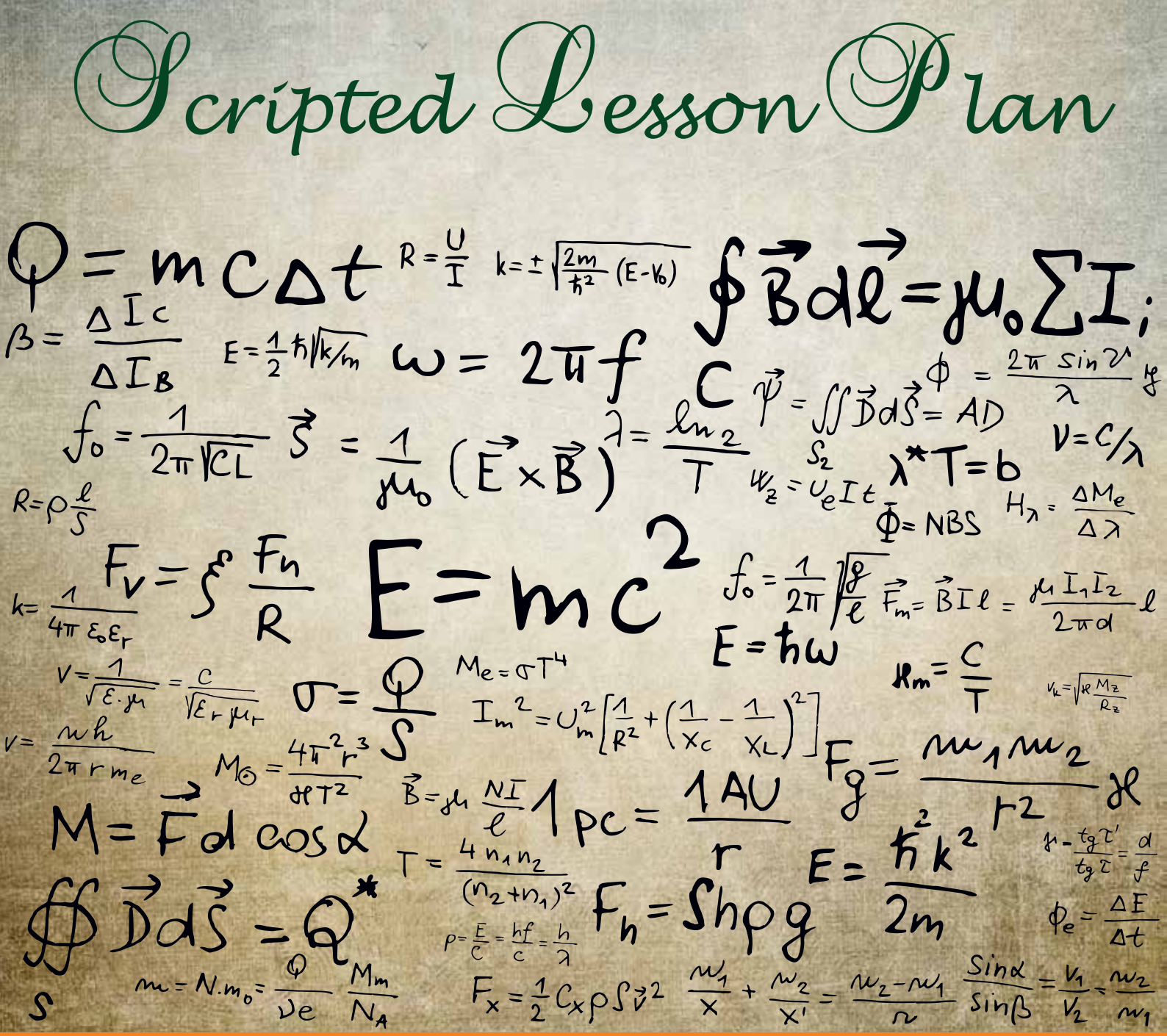
Mathematical Literacy

Scripted Lesson Plan



basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Read to Lead
A Reading Nation Is a Leading Nation

2030 NDP

ALBERTINA SISULU Centenary 2018

Nelson Mandela Centenary 2018 Be the Legacy

Contents

DAY 1
SCRIPTED LESSON PLAN
Basic Mathematical Operations

Mathematical Literacy **Duration: 2 Hours**

Grade: 12

TOPIC	SECTION	CONTENT/SKILLS
Basic Mathematical Operations.	Operations using numbers and calculator skills. Percentages and rounding.	**Determine** (find) the most appropriate **units** in which to express the answer as determined by the context in which the problem is posed. Work with numbers expressed in the following formats: Whole numbers; decimals; fractions; percentages**.** Percentage notation and percentage calculations Estimating an answer to a problem. Perform calculations using a basic (non-scientific) calculator. Perform calculations involving squaring (raising to the power of 2) and cubing (raising to the power of 3). Performing square root calculations. Know the three types of rounding: a. Rounding off. b. Rounding up. c. Rounding down. Know and understand the different number formats: Decimal comma, thousands separator, positive and negative numbers as directional indicators and numbers in word format. Multiplication and division by 10, 100 and 1 000 without the use of a calculator. Understand the order of operations and brackets. Know how to square and cube values. Performing square root operations.
		Operations using fractions. Know and use the different functions on a basic calculator.

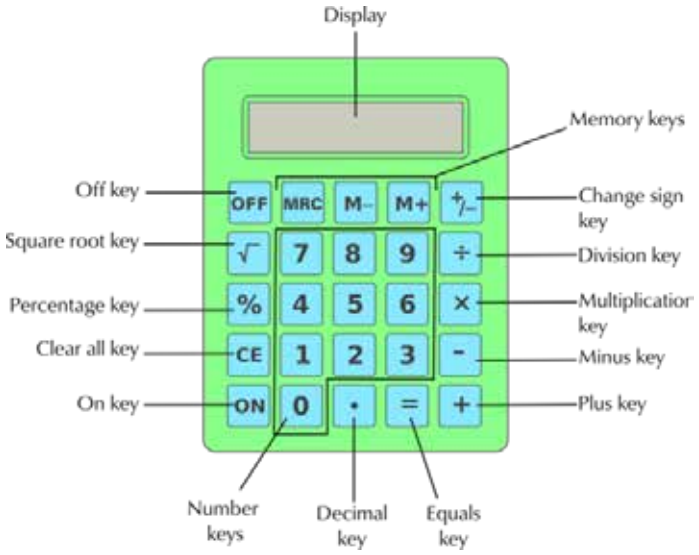
Terminology and related concepts	
Rounding Off	**Express a number** as the **nearest** significant (deciding number) number above or below it for ease of calculation.
Rounding Up	**Express** a **number** as a *larger* (less exact) but a more manageable(easy to work with)number for ease of calculation.
Rounding Down	**Express** a **number** as a *smaller* (less exact) but a more manageable (easy to work with) number for ease of calculation.
Percentage	Counting **per hundred** *per* –**counting** *centage* – **hundred** Unit for percentage is **%**
Cubed Shape	Three dimensional shape, **3D.**
Comma	The **same** as **decimal point (,)** on your calculator (i.e. 4,5 = 4,5). Do not confuse the decimal point with dot product (multiply): 4,5 = 4½ but 4·5 = 20.
Four Basic Operations	Division ÷ Multiplication × Addition **+** Subtraction **-**
Percentage Increase	When we **increase** a value by a certain percentage. The new answer must be **greater** than the initial value.
Percentage Decrease	When we **decrease** a value by a certain percentage. The new answer must be **smaller** than the initial value.
Discount	Reduction (making smaller) in **price paid** for something. Discount is normally given when customers pay cash, it is an **incentive** (reward) given to customers when paying cash.
Probability	The **chance** of an event to occur. The **chance** can be written as a **fraction, percentage** or **decimal fraction**. Probability(chance) cannot be more than 1 or 100%.
cm	Centimetre
mm	Millimetre
km	Kilometre
l	Litre
cm^2	Square centimetre
m^2	Square metre

Terminology and related concepts	
mm^2	Square millimetre
cm^3	Cubic centimetre
mm^3	Cubic millimetre
m^3	Cubic metre
C^0	Degrees Celsius
${}^0F$	Degrees Fahrenheit
Vertical Axis	The vertical axis of a graph is **upright**, like a person in a standing position. A person is more visible when **standing upright** in a vertical position.
Horizontal Axis	The horizontal axis is in the plane (left to right) of the horizon or a base line. It is level with the horizon.
Horizon	The line at which the sky and the earth appear to meet.
Dependent Variable	Is found along the vertical axis of the graph and shows the variable that is dependent on the value of the independent variable. The type of car a person can drive depends on what he can afford.
Independent Variable	Is found along the horizontal axis of the graph and shows the variable that is not dependent on any other variable. For example time will continue as normal, unaffected by the goings on around it.
Break–even Point	In a **business context** it refers (points) to the income that must be generated to cover all expenses. **On the graph** it is indicated (showed) at the point where the **two graphs** intersect (cross)
Teaching Methodology	
Question and answer method, making use of probing questions. Using the concrete visual resource to empower learners with basic calculator skills. The teacher will draw from learners' experiences when teaching the skill of Rounding.	
LESSON PRESENTATION	

Terminology and related concepts	
INTRODUCTION **Prior knowledge** Familiarity with rounding off to an appropriate number of decimal places according to a given context. Basic understanding of percentage. Familiarity with a basic calculator. **EXPLANATION OF TERMINOLOGY AND KEY CONCEPTS** The l**earners** are requested to **take out their calculators** and **show** the **different parts** of **the calculator**: The learners will respond to the following questions: 1. State the **meaning** and the **function** of **M+** 2. State the **meaning** and the **function** of **M-** 3. State the **meaning** and the **function** of **MRC** 4. State the **meaning** and the **function** of $\pm$ 5. State the **meaning** and the **function** of **CE** 6. State the **meaning** and the **function** of 7. State the **meaning** and the **function** of %	**Language aspects/ Teacher activities** Teacher asks the learner to e**xplain** the **various parts** of the c**alculato**r and their f**unctions**(work). The response will inform where they are lacking. The teacher to emphasise that if you click the **equal sign (=)** more than once it will give the incorrect answer. **Note: This only applies to a basic calculator and not a scientific calculator.** Answers will be presented and discussed. The teacher must explain the rule to be followed when dealing with any calculation. Compare the **key sequence** in the previous example to the key sequence: **200+2×80−60** The **memory key** allows you to **work without brackets**. **Note :** It is important to **solve/ simplify** what is in the brackets first to one value and then store this value by using the **keys M-** or **M+** The teacher must emphasise and illustrate the importance of determining the **increase** before calculating the **percent increase.** **Note**: Learners often do not know how to distinguish between the **actual Increase** (value) and the **percentage** (%) Increase. The teacher must demonstrate how to use the **actual increase** to determine the **percentage increase** by using the **formula.** **Note:** **Order of operation** must be emphasised when simplifying.
	The teacher must e**mphasise** and **illustrat**e the importance of determining the **decrease** before calculating the **percent decrease.**

Terminology and related concepts

The leaners will review their own responses with the teacher's guidance.



Order of operations

In **any calculation**: if there are **brackets involved** then the operation in the **brackets** must be performed **first**; **multiplication or division (in any order)** must be performed second; and **addition or subtraction (in any order)** must be performed **last**.

How to use the memory keys (M+), (M-) and (MRC) on your calculator.

The memory keys **(M+, M−, and MRC**) allow you to do calculations in the calculator's memory (learners must check what the **equivalent** (same) keys are on their own calculators).

- The **M+ key** is used to **add a number** to the **memory**, or to **add** it to a number already in the **memory**.
- The **M−** key is used to **subtract a number** from the number in **memory.**
- If you **press** the **MRC key once**, the calculator displays the number stored in **memory**.

  If you **press** this **key twice**, the calculator's **memory** is **cleared**.
- When you use a **memory key**, the letter **'M**' or the word 'Memory' appears at the top of the display screen, showing that the number on the display has been stored in the calculator's memory.

Note: Learners often do not know how to distinguish between the **decrease** (value) and the **percentage** (%) **decrease**.

Teacher must demonstrate how to use the **decrease** to determine the **percentage decrease** by using the **formula.**

Note:

Order of operation must be emphasised when simplifying.

The teacher must emphasise that rounding is a form of estimation**.**

Teacher must illustrate by means of specific questions, how to round off to context.

1. There is **no 1 cent** coin available for change, therefore the cost is **rounded up** to **R13.00**, **because** of the **context.**

   However, the consumer will receive 10c change as per the consumer act.

Teacher will **illustrate** and **explain** the following actions:

1. Round **up** to **R13**
2. Round **up** to **R9.50**
3. Round to the **nearest 10** ^{0}C
4. Round **up** to **26** m^2
5. Round **up** to **4** mini bus **taxis**

The teacher must further illustrate the three types of rounding with examples.

Note: Learners must always be made aware of the context of the problem, the context will determine whether we round off, up or down.

The teacher must explain to learner why this **context requires** that we **round up** to **7.**

The supplier will not sell part of the box but only full boxes.

Terminology and related concepts

USING THE MEMORY KEYS ON YOUR CALCULATOR:

Examples

1. **Show** the **correct key** sequence (step by step) on your calculator for working out:

   200+(2×80) −60

   Enter 200 into calculator and **add** it **to the memory** by **pressing M+**

   Calculate **2×80** =160 and **add** it **to the memory** by **pressing M+**

   Enter 60 and **subtract** it **from the memory** by **pressing M−**

   Press MRC to show the answer stored in the memory: **300**

So the complete sequence of keys will be:

200 [**M+**] 2 × 80=**160 [M+]** 60 [**M−**] [**MRC**]

2. **Show** the **correct key** sequence (step by step) on your calculator for working out:

   450 - (25 + 60) – 28

   Enter 450 into calculator and **add** it **to the memory** by **pressing M+** Calculate **25 + 60= 85** and **subtract** from **the memory** by **pressing M-**

   Enter 28 and **subtract** it **from the memory** by **pressing M−**

   Press MRC to show the answer stored in the memory: **337**

So the complete sequence of keys will be:

450**[M+]** 25-60=**85 [M-]**28 [**M−**] [**MRC**]

Application of calculator skills: Percentage Increase and **Decrease** calculation

Steps to calculate the percentage increase(from low to high)**:**

Step 1: Work out the **difference** (minus) between the two numbers you are comparing.

Increase = New Number – Original (old) Number.

Step 2: Divide the**increase** by the original number and multiply the answer by 100%.

Note

If Jacolene bought 6 packs she would not have enough to cater for the 54 people.

The teacher must continue to draw attention to **rounding off** according to the context.

The teacher must highlight that 4.64 for buses must be rounded up to 5 buses based on the context.

$$\% \textbf{ Increase } = \frac{New\ number - Original\ number}{Original\ number} \times 100\%$$

EXAMPLE 1

Calculating percentage increase:

There are **40 Mathematical Literacy learner**s in a classroom.

Ten additional learners who changed from Mathematics to Mathematical Literacy were added to the class.

Question

Calculate the **percentage increase** in the number of Mathematical Literacy learners.

Solution

Increase = New Number – Original (old) Number

Increase = 50 – 40

= 10

$$\% \textbf{ Increase } = \frac{New\ number - Original\ number}{Original\ number} \times 100\%$$

$$\% \textbf{ Increase } = \frac{50-40}{40} \times 100\%$$

$$\% \textbf{ Increase } = \frac{10}{40} \times 100\%$$

$$\% \textbf{ Increase } = 0{,}25 \times 100\%$$

$$\% \textbf{ Increase } = 25\%$$

Steps to calculate the percentage decrease (from high to low)**:**

Step 1: Work out the difference (minus) between the two numbers you are comparing.

Decrease = Original Number (old number) - New Number

Step 2: Divide the **decrease** by the original number and multiply the answer by 100%.

$$\textbf{\% Decrease } = \frac{Decrease}{Original\ number} \times 100\%$$

EXAMPLE 2

Calculating percentage decrease(from high to low):

There are **60 teachers** in a **particular school**.

Twelve teachers are transferred (left) to **other schools** such that only **48** are **remaining** in the school.

Question

Calculate the **percentage decrease** in the number of teachers.

Solution

Decrease = Original Number (old number) - New Number

Decrease = 60 - 48

= 12

$$\% \textbf{ Decrease} = \frac{Original\ number - New\ Number}{Original\ number} \times 100\%$$

$$\% \textbf{ Decrease} = \frac{60-48}{60} \times 100\%$$

$$\% \textbf{ Decrease} = \frac{12}{60} \times 100\%$$

$$\% \textbf{ Decrease} = 0{,}20 \times 100\%$$

$$\% \textbf{ Decrease} = 20\%$$

PRESENTING ROUNDING

Introduce rounding with a scenario where rounding is involved.

1. If a **loaf of bread** costs **R12.99**, how much will the person pay in cash?

2. If the cost of **a pen** is **R9.45**, how much will a person pay in cash?

3. A chocolate cake can be baked in an oven with a temperature of $186\,^{0}C$.

Round off the temperature to the nearest $10\,^{0}C$ (degrees Celsius).

4. If the number of **tiles** needed to tile a floor equals to **25.75** m^2, how many tiles will be p**urchased**?

5. If **48 teachers** need to be t**ransported** to a workshop, **how many 15-seater** mini bus **taxis** will be **needed**?

Solutions

1. R13
2. R9.50
3. $190\,^{0}C$
4. $26\,m^{2}$
5. $48 \div 15 = 3.2$

   = 4 mini bus taxi's

Explanation with examples of the three types of rounding:

1. Rounding **off**: rounding off to a **specific number** of **decimal places** using **normal rounding rules**. We round **down if** the significant digit is **less than five** and round **up** if the significant digit is **equal to or greater** than **5.**
2. Rounding **up**: We consider the **given context**, as such the value of the

   significant digit does not count.
3. Rounding **down**: We consider the **context given**, as such the value of the significant digit does not count.

Examples

1. Jacolene is catering for a group of **54 people**. The **muffins** are **sold** in packs of **8**. How many packs of muffins must she buy?

Solution

The number of muffins = 54 ÷ 8

= 6.75

= 7

2. A group of learners is going to the Maropeng Centre at the Cradle of Humankind

   There are **232 learners** and teachers going on the outing.

   The school needs to hire buses and each bus can carry **50 passengers**.

   1.1 How many **buses** should they **hire**?

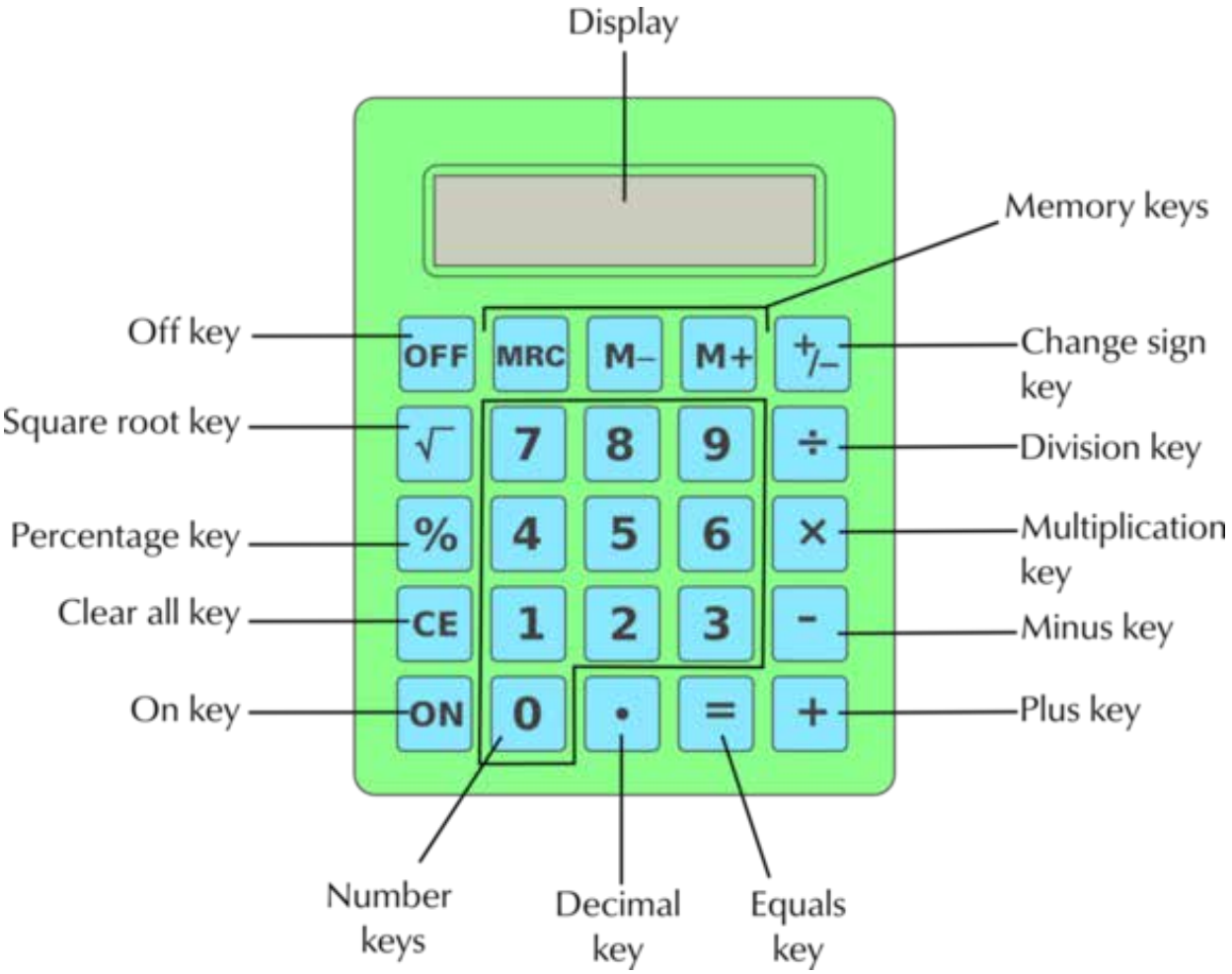
   1.2 How many **empty seats** will there be?

Terminology and related concepts	
Solution 2.1. Buses to be hired = 232 ÷ 50 = 4.64 = 5 buses must be hired 2.2. Used seats = 0.64 x 50 = 32 seats are use. Empty seats = 50 – 32 = 12 seats are empty.	

ASSESSMENT DESCRIPTORS	
Explain	Make clear; express in words, interpret and spell out.
Calculate	This means a numerical answer is required – in general, you should show your calculations especially where two or more steps are involved.
Show	Do calculations to prove that the answer is correct.
Verify	Calculate, get the answer and compare the answer with the one given.
Compare	When two or more values are involved.
Determine	Work out or calculate by finding the correct answer.

RESOURCES/ANNEXURES

Learner calculators and calculator diagram with labels for all learners.



DAY 2
SCRIPTED LESSON PLAN
Finance

Mathematical Literacy **Duration: 2 Hours**

Grade: 12

TOPIC	SECTION	CONTENT/SKILLS
Finance:	• Tariff systems • Municipal tariff • Cost and selling prices	• Learners should know how municipality bills are calculated. • Learners should have understanding of how cost and selling prices are calculated. • They should be exposed to different types of financial documents.

Terminology and related concepts	
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).
Budget	A plan of how to spend money. An estimate of income and expenditure.
Capital	Money that is owned by someone for the purposes of investing or lending.
Commission	The sum of money paid to an agent (usually a salesperson) that is a percentage of the total value of goods sold by the agent.
Consumption rate	The rate at which a commodity, such as water, electricity or fuel, is consumed.
Cost price	This is the amount that it **costs per unit** to either manufacture, purchase the item or to prepare for a service that will be delivered. This amount is pure cost, no mark up or profit added yet.
Cost rate	The price of a product per mass, volume, length or time unit.
Cost-effective	Best value for money.
Credit	This is an entry in an account showing a payment made to the account.
Credit balance	The amount in the account is your own.
Credit card	A credit card is a service bank's offer to allow 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 that you owe the bank for transactions made with borrowed money.
Debit order	It is an arrangement giving permission to a third party to withdraw money from a bank account on a regular basis.
Deposit	Payment made into a bank account.
Disposable income	Income that is left over after all payments have been made.
Expenditure	How much money has been used on something.
Fixed deposit	A single deposit invested for a fixed period at a fixed interest rate.
Fixed expenses	These are amounts that are the same every month 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.
Inflation	It is the continuous rise, value of money where there is increase over time. Increase in the price of a basket of goods or services that is representative of the economy as a whole.

Interest	Money paid regularly at a particular rate for the use or loan of money. It can be paid by a finance organisation or bank to you (in case of savings), or it may be payable by you to a finance organisation on money you borrowed from the organisation.
Interest rate value	This is the % rate of interest that will be charged on your loan amount, i.e. a percentage value of the original loan amount.
Interest value	This is the actual rand value amount of interest that will be added to your loan.
Invoice	A comprehensive document that details all the work done or items sold, and what costs are due.
Selling price	This is the price that something is offered for sale.
Statement	A summary of transactions (debits and credits, or payments and receipts) made on an account.
Tariff	A charge rate for a service rendered, e.g. import duties, water consumption cost, etc.
Tax invoice	Printed record of what was bought, what it cost, what was taxable, the tax amount, method of payment, amount tendered and change, if any.
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 (things like telephone and electricity costs).
VAT	**Value Added Tax (VAT)** is a tax that is levied at 15% (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	Price before adding **VAT**.
VAT inclusive price	Price after adding **VAT**.

Teaching Methodology

- Learners should be able to define terms.
- Assist learners to read and analyse the financial documents in the given activities.
- Answer questions based on these financial documents.

LESSON PRESENTATION

INTRODUCTION **Pre-knowledge** • Household bills (electricity, water, telephone and cell phone bills) • Shopping documents (till slips, account statements)	**Language aspects/ Teacher activities** The teacher will introduce the lesson by asking learners about the household bills and shopping documents.
EXPLANATION OF TERMINOLOGY AND KEY CONCEPTS • Date , consumption details, tariff , previous and current readings • Categories, range and price per kl	**Language aspects/ Teacher activities** The teacher should explain the given terminology and key concepts.

PRESENTATION

EXAMPLE 1

Study the monthly electricity statement below issued to Mr S Van Heerden.

The Mbombela Municipality		44 Swallows street			
P.O. Box 32178		Tel: (013) 752 8910			
Street Address		Client Name		Invoice Number	
Flat 3C Sonpark Heights		Mr S. Van Heerden		WEST – ELEC7810457812	
Date	Consumption details	Tariff	Sub Total	VAT (15%)	Total Due
29/11/16	Previous reading: 114628 kWh Current reading: 115353 kWh	R0,219 per kWh	R158,78	**A**	R182,60

Tariff intervals for the Mbombela Municipality

Intervals usage (kWh)	Tariffs
0 kWh-100 kWh	R0,219
101 kWh – 1000 kWh	R1,55

1.1. How many kWh of electricity did Mr van Heerden use in November? (2)

1.2. How much VAT (value of **A**) will Mr van Heerden has to pay for the electricity he used in November? (2)

1.3. Show how the *Sub Total Charge* values of R158,78 was calculated. (4)

1.4. Calculate the amount that Mr van Heerden paid if he has used 803kWh of electricity in the previous month? (6)

<table>
<tr>
<td>1.1</td>
<td>No of kWh = Current reading – previous readings

= 115353 kWh – 114628 kWh

= 725 kWh</td>
<td>• Learners should look at date, check consumption details.

• Look at current and previous readings (find the difference).</td>
</tr>
<tr>
<td>1.2</td>
<td>VAT = 15/100 x R158,78

= R23,82 (A)</td>
<td>• Note that VAT is now 15%.

• Calculate the value of VAT which is 15 % of subtotal (R158,78).</td>
</tr>
<tr>
<td>1.3</td>
<td>Total charge for consumption = consumption x tariff

= 725 kWh x R0,219

= R158,78</td>
<td>• Consumption for November multiply by tariff (R0,219).</td>
</tr>
<tr>
<td>1.4</td>
<td>Amount of used: 803kWh

<table>
<tr><th>Intervals</th><th>Amount of kWh multiply by tariff</th><th>Sub- total</th></tr>
<tr><td>0- 100</td><td>100 kWh x R0,219</td><td>R21,90</td></tr>
<tr><td>101 - 1000</td><td>(803-100 = 703 kWh)

703 kWh x R1,55</td><td>R1089,65</td></tr>
<tr><td></td><td>Total</td><td>R1111,55</td></tr>
<tr><td></td><td>Amount paid</td><td>R1111,55 x 1.15

R1278,28</td></tr>
</table>
</td>
<td>• Look at intervals, tariff and amount of kWh used.

• Interval of 0-100, use 100 kWh multiply by tariff of R0,219.

• Get the difference:

803 kWh -100 kWh = 703 kWh.

• Multiply 703 by 1.55 tariff.

• Note: the amount to be paid should include VAT.

(R1111,55 + VAT).</td>
</tr>
</table>

Example 2

2. Study the water tariff below of a certain municipality.

The following tariffs were used to determine the amount payable for the month of October.		
CATEGORIES	**RANGE**	**Price per kℓ** (VAT excluded)
1	**0 – 12 kℓ**	**R0, 00**
2	**13 kℓ– 28 kℓ**	**R7,96**
3	**29 kℓ – 60 kℓ**	**R13,55**
4	**More than 60 kℓ**	**R16,80**

2.1	What does VAT stand for?	(2)
	Solution VAT stands for Value Added Tax	

2.2	Calculate the total amount including VAT to be paid if 36 kl of water was used.	(4)

Solution

Range	Number of kl	Amount of kl x Price per kl	Amount including VAT
0-12 kl	12	12 x R0,00 = R0	R0 x 1.15= R0
13 kl- 28 kl	16	16 x R7,96 = R127,36	R12,36x-1.15=R146,46
29 kl-60 kl	8	8 x R13,55 = R108,40	R108,40x-1.15=R124,66
More than 60 kl	0	0 x R16,80 = R0	R0 x1.15= R0
		Total Amount	R271,12

Language aspects/ Teacher activities

- Learners should be advised to read the given tariff table.
- Note that the first 12 kl of water falls under the range of 0 -12 kl and zero charges (no payment), amount multiply by price per kl and amount including VAT.
- Under the range of 13kl – 28 kl there are 16 kl. The 16 kl multiplied by rate (R7,96) + 15% of VAT.
- Under the range of 29 kl – 60 kl, there are 8 kl. The 8 kl multiplied by R13,55 + 15% of VAT.
- Under more than 60kl there is 0 kl.
- To get the total, add R0 + R146,46 + R124,66 + R0 = R271,12.

2.3

- First 12 kl is free of charge.
- (13 kl – 28 kl),16 kl multiplied by R7,96, multiplied by 1.15(VAT).
- (29 kl-60 kl), 32 kl multiplied by R16,80, multiplied by 1.15(VAT).
- (More than 60 kl), 22 kl multiplied by R16,80, multiplied by 1.15(VAT)
- Total :

  Add (R0 +R146,46 + R498,64 + R425,04) = R1070,14.

2.3.	How much will a person staying in the municipality pay if 82 kℓ.is used?	(6)
	Solution	

Range	Num-ber of kl	Amount of kl x Price per kl	Amount in-cluding VAT
0-12 kl	12	12 x R0,00= R0	R0 x 1.15= R0
13 kl-28 kl	16	16 x R7,96= R127.36	R12,36x1.15 = R146,46
29 kl-60 kl	32	32 x R13,55= R433,60	R433,60 x 1.15 = R498,64
More than 60 kl	22	22 x R16,80 = R369,60	R369,60 x 1.15 = R425,04
		Total Amount	R1070,14

Example 3

Grade 12 learners from Mollo High School are selling apples during lunch to raise funds for their matric farewell function. They have asked the principal to use the school's tuck-shop. They bought a crate for R255,00 and sold the apples at R3,00 each.

3.1Explain what is meant by break-even point? (2)

Break-even point is a point where the income and expenses are the same. i.e. income = costs, no profit is made□□

- The teacher should explain the meaning of break-even point in the context.
- The teacher should explain the meaning of selling price, cost price and profit.
- Show how profit is calculated.

3.3

- Explain the meaning of profit.
- Substitute profit value and cost value.
- Divide income by the cost of one apple.

(b)

- Equate the income price and cost price.
- Divide income by R3,00 get 125 apples.

3.2 Calculate the profit they made if 116 apples were sold. (2) Cost price = R255,00; Selling price = 116 x R3,00 = R348,00 Profit = selling price – cost price = R348,00 – R255,00 = R93 3.3 (a) If they made a profit of R120 per day, how many apples were sold per day? Profit = income – cost Income = profit + cost = R120 + R255 =R375 No of apples sold = R373/R3 = 125 (b) How many apples did they sell to break even per day? Income = cost R375 = R3,00 x n, where n stands for number of apples n = R375/R3,00 = 125 apples sold per day to break even	
ASSESSMENT DESCRIPTORS	
Explain	Make clear; express in words, interpret and spell out
Calculate	This means a numerical answer is required - in general, you should show your calculations, especially where two or more steps are involved.
Assessment	• Compare bank charges of different banks using tariff tables, given formulae, and draw graphs to assess the suitability of different accounts for individuals with particular needs. • Investigate the advantages and disadvantages of all the different types of accounts. • Investigate different ways in which interest is calculated on different types of accounts.
Verify	Calculate, get the answer and compare the answer with the one given.
Compare	When two or more values are involved.

ADDITIONAL RESOURCES/ANNEXURES

Second Chance Matric Support Programme, Bright Ideas Revision Booklet, Mathematical Literacy.

1. A parent of one of the learners wants to hire a car for her child's matric dance farewell. Car hire companies have different tariffs and benefits to offer. Parents will always compare these companies and choose the one that will give them the best value for their money. The tariffs of two companies are given below:

AVIS CAR HIRE

R6,50 per kilometre

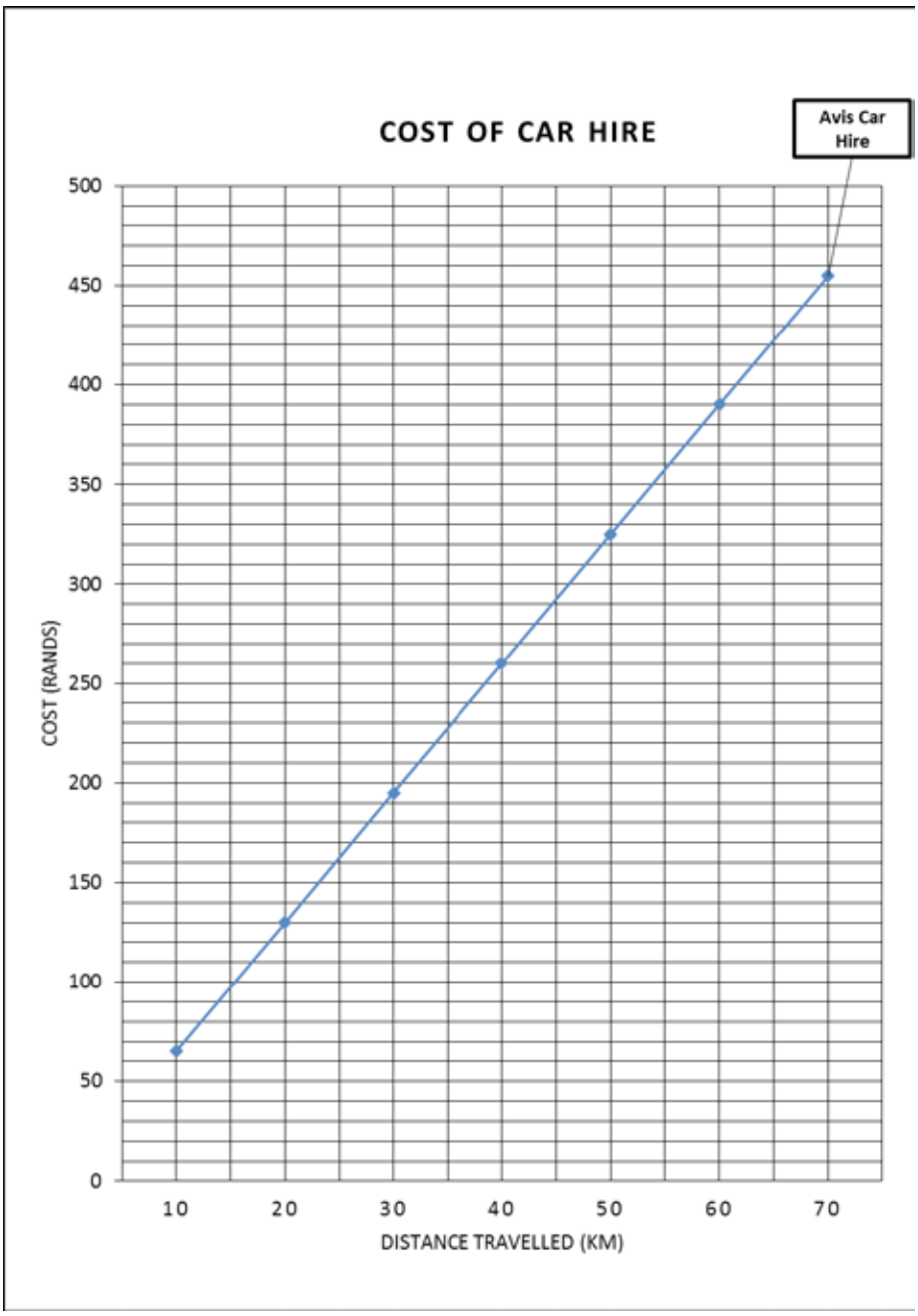
BUDGET CAR HIRE

R165 plus R3,50 per kilometre

The table below shows the cost of the two options:

Kilometres travelled	10	20	40	**C**
Cost for Avis Car Hire	R65	**A**	R260	R455
Cost for Budget Car Hire	R200	R235	**B**	R410

1.1 Calculate the missing values A, B and C.	(6)
1.2 The graph for AVIS CAR HIRE is already drawn on the **diagram sheet provided below**. On the same diagram sheet, draw a graph for the cost of BUDGET CAR HIRE.	(6)



1.2 Use the graph or table to answer the following questions:

1.2.1 After how many kilometres will the cost of the two companies be the same? (2)

1.2.2 The child wants to travel 80 km on a particular day. Which car hire company would be cheaper for the parent, and by how much? Show all calculations. (3)

Solutions:

1.1 Cost = 6,50 × 20□

A = R130□

Cost = 165 + 3,5 × 40

= 165 + 140

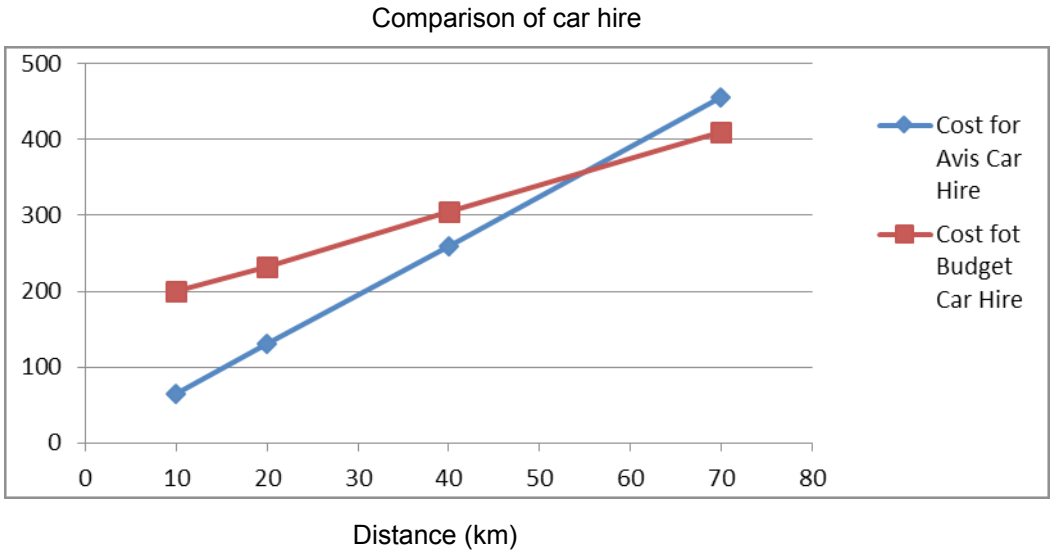
B = R305□

455 = 6,5 × C□

455 ÷ 6,5 = C

C = 70km□

1.2



1.2.1 After 55 km□□

1.2.2

Avis = (6,5 × 80)

= R520,00□

Budget = 165 + 3,5 × 80

= R445,00□

= R520 – R445

= R75,00

Budget Car Hire will be cheaper by R75,00□

DAY 3
SCRIPTED LESSON PLAN
Finance

Mathematical Literacy **Duration: 2 Hours**

Grade: 12

TOPIC:	SECTION: TAXATION	CONTENT/SKILLS

Finance	1) VAT	• Items inclusive and exclusive of VAT
		• Calculating:
		  ○ Price VAT included
		  ○ Price VAT excluded
		  ○ Amount of VAT

	2) Income tax & UIF	Calculating personal income tax • Use both the tax deductions tables and the tax brackets to investigate how the tax value on a payslip is calculated. • Investigate the impact of an increase in salary on the amount of tax payable. • Find reasons for differences in tax values calculated using tax deduction tables and tax brackets.

TERMINOLOGY	
Net pay	The **money** that an employee **"takes home" after** income **tax** has been deducted.
Gross income	The **total** money of a person's or business's **income before deductions**.
PAYE	**P**ay **A**s **Y**ou **E**arn **Tax** taken **off** your **salary** **Sent** to **SARS** (**S**outh **A**frican **R**evenue **S**ervices)
Salary	**Money** paid **for** the **work** you do (pay **every month**).
VAT	**V**alue **A**dded **T**ax **(VAT)** **15% tax** you must **pay** on the **things you buy**.
VAT exclusive price	The **price before VAT** is added.
VAT inclusive price	The **price after VAT** is added.
Zero rated VAT items	Things that you do **not pay VAT on**. **Basic food**: e.g. brown bread, milk, mealie meal, samp, rice, etc.
Tax	**Money** you **must pay** from your income **to** SARS.
Taxable	A **service, buying** things or items or **income** that has **tax in** it.
UIF	**U**nemployment **I**nsurance **F**und: A **government insurance** fund which **employers**(bosses) **and employees**(workers) **contribute**(give money) to. When **employees lose** their **work** they can **collect money**.
Wages	**Money paid to** a **worker**. It is **pay** for **working hours per week**.
Income tax	The **money** a person **must pay from** his/her **salary** to **SARS**.
Income	The **money** that a **person or business gets**.
Expenditure	**Money** that you **spend**.
Deduction from tax	**Expenditure or losses** in a tax year.
Tax threshold	The **income level** at which a person or company begins **paying income tax**.
Rebates	**Tax relief**(make less) given to **all tax payers**.

Pension	**Money** taken **from salary** to **save** for your **retirement**$_{(old\ age/finish\ work)}$.
Notch salary	**Annual**$_{(every\ year)}$ basic salary.

METHODOLOGY
1) Question and answer.
2) Explain concepts by using resource documents.
3) Work out examples step by step.
RESOURCES
1) Short activity on VAT calculation in ANNEXURE 2.
2) Example of a salary advice in ANNEXURE 2.
3) Tax tables in ANNEXURE 1.
LESSON PRESENTATION

INTRODUCTION	**Language aspects/Teacher activity**
Pre-knowledge • Calculation of VAT • VAT inclusive price • VAT exclusive price • Zero rated VAT items **NB:** Calculating a "VAT exclusive price" from a "VAT inclusive price" means dividing the VAT inclusive price by 115% to reverse it to 100%.	Explain the concepts: ○ **VAT** ○ **Zero rated items** ○ **VAT inclusive price** is **115%** of the **original price**. ○ **VAT exclusive price** is **100%** of the **original price.** **Misconception:** Calculating "**VAT exclusive price**" from a "**VAT inclusive price**" means **subtracting 15%** from the VAT **inclusive price**. Do activities to recap VAT (refer to A**ctivity 1 in Annexure 2**).

EXPLANATION OF TERMINOLOGY AND KEY CONCEPTS	LANGUAGE ASPECTS/ TEACHER ACTIVITIES
Notch salary • **Salary** for **one year before deductions**.	• Explain the meaning of all the words with practical examples. (various salary advices)

EXPLANATION OF TERMINOLOGY AND KEY CONCEPTS	LANGUAGE ASPECTS/ TEACHER ACTIVITIES
Gross income • **Income before** any **deductions.** • **Include basic salary and benefits.** • **Benefits are:** o medical aid subsidy; o housing subsidy; and o car subsidy, etc. **Deductions** • **Money taken** from **gross salary**. • **Deductions are e.g.** o medical aid; o pension contributions; and o UIF and PAYE etc. **Net salary** • Salary **money** left **after deductions**.	
PRESENTATION	**LANGUAGE ASPECTS/TEACHER ACTIVITIES**
Taxation and Income Tax **Two types of Tax** • **VAT**: The **money paid** by consumers (people buying) and businesses. • **Income Tax: The money paid** by working people, earning a salary above the tax threshold. **All income tax** and **VAT** is paid to **SARS**.	Explain the difference between "taxation" and tax: • **Taxation**: The **government's process** of **getting tax** money from the workers or businesses. • **Tax**: The **money** that a person or business **pay to SARS**. Ask the learners to explain "income tax". Use the learners' explanation to give further explanation of income tax.

Step 1: **Calculating Income Tax:** • Calculate the **annual income**. • Multiply the **monthly salary by 12** to make it **the annual salary and add extra benefits.**	Explain the terms: **Annual income:** All the income a person earned over the year. Income is: • wages (**money** earned **per hour**); • salary (**money** earned **per month**); • bonuses; • commissions; and • overtime. **Do not use only salary to calculate income.**
Step 2: **Calculating non-taxable income:** • UIF- 1% of income • Pension fund : 7,5% • Donations (charity gift to charity organisation) • Child support payments A **donation** will be **exempted**$_{\text{(not added)}}$ if the **total value** of donations for a year of assessment is not more than: • casual gifts by **companies** and trusts: **R10 000;** and • donations by **individuals: R100 000.**	Explain the concepts. Assist learners to find the non-taxable income on the salary slip.
Step 3: **Calculating the taxable income:** Taxable income = total income - non-taxable income	
Step 4 **Tax threshold:** • **Use** the **tax table** to see if the person must pay tax. • The **person** whose **income is lower** than the **tax threshold** does **not pay tax.**	Ask the learners to look at the tax table. See if the person must pay tax. Explain tax threshold.

Step 5: • **Identify** the **tax bracket**. • **Copy** the **bracket**. • **Calculate payable tax before** the **rebates** and **medical credits** could be subtracted. NB: Remember order of calculations!	
Step 6: • **Identify** the **rebate**. • **Calculate** the **annual medical credits.** • **Subtract** the **rebate and medical credits** from the calculated **tax in step 4.** **Rebate:** • Is the **tax relief**$_{\text{(pay less).}}$ • It is **deducted after annual tax** has been **calculated.** • The **older** the **person**, the **higher the rebate.** • **People younger** than **65** get the **primary rebate.** • **People above 65** qualify for **both primary and secondary rebates.** • **People above 75** qualify for **primary, secondary and tertiary rebates.**	Explain **"tax rebate"**. **Show** the **tax table** to the learners. **Show** the **rebates** indicated on the given **tax table**. **Explain age** related **additional rebates**.

Medical tax credit:
• Monthly medical rebate.
• **Relieving**$^{\text{(make less)}}$ personal tax; irrespective of the income.
• **More dependants** on medical aid = **higher medical tax credit**.
• **Dependants**:
  ○ **First dependant** = **main** member.
  ○ **Second/third dependant etc** = **other members** on your medical aid.
	Explain medical tax credit.
	Show the medical tax credit on the given tax table.
	Explain dependants:
	• The people who are on your medical aid.

ASSESSMENT DESCRIPTORS	
Explain	Make clear; express in words, interpret and spell out.
Calculate	This means a numerical answer is required – in general, you should show your calculations, especially where two or more steps are involved.
Show	Do calculations to prove that the answer is correct.
Verify	Calculate, get the answer and compare the answer with the one given.

ACTIVITY

Example: Ms Nhlapo is **56 years** old. Her **monthly salary** is **R27 876,80**. Her **bonus** is **equal** to her **monthly salary**. GEPF = **7,5%** of her **basic salary**. Her **two sons** are on her **medical aid**.	Explain the scenario to the learners. Emphasise that the information for one month is given.

1. Why is it important to know Ms Nhlapo's age? **Solution** • To **identify** the **tax threshold** as the age determines the suitable tax threshold. • To **identify** the **correct rebate** as the age will determine the rebate/s the person qualifies for.	Ask the question from the learners. Interpret and discuss the learners' answers.
2. Use calculations to show that Ms Nhlapo qualifies to pay tax. **Solution:** **Annual income = (**R27 876,80 x 12) + R27 876,80 = R334 521,60 + R27 876,80 = R362 398,40 She qualifies to pay tax because she earns an income more than R75 000.	Let learners do the calculations. Write down the correct answer and discuss.

3. Use the tax information in the tax table below to calculate the annual tax payable on Ms Nhlapo's taxable income. **Solution:** **Step 1 : Taxable income as calculated in 2** **Step 2: Non–taxable income** **GEPF: 7,5% of** R334 52160 = R25089,12 **Step 3 :** Taxable income = R362 398,40 — R25089,12 = R337 309,28 **Step 4:** **It falls in tax bracket 3** Payable tax before rebates and medical credits = 61 296 + 31% of taxable income above 293 600 = 61 296 + 31% (337 309,28 - 293 600) = R74 845,88 **Step 5:** **Medical credit =** [(R286 x 2) + R192] x 12 = R9 168 Income tax = R74 845,88 - R9 168 - R13 500 = R 52177,88	Learners only calculate the income tax before the rebate and medical credits are subtracted.
4. Ms Nhlapo claims that if she was 10 years older she would pay the monthly tax of R4 911, 40. Verify her claim. **Solution:** Annual income tax at 66 years = R52 177,88 - R7 407 = R44 770,88 Monthly income tax = R44 770,88 ÷ 12 = R3 730,91 Her claim is incorrect.	Learners don't write the conclusion. They only calculate and get the answer without validating the statement.

ANNEXURE 1

RATES OF TAX FOR INDIVIDUALS

2017 tax year (1 March 2016 - 28 February 2017)

Taxable income (R)	Rates of tax (R)
0 – 188 000	18% of taxable income
188 001 – 293 600	33 840 + 26% of taxable income above 188 000
293 601 – 406 400	61 296 + 31% of taxable income above 293 600
406 401 – 550 100	96 264 + 36% of taxable income above 406 400
550 101 – 701 300	147 996 + 39% of taxable income above 550 100
701 301 and above	206 964 + 41% of taxable income above 701 300

Tax Rebate	2017
Primary	R13 500
Secondary (65 and older)	R7 407
Tertiary (75 and older)	R2 466

Tax Thresholds	
Person	**2017**
Under 65	R75 000
65 an older	R116 150
75 and older	R129 850

2016/2017 year of assessment (1 March 2016 - 28 February 2017)
R286 per month for the taxpayer who paid the medical scheme contributions
R286 per month for the first dependant
R192 per month for each additional dependant(s)

ANNEXURE 2

VAT ACTIVITY:

Complete the table. Show all calculations (workings).

No	VAT INCLUDED	VAT EXCLUDED	VAT AMOUNT
1	R88 444,33		
2		R796 234	
3		R1818,18	
4	R225 443		
5	R23 125		
6		R241	
7	R2 678		
8		R312,45	
9	R0,95		
10		R0,22	

EXAMPLE SALARY ADVICE:

Sambuti's salary advice for May 2015

INCOME	AMOUNT	DEDUCTIONS	AMOUNT
Basic Salary	15 000,00	Income Tax	2520,00
Overtime	1 720,65	Pension fund	**A**
Uniform allowance	150,00	Medical aid	2718,00
		UIF	**B**
Total Income	**16870,65**	**Total deductions**	**C**
		NET SALARY	**D**

1 How much is Sambuti's gross income per month?

2. **UIF** is calculated at 1% of his basic salary.

   Calculate the value of B.

3. Pension fund is 6,5% of his basic salary.

   Calculate the value of A.

4. Calculate the value of C.

5. Calculate the value of D.

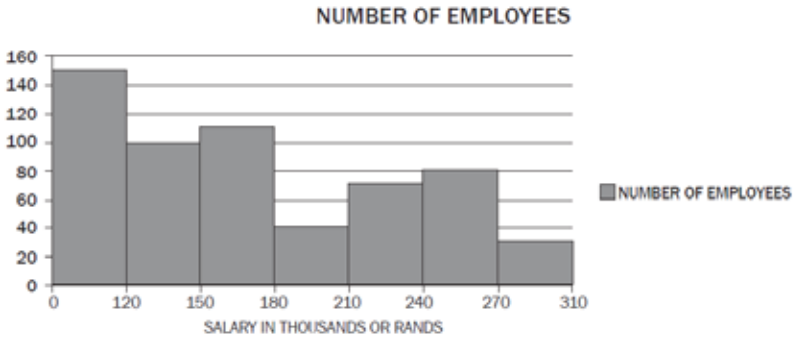
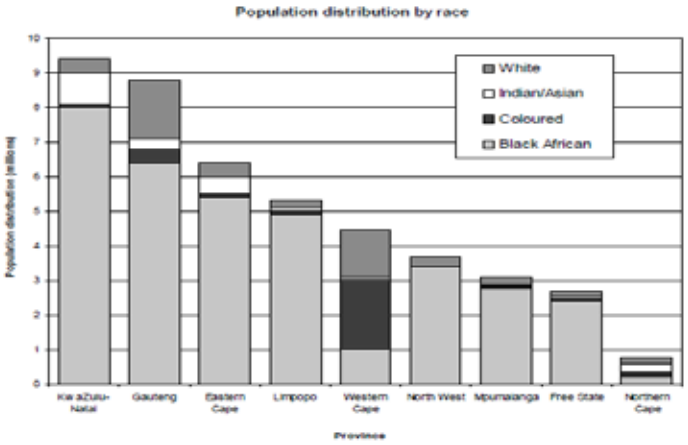
DAY 4
SCRIPTED LESSON PLAN
Data Handling

Mathematical Literacy **Duration: 2 Hours**

Grade: 12

TOPIC	SECTION	CONTENT/SKILLS
Data Handling	Summarising, Interpreting, Classifying and Representing data	**Multiple sets** of **data** containing **multiple categories** **Data relating** to **national** and **global issues:** e.g. Education statistics Road accident statistics Population statistics **Calculating**: measures of central tendency and spread interpreting these measures **Comparing** box and whisker diagrams in order to make comparisons **Arranging** data in **ascending** and **descending order** **Interpreting** compound bar graphs **Identifying misleading aspects** in **graphs**

Terminology and related concepts	
Ascending order	**Arranging data from** the **smallest value to** the **largest value.**
Descending order	**Arranging data from** the **largest** value to the **smallest** value.
Classifying/ Organising	**Data** is classified in **Qualitative**(characteristics) and **Quantitative**(counting) data.
Categorical data	**Grouping data** according **to** certain **characteristics**, e.g. data categorised according to **gender (male/female).**
Qualitative data	Categorical **measuring** and **observing** the ***quality*** or c**haracteristics** of the data, e.g. the car is red. This data cannot be measured.
Quantitative	A measured result in numerical format. Quantitative data can be in two forms, **Discrete** or **Continuous**.
Discrete data	There are **no decimals** in this data. It consists of **whole numbers** or **counting numbers**, e.g. the number of learners in the classroom.
Continuous data	Is used when **we measure**, e.g. the measured **height** of a person **is 1,72 m**.
Pie chart	**A circular graph divided** into **sectors**. They are used to show the parts that make up a whole that **equals 100%.**
Bar graphs	**Graphs** used **to represent** data that is sorted into **categories.** The bars have **spaces between them.** Bar graphs come in three forms: **single bar graph**, **double** or **multiple bar graph**, or **compound stacked bar graph**.

Histogram	 **Graphs** used **to represent** data that is sorted into **categories.** The bars have **no spaces between them**.
Multiple sets of data	**2**, **3** or **more** sets of data, e.g. comparing the pass marks for two or three different grade 12 classes instead of 1 class only.
Compound/ Vertical stack graphs	 Each bar consists of more than one category of data.
Box and Whisker plot	 **Graphic representation** of **data** along a **number line** divided into **quartiles** (quarters).
Mean/Average	**Adding all the values** together and **dividing** by the **number of values** in the **data set**.
Median/2nd quartile	The **middle value** in the data set, that divides all the data into two equal halves, a bottom half and a top half
Mode	**The data value** that **appears the most**. Also known as **the modal number** or value.
Lower quartile	The **median** (middle value) of the bottom half, also known as the **lower quartile** or **Q1.**
Upper quartile	The **median** (middle value) of the top half, also known as the **upper quartile** or **Q3.**
Range	**Range** = **highest value** – **lowest value**
Outlier	Lies an **abnormal distance from** the **other data** values in the set.
Trend	A set of data **values** will normally **follow a particular pattern** or trend.
Percentile	The division of the **data set into 100 equal groups**. Percentiles enable **the reader** to **see** what **percentage** of the **scores** is below and above the **given percentile.**

Teaching Methodology
Build up from one set of data to two sets of data to multiple sets. Give learners tasks to classify data. Organising data using tallies and frequency tables. Teach learners to recognise the way data is classified, sorted and grouped. Illustrate how it will affect the way data is summarised and represented. Question and answer approach.
<u>Visual aid</u>: Pack of playing cards The teacher must give each learner 12 playing cards (even number of scores) or any manageable number of cards. Learners must do the following: • Arrange the card values in ascending order, then in descending order. (If no cards are available, make a pack of cards). • Determine the Mean, Median, Mode, Range, Quartiles and IQR. • Stick cards on board and present answers to class. • The teacher must give each learner 11 (even number of scores) cards. • Arrange the card values in ascending order, then in descending order. (If no cards are available, make a pack of cards). • Determine the Mean, Median, Mode and Range. **Or alternatively:** Make use of two hands, showing your ten fingers to illustrate how the median is calculated for an even number of scores. **Box and whisker diagram:** • Unpacking each part of the box and whisker diagram. • Comparing random box and whisker diagrams to teach the skills of comparing box and whisker diagrams and drawing conclusions.

LESSON PRESENTATION	Language aspects/ Teacher activities
INTRODUCTION **Pre-knowledge** Summarise and compare two sets of data using the measures of central tendency and spread. Arrange data in ascending or descending order.	Teacher asks learners to explain the **measures of central tendency and spread** that was learnt in prior grades as diagnostic assessment. Teacher will use learner responses to inform teaching.

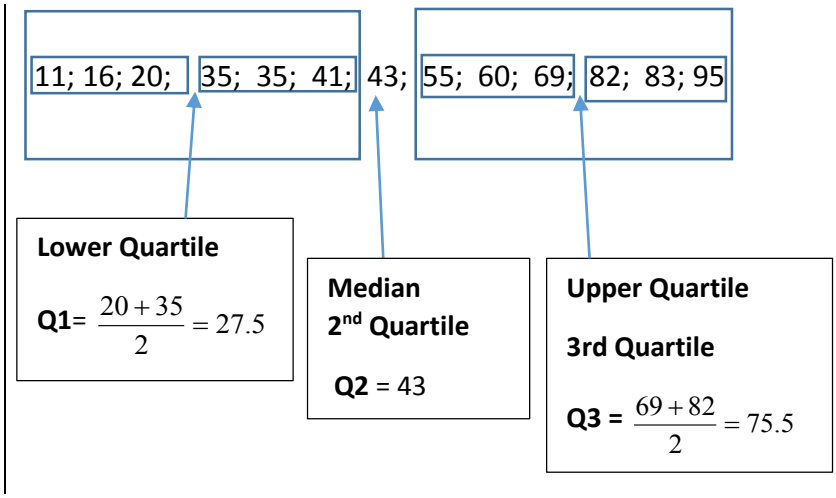
EXPLANATION OF TERMINOLOGY AND KEY CONCEPTS	Language aspects/ Teacher activities
Quartiles: Data is divided into 4 quarters **Upper quartile**: 3rd quartile or **Median of top half** **Lower Quartile**: 1st quartile or **Median of bottom half** **I**nter **Q**uartile **R**ange (IQR): The **difference** in value between the 3rd Quartile and the 1st Quartile of the data set. $\mathbf{IQR = Q_3 - Q_1}$ **Range**: The **difference** in value **between** the **highest value** and the **lowest** value in the data set. **Mean**: The **sum** of all **values divided** by the actual **total number** of values in the data set. **Median:** The **middle value** in the data set that divides all the data into two equal halves, i.e. a bottom half and a top half **Mode:** The **value** that **appears the most** Five number summary: Minimum 1st Quartile 2nd Quartile 3rd Quartile Maximum	Teacher introduces the terminologies and allows the learners to brainstorm and write the correct meaning. Teacher illustrates the meaning of all terminologies when teaching the first example.
PRESENTATION	**Language aspects/ Teacher activities**

EXAMPLE

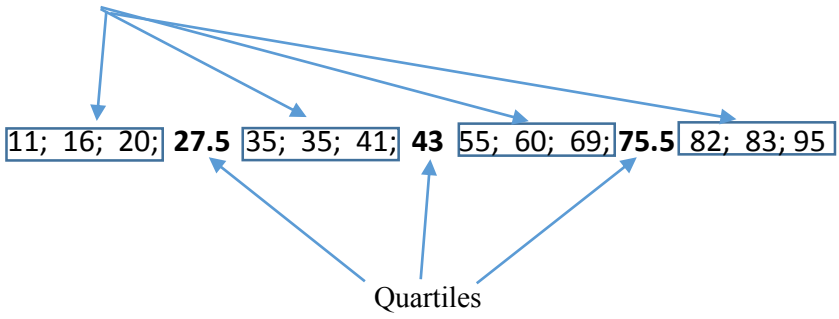
The test marks of 13 Mathematical Literacy tests for 13 learners are given below: The total mark of the test is 100.

55; 20; 35; 16; 60; 69; 95; 83; 82; 35; 11; 41; 43

Arrange in ascending order and illustrate measures of central tendency and spread, quartiles and percentiles.



Data is divided into 4 Quarters and the Quartiles



Arrange in **ascending order** and illustrate:

- **measures of central tendency and spread**,
- **quartiles, and**
- **percentiles**

Emphasise that it is not necessarily the case that the items in each quarter of the data, consists of four values. At times the values can be less than four or more.

The word **quarter** in **quart**ile simply means that the data is divided into **four** equal parts and be illustrated.

Teacher must **illustrate** where the **IQR** comes **from** in the **diagram.**

Show the **relationship** between the normal **Range** and the **IQR** by making use of the diagram.

Allow the **discussion** with the learners to **critique** (find negative and positive) the two types of **range**s by determining the **advantages** (positive) and the **disadvantages** (negative) of the **IQR** and the **Range.**

To also **determine which Range** is more **reliable** as both of them are Ranges.

Teacher allows the **learners** to **do** the **activity on their own** and **mark** it together.

When marking the **teache**r must **highlight** that **50%** of the data is in **the box** and **25%** is contained in the **whisker.**

Inter-Quartile Range(IQR)

IQR = Q3 – Q1

= 75.5 – 27.5

= 48

Range: = 95 – 11

= 84

Five number summary:

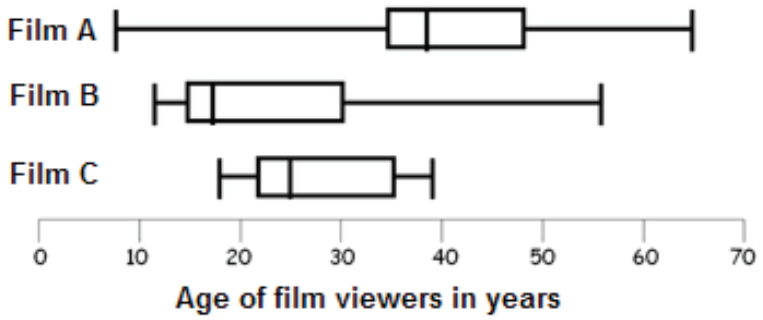
(Minimum; Quartile 1; Quartile 2; Quartile 3; Maximum)

11 27.5 43 75.5 95

Activity:

1. The **box-and-whisker plots** below **represent** the **age** of people who viewed (watched) **three different films**.

   Study and **answer** the questions that follow:



1.1 Write down the **median** (middle value) of **Film A** viewers (people watching).

1.2 Determine the age of the youngest person who viewed **Film B**.

1.3 Which film was **viewed** (watched) by a 65-year-old person?

1.4 Which film is **viewed** (watched by the most age group? Explain why?

1.5 Determine the **age group** of all the **viewers** (people watching) of **Film C**.

Teacher must **illustrate** how to **calculate** the **quantity** (counting) of each **aspect** (part) of the compound bar and allow the learners to calculate themselves.

2. The **table below** shows **the training times** and the **2014 results** of a certain group of **cyclists.**

Study the table **and answer** the questions that follow:

Cyclist number	1	2	3	4	5	6	7	8	9
Training (**hours**)	20	18	16	17	19	13	12	9	15
Results (**minutes**)	203	285	245	256	230	297	210	310	255

2.1 (a) **Which cyclist** took the **longest time** to **complete** the **race**?

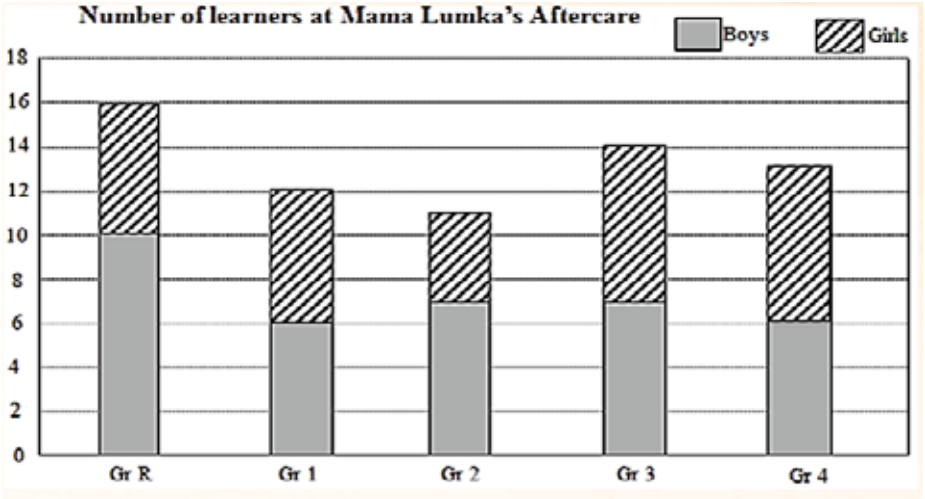
(b) How many **hours of training** did the **cyclist** in (a) above **take**?

2.2 Which of the **nine cyclists** had the **best results** in the race?

Explain your choice.

2.3 **Identify** the type of **correlation**(relationship) **between** training **hours** and **time** taken **to complete** the **race.**

3. The **stacked bar graph** below **shows** the number of **learners** in **each grade** at Mama Lumka's Aftercare.



1. How many learners are there in the Grade 2 aftercare class?

2. How many more boys than girls are there in Grade R?

3. What percentage of learners in Mama Lumka's Aftercare is in Grade 4?

4. What is the average (mean) number of boys per grade?

ASSESSMENT DESCRIPTORS	
Explain	Make clear; express in words, interpret and spell out.
Calculate	This means a numerical answer is required – in general, you should show your calculations, especially where two or more steps are involved.
Show	Do calculations to prove that the answer is correct.
Verify	Calculate, get the answer and compare the answer with the one given.
Compare	When two or more values are put together or analysed.
Determine	Finding out the correct value.

RESOURCES/ANNEXURES

Second Chance Matric Support Programme, Bright Ideas Revision Booklet, Mathematical Literacy

DAY 5
SCRIPTED LESSON PLAN
Measurement

Mathematical Literacy **Duration: 2 Hours**

Grade: 12

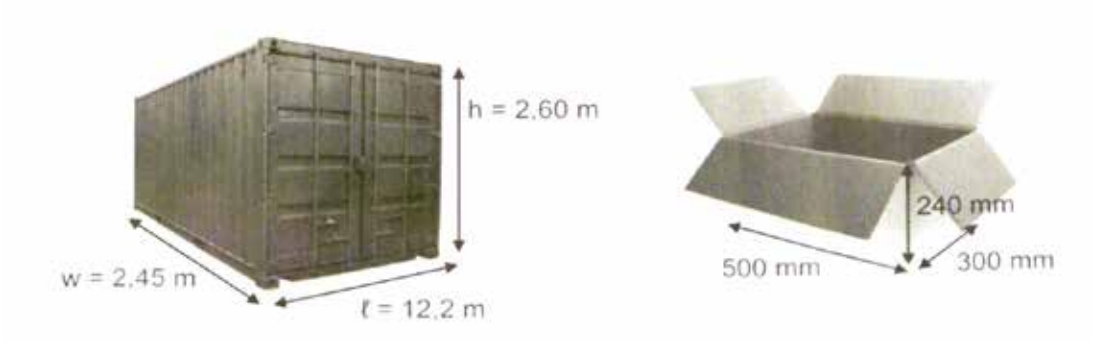
TOPIC	SECTION	CONTENT/SKILLS
MEASUREMENT	Volume, Area, and Perimeter	Calculate the **perimeter**, **area** (including surface area) and/or **volume** of objects. Calculation for each of the following: ➢ Rectangles and circles using known formulae. ➢ Rectangular prisms and cylinders using known formulae.

Terminology and related concepts	
Area	A region is the amount of **space** which it **occupies**. It is measured in **squares**.
2-D drawings	A shape with two (2) dimensions and no thickness.
3-dimensional models	It is a solid. It has **length, breadth/ width and height.**
Capacity	The amount of space available to hold something, usually measured in **litres.**
Circle	A closed curve that is everywhere at the same distance from a fixed point.
Circumference	Distance around a **circle** / **perimeter of a circle.**
Cylinder	Three dimensional objects with round base and height that are joined by a curved surface.
Diameter	A straight line passing through the centre of a circle and touching the circle at both ends thus dividing the circle into **two equal halves**.
Distance	**How far** it is from one place to another, e.g. from one town to another. Usually measured in **kilometres.** Does not have to be in a straight line.
Face	In any geometric solid that is composed of **flat surfaces**. Each flat surface is called a face.
Length	The **measurement** between **two points** in a straight line, e.g. the length of a room.
Measuring	Determining the **value** of a **quantity** directly, e.g. reading the length of an object from a ruler or the mass of an object from a scale.
Perimeter	The **total distance** around the boundary or **edge** that outlines a specific shape.
Pi (π)	The value obtained when dividing the **circumference** of the circle by its **diameter.** π is approximately **3.142.**
Prism	A **three** dimensional object such as a cylinder with two identical faces at opposite ends. There are **triangular, rectangular and circular** prisms.
Quadrilateral	A polygon with **four** sides.
Radius	**Half** of diameter.
Surface area	The **areas of all the faces/surfaces** of an object **added** together.
Unit of measurement	A standard amount of a physical quantity.
Volume	The amount of 3-D space occupied by an object. It is measured in **cubic** units.

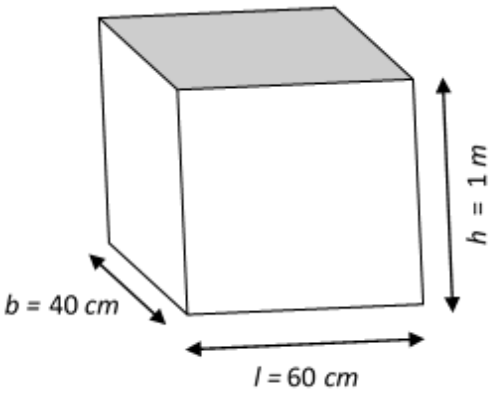
Teaching Methodology
• Demonstrations and illustrations. • Question and answering method.
Resources: **Scissors, papers, paper glue, cans, coins, different types of boxes (square, rectangles), cones, etc.**
LESSON PRESENTATION
Pre- knowledge • Shapes • Objects

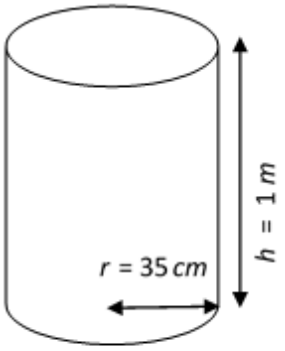
PACKAGING COFFEE TINS IN A BOX

PACKAGING COFFEE BOXES IN A CONTAINER



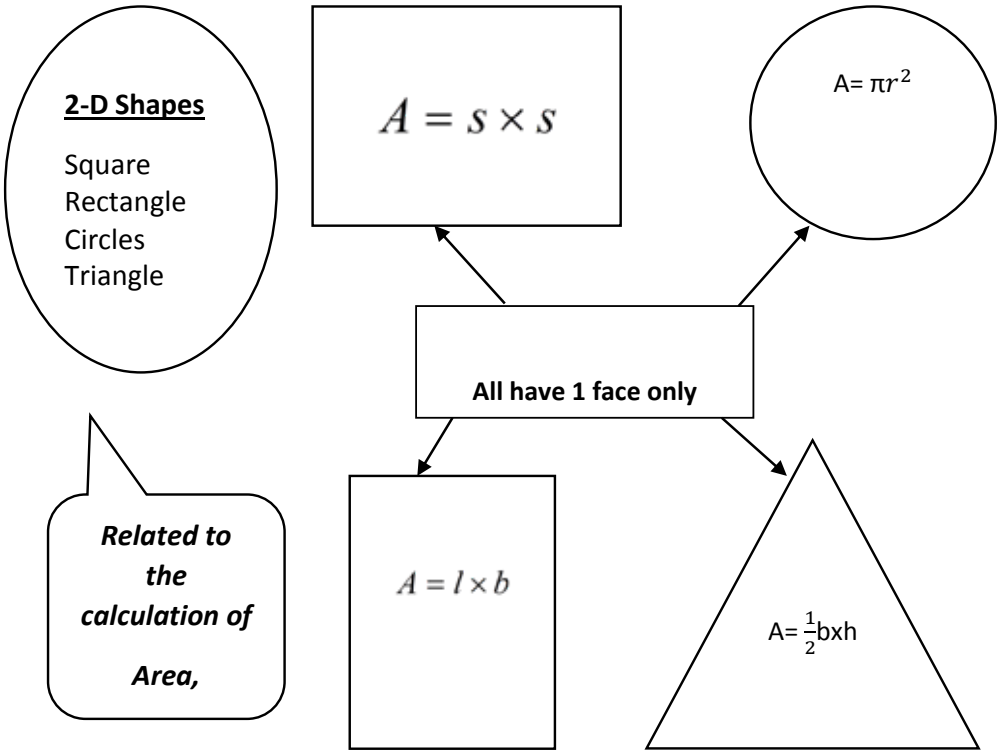
The dimensions are as follows:

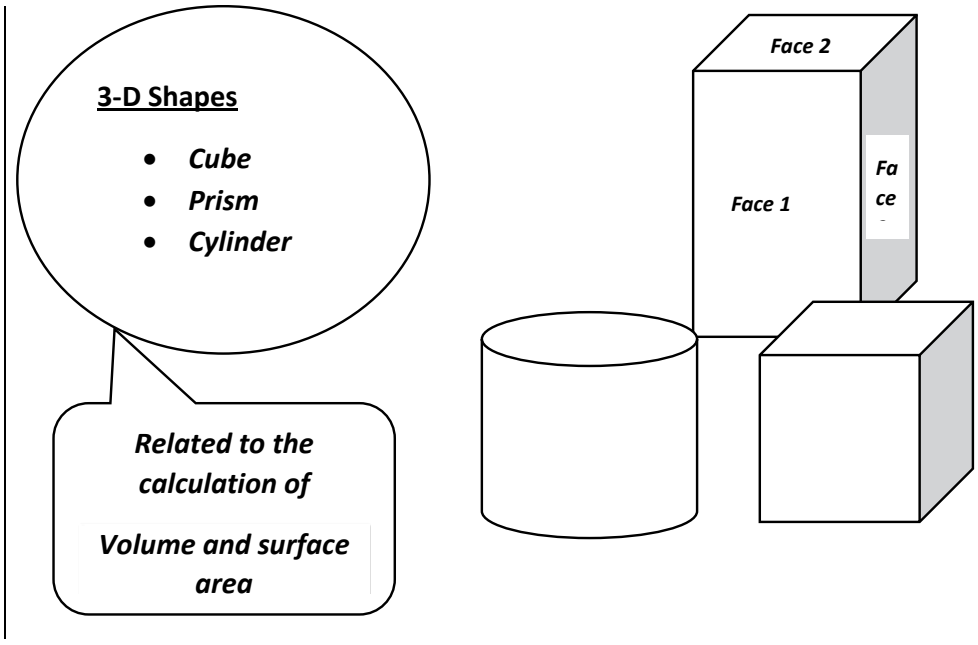




Lesson presentation

Revision about 2-D





Language aspects/ Teacher activities

Dimension defined:

As a measurement of size of something in one or more directions such as length, width or height as in the case of the dimensions of a room.

The area of a rectangle is measured by its length and width.

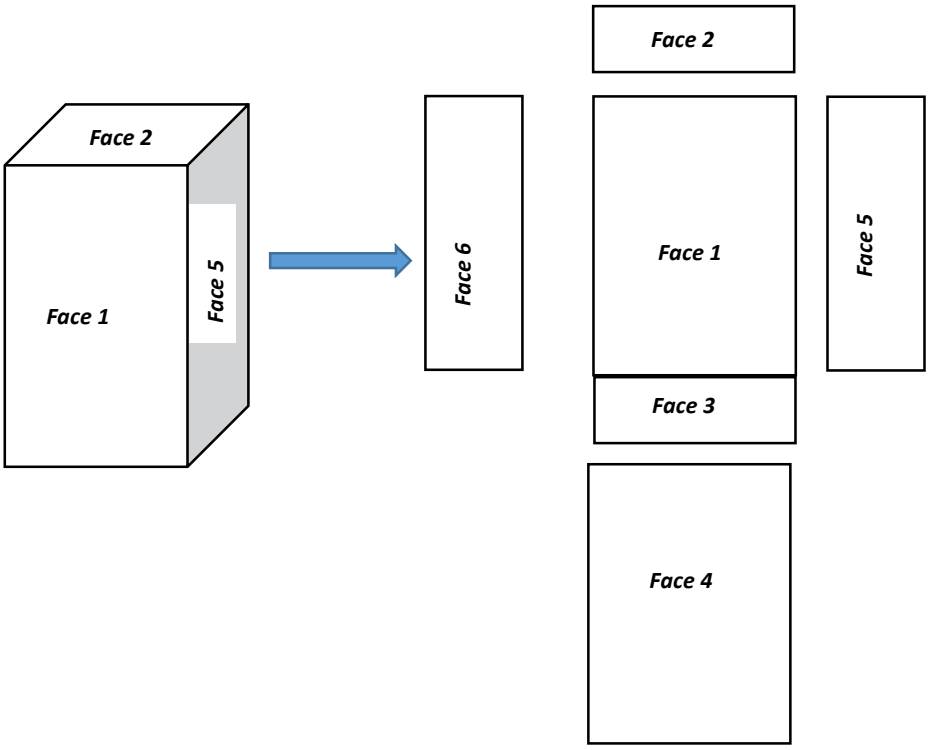
The area of a triangle is measured by half base and perpendicular height.

The area of circle is measured by and *radius square*.

3-D means three a dimensional shape that has more than one "***face***" (e.g. cube, rectangular prism and cylinder).

SURFACE AREA OF A RECTANGULAR BOX

Surface area of a rectangular box =2(ℓ x w) + 2(ℓ x h) + 2(w x h)



To calculate the **surface** we calculate **the area of each flat** surface separately:

Surface area = area of F1 + area of F 2 + area of F3 + area of F4 + area of F5 + area of F6

= (3cm x 6cm) + (3cm x 8cm) + (6cm x 8cm) +(3cm x 8cm) +(3cm x 6cm) + (6cm x 8cm)

= $18cm^2 + 24cm^2 + 48cm^2 + 24cm^2 + 18cm^2 + 48cm^2$

= $180cm^2$

It can also be written as:

Surface area = 2 (3cm x 6cm) + 2(3cm x 8cm) + 2(6cm x 8cm)

= $36cm^2 + 48cm^2 + 96cm^2$

= $180cm^2$

Area v/s Surface area:

AREA of a shape is the size of its surface measured in square units.

SURFACE AREA:

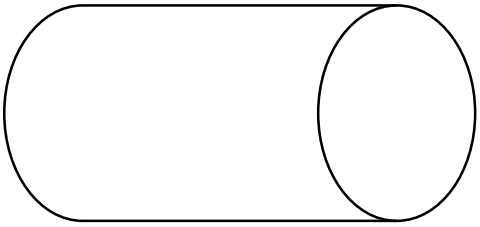
The sum of the areas of all the faces.

Note: *In essence, the area of a surface can also be the surface area of an object, depending on the context related to.*

If the box is **open**, it means one area is not going to be added.

SURFACE AREA OF A CYLINDER

Surface area of a cylinder = $2r^2 + 2rh$



The surface area of a (closed) cylinder can be found by breaking it down into three parts:

- The **two circles** that make up the ends of the cylinder.
- The side of the cylinder, which when "unrolled" is a **rectangle.**

To calculate the surface area of the cylinder we calculate the sum of the areas of the two circular disks and the rectangle as shown below:

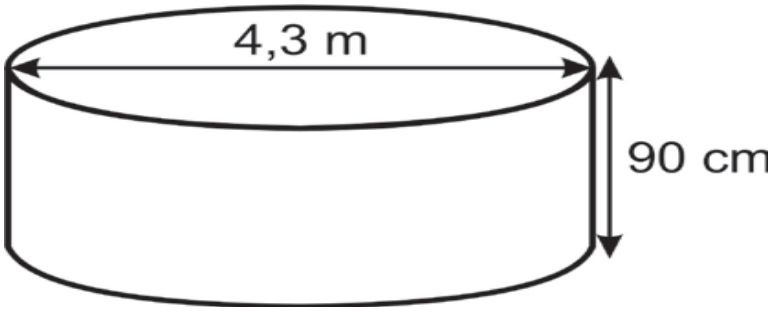
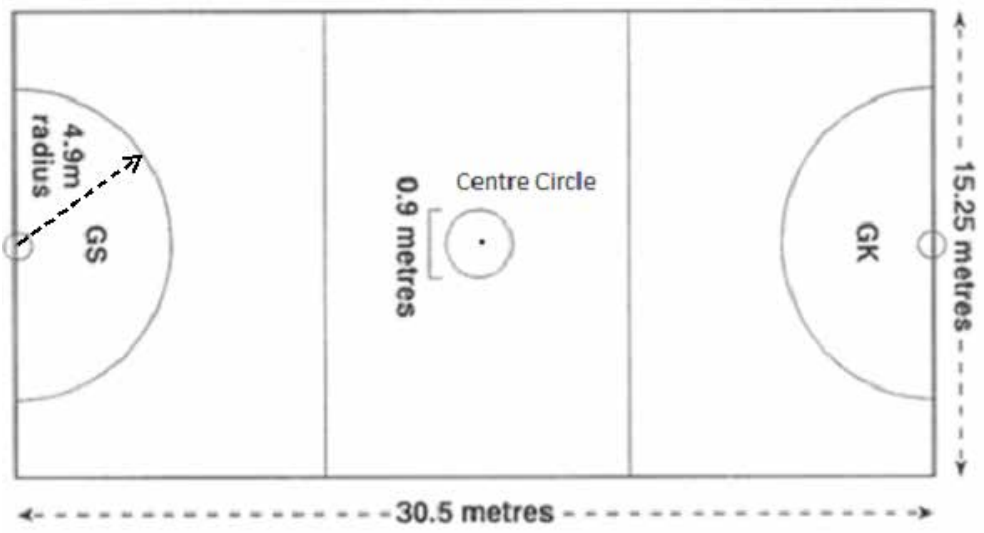
Area =r^2 **Area = 2r x h** **Area =r^2**

Circumference = 2πr

or

circumference = π x diameter

(Since diameter = 2r)

EXAMPLES	Language aspects/ Teacher activities
1. Thembinkosi was digging a cylindrical hole to secure a trampoline for his children. He wanted to reuse some of the excavated (dug up) sand. He still has two-thirds of the sand left over. A company is prepared to collect the sand free of charge provided it is more than 5 m^3.  	
2. The following diagram is an Australian court which conforms the current official rules (dated 2001) of the International Federation of Netball Associations. The court measures **30,5 metres long**, **15,25 metres wide**. The goal circle has a **radius** of **4,9 metres.** The centre circle is **0,9 metres** in **diameter**. All the lines on the court are part of the court and are **no more than 50 millimetres wide.** *Source: Netball Australia Instagram*  	

2.1 What is the diameter of the goal shooter (GS)? (2)

Solution

Diameter = 4,9m × 2 ✓M **(radius x 2)**

= 9,8**m**✓A **(unit)**

2.2 Calculate the perimeter of the court. (2)

Use the formula: **Perimeter of a rectangle = 2 (Length + Width)**

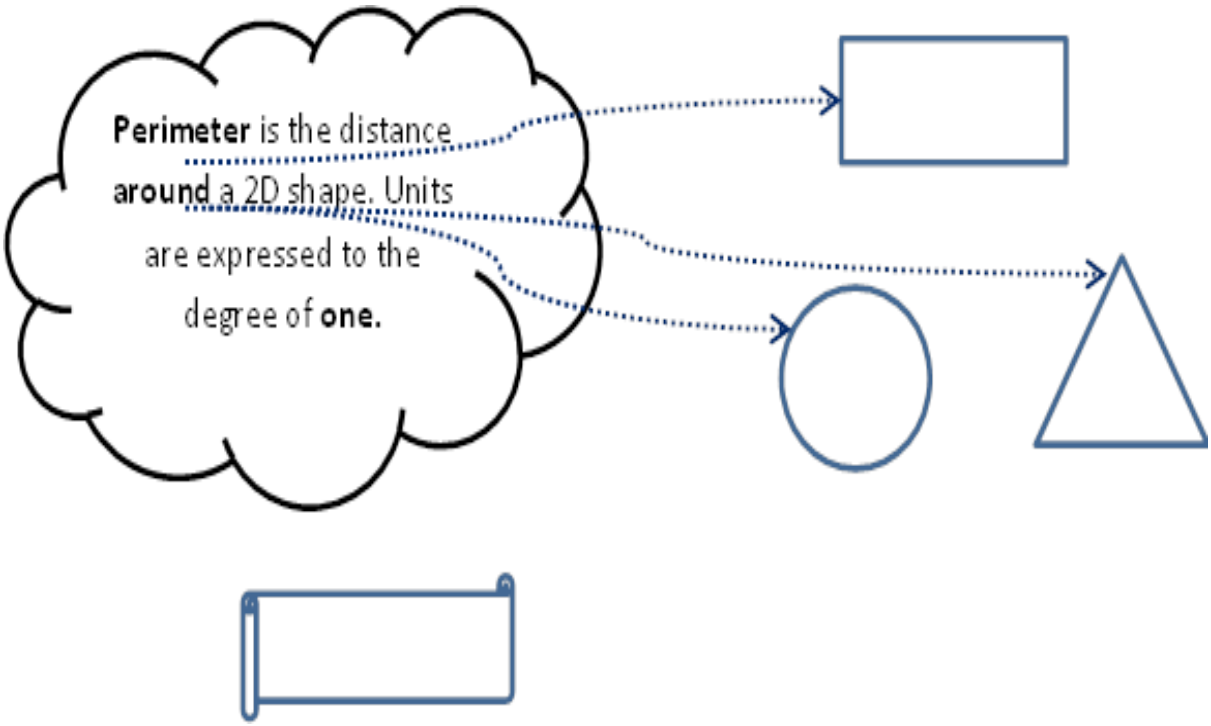
Solution

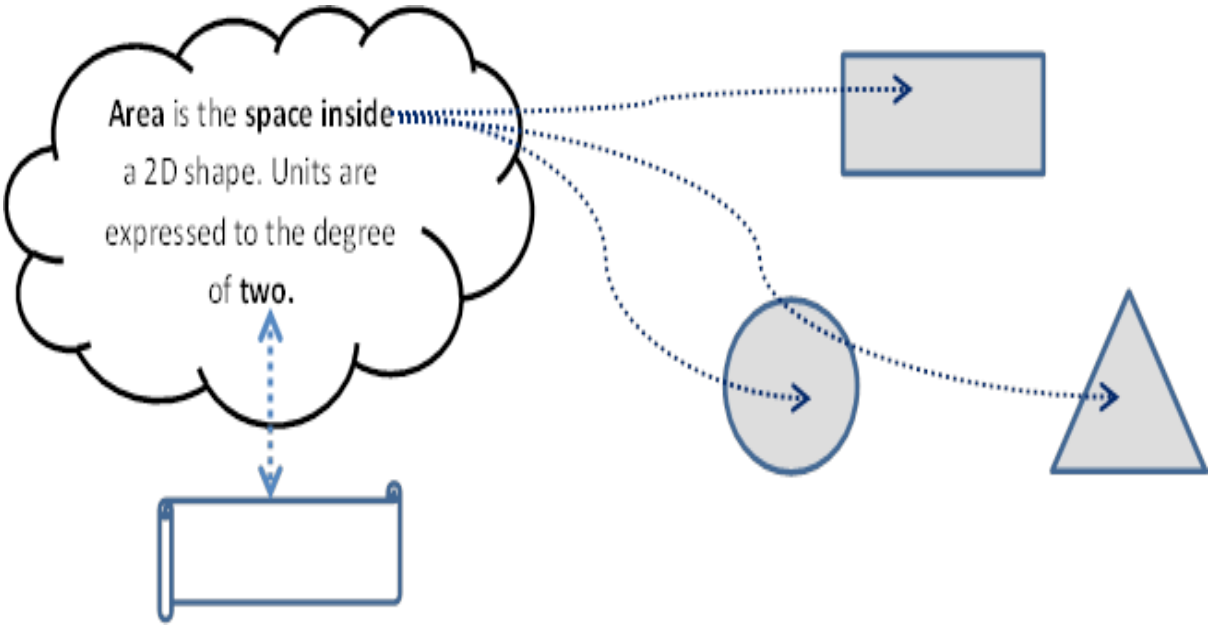
Perimeter of a court = 2 × (30,5m + 15,25m)✓SF **2 x (L+W) or 2L + 2W**

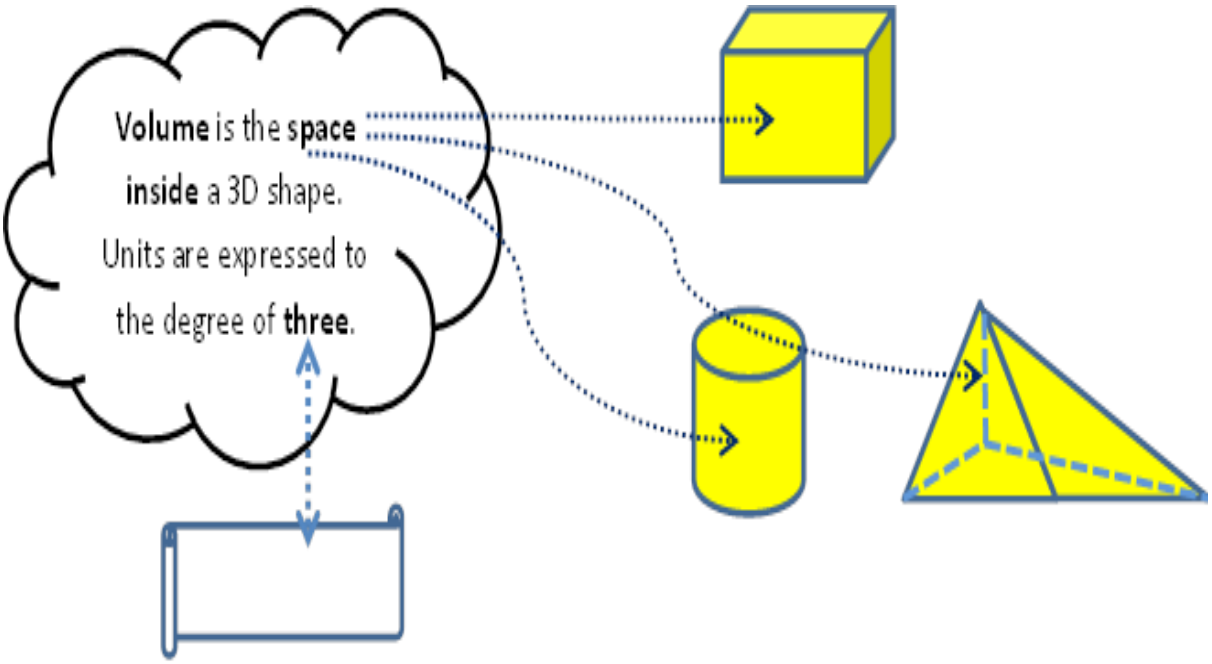
= 91,5**m**✓A **(unit)**

ASSESSMENT DESCRIPTORS	
Explain	Make clear; express in words, interpret and spell out.
Calculate	This means a numerical answer is required – in general, you should show your calculations, especially where two or more steps are involved.
Show	Do calculations to prove that the answer is correct.
Verify	Calculate, get the answer and compare the answer with the one given.

RESOURCES/ANNEXURES




Area is the space inside a 2D shape. Units are expressed to the degree of two.


Volume is the space inside a 3D shape. Units are expressed to the degree of three.

Note

Note

Note

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