GRADE 12

Mathematical LITERACY

SELF STUDY GUIDE BOOKLET 1B

DATA HANDLING

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1. Introduction

The declaration of COVID-19 as a global pandemic by the World Health Organisation led to the disruption of effective teaching and learning in many schools in South Africa. The majority of learners in various grades spent less time in class due to the phased-in approach and rotational/ alternate attendance system that was implemented by various provinces. Consequently, the majority of schools were not able to complete all the relevant content designed for specific grades in accordance with the Curriculum and Assessment Policy Statements in most subjects.

As part of mitigating against the impact of COVID-19 on the current Grade 12, the Department of Basic Education (DBE) worked in collaboration with subject specialists from various Provincial Education Departments (PEDs) developed this Self-Study Guide. The Study Guide covers those topics, skills and concepts that are located in Grade 12, that are critical to lay the foundation for Grade 12. The main aim is to close the pre-existing content gaps in order to strengthen the mastery of subject knowledge in Grade 12. More importantly, the Study Guide will engender the attitudes in the learners to learning independently while mastering the core cross-cutting concepts.

2. How to use this Self Study Guide.

- This study guide covers selected sections of data handling which form part of paper 1.
- The topic is drawn from the CAPS Grade 10 – 12 curricula. Selected sections are presented in the following way:
    - What you should know at the end of the section.
    - Explanation of key concepts.
    - Summary/Notes.
    - Worked examples.
    - Practice questions.
    - Solutions to practice questions.
- Mathematical Literacy is a highly contextualised subject. Whilst every effort has been taken to ensure that the skills and concepts you will be examined on, are covered in this study guide, it is in fact the context used in the examination that will determine how these skills and concepts are assessed.
- This study guide covers all the cognitive levels.
- Go through the worked examples on your own.
- Do the practice examples on your own. Then check your answers.
- Read symbols and explanation table below to understand how marks are allocated.

Symbol	Explanation
M	Method
M/A	Method with accuracy
MCA	Method with consistent accuracy
CA	Consistent accuracy
A	Accuracy
C	Conversion
S	Simplification
RT/RG/RD	Reading from a table/graph/diagram
SF	Correct substitution in a formula
O	Opinion/Example/Definition/Explanation
P	Penalty, e.g. for no units, incorrect rounding off, etc.
R	Rounding off
NPR	No penalty for rounding
NPU	No penalty for the units
AO	Answer only, if correct, full marks

- Reward yourself for the things that you get right.
- If any of your answers are incorrect, make sure that you understand where you went wrong, before moving on to the next section.
- The study guide covers both generic and subject specific examination tips. You are expected to read and understand the tips, so that you are able to study more effectively.

3.1 Data handling

3.1.1 Key Concepts

DATA HANDLING	
TERMS	**MEANING**
Bar graph	The graphical representation of data that uses bars to compare different categories of data. 90° graph using bars to show frequencies (horizontal and vertical graph), the vertical heights of a set of bars of equal breath represent the values of the dependant variable in a data set.
Biased question	Biased question is the question containing factors that may influence the respondent to answer in a way that is not entirely true.
Box-and-whisker plot	Diagram that statisticians use to show the distribution of data along a number line divided into quartiles.
Broken line graph	A graph that has numbers that alternate going up and down and do not keep to a curved consistent line.
Categorical data	The data that is given in the form of words, names, or labels. It is generally descriptive in nature, as data classified and organized into categories.
Class Interval	Data that is divided into a smaller number of categories
Classify	Identify the type or class.
Compound bar graph	(Also referred as vertical stack graph or component bar chart) display two or more sets of data. However, it shows a part/whole relationship so you can easily see what amount each data group makes up of the whole.
Continuous data	The data that that is given as numbers including the decimal numbers and/or fractions. Numerical data (measurements like weight or age).
Data	Information, series of observations, measurements, facts; collection and recording of information for statistical investigation. It is raw information that has been collected, without any organization or analysis.
Data collection sheet	Two-column table showing what is observed and how many times it was observed; items of information.
Data handling	Data handling refers to the process of collecting, organizing, summarizing, representing, and analyzing information.
Discrete	Separate; distinct; opposite of continuous.
Discrete data	Numerical data (fixed numbers like size of family). Data that can have only certain values (quantities that can be counted, usually whole numbers).
Double bar graph	The most common multiple bar graph that compares two sets of data.
Frequency (f)	Number of times a data value is recorded.
Frequency table	Table showing frequencies in organised form. Table summarising the frequencies of all the data values in a data set.
Group	Put into classes, sort, arrange, organise.
Grouped data	The data given in the form of intervals.
Histogram	90° graph using adjacent bars to show frequencies of continuous numerical data with many different values. Areas of rectangles (continues; no gaps between them) show frequency of classes of data. The graphical representation of continuous numerical data by way of bars to display the frequency of the items in the data set.

Horizontal bar graph	90° bar graph using horizontal bars to compare or rank items like household sizes in a block of flats.
Impossible outcome	No chance of the outcome happening e.g. getting a 7 with an ordinary six-sided dice.
Interview	Record data by talking to someone face to face or over the telephone.
Inter-quartile range	The difference between quartile 3 and quartile 1 **OR** The difference between largest quartile and the smallest quartile.
Investigate	Examine; look into; study.
Line graph	A graph that uses line segments to connect data points and shows changes in data over time.
Maximum value	The highest or biggest value in the data set.
Mean	Average of the values in a data set; sum of all the observed values divided by the number of observations.
Mean [of a set of data]	Average: sum of all data values divided by the number of data values.
Measures of central tendency	Numbers that tell more about the balance (middle values) in a data set (mode; median; mean).
Measures of spread	Numbers that tell how far data values in a data set lie apart; spread of numerical data set (range, quartiles, and percentiles).
Median	Middle value in an ordered data set.
Median [of a set of data]	Value that cuts an ordered data set in half.
Methods of collecting data	Methods of collecting data is interview, observation and research or survey.
Minimum value	The lowest or smallest value in the data set.
Mode	Value or values appearing most often in a data set.
Mode of a set of data	Most common data value in a data set.
Multiple bar graph	A bar graph that displays two or more sets of data at once for easy comparison
Numerical data	The data that is given in the form of numbers.
Observation	Recording of data by watching someone or something closely. **OR** The method of collecting data that involves watching, listening, touching, reading.
Outcome	Result of a trial (experiment).
Outcome [fair]	All outcomes are equally likely to occur.
Outliers	Data value that lies an abnormal distance from the other data values in the data set. **OR** Extreme low or extremely high value in the data set. **OR** The item or value in the data set that differs significantly with other items or values.
Percentiles	The points that divide the data set into 100 equal parts. Quartile 1 is the 25^{Th} percentile i.e., the value at which 75% of the data set lies above and 25% of the data set lies below it. Quartile 2 Is the 50^{th} percentile i.e., the value at which 50% of the data set lies above and 50% of the data set lies below it. Quartile 3 is the 75^{th} percentile i.e., the value at which 25% of the data set lies above and 75% of the data set lies below it.

Qualitative data/ Categorical data	Data that relates to certain categories e.g. male/female or type of car etc.
Quantitative data/ Numerical data	Data that can be measured and can be discrete or continuous.
Quartiles	The values that divide a list of numbers into four equal parts.
Questionnaire	List of questions that can be used to collect data. An instrument consisting of questions for the purpose of collecting data.
Random sampling	The sampling method that allows every member of the population a chance of being included in the sample.
Range [of a data set]	Difference between the highest and lowest values in a data set. **OR** The difference between the maximum value and the minimum value in the data set.
Related [data sets]	Linked; connected.
Represent[data]	Draw; graph.
Representative sample	Sample likely to give results similar to those obtained from studying the whole population.
Sample	Subset (small group) chosen from the population to represent the population. **OR** The fraction of the entire group to be used in the collection of data
Sampling	Choosing a representative sample.
Scatter plot	A graph that is made by plotting ordered pairs in a coordinate plane to show the relationship between two sets of data, but the points are not connected by a line.
Sort	Put, organise into categories.
Stacked bar graph	(Also known as stacked bar charts) Instead of displaying a compound bar graph with bars side-by-side, a stacked bar graph divides the bar into segments. It is used to show how one bar is divided into smaller parts.
Survey	Collect data from a group of people or objects.
Survey [biased]	Survey containing factors that produce answers that do not represent a truthful picture of the situation.
Ungrouped data	The data given as individual items or values.

3.1.2 SUMMARISING DATA

OBJECTIVES

At the end of this section, you must be able to do the following:

- Calculate the mean.
- Calculate the median.
- Identify the mode for arranged data.
- Calculate the range.
- Analyse measures of central tendency and make deduction about the trends in the data

Summary

Summarising Data

Once the collected data has been classified and organised, it is important to summarise the data, in order to provide additional information regarding the trends of the data set.

Measures of Central Tendency

There are 3 measures of central tendency

- Mean
- Median
- Mode

MEAN

- the formula used:

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

- It can be only be calculated if the data set is numerical

MEDIAN

- All data values must be arranged in ascending order.

- The median is the middle value of an ordered data set.
- It can be calculated if the data set is numerical

MODE

- The mode is the data value(s) that occur(s) most frequently in a set.
- If two values occur most frequently, then the data set is referred to as bimodal.
- It can be determined for both numerical and categorical data.

RANGE

- The range of data indicates the difference between the highest and the lowest values in the data set.

  Range = highest value – lowest value

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

NOTE: Range is not part of **Measures of Central Tendency** but **Measures of Spread**

Worked examples 1

1. Mr Khabo's Grade 12G Mathematical Literacy class test marks out of 20 are as follows:

18; 12; 15; 15; 15; 17; 18; 19; 20

1.1 Calculate the mean.

1.2 Find the median of the data set.

1.3 Write down the mode.

1.4 Determine the range.

Solutions

1.1 Mean $= \frac{12+15+15+15+17+18+18+19+20}{9}$

$= \frac{149}{9}$

$=16,6$

1.2 17

1.3 15

1.4 Range = **Highest – Lowest**

= 20 – 12

= 8

Worked examples 2

2. Mr Khabo's Grade 12G Mathematical Literacy examination marks out of 100 are as follows:

50; 26; 72; 37; 53 ;23 ;89 ;67; 53; 42

2.1 Calculate the mean.

2.2 Arrange the marks in ascending order.

2.3 Write down the mode.

2.4 Determine the range.

2.5 Find the median of the data set.

Solution

2.1 Mean $= \frac{50 + 26 + 72 + 37 + 53 + 23 + 89 + 67 + 53 + 42}{10}$

$= \frac{512}{10}$

$=51,2$

2.2 23; 26; 37; 42; 50; 53; 53; 67; 72; 89

2.3 53

2.4 Range = **Highest – Lowest**

= 89 – 23

= 66

2.5 Median $= \frac{50 + 53}{2}$

$= \frac{103}{2}$

$=51,5$

Practice Questions

Question 1

1. The data below represents the points accumulated during the 2017 University female hockey and soccer tournament.

TABLE 1: Accumulated points by hockey and soccer in the tournament

Teams	Up Tuks	Maties	NWU Puk	Wits	UFS Kovsie	UJ	Madibas	UKZN
Hockey	18	18	18	12	9	6	3	0
Soccer	11	17	11	6	12	9	12	0

[Source: Varsity Sports]

Use the Table 1 from above to answer the questions that follow.

1.1 Arrange the soccer points in descending order. (2)

1.2 Identify the teams that accumulated less points in hockey than in soccer during the tournament. (2)

1.3 Determine the mode of the soccer points. (2)

1.4 Calculate the mean of the hockey points. (3)

1.5 If the tournament points for the two sporting codes are chosen at random, determine the probability (as a common fraction) that the points will be less than 10. (2)

[11]

Question 2

Moipone, a Grade 10 learner conducted a research about Top achievers of Mpatleng Secondary School after attending the award ceremony held on the 11 October 2019 when Seboko M received an award again. She found that from 2013 the school held the award ceremony for the best learners. The 2013 and 2017 best learners were among the top 100 in the Free State Province.

Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Name	Mompe	Domkrag T	Nyila P	Maleho k	Thapong S	Seboko M
Average %	85	72	69	71	78	72
Grade	12	12	12	12	12	11

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

2.1 Find the median of average percentage of best learner. (3)

2.2 Show that the best learner average percentage mean it's 75%. (4)

2.3 Give the modal average percentage, and compare with the median. (2)

2.4 Determine the range. (2)

2.5 Use the table of best learner above to determine the probability (as decimal) of randomly selecting a learner appeared in Top 100 of the province. (3)

Question 3

Mrs Bush wanted to encourage Mr Bush to drive carefully while on holiday. She showed him some statistics which represents the number of accidents occurring across South Africa. The statistics are reflected in TABLE 4.

TABLE 4: Statistics of road accidents from 1 December to 11 January 2015/2016

Year	PROVINCES									TOTAL SA
	GP	KZ-N	WC	EC	FS	MP	NW	LP	NC	
2015/2016	246	308	122	227	131	159	108	186	***A***	1535
2016/2017	271	***B***	162	278	157	184	136	208	57	***C***
Difference	**25**	**-6**	**40**	**51**	**26**	**25**	**28**	**22**	**9**	**220**

Use **TABLE 4** from above to answer the questions that follow.

3.1 Calculate the value of A. (2)

3.2 Determine the value of B. (2)

3.3 Hence determine the value of C. (2)

3.4 Determine the mean number of accidents in 2015/2016. (3)

3.5 Determine the median for the difference in road accidents reported. (2)

3.6 What is the probability that the number of accidents for 2016/2017 will drop the following year? (2)

Question 4

Neo opened a car wash business and decided to observe the different types of cars that come for a wash on a particular Saturday and Sunday. Table 2 below shows his findings:

TABLE 2: TYPES OF CARS WASHED AT A CAR WASH ON SATURDAY AND SUNDAY

Type of car	Number of cars washed on Saturday	Number of cars washed on Sunday
Jaguar	2	4
Mercedes Benz	5	6
BMW	6	6
Renault	4	3
Toyota	18	15
TOTAL	**35**	**34**

Use the information above to answer the following questions:

4.1 Write down the data collection method used to collect the data above. (2)

4.2 State whether the number of cars washed represent discrete or continuous data. (2)

4.3 Calculate the number of cars that were washed altogether on Saturday and Sunday? (2)

4.4 Write down the probability of a worker washing a Renault car on a Saturday. (2)

[08]

Question 5

Sipho and Sandile recorded their times in minutes for a number of 7 km trial runs.

TABLE 6: Times taken for a 7 km trial run

Sandile (in minutes)	**35**	**32**	**31**	**32**	**32**	**31**	**30**	**29**	**32**	**30**	
Sipho (in minutes)	**30**	**31**	**32**	**33**	**33**	**34**	**34**	**35**	**35**	**35**	**37**

Use **TABLE 6** from above to answer the questions that follow.

5.1 Write down Sipho's median time. (2)

5.2 Calculate Sandile's median time. (3)

5.3 Determine the range of Sipho's time. (2)

5.4 Calculate Sandile's mean time, rounded off to TWO decimal places. (3)

5.5 Determine the mode of the times taken by Sandile. (2)

5.6 Use Sipho's times for his eleven trial runs to determine the probability that his next trial run will be less than 35 minutes. (2)

[14]

3.1.3 MEASURES OF SPREAD

OBJECTIVES

At the end of this section, you must be able to do the following:

- Identify the minimum and the maximum value.
- Calculate the quartiles (Q_1, Q_2 and Q_3).
- Analyse measures of spread and make deduction/s about the trends in the data.

SUMMARY

Measures of Spread

There are two measures of spread:

- Range
- Interquartile Range

INTERQUARTILE RANGE (IQR)

- The IQR is the difference between the upper quartile (Q_3) and the lower quartile (Q_1).

  $IQR = Q_3 - Q_1$
- Lower quartile (Q_1) is 25% mark.
- Median (Q_2) is 50% mark
- Upper quartile (Q_3) is 75% mark
- If the IQR is a low number, the middle 50% of the data is close together/clustered.
- If the IQR is a high number, the middle 50% of the data is far apart/spread out.

Before you can calculate the interquartile range, you first need to determine the quartiles of the data.

QUARTILES

- All data values must first be arranged in ascending order (from smallest to highest).
- Quartiles divide a data set into four equal parts.
  - Middle quartile (Q_2) is the median of the data set.
  - Lower quartile (Q_1) indicates the first quarter of the data set.
  - Upper quartile (Q_3) indicates the upper quarter of the data set.

Worked example 1

The final Grade 12 results for Ntema and Khati are given below:

Ntema	85%	68%	57%	79%	92%	72%	60%	43%	50%
Khati	78%	29%	45%	55%	83%	72%			

Use the above table to answer the following questions:

1.1 Calculate the quartiles for each set of data

1.2 Determine the interquartile range for each data set.

Solutions

1.1 Ntema

43; 50; 57; 60; 68; 72; 79; 85; 92.

Q_2 = 68%

$Q_1 = \frac{50+57}{2}$

$= \frac{107}{2}$

= 53.5

$Q_3 = \frac{79+85}{2}$

$= \frac{164}{2}$

= 82

Khati

29;45; 55; 72; 78 ;83

$Q_2 = \frac{55+72}{2}$

$= \frac{127}{2}$

= 63,5

Q_1 = 45

Q_3 = 78

2.2 Ntema

IQR = $Q_3 - Q_1$

= 82 – 53,5

= 28,5

Khati

IQR = $Q_3 - Q_1$

= 78 – 45

= 33

Practice Questions

Question 1

Mr Mokebe, a Grade 12 educator, teaches learners about the Body Mass Index (BMI). He brings a digital bathroom scale and a measuring tape to class. Table 1 shows the weight of 60 learners in three classes.

TABLE 1: Weight of learners in 12A, 12B and 12C classes.

12 A	50	48	55	53	55	56	51	60	62	57
	52,5	60	58	43	47	50	51	58	55,5	60

12 B	40	42	46	46	48	48	51	51	51	52
	53	55	57	58	60	60,2	61	64	68	70

12 C	43	47	48,1	49	50	52	53,1	53,6	54	56
	56,2	57	60	60	61	61	63	63	65	65

Use **TABLE 1** from above to answer the following questions.

1.1 The mean (average) weight of learners in 12A. (3)

1.2 The modal weight of learners in 12B. (2)

1.3 The median weight of learners in 12C. (3)

1.4 Calculate the quartile 1 and the quartile 3 for 12C. (4)

1.5 Hence calculate the interquartile range for 12 C. (2)

1.6 Show by calculations that the range for the weight of 12A class is 19 kg. (2)

Question 2

The data in the tables below represent the distance (in km) that the learners from Exhibition High School walked to school the morning before a Mathematical Literacy test, and the marks (out of 50) that they obtained for the test.

TABLE 1 : Distance (in km) travelled by learners

0,2	0,5	0,3	1,2	0,25
0,75	1,3	3	1,2	1,8
2,4	1,5	0,2	0,8	2,6
3	1,4	0,75	0,5	1,2
3,2	0,8	0,3	1	1,8

TABLE 2 : Marks obtained for the test

49	38	37	30	39
34	29	19	27	25
20	28	43	33	41
15	25	38	40	30
18	30	39	28	28

Use **TABLE 1** and **TABLE 2** from above to answer the questions that follow.

2.1 Identify the SECOND shortest distance walked by a learner. (2)

2.2 Determine the highest mark scored by a learner. (2)

2.3 Name ONE data collection instrument used to collect this data. (2)

2.4 Determine the median of the test marks. (3)

2.5 Determine the mode of the test marks. (2)

2.6 Calculate the mean mark for this test. (3)

2.7 Determine the probability of randomly selecting a learner who walked less than 1 km on the day of the test. (2)

2.8 Determine the probability of randomly selecting a learner who scored more than 35 out of 50 for the test. Write your answer as a decimal. (2)

Question 3

TABLE 5 below shows the results of a recent gymnastics competition held at a school. The table shows the gymnasts' names, teams, divisions and various events with total scores given to three decimal places.

TABLE 5: RESULTS OF A GYMNASTICS COMPETITION

GYMNAST	TEAM	DIV.	EVENTS				TOTAL SCORE
			VAULT	BARS	BEAM	FLOOR	
G Gilliland	GTC	Senior A	9,550	9,100	9,400	9,625	37,675
H Radebe	Olympus	Junior B	9,450	9,250	8,900	9,400	37,000
L Gumede	Olympus	Junior A	9,475	9,300	8,700	9,500	36,975
S Rigby	TGA	Senior A	9,500	8,650	8,925	9,350	36,425
H Khumalo	GTC	Senior A	9,300	9,100	**A**	9,225	36,425
C Maile	Olympus	Junior A	8,950	9,050	9,025	9,375	36,400
M Stolp	GTC	Senior A	9,400	8,750	8,725	9,500	36,375
M McBride	GTC	Junior A	9,475	9,050	8,700	9,050	36,275
A Boom	TGA	Senior A	9,650	8,300	8,700	9,500	36,150
B Makhatini	Olympus	Junior B	9,350	9,200	9,150	9,350	37,050

Use **TABLE 5** from above to answer the questions that follow.

3.1 Identify the team that achieved the highest score for the vault event. (2)

3.2 Determine the range of G Gilliland's scores. (2)

3.3 Calculate the mean score for the bar event. (3)

3.4 Determine missing value **A**. (3)

3.5 Write down the modal score for the total points scored. (2)

3.6 Determine, as a percentage, the probability of selecting a gymnast in the Junior division with a total score of more than 36,970. (3)

3.7 Calculate the value of quartile 2 for the floor event. (3)

3.1.4 REPRESENTING DATA

OBJECTIVES

At the end of this section, learners must be able to do the following:

- Identify the minimum and the maximum value.
- Calculate IQR.
- Interpret the box-and-whisker plot.

SUMMARY

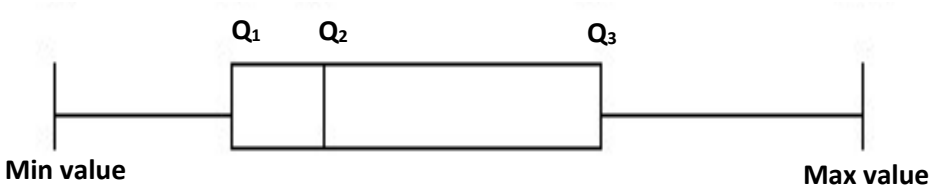
Representing data

BOX – AND – WHISKER PLOTS

- The box-and-whisker plot is a visual representation of the 5-number summary of a data set.
- The 5-number summary is made up of the following data values:

1. Minimum value
2. Q_1 (lower quartile)
3. Q_2 (median)
4. Q_3 (upper quartile)
5. Maximum value

Visual representation

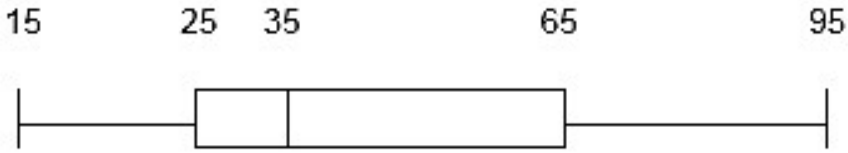


NOTE:

You are only expected to interpret the box-and-whisker plot, you will not be expected to draw the box-and-whisker

Worked example 1

1 The following box – and - whisker plot represents the summary of data collected about the amount of rand saved by the learners in a certain school in the ordinary public school sector. One hundred and forty (140) people took part in this survey



Study the box-and-whisker plot above and answer the questions that follow:

1.1 Why is it important for a learner to save money?

1.2 What percentage of the people saves more than R65 per month?

1.3 Calculate the value of inter-quartile range

1.4 Busi claims that 70 people save between R15 and R35. Verify, showing ALL calculations, whether her statement is valid.

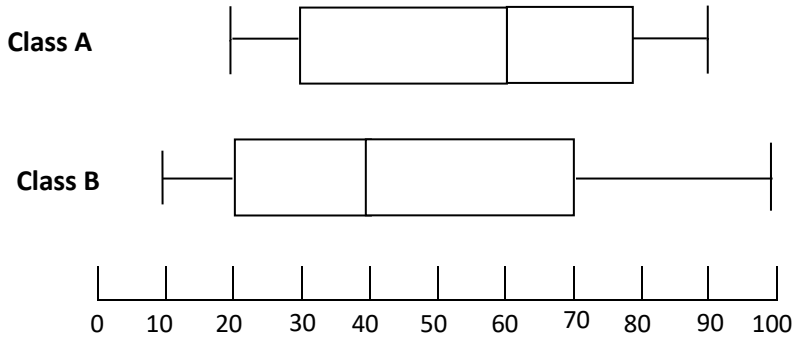
Solution

1.1	It will assist learners to buy bigger articles like bicycles, cell phones etc. for which their pocket money is not enough any other reasonable answer
1.2	25%
1.3	IQR = 65-25✓M = 40✓CA
1.4	$\frac{50}{40}\times 140$ = 70 people Her statement is correct

Practice Questions

Question 1

The box-and-whisker diagrams representing the percentage achieved in the exam of the two Mathematical Literacy Grade 12 classes consisting of 26 learners each are shown below:



The arranged percentage marks of **class A** are given below:

19,8	26	27,9	28	29,8	30	30,1	49	49,7
49,7	49,8	52	53,3	**X**	66,7	66,8	66,9	**H**
75	79,9	79,9	80	80	80	84	89,9	

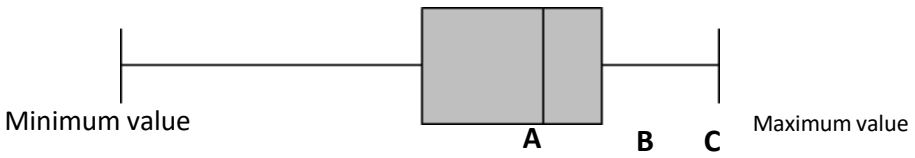
1.1	Calculate the missing values of: **X**, by reading the median value from the box-and-whisker plot **H**, if the mean percentage mark of Class A is 57,1	(6)
1.2	Calculate the probability of randomly selecting a learner from Class A with a mark less than 79,9%.	(2)
1.3	Compare the **Inter Quartile Ranges (IQR)** of Class A and Class B.	(5)
		[13]

Question 2

After the first term a Mathematical Literacy test was written at Matlwangtlwang Secondary School in Steynsrus. The Head of department sampled the scripts of 24 learners out of 84 learners. The results of these 24 learners were as follows. The test was out of 60 marks.

The arranged test results and a corresponding box and whisker diagram are given below.

8	14	15	15	16	16
17	18	19	20	20	20
22	23	24	24	25	26
30	35	35	35	35	36



Use only the results of the sample to answer the following questions:

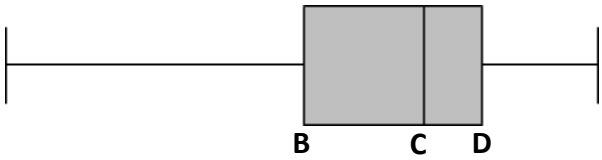
2.1	Calculate the range of the learners' marks.	(2)
2.2	Determine the median mark of the learners.	(2)
2.3	What is the modal mark of the learners?	(2)
2.4	Calculate the mean mark of the learners.	(3)
2.5	Write down the minimum value and maximum value of the box and whisker diagram	(2)
2.6	Calculate the missing quartile values **A**, **B** and **C** of the box and whisker diagram.	(5)
2.7	Calculate the interquartile range of the learners' test.	(2)

Question 3

The majority of Metro High Schools' learners who committed violent incidents wereGrade 9 boys.

The arranged ages of these Grade 9 boys and a corresponding box-and-whisker plot aregiven below.

A	14	14	14	14	15	15	15
15	15	16	16	16	16	16	16
16	16	16	16	17	17	17	17
17	17	17	17	17	17	17	17
17	18	18	18	18	18	18	18



[Adapted from the South African School Administration and Management System]

Use the information given above to answer questions that follow.

3.1 Determine the missing value **A** if the range of the ages of the Grade 9 boys who committed violent incidents is 5 years. (2)

3.2 Calculate the mean age of the Grade 9 boys who committed violent incidents. (3)

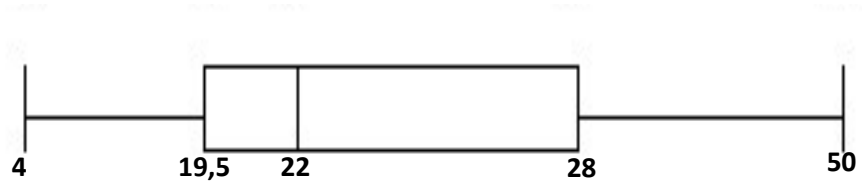
3.3 Calculate the missing quartile values **B**, **C** and **D** of the box-and-whisker plot. (5)

3.4 A Grade 9 boy who committed a violent act is randomly selected. Determine the probability (expressed in decimal form) that the boy would be 16 years or older. (3)

3.5 Give a possible reason why so many Grade 9 boys at Metro High School committed violent incidents. (2)

Question 4

The box-and-whisker diagram that represent the marks achieved in a Mathematical Literacy Test for a Grade 12 class consisting of 20 learners is shown below:



Use the information given above to answer questions that follow.

4.1 Write down the lowest score obtained. (2)

4.2 Define the term *range* in the context of the information provided. (2)

4.3 What percentage of learners scored between 4 marks and 19,5 marks? (2)

4.4 Determine the number of learners who scored marks that are less than the 3rd quartile. (3)

4.5 If a mark of a learner falls on the 2nd Quartile (Q2), what does this mean? (2)

3.2 SOLUTIONS TO PRACTICE QUESTIONS

3.2.1 SUMMARISING DATA

Question 1			
Q	**Solution/s**	**Explanation**	**L**
1.1	17 12 12 11 11 9 6 0 ✓✓A	1 A all values in correct order 1 A Descending (2)	L2
1.2	UFS Kovsie UJ Madibas } ✓✓A	2 A all correct -1 for every one omitted -1 for every incorrect answer -1 for every extra team mentioned. (2)	L2
1.3	12✓A and 11✓A	A 12 A 11 (2)	L2
1.4	Mean = $\frac{84}{8}$ ✓M ✓A = 10,5 ✓CA	1 A 84 1 M divide total by 8 1 CA answer (3)	L2
1.5	$\frac{7}{16}$ ✓✓A	1A Numerator 1A Denominator (2)	L2

Question 2			
Q	**Solution/s**	**Explanation**	**L**
2.1	69; 71; 72; 72; 78; 85 ✓ Median = $\frac{72+72}{2}$ ✓M = 72✓A	1 Arrangement 1M 1Answer (3)	L3
2.2	Mean = $\frac{69+71+72+72+78+85}{6}$ ✓ = $\frac{447}{6}$ ✓✓ = 74.5✓A	1MA 1A 447 1M dividing by 6 1Answer (4)	L4
2.3	72✓A They are the same R✓	1Answer 72 1Reason (2)	L2
2.4	Range = 85 – 69✓M = 16✓A	1Method 1Answer (2)	L1
2.5	Probability = $\frac{2}{6}$ ✓A ✓A =0.33 ✓CA	1 Numerator 1Denominator 1CA Answer (3)	L2

Question 3			
Q	**Solution/s**	**Explanation**	**L**
3.1	1 535 – 1 487 ✓ M A = 48 ✓A **OR** A = 57-9✓M = 48✓A	1Method 1A Answer (2)	L2
3.2	B = 308 + (-6) ✓M = 302✓A	1M Addition 1A Answer (2)	L2
3.3	C = 271 + 302 + 162 + 278 + 157 + 184 + 136 + 20 ✓ M = 1 755 ✓A **OR** 1 535 + 220✓M = 1 755✓A	1M Addition 1A Answer (2)	L2
3.4	Mean = $\frac{246+308+122+227+131+159+108+186+48}{9}$ ✓SF = $\frac{1535}{9\checkmark M}$ = 170,56✓A	1SF Correct values 1M Dividing by 9 1A Answer (3)	L2
3.5	-6; 9; 22; 25; 25; 26; 28; 40; 51 ✓M Median = 25 ✓A	1M Arrange in ascending/ descending order 1A Answer (2)	L2
3.6	Unlikely ✓A Most of the accidents increased from 2015/16 to 2016/17. ✓ J	1A Answer 1J Reason (2)	L2

Question 4			
Q	**Solution/s**	**Explanation**	**L**
4.1	Observation ✓✓A	2A correct method (2)	L1
4.2	Discrete✓✓A	2A discrete (2)	L1
4.3	No. of cars washed = 35 + 34✓MA = 69✓CA **OR** No. of cars washed = 2 + 5 + 6+ 4 +18 +4+6+6+3+15 ✓MA = 69 ✓CA	1MA adding correct values 1CA total number of cars 1MA adding all values 1CA number of cars (2)	L1
4.4	Probability = $\frac{4}{35}$ ✓A ✓A	1A numerator 1Adenominator (2)	L1

Question 5			
Q	**Solution/s**	**Explanation**	**L**
5.1	Median time = 34 minutes ✓✓A	2A Correct median (2)	L1
5.2	Sandile:29; 30; 30; 31; 31; 32; 32; 32; 32 ✓A Median time = $\frac{31+32}{2}$ ✓M = 31,5 ✓CA	1A arranging in order 1M calculation 1CA solution (3)	L3
5.3	Range = 37 – 30 ✓M =7 minutes ✓A	1M method 1A correct Range (2)	L2
5.4	Sandile's $Mean = \frac{29+30+30+31+31+32+32+32+32+35}{10}$ ✓M $= \frac{31}{10}$ ✓A = 31, ✓CA	1M concept of mean 1A addition 1 CA solution (3)	L2
5.5	Mode = 32 minutes	2A correct mode	L1
5.6	Probability = $\frac{7}{11}$ ✓A ✓A	1A Numerator 1 A Denominator (2)	L2

3.2.2 MEASURES OF SPREAD

Question 1			
Q	**Solution/s**	**Explanation**	**L**
1.1	*Mean* for 12 A = $\frac{50+48+55+.....60}{20}$ ✓M = $\frac{1082}{20}$ ✓M = 54,1 ✓A	1M adding all values 1M dividing by 20 1A Answer (3)	L2
1.2	Modal weight for 12B = 51	2A answer (2)	L2
1.3	Median for 12C = $\frac{56+56,2}{2}$ ✓M ✓M = 56,1 ✓A	1M identifying 56 and 56,2 1M dividing by 2 1A answer (3)	L2
1.4	$Q_1 = \frac{50+52}{2}$ = 51 ✓✓A $Q_3 = \frac{61+61}{2}$ = 61 ✓✓A	2A answer 2A answer (4)	L1
1.5	Interquartile range (12C) = 61 – 51 ✓M = 10 ✓CA	1M IQR concept 1CA answer (2)	L1
1.6	Range for 12A = 62 – 43 ✓✓M = 19kg	2M Range Concept (2)	L1

Question 2			
Q	**Solution/s**	**Explanation**	**L**
2.1	0,25 km **OR** 250 m ✓✓RT	2 RT (2)	L1
2.2	49 ✓✓RT	2 RT (2)	L1
2.3	Questionnaire ✓✓A **OR** Survey	2A (2)	L1
2.4	15; 18; 19; 20; 25; 25; 27; 28; 28; 28; 29; 30; 30; 30; 33; 34; 37; 38; 38; 39; 39; 40; 41; 43; 49 ✓M Median = 30 ✓✓A	1M arranging all correct values 2A correct median (3)	L2
2.5	Mode(s) = 28 and 30 ✓✓A	2A (2)	L1
2.6	*Mean* ✓A $= \frac{783}{25}$ ✓MA = 31,32 ✓CA	1 A addition of all correct values 1 MA dividing by 25 1CA final answer (3)	L2
2.7	$\frac{11}{25}$ **OR** 44% **OR** 0,44 ✓✓A	2A Answer (2)	L2
2.8	$\frac{9}{25}$ = 0.36✓✓A	2A Correct decimal (2)	L2

Question 3			
Q	**Solution**	**Explanation**	**L**
3.1	TGA – team✓✓RT	2RT correct team (2)	L1
3.2	✓RT Range = 9,625 – 9,100 = 0,525 ✓CA	1RT reading correct values 1CA concept of range (2)	L1
	Mean = ✓RT ✓M $\frac{9{,}100+9{,}250+9{,}300+8{,}650+9{,}100+9{,}050.+8{,}750+9{,}050+9{,}200+8{,}300}{10}$ = 8,975 ✓CA	1RT adding correct values 1M concept of mean 1CA simplification (3)	L2
3.4	**A** = 36,425 – (9,300 + 9,100 + 9,225) ✓RT = 8,800 ✓A	1RT correct values 1M adding and subtracting 1A simplification (3)	L1
3.5	36,425 ✓✓A	2A correct mode (2)	L1
3.6	$\frac{3}{5}$ ✓A $\times 100$ ✓A = 60% ✓A	1A numerator 1A denominator 1A percentage (3)	L2
3.7	$Quartile2 = \frac{9{,}375 + 9{,}400}{2}$ ✓RT ✓M = 9,3875 ✓A	1RT correct values 1M dividing by 2 1A simplification (3)	L2

3.2.3 REPRESENTING DATA

Question 1			
Q	**Solution/s**	**Explanation**	**L**
1.1	$Median = \frac{53,3 + X}{2} = 60$ ✓MA ✓RG => X = 66,7 ✓CA $Mean = \frac{\text{sum of the marks}}{\text{total number of learners}}$ ✓CA $57,1 = \frac{1410,9 + H}{26}$ ✓MA 1484,6 =1410,9 + H H = 73,7✓CA	1MA median concept. 1RG median 1CA value 1MA mean concept 1CA adding values 1CA value of H (6)	L3
1.2	$P_{(\text{more than } 79,9\%)} = \frac{19}{26}$ ✓CA ✓MA = 0,731 OR 73,1%	1CA numerator 1MA denominator (2)	L2
1.3	Class A: Q_1 = 30 ✓A Q_3 = 80 ✓A IQR A Class = 80 – 30 = 50 ✓CA Class B: Q_1 = 20 Q_3 = 70 IQR Class B = 70 – 20 = 50 ✓A Both classes have the same IQR.✓J	2A identification of quartiles 1CA IQR 1A IQR value 1J compare (5)	L1

Question 2			
Q	**Solution/s**	**Explanation**	**L**
2.1	Range = Highest - Lowest = 36 – 8 ✓SF = 28 ✓CA	1SF 1CA (2)	L2
2.2	Median = $\frac{20+22}{2}$ ✓M =21 ✓A	1M median concept 1 CA (2)	L2
2.3	Modal mark = 35yrs ✓✓A	2A (2)	L2
2.4	*Mean* mark = $\frac{548}{24}$ ✓A ✓A = 22,83 ✓CA	1A adding all values 1 A dividing by 24 1 CA simplification (3)	L2
2.5	Minimum = 8 ✓RT Maximum = 36 ✓RT	1A identify Min value 1A identify Max value (2)	L1
2.6	A = $\frac{16+17}{2}$ ✓RT = 16,5 ✓CA B = 21 ✓A C = $\frac{26+30}{2}$ ✓RT = 28 ✓CA	1A identify correct values 1CA answer 1A answer 1A identify correct values 1 CA answer (5)	L2
2.7	IQR = 28 – 16,5 ✓ MA =11,5 ✓A	1 MA subtract 1A (2)	L2

Question 3

Q	Solution/s	Explanation	L
3.1	Range = Highest - Lowest 5 = 18 – A ✓M A = 13 ✓CA OR A = 18 – 5 ✓M = 13 ✓CA	1M concept of range 1CA value of A OR 1M concept of range using 5 1CA value of A (2)	L2
3.2	$Mean = \frac{13+14\times4+15\times5+16\times10+17\times13+18\times7}{40}$ ✓M $= \frac{651}{40}$ ✓A = 16,275 ✓CA	CA answer from 3.1 1M adding all 40 values 1A dividing by 40 1CA Simplification (3)	L2
3.3	B = $\frac{15+16}{2}$ ✓A = 15,5 ✓CA C = $\frac{16+17}{2}$ ✓M = 16,5✓CA D = 17✓CA	1A correct values 1CA value of B 1M mean concept 1 CA value of D (5)	L2
3.4	P = $\frac{30}{40}$ ✓A ✓A = 0,75 ✓CA	1A 30 grade 9 boys 1A no. of boys 40 1CA decimal (3)	L2
3.5	The grade 9 boys are too old for their grade. ✓✓J **OR** Social: Need recognition / low self- esteem / identity crisis. **OR** Economic: To gain favours from others. ✓✓J Unemployment in the community, come from poor homes ✓✓J **OR**	2J reason	L4

	Educational: They are frustrated by their lack of progress. ✓✓ J **OR** Environmental factors/ emotional factors **OR** Contextual factors/ No parental control/Peer pressure ✓✓ J **OR** Violent community / child headed family/gang related ✓✓ J **OR** Any other reasonable justification ✓✓ J	(2)	

Question 4			
Q	**Solution/s**	**Explanation**	**L**
4.1	4✓✓A	2A correct answer (2)	L2
4.2	Range is the difference between the highest/maximum value and the lowes/minimum value in a data set. ✓✓A	2A correct definition (2)	L2
4.3	25%✓✓A	2A percentage (2)	L2
4.4	✓A Number of learners = $\frac{75}{100}$ × 20✓MA = 15✓CA	1A 75% 1MA multiplying by 20 1CA simplification (3)	L3
4.5	It means that 50% of learners scored 22 marks and below✓✓O **OR** It means that 50% of learners scored 22 marks and above✓✓O	2O explanation 2O explanation (2)	L4

4. EXAMINATION GUIDANCE

	PAPER 1
Weighting oftopics	Finance 60% (±5)
	Data Handling 35% (±5)
	Probability 5%
	Including Growth Charts (CAPS page 65) assesses application of measures of spread in data handling.
Structure and scope of contentand/or skills	**Question 1**:30 marks ± 5 marks
	Level 1 questions from Finance and
	Data Handling
	Question 2
	Finance
	Question 3
	Data Handling
	Question 4
	Integrated context on Finance and Data
	Handling Including Growth Charts (CAPS page 65) assesses application of measures of spread in data handling.
	Question 5
	Finance, data handling or integrated
	question
	Probability will be examined in thecontext of one or more of the other questions. Each question can contain more than one context.
N.B Each paper may have 4 or 5 questions	

Topics		%	150 marks			
Finance	PAPER 1	60%	90	Taxonomy levels	Level 1: Knowing	30% (±45 marks)
Data handling		35%	53		Level 2: Applying routine proceduresin familiar contexts	30% (±45 marks)
Probability		5%	7		Level 3: Applying multi-step procedures in a variety of contexts	20% (±30 marks)
		100%	**150 marks**		Level 4: Reasoning and reflecting	20% (±30 marks)

Time and mark allocation

Paper 1

Duration	Marks
3 hours	150 Marks

Time management for Examination preparation:

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

Application Topics	Number of hours
Finance	60
Data handling	35
Probability	5

Order of the questions in the question paper

Each paper may have 4 or 5 questions.

Paper 1:

QUESTION 1 (30 marks ± 5 marks ONLY taxonomy Level 1.) Short context – mixed questions(Finance and Data Handling.)
QUESTION 2 –
Finance
QUESTION 3 –
Data Handling
QUESTION 4 – Finance and Data
Handling QUESTION 5 – Finance,
Data Handling or integrated
Probability will be integrated in all five questions, where it is appropriate.

GUIDANCE

Set a goal (marks you would like to see on your Matric Certificate) at the beginning of the term,

If for example your aim is to achieve 60% for Mathematical Literacy.

One way of getting it is as follows:

Paper 1: 90 marks out of a possible 150

Paper 2: 90 out of a possible 150

A total of 180 out of 300 = 60%

5.GENERAL EXAMINATION TIPS

1. Study the matric timetable. Know when you are going to write the papers you have registered for. There are sometimes two exams on one day so you will have to be super sharp and alert. **Be sure to check the final timetable in case there are any changes.**
2. There are less than 123 days to the start of the final exams. This includes all weekends and holidays. Start today and work every day. Set targets for achievement.
3. Do not miss **one day of studying** between now and your exams. Work at least two to three hours per day. Keep healthy and alert.
4. **Reading** is a hot skill. Reading will change your life. Read at least 1000 words every day. Read everything you can get your hands on. Read accurately and quickly.
5. **Writing** is power, but it requires practice. We are all judged, every day, on our writing. We can inspire, impress, persuade, congratulate and express love in writing. Write at least 400 words every day carefully, accurately and beautifully.
6. **Resources** are an essential student companion. Work systematically through your question papers and Self Study Guide. Don't wait for your face-to-face classes or broadcasts to explain it all. Look at what you have to cover for the subject and plan accordingly.
7. Your **BMI** can help you in matric. Your Body mass Index (BMI) is an indication of how healthy you are. Calculate your BMI and then exercise and eat healthy throughout the year to keep an optimum BMI.
8. Academic work requires **concentration and focus**. Every day you should be engaged in intensive, focused, individual academic work. Turn off iPods, music centres, the TV, the cell phone and have an intensive and rewarding academic work out every day. Except of course if you are using it to access the resources. Be diligent and don't be tempted to watch or access non – academic material. Technology is a fabulous platform to learn and prepare for the examinations but it can also be a deterrent if you are not focused and dedicated. Build your brain cells and be the envy of all your friends.
9. Good vibes are good for success. Surround yourself with positive people who want you to succeed. Your family and friends will be important ibn supporting you in the next 123 days. Be grateful for their support.
10. Matric success requires **Planning and hard work**. Start planning and working today. Read every day. Write and calculate every day. Stick to your year plan.

6. References

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2 NSC Mathematical Literacy, DBE Nov Exam P1, 2020.

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8 NSC Mathematical Literacy, GP (10601) Preparatory Exam P1, 2019.

9 NSC Mathematical Literacy, KZN Preparatory Exam P1, 2017.

10 The Answer Series, Mathematical Literacy, Grade 12.

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