

MATHEMATICAL LITERACY (Updated September 2013)

A. MEANS OF ASSESSMENT

Paper 1	3 hours	[150]
Paper 2	3 hours	[150]
School Based Assessment		[100]

400 marks

B. REQUIREMENTS

To be read in conjunction with the: *Curriculum and Assessment Policy Statement (CAPS) Mathematical Literacy – Section 3*. Department: Basic Education Republic of South Africa (2011).

MATHEMATICS EXAMINATION PAPER 1 AND PAPER 2

The two examination question papers will assess the achievement of the topics using integrated questions or assessment tasks within a relevant context.

Weighting per topic

Table 1

	Topic	Weighting (%)
Basic Skills Topics	Interpreting and communicating answers and calculations	No weighting is provided for these topics. They will be assessed in an integrated way in the Application Topics.
	Numbers and calculations with numbers	
	Patterns, relationships and representations	
Application Topics	Finance	35% ($\pm 5\%$)
	Measurement	20% ($\pm 5\%$)
	Maps, plans and other representations of the physical world	15% ($\pm 5\%$)
	Data handling	25% ($\pm 5\%$)
	Probability	5%

WEIGHTING ACCORDING TO THE TAXONOMY OF COGNITIVE LEVEL ACROSS PAPER 1 AND PAPER 2

Table 2

Assessment is designed to the following weightings

		Paper 1	Paper 2	Total
Level		%	%	%
1	Knowledge	60(± 5)	-	30 (± 2.5)
2	Applying routine procedures in familiar contexts	35(± 5)	25(± 5)	30 (± 5)
3	Applying multi-step procedures in a variety of contexts	5	35(± 5)	20(± 2.5)
4	Reasoning and reflecting	-	40(± 5)	20 (± 2.5)
	Total	100	100	100

SCHOOL-BASED ASSESSMENT

School based assessment (SBA) comprises 25% of the total assessment for the National Senior Certificate. The requirements for the school-based component of the senior certificate assessment are outlined in Table 3.

All schools must make available the SBA evidence of all learners should it be required by IEB or Umalusi.

These Subject Assessment Guidelines must be read in conjunction with the IEB Manual for the Moderation of School Based Assessment (2011) available at www.ieb.co.za.

Table 3: PORTFOLIO REQUIREMENTS FOR GRADE 12

Descriptions	Weighting	%
Two alternate assessment tasks (1-2 hours duration).	2 × 10	20
Two tests: Standardised and at least 45 minutes to an hour in duration in controlled environment.	2 × 10	20
Two additional assessments – can be either standardised tests or alternate assessment tasks or one of each	2 × 10	20
Grade 12 Preliminary Examination consisting of Paper 1 and Paper 2.	2 × 20	40
Total:		100

- Alternate Assessment Tasks must have a minimum of two different types. (See page 26/3)
- The standardised tests and alternate assessment tasks must, together, cover at least four of the five topics in the curriculum.
- Tasks tackled in Grade 10 and Grade 11 may **not** be submitted in the Grade 12 learner file.

Grades 10 and 11

Although SBA in Grades 10 and 11 will not be monitored by the IEB, it is proposed that SBA in Grades 10 and 11 follow the same format as that for Grade 12.

Standardised tests in a controlled environment

- These tests are moderated.
- They are written by all learners of the same grade at the same time under controlled conditions.
- Teachers do the marking using the same marking memorandum or set of criteria.
- These tests could focus on a particular topic or be integrated across various themes.
- Questions must be differentiated across the four cognitive levels.

Examinations

Grade 12	One examination (Paper I and Paper II) according to the end of year format.
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Description of different types of Alternate Assessment Tasks

1. Projects

Projects require thinking about mathematics in a new context. Projects

- are practical.
- are more comprehensive than assignments or investigations.
- may be of an integrated nature.
- may be tackled by groups or individuals.
- usually have a significant part of the work that is carried out without close supervision.

A Mathematical Literacy project may be used to provide learners with an opportunity to apply mathematical knowledge and skill in their daily life situations.

Learners should be encouraged to identify suitable topics/issues relevant to their school situation or community needs. A project must enhance a learner's understanding of mathematics.

Criteria should be developed to assess the project. Learners should be made aware of the criteria beforehand.

Possible assessment criteria for projects could be:

- Formulation of the problem. If the problem is not provided, is it a relevant and current issue?
- Effective group work. Is the group work effective?
- The design of the project has clear vision and organisation.
- The variety of media resources accessed are sufficient for the problem being assessed and are used in an effective manner.
- Is the standard and quality of the project high?
- Effective use of time in completing the project.
- Has sensitivity been shown towards cultural differences and different viewpoints when completing the project?

2. Assignments

A Mathematical Literacy assignment is a guided or structured activity that seeks to enhance understanding of mathematical principles.

- Assignments are used for integration and consolidation of work done previously and serve to prepare the learners for examinations and tests.

- The content and context of the assignment is usually familiar to the learner.
- Educators may supervise the process in order to assess some skills that learners demonstrate, and the assignment may be completed by the learner in his or her own time.
- Learners can work on their own or in groups and assessment can be done in groups or individually.
- It is anticipated that each assignment will be completed in less than two hours.
- An assignment is meant to integrate and consolidate work that is done over a period of time.
- Educators must give clear instructions for assignments, as well as specific criteria for assessment.

3. Investigation

- Mathematical Literacy investigations aid construction of knowledge.
- Investigations give learners an opportunity to use various logical processes to formulate, test and justify conjectures.
- Investigations could be used for:
 - inductive reasoning: observe and analyse three or more specific examples.
 - identification of a pattern or a relationship e.g. number patterns.
 - testing whether the identified pattern holds for other cases.
 - formulating a conjecture (a rule).
 - developing an argument.
- Instructions to learners must be clear for an investigation to take place.
- Criteria for assessment must be given to learners prior to the investigation.
 - Formulation of the problem
 - Understanding of the problem
 - Application of mathematical concepts and skills
 - Use of diagrams, tables, graphs, etc.
 - Correctness of calculations
 - Discoveries, patterns and generalisations
 - Testing, justifying and proving conjectures
 - Communication of ideas in writing
 - Correct usage of mathematical symbols and notation
 - Layout, neatness and logical coherence
- Investigations could include the following components:
 - pattern searching
 - predicting
 - conjecturing and testing
 - hypothesising and testing
 - generalising and testing
 - proving
- Whilst the main focus of an investigation may pertain to a particular topic, the nature of the topic may also link with other topics or concepts.

In most investigations, it is not the results that are important but the mathematical processes involved. It is this aspect of investigations that makes it an ideal vehicle for performance assessment, because the focus is no longer on the “content” but on the skills and processes involved.

4. Research Task

A research task, in the context of Mathematical Literacy, involves the collection of data and/or information to solve a problem.

While the problem that focuses the research task is well defined, the nature of the data that is collected will determine the solution of the problem.

The following steps can be followed when formulating a research task for learners:

- Define the research question for the learners
- A questionnaire must be compiled.
- A sample group needs to be selected for the research
- The collection of data needs to take place. Learners need to reassure their subjects why they do the survey and that their information will be kept confidential.
- Analysis of data needs to be done using the relevant skills, e.g. frequency tables, statistics.
- Appropriate means of representing data needs to be done, e.g. graphs, tables.
- If the situation is appropriate, comparison of the learners' findings to that of various other surveys can be made.
- A report summarising the learners' findings and conclusions needs to be written.

5. Case Study

In Mathematical Literacy, the learner will be required to monitor events and/or a situation, to gather data and to make predictions about the situation.

Possible steps in a case study could be:

- The learner is required to keep a log book regarding a particular topic, e.g. monthly expenses.
- Using the data gathered, the learner can draw various conclusions and predictions regarding various changes that can effect his/her conclusions, e.g. the impact of the rising interest rate on monthly expenses.
- A case study can also be used to test how well a learner can identify the main problems of a situation and suggest solutions to these problems.
- The presentations of the case study to the class take on various forms, namely oral or written. The social skills in an oral presentation allow a learner to communicate his/her viewpoint, defend or clarify his/her viewpoint and listening to supporting viewpoints of others.

C. INTERPRETATION OF REQUIREMENTS

DESCRIPTION OF THE LEVELS IN THE MATHEMATICAL LITERACY ASSESSMENT TAXONOMY

(Adapted from the DBE Mathematical Literacy CAPS Document (2011))

Level 1: Knowing

Level 1: Knowing questions serve two functions:

- to familiarise learners with the context in which problems are posed by asking them questions about the context;

- To test ability to interpret contextualised information, to use familiar techniques to perform basic calculations and to explain common terms.

Level 2: Applying routine procedures in familiar contexts

Tasks at the *applying routine procedures in familiar contexts* level of the Mathematical Literacy taxonomy require learners to perform well-known procedures and complete common tasks in familiar contexts. Learners know which procedure/task is required from the way the problem is posed and all the necessary information to solve the problem is immediately available to the learner. Routine procedures questions commonly involve single-step calculations, repeating the same calculation several times, or the completion of a task with which learners are familiar (e.g. *constructing an income-and-expenditure statement to reflect an individual's finances*).

Level 3: Applying multi-step procedures in a variety of contexts

Tasks at the *applying multi-step procedures in a variety of contexts* level of the Mathematical Literacy taxonomy require learners to solve problems or complete tasks using well-known procedures and methods, but where the procedure or method is not immediately obvious from the way the problem is posed. As such, learners may have to decide on the most appropriate procedure or method to find the solution to the question or to complete a task, and they may have to perform one or more preliminary calculations or complete one or more preliminary tasks before determining a solution. Situations, in which a variety of mathematical and non-mathematical content, skills and/or considerations should be utilised from different topics in the curriculum in order to make sense of a problem, are also at the *multi-step procedures* level of the taxonomy.

Tasks at the *multi-step procedures* level contain far less direction or guidance than tasks at the *routine procedures level* and require that learners make decisions regarding the appropriate content, methods and non-mathematical considerations needed to solve problems and complete tasks.

Level 4: Reasoning and reflecting

Tasks at the *reasoning and reflecting* level of the Mathematical Literacy taxonomy can be divided into two groups of questions:

- Questions that require a decision, opinion or prediction about a particular scenario based on calculations in a previous question or on given information (e.g. *analysing calculations performed in a previous question on two different electricity costing options and making a decision about the most suitable option for a person with particular needs; or critiquing a statement regarding crime statistics reported in a newspaper article; or making a prediction about the projected income for a business based on current financial data*).

Examples of these types of *reasoning and reflecting* questions include:

- comparing provided data on the performance of two groups of learners in an examination and explaining which group performed better based on the available data;
- providing an opinion on how a particular government minister might react to a particular set of statistics;
- analysing a completed income-and-expenditure statement for a household and making suggestions on how the members of the household could change their expenditure to improve their financial position.

- Questions that require learners to pose and answer questions about which mathematics they require to solve a problem, select and use that mathematical content, recognise the limitations of using mathematics to solve the problem, and consider other non- mathematical techniques and factors that may define or determine a solution to the problem. (E.g. *when presented with adverts for two different cell phone contracts, learners have to decide which method will be the most appropriate to compare the costs involved in the contracts.* They may decide to construct tables of values, or draw graphs, or use equations. Having chosen a suitable method, they will need to perform the necessary calculations and then make sense of their calculations in order to make a decision regarding the most affordable contract for an individual with particular needs.

They will also need to recognise that irrespective of the mathematical solution to the problem, the individual may choose a cell phone based on personal preference, e.g. *colour or cell phone model*).

Examples of these types of *reasoning and reflection* questions include:

- using calculations to compare income and expenditure values for a business in order to determine whether the business is in a healthy financial position;
- comparing bank charges on two different types of accounts for various transactions and making a decision about the most suitable account for an individual with particular needs;
- constructing a table to model a loan scenario, taking into account the interest calculated on the loan, the monthly repayment and the closing balance on the loan every month;
- using the model of the loan scenario to investigate the effect of changes in the interest rate on the loan and the impact of increasing the monthly repayment on the real cost of the loan;
- designing two different types of boxes for packaging an item, comparing the boxes in terms of wasted space (volume) and materials (surface area), and making a decision about the most cost-effective box for packaging the item.

**D. ADMINISTRATIVE AND SUPPORT DOCUMENTATION
(Implementation Date: Grade 12 in 2014)**

Appendix A: School Based Moderation Form

Appendix B: Evidence of Moderation Form (example)

Appendix C: Consolidation Form for Learners

Appendix D: Sample Moderation

Appendix E: Letter from the Principal

Appendix F: Consolidated Mark Schedule (example)

IEB COPYRIGHT

APPENDIX B: Evidence for Moderation Form. (*Can be attached to Appendix A*)

	1st Draft	Final Draft
Memo attached	Yes / No	Yes / No
Front page	Comments:	Comments:
Type setting	Concerns: Correct / Incorrect	Concerns: Correct / Incorrect
Mark allocations	Concerns: Correct / Incorrect	Concerns: Correct / Incorrect
Question level indicated? Is the distribution correct?	Concerns: Yes / No	Concerns: Yes / No
General comments		
Ready for printing?	Yes / No	Yes / No
Signature of moderator		
Date of moderation		

APPENDIX C



MATHEMATICAL LITERACY CONSOLIDATION FORM FOR LEARNERS

(To be filled in by the learner, controlled by the teacher and included as the 1st Page of the Learner File)

Examination Number:

	Date of submission	According to Appendix B	Description of task	Actual Mark	%	Weighting (Correct to 1 decimal place)	
1		Test 1				$\frac{\quad}{10}$	
2		*Test 2				$\frac{\quad}{10}$	
3		Alternate Task 1				$\frac{\quad}{10}$	
4		Alternate Task 2				$\frac{\quad}{10}$	
5		Alternate Task / Test				$\frac{\quad}{10}$	
6		Alternate Task / Test				$\frac{\quad}{10}$	
7a		Examination – Paper 1				$\frac{\quad}{20}$	
7b		Examination – Paper 2				$\frac{\quad}{20}$	
		Total (rounded off to the nearest integer)					$\frac{\quad}{100}$

**If an examination is used as a test, the final percentage of the combined exams must be used as the raw score.*

DECLARATION OF OWNERSHIP OF WORK DONE IN THIS LEARNER FILE

Declaration by the Teacher:

I declare that, to the best of my knowledge, all the work done in this learner file is the sole work of this student.

Signed: _____

Date: _____

Declaration by the Learner:

I, _____ declare that all the external sources used in my file have been properly referenced and that the remaining work contained in this file is my own original work. I understand that if this is found to be untrue, I am liable for disqualification from the National Senior Certificate.

Signed: _____

Date: _____

APPENDIX D



**MATHEMATICAL LITERACY
SAMPLE MODERATION**

To be completed and returned to the school

EXAMINATION CENTRE: _____ **DATE:** _____

MODERATOR: _____

N° Learners entered for Senior Cert: _____ N° Learner Files Moderated: _____

TEACHER FILE		(3 = fully achieved; 2 = partially achieved; 1 = no evidence)			
		3	2	1	Comment(s)
ORGANISATION					
Cover with Centre Details					
Contents page + Dividers with tabs					
FORMS					
Learner files supplied according to IEB list					
Principals letter					
Moderation forms: Regional (where applicable)					
MARKS	SBA				
Appendix F – Whole group marksheet					
SBA Ranked mark sheet					
PRELIMINARY EXAMINATIONS					
Paper 1 – Evidence of school based moderation (Appendix B)					
Paper 1 – Achieves the weighting according to thinking levels					
Paper 1 – Detailed memo available					
Paper 2 – Evidence of school based moderation (Appendix B)					
Paper 2 – Achieves the weighting according to thinking levels					
Paper 2 – Detailed memo available					
TEST 1					
Minimum of 45 minutes					
Evidence of school based moderation (Appendix B)					
Detailed memo available					
Standard of test					
TEST 2					
Minimum of 45 minutes					
Evidence of school based moderation (Appendix B)					
Detailed memo available					
Standard of test					
Alternate Assessment 1					
Evidence of school based moderation (Appendix B)					
Detailed memo available					
Minimum 1 – 2 hours					
Standard of task					
Alternate Assessment 2					
Evidence of school based moderation (Appendix B)					
Detailed memo available					
Minimum 1 – 2 hours					
Standard of task					
Alternate Assessment / Test 3					
Minimum time adhered to					
Evidence of school based moderation (Appendix B)					
Detailed memo available					
Standard of task					

Alternate Assessment / Test 4				
Minimum time adhered to				
Evidence of school based moderation (Appendix B)				
Detailed memo available				
Standard of task				
LEARNER'S FILE				
	3	2	1	Comment(s)
Contents page + Dividers with tabs				
Appendix B				
PRELIMINARY EXAMINATIONS				
Included				
Marked according to the memo applying concept marking where required				
Correct marks have been captured onto mark sheet				
TESTS × 2				
Included				
Marked according to the memo applying concept marking where required				
Correct marks been captured onto mark sheet				
ALTERNATE ASSESSMENTS × 2				
Included				
Marked according to the memo applying concept marking where required				
Correct marks been captured onto mark sheet				
ALTERNATE ASSESSMENTS/TESTS × 2				
Included				
Marked according to the memo applying concept marking where required				
Correct marks been captured onto mark sheet				

4 Topics covered (excluding preliminary examinations)	YES	NO
2 Different types of alternate assessment	YES	NO

COMMENTS: _____

Moderator's Signature: _____ Date: _____

Teacher's Signature: _____ Date: _____

APPENDIX E



**MATHEMATICAL LITERACY
LETTER FROM THE PRINCIPAL**

School Address: _____

The IEB
P O Box 875
Highlands North
2037

Dear IEB Moderator

RE: SCHOOL BASED ASSESSMENT AND MODERATION OF SBA IN GRADE 12

We certify that:

Teachers of the same subject have ensured that:	<i>Circle your response</i>	
they have met regularly to reflect on and discuss issues of standardisation	YES	NO
the assessment tasks they have set learners are of the required standard	YES	NO
the memoranda they have used for marking are accurate and functional	YES	NO
the tasks learners have completed meet the criteria described in the IEB Subject Assessment Guidelines	YES	NO
marking is complete and of the appropriate standard	YES	NO
all administrative procedures have been correctly completed	YES	NO
all information on the 1 st page of the portfolio (Appendix C) in each learner's file is complete and correct	YES	NO

Teacher: _____

Date: _____

Principal: _____

Date: _____

APPENDIX F



MATHEMATICAL LITERACY
EXAMPLE OF CONSOLIDATED MARK SCHEDULE

Centre Number: _____

		Learner Name/ Examination Number																
Tests	Test 1	Actual Mark																
		%																
	Test 2	Actual Mark																
		%																
		20																
Examinations	Paper 1	Actual Mark																
		%																
	Paper 2	Actual Mark																
		%																
		40																
Alternate Assessment	Task 1	Actual Mark																
		%																
	Task 2	Actual Mark																
		%																
		20																
Additional Tests/Tasks	1	Actual Mark																
		%																
	2	Actual Mark																
		%																
		20																
OVERALL TOTAL		100																