



Province of the  
**EASTERN CAPE**  
EDUCATION

# MATHEMATICAL LITERACY

AUTUMN CLASSES

**GRADE 12**

TERM 1

## **TEACHER AND LEARNER CONTENT MANUAL**



## MATHEMATICAL LITERACY PROGRAMME FOR 2025 AUTUNM CLASSES

<b>STRUCTURE OF EXAMINATION</b>			
<b>PAPER</b>	<b>TOPICS</b>	<b>TOTAL MARKS</b>	<b>WEIGHTING</b>
<b>PAPER 1:</b> (FINANCE & DATA HANDLING)	<b>Finance</b>	<b>±90</b>	<b>± 60 %</b>
	<b>Data Handling</b>	<b>±53</b>	<b>± 35 %</b>
	<b>Probability</b>	<b>±7</b>	<b>5%</b>
<b>TOTAL</b>		<b>± 4</b>	<b>± 32%</b>
<b>PAPER 2:</b> (MEASUREMENT, MAPS, PLANS & SCALES)	Measurement	± 83	± 55%
	Maps, Plans and Scale	± 60	± 40%
	Probability	±7	± 5%
<b>TOTAL</b>		<b>150</b>	<b>±100%</b>
Pre-test and Post-test to be administered focuses only on Finance & Probability			



<b>GUIDELINES</b> <ul style="list-style-type: none"><li>○ Icon descriptions</li><li>○ Examination Guideline</li><li>○ Lesson Objectives</li><li>○ Important terms and definitions</li></ul>	<b>4 - 17</b>
<b>SECTION 1: Financial Documents (Bank Statements)</b> <ul style="list-style-type: none"><li>○ Outlining the key concepts</li><li>○ Worked examples.</li><li>○ Activities</li></ul>	<b>19 - 38</b>
<b>SECTION 2: Taxation (PAYE)</b> <ul style="list-style-type: none"><li>○ Outlining the key concepts</li><li>○ Worked examples.</li><li>○ Activities</li></ul>	<b>35 - 40</b>
<b>SECTION 3: Tariff System</b> <ul style="list-style-type: none"><li>○ Outlining the key concepts</li><li>○ Worked examples.</li><li>○ Activities</li></ul>	<b>41 -52</b>
<b>SECTION 4: Hire Purchase</b> <ul style="list-style-type: none"><li>○ Outlining the key concepts</li><li>○ Worked examples.</li><li>○ Activities</li></ul>	<b>53 - 60</b>
<b>SECTION 5: Loans and Investments</b> <ul style="list-style-type: none"><li>○ Outlining the key concepts</li><li>○ Worked examples.</li><li>○ Activities</li></ul>	
<b>SECTION 6: Data Handling</b> <ul style="list-style-type: none"><li>○ Outlining the key concepts</li><li>○ Worked examples.</li><li>○ Activities</li></ul>	<b>61 - 97</b>
<b>BIBLIOGRAPHY</b>	<b>98</b>



## FINANCIAL DOCUMENTS: EXAMINATION GUIDELINES



### TOPIC: FINANCE

Section	Level 1: Knowing	Level 2: Applying routine procedures	Level 3: Applying multi-step procedures in a variety of contexts	Level 4: Reasoning and reflecting
<b>Financial Documents &amp; Tariff systems</b>	<ul style="list-style-type: none"> <li>• Read information directly from an electricity bill (e.g. date; name of account holder; electricity consumption for the month).</li> <li>• Show how the 'Total Due' on the electricity bill has been calculated by adding together all items listed on the bill.</li> <li>• Show how the VAT value listed on the electricity bill has been calculated when told that VAT is 14% of the value excluding VAT (that is, calculating a direct percentage of an amount).</li> </ul>	<ul style="list-style-type: none"> <li>• Use a given formula to show how the amount charged for electricity consumption shown on the bill has been determined.</li> <li>• Complete a table of values to show the cost of various quantities of electricity consumption.</li> <li>• Use the table of values to construct a graph to represent the cost of electricity consumption.</li> </ul>	<ul style="list-style-type: none"> <li>• Replicate the calculations/values shown on the bill for a different electricity consumption value.</li> <li>• Without any scaffolded or guiding questions, draw a graph to represent the cost of electricity on a particular electricity system.</li> </ul>	<ul style="list-style-type: none"> <li>• Choose an appropriate strategy (e.g. tables of values, graphs, and interpreting points of intersection.) to compare the electricity costs of two different electricity systems and make a decision about which system is the most cost effective for a user with particular needs.</li> <li>• Analyse a newspaper article describing proposed increases in electricity tariffs and make deductions about the implications of these</li> </ul>

		<ul style="list-style-type: none"> <li>Increasing/Decreasing by a given percentage</li> </ul>		<p>increases for consumers.</p> <ul style="list-style-type: none"> <li>Rework the answer if the initial conditions change.</li> </ul>
<b>Taxation</b>	<ul style="list-style-type: none"> <li>Identify the name of the employee listed on a pay slip and the month for which the pay slip has been issued. * Identify the employee's monthly salary.</li> <li>State how the employees 'taxable income' has been determined by referring to the salary and deduction values shown on the payslip.</li> <li>Define the terms 'gross pay', 'net pay', 'deductions', and 'taxable income' shown on a payslip.</li> </ul>	<ul style="list-style-type: none"> <li>Read appropriate tax values from given income tax deduction tables. * Identify the income tax bracket into which an individual falls based on a given monthly and/or annual income.</li> </ul>	<ul style="list-style-type: none"> <li>Use formulae provided on income tax bracket tables to calculate an individual's annual and monthly income tax.</li> <li>Investigate through calculation how the tax rebate value is determined.</li> <li>Calculate compound growth/decline.</li> </ul>	<ul style="list-style-type: none"> <li>Compare income tax tables over different financial periods and explain how an individual's tax may have changed from one period to another.</li> <li>Investigate the effect that an increase in salary has on increased tax payments.</li> <li>Analyse graphs showing changes in income tax over different time periods and explain differences</li> </ul>
<b>Income, Expenditure and loss</b>	<ul style="list-style-type: none"> <li>Classify items on an income and expenditure statement as fixed, variable and occasional income and expenditure. * Show</li> </ul>	<ul style="list-style-type: none"> <li>Construct an income and expenditure statement for an</li> </ul>	<ul style="list-style-type: none"> <li>Construct an income and expenditure statement for a business that</li> </ul>	<ul style="list-style-type: none"> <li>Analyse a budget for a household or business and make recommendation as to how the</li> </ul>

	<p>how total income, expenditure and profit/loss values on an income and expenditure statement or budget have been determined.</p>	<p>individual or a household.</p> <ul style="list-style-type: none"> <li>• Construct a budget for a small household project.</li> </ul>	<p>includes a comparison of income and expenditure values over a two-year period. * Construct a budget for a large fundraising event.</p> <ul style="list-style-type: none"> <li>• Revise a budget if conditions change</li> </ul>	<p>expenditure should be changed to improve the finances of the household/business.</p> <ul style="list-style-type: none"> <li>• Compare income and expenditure values for a business or organisation over a two-year period and describe differences and/or trends.</li> <li>• Analyse projected versus actual budget values and explain differences.</li> </ul>
<p><b>Inflation</b></p>	<ul style="list-style-type: none"> <li>• Define the term 'inflation'.</li> </ul>	<ul style="list-style-type: none"> <li>• Show by calculation how the price of an item might change if affected by inflation (that is, increasing a value by a percentage).</li> </ul>	<ul style="list-style-type: none"> <li>• Calculate compound growth/decline.</li> </ul>	<ul style="list-style-type: none"> <li>• Show by calculation how the price of an item might change if affected by inflation over multiple time periods * Use knowledge of inflation rates to argue and justify a particular salary * Rework the answer if the initial conditions change.</li> </ul>

<p><b>Cost price and selling price</b></p>	<ul style="list-style-type: none"> <li>• Determine the cost price of an item by adding together given cost values for the component parts of the item.</li> <li>• Determine the income generated from the sale of an item based on a given sales price and given sales volumes.</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Compare the difference between the cost and selling price of an item by calculating the percentage mark-up in price of the selling price from the cost price.</li> <li>• Construct a table of values to show how the cost price of an item changes depending on the number of items made.</li> <li>• Draw a graph from a given table.</li> </ul>	<ul style="list-style-type: none"> <li>• Draw graphs, without scaffolded or guiding questions, to show the costs involved in producing an item and money generated from the sale of the item.</li> <li>• Investigate, through research, the various costs involved in manufacturing an item and decide on an appropriate selling price for the item.</li> <li>• Calculate profit if only one of income or expenses is given and the other still needs to be calculated.</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct market research on a group of people and use the results of the research to defend a particular selling price for a product.</li> <li>• Interpret graphs showing the cost of production and income generated from the production and sale of an item and use the graphs to make decisions about the business (e.g. how many items must be manufactured and sold to cover all production costs).</li> </ul>
<p><b>Break-even analysis</b></p>	<ul style="list-style-type: none"> <li>• Define 'break-even' in the context in which a problem is posed (e.g. in the context of a business, 'break- even')</li> </ul>	<ul style="list-style-type: none"> <li>• Determine the break-even point of a business from a given table of</li> </ul>	<ul style="list-style-type: none"> <li>• Draw two or more graphs and identify the point of intersection of those two graphs to</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the relevance of the break-even point of two graphs in relation to the</li> </ul>

	<p>refers to the income that must be generated to cover all expenses).</p>	<p>income and expenditure values.</p> <ul style="list-style-type: none"> <li>• When given two graphs that intersect, read off the value of the independent and dependent variables at the breakeven point (point of intersection) of the graphs.</li> </ul>	<p>compare different options (e.g. income vs. expenditure; cell phone contract options; electricity tariff system.).</p>	<p>problem or context for which the graphs have been drawn.</p> <ul style="list-style-type: none"> <li>• Explain the meaning of different regions on a graph (that is, between different points of intersection) in relation to the problem or context for which graphs have been drawn. * Rework the answer if the initial conditions change.</li> </ul>
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<p><b>Tariff system</b></p>	<ul style="list-style-type: none"> <li>• Identify the name of the employee listed on a pay slip and the month for which the pay slip has been issued. * Identify the employee's monthly salary.</li> <li>• State how the employees 'taxable income' has been determined by referring to the salary and deduction values shown on the payslip.</li> <li>• Define the terms 'gross pay', 'net pay', 'deductions', and 'taxable income' shown on a payslip.</li> </ul>	<ul style="list-style-type: none"> <li>• * Read appropriate tax values from given income tax deduction tables. * Identify the income tax bracket into which an individual falls based on a given monthly and/or annual income.</li> </ul>	<ul style="list-style-type: none"> <li>• Use formulae provided on income tax bracket tables to calculate an individual's annual and monthly income tax.</li> <li>• Investigate through calculation how the tax rebate value is determined.</li> <li>• Calculate compound growth/decline.</li> </ul>	<ul style="list-style-type: none"> <li>• * Compare income tax tables over different financial periods and explain how an individual's tax may have changed from one period to another. * Investigate the effect that an increase in salary has on increased tax payments. * Analyse graphs showing changes in income tax over different time periods and explain differences</li> </ul>
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<p><b>Interest, bank loans and investments</b></p>	<ul style="list-style-type: none"> <li>Define 'interest' and the 'interest rate'. * Identify interest rate values quoted on bank statements.</li> </ul>	<ul style="list-style-type: none"> <li>Perform simple interest calculations manually (that is, without the use of a calculator) over multiple time periods. * Read values off graphs showing simple and compound investment scenarios.</li> <li>Calculate compound interest compounded annually.</li> <li>*Increase or decrease a given amount by a certain percentage.</li> </ul>	<ul style="list-style-type: none"> <li>Perform compound interest calculations manually (that is, without the use of a formula) over multiple time periods.</li> <li>Complete a table that models a loan scenario and include consideration of a monthly interest calculation, monthly repayment, and monthly amount outstanding on the loan.</li> <li>Draw graphs from given tables of values to represent loan scenarios. * Calculate compound growth/decline</li> </ul>	<ul style="list-style-type: none"> <li>Construct a model of a loan or investment scenario without scaffolded or guiding questions.</li> <li>Investigate and describe the impact of increasing the monthly repayments on the total cost of the loan/investment. * Investigate and describe the impact of making a lump sum payment into a loan/investment during the first half of the loan/investment period on the total cost of the loan/investment.</li> <li>Rework the answer if need be.</li> </ul>
<p><b>Probability</b></p>	<ul style="list-style-type: none"> <li>Identify the percentage chance of rain for a particular town from a weather report in a newspaper.</li> <li>State the meaning of terms associated with probability (e.g. event; outcome).</li> </ul>	<ul style="list-style-type: none"> <li>Express the probability of an event using fraction, percentage and decimal notation.</li> <li>Identify all of the possible outcomes of a particular event (e.g. rolling a dice; gambling game).</li> </ul>	<ul style="list-style-type: none"> <li>Conduct an experiment to compare the experimental probability of an event to its theoretical probability.</li> <li>Identify appropriate values from a given table of data values (e.g. on motor vehicle</li> </ul>	<ul style="list-style-type: none"> <li>Analyse a table of rainfall data for a town and make predictions about the chance of rain in that town during a particular month during the year.</li> <li>Explain whether the statement 'if I take the same lottery numbers every week then my</li> </ul>

		<ul style="list-style-type: none"> <li>• Explain whether or not a particular rainfall prediction indicates that it is more or less likely to rain.</li> </ul>	<p>fatalities in South Africa) and express the probability of certain events shown in the table.</p> <ul style="list-style-type: none"> <li>• Develop a game involving probability and play the game with another learner in the class.</li> <li>• Design simple contingency tables and use them to calculate probabilities. * Draw tree diagrams and use them to calculate probabilities</li> </ul>	<p>chances of winning increase' makes sense.</p> <ul style="list-style-type: none"> <li>• Critique the use of references to probability values in newspaper articles.</li> <li>• Analyse a table showing risk assessment profiles of people in different age groups and explain why particular age groups are classified as higher risks than others.</li> <li>• Analyse a game involving probability and make a deduction about the fairness of the game.</li> </ul>
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## LESSON OBJECTIVES

### TOPIC: FINANCE

At the end of this module, you will be able to:

#### **Financial Documents**

- Understand terminology used in the bank statement.
- Read and analyse and interpret information in the bank statement .

#### **Taxation (PAYE)**

- Understand terminology used in taxation.
- Working with tax tables income brackets and formulae.
- Know how to calculate taxable income and personal tax.
- Know how to interpret the impact of salary increase in personal income tax.

#### **Tariff System**

- Understand terminology used in tariffs.
- Calculate costs using given tariffs
- Interpret various tariff systems tables

#### **Hire Purchase**

- Understand terminology used in hire purchase
- Understand the difference between hire and cash purchases
- Repayment period of 12; 24; 36; 48; or 60 months.

#### **Loans and Investment**

- Loans from banks and micro-lenders where there is a monthly repayment (e.g. personal, student, car and house loans)
- Investments where there is a monthly deposit.



## IMPORTANT TERMS AND DEFINITIONS

### FINANCE

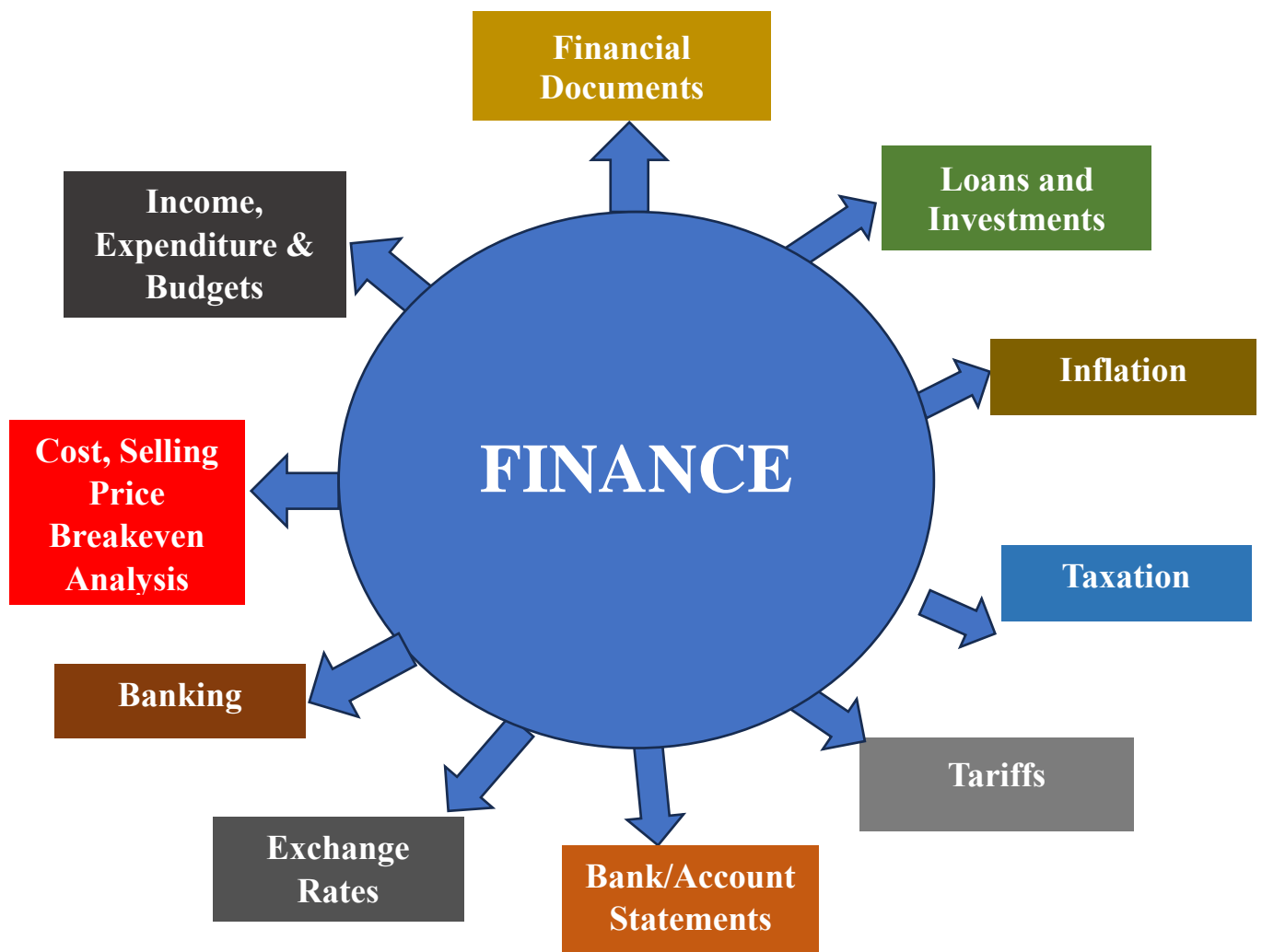
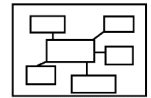
<b>Account</b>	A record of income and expenditure.
<b>Bank Statement</b>	The details of all the transactions made from one bank account in each period.
<b>Opening Balance/Balance brought forward</b>	The amount of money that appears in the bank statement at the beginning of the financial period.
<b>Closing Balance</b>	The amount of money that appears in the bank statement at the end of the financial period.
<b>Credit</b>	The amount of money that shows a payment made into the account and ready to spend.
<b>Debit</b>	The amount of money in an account removed from an account.
<b>Debit order</b>	An agreement between you and a company or individual take funds/money from your account.
<b>Stop order</b>	An agreement between you and your bank to make a of future-dated repeat payments on your behalf.
<b>Service Fee</b>	A fee collected to pay for services that relate to a product or service that is being purchased or rendered.
<b>Salary</b>	An amount of money paid for the work you do. (This is normally paid monthly.)
<b>Overdraft</b>	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.
<b>Interest</b>	Money paid regularly at a particular rate for the use or loan of money or money borrowed from the organisation/financial institution.
<b>Interest rate</b>	This is the % rate of interest that will be charged on your loan amount, i.e. a percentage value of the original loan amount.

<b>Bank Charges</b>	Amount of money paid by a customer for a bank's services.
<b>Withdrawal</b>	Money taken out of a bank account.
<b>Deposit</b>	A payment made into a bank account
<b>Budget</b>	A plan of how to spend money or an estimate of income and expenditure
<b>Income</b>	The amount of money received for work done, investments or providing services as well as products.
<b>Fixed Expenses</b>	These are amounts that must be paid every month and stays the same for a period, like rent, school fees and transport costs.
<b>Variable Expenses</b>	Expenses that change over time or from one week/month to the other but the amount changes e.g. telephone and electricity costs.
<b>Variable Income</b>	an amount of money a person receives, and it changes over time, or changes according to the situation
<b>Fixed Income</b>	An amount of money a person receives, which does not change with time. Salaries and wages are examples of fixed income
<b>Expenditure</b>	The total amount of money that an institution/individual or person spends.
<b>Profit</b>	A financial gain, especially the difference between the amount earned and the amount spent in buying, operating, or producing something.
<b>Surplus</b>	An excess of something, or an amount remaining once the demand for the item has been met
<b>Loss/Deficit</b>	The difference between total income and total expenditure (where expenses are higher than income)
<b>EFT</b>	Electronic Funds Transfer
<b>ATM</b>	Automated Teller Machine, you can withdraw money, check your balance, or even transfer funds at an ATM.
<b>Salary</b>	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. .

<b>Gross Income</b>	The total amount of all an individual's income before deductions.
<b>Nett Income</b>	The amount an employee "takes home" after income tax has been deducted
<b>Employer</b>	A person, company, or organization that pays people to work for them.
<b>Employee</b>	a person who is paid to work for an individual, company or institution.
<b>Tax Rebate</b>	A refund on taxes when the tax liability is less than the taxes paid. An amount of money that is paid back to you if you have paid too much tax.
<b>Taxable Income</b>	It is the amount of income used to calculate how much tax an individual or a company owes to the government in a given tax year.
<b>Tax Threshold</b>	An income below which you do not pay any income tax
<b>Tax Invoice</b>	
<b>PAYE</b>	Pay As You Earn. If you are an employee, you normally pay tax through PAYE
<b>IRP5</b>	An IRP5 is a certificate of various earnings and fringe benefits. It includes the tax paid and taxpayers' details for any given tax year.
<b>SARS</b>	South African Revenue Services
<b>UIF</b>	Unemployment Insurance Fund. Gives short-term relief to workers when they become unemployed or are unable to work because of maternity, adoption and parental leave, or illness
<b>GEPF</b>	Government Employees Pension Fund. A fund that manages pensions and related benefits on behalf of government employees in South Africa.
<b>Tariff</b>	The rate charged for a service rendered, e.g. import duties, water consumption cost, etc.
<b>Consumption rate</b>	The rate at which a commodity, such as water, electricity or fuel, is consumed.

<b>Break-even point</b>	Break-even point is where the business is at an activity level (doing business) at which total cost = total sales,
<b>Budget</b>	A plan of how to spend money. An estimate of income and expenditure.
<b>Capital</b>	Money that is owned by someone and used for the purpose of investing or lending.
<b>Compound interest</b>	Interest charged on an amount due, but including interest charges to date.
<b>Cost rate</b>	The price of a product per mass, volume, length or time unit.
<b>Deposit</b>	A payment made into a bank account.
<b>Fixed Deposit</b>	A single deposit invested for a fixed period at a fixed interest rate.
<b>Interest</b>	Money paid regularly at a particular rate for the use or loan of money. It can be paid to you by a finance organisation or bank (in case of savings); or it may be payable by you to a finance organisation on money you borrowed from the organisation.
<b>Gross Income</b>	The total amount of all an individual's income before deductions.
<b>Nett Income</b>	The amount an employee "takes home" after income tax has been deducted.
<b>Investment</b>	Something in which you have invested money. Money invested for specific period.
<b>Lay-bye</b>	It is a form of credit where the buyer pays a deposit and pays the balance in instalments while the shop keeps the item(s) until it has been paid off.
<b>Invoice</b>	A comprehensive document that details all the work done or items sold, and what costs are due.
<b>Zero rated VAT items</b>	These are goods that are exempted from VAT. Groceries that are basic foodstuffs are zero-rated in South Africa, e.g. brown bread, milk, mielie meal, samp, rice, etc.

# FINANCE



## LESSON OBJECTIVES

### SECTION: FINANCIAL DOCUMENTS:

Learners must be able to:

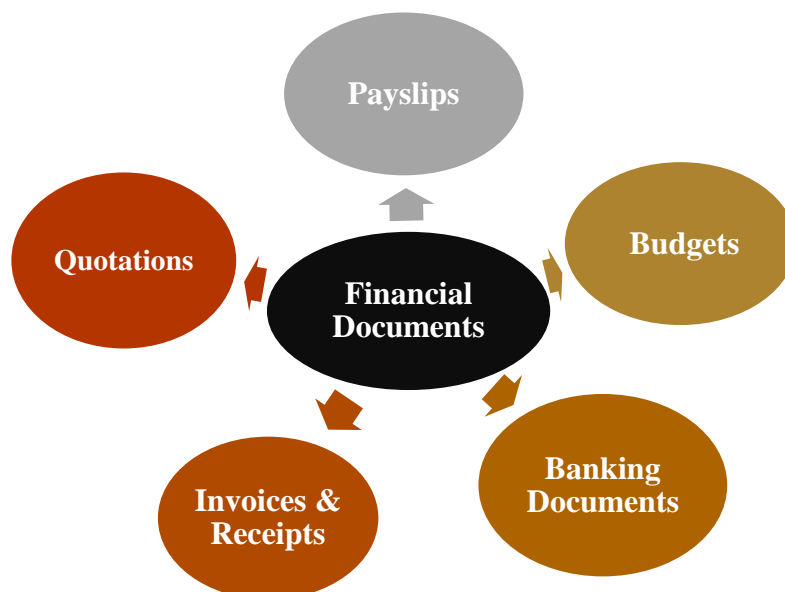
#### OUTCOMES

##### What is a financial document?

- A financial document (also known as financial statement) is a formal record of financial activities of a business, person or other entity. Relevant financial information is presented in a structured manner and in a form easy to understand
- In this manual, we will be dealing with the following documents:
  1. Payslips
  2. Budgets
  3. Quotations
  4. Invoices and receipts
  5. Banking documents

##### Benefits of organizing your financial documents:

- Plan and measure your financial progress
- Handle routine money matters, such as paying bills on time
- Determine how much money you will have now and, in the future,
- Make effective decision about how to save money.



## 1. Payslip:

### What is a Payslip?

- A payslip is a record of information given to employee when they have been paid a salary, detailing the amount of pay given, by law, the following information must be included employer's payslip:
  - Name of employer
  - Address of the employer
  - ID (identity number) of the employee
  - Work number of the employee
  - Date of employment
  - Occupation/job title
  - Pay date/Pay period
  - Gross salary and Nett salary
  - Deductions
  - Tax
  - Pension Fund
  - UIF (Unemployment Insurance Fund)
  - Union contributions
  - **Anything that the employee has authorized to be deducted**

**Worked Example 1 (Payslip):**

Mr Moloisoa is an employee at Bojanala Road Construction company. He works from 07:00 to 16:00 daily during weekdays and from 08:00 to 15:00 on Saturday. He takes a 35 minutes tea break and a 55 minutes lunch break.

Below is a copy of Mr Moloisoa’s payslip for the month of November 2024.

<b>ANNEXURE A</b>			
<b>Company Name</b>			<b>Date</b>
Bojanala Road Construction P O Box 12398 Brandwag 9324			30 November 2024
<b>Name of Employee</b>	<b>Employee number</b>	<b>Address</b>	<b>Identity Number</b>
Mr RN Moloisoa	MOL2798001	26589 Bruna Park Bloemfontein 9300	711029 0578 989
<b>Occupation</b>			
Driver: Motor grader			
<b>INCOME</b>			
<b>Gross Salary</b>			R 20 245,00
<b>Description</b>	<b>Rate</b>	<b>No of hours</b>	<b>Amount</b>
Basic salary	R105,00	189	R 19 845,00
Overtime worked (Saturdays)	R112,95	-----	R 1 581,30
Overtime worked (Public Holidays)	R112,95	0	R 0,00
Housing allowance			R 400,00
<b>INCOME</b>			
Description			Amount
PAYE tax			R 4 698,45
UIF contribution			202,45
Pension fund contribution			-----
<b>Total deductions</b>			R 6 419,28
<b>Nett Salary</b>			-----
<b>Below is a summary of deductions made from Mr Moloisoa’s salary.</b>			
<ul style="list-style-type: none"> <li>- 7,5% Of his gross monthly salary for pension fund contributions</li> <li>- UIF (Unemployment Insurance Fund) of 1% of his contributions</li> <li>- PAYE (pay as you earn) tax as per tax bracket.</li> </ul>			

### Worked Example 1 (Payslip):

Use information and TABLE 1 above to answer the questions that follow.

- 1.1 Does Mr Moloisoa earn a salary or a wage? Explain your answer. . . .

(2)

**Answer:** Salary, because he receives a fixed payment per month.

- 1.2 Explain the difference between gross and nett salary. . . .

(2)

**Answer:** gross salary – is the income received before any deductions have been made

**Nett salary** – is the income received after deductions have been subtracted

- 1.3 Calculate the amount that Mr Moloisoa contributes towards his pension fund.

**Answer:**  $R\ 20\ 245,00 \times \frac{7,5}{100}$  (2)

$$= R\ 1\ 518,38$$

- 1.4 Mr Moloisoa claims that his nett salary will be R13825,72. Verify using calculation s whether his claim is valid. (5)

- 1.5 Determine how much did he take home at the end of the month?

**Answer:**  $R\ 20\ 245,00 - R\ 6\ 419,28 + R\ 1\ 581,30$

$$= R\ 15\ 407,02$$
 (3)

- 1.6 Show how the UIF contribution of R202,45 was calculated.

**Answer:**  $R\ 20\ 245,00 \times \frac{1}{100} = R\ 202,45$

- 1.7 Determine the difference between the hourly rate paid for working during weekdays and for working during Saturdays. (3)

**Answer:**  $R112,95 - R105,00$

$$= R\ 7,95$$

**Activity 1: Payslip****Payslip**

Zoonodle Inc.

21023 Pearson Point Road

Gateway Avenue

**Date of Joining :** 2018-06-23**Employee Name :** Salley Harley**Pay Period :** August 2021**Job Description :** Marketing Executive**Worked Days :** 26**Department :** Marketing

<b>Earnings</b>	<b>Amount (R)</b>	<b>Deductions (R)</b>	<b>Amount (R)</b>
Basic	10 000	Provident Fund	1 200
Incentive	1 000	Professional Tax	500
House Rent Allowance	400	Loan	400
Meal Allowance	200		
Overtime	A		
<b>Total Earnings</b>	<b>12 800</b>	<b>Total Deductions</b>	<b>2 100</b>
		<b>Nett Pay</b>	<b>10 700</b>

- 1.1 Define the term *nett salary* (2)
- 1.2 What position does Salley Harley hold at work? (2)
- 1.3 Determine the unit ratio of Incentive to Basic. (2)
- 1.4 Calculate the value of A. (3)
- 1.5 Determine how long Miss Harley worked for the company from the date she joined the company until 31 July 2021. Give your answer in years and months. (2)
- 1.6 Show how the nett salary was calculated. (3)

**TOTAL****[14]**

## 2. Budget Statement:

**A budget is a list of expected income and expenditure. It consists of fixed and variable costs**

For the company to compile a budget, they must:

- a. Make a list of Income and Expenditure
- b. Calculate the total Income and Expenditure
- c. Check if the budget covers all planned activities
- d. Know what effects the increase of prices will have on their budget?

### Worked Example 2: (Budget Statement)

Use information and TABLE below to answer the questions that follow.

Sphiwe, a businesswoman who lives at Bloemfontein, have a clothing shop which is situated at Brunos Mall. To keep track of her business, she checks the budget of her shop on monthly basis. Below is a copy of the shop's budget for the month of December 2024

<i>Viola Boutique</i> <i>Budget for December 2024</i>			
<b>Income</b>		<b>Expenses</b>	
Sales	R 658 450,00	Rent	R 5 600,00
		Advertising	<b>A</b>
		Salaries	R 2 900,00
		Insurance	R 234 560,00
		Stock purchase	R 4 898,20
		Telephones	R 2 400,55
		Electricity	R 1 900,80
		Water	R 8 400,40
		Incidentals	R 13 456,20
<b>Total Income</b>	<b>R 658 450,00</b>	<b>Total Expenses</b>	<b>R 316 416,15</b>

2.1 Define the term *profit*.

**Possible Answer:**

An amount of money that you gain when you are paid more for something than it cost you to make, get, or do it. (2)

2.2 Determine the value of **A**, the amount budgeted for advertising.

**Possible Answer:**

$$\text{Advertising: } R316\,416,15 - R217\,116,15 = R\,42\,300,00 \quad (2)$$

2.3 Calculate the profit that Sphiwe would made from the sales.

**Possible Answer:**

$$\text{Profit} = R658\,450,00 - R316\,416,15 = R\,342\,034,85 \quad (2)$$

2.4 Sphiwe has budgeted R 13 456,20,00 VAT inclusive for incidentals. Calculate the amount of VAT that is included in the purchasing price.

**Possible Answer:**

$$\text{VAT Inclusive} = \frac{R13\,456,20}{1,15} = R11\,701,34$$

$$\text{Amount of VAT} = R13\,456,20 - R11\,701,34 = R1\,755,16 \quad (3)$$

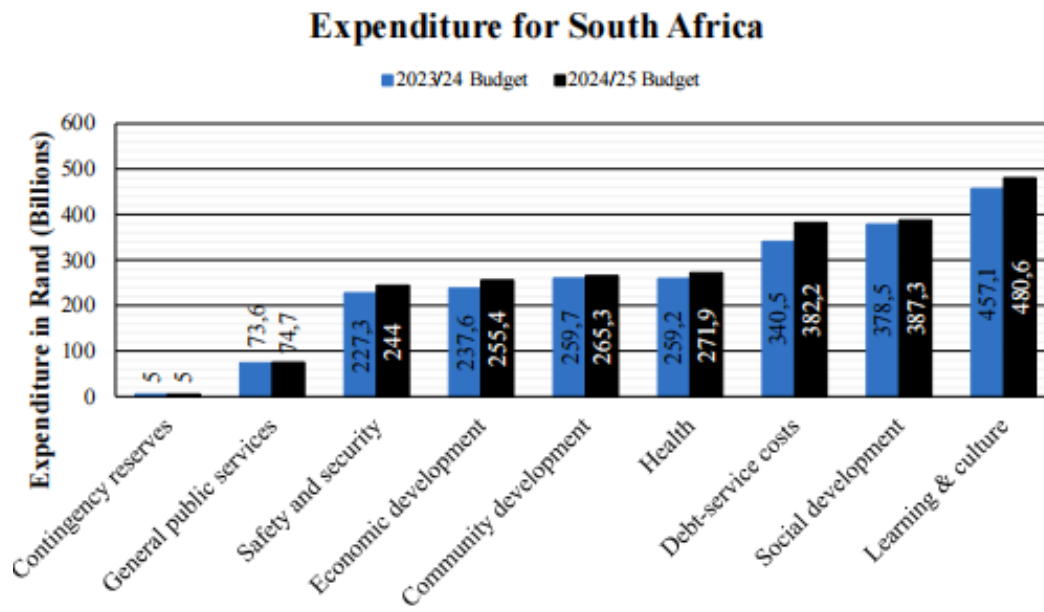
2.5 Express the amount paid for stock purchase as a percentage of the total expenses.

**Possible Answer:**

$$\text{Percentage} = \frac{R4\,898}{R316\,416,15} \times 100\% = 1,55\% \quad (2)$$

### Activity 1: (Budget Statement)

Use information and graph below to answer the questions that follow.



1.1 Name the type of graph that is used to represent this data. (2)

1.2 Identify the sector that received the same allocation for the 2023/24 and 2024/25 Financial year budget. (2)

1.3 The total budget allocation for the 2024/25 Budget was R2 366,4 billion and learning and culture received R480,6 billion of the budget. (2)  
Calculate the percentage of the budget that was allocated to learning & culture

1.4 Name another type of graph that can be used to represent the data above (2)

1.5 Write the amount allocated for Peace and security in 2024/25 in words without numerals. (2)

**TOTAL** [10]

### 3. Invoice:

**An invoice is a document outlining the exchange of the seller's product or service for the buyer's payment.**

The term "invoice" is commonly used interchangeably with "receipt." Essentially, they serve the same purpose – to document the price and terms of a sale or exchange of service.

#### Worked Example 3: ( Invoice)

Use information and TABLE 1 above to answer the questions that follow.

Ms R. Gumede took her car to Hi-Q (a tyre fitment centre) to do a 10-point safety check before driving to Durban. She was informed that she would need to replace two of her tyres. She received the financial document below, which she paid for using her credit card.

#### ANNEXURE B

##### Hi-Q

*Tyres, Batteries, Breaks and More*

61 Victoria Road, Somerset West, 7130  
Phone: 021 851 7004

##### TO:

Ms R. Gumede  
17 Mountain Road, Somerset West, 7130  
Phone: 083 566 3434

##### COMMENTS OR SPECIAL INSTRUCTIONS:

Cash Customer, Honda Jazz, CAA 7821  
125 430 km  
Salesperson: Chris Warner



**INVOICE:** 6359  
**DATE:** 21/12/2024  
**DUE DATE:** 31/11/2024

Quantity	Description	VAT %	Unit Price	Excl. VAT	TOTAL	
2	Falken Tyres 195/50R15	15%		R1 547,83	R1 780,00	
1	Wheel Alignment	15%	R300	R 260,87	R 300,00	
<b>Total Exclusive of VAT</b>					<b>R1 808,70</b>	
					Total VAT	R 271,30
					Sub-Total	<b>A</b>
					<b>Total Due</b>	<b>R2 080,00</b>

##### Banking Details

Nedbank  
Account number: 105 325 2078  
Branch Code: 198765  
Branch: Somerset tr  
[hiqswest@gmail.com](mailto:hiqswest@gmail.com)

If you have any questions concerning this invoice, Chris Warner, 021 851 7124, [hiqswest@gmail.com](mailto:hiqswest@gmail.com)

3.1 Name the type of financial document shown above.

**Possible Answer:**

Invoice (2)

3.2 State two ways of contacting Hi-Q.

**Possible Answer:**

Telephone, cell phone and email. (2)

3.3 Give the name and address of the customer.

**Possible Answer:**

R. Gumede  
17 Mountain Road Somerset West 7130  
17 mountain Road (2)

3.4 Determine the Sub-Total, the value A.

**Possible Answer:**

Value (A) = R2 080 (2)

3.5 Calculate the unit price (including VAT) of Falken Tyres

**Possible Answer:**

Unit =  $\frac{R1\ 780}{2} = R890,00$  (2)

3.6 Write as a unit ratio (to two decimal places), the total price of the tyres to the price of the wheel alignment in the form (2)

#### 4. Quotation:

**A quotation is a document that a seller provides to a buyer to offer goods or services at a stated price, under specified conditions.**

Also known as quotes, sales quotes or sales quotations, quotations are used to let a potential buyer know how much goods or services will cost before they commit to the purchase.

#### ANNEXURE C

#### QUOTATION FOR DENTAL PROCEDURE

ABC Medical Centre Practice number: 2458793 Corner of Bolt and Louw Streets, Kimberley, 8301 <b>Tel.:</b> 053 839 6322 <b>E-mail:</b> admin@dutoit.co.za	
<b>Date:</b> 15-01-2023 Procedure: Crown <b>Dentist: Dr JJ Ndlovu</b>	
<b>Ms Mpho Hendricks</b> <b>Acc. No.:</b> 000128966 <b>ID:</b> 821213 0045 071 <b>Cell:</b> 066 468 0206	<b>Med. Aid:</b> GEMS (00897588) <b>Member No.:</b> 00897588 <b>Dep. No.:</b> 00

Code	Description	ICD-10	Tooth	Qty	Amount
8018	Infection control measure	K02.9		2	R40,55
8220	Sterilised instrumentation	K02.9		1	R56,20
8145	Local anaesthetics – per visit	K02.9		1	R89,10
8114	Crown	K02.9	12	1	R1 588,90
	<b>SUBTOTAL</b>				<b>R1 744,75</b>
	<b>TOTAL (including 15% VAT)</b>				<b>R1 744,75</b>

Summary	
	Amount
Medical Aid Payment	R1 744,75
Patient Payment	R0,00

[Adapted from an actual quotation for a dental procedure]

### Worked Example 1: Quotation

A dental procedure, e.g. a crown implant, is performed by a dentist.  
ANNEXURE C above shows a quotation for a dental procedure for Ms Mpho Hendricks.

**NOTE:** A crown is a dental cap which completely covers a tooth.

Use the ANNEXURE C above to answer the questions that follow

- 4.1 Calculate the price of ONE infection control measure. (2)

**Possible Answer:**

$$\begin{aligned} &= R40,55 \div 2 \\ &= R20,28 \end{aligned}$$

- 4.2 Write down the name of the dentist who is treating Mpho. (2)

**Possible Answer:**

Dr JJ Ndlovu

- 4.3 State the year in which Mpho was born. (2)

**Possible Answer:**

1982

- 4.4 Write down the amount that Mpho has to pay when the procedure is done.

**Possible Answer:** (3)

R0,00/nothing

- 4.5 Calculate the total amount excluding 15% VAT

**Possible Answer:**

$$\text{VAT Inclusive} = R1\,744,75 \div \frac{115}{100} = R15\,517,17 \quad (3)$$

### Activity 1: Quotation

Bergvlei High School wants to gift each of their 106 Grade 12 learners a bag with the school's emblem printed on it to wish them good luck with their exams.

TABLE below shows the cost of screen printing on items:

UNITS PRINTED	1 COLOUR		2 COLOURS	
	Print Price/Unit	Set Up	Print Price/unit	Set Up
50 -100	R 6,75	R 150	R 7,87	R 300
101 – 250	R 5,92	R 150	R 7,12	R 300
251 – 500	R 5,62	R 150	R 6,75	R 300
500 – 1 000	R 4,37	R 150	R 6,37	R 300

#### COST OF UNPRINTED BAGS

Bags – 10 per pack	Bags – 20 per pack	Printed bag
R 499,00	R 899,00	

[Source: ppehygiene.co.za]

Use the ANNEXURE C above to answer the questions that follow

- 1.1 State the print price/unit of 500 – 1 000 units . (2)
- 1.2 Identify the minimum number of items that can be printed by this business. (2)
- 1.3 Show that the printing cost of one bag for each learner (when using one colour) is R627,52. (2)
- 1.4 The school decided on buying the bags using the 20-pack option. Determine the number of packs of bags the school should buy to give each learner a bag. (2)
- 1.5 Was the answer to 4.4 round down or up, and why? (2)

**TOTAL** [10]

## 5. Account Statement

A bank statement is a record, typically sent to the account holder every month, summarizing all transactions in an account during a set period.

### Worked Example 1: Account Statement

Use the ANNEXURE D above to answer the questions that follow

1.1 Write down the name of the premises Bongiwe rented.

**Possible Answer:** Unit 16 (2)

1.2 Give ONE reason why reference numbers are used when making payments.

**Possible Answer:** Easier to read numbers on long bank statements; to identify which clients have made payments to their accounts; convenience (2)

1.3 State the months that this statement cover.

**Possible Answer:** June and July (2)

1.4 The total amount due for this invoice is R2 340,73, including 15% VAT.

Calculate the total amount due, excluding VAT.

**Possible Answer:**

$$= R2\ 340,73 \times \frac{100}{115} = R2\ 035,42$$

**OR**

$$= \frac{2340}{1,15} = R2\ 035,42 \quad (2)$$

1.5 Blueberry Gardens have 49 units in total.

Calculate the total amount collected by the body corporate if all 49 units paid their levy CSOS on 1 July 2021.

**Possible Answer:**

Total amount collected

$$= 49 \times R30,90$$

$$= R1\,514,10 \quad (3)$$

- 1.6 The Blueberry Gardens body corporate increased the standard levy by 6,45% from 1 August 2021.

Calculate the new standard levy after the increase.

**Possible Answer:**

$$= R1\,498,63 \times 6,45\%$$

$$= R96,66$$

**Standard Levy after increase**

$$= R1\,498,63 + R96,66$$

$$= R1\,595,29 \quad (4)$$

### Activity 1: Account Statement

A bank statement from Ms Bhedie's monthly account is shown below.

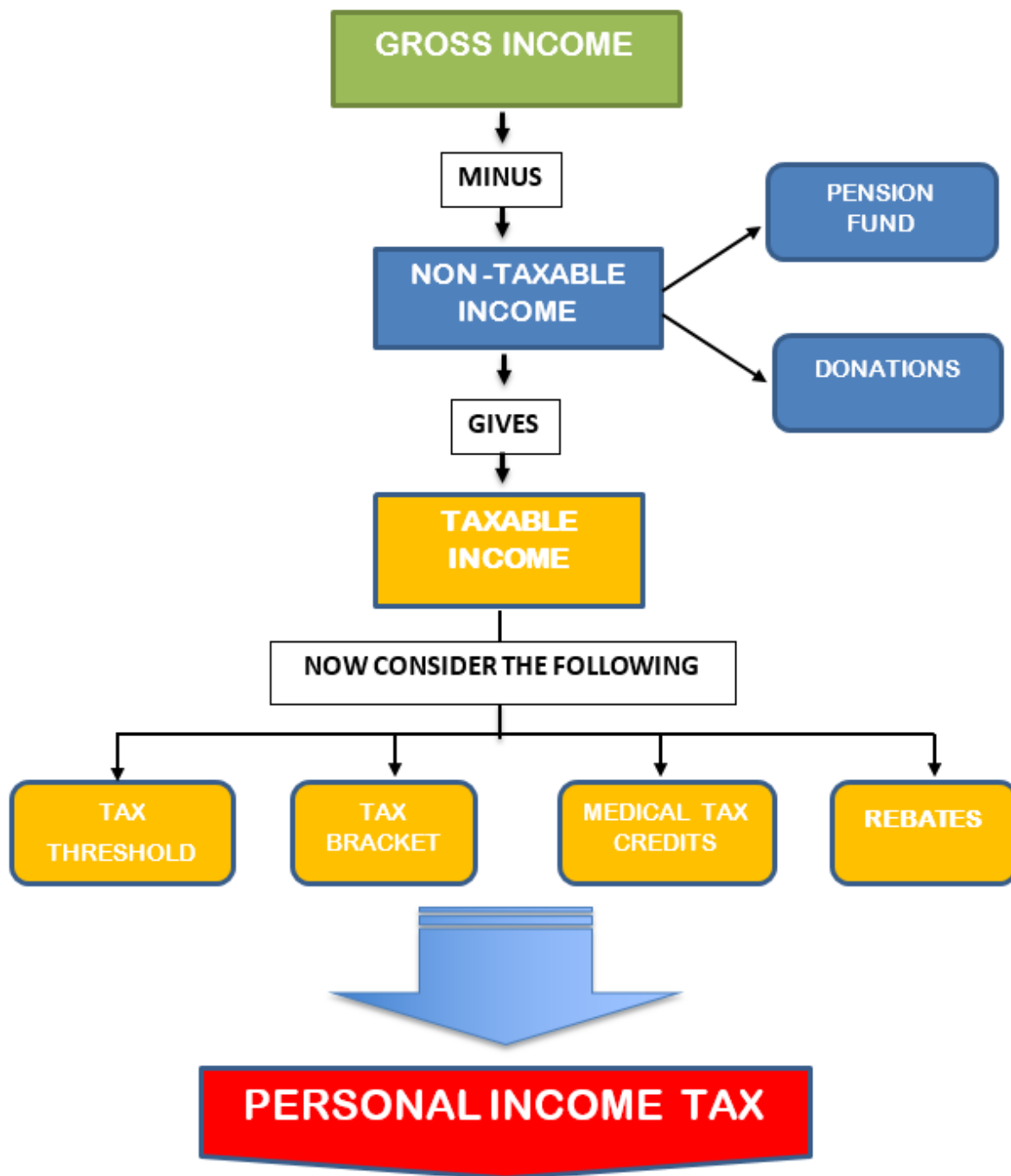
DETAILS	DEBIT(R)	CREDIT(R)	DATE	BALANCE (R)
<b>Previous Balance</b>			2 March	<b>1 895,00</b>
Bank charges	-R129,98		3 March	1 765,02
Loan	-R1 100,00		16 March	<b>(a)</b>
Salary		R29 688,50	20 March	R27 923,50
Fibre Votex	-R599,00		20 March	R27 234,50
Showmax	-R335,00		21 March	R22 635,00
Builders Warehouse	-R4 388,00		26 March	R18 247,00
Refund BWH		R2 076,00	26 March	R20 323,00
EFT Payment-Foschini	-R500		29 March	R19 823,00
Transaction fee	-R55,90		29 March	<b>(b)</b>
Cash Withdrawal	-R3 500		31 March	R19 878,90
				<b>R16 378,90</b>

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

- 1.1 What type is the statement shown above? (2)
- 1.2 The statement shown above is monthly or quarterly. (2)
- 1.3 Determine the probability of having a transaction on the 02 May. (2)
- 1.4 Calculate the value of (a) and (b). (2)
- 1.5 Determine the difference between the salary and refund. (3)
- 1.6 The Blueberry Gardens body corporate increased the standard levy by 6,45% from 1 August 2021. (4)  
Calculate the new standard levy after the increase.

**TOTAL** [15]

**SECTION: TAXATION:**



Learners must be able to:

## OUTCOMES

### What is Personal Income Tax?

- Individual income tax is also referred to as personal income tax. This type of income tax is levied on an individual's wages, salaries, and other types of income. This tax is usually a tax the state imposes. Because of exemptions, deductions, and credits, most individuals do not pay taxes on all of their income.

### Documents related to Income Tax:

- Payslips
- Tables containing income tax brackets and income tax formulae
- Tax deduction tables issued by SARS to employers
- IRP5 forms
- Personal Income tax forms to be completed by employees

### Facts to be considered when dealing with taxation:

- **UIF:** stands for unemployment insurance fund. UIF is not a TAX DEDUCTION. (Take note: some textbooks are WRONG).
- **Net Pay or net income – It is a person's income after all deductions were done.** Take note: the Net income and taxable income can be the same, but it is not necessarily the same. Example of Net income: Net income = Gross income – pension fund contribution – medical aid contribution – tax payable - UIF (whatever is applicable to a person's situation).
- **Tax rebate:** An amount deducted from or taken off the tax after your tax payable has been worked out. For math lit we only work with the *primary, secondary and tertiary* rebates – which is age dependent. MTC (Medical tax credit) is also a rebate and not a deduction.
- **Tax threshold:** Persons with gross annual income less than these amounts do not pay any income tax (it is age dependent).
- **Taxable Deductions:** Taxable deductions (e.g. medical aid, pension fund – CAPS doc p. 59): SARS does not indicate the word taxable deductions, but rather talk of “**tax deductible expenses**”. Since MTC was introduced, medical aid is no longer a tax deductible expense. **Pension fund is a tax deductible expense.** It was always 7,5% but changed and provision is now made for a combination of pension fund, annuity and provident fund. Learners don't have to learn maximums; the question must be clear about how much is deductible.
- **Taxable income:** The income on which the tax will be calculated. In math lit we usually deal with the following to get the taxable income: it is the gross income minus deductions  
**Taxable income = Gross income – pension fund contributions**  
**If there is not pension fund contributions:** Taxable income = Gross Income
- **Medical Tax credits (MTC):** A Medical Scheme Fees Tax Credit (also known as an “MTC”) is a rebate which is used to reduce the normal tax a person pays. MTC is not a DEDUCTION, but a REBATE.

**TAKE NOTE: DEDUCTION - subtracted BEFORE tax calculation  
REBATE – subtracted AFTER tax calculation**

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7	STEP 8
Get the annual salary (if necessary)	Deduct pension fund (if necessary)	Check the tax threshold – Lower: stop -Higher: proceed	Identify the tax bracket	Do calculation	Subtract correct rebate (depending on age).	Subtract MTC (ensure that it is the annual MTC)	If asked per month: divide by 12

**Tax Table Annexure A Worked Example 1**

Taxable Income	Taxable Rate
R0-R205 900	18% of taxable income
R205 901-R321 600	R37 062 + 26% of taxable income above R205 900
R321 601-R445 100	R67 144 + 31% of taxable income above R321 600
R445 101-R584 200	R105 429 + 36% of taxable income above R445 100
R584 201-R744 800	R155 505 + 39% of taxable income above R584 200
R744 801-R1 577 300	R288 139 + 41% of taxable income above R744 801
R1 577 301 and above	R559 464 + 45% of taxable income above R1 577 300

**Tax Threshold**

- R83 100 for taxpayers younger than 65
- R128 650 for taxpayers aged 65 to 74
- R143 850 for taxpayers aged 75 and over

**Rebates**

- R14 958 per year for all individuals
- R8 199 for taxpayers aged 65 and over
- R2 736 for taxpayers aged 75 and over

**Medical tax credits**

- R319 per month per beneficiary for the first two beneficiaries
- R215 per month for each additional benefi

## Income Tax: Worked Example 1

A bank statement is a record, typically sent to the account holder every month, summarizing all transactions in an account during a set period.

1.1 Mrs Ndlovu, who is 58 years old, earns a monthly income of R60 000.

Each month she contributes the following from her monthly income:

- Medical aid for herself, her husband and two children.
- 7,5% of her basic income is contributed to a pension fund.
- 1% of her basic income is contributed to the UIF (max. R148,72).

Use the tax table on ANNEXURE A ABOVE to answer the questions that follow.

Use Tax table (Annexure A) and the information above to answer the questions that follow.

1.1.1 Explain what the tax threshold for people 65 years and younger means to a taxpayer.

**Possible Answer:**

It means that people 65 years and younger, receiving an annual income of R83 100 or less, does not have to pay tax (2)

1.1.2 Calculate Mrs Ndlovu's annual taxable income

**Possible Answer:**

Income – pension – UIF = taxable income  
 $R60\,000 - (7,5\% \times 60\,000) - R148,72 = R55\,351,28$   
 $R55\,351,28 \times 12 = R664\,215,36$  (5)

1.1.3 Determine Mrs Ndlovu's annual medical aid tax credits.

**Possible Answer:**

$(R319 \times 2) + (R215 \times 2) = R1\,068$  per month  
 $R1\,068 \times 12 = R12\,816$  per year (4)

Mrs Ndlovu stated that her monthly tax contribution is R 9 111,75.  
Verify, showing ALL calculations, whether her statement is valid.

**Possible Answer:**

- 1.1.4 R155 505 + 39% (R664 215,36 – R584 200)  
 R155 505 + R31 2015,99  
 R186 710,99  
 R186 710,99 – R14 958 = R171 752,99  
 R171 752,99 – R12 816 = R158 936,99  
 R158 936,99 ÷ 12 = R13 244,75  
 No, her claim is NOT VALID

(8)

**Income Tax: ACTIVITY 1**

Mr Nxeba is 50 years old and earns a monthly taxable income of R42 835,60 in the 2023/2024 tax year. He belongs to the medical aid with two children.

TABLE below shows the annual tax table for individuals for the 2023/2024 tax year.

**TAX RATES FROM 1 MARCH 2023 TO 29 FEBRUARY 2024**

Taxable income	Rates of tax
0 – 237 100	18% of taxable income
237 101 – 370 500	42 678 + 26% of taxable income above 237 100
370 501 – 512 800	77 362 + 31% of taxable income above 370 500
512 801 – 673 000	121 475 + 36% of taxable income above 512 800
673 001 – 857 900	179 147 + 39% of taxable income above 673 000
857 901 – 1 817 000	251 258 + 41% of taxable income above 857 900
1 817 001 and above	644 489 + 45% of taxable income above 1 817 000

**Rebates**

Rebates Primary	R17 235
Secondary (Persons 65 and older)	R9 444
Tertiary (Persons 75 and older)	R3 145

**Tax Threshold**

Below age 65	R97 750
Age 65 to below 75	R148 217
Age 75 and older	R165 689

**Medical Tax Credit**

For the taxpayer or for a dependant who is a member of a medical aid	R364
For the taxpayer and one dependant	R728
For each additional dependant	R246

1.1.1 What should the taxable income be of a 66-year-old person to start paying tax? (2)

1.1.2 Identify the tax bracket that Mr Nxeba will use to calculate her income tax payable. (2)

1.1.3 Calculate Nxeba's annual taxable income for the 2023/2024 tax year. (5)

1.1.4 Show by means of calculation that the person under 65 is not liable to pay tax. (4)

1.1 **Income Tax: ACTIVITY 2**

In South Africa, when any property is sold, transfer duties need to be paid by the person purchasing the property. This is a government tax which is paid to SARS.

James Martin is looking at purchasing a house with a market value of R2 500 000. He sold his small flat for R1 000 000.

**2023 tax year (1 March 2022 – 28 February 2023)**

Value of property (rands)	Rates of tax (rands)
1 – 1 000 000	0%
1 000 001– 1 375 000	3% of the value above R1 000 000
1 375 001– 1 925 000	R11 250 + 6% of the value above R1 375 000
1 000 001– 2 475 000	R44 250 + 8% of the value above R1 925 000
1 000 001– 11 000 000	R88 250 + 11% of the value above R2 475 000
11 000 001 and above	R1 026 000 + 13% of the value above R11 000 000

[Source: <<https://www.sars.gov.za/tax-rates/income-tax/rates-of-tax-for-individuals/>>]

Use the information above to answer the questions that follow.

1.1.1 The person who earns R79 000 pay tax according to SARS. True/False (2)

1.1.2 Write down the acronym SARS in full. (3)

1.1.3 Explain how the person buying James Martin's flat benefitted by only paying R1 000 000. Use the value(s) from the tax table to support your answer. (2)

1.1.4 Show, using calculations, how much tax James would need to pay to SARS if he offered the asking price of R2 500 000 for the house. (5)

1.1.5 James's wife claimed that if the current owners of the house reduced their asking price by 5%, they would have saved exactly R10 750 in transfer costs.

Verify, showing all calculations, whether James's wife's claim is valid. (5)

**TOTAL** [17]

## SECTION: TARIFFS

### OUTCOMES

#### Introduction

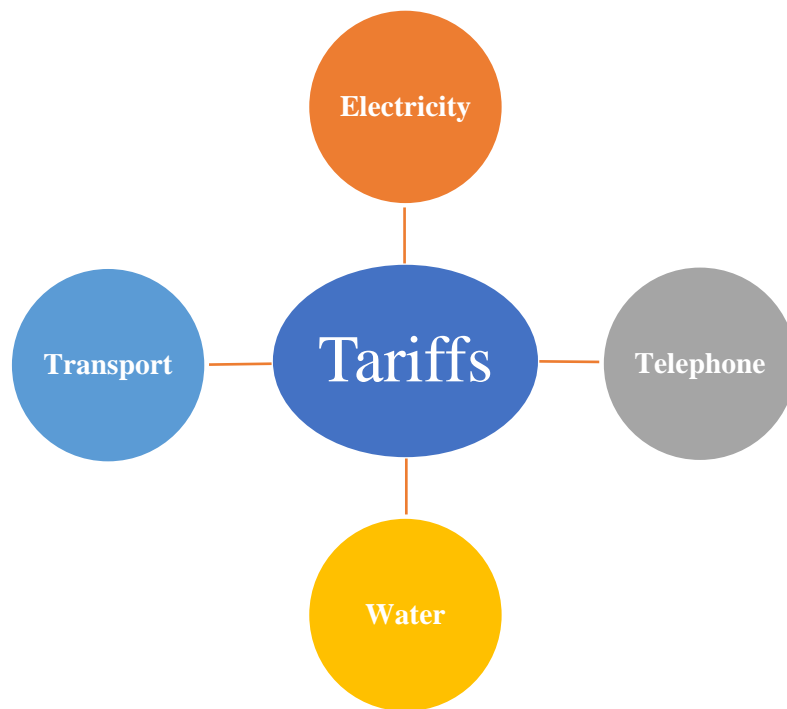
A tariff is the charge in rands per measuring unit for a specific service. Tariffs are not always constant; they change from time to time.

The formulae for calculating the total cost is:

**Total cost = number of units x tariff (cost per unit)**

In this grade we are going to deal with the following tariffs:

- Electricity
- Water
- Telephone
- Transport



## Electricity Tariffs

Electricity tariff (sometimes referred to as the price of electricity) varies widely from country to country, province to province and may vary significantly from municipality to municipality within a particular province. There are many reasons that accounts for these differences in price, such as market price of the fuel used, government subsidies and even local weather patterns.



- Electricity usage is measured in kilowatt per hour (KWh)
- The amount of electricity that a person will pay each month depends on the number of Kwh of electricity used during the month.
- Electricity is charged at a sliding scale. This means that the more electricity you use, the higher the rate at which you are charged for electricity.

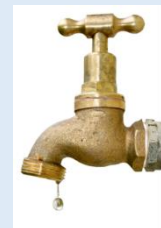
## Water Tariffs

Water tariff, just like electricity tariffs also varies from one place to the other.

Water consumption is measured in kilolitres (kl)

*1 kl = 1000 L*

- The amount payable for water also depends
- on the number of kl of water used during the month.
- Water is charged at a sliding scale. The more water you use, the higher the rate at which you are charged.



## Transport Tariffs

Majority of the people in South Africa depend on public transport. Of the 35 million daily trips recorded in South Africa, over 60% are by public transport. The most common means of public transport are:

- Taxi
- Bus
- Train
- Aeroplane
- Motor vehicle (car)

*Fuel can be  
Petrol or Diesel*



Transport tariffs (fares) are based on the distance travelled, cost of fuel and the general wear-and-tear on the vehicle. Fares can be purchased as:

- Single trip – one-way only
- Return (round) trip – there-and-back
- Weekly and monthly tickets

## Cell phone Tariffs

Cell phone networks use either **prepaid** or **contract** billing structure. Different networks charge different tariffs. The most common networks in South Africa are *Vodacom, MTN, Cell C, Telkom*



### Prepaid tariff system

The general formula for the prepaid tariff system is:

*Prepaid cost = total number of units x tariff*

*Units can be in minutes or seconds  
Prepaid: No calls, no costs!*

### Contract tariff system

A cellphone contract for a specific period is taken out from a service provider.

The cost per month includes: Subscription fee and cost for the calls

The cost formula for the contract tariff system is: = subscription fee + (number of minutes – free minutes) x tariff

### 1.1 Worked Example (Electricity tariffs)

Mr Marange household is using the post-paid electricity meter. Their meter reading for the month is 39 513kWh. The reading at the end of last month was 38 953 kWh.

Post-post tariffs (VAT exclusive)		
Cost		R2, 04 per kWh
Pre-paid (VAT exclusive)		
<b>Block 1</b>	0 - 50 kWh	R1,92 per kWh
<b>Block 2</b>	51 - 350 kWh	R2,04 per kWh
<b>Block 3</b>	Over 350 kWh	R2,79 per kWh

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

1.1.1 Calculate the number of units the Marange household used in this month.

**Possible Answer:**

$$\begin{aligned}\text{No. of units} &= 39\,513 \text{ kWh} - 38\,953 \text{ kWh} \\ &= 560 \text{ kWh}\end{aligned}\quad (2)$$

1.1.2 Determine (in rands) the cost of electricity for this month. The cost must include VAT.

**Possible Answer:**

$$\begin{aligned}\text{Post-paid cost:} &= 560 \text{ kWh} \times \text{R}2,04 \\ &= \text{R}1\,142,40 + \text{R}171,30 \\ &= \text{R}1\,313,70\end{aligned}\quad (2)$$

1.1.3 How much (including VAT) they would have paid if they were on pre-paid system?

**Pre-paid cost:**

$$\begin{aligned}1^{\text{st}}: & 50 \times \text{R}1,92 = \text{R}96,00 \\ 2^{\text{nd}}: & 299 \times \text{R}2,04 = \text{R}609,96 \\ 3^{\text{rd}}: & 211 \times \text{R}2,79 = \text{R}588,69 \\ \text{Total cost:} & \text{R}96,00 + \text{R}609,96 + \text{R}588,69 = \text{R}1\,294,65 + \text{R}194,20 = \text{R}1\,488,85\end{aligned}\quad (4)$$

1.1.4 Which system will you recommend for it to be utilised, and why?

**Possible Answer:**

The post-paid system is the more economical than pre-paid system. I will recommend post-paid. (2)

**Activity 1: (Electricity tariffs)**

- 1.1 The following stepped tariff table is used by the City of Johannesburg for electricity charges. The tariff table includes the 2021/2022 increase in electricity costs of 14,59%.

**Residential Single Phase 60A 2021/2022**

Block Name	Kwh used	Tariff (cents/kwh incl. VAT)
Block one	0 - 500 kWh	146,48
Block two	501 - 1000 kWh	169,11
Block three	1 001 – 2 000 kWh	182,07
Block four	2 001 – 3 000 kWh	192,47
Block five	More than 3 000 kWh	202,25
*Service charge in cents per month (including VAT)		169,30
*Capacity charge in cents per month (including VAT)		498,74
<b>*These are two compulsory monthly charges</b>		

[Adapted from source: <<https://www.citypower.co.za/customers/Documents>>]

Use the information provided to answer the questions that follow.

- 1.1.1 Sashin uses 1 100 units of electricity during January 2022. He calculates this to be R1 766,70 (including VAT) for the month. Using calculations, show he is correct. (6)
- 1.1.2 Calculate, in rand rounded to two decimal places, the average cost per unit for the 1 100 units of electricity consumed by Sashin for January 2022. (3)
- 1.1.3 Calculate how much Sashin would have paid for the same 1 100 units of electricity in the previous financial year. (3)

**TOTAL** [12]

1.1 **Worked Example: (Water tariffs)**

Thando received the slip below after purchasing prepaid water at one of the approved vendors.

**PREPAID WATER SLIP**

Blue Approved Tax Invoice Mangaung Metropolitan Municipality Credit Token <b>3974 0445 6670</b> <b>6712 5026</b>		
6 kℓ	@ 9,6600 R/kℓ	= R57,96
9 kℓ	@ 22,7200 R/kℓ	= R204,48
15 kℓ	@ 25,2300 R/kℓ	= ...
22, 4 kℓ	@ 29,6900 R/kℓ	= R665,056
Amount:		R1 305,95
VAT @ 15%:		R195,89
Total:		R1 501,84
Free Units:		0,00 kℓ
Credit Units:		52,40 kℓ
Total Units : 52,50 kℓ		
Receipt No:		01166515
Meter No:		41150801599
Date:	25/02/2022	18:20:27

[Adapted from actual slip]

Use the information above to answer the questions that follow.

1.1.1 Write down Thando's water meter number.

**Possible Answer:**

(2)

41150801599

1.1.2 Define the term tariff in the given context.

**Possible Answer:**

A tariff is the amount at which a single unit for a service is charged

(2)

1.1.3 Identify the maximum number of kilolitres that can be bought at R9,6600 per kilolitre.

**Possible Answer:**

6

(2)

1.1.4 Determine the missing value, the cost of using 15 kℓ of water in the context above.

**Possible Answer:**

$15 \text{ kℓ} \times R25,2300/\text{kℓ} = R378,45$

(3)

- 1.2 Lamura used 47 kilolitres (kl) at her residence site. She consulted the municipal water tariff to check how much she will have to pay for ALL the water used.

TABLE below shows the costing structure of water at Nkutulwelleng Municipality:

WATER TARIFFS	
Water usage in kilolitres	Tariff*(per kilolitre)
0 kl to 9 kl	R0,00
From 9 kl to 25 kl	R9,27
From 26 kl to 30 kl	R12,46
From 31 kl to 45 kl	R19,06
More than 45 kl	R20,96
Fixed charges per month	Tariff*
0 kl to 9 kl	R0,00
Greater than 9 kl	R83,56
<b>*Tariffs excludes 15% VAT</b>	

Use TABLE above to answer the following questions.

- 1.2.1 The tariffs in Table 1 above are said to be in “progressive or sliding scale of billing” explain this.

**Possible Answer:**

The more the water is used the more one is charged / pays (2)

- 1.2.2 Calculate how much must Lamura pay for using 47 kl of water.

**Possible Answer:**

Cost of water usage (excluding VAT):  
 $= [R0,00 \times 9 \text{ kl}] + [R9,27 \times 16 \text{ kl}] + [R12,46 \times 5 \text{ kl}] + [R19,06 \times 15 \text{ kl}] + [R20,96 \times 2 \text{ kl}]$   
 $= R0,00 + R148,32 + R62,30 + R285,90 + R41,92$   
 $= R538,44$

Cost of fixed charges per month (excluding VAT):  
 $= R83,56$  for amount higher than 9 kl

Total cost (excluding VAT):  $= R538,44 + R83,56$   
 $= R622$

VAT (at 15%) on total costs:  $\frac{15}{100} \times R622 = R87,08$   
Hence, total cost (including VAT):  $R622 + R87,08 = R709,08$  (10)

- 1.2.3 State how the cost would be if the same amount of water had been used by the Business purpose on its site. Explain.

**Possible Answer:**

Will be higher.

Business are billed higher than residence. Different tariffs apply for residence (LOW) and business (HIGHER). (4)

**Activity 2: (Water tariffs)**

- 1.1 Mr Chatima bought a house with a pool in Queenstown. After moving in, she realizes that the pool had a crack on the side. To fix the crack, 48 kℓ of water had to be drained.

<b>Chris Hani District Municipality Tariffs</b>	
<b>Residential</b>	
<b>(all tariffs are VAT inclusive)</b>	
0 - 6 kℓ	R11, 28
7 – 15 kℓ	R13, 05
16 – 30 kℓ	R15,81
31 – 60 kℓ	R17,63
> 60 kℓ	R19,89

[Adapted from www.businessstech.co.za]

Use the information provided to answer the questions that follow.

- 1.1.1 Using the water tariffs table ABOVE to calculate the cost (exc. VAT) of refilling the pool. (5)

- 2.1 Ms Maome-Dikana (Maths Lit teacher) claims that she will use R1 351,38 (including VAT) for consuming 40 kℓ of water at Buffalo city local municipality. He made an enquiry on his water consumption and charge. He was given the table below to check the calculations.

<b>2023/2024 Buffalo District Municipality water tariffs</b>		
<b>Residential</b>		
<b>(all tariffs are VAT exclusive)</b>		
<b>FROM (kℓ)</b>	<b>TO (kℓ)</b>	<b>R per kℓ</b>
0	6	R17,22
7	10	R17,55
11	20	R24,37
21	30	R31,59
31	Max	R39,65

Use the information provided to answer the questions that follow.

- 2.1.1 Verify with calculations whether his bill was correct or not. (6)

### Worked Example: Transport Tariffs

1.1 Study the following table and answer the questions that follow:

Gautrain Fares			
OR Tambo Airport to:		Other routes	
Sandton, Marlboro, Rhodesfield	R205,00	Sandton - Marlboro	R36,00
Rosebank, Park, Midrand	R215,00	Sandton - Rhodesfield	R53,00
Centurion, Pretoria, Hatfield	R225,00	Marlboro - Rhodesfield	R41,00
<b>Same fare applies in other direction</b>			

Use the information provided to answer the questions that follow.

1.1.1 Calculate the weekly cost of using the Gautrain to travel from Sandton to Rhodesfield and back for 5 days a week.

**Possible Answer:**

$$R205 \times 5 \times 2 = R 2\ 050$$

(2)

1.1.2 A tourist from USA used the Gautrain from O.R Tambo International Airport and got off at Marlboro:

a) How much did he pay for this service?

**Possible Answer:**

R205,00

b) He then realized that he should have got off at Sandton and therefore needed to head back to Sandton on the next train. How much was he expected to pay for this service?

**Possible Answer:**

R36,00

c) This tourist had loaded his Gautrain Gold card with R300,00 at O.R Tambo International Airport. How much money was left on his card when he got to his hotel in Sandton

**Possible Answer:**

$$\begin{aligned} R300,00 - R205,00 - R36,00 \\ = R59,00 \end{aligned}$$

(6)

1.1.3 Rafique is the driver of a metered taxi. The company he works for charges the following fare for a single trip:

- A minimum call-out fee of R50 per trip with the first free kilometres free.
- Thereafter, R12,00 for each additional kilometres or part thereof.

Write down the formula that Rafique can use to calculate the total cost (in rands) per single trip, in the form:

**Possible Answer:**

$$\text{Cost (R)} = 50 + 12 \times (\text{number of kilometres} - 3)$$

(6)

### Activity 1: Transport Tariffs

1.1 The table below indicates the fares for myCiTi bus routes in Cape Town.  
Arthur buys his first *myconnect* card from a MyCiTi kiosk. He wants to travel from his home in Parklands East to the Civic Centre every day for work. Assume that there are 20 working days per month.

My Citi	
<b>R40</b>	Card Activation/initiation fee (Myconnect)
<b>R16,30 per single trip</b>	<b>Suburban and central city services:</b> <ul style="list-style-type: none"> <li>• Table View route <b>F14</b>: Big Bay – Table View – Parklands East</li> <li>• Table View route <b>F15</b>: Parklands East – Table View – Blouberg</li> <li>• Table View route <b>F16</b>: Marine Circle – Table View – Blouberg</li> <li>• Central City route <b>F1</b>: Gardens – Civic Centre - Waterfront</li> </ul>
<b>R10,60 per trip</b>	Civic Centre – Table View main route (T1)
<b>FREE</b>	Children under 1 m tall and under 14 years old
<ul style="list-style-type: none"> <li>• All routes operate in both directions.</li> <li>• Suburban routes connect to the main station in Table View. All suburban routes are free when used in conjunction with the main route.</li> </ul>	

- 1.1. How many routes does suburban and central city services have? (2)
- 1.2 Arthur travels on route F16. Write this route in full description. (2)
- 1.3 Determine the cost of Arthur if he is travelling on F14 on return trip, and the cost for *myconnect* card activation. (4)
- 1.4 Arthur’s family has a wife, 2 boys aged 13 yrs and 0,95 m tall and the other is 12 yrs and 1,13 m tall. His wife claims that they will spend less than R300 if they travel on F1 on a return trip. (5)

### Worked Example 1: Cell phone Tariffs

1.1 Marina wants to buy a new cellular phone and consider the following call packages:

Call Package 1	Call Package 2	Call Package 3
<ul style="list-style-type: none"> <li>• Monthly rental = R200,00</li> <li>• First 50 minutes free</li> <li>• Calls cost R1,00 per minute</li> </ul>	<ul style="list-style-type: none"> <li>• Monthly rental = R300,00</li> <li>• First 200 minutes free</li> <li>• Calls cost R1,00 per minute</li> </ul>	<ul style="list-style-type: none"> <li>• Monthly rental = R350,00</li> <li>• First 200 minutes free</li> <li>• Calls cost R2,50 per minute</li> </ul>

The total cost for Call Package 1 is given by the following formula:

$$\text{Total cost (in rand)} = R200 + R1,00 \times (\text{number of minutes more than } 50)$$

1.1. Write down a formula which can be used to calculate the total cost for Call Package 2. (2)

**Possible Answer**

$$\text{Total cost (in rand)} = R300 + R1,00 \times (\text{number of minutes more than } 200)$$

1.2 Write down a formula which can be used to calculate the total cost for Call Package 3.

**Possible Answer**

$$\text{Total cost (in rand)} = R350 + R2,50 \times (\text{number of minutes more than } 200) \quad (2)$$

1.3 Use the formula for Call Package 1, Call Package 2 and Call Package 3 to complete the table below.

Duration of calls	0	50	100	150	250	300
Cost of Package 1						
Cost Package 2						
Cost of Packages 3						

**Possible Answer**

<b>Duration of calls</b>	<b>0</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>250</b>	<b>300</b>
<b>Cost of Package 1</b>	200	200	250	300	350	400
<b>Cost Package 2</b>	300	300	300	300	300	350
<b>Cost of Packages 3</b>	350	350	350	350	350	475

(6)

- 1.4 Explain in words what happens at column (300; 150) on the table for Call Package 1 and Call Package 2. Also give a name for this point.

**Possible Answer**

The total cost for Call Package 1 and Call Package 2 is the same.

(3)

- 1.5 If Marina intends to use 250 minutes per month and wants to take the cheapest Call Package, which contract must she choose and why?

**Possible Answer**

Call Package 2

(2)

### Activity 1: Cell phone Tariffs

1.1 A telephone company has a landline service and a cell phone service. The cell phone service is either on contract or prepaid. The phone tariffs are shown below.

Description	Landline	Cell phone tariffs	
		Contract	Pre-paid
Monthly rental	R150	-	-
Normal call rates	R0,50	R1 per minute	R2 per minute
Other charges	-	R250 per month	-
Monthly benefits	200 free minutes	100 free minutes and free handset	-

1.1. Write a formula for 1.1.1 and 1.1.2 that you can use to calculate the amount you would pay every month if you use it:

1.1.1 Contract cell phone service (2)

1.1.2 The prepaid cell phone. (2)

1.2 How much would you pay in a month if you used 300 minutes, and you are subscribed to the: (2)

1.2.1 Contract cell phone service

1.2.2 Prepaid cell phone service (3)

1.3 Determine the actual cost of a handset if the contract length is two years. (4)

1.3 Linda runs a telephone service business near a university. She charges R2,50 per minute, or part thereof, for a call. She expects her total usage to be 2 000 minutes.

1.3.1 How much would Linda's income be if she sold 2 000 minutes' worth of phone calls? (2)

1.3.2 Using the relevant calculations, show which service would be best for her clients. (6)

## **HIRE PURCHASE**

**Hire purchase agreements** are used when customers don't have the full amount to purchase a product, usually appliances (e.g. TV's, washing machines, fridges etc) and cars.

- Customers are able to put down a deposit and then pay the remaining outstanding balance off by means of **monthly instalment repayment**
- Often insurance is added onto a monthly repayment.
- Repayment period is usually 12; 24; 36; 48; or 60 months.


## **LOANS AND INVESTMENTS**

- Agreement and loans (e.g. personal, car, house) where a repayment is made every month.
- Other investments (e.g. retirement annuities, funeral plans) where a fixed deposit is made every month.
- loans from banks and micro-lenders where there is a monthly repayment (e.g. personal, student, car and house loans)
- investments where there is a monthly deposit, including:
  - stokvel
  - retirement annuities
  - pension funds
  - funeral plans

### Worked Example 1: Hire Purchase

A gas cylinder and outdoor cooker are useful devices to provide an alternative energy source during camping.

Below is a picture of a set consisting of a gas cylinder and an outdoor cooker with different payment options.

<b>CASH PRICE</b> R10 099 (including 15% VAT)	<b>HIRE-PURCHASE</b>	<b>ONLINE CREDIT</b>
	<b>Deposit:</b> 10% <b>Instalment:</b> R276,45 p.m. × 36 months <b>Interest rate:</b> 9,5%	<b>Instalment:</b> R942,50 p.m. × 12 months <b>Interest rate:</b> 9,76%

[Source: [walmart.com](http://walmart.com)]

Use the information above to answer the questions that follow.

1.1.1 Name the TWO most costly payment options for this gas cylinder and outdoor cooker set.

**Possible Answer:**

Hire-purchase and Online credit (2)

1.1.2 Define *hire-purchase* within the given context. (2)

**Possible Answer:**

You pay for the gas set using a monthly instalment. Only after your final instalment, you own the gas set.

OR

A payment option is where the store charges a deposit and then goes into a contract with the buyer to pay monthly instalments while using the product.

1.1.3 Write down the interest rate if the gas cylinder and outdoor cooker set were bought on hire-purchase. (2)

**Possible Answer:**

9,5%

1.1.4 Calculate the total cost of the gas cylinder and outdoor cooker set, using online credit.

**Possible Answer:**

Total cost

$$= R942,50 \times 12$$

$$= R11\,310,00$$

(2)

1.1.5 A 10% discount is given on the cash price.

Calculate the amount of discount given if the gas cylinder and outdoor cooker set are purchased for cash.

**Possible Answer:**

Discount

$$= R10\,099 \times \frac{10}{100}$$

$$= R1\,009,90$$

(2)

1.1.6 Choose which ONE of the following **A, B or C** completes or explains the leading statement below the best.

**Statement:** '15% VAT is an indirect form of tax because it is ...'

- A. included in the cash price.
- B. paid straight to the government.
- C. collected by a retail store from the customer who pays the tax included in the price of purchased goods. The store later files a tax return and forwards the tax takings to the government.

**Possible Answer:**

C

OR

Collected by a retail store from the customer who pays the tax included in the price of purchased goods. The store later files a tax return and forwards the tax takings to the government.

(2)

### Worked Example 1: Loans and Investments

Solly and his wife Queen are about to buy their first house through Magic Bank. The property (House) they are interested in costs R 580 440,00 (Inclusive of transfer costs and lawyer fees). Solly and Queen managed to raise a deposit of 25%. Magic Bank granted them a home loan at 10,75% interest for the balance of the loan over a period of 30 years.

**TABLE 1: BOND REPAYMENT FACTORS**

Interest %	Years			
	15	20	25	30
9,75%	10,59	9,49	8,91	8,59
10,00%	10,75	9,65	9,09	8,78
10,25%	10,90	9,82	9,26	8,96
10,50%	11,05	9,98	9,44	9,15
10,75%	11,21	10,15	9,62	9,33
11,00%	11,37	10,32	9,80	9,52
11,25%	11,52	11,52	9,98	9,71

Use TABLE 1 and the information above to answer the questions that follow:

1.1.1 Explain the term home loan.

**Possible Answer:**

Money given by the bank to help one in buying a house or property (2)

1.1.2 How long will they take to pay back the bank if the Bond repayment factor is 10,15 and the interest rate is 10,75%? (2)

**Possible Answer:**

30 years

1.1.3 Calculate the amount that Magic Bank loaned to Solly and Queen. (4)

**Possible Answer:**

Deposit = R 580 440,00 × 25%

= R 580 440,00 × 0,25

= R 145 110,00

Money loaned to Solly and Queen

= R 580 440,00 - R 145 110,00

$$= R\ 435\ 330,00$$

1.1.4 Calculate the monthly repayment amount that Bra Solly must pay on the loaned bond.

Use the formula below and the table above:

$$\text{Monthly repayment} = \frac{\text{Bond Amount}}{1000} \times \text{bond repayment factor}$$

**Possible Answer:**

$$\text{Monthly repayment} = \frac{R435\ 330,00}{1000} \times 9,33 \quad (3)$$

1.1.5 Calculate the total amount and the interest that they will have paid at the end of the loan term. (2)

**Possible Answer:**

$$\text{Total amount after 30yrs} = R\ 4\ 061,63 \times 30 \text{ yrs}$$

$$= R\ 4\ 061,63 \times 360 \text{ months}$$

$$= R\ 1\ 462\ 186,80$$

$$\text{Total Interest} = R\ 1\ 462\ 186,80 - R\ 435\ 330,00$$

$$= R\ 1\ 026\ 856,80$$

## Activity 1: Hire Purchase

Mr. Zweli wants to purchase a new lounge suite. He goes to a local furniture shop and the sales person shows him the lounge suite on the picture below.



WAS R15 999

NOW R14 999

### Hire-Purchase Options

Deposit: 15% of the new purchase price.

R759,64 × 24 months

**Total Cost = R \_\_\_\_\_**

Use TABLE 1 and the information above to answer the questions that follow:

- 1.1. Calculate the discounted amount. (2)
- 1.2 Determine the percentage discount (rounded to one decimal place), using the following formula:  
$$\text{Percentage discount} = \frac{\text{discount}}{\text{old price}} \times 100\%$$
 (3)
- 1.3 Calculate the deposit on the lounge suite if the hire- purchase option is used. (2)
- 1.4 What will be the total cost if Mr Zweli purchased the lounge suite on the hire-purchase option? (2)
- 1.5 How much will be saved if the cash option is used rather than the hire purchase option to buy the lounge suite? (2)
- 1.6 Mr Mofokeng does not have the cash and decided to go to **Bank X** to make a personal loan of R15 000. The Bank offers him 15% interest compounded annually.  
Calculate the total amount he will pay back to **Bank X** after 24 months. (4)

## Activity 1: Loans and Investments

ANNEXURE A below shows a home loan statement and transaction history for the period 1 March 2017 to 28 February 2018.

**PLEASE NOTE:** The loan period is 20 years.

Use TABLE 1 and the information above to answer the questions that follow:

- 1.1.1 Write down the name of the borrower. (2)
- 1.1.2 State the loan amount (2)
- 1.1.3 Explain the meaning of the term *debit* in the context of the question. (2)
- 1.1.4 Determine **A**, the initial fee. (3)
- 1.1.5 The interest rate decreases on 1 March 2018 by 0,25%. Determine the interest rate that is used from 1 March 2018. (2)
- 1.1.6 Calculate the total interest that was charged for the tax year ending 28 February 2018. (2)
- 1.1.7 VAT increased on 1 April 2018 from 14% to 15%. If the initial fee were to be calculated on 1 April 2018, how much more would the borrower had to pay as a result of the increased VAT? (3)
- 1.1.8 Calculate the amount of interest owed on 31 March 2018 that will be shown on the next statement.  
You may use the following formula:

$$\text{Monthly repayment} = \frac{B \times n \times r}{365}$$

**B** = closing balance on last day of previous month

**n** = number of days in month

**r** = interest rate

## ANNEXURE A

### HOME LOAN STATEMENT

MR J.J.B. MOUTON P.O. Box 354 UPINGTON 8800	<b>Date</b>	2018-02-28
	<b>Statement period</b>	2017-03-01 to 2018-02-28
<b>Account number:</b> 5439823498		

<b>Name of branch</b>	Thibault Square		
<b>Approved loan amount</b>	R900 000,00	<b>Monthly payment</b>	R8 527,41
<b>Current interest rate</b>	9,52%	<b>Pay date</b>	2018/04/03
		<b>Payment frequency</b>	Monthly

<b>Date of transaction</b>	<b>Transaction</b>	<b>Debit</b>	<b>Credit</b>	<b>Balance</b>
2018-01-09	BROUGHT FORWARD	900 000,00		900 000,00
2018-01-09	Initial fee*	A		905 985,00
2018-01-31	Interest	5 434,92		911 419,92
2018-02-02	Debit order		8 527,41	902 892,51
2018-02-28	Interest	6 596,06		909 488,57

\* Total cost: R5 250 (VAT excluded) + VAT ... = A

**The VAT on all fees and cost on you loan account shall increase from 14% to 15% with effect of 1 April 2018.**

**All costs on our statements on which VAT is charged is indicated by an asterisk (\*).**

## **DATA HANDLING**

- **Developing questions,**
- **summarising data,**
- **Representing,**
- **Interpreting and**
- **Analysing data**

## DATA HANDLING: EXAMINATION GUIDELINES



### TOPIC: DATA HANDLING

Section	Level 1: Knowing	Level 2: Applying routine procedures	Level 3: Applying multi-step procedures in a variety of contexts	Level 4: Reasoning and reflecting
<b>Developing Questions and Collecting Data</b>	Read information directly from a given questionnaire/survey (e.g., the name of the organisation for which the questionnaire is being conducted). Complete a given questionnaire.	Conduct a given questionnaire/survey with a group of people.	Decide on appropriate questions to include on a questionnaire/survey, construct and then conduct the questionnaire/survey.	Critique the questions/layout of a questionnaire/survey
<b>Classifying and Organising data</b>	Sort data from smallest to biggest. Count the number of values in a dataset.  State the difference between categorical data and numerical data; discrete and continuous data. Read information from frequency tables.	Sort data according to two categories (e.g., sort a set of data separately for females and males).  Complete a given frequency table. Calculate percentage values to represent, the relative sizes of different categories of data.	When given a raw set of data, sort the data, decide on appropriate intervals (if necessary), and construct a frequency table to organise the data. If necessary, use the frequency table to draw an appropriate graph to represent, the data.	Make a deduction about whether collected information is biased or valid based on the structure of instrument. used to collect the data and the way in which the data was collected. Explain with justification whether data is discrete or continuous. Analyse data organised in tables and make deductions about trends in the data.

<p><b>Measuring data/ Summarising data</b></p>	<p>Identify the maximum and minimum values in a set of data.</p> <p>Identify the mode for arranged data.</p> <p>Identify the median for odd data that has already been arranged.</p>	<p>Calculate mean and range.</p> <p>Calculate the median for even data.</p> <p>Calculate the median if the data is not arranged.</p> <p>Calculate the quartile values for arranged data.</p> <p>Calculate the inter-quartile range when quartile values are given.</p>	<p>Calculate the mean, median and modal average for a set of data and decide with reasons which average provides the most accurate representation of the data.</p> <p>Use data presented on a graph to determine the mean, median, mode and range of a data set.</p> <p>Calculate the quartile values for data that is not arranged.</p> <p>Calculate the inter-quartile range when the quartile values are not given.</p>	<p>Analyse graphs and make deductions about trends in the data and predictions for the future.</p> <p>Identify and describe the use and misuse of statistics and make justified recommendations.</p>
<p><b>Representing data</b></p>	<p>Read values directly from the</p>	<p>Draw a specified graph date from a given table of data.</p> <p>Estimate values from given graphs.</p>	<p>Organise data using an appropriate table, decide on the most appropriate format for representing the data (that is, actual values or percentages), and decide on the most appropriate graph needed to represent the data.</p>	<p>Analyse graphs and make deductions about trends in the data and predictions for the future.</p> <p>Identify and describe the use and misuse of statistics and make justified recommendations.</p>

## LESSON OBJECTIVES

### Stage 1: Developing Questions

#### Learners must be able to:

- How to develop questions.
- Develop questions to collect multiple sets of data.

### Stage 2: Collecting Data

#### Learners must be able to:

Develop and use instruments to collect multiple sets of data.

- Observation
- Interview
- Questionnaires:
  - Advantages and disadvantages of each type
  - Difference between sample and population
  - How to select an appropriate sample from a population
  - Impact of choice of samples on reliability of data

### Stage 3: Classifying and Organising Data

#### Learners must be able to:

Classify collected data as a categorical or numerical.

- Numerical data classified as discrete or continuous.
- Sort collected numerical data into two or more categories.
- Group collected data using intervals.
- Revise tally-tables and frequency tables

### Stage 4: Summarising Data

#### Learners must be able to:

- Summarizing multiple sets of data using the mean, median, mode and range (central tendency and spread).
- Quartile and inter-quartile range values.
- Analyse calculated measures of central tendency.
- Percentiles (interpretation only).
- Understanding the function /purpose of values above.
- The role and impact of outliers.

### **Stage 5: Representing Data**

#### **Learners must be able to:**

- Represent multiple sets of collected data using pie charts, histograms, single bar graph, line, and broken line graphs.
- Multiple bar graphs and compound/vertical stack graphs
- Scatter plot graphs.
- Box and whisker plot.
- Understand suitability of the types of graphs for different situations
- Understand the effect of the scale of the axes on the impression.
- Read/estimate information from graphs.

### **Stage 6: Analysing and Interpreting Data**

**NB: Analysing and Interpretation of data must be done whilst dealing with all other five (5) stages, i.e., it is integrated.**

#### **Learners must be able to:**

- Identify/describe the trends (increase, decrease, stay the same and time)
- Ask questions about the way in which data was collected, organized, summarized, and presented to reveal possible sources of errors/bias. Indemnify & describe any misleading representations/summaries.
- Compare different representation of multiple sets of data and explain the differences.
- Investigate situations in which summarized/represented data is interpreted in different ways.
- Develop opposing arguments using the same summarized/represented data.

## IMPORTANT TERMS AND DEFINITIONS

### DEVELOPING QUESTIONS AND COLLECTING DATA

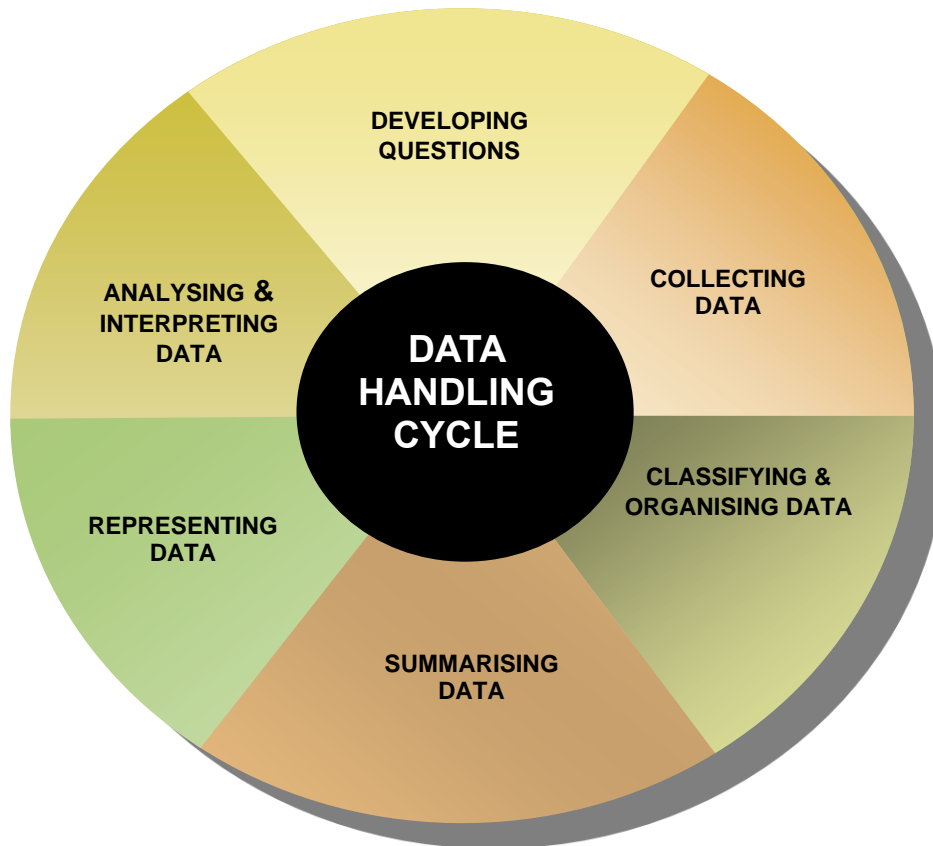
<b>Data</b>	Raw information that has been collected, without any organization of analysis.
<b>Data Handling</b>	Process of collecting, organizing, summarizing, representing, and analyzing information.
<b>Qualitative data</b>	Descriptive information (it describes something). It is referred to as categorical data
<b>Quantitative data</b>	Numerical data which involves numbers. e.g., measurements, length, height, area, volume, mass, etc. It can be further divided into Continuous and Discrete data.
<b>Categorical data</b>	The data that is given in the form of words, names, or labels. It is generally descriptive in nature, as data classified and organized into categories
<b>Observation</b>	Recording of data by watching someone or something closely.
<b>Discrete data</b>	Numerical (fixed numbers, like size of family, age); data that can have only certain values (quantities that can be counted)
<b>Continuous data</b>	Numerical data quantities that can be measured (e.g., measurements like weight, height, etc.)
<b>Interview</b>	List of questions that can be used to collect data. An instrument consisting of questions for the purpose of collecting data.
<b>Survey</b>	List of questions and obtain the data you need from the answers to those questions
<b>Grouped data</b>	The data given in the form of intervals.
<b>Frequency</b>	Number of times a data value is recorded.
<b>Frequency table</b>	Table showing frequencies in organized form, and summarizing the frequencies of all the data values in a data set
<b>Tally</b>	Mark/Tick that shows one count of a data value
<b>Classify</b>	Identify the type or class.

<b>Inter-quartile range</b>	The difference between quartile 3 and quartile 1 or the difference between largest quartile and the smallest quartile.
<b>Population</b>	The entire source of data involved in an investigation
<b>Sample</b>	The small group chosen from the population
<b>Mean</b>	Average of the values in a data set; sum of all the observed values divided by the number of observations.
<b>Mode</b>	Value or values appearing most often in a data set.
<b>Median</b>	Middle value in an ordered data set.
<b>Range</b>	Difference between the highest and lowest values in a data set.
<b>Inter-Quartile Range (IQR)</b>	The difference between largest quartile (Q3) and the smallest quartile (Q1).
<b>Box-and-Whisker Plot</b>	Diagram used to show the distribution of data along a number line divided into the quartiles.
<b>Bias</b>	To favour or oppose something or someone in a way which is considered unfair
<b>Ascending Order</b>	Arranging data from smallest to the biggest value.
<b>Descending Order</b>	Arranging data from biggest to the smallest value.

# DATA HANDLING CYCLE

Data handling consist of six (6) inter-connected stages of statistical process shown below:

- The learners must know how to unpack each stage and remember that each stage depends on the other.



**Important facts about six (6) stages of statistical process/data handling cycle**

Stage	Statistical Process	Meaning
Stage 1	<b>Developing a question or posing a problem</b>	A question is posed regarding the problem and appropriate data sources are identified.
Stage 2	<b>Collect data (information) related to the posed question</b>	A data collection method and tool/technique are chosen and data is collected.
Stage 3	<b>Classifying and Organising data</b>	Process of organizing raw data, by classifying them into different categories.
Stage 4	<b>Summarising Data</b>	A large amount of data can be summarised using one or two numbers to represent all of it.
Stage 5	<b>Representing Data</b>	It is often very useful to represent the data visually. It can further quickly illustrate general behaviour or pattern of the data.
Stage 6	<b>Analysing Data</b>	Develop opposing arguments using the same summarised and/or represented data to conclude and bring about solutions to the posed question at stage 1.

- Each stage in the process is dependent on the stage that precedes it and directly impacts on the stage that follows.
- If the data that is collected is biased, then every subsequent stage will be flawed.
- If the data is summarised using an inappropriate or incorrect average, then the analysis of the data will be incorrect.
- In the diagram of the statistical process above, you will see that “analyse is linked to all stages. Data must be analysed throughout the statistical process, and it is not separate step following one specific stage.

## **STAGE 1: DEVELOPING QUESTIONS**

Statistical process starts with developing or posing a question. The phrasing of the question will determine the way in which the data is collected, organised, and analysed.

### **How to develop a questions**

- Identify the main reason or aim for the research or investigation. Develop a main question with sub-questions which give more information or details.

#### ➤ **Worked Example 1:**

**Main question:** *“What is the performance of Grade 12 performance in March test”?*

#### **Sub-question:**

1. *How many girls and boys passed the test?*
2. *What is the average and pass rate?*
3. *Which class that obtained more level 7?*



### Activity 1 (Developing Questions)

1.1 Write down three (3) questions that will enable you to collect meaningful data, for each of the following topics below

1.1.1 Will the weekends extra classes improve learners' academic performance? (6)

1.1.2 What is the importance of exercising to the learners? (6)

1.2 Develop or pose a question that requires the collection of data on:

1.2.1 Test and Examination results (2)

1.2.2 School sport results (2)

1.2.3 Learners in your class or school (2)

**(18)**

Populations and Sample		
Concept	Definition	Worked Example
<b>Population</b>	Entire group or source of data involved in the research.	Identify the population and the sample from the question posed below: <b>Question:</b>
<b>Sample</b>	The small group chosen from the population to represent that population.	<i>What percentage of Grade 12 learners in my school has cell phones?</i> <b>Answer:</b> <u>Population:</u> All the learners at the school <u>Sample:</u> Grade 12 learners



### Activity 1.3 (Population and Sample)

1.3 Read the statements below and identify the population and sample for each.

1.3.1 Which cell phone brand is popular amongst the Grade 12 learners of Nzimeni high school?

**Population:** ..... **Sample:** ..... (4)

1.3.2 Five rugby players of the Karoo team were born in Eastern Cape.

**Population:** ..... **Sample:** ..... (4)

1.3.3 Skinny jeans is one of the most preferred made of Just-Bongi's clothing store.

**Population:** ..... **Sample:** ..... (4)

(12)

## STAGE 2: COLLECTING DATA

**Data Collection:** The process of gathering and analysing accurate data from various sources to find answers to research problems.

**Below are methods of collecting data:**

### The advantages and disadvantages of the data collection methods:

Methods	Example	Instrument	Advantages	Disadvantages
<b>Observation</b>	Watch someone or something closely and record the data you need on a data collection sheet.	Recording sheet	Easy to record information. Participants do not fill forms.	Time consuming for the observer. Reliant on accuracy of the observer.
<b>Interview</b>	Talk to someone face to face or over the telephone	Recording sheet and Questionnaire. The interviewer can clarify questions and make follow-ups.	Data is obtained immediately. Interviewee can be asked to clarify responses.	Time consuming and expensive. Difficult to target large audience.
<b>Survey</b>	Hand or send out a list of questions and obtain the data you need from the answers to those questions.	Questionnaire	Can be completed in convenient time. Many people can complete it simultaneously.	People can be dishonest. Questions can be vague or ambiguous.
<b>Database</b>	Class register, performance academic results, employee's personal information, etc.	Electronic device. (e.g., Computer)	Data can be retrieved quickly. It is often accurate, consistent, and reliable.	It can be expensive. Needs computer skills.



## Activity 2 (Collecting Data)

2.1 Which data collection method would be used to the following scenarios?

2.1.1 Whether there is a need for a pedestrian bridge in a local village. (2)

2.1.2 Collecting data whether a school should reward teachers for producing good results in Grade 12. (2)

2.1.3 Finding out about the number of cars passing near the mall in an hour. (2)

2.1.4 The water consumption by members of the household in a week. (2)

2.1.5 The 2021-2023 Grade 11 final examination performance. (2)

2.2 Choose the method or instrument from Column B that matches a description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.2.1 Printing the names of Grade 12 A	Interview
2.2.2 Looking at the behaviour of the birds.	Survey
2.2.3 A tool used in an interview.	Database
2.2.4 Radio presenter ask the President questions.	Questionnaire
2.2.5 Census employees counts people in the city.	Observation

(10)

[20]

### STAGE 3: CLASSIFYING & ORGANISING DATA

#### Classifying Data

Once the data has been collected, it can be classified as qualitative or quantitative, where qualitative data is *categorical* and quantitative is *numerical*.

Type of Data	Description	Examples
<b>Categorical Data</b>	<ul style="list-style-type: none"> <li>It is descriptive in nature.</li> <li>Consists of words representing categories.</li> <li>Usually observed, not measured.</li> </ul>	<ul style="list-style-type: none"> <li>Colour of the shoes</li> <li>Types of food</li> <li>Gender</li> <li>Names of the provinces in a country, etc.</li> </ul>
<b>Numerical Data</b>	<ul style="list-style-type: none"> <li>It is numerical.</li> <li>Consists of quantities.</li> <li>Can be further divided in two groups (<i>continuous and discrete</i>)</li> <li><b><u>Continuous</u></b>: data which can be measured.</li> <li><b><u>Discrete</u></b>: data which can be counted.</li> </ul>	<p><b>Continuous (measured):</b></p> <ul style="list-style-type: none"> <li>Speed of the car</li> <li>Height of the building</li> <li>Mass of a cow</li> <li>Volume of the water</li> </ul> <p><b>Discrete (counted):</b></p> <ul style="list-style-type: none"> <li>Number of balls</li> <li>Number of calculators</li> <li>Quantity of money</li> <li>Number of water bottles</li> </ul>

#### Organising Data

A raw data can be organised using the following:

- Ascending or Descending Order**
- Frequency Tables** (*which includes tallies, frequencies, and cumulative frequencies*)
- Where there is a large amount of data, it can be grouped into class intervals, e.g., 0-5; 10-15; 15-20; etc. depending on the size of intervals.**
- The class intervals must be the same width i.e., each interval must have the same number of data points to be comparable**

Concept	Description	Examples												
<b>Ascending order</b>	Arranging data from lowest to highest value.	<p>Arrange the following data in <i>ascending</i> order:</p> <table border="1"> <tr> <td>0,08</td> <td>1,2</td> <td>0,05</td> <td>3,2</td> <td>3,1</td> <td>1,15</td> </tr> <tr> <td>2</td> <td>0,01</td> <td>4</td> <td>2,75</td> <td>4,05</td> <td>1</td> </tr> </table> <p><b>Possible Answer: 0,01; 0,05; 0,08; 1; 1,15; 1,2; 2; 2,75; 3,1; 3,2; 4; 4,05</b></p>	0,08	1,2	0,05	3,2	3,1	1,15	2	0,01	4	2,75	4,05	1
0,08	1,2	0,05	3,2	3,1	1,15									
2	0,01	4	2,75	4,05	1									
<b>Descending Order</b>	Arranging data from the highest to lowest value.	<p>Arrange the following data in <i>descending</i> order:</p> <table border="1"> <tr> <td>0,08</td> <td>1,2</td> <td>0,05</td> <td>3,2</td> <td>3,1</td> <td>1,15</td> </tr> <tr> <td>2</td> <td>0,01</td> <td>4</td> <td>2,75</td> <td>4,05</td> <td>1</td> </tr> </table> <p><b>Possible Answer: 0,01; 0,05; 0,08; 1; 1,15; 1,2; 2; 2,75; 3,1; 3,2; 4; 4,05</b></p>	0,08	1,2	0,05	3,2	3,1	1,15	2	0,01	4	2,75	4,05	1
0,08	1,2	0,05	3,2	3,1	1,15									
2	0,01	4	2,75	4,05	1									

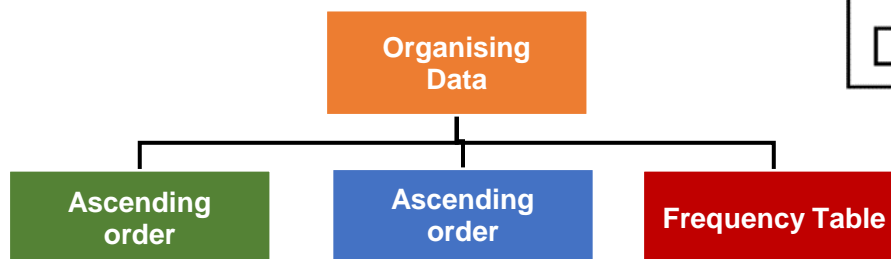
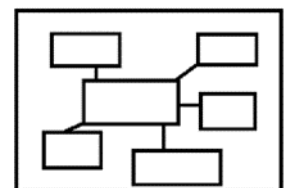
**Frequency tables**

Draw and complete a frequency table based on the shoe's sizes of Grade 12D class learners given below.

7	5	6	3	4	6
4	4	4	8	5	3
8	9	5	6	5	5
5	5	3	7	4	6

**Possible Answer:**

Size	Tally	Frequency	Cumulative Frequency
3		3	3
4		5	8
5		7	15
6		4	19
7		2	21
8		2	23
9		1	24
<b>Total</b>		<b>24</b>	





### Activity 3 (Classifying data)

3.1 Classify the following types of data in either *categorical* or *numerical*:

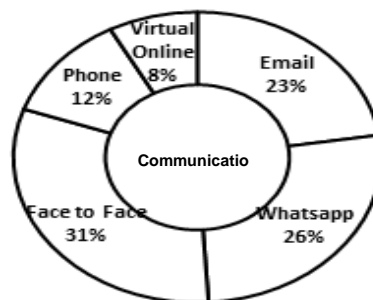
- 3.1.1 Types of television brand. (2)
- 3.1.2 Names of the learners in Grade 12F class. (2)
- 3.1.3 The speed of Tom's motorbike. (2)
- 3.1.4 The capacity of fuel tank of the car. (2)
- 3.1.5 The mass of an aeroplane. (2)

3.2 Read the following data and state whether it is discrete or continuous.

- 3.2.1 The volume of Mr Monyane's Jojo tank is 2 000 litres. (2)
- 3.2.2 Sdwala call centre agents are given 5 000 calls per month. (2)
- 3.2.3 Below are the sizes of Frikkie Booysen's farms. (2)

Farm 1	Farm 2	Farm 3
3 hectares	$2\frac{1}{2}$ hectares	4 hectares

3.2.4 The rate of communication method. (2)



3.2.5 Only 6% of the South African population have university degrees, a new report by the Higher Education Department has revealed. (2)

**(20)**



### Activity 3.2 (Organising data)

3.2.1 Below are the leave days taken by the cleaning employees of Tom's Clothing Textiles during the month of March 2023.

*2; 4; 0; 3; 0; 0; 0; 5; 1; 2; 2; 3; 1; 0; 1; 2; 1; 0; 1; 2; 4*

Use the above given data to answer the following:

- How many employees are working at Tom's Clothing Textiles? (2)
- Determine the number of employees who did not take a leave in March 2023. (2)
- Draw up a frequency table using the data given. (2)

3.2.2 The data below indicates the heights of 24 athletes of the Silithuli marathon team.

<i>1,61</i>	<i>1,50</i>	<i>1,63</i>	<i>1,60</i>	<i>1,49</i>	<i>1,66</i>	<i>1,41</i>	<i>1,70</i>	<i>1,72</i>	<i>1,53</i>	<i>1,54</i>	<i>1,72</i>
<i>1,45</i>	<i>1,57</i>	<i>1,63</i>	<i>1,41</i>	<i>1,51</i>	<i>1,80</i>	<i>1,68</i>	<i>1,74</i>	<i>1,56</i>	<i>1,77</i>	<i>1,40</i>	<i>1,39</i>

Complete the frequency table given below:

Height in metres (m)	Tally	Frequency
$1,30 < m \leq 1,35$		
$1,35 < m \leq 1,40$		
$1,40 < m \leq 1,45$		
$1,45 < m \leq 1,50$		
$1,50 < m \leq 1,55$		
$1,55 < m \leq 1,60$		
$1,60 < m \leq 1,65$		
$1,65 < m \leq 1,70$		
$1,70 < m \leq 1,75$		
$1,75 < m \leq 1,80$		
<b>TOTAL</b>		

## STAGE 4: SUMMARISING DATA

Once the data has been organised, it can be summarised using measures of *central tendency* and measures of *spread*, to provide additional regarding the trends in data trends.

### Measures of Central Tendency

There are three (3) types of measures of tendency namely:

- *Mean, Mode and Median*

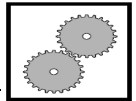
These three (3) measures of tendency all reflect some aspect of the data values which is *representative* of the whole data set, and further provides an indication of the “*middle*” or “*centre*” of the data.

#### Mean

- Commonly referred to as the “*average*”
- To calculate the *mean*, you add all the values of the data set and divide the sum by the total number of values in the data set.
- It can only be calculated if the data set is **numerical**.

$$\text{Mean} = \frac{\text{sum of all values in the data set}}{\text{total numbers of values in the data set}}$$

### 1. Worked Example (Mean)



The rugby team recorded all the scores of the matches the played as shown below.

Match 1	Match 2	Match 3	Match 4	Match 5	Match 6	Match 7	Match 8
23	34	18	45	28	39	12	9

Use the table of the scores given in the above table to answer the following questions.

- 1.1 How many matches did the rugby team play?  
**Possible Answer:** They played 8 matches

- 1.2 Calculate the mean score.

**Possible Answer:**

$$\begin{aligned}\text{Mean} &= \frac{23 + 34 + 18 + 45 + 28 + 39 + 12 + 9}{8} \\ &= \frac{208}{8} = 26\end{aligned}$$

- 1.3 Paul, Nimmi, Nomvuyo, Siphon and Fifi write their university entrance competency test and compare their results. Paul achieved 89%; Nimmi 98%; Nomvuyo 88%. Calculate Fifi's mark, if the mean value of all five (5) marks is 92%.

**Possible Answer:**

$$\text{Mean} = \frac{\text{sum of all values in the data set}}{\text{total numbers of values in the data set}}$$
$$92 = \frac{89 + 98 + 88 + 90 + \text{Fifi}}{5}$$

$$92 \times 5 = 365 + \text{Fifi}$$

$$460 = 365 + \text{Fifi}$$

$$\text{Fifi} = 460 - 365 = 95$$

**Fifi achieved 95% in the competency test.**

## Median

- This is the middle value of the data set when arranged in ascending order.
- If the total number of the data set is **odd** number, the middle value will be the median.
- If the total number of the data set is **even** number, there will be two values in the middle of the data set, and you will have to add these two values and divide them by two (2) to determine the median.
- It is important to know that the median can only be determined or calculated if the data set is **numerical**.

### 1. Worked Example (Median)

1.1

Below are the marks Babalwa got from five Mathematical Literacy tests she wrote. Each test had total marks of 50.

<i>Test 1</i>	<i>Test 2</i>	<i>Test 3</i>	<i>Test 4</i>	<i>Test 5</i>
29	31	22	40	20

**Possible Answer:**

**Step 1:** Arrange the data values in ascending order.

20; 22; **29**; ~~31~~; 40

**Step 2:** Then find the middle value, which be the median (3)

Therefore, the median is **29**.

1.2

If Babalwa in 1.1 wrote test 6 and got 44 marks. Calculate the median of the new data set. (2)

New marks: 20; 22; **29**; **32**; 40; 44

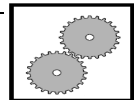
**Possible Answer:**

The median will now lie between 29 and 32. Therefore to calculate the median; add the two “middle” values and divide the sum by 2.

$$\text{Mean} = \frac{29 + 32}{2} = 30,5$$

## Mode

- It is the data value that occurs most frequently in a data set, i.e., the value with the highest frequency.
- In case where two data values occur most frequently, then the data set is referred as bimodal.
- Mode can be determined for both categorical and numerical data.



### 1. Worked Example (Mode)

- 1.1 Read the distances in kilometres which Unathi ran when he was exercising and determine the mode.

10 ; 15 ; 15 ; 7 ; 8

**Possible Answer:**

**Mode = 15**

(2)

- 1.2 If Unathi had an extra 10 km which he ran, determine the mode.  
New data values:

10 ; 15 ; 15 ; 7 ; 8 ; 10


**Possible Answer:**

**Mode = 10 and 15** (that is known as *bimodal* data set)

(2)

### **Outlier**

- A value in a data set that is far away from most of the other values.

**Example:** 62 ; 56 ; 51 ; 58 ;  65 ; 69

### **Skewed Data**

- It occurs when an outlier affects the measure of central tendency, thereby resulting in a middle value that is not necessarily representative of the middle of the data set.

### **When to use the Mean, Median and Mode (Measures of Central Tendency)**

- Now that all three measures of central tendency describe the “*middle*” value of a set of data, you need to know the most suitable measure amongst the three measures of central tendency.

### **Limitations of Measures of Central Tendency**

#### **Mean:**

- This averages the total of the data by the number of pieces of data and is the most used measurement, but it is strongly affected by outliers.

#### **Median:**

- This is the most accurate measure of the centre of the data, but it can be very difficult to calculate with a large dataset.

#### **Mode:**

- This is often not a useful measure of the “average”. It is only useful when the data is categorical (*e.g., shoe size or cell phone brand*)

### Analysis using Measures of Central Tendency

- Two sets of data can be compared by looking at their measures of central tendency (*mean, median and mode*), but they do not always give the complete picture or analysis. In Grade 12 a more and thorough analysis is required.

### Advantages and Disadvantages of the Measures of Central Tendency

	<b>Advantages</b>	<b>Disadvantages</b>
<b>Mean</b>	<ul style="list-style-type: none"><li>- Helpful when comparing two sets of data, e.g., <i>comparing test results of two different classes.</i></li><li>- Unique and it has only one answer.</li></ul>	<ul style="list-style-type: none"><li>- It is affected by outliers.</li></ul>
<b>Median</b>	<ul style="list-style-type: none"><li>- Useful when comparing sets of data.</li><li>- Unique and it has only one answer.</li><li>- Not affected by outliers as strongly as it is the case with mean.</li></ul>	<ul style="list-style-type: none"><li>- The data needs to be arranged in ascending first.</li><li>- The median is not always representative of the, especially when the data is not spread evenly about the median.</li></ul>
<b>Mode</b>	<ul style="list-style-type: none"><li>- It is not affected by the outliers.</li></ul>	<ul style="list-style-type: none"><li>- Not unique, answers maybe more than one.</li><li>- In case of more than one mode, it is difficult to compare the data</li></ul>

**Worked Example:**



1. Class **A** and **B** below indicates the final examination results of two Grade 12 (matric) classes.

<b>A</b>	28	36	37	42	48	52	53	55	56	58	59	60	61	62	63	63	65	78	79	93	97
<b>B</b>	50	52	53	54	54	54	57	58	58	60	63	63	64	65	65	66	72	81			

1.1 Determine or analyse as to which class performed better in the examination using one of the measures of central tendency.

**Possible Answer:**

Measure of Central Tendency	Method	Class A	Class B
<b>Mean</b>	$\frac{\text{Sum of data}}{\text{No. of data}}$	$\frac{1245}{21}$ = 59,3%	$\frac{1089}{18}$ = 60,5%
<b>Median</b>	Middle value in an ordered data set	The value in the middle of the data:  <b>59%</b>	There are two values in the middle of the data, so we average them:  $\frac{58 + 60}{2}$ = 59,0%
<b>Mode</b>	Most frequent value	<b>63%</b>	<b>54%</b>

<b>Analysis</b>	
<b>Mean</b>	According to the mean, <b>Class B</b> performed <i>slightly better</i> than <b>Class A</b> . However, <b>it is not enough</b> of a difference to say that they performed significantly better.
<b>Median</b>	Both <b>Class A</b> and <b>Class B</b> have the <b>same median</b> so this measure <b>could not decide</b> between them.
<b>Mode</b>	According to the mode, <b>Class A</b> performed <b>better</b> than <b>Class B</b> , but in type of data, <b>mode is not useful measurement</b> . There are too few of the modal data to declare it to be a good indicator.

## Measures of Spread

There are four (4) measures of spread: range, quartiles, inter-quartile range and percentiles, namely:

- **Range**
- **Quartiles**
- **Inter-quartile Range**
- **Box and Whisker Plot**
- **Percentiles**
- 

### Range

- The difference between highest (maximum) value and lowest (minimum) value:

$$\text{Range} = \text{Highest value} - \text{Lowest value}$$

- If the range is small, the data is clustered together, and if the range is large, the data is more spread apart.

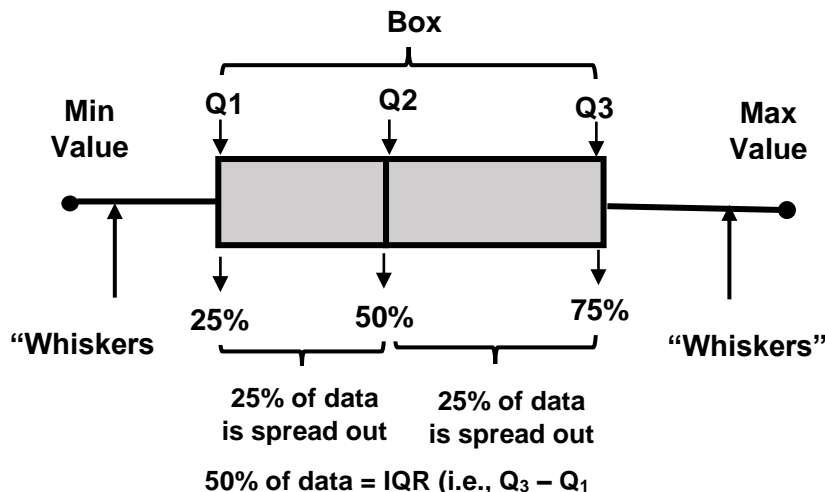
### Interquartile Range (IQR)

- This is a measure of spread of the middle 50% of the data.

$$\text{IQR} = \text{Quartile 3 (Q3)} - \text{Quartile 1 (Q1)}$$

### Box and Whisker Plot

- Also known as Box Plots
- The box-and-whisker plot is a visual representation of the “5-Number Summary” of a data set.

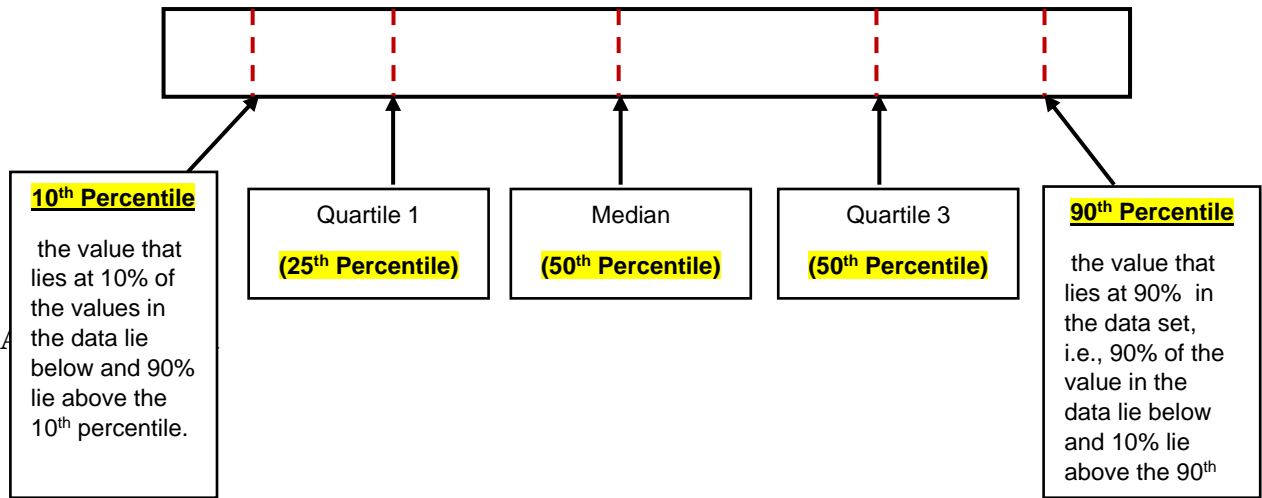


The 5-Number Summary	
No.	Value
1	Minimum Value
2	Lower Quartile (Q <sub>1</sub> )
3	Median (Q <sub>2</sub> )
4	Upper Quartile (Q <sub>3</sub> )
5	Maximum Value

### Percentiles

- The word “**percentile**” is derived from the word *percent* or *percentage*. Percentile divides the data into one hundred equal parts/segments, i.e., The 20<sup>th</sup> percentile is the value on or below which 20 percent of the data set lies.
- The 25<sup>th</sup> percentile is **equivalent** to the **first quartile (Q<sub>1</sub>)**; the 50<sup>th</sup> percentile is **equivalent to the median or second quartile (Q<sub>2</sub>)**; and the 75<sup>th</sup> percentile is **equivalent to the third quartile (Q<sub>3</sub>)**.

**Important:** You are *ONLY* expected to *INTERPRET* percentiles. You will *NOT* be expected to calculate them from a data set.

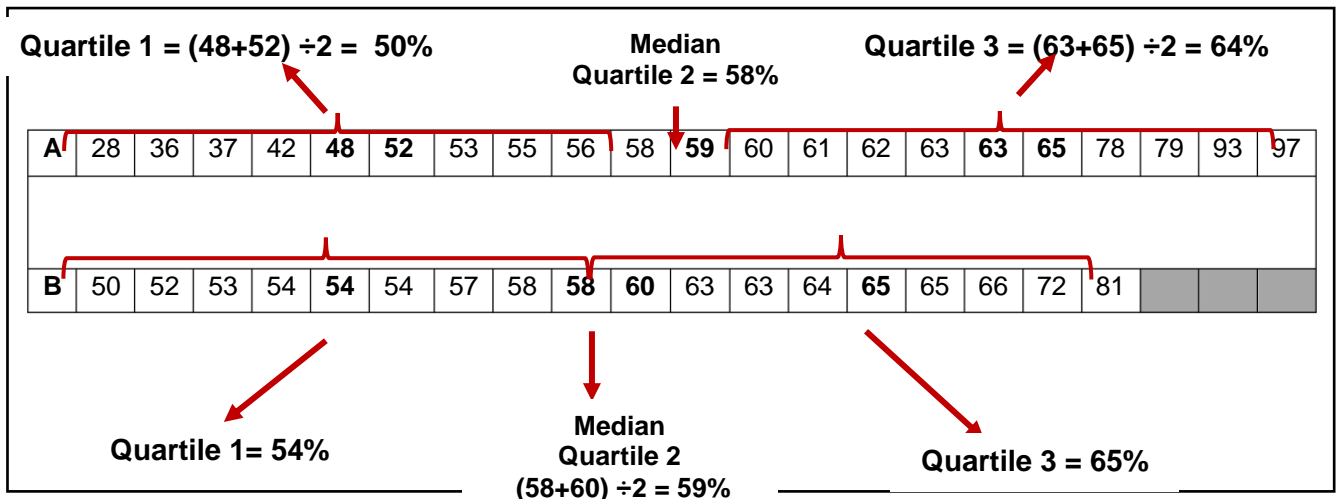


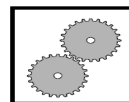
### Disadvantages of the Measures of Spread

	Advantages	Disadvantages
<b>Range</b>	Quick and easy to calculate	Affected by outliers
<b>Interquartile range</b>	Gives you an indication of the spread of 50% of the data values. Not affected by outliers.	The data must be first arranged in ascending order. Time consuming to calculate, as you first need to determine Q <sub>1</sub> and Q <sub>3</sub> .

### Analysis of the data:

	Class A	Class B	Analysis
<b>Bottom 25% of the data</b>	28% to 50%	50% to 54%	The bottom quarter of <b>Class A</b> scored at most <b>50%</b> , while the bottom quarter of <b>Class B</b> scored at least <b>50%</b> , but at most <b>54%</b> .
<b>Top 25% of the data</b>	64% to 97%	65% to 81%	The top quarter of <b>Class A</b> scored at least <b>64%</b> which is almost the same as <b>Class B</b> at <b>65%</b> , but <b>Class A</b> results were as high as <b>97%</b> while <b>Class B's</b> results peaked at <b>81%</b> .





### Worked Example:

Use the performance of **Class A** and **Class B** to determine the following:

1. Range of both classes
2. Find Quartiles for both **Class A** and **Class B** and interpret the two data set.

<b>A</b>	28	36	37	42	48	52	53	55	56	58	59	60	61	62	63	63	65	78	79	93	97
<b>B</b>	50	52	53	54	54	54	57	58	58	60	63	63	64	65	65	66	72	81			

**Possible Answer:**

1. Range of **Class A** = **Maximum Value** – **Minimum Value**

$$= 97 - 28$$

$$= \mathbf{69}$$

- Range of **Class A** = **Maximum Value** – **Minimum Value**

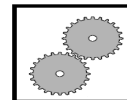
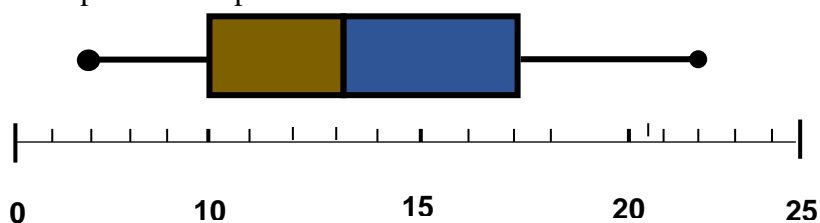
$$= 81 - 50$$

$$= \mathbf{31}$$

2. Quartiles of **Class A** and **Class B**

### 1. Worked Example (Range, Interquartile range, box and whisker plot and percentiles)

- 1.1 Study the box-and-whisker plot below and interpret all the key “5-Number Summary” values with respect to the spread of data.



**Possible Answer:**

- “Five (5) Number Summary” values:

1. Minimum value = 2

2.  $Q_1$  (lower quartile) = 10

3.  $Q_2$  (median) = 13

4.  $Q_3$  (upper quartile) = 17

5. Maximum value = 22

- **Range** =  $22 - 2 = 20$

- **Interquartile Range (IQR)** =  $Q_3 - Q_1 = 17 - 10 = 7$  (IQR is the lower, it means the data values are clustered/close together)

- 1.2 A student earned a mark of 73% for an exam and it is in the 92<sup>nd</sup> percentile of the grade.

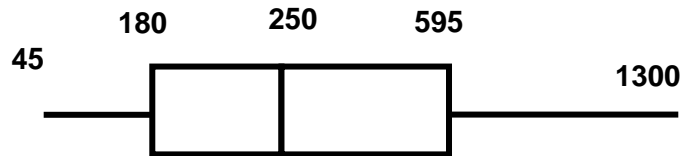
**Possible Answer:**

This means that 92% of the grade obtained a mark of 73% or less for the exam and only 8% of the grade achieved a mark that was higher than (or equal) to 73%.

### Activity 1 Developing Questions, Collecting Data and Classifying & Collecting Data

- 1.1 For each of the main questions given below, formulate 3 sub-questions that will enable meaning data collection
- 1.1.1 How can the South African matric pass be improved? (3)
  - 1.1.2 What is the importance of matric dance? (3)
  - 1.1.3 How can we decrease the rate of school drop-out in South Africa (3)
- 1.2 Decide on the best method of collecting data for the following investigations.
- 1.2.1 Types of motorcycles for Kumba Biking Club (2)
  - 1.2.2 The dissatisfaction of the community about poor service delivery (2)
  - 1.2.3 Finding a suitable candidate to be an administration clerk (2)
  - 1.2.4 The number of trucks passing in an hour on the National Road (2)
- 1.3 Sizwe attends the schools with the total of 1 700 learners and he is in Grade 12 class which has 37 learners. Identify the following from this given information.
- 1.3.1 Population (2)
  - 1.3.2 Sample (2)
- 1.4 State which data is Categorical or Numerical
- 1.4.1 Quantity of boxes of books delivered to the schools. (2)
  - 1.4.2 The country of birth. (2)
  - 1.4.3 Yvonne has a choice of either installing wooden or glass door at her house. (2)
- 1.5 Determine whether the data represented below is discrete or continuous.
- 1.5.1 The rate at which water flows from the tap (2)
  - 1.5.2 The participants of South African School Sports awards. (2)
  - 1.5.3 The floor size of Ms Jasi's double storey house. (2)

1.5.4 Money (in rands) saved matric class for the market day at their school.



1.6 The incomplete frequency table below shows the Mathematical Literacy marks of a group of 67 learners.

INTERVAL As a %	TALLIES	FREQUENCY	CUMULATIVE FREQUENCY
90–100		0	0
80–89	III	3	3
70–79	...	...	...
60–69	HHH HH II	12	21
50–59	HHH II	7	28
40–49	HHH HHH HHH	15	43
30–39	HHH HHH HHH II	17	60
20–29	IIII	4	64
10–19	II	2	66
0–9	I	1	67

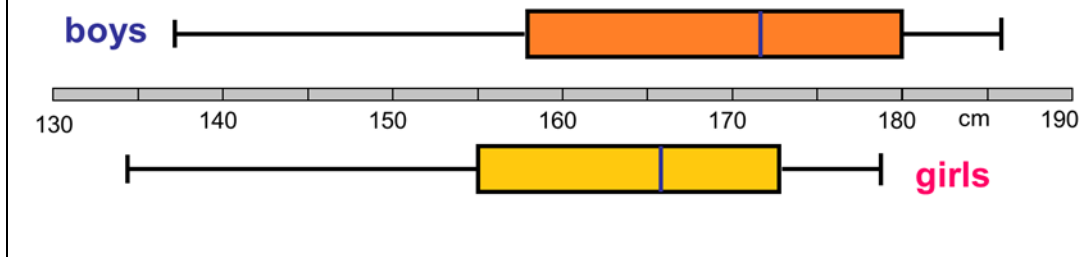
Use the frequency table above to answer the questions that follow.

1.6.1 Complete the tally for the 70–79% interval. (2)

1.6.2 Write down the frequency for the 70–79% interval. (2)

1.6.3 Show, by means of calculations, how the cumulative frequency for the 30–39% interval was determined. (2)

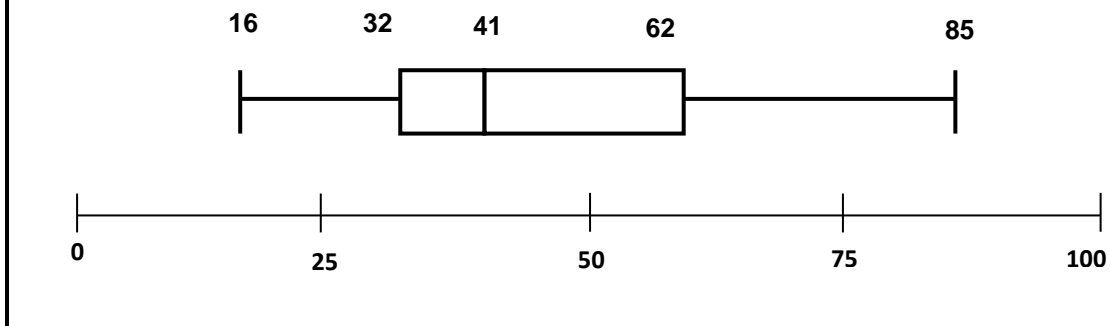
- 1.2 The box and whisker plots below represent the heights of boys and girls in Grade 12 class. Interpret the box and whisker to answer the following questions:



State whether the following statements are True or False

- 1.2.1 The tallest person is a boy. (2)
- 1.2.2 The shortest person is a girl. (2)
- 1.2.3 The girls show less spread in height. (2)
- 1.2.4 Half the boys are over 172 cm tall. (2)
- 1.2.5 The girls are taller on average. (2)

- 1.3 Below is a box-and-whisker diagram of the results (in %) of a Mathematical Literacy test written by 96 Grade 12 learners in a school. Use the diagram to answer the questions that follow:



- 1.3.1 What is the highest mark obtained? (2)
- 1.3.2 What percentage of learners obtained more than 41%? (2)
- 1.3.3 How many learners obtained more than 62%? (2)
- 1.3.4 Determine the inter-quartile range. (2)
- 1.3.5 The lower quartile is 32%. Say in your own words what does this mean. (2)

## STAGE 5: REPRESENTING DATA

Once the data has been summarised, it is important to represent it visually.














- The following representations of data can be drawn:

<p><b>Pie Charts</b></p> <ul style="list-style-type: none"> <li>- Each sector/slice represents data value.</li> <li>- Commonly used for categorical data</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NB: You are not required to draw it, just read, and interpret values.</b></p> </div>	<p>A pie chart illustrating the distribution of social media usage. The categories and their percentages are: Tiktok (45%), Facebook (23%), Twitter (17%), and Instagram (15%). A legend at the top identifies the colors: Twitter (blue), Facebook (orange), Tiktok (grey), and Instagram (yellow).</p>
<p><b>Single bar graphs and compound bar graphs (stacked and multiple)</b></p> <ul style="list-style-type: none"> <li>- Show frequency of each data</li> <li>- Used for discrete categorical data.</li> <li>- Spaces between the bars indicate discrete nature of the data</li> </ul>	<p>Two bar graphs are shown. The left graph is a single bar graph with 'Number of students' on the y-axis (0 to 15) and 'Class categories' on the x-axis (Period 1 to Period 5). The bars represent discrete data points. The right graph is a stacked bar graph with 'Percent' on the y-axis (0 to 100) and 'group' on the x-axis (2a, 2b, 2c, 2f). Each bar is composed of multiple colored segments representing different sub-categories.</p>
<p><b>Histograms</b></p> <ul style="list-style-type: none"> <li>- Represents continuous data.</li> <li>- Data grouped into intervals.</li> <li>- Class intervals on the horizontal axis</li> <li>- Bars on the same width.</li> </ul>	<p>A histogram showing the frequency distribution of age. The y-axis is labeled 'Frequency' (0.0 to 5.0) and the x-axis is labeled 'Age' (20 to 100). The bars represent continuous data grouped into intervals of width 10.</p>
<p><b>Line and Broken line graphs</b></p> <ul style="list-style-type: none"> <li>- Show the trend between plotted points of continuous data.</li> <li>- Broken line shows the trend between plotted points of discrete data.</li> <li>- Points are joined to show discrete nature of data.</li> </ul>	<p>Two line graphs are shown. The left graph is titled 'Produce sales in thousands (R100)' and shows a solid line connecting data points for months from OCT 2019 to JUN. The right graph shows a broken line connecting data points on a grid, illustrating a trend between discrete points.</p>
<p><b>Scatter plots</b></p> <ul style="list-style-type: none"> <li>- Increasing straight line pattern gives positive correlation.</li> <li>- Decreasing straight line pattern gives negative correlation.</li> <li>- Scattered random points without pattern gives no correlation.</li> </ul>	<p>A scatter plot titled 'Distance covered in minutes'. The y-axis is 'Distance in km' (0 to 100) and the x-axis is 'Time minutes' (0 to 50). The data points show a clear positive linear correlation.</p>
<p><b>Box-and-whisker plots</b></p> <ul style="list-style-type: none"> <li>- Only expected to interpret, not to draw.</li> </ul>	<p>A diagram of a box-and-whisker plot. The box represents the interquartile range (IQR) from the lower quartile (Q1) to the upper quartile (Q3). A vertical line inside the box represents the median. Whiskers extend from the box to the minimum (min) and maximum (max) values.</p>

### Activity: Data Handling

TABLE 2 below represents the weather forecast for Bloemfontein from the 16<sup>th</sup> of July 2019 to the 28<sup>th</sup> of July 2019.

**TABLE 2: BLOEMFONTEIN WEATHER FORECAST FOR 16 – 28 JULY 2019**

DAY	Symbol	Description	Maximum Temperature	Minimum Temperature
Tue, Jul 16		Sunny, Mild	20 <sup>0</sup> C	0 <sup>0</sup> C
Wed, Jul 17		Sunny, Mild	20 <sup>0</sup> C	-1 <sup>0</sup> C
Thu, Jul 18		Sunny, Mild	20 <sup>0</sup> C	-2 <sup>0</sup> C
Fri, Jul 19		Sunny, Mild	19 <sup>0</sup> C	-2 <sup>0</sup> C
Sat, Jul 20		Sunny, Refreshingly cool	16 <sup>0</sup> C	0 <sup>0</sup> C
Sun, Jul 21		Sunny, Mild	17 <sup>0</sup> C	-5 <sup>0</sup> C
Mon, Jul 22		Sunny, Cool	20 <sup>0</sup> C	0 <sup>0</sup> C
Tue, Jul 23		Sunny, Refreshingly cool	21 <sup>0</sup> C	3 <sup>0</sup> C
Wed, Jul 24		Sunny, Cool	17 <sup>0</sup> C	1 <sup>0</sup> C
Thu, Jul 25		Sunny, Refreshingly cool	21 <sup>0</sup> C	-1 <sup>0</sup> C
Fri, Jul 26		Sunny, Cool	18 <sup>0</sup> C	-1 <sup>0</sup> C
Sat, Jul 27		Sunny, Cool	17 <sup>0</sup> C	-1 <sup>0</sup> C
Sun, Jul 28		Sunny, Cool	17 <sup>0</sup> C	0 <sup>0</sup> C

[Source:www.accuweather.com]

Use the information above to answer the questions that follow.

- 1.1 Is the type of data represented in TABLE 2 above regarded as discreet or continuous? (2)
- 1.2 Write down the number of days covered by the above weather forecast. (2)
- 1.3 Determine:
  - (a) The average maximum temperature. (2)
  - (b) The mode of the minimum temperatures. (2)
- 1.4 Determine, as a decimal number (rounded to two decimal places), the probability of Bloemfontein experiencing sunny and refreshingly cool weather in the mentioned time period. (3)
- 1.5 An incomplete line graph showing minimum temperatures for the first seven (7) days of the mentioned time period is drawn on the set of axes on the ANSWER SHEET in the ADDENDUM. (4)

Complete the line graph for the last six (6) days on the same ANSWER SHEET.

[15]

### Activity: Data Handling

- 1.1 The data in the following table (**TABLE 5**) show to the usage of solar geysers per province as found on 3 March 2019.

**TABLE 5: NUMBER OF SOLAR GEYSERS IN USE PER PROVINCE**

Number of households per province using a solar geyser	
PROVINCE	NUMBER OF HOUSEHOLDS
Eastern Cape	3 161 535
Free State	1 418 288
Gauteng	5 937 471
KwaZulu Natal	5 056 518
Limpopo	2 436 112
Mpumalanga	1 827 935
North West	1 651 242
Northern Cape	584 830
Western Cape	2 900 567
TOTAL number of households	<b>C</b>

Refer to **TABLE 5** (supplied by the CSIR) and answer the questions that follows:

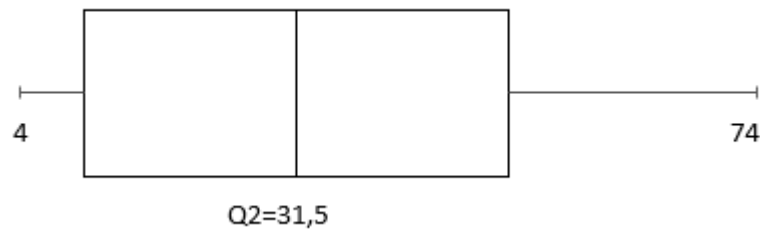
- 1.1.1 Calculate the total number of households using solar geysers in South Africa. (2)
- 1.1.2 Which Province had the second highest usage of solar geysers? (2)
- 1.1.3 If 60% of the total users of solar geysers in South Africa (SA) are male home owners, calculate the total number of female home owners in SA that makes use of solar geysers. (3)

- 1.2 A municipality collected data about the number of solar geysers per suburb. The data that has been collected for the 14 suburbs is arranged as follows in ascending order:

4; 6; 8; 12; 14; 22; **D**; 35 ;42; 42; 44; 72; 73;74

- 1.2.1 Is the data discrete or continuous? Give a reason for your answer (3)

- 1.2.2 The following is a box and whisker plot of the data represented. Some values are omitted.



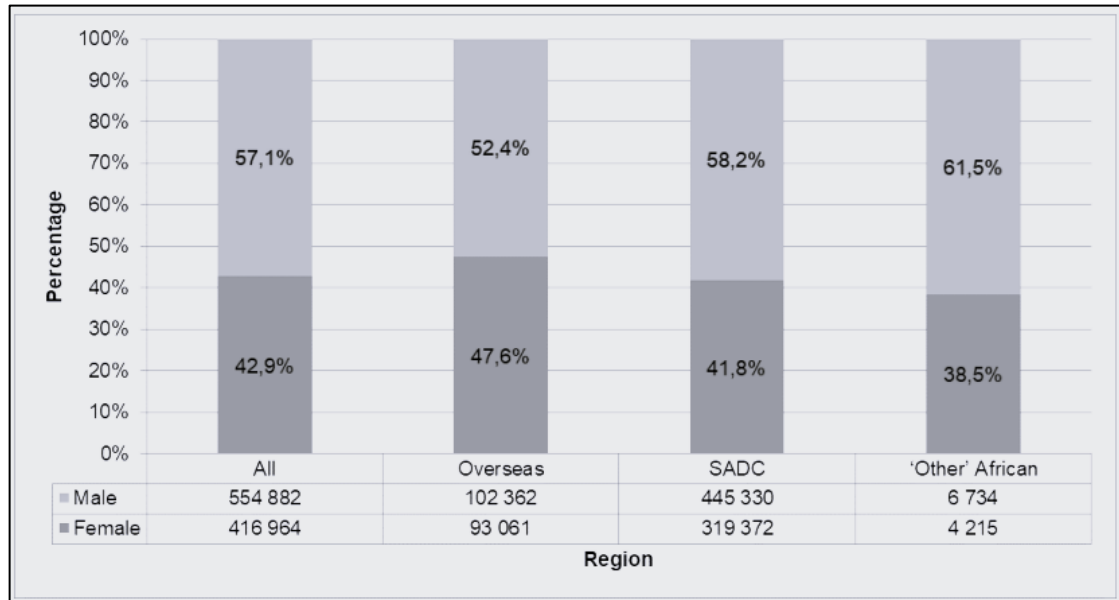
- Use this box-and-whisker plot to determine the value of **D** in the given data set. (4)

- 1.2.3 Determine the interquartile range (IQR) of the set of data. (2)

[16]

## Activity: Data Handling

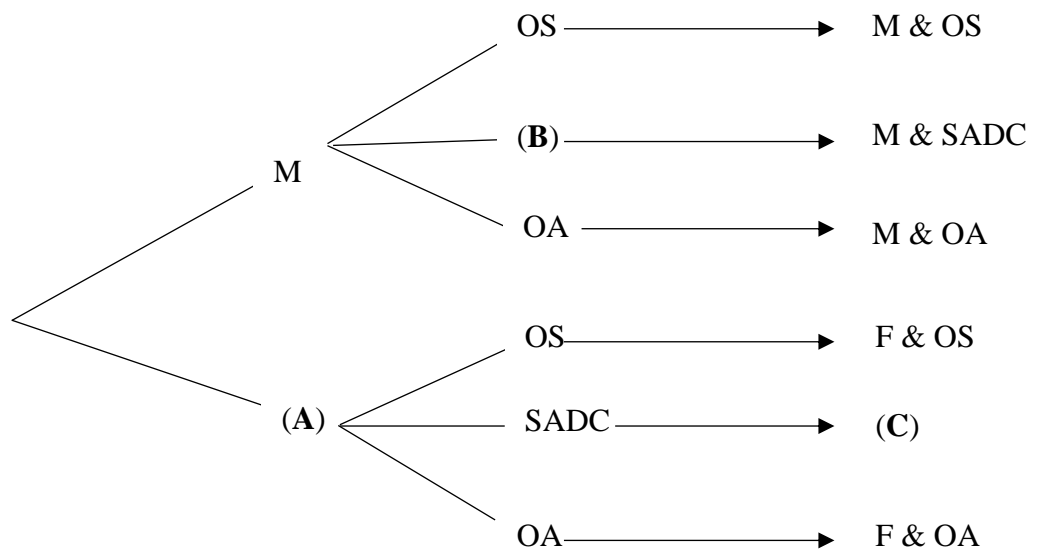
- 1.1 Tourism has always contributed a lot to the economy of South Africa. At the end of 2023 the total contribution was R268 billion (4,3% of total economy). The graph below shows the percentage distribution of tourists by region of residence and gender for January 2024.



Use the graph above to answer the questions that follow.

- 1.1.1 Name the type of graph shown above. (2)
- 1.1.2 Write down the gender that contributed the majority of tourists for all three regions. (2)
- 1.1.3 Calculate the mean percentage of the female tourists in all three regions (Overseas, SADC and Other African). (3)
- 1.1.4 The estimated 2023 population for the SADC region was 389,4 million people. Calculate the percentage of both male and female tourists in the SADC region who visited South Africa. (5)

- 1.2 The probability tree diagram below shows all the combinations of tourists visiting the country in January 2024.

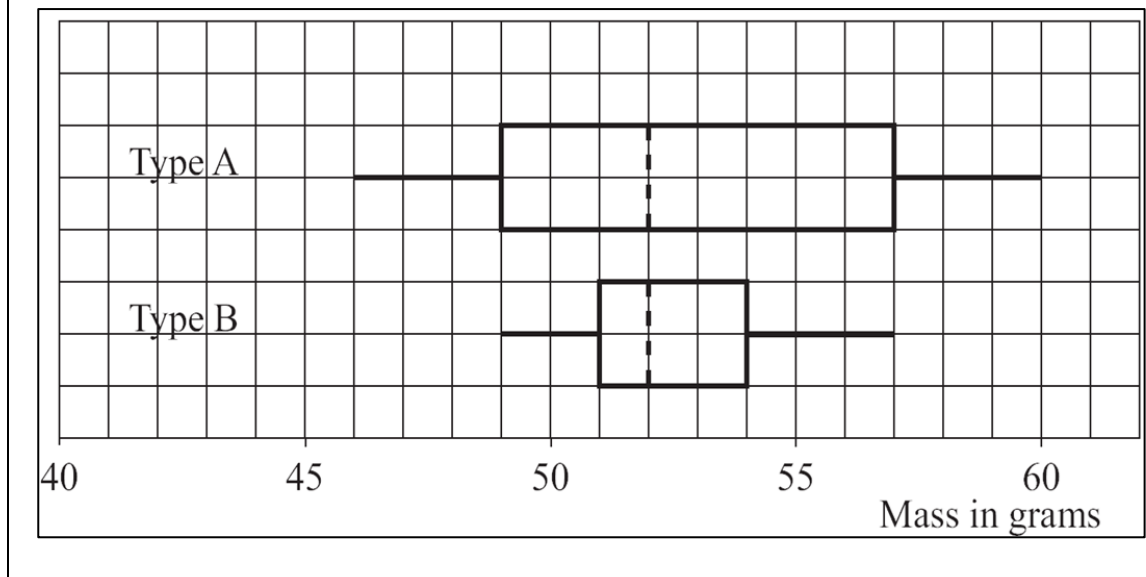


**M: Male    F: Female    OS: Overseas    OA: Other Africans**  
**SADC: Southern African Development Community**

Use the tree diagram above to answer the questions that follow.

- 1.2.1 Complete the tree diagram by writing down the missing information for **A**, **B** and **C**. (3)
- 1.2.2 Determine the probability, as a simplified fraction, of randomly choosing a tourist from SADC. (3)

- 1.3 Mr Kert, a prominent farmer in KZN collected data on two types of tomatoes (Type A and Type B) and presented it in the form of a box-and-whisker plot as shown below.



Use the diagram above to answer the questions that follow.

- 1.3.1 Write down the 25<sup>th</sup> percentile for Type B tomato. (2)
- 1.3.2 Identify the median mass for the two types of tomatoes. (2)
- 1.3.3 Calculate the difference between the Range and Interquartile Range (IQR) for Type A tomato. (5)
- 1.3.4 Based on the box and whisker plot shown above for both types of tomatoes, advise Mr Kert which type of tomato he should grow in future. (3)

[30]

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