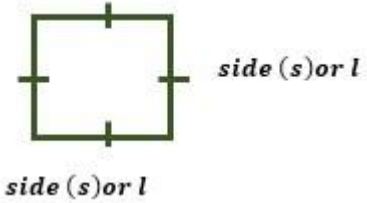
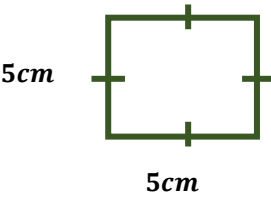
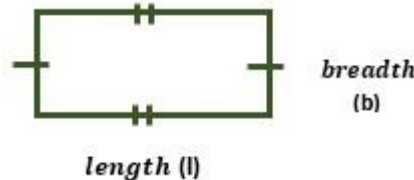
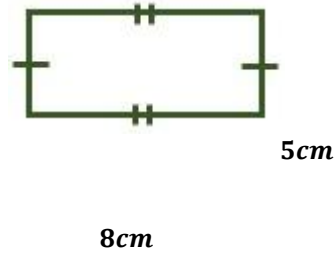
What is an area?

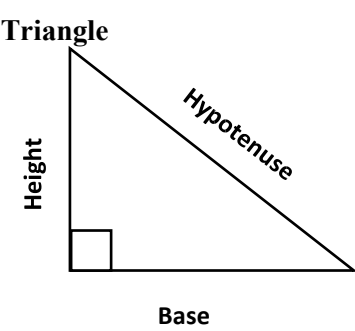
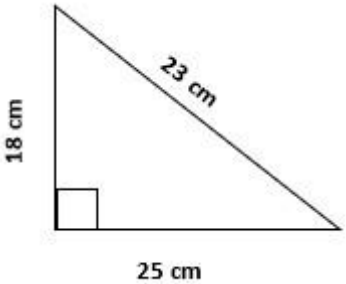
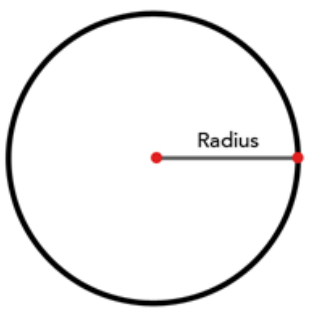
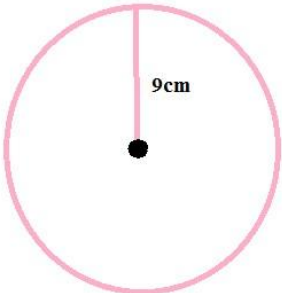
- The amount of space inside the boundary of a flat (2-dimensional) object

Understanding Area

- Shapes are two dimensional (2D).
- It is measured in square units, e.g., cm^2 , m^2 , mm^2 , etc)

Area of a square, rectangle, triangle, and circle.

Shape	Area (A)	Worked Examples
Square 	$\text{Area} = \text{side} \times \text{side}$ $= (\text{side})^2$	 $\text{Area} = \text{side} \times \text{side}$ $= 5\text{cm} \times 5\text{cm}$ $= 25\text{cm}^2$
Rectangle 	$\text{Area} = \text{length} \times \text{breadth}$	 $\text{Area} = \text{length} \times \text{breadth}$ $= 8\text{cm} \times 5\text{cm}$ $= 40\text{cm}^2$

Triangle 	Area $= \frac{1}{2} \times \text{base} \times \text{perpendicular height}$	 Area $= \frac{1}{2} \times \text{base} \times \text{perpendicular height}$ $= \frac{1}{2} \times 25 \text{ cm} \times 18 \text{ cm}$ $= 225 \text{ cm}^2$
Circle 	Area = $\pi \times \text{radius}^2$ $= \pi \times r^2$	 Area = $\pi \times \text{radius}^2$ $= \pi \times r^2$ $= 3,142 \times 9^2$ $= 254,5 \text{ cm}^2$

Working with Area

- When working with complex shape, break it down into smaller (basic) shapes.
- Add all the areas of the smaller (basic) shapes to get the area of the complex shape.
- Make sure that all the units are the same.
- Rounding must only be done at the end of the calculations.
- Rounding must always be done according to the context.

Surface Area

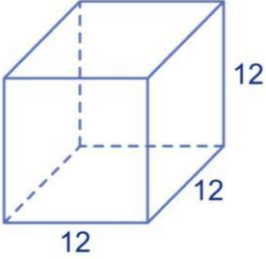
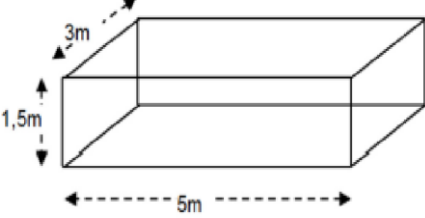
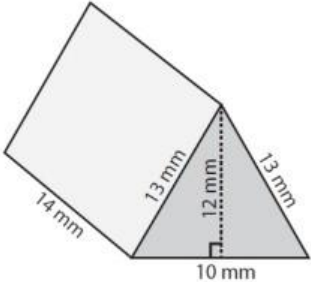
What is Surface Area?

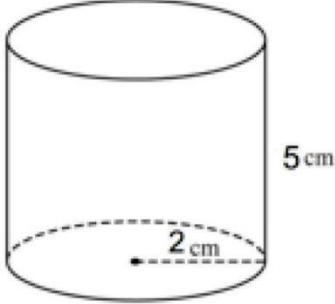
- The total exterior area of all the exposed surface area a 3D object.

Understanding Area

- Shapes are three dimensional (3D).
- The difference between the total surface area (TSA) and area is that the total surface area refers to 3D objects and the area refers to 2D objects.
- It is measured in square units, e.g., cm^2 , m^2 , mm^2 , etc)

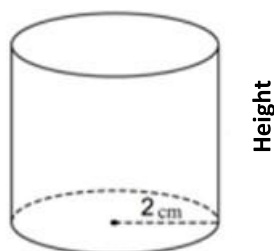
Total Surface Area of a rectangular prism and cylinder.

Shape	Total Surface Area (TSA)	Worked Examples
Cube 	Total Surface Area (TSA) = 6 x side	Total Surface Area (TSA) = 6 x side = 6 x 12 = 72 units²
Rectangular Prism  Length = 5m Breadth = 3m Height = 1,5m	Total Surface Area (TSA) = (2 x length x breadth) + (2 x length x height) + (2 x breadth x height)	Total Surface Area (TSA) = (2 x 5m x 3m) + (2 x 5m x 1,5m) + (2 x 3m x 1,5m) = 54 m²
Triangular Prism  Breadth = 10 mm height = 12 mm side = 13 mm Height = 14 mm	Total Surface Area = 2 x ($\frac{1}{2}$ x breadth x height) + (side + side + side) x Height	Total Surface Area = 2 x ($\frac{1}{2}$ x 10 x 12) + (13 + 13 + 10) x 14 = 624 mm²

Cylinder 	Total Surface Area = $2 \times (\pi \times \text{radius}^2) + (2 \times \pi \times \text{radius}) \times \text{height}$ Where $\pi = 3,142$	Total Surface Area = $2 \times (3,142 \times 2^2) + (2 \times 3,142 \times 2) \times 5$ $= 87,976\text{cm}^2$
---	--	---

A case where the Total Surface Area is given and there is a missing value.

Total surface area = $87,976\text{cm}^2$



Height

$$\text{T.S.A} = 2 \times (\pi \times \text{radius}^2) + (2 \times \pi \times \text{radius}) \times \text{height}$$

$$87,976 \text{ cm}^2 = 2 \times (3,142 \times 2^2) + (2 \times 3,142 \times 2) \times \text{Height}$$

$$87,976 \text{ cm}^2 = 17,5952 \times \text{Height}$$

$$\frac{87,976 \text{ cm}^2}{17,5952} = \text{Height } 5 \text{ cm}$$

$$\therefore \text{Height} = 5 \text{ cm}$$

Volume

What is a Volume?

- The 3-dimensional space occupied by a gas, liquid, or a solid substance.

What is Capacity?

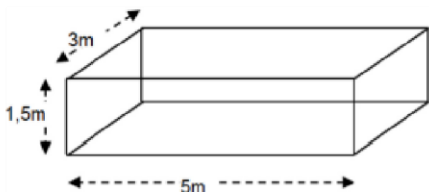
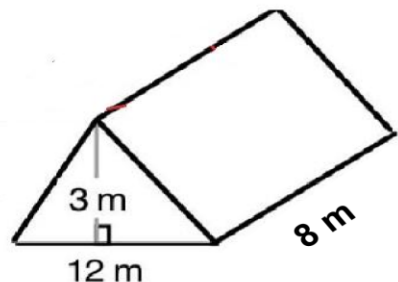
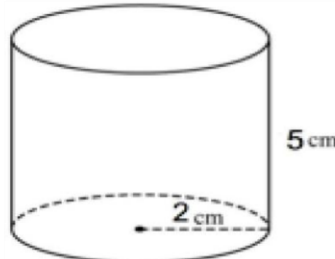
- The amount an object can hold.

E.g., the capacity of the stadium is how many spectators it can hold, whereas the volume is the space they occupy.

Understanding Volume

- It is also known as Capacity.
- Shapes are three dimensional (3D).
- Units of a volume include ml; l and kl
- Units of a solid volume include: mm^3 , cm^3 , m^3 , km^3

Total Surface Area of a rectangular prism and cylinder.

Shape	Volume (V)	Worked Examples
Rectangular Prism  Length = 5m Breadth = 3m Height = 1,5m	Volume = length x breadth x height	$V = 5\text{m} \times 3\text{m} \times 1,5\text{m}$ $= 22,2 \text{ m}^3$
Triangular Prism  Base = 12m height = 3m Height = 8m	Volume = $\frac{1}{2} \times b \times h \times H$	$V = \frac{1}{2} \times b \times h \times H$ $= \frac{1}{2} \times 12\text{m} \times 3\text{m} \times 8\text{m}$ $= 144\text{m}^3$
Cylinder  Radius = 2cm Height = 5 cm	Volume = $\pi \times \text{radius}^2 \times \text{height}$ Where $\pi = 3,142$	$V = 3,142 \times (2 \text{ cm})^2 \times 5\text{cm}$ $= 62,84 \text{ cm}^3$

Calculating Volume

- Make sure that units are the same before substituting into the given formula.
- When the diameter is given, divide it by two to get the radius before substituting into the formula.
- (radius)² does not mean “multiply by 2”.

Measurements

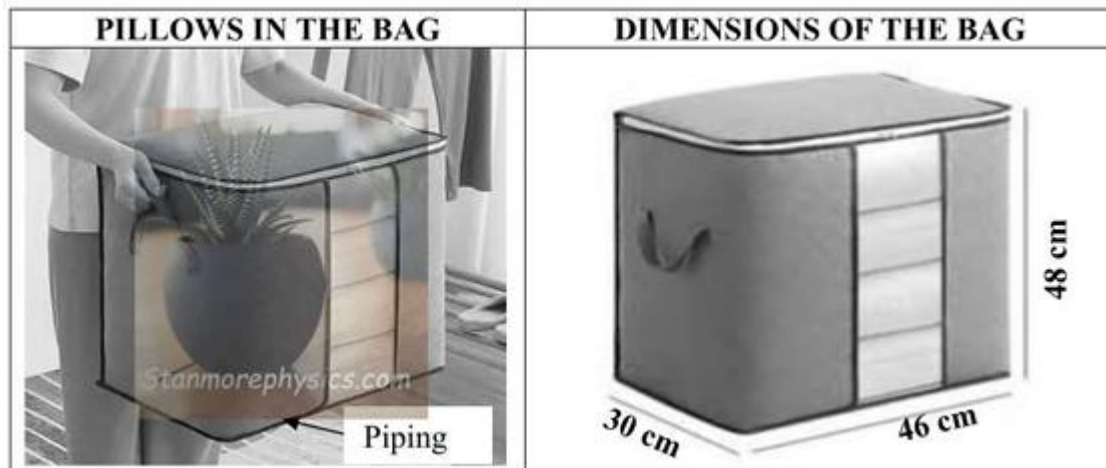
Perimeter and Area

WORKED EXAMPLE

Mrs Kgomo is a Grade 2 educator at Happy Valley Primary School.

She has a reading corner at the back of her classroom. Learners who wait for their transport after school; usually sit there and read a book.

Mrs Kgomo stores in bags (see pictures below). Learners sit on these pillows after school.



[adapted from: www.shein.com]

NOTE: Piping: thin cord covered in fabric used to decorate the bag and reinforce the seams,

Use the information above to answer the questions that follow.

1. Define the term Perimeter in the given context. (2)

Possible solution:

Perimeter is the total length outside the top, side, or bottom of the bag.

2. The height of one pillow is 11 cm

Determine the difference between the total height of the pillows in one bag and height of the bag. (4)

Possible solution:

$$\begin{aligned} &= \frac{48 \text{ cm}}{11 \text{ cm}} \\ &= 4 \text{ pillows} \times 11 \\ &= 44 \text{ cm} \\ &= 48 - 44 \\ &= 4 \text{ cm} \end{aligned}$$

3. The piping around the bottom edge of the some of the bags for the pillows needs to be replaced. The store sells the piping in half – metre lengths.

Calculate the total length of piping she will have to purchase to replace the piping around the bottom edges of FOUR bags.

You may use the following formula:

$$\text{Perimeter} = 2 (\text{length} + \text{Width}) \quad (5)$$

Possible solution:

$$P = (46 + 30)$$

$$P = 2 \times 76$$

$$P = 152 \text{ cm} \times 4$$

$$= \frac{608 \text{ cm}}{6,08 \text{ cm}}$$

$$= 6,08 \text{ m}$$

$$= 7 \text{ m.}$$

4. Calculate the area of the bottom part of the bag. (2)

Possible answer:

$$\text{Area} = 46 \text{ cm} \times 30 \text{ cm}$$

$$= 1\,380 \text{ cm}^2$$

ACTIVITY 1

1. The principal of Rosemary High school was gifted a table decoration by one of the educators. The decoration consists of two wooden bases. Three glass bottles, each containing a flower, were glued to the upper wooden base.

The picture below illustrates the table decoration.



Dimensions:

Top wooden base:

Diameter – 25 cm
Height – 7,9 cm

Bottom wooden base:

Diameter – 36 cm
Height – 105 mm

[Source: FabMood.com]

Use the information above to answer the questions that follow.

- 1.1 Determine the number of flowers on the table decoration. (2)
- 1.2 Determine the radius of the bottom wooden base. (2)
- 1.3 Write down the term used for the line going from the one end, through the middle, to the other end of any circular shape. (2)
- 1.4 Identify, using the letters below, the shape of the wooden bases: (2)
- A Rectangular prism
B Pentagonal prism
C Cylinder
- 1.5 The area of the cylinder can be calculated using the formula:

$$\text{Area} = \pi \times \text{radius}^2$$

Hence, define the term area. (2)

- 1.6 Calculate the perimeter of the top wooden base.

You may use the following formula:

Perimeter of a circle = $\pi \times \text{diameter}$ (2)

- 1.7 Convert the height of the bottom wooden base to centimetres. (2)

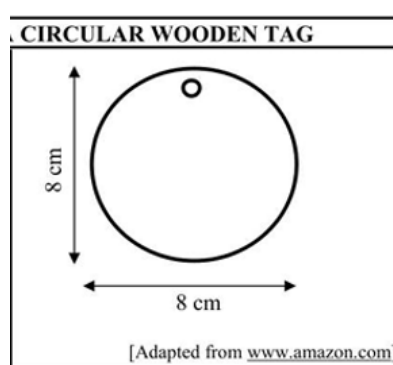
2. Mrs Lamani created a birthday calendar for her 2025 class to hang against the wall.

She will write each learner's name and birthday on a small circular wooden tag and attach the tag to the correct month.

The circular wooden tag has a circular hole to attach a ring that is used to hang the tag. The area of the circular hole is $0,3142 \text{ cm}^2$.

Every year she paints the front surface area of the circular wooden tags.

The spread rate of the paint is $6 \text{ m}^2/\ell$



Use the information above to answer the questions that follow.

- 2.1 Determine, in cm, the circumference of the circular wooden tag.

You may use the following formula:

Circumference of a circle = $3,142 \times \text{diameter}$ (2)

- 2.2 Determine, in cm, the radius of ONE circular wooden tag. (2)

- 2.3 The hardware store sells paint in 50 ml can of paint, 1 litre, 5 litre and 20 litre containers.

Mrs Lamani claims that a 50 ml can of paint will be sufficient to paint ONE side of 36 circular wooden tags.

Verify her statement. Show ALL calculations

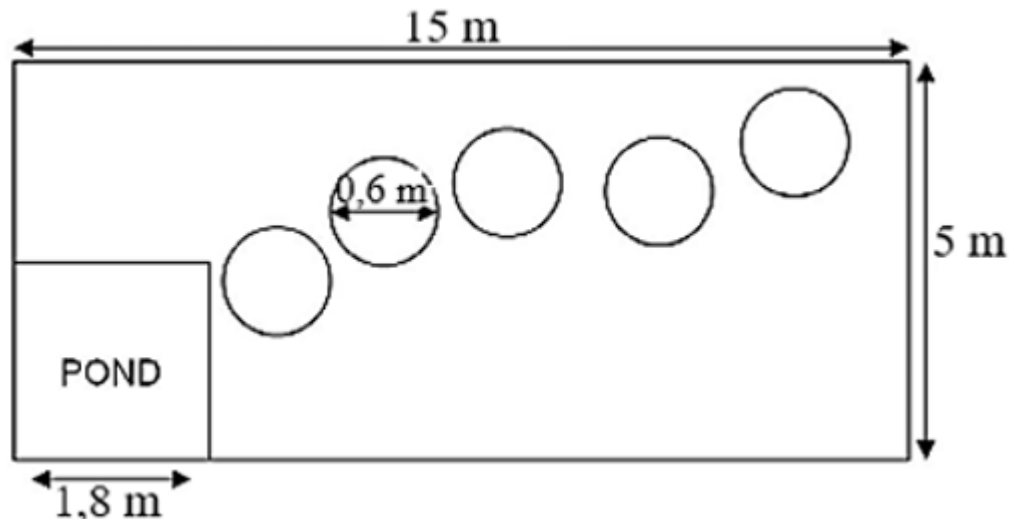
Use the following formula.

Area of a circle = $3,142 \times \text{radius}^2$ (9)

ACTIVITY 2

The Grade 12 learners of Rosemary High School designed a new rectangular garden as a farewell gift for their school when they matriculate. The garden will consist of a square pond at one end, and circular stone tiles forming a walkway to the pond. The area surrounding the pond and walkway will be grassed.

The design of the garden is shown below.



You may use the following formulae:

Area of a rectangle = length $\times$ width

Area of a circle = $\pi \times \text{radius}^2$

Area of a square = side $\times$ side

The steering committee of the gardening project needs to order the stone tiles and grass for the new garden.

1.1 Calculate the area of one of the circular stone tiles. (3)

1.2 Calculate the number of squared metre of grass the committee needs to order for the new garden. (5)

1.3 The nursery where the grass is ordered from charges R45,50 per m² for the grass. The steering committee claims that they will spend less than R3 000 on grass.

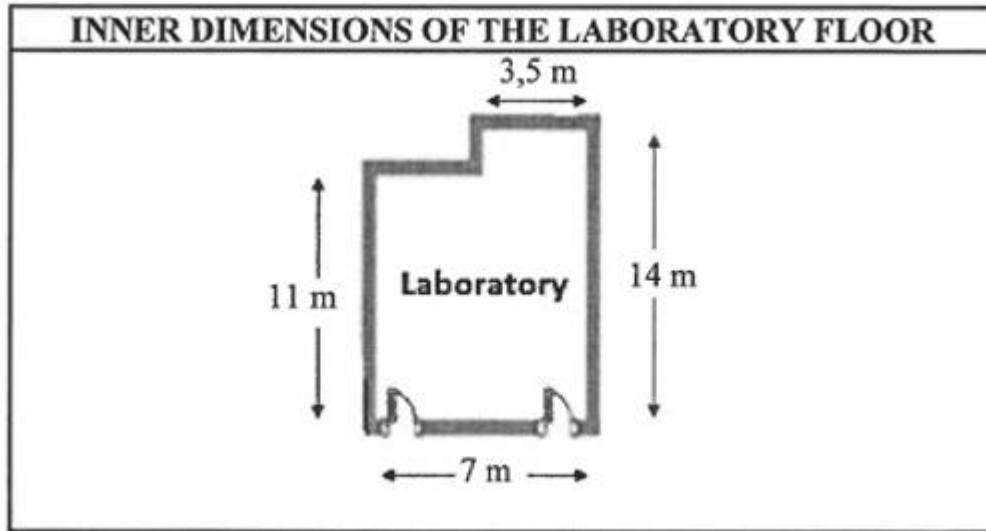
NOTE: The grass can only be bought in full squared metres (m²)

Verify, with necessary calculations if her claim their claim is VALID. (4)

1.4 The laboratory floor needs to be re-tiled.

The dimensions of the tiles that will be used are: 600 mm $\times$ 600 mm.
There are five tiles in a box.

The sketch and inner dimensions of the laboratory floor are below.



The science teacher claimed that they will need a minimum of 40 boxes of tiles to tile the laboratory floor if cutting and breakages are ignored.

Verify, showing ALL calculations if his claim is VALID.

You may use the following formula:

Area of a rectangle = length $\times$ width

(10)

Measurements

Surface area

WORKED EXAMPLE

Mrs Rasseau decided to buy a new canister set to brighten up her kitchen. She was two different sets of canisters as shown in the table below.

TABLE 3: DIFFERENT SHAPES OF CANISTER SETS

CYLINDRICAL CANISTERS	RECTANGULAR CANISTERS
	
 Lid goes in 1,5 cm Dimensions of canister: Diameter = 14 cm Height = 17 cm	 Lid goes in 1,5 cm Dimensions of canister: Length = 15 cm Width = 13,5 cm Height = 17 cm

[Source: <https://www.etsy.com>]

The following formula maybe used:

Surface area of a cylindrical canister = $\pi \times \text{radius}^2 (2 \times \pi \times \text{radius} \times \text{height})$

Surface area of a rectangular canister = $(\text{length} \times \text{width}) + 2(\text{length} \times \text{height}) + 2(\text{width} \times \text{height})$

Use the information in TABLE 3 above to answer the following questions.

- Determine the height of the sugar in a rectangular canister if the canisters are filled to just below the lid. (2)

Possible solution:

$$\begin{aligned} \text{Height of sugar} &= 17 \text{ cm} - 1,5 \text{ cm} \\ &= 15,5 \text{ cm} \end{aligned}$$

- Both sets of coffee canisters are made of stainless steel lined with transparent film that is made from assorted plastic. (7)

Calculate the different transparent film that is used to line the cylindrical and rectangular canisters, respectively.

Possible solution:

$$\text{TSA} = 3,142 \times 7^2 \times (2 \times 3.142 \times 7 \times 17) \\ = 901,754 \text{ cm}^2$$

$$\text{TSA} = (15 \times 13,5) + (15 \times 17) + (13,5 \times 17) \\ = 202,5 + 510 + 459 \\ = 1\,171,5 \text{ cm}^2$$

$$\text{Difference in plastic used} = 1\,171,5 \text{ cm}^2 - 901,754 \text{ cm}^2 \\ = 269,746 \text{ cm}^2$$

ACTIVITY 1

Anne is candy maker who designs the cylindrical sweets contain shown below. The diameter of the container is $\frac{2}{3}$ of its height.



[adapted from:

www.pngtree.com]

Use the image and information above to answer the following questions.

1. Calculate the surface area of the sweet container.

You may use the formula:

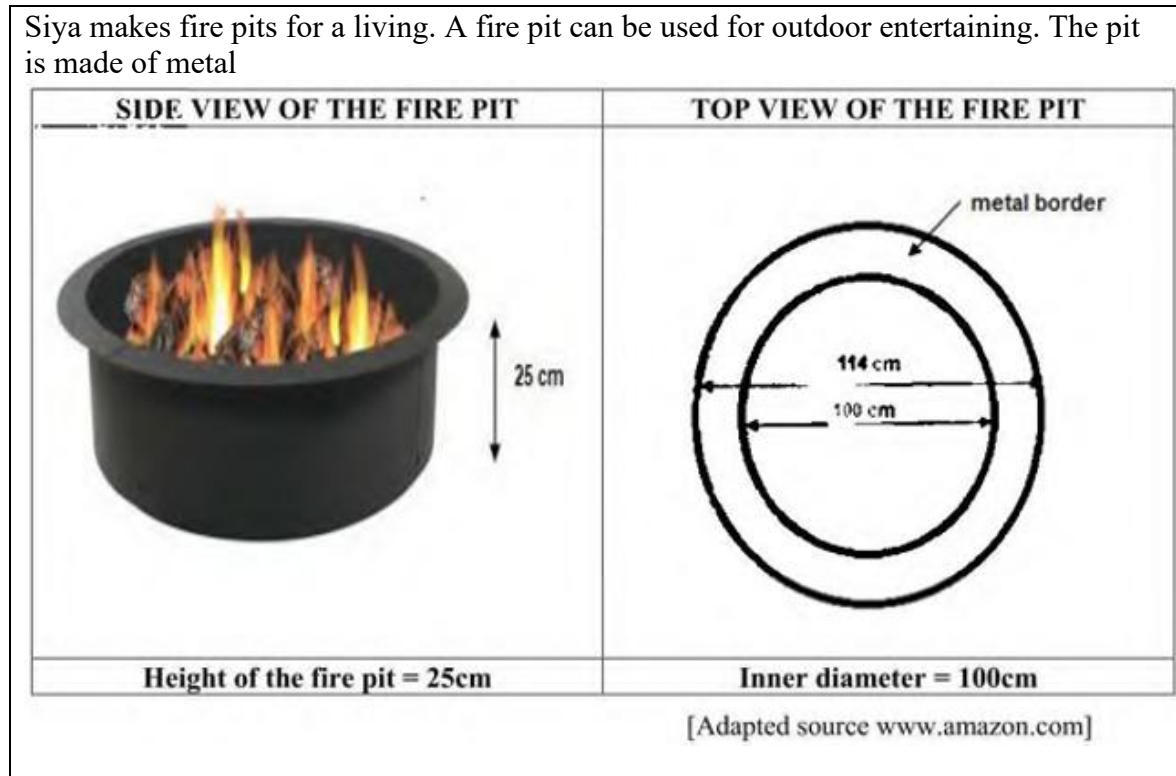
$$\text{SA} = 2 \times \pi \times \text{radius}^2 + (2 \times \pi \times \text{radius} \times \text{height}) \quad (6)$$

2. Determine how many cylindrical sweet containers can be made from 1 m^2 of cupboard. (4)

3. The cylinder holds 0,45 kg of sweets, calculate how many sweets it will hold if one sweet weighs 25 g. (4)

ACTIVITY 2

Siya makes fire pits for a living. A fire pit can be used for outdoor entertaining. The pit is made of metal



Use the image and information above to answer the following questions.

- Determine the area of the metal board.

You may use the formula:

$$\text{Area of a circle} = \pi \times r^2$$

(4)

- Siya claims he needs 1,99 m² of metal sheeting, including 10% for wastage, to make one fire pit.

Verify his **CLAIM** by showing all calculations.

You may use the formula:

$$\text{Surface Area of a Cylinder} = 2 \times \pi \times \text{radius}^2 + 2 \times \pi \times \text{radius} \times \text{height}$$

- Siya wants to apply two coats of paint to the fire pit to rust proof it.

Determine the number of litres of paint he must buy, if one litre of paint covers 5 m².

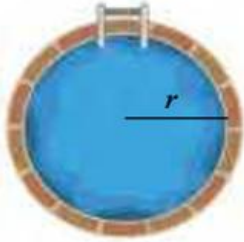
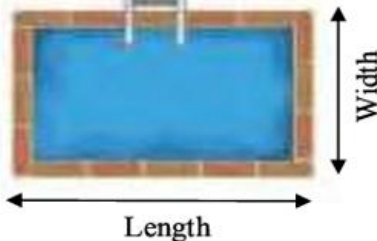
(4)

Measurements Volume

WORKED EXAMPLE

The caretakers of Pilanesberg National Park plan to build a cylindrical pool in one of the picnic sites to accommodate children.

The pictures below show the existing rectangular swimming pool and a cylindrical swimming pool which the caretakers plan to build at the picnic si

CYLINDRICAL SWIMMING POOL	RECTANGULAR SWIMMING POOL
	
Inner dimensions of the pool: Radius (r) = 4 m Depth = 1 m Tiles = 0,2 m $\times$ 0,2 m (16 in a box)	Inner dimensions of the pool: Length = 8,2 m Width = 4,3 m Depth = 1,75 m
NOTE: 1m ³ = 1 000 ℓ	

[Adapted from <https://pngtree.com>]

Use the information above to answer the questions that follow.

- Calculate, rounded to the nearest litre, the difference in capacity of the two swimming pools.

You may use the following formulae:

Volume of a cylinder = $3,142 \times (\text{radius})^2 \times \text{depth}$

Volume of rectangular prism = $\text{length} \times \text{width} \times \text{depth}$ (6)

Possible solution:

Volume of cylinder

$$= 3,142 \times (4 \text{ m})^2 \times 1 \text{ m}$$

$$= 50,272 \text{ m}^3$$

Volume of rectangular prism

$$= 8,2 \text{ m} \times 4,3 \text{ m} \times 1,75 \text{ m}$$

$$= 61,705 \text{ m}^3$$

Difference

$$= 61,705 \text{ m}^3 - 50,272 \text{ m}^3$$

$$= 11,433 \text{ m}^3 = 11,433 \text{ m}^3 \times 1\,000 = 11\,433 \text{ l}$$

ACTIVITY 1

The image below a 32 oz water bottle alongside the box it is sold in, the bottle is filled with water only up to the neck and not all the way to the top.



NOTE: 1 ounce = 0,03 litres
1 000 cm³ = 1 litre

Use the image and the information above to answer the following question.

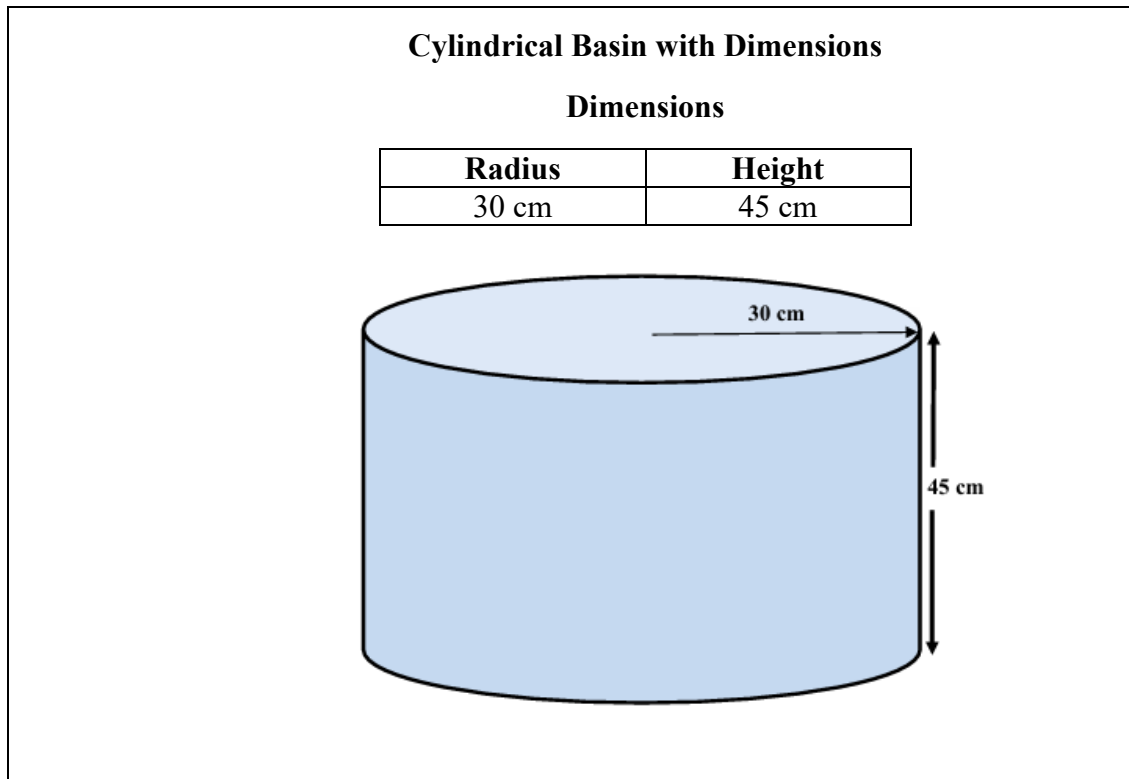
1. Calculate the diameter of the water bottle in cm.

You may use the formula:

$$\text{Volume} = \pi \times (\text{radius})^2 \times \text{height}$$

(8)

2. Sandra washes her dishes by hand three times daily in TWO identical cylindrical basins. She uses one basin for washing the dishes and the other for rinsing it. Each basin has a radius of 30 cm and a depth of 45 cm, as shown in the diagram below.



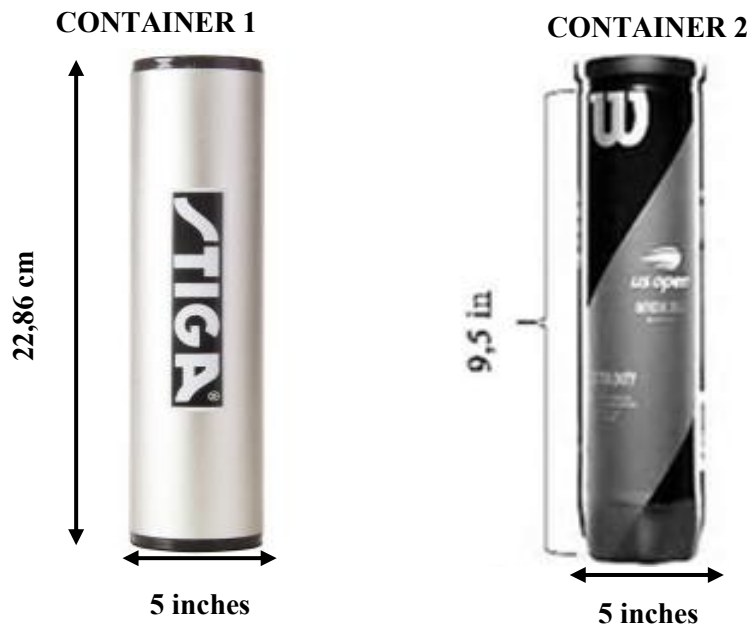
- 2.1 Sandra fills each basin to three quarters $\frac{3}{4}$ of its capacity whenever she washes or rinses the dishes.
Calculate how much water (in litres) she will use daily to wash and rinse dishes by hand. (NOTE: $1\,000\text{ cm}^3 = 1\text{ litre}$)

You may use the following formula:

$$\text{Volume} = \pi \times r^2 \times h \quad (5)$$

ACTIVITY 2

1. The company that manufactures balls to play table tennis uses the containers below to package them for delivery.



NOTE: 1 cm = 0,393701 inches

Use the information above to answer the questions that follow.

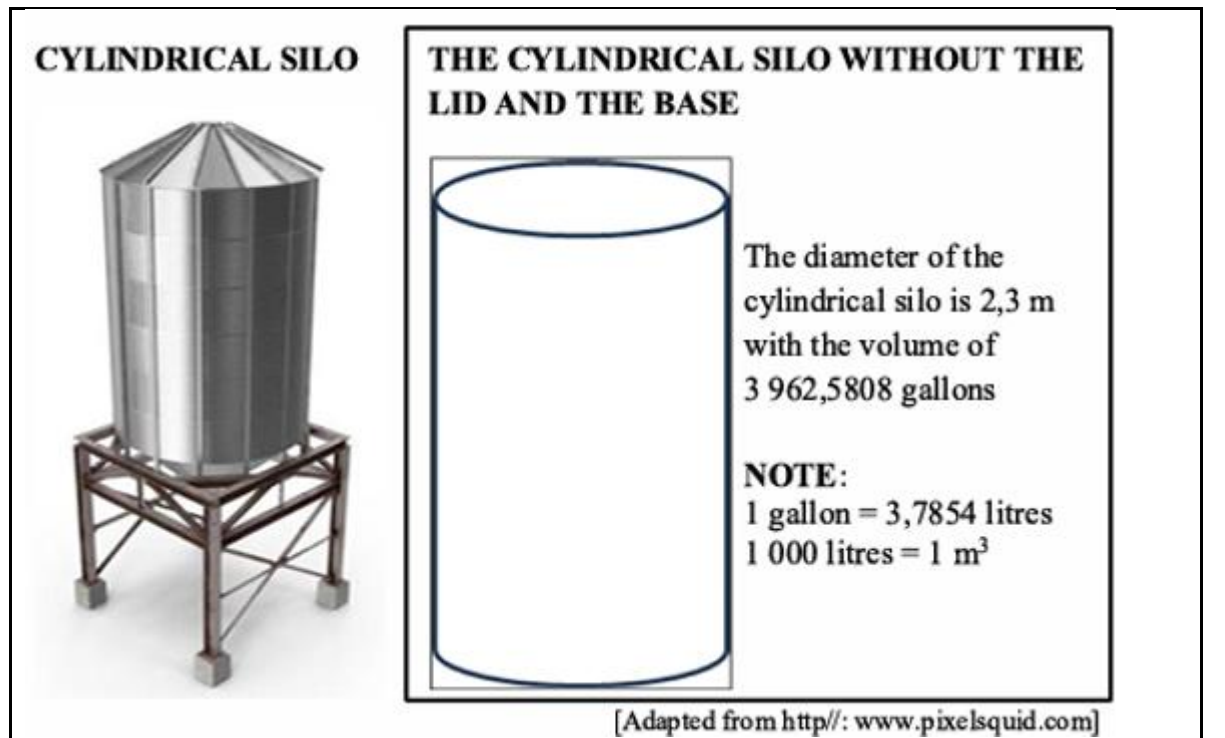
Musa claims that the volume of container 1 is bigger than the volume of container 2. Verify with calculations whether her claim is VALID.

Use the following formulae:

$$\text{Volume of a cylinder} = 3,142 \times (\text{radius})^2 \times \text{height} \quad (6)$$

2. Pule intends to buy three new cylindrical silos, to top up the silos he already has. The cylindrical silos have cone – shaped lids and bases. The maize will only be stored in the silo as shown below.

Below is a picture of a cylindrical silo and its diagram without the lid and the base.



Use the information above to answer the questions that follow.

- 2.1 Convert the volume of a cylindrical silo to m³. Round off answer to the nearest m³. (4)
- 2.2 Calculate the height of the cylindrical silo without the lid and the base.

You may use the following formula:

$$\text{Volume of cylinder} = 3,142 \times r^2 \times h \quad (4)$$

- 2.3 Pule was advised to paint the cylindrical silo with a silver shield paint. Each silo has a surface area of 34,33 m².

The spread rate of a silver shield paint is 9 m² per litre for the first coat and 12 m² per litre for subsequent coats.

The shopkeeper claims that Pule will need more than 20 litres of paint for THREE silos.

Verify, showing ALL calculations, whether the claim is VALID.

(7)

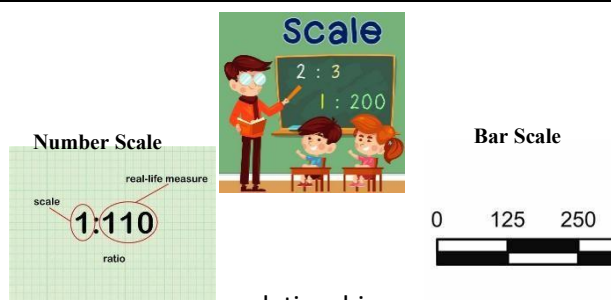
TERMINOLOGY

Scale, Maps and Plans	
Dimensions	The measurements of an object which describes its size and shape, in terms of its length, width(breath) and height.
Numeric Scale/Number Scale	A scale that is written in a ratio format. E.g., 1:100
Scale factor	The factor by which each dimension of the actual object is either reduced (for very large objects) or enlarged (for very small object). e.g., 1:100..... where 100 is the scale factor
Bar Scale	Also known as Linear scale. A map element that graphically represents the scale of a map by means of a line with ruler marking and units that are proportional to the scale.
Map	Two-dimensional representation of an area of the earth's surface. E.g., map of South Africa.
Compass Direction	The four directions or cardinal points are the four main compass directions: north, east, south, and west
Grid Reference	A map that has been divided up in rows and columns, forming a grid, which is labelled alphabetically or numerically and is used to easily reference a particular area or point on the map.
Strip map/chart	A linear map, not drawn to scale, represents the approximate distances between major towns along a main road, as well s the general direction in which the major towns lie relative to the main road.
Distance table	A table which indicates the approximate distances between different towns.
Transport Map	A map which indicates the transport routes that a bus/taxi/train takes, together with its stops along the route.

TOPIC: Scales and Maps

What is a Scale?

A scale represents the measurement on a model measurement on the actual object



relationship

between a and the corresponding

Types of Scales

Number Scale	Bar Scale
It is also known as ratio scale. Number Scales are always written in the form. $1 : 20$ Map : Reality This means that 1 unit on the map equals 100 units in reality. NB: The explanation is only correct when units are the same.	Also known as a linear scale, it is a means of visually showing the scale of the map. Example of a bar scale It also shows the relationship between distances on the map and the real world.

ADVANTAGES AND DISADVANTAGES OF EACH TYPE OF SCALE

Types of Scale	Advantages	Disadvantages
Bar Scale	- Are quick and easy to use. - You may be able to determine actual lengths and distances without doing calculations.	- Measurements (using a ruler, string or markings) obtained using bar scales tend to be less accurate. - Bar scales may still require calculation to determine the actual lengths and distances.
Number Scale	- Are more accurate than bar scales. - Are more convenient to use when working with small scales.	- Number scales require the use of calculators in determining actual distances. - With digital printing number scales become inaccurate and if there is resizing of the map or plan.

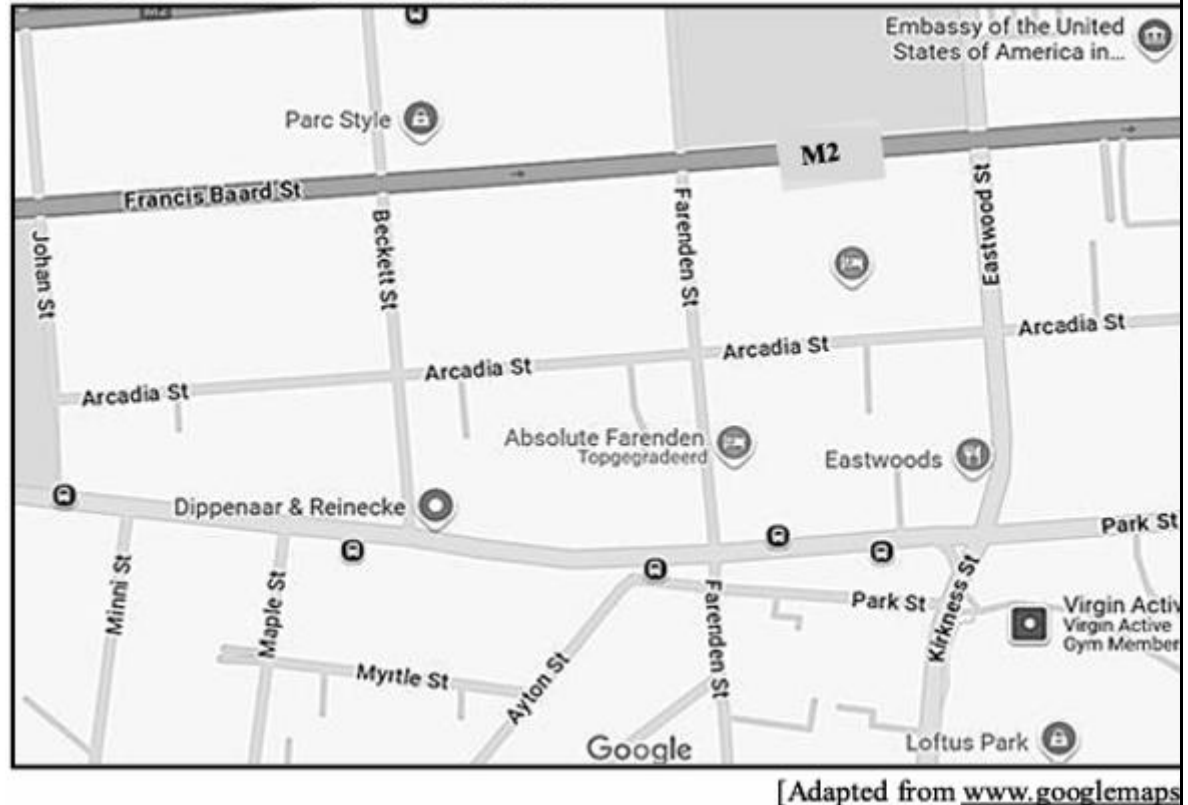
MAPS, SCALE

WORKED EXAMPLE

1. Mac stays in Pretoria and prefers to run every morning before going to work.

Below is a map of part of Pretoria where Mac runs.

A MAP OF PART OF PRETORIA



Use the map above to answer the questions that follow.

- 1.1 Name the type of map used above. (2)

Possible solution:

Street map

- 1.2 Identify the street on the map that one can use to reach M2. (2)

Possible solution:

Francis Baard Street

- 1.3 Every morning Mac runs anticlockwise from Absolute Farenden and back using Arcadia street, Beckett street, Park street and Farenden street.

Arrange the order of the streets for Mac to plan a COMPLETE route. (3)

Possible solution:

Farenden Street; Arcadia Street

Beckett Street; Park Street

Farenden Steet

2. Mr and Mrs Rosseau live in Mbombela. They had to travel to eMakhazeni for a funeral. An extract of the map below illustrates the travelling distance between Mbombela and eMakhazeni.



- 2.1 Calculate how long (in hours and minutes) it took Mr and Mrs Rosseau to reach eMakhazeni if they travelled at an average speed of 76 km/h.

You may use the following formula:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Possible solution:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$75 \text{ km/h} = \frac{127 \text{ km}}{\text{Time}}$$

$$\text{Time} = \frac{127}{75}$$

$$= 1,69333... \text{ hours}$$

$$= 0,6933... \times 60$$

$$= 41,6 \text{ minutes}$$

$$\text{Time} = 1 \text{ hour } 42 \text{ minutes}$$

- 2.2 Determine the probability that Mr and Mrs Rosseau will travel on a regional road to get to eMakhazeni. (2)

$$\text{Probability} = \frac{1}{2}$$

4. John need to get a bucket loader to his farm. He is worried that it will not pass under a LOW CLEARANCE with a height of 4.4 m.

Below is the reduced picture illustrating the height of John and that of the Bucket loader. The actual height of John is 1,75 m



Below is the picture illustrating the height of the bridge.



[source:ALSconstruction.co.za]

- 4.1 The scale used to reduce the picture is **1: 125**. Explain the meaning off the scale. (2)

Possible solution:

One unit on paper represents 125 unit on actual ground.

- 4.2 The actual height of the loader is 4,6 m. determine in mm the height of the loader on the diagram. (3)

Possible solution:

Bucket loader: 4,6 m : x

Scale 1 ; 125

$$x : 4,6 \text{ m}$$

$$= 0,0368$$

$$= 0,0368 \times 1\,000$$

$$= 36,8 \text{ mm on the diagram}$$

- 4.3 Will the bucket loader fir under the bridge? Justify your answer. (2)

Possible solution:

No; the bridge clearance is 4,4 m but the bucket loader is 4,6 m

ACTIVITY 1

ANNEXURE C shows the map of Limpopo Province.



Use Annexure C to answer the questions that follow:

1. Identify the type of scale on the map. (2)
2. Write the scale of the map in the form of 1: (4)
3. Give the general direction of Alladay's from Magoebaskloof. (2)
4. Measure the distance from Bela-Bela to Alladay's in a straight line and calculate the actual distance in kilometres. (4)
5. Which national road can you use to travel from Mokopane to Musina. (2)
6. Name three provinces which share a border with Limpopo. (3)
7. Calculate the probability of finding a National Park to a game reserve in Limpopo according to Annexure C as a decimal. (3)

8. Thapelo travelled with his family for 283 km from Mokopane to Mapungubuwe art festival. He left his place at 08:30, rested for 20 minutes along the way. He drove at a speed of 110 km/h, he indicated that it will only take him 2 hours 25 minutes including resting time to arrive.

Prove with calculations if he is correct.

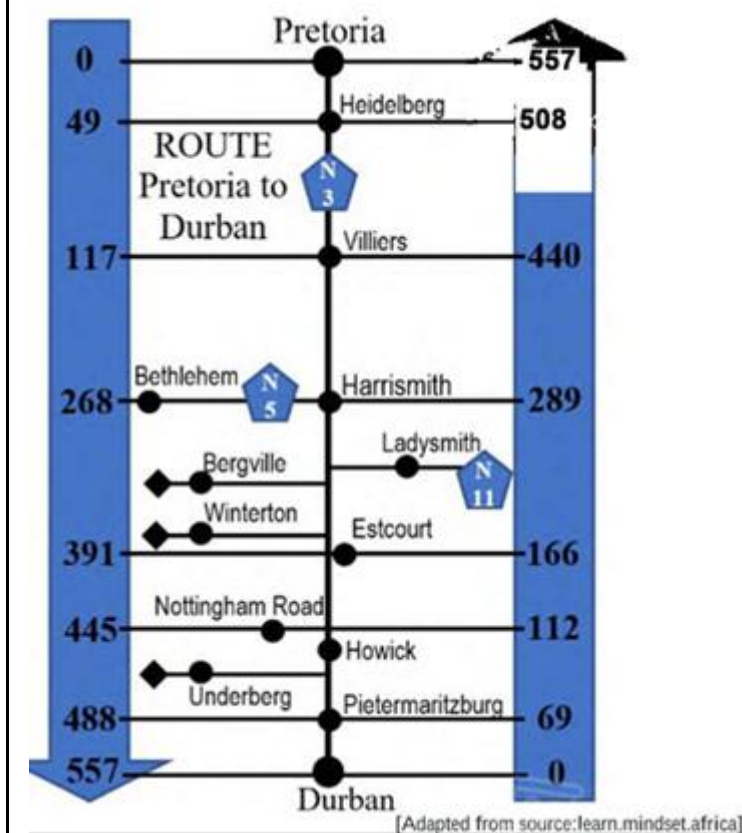
You may use the formula:

Distance = speed $\times$ time

(7)

ACTIVITY 2

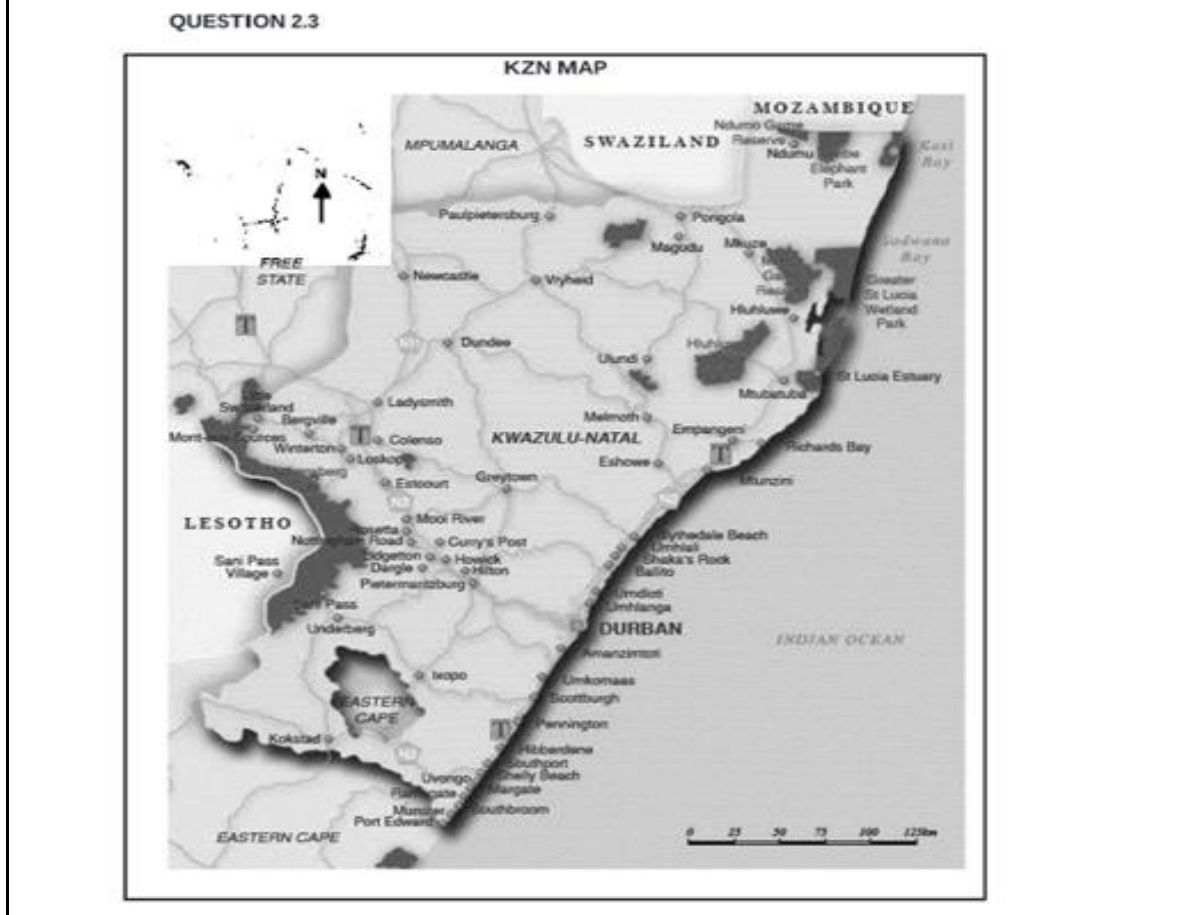
1. Kgotso and his friends travelled from Pretoria to Durban to participate in the Comrade's marathon on 9 June 2025. They used the map below to plan their trip.



- 1.1 Write down the total distance that Kgotso and his friends travelled to attend the marathon. (2)
- 1.2 Choose the correct letter A, B or C that does **NOT** apply to this type of map. (2)
- A. The map is not drawn to scale
 - B. The actual distance are displayed.
 - C. The roads not displayed with straight line.
- 1.3 Write down the national road that connect Pretoria and Durban. (2)

1.4 It is recommended that during a trip, drivers must take a break after they have travelled 200 km. Kgotso and his friends made their first stop at Harrismith, thereafter, they travelled for another 220 km. write down the name of the place where they stopped.

2. Mr Naidoo, who stays in Durban decides to go to Richard's Bay to go and fish there. Use ANNEXURE A to answer the questions that follow.



2.1 Give the general direction from Durban to Richard's Bay. (2)

2.2 Convert the bar scale on the map to a ratio scale in unit form. (4)

2.3 Mr Naidoo is saying that the approximate distance between Durban and Richard's Bay on the map differs from the distance between the two places given the distance below. Use the map in ANNEXURE A, accurate measurement and the distance table below to verify his statement.

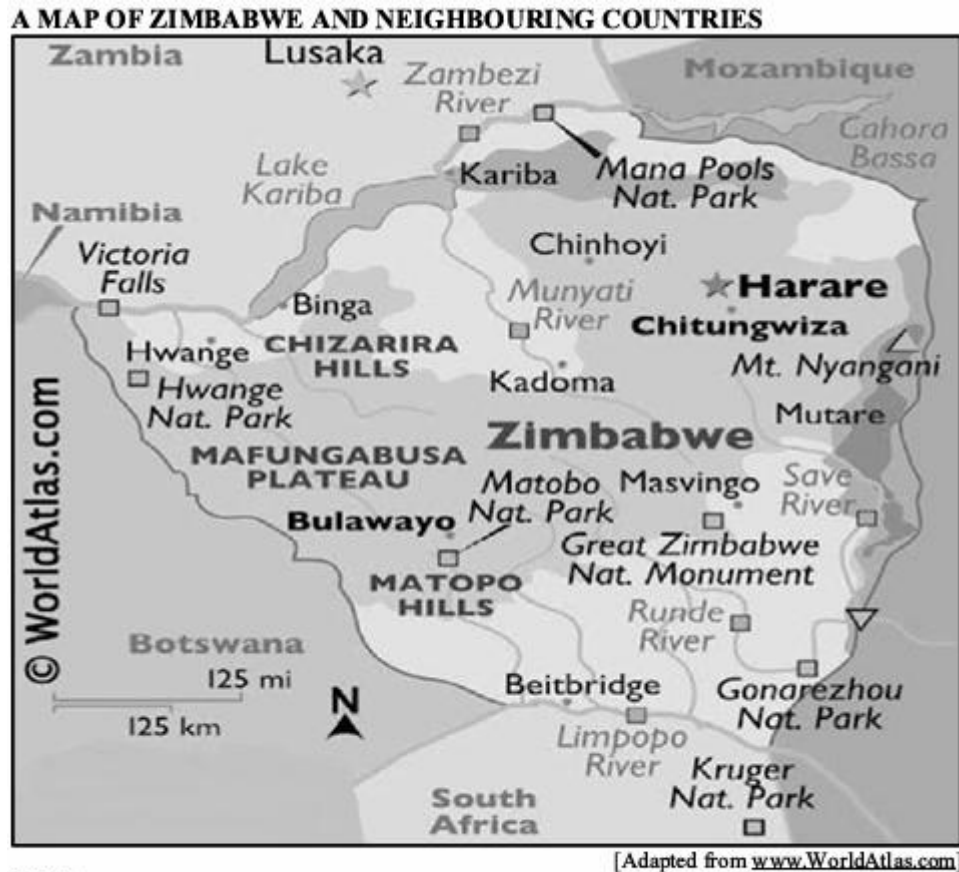
Durban				
236	Ladysmith			
170	336	Richard's Bay		
356	422	195	Sodwana Bay	
134	366	303	492	Margate

(6)

MAPS AND SCALE CONTINUE

ACTIVITY 3

The map below shows Zimbabwe and neighbouring countries.



NOTE:

 National Parks

Use the information above to answer the questions that follow.

1. Name the river that is on the border line of South Africa and Zimbabwe. (2)
2. Determine the probability, as a percentage, of Zambezi River forming a border between Botswana and Namibia. (2)
3. Give the compass direction of Victoria Falls from Kruger National Park. (2)
4. It is claimed that the scale of the map is **1 : 5 000 000**.

Use 125 km of the scale given on the map to verify whether the claim is **VALID**.

5. A group of tourists travelled a distance of 1 852 km by bus from Kruger National Park to Victoria Falls in Namibia. The bus was driving at a speed of 80 km/h.

5.1 Calculate the time (in hours and minutes). Excluding the stops, that the tourists took to drive to Victoria Falls.

You may use the formula:

$$\text{Time} = \frac{\text{distance}}{\text{speed}} \quad (4)$$

5.2 The tourists left Kruger National Park on Friday at 13:15. They spent 48 minutes at Beitbridge border gate and 1 hour 30 minutes at Bulawayo.

Determine the day and arrival time at Victoria Falls. (5)

5.3 Give ONE possible reason why the tourists stopped at Bulawayo. (2)

ACTIVITY 4

The map below shows how to travel from Pretoria to Mpungubwe National Park by car.

The map below shows how to travel from Pretoria to Mapungubwe National Park by car.



Beria and his two sons, Jordan and Benjamin, drove from Pretoria to the Mpungubwe National Park to participate in an annual birdwatching contest and marathon.

Use the map and information above to answer the questions that follow.

1. Determine, in kilometres, the total distance between Pretoria and Makhado. (2)

2. In which South African province is the Mapungubwe National Park found? (2)

3. Which town is located north-east of the park entrance and reception? (2)
4. It took them 0,8 hours to travel from Musina to the park entrance.
Calculate the average speed of their vehicle in kilometres per hour (km/h).
- You may use the formula:
- $$\text{Speed} = \frac{\text{distance}}{\text{time}} \quad (3)$$
5. Give a set of directions when driving from Venetia mine to the park entrance and entrance. (4)
6. Determine the scale of the map by using the distance between Musina and Makhado as a reference. Round – off your answer to the nearest hundred thousand. (5)
7. Give ONE disadvantage of working with a number/ratio scale. (2)

PLANS

Plans

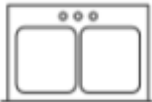
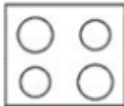
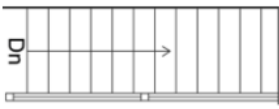
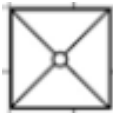
What is a Floor Plan?

A Floor Plans is a diagram which shows a two-dimensional view of a building from above excluding the roof of a building.

The following information may be obtained from the floor plan:

- The size and shape of a building/house including all the dimensions of each room.
- The position of all the features of the building, the doors, windows, basins, toilets cupboards, showers etc.

Symbols that are used for floor plans:

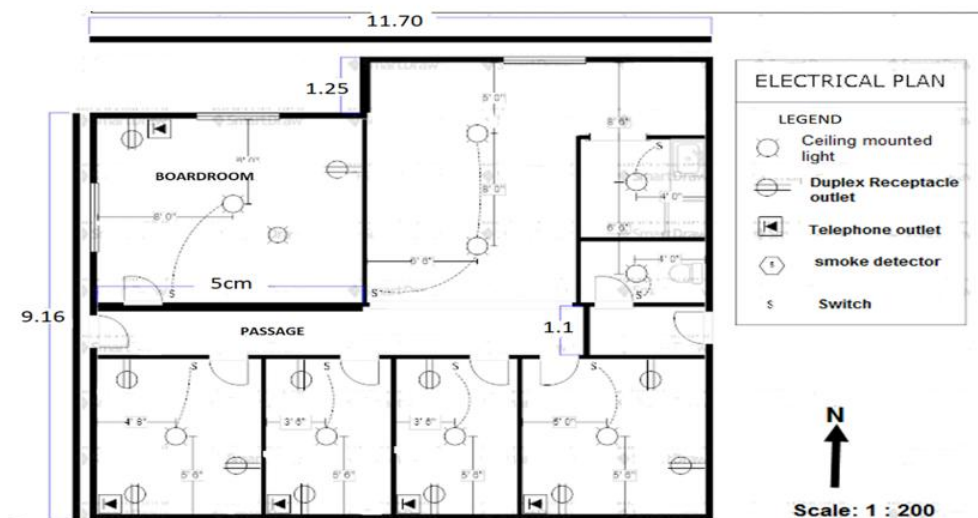
Door 	Window 	Sliding door 
Toilet 	Bed 	Bathtub 
Bathroom sink 	Kitchen sink 	Stove 
Stairs 	Shower 	Wall 

TERMINOLOGY

Plans, Assembly Diagrams and Models	
Plan	A more detailed representation of a smaller area, often showing landmarks or objects. E.g., layout plan of a school hall.
Floor Plan	A two-dimensional view of a building/ structure from above, excluding the roof of a building and provides information regarding the size and shape of each room, together with positions of exterior and interior walls, doors, windows.
Layout Plan	A layout plan is a top view that shows the arrangement of features/A layout plan is the structural arrangement of items within a certain space.
Elevation Plan	A two-dimensional picture of the outside of a building/structure and provides information regarding the height of the building/structure and external features.
North Elevation	The side view of the building from the northern side
South Elevation	The side view of the building from the southern side
Design Plan	A drawing which shows how a building/structure is made and how it functions or looks and provides manufacturing and or assembly details such as measurements and points of attachment for individual components.
Assembly diagram	A set of instructions, which can be in the form of diagrams, pictures, words or a combination thereof, which is used in the assembly or construction of a product.
Model	A three-dimensional representation of an object/structure, which is made to scale of the original or proposed object/structure.

WORKED EXAMPLE.

1. A floor plan for offices is given below. The length of the building on the plan is 11.70 cm and the width is 10.40 cm. An electrical plan is also attached to the floor plan. Use the information on the floor plan to answer the following questions.



- 1.1 Determine the number of telephone outlets in the building. (2)

Possible solution:
05

- 1.2 Write down the ratio of the outside doors to the inside doors in simplest form. (3)

Possible answer:
2 : 6
1 : 3

- 1.3 Explain the meaning of the scale 1:200 on the plan. (2)

Possible solution:
One cm on the map equals 200 cm in reality

- 1.4 Use the given scale to determine the actual dimensions of the building. (3)

Possible solution:
Length = $11,7 \times 200$ Width = $10,4 \times 200$
= 2 340 cm = 2 080 cm
= 23,4 m = 20,8 m

- 1.5 Determine the probability of finding a window on the eastern wall of the offices. (2)

Possible solution: 0%

Jane and Tom are the newly-weds. They plan to build a house using the floorplan and elevations shown in ANNEXURE A in the addendum.

Use the information above and ANNEXURE A to answer the questions that follow.

- 1 How many bedrooms are shown on the floorplan? (2)

Possible solution: 03

- 2 The elevations are numbered from 1 to 4. Match the elevation with the correct number e.g., West elevation 3.

- (a) North elevation
(b) South elevation
(c) West elevation
(d) East elevation

(4)

Possible solution:

North Elevation – 2

South Elevation – 1

West Elevation – 4

East Elevation - 3

- 3 Is this plan for a single or double storey house? (2)

Possible solution:

Double storey

- 4 The actual length of the northern wall is 20 metres. Calculate the length on the floorplan. (3)

Possible answer:

length on the floorplan

1 : 250

1 cm : 250 cm

20 m × 100

= 2 000 cm

length = $\frac{2\,000}{250}$

= 8 cm

OR

length on the floorplan

1 : 250

1 mm : 250 mm

20 m × 1 000

= 20 000 mm

length = $\frac{20\,000}{250}$

= 80 mm

- 5 How many doors are found on the first floor? (2)

Possible solution:

5 doors

- 6 Give the compass direction of the kitchen from the garage. (2)

Possible solution:

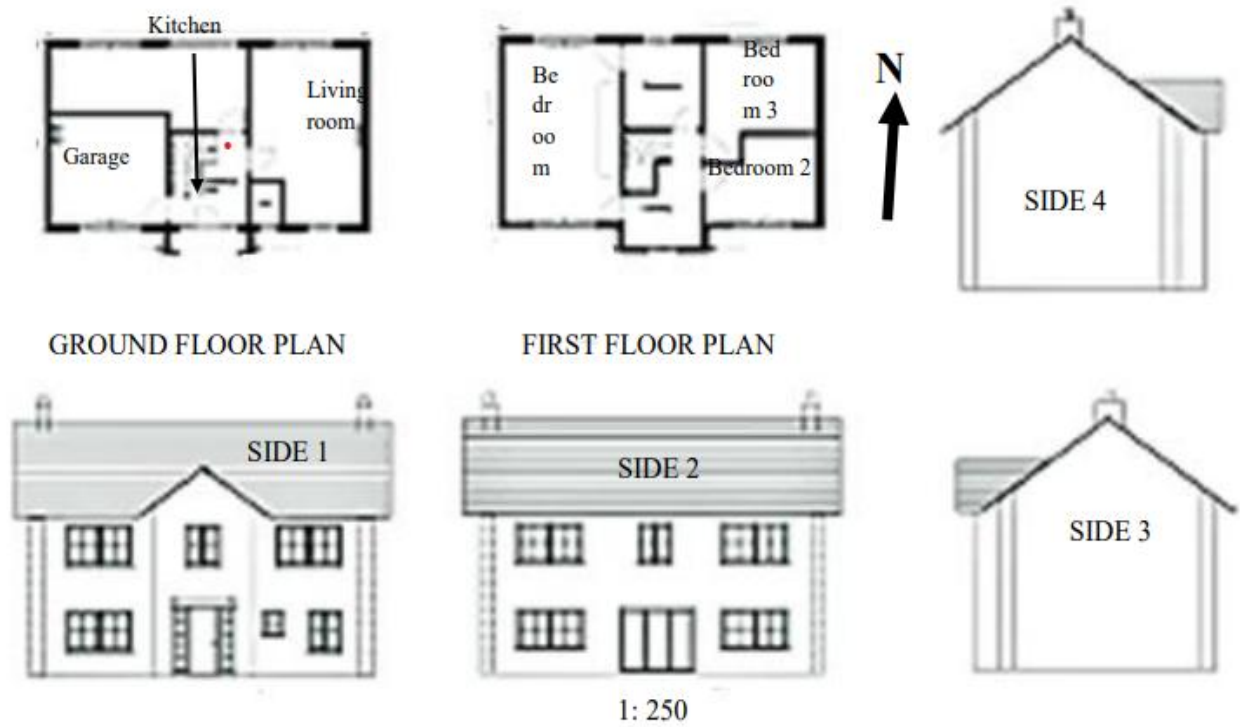
East

- 7 Which symbol represents a door on the floorplan? (2)

Possible solution:

Quarter circle OR Drawing symbol of a quarter circle

ANNEXURE A



Source: www.floorplans.com

ACTIVITY 1

Dr Brooke and his family in a townhouse. ANNEXURE B shows the floor plan of their town house.

Use ANNEXURE B to answer the questions that follow.

1. Define the concept floor plan. (2)
2. Determine the total number of doors on the floor plan. (2)
3. Which ONE of the following statements regarding the porch is CORRECT?

A. The porch is on the West elevation.

B. The porch is on the East elevation.

C. The porch is on the North elevation. (2)

4. The dimensions of BEDROOM 1 on the plan are as follows.

Length = 40 mm and width = 32 mm

The area of the window must be at least 12,5 % of the floor area of the bedroom.
The actual window is 256 cm high.

Calculate the actual width of the window.

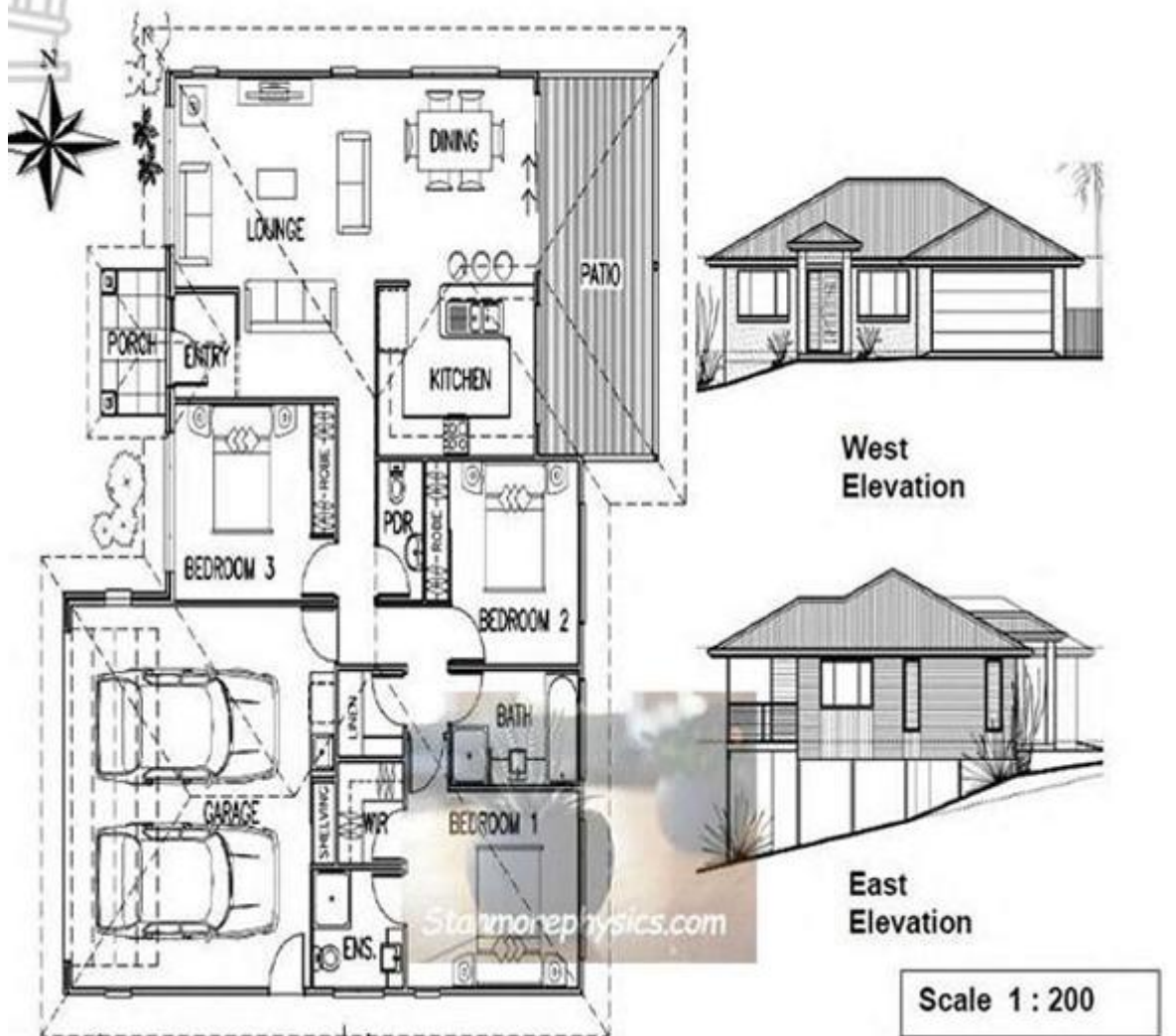
You may use the following formula:

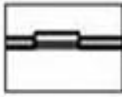
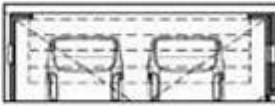
Area of rectangle = length × width

(9)

ANNEXURE B

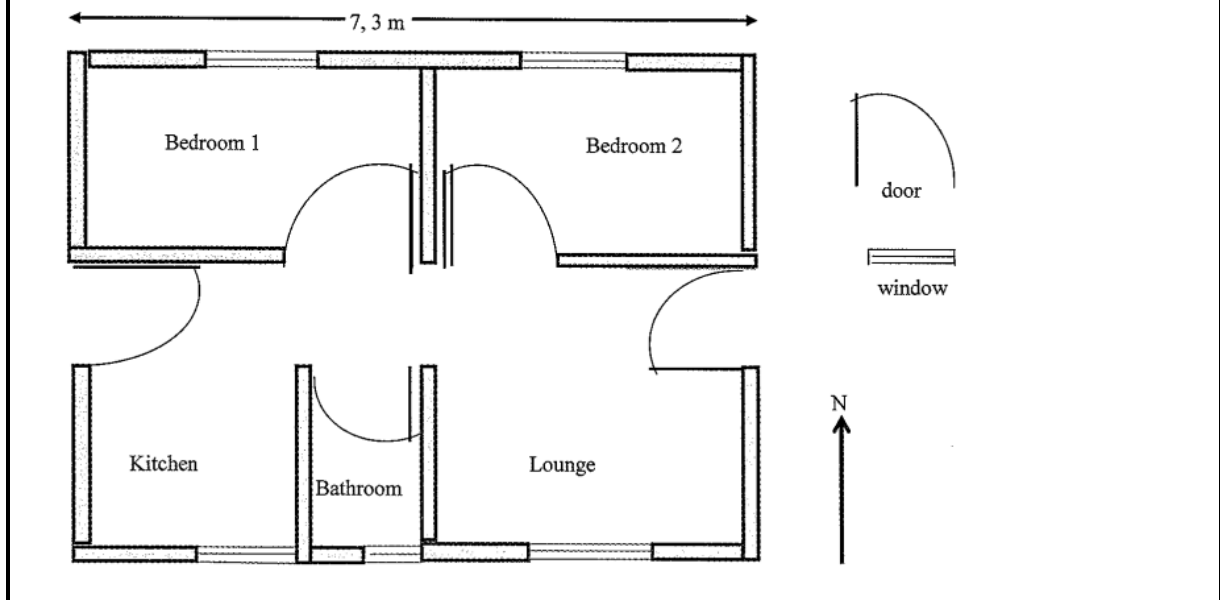
FLOOR PLAN OF DR. BROOKE'S TOWN HOUSE



KEY:	
	
Window	Door
	
Sliding Door	Garage Door

ACTIVITY 2

1. Siya owns a company that was hired to build RDP houses for 100 families. Below is the floor plan of one of the RDP houses that were build.



Use the plan above to answer the questions that follow:

- 1.1 Explain the term floor plan. (2)
- 1.2 Determine the number of windows on the above plan. (2)
- 1.3 Give the general direction of bedroom 1 from the lounge (2)
- 1.4 The actual length of the house is 7,3 m and, on the plan, it is 133 mm. Determine the scale used the form 1 : (4)
- 1.5 If the width of the house is 7,1 m. Calculate the area covered by the house.

You may use the following formula:

Area of a rectangle = length x width (2)

- 1.6 Does the door leading to the bathroom open to the right or the left? (2)

- 2 The layout and elevation plans of a clinic is shown on ANNEXURE A.

Use the following information:

1 foot = 0,3048 m

1 inch = 2,54 cm

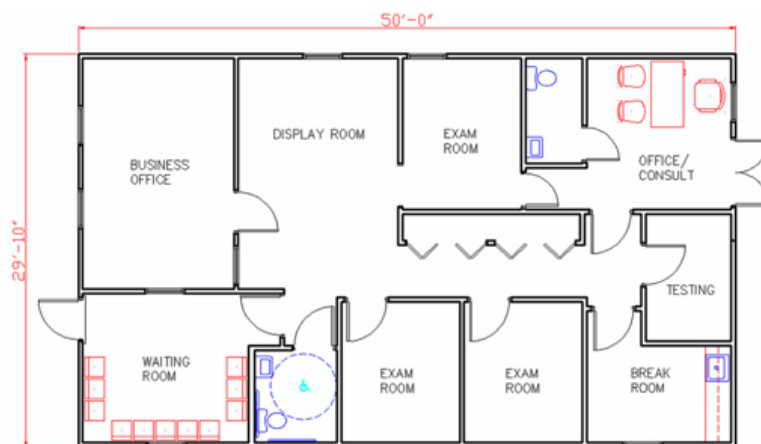
50' represents 50 feet

10" represents 10 inches.

Study ANNEXURE A and answer the questions that follow.

- 2.1 If the outer door of the waiting room is facing north, determine the direction the window of the break room is facing. (2)
- 2.2 The width of the clinic is 29 feet and 10 inches. Convert the width to metres. (4)
- 2.3 Calculate the scale of the plan if the length of the clinic is 50 feet as indicated on the plan and the measurement on the plan is 135 mm. Express your answer in the form 1 : ... (5)
- 2.4 Which one of the elevation plans is incorrect? Justify your answer. (3)

ANNEXURE A

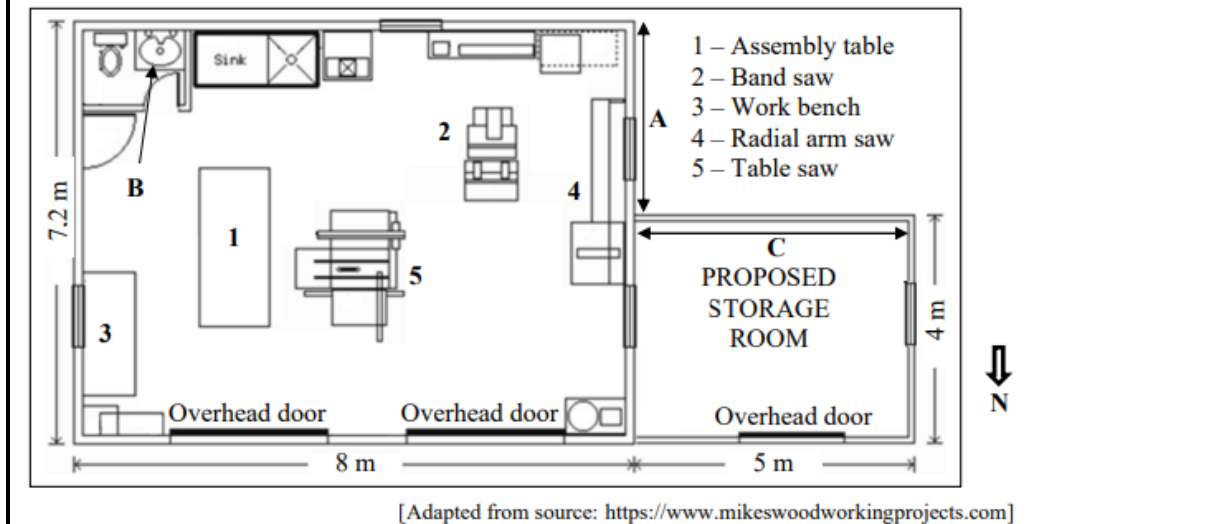


[Source: Adapted from <http://www.roseoffices.com/floorplans>]

Elevation View A	Elevation View B
Elevation View C	Elevation View D

ACTIVITY 3

The plan below shows the workshop of Loyiso with a key that shows some of his machinery, tools, work surfaces and its location within the workshop.



Study the plan above and answer the questions that follow.

1. Write down the number of windows found on the western wall of the workshop. (2)
2. Determine the length of the outer wall, marked A. (2)
3. Name the feature that is indicated by the letter B on the plan. (2)
4. Give ONE change to the plan that you would suggest to the draftsman in terms of accessibility for the proposed storage room. (2)
5. The length of C is 4,77 m. If the thickness of the wall is 0,23 m, determine the perimeter of the inner walls of the proposed storage room. (4)

ACTIVITY 4

ANNEXURE B shows a layout of a passenger's aeroplane Airbus A380

Use ANNEXURE B to answer the questions that follow.

1. Determine the number of exit doors indicated on the layout of the aeroplane. (2)
2. Write down the seat number of the United First – class seats, in the left side of the front row. (2)
3. a) Name and explain the meaning of the scale shown on the seating plan. (2)

b) the actual length of the aeroplane (from the cockpit to the end of the passenger cabin) is given as 50 m.

calculate, correct to the nearest 10 mm, the length of the layout of the aeroplane provided.

(4)

4. Determine the number of in seat power sockets in the Airbus A380.

(2)

5. A passenger seated at E07, used the following route to move to another seat.

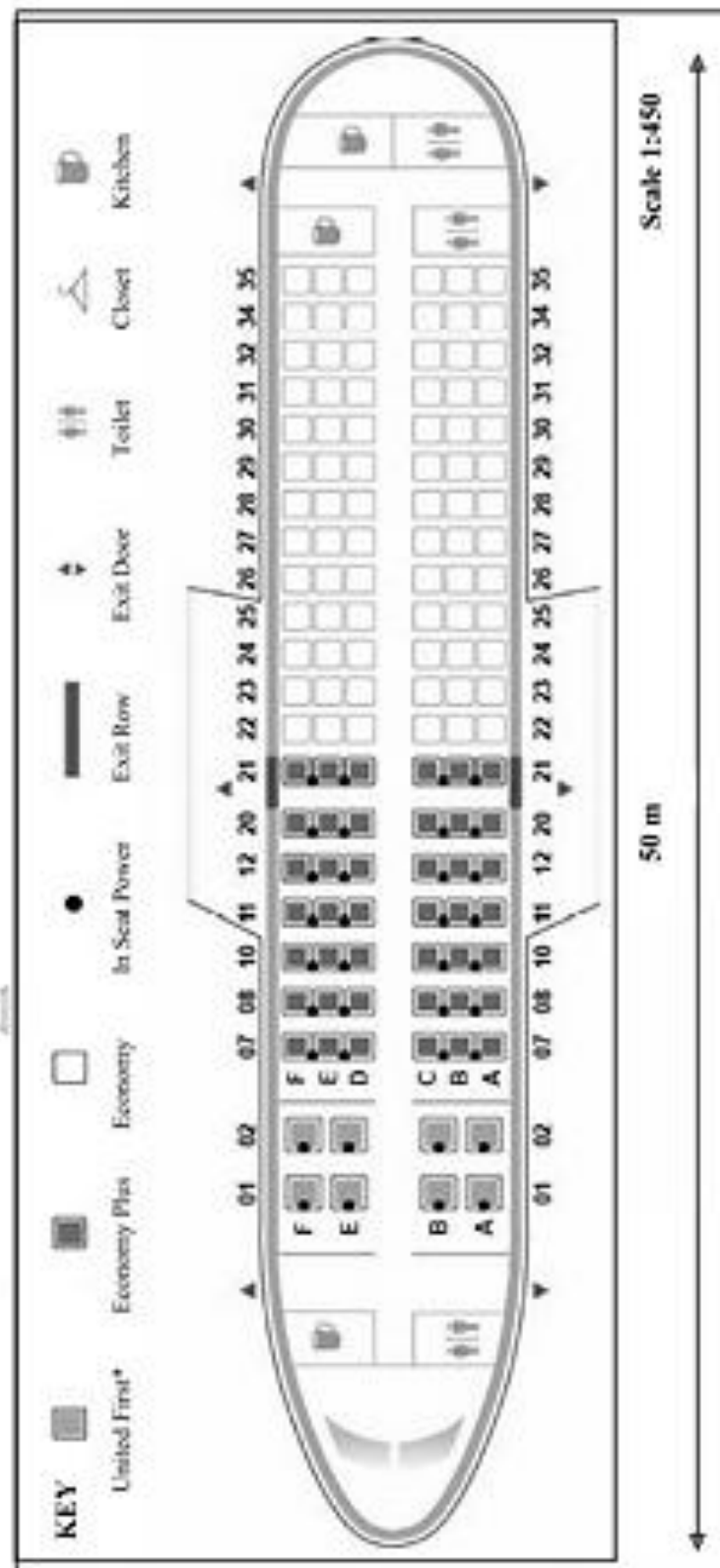
- From his seat, he passed seat D7
- He turned left and walked down the passage, passing all Economy Plus seats.
- He continued straight, passing four more seats, turned right and sat in the middle seat.

Write down his new seat number.

(2)

ANNEXURE B

QUESTION 2.2 – LAYOUT OF A PASSENGERS AEROPLANE: AIRBUS A380



[Adapted from Different Aircraft's Layouts]

BIBLIOGRAPHY

1	Free State September examinations, paper 2, 2024
2	Free State September examinations, paper 2, 2025
3	Gauteng September examinations, paper 2, 2024
4	Gauteng September examinations, paper 2, 2025
5	Eastern Cape September examinations, paper 2, 2024
6	Eastern Cape September examinations, paper 2, 2025
7	Western Cape September examinations, paper 2, 2024
8	Western Cape September examinations, paper 2, 2025
9	North West September examinations, paper 2, 2024
10	North West September examinations, paper 2, 2025
11	Mpumalanga September examinations, paper 2, 2024
12	Mpumalanga September examinations, paper 2, 2025
13	NSC November question paper, paper 2 2022
14	SCE May/June paper 2 2024
15	NSC paper 2 exemplar 2025
16	Jenn Term 2 2024 material