MATHEMATICS LITERACY

BOOK 2 : SOLUTIONS PATHWAYS

GRADE 12

basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Read to Lead
A Reading Nation is a Leading Nation

2030 NDP

TABLE OF CONTENTS PAGE

1. Foreword 3

2. How to use this booklet 4

3. Examination tips for Mathematical Literacy 5

4. Overview of solution pathways 8

5. Solutions paths 9

6. Check your answers 33

7. Message to Grade 12 learners from the writers 41

8. Thank you 42

Foreword

In order to improve learning outcomes the Department of Basic Education conducted research to determine the specific areas that learners struggle with in Grade 12 examinations. The research included a trend analysis by subject experts of learner performance over a period of five years as well as learner examination scripts in order to diagnose deficiencies or misconceptions in particular content areas. In addition, expert teachers were interviewed to determine the best practicesto ensure mastery of thetopic by learners and improve outcomes in terms of quality and quantity.

The results of the research formed the foundation and guiding principles for the development of the booklets. In each identified subject, key content areas were identified for the development of material that will significantly improve learner's conceptual understanding whilst leading to improved performance in the subject.

The booklets are developed as part of a series of booklets, with each bookletfocussing onlyon one specific challenging topic. The selected content is explained in detail and include relevant concepts from Grades 10 - 12 to ensure conceptual understanding.

The main purpose of these booklets is to assist learners to master the content starting from a basic conceptual level of understanding to the more advanced level. The content in each booklets is presented in an easy to understand manner including the use of mind maps, summaries and exercises to support understanding and conceptual progression. These booklets should ideally be used as part of a focussed revision or enrichment program by learners after the topics have been taught in class. The booklets encourage learners to take ownership of their own learning and focus on developing and mastery critical content and skills such as reading and higher order thinking skills.

Teachers are also encouraged to infuse the content into existing lesson preparation to ensure in-depth curriculum coverage of a particular topic. Due to the nature of the booklets covering only one topic, teachers are encouraged to ensure learners access to the booklets in either print or digital form if a particular topic is taught.

2. How to use this booklet

Purpose

To a large extent, the National Diagnostic Reports highlightcommon problems that learners experience when answering National Examination question papers.

Among other things, these reports highlight the following problems:

- "One of the major problems inboth papers is learners' poor command of the relevant terminology and definitions."
- "Learnersdid not know abbreviations."
- "Candidates did not complete the entire table."
- "Candidates did not use the given formula."
- "Candidates struggled to covert Botswana pula into South African rand."

In answering Mathematical Literacy questions, you should always make use of the information given. This information is often given as the context within which the problem must be solved. The purpose of this booklet is therefore to help you to extract such information from a given context in Mathematical Literacy examinations as well aswhen doing the exercises found in textbooks.

Mathematical Literacy is taught and tested in a real-life authentic context. In order to sketch this context, a variety of texts, tables, pictures, diagrams, annexures, etc. are used.It follows that one of the skills needed to solve Mathematical Literacy problems is extracting the 'knowns' and the 'unknowns' from the given context.

'Knowns' are defined as information given in the context of a question, and 'unknowns'are defined as information given within a question.

Each section starts with examples, followed by fully calculated answers and explanations.

Activities based on the examples follow, to allow you to practise the skills you have acquired after reading the example.

The answers to all the activities are in **Section6: Check Your Answers.**

1.Examination tipsfor Mathematical Literacy

3.1Paper 1(set in a familiar context)

- **5 Questions**
  - Question 1
    - 30 marks (±5)
    - Level 1 type questions only
    - All 5 application topics
  - Question 2
    - Finance
    - Level 1 to 3 type questions
  - Question 3
    - Measurement
    - Level 1 to 3 type questions
  - Question 4
    - Maps, plans and other representations from the real world
    - Level 1 to 3 type questions
  - Question 5
    - Data handling
    - Level 1 to 3 type questions

- Mark allocation per topic in Mathematical Literacy P1
  - Finance (± 52 marks)
  - Measurement (± 30 marks)
  - Maps, plans and other…from the real world (± 23 marks)
  - Data handling (± 37 marks)
  - Probability (minimum 8 marks)

- Cognitive levels for Mathematical Literacy P1

  All levels have a range of ±5%

  - Level 1: 90 marks (60% of P1)
  - Level 2: 53 marks (35% of P1)
  - Level 3: 7 marks(5% of P1)
  - Level 4: 0 marks (0% of P1)

3.2Paper 2(set in a familiar and an unfamiliar context)

- **4 OR 5 Questions**
  - Question 1
    - Integrated application topics
    - Level 2 to 4 type questions
  - Question 2
    - Integrated application topics
    - Level 2 to 4 type questions
  - Question 3
    - Integrated application topics
      Level 2 to 4 type questions
  - Question 4
    - Integrated application topics
    - Level 2 to 4 type questions

    AND / OR
  - Question 5
    - Integrated application topics
    - Level 2 to 4 type questions

- **Mark allocation per topic in Mathematical Literacy P2**
  - Finance (± 52 marks)
  - Measurement (± 30 marks)
  - Maps, plans and other…from the real world (± 23 marks)
  - Data handling (± 37 marks)
  - Probability (minimum 8 marks)

- **Cognitive levels for Mathematical Literacy P2**

  All levels have a range of ±5%

  - Level 1:0 marks (0% of P2)
  - Level 2:37 marks (25% of P2)
  - Level 3:53 marks (35% of P2)
  - Level 4: 60 marks (40% of P2)

3.3 Allocation of examination marks (i.e. Paper 1 and Paper 2 combined)

Cognitive Levels:

Level 1: 90 marks or 30% for P1 and P2 combined.

Level 2: 90 marks or 30% for P1 and P2 combined.

Level 3: 60 marks or 20% for P1 and P2 combined.
Level 4: 60 marks or 20% for P1 and P2 combined.

3.4 Key features of a Mathematical LiteracyPaper 1examination

Paper 1 is the easierquestion paper of the two,for the following reasons:

- **90**of the **150** marks areallocated to **Level 1** type questions.
- It is set in a familiar context.
- Question 1(30 marks ±5) contains Level 1 type questions only with a short description of the context.

You will be able to scorethese marks if **you workthrough past examination papers**,**work** in the classroom **everyday,** and **complete all tasks** given by the educator.

Examples of these Level 1 type questions are listed in the following past DBE examination papers:

2017 June examination P1

2017 November examination P1

2018 March examination P1

2018 June examination P1

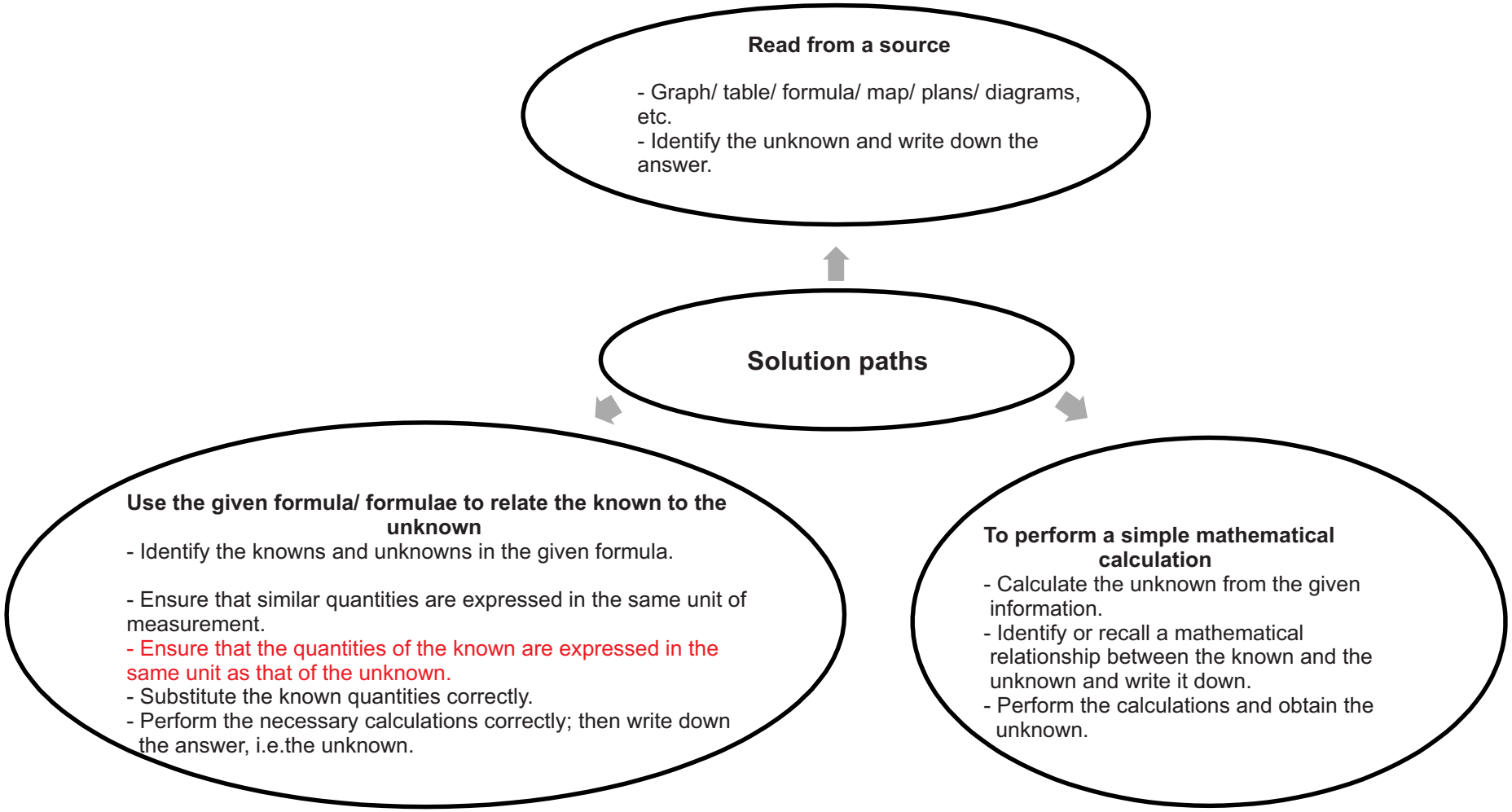
3.5 Time management for examination preparation

If you have 100 hours to prepare for the examination, the following can be used as a guide regarding how to use your hours:

Application topics	Number of hours
Finance	35
Measurement	20
Maps, plans and other	15
Data handling	25
Probability	5

1. Overview

Solution pathways (carrying out the steps from 'known' to 'unknown')



1.Solution paths

Example 2

Identify the following from the text below:

1. Knowns
2. Unknowns
3. The relationship between the known and the unknown.

DBE JUNE 2018 P1 Q2

2.2

John is interested in running a small internet station in a coffee shop. He searches the internet and finds the advertisement below on a website www.wish.com. Keyword

ALL prices include 14% VAT.

Portable Pocket Hotspot (PPH)
Was: R988,00
Now: R210,00

Identification of different names of items

New Ultra-thin mouse (UTM)
Was: R223,00
Now: R13,00

[Source: www.wish.com]

Study the advertisement above and answer the questions that follow:

2.2.1 What does the acronym *VAT* stand for? (2)

2.2.2 Calculate the amount of VAT payable on the old price for the PPH. (3)

2.2.3 Calculate the difference between the *new price* and the *old price* of the UTM. (2)

2.2.1 What does the acronym *VAT* stand for? (2)

Solution path

Value
Added
Tax

The first letter of the acronym MUST start with V (*known*); then make sure the letters (*unknown*) after V are correct. The secondletter of the acronym MUST start with A (*known*); then make sure the letters (*unknown*) after A are correct.Thethird letter of the acronym MUST start with T (*known*); then make sure the letters (*unknown*) after T are correct.

2.2.2 Calculate the amount of VAT payable on the old price ofthe PPH. (3)

$$\text{VAT} = \text{R988,00} \times \frac{14\%}{114\%}$$

The candidate must read and write the correct value from the table (known), and then multiply 14% over 114% (unknown).

114 is from VAT Inclusive

= R121,333333

Calculator answer (as it appears on the calculator).

˜ R121,33

Answer(in rands andcents).

OR

VAT = R988,00 ÷1,14 × 0,14

The candidate must read and write the correct value from the table (known), then multiply 1,14 (unknown), and then multiply by 0,14 (known).

114 is from VAT Inclusive

= R121,333333

Calculator answer (as it appears on the calculator).

˜ R121,33

Answer(in rands andcents).

2.2.3 Calculate the difference between the *new price* and the *old price* of the UTM. (2)

Solution path

Difference = old price – new price

Create an equation or formula for calculating the difference.Identifythe prices of UTM, i.e. which value is bigger and which value is smaller.

Difference = R223 – R13

Subtract the smaller value from the bigger. value.

= R210

Answer.

Activity 1

A

Identify the following from each of the questions below:

1. Knowns
2. Unknowns
3. The relationship between the known and the unknown

1.1 Tyrone buys chocolates in bulk to make gift baskets containing different chocolate bars, which he will sell. He buys boxes that contain bars of Peppermint Crisp, BarOne, Kit Kat, and Cadbury 80g chocolate slabs.

Picture of a gift basket with chocolate bars.

DBE JUNE 2017 P1 Q1

1.1.1 Determine the total price of a box of Peppermint Crisp bars if there are 40 bars in a box and the unit price of a bar is R8,70. (2)

Solution path

_____ ← Multiply the price of a bar with number of bars in a box.

_____ ← Answer

1.1.2 Explain the term *profit*. (2)

Solution path

_____ ← Identification of 3 key words.

_____ ← Construct/ form a sentence.

1.1.3 A box of Kit Kat bars costs R435,04. To determine the selling price, Tyrone increases the cost price by 40%. Determine the amount that he adds to the cost price. (2)

Solution path

_____ ← Multiply the percentage increase by the price of a box of Kit Kat bars.

_____ ← **Calculator answer** (as it appears on the calculator).

_____ ← **Answer**(in rands andcents).

B

DBE NOV 2017 P1 Q2

2.3 Rajesh exchanged a gift of £360,00 into South African rand at a bank.

The exchange rate was **R1,00 = £0,05773**.

The bank charged 1,95% commission on the amount exchanged.

Rajesh then invested R5 000 of his gift in a fixed deposit account for $1\frac{1}{2}$ years at a compound interest rate of 6,3% per annum.

2.3.1 Calculate (in pounds) the amount of commission Rajesh paid. (2)
2.3.2 Convert £360,00 to rand. (3)
2.3.3 Calculate (without the use of a formula) the value of the fixed deposit at the end of years. Show all the steps of the calculation. (5)

2.3.1 Calculate (in pounds) the amount of commission Rajesh paid. (2)

Solution path

_____ ← Multiply the price of the gift in pounds by the bank charges.

_____ ← Answer in pounds.

2.3.2 Convert £360,00 to rand. (3)

Solution path

_____ ← Divide the price of the gift in pounds by the exchange rate in pounds.

_____ ← Answer in rands.

2.3.3 Calculate (without the use of a formula) the value of the fixed deposit at the end of $1\frac{1}{2}$ years. Show all the steps of the calculation. (5)

Solution path

_____

_____

_____

Calculate the interest for the first year. Then multiply the invested amount by the interest rate.

To calculate the amount for the firstyear, add the invested amount to the interest for the firstyear. Calculate the interest for the full second year and divide it by 2 to get the interest for the half year.

To get the value of the fixed deposit, add the amount after one year and the interest for the half year.

C

DBE MARCH 2018 P1 Q3

3.2 A nurse uses a sedan vehicle to travel. The fuel consumption of her vehicle is 7,6 litres per 100 km when travelling at an average speed.

3.2.1 Calculate (to the nearest km) the distance her vehicle can travel using 55 litres of petrol. (3)

3.2.2 The nurse spends 1 hour and 45 minutes on a particular day driving between two workstations that are 189 km apart. Determine the average speed of the vehicle.

Use the following formula:
Average speed = $\frac{\text{distance}}{\text{time}}$ (3)

Solution path
3.2.1

$Distance = \frac{551}{7,61}$ — Divide litres of petrol used by fuel consumption in litres.

$= \frac{551}{7,61} \times 100$ — Then multiply by fuel consumption distance.

Calculator answer (as it appears on the calculator).

$= 724$ km — Answer(rounded to the nearest km).

Solution path

3.2.2 $Time = \frac{551}{7,61} = 0,75$ ← Convert known given time into hours, i.e. 45 min into hours.

$Total\ Time = 1+0,75 = 1,75$ ← Then add the answer to 1 hour.

$Average\ speed = \frac{189}{1,75}$ ← Substitute the formula.

$= 108\ km/h$ ← Answer in units.

D

DBE JUNE 2018 Q5

QUESTION 5

5.1 Statistics South Africa (STATSSA) collects and releases data based on passenger transport annually. TABLE 2 below shows the 2016 data for land passenger transportation

TABLE 2: 2016 DATA FOR LAND PASSENGER TRANSPORT K

	LAND TRANSPORT				TOTAL LAND	
	RAIL		ROAD			
	Passenger journeys in thousands	Income in millions (R)	Passenger journeys in thousands	Income in millions (R)	Passenger journeys in thousands	Income in millions (R)
JAN.	30 526	238	24 279	748	54 805	986
FEB.	36 528	266	27 684	757	64 212	1 023
MAR.	34 250	254	30 277	869	64 527	1 123
APR.	32 940	238	24 268	743	57 208	981
MAY	32 372	233	25 940	770	58 312	1 003
JUN.	32 741	216	25 308	790	58 049	1 006
JUL.	31 792	247	23 609	768	55 401	1 015
AUG.	33 550	251	24 835	769	58 385	1 020
SEP.	38 024	275	27 144	836	65 168	1 111
OCT.	35 802	269	24 304	771	60 106	1 040
NOV.	34 700	254	25 225	782	59 925	1 036
DEC.	23 592	198	22 313	801	45 905	999
TOTAL	**396 817**	**...**	**305 186**	**9 404**	**702 003**	**12 343**

[Adapted from www.statssa.co.za]

Use the table above to answer the questions that follow:

5.1.1 Write down the month with the highest income for rail transportation. (2)

5.1.2 Calculate the mean monthly income for rail transportation. (3)

5.1.3 Calculate the road transportation income for April as a percentage of total land income. (3)

5.1.4 Write down the total number of land passenger journeys for December. (2)

5.1.5 Write down (in words) the total number of passenger journeys for September. (2)

5.1.6 Calculate the median total land income. (3)

5.1.7 Write down the probability, as a decimal, of randomly selecting a month when the rail income for passenger transport was less than R200 000 000. (3)

5.1.8 A bar graph showing the monthly income for road transport for the last six months of the year, has beendrawn on ANSWER SHEET 1.

On the same set of axes, draw another bar graph that represents the monthly income for rail transport for the last six months of the year. (6)

5.1.1 Write down the month with the highest income for rail transportation. (2)

Solution path

_____

Look at column with the months for rail transportation and identify the month with the highest income.

5.1.2 Calculate the mean monthly income for rail transportation. (3)

Solution path

_____

ADD the monthly income for rail transportation and **DIVIDE** by the number of months.

_____

Answer in millions.

5.1.3 Calculate the road transportation income for April as a percentage of the total land income (3)

Solution path

_____

Identify the road transportation income for April and the total land income.

DIVIDE the road transportation income for April by the total land income; then**MULTIPLY** by 100.

_____

Answer in percentage.

5.1.4 Write down the total number of land passenger journeys for December. (2)

Solution path

_____

Identify the column with months and the total number of land passenger journeys for December.

_____

Add three zeros, because the answer must be in thousands.

5.1.5 Write down (in words) the total number of passenger journeys for September. (2)

Solution path

_____

Identify the total number of passenger journeys for September.

_____

Write the answer in word format.

5.1.6 Calculate the median total land income. (3)

Solution path

_____

Identify the total land income.

_____

Write in ascending order (from lowest to highest).

_____

Take the **two innermost** numbers and **divide by two** i.e. for even numbers.

_____

Answer in millions.

5.1.7 Write down the probability, as a decimal, of randomly selecting a month when the rail income for passenger transport was less than R200 000 000. (3)

Solution path

_____

Identify the column for months and count the number of months when rail income for passengers was less than R200 000 000.

_____

Write thetotal number of months as a denominator, and the number of months with railpassenger income of less than R200 000 000 as a numerator.

Answer must be in **decimal** form **(the comma must be visible).**

5.1.8	A bar graph showing the monthly income for road transport for the last six months of the year, has beendrawn on ANSWER SHEET 1. On the same set of axes, draw another bar graph that represents the monthly income for rail transport for the last six months of the year.	(6)

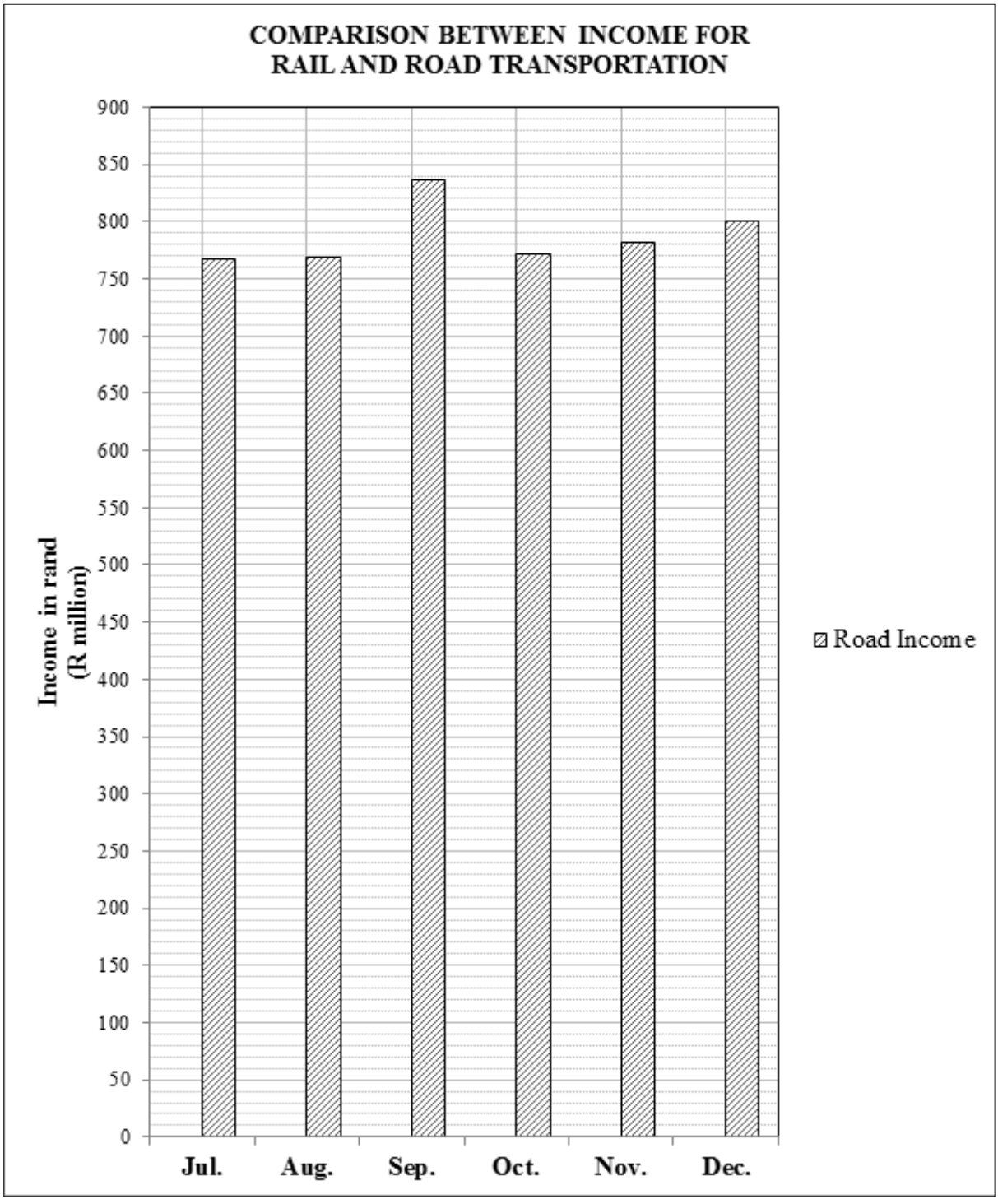
Solution path

Identify the monthly income for rail transport for the last six months of the year, i.e. from July to December).

Draw the bar graphs in the correct months, and make sure the height of each bar graph is in the correct position in terms of rand.

ANSWER SHEET 1

QUESTION 5.1.8



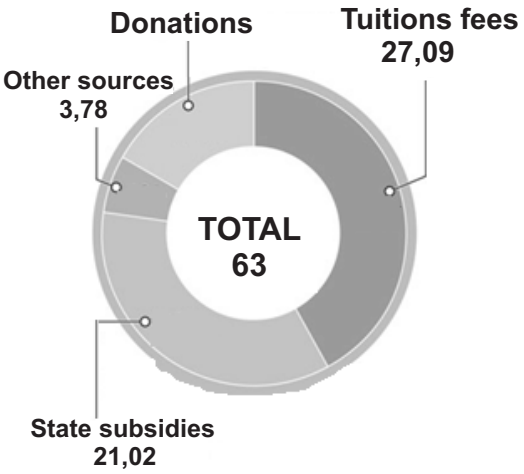
E

DBE NOV 2017 P1 Q 5

5.2 The two pie charts below, **A** and **B**, represent the income and expenditure of all South African tertiary institutions.

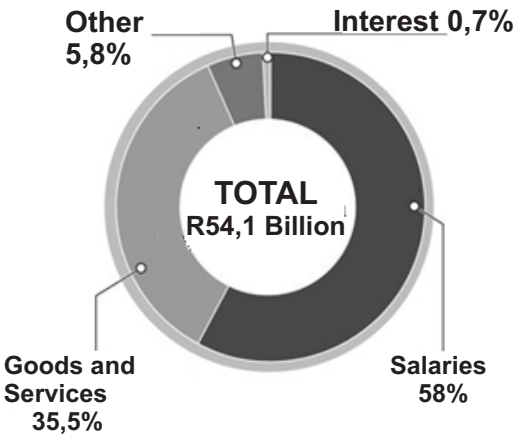
PIE CHART A

INCOME (IN BILLION RAND)



PIE CHART B

TYPE OF EXPENDITURE



[Source: www.grafika24.co.za]

5.2.1 Give ONE example of an Other type of expenditure applicable to tertiary institutions. (2)

5.2.2 What percentage of income comes from donations? (3)

5.2.3 Calculate the amount (in rand) of interest paid by tertiary institutions. (3)

5.2.4 Determine the difference (in millions of rand) between the income and expenditure of the tertiary institutions. (3)

5.2.1 Give ONE example of an Other type of expenditure applicable to tertiary institutions. (2)

Solution path

Write one Other type that is NOT given in the pie chart.

5.2.2 What percentage of income comes from donations? (3)

Solution path

Identify and write down the total income.

Identify and write down the income from tuition fees, state subsidies and other sources.

Add the tuition fees, state subsidies and other sources. Then subtract the sum from the total income.

_____

Write the answer in billions (of rand). Then divide by the total income, and multiply by 100.

_____

Write the answer as a percentage.

5.2.3 Calculate the amount (in rand) of interest paid by tertiary institutions. (3)

Solution path

_____

Identify the road transportation income for April and the total land income.

_____

DIVIDE the road transportation income for April by the total land income, and **MULTIPLY** by 100.

_____

Answer in percentage.

5.2.4 Determine the difference (in millions of rand) between the income and expenditure of the tertiary institutions. (3)

Solution path

_____

Identify the income and expenditure. Then subtract expenditure from income.

_____

Answer in billions of rand.

_____

Answer in millions of rand.

Understanding the solution path – maps and plans

The solution path consists of the steps completed to get the answer from the given information; that is, executing the steps involved in moving from the 'known' to the 'unknown'.

The examples below illustrate the process.

Example 1

1. Rammone plans to travel from Colesberg to Port Elizabeth using only national roads.
Diagram 1 alongside shows a strip chart of the route from Colesberg to Port Elizabeth.
Use Diagram 1 to answer the questions that follow.

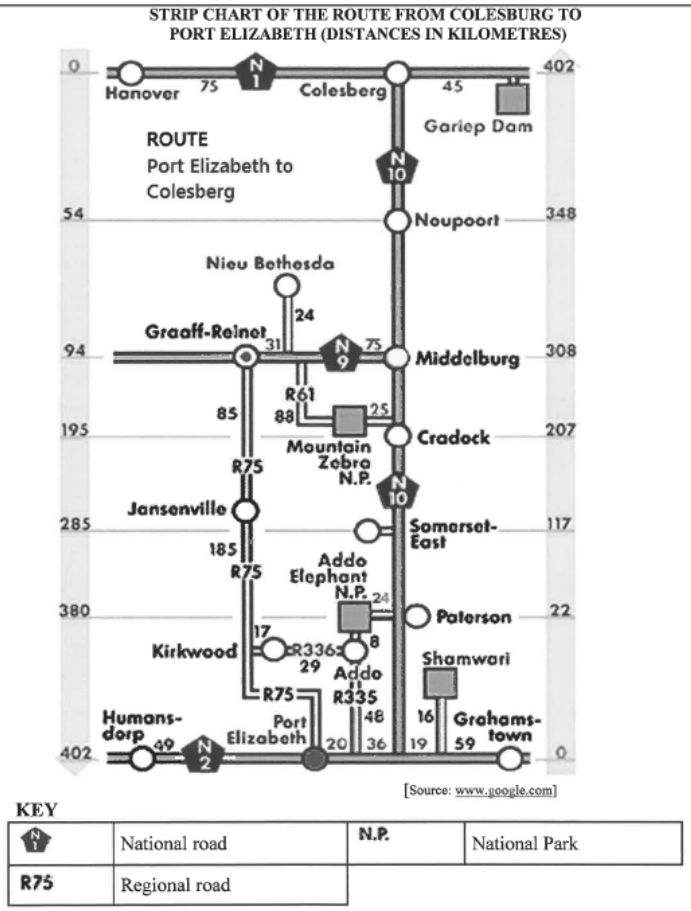
1.1 Name the national roads that Rammone will use to travel to Port Elizabeth.

1.2 Which national park is furthest from the N10?

1.3 Rammone met a friend in Paterson who had to travel 61km via the R336 from his hometown. Name the friend's hometown.

1.4 Write down the names of the two national parks shown on the map.

1.5 Calculate the travel distance between the TWO national parks.



[Source: www.google.com]

Diagram 1

Solution: (extracting information + solution path)

Known: strip chart features

1.1 Unknown: The name of the national road

Relationship: known ⟷ unknown

Extracting information

Answer: N10

Use the map key to identify the road from the map

1.2 Known: Map features, N10

Unknown: national park furthest from N10

Extract information.

Relationship: known ⟷ unknown

Answer: Addo Elephant Park

Use the map key to identify the national park.

1.3 Known: strip chart features;
Destination = Paterson;

Name of the road = R336;

Distance between home town and Paterson = 61 km.

Extract information.

Unknown: hometown

Relationship: known ⟷ unknown

Distance from hometown along R336 = 29km (identify distance on R336)

29km + 24km = 61km(identify distance to Paterson = that gives

61km when added to 29km).

Solution path

Identify the home town.

Answer: Kirkwood

1.4 Known: strip chart features
Unkown: names of the national parks.

Extracting information

Relationship: known ⟷ unknown:names of the national parks

Answer: Mountain Zebra and Addo Elephant

Identify the two national parks from the chart.

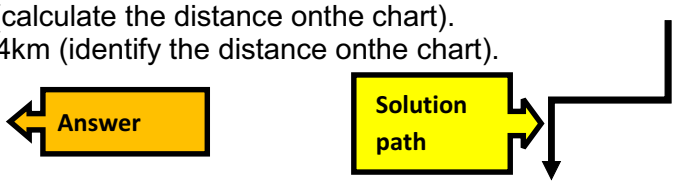
1.5 Known: Strip chart features
Unkown: distance between two parks

Extract information.

Relationship: known ⟷ unknown

Distance from Mountain Zebra to Cradock = 25km (identify the distance onthe chart).
Distance from Cradock to Paterson = 185km (calculate the distance onthe chart).
Distance from Paterson to Addo Elephant = 24km (identify the distance onthe chart).

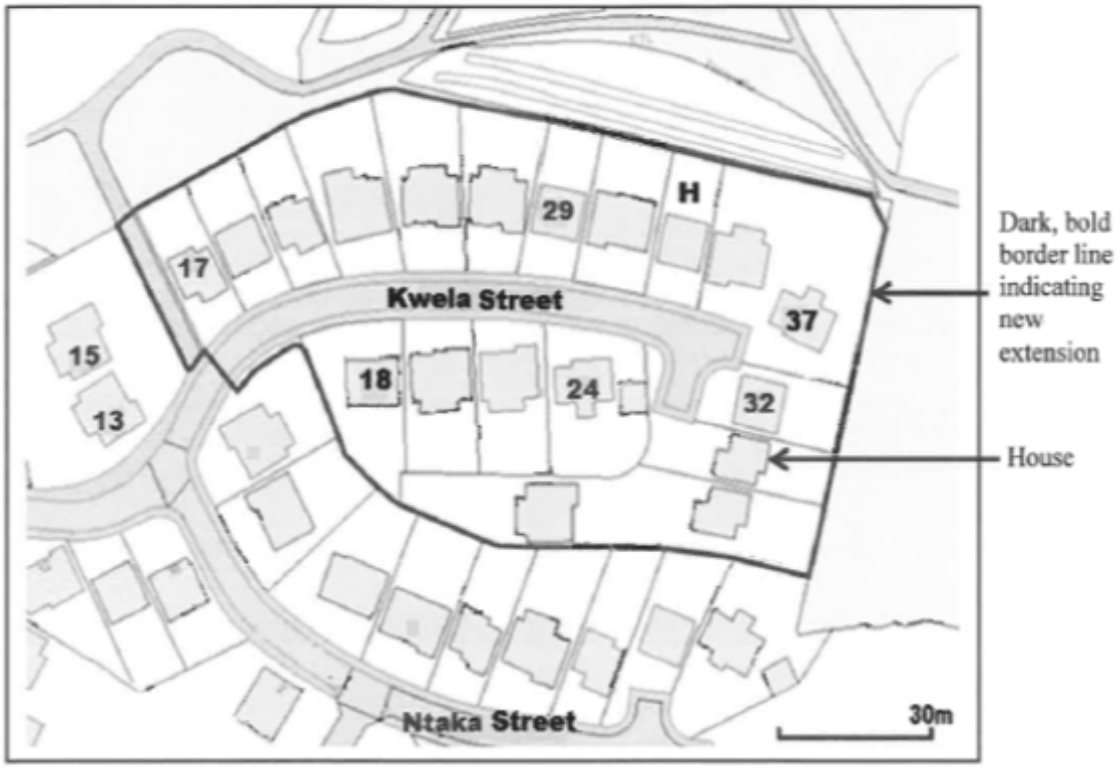
Answer: 25km + 185km + 24km = 234km



ACTIVITIES

Activity A (In this activity, work out a complete solution to the question. DO NOT write the steps you take in words.Simply show them by doing the necessary calculations.)

Map of Mandela Park Extension



Enlargement of a section of the main map

[Source: https://uniformonline.harrogate.gov.uk/arcgis/rest/services/Base Mapping]

Diagram 2: Map of Mandela Park

1.1.1	If the numbering system for the properties follows the same pattern as shown on the main map, determine the street address of the property marked **H**.	(2)

Solution path

House number and street address.

1.1.2	Use the measurement and the given scale to determine the actual dimensions (in metres) of the rectangular property marked **H**.	

Solution path

Measure the length and the width.

Use the bar scale given to measure the width.

Simplify the scale into unit ratio.

Multiply the length with the simplified scale.

Multiply the width with the simplified scale.

1.1.3	Lizette stated that the enlargement is 5 times bigger than the corresponding section on the main map. Verify whether her statement is valid, by showing ALL calculations.	

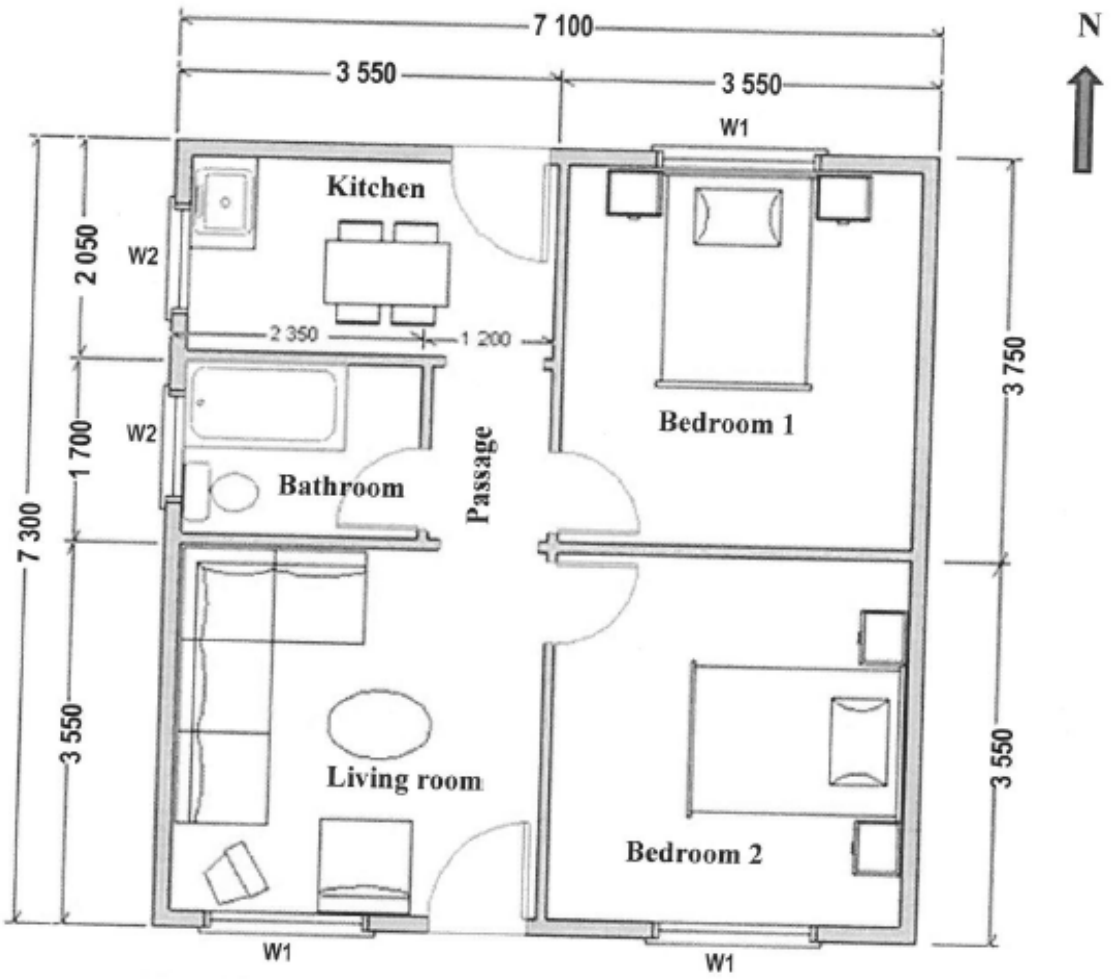
Solution path

Measure the length.

DIVIDE the length by the enlargement value.
OR
DIVIDE the width by the enlargement value.

Answer for the purpose of comparison.

Conclusion



Key:

All measurements are in mm	
	Door
	Window

2. **Diagram3** above shows the floor plan of an RDP house. Use the floor plan to answer the following questions.

2.1 Determine the total number of windows shown on the plan.

2.2 Write down the ratio (in simplified form) of the number of outside doors to the number of inside doors.

2.3 **Write down the general direction of the bathroom from Bedroom2.**

2.4 Show, with calculations, how the total living area of 51.8 m^2 was determined. The following information should be used:

Area = length × width
1m = 1000mm

Solution:(extracting information + solution path)

Known: floor plan
Unknown: number of windows

Extract information.

Relationship: known ⟷ unknown

Answer: 5 ← Use the key to identify windows on the plan; then count the number of windows.

2.1 Known: floor plan
Unknown: ratio between outside and inside doors

Extract information.

Relationship: known…… ⟷ ……unknown

Number of outside doors = 3 ← Use the key to identify number of outside doors.

Answer: $\frac{??}{??}$ ← Write down the ratio.

Known: floor plan
2.2 n
Direction indicator (North)
Unknown: general direction of the bathroom from Bedroom 1

Extract information.

Relationship: knownunknown ⟷

Answer: north west ← Identify the general direction.

2.3 **Known: length(mm) = 7300, width(mm) = 7100, area(m^2) = 51.8m^2.**
Formula: area = length × width
Unit conversion factor: 1m = 1000mm

Unknown: solution path from length and width values to the area value.

Relationship: known ⟷ unknown

Unit conversion: length(m) = 7.3, width(m) = 7.1 ← Unit conversion

Area = 7.3m × 7.1m ← Substitution

= 51.83m^2 ← Multiplication

= 51.8m^2 ← The answer is the same as the known value.

ACTIVITIES

Activity B:

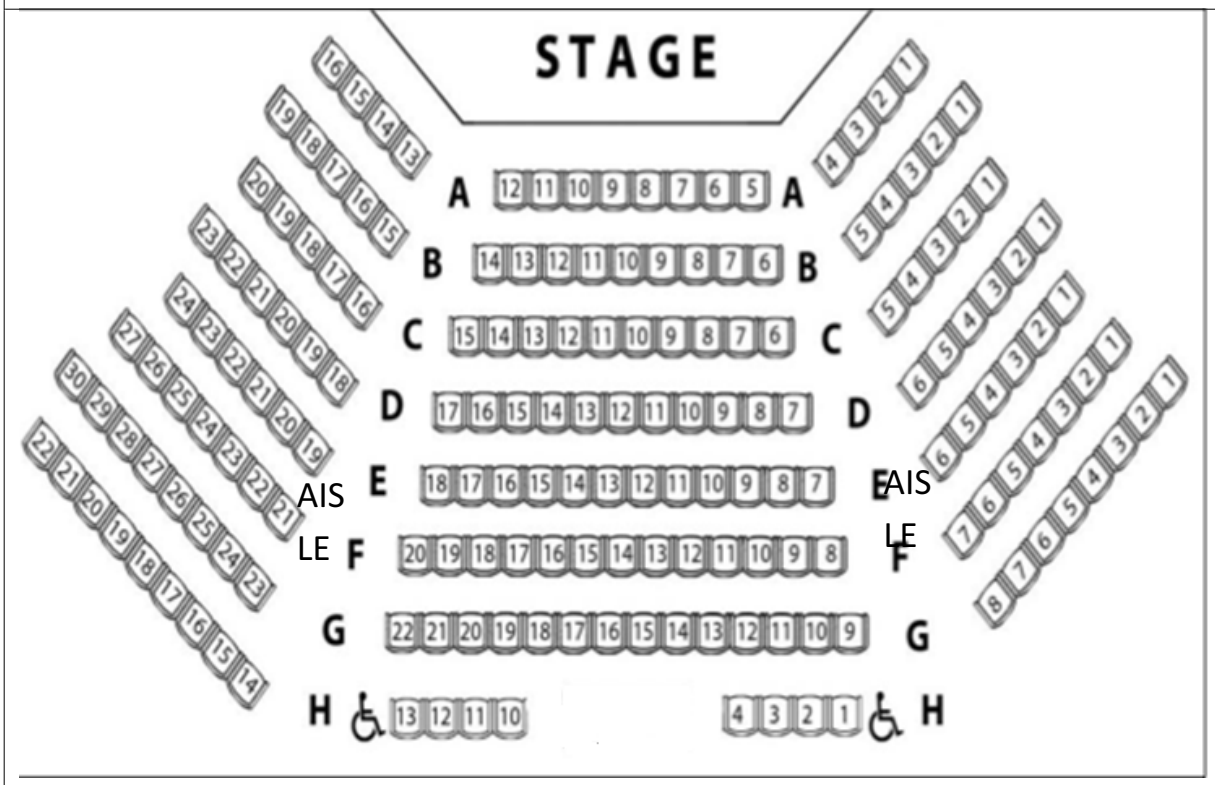


Diagram 4: Baxter Theatre, Cape Town

2. Diagram 4 above shows theseating plan in the Baxter Theatre in Cape Town. Use Diagram 4 to answer the questions that follow. Indicate only the known, the unknown and the relationship between them in each question.

2.1 Determine the total number of chairs in the cinema.

2.2 Thembi bought a ticket to attend a concert at the Baxter Theatre. Determine the probability that Thembi gets a ticket for a seat in row G.

2.3 Thembi gets a ticket for G5. She wants to go and say hello to her friend who is sitting at seat A13. Use the words ***left, right, up***and***down***to give directions for the shortest route Thembi should take.

2.4 How many spaces are reserved for wheelchairs?

2.5 Which row would be most comfortable for people with long legs?.

Example

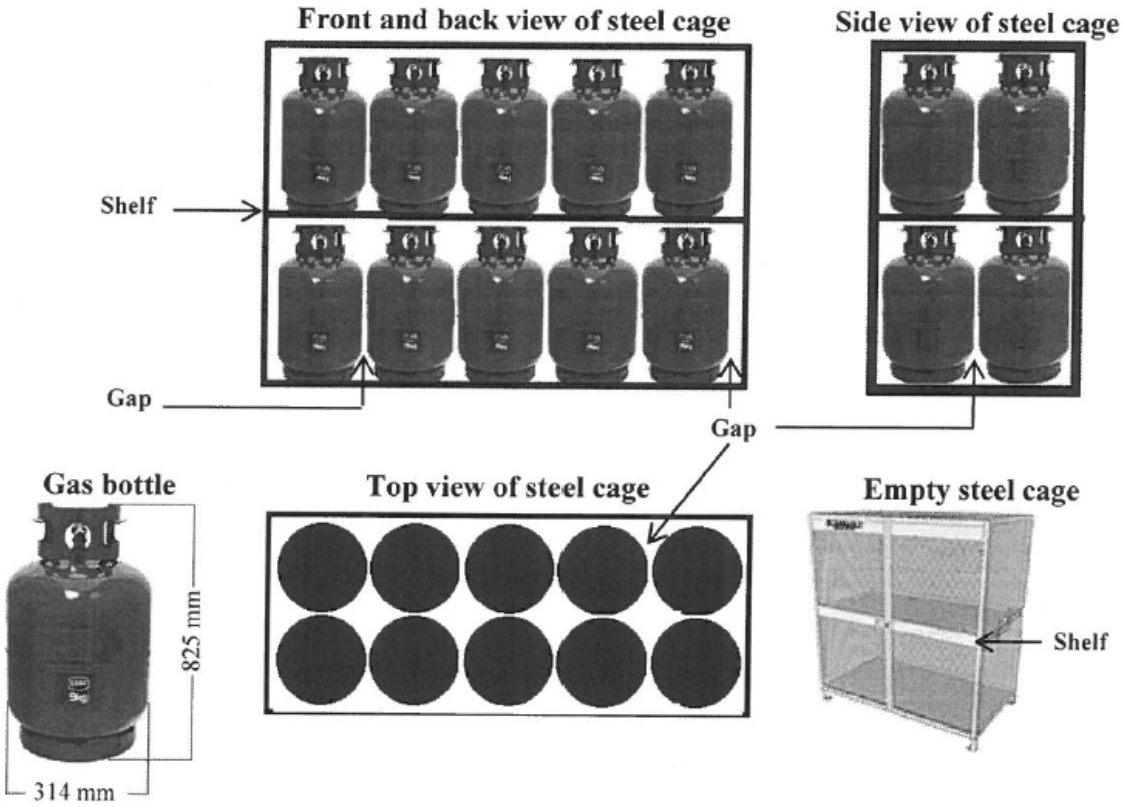


Diagram5: Packaging arrangement of cylindrical gas containers

3.A certified gas dealer sells 9kg gas containers. These cylindrical containers are stored outside the shop in a steel cage, as shown above. There is a gap of 10mm on either side of each gas bottle when they are placed on the shelf in the steel cage.

3.1 Calculate the maximum number of gas containers that can fit into ONE steel cage.

3.2 Determine the dimensions of the rectangular shelf in metres.

3.3 Calculate the weight of the gas containers in a filled cage.

3.4 Determine the height of a cage, without its legs.

3.5 The company sells rectangular metal sheets with dimensions 3,4 m by 2,1 m. Determine the maximum number of shelves for the steel cage that could be cut from ONE metal sheet. Show ALL calculations.

Solution: (extracting information + solution path)

3.1

Known: Packaging arrangement Extract information.
Weight of the container = 9kg.
Diameter of gas container = 314mm.
Height of the container = 825mm.
Gap between containers = 10mm.

Extract information.

Unknown: The maximum number of gas bottles in a cage.

Relationship: known ⟷ unknown
Answer: 10 containers in 1 row

Count the gas containers in the diagram = 20 gas containers. (Multiply the number of containers by 2.)

3.2
Known: Packaging arrangement
Weight of container = 9kg.
Diameter of gas container = 314mm.
Height of container = 825mm.
Gap between containers = 10mm.

Extracting information

Unknown: Length and width of the shelf, both in metres.

Relationship:knownunknown ⟷

Ccount the gaps between the containers along the length; then add.

diameters)

Answer: Units conversion: diameter = 314mm = 0.314m.
Gap between containers = 10mm = 0.01m.

Length(in metres) = 6×0.01m + 5×0.314m = 1.63m.

Width(in metres) = 3×0.01 + 2×0.314 = 0.658m.

Count the gaps between the containers along the width, and add diameter.

3.3
Known: Packaging arrangement
Weight of container = 9kg.
Diameter of gas container = 314mm.
Height of container = 825mm.
Gap between containers = 10mm.

Extract information.

Unknown: Height of the cage.

Answer: Height(without legs) = 2×825mm = 1650mm.

Multipy height of container by 2.

3.4
Known: Packaging arrangement
Weight of container = 9kg.
Diameter of gas container = 314mm.
Height of container = 825mm.
Gap between containers = 10mm.
Dimensions of the metal sheet: length = 3.4m = 3400mm.
width= 2.1m = 2100mm.

Extracting information.

Unknown: Maximum number of shelves
Relationship: known ⟷ unknown

Ddivide the length of the metal sheet by the length of the shelf.Divide the width of the metal sheet by the width of the shelf. Multiply the answers to get the total number of shelves.

Number of shelves = $\frac{3400\ mm}{1630\ mm}$ x $\frac{2100\ mm}{658\ mm}$ = 2 x 3 = 6.

Activity 3(DBE May/June 2018 P2)

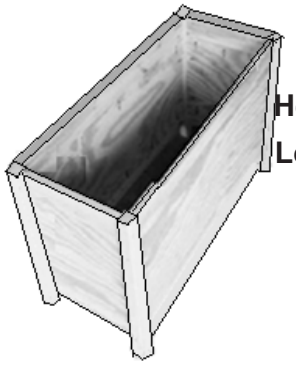
Landy has a contract to deliver 2 750 wooden toy storage boxes without lids. The dimensions of a sheet of plywood and a box are shown below.

Picture of a sheet of plywood

York Timbers Plywood Pine

2 440 mm × 1 220 mm × 12 mm

Woodentoy storage box



Height 279 mm

Length 508 mm

Width 304 mm

[Source: www.yorktimber.com]

Diagram 6 below shows the layout of the parts of toy storage boxes on ONE sheet of plywood.

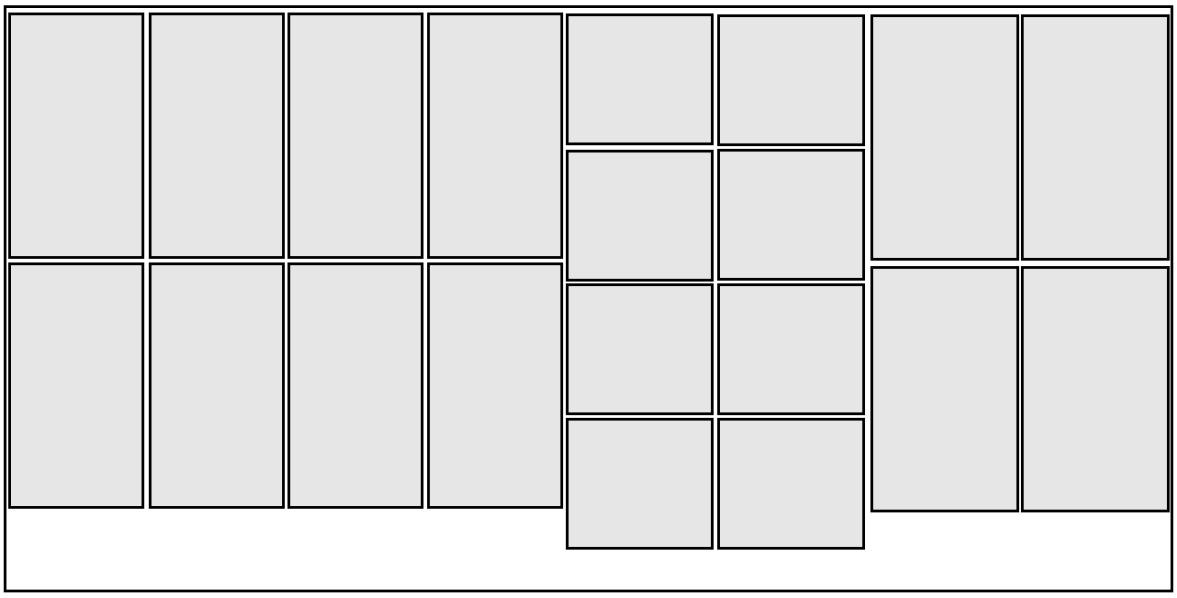


Diagram 6

Use the information above to answer the questions that follow:

3.1 Determine how many complete boxes can be cut from ONE sheet of plywood.

3.2 Verify whether 687 sheets of plywood will be enough to make 2 750 boxes. Show ALL calculations.

6. Check your answers

Activity 1

A

1.1

Tyrone buys chocolates in bulk to make gift baskets containing different chocolate bars, which he will sell. He buys boxes that contain bars of Peppermint Crisp, BarOne, Kit Kat, and Cadbury 80g chocolate slabs.

Picture of a gift basket with chocolate bars.

DBE JUNE 2017 P1 Q1

	1.1.1	Determine the total price of a box of Peppermint Crisp bars if there are 40 bars in a box and the unit price of a bar is R8,70.		(2)

Solution path

??8,70 × 40

= ??348

Multiply the price of a bar bythe number of bars in a box.

Answer

	1.1.2	Explain the term *profit*		(2)

Solution path

Selling price, more, cost price

Identify 3 keywords.

A profit is made when the selling price is more than the cost price.
OR
Profit is the amount added to the cost price.
OR
Profit is making more money than the cost price.
OR

Constructed sentence

There is a positive difference between income and expenditure.
OR
Income is more than cost or expenses.
OR
There is extra money after the sale of the product.

	1.1.3	A box of Kit Kat bars costs R435,04. To determine the selling price, Tyrone increases the cost price by 40%. Determine the amount that he adds to the cost price.		(2)

Solution Path

$??????????? = 40\% \times ??435{,}04$ ← **Multiply the percentage increase by the price of a box of Kit Kat bars.**

$= ??174{,}016$ ← **Calculator answer** (as it appears on the calculator).

← **Answer**(rands andcents).

B

DBE NOV 2017 P1 Q2

2.3	Rajesh changed a gift of £360,00 into South African rand at a bank. The exchange rate was **R1,00 = £0,05773**. The bank charged 1,95% commission on the amount exchanged. Rajesh then invested R5 000 of his gift in a fixed deposit account for $1\frac{1}{2}$ years at a compound interest rate of 6,3% per annum.	

2.3.1 Calculate (in pounds) the amount of commission Rajesh paid. (2)
2.3.2 Convert £360,00 to rand. (3)
2.3.3 Calculate (without the use of a formula) the value of the fixed deposit at the end of $1\frac{1}{2}$ years. Show all the steps of the calculation. (5)

	2.3.4	Calculate (in pounds) the amount of commission Rajesh paid.		(2)

Solution path

$Commission = 1{,}95\% \times £\ 360{,}00$

Multiply the price of the gift in pounds by the bank charges.

$= £\ 7{,}02$

Answer in pounds.

	2.3.2	Convert £360,00 to rand.		(3)

Solution Path

$£\ 360{,}00 = \frac{360}{0{,}05773}$

Divide the price of the gift in pounds by the exchange rate in pounds.

$= R\ 6\ 235{,}9258 \ldots$

Calculator answer (as it appears on the calculator).

= R 6 235, 93 OR R6 235 OR R 6 236

Answer in rands.

	2.3.3	Calculate (without the use of a formula) the value of the fixed deposit at the end of $1\frac{1}{2}$ years. Show all the steps of the calculation.		(5)

Solution path

Interest after 1 year = R5 000 x 6,3%
= R315

Calculate interest for the first year. Then multiply the invested amount by the interest rate.

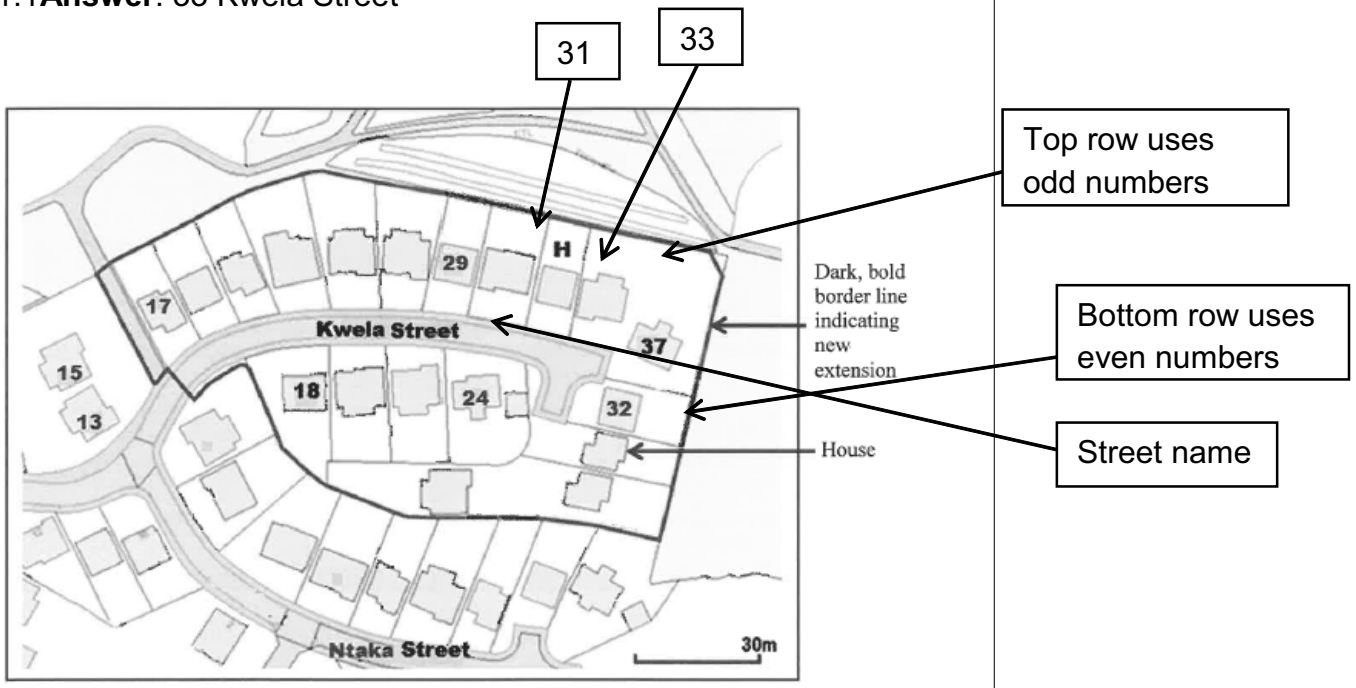
To calculate the amount for the firstyear, add the invested amount and the interest for the firstyear. Calculate interest for the full second year and divide it by 2 to get the interest for half a year.

To get the value of the fixed deposit, add the amount after one year and the interest for the half-year.

Check your answers

ACTIVITY 1(DBE Nov 2017 P2)

1.1**Answer**: 33 Kwela Street



1.2

Length = 22 mm
Width = 9 mm

Scale 25 mm : 30m
25 mm : 30 000 mm
1 : 1 200
∴Length = 22 × 1 200 mm
= 26 400 mm
= 26,4 m

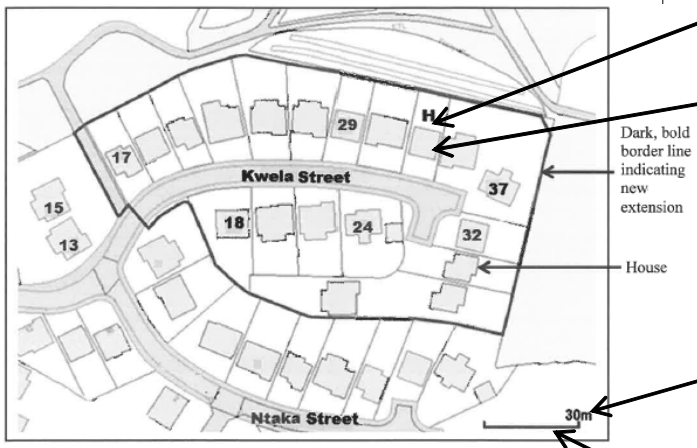
Width = 9 × 1 200 mm
= 10 800 mm
= 10,8 m

OR

Length = 22 mm
Width = 9 mm

Scale 25 mm = 30m

∴Length = $\frac{30}{25}$ × 22 m
= 26,5 m
Width = $\frac{30}{25}$ × 9m
= 10,8 m



Measured length = 22 mm

Measured width = 9 mm

Given length of scale = 30 m

Measured length of scale = 25 mm

1.3 On the enlarged map

Measure length = 62 mm

Scaled length = 62 mm ÷ 5
= 12,4 mm ≠ 22 mm

∴ Not valid

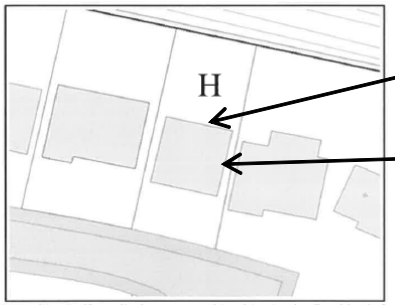
OR

Measure width = 24 mm

Width = 9 mm × 5
= 45 mm ≠ 24 mm

∴ Not valid

Enlargement of a section of the main map



[Source: https://uniformonline.harrogate.gov.uk/arcgis/rest/services/Base Mapping]

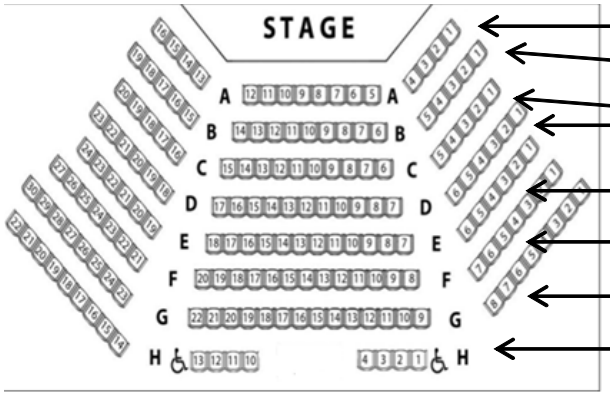
Measured length
= 62 mm

Measured width

= 24 mm

ACTIVITY2 (adapted from WC Sept 2018 P1)

2.1**Answer**: = 176 chairs



Row A = 16

Row B = 19

Row C = 20

Row D = 23

Row E = 24

Row F = 27

Row G = 30

Row H = 17 chairs

2.2 **Answer**:

Probability = $\frac{30}{176}$

= 0,17

= 17%

2.3 **Answer:**

From G5,turn left and walk straight to the aisle; then turn right. Walk up the aisle, and then turn left at the end of row A. Walk straight to A13.

2.4**Answer:** = 2

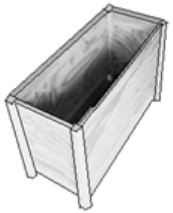
2.5**Answer**: = Row A

ACTIVITY 3(DBE May/June 2018 P2)

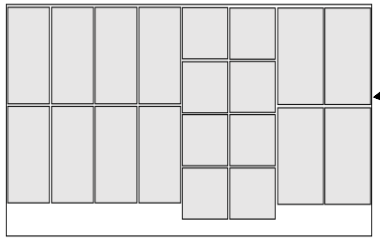
3.1

Answer: $= \frac{20}{5}$

= 4 boxes



The box has 5 parts.



The layout has 20 parts.

3.2Answer:

Number of sheets $= \frac{2750}{4}$

= 687,5

∴ Not enough

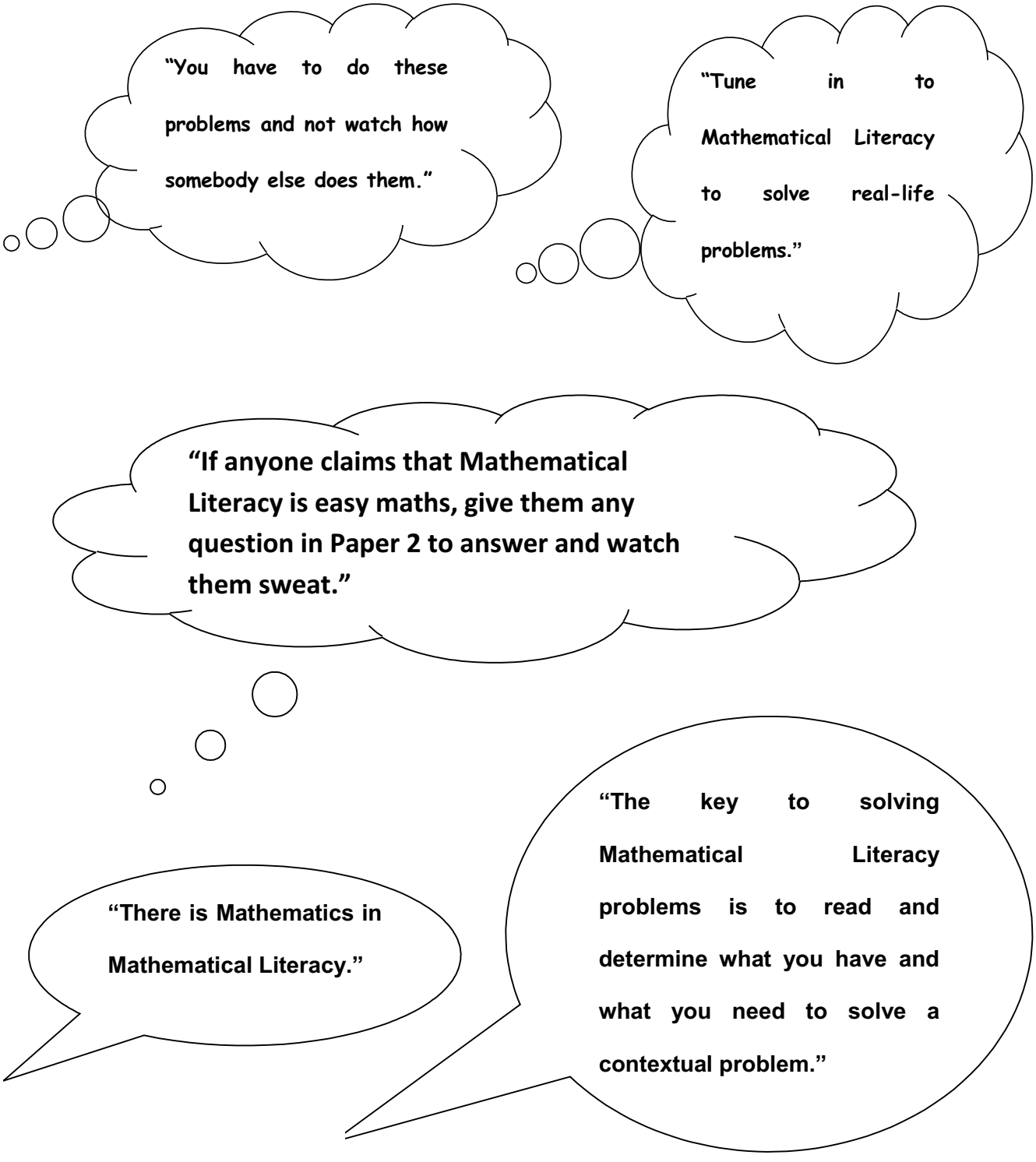
OR

Number of sheets = 687 × 4

= 2 748

∴ Not enough

7. Message to Grade 12 learners from the writers



8. Thank you/ Acknowledgements

A candle does not lose any of its light by lighting another candle. It took a collective to put together this material. That is why two heads will always be better than one. A very big thank you to the provincial colleagues who made themselves available to develop this material. Their names are:

- Ms Thembeka Nethe (Free State Education Department)
- Mr Mandla Nkomo (Gauteng Education Department)
- Mr Sean Tune (Gauteng Education Department)
- Ms Zandile Mdiniso (KwaZulu-Natal Education Department)
- Mr Mbulelo Bali (Western Cape Education Department)

A very big thank you as well to their respective principals who allowed them to prepare material for the education sector even though they have their own duties have duties to perform in their provinces, as provincial officials.

Together we can!

MATHEMATICS LITERACY

BOOK 2 : SOLUTIONS PATHWAYS

GRADE 12

Department of Basic Education
222 Struben Street, Pretoria, 0001
Private Bag X895, Pretoria, 0001, South Africa
Tel: (012) 357 3000 Fax: (012) 323 0601

Hotline: 0800 202 933

website	facebook	twitter
www.education.gov.za	www.facebook.com/BasicEd	www.twitter.com/dbe_sa

ISBN NO. 978-1-4315-3295-7