

SSIP JANUARY – MARCH 2020
MATHEMATICAL LITERACY
PARTICIPANT GUIDE

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TABLE OF CONTENTS

NO.	PREAMBLE	PAGE
A	Foreword	3
B	Purpose	3
C	SSIP Aims/goals	4
D	SSIP Objectives	4
E	Learning Assumed to be in place	4
F	Target Audience	4
G	Notional Hours	5
H	Course Design and Assessment Strategy	5
I	Course outline/Map	5
J	Table of Icons	6
K	Table of Acronyms and Abbreviations	7
L	Term ATP	7
M	Course Timetable	10
Module 1: Finance Part One		11
Unit 1	Financial Documents; Taxation and Tariffs	13
Unit 2	Income and Expenditure; Profit and Loss; Break Even Points	22
Module 2: Data Handling		29
Unit 1	Developing Questions; Collecting Data and Classifying Data	33
Unit 2	Summarising Data; Representing Data; Interpreting Data and Analysing Data	38
Unit 3	Measuring Weight	49

A. FOREWORD

This document is the result of the Just in Time Secondary School Intervention Programme (JIT SSIP) which is an intervention programme for FET teachers in the Gauteng Department Education (GDE) in collaboration with Matthew Goniwe School of Leadership and Governance (MGSLG).

B. PURPOSE

The purpose of this programme is professional development of FET teachers who are currently teaching in the school FET phase of the education system. The programme is aligned to the strategic goals of the GDE which focuses on improving the teaching and learning practice in the most

classrooms through capacitation of teachers on Content, Pedagogy, and Assessment and ICT integration.

C. SSIP AIMS/GOALS

The SSIP programme aims at professional development for Grade 10-12 teachers in the application of effective teaching and reflective practice to improve learner performance on the identified Grade 12 examinable topics. The overall goal for SSIP is to provide teachers with professional expertise, tools and skills to spot student learning difficulties and decide on the course of action.

SSIP came about as result of the diagnostic needs that are identified through the end of the year NSC examination student learning data. In response to this design and development of teaching resources are developed to train teachers on the learner needs.

The four interconnected outcomes that drive the professional development activities for SSIP are:

- Enhancing Teachers knowledge: deep understanding of subject matter knowledge and students ideas on the content
- Enhancing quality teaching and assessment for learning: effective instructional approaches that teachers may use to ensure improved understanding by most learners.
- Developing ICT integration skills :Use of ICT to improve teaching and learning
- Building professional learning communities: allow teachers to start collaborating and form professional networks in non-formal settings in context of their schools

D. SSIP OBJECTIVES

By the end of the workshop teachers should be able to:

- have mastered and understood all aspects related to Finance Part 1 and Data Handling within the FET Mathematical Curriculum
- utilise ICT integration and encourage interactive lessons in teaching and learning

E. LEARNING ASSUMED TO BE IN PLACE

Participants are qualified teachers with a qualification in teaching at NQF 4 or above and teaching Mathematical Literacy.

F. TARGET AUDIENCE

Teachers who were identified through the 2019 NSC results, diagnostics report, and needs analyses of the teacher in the Integrated Quality Management System (IQMS) who teaching Mathematical Literacy in target schools. The course is aimed at professional development to improve learner performance in Mathematics Literacy.

G. NOTIONAL HOURS:

The time required to successful completion has been allocated as follows:

Contact face to face session	17, 5 hours
Pre Test	1 hour
Day 2 : Content Practice and Demonstration	10,5 hours
Day 3: Content Practice and Demonstration	5 hours
Post Test	1 hour

H. COURSE DESIGN AND ASSESSMENT STRATEGY






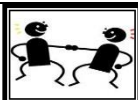
- The envisaged course focuses on two modules with at least two units each viz.
 - Module 1: Finance Part One
 - Module 2: Data Handling
- Teachers will be subjected to the variety of content knowledge, formative activities to consolidate the content learnt, Pre-test at the beginning of each workshop session to further verify content gaps and post-test in the last session.
- Pre-Post Test data will be used to monitor what learning has taken place in the 3 days of the session and workshop activities will also be used to support participant on subject matter knowledge



I. COURSE OUTLINE/ MAP

Module 1 : Finance Part One	
Objectives/Outcomes	Units
At the end of this module you will be able to: <ul style="list-style-type: none"> • Work with Financial documents relating to personal/household/work place/business • Work with tariff systems • Identify and perform calculations involving income, expenditure, profit and loss values • Determine and work with break-even analysis 	Unit 1: Financial document, Taxation and Tariff systems At the end of this Unit, you should be able to: <ul style="list-style-type: none"> • Financial documents relating to personal/household/work place/business • Income Tax, Value Added Tax, UIF and Personal Income Tax • Tariff systems
	Unit 2: Income, Expenditure, Profit, Loss and Break Even Analysis At the end of this Unit, you should be able to: <ul style="list-style-type: none"> • Identify and perform calculations involving income, expenditure, profit and loss values. • Determine break-even values

Module 2: Data Handling Graphs	
Objectives/Outcomes	Units
<p>At the end of this module you will be able to:</p> <ul style="list-style-type: none"> • Develop investigative questions • Collect data using appropriate instruments and methods • Summarise data collected • Organise and represent data • Interpret and discuss data 	<p>Unit 1: developing questions; collecting data and classifying data</p> <p>At the end of this Unit, you should be able to:</p> <ul style="list-style-type: none"> • Develop questions • Collect data • Classify data
	<p>Unit 2: summarizing data; representing data; interpreting data and analysing data</p> <p>At the end of this Unit, you should be able to:</p> <ul style="list-style-type: none"> • Summarising data • Representing data • Interpreting data • Analysing data
	<p>Unit 3: Measuring Weight</p> <p>At the end of this Unit, you should be able to:</p> <ul style="list-style-type: none"> • Determine the weight/mass using appropriate measuring instrument • Use recorded weight/mass data together with recorded length/height data to calculate Body Mass Index values and determine weight status for adults • Calculate values using a formula involving mass/weight

J. TABLE OF ICONS TO BE USED IN THIS MANUAL

Discussion	
Group ACTIVITY	
Individual ACTIVITY	
Study Tips	
Notes	
Ice Breaker	

Time	
Tools	

K. TABLE OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
ATP	Annual Teaching Plan
CAPS	Curriculum and Assessment Policy Statement
ICT	Information and Communication Technology
LP	Lesson Plan
FG	Facilitator's Guide
NPPPPR	National Policy Pertaining to Programme and Promotion requirements
PG	Participant Guide
FS	Fact Sheet
PPT	PowerPoint Presentation
TPACK	Technological, Pedagogical, Content and Knowledge
TS	Training Session

L. TERM ANNUAL TEACHING PLAN

DATE	CONTENT	CONTEXT
15/01 – 17/01	<p>1. CONVERSIONS</p> <ul style="list-style-type: none"> • Conversion factors and tables • Metric to imperial and vice versa • °C to °F and vice versa <p>2. TIME</p> <ul style="list-style-type: none"> • Time Tables, • Transport (Bus, Train, Taxi) • Production e.g. building a house • Tide 	<p>Complex projects in familiar and unfamiliar context.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Determine quantities of materials needed to build an RDP house. <p>Planning a trip between two places</p>
20/01 –24/01	<p>3. FINANCIAL DOCUMENTS:</p> <ul style="list-style-type: none"> • Loans • Tax forms 	<p>Loans:</p> <ul style="list-style-type: none"> • loan agreements (term of loan; interest rate) • Bank statements: Showing interest rate and monthly repayment changes

		<p>Tax:</p> <ul style="list-style-type: none"> • Tax deduction tables; Tax rate tables; IRP5 forms; Employee income tax forms
<p>27/01– 31/01</p> <p>03/02– 07/02</p>	<p>4. TAXATION</p> <ul style="list-style-type: none"> • Taxable income • personal income tax, • taxable & non-taxable income, • rebates and UIF 	<p>Two methods are promoted for this type of calculation:</p> <ul style="list-style-type: none"> • dividing the “VAT inclusive” value by 1,15 • identifying the “VAT inclusive” value as being 115% and working out the “value excluding VAT” as 100%.
<p>10/02 – 14/02</p>	<p>5. TARIFF SYSTEMS: (Compare 2 or more)</p> <ul style="list-style-type: none"> • Tables • Graphs <p>Formulae</p>	<ul style="list-style-type: none"> • Subsistence farming • Electricity tariff systems • Telephone tariff systems • Rental options (e.g. photo copiers, machinery, etc.)
<p>17/02 – 21/02</p>	<p>6. INCOME, EXPENDITURES, PROFIT/LOSS</p> <ul style="list-style-type: none"> • large organisations and fundraising projects <p>7. COST PRICE & SELLING PRICE:</p> <ul style="list-style-type: none"> • Cost of producing/ manufacturing • Appropriate selling price • Percentage profit <p>8. BREAK-EVEN ANALYSIS: determine break-even values from formulae and graphs</p>	<ul style="list-style-type: none"> • Running a small business
<p>24/02 – 28/02</p>	<p>9. DEVELOPING QUESTIONS:</p> <ul style="list-style-type: none"> • National and global issues <p>10. COLLECTING DATA:</p> <ul style="list-style-type: none"> • Develop and use data collection instruments <p>11. CLASSIFYING & ORGANISING DATA:</p> <ul style="list-style-type: none"> • sort numerical and categorical data using categories and class intervals <p>tallies and frequency tables</p>	<p>Develop and use an appropriate form/instrument for collecting multiple sets (Grade 12) of data, including</p> <ul style="list-style-type: none"> • National and global issues <p>Collect data on problems being investigated relating to the national and global issues (Grade 12).</p> <p>Classify collected data as:</p> <ul style="list-style-type: none"> • categorical data (e.g. <i>male/female; type of car</i>) • numerical data, further classified as discrete data (e.g. <i>number of people; number of cars</i>) and continuous data <p>Sort collected numerical data according to more than two categories (Grade 12).</p>

02/03 – 06/03	<p>12. SUMMARISING DATA:</p> <ul style="list-style-type: none"> quartiles inter-quartile range calculate and analyse measures of central tendency and spread percentiles 	<p>Quartiles and IQR values in conjunction with box-and-whisker diagrams</p> <ul style="list-style-type: none"> percentiles (<i>interpretation only</i>)
09/03 – 13/03	<p>13. REPRESENTING DATA:</p> <ul style="list-style-type: none"> pie charts histograms and bar graphs line and broken line graphs scatter plots <p>box and whiskers</p>	<p>In Grade 12, owing to the large and complex nature of the data dealt with in relation to national and/or global issues, it is expected that more complex estimation will be required</p>
	<p>14. INTERPRET AND ANALYSE DATA:</p> <ul style="list-style-type: none"> identify and describe trends identify and describe sources of bias answer questions under investigation identify and describe any misleading representations and data summaries 	<p>Compare different representations of multiple sets of data and explain differences.</p> <p>Investigate situations in which summarized and/or represented data is interpreted in different ways.</p>
16/03 – 20/03	<p>15. MEASUREMENT</p> <ul style="list-style-type: none"> Mass(weight) (cost of a product) BMI (formulae for BMI = kg/m²) Interpreting charts 	<ul style="list-style-type: none"> Growth charts BMI charts

M. COURSE TIMETABLE

Day 1

TIME	ACTIVITY
15:30 – 16:30	Arrival
16:00 – 17:00	Plenary Session: Opening and Welcome
17:00 – 18:00	TS 1: Pre Test
18:00 – 19:30	Supper

DAY 2

TIME	ACTIVITY
06:30 – 08:00	Breakfast
08:00 – 10:30	TS 2: Module 1 – Unit 1
10:30 – 11:00	Tea Break
11:00 – 13:00	TS 3: Module 1 – Unit 1
13:00 – 14:00	Lunch
14:00 – 15:30	TS 4: Module 2 – Unit 1
15:30 – 17:00	TS 5: Module 2 – Unit 1
17:00 – 18:30	TS 6: Module 2 – Unit 2
19:00 – 20:30	Supper

DAY 3

TIME	ACTIVITY
06:30 – 08:00	Breakfast
08:00 – 10:30	TS 7: Module 2 – Unit 3
10:30 – 11:00	Tea Break
11:00 – 12:00	TS 8: Module 2 – Unit 3
12:00 – 13:00	TS 11: Post Test
	Closing Session and Remarks:
13:00 – 14:00	Lunch

MODULE 1: FINANCE PART ONE

INTRODUCTION

In this module you will look at the concept of finance with specific focus on Financial Documents, Taxation, Tariff Systems, Income/Expenditure, Cost Price/Selling Price and Break Even Analysis.

OVERVIEW

In this topic, you will work with complex projects in familiar and unfamiliar contexts

SPECIFIC OBJECTIVES

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

- Work with Financial documents relating to personal/household/work place/business
- Work with tariff systems
- Identify and perform calculations involving income, expenditure, profit and loss values
- Determine and work with break-even analysis

GLOSSARY OF TERMS

Account	A record of income and expenditure.
Balance	This is the difference between debits and credits.
Bank statement	The details of all the transactions made from one bank account in a given time period.
Break-even point	Break-even point is where the business is at an activity level (doing business) at which total cost = total sales , i.e. you have made enough income to cover the costs. At the break-even point, you are making neither a profit nor a loss; from that point on you will be making a profit with each sale (until new costs are incurred).
Consumption rate	The rate at which a commodity, such as water, electricity or fuel, is consumed.
Cost-effective	Best value for money.
Cost price	This is the amount that it costs per unit to either manufacture or purchase an item or to prepare for a service that will be delivered. This amount is pure cost, no mark-up or profit has been added yet.
Cost rate	The price of a product per mass, volume, length or time unit.
Credit	This is an entry in an account that shows a payment made into the account.
Credit balance	The amount in the account is your own.
Credit card	A credit card is a service bank product that allows you to buy goods and pay for them at the end of the month.
Credit limit	The maximum amount you can spend on your credit card.
Debit	When someone or an organisation takes money out of your account. An entry in an account showing a payment made from an account.
Debit balance	The amount owed to a lender or seller.
Debit order	It is an arrangement whereby you give permission to a third party to withdraw money from bank account on a regular basis.
Deposit	A payment made into a bank account.
Disposable income	Income that is left over after all payments have been made.
Expenditure	An amount of money that is spent on something.

Fixed deposit	A single deposit invested for a fixed period at a fixed interest rate.
Fixed expenses	These are amounts that must be paid every month and which stay the same, like rent, school fees and transport costs.
Fund	A source of money.
Gross income	The total amount of all an individual's income before deductions.
Invoice	A comprehensive document that details all the work done or items sold, and what costs are due.
Loan	A loan is an agreed sum of money that is lent by a bank or moneylender (e.g. personal loan or home loan).
Luxury item or service	An item or service that is not essential for daily life, but which makes life easier or more convenient.
Net pay	The amount an employee "takes home" after income tax has been deducted.
Overdraft	An overdraft is an arrangement you make with the bank that allows you to draw more money than there is in your account.
PAYE	(abbr.) Pay as you earn: tax taken off your earnings by your employer and sent to the South African Revenue Service before you are paid (the balance).
Remittance slip	A piece of paper that accompanies a payment and contains the most important details of the transaction.
Salary	An amount of money paid for the work you do. (This is normally paid monthly.)
Selling price	This is the price at which something is offered for sale.
Statement	A summary of transactions (debits and credits, or payments and receipts) made on an account.
Tariff	The rate charged for a service rendered, e.g. import duties, water consumption cost, etc.
Tax	A compulsory levy imposed on citizen's earnings or purchases to fund the activities of government.
Taxable	A service, purchase or item or earning that has tax applied to it.
Tax invoice	Printed record of what was bought, what it cost, what was taxable, the tax amount, method of payment, amount tendered, and change due, if any.
Trillion	One-million-million (one followed by twelve zeros).
UIF	(abbr.) Unemployment Insurance Fund: A government-run insurance fund which employers and employees contribute to, so that when employees are retrenched they can collect some earnings (a portion).
Variable expenses	Expenses that change over time or from one week/month to the next. These are things that you usually pay or buy each month, but the amount changes e.g. telephone and electricity costs.
VAT	Value Added Tax (VAT) is a tax that is levied at 14% (currently in South Africa) on most goods and services, as well as on the importation of goods and services into South Africa.
VAT exclusive price	The price before VAT is added.
VAT inclusive price	The price after VAT is added.
Wages	A wage is an amount of money paid to an employee normally based on a fixed number of hours worked per week.
Withdrawal	Money taken out of a bank account.
Zero rated VAT items	These are goods that are exempt from VAT. Groceries that are basic foodstuffs are zero-rated in South Africa, e.g. brown bread, milk, mielie meal, samp, rice, etc..

CONTENT

You will study this module through the following units

Unit 1	FINANCIAL DOCUMENT, TAXATION AND TARIFF SYSTEMS
Unit 2	INCOME, EXPENDITURE, PROFIT, LOSS AND BREAK EVEN ANALYSIS

UNIT 1: FINANCIAL DOCUMENT, TAXATION AND TARIFF SYSTEMS

INTRODUCTION

In this unit you will focus on:

- Financial documents relating to personal/household/work place/business
- Income Tax, Value Added Tax, UIF and Personal Income Tax
- Tariff systems

LEARNING OUTCOME

At the end of this Unit, you should be able to:

- Work with VAT in the context of purchases, slips and bills
- Work with UIF in the context of payslips
- Work with payslips, income tax brackets and income tax formulae, tax deductions



LESSON NOTES

1.1.1. Financial documents

- Financial documents include shopping documents and business documents
- Any time that you go shopping, you should receive a till slip which shows what you have bought
- It is also proof that you have paid for the goods listed.
- For some items these should be kept for guarantee purposes.
- Many shops also allow you return goods as long as you have the till slip.
- There are many different household bills or accounts. For example:
 - ✓ municipal bills
 - ✓ telephone bills
 - ✓ clothing accounts
 - ✓ TV license, M-Net or DSTV
 - ✓ hire purchase agreements
 - ✓ car payments
 - ✓ bond statements
 - ✓ A till slips etc.



Activity 1.1.1
(Adapted from NSC Nov P1 2019)

Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
- Task 2: Allocate marks for each question
- Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion

Resources: Training manual, Note pad, Pen and Calculator

Extract below shows Mr Daniels' monthly municipality statement including the residential water and sewer tariff tables. Use the extract and answer the questions that follow:

Mr KJ Daniels 14 Sirkoon Street Kruger Park 2738		Date: 2019/03/12 Statement for: March 2019
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STAND SIZE	NUMBER OF DWELLINGS	DATE OF VALUATION	PORTION	MUNICIPAL VALUATION	REGION
463 m ²	1	2018/07/01	R1	Market value R944 630,00	WARD C

ACCOUNT NUMBER: 345 678 8900 60		
	SUBTOTAL (R)	TOTAL AMOUNT (R)
Water and sewer		
Reading period	2019/01/16 to 2019/02/12	
Meter reading	Start: 795 000 End: 807 000	
Water usage	12 kℓ (kilolitres)	
Daily average consumption	0,429 kℓ	
Charges for 12 kℓ are based on a sliding scale for a 28-day period		
Total water charge (excluding VAT)	B	
Water demand management levy	22,64	
Monthly sewer charge based on stand size (excluding VAT)	A	
VAT: 15%	73,75	

PAYMENT DUE	XXX
DUE DATE	2019/03/27

STEPPED RESIDENTIAL WATER TARIFF	
KILOLITRES PER CONNECTION PER MONTH	2018/19 TARIFF (R/kℓ) EXCLUDING 15% VAT
from 0 to 6	8,28
above 6 to 10	8,79
above 10 to 15	15,00
above 15 to 20	21,83

SEWER MONTHLY CHARGE BASED ON STAND SIZE	
STAND SIZE (m ²)	2018/19 TOTAL CHARGE (IN RAND) EXCLUDING 15% VAT
Up to and including 300 m ²	194,67
Larger than 300 m ² to 1 000 m ²	378,95
Larger than 1 000 m ² to 2 000 m ²	573,29
Larger than 2 000 m ²	836,02

[Adapted from www.joburgwater.co.za and www.jotariffs.co.za]

- Write down the market value in words
- Calculate the VAT amount for the sewer monthly charge on a stand larger than 2000m²
- Determine the value of A
- Use the stepped residential water tariff table to calculate the value of B, the total amount for water usage.

1.1.2. Value Added Tax (VAT)

- an indirect tax on the consumption of goods and services in the economy
- Revenue is raised for government by requiring certain businesses to register and to charge VAT on the supply of goods and services.
- VAT is presently levied at the standard rate of 15% on the supply of most goods and services and on the importation of goods.
- There is a limited range of goods and services which are subject to VAT at the zero rate
- For example: Mr Smit bought goods for his shop and he paid a total of R12 345,67.
If all the goods included VAT, how much was the cost excluding VAT
Answer: $R12\ 345,67 \div 115\% = R10735,37$

1.1.3. Income Tax

- Income tax is the money paid to government from wages to pay for schools, hospitals, infrastructure etc.
- The amount of tax depends on:
 - ✓ how much you earn
 - ✓ your age
 - ✓ whether you are a member of retirement annuity
- For example: The employee and employer each contribute 1% to UIF based on the total remuneration of the employee. Calculate the monthly amount paid to the fund if the gross salary of the employee is R12 345,78 per annum.
Answer: $2\% \times R12\ 345,78 = R2469,14$ pa
Per month = $R2469,14 \div 12 = R205,76$

1.1.4. Calculating Personal Income Tax

Tax rates (year of assessment ending 28 February 2020)		
Taxable Income		Rates of tax
0 - 195 850		18 % of taxable income
195 851 - 305 850	35 253	+ 26% of taxable income above 195 850
305 851 - 423 300	63 853	+ 31% of taxable income above 305 850
423 301 - 555 600	100 263	+ 36% of taxable income above 423 300
555 601 - 708 310	147 891	+ 39% of taxable income above 555 600
708 311 - 1 500 000	207 448	+ 41% of taxable income above 708 310
1 500 001 and above	532 041	+ 45% of taxable income above 1 500 000

Rebates	
Primary Rebate	R14 220
Secondary (Persons 65 and older)	R7 794
Tertiary (Persons 75 and older)	R2 601

Tax Thresholds	
The tax thresholds at which liability for normal tax commences	
Persons under 65	R79 000
Persons of 65 - 74 years	R122 300
Age 75 and older	R136 750

Medical Aid Tax Credits	
Main member	R310
First dependant	R310
Each additional dependant	R209

1.1.5. Tax deductions:

- **UIF:** Unemployment Insurance Fund: A government-run insurance fund which employers and employees contribute, so that when employees are retrenched they can collect some earnings (a portion) .The employee contributes 1% and the employer contributes 1% of basic salary.
- **Pension fund:** It is a fund established by an employer to facilitate and organize the investment of employees' retirement funds contributed by the employer and employees.
- Other deductions like medical aid contribution, insurance policies, maintenance, house payment, car payment, etc.
- **PAYE:** (abbr.) Pay as you earn: tax taken off your earnings by your employer and sent to the South African Revenue Service before you are paid (the balance).
- **Net salary:** The amount an employee “takes home” after income tax has been deducted.
- **For example:** Determine the tax that a teacher , age 41, a member of GEMS, will pay per annum if his taxable income is R312 000 per annum for tax year 2020.

- **Answer:** He will pay R63 853 + 31% of taxable income above 305 850
Amount over R305 850 = R312 000 – R305 850 = R6150
R6150 × 31% = R1906,50
Total tax before rebates = R63 853 + R1906,50 = R65 759,50

Since he is under 65, he gets only the primary rebate
Rebate = R14 220

Total Tax Payable = R65 759,50 – R14 220 = R51 539, 50 pa

Steps for calculating income tax	
Step 1	Calculate taxable income <ul style="list-style-type: none"> • Determine the annual income • Multiply the monthly salary by 12 to make it the annual salary and add extra benefits • If taxable income is given, then there is no need for step 1, 2 and 3.
Step 2	Calculate non-taxable income <ul style="list-style-type: none"> • UIF: Calculate 1% of the basic salary. • Pension fund: It is calculated by multiplying 7.5% by the basic salary, unless the structure of provident fund is stated. Two types of pension fund: GEPF for government employees and provident fund for non-governmental institutions. • Donations: Is a gift given by legal persons, typically for charitable purposes and/or to benefit a cause and is considered when calculating non-taxable income. The gift has to be given to an organisation that is registered under section 18A.

	<p>(A donation will be exempted if the total value of donations for a year of assessment does not exceed:</p> <ul style="list-style-type: none"> Casual gifts by companies and trusts: R10 000 Donations by individuals: R100 000). <p>Child support payments received, as the tax is deducted from payer's income.</p>
Step 3	<ul style="list-style-type: none"> Calculating the taxable income by subtracting non-taxable income from the total income, Tax Taxable income: Income remaining after the non-taxable income has been subtracted and is used to calculate the payable income tax. Or income that has tax applied to it. <p>Income tax: It is the amount of money one must pay to the South African Revenue Services (SARS) for earning an income.</p>
Step 4	<ul style="list-style-type: none"> Tax threshold: The income level at which a person begins paying income taxes: Check if the person qualifies to pay tax by using the tax threshold. The people earning lower than the tax threshold do not pay tax
Step 5	<ul style="list-style-type: none"> Identify the correct tax bracket, write down the correct rate and calculate payable tax before the rebates and medical credits could be subtracted, USING BODMAS BODMAS is an acronym for Brackets, Orders, Division, Multiplication, Addition and Subtractions and determines the order of operations. Rewrite the correct tax bracket Substitute the annual taxable in the formula on the amount above..... Write the simplified value before adding it to the value given in the formula Write the final answer before the subtraction of rebates and medical credits.
Step 6	<p>Subtract the rebates and medical credits from the value calculated in step 5.</p> <p>Rebate:</p> <ul style="list-style-type: none"> Is the tax relief according to age categories ; it is deducted after annual tax has been calculated The older the citizen, the higher the rebate People younger than 65 get the primary rebate only (compulsory rebate to every citizen) People above 65 qualify for both primary and secondary rebate People above 75 qualify for qualify for primary, secondary and tertiary rebate(the highest rebate) Identify the correct rebate

1.1.6. Medical tax credit

- **Medical credit:** Is the fixed monthly medical rebate aimed at relieving personal tax; irrespective of the income
- The more the number of dependents the higher the medical tax credit; the person's tax bracket is not considered.
- The medical credit depends on the number of dependents.
- Identify the number of members in the medical aid
- The medical credit allocated to the **first dependent** equals to that of the main member; there after the medical credits of the remaining dependent is the same for every additional member. First means being before all others with respect to time or order. i.e. anyone can be the 1st dependent, including wife/husband, depending on the order in which the dependents are captured.
- Calculate the annual medical credits as they are given as monthly values on the tax table. This will depend on the number of months the tax payer had contributed to the medical aid.



Activity 1.1.1 (Adapted from NSC Nov P2 2019)

Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
- Task 2: Allocate marks for each question
- Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

The tax table below shows the tax rates for individuals for the 2018/2019 tax year. John (68 years old) received a taxable income of R2 045 364 for the 2018/2019 tax year. He paid a monthly contribution towards a medical scheme for himself and his wife.

Use the information above and tax table provided below to answer the questions that follow:

- a) Calculate John's total medical scheme tax rebate for the year.
- b) Hence, calculate the amount of income tax he had to pay for the 2018/2019 tax year.

TAX RATES FOR INDIVIDUALS
2018/2019 TAX YEAR (1 MARCH 2018 – 28 FEBRUARY 2019)

The tax table 1 for the tax year March 2019 to February 2020

Taxable Income	Rates of tax
0 - 195 850	18 % of taxable income
195 851 - 305 850	35 253 + 26% of taxable income above 195 850
305 851 - 423 300	63 853 + 31% of taxable income above 305 850
423 301 - 555 600	100 263 + 36% of taxable income above 423 300
555 601 - 708 310	147 891 + 39% of taxable income above 555 600
708 311 - 1 500 000	207 448 + 41% of taxable income above 708 310
1 500 001 and above	532 041 + 45% of taxable income above 1 500 000

Rebates

Primary Rebate	R14 067
Secondary (Persons 65 and older)	R7 713
Tertiary (Persons 75 and older)	R2 574


Medical Aid Tax Credits

Main member	R310
First dependant	R310
Each additional dependant	R209

1.1.7. Type of tariffs:

- ✓ Telephone tariffs (e.g. cell phone and fixed line)
 - ✓ Municipal tariffs (e.g. electricity; water; sewage)
 - ✓ Transport tariffs (e.g. bus, taxi and train tariffs)
 - ✓ Bank fees.
- **Telephone tariffs** differ from one network to another one. The rates are charged either per minute or per second. Promotional tariffs are different, this includes various packages which promotes calling the same network. The rates are different during peak hours and off-peak hours.
 - **Electricity tariffs** are charged per unit used. It also depends on the peak and off peak hours. The rates of metered electricity and prepaid are different. Free units are given.
 - **Water tariffs** are charged per kilolitre used, there are free kilolitres given and there after different rates are charged. The more water you use, the higher the cost.
 - **Transport tariffs** depend on the rates charged by service provider. Distance is used to charge the tariffs. Regular users are discounted. Distance chart may be used to determine the cost if the rates are charged per kilometre.

Instructions



Activity 1.1.2

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
- Task 2: Allocate marks for each question
- Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

The cost of electricity is calculated on a sliding scale. This means that the more electricity you use the more you will pay per kilowatts. The tariffs for a municipality for 2 years is given below:

Energy charge [c/kWh] excl. VAT	2018/2019	2019/2020
1 – 100	96,94	101,79
101 – 400	102,94	113,85
401 – 650	108,44	120,37
> 650	115,54	128,25

Calculate the cost for January 2020 if the usage was 450 kWh including VAT.



Activity 1.1.3
(Adapted from NSC May/June P1 2018)

Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
- Task 2: Allocate marks for each question
- Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

The graphs below show the water tariffs for Cape Town and Johannesburg. Study the graphs below and answer the questions which follow.

CAPE TOWN			
	Kilolitres (kℓ) used per month	Price	Increase (%)
Step 1	0–6	Free R4,56	New
Step 2	6–10,5	R16,54 R17,75	7,3%
Step 3	10,5–20	R23,54 R25,97	10,3%
Step 4	20–35	R40,96 R43,69	6,6%
Step 5	35–50	R66,41 R113,99	71,6%
Step 6	> 50	R200,10 R302,24	51%
JOHANNESBURG			
	Kilolitres (kℓ) used per month	Price	Increase (%)
Step 1	0–6	Free R7,14	New
Step 2	6–10	R7,14 R7,58	6,2%
Step 3	10–15	R12,07 R13,17	9,1%
Step 4	15–20	R17,65 R19,63	11,2%
Step 5	20–30	R24,03 R26,96	12,2%
Step 6	30–40	R25,81 R29,22	13,2%
Step 7	40–50	R32,27 R37,11	18%
Step 8	> 50	New R38,72	20%

Key: 2016/17 2017/18

[Adapted from www.graphics24.co.za]

- Identify the step that indicates the largest increase (in rand) in Cape Town's water tariff from 2016/17 to 2017/18.
- Determine in which ONE of the two cities water is more expensive.
- Calculate the Cost of 3,5kl of water in Johannesburg during 2017/18.



Activity 1.1.4
(Adapted from NSC Nov P2 2018)

Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
Task 2: Allocate marks for each question
Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion

Resources: Training manual, Note pad, Pen and Calculator

Mike plans to purchase a bakkie. He received the following quotation from a car dealer on the 28 February 2019

Extract of a quotation for a bakkie from a dealer:

	Rand (R)
Selling price (excluding VAT) without accessories (extras)	160 087,72
Discount	6 140,00
ACCESSORIES (EXTRAS)	
Smash-and-grab film	3 500,00
Door protector	3 500,00
OTHER CHARGES	
On-road charges	4 298,25
Transaction fee	1 315,79
SUBTOTAL	166 561,76
VALUE-ADDED TAX	14%
TOTAL DUE	189 880,41

[Source: Group 1 Nissan and The Glen]

Use the information above to answer the questions that follow:

- a) Calculate (rounded off to ONE decimal place) the percentage discount given on the bakkie's selling price, excluding VAT.
- b) Show how the amount of R166 561,76 was calculated.
- c) Give ONE reason why customers would prefer to install the accessories (extras), as shown in the quotation.
- d) VAT in South Africa increased to 15% with effect from 1 April 2018.
The following shows how the dealer calculated the new increased VAT incorrectly:

Selling price, including 14% VAT = R160 087,72 + 14% of R160 087,72
 = R160 087,72 + R22 412,28
 = R182 500

VAT increased with 1%.

New selling price, including 15% VAT = R182 500 + R182 500 × 1%
 = R182 500 + R1 825
 = R184 325

Identify the mistake the dealer has made in calculating the new selling price. Hence, calculate the new selling price, including 15% VAT (excluding accessories and other charges)

UNIT 2: INCOME, EXPENDITURE, PROFIT, LOSS AND BREAK EVEN ANALYSIS

INTRODUCTION

In this unit you will focus on Selling price, Cost price, Income, Expenditure and Break even analysis

LEARNING OUTCOME

At the end of this Unit, you should be able to:

- Identify and perform calculations involving income, expenditure, profit and loss values.
- Determine break-even values



LESSON NOTES

2.1.1. Cost price and Selling price

- For a business to make money it needs to sell goods or services for more than it cost.
- The cost price is how much the item cost the business.
- The selling price is how much the business gets for the item.
- A business may offer the customer a discount on items. This means that the customer will pay less than the selling price for the item.
- The profit a company makes is determined by the difference between the selling and cost price. If the selling price is less than the cost price, the company will make a loss.
- For example: A clothing shop paid R123 for a trouser and sold them at R177 each. Calculate the percentage profit that the clothing shop made on the sale of the shirts.

Answer: Profit = R177 – R123 = R54

$$\% \text{ profit} = \frac{54}{123} \times 100 = 43,9\%$$

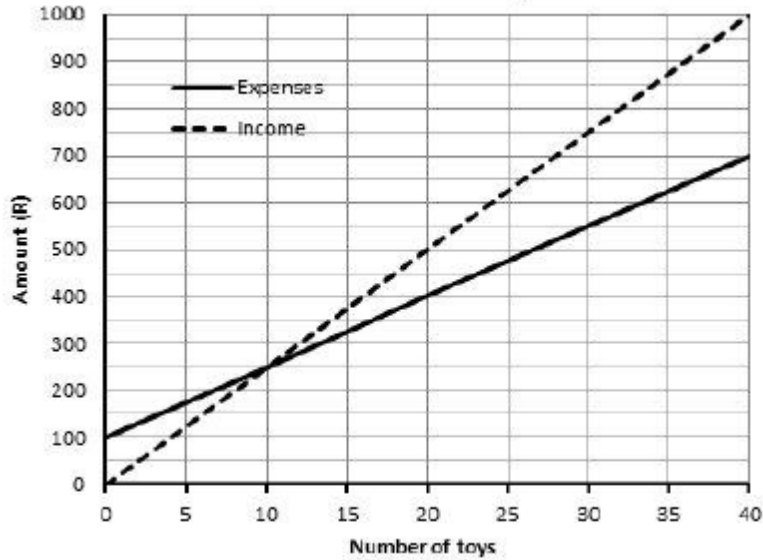
2.1.2. Income and Expenditure

- Profit means making more money than you spend.
- Profit is calculated by taking the difference between its income and expenditure.
- However, the costs involved before you can sell the product is also important.
- The cost may include more than just the purchase or production cost of an item.
A retailer may buy products and then ship them to a warehouse where they have to be prepared for sale. All these steps add to the cost of an item.
- The costs may be divided into **variable and fixed expenses**.
- **Fixed expenses:**
 - ✓ Costs that remain constant over time
 - ✓ For example: rent, salaries, security, insurance, rates and taxes, etc.
- **Variable expenses:**
 - ✓ Depend on the production level, as the production volume goes up, so will the costs
 - ✓ For example: commissions, material costs, water and electricity, petrol etc.
- Income may also be divided into **fixed and variable**
- **Fixed Income**
 - ✓ Fixed income is money that is definite on a monthly basis.
 - ✓ For example: salary received monthly
- **Variable income**
 - ✓ Variable income changes from month to month and is
 - ✓ It is irregular and often unexpected
 - ✓ For example: royalties, dividends
- **Profit Margin**
 - ✓ Profit margin is the percentage of the final selling price that is profit.
 - ✓ Profit = Selling price – cost price
 - ✓ to calculate profit margin we use the formula:
$$\text{Profit margin} = \frac{\text{profit}}{\text{selling price}} \times 100$$
 - ✓ The profit margin is a better indication of how well a product or company is doing.
 - ✓ For example: Consider the following 2 scenarios to establish a better company:
 - A company A has an income of R1 400 000 and costs of R600 000.
 - A company B has an income of R200 000 and costs of R50 000.

2.1.3. Break Even Analysis

- a financial tool which helps you to determine at what stage a company or product, will be profitable.
- For example

The graphs showing the toy making business income and expenses is given below: A toy making business may below:



- Determine the income if 30 toys are sold
- How many toys must be made and sold to break even?



Activity 1.2.1
(Adapted from NSC May/June P1 2018)

Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
- Task 2: Allocate marks for each question
- Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

The price list given below shows the selling price and profit for different types of clocks. Study the price list and answer the questions that follow.

CLOCK A

Selling price: R3 350,00
Profit: R914,00



CLOCK B

Selling price: R220,00
Profit: R60,00



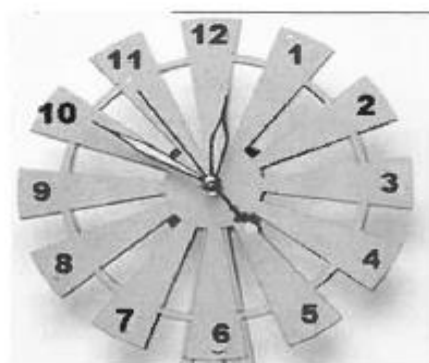
CLOCK C

Selling price: R2 100,00
Profit: R573,00



CLOCK D

Selling price: R5 950,00
Profit: R1 623,00



Note: All prices exclude 15% VAT

- Calculate the cost price of Clock A, excluding VAT.
- Write down the time on clock B, using the 24-hour format if it represents the time in the evening.
- Calculate the total profit made if all four clocks are sold.



Activity 1.2.2
(Adapted from NSC May/June P1 2019)

Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
Task 2: Allocate marks for each question
Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

Susan started her business one month later and because of the price increase of products, it then cost her R9,50 to make ONE cup of Milo. She calculated that the daily fixed cost was R90,00 and she would be able to sell 100 cups of Milo per day. She will sell the Milo at R12,50 per cup.

Use the information above to answer the questions that follow:

1. Table 1 below shows the income from the side of cups of Milo

Number of cups of Milo (n)	0	20	30	40	80	100
Income in rand (R)	0	250	375	P	1000	1250

- a) Determine the value of P in TABLE 2 above
 - b) Write down the equation that can be used to calculate the icome
 - c) Identify the independent variable in the table above.
2. Susan uses the following formula to determine the cost price of the cups of Milo.

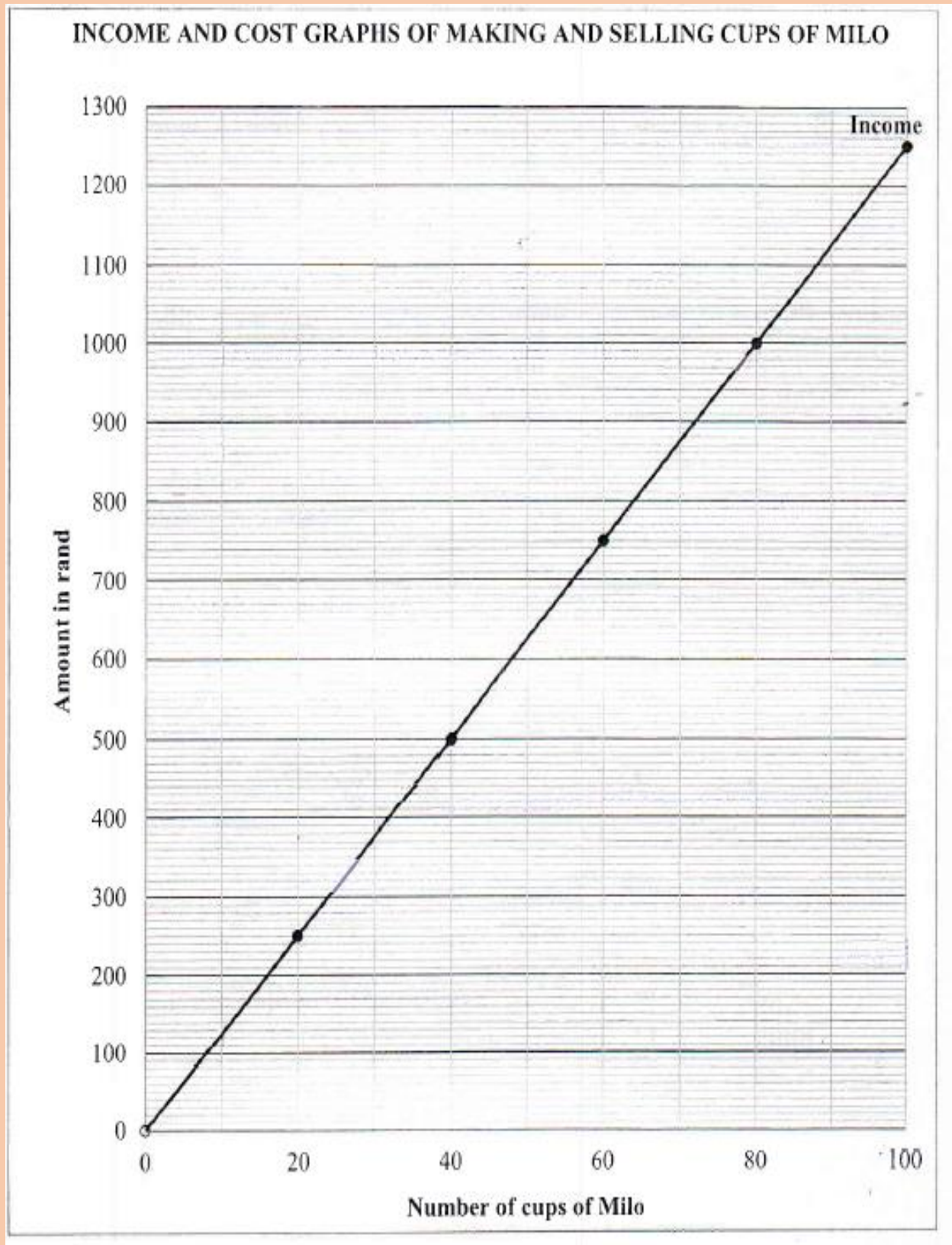
Cost = R90,00 + R9,50 × n where n = number of cups of Milo

Table 2 below shows the cost price for a number of cups of Milo

Number of cups of Milo (n)	0	20	30	Q	80	100
Cost price in rand in rand (R)	90	280	375	612,50	850	1040

Calculate the value o Q in the table 2 above.

3. The graph on the answer sheet below shows the total income for making up 100 cups of Milo. Use the information in table 2 to draw another graph representing the cost from the selling of up to 100 cups of Milo.
4. Use the tables or the graph to determine the number of cups of Milo at the break-even point





ACTIVITY 1.2.3

Individual Work (20 Minutes)

Instructions

- Individual activity
- Duration: 10 minutes
- This activity is intended to advance ICT skills that can be used in the classroom
- **Task** : Download and save a video lesson on Break Even Analysis
- Report Back and Discussion
- Resources: Training manual, Laptop and Wi-fi

STEPS IN DOWNLOADING A VIDEO

savefrom.net

- In your BROWSER type YouTube or Go to YouTube
- Type the topic of your choice
- Click the video and type **ss** or **vd** in front of **youtube** on the link OR insert 'magic' between 'you' and 'tube'.
For example:
 - ✓ Before typing ss or vd: <https://www.youtube.com>
 - ✓ After typing ss or vd: <https://www.ssyoutube.com>
- Then it will take you to the **savefrom.net** page
- Click download then save

RESOURCES FOR MODULE

- NSC Exam 2018 Diagnostic Report
- www.google.co.za/shopping/product/catalogue

SUMMARY

In this module, participants:

- Worked with Financial documents relating to personal/household/work place/business
- Worked with tariff systems
- Identified and performed calculations involving income, expenditure, profit and loss values
- Determined and worked with break-even analysis

REFLECTION

- Learners should be afforded opportunities to define terms in their own words, as part of assessment to ensure conceptual understanding.
- Teachers must provide learners with opportunities to extract information from tables as often as possible.
- Teachers should give learners sufficient exercises on how to substitute correct values from tables (correct columns) into a given formula.
- Teachers should encourage candidates to use the LOLT always during the lessons. Scenarios should be discussed and critically analysed during lessons to give learners the opportunity to think critically and develop analytical and problem-solving skills.

END OF MODULE 1

MODULE 2: DATA HANDLING

INTRODUCTION

In this module you will look at the concept of Data Handling with specific focus on Developing questions; Collecting data; Classifying data; Organising Data; Summarising Data; Representing data; Interpreting data and Analysing data.

OVERVIEW

In this topic, you will work with complex projects in familiar and unfamiliar contexts

SPECIFIC OBJECTIVES

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

- Develop investigative questions
- Collect data using appropriate instruments and methods
- Summarise data collected
- Organise and represent data
- Interpret and discuss data

GLOSSARY OF TERMS

TERMS	MEANING
Bar graph	90 ⁰ graph using bars to show frequencies (horizontal and vertical graph), the vertical heights of a set of bars of equal breath represent the values of the dependant variable in a data set.
Box-and-whisker plot	Diagram that statisticians use to show the distribution of data along a number line divided into quartiles.
Classify	Identify the type or class.
Continuous data	Numerical data (measurements like weight or age)
Data	Information, series of observations, measurements, facts; collection and recording of information for statistical investigation.
Data collection sheet	Two-column table showing what is observed and how many times it was observed; items of information.
Discrete	Separate; distinct; opposite of continuous.
Discrete data	Numerical data (fixed numbers like size of family); data that can have only certain values (quantities that can be counted, usually whole numbers)
Equivalent	Quantities that have the same value.
Frequency table	Table showing frequencies in organised form; table summarising the frequencies of all the data values in a data set.
Group	Put into classes, sort, arrange, organise.

Histogram	90 ⁰ graph using adjacent bars to show frequencies of either continuous numerical data or discrete numerical data with many different values; areas of rectangles (continues; no gaps between them) show frequency of classes of data (breadth 5 class; height 5 frequency)
Horizontal bar graph	90 ⁰ bar graph using horizontal bars to compare or rank items like household sizes in a block of flats.
Interview	Record data by talking to someone face to face or over the telephone.
Investigate	Examine; look into; study.
Mean	Average of the values in a data set; 5 sum of all the observed values divided by the number of observations.
Mean [of a set of data]	Average; sum of all data values divided by the number of data values.
Measures of central tendency	Numbers that tell more about the balance (middle values) in a data set (mode; median; mean)
Measures of spread	Numbers that tell how far data values in a data set lie apart; spread of numerical data set (range, quartiles, percentiles)
Median	Middle value in an ordered data set.
Median [of a set of data]	Value that cuts an ordered data set in half.
Mode	Value or values appearing most often in a data set.
Mode of a set of data	Most common data value in a data set.
Observation	Recording of data by watching someone or something closely.
Outliers	Data value that lies an abnormal distance from the other data values in the data set.
Population	Entire source of data involved in an investigation; all the subjects included in a study or survey in order to draw conclusions about that population as a whole.
Quartiles	The values that divide a list of numbers into four equal parts
Questionnaire	List of questions that can be used to collect data.
Range [of a data set]	Difference between the highest and lowest values in a data set.
Related [data sets]	Linked; connected.
Represent[data]	Draw; graph
Representative sample	Sample likely to give results similar to those obtained from studying the whole population.
Sample	Subset (small group) chosen from the population to represent the population.

Sampling	Choosing a representative sample
Sort	Put, organise into categories.
Survey	Collect data from a group of people or objects.
Survey [biased]	Survey containing factors that produce answers that do not represent a truthful picture of the situation.
Variable	A quantity that can take different values in a situation.
Vertical bar graph	90 ⁰ bar graph using vertical bars to show change over time at discrete times like absentees per day for three weeks.

CONTENT

You will study this module through the following units

UNIT 1	DEVELOPING QUESTIONS; COLLECTING DATA AND CLASSIFYING DATA
UNIT 2	SUMMARIZING DATA; REPRESENTING DATA; INTERPRETING DATA AND ANALYSING DATA
UNIT 3	MEASUREMENT: MEASURING WEIGHT

UNIT 1: DEVELOPING QUESTIONS; COLLECTING DATA AND CLASSIFYING DATA

INTRODUCTION

In this unit you will look at the concept of:

- Developing questions
- Collecting data
- Classifying data

LEARNING OUTCOME

At the end of this Unit, you should be able to:

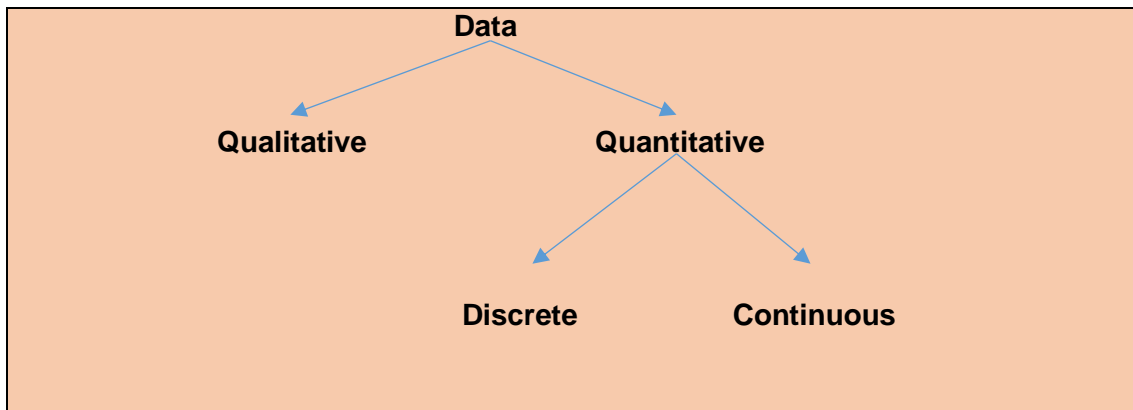
- Develop questions that require the collection of data
- Use appropriate instrument to collect data
- Classify the collected data as categorical or numerical
- Organise the collected data using tallies and frequency tables



LESSON NOTES

2.1. DATA HANDLING

- Data handling: Is a process of collecting data, classifying, organising, summarising, analysing, representing and interpreting data.
- **Data** refers to the information, a series of observations, measurements, facts; collecting and recording information for purposes of statistical investigation.
- **Qualitative** versus **Quantitative**
Data can be qualitative or quantitative.
 - ✓ **Qualitative data** is descriptive information (it *describes* something)
 - ✓ **Quantitative data** is numerical information (numbers)



- ✓ **Quantitative data** can also be discrete or continuous:
- ✓ **Discrete data** can only take certain values
- ✓ **Continuous data** can take any value (within a range)
- Data is limited to contexts related to the personal lives of learners, wider social issues and national and global issues.
- These are scenario involving daily life, workplace and business environment, social, national and global issues.
- The statistical process is made up of inter-connected stages:

Steps of statistical processes:

- ✓ Developing questions
- ✓ Collecting data
- ✓ Classifying and Organising data
- ✓ Summarising data
- ✓ Representing data
- ✓ Interpreting and Analysing data

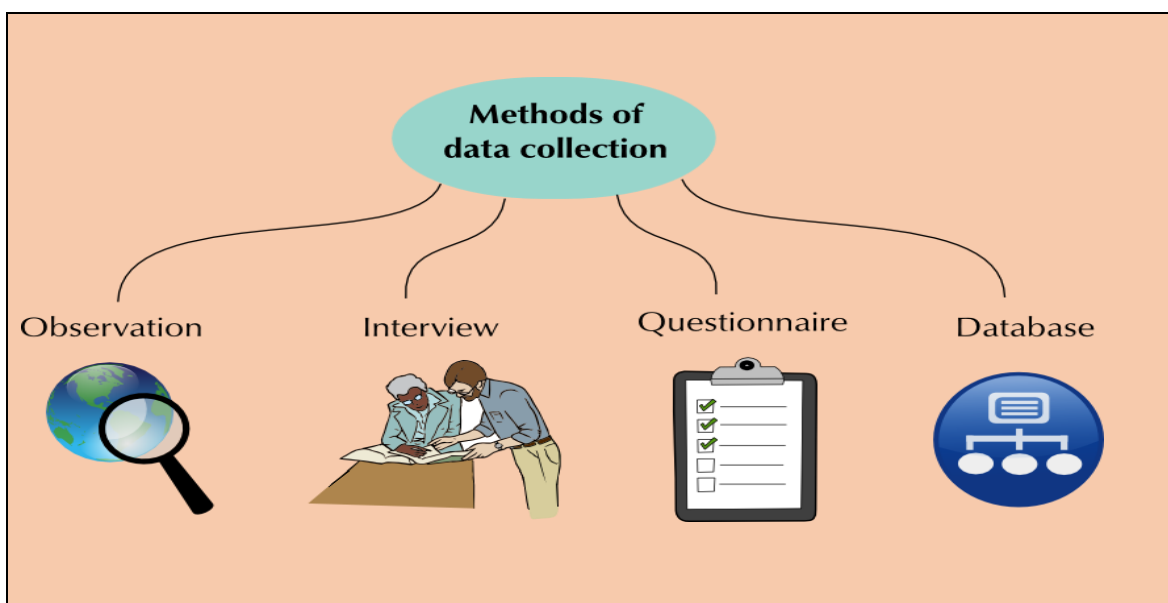
- It is important that learners understand the inter-connectedness of the statistical process and that these processes are taught and assessed at related stages.

2.1.1. Developing Questions:

- A statistical question is one that can be answered by collecting data where there are single, double and multiple sets of data that contains multiple categories.
- Examples:
 - ✓ Single sets of data: working with different test scores categorised into mark categories for an entire class; test and exam results; height and weight of data of learners in a class; number of learners in each grade; data on telephone call time and duration.
 - ✓ Double sets of data: working with different test scores categorised into mark categories and organised according to gender; vehicle statistics of shoppers at a shopping centre; sport results statistics for provincial and national sport events; data on housing; water and electricity facilities for a small community.
 - ✓ Multiple sets of data: national and provincial (health, education, road accident, population) statistics; complex values that is always expressed in millions or large data values containing decimal values

2.1.2. Collecting Data

- **Data collection** is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes.
- Data is a collection of similar information obtained in different ways of sources.
- Examples: observation, interview, surveys and questionnaires could be used to collect the data if it is not available.



2.1.3. Classifying and Organising Data


- Data collected in original form is called raw data.
- Data can be classified into two types:
 - ✓ **Categorical data:** Qualitative data, usually collected through observation and is descriptive. E.g. colour, texture, etc.
 - ✓ **Numerical data:** Quantitative data consisting of numerical values.
- There are 2 types of numerical data:
 - ✓ **Discrete data :**
 - It is data based on counts, it is data that can be associated with a specific value.
 - Bar graph represents discrete data only
 - ✓ **Continuous data:**
 - Data representing series of values or values grouped into categories.
 - Histogram represents continuous data.
- A frequency distribution is the organisation of raw data in table form, using classes and frequencies.
- The data can be placed in categories and organized in categorical frequency distributions.
- Example:

Data collected can be grouped using intervals, frequency tables and tallies.

CREATING FREQUENCY TABLES EXAMPLE 1

1, 5, 3, 1, 2, 3, 4, 5, 1, 4, 2, 4, 4, 5, 1, 4, 2, 4, 2, 2

Steak	Frequency Chosen-Tally	Number
1	IIII	4
2	IIII	5
3	II	2
4	IIII	6
5	III	3



Study.com

- A survey can be used to gather information about a group. Often, a part of the group, called a **sample**, is chosen to represent the whole group or population.
- A sample must represent the population fairly. In a random sample, each person in the population has an equal chance of being chosen.
- A **statistic** is **biased** if it is calculated in such a way that it is systematically different from the population parameter being estimated eg when certain individuals are being more likely to be selected than others.
- An estimator or decision rule with zero **bias** is called **unbiased**.
- Analysing information involves identifying and describing trends(patterns in data represented in tables/graphs and explain what the data indicates about the question/problem for which the data was collected.

ACTIVITY 2.1.1



Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
- Task 2: Allocate marks for each question
- Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

- Use the topics below to answer the following questions:
 - a) Develop an investigative question and 3 sub-questions.
 - b) Identify the method and instrument you would use to collect the following data.
 - c) Indicate whether you would use the population or sample
 - d) If you use a sample, what demographic factors would you control?
 - Population of South Africa, per province, gender and population group for 2016
 - The distance (in km) that the learners from exhibition high school walked from home to school daily.
 - The marks of Mathematical Literacy top achievers in Matric for the year 2019.
 - The annual salaries (in Rands) of the top 9 highest paying jobs in South Africa
 - The distribution of deaths by province and the province of usual residence of the deceased.
 - Number of children receiving foster care and child support care grants for 2016/2017 and 2017/2018.
 - e) Choose 1 topic from the given ones and download the data. Use tally tables to organise the data.

UNIT 2: SUMMARIZING DATA; REPRESENTING DATA; INTERPRETING DATA AND ANALYSING DATA

INTRODUCTION

In this unit you will look at the concept of:

- Summarising data
- Representing data
- Interpreting data
- Analysing data

LEARNING OUTCOME

At the end of this Unit, you should be able to:

- Summarise the collected data using measures of central tendency and measures of spread
- Analyse the collected data presented in the graphs
- Represent the collected data using appropriate graphs
- Read the collected data from the graphs



LESSON NOTES

2.2.1. Summarising Data

- Collected data can be summarised by using the following measures of central tendency and spread.
 - ✓ Summarise single sets (personal lives) of collected data.
 - ✓ Summarise and compare two sets (wider community) and multiple sets (national and global issues) of collected data using the following measures of central tendency and spread.
- Measure of central tendency

mean

The mean is the average or norm.

- Add up all of the values to find a total.
- Divide the total by the number of values you added together.

$2 + 2 + 3 + 5 + 5 + 7 + 8 = 32$
There are 7 values

$32 \div 7 = 4.57$
(Divide the total by 7)

median

The median is the middle value.

- Put all of the values into order.
- The median is the middle value.
- If there are two values in the middle, find the mean of these two.

mode

The mode is the most frequent value.

- Count how many of each value appears
- The mode is the value that appears the most
- You can have more than one mode.

2, 2, 3, 5, 5, 7, 8

2

5

The modes are 2 and 5

- **Example 2:**

Finding the median, quartiles and inter-quartile range.

Example 1: Find the median and quartiles for the data below.

12, 6, 4, 9, 8, 4, 9, 8, 5, 9, 8, 10

Order the data

Q₁

4, 4, 5, | 6, 8, 8, | 8, 9, 9, | 9, 10, 12

Lower Quartile = 5½

Q₂

Median = 8

Q₃

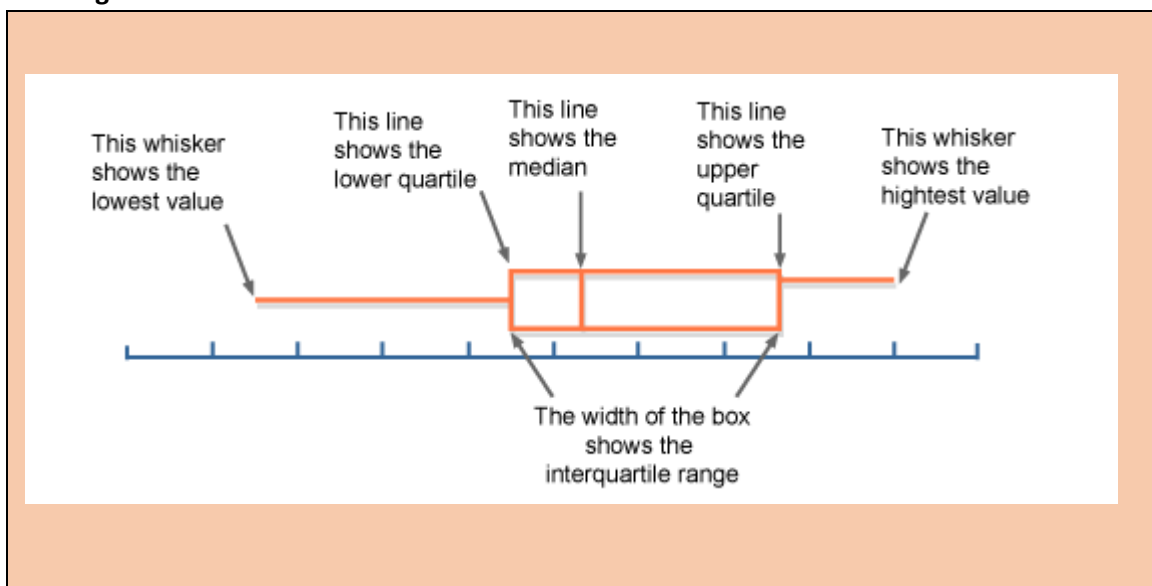
Upper Quartile = 9

Inter- Quartile Range = 9 - 5½ = 3½

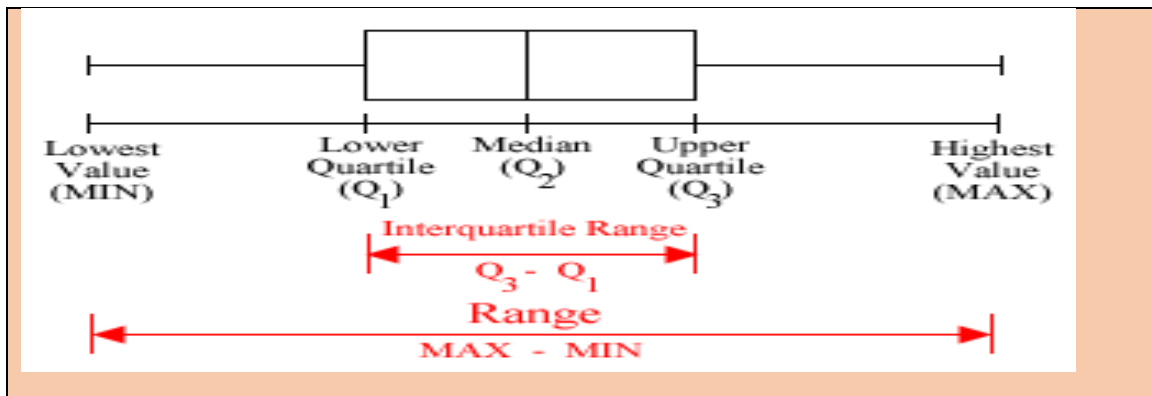
- **Box and Whisker Plot**

- ✓ The box and whisker plot is a diagram showing statistical distribution of a data set.
- ✓ Learners are only expected to interpret not draw, they should be able to locate minimum, maximum, median and quartile values (the five number summary on the plot)
- ✓ Box and whisker plots as graphical representation of quartiles:

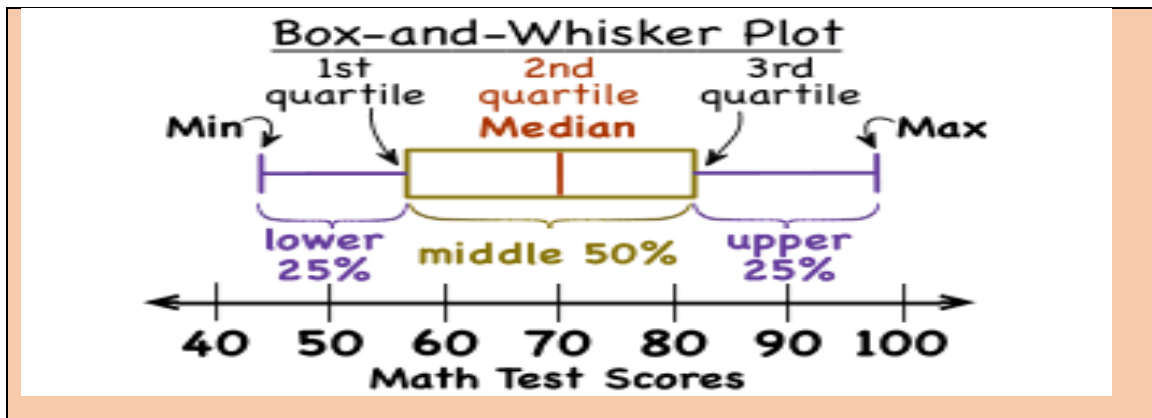
- **Diagram 1**



- **Diagram 2**



- **Diagram 3**



- **Percentiles**

Student Growth Percentile (SGP) Characteristics Percentiles express the percentage of students that fall below a certain score SGP's are reported between 1 and 99.

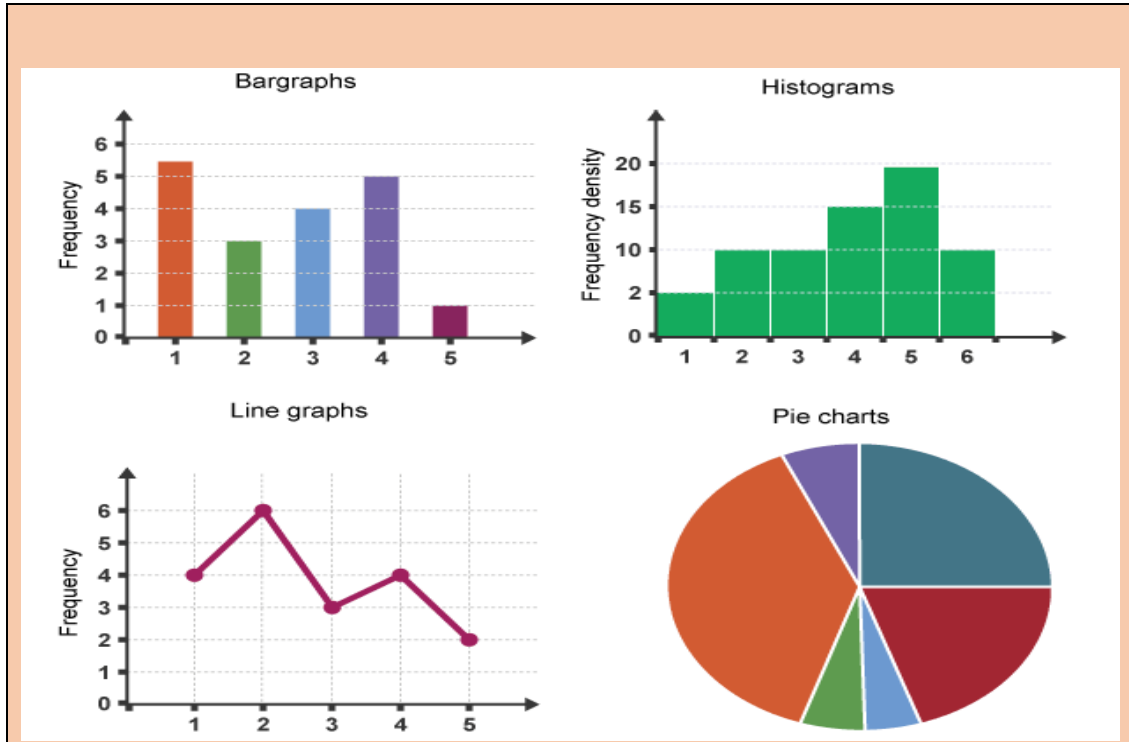
What Do Percentiles Mean?

Percentiles express the percentage of students that fall below a certain score

Source: Virginia Dept. of Ed

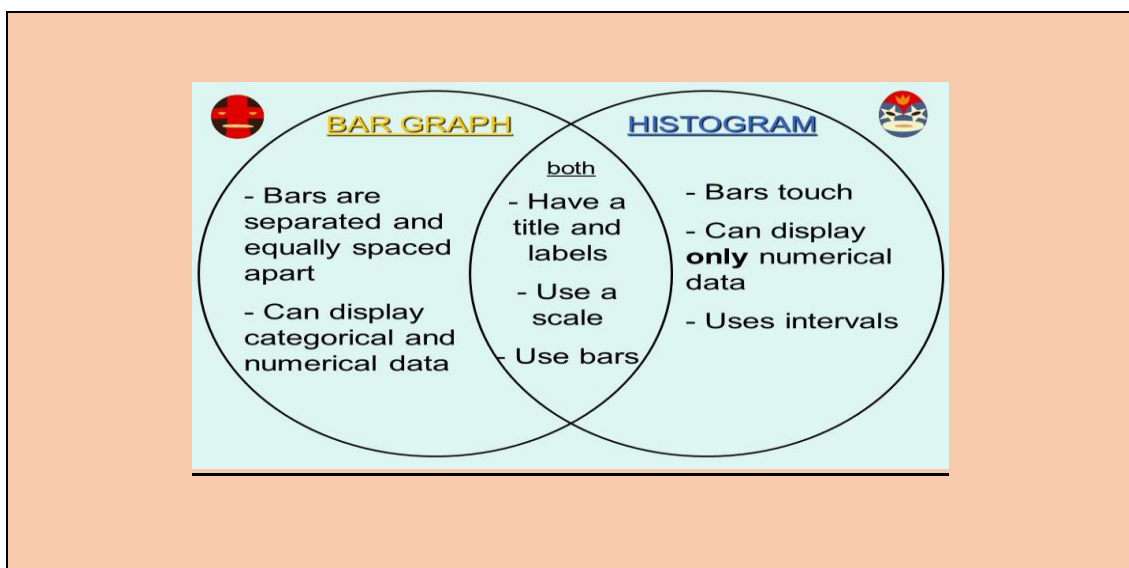
2.2.2. Representing and Interpreting Data

- Data can be represented through the use of graphs. Different graphs displaying the same data can convey different messages, so selecting the graph that best represents the data is important.
- Examples of bar graph, histogram, line graph and pie chart



NB: Learners are not expected to draw a pie chart but must be able to interpret and read values.

- Bar graph versus Histogram



- Problem solving

Problem Solving Using a Graph

A group of adults were asked how many children they have in their families. The bar graph below shows the number of adults who indicated each number of children.

Number of Children	Number of Adults
0	3
1	6
2	5
3	2
4	1
5	2

How many adults were questioned?
 $3+6+5+2+1+2 = 19$

What percentage of the adults questioned had 5 children?
 %

$\frac{2}{19} \approx 0.105 = 10.5\%$

Fraction to Decimal

$$\frac{a}{b} = a \div b$$

Decimal to Percent

1. Multiply by 100
2. Add a Percent Sign

- Problem solving

histogram

- a bar graph representing frequency distribution for certain ranges or intervals.

The number of data items in an interval is a frequency.
The bar heights represent these frequencies.

EXAMPLE: A survey of 30 students to see how many times they accessed the internet last week.

frequency distribution table

Number of Sessions on the Internet (intervals)	Number of Students (frequency)
0 - 10	4
11 - 20	5
21 - 30	8
31 - 40	9
41 - 50	4

frequency histogram

Activity 2.2.1

(Adapted from NSC May/June P1 2019 and NSC Nov 2019)



Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
Task 2: Allocate marks for each question
Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion

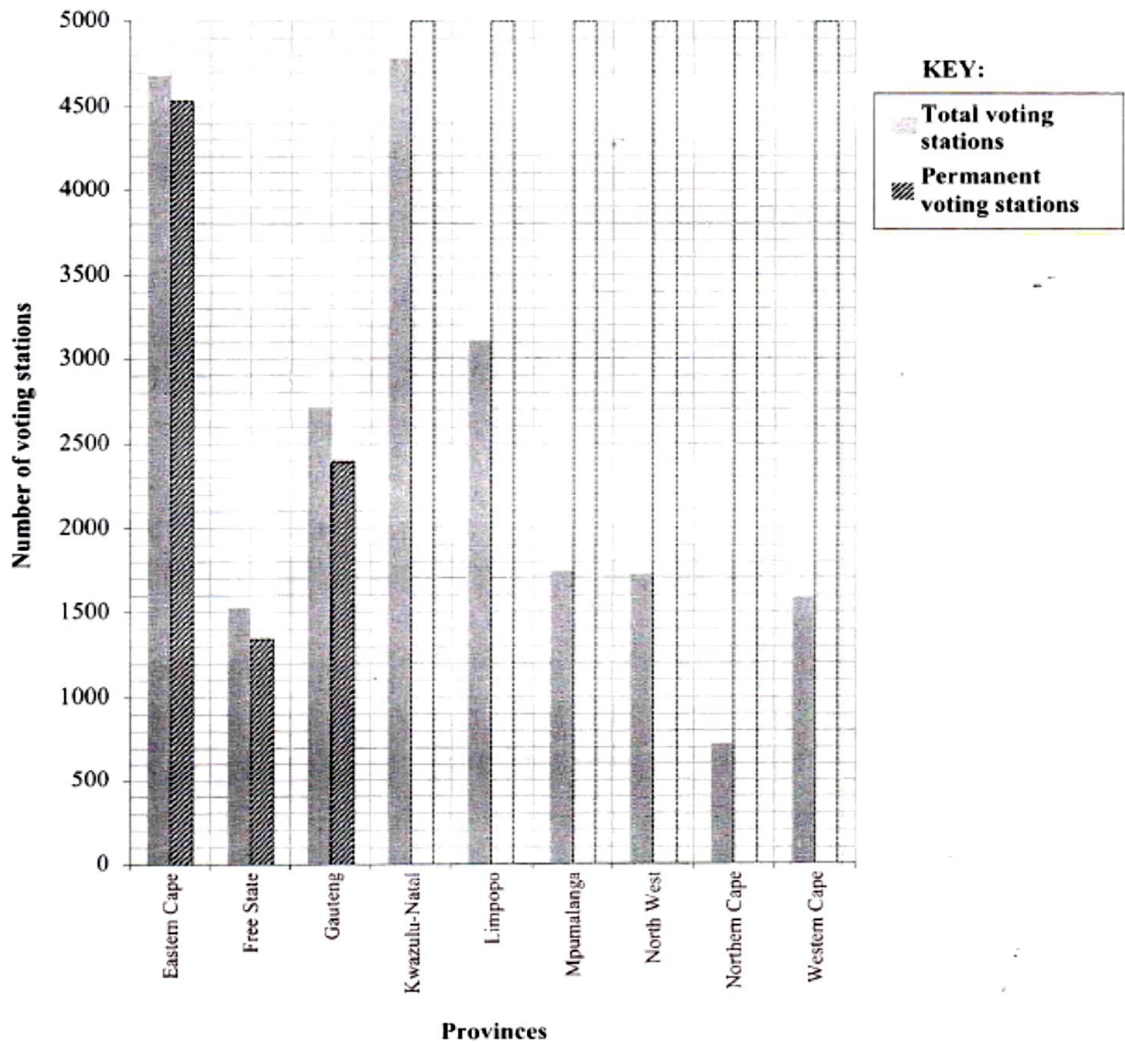
Resources: Training manual, Note pad, Pen and Calculator

The table below shows the types of voting stations (VSs) used during the 2016 local government elections in South Africa.

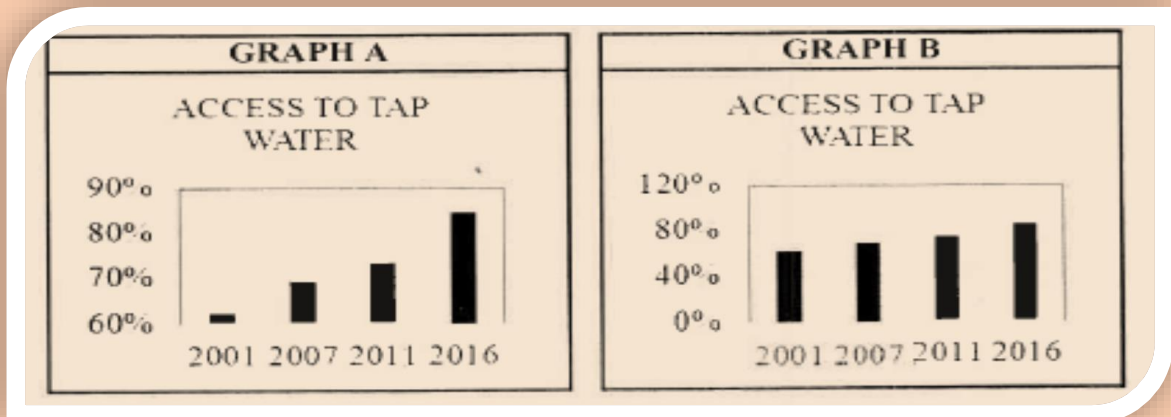
PROVINCE	VSs	PERMANENT	TEMPORARY	MOBILE
EC	4 699	4535	161	3
FS	1 531	1342	189	0
GP	2 716	2389	327	0
KZN	4 792	4647	133	12
LP	3 111	2966	145	0
MP	1 744	1650	82	12
NW	1 723	1605	115	3
NC	710	684	26	0
WC	1 586	1534	50	2
TOTAL	22 612	21352	1228	32

1.
 - a) Name a type of instrument used to collect this data.
 - b) State the province which has the most voting stations.
 - c) Determine the mean number of voting stations (VSs) in South Africa.
 - d) Write down the modal number of mobile voting stations in South Africa
 - e) Determine the total number of temporary VSs as a percentage of the total number of VSs in South Africa.
 - f) Show how the value of 145 was calculated.
 - g) The bar graph on the answer sheet below shows the total number of voting stations. On the same Answer Sheet, the first three bars are drawn showing the permanent voting stations. Fill in the remaining bar graphs showing the permanent voting stations.

Types of voting stations used during the 2016 local government elections



2. The two graphs below show the same data for the number of households that have access to the tap water. Give a possible reason for the difference in the length of the bars for each of the graphs.





Activity 2.2.2
(Adapted from NSC May/June P2 2019)

Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
Task 2: Allocate marks for each question
Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

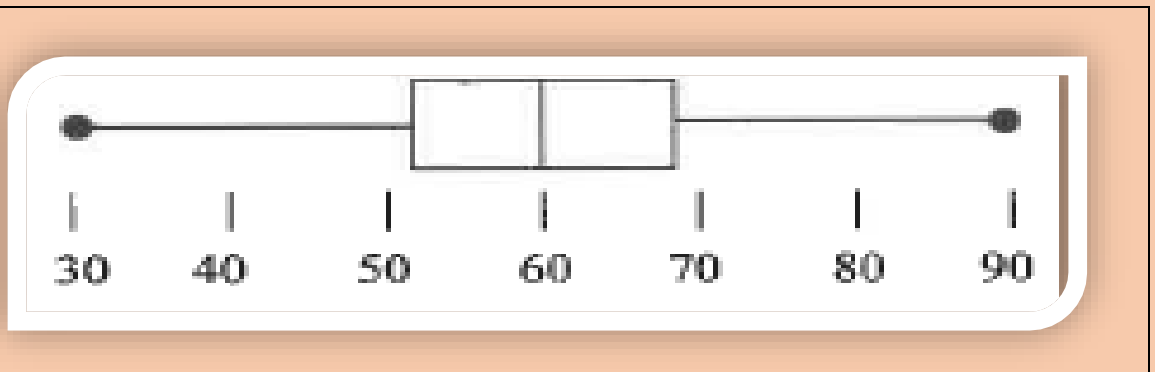
Matuli, Bianca and Khotso wrote some practice tests at their school. Their percentage marks are given in the table below.

Matuli	53	48	62	80	48	58	72	48	70	86
Bianca	36	42	48	58	60	61	62	76	86	
Khotso	30	47	C	55	60	60	68	68	70	90

Note:

- Bianca's median percentage mark is 60%
- Matuli's mean percentage mark is 62,5%
- Khotso's median percentage mark and range are both 60% and marks are ordered

1. Use the information above to answer the questions that follow:
- Calculate Matuli's median percentage mark.
 - Calculate Bianca's mean percentage mark
 - The box and whisker diagram below represents the spread of Khotso's percentage marks
 -



- Determine the missing value C, the lower quartile mark, if Khotso's interquartile range (IQR) is 16.
- Bianca stated that Matuli performed better than she did in the practice tests.
Give TWO possible reasons to support Bianca's statement.



ACTIVITY 2.2.3

Individual Work (20 Minutes)

Instructions

- Individual activity
- Duration: 10 minutes
- This activity is intended to advance ICT skills that can be used in the classroom
- **Task** : Download and save a video lesson on Box and Whisker Plot
- Report Back and Discussion
- Resources: Training manual, Laptop and Wi-fi

STEPS IN DOWNLOADING A VIDEO

savefrom.net

- In your BROWSER type YouTube or Go to YouTube
- Type the topic of your choice
- Click the video and type **ss** or **vd** in front of **youtube** on the link OR insert 'magic' between 'you' and 'tube'.
For example:
 - ✓ Before typing ss or vd: <https://www.youtube.com>
 - ✓ After typing ss or vd: <https://www.ssyoutube.com>
- Then it will take you to the **savefrom.net** page
- Click download then save



Activity 2.2.4

(Adapted from NSC Nov P2 2019)

Instructions

- You should form groups of 4 – 5
- Duration: 20 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
- Task 2: Allocate marks for each question
- Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculato

The table below shows the top marginal Tax rate for individuals in the G20 countries. The table provides present and past data of the top marginal tax rates. It was updated in January 2019.

COUNTRY	UNIT %	
	2019	PREVIOUS
Japan	55,95	55,95
Netherlands	52,00	52
Germany	47,50	47,5
Australia	45,00	45
China	45,00	45
France	45,00	45
South Africa	45,00	45
Spain	45,00	45
United Kingdom	45,00	45
Italy	43,00	43
South Korea	40,00	40
Switzerland	40,00	40
United States of America	37,00	39,6
India	35,88	35,54
Argentina	35,00	35
Mexico	35,00	35
Turkey	35,00	35
Canada	33,00	33
Indonesia	30,00	30
Brazil	27,50	27,5
Singapore	22,00	22
Russia	13,00	13
Saudi Arabia	0,00	0

[Source: tradingeconomics.com/country]

Use the information to answer the questions that follow:

- Name the country that has the biggest range between 2019 and the past top marginal tax rates.
- Use the 2019 top marginal tax rate to determine quartile 2
- The interquartile range is given as 12 in the 2019 top marginal tax rate.
Verify, showing ALL calculates, whether the given interquartile range is CORRECT.

UNIT 3: MEASUREMENT: MEASURING WEIGHT

INTRODUCTION

In this unit you will look at the concept of:

- Body Mass Index (BMI)
- Growth Chart

LEARNING OUTCOME

At the end of this Unit, you should be able to:

- Determine the weight/mass using appropriate measuring instrument
- Use recorded weight/mass data together with recorded length/height data to calculate Body Mass Index values and determine weight status for adults
- Calculate values using a formula involving mass/weight

GLOSSARY OF TERMS

Body mass index (BMI)	A number calculated from an adult's weight and height, expressed in units of kg/m^2
Growth charts	Graphs consisting of a series of percentile curves that show the distribution of the growth measurements of children.
Mass/Weight	Mass/Weight is an indication of how heavy an object is.

LESSON NOTES

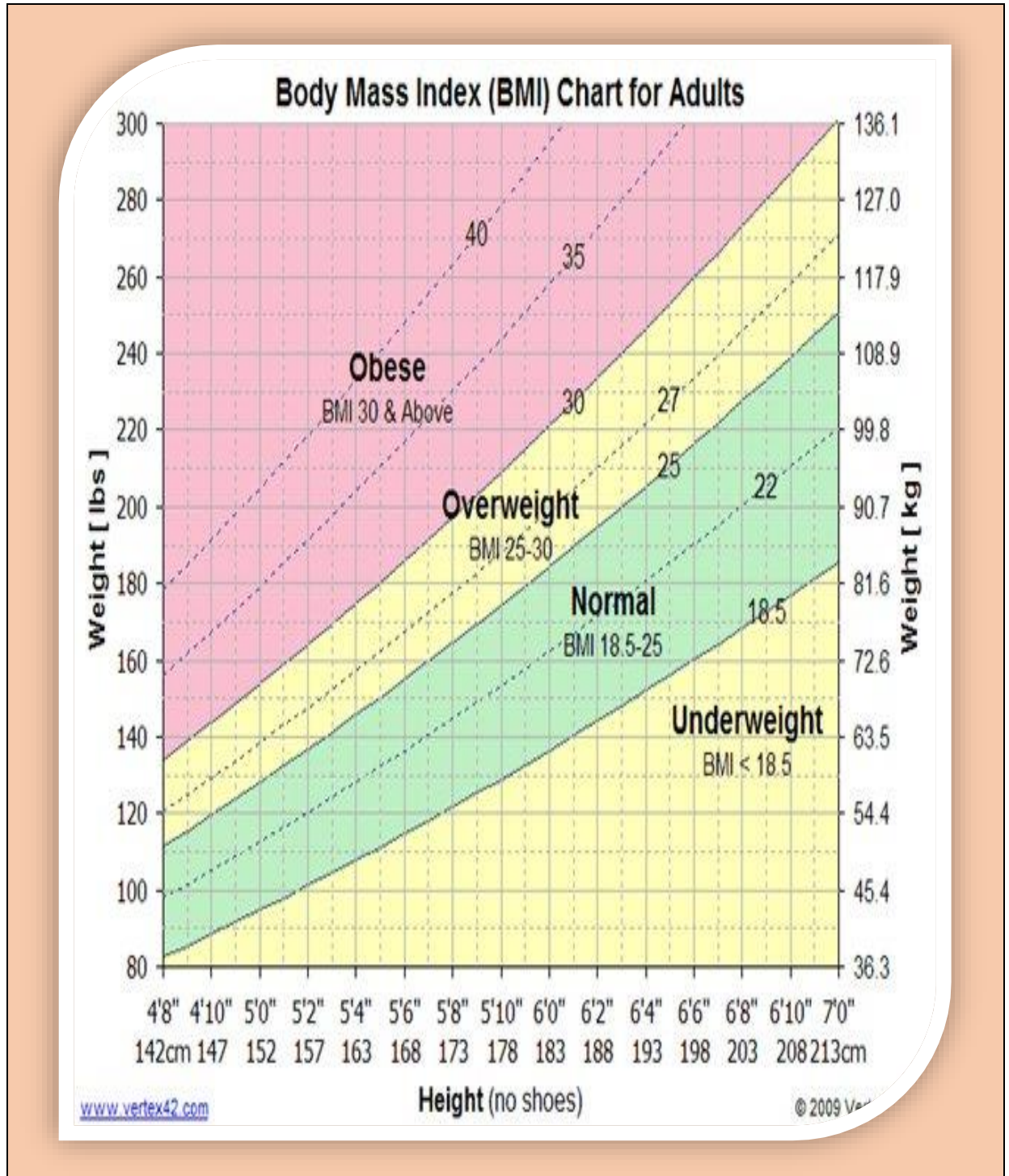


2.3.1. Body mass Index

- Obesity means being grossly overweight
- One of the measures used to calculate whether a person is healthy or not is called the Body Mass Index (BMI).
- The Body Mass Index (BMI), estimates the ideal weight of a person based on its size and weight.
- The Body Mass Index is valid for an adults between 18 – 65 years
- The World Health Organisation (WHO) defines this body mass index as the standard for measuring the risks associated with adults who are overweight.
- A high BMI is associated with increased risk of death.
- The risk of death increases the more overweight a person is for adults for cancer or other diseases.
- BMI is, however, much more reliable.
- It's the result of a calculation between your weight and height, and gives you the possible risks to your health.
- Body mass index is defined as the individual's body mass divided by the square of their height.

$$\text{BMI} = \frac{\text{mass (kg)}}{(\text{height (m)})^2}$$

- BMI can also be determined using a BMI chart, which displays BMI as a function of weight (horizontal axis) and height (vertical axis) using contour lines for different values of BMI or colours for different BMI categories.





Activity 2.3.1
(Adapted from NSC May/June P1 2019)

Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer all the questions
- Task 2: Allocate marks for each question
- Task 3: Identify the taxonomy levels for each questions
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

The waist-to-hip ratio (WHR) is another way of determining the disease risk related to obesity.

You may use the following formula:

$$\text{Waist-to-hip ratio} = \frac{\text{waist measurement}}{\text{hip measurement}}$$

Once the calculation is done, a person's disease risk related to obesity is classified as low, moderate, high or very high, based on their age.

DISEASE RELATED TO OBESITY

	AGE GROUP	CLASSIFICATION			
	(YEARS)	LOW	MODE-RATE	HIGH	VERY HIGH
MEN	20–29	<0,83	0,83–0,88	0,89–0,94	>0,94
	30–39	<0,84	0,84–0,91	0,92–0,96	>0,96
	40–49	<0,88	0,88–0,95	0,96–1,00	>1,00
	50–59	<0,90	0,90–0,96	0,97–1,02	>1,02
	60–69	<0,91	0,91–0,98	0,99–1,03	>1,03
WOMEN	20–29	<0,71	0,71–0,77	0,78–0,82	>0,82
	30–39	<0,72	0,72–0,78	0,79–0,84	>0,84
	40–49	<0,73	0,73–0,79	0,80–0,87	>0,87
	50–59	<0,74	0,74–0,81	0,82–0,88	>0,88
	60–69	<0,76	0,76–0,83	0,84–0,90	>0,90

[Adapted from Champaign JL, Human Kinetics, 1999, p82]

Use the information above to answer the questions that follow:

- a) Determine if a 37 year old man with a WHR of 0,95 has a moderate or a high risk of obesity
- b) A 50 year old man has the following measurements:
Waist = 105 cm; hip = 92 cm, Calculate this man's WHR.
- c) A woman with a waist of 72 cm has a WHR equal to 0,7826 and is classified as a moderate risk.
 - I. State the possible age group of this woman
 - II. Calculate the woman's hip measurement. Round off your answer to the nearest cm.

ACTIVITY 2.3.2



Instructions

- Individual activity
- Duration: 20 minutes
- Refer to the questions provided
- Task 1: Answer the questions
- Task 2: Identify the taxonomy levels for each question
- Task 3: Show mark allocation
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught

Report Back and Discussion

Gladys is studying to become a doctor. She uses the body mass index table to check the health status of her patients so that she can advise them accordingly.

BMI range and Health Status

BMI Range	Health Status
$20 \leq \text{BMI} < 25$	Health weight
$25 \leq \text{BMI} < 30$	Overweight
$\text{BMI} \geq 30$	Obese

Below is the information of patients gathered by Gladys

Name	Heights in cm	Weight in kg	BMI
Basani	157	71	28,8
Edith	162	58	22,1
Lerato	173	75	25,1
Lufuno	167	76	27,3
Petrus	182	85	25,7
Willem	178	70	22,1
Zane	172	A	26,0
Yvonne	B	94	30,3

Use the tables above to answer the questions that follow:

1. Calculate the missing value A, to the nearest kg. You may use the BMI formula.
2. List people from the table with overweight range.
3. Determine the modal BMI.
4. Calculate the missing value B, if the mean height is 170,875cm
5. Calculate the range of the height
6. Gladys states that the interquartile range of the BMI is 8,1kg/m². Verify, showing ALL calculations, whether her statement is valid. You may use the IQR formula

ACTIVITY 2.3.3



Instructions

- Individual activity
- Duration: 10 minutes
- Refer to the questions provided
- Task 1: Develop possible questions based on the resources
- Task 2: Identify the taxonomy level
- Task 3: Show mark allocation
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion

BMI-FOR-AGE PERCENTILE RANGE	WEIGHT STATUS
< 5 th percentile	Underweight
5 th to <85 th percentile	Healthy
85 th to < 95 th percentile	Risk of overweight
≥ 95 th percentile	Overweight

ACTIVITY 2.3.4



Instructions

- Individual activity
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer the questions
- Task 2: Show mark allocation
- Task 3: Identify the taxonomy level
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion

- Sandra started walking to get fit and stay in shape. She recorded her times and distances by using the Endomondo app on her smartphone. Dates and starting times of the practicing session are also recorded. Her statistics for November and December is shown on the table below.

Study the data given below to answer the questions that follow.

1. How far did Sandra walk in December 2017?
2. Calculate the total time that Sandra walked in November.
3. How far did Sandra walk on the 22 December 2017?
4. What time did Sandra finish her walking on 26 December 2017?
5. Sandra's Height is 160 cm and her weight is 80 kg. She claimed that her BMI will be less than 30 kg/m^2 . Verify her claim

ACTIVITY 2.3.5



Instructions

- You should form groups of 4 – 5
- Duration: 15 minutes
- Refer to the questions provided
- Task 1: Answer the questions and allocate marks or indicate where marks are allocated.
Task 2: Identify the taxonomy levels for each question
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion
- Resources: Training manual, Note pad, Pen and Calculator

The family joined a fitness competition in the hotel they logged in. They must have a BMI of normal weight.

BMI	MEANING	PERCENTILE POSITION ON GROWTH CHART
Below 18,5	Underweight (UW)	Less than 5th percentile
18,5 – 24,9	Normal Weight (NW)	≥ 5th percentile and < 85th percentile
25 –29,9	Overweight (OW)	≥ 85th and < 95th percentile
30 and above	Obese (OB)	≥ 95th percentile

The following information was recorded from the participants:

Participant	A	B	C	D	E	F	G	H	I
Height (m)	1.69	1.53	1.50	1.54	1.67	1.52	1.35	1.53	1.79
Mass(kg)	68	46	73	60	67	57	43	40	62
Weight status	NW	NW	OB	OW	NW	OW	NW	UW	NW

1. Justify by calculation that participant H is underweight. You may use BMIU formula.
2. Which participants met the criteria for competing?
3. What is the range of the mass of the participants who did not qualify?
4. Show that the median of the height of qualifying participants is 1,67m
5. Show that the median of the height of qualifying participants is 1,67m
6. What do you think may be the reason people become overweight? Give two reasons

LESSON NOTES



2.3.2. GROWTH CHARTS

- Percentiles are measures of spread which divide the data into 100 equal portions. This is used to analyse the spread of large sets of data like data collected by census. The data is then divided into 100 portions and the report is given as a percentage.
- The value at the 5th percentile implies that 5% of values lie below 5th percentile and 95% of the values lie above the 5th percentile.
- The value at quartile 1 implies that 25% of the values lie below 25th percentile and 75% of the values lie above the 25th percentile.
- The concept of the percentiles is used when the data is large. This concept will be used in growth charts. The curve on the growth chart represents the percentile values of the collected data from different age groups .E.g. height, length, weight, circumference of the head.
- The growth chart is used to compare the BMI of an individual versus the one of their age group. This is also used to determine the health status of individuals.
- 3 types of questions should be covered:
 - ✓ Reading information from the chart
 - ✓ Understanding significance of the curve
 - ✓ Understanding significance of positioning on the chart

ACTIVITY 2.3.6.

Individual Work (20 Minutes)



Instructions

- Individual activity
- Refer to the questions provided
- Task 1: Answer the questions
Task 2: Show mark allocation
- These questions are intended to prompt you to consolidate the unit and possible ways in which this section can be taught
- Report Back and Discussion

Mrs Dubula gave birth to triplets. The weight of the triplets over the first 6 months are given in the table below along with the growth charts for Girl A and the boy on ANNEXURE C.

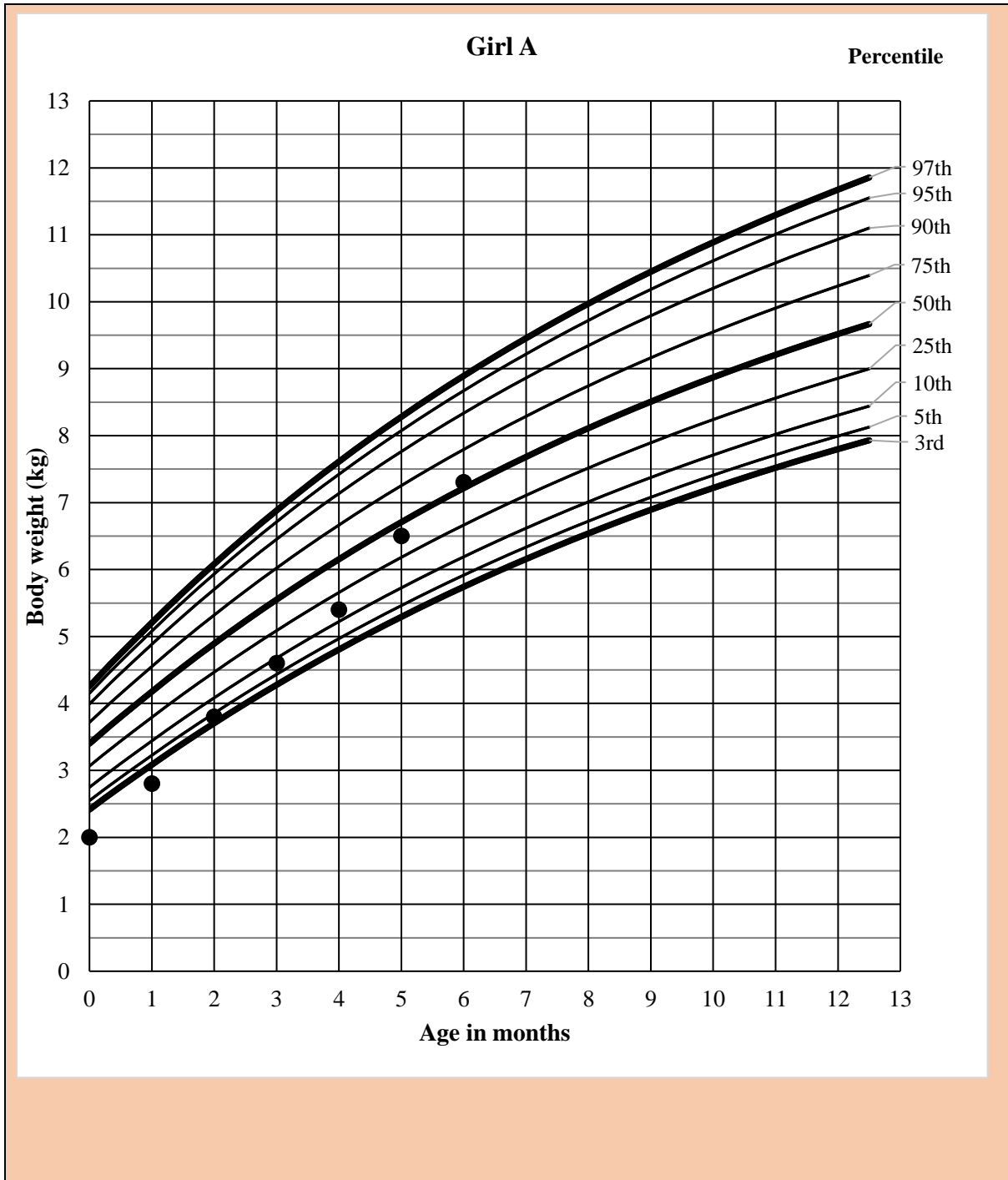
TABLE 6: GROWTH RATE OF TRIPLETS

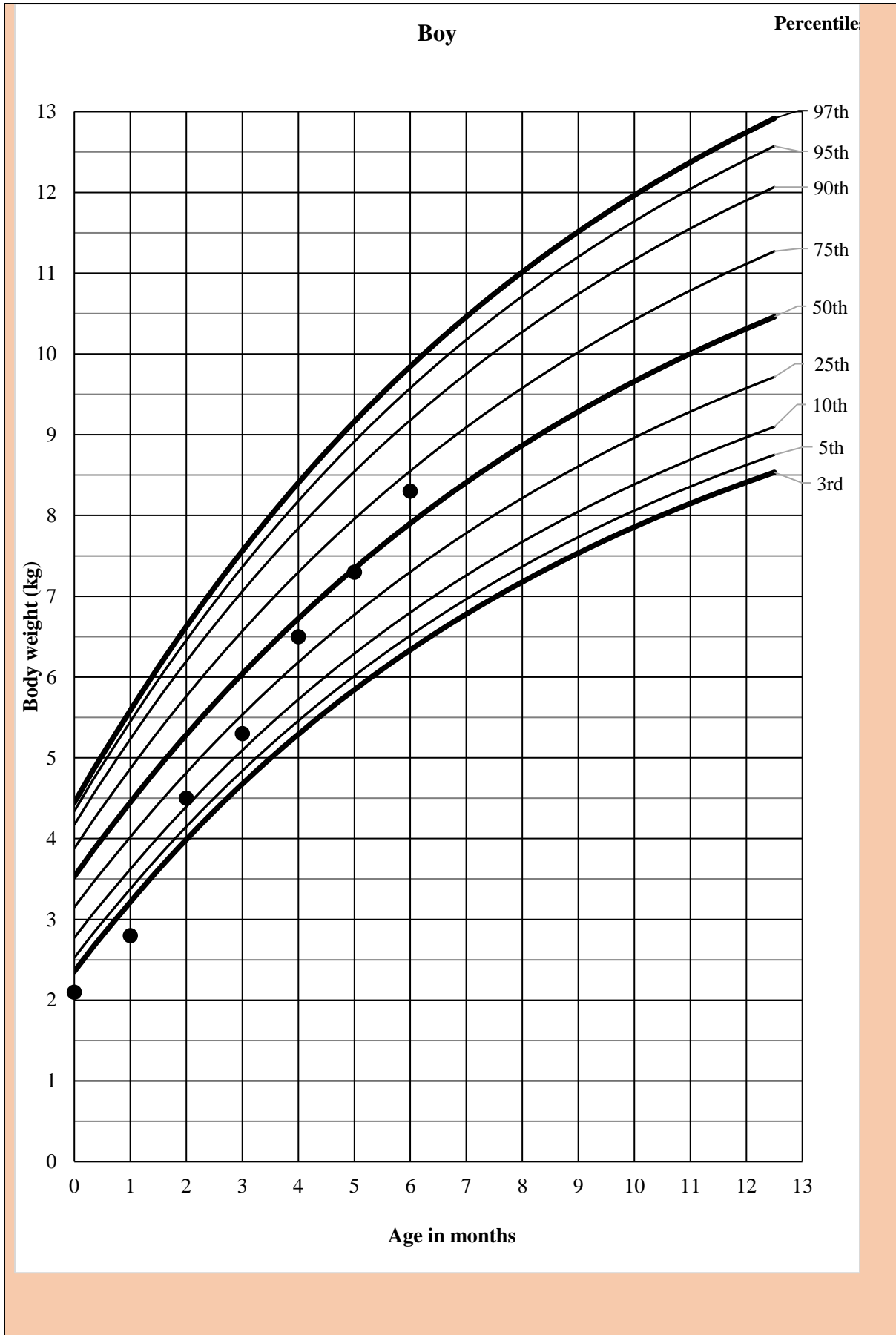
	Girl A	Boy	Girl B
Weight in kg			
Birth	2,0	2,1	2,0
Month 1	2,8	2,8	2,4
Month 2	3,8	4,5	3,7
Month 3	4,6	5,3	4,4
Month 4	5,4	6,5	5,5

Month 5	6,5	7,3	6,7
Month 6	7,3	8,3	8,1

Study the growth charts below along with the table above and answer the questions that follow

1. Determine if the following statement correctly represent the **triplets** growth over the 6 months. Write down TRUE or FALSE. If FALSE, correct the statement.
Statement: Girl A's weight was on the 10th percentile at birth.
2. Plot the weight of Girl B for the first 6 months on the ANSWER SHEET as was indicated for the other two.
3. Determine the month(s) in which the weight of Girl A and the Boy were closest to the 50th percentile.
4. Mrs Dubula claims that the weight of all three babies after the 3rd month lied on the 25th percentile. Use the growth charts to verify if the claim in valid.





ACTIVITY 2.3.7.



Individual Work (20 Minutes)

Instructions

- Individual activity for 10 minutes
- Refer to the context provided: How to download a video lesson
- This activity are intended to advance ICT skills that can be used in the classroom
- **Task** : Download a video lesson on paediatric growth chart (5 min)
- Report Back and Discussion
- Resources: Training manual, Laptop and Wi-fi

STEPS IN DOWNLOADING A VIDEO

savefrom.net

- In your BROWSER type YouTube or Go to YouTube
- Type the topic of your choice
- Click the video and type **ss** or **vd** in front of **youtube** on the link OR insert 'magic' between 'you' and 'tube'.
- For example:
 - ✓ Before typing ss or vd: <https://www.youtube.com>
 - ✓ After typing ss or vd: <https://www.ssyoutube.com>
- Then it will take you to the **savefrom.net** page
- Click download then save

RESOURCES FOR MODULE 2

1. Online resources:
 - a. www.chartsgraphsdiagrams.com/HealthCharts/growth-2-20-girls
 - b. www.chartsgraphsdiagrams.com/HealthCharts/growth-2-20-boys
2. 2019 Annual Teaching Plan
3. DBE Mathematical Literacy CAPS
4. DBE 2017 – 2019 Mathematical Literacy Examination Guidelines

MODULE SUMMARY

In this module, participants:

- Developed questions that require the collection of data
- Used appropriate instrument to collect data
- Classified the collected data as categorical or numerical
- Organised the collected data using tallies and frequency tables
- used recorded mass/weight data together with recorded length/height data to calculate BMI values and determine the weight status for adults.
- Used recorded mass/weight data, recorded length data, calculated BMI values and appropriate growth charts including the road to health chart to monitor the growth patterns of children.

RESOURCES FOR MODULE 2

- Mathematical Literacy NSC Exam 2018 Diagnostic Report
- Statistics SA reports
- DBE question papers
- Provincial question papers

SUMMARY

In this module, you:

- Represented and interpreted box and whisker plots, pie charts, bar, histogram, line graphs and scatter plot
- Determined trends in the data and use these to answer questions and make predictions based on the data
- Read and analyse information from the graph.

REFLECTION

- A careful reading of tables/graphs is a crucial skill in solving mathematical problems. Teachers should give learners enough opportunities, during contact time, to practise and develop this skill.
- Teachers must incorporate large numbers in their lessons, across all topics in Mathematical Literacy. It is advisable that every assessment (formal or informal) task should involve a problem on big numbers so that learners can familiarise themselves with them.
- Learners should be taught how a trend should be described.
- Teachers should teach learners first to make sense of the information before attempting the questions.

END OF MODULE 3

CONCLUSION

This is the end of the e-SSIP training and hopefully, it was informative and fruitfully. You have been equipped with the Term 3 subject content and ICT skills. You have been provided with the teaching tips on how to approach each sub-topic or content simplification. All of the above mentioned skills will enable you to manage and enhance teaching, learning and assessment in the classroom effectively. Please share the knowledge gained with other colleagues within your PLCs.

REFERENCES USED

1. DBE NSC Question Papers, 2014 – 2019
2. GDE Preliminary Question Papers, 2018/19
3. Mathematical Literacy CAPS
4. Other Provinces Preliminary Question Papers, 2018/19
5. 2017 – 19 Examination Guidelines
6. 2019 GDE ATP

END OF THE COURSE MANUAL
