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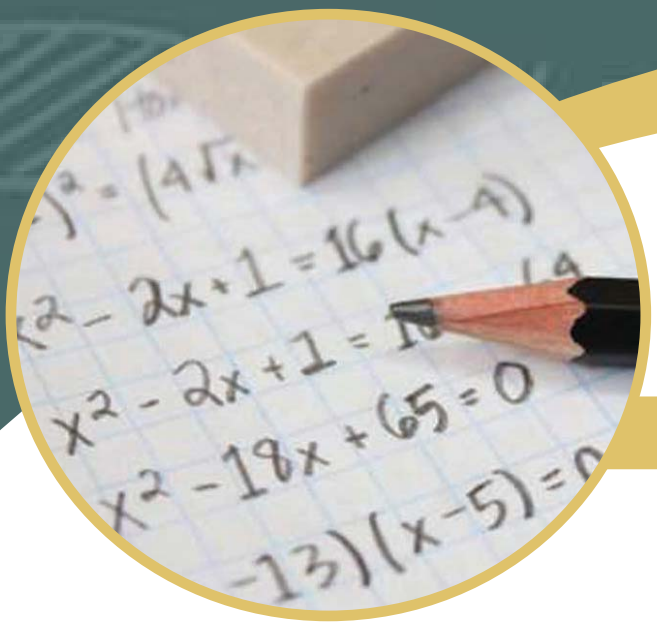

# MATHEMATICS LITERACY

## BOOK 1: JCG

## GRADE 12

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Read to Lead
A Reading Nation is a Leading Nation

2030 NDP

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# 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.

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## 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.**



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## 1. Examination tips for Mathematical Literacy

### 1.1 Paper 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)

**Note:** Paper 1 is the easier paper of the two. Set your target for this paper at **140** out of **150.** The mark you get for Paper 2 will determine the quality of your Mathematical Literacy mark.



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### 3.2 Paper 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)



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### 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 Literacy Paper 1 examination

Paper 1 is the easier question paper of the two for the following reasons:

- **90** of the **150** marks are allocated to **Level 1** type questions
- It is set in a familiar context.
- Question 1 (30 marks ±5) comprises L1 type questions only, with a short description of the context.

You will be able to score these marks if you **work through past examination papers**, **work** in the classroom **every day** 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 |



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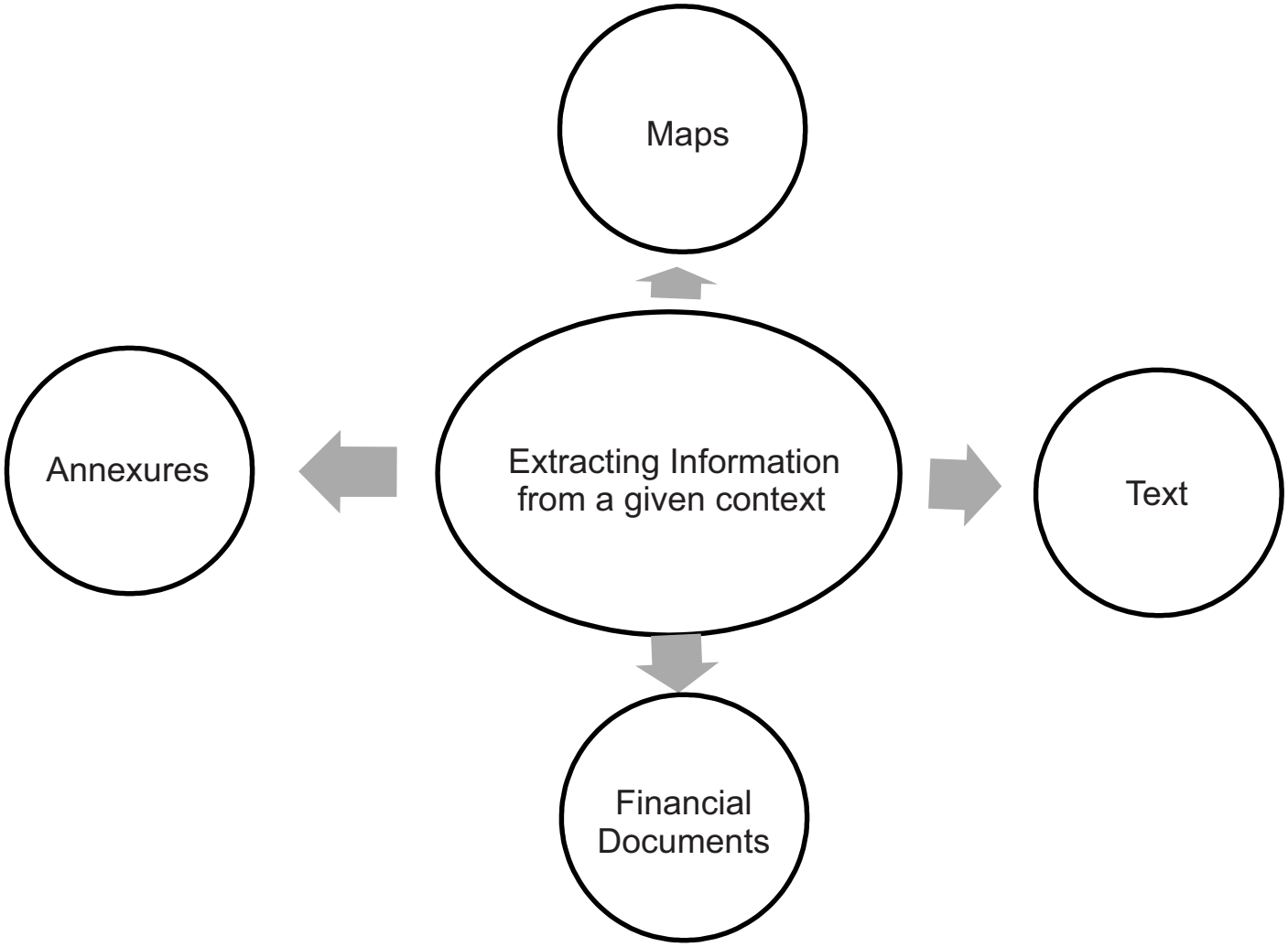
## 4. OVERVIEW



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# 1. Extracting information

In the following section, information will be extracted from the given text. These are examples from past DBE examination question papers.

Three things must be identified **before** the answer can be calculated or the problem can be solved.

1. Identify what is known, i.e. what was given (knowns).
2. Identify what has to be calculated (unknowns).
3. Identify the relationship between the known and the unknown, i.e. how is the known used to calculate the unknown.

Financial acronyms must be known by heart by ALL learners of Mathematical Literacy

**Frequently used acronyms in finance**

| Financial acronyms (abbreviations) | What they stand for |
|---|---|
| ATM | Automated Teller Machine |
| PAYE | Pay As You Earn |
| SARS | South African Revenue Service |
| SITE | Standard Income Tax on Employees |
| UIF | Unemployment Insurance Fund |
| VAT | Value Added Tax |

**Currency symbols – Examples**

There is a difference between countries' currency symbols and ISO currency codes.

**Currency symbol**: This is a sign used to denote or represent a currency in a foreign exchange transaction.

**International organisation for standardisation (ISO) currency codes**: This is a three-letter alphabetic code that represents the various currencies used throughout the world.



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| COUNTRY | SYMBOL | ISO CURRENCY CODE | NAME |
|---|---|---|---|
| South Africa | R | ZAR | South African rand |
| Botswana | P | BWP | Botswana pula |
| Zambia | ZK | ZMW | Zambian kwacha |
| Nigeria | ? | NGN | Nigerian naira |
| United States of America | $ | USD | US dollar |
| United Kingdom | £ | GBP | British pound |
| Europe | € | EUR | European euro |
| Japan | ¥ | JPY | Japanese yen |
| China | ¥ | CNY | Chinese yuan renminbi |



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**Example 1**

Identify the following from the text/question below:

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

Key word

**DBE NOV 2017 P1 Q1**

1.2 A coin shop buys and sells gold Kruger rand coins. The shop bought a one-ounce gold coin for *R14 960* at *10:15* and sold it for *R18 700 5 hours and 50 minutes later.*

**Cost Price** | Starting Time | **Selling Price** | Lapsed Time

1.2.1 Calculate the profit that the shop made on this one-ounce gold coin. (2)

1.2.2 Write down the exact time when the coin was sold. (2)

**Solution**

| **Question 1.2.1** | **Question 1.2.2** |
|---|---|
| **Knowns**<br>• The CP (R14 960);<br>• The SP (R18 700)<br>**Unknowns**<br>• The profit has to be calculated.<br>**Relationship**<br>Profit = Selling price – Cost price. | **Knowns**<br>• The exact time the coin was bought;<br>• Total lapsed time before the coin was sold.<br>**Unknowns**<br>• Calculate the time the coin was sold.<br>**Relationship**<br>Exact time + total lapsed time. |



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**Example 2**

Identify the following from the text/question 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)**<br>Was: R988,00<br>Now: R210,00 |
| | **New Ultra-thin mouse (UTM)**<br>Was: R223,00<br>Now: R13,00 |

Identification of different names of items

[Source: www.wish.com]

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)



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**Solution**

| Question 2.2.1 | Question 2.2.2 |
|---|---|
| **Knowns**<br>• Financial acronym used | **Knowns**<br>• VAT = 14%<br>• Old price (PPH) = R988,00<br>• New price (PPH) = R210,00<br><br>**Unknowns**<br>• VAT amount<br><br>**Relationship**<br>VAT and old price |
| **Question 2.2.3** | |
| **Knowns**<br>• Old price (UTM) = R223,00<br>• New price (UTM) = R13,00<br><br>**Unknowns**<br>• Difference<br><br>**Relationship**<br>Old and new price of UTM **ONLY** | |



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**Activity 1**

Identify the following from each of the text/question items below:

1. Knowns

2. Unknowns

3. The relationship between the known and the unknown.

**A**

1.3 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, Bar One, Kit Kat, and Cadbury 80 g 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.

1.1.3 A box of 40 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.



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**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 charges 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 that 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)

**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 work stations that are 189 km apart. Determine the average speed of the vehicle.

Please use the following formula:

**Average speed** $= \frac{\text{distance}}{\text{time}}$ (3)



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**Extracting information from different kinds of maps, plans and models in Mathematical Literacy**

| MAPS | | |
|---|---|---|
| **Category** | **Examples** | **Properties** |
| Item arrangement maps<br><br>**Note:** scale is NOT important in maps of this kind. | ▪ Seating plans. Specific examples include: classroom, hall, cinema and seating arrangements for stadiums; transport (buses, trains, aeroplanes, ships, etc.). | (i) Use symbols and words to show names and/ or positions of arranged items.<br>(ii) A key that explains the meaning of the symbols used is usually included in the plan.<br>(iii) Compass direction indicators are sometimes also included. |
| | ▪ Layout plans. Specific examples include: school building arrangements, building and facility arrangements of a hotel/ camping site, sports field arrangements, arrangement of shops in a shopping centre, arrangement of a lecture mall. | (i) Use icons with names to show different buildings or structures.<br>(ii) Symbols are also used where necessary to clarify the diagram.<br>(iii) Compass direction indicators are also common. |
| Geographic maps | ▪ National and provincial maps | (i) Show aerial pictures of countries and provinces.<br>(ii) Always drawn to a specific scale.<br>(iii) May show a variety of features, such as names of cities and towns, names of roads that connect towns, railway lines, rivers, seas/oceans, etc.<br>(iv) Names of roads that connect towns and cities are also shown on the map. The |



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| | | |
|---|---|---|
| | | **following nomenclature is used for naming roads.**<br>**(a) N(x) means national road x; for example, N1.**<br>**(b) R(x) means regional road x; for example, R61.**<br>**(c) M(x) means local/municipal road x; for example, M3.**<br>**(v) Compass direction indicators are always shown.** |
| | ▪Street maps | (i) Show aerial pictures of industrial or residential areas.<br>(ii) Street/ avenue/ boulevard/ road/ close names are indicated.<br>(iii) May also show name and position of building.<br>(iv) May have grid references.<br>(v) Always drawn to a specified scale. |
| | ▪Strip charts | (i) They are useful for planning a trip.<br>(ii) Straight lines are used to connect important features along the route, such as towns, tourist destinations, dams, etc.<br>(iii) Distances between places are written on a straight line that joins the places.<br>(iv) There is no relationship between the length of the line joining any two places and the actual distance that must be travelled. |
| | ▪Elevation maps | (i) These maps show the slope or various inclinations of a route.<br>(ii) Names of important features of the route are given on the map.<br>(iii) They are useful when preparing for a walk, fun-run or marathon.<br>(iv) They usually include the starting and finishing points of a route. |



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| PLANS | | |
|---|---|---|
| **Category** | **Examples** | **Properties** |
| Assembly diagrams | Specific examples are: plugs, plastic models, wooden furniture units, toys, Lego-type kits, cellphones, electrical appliances, etc. | (i) Show diagrams/ pictures/ nets of complete items.<br>(ii) They use symbols for the different components of an item.<br>(iii) They have written instructions regarding how to put the different components together. |
| Floor | Specific examples are: room, office, house, shop, classroom, etc. | (i) Shows the top view of a floor in a building (room, office, house, etc.).<br>(ii) Always drawn to a given scale.<br>(iii) Includes length measurements.<br>(iv) Uses standard symbols for building features, such as door/ window/ garage openings, bathroom utilities, furniture, etc.<br>(v) May include compass direction indicators (north, south, east, west). |
| Elevation | Specific examples are: front, back and side views of a house or a building/ structure. | (i) Shows the different side views of a building, i.e. north/ south/ east/ west side view or elevation.<br>(ii) Shows the complete outside structure of a building.<br>(iii) Always drawn to scale.<br>(iv) Shows different wall features, such as doors and windows. |
| Design | Specific examples are: clothing, furniture, equipment, etc. | (i) Shows a paper design of an item such as clothing, furniture, machine, etc.<br>(ii) Always drawn to scale.<br>(iii) Different views of an item can be represented. |



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| MODELS | | |
|---|---|---|
| **Category** | **Examples** | **Properties** |
| Models | Specific examples are: packaging arrangements, packaging shapes, best item arrangement (e.g. tables and chairs in a room/ hall) | (i) Show diagrams/ nets of packaging containers for various shapes.<br>(ii) Show diagrams/ nets of packaging arrangements of various containers or items. |



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**Example 3**

Identify the following from the text/ question below:

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

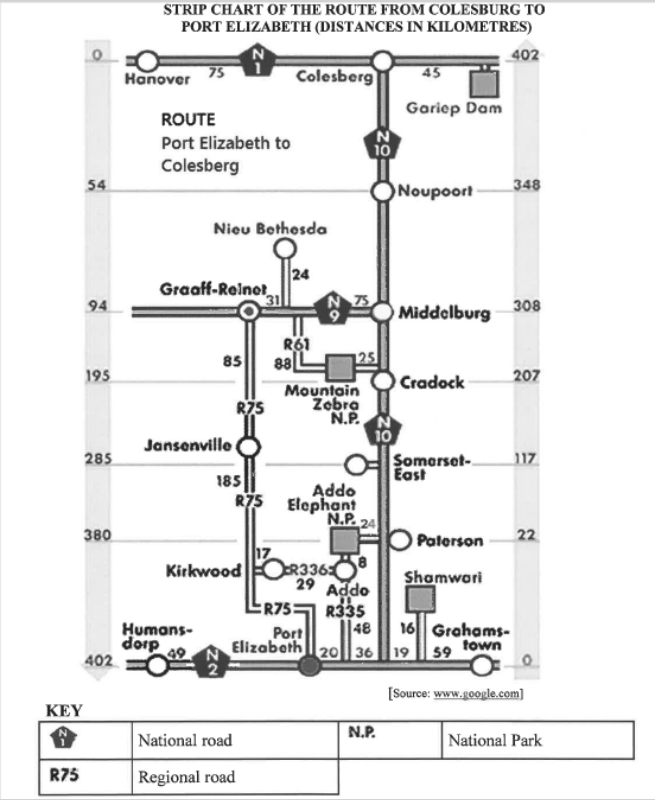
**DBE MARCH 2018 P1 Q3**

3.2 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:

**Diagram 1**




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

1.1.2 Which national park is furthest from the N10?

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

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

1.1.5 Calculate the travel distance between the two national parks.



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**Solution**

| Question 1.1.1 | Question 1.1.2 |
|---|---|
| **Knowns**<br>• Features of a strip chart<br>**Unknowns**<br>• The name of the national road<br>**The relationship between the known and the unknown**<br>• Features $\xleftrightarrow{\text{identify}}$ Name of the national road | **Knowns**<br>• Map features, N10<br><br>**Unknowns**<br>• National park furthest from N10<br><br>**The relationship between the known and the unknown**<br>• Features $\xleftrightarrow{\text{identify}}$ Name of the park |

**Question 1.1.3**

**Knowns**

- Map features, destination = Paterson, name of the road = R336, distance between home town and Paterson = 61 km

**Unknowns**

- Home town

**The relationship between the known and the unknown**

- Paterson $\longleftrightarrow$ Home town

Identify Paterson and the R336 on the map

Identify distances along the R366 that add up to 61 km

**Question 1.1.4**

**Knowns**

- Map features, national park key

**Unknowns**

- Names of the national parks

**The relationship between the known and the unknown**

- Map features $\xleftrightarrow{\text{identify}}$ Names of the national parks

**Question 1.1.5**

**Knowns**

- Map features

**Unknowns**

- Distance between parks

**The relationship between the known and the unknown**

- Location of the two parks $\xleftrightarrow{\text{identify}}$ Distance between parks

Identify the two parks

Determine the distance between them



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**Activity 2**

Identify the following from the text/ question below:

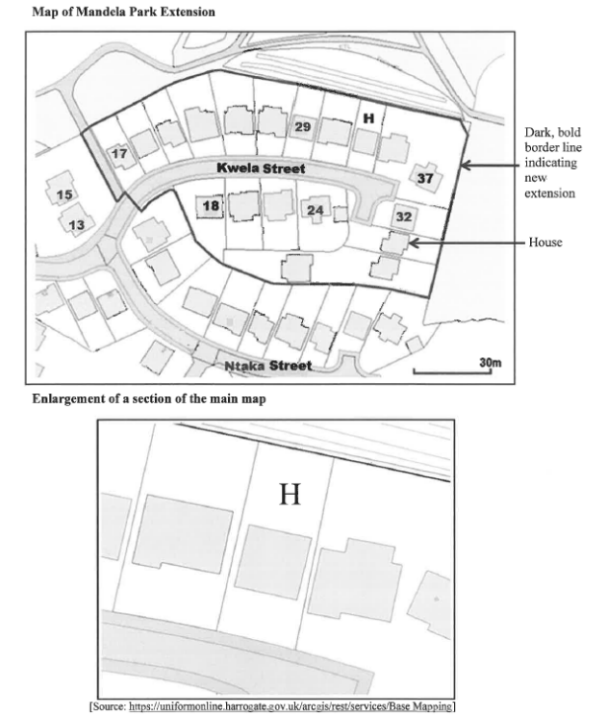
1. Knowns
2. Unknowns
3. The relationship between the known and the unknown.

**DBE NOVEMBER 2017 P2 Q1**

1.1 The map of Mandela Park below shows the location of Thomas's property, marked H (which includes the house). The new extension is indicated using a dark, bolder line, as shown on the map. An enlargement of a section of the main map is also shown.

Use Diagram 2 to answer the questions that follow. Indicate only the knowns, the unknowns and the relationship between them in each question.

Diagram 2




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**.

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

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.



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**Example 4**

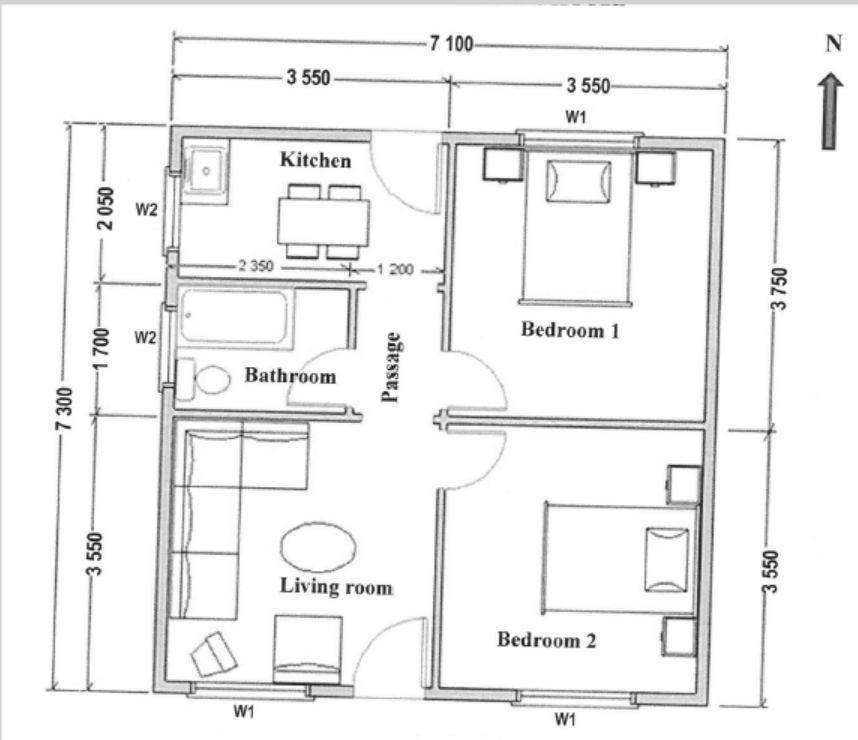
Identify the following from the text/ question below:

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

**ADAPTED FROM DBE NOVEMBER 2015 P2**

2 Diagram 2 below shows the floor plan of a house. The total living area of this house is 51,8 m$^2$.

**Diagram 3**




key

| | |
|---|---|
| | Door |
| | Window |

**Note**: All dimensions are in mm

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 bedroom 2.

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

**Area = length × width**



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**Solution**

| Question 2.1 |
|---|
| **Knowns**<br>• **Key for windows**<br>**Unknowns**<br>• **Number of windows**<br>**The relationship between the known and the unknown**<br>• **Window key** ⟷ **Number of windows** |
| **Question 2.2** |
| **Knowns**<br>• **Key for doors**<br>**Unknowns**<br>• **The ratio between outside and inside doors**<br>**The relationship between the known and the unknown**<br>• **Door key** — Determine number of inside and outside doors ⟷ **Ratio** |
| **Question 2.3** |
| **Knowns**<br>• **North direction, position of bedroom 2, position of bathroom**<br>**Unknowns**<br>• **General direction**<br>**The relationship between the known and the unknown**<br>• **Bedroom 2 and bathroom** ⟷ identify ⟷ **General direction** |
| **Question 2.4** |
| **Knowns**<br>• **Length and width, area of the house**<br>**Unknowns**<br>• **How the area was calculated**<br>**The relationship between the known and the unknown**<br>• **Length and width** ⟷ identify ⟷ **Area of the house** |



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**Activity 3**

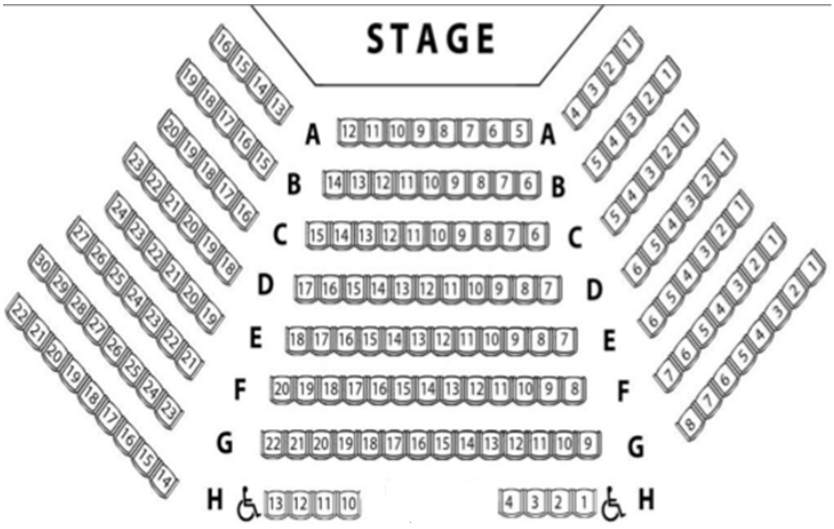
Identify the following from the text/ question below:

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

**ADAPTED FROM WC SEPT 2018 P1**

2 Diagram 3 below shows the seating plan in the Baxter Theatre in Cape Town Use Diagram 3 to answer the questions that follow. Indicate only the knowns, the unknowns and the relationship between them in each question.

Diagram 3




2.1 Determine the total number of chairs in the cinema.

2.2 Which row has chairs reserved for people in wheel chairs?

2.3 Determine the percentage of chairs reserved for people in wheel chairs.

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



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**Example 5**

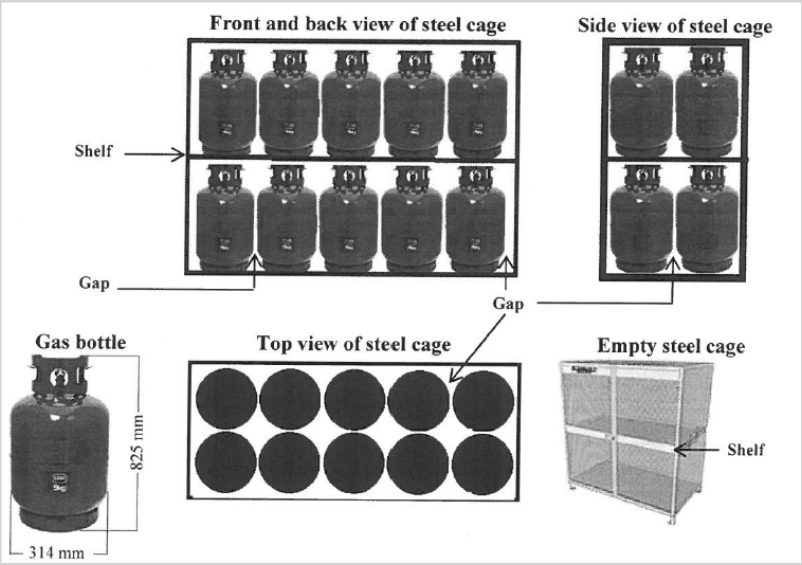
Identify the following from the text/ question below:

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

**DBE FEBRUARY/ MARCH 2016 P2**

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

Diagram 3




2.1 Calculate the maximum number of gas bottles that can fit into ONE steel cage.

2.2 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.



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**Solution**

| **Question 3.1** |
|---|
| **Knowns**<br>• Front and back view, side view and top view of the steel cage.<br>**Unknowns**<br>• The maximum number of gas bottles<br><br>**The relationship between the known and the unknown**<br><br>• Different views of the cage $\xleftrightarrow{\text{calculate}}$ Maximum number of gas bottles |

| **Question 3.2** |
|---|
| **Knowns**<br>• Dimensions of a rectangular metal sheet<br>• Dimensions of a gas bottle<br>• Dimensions of the gap between the gas bottles<br><br>**Unknowns**<br>• Maximum number of shelves<br><br>**The relationship between the known and the unknown**<br><br>• All dimensions $\xleftrightarrow{\text{calculate}}$ Maximum number of shelves |



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**Activity 4**

Identify the following from the text/ question below:

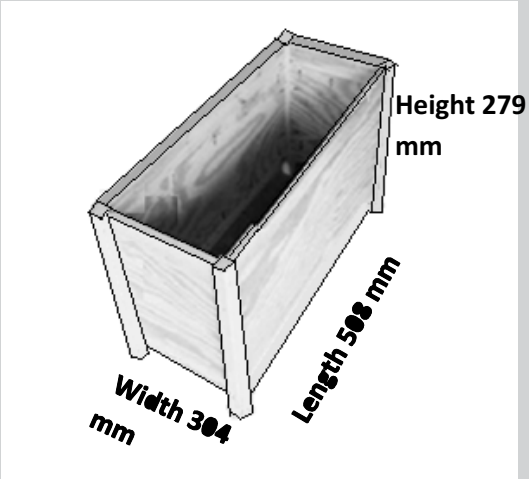
1. Knowns
2. Unknowns
3. The relationship between the known and the unknown.

**DBE MAY/ JUNE 2018 P2**

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

Picture of a sheet of plywood

Wooden toy storage box




[Source: www.yorktimber.com]



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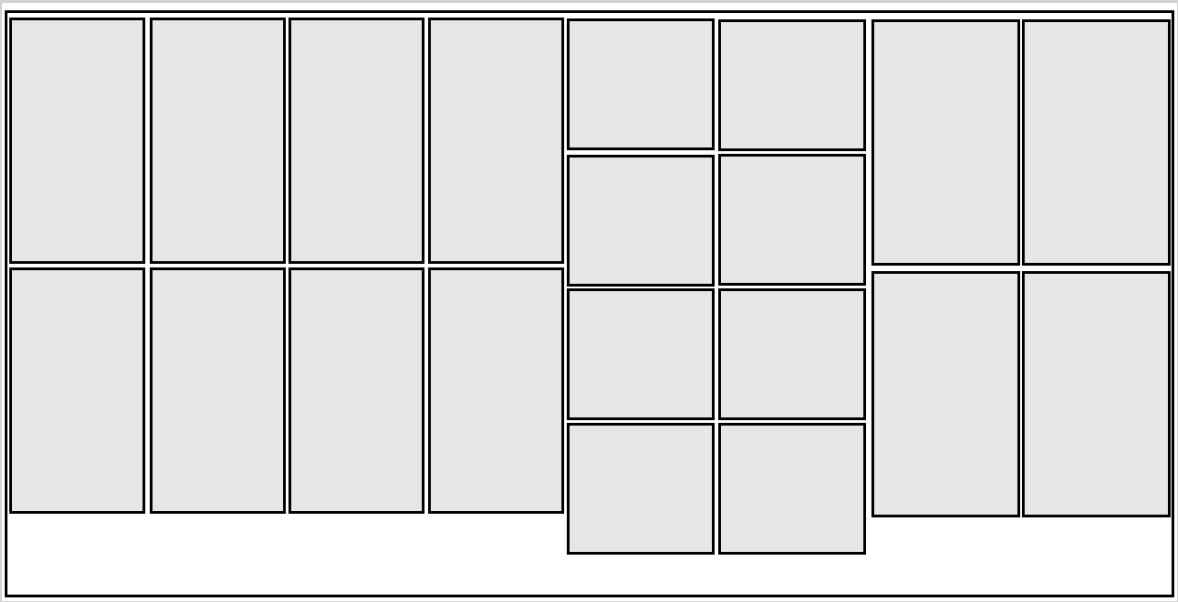
Diagram 3 below shows the layout of the parts of toy storage boxes on ONE sheet of plywood.



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.



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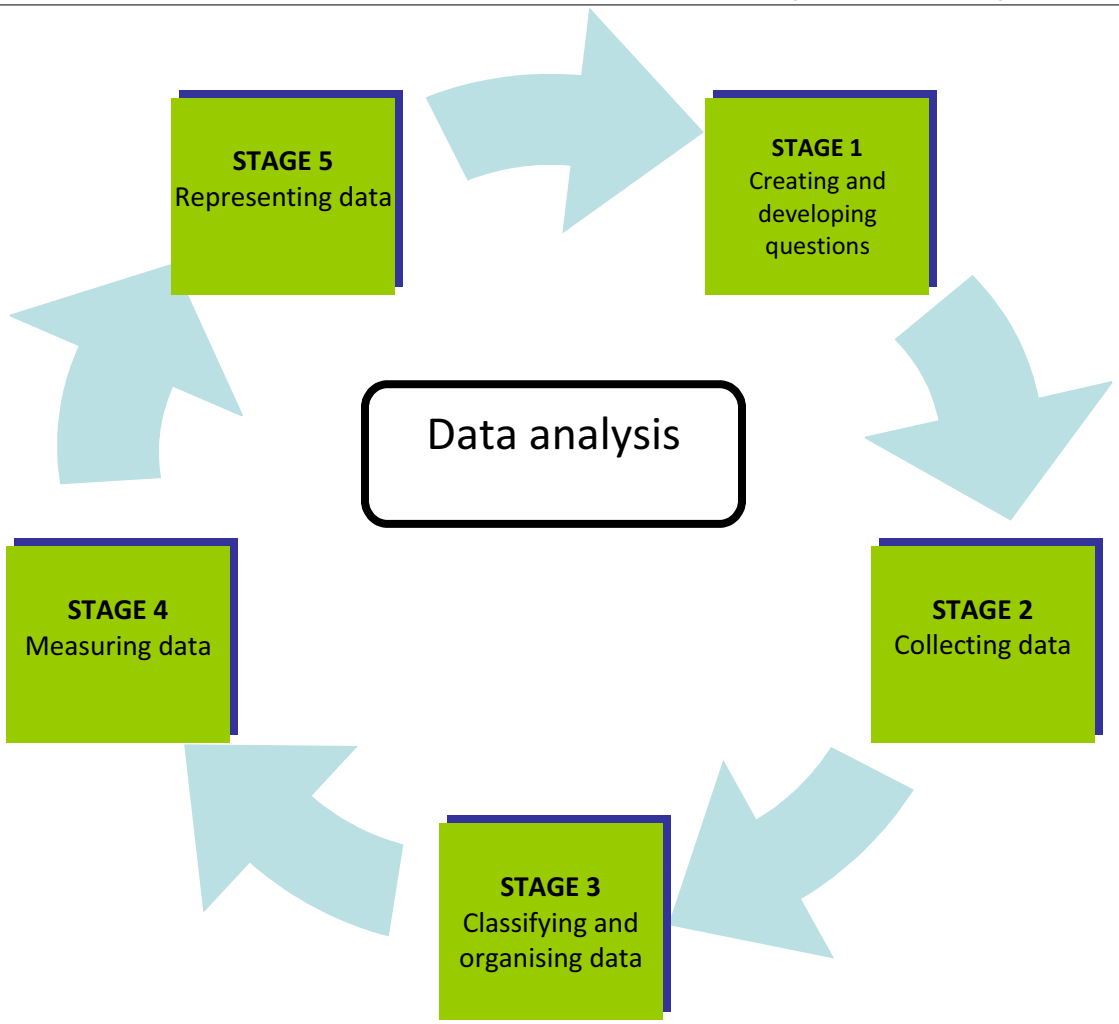
## Extracting information from different data handling resources

Every statistical process is made up of at least six inter-connected stages. List the stages.




**A.** Explain/ define data:

It is a collection of facts, such as numbers, words, measurements, observations or even just descriptions of things.

**Did you know?**
**Statistics** is the collection, organisation, presentation and analysis of data.

**B.** Data can be qualitative or quantitative.

| Qualitative data | Quantitative data |
|---|---|
| Descriptive information (it *describes* something). | Numerical information (numbers). |



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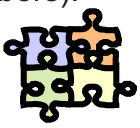
**C.**

**Quantitative data**

**Discrete data**
can only take certain values (like whole numbers).



Continuous data
can take any value (within a range).

***12,5 kg or 1,25 L***

## Summarising data

| | |
|---|---|
| I. | Data can be collected in many ways, for example: through interviews, observatio questionnaires and conducting surveys. |
| II. | What is a sample? This is when data is collected from only **selected members** o group. |

## Box and whisker plot

This is a graphical representation of the minimum value, quartile 1, quartile 2, quartile 3 and maximum value.
Each portion represents 25%.



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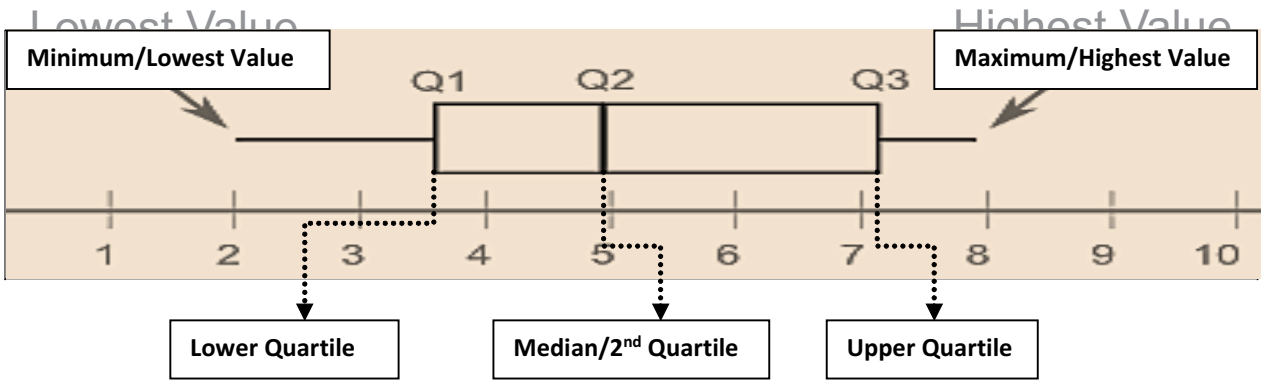


| There are 3 measures of central tendency: mean, median and mode | | |
|---|---|---|
| **Category** | **Explanation/ definition** | **Operational skill (what you must do as a learner)** |
| **Mean** | Average | Find the sum of all items and divide it by the number of all items. |
| **Median** | The middle value in a set of data. | Arrange the data in ascending or descending order.<br>Find the middle value. |
| **Mode** | The number that appears most frequently in a set of data. | Identify the number that appears most frequently. |

| There are 3 measures of spread: range, quartile and percentile | | |
|---|---|---|
| **Category** | **Explanation/ definition** | **Operational Skill (what you must do as a learner)** |
| **Range** | This is the difference between the maximum and the minimum value. | Subtract the smallest value from the biggest value. |
| **Quartiles** | These are measures of spread that divide the data into 4 equal parts of 25% each.<br>The lower quartile is at 25%.<br>The median is at 50%.<br>The upper quartile is at 75%. | To determine the quartiles, divide the information into 4 equal parts. The median is the second quartile ($Q_2$). Then divide the first half into 2 equal parts. The median of the first half is the lower quartile ($Q_1$). Divide the second half into 2 equal parts, and the median of the second half is the upper quartile ($Q_3$). |
| **Interquartile range** | This is the difference between the upper quartile and the lower quartile. It indicates the spread between the lower part of data and the upper part of data. | Identify quartile 1 and quartile 2.<br>Subtract quartile 1 from quartile 3. |



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**EXAMPLE 6**

Identify the following from the text/ question below:

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

**DBE JUNE 2018 P1 Q2**

**QUESTION 1**

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

| CAPE TOWN Kilolitres (kl) used per month | | Price | Increase (%) |
|---|---|---|---|
| Step 1 | 0–6 | Free<br>R4,56 | New |
| Step 2 | 6–10,5 | R16,54<br>R17,75 | 7,3% |
| Step 3 | 10,5–20 | R23,54<br>R25,97 | 10,3% |
| Step 4 | 20–35 | R40,96<br>R43,69 | 6,6% |
| Step 5 | 35–50 | R66,41<br>R113,99 | 71,6% |
| Step 6 | > 50 | R200,10<br>R302,24 | 51% |

[Adapted from www.graphics24.co.za]



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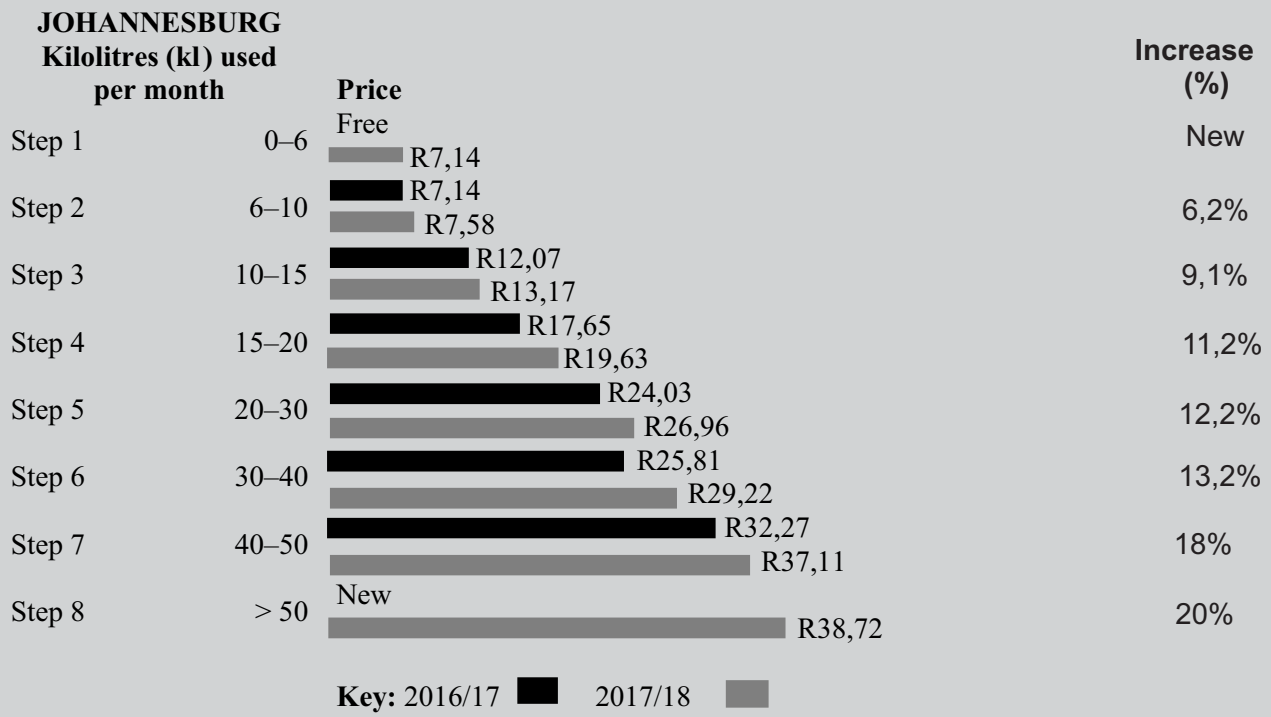


1.1.1 State the type of graph used to represent this data. (2)

1.1.2 Arrange Cape Town's percentage increase in descending order. (2)

1.1.3 Identify the step that indicates the largest increase (in rand) in Cape Town's water tariff from 2016/17 to 2017/18. (2)

1.1.4 Determine in which ONE of the two cities water is more expensive. (2)

1.1.5 Calculate the cost of 3,5 kl of water in Johannesburg during 2017/18. (2)

1.1.6 Is the data given categorically or numerically? (2)



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**Solution**

| Question 1.1.1 | Question 1.1.2 |
|---|---|
| **Knowns**<br>• Picture of the graphs<br><br>**Unknowns**<br>• Naming the **type** of graph<br><br>**Relationship**<br>Picture and naming the type of graph | **Knowns**<br>• Percentage increase of two cities<br><br>**Unknowns**<br>• Arrangement in descending order for Cape Town<br><br>**Relationship**<br>Percentage increase in value and descending order arrangement |
| **Question 1.1.3** | **Question 1.1.4** |
| **Knowns**<br>• Prices for 2016/17<br>• Prices for 2017/18<br><br>**Unknowns**<br>• Identifying the step number with the largest increase in Cape Town.<br><br>**Relationship**<br>Prices in rand and step number in Cape Town. | **Knowns**<br>• Names of two cities<br><br>**Unknowns**<br>• Name of one city<br><br>**Relationship**<br>Sifting two cities to one city |
| **Question 1.1.5** | **Question 1.1.6** |
| **Knowns**<br>• The tariff for a specific step.<br><br>**Unknowns**<br>• The step at which 3,5kl is categorised.<br>• The cost of 3,5 kl of water in Johannesburg during 2017/18.<br><br>**Relationship**<br>Number of litres used and tariff for step 1 in Johannesburg. | **Knowns**<br>• Categorical or numerical data<br><br>**Unknowns**<br>• One of the types of data<br><br>**Relationship**<br>• Multiple choice |



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**ACTIVITY 5**

**A**

**DBE JUNE 2018 Q5**

**QUESTION 5**

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

**TABLE 2: 2016 DATA FOR LAND PASSENGER TRANSPORT**

| | 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]



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Use the table above to answer the questions that follow.

| | | |
|---|---|---|
| 5.1.1 | Write down the month with the highest income from 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 the 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 is less than R200 000 000. | (3) |
| 5.1.8 | A bar graph is drawn on ANSWER SHEET 1, which shows the monthly income for road transport for the last six months of the year. 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) |



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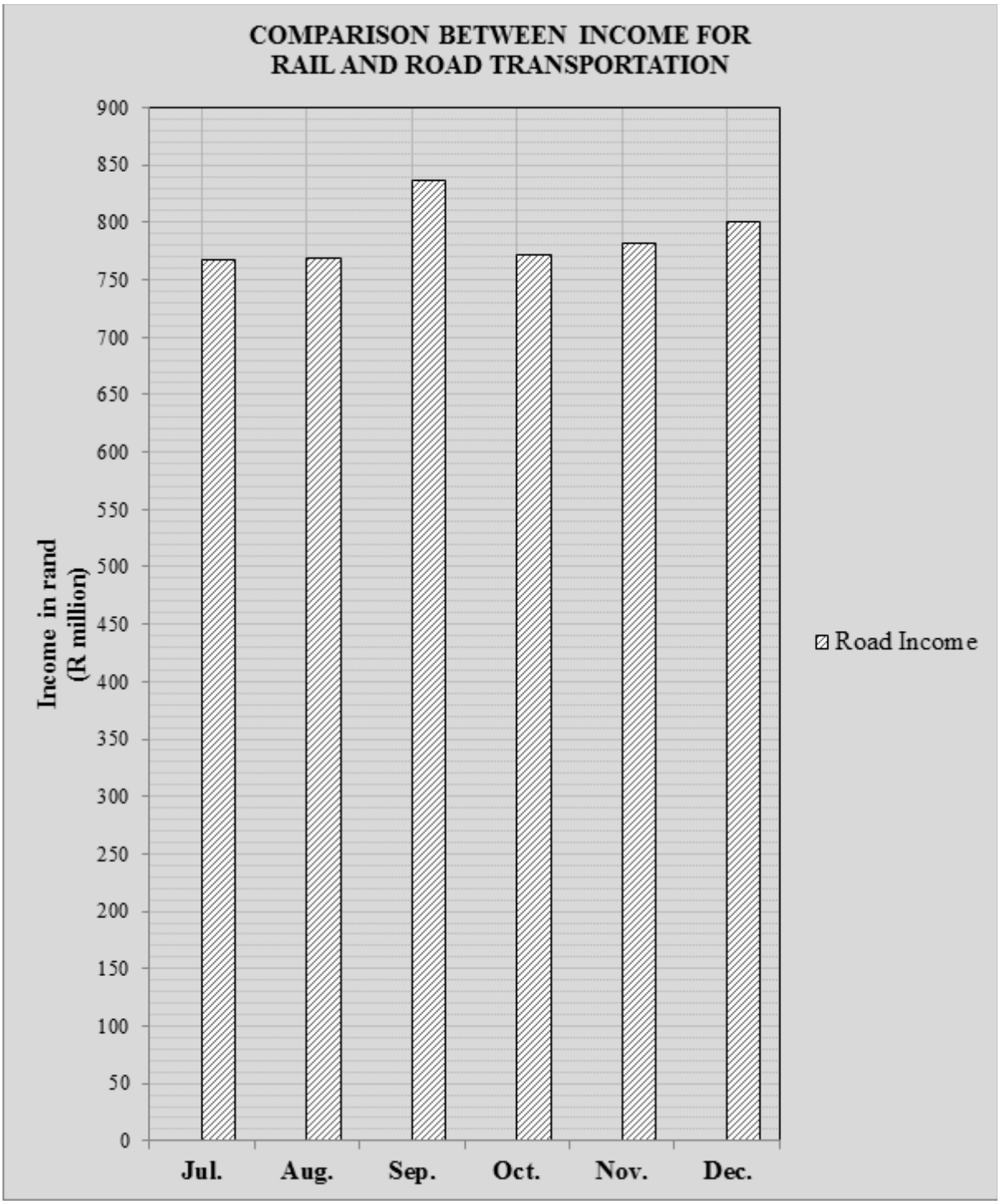
**ANSWER SHEET 1**

**QUESTION 5.1.8**



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**B**

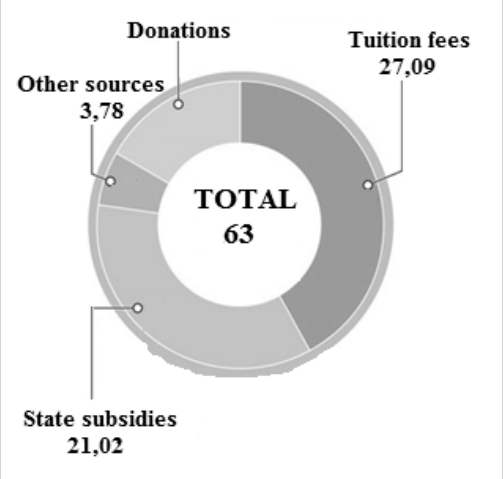
Identify the following from the text/ question below:

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

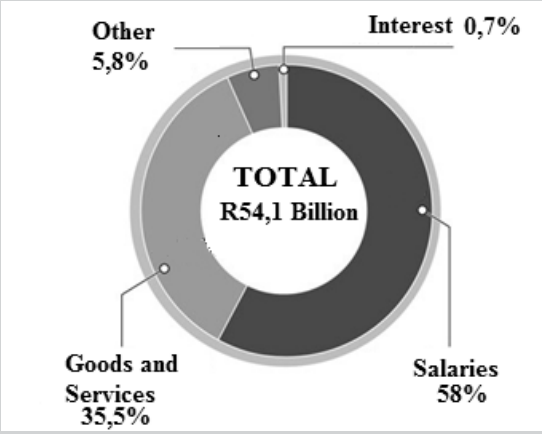
**DBE NOV 2017 P1 Q 5**

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**
**TYPES 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)



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## 1. Check your answers

### ACTIVITY 1

### Solutions

### A

| Question 1.1.1 | Question 1.1.2 |
|---|---|
| **Knowns**<br>• Mass/ weight of 1 chocolate bar = 80 g<br>• Number of bars in a box = 40 bars<br>• Price of 1 bar = R8,70<br><br>**Unknowns**<br>• Total price of a box with bars<br><br>**The relationship between the known and the unknown**<br>• Number of bars and the price of 1 bar<br>Known<br>Unknown<br>• Total price of a box with bars | **Knowns**<br>• The profit is associated with money.<br><br>**Unknowns**<br>• Key words<br>• Sentence construction/formation<br><br>**The relationship between the known and the unknown**<br>• The word *money*<br>Known<br>Unknown<br>• Key words |
| **Question 1.1.3** | |
| **Knowns**<br>• Cost of a box of Kit Kat bars = R435,04<br>• % price increase = 40%<br><br>**Unknowns**<br>• Amount added to the selling price?<br><br>**The relationship between the known and the unknown**<br>• Cost of a Kit Kat box and percentage increase<br>Known<br>Unknown<br>• Amount added to the selling price? | |



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**B**

| Question 2.3.1 | Question 2.3.2 |
|---|---|
| **Knowns**<br>• Price of gift in pounds = £360,00<br>• Bank charges = 1,95%<br><br>**Unknowns**<br>• Amount of commission paid in pounds<br><br>**The relationship between the known and the unknown**<br>• Use the 1,95% to calculate the commission paid in pounds | **Knowns**<br>• Exchange rate R1,00 = £0,05773<br>• Price of gift in pounds = £360,00<br><br>**Unknowns**<br>• Amount in rand<br><br>**The relationship between the known and the unknown**<br>• Use the conversion rate to convert £360,00 to rand |

| Question 2.3.3 |
|---|
| **Knowns**<br>• Investment amount = R5 000<br>• Period $1\frac{1}{2}$ years<br>• Interest 6,3% per annum<br><br>**Unknowns**<br>• The value of the fixed deposit at the end of the term (period).<br><br>**The relationship between the known and the unknown**<br>• Use the investment amount, period and interest rate to calculate the amount after the investment term. |



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**C**

| Question 3.2.1 | Question 3.2.2 |
|---|---|
| **Knowns**<br>• Fuel consumption rate = 7,6 litres per 100 km<br>• Fuel used = 55 litres<br><br>**Unknowns**<br>• Distance travelled with 55 litres of petrol?<br><br>**The relationship between the known and the unknown**<br>• Use the consumption rate to calculate the distance travelled with 55 litres. | **Knowns**<br>• Fuel consumption rate = 7,6 litres per 100 km<br>• Time = 1 hour 45 minutes<br>• Distance between stations = 189 km<br>• Average speed formula:<br>**Average speed** $= \frac{\text{distance}}{\text{time}}$<br><br>**Unknowns**<br>• Average speed travelled between the two towns.<br><br>**The relationship between the known and the unknown**<br>• Use the average speed formula to calculate average speed. |



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**ACTIVITY 2**

| **Question 1.1** |
|---|
| **Knowns**<br>• Features of a street map<br>• Numbering of some properties<br>**Unknowns**<br>• Street address of property **H**<br><br>**The relationship between the known and the unknown**<br>• Numbering of properties ⟷ Identify numbering pattern ⟷ Street address of property **H** |
| **Question 1.2** |
| **Knowns**<br>• Length of the bar scale<br>• Shape of property<br>**Unknowns**<br>• Dimensions of the property<br><br>**The relationship between the known and the unknown**<br>• Length and shape of property ⟷ Determine using calculations ⟷ Dimensions of property |
| **Question 1.3** |
| **Knowns**<br>• Measured length<br>**Unknowns**<br>• If the measured length is 5 times bigger<br><br>**The relationship between the known and the unknown**<br>• Measured length ⟷ Determine using calculations ⟷ if 5 times bigger<br>**OR**<br>**Knowns**<br>• Measured width<br>**Unknowns**<br>• If the measured width is 5 times bigger<br><br>**The relationship between the known and the unknown**<br>• Measured width ⟷ Determine using calculations ⟷ if 5 times bigger |



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## ACTIVITY 3

### Question 2.1

**Knowns**

- Rows and chairs

**Unknowns**

- Number of chairs in theatre

**The relationship between the known and the unknown**

- Rows and chairs $\xleftrightarrow{\text{Determine}}$ Number of chairs in theatre

### Question 2.2

**Knowns**

- Rows identification
- Wheelchair key

**Unknowns**

- Rows reserved for people in wheelchairs

**The relationship between the known and the unknown**

- Rows identification and wheelchair key $\xleftrightarrow{\text{Identification}}$ Row for wheelcha

### Question 2.3

**Knowns**

- Number of chairs for people in wheelchairs

**Unknowns**

- Percentage of the number of wheelchairs

**The relationship between the known and the unknown**

- Number of wheelchairs $\xleftrightarrow{\text{Determine using calculations}}$ Percentage of wheelchairs

### Question 2.4

**Knowns**

- Rows on seating plan

**Unknowns**

- Rows for people with long legs

**The relationship between the known and the unknown**

- Rows on seating plan $\xleftrightarrow{\text{Identification}}$ Rows for people with long legs



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## ACTIVITY 4

### Question 3.1

**Knowns**

- Number of boxes and shape of a complete box
- Number of parts for a complete box
- Layout of parts of boxes

**Unknowns**

- Number of boxes

**The relationship between the known and the unknown**

- Rows and chairs ⟷ Identification ⟷ number of chairs in theater

### Question 3.2

**Knowns**

- 2 750 boxes
- 687 sheets
- Layout of boxes per sheet = 4 boxes

**Unknowns**

- Verify if 687 sheets will make 2 750 boxes

**The relationship between the known and the unknown**

- 2 750 boxes and 4 per sheet ⟷ Calculation ⟷ verify if 687 sheets make 2 750 boxes



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**ACTIVITY 5**

**Solutions**

**A**

| **Question 5.1.1** | **Question 5.1.2** |
|---|---|
| **Knowns**<br>• Months<br>• Monthly income for rail transportation<br><br>**Unknowns**<br>• Highest income | **Knowns**<br>• Monthly income for rail transportation<br>• Number of months<br><br>**Unknowns**<br>• Concept of mean<br><br>**Relationship**<br>• Monthly income for rail transportation and the number of months |
| **Question 5.1.3** | **Question 5.1.4** |
| **Knowns**<br>• Road transportation income for April<br>• Total land income<br><br>**Unknowns**<br>• Road transportation income for April as a percentage<br><br>**Relationship**<br>• Road transportation income for April and total land income | **Knowns**<br>• Months<br>• Total number of land passenger journeys<br><br>**Unknown**<br>• Total number of land passenger journeys for December in thousands |
| **Question 5.1.5** | **Question 5.1.6** |
| **Knowns**<br>• Total number of passenger journeys for September.<br><br>**Unknowns**<br>• Total number of passenger journeys for September, in words | **Knowns**<br>• Monthly total land income<br>• Ascending order<br>• Concept of median<br><br>**Unknowns**<br>• Median total land income |
| **Question 5.1.7** | **Question 5.1.8** |



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| | |
|---|---|
| **Knowns**<br>• Months<br>• Rail income for passenger transport less than R200 000 000.<br><br>**Unknowns**<br>• Probability, as a decimal<br><br>**Relationship**<br>The number of months and the rail income for passenger transport less than R200 000 000. | **Knowns**<br>• Bar graphs<br>• Monthly income for rail transport for the last six months of the year.<br>• A bar graph showing monthly income for road transport for the last six months of the year.<br>**Unknowns**<br>• A bar graph representing monthly income for rail transport for the last six months of the year |

**B**

| **Question 5.2.1** | **Question 5.2.2** |
|---|---|
| **Knowns**<br>• Different types of expenditure<br><br>**Unknowns**<br>• Other types of expenditure not given | **Knowns**<br>• Total Income = 63 billion<br>• Income from tuition fees = 27,09 billion<br>• Income from state subsidies = 21,02 billion<br>• Income from other sources = 3,78 billion<br><br>**Unknowns**<br>• Income from donations, as a percentage<br>**Relationship**<br>• The relationship between income from donations, total income and income from tuition fees, state subsidies and other sources. |
| **Question 5.2.3** | **Question 5.2.4** |
| **Knowns**<br>• Total amount of interest paid by tertiary institutions = 54,1 billion<br>• Interest rate = 0,7%<br><br>**Unknowns**<br>• Interest amount in rand<br><br>**Relationship**<br>Total amount of interest paid by institutions and the interest rate. | **Knowns**<br>• Income of the tertiary institutions = 63 billion<br>• Expenditure of the tertiary institutions = 54,1 billion<br><br>**Unknown**<br>• The difference (in millions of rand) between the income and expenditure of the tertiary institutions. |



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## 7. Message to Grade 12 learners from the writers

"You have to do these problems and not watch how somebody else does them."

"Tune in to Mathematical Literacy to solve real-life problems."

**"If anyone claims that Mathematical Literacy is easy maths, give them any question in Paper 2 to answer and watch them sweat."**

**"The key to solving Mathematical Literacy problems is to read and determine what you have and what you need to solve a contextual problem."**

**"There is Mathematics in Mathematical Literacy."**



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## 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:

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- 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!



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# MATHEMATICS LITERACY

## BOOK 1: JCG

## GRADE 12

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