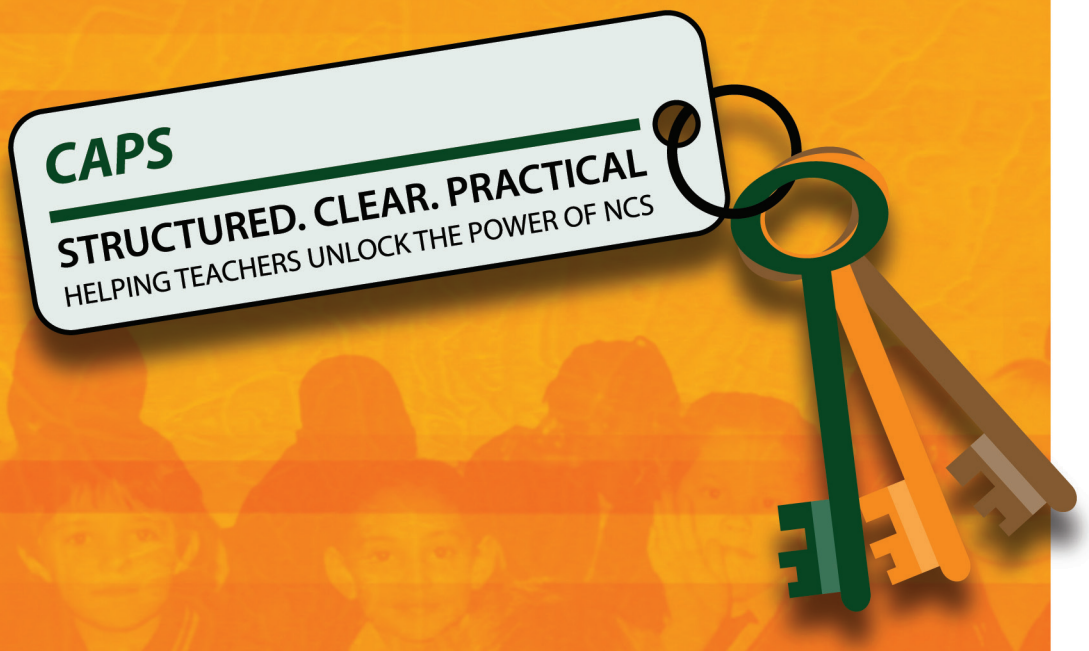
MATHEMATICAL LITERACY

National Curriculum Statement (NCS)

Curriculum and Assessment Policy Statement



Further Education and Training Phase Grades 10-12

basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

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CURRICULUM AND ASSESSMENT POLICY STATEMENT
GRADES 10-12

MATHEMATICAL LITERACY

Department of Basic Education

222 Struben Street
Private Bag X895
Pretoria 0001
South Africa
Tel: +27 12 357 3000
Fax: +27 12 323 0601

120 Plein Street Private Bag X9023
Cape Town 8000
South Africa
Tel: +27 21 465 1701
Fax: +27 21 461 8110
Website: http://www.education.gov.za

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FOREWORD BY THE MINISTER

Our national curriculum is the culmination of our efforts over a period of seventeen years to transform the curriculum bequeathed to us by apartheid. From the start of democracy we have built our curriculum on the values that inspired our Constitution (Act 108 of 1996). The Preamble to the Constitution states that the aims of the Constitution are to:

- heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights;
- improve the quality of life of all citizens and free the potential of each person;
- lay the foundations for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law; and
- build a united and democratic South Africa able to take its rightful place as a sovereign state in the family of nations.

Education and the curriculum have an important role to play in realising these aims.

In 1997 we introduced outcomes-based education to overcome the curricular divisions of the past, but the experience of implementation prompted a review in 2000. This led to the first curriculum revision: the *Revised National Curriculum Statement Grades R-9* and the *National Curriculum Statement Grades 10-12* (2002).

Ongoing implementation challenges resulted in another review in 2009 and we revised the *Revised National Curriculum Statement* (2002) and the *National Curriculum Statement Grades 10-12* to produce this document.

From 2012 the two National Curriculum Statements, for *Grades R-9* and *Grades 10-12* respectively, are combined in a single document and will simply be known as the *National Curriculum Statement Grades R-12.* The *National Curriculum Statement for Grades R-12* builds on the previous curriculum but also updates it and aims to provide clearer specification of what is to be taught and learnt on a term-by-term basis.

The *National Curriculum Statement Grades R-12* represents a policy statement for learning and teaching in South African schools and comprises of the following:

(a) Curriculum and Assessment Policy Statements (CAPS) for all approved subjects listed in this document;

(b) *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R-12*; and

(c) *National Protocol for Assessment Grades R-12.*

MRS ANGIE MOTSHEKGA, MP
MINISTER OF BASIC EDUCATION

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SECTION 1

INTRODUCTION TO THE CURRICULUM AND ASSESSMENT POLICY STATEMENTS FOR MATHEMATICAL LITERACY GRADES 10-12

1.1 Background

The *National Curriculum Statement Grades R-12 (NCS)* stipulates policy on curriculum and assessment in the schooling sector.

To improve implementation, the National Curriculum Statement was amended, with the amendments coming into effect in January 2012. A single comprehensive Curriculum and Assessment Policy document was developed for each subject to replace Subject Statements, Learning Programme Guidelines and Subject Assessment Guidelines in Grades R-12.

1.2 Overview

(a) The *National Curriculum Statement Grades R-12 (January 2012)* represents a policy statement for learning and teaching in South African schools and comprises the following:

(i) Curriculum and Assessment Policy Statements for each approved school subject;

(ii) The policy document, National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R-12; and

(iii) The policy document, National Protocol for Assessment Grades R-12 (January 2012).

(b) The *National Curriculum Statement Grades R-12 (January 2012)* replaces the two current national curricula statements, namely the

(i) Revised National Curriculum Statement Grades R-9, Government Gazette No. 23406 of 31 May 2002, and

(ii) National Curriculum Statement Grades 10-12 Government Gazettes, No. 25545 of 6 October 2003 and No. 27594 of 17 May 2005.

(c) The national curriculum statements contemplated in subparagraphs b(i) and (ii) comprise the following policy documents which will be incrementally repealed by the *National Curriculum Statement Grades R-12 (January 2012)* during the period 2012-2014:

(i) The Learning Area/Subject Statements, Learning Programme Guidelines and Subject Assessment Guidelines for Grades R-9 and Grades 10-12;

(ii) The policy document, National Policy on assessment and qualifications for schools in the General Education and Training Band, promulgated in Government Notice No. 124 in Government Gazette No. 29626 of 12 February 2007;

(iii) The policy document, the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF), promulgated in Government Gazette No.27819 of 20 July 2005;

(iv) The policy document, An addendum to the policy document, the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF), regarding learners with special needs, published in Government Gazette, No.29466 of 11 December 2006, is incorporated in the policy document, National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R-12; and

(v) The policy document, An addendum to the policy document, the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF), regarding the National Protocol for Assessment (Grades R-12), promulgated in Government Notice No.1267 in Government Gazette No. 29467 of 11 December 2006.

(d) The policy document, *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R-12*, and the sections on the Curriculum and Assessment Policy as contemplated in Chapters 2, 3 and 4 of this document constitute the norms and standards of the *National Curriculum Statement Grades R-12.* It will therefore, in terms of *section 6A* of the *South African Schools Act, 1996 (Act No. 84 of 1996,)* form the basis for the Minister of Basic Education to determine minimum outcomes and standards, as well as the processes and procedures for the assessment of learner achievement to be applicable to public and independent schools.

1.3 General aims of the South African Curriculum

(a) The *National Curriculum Statement Grades R-12* gives expression to the knowledge, skills and values worth learning in South African schools. This curriculum aims to ensure that children acquire and apply knowledge and skills in ways that are meaningful to their own lives. In this regard, the curriculum promotes knowledge in local contexts, while being sensitive to global imperatives.

(b) The National Curriculum Statement Grades R-12 serves the purposes of:

- equipping learners, irrespective of their socio-economic background, race, gender, physical ability or intellectual ability, with the knowledge, skills and values necessary for self-fulfilment, and meaningful participation in society as citizens of a free country;
- providing access to higher education;
- facilitating the transition of learners from education institutions to the workplace; and
- providing employers with a sufficient profile of a learner's competences.

(c) The National Curriculum Statement Grades R-12 is based on the following principles:

- Social transformation: ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of the population;
- Active and critical learning: encouraging an active and critical approach to learning, rather than rote and uncritical learning of given truths;
- High knowledge and high skills: the minimum standards of knowledge and skills to be achieved at each grade are specified and set high, achievable standards in all subjects;
- Progression: content and context of each grade shows progression from simple to complex;

- Human rights, inclusivity, environmental and social justice: infusing the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa. The National Curriculum Statement Grades R-12 is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors;
- Valuing indigenous knowledge systems: acknowledging the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution; and
- Credibility, quality and efficiency: providing an education that is comparable in quality, breadth and depth to those of other countries.

(d) The National Curriculum Statement Grades R-12 aims to produce learners that are able to:

- identify and solve problems and make decisions using critical and creative thinking;
- work effectively as individuals and with others as members of a team;
- organise and manage themselves and their activities responsibly and effectively;
- collect, analyse, organise and critically evaluate information;
- communicate effectively using visual, symbolic and/or language skills in various modes;
- use science and technology effectively and critically showing responsibility towards the environment and the health of others; and
- demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation.

(e) Inclusivity should become a central part of the organisation, planning and teaching at each school. This can only happen if all teachers have a sound understanding of how to recognise and address barriers to learning, and how to plan for diversity.

The key to managing inclusivity is ensuring that barriers are identified and addressed by all the relevant support structures within the school community, including teachers, District-Based Support Teams, Institutional-Level Support Teams, parents and Special Schools as Resource Centres. To address barriers in the classroom, teachers should use various curriculum differentiation strategies such as those included in the Department of Basic Education's *Guidelines for Inclusive Teaching and Learning* (2010).

1.4 Time Allocation

1.4.1 Foundation Phase

(a) The instructional time in the Foundation Phase is as follows:

SUBJECT	GRADE R (HOURS)	GRADES 1-2 (HOURS)	GRADE 3 (HOURS)
Home Language	10	8/7	8/7
First Additional Language		2/3	3/4
Mathematics	7	7	7
Life Skills	**6**	**6**	**7**
• Beginning Knowledge	(1)	(1)	(2)
• Creative Arts	(2)	(2)	(2)
• Physical Education	(2)	(2)	(2)
• Personal and Social Well-being	(1)	(1)	(1)
TOTAL	**23**	**23**	**25**

(b) Instructional time for Grades R, 1 and 2 is 23 hours and for Grade 3 is 25 hours.

(c) Ten hours are allocated for languages in Grades R-2 and 11 hours in Grade 3. A maximum of 8 hours and a minimum of 7 hours are allocated for Home Language and a minimum of 2 hours and a maximum of 3 hours for Additional Language in Grades 1-2. In Grade 3 a maximum of 8 hours and a minimum of 7 hours are allocated for Home Language and a minimum of 3 hours and a maximum of 4 hours for First Additional Language.

(d) In Life Skills Beginning Knowledge is allocated 1 hour in Grades R-2 and 2 hours as indicated by the hours in brackets for Grade 3.

1.4.2 Intermediate Phase

(a) The instructional time in the Intermediate Phase is as follows:

SUBJECT	HOURS
Home Language	6
First Additional Language	5
Mathematics	6
Natural Sciences and Technology	3,5
Social Sciences	3
Life Skills	**4**
• Creative Arts	(1,5)
• Physical Education	(1)
• Personal and Social Well-being	(1,5)
TOTAL	**27,5**

1.4.3 Senior Phase

(a) The instructional time in the Senior Phase is as follows:

SUBJECT	HOURS
Home Language	5
First Additional Language	4
Mathematics	4,5
Natural Sciences	3
Social Sciences	3
Technology	2
Economic Management Sciences	2
Life Orientation	2
Creative Arts	2
TOTAL	**27,5**

1.4.4 Grades 10-12

(a) The instructional time in Grades 10-12 is as follows:

SUBJECT	TIME ALLOCATION PER WEEK (HOURS)
Home Language	**4.5**
First Additional Language	**4.5**
Mathematics	**4.5**
Life Orientation	**2**
A minimum of any three subjects selected from **Group B** Annexure B, Tables B1-B8 of the policy document, *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R-12,* subject to the provisos stipulated in paragraph 28 of the said policy document.	**12 (3x4h)**
TOTAL	**27,5**

The allocated time per week may be utilised only for the minimum required NCS subjects as specified above, and may not be used for any additional subjects added to the list of minimum subjects. Should a learner wish to offer additional subjects, additional time must be allocated for the offering of these subjects.

SECTION 2

MATHEMATICAL LITERACY

2.1 What is Mathematical Literacy?

The competencies developed through Mathematical Literacy allow individuals to make sense of, participate in and contribute to the twenty-first century world — a world characterised by numbers, numerically based arguments and data represented and misrepresented in a number of different ways. Such competencies include the ability to reason, make decisions, solve problems, manage resources, interpret information, schedule events and use and apply technology. Learners must be exposed to both mathematical content and real-life contexts to develop these competencies. Mathematical content is needed to make sense of real-life contexts; on the other hand, contexts determine the content that is needed.

The subject Mathematical Literacy should enable the learner to become a self-managing person, a contributing worker and a participating citizen in a developing democracy. The teaching and learning of Mathematical Literacy should thus provide opportunities to analyse problems and devise ways to work mathematically in solving such problems. Opportunities to engage mathematically in this way will also assist learners to become astute consumers of the mathematics reflected in the media.

There are five key elements of Mathematical Literacy.

- **Mathematical Literacy involves the use of *elementary* mathematical content.**

The mathematical content of Mathematical Literacy is limited to those elementary mathematical concepts and skills that are relevant to making sense of numerically and statistically based scenarios faced in the everyday lives of individuals (self-managing individuals) and the workplace (contributing workers), and to participating as critical citizens in social and political discussions. In general, the focus is not on abstract mathematical concepts. As a rule of thumb, if the required calculations cannot be performed using a basic four-function calculator, then the calculation is in all likelihood not appropriate for Mathematical Literacy. Furthermore, since the focus in Mathematical Literacy is on making sense of real-life contexts and scenarios, in the Mathematical Literacy classroom mathematical content should not be taught in the absence of context.

- **Mathematical Literacy involves *authentic* real-life contexts.**

In exploring and solving real-world problems, it is essential that the contexts learners are exposed to in this subject are authentic (i.e. are drawn from genuine and reaslitic situations) and relevant, and relate to daily life, the workplace and the wider social, political and global environments. Wherever possible, learners must be able to work with *actual* real-life problems and resources, rather than with problems developed around constructed, semi-real, contrived and/or fictitious scenarios. E.g. learners must be exposed to real accounts containing complex and “messy” figures rather than contrived and constructed replicas containing only clean and rounded figures.

Alongside using mathematical knowledge and skills to explore and solve problems related to authentic real-life contexts, learners should also be expected to draw on non-mathematical skills and considerations in making sense of those contexts. E.g. although calculations may reveal that a 10 kg bag of maize meal is the most cost-effective, consideration of the context may dictate that the 5 kg bag will have to be bought because the 10 kg bag cannot fit inside the taxi and/or the buyer does not have enough money to buy the 10 kg bag and/or the buyer has no use for

10 kg, etc. In other words, mathematical content is simply one of many tools that learners must draw on in order to explore and make sense of appropriate contexts.

- **Mathematical Literacy involves solving familiar and unfamiliar problems.**

It is unrealistic to expect that in the teaching of Mathematical Literacy learners will always be exposed to contexts that are specifically relevant to their lives, and that they will be exposed to all of the contexts that they will one day encounter in the world. Rather, the purpose of this subject is to equip learners with the necessary knowledge and skills to be able to solve problems in any context that they may encounter in daily life and in the workplace, irrespective of whether the context is specifically relevant to their lives or whether the context is familiar. Learners who are mathematically literate should have the capacity and confidence to interpret any real-life context that they encounter, and be able to identify and perform the techniques, calculations and/or other considerations needed to make sense of the context. In this sense Mathematical Literacy develops a general set of skills needed to deal with a particular range of problems.

If Mathematical Literacy is seen in this way, then *a primary aim* in this subject is to equip learners with a set of skills that transcends both the mathematical content used in solving problems and the context in which the problem is situated. In other words, both the mathematical content and the context are simply tools: the mathematical content provides learners with a means through which to explore contexts; and the contexts add meaning to the mathematical content. But what is more important is that learners develop the ability to devise and apply both mathematical and non-mathematical techniques and considerations in order to explore and make sense of any context, whether the context is familiar or not.

The interplay between content, contexts and solving problems is illustrated in the following diagram:[1]

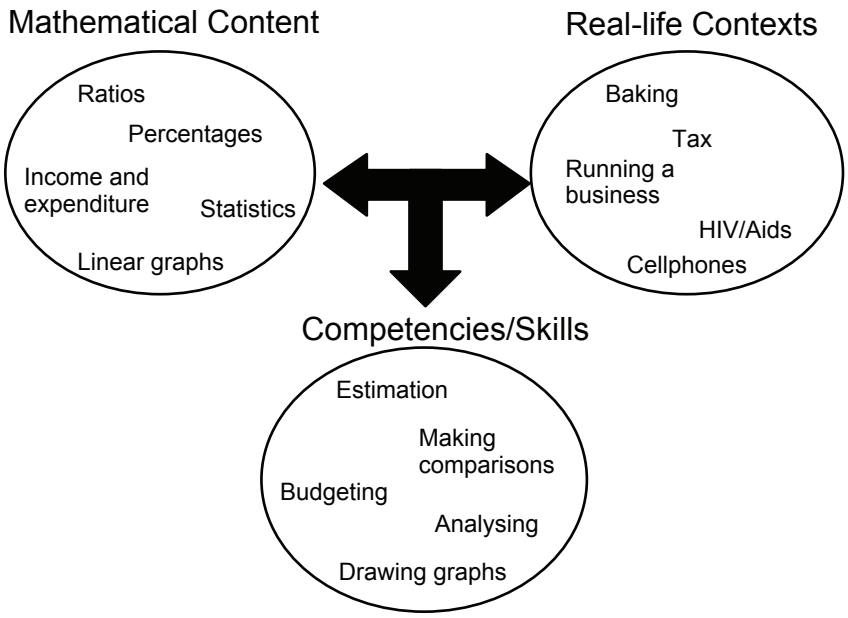


Figure 1: Interplay between content, context and problem-solving skills in Mathematical Literacy

- **Mathematical Literacy involves decision making and communication.**

A mathematically literate individual is able to weigh up options by comparing solutions, make decisions regarding the most appropriate choice for a given set of conditions, and communicate decisions using terminology (both

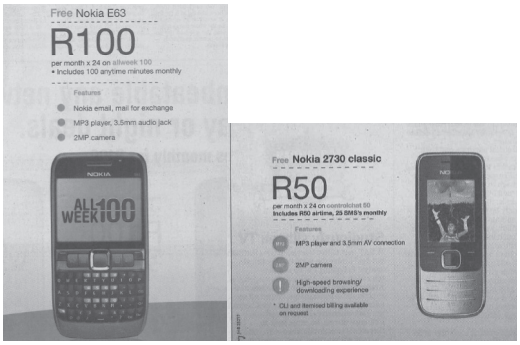
1 Adapted from: Brombacher, A. 2007. *Mathematical Literacy − A Reader*. Cape Town: Bateleur Books. p.15.

mathematical and non-mathematical) appropriate to the context. In the teaching of Mathematical Literacy, teachers should provide learners with opportunities to develop and practise decision-making and communication skills.

- **Mathematical Literacy involves the use of integrated content and/or skills in solving problems.**

The content, skills and contexts in this document are organised and categorised according to topics. However, problems encountered in everyday contexts are never structured according to individual content topics. Rather, the solving of real-life problems commonly involves the use of content and/or skills drawn from a range of topics, and so, being able to solve problems based in real-life contexts requires the ability to identify and use a wide variety of techniques and skills integrated from across a range of content topics.

To illustrate these elements of Mathematical Literacy, consider the following two cellphone advertisements that appeared in the *Sunday Times* newspaper on 11 April 2010.



Context: The context is authentic, as drawn from a newspaper, and is relevant in that many people often have to make a choice between different cellphone contract options.

Notice, however, that although the context is authentic, it is highly unlikely that this context will be relevant or familiar for all learners. Nonetheless, situations in life in which we are expected to make comparisons occur frequently and a mathematically literate individual is able to make sense of those situations irrespective of the context.

Content: To determine the conditions under which each of these contracts will be the most cost-effective, we could perform calculations, complete tables or draw graphs. Whatever method we might choose, though, the method requires an understanding of only *basic* mathematical concepts and calculations, and does not require an understanding of complex and/or abstract mathematical principles.

It is also crucial to notice that the primary aim in working with these adverts is not to test understanding of a particular section of mathematical content or calculation. Rather, the primary aim is to make sense of the context in order to make a decision about which contract is the most cost-effective under a certain set of conditions.

Non-mathematical considerations: Although we can use mathematical calculations to determine the conditions for which one contract is more cost-effective than the other, many people will choose a particular contract not because of cost, but because of the make and model of cellphone that comes with the contract and/or the features attached to the phone. In other words, although mathematical calculations provide us with a deeper insight into a scenario, there are often non-mathematical considerations that affect the decisions we make. A mathematically literate person has the capacity to take into account both mathematical and non-mathematical considerations and to be aware that there are factors other than economy which may influence decisions.

Decision making and communication: Although we can use mathematical tools to explore the options, what is equally important is being able to interpret the findings, make a decision about which contract is the most cost-effective option under certain conditions, and communicate the decision with an awareness of non-mathematical considerations such as preference for make, model, colour, features, etc. The mathematical calculations are meaningless without decision making and appropriate communication.

Integrated content: In order to make sense of each of the contracts, we could perform cost calculations involving addition, multiplication and division. An alternative approach would be to draw two graphs to represent each of the contract options on the same set of axes. A still further approach involves completing a table of values. Irrespective of the method used, interpretation and decision-making and communication skills will be needed to make sense of the calculated answers.

The point is that in order to make sense of the different cellphone contracts, a variety of techniques, calculations, skills and content topics can and should be utilised. This approach must be adopted for all problem-solving scenarios.

2.2 Progression in Mathematical Literacy

Progression refers to the process of developing more advanced and complex knowledge and skills. In Mathematical Literacy, progression occurs on three levels:

2.2.1 Content

One of the ways in which Mathematical Literacy develops across the grades is in terms of mathematical concepts/ skills. E.g. in Grade 10 learners are expected to be able to work with one graph on a set of axes; in Grade 11 two

graphs; and in Grade 12 two or more graphs on the same set of axes. This is not the case for all topics, though, and there are some instances where there is no new content in Grade 12 compared to Grades 10 and 11. In such cases progression may occur in relation to contexts and/or problem-solving processes.

2.2.2 Contexts

Progression also occurs in relation to the nature, familiarity and complexity of the context in which problems are encountered. Moving from Grade 10 to Grade 12, the contexts become less familiar and more removed from the experience of the learner and, hence, less accessible and more demanding. There are some topics in which the focus in Grade 10 is on contexts relating to the personal lives of learners and/or household issues (e.g. personal finance → cell-phone accounts; household budget), in Grade11 on contexts relating to the workplace and/or business environment (e.g. business finance → payslips; taxation), and in Grade 12 on contexts relating to scenarios encompassing wider social and political contexts incorporating national and global issues (e.g. exchange rates and inflation).

While these broad categories of contexts work well to define progression for certain topics, for other topics, such as measurement, map work and probability, these categories do not provide a useful indication of progression. In such cases progression may occur in relation to content and/or problem-solving processes.

2.2.3 Confidence in solving problems

One of the key characteristics of a mathematically literate individual is the ability to identify and apply appropriate mathematical and non-mathematical techniques needed to solve problems encountered in both familiar and unfamiliar contexts. However, this ability to solve problems without guidance is not something that develops naturally, but rather should be demonstrated and nurtured from Grade 10 to Grade 12. One of the key distinctions between Grade 10, 11 and 12 learners is the confidence with which learners are able to identify and utilise appropriate mathematical content, techniques and other non-mathematical considerations in order to explore authentic real-life contexts without guidance and/or scaffolding.

This progression in the development of confidence in solving problems can be linked directly to the Mathematical Literacy assessment taxonomy (see section *4.3 Mathematical Literacy assessment taxonomy* and *Appendix 1* below for a discussion and description of the taxonomy levels). In Grade 10, while learners are expected to answer questions involving multi-step procedures, scaffolded questions involving single-step (knowledge and/or routine procedure) calculations will often be provided to help learners to understand the context in which the problem is encountered or as precursors to the questions requiring multi-step procedures. The number of steps required in such multi-step calculations is also limited to two or three steps.

In Grade 12, in contrast, it is expected that learners will be able to perform multi-step calculations involving numerous and complex calculations with confidence and without guidance or scaffolded questions involving single-step calculations. There is also a greater expectation that Grade 12 learners will be able to identify and utilise appropriate mathematical content and other non-mathematical considerations needed to solve problems.

2.3 Overview and weighting of topics

The content, skills and contexts appropriate to Mathematical Literacy are presented in topics in this document.

The topics have been separated into *Basic Skills Topics* comprising:

- Interpreting and communicating answers and calculations

- Numbers and calculations with numbers
- Patterns, relationships and representations

and *Application Topics* comprising:

- Finance
- Measurement
- Maps, plans and other representations of the physical world
- Data handling
- Probability.

Much of the content in the Basic Skills Topics comprises elementary mathematical content and skills that learners have already been exposed to in Grade 9 (e.g. different number formats and conventions, calculating percentages, drawing graphs from tables of values, and so on). The inclusion of this content in this document provides teachers with the opportunity to revise these important concepts and provide learners with the opportunity to explore these concepts in contexts. It is expected that a firm grasp of the concepts in the *Basic Skills Topics* is necessary for making sense of the content and contexts outlined in the *Application Topics*.

The *Application Topics* contain the contexts related to scenarios involving daily life, workplace and business environments, and wider social, national and global issues that learners are expected to make sense of, and the content and skills needed to make sense of those contexts. It is expected that learners will integrate content/skills from the *Basic Skills Topics* in making sense of the contexts and content outlined in the *Application Topics*.

Figure 2 shows an overview and weighting of the topics according to which the Mathematical Literacy curriculum has been organised for Grades 10, 11 and 12.

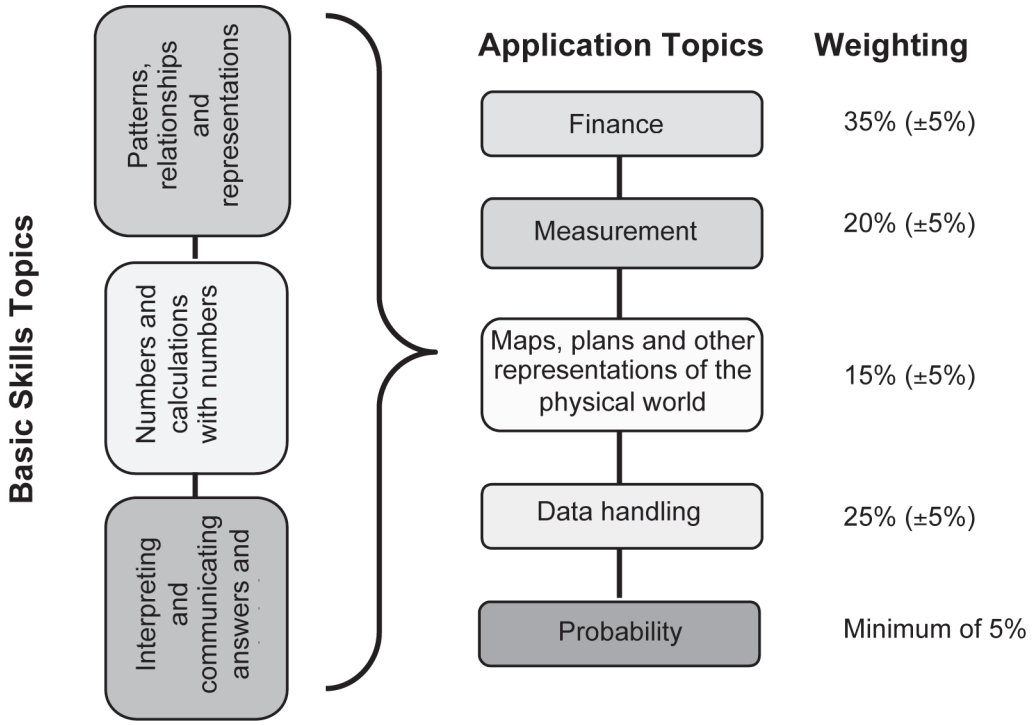


Figure 2: Overview and weighting of topics in Grades 10, 11 and 12

Comments on the structure of topics

The *Basic Skills Topics* have been included to the left of the other topics to indicate that the content and/skills outlined in these topics permeate all of the other topics in the curriculum. It is expected that learners will integrate the content and/skills from these three topics with confidence in any context and in any other topic in which they have relevance and application. This structure also indicates the way in which the curriculum will be assessed in Mathematical Literacy examinations (see section 4.2 below for more details).

Weighting of topics

Minimum weightings have been indicated for each topic. These minimum weightings stipulate the minimum number of marks in any assessment that must be allocated to each of the topics. The remaining balance of marks can either be equally distributed between the topics or be allocated to the topics that have particular application and relevance in the context(s) being explored in the assessment. This will ensure that there is sufficient coverage of each topic in any examination and will allow for greater flexibility in the nature of contexts that can be explored and the depth to which those contexts can be explored.

It is important to note that no weighting has been provided for the *Basic Skills Topics*. This is because these topics have to be dealt with in an integrated manner throughout the *Application Topics*. There is an expectation, though, that the concepts outlined in these *Basic Skills Topics* will be included in any assessment, but that the extent to which these concepts are included is at the discretion of the teacher and/or examiner.

2.4 Suggested time allocation

SUMMARY OF THE NUMBER OF WEEKS SPENT ON EACH TOPIC				
		NUMBER OF WEEKS		
		Grade 10	**Grade 11**	**Grade 12**
BASIC SKILLS TOPICS	Numbers and calculations with numbers	5 - 6		
	Patterns, relationships and representations	3 - 4	3 - 4	
APPLICATION SKILLS	Finance	6 - 7	9 - 10	8 - 9
	Measurement	6 - 7	7 - 8	5 - 6
	Maps, plans and other representations of the physical world	5 - 6	5 - 6	4 - 5
	Data handling	4 - 5	4 - 5	5 - 6
	Probability	1-2	1-2	1-2

2.5 Suggested work schedule

Below is a suggested work schedule that outlines *estimated* time allocations per topic as well as a particular sequence of teaching.

- The topics "Numbers and calculations with numbers" and "Patterns, relationships and representations" have been included in this work schedule to provide teachers with the opportunity to revise the concepts contained in these topics. However, it is essential that these concepts are not taught in the absence of contexts but that learners are exposed to these concepts in realistic scenarios.
- Also note that the topic *Interpreting and communicating answers and calculations* does not appear in this work schedule. This is because it is expected that the skills outlined in this topic will be integrated and taught throughout all of the other topics.

Suggested work schedule for Grade 10

GRADE 10: TERM 1		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Numbers and calculations with numbers*									
	Contexts focusing on *Patterns, relationships and representations*									
	Contexts focusing on *Measurement* (Conversions and Time)									

Assessment	Assignment/Investigation Control test (covering *Numbers and calculations with numbers*, p*atterns, relationships and representations* and m*easurement*)									
GRADE 10: TERM 2		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Finance* (Financial Documents and Tariff Systems)									
	Contexts focusing on *Measurement* (Measuring Length, Weight,Volume,Temperature)									
	Contexts focusing on *Maps, plans and other representations of the physical world* (Scale and Map work)									
	Contexts focusing on *Probability*									
	Revision									
Assessment	Assignment/Investigation Mid-year examinations (2 papers; 1 hour each; 50 marks each) (covering *Finance, Measurement, Maps*, and *Probability* integrated with *Numbers* and *Patterns* concepts)									
GRADE 10: TERM 3		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Finance* (Income, expenditure, profit/loss, income-and-expenditure statements and budgets)									
	Contexts focusing on *Measurement* (Perimeter, area and volume)									
	Contexts focusing on *Maps, plans and other representations of the physical world* (Models and Plans)									
Assessment	Assignment/Investigation Control test (covering *Finance, Measurement* and *Models and Plans*, integrated with *Numbers* and *Patterns* concepts)									
GRADE 10: TERM 4		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Finance* (Interest, Banking and Taxation)									
	Contexts focusing on *Data Handling*									
	Revision									
Assessment	Assignment/Investigation End-of-year examination (2 papers; 1½ hours each; 75 marks each) (covering all topics in the Grade 10 curriculum)									

Suggested work schedule for Grade 11

GRADE 11: TERM 1		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Patterns, relationships and representations*									
	Contexts focusing on *Measurement* (Conversions and Time)									
	Contexts focusing on *Finance* (Financial documents; Tariff systems; Income, expenditure, profit/loss, income-and-expenditure statements and budgets; Cost price and selling price; Break-even analysis)									
Assessment	Assignment/Investigation Control test (covering *Measurement* and Finance, integrated with *Numbers* and *Patterns* concepts)									

GRADE 11: TERM 2		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Finance* (Interest, Banking, Inflation)									
	Contexts focusing on *Measurement* (Measuring length, measuring weight, measuring volume, measuring temperature)									
	Contexts focusing on *Maps, plans and other representations of the physical world* (Scale and Map work)									
	Revision									
Assessment	Assignment/Investigation Mid-year examinations (2 papers; 1½ hours each; 75 marks each) (covering *Finance*, *Measurement* and *Maps*, integrated with *Numbers* and *Patterns* concepts)									

GRADE 11: TERM 3		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Measurement* (Perimeter, area and volume)									
	Contexts focusing on *Maps, plans and other representations of the physical world* (Models and Plans)									
	Contexts focusing on *Finance* (Taxation)									
	Contexts focusing on *Probability*									
Assessment	Assignment/Investigation Control test (covering *Measurement, Models and Plans, Finance* and *Probability*, integrated with *Numbers* and *Patterns* concepts)									

GRADE 11: TERM 4		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Finance* (Exchange rates)									
	Contexts focusing on *Data Handling*									
	Revision									
Assessment	Assignment/Investigation End-of-year examinations (2 papers; 2 hours each; 100 marks each) (covering all topics in the curriculum)									

Suggested Teaching Plan for Grade 12

GRADE 12: TERM 1		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Measurement* (Conversions; Time)									
	Contexts focusing on *Finance* (Financial documents; Tariff systems; Income, expenditure, profit/loss, income-and-expenditure statements and budgets; Cost price and selling price; Break-even analysis)									
	Contexts focusing on *Data handling*									
Assessment	Assignment + Investigation Control test (covering *Measurement*, *Finance*, and *Data Handling*, integrated with *Numbers* and *Patterns* concepts)									

GRADE 12: TERM 2		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Finance* (Interest; Banking; Inflation)									
	Contexts focusing on *Maps, plans and other representations of the physical world* (Scale and Map work)									
	Contexts focusing on *Measurement* (measuring length, weight, volume, temperature; Calculating perimeter, area and volume)									
	Revision									
Assessment	Assignment/Investigation Mid-year examinations (2 papers; 2 hours each; 100 marks each) (covering *Finance*, *Maps,* and *Measurement*, integrated with *Numbers* and *Patterns* concepts)									

GRADE 12: TERM 3		Week Number								
		1	2	3	4	5	6	7	8	9
Topics	Contexts focusing on *Finance* (Taxation; Exchange rates)									
	Contexts focusing on *Maps, plans and other representations of the physical world* (Scale and Plans)									
	Contexts focusing on *Probability*									
	Contexts focusing on *Maps, plans and other representations of the physical world* (Models)									
	Revision									
Assessment	Control test (covering *Data Handling* and/or Probability integrated with *Numbers* and *Patterns* concepts) Trial examinations (2 papers; 3 hours each; 150 marks each) (covering all topics in the curriculum)									
GRADE 12: TERM 4										
Topics	Revision									
Assessment	End-of-year examinations (2 papers; 3 hours each; 150 marks each) (covering all topics in the curriculum)									

SECTION 3

CONTENT AND SCOPE OF CONTEXTS PER TOPIC

3.1 Introduction

This part of the CAPS document provides a detailed outline of the content and/or skills and suggested contexts to be taught in each grade. The content is organised according to topics and sections.

The topics have been separated into Basic Skills Topics and Application Topics. Each topic has been further organised into “sections” which contain comprehensive descriptions of the content, skills and suggested contexts that learners should be exposed to in each grade.

The document does not provide separate descriptions of content for Grades 10, 11 and 12. Rather, a single description of content is provided that includes Grade 10 content, Grade 11 content and Grade 12 content, and an indication is provided as to which parts of the description relate to Grade 10, which to Grade 11 and which to Grade 12. This provides a clear description of expected progression in terms of content and contexts from Grade 10 to Grade 12.

The following diagram illustrates how the curriculum is structured in the pages below.

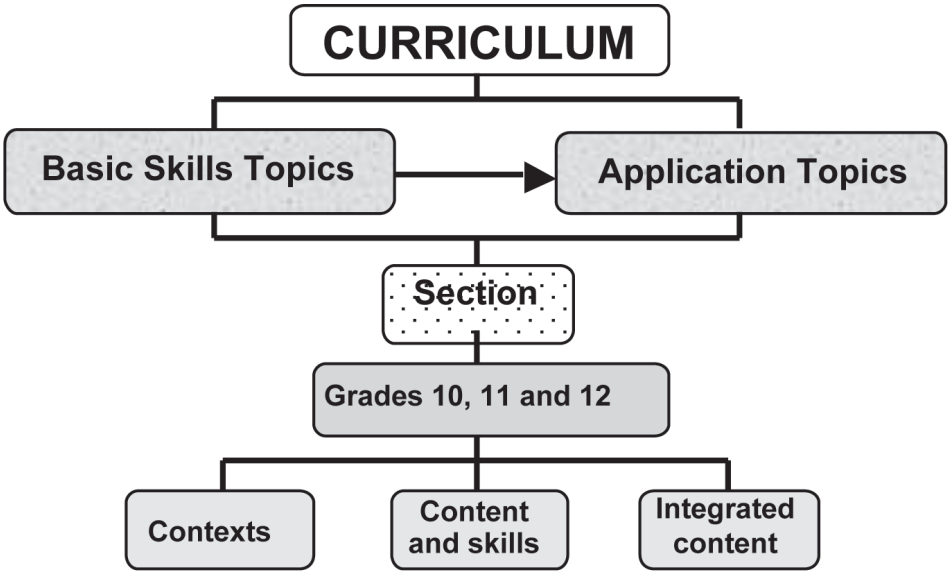


Figure 3: Structure of the Mathematical Literacy curriculum in the CAPS document according to topics and sections

Examples to illustrate possible contexts and problems relating to the content and skills outlined in each section are provided. These examples provide a guideline rather than an exhaustive list.

3.2 Overview of contexts, content and/or skills per topic and grade

Basic Skills Topics

Topic	Section	Grade 10	Grade 11	Grade 12
Learners will use the content and/or skills outlined in the Basic Skills Topics to understand situations and solve problems in scenarios involving *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability*. How learners make use of these basic skills concepts will be determined by the contexts in which particular problems are situated e.g. banking, or the construction of a house, or interpreting population statistics.				
Interpreting and communicating answers and calculations	Interpreting answers	• Check the appropriateness of a solution by comparing it to the estimated solution • Modify the solution as required by the context of the problem • Round numbers up, down, or off (to an appropriate number of decimal places) depending on the requirements of the context • Determine the most appropriate units in which to express the answer • Rework a problem if the initial conditions change • Recognise that an error in measurement or a small change in rounding can make a large difference to an answer if the error or change is compounded over many calculations or through a large multiplication		
	Communication	• Communicate solutions using appropriate terminology, symbols and units • Clearly state workings and methods used for solving a problem • Justify comparisons and opinions with calculations or with information provided in the context		
Numbers and calculations with numbers	Number formats and conventions	• Number formats: decimal comma; thousands separator; positive and negative numbers as directional indicators; numbers in word format • Number conventions (e.g. different numbering conventions used in cricket or in flat numbering systems)		
	Operations using numbers and calculator skills	• Estimate anticipated solutions to calculations • Addition, subtraction, multiplication and division of whole numbers and decimals • Multiplication and division by 10, 100 and 1 000 *without* the use of a calculator • Order of operations (BODMAS) and brackets • Addition and multiplication facts (distributive and associative properties) • Squaring, cubing, square rooting • Operations using fractions • Know and use the different functions on a basic calculator		
	Rounding	• Types of rounding and the effect of rounding		
	Ratios	• Basic ratio concepts and ratio calculations		
	Proportion	• Direct proportion and indirect (inverse) proportion		

Topic	Section	Grade 10	Grade 11	Grade 12
Numbers and calculations with numbers	Rates	• Rate notation, types of rates (constant, average, cost, consumption and distance, speed and time rates) and rate calculations		
	Percentages	• Percentage notation and percentage calculations		

Topic	Section	Grade 10	Grade 11	Grade 12
Patterns, relationships and representations	Making sense of graphs that tell a story	Content and/or contexts limited to those that include: • fixed and linear relationships • single relationship • no estimation required in determining values in tables and graphs	Content and/or contexts limited to those that include: • fixed, linear, inverse proportion, compound growth and other non-linear relationships • two relationships • estimation required in determining values in tables and on graphs	Content and/or contexts limited to those that include: • fixed, linear, inverse proportion, compound growth and other non-linear relationships • two or more relationships • estimation required in determining values in tables and on graphs
	Patterns and relationships			
	Representations of relationships in tables, equations and graphs			
	Working with two or more relationships and/or representations	---		

Application Topics

Topic	Section	Grade 10	Grade 11	Grade 12
Finance	Financial documents	Contexts are limited to those that deal with personal and/or household finance	Contexts are limited to those that deal with personal, household, workplace and/or business finance	Contexts are limited to those that deal with personal, household, workplace, business, national and global finance, and more complex financial scenarios
	Tariff systems			
	Income, expenditure, profit/loss, income-and-expenditure statements and budgets			
	Cost price and selling price	----		
	Break-even analysis	----		
	Interest	Contexts are limited to those that deal with personal and/or household banking		
	Banking, loans and investments			
	Inflation	----		
	Taxation	Contexts are limited to VAT		
	Exchange rates	----		
Measurement	Conversions	Simple tasks in the familiar context of the household	Larger projects in familiar contexts of the household and school and/or wider community	Complex projects in familiar and unfamiliar contexts
	Measuring length			
	Measuring weight			
	Measuring volume			
	Temperature			
	Calculating perimeter, area and volume			
	Time	Work with time formats and calculations to plan and complete daily activities in the familiar context of the household	Work with time formats and calculations to plan and complete daily activities in the household, school and wider community	Work with time formats and calculations to plan and complete daily activities and trips in both familiar and unfamiliar contexts

Topic	Section	Grade 10	Grade 11	Grade 12
Maps, plans and other representations of the physical world	Scale	Maps and plans of familiar contexts and/or simple structures (*e.g. school*)	Maps and plans of less familiar contexts and/or structures (*e.g office space*) and models of packaging containers	Maps and plans of unfamiliar contexts and/or complex structures (*e.g RDP house*) and models of packaging containers and buildings
	Maps		Maps and plans of less familiar contexts and/or structures	Maps and plans of possibly unfamiliar contexts and/or complex structures
	Plans			
	Models	Work with actual tins and boxes to explore packaging arrangements	Build 3D scale models of packaging containers to investigate packaging arrangements Draw 2D scale pictures of 3D packaging containers	Build 3D scale models of packaging containers and buildings to explore what the final product will look like Draw 2D scale pictures of 3D buildings and packaging containers
Data handling	Developing questions	Data is limited to contexts relating to the personal lives of learners Learners are expected to work with only one set of data	Data is limited to contexts relating to the personal lives of learners and wider social issues Learners are expected to work with two sets of data and comparisons thereof	Data is limited to contexts related to the personal lives of learners, wider social issues and national and/or global issues Learners are expected to work with multiple sets of data and comparisons thereof
	Collecting data			
	Classifying and organising data			
	Summarising data			
	Representing data			
	Interpreting and analysing data			
Probability	Expressions of probability	Explore probability in scenarios involving: • games using coins and dice • weather predictions	Explore probability in scenarios involving: • games using coins and dice • weather predictions • tests where there is the chance of inaccurate results • cosmetic and other products making statements regarding probability	Explore probability in scenarios involving: • games using coins and dice • weather predictions • tests where there is the chance of inaccurate results • cosmetic and other products making statements regarding probability • lottery and other gambling games • risk assessments; newspaper articles containing references to probability
	Prediction			
	Representations for determining possible outcomes			
	Evaluating expressions involving probability	---	---	

3.3 Detailed outline of content/skills to be taught per grade

Part 1:
Basic Skills Topics

Topic: Interpreting and communicating answers and calculations		**Grades 10, 11 and 12**
Suggested teaching time:	**Recommended texts and/or resources:** • Textbooks	
The skills associated with interpreting and communicating answers are applicable to every topic and section in the curriculum and across every grade. Learners have to be shown continuously how to interpret answers in relation to the context in which the answers have been calculated and how to communicate their answers in an appropriate way. For this reason there is no indication of "Suggested teaching time" or the "Term" in which this section must be taught.		
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Interpretation of answers	Check the appropriateness of a solution by comparing it to the estimated solution. Modify the solution as required by the context of the problem. (*e.g. If it is calculated that 6,2 litres of paint is needed to paint a wall, this value must be rounded up to 7 litres since more than 6 litres is needed and paint is not sold in decimal portions of a litre. Furthermore, if this paint is sold only in 5 litre tins, 10 litres of paint will have to be bought and not the calculated 6,2 litres or the rounded 7 litres.*) Round numbers up, down, or off to an appropriate number of decimal places depending on context. Determine the most appropriate units in which to express the answer as determined by the context in which the problem is posed. (*e.g. When working with maps, lengths are commonly measured in mm or cm, but actual distances are commonly expressed in m or km; furthermore, actual distances are commonly quoted in full kilometres without decimal values.*) Rework a problem if the initial conditions change. (*e.g. Recalculating the monthly repayment amount on a car loan as a result of an increase in the interest rate.*) Recognise that an error in measurement or a small change in rounding can make a large difference to an answer if the error or change is compounded over many calculations or through a large multiplication. (*e.g. On a map with a scale of 1:500 000, an inaccurate measurement of 0,5 cm on the map will result in an error calculation of 2,5 km in actual distance.*)	10, 11 and 12
Communication	Communicate solutions using appropriate terminology, symbols and units. Clearly state workings and methods used for solving a problem. Justify comparisons and opinions with calculations or with information provided in the context.	10, 11 and 12

Topic: Numbers and calculations with numbers **Grades 10, 11 and 12**

Suggested teaching time:	**Recommended texts and/or resources:**
Grade 10: 4–5 weeks	• Textbooks • "Basic Skills for Mathematical Literacy" (2009) booklet published by the DBE

It is expected that learners will make use of a variety of number concepts and calculations as they explore contexts and solve problems relating to situations involving the topics of *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability*. The content and/or skills outlined in this topic should be used in conjunction with the content and/or skills and contexts outlined in the other application topics. How learners make use of these number concepts will be determined by the contexts in which particular problems are situated - such as personal finance, painting a room or planning a trip.

Teaching time is allocated only to the revision and/or teaching of these number concepts in Grade 10. There are no new number concepts in Grades 11 and 12. Rather, it is expected that learners perform any calculation involving number concepts with confidence in any context or problem in which number concepts have application.

Scope of contexts and/or content per section and grade:

Section	**Grade 10**	**Grade 11**	**Grade 12**
Number formats and conventions Operations on numbers and calculator skills Rounding Ratios Proportion Rates Percentages	Number concepts to be used in the context of: • Finance → personal and/or household finance • Measurement → simple tasks in the familiar setting of the household • Maps, plans and other representations of the physical world → maps and plans of familiar contexts and/or simple structures • Data handling → data related to the personal lives of learners • Probability → games with coins and dice, and weather predictions	Number concepts to be used in the context of: • Finance → personal, household, business and workplace finance • Measurement → larger tasks in familiar contexts of the household and school • Maps, plans and other representations of the physical world → maps and plans of less familiar contexts and/or structures • Data handling → data related to the personal lives of learners and wider social issues • Probability → games with coins and dice, weather predictions, tests where there is the chance of inaccurate results, cosmetic and other products making statements regarding probability	Number concepts to be used in the context of: • Finance → personal, household, business, workplace, national and global finance • Measurement → complex tasks in familiar and unfamiliar contexts • Maps, plans and other representations of the physical world → maps and plans of possibly unfamiliar contexts and/or complex structures • Data handling → data related to the personal lives of learners, wider social issues and national/global issues • Probability → games with coins and dice, weather predictions, tests where there is the chance of inaccurate results, cosmetic and other products • making statements regarding probability, lottery and other gambling games, risk assessments, newspaper articles containing references to probability

Topic: Numbers and calculations with numbers		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
For all calculations involving numbers, learners are expected to be able to work with numbers expressed in the following formats: whole numbers; decimals; fractions; percentages.		
Number formats and conventions	Work with the following number formats: • decimal comma and decimal point (*e.g. 1,2 and 1.2*) • thousands separator (*e.g. "space" → 1 000 000; and "comma" → 1,000,000*) • positive and negative numbers as directional indicators (*e.g. −10° indicates 10 degrees below freezing point; R300,00 indicates credit while −R300,00 indicates debit*) • numbers expressed in word format, including - 1 hundred thousand = 100 000 - 1 million = 1 000 00 - 1 billion = 1 000 000 000 Interpret, understand and use different numbering conventions in contexts and recognise that although these representations look like numbers, they cannot be manipulated in the same way (*e.g. an "over" in cricket is completed when 6 balls have passed; 1214 in building numbers refers to unit 14 on the 12th floor*). *In order to*: Make sense of scenarios involving the topics of *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability*.	10, 11 and 12

Topic: Numbers and calculations with numbers		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Operations on numbers and calculator skills	Perform the following calculations for numbers expressed as whole numbers, fractions, decimals and percentages • estimate anticipated solutions to calculations* • add, subtract, multiply and divide whole numbers and decimals both with and without using a calculator • multiply and divide by 10, 100 and 1 000 without a calculator • apply operations in the correct order • recognise the effect of brackets on the order of operations and make use of brackets in ordering and performing calculations • apply addition and multiplication facts (distributive and associative properties) to simplify calculations - it is not necessary to know the names of these facts • find the square and the cube of a number with the use of a calculator+ • find the square root ($\sqrt{\ }$) of a number with the use of a calculator+ • specific operations on fractions: - add, subtract, multiply and divide both with and without the use of a calculator - convert between equivalent forms of fractions - find the decimal equivalent of any fraction using a calculator Use the following functions on a basic calculator: • addition; subtraction; multiplication and division • percentage • "memory" (M+, M−, MRC), "clear" (C) and "clear all" (CE) keys	10, 11 and 12
Operations on numbers and calculator skills (continued)	*In order to*: Make sense of scenarios involving the topics of *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability*.	
	Additional comments: * Estimating an answer to a problem is a crucial step in any calculation for two reasons. Firstly, before estimation can occur, a proper understanding of the problem should be developed. Secondly, an estimated answer provides a benchmark against which to compare the calculated answer: if the calculated answer and the estimation are very different, then this provides evidence of a possible problem. It is expected that learners will be shown methods for estimating answers for *every* type of calculation that they are exposed to, including calculations involving decimals and fractions, ratios, proportion, rates and percentages. + In Mathematical Literacy, learners are only expected to be able to perform calculations using a basic (non-scientific) calculator. • only squaring (raising to the power of 2) and cubing (raising to the power of 3) are required • only square rooting ($\sqrt{\ }$ or $\sqrt[2]{\ }$) is required	

Topic: Numbers and calculations with numbers			**Grades 10, 11 and 12**
Section		**Content/skills to be developed in appropriate contexts**	**Grade**
Rounding		Round* values in the following ways: • off (to a specified number of decimal places or a specific whole number) • off to the nearest 5 (a common practice in supermarkets since 1 c and 2 c pieces are no longer available) • up • down with an understanding: • that the way in which a value has to be rounded and/or the number of decimal places to which a value is rounded will be determined by the context in which the rounding occurs (*e.g. Money is generally rounded off to two decimal places; paint quantities are generally rounded up to the nearest litre; solutions involving people are generally rounded up or down to the nearest whole value depending on the context*) • of the possible effect of rounding values within a calculation on the final calculated answer (*e.g., When working with a scale of 1:500 000 on a map, a 1 mm error in measurement will result in a calculation of actual distance that is inaccurate by 0,5 km*) *In order to*: Make sense of contexts and problems involving the topics of *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability*.	10, 11 and 12
		Additional comments: * In Grade 10, instructions will be provided as to the type of rounding and/or appropriate number of decimal places to which an answer should be rounded. In Grades 11 and 12, it is expected that learners will determine the most appropriate form of rounding and/or number of decimal places for a given context or calculation.	
	A	**Possible assessment (incorporating rounding, ratios, scale and maps):** Assignment: *Exploring the impact of rounding* Measure a distance accurately on a map. • Use a given scale to determine the actual distance • Investigate the impact of rounding the measured distance up and down on the calculation of the final distance	10

Topic: Numbers and calculations with numbers		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Ratios	Perform the following calculations involving ratios: • convert between different forms of a ratio • (*e.g. If the scale of a plan is 1:100, then 1 cm measured on the plan is equal to 1 m (100 cm) in actual length*) • determine missing numbers in a ratio • (*e.g. If cement, sand and stone is to be mixed in the ratio 1:2:2 to make high-strength concrete, how many wheelbarrows of sand and stone should be mixed with 50 wheelbarrows of cement?*) • divide or share an amount in a given ratio (*e.g. How many millilitres of tint and peroxide will a hairdresser need to make a 50 ml mixture if the tint and peroxide is mixed in the ratio 1:2?*) with an understanding of: • different formats for expressing ratios *e.g.* 1:50 and/or $\frac{1}{50}$) • why no units are included in a ratio • equivalent ratios (e.g. 1:50 = 2:100) • how to write a ratio in unit form (e.g. 3:8 can be written as 1:2,667˙) *In order to*: Make sense of situations and calculations involving: • mixing quantities • proportion • rates (e.g. *Electricity tariffs; speed*) • percentage calculations • conversions • scale • expressions of probability • any other scenarios involving the topics of *Finance*, *Measurement, Maps, plans and other representations of the physical world*, *Data handling* and *Probability*, in which ratios have application	10, 11 and 12

Topic: Numbers and calculations with numbers		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Proportion	Perform calculations involving: • direct proportion (e.g. *If the cost of a trip is R5,00 per km, then an 85 km trip will cost R5,00/km × 85 km = R425,00; if 50 m² of carpeting costs R1 750,00, then 1 m² of carpeting will cost R1 750,00 ÷ 50 = R35,00*) • indirect (inverse) proportion (e.g. *A soccer season ticket costs R800,00. If you watch only one game during the season, the cost per game is R800,00; for two games the effective cost per game is R400,00; and so on*) Interpret graphs representing situations involving direct and inverse proportion and illustrating the difference between the two types of proportion.* *In order to*: Make sense of contexts and problems involving the topics of *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability*.	10, 11 and 12
	Additional contexts/resources and comments: * This section requires integration with the content/skills and contexts related to graphs outlined in the topic *Patterns, relationships and representations*.	
	A **Possible assessment:** Investigation: *Comparing direct and indirect proportion* • Choose two different authentic real-life scenarios involving direct proportion and inverse proportion • Draw graphs to represent each scenario • Investigate, describe and explain the shapes of the graphs in relation to each scenario	10

Topic: Numbers and calculations with numbers			Grades 10, 11 and 12
Section		**Content/skills to be developed in appropriate contexts**	**Grade**
Rates		Calculate the following types of rates: • cost rates (e.g. *price of chicken in Rand/kg*) • consumption rates (e.g. *petrol consumption rate of a car in litres/km*) • distance, time and speed rates (e.g. *average speed of a car in km/h*) • more complex rates (e.g. *petrol consumption of a car expressed in litres/100 km; the running speed of a marathon runner measured in min/km*) with an awareness of: • the meaning of "/" as "per" and the relevance of this term in relation to the values in the rate (e.g. *km/h means the number of km travelled in 1 hour*) • the difference between constant and average rates (e.g. *The price of chicken in Rand/kg is a constant rate while the speed of a car in km/h is an average rate*) • how to write rates in unit form • how to simplify and compare rates (e.g. *Is it more cost-effective to buy a 4 kg box of washing powder that costs R42,99 or a 5 kg box that costs R47,50?*) *In order to*: Make sense of situations involving: • costs (e.g. *the price of a litre of paint*) • tariffs (e.g. *electricity, water, transport*) • consumption (e.g. *water or petrol consumption*) • calculations of estimated travelling times, distance and speed using maps • conversions • any other problems in the context of the topics of *Finance*, *Measurement, Maps, plans and other representations of the physical world*, *Data handling* and *Probability*, in which rates have application	10, 11 and 12
	A	**Possible assessment:** Assignment: *Comparing prices* • Visit a supermarket and record pricing and size/weight/volume information for different grocery items • Determine the most cost-effective size for each of the grocery items • Discuss reasons why a particular size for a particular grocery item may be the most cost-effective • Discuss reasons other than cost that may affect the size of a grocery item that a person will choose to buy	10

Topic: Numbers and calculations with numbers		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Percentages	Perform the following percentage calculations: • calculate a percentage of a value (e.g. *If 14% discount is offered on a R200,00 pair of shoes, how much discount will you receive?)* • increase a value by a percentage (that is, calculating a percentage of a value and adding it to the value) • (e.g. *If a bottle of milk that costs R8,20 increases in price by 5%, what will the new price of the milk be?)* • decrease a value by a percentage (that is, calculating a percentage of a value and subtracting it from the value) • (e.g. *If you are given a 10% discount on a R300,00 pair of shoes, how much will you pay for the shoes?*) • express a part of a whole as a percentage (e.g. *If a learner scores a mark of 42/60 for a test, what percentage was scored for the test?*) • determine percentage increase and/or decrease (e.g. *If the price of a bag of maize meal increases from R48,99 to R52,49, by what percentage has the price increased?*) • determine the original value when given a value to which a percentage has been added or subtracted (e.g. *If the price of a pair of shoes after a 15% discount is R325,00, what was the original price of the shoes?*) with an understanding of: • the equivalence of the different formats 50%, $\frac{50}{100}$ and 0,5 • how to move interchangeably from fractions to percentages • how to convert from percentages to decimals with the use of a calculator *In order to*: Make sense of situations involving: • discount • tax • budgets • marks • estimating measurement quantities (e.g. *paint, concrete*) to account for wastage • representing and/or comparing data values in tables and on a graph • expressions of probability • any other problems in the context of the topics of *Finance*, *Measurement, Maps, plans and other representations of the physical world*, *Data handling* and *Probability*, in which percentages have application	10, 11 and 12

Topic: Numbers and calculations with numbers			Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**		**Grade**
	A	**Possible assessment:** Assignment: *Comparing actual and relative size* Consider two different items whose prices have increased and then • work out the actual Rand increase in price for each of the items • work out the percentage change in price for each of the items • compare the actual increase to the percentage increase and discuss the usefulness of percentages.	10

Topic: Patterns, relationships and representations **Grades 10, 11 and 12**

Suggested teaching time:	**Recommended texts and/or resources:**
Grade 10: 4−5 weeks	• Textbooks
Grade 11: 3-4 weeks	• "Basic Skills for Mathematical Literacy" (2009) booklet published by the DBE

Learners will make use of a variety of patterns, relationships and representations of those relationships as they explore contexts and solve problems in *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability*. The content and/or skills outlined in this topic shouldt be used in conjunction with the content and/or skills and contexts outlined in the other application topics. How learners make use of these concepts will be determined by the contexts in which particular problems are situated, e.g. tariff systems or business finance.

Teaching time is allocated only to the revision and/or teaching of these patterns, relationships and representation concepts in Grades 10 and 11. There is no new content in Grade 12. Rather, it is expected that learners will construct and interpret tables, equations and graphs to make sense of any context or problem in which these concepts have application and in particular will be able to work with two (Grade 11) or more (Grade 12) relationships at the same time in a single representation (table and/or graph).

Scope of contexts and/or content per section and grade:

<table>
<tr><th>Section</th><th>Grade 10</th><th>Grade 11</th><th>Grade 12</th></tr>
<tr><td>Making sense of graphs that tell a story</td><td rowspan="3">In Grade 10, Patterns, relationships and representations of relationships are limited to contexts involving:
• constant (fixed), linear and inverse proportion relationships
• only one relationship in a table or on a set of axes (e.g. exploring the cost of a single cell-phone contract rather than comparing two different contracts)</td><td colspan="2" rowspan="3">In Grades 11 and 12, Patterns, relationships and representations of relationships are limited to contexts involving:
• constant, linear, inverse proportion, exponential (compound growth) and other non-linear relationships appropriate to contexts as specified in the topics Finance, Measurement, Maps, plans and other representations of the physical world, Data handling and Probability
• in Grade 11, two relationships in a table or on a set of axes (e.g. comparing two different cell phone billing options)
• in Grade 12, two or more relationships in a table or on a set of axes (e.g. comparing three different electricity billing options)</td></tr>
<tr><td>Patterns and relationships</td></tr>
<tr><td>Representations of relationships in tables, equations and graphs</td></tr>
<tr><td>Working with two or more relationships and/or representations</td><td></td><td colspan="2"></td></tr>
</table>

Topic: Patterns, relationships and representations		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Making sense of graphs that tell a story*	Work with a variety of graphs found in newspapers, magazines and other resources for which there are no obvious or available equations and/or patterns between the variables represented in the graphs. *In order to*: Recognise that graphs tell a story and be able to explain the story/message/impression represented in a graph Recognise that graphs represent a relationship between two or more items/quantities and be able to identify those items and describe the relationship Recognise and describe how the shape and direction of a graph and changes to the shape/direction affect the story/message represented in the graph Recognise and describe the meaning of different points on the graph, including: • the point where the graph(s) cross the vertical and horizontal axes; • maximum and minimum points on the graph; • the point where different graphs cross.	10, 11 and 12
	Additional comments: * The primary purpose of this section is to provide learners with the opportunity to investigate a variety of different types of graphs in order to develop a feel for working with graphs and an understanding that graphs tell a story and present a message to the reader, without getting bogged down by formal mathematical procedures involving equations, plotting points, substitution, etc. This section is also intended to provide learners with the opportunity to describe graphs using everyday and/or familiar terminology (e.g. *"going up"; "top"*) rather than explicit mathematical terminology (e.g. *"increasing"; "maximum"*). The focus in this section must be on understanding the graphs and the message displayed in the graphs rather than on formal graphing procedures and terminology.	

Topic: Patterns, relationships and representations — **Grades 10, 11 and 12**

<table>
<tr><th>Section</th><th>Content/skills to be developed in appropriate contexts</th><th>Grade</th></tr>
<tr><td rowspan="2">Patterns and relationships</td><td>
Work with the following types of formal relationships between quantities found in both numerical (e.g. cell phone costs) and geometric (e.g. tiling patterns) forms in the context of situations involving the topics of Finance, Measurement, Maps, plans and other representations of the physical world, Data handling and Probability.
• Relationships where there is no difference (that is, constant or fixed relationship) between the terms in the relationship.
e.g. A school hires a bus at a cost of R10 000,00 per day. This cost remains fixed no matter how far the bus travels or how many people use the bus.
• Relationships where there is a constant difference between the terms in the relationship (that is, direct proportion relationships and other linear relationships).
e.g. The table below shows the cost of filling a car with petrol at a cost of R7,50 per litre.
<table>
<tr><td>Litres</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td rowspan="2">…</td><td>50</td></tr>
<tr><td>Cost</td><td>R0,00</td><td>R7,50</td><td>R15,00</td><td>R22,50</td><td>R30,00</td><td>R375,00</td></tr>
</table>
The cost increases at a constant rate of R7,50 for every litre of petrol bought.
• Relationships where there is an inverse proportion between the terms in the relationship.
e.g. The table below shows how much each teacher who is part of a taxi hire scheme will have to pay per month for the hire of the taxi as dependent on the number of people who are part of the scheme.
<table>
<tr><td>No. of teachers</td><td>1</td><td>2</td><td>3</td><td>4…</td><td>12</td></tr>
<tr><td>Cost per teacher</td><td>R2 200,00</td><td>R1 600,00</td><td>≈ R734,00</td><td>R550,00</td><td>≈ R184,00</td></tr>
</table>
There is an inverse proportion relationship between the number of teachers in the transport club and the amount that every teacher will have to pay per month, and the cost per teacher is calculated using the method $\frac{\text{R2 200,00}}{\text{no. of teachers}}$.
</td><td>10, 11 and 12</td></tr>
<tr><td>
• Relationships where there is a constant ratio between the terms in the pattern.
e.g. The table below shows the amount of money in a fixed deposit account over time.
<table>
<tr><td>Month</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>…</td></tr>
<tr><td>Account balance</td><td>R2 000,00</td><td>R2 010,00</td><td>R2 020,05</td><td>R2 030,15</td><td>R2 040,30</td><td>…</td></tr>
</table>
The amount is increasing at a rate of 0,5% of the balance in the account during the previous month and can be calculated using the following method:
current month's balance = previous month's balance + 0,5% × previous month's balance.
</td><td>11 and 12</td></tr>
</table>

Topic: Patterns, relationships and representations — **Grades 10, 11 and 12**

<table>
<tr><th>Section</th><th>Content/skills to be developed in appropriate contexts</th><th>Grade</th></tr>
<tr><td rowspan="2">Patterns and relationships (continued)</td><td>
• Relationships containing a combination of the above.
e.g. A particular cell-phone contract includes 100 free minutes and a call cost of R1,50 per minute. The table below shows the relationship between the monthly cost of this contract and the amount of time spent on calls during the month.
<table>
<tr><td>Talktime (min)</td><td>0</td><td>20</td><td>40</td><td>60</td><td>80</td><td>100</td><td>101</td><td>102</td></tr>
<tr><td>Monthly cost</td><td>R100,00</td><td>R100,00</td><td>R100,00</td><td>R100,00</td><td>R100,00</td><td>R100,00</td><td>R101,50</td><td>R103,00</td></tr>
</table>
For the first 100 minutes there is a fixed relationship between monthly cost and talktime. After 100 minutes, there is a constant difference relationship, with an increase in cost of R1,50 for every minute of talktime.
• Relationships for which there is no obvious pattern, or for which no formula is available, or which develop out of the exploration of a context.
e.g. A graph showing the effect that changes in the interest rate will have on the outstanding balance on a loan.
</td><td></td></tr>
<tr><td>
In working with the relationships described above:
• Describe features of patterns and/or relationships in words that include:
- independent and dependent variables
- discrete and/or continuous variables
- increasing and/or decreasing relationships
- critical values including maximum, minimum and zero values.
e.g. Consider a cell phone contract where the cost of talking on the phone is R1,50 per minute. In this scenario, cost is dependent on the amount of time spent talking on the cell phone; also, the relationship between cost and talktime is an increasing relationship, with cost increasing at a fixed rate of R1,50 per minute
• Use a range of techniques to determine missing and/or additional terms in a pattern, including:
- the relationship between consecutive terms
- the relationship between the term's position in the pattern and its value
- the formulae provided for calculations.
e.g. Consider the table on the right that shows the cost of filling a car with petrol.
There are two ways to determine the pattern in the values in the table:
<table>
<tr><td>Litres</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Cost</td><td>R0,00</td><td>R7,50</td><td>R15,00</td><td></td><td></td></tr>
</table>
• The difference between consecutive cost values is R7,50. So, to find the cost of buying 3 litres of petrol you can add R7,50 to the cost of buying 2 litres (that is, R15,00) 3 litres would cost R15,00 + R7,50 = R22,50
• The relationship between litres of petrol and cost is R7,50 for every litre of petrol. Therefore the cost of filling a car with 3 litres of petrol is R7,50/ℓ × 3 ℓ = R22,50
</td><td>10, 11 and 12</td></tr>
</table>

Topic: Patterns, relationships and representations — **Grades 10, 11 and 12**

<table>
<tr><th>Section</th><th>Content/skills to be developed in appropriate contexts</th><th>Grade</th></tr>
<tr><td rowspan="2">Patterns and relationships (continued)</td><td>
• Describe and/or represent patterns for constant, constant difference and inverse proportion relationships using:
- words, spoken and written
- formulae that include mathematical operators and either variables or words.
• Construct patterns from descriptions given in words (instructions) and/or formulae and represent these patterns in a table or picture.
e.g. A quotation states that the cost of hiring a photocopier is R1 500,00 per month with an additional charge of R0,50 per copy. The following table can be constructed to represent the relationship between number of copies and cost:
<table>
<tr><td>Pages photocopied</td><td>0</td><td>10</td><td>20</td><td>…</td></tr>
<tr><td>Total monthly cost</td><td>R1 500,00</td><td>R1 505,00</td><td>R1 510,00</td><td>…</td></tr>
</table>
• Identify and extend numerical patterns arising from a formula.
e.g. The following formula can be used to determine the rate at which medicine will flow from a drip:
Drip rate = [total volume of the drip (ml) ÷ total time for which the drip is administered (min)] × drip factor
We can use the formula to construct the following table to show how the drip rate for a 4 litre drip with a drip factor of 15 gtt/ml will vary over time:
<table>
<tr><td>Time administered (min)</td><td>30</td><td>60</td><td>90</td><td>…</td></tr>
<tr><td>Drip rate (gtt/min)</td><td>2 000</td><td>1 000</td><td>≈ 6667</td><td>…</td></tr>
</table>
Analysing the values in the table will reveal that the relationship between drip rate, volume of the drip and drip time is an inverse proportion relationship.
</td><td></td></tr>
<tr><td>
In order to:
Understand situations involving:
• finance (e.g. tariff systems; growth/decline of investments and loans; changes in the inflation rate)
• measurement (e.g. temperature conversions; use of formulae in perimeter, area and volume calculations)
• maps, plans and other representations of the physical world (e.g. using formulae and graphs to determine travelling costs for a journey)
• data handling (e.g. interpreting information in tables and graphs)
• any other situations in which patterns, relationships and representations can be used to solve problems relating to contexts involving the topics of Finance, Measurement, Maps, plans and other representations of the physical world, Data handling and Probability.
</td><td>10, 11 and 12</td></tr>
</table>

Topic: Patterns, relationships and representations		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Representations of relationships in tables, equations and graphs	Understand the following regarding the relationships described above: • tables, formulae and graphs can be used to provide different representations of the same relationship* • how to move between representations of relationships, including: - completing a table of values by reading values from a graph - plotting a graph from the values in a table - using a given formula and/or description of a relationship to construct a table of values - matching formulae/equations to graphs and/or tables of values of the relationship based on features and/or trends. In working with relationships (from those described above) represented in tables, equations and graphs: • identify and distinguish between: - the dependent and independent variables - discrete and/or continuous variables • identify: - dependent variable values for given independent variable values - independent variable values for given dependent variable values • identify independent variable values associated with the critical points of the dependent variable including: - zero values - maximum/minimum values • determine formulae and/or equations to describe relationships represented in tables and/or graphs for: - constant (fixed) relationships - linear relationships - inverse proportion relationships. In working specifically with equations of relationships: • substitution (that is, determine the value of the dependent variable for given value(s) of the independent variable) • solving (that is, determine the value of the independent variable for given value(s) of the dependent variable), using: - trial and improvement - simple algebraic manipulation (continued)	10, 11 and 12

Topic: Patterns, relationships and representations		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Representations of relationships in tables, equations and graphs (*continued*)	In working specifically with graphs of relationships: • draw graphs of one (Grade 10), two (Grade 11) or more (Grade 12) relationships on the same set of axes by: - plotting points from a given table of values or from a table of values constructed from given or constructed equations - constructing axes with an appropriate scale chosen for both the vertical and horizontal - labelling the vertical and horizontal axes and the chart appropriately • interpret graphs with consideration of the following: - identify dependent variable values for given independent variable values - identify independent variable values for given dependent variable values - identify independent variable values for intervals over which the dependent variable values increase and/or decrease e.g. *In a graph showing the change in the price of bread during the course of a year, between which months did the price of bread increase?* - explain the significance of the shape of the graph in relation to the variables and scenario being represented on the graph e.g. *Consider a straight line graph showing the cost of filling a car with petrol where the cost of petrol is R7,50 per litre. The graph is a straight line because for every 1 litre that you fill, the cost increases by a fixed amount of R7,50*	10, 11 and 12
	- identify the independent variable values for which two relationships have the same dependent variable value e.g. *For graphs showing a comparison between the amount of money in an investment over time, if both simple and compound interest are calculated on the investment, how long will it take for the money in each investment to increase to R5 000,00?*	11 and 12
	Choose and develop the most effective representation (including tables, graphs and/or equations) for solving a problem.+ e.g. *In order to compare the monthly cost of making calls on two different cell phone contracts, tables of cost value can be drawn up for each of the contracts and then the information from the tables can be represented on graphs. Analysing these graphs will make it possible to decide which contract is the better option for a certain number of minutes of talktime during a month*.	11 and 12
	<u>*In order to*</u>: Make sense of situations involving: • Finance (e.g. *tariff systems; growth/decline of investments and loans; changes in the inflation rate*) • Measurement (e.g. *temperature conversions; use of formulae in perimeter, area and volume calculations*) • Maps, plans and other representations of the physical world (e.g. *using formulae and graphs to determine travelling costs for a journey*) • Data handling (e.g. *interpreting information in tables and graphs*) • Any other situations in which patterns, relationships and representations can be used to solve problems relating to contexts involving the topics of *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability.*	10, 11 and 12

Topic: Patterns, relationships and representations		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Representations of relationships in tables, equations and graphs (*continued*)	**Additional comments:** * It is very important for learners to understand that tables, graphs and equations can all describe the same relationship, but in different ways. Learners should develop the ability to move flexibly between these different representations. + In Grade 10 it is expected that learners will be instructed on the most appropriate representation of a relationship required for solving a problem. In Grades 11 and 12, however, it is expected that learners will be able to decide on the most appropriate representation for a given scenario and then construct, interpret and analyse that representation.	
A	**Possible assessment:** Investigation: *Identify and represent a relationship in daily life:* • Select a scenario in daily life involving a fixed, linear or inverse proportion relationship • Draw a graph to represent the relationship • Construct an equation to represent the relationship • Present your findings to the class. OR Assignment: *Represent electricity costs graphically:* • Found out the different charges for electricity in the municipality in which your home is situated • Draw a graph to represent the monthly cost of electricity as dependent on the units of electricity used during the month.	10
A	**Possible assessment:** Assignment: *Represent cell phone costs graphically:* • Select an advert for a cell phone contract that includes a monthly subscription fee, free airtime or free minutes, and a fixed per minute or per second tariff (e.g. R1,50 per minute) • Represent the costs involved in making calls on this contract on an appropriate graph.	11

Topic: Patterns, relationships and representations		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Working with two or more relationships*	In situations involving representations of two (Grade 11) or more relationships (Grade 12) (from those described above) on the same set of axes: • identify the values of the dependent and independent variables for which two or more relationships are equal (e.g. *the points of intersection of three graphs*) and explain the meaning of these values+ in relation to the context in which the problem is posed. e.g. *Two graphs are drawn to show the total monthly cost of two different cell phone contracts as dependent on a monthly subscription value and the number of minutes of talktime used during the month. The point at which the graphs intersect, represents the number of minutes that you can talk on each of the contracts for the monthly cost to be the same.* <u>*In order to*</u>*:* Solve financial and other problems including: • comparing different tariff systems# • determining break-even values for a business# • comparing different banking options# • any other situations in which comparing two or more relationships can be used to solve problems relating to contexts involving the topics of *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability.*	11 and 12
	Additional comments: * In Grade 11 it is expected that learners will work with <u>two</u> relationships in a representation (table and/or graph) and comparisons of those relationships. In Grade 12 it is expected that learners will work with <u>two or more</u> relationships in a representation (table and/or graph) and comparisons of those relationships. + Learners are not expected to determine the values for which two or more relationships are equal through algebraic calculations (that is, solving equations simultaneously). Rather, they should be able to read off and, if necessary, estimate the values of the dependent and independent variables for which the relationships are equal from graphs and/or values presented in tables, through trial and improvement, and substitution using equations. # Refer to the sections on *Tariff systems*, *Break-even analysis* and *Banking, investments and loans* in the topic *Finance* for more specific details regarding contexts in which learners are expected to make use of comparisons of two or more relationships.	

Topic: Patterns, relationships and representations		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Working with two or more relationships (*continued*)	Compare representations of two (Grade 11) or more (Grade 12) relationships (from those described above) that describe alternative options/solutions, with specific focus on: • differences in the rates of change between the dependent and independent variables for each of the relationships* • differences in the steepness of graphs representing the relationships* • differences in the constant values in equations and graphs representing the relationships* • the use of the following terms in relation to specific dependent/independent variable values: "less than"; "equal to"; "greater than" or "more than"; "between" + • making decisions based on a comparison of the representations and explaining solutions by referring to specific dependent and independent variable values. <u>*In order to*</u>: Solve financial and other problems including: • comparing different tariff systems# • determining break-even values# for a business • comparing different banking options# • any other situations in which comparing two or more relationships can be used to solve problems relating to contexts involving the topics of *Finance*, *Measurement*, *Maps, plans and other representations of the physical world*, *Data handling* and *Probability.*	11 and 12
	Additional comments: * e.g. *Two graphs are drawn to show the monthly cost of electricity on a pre-paid system compared to a flat-rate system.* *The fact that the graph representing the flat-rate option does not start at 0 on the vertical axis indicates that there is a fixed fee payable every month on this option irrespective of consumption. The fact that the graph representing the pre-paid option is steeper than the graph for the flat-rate option indicates that the tariff for electricity consumption on the pre-paid system is higher.* + e.g. *Two graphs are drawn to show the monthly cost of electricity on a pre-paid system compared to a flat-rate system.* *If you use an average of 650 kWh of electricity per month, then the cost of being on the pre-paid option and the flat-rate option are the same. However, if you use <u>less than</u> 650 kWh per month, then it will be cheaper to be on the pre-paid option. And if you use <u>more than</u> 650 kWh, it will be cheaper to be on the flat-rate option.* # Refer to the sections on *Tariff systems*, *Break-even analysis* and *Banking, investments and loans* in the topic *Finance* for more specific details regarding contexts in which learners are expected to make use of comparisons of two or more relationships.	

Topic: Patterns, relationships and representations		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
A	**Possible assessment:** Investigation: *Comparison of costs on different cell phone systems* • Find adverts for two different types of cell phone systems in a newspaper (e.g. a pre-paid cell phone and a contract cell phone) • Find out the tariffs charged for two different types of cell phones (e.g. pre-paid system and a contract system) • Draw graphs to represent the monthly cost of making calls on each cell phone system • Use the graphs to make a deduction about which cell phone system would be better for you based on the minutes of talktime that you use during the month.	11
	Possible assessment: Investigation: *Comparison of costs on different electricity systems* • Find costs/tariffs for three different types of electricity systems (e.g. pre-paid, flat-rate and seasonal) • Find out the tariffs charged for the three systems • Draw graphs to represent the monthly cost of electricity on each of the systems • Use the graphs to make a deduction about which electricity system will be most suitable and cost effective for an individual with particular needs.	12

PART 2:

Application Topics

Topic: Finance **Grades 10, 11 and 12**

Suggested teaching time:

Grade 10: 6–7 weeks

Grade 11: 8–9 weeks

Grade 12: 8–9 weeks

Recommended texts and/or resources:

- Textbooks
- Relevant financial documents relating to personal, household, workplace, business, national and global contexts and more complex financial topics (e.g. household bills; bank and store account statements; adverts showing car and home loan conditions; tax forms)

Scope of contexts and/or content per section and grade:

Section	Grade 10	Grade 11	Grade 12
Financial documents	Contexts are limited to those that deal with personal and/or household finance	Contexts are limited to those that deal with personal, household, workplace and business finance. *Examples of contexts in which workplace and business finance can be explored:* • *small home industry (e.g. bread-baking business)* • *small business (e.g. tuck shop; street vendor; flea-market stall; cell phone container business; garden services; painting business; car wash; catering business; crèche)* • *subsistence farming* • *outreach programme or non-profit organisation* • *business banking* • *etc.*	Contexts include those that deal with personal, household, workplace, business, national and global finance, and more complex financial scenarios. *Examples of contexts in which national, global and more complex financial scenarios can be explored:* • *"Tax Pocket Guide" issued by SARS* • *buying a car or a house* • *student loan* • *pension fund or retirement annuity* • *funeral policy* • *inflation data and graphs* • *financial documents for provincial and national government* • *financial documents for a large business (sometimes shown in newspapers) etc.*
Tariff systems			
Income, expenditure, profit/loss, income-and-expenditure statements and budgets			
Cost price and selling price	----		
Break-even analysis	----		
Interest	Contexts are limited to those that deal with personal and/or household banking		
Banking, loans and investments			
Inflation	----		
Taxation	Contexts are limited to those that deal with VAT		
Exchange rates	----		

Topic: Finance		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Financial documents	Work with the following financial documents: • documents relating to personal and/or household finance, including: - household bills (e.g. electricity, water, telephone, cell phone) - shopping documents (e.g. till slips, account statements) - banking documents* (e.g. bank statements and fee structures) - household budgets*	10, 11 and 12
	• documents relating to workplace and small business finance, including: - payslips; budgets*; quotations; invoices; receipts; travel allowance/claim forms; banking documents*	11 and 12
	• documents relating to national/global and more complex financial topics, including: - tax forms (e.g. tax deduction and tax rate tables, IRP5 forms, employee income tax forms) - loan documentation*, including: o agreements stating loan conditions (e.g. *term of the loan, interest rate*) o statements from banks and other loan institutions showing changes in a loan agreement (e.g. *interest rate and monthly repayment changes*)	12
	In order to: Understand terminology used in documents, including: Grades 10, 11 and 12: Grades 11 and 12: • date or time period of the document • opening and closing balance • credit and debit • payment due • minimum payment • tariff or charge • income, expenditure, profit/loss • VAT • UIF, net pay, gross pay, deductions and taxable income • items and quantities • tax rates and tax brackets • PAYE and SITE • interest rates • repayment amounts and periods • residual • real cost or total cost Explain and demonstrate how the values appearing in the documents have been determined.	10, 11 and 12

<table>
<tr><td colspan="3">Topic: Finance</td><td>Grades 10, 11 and 12</td></tr>
<tr><td>Section</td><td colspan="2">Content/skills to be developed in appropriate contexts</td><td>Grade</td></tr>
<tr><td rowspan="3">Financial documents
(continued)</td><td colspan="3">Additional comments:
* For a description of the terminology relating specifically to budgets and banking documents, see the sections below on Income, expenditure, profit/loss, income-and-expenditure statements and budgets and Banking, loans and investments.</td></tr>
<tr><td rowspan="2">A</td><td>Possible assessment:
Assignment: Demonstrate the understanding of a household bill
Analyse a household bill (electricity, water, telephone, etc.) and explain how the different cost values on the bill have been determined.</td><td>10</td></tr>
<tr><td>Possible assessment:
Assignment: Understanding the “Tax Pocket Guide”
Read through and answer questions relating to the “Tax Pocket Guide” brochure issued by SARS.</td><td>12</td></tr>
<tr><td rowspan="4">Tariff systems</td><td colspan="3">Work with the following tariff systems:
• municipal tariffs (e.g. electricity; water; sewage)
• telephone tariffs (e.g. cell phone and fixed line)
• transport tariffs (e.g. bus, taxi and train tariffs)
• bank fees.
In order to:</td></tr>
<tr><td colspan="2">Calculate costs using given tariffs and/or formulae.
Draw and interpret graphs of various tariffs systems.*</td><td>10, 11 and 12</td></tr>
<tr><td colspan="2">Compare two (Grade 11) or more (Grade 12) different options for a tariff system to determine the most appropriate option for individuals with particular needs (e.g. comparing pre-paid versus contract cell phone costs) by:
• performing calculations
• drawing graphs to represent the different options and interpreting the point(s) of intersection and other regions on the graphs in relation to the context+</td><td>11 and 12</td></tr>
<tr><td colspan="3">Additional comments:
* In Grade 10 learners are expected to be able to draw and interpret constant (fixed), linear and inverse proportion graphs. As such, Grade 10 learners can only be expected to draw graphs of tariff systems that relate to these types of graphs. For more specific details, refer to the topic Patterns, representations and relationships.
In Grades 11 and 12 there is no limitation on the types of graphs that learners are expected to be able to draw to demonstrate their understanding of tariff systems.
+ Learners are not expected to find break-even values for scenarios involving different tariff systems through algebraic calculations (that is, solving equations simultaneously). Rather, they should be able to read off and, if necessary, estimate the values of the dependent and independent variables for which the graphs are equal directly from the axes.
For more specific details on the content and/or skills and approach that learners are expected to work with in determining points of intersection of graphs, refer to the section Working with two or more relationships and/or representations in the topic Patterns, relationships and representations.</td></tr>
<tr><td></td><td>A</td><td>Possible assessment:
• Investigation: Which cell phone?
• Use calculations, graphs and break-even analysis to compare the options presented in two different cell phone adverts
• Discuss non-mathematical considerations that affect the type of cell phone option a person may choose.</td><td>11</td></tr>
</table>

Topic: Finance — **Grades 10, 11 and 12**

Section	Content/skills to be developed in appropriate contexts		Grade
Income, expenditure, profit/loss, income-and-expenditure statements and budgets*	Identify and perform calculations involving income, expenditure, profit and loss values, including: • Fixed, variable and occasional *income* values and fixed, variable, occasional, high-priority and low-priority *expenditure* values from the following sources:		
	- personal income: o salaries, wages and commission o gifts and pocket money o bursaries and loans o savings o interest o inheritance	- personal expenditure: o living expenses (e.g. *food, clothing, entertainment*) o accounts (e.g. *electricity and water*) o telephone o fees (e.g. *school fees and bank fees*) o insurance (e.g. *car, household and medical aid*) o personal taxes o loan repayments (e.g. *store accounts*) o savings	10, 11 and 12
	- business and/or workplace income: o income from sales and/or services rendered o donations and/or grants o interest on money in accounts and/or investments	- business and/or workplace expenditure: o salaries, wages and commission o running expenses (e.g. *services, telephone, rent*) o investments and savings o taxes	11 and 12
	- income for larger organisations (e.g. taxes for a government).	- expenditure for larger organisations (e.g. municipality).	12
	In order to:		
	Manage finances by: • analysing and preparing income-and-expenditure statements and budgets, with an awareness of the difference between these two documents, for: - an individual and/or household - a trip (e.g. holiday) - personal projects (e.g. dinner party; significant purchases such as a cell phone, television or furniture)		10, 11 and 12
	- a small business (e.g. spaza shop), including: o a comparison of income/expenditure/profit values over two years *(analysis only)* o budgets showing a comparison of projected versus actual income, expenditure and profit/loss values *(analysis only)* - large projects and/or events (e.g. fund-raising event or a wedding)		11 and 12

Topic: Finance **Grades 10, 11 and 12**

Section	Content/skills to be developed in appropriate contexts		Grade
Income, expenditure, profit/loss, income-and-expenditure statements and budgets (*continued*)	- large organisations (<u>analysis only</u>) (e.g. municipality or provincial/national government), including: o a comparison of income/expenditure/profit values over two years o budgets showing a comparison of projected vs actual income, expenditure and profit/loss values		12
	• considering the importance of saving for occasional or future expenses.		10, 11 and 12
	Additional comments: * In Grades 10 and 11 it is expected that learners will be able to work with income-and-expenditure statements and budgets containing reasonably small and simple money values appropriate to personal, household, workplace and small business contexts. In Grade 12, it is expected that learners will be able to work with income-and-expenditure statements and budgets containing large and complex money values, including values expressed in thousands, hundreds of thousands, millions and billions.		
	A	**Possible assessment (incorporating Finance and Data handling, i.e. collecting data):** <u>Assignment</u>: *Developing a household budget* • Keep a record of household income and expenditure for a time period • Draw up a statement of income and expenditure for the household • Analyse the statement and suggest how the financial position of the household could be changed or improved.	10
Cost price and selling price*	Identify the costs associated with producing/manufacturing an item or rendering a service in the context of: • a home industry (e.g. *bread-baking business*) • small business (e.g. *tuck shop; street vendor; flea-market stall; cell phone container business; garden services; painting business; car wash; hairdresser; catering business; crèche; subsistence farming*). <u>*In order to*</u>*:*		
	Determine the cost of production and/or cost price of an item or service, with an understanding of the difference between these two costs. Decide on an appropriate selling price for an item and/or service based on an expected percentage profit.		11 and 12
	Investigate the running of a small business with consideration of the following for the business: • income-and-expenditure statements • budgets • break-even analysis (see the section below on *Break-even analysis*) • the cost of production, cost price and selling price of an item or service sold/rendered by the business.		12
	Additional comments: * This section on *Cost price and selling price* applies only to Grade 11 and Grade 12 learners.		

Topic: Finance			Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**		**Grade**
Break-even analysis*	Determine break-even values using the following methods: • drawing two (Grade 11) or more (Grade 12) graphs on a set of axes and reading off the points of intersection of the graphs • trial and improvement through substitution into two or more equations representing the scenario and/or graphs. Understand the following components of break-even analysis: • the break-even point is always made up of two values (e.g. *the number of items that should be sold and the amount of money that should be made from the sale of those items*) • the relevance/meaning of the break-even values is determined by the context in which the break-even values occur. *In order to*: Make sense of situations involving: • the break-even values for a business with consideration of cost price, selling price, income and expenditure values • the values for which two (Grade 11) or more (Grade 12) different costing options are equal (e.g. *different cell phone or electricity costing options*).		11 and 12
	Additional comments: * Learners are not expected to find break-even values for scenarios through algebraic calculations (that is, solving equations simultaneously). Rather, they should be able to read off and, if necessary, estimate the values of the dependent and independent variables for which the graphs are equal directly from the axes. * This section on *Break-even analysis* applies only to Grade 11 and Grade 12 learners. Examples of contexts and/or resources in which the concept of break-even can be explored: • small home industry (e.g. *bread-baking business*) • small business (e.g. *tuck shop; street vendor; flea-market stall; cell phone container business; garden services; painting business; car wash; catering business*) • subsistence farming • electricity tariff systems • telephone tariff systems • rental options (e.g. *hiring a photocopier*); • etc.		
	A	**Possible assessment:** Assignment: *Running a home industry business* • Investigate the various factors involved in running a small home industry business • budgets and income-and-expenditure statements • cost price and selling price of items made and sold for the business • the break-even values for the business.	11

Topic: Finance — **Grades 10, 11 and 12**

Section	Content/skills to be developed in appropriate contexts		Grade
Interest	Work with various banking and other financial documents (e.g. *bank statements; account statements showing interest rates on a debit balance*). *In order to*: Distinguish between "interest rate" values and "interest" values. Investigate through calculation how interest values are calculated using interest rate values.		10
	Perform calculations involving simple and compound interest through manual calculations and without the use of formulae*. Represent simple interest growth scenarios using linear graphs and compound interest growth scenarios using graphs showing compound change. *In order to*		
	Investigate the following scenarios+: • loan agreements between family members where repayments are made only once at the end of the loan • investments in fixed deposit accounts where the money is deposited and withdrawn from the account only once • bank accounts with a changing balance		11 and 12
	• hire-purchase agreements and loans (e.g. *personal, car, house*) where a repayment is made every month • other investments (e.g. *retirement annuities, funeral plans*) where a fixed deposit is made every month.		12
	Additional comments: * Learners are not expected to work with any formulae here. The focus is on developing an understanding of the concept of a compounding calculation, that is, where the values used in a calculation draw on answers/values from a previous calculation. Learners should be able to: • perform simple and compound interest calculations manually using a basic calculator, pen and paper, and/or spreadsheets • interpret and use tables showing compounded values. + For more information on these scenarios, see the section below on *Banking, loans and investments*		
	A	**Possible assessment:** Investigation*: Comparing simple and compound interest graphically* Investigate the difference between simple and compound interest scenarios by drawing and comparing graphs of these scenarios.	11

Topic: Finance — **Grades 10, 11 and 12**

Section	Content/skills to be developed in appropriate contexts				Grade
Banking, loans and investments (banking)	Investigate the following types of bank accounts: • savings account • cheque/current account • fixed deposit account • credit account (with a credit card) and a debit account (with a debit card). *In order to:*				10, 11 and 12
	Interpret banking documents (e.g. *bank statements and fees brochures*) and understand the following terminology in the documents:				10
	• opening and closing balance • debit • credit • stop order	• bank charge or transaction fee • debit order • ATM • electronic transfer	• payment • interest • credit rates; • debit rates	• branch • deposit • withdrawal	
	Determine bank charges for different types of accounts using given fee tables and formulae. Draw graphs from given bank charge formulae to represent bank charges for different transaction amounts on different types of accounts.				
	Compare bank charges of different banks using tariff tables, given formulae and drawn graphs to assess the suitability of different accounts for individuals with particular needs. Investigate the advantages and disadvantages of the different types of accounts regarding access to money, bank charges and interest rates. Investigate the implications of late payments on a credit card account. Investigate the different ways in which interest is calculated on different types of accounts (e.g. *Interest on a savings account is calculated daily but compounded monthly; on a fixed deposit account simple interest is calculated during the month but is compounded only at the end of the month).*				11 and 12
	A	**Possible assessment:** Assignment: *Which bank?* • Visit two banks and collect pricing information on a similar type of savings account at each bank • Compare the costs associated with these accounts at the two banks • Decide which bank would be the better option for a particular customer.			11

Topic: Finance — **Grades 10, 11 and 12**

Section	Content/skills to be developed in appropriate contexts	Grade
Banking, loans and investments (loans and investment)*	Investigate the following types of loan and investment scenarios: • informal loan agreements between family members • investments in fixed deposit accounts where the money is deposited and withdrawn from the account only once • hire-purchase agreements (e.g. *buying furniture on credit*)	11 and 12
	• loans from banks and micro-lenders where there is a monthly repayment (e.g. *personal, student, car and house loans*) • investments where there is a monthly deposit, including: - stokvel - retirement annuities - pension funds - funeral plans	12
	In order to:	
	Identify and understand the following elements of loan and investment situations: • Loans: - borrower - lender - interest rate - deposit - repayment - loan term (life) - real (total) cost of a loan - interest - residual (for a car loan) • Investments: - principal - interest rate - monthly payment - investment term (life) - interest - charges	11 and 12
	Model loan and investment scenarios using a pen, paper, basic calculator and tables, spreadsheets, and/or available loan calculators (e.g. *calculators available on bank websites*). Determine the real cost of a loan and the interest paid on a loan. Determine the total amount of money in an investment at the end of a certain time period. Make sense of graphs showing loan and investment scenarios.+	

<table>
<tr><td colspan="3">Topic: Finance</td><td>Grades 10, 11 and 12</td></tr>
<tr><th>Section</th><th colspan="2">Content/skills to be developed in appropriate contexts</th><th>Grade</th></tr>
<tr><td rowspan="3">Banking, loans and investments (loans and investment)* (continued)</td><td colspan="2">Investigate the effect of changes in the interest rate on the cost of a loan and on the final/projected value of an investment.
Investigate the effect of changes in the monthly repayment amount on the real cost of a loan.
Investigate the effect of changes in the monthly investment amount on the value of the final investment.</td><td>12</td></tr>
<tr><td colspan="3">Additional comments:
* Learners are not expected to know complex financial formulae. Rather, it is expected that they will develop an understanding of loans using a pen, paper and calculator techniques and through modelling loan scenarios using tables and graphs.
+ For more specific details on the content and/or skills and approach that learners are expected to work with in Grade 12 regarding drawing, interpreting and analysing graphs, see the section Representations of relationships (graphs) in the topic Patterns, relationships and representations.
Examples of additional contexts in which the concepts of loans and investments can be explored include:
• education investment schemes
• life insurance policies
• any other formal or informal loan and investment scenarios.</td></tr>
<tr><td>A</td><td>Possible assessment
<u>Assignment</u>: Modelling a loan
• Use tables and/or spreadsheets to construct a model of a loan scenario
• Investigate the impact of increasing monthly repayments on the real cost of the loan
• Investigate the impact of changes in the interest rate on the loan.</td><td>12</td></tr>
</table>

Topic: Finance		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Inflation	Investigate changes in the prices of goods and/or services. *In order to:*	
	Recognise that: • inflation is a measure of the change in the purchasing power of money over time • inflation represents the *average* increase in the prices of a variety of goods and services over time and that different items can have different inflation rates Investigate, through calculation and discussion, the impact of inflation on: • purchasing power (e.g. *Thembi spends an average of R2 200,00 per month on groceries. If her salary remains the same but her grocery bill increases at the rate of inflation of 5%, what effect would this have on the amount of money that Thembi has available at the end of every month?*) • the value of an item over time (e.g. *If the price of a house increases at the rate of inflation of 10% per year, how much will the house be worth in two years' time?*) • the value of money in a bank account and/or investment (*discussion only*). Compare the rates of increase/decrease in prices through calculation (e.g. *An increase in price from R8,00 to R9,00 is a greater percentage increase than an increase from R19,00 to R21,00 - this type of inflation calculation commonly involves percentage increase/decrease.*	11 and 12
	Interpret and analyse graphs showing changes in the inflation rate over time and understand that a decreasing graph does not necessarily indicate negative inflation (deflation) or a decrease in price. Evaluate situations involving proposed price increases (e.g. *salary negotiations, school fee increases*).	12
	A **Possible assessment (incorporating Inflation and Data handling, that is, collecting data):** Investigation: *Tracing inflation in the real world* • Investigate and record the prices of different food items from two different brochures or newspaper charts over a period of one month • Compare inflation for the different food items at two different shops • Explore the possible reasons for food price inflation and the impact of this inflation on the people who buy food from these shops	11
Taxation (VAT and UIF)	Work with VAT (Grade 10) in the context of shop purchases, till slips and bills (e.g. *electricity, water, telephone*);	10, 11, and 12
	Work with UIF (Grade 11) in the context of payslips.	11 and 12
	In order to:	
	Develop an understanding of the difference between a "VAT inclusive" value and a value "excluding VAT". Investigate through calculation how a final price has been determined by adding 14% VAT to a price excluding VAT. Investigate through calculation the amount of VAT that has been added to a "VAT inclusive" price*.	10, 11 and 12
	Develop an understanding of why UIF is deducted, the benefits to the employee and the responsibility of the employer. Investigate through calculation how UIF values are calculated as a percentage of gross income.	11 and 12

Topic: Finance — **Grades 10, 11 and 12**

Section		Content/skills to be developed in appropriate contexts	Grade
Taxation (Income tax)		Work with the following documents: • payslips • tables containing income tax brackets and income tax formulae • tax deduction tables issued by SARS to employers • IRP5 forms • personal income tax forms to be completed by employees • net pay • tax rebate Develop an understanding of the following terminology: • gross income • taxable deductions (e.g. *medical aid, pension, UIF*) • non-taxable deductions (e.g. *car allowance*) • taxable income <u>*In order to*</u>*:* Determine an individual's: • taxable income • personal income tax • net pay Analyse, interpret and understand completed tax return forms issued by SARS as well as IRP5 forms supplied by the employer. Investigate the effect of an increase in salary on the amount of income tax payable.	12
		Additional comments: * Two methods are promoted for this type of calculation: • dividing the "VAT inclusive" value by 1,14 • identifying the "VAT inclusive" value as being 114% and working out the "value excluding VAT" as 100%.	
Taxation (VAT, UIF and income tax)	**A**	**Possible assessment:** <u>Assignment</u>: *Understanding UIF* Analyse a payslip and show how the values on the payslip have been determined, including the UIF.	11
		Possible assessment: <u>Assignment</u>: *Calculating personal income tax* • Use both the tax deductions tables and the tax brackets to investigate how the tax value on a payslip is calculated • Investigate the impact of an increase in salary on the amount of tax payable • Find reasons for differences in tax values calculated using tax deduction tables and tax brackets.	12

Topic: Finance		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Exchange rates*	Work with exchange rates presented in foreign exchange tables found in newspapers for different currencies. *In order to:*	
	Estimate+ the value of a currency in relation to other currencies. Recognise the meaning of the terms "strong" and "weak" with regard to the relationship between different currencies. Develop an understanding of the "buying power" of a currency in a particular country (that is, the value of the currency in relation to the cost of living in that country).	11 and 12
	Plan trips, to include: • a travel budget • maps and distance tables to organise travel routes# • bus, train, airplane and taxi timetables and fare tables♦ • calendars♦	12
	Additional comments: * The focus in this section is on developing an understanding of the value of a currency in relation to other currencies and on the value of a particular currency in relation to the cost of living in a country, rather than on repetitive calculation using formal mathematical content (that is, ratios and rates) and procedures. + When working with currency conversions, we commonly use estimation (without the need for a calculator) rather than formal mathematical calculations to determine the value of a currency. It is this skill of estimating appropriately that should be the focus of teaching in this section. # Refer to the section on *Maps* in the topic *Maps, plans and other representations of the physical world* for more details on the specific maps that learners are expected to work with in Grade 12. ♦ Refer to the section on *Time* in the topic *Measurement* for more details on the specific content, skills and contexts relating to timetables and calendars that learners are expected to work with in Grade 12.	
	A — **Possible assessment:** Assignment: *Planning a holiday in another country* Plan a trip to another country (e.g. *Botswana or Zimbabwe), taking into consideration the cost of the trip (including transport and accommodation), currency that will need to be exchanged for the trip, maps and other travel resources, distance chart,,etc.*	12

Topic: Measurement	**Grades 10, 11 and 12**
Suggested teaching time: Grade 10: 6−7 weeks Grade 11: 7−8 weeks Grade 12: 5−6 weeks	**Recommended texts and/or resources:** • Textbooks • Measuring instruments (e.g. *ruler; tape measure; kitchen and/or bathroom scale; baking measures - spoons and cups; watches and clocks*) • Sources relevant to measurement in the household and school, and for more complex projects (e.g. *baking recipes and conversion tables; plans of a school/house; timetables; prices of building materials; conversion ratios found on paint tins*)

When performing calculations in contexts involving measurement, it is expected that problems will involve:

- integration with the content and/or contexts of maps, plans and models from the topic *Maps, plans and other representations of the physical world*
- integration with the content and/or contexts of rates from the topic *Numbers and calculations with numbers* to determine quantities and costs, including:
  - conversion rates → e.g. g to kg
  - cost rates → e.g. Rand per litre
  - distance, speed and time rates → e.g. speed measured in km/h
  - consumption or spread rates → e.g. litres per $m^{2.}$

It is also expected that:

- learners know how to read values off different measuring instruments, scales, dials and meters
- the approximate value of pi (π) of 3,142 is sufficiently precise for all calculations in Mathematical Literacy
- learners understand that different measuring instruments will give different degrees of accuracy (e.g. *measuring running times using a clock and a stopwatch may give answers that differ in accuracy*)
- learners understand that the degree of accuracy required is determined by the context in which the measuring occurs (e.g. *when determining the volume of concrete needed to fill a hole, precision is not essential and estimation or rule-of-thumb methods are appropriate; however, when deciding on the different chemicals that must be mixed together to make a type of medicine, precision is crucial)*

(*continued*)

Topic: Measurement **Grades 10, 11 and 12**

Scope of contexts and/or content per section and grade:

Section	Grade 10	Grade 11	Grade 12
Conversions	Measurement concepts are limited primarily to scenarios involving planning and completing simple tasks in the familiar context of the household. *Examples of simple tasks in the household:* • *household cooking/baking/catering projects* • *household sewing projects (e.g. tablecloth)* • *small household maintenance tasks (e.g. painting/varnishing household furniture)* • *recording and managing personal weight;* • *designing a small vegetable garden* • *determining the quantity of fertiliser and/or pesticide needed for a small garden* • *determining the quantity of fencing and poles needed to fence an animal enclosure;* • *designing a sandpit or children's play area* • *investigating the quantity of materials needed to build a concrete platform and drain (run-off space) beneath a tap* • *interpreting television, bus, or train timetables*	Measurement concepts are limited primarily to scenarios involving planning and completing larger projects in the familiar contexts of the household, school and wider community. It is expected that these larger projects may involve the coordination and/ or completion of several smaller tasks e.g. *Painting the walls of a bedroom or classroom requires consideration of the estimated or calculated surface area of the walls of the room in m^2, the converted volume of paint needed in litres, and the quantity of paint to buy from the hardware store which is dependent on available tin sizes* *Examples of larger projects:* • *painting the walls of a classroom and/ or bedroom* • *determining the layout of a sports field* • *fencing a small property, taking into consideration the number of poles needed for the fence, extra fencing that may be needed for overlapping sections, and the total cost of the fence* • *determining the dimensions of carpet needed for a classroom and/or bedroom and establishing how many running metres of carpet must be bought and how much wastage there will be* • *making and calibrating a rain gauge* • *determining the daily water consumption of a household, taking into consideration volumes of water used in a shower, bath, sink and other locations*	Complex projects involving measurement concepts integrated with content/skills from other topics in both familiar and unfamiliar contexts. It is expected that these more complex projects will involve integration of content and/or skills from other topics e.g. *Analysing the floor and elevation plans of a house (Plans) to determine the quantities of materials needed for building the house (Measurement) and preparing a budget for the construction project (Finance)* *Examples of complex projects:* • *using plans of an RDP (Reconstruction and Development Programme) house to determine quantities and cost of materials for the house* • *investigating the number and cost of the tiles needed to tile a floor, taking into consideration the space for grouting between the tiles and cut tiles* • *calculating actual housing density for a suburb, settlement or township and critiquing municipal housing density policies in terms of the findings of this project* • *investigating the size of a dam needed to service a village based on the number of people living in the village, each person's water usage and/or requirements, and data on the annual rainfall in the area*
Measuring length and distance			
Measuring mass (weight)			
Measuring volume			
Measuring temperature			
Calculating perimeter, area and volume			
Time			

<table>
<tr><th colspan="2">Topic: Measurement</th><th>Grades 10, 11 and 12</th></tr>
<tr><th>Section</th><th>Content/skills to be developed in appropriate contexts</th><th>Grade</th></tr>
<tr><td rowspan="5">Conversions</td><td>For all calculations involving measurement:
• convert units of measurement from memory for:
- the metric system:
o mm - cm - m - km
o ml - ℓ
o g - kg - ton
- time:
o sec - min - hours - days
• convert units of measurement using given conversion factors and/or tables:
- for cooking conversions
o spoons - ml
o cups − ml</td><td>10, 11 and 12</td></tr>
<tr><td>- between different systems, including:
o metric to imperial units
o solid to liquid conversions, including:
→ g and/or kg to ml and/or litres
→ cm^2 and m^2 to litres
→ mm^3, cm^3 and m^2 to ml and litres
o temperature (from °Celsius to °Fahrenheit) using the following given formulae*
°F = (1,8 × °C) + 32°
°C = (°F − 32°) ÷ 1,8</td><td>11 and 12</td></tr>
<tr><td colspan="2">In the context of:
• simple tasks in the familiar context of the household (e.g. household baking/cooking/catering projects) (Grade 10)
• larger projects in the familiar contexts of the household and school and/or wider community (e.g. painting the walls of a bedroom or classroom) (Grade 11)
• complex projects in both familiar and unfamiliar contexts (e.g. determining quantities of materials needed to build an RDP house) (Grade 12)
• appropriate maps, plans and models+ (all grades)
<u>In order to</u>:</td></tr>
<tr><td colspan="2">Express measurement values and quantities in units appropriate to the context
(e.g. expressing the length of a house in metres rather than in mm, cm or km; or the distance between two towns in kilometres rather than in mm, cm or m; or
the quantity of paint needed to paint a wall, based on a calculation of surface area, in litres rather than in m^2).</td><td>10, 11 and 12</td></tr>
<tr><td colspan="2">Additional comments:
* Refer to the section below on Measuring temperature for more specific details on the contexts in which learners are expected to perform temperature conversions.
+ Refer to the topic Maps, plans and other representations of the physical world for more details on the different types of scales, maps, plans and models, and the specific calculations involving scale that learners are expected to be able to perform.</td></tr>
</table>

<table>
<tr><td colspan="4">Topic: Measurement</td><td>Grades 10, 11 and 12</td></tr>
<tr><td>Section</td><td colspan="3">Content/skills to be developed in appropriate contexts</td><td>Grade</td></tr>
<tr><td rowspan="6">Measuring length and distance</td><td colspan="3">Determine length and/or distance using appropriate measuring instruments, including:
• “rule of thumb” methods (e.g. One metre is approximately the length from the shoulder to the fingertips when arms are outstretched; one metre is approximately one large step/jump)
• rulers; measuring tapes; trundle wheels
• odometers
• scales.
In the context of:
• simple tasks in the familiar context of the household (e.g. household baking/cooking/catering projects) (Grade 10)
• larger projects in the familiar contexts of the household and school and/or wider community (e.g. painting the walls of a bedroom or classroom) (Grade 11)
• complex projects in both familiar and unfamiliar contexts (e.g. determining quantities of materials needed to build an RDP house) (Grade 12)
• appropriate maps, plans and models* (all grades)
<u>In order to</u>:</td><td></td></tr>
<tr><td colspan="3">Estimate lengths and/or measure lengths of objects accurately to complete tasks.
Estimate distances and/or measure distances accurately between objects/positions in space using appropriate maps and scales.</td><td>10, 11 and 12</td></tr>
<tr><td colspan="3">Calculate:
• cost of products (e.g. the cost of 3 m of carpeting at R79,50/m)
• values using a formula involving length (e.g. area and volume formulae)
• perimeter, area and volume (see the section below on Perimeter, area and volume)</td><td>10, 11 and 12</td></tr>
<tr><td colspan="3">• the cost associated with travelling a certain distance
• the time taken to complete a journey
• speed (distance travelled in terms of time taken)+</td><td>11 and 12</td></tr>
<tr><td colspan="4">Additional comments:
* Refer to the topic Maps, plans and other representations of the physical world for more details on the different types of scales, maps, plans and models, and the specific calculations involving scale that learners are expected to perform.
+ Refer to the topic Numbers and calculations with numbers and the section on Rates for more details on content and/or skills relating to calculations involving speed.</td></tr>
<tr><td>A</td><td colspan="2">Possible assessment:
<u>Assignment</u>: Measuring accurately
Use a tape measure or measuring wheel to measure the dimensions of a room or object (e.g. door, window).</td><td>10</td></tr>
</table>

Topic: Measurement		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Measuring mass (weight)	Determine mass (weight) using appropriate measuring instruments, including: • bathroom scales • kitchen scales • electronic scales for weighing large objects In the context of: • simple tasks in the familiar context of the household (e.g. *household baking/cooking/catering projects*) (Grade 10) • larger projects in the familiar contexts of the household and school and/or wider community (e.g. *determining the weight status of adults using Body Mass Index*) (Grade 11) • complex projects in both familiar and unfamiliar contexts (e.g. *monitoring the growth patterns of a baby using growth charts)* (Grade 12) *In order to*:	
	Measure out quantities to complete a task (e.g. *ingredients in cooking and baking; fertiliser to be used in garden/agriculture*).	10, 11 and 12
	Monitor and manage mass (weight), including: • manage and monitor mass (weight) of self and other family members over time, recording data in tables	10, 11 and 12
	• use recorded mass (weight) data together with recorded length (height) data to calculate Body Mass Index values and determine weight status for adults	11 and 12
	• use recorded mass (weight) data, recorded length (height) data, calculated Body Mass Index values and appropriate growth charts (including the *Road to Health Chart* and other similar growth charts*) to monitor the growth patterns of children.	12
	Calculate: • the cost of a certain amount of a product (e.g. *calculate the cost of 2,3 kg of bananas at R8,20/kg*)	10, 11 and 12
	• values using a formula involving mass (weight) (e.g. *Body Mass Index of individuals; formula for calculating medicine dosage*)	11 and 12
	medicine and/or other dosages using formula supplied and, if necessary, appropriate growth charts+	12
	Additional contexts/resources and comments: * Interpreting the *Road to Health* chart and other growth charts requires an understanding of quartiles and percentiles. Refer to the topic *Data handling* for a description of specific content and/or skills relating to these sections.	

Topic: Measurement		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Measuring mass (weight) (*continued*)	**A** **Possible assessment (incorporating measuring length and weight, working with equations and data handling, that is, collecting, organising and analysing data):** Investigation: *Investigating the (mass) weight status of adults* Collect height and weight data from a sample of adults, including an equal number of females and males. • Determine the Body Mass Index (BMI) values and weight status for each of the females and males in the group, and use appropriate frequency tables and/or graphs to compare the weight status data • Make deductions about the health of the whole group and of the females compared to the males.	11
	A **Possible assessment (incorporating measuring length and weight, working with equations and data handling, that is, collecting, organising and analysing data, percentiles and quartiles):** Investigation: *Investigating the weight status of children* • Collect height and weight data from a sample of learners, including an equal number of females and males • Determine the Body Mass Index (BMI) values for each of the females and males in the sample • Use appropriate growth charts to determine the growth patterns and/or weight status of each of the learners in the sample • Make deductions about the health of the whole group and of the females compared to the males.	12
Measuring volume*	Determine volume using appropriate measuring instruments, including: • measuring spoons and cups • jugs, bottles and/or canisters • buckets and wheelbarrows. In the context of: • simple tasks in the familiar context of the household (e.g. *household baking/cooking/catering projects*) (Grade 10) • larger projects in the familiar contexts of the household and school and/or wider community (e.g. *monitoring rainfall over a period of time*) (Grade 11) • complex projects in both familiar and unfamiliar contexts (e.g. *determining quantities of materials needed to build an RDP house*) (Grade 12) *In order to*:	
	Measure out quantities to complete a task (e.g. *ingredients in cooking and baking; quantities of drinks needed for a function; volume of concrete needed for a foundation trench*). Monitor quantities (e.g. *rainfall over time*).	10, 11 and 12
	Calculate: • the cost of a certain volume of a product (e.g. *calculate the cost of 2,5 litres of milk at 7,99/litre*)	10
	• values using a formula involving volume (e.g. *alcohol content of different drinks; E. coli concentrations in water; determining the run-off rate of rain from a roof*) • consumption rates (e.g. *the rate at which water is being used in a household*)	11 and 12

Topic: Measurement			Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**		**Grade**
Measuring volume* *(continued)*	**Additional contexts/resources and comments:** Primary focus in Grade 10 is on helping learners to develop an understanding of what the 'volume' of an item represents in relation to the quantity of a liquid object on developing a sense for measuring out the volumes of different quantities of liquid objects using various measuring instruments (e.g. measuring jugs, and cups and spoons). Grade 10 learners are *not* expected to have to perform calculations of volumes using appropriate formulae: rather, emphasis must be placed on understanding the concept of volume and measuring volumes using appropriate measuring instruments.		
	A	**Possible assessment:** <u>Assignment</u>: *Making and calibrating a rain gauge to monitor rainfall* • Make and calibrate a rain gauge • Use the rain gauge to monitor rainfall patterns for an area over time.	11
Measuring temperature	Measure, monitor and interpret temperature values using appropriate instruments and/or resources, including: • thermometer • temperature dials and indicators (e.g. *on a stove or a refrigerator*) • weather reports. In the context of: • simple tasks in the familiar context of the household (e.g. *household baking/cooking/catering projects*) (Grade 10) • larger projects in the familiar contexts of the household and school and/or wider community (Grade 11) • complex projects in both familiar and unfamiliar contexts (Grade 12) <u>*In order to*</u>: Complete projects (e.g. *baking a cake*). Plan activities (e.g. *determine whether or not to embark on an outing; investigate the most appropriate time to plan crops and/or the most appropriate crops to plant in an area with particular average maximum and minimum temperatures; investigate whether a refrigerator has been set at the most appropriate temperature for storing certain products*). Monitor the health of a child or adult (e.g. *taking the temperature of a sick child*).		10, 11 and 12
	Convert temperature values from degrees Celsius (°C) to degrees Fahrenheit (°F) using the following given formulae:* • °F = (1,8 × °C) + 32° • °C = (°F - 32°) ÷ 1,8 <u>*In order to*</u>: Interpret resources that refer to temperature values in different units (e.g. *recipes; travel documents/resources; overseas newspaper articles*). Plan trips, including working with currency conversions (exchange rates), travel budgets, transport time and fare tables (e.g. *flight schedules*), travel maps and other necessary travel resources.+		11 and 12

Topic: Measurement		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Measuring temperature *(continued)*	**Additional contexts/resources and comments:** * Converting between different temperature units and/or systems is also included in the section on *Conversions* (see above). + This statement should be taught in conjunction with the statement in the section on *Maps* in the topic *Maps, plans and other representations of the physical world* that refers to planning trips. The statement must also be integrated with the sections on *Budgets* and *Exchange rates* described in the topic *Finance*, and timetables in the topic *Measurement* (see below).	
Calculating perimeter, area and volume	Calculate/measure the perimeter, area (including surface area) and/or volume of objects* by: • direct measurement (perimeter using rulers, etc.; area using grids, etc.; and volume using measuring jugs, etc.) • calculation for each of the following: - rectangles, triangles and circles (quarter, semi and three-quarters) using known formulae+	10, 11 and 12
	- rectangular prisms and cylinders using known formulae+ • calculation for objects that can be decomposed into those listed above.	11 and 12
	In the context of: • simple tasks in the familiar context of the household (e.g. *household baking/cooking/catering projects*) (Grade 10) • larger projects in the familiar contexts of the household and school and/or wider community (e.g. *painting a classroom*) (Grade 11) • complex projects in both familiar and unfamiliar contexts (e.g. *determining quantities of materials needed to build an RDP house*) (Grade 12) • appropriate maps, plans and models+ (all grades). *In order to*:	
	Solve problems and complete tasks/projects, including: • determining and/or calculating appropriate quantities of materials/components needed to complete a task/project (e.g. *sewing tablecloths; painting a classroom; construction/building projects such as an RDP house*), with consideration given to: - using appropriate maps, plans and models to inform calculations and decisions# - the realities of the context (e.g.*Ttiles are bought in whole tiles and not in m^2; spreading rates for paint are estimates only; certain products, such as wood and carpet, are sold in running metres of a given width and not according to area*) - the appropriateness of estimation for a given context/problem (e.g. *When working out paint quantities estimation is appropriate; but when working with medicine dosages, accuracy is essential*) - the impact of rounding and/or errors in measurement (e.g. *On a house plan with a scale of 1:100, an inaccurate measurement of 1 cm on the plan will result in an error calculation of 1 m in actual length*) • calculating the cost of materials/components needed to complete a task/project: - using cost of materials supplied by the teacher (Grade 10) - using cost of materials determined through research (Grades 11 and 12) • determining a required budget for a given project	10, 11 and 12
	• making choices regarding costs and/or quantities and/or materials used in order to complete the task/project within a given budget. (*continued*)	12

<table>
<tr><td colspan="3">Topic: Measurement</td><td>Grades 10, 11 and 12</td></tr>
<tr><td>Section</td><td colspan="2">Content/skills to be developed in appropriate contexts</td><td>Grade</td></tr>
<tr><td>Calculating perimeter, area and volume (continued)</td><td colspan="3">
Additional comments:
* In Grade 10, primary focus is on working with 2-dimensional shapes and calculations of perimeter and area of such shapes.
In Grades 11 and 12, focus shifts to include 3-Dimensional shapes, with calculations of perimeter, area and volume extended accordingly.
+ All formulae for calculations involving perimeter, area, surface area and volume will be provided in assessments. Note that in all formulae learners are expected to work with the approximate value of pi (π) of 3,142.
Standard formulae:
<table>
<tr><td>Circumference:
Circumference of a circle = π × diameter
OR
Circumference of a circle = π × (2 × radius)</td><td>Area:
Area of rectangle = length × width

Area of triangle = ½ × base × perpendicular height

Area of circle = π × (radius)^2</td><td>Surface area:
Surface area of rectangular box
= 2 × (l × w) + 2 × (l × h) + 2 × (w × h)
where: l = length; w = width; h = height

Surface area of cylinder with a closed lid and base
= (2 × π × [radius]^2) + (2 × π × radius × height)</td></tr>
<tr><td colspan="2">Volume:
Volume of rectangular box = area of base/lid × height
= length × width × height/depth</td><td>Volume of cylinder = area of base/lid × height
= π × (radius)^2 × height/depth</td></tr>
</table>
Refer to the topic Maps, plans and other representations of the physical world for more details on the maps, plans and models that learners are expected to work within each grade.
</td></tr>
<tr><td rowspan="3">Calculating perimeter, area and volume (continued)</td><td rowspan="3">A</td><td>Possible assessment (incorporating perimeter, area and finance):
Assignment: Designing and costing a small vegetable garden
• Determine the quantity of fencing needed to fence the garden
• Determine how far apart the vegetables must be planted and how many vegetables the garden can accommodate
• Visit relevant stores (hardware store, nursery, etc.) to investigate the cost of the materials for the garden.</td><td>10</td></tr>
<tr><td>Possible assessment (incorporating volume, consumption rates and finance):
Assignment: Household water consumption
• Determine the daily water consumption of a household, taking into consideration volumes of water used in a shower, bath, sink and other locations
• Critique the government's free water policy in terms of the findings of this project.</td><td>11</td></tr>
<tr><td>Possible assessment:
Investigation: Tiling a floor
Investigate the number and cost of the tiles needed to tile the floor and/or walls in a building, taking into consideration the space for the grouting between the tiles and the number of tiles that have to be cut to fit the floor space properly.
OR
Investigation: Housing density (incorporating area and surface area, and data handling, that is, collecting data)
Calculate the actual housing density for a suburb, settlement or township by comparing the number of people living in a household to the area of land occupied by the household; critique municipal housing density policies in terms of the findings of this project.</td><td>12</td></tr>
</table>

Topic: Measurement		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Time	Read, record and perform calculations involving time values, including: • time values expressed and/or recorded on watches, clocks and stopwatches • time values expressed in the following formats: - time of day formats (e.g. 8 o'clock, 8:00 am, 8:00 pm, 20:00) (Grade 10) - time recording formats (e.g. 1 h 12 min 20 sec) (Grades 11 and 12) • converting between different units of time: - seconds - minutes - hours - days - weeks - months • calculating elapsed time involving the different time formats (e.g. *the amount of time that has passed from 8:45 am to 9:17 am; the difference in time between 1 h 23 min 12 sec and 1 h 39 min 4 sec*) • calendars showing days, weeks and months • timetables, including: - study timetables and television timetables (Grade 10) - lesson/exam timetables (Grade 11) - transport timetables (e.g. bus, train, taxi); production timetables e.g. for manufacturing an object or for constructing a house); and tide timetables (Grade 12) In the context of: • simple tasks in the familiar context of the household (e.g. *household baking/cooking/catering projects*) (Grade 10) • larger projects in the familiar contexts of the household and school and/or wider community (e.g. *school sports event*) (Grade 11) • complex projects in both familiar and unfamiliar contexts (e.g. *timetable for a construction project*) (Grade 12) • appropriate maps* (all grades) *In order to:*	
	Plan and complete activities and projects (e.g. *arriving at school on time*; *baking a cake; drawing up an exam study timetable; making sense of a school timetable; analysing and following a production timetable for a construction project; the best time to launch a boat based on the tides represented in a tide timetable*).	10, 11 and 12
	Record times (e.g. *recording running times at a school sports event*).	11 and 12
	Plan trips, including: • estimating travelling times • determining travel costs • determining appropriate stopping locations with consideration of petrol consumption and fatigue	11 and 12

<table>
<tr><th colspan="3">Topic: Measurement</th><th>Grades 10, 11 and 12</th></tr>
<tr><th>Section</th><th colspan="2">Content/skills to be developed in appropriate contexts</th><th>Grade</th></tr>
<tr><td rowspan="6">Time
(continued)</td><td colspan="2">• determining departure/arrival and/or start/end times from timetables
• preparing budgets for the trip by making use of relevant maps, timetables and fare tables, vehicle operating cost tables from the AA and other travel resources+</td><td>12</td></tr>
<tr><td colspan="2">Calculate speed (distance travelled in terms of time taken)+ (e.g. average speed travelled during a journey; the average racing speed of a participant in a sports event).</td><td>11 and 12</td></tr>
<tr><td colspan="3">Additional contexts/resources and comments:
* Refer to the topic Maps, plans and other representations of the physical world for more details on the maps, plans and models that learners are expected to work with in Grade 12.
+ Refer to the topic Numbers and calculations with numbers and the section on Rates for more details on specific content and/or skills relating to calculations involving speed.</td></tr>
<tr><td rowspan="3">A</td><td>Possible assessment (incorporating conversions, temperature, measuring weight and volume, and time):
<u>Assignment</u>: Baking a cake
• Use measuring cups and/or a scale to measure ingredients for a recipe
• Bake the cake according to the given instructions.</td><td>10</td></tr>
<tr><td>Possible assessment (incorporating measuring length and time):
<u>Assignment</u>: Mini-Olympics
• Divide the class into groups and each group is responsible for a different sports activity
• Sports activities must involve measurement (e.g. long jump) and time (e.g. running times)
• Each group is responsible for managing their own sports activity and for recording measurement values and times
• Each group participates in all of the sports activities.</td><td>11</td></tr>
<tr><td>Possible assessment (incorporating finance, maps and timetables):
<u>Assignment</u>: Planning a trip
(The same assignment is provided in the section on Maps in the topic Maps, plans and other representations of the physical world.)
Plan a trip between two cities or countries, making use of maps, bus/train/taxi/flight timetables, tariff tables, exchange rates (if necessary) and the AA fixed, running and operating cost tables (if necessary).</td><td>12</td></tr>
</table>

Topic: Maps, plans and other representations of the physical world **Grades 10, 11 and 12**

Suggested teaching time:

Grade 10: 5-6 weeks

Grade 11: 5-6 weeks

Grade 12: 4-5 weeks

Recommended texts and/or resources:

- Textbooks
- Street maps, provincial and national road maps, and maps showing railway routes; timetables, fare tables and distance charts appropriate floor plans and elevation plans; cardboard for making models

Scope of contexts and/or content per section and grade:

Section	Grade 10	Grade 11	Grade 12
Scale	Maps and plans of familiar contexts and/or simple structures (e.g. *school*).	Maps and plans of less familiar contexts and/or structures (e.g. *office space*) and models of packaging containers.	Maps and plans of possibly unfamiliar contexts and/or complex structures (e.g. *RDP house*) and models of packaging containers and buildings.
Maps			
Plans		Maps and plans of less familiar contexts and/or structures.	Maps and plans of possibly unfamiliar contexts and/or complex structures.
Models	Work with actual tins and boxes to explore packaging arrangements.	Build 3D scale models of packaging containers to investigate packaging arrangements. Draw 2D scale pictures of 3D packaging containers.	Build 3D scale models of packaging containers and buildings to explore what the final product will look like. Draw 2D scale pictures of 3D buildings and packaging containers.

Topic: Maps, plans and other representations of the physical world		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Scale*	Work with the following types of scales on maps, plans and in the construction of models:+ • number scales expressed in the form 1:500 • bar scales expressed in the form with an understanding of the advantages and disadvantages of each type of scale and the situations in which one type of scale is more appropriate than the other. <u>*In order to*</u>:	
	Calculate actual length and distance when map and/or plan measurements are known.	10, 11 and 12
	Calculate map and/or plan measurements when actual lengths and distances are known using a given scale to inform the drawing of 2-dimensional plans and pictures and the construction of 3-dimensional models.+ Determine the most appropriate scale in which to draw/construct a map, plan and/or model, and use this scale to complete the task.	11 and 12
	Determine the scale in which a map and/or plan has been drawn in the form 1:… and use the scale to determine other dimensions on the map and/or plan.	12
	Additional comments: * Although scale is a form of measurement, the section on *Scale* has been included as part of the topic *Maps, plans and other representations of the physical world* rather than in the topic *Measurement* owing to the direct relevance of scale in the context of calculations involving maps, plans and models. It is essential that this section on *Scale* be taught in conjunction with the content and/or skills outlined in the section on *Measuring length and distance* in the topic *Measurement*. + See the sections below on *Maps*, *Plans* and *Models* for specific details of the types of maps, plans and models that learners are expected to work with in Grade 11.	
	A **Possible assessment (incorporating maps and/or plans):** <u>Investigation</u>: *What happens if you resize a map or plan*? • Investigate the effect that resizing a map or plan with a number scale has on the scale of the plan or map • Investigate the effect that resizing a map or plan with a bar scale has on the scale of the plan or map • Discuss the advantages and disadvantages of using number and bar scales on maps and plans	10

Topic: Maps, plans and other representations of the physical world	**Grades 10, 11 and 12**	
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Maps	Work with the following maps: • map showing the seating plan and/or layout of a classroom • map showing the layout of the buildings and/or sports fields at a school • map showing the layout of the stores in a shopping centre • seating plans for cinemas and a sports stadium	10, 11 and 12
	• street maps with and without a grid reference system • national and provincial road and rail maps • strip charts showing distances on a portion of road • elevation maps (e.g. *the Comrades Marathon route*) • residential or housing estate maps.	11 and 12
	In order to:	
	Describe the position of an object (e.g. *buildings, furniture, seats*) in relation to surrounding objects. Describe the position of a building in relation to surrounding buildings (e.g. *the building is directly across the road from the double-storey brick building*). Find locations, follow directions and develop directions for travelling between two or more locations using the following mapping reference systems and/or techniques: • directional indicators “left”, “right”, “along”, “straight”, “up” and “down” • house and/or building numbering systems • numbering systems used for seating in sports stadiums	10, 11 and 12
	• grid reference system (*e.g. North Street is located on AD14*) • the “street names index” located at the back of street maps showing the page and/or grid reference for various streets.	11 and 12
	Estimate*: • distances using measurement and a given scale (number or bar scale)	10, 11 and 12
	• the time it will take to travel between two or more locations • the amount and cost of fuel that will be used in travelling between two or more locations • the average speed travelled during a trip (that is, distance travelled in terms of time taken). Determine appropriate stopping locations with consideration of petrol consumption and/or fatigue.	11 and 12
	Determine the “operating cost” of a vehicle using the fixed, running and operating cost tables distributed by the Automobile Association of South Africa. Plan and cost trips using timetables, fare charts, distance charts and budgets.+	12

Topic: Maps, plans and other representations of the physical world		Grades 10, 11 and 12	
Section		**Content/skills to be developed in appropriate contexts**	**Grade**
Maps (*continued*)		Work with a combination of maps showing different perspectives and scales to navigate the route to a destination. (e.g. *When travelling between two cities, a map with a large scale showing national roads and towns will be useful. Upon approaching one of the cities, a map showing the suburbs and major roads in and around the city will be more practical to determine in which direction to travel to get to a particular destination in the city. Upon arrival in a particular suburb, a street map with a much smaller scale will become more practical to navigate the route to a particular destination*.)	12
		Interpret the following compass directions in the context of appropriate maps and plans: • "North", "South", "East" and "West" • "North-east", "North-west", "South-east" and "South-west". *In order to*: Understand directions and signboards on roads and in map books that refer to compass directions (e.g. *"Travel North on the M3"*). Interpret elevation plans of buildings that include the words "North Elevation", "South Elevation", "East Elevation" and "West Elevation". Decide on where to position a house or a garden in relation to the position of the sun at different times of the day.	12
		Additional comments: * When working with maps, it is unreasonable to expect learners to measure and determine distances, travelling time, petrol consumption and/or average speed accurately. There simply are too many factors that influence the accuracy of such calculations when working with maps: e.g. *whether you cut the corner or turn the corner on the outside of the road; or whether there are traffic lights or other obstructions like roadworks on a stretch of road*. For this reason, maps should be used only for estimating distances, travelling times and petrol consumption between different locations. A more appropriate context in which to test accurate measurement involves working with floor and elevation plans. + Refer to the section on *Time* in the topic *Measurement* for more information on expected calculations involving time and relevant timetables.	
	A	**Possible assessment:** Assignment: *Finding your way* Use a given map to find your way to a destination. OR Select the seats with the best view for an event from the remaining available seats.	10
		Possible assessment (incorporating finance, maps and timetables): Assignment: *Planning a trip* Plan a trip between two cities or countries, using maps, bus/train/taxi/flight timetables, tariff tables, exchange rates (if necessary) and the AA fixed, running and operating cost tables (if necessary).	12

Topic: Maps, plans and other representations of the physical world		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Plans (instruction/ assembly diagrams)	Use instruction/assembly diagrams, containing words and/or pictures, found in manuals for: • plugs • plastic models • unassembled wooden furniture units • cell-phones (e.g. *installing a battery and sim card; or operating instructions*) • electrical appliances that require individual components to be connected (e.g. *connecting speakers to a hi-fi; or connecting an aerial to a television*) • children's toys including *Lego*-type kits. *In order to*: Complete the task presented in the instructions and/or explain what the instructions mean and/or represent, using everyday language.	10, 11 and 12
	A **Possible assessments:** Assignment: *Writing instructions* Study the instruction/assembly diagrams for an appliance and write a detailed set of instructions in words to accompany and/or explain the diagrams. OR Draw instruction/assembly diagrams for an appliance where the instructions are given only in words. Assignment/demonstration: *Assembling an object* Assemble an object based on the instructions provided (including children's toys) to show the learner's ability to follow instructions.	10

Topic: Maps, plans and other representations of the physical world	Grades 10, 11 and 12	
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Plans (floor, elevation and design plans)	Use the following plans: • rough and scaled floor/layout plans showing a top view perspective (Grade 10) • rough and scaled elevation plans (front, back and side) showing a side view perspective (Grades 11 and 12) • rough and scaled design drawings of items to be manufactured (e.g. *clothing; furniture*) (Grades 11 and 12) In the context of: • a familiar structure (e.g. *classroom; room in a house → bedroom or lounge*) (Grade 10) • a less familiar structure (e.g. *office space containing cubicles; a garden/tool shed*) (Grade 11) • a complex structure (e.g. *house → RDP house*) (Grade 12) *In order to:*	
	Understand the symbols and notation used on plans (e.g. *the symbol for a window is a double line; the symbol for a door is a vertical line attached to a quarter circle indicating the swing direction of the door*). Describe what is being represented on the plans. Analyse the layout of the structure shown on the plan and suggest alternative layout options. Determine actual lengths of objects shown on plans using measurement and a given scale (number or bar scale). Determine quantities of materials needed by using the plans and perimeter, area and volume calculations.	10, 11 and 12
	Understand the terms • "North Elevation" • "South Elevation" • "East Elevation" • "West Elevation" and the relevance of compass directions in the construction of buildings. Connect the features shown on elevation plans with features and perspectives shown on a floor plan of the same structure.	11and 12

<table>
<tr><th colspan="4">Topic: Maps, plans and other representations of the physical world Grades 10, 11 and 12</th></tr>
<tr><th>Section</th><th colspan="2">Content/skills to be developed in appropriate contexts</th><th>Grade</th></tr>
<tr><td rowspan="4">Plans
(floor, elevation and design plans) (continued)</td><td colspan="2">Determine the most appropriate scale (Grade 12) in which to draw a plan and use the scale (Grade 10 and 11).
<u>In order to</u>:
Determine how long/wide/high an object should be drawn on a plan when actual dimensions are known.
Draw scaled 2D floor and elevation plans for:
• a familiar structure (e.g. classroom; room in a house → bedroom or lounge) (Grade 10)
• a less familiar structure (e.g. office space containing cubicles; a garden/tool shed) (Grade 11)
• a complex structure (e.g. house → RDP house) (Grade 12).</td><td>10, 11 and 12</td></tr>
<tr><td colspan="3">Additional comments:
Additional contexts and/or resources include any other plans in the context of the learner’s daily life and in less familiar contexts relating to simple and complex structures.</td></tr>
<tr><td></td><td>Possible assessment (incorporating plans, conversions, area and surface area, and finance):
<u>Assignment</u>: Painting a classroom
• Create accurate 2-dimensional scaled drawings of the inside walls of a classroom
• Use the plans to determine the quantity of paint needed to paint the classroom
• Prepare a budget to show the projected cost of painting the classroom.</td><td>11</td></tr>
<tr><td>A</td><td>Possible assessment (incorporating finance, models, plans, perimeter, area and volume):
<u>Assignment</u>: Building a house
• Investigate the considerations involved in the construction of a house
• After interpreting the plans of a house, build a scale model and perform perimeter, area and volume calculations in the context of fencing, paint, concrete, etc.
• Analyse a budget for the building project
• Analyse inflation figures to predict possible adjustments to building costs.</td><td>12</td></tr>
</table>

Topic: Maps, plans and other representations of the physical world	Grades 10, 11 and 12	
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Models*	Investigate packaging arrangements using actual cans and a range of actual boxes. *In order to:* Determine the most appropriate way to package cans and/or boxes for optimal use of space. Determine the most cost-effective way to package a number of cans and/or boxes. Make and use: • 3-dimensional scale models of packaging containers (e.g. *packaging containers for balls, biscuits, etc.*) • 2-dimensional scale cut-outs/pictures of appropriate views of 3-dimensional models of packaging containers. *In order to:* Investigate the best packaging shape to use for packaging a particular product (e.g. *Should balls be packaged in a cylindrical or rectangular container?*). Investigate the best packaging shape to use for fragile and irregular-shaped objects (e.g. *a television set*), while trying to minimise wasted space and cost. Investigate the amount of material used to make a box. Investigate the number of furniture items that can fit into a venue, while considering the space needed for tables, chairs and walking around. Estimate quantities of materials needed (e.g. *paint; tiles*) using perimeter, area and volume calculations	10 (only) 11 and 12
	Make and use: • 3-dimensional scale models of buildings (e.g. *classroom; storeroom; school hall; house*) from given or constructed 2-dimensional floor and elevation plans • 2-dimensional scale cut-outs/pictures of appropriate views of buildings. *In order to:* Investigate possible ways to stack/arrange boxes in a storeroom in order to minimise wasted space. Critique aspects of the layout and/or design of a structure and make suggestions for alterations. Investigate the placement of furniture in a room. Estimate quantities of materials needed (for example, *paint; tiles*) using perimeter, area and volume calculations+.	12

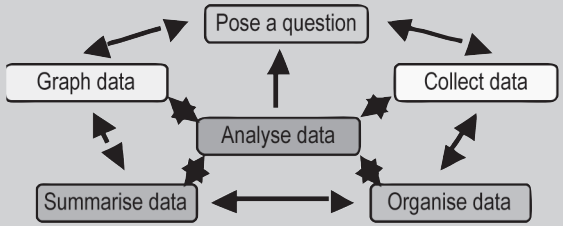
Topic: Maps, plans and other representations of the physical world **Grades 10, 11 and 12**

Section		Content/skills to be developed in appropriate contexts	Grade
Models* (*continued*)		**Additional comments:** * Models are constructed to represent the physical world for two main reasons: 1. 3D-scale models made from 2D-diagrams/plans help us to better visualise objects (e.g. *what a building will look like once it has been constructed*); 2. scale models (including maps and diagrams) can help us to investigate problems and develop solutions (e.g. *how long it will take to make a journey; how best to place furniture in a room*). In Grade 10, learners are expected to work with actual cans and boxes to investigate packaging arrangements and considerations of space and cost. In Grade 11, the focus is primarily on helping learners to develop the skills to create scale models or drawings to investigate problems where actual resources are unavailable or impractically large. In Grade 12, the primary focus is on using scale models and drawings to solve problems. The models and/or drawings should be drawn to scale. + See the section on *Perimeter, area and volume* in the topic *Measurement* for more details on expected calculations involving perimeter, area and volume. Additional contexts and/or resources involving 3D models and 2D drawings in which the concepts described above can be explored include: • packaging containers: - fruit juice containers; chocolate boxes; - cool drink cans; tinned food; tennis ball, golf ball containers - boxes used for packaging fruit juice containers and/or cool drink cans - boxes used for packaging floor tiles • 3D models of buildings: - school tuck shop - spaza shop and/or local café/supermarket - sports club change rooms • 2D drawings: - office space containing office cubicles; - matric dance and/or birthday party and/or wedding venue - crop estimates for a piece of land - possible seating arrangements at a local sports ground	
	A	**Possible assessment (integrating surface area, volume and models):** Investigation: *Which box should you use?* • Build models of differently shaped containers (e.g. *rectangular; cylindrical*) • Compare the containers by determining: - which container requires more material - which container can hold more - how many of each container can fit into a larger packaging/storage/transportation box - which container is the most suitable for packaging a particular item considering space and cost.	11
		Possible assessment: Assignment: *Building a model of a school hall* Build a model of a school hall to investigate the best way to arrange furniture (tables, chairs, dance floor, etc.) for a school function.	12

Topic: Data handling	**Grades 10, 11 and 12**
Suggested teaching time: Grade 10: 4-5 weeks Grade 11: 4-5 weeks Grade 12: 5-6 weeks	**Recommended texts and/or resources:** • Textbooks • Other sources of statistics (e.g. *websites; newspaper articles; test and exam mark sheets; sports results; sales figures; education statistics*)

Every statistical process is made up of at least six inter-connected stages: posing a question; collecting data; *classifying and organising data*; *summarising data*; *representing data*; and *interpreting/analysing data*. Every stage in the process is dependent on the stage that precedes it and directly impacts on the stage that follows. If the data that is collected is biased, then every following stage will be flawed; or if the data is summarised using an inappropriate average, then the analysis of the data will be incorrect.

It is important that learners understand the inter-connectedness of the statistical process and that these processes are taught and assessed at related stages.



Topic: Data handling **Grades 10, 11 and 12**

Type and scope of data per grade:

Section	Grade 10	Grade 11	Grade 12
Developing questions Collecting data Classifying and organising data Summarising data Representing data Analysing data	In Grade 10, the type of data dealt with is limited primarily (but not exclusively) to data including: • single sets of data containing multiple categories (*e.g. working with different test scores categorised into mark categories for an entire class, but not sorted according to gender*) • values that can be read directly from graphs and/or tables without the need for estimation • data relating to the personal lives of learners and/or to issues that are familiar to the learners, e.g.: - test and exam results - school sports results - height and weight data of learners in a class - school statistics (e.g. number of learners in each grade; number of male and female learners) - data about the type and amount of litter in a school - data about electricity consumption of various appliances in a household - data on telephone call time and duration - pocket money data.	In Grade 11, the type of data dealt with is limited primarily (but not exclusively) to data including: • two sets of data containing multiple categories (*e.g. working with different test scores categorised into mark categories and organised according to gender*) • values that can be read directly from graphs and/or tables without the need for estimation • data relating to the wider community and more complex social issues that are less familiar to learners, e.g.: - sports results/statistics for provincial and/or national sports events - sales figures for a business - profile of shoppers at a shopping centre - vehicle statistics (as an indication of income level) of shoppers at a shopping centre - price history data for grocery items - data on housing, toilet, water and electricity facilities for a small community - data on employment rates for a small community	In Grade 12, the type of data dealt with is limited primarily (but not exclusively) to data including: • multiple sets of data containing multiple categories (*e.g. working with vehicle statistics containing information on the number of different types of unroadworthy vehicles in each province in South Africa*) • complex values (that is, values expressed in millions or large data values containing complex decimal values) for which estimation may be necessary to determine values on graphs and in tables • data relating to national and global issues, e.g.: - national and/or provincial health statistics (sourced from the Department of Health) - national and/or provincial education statistics (sourced from the Department of Education) - national and/or provincial road accident statistics (sourced from Arrive Alive campaign) - national and/or provincial population statistics (sourced from Statistics South Africa) - historical inflation and/or exchange rate data (sourced from Statistics South Africa)

Topic: Data handling		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Developing questions	Develop a question or set of questions that requires the collection of a single set (Grade 10), two sets (Grade 11) and multiple sets (Grade 12) of data. Recognise that the way in which questions are phrased can impact on the data collected and, therefore, on the findings of the investigation. *In order to:* Investigate problems relating to the personal lives of learners (Grade 10), the wider community (Grade 11), and national and global issues (Grade 12).	10, 11 and 12
Collecting data	Develop and use an appropriate form/instrument for collecting a single set (Grade 10), two sets (Grade 11) and multiple sets (Grade 12) of data, including: • observation • interview • questionnaire or survey with an awareness of the following: - the situations for which the different types of data collection instruments are most appropriate and the advantages and disadvantages of each type - the difference between a "population" and a "sample" - how to select an appropriate sample from a population - the impact that the choice of sample will have on the reliability of the data collected *In order to:* Collect data on problems being investigated relating to the personal lives of learners (Grade 10), the wider community (Grade 11), and national and global issues (Grade 12).	10, 11 and 12
Classifying and organising data	Classify collected data as: • categorical data (e.g. *male/female; type of car*) • numerical data, further classified as discrete data (e.g. *number of people; number of cars*) and continuous data (e.g. *weights; rainfall*) Sort collected numerical data according to one (Grade 10), two (Grade 11) or more than two categories (Grade 12). (e.g. *Sort data relating to the heights of the learners in a class according to height only; or according to both gender and height; or according to gender, height and class.*) Group collected data using intervals (where appropriate) (e.g. *It is often appropriate to group test scores in the mark intervals "0-29"; "30-39"; etc.*). Organise collected data using: • tallies • frequency tables	10, 11 and 12
Classifying and organising data *(continued)*	Recognise that the way in which data is classified, sorted and/or grouped will affect how data is organised, summarised and represented. *In order to:* Transform the data into a form that can be analysed, or into a form that can be more easily summarised and/or represented, to find answers to the question(s) posed on issues relating to the personal lives of learners (Grade 10), the wider community (Grade 11), and national and global issues (Grade 12).	

Topic: Data handling		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Summarising data	Summarise single sets of collected data (Grade 10); summarise and compare two (Grade 11) and multiple (Grade 12) sets of collected data using the following measures of central tendency and spread (for *ungrouped* data only): • mean • median • mode • range	10 and 11
	• quartiles and inter-quartile range values* (in conjunction with box-and-whisker diagrams - see *"Representing data"* below) • percentiles (*interpretation only*)+	12
	with an understanding of the following: • the function/purpose of the measures of central tendency and spread • the measure of central tendency referred to when the term "average" is used	10, 11 and 12
	• the role and impact of outliers on the measures of central tendency and/or spread • the strengths and limitations of each type of measure of central tendency and spread and the situations in which one measure is more or less appropriate than the other measures (e.g. *If there is an outlier in a data set, the mean average may be skewed by the outlier. As such, it would be advisable to calculate the mean, median and modal averages, compare these averages, and then decide which average is the most representative of the majority of the data values*.)	11 and 12
	Analyse calculated and/or given measures of central tendency and/or spread.	10, 11 and 12
	In order to: Recognise trends at different places in the data to facilitate finding answers to the questions posed on issues relating to the personal lives of learners (Grade 10), the wider community (Grade 11), and national and global issues (Grade 12).	10, 11 and 12

Topic: Data handling		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Summarising data (*continued*)	Use quartile and percentile values, together with various measuring instruments#, in the following contexts: • *Road to Health* chart and other growth charts for children • test and exam results. *In order to:* Analyse the growth pattern of a baby/toddler. Analyse the health status of a child using calculated Body Mass Index values. Determine the quantity of paracetamol (a drug found in several medicines, including Panado) to be administered to a child. Analyse the performance of a group of learners in a test and/or examination.	12
	Additional comments: Common contexts involving quartiles and percentiles include: • growth charts for babies and children • quartile and percentile categories used in analysing results (e.g. *for the Grade 12 examination results*) • test and/or exam results for a large group of learners (e.g. *for the whole school*) * In working with quartiles, learners are expected to: • identify the quartile values in a set of data • explain the process involved in determining given quartile values in a set of data • calculate inter-quartile range values • interpret quartile values, inter-quartile range values, and box-and-whisker diagrams in order to make deductions regarding trends in the data Learners are *not* expected to: • calculate quartile values using formulae. + Learners are not expected to perform any calculations involving percentiles. If presented with percentile values in tables or graphs, learners should be able to explain what those values indicate about the data. # See the topic *Measurement* and the sections on *Measuring length and distance* and *Measuring mass (weight)* for a description of the types of measuring instruments to be used in this context.	

Topic: Data handling		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Representing data	Represent single (Grade 10), two (Grade 11) and multiple (Grade 12) sets of collected data using: • pie charts* • histograms • single bar graphs • line and broken line graphs	10, 11 and 12
	• multiple bar graphs and compound/vertical stack graphs • scatter plot graphs+	11 and 12
	• box-and-whisker plots (as graphical representations of quartiles) (*interpretation only*)#	12
	with an understanding of the following: • that each type of representation offers a different picture of the data and that certain types of representations are more appropriate for particular types of data (e.g. *Although it would be possible to use a pie chart to show the monthly rainfall in a town, it would be difficult to identify trends in the rainfall pattern from this chart. A bar graph and especially a line graph would allow for a much more in-depth analysis of the trends in the rainfall data.*) • the effect that the scale of a set of axes and the point at which the axes cross can have on the impression created by a graph. Read information from graphs and, if necessary, use estimation to determine values on the graphs. Analyse data presented in graphs.	10, 11 and 12
	In order to: Identify trends in data to answer the questions on the personal lives of learners (Grade 10), the wider community (Grade 11), and national and global issues (Grade 12).	10, 11 and 12
	Additional comments: * Learners are not expected to draw pie charts in an examination. Rather, they must be able to interpret and read values from a pie chart and, if necessary, explain how the sizes of the different segments of a pie chart have been determined. + In working with scatter plot graphs learners are not expected to draw *lines of best fit*. They should, however, identify and describe observable trends in the plots. # Learners are not expected to draw box-and-whisker plots. They should be able to: • locate minimum, maximum, median and quartile values on the plot • interpret the plot and explain what the shape of the plot signifies in terms of the spread of the data values.	

Topic: Data handling		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Representing data *(continued)*	In Grade 10, it is expected that it will be possible to read and identify values in graphs directly from the values provided on the axes and without the need for estimation. In Grade 11, it is expected that some estimation may be required, but that the estimation will involve estimating between two given values or estimating values where tick marks are provided on the axes but only certain tick marks are labelled. In Grade 12, owing to the large and complex nature of the data dealt with in relation to national and/or global issues, it is expected that more complex estimation will be required (e.g. *Given that a bar representing the population of a particular age group lies between 23 000 000 and 24 000 000, the population in that age group is approximately 23 500 000*).	
Interpreting and analysing data*	Read and select data from representations (that is, tables and graphs) containing data in order to answer questions relating to the data. Identify and describe trends/patterns in data presented in tables/graphs and explain what the data indicates about the question/problem for which the data was collected. Investigate how the choice of representation of the data impacts on the impressions created and conclusion(s) that can be drawn, taking into account that: • using percentages to represent data values in a table or graph is useful for comparing relationships in size, but does not reveal the size of the population/ sample • using actual values to represent data values in a table or graph shows the population/sample size, but is often not useful for showing the relationship between categories clearly • when comparing different categories of data, if there is an unequal number of data items in each category, then the use of actual values or percentage values to represent the data will affect the impression created by the data • the choice of scale on the axes and/or the point at which the axes cross impact on the impression created by the graph • tables will often contain more information than graphs, but trends/patterns are not easy to observe. Ask questions about the way in which data has been collected, organised, summarised and represented to reveal possible sources of error/bias/ misinterpretation. Learners should know to ask questions about: • the size of the sample • the representivity of the sample • the methods used for collecting data • the neutrality of the data collection process • whether the data collected was fact or opinion • the way in which the data was sorted and/or grouped • the sizes of the groups used in grouping the data • the type of measure used to determine the average of the data • the spread (range) of the data and what this spread suggests about the data.	10, 11 and 12
	Compare different representations of multiple sets of data and explain differences. Investigate situations in which summarised and/or represented data is interpreted in different ways. (e.g. *A newspaper may use statistics on the number of deaths related to motor vehicles to paint a picture of how dangerous it is to drive in South Africa. The Minister of Transport, on the other hand, may applaud the fact that the statistics show a drop in the number of road deaths.*)	11 and 12

<table>
<tr><th colspan="2">Topic: Data handling</th><th>Grades 10, 11 and 12</th></tr>
<tr><th>Section</th><th>Content/skills to be developed in appropriate contexts</th><th>Grade</th></tr>
<tr><td rowspan="3">Interpreting and analysing data* (continued)</td><td>Develop opposing arguments using the same summarised and/or represented data.
(e.g. Analyse data on the matric results and explain how the statistics may be interpreted favourably by the Education Minister and negatively by a newspaper journalists.)</td><td>12</td></tr>
<tr><td><u>In order to</u>:

Find answers to the questions posed regarding issues relating to the personal lives of learners, the wider community, and national and global issues.</td><td>10, 11 and 12</td></tr>
<tr><td colspan="2">Additional comments:
* Although the section on Interpreting and analysing data has been included as a separate section, it is essential that the interpretation and analysis of data occur at every stage during the statistical cycle:
• when drawing up a questionnaire, questions should be asked about the reliability of the questionnaire
• when organising data, decisions should be made about whether to express data as actual values or percentages, and the implications of each format
• once measures of central tendency and spread have been calculated, the meaning of these measures in relation to the data should be determined
• once graphs have been drawn to represent data, the graphs should be analysed to determine trends or meaning in the data
• when conclusions are made from organised, summarised and represented data on a question or problem, those conclusions should be analysed in terms of each stage of the statistical cycle to determine the reliability and validity of the conclusions.</td></tr>
</table>

Topic: Data handling		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
A	**Possible assessment (incorporating all the stages of the statistical cycle):** Assignment: *Electricity usage* • Design a data collection tool for recording how long different electric appliances are used in a household • Record, organise, summarise and represent data on the usage and consumption of various electric appliances • Analyse the data to determine which appliances use the greatest amount of electricity during a specified time period.	10
	Possible assessment (incorporating measuring length and weight, working with equations and data handling, that is, collecting, organising and analysing data): Investigation: *Healthy living for adults* • The same investigation is provided for the section on *Weight* in the topic *Measurement*. In other words, it is expected that this investigation will draw on content and/or skills from both *Measurement* and *Data handling* • Collect height and weight data from a sample of adults including an equal number of females and males • Determine the Body Mass Index (BMI) values and weight status for each of the females and males in the group, and use appropriate frequency tables and/or graphs to compare the weight status data • Make deductions about the health of the whole group and of the females compared to the males.	11
	Possible assessment (incorporating all the stages of the statistical cycle): Assignment: *Risky behaviour* • Collect, organise, summarise and represent data on drug and alcohol usage drawn from learners in different grades and from different gender and racial groups • Analyse the data in relation to the national results presented in the 1st or 2nd *National Youth Risk Behaviour Survey* • Present the findings of the study to the management, teachers and learners of the school.	12

Topic: Probability **Grades 10, 11 and 12**

Suggested teaching time:	**Recommended texts and/or resources:**
Grade 10: 1-2 weeks Grade 11: 1-2 weeks Grade 12: 1-2 weeks	• Textbooks • Coins and dice • Games involving coins and dice; weather reports; newspaper articles referring to probability; cosmetic and other products making statements regarding probability (*e.g. 80% of the women who used this product …*); products showing success and failure rates for their usage (*e.g. pregnancy tests; drug tests*); information on a lottery; etc.

Calculations involving probability are often confined to *mathematical calculations* primarily in the context of dice, coins and games. Although we may encounter situations involving probability and chance on a regular basis in daily life, it is very seldom that mathematical calculations are needed in order to make sense of those situations. E.g. *you don't need to be able to calculate the probability of winning a lottery to know that even though there is a chance of winning, that chance is very small.* What is more important is having an understanding of the concept of probability, together with a sense of whether an event is more or less likely to take place.

In light of the above, the descriptions given below encourage teachers to focus more on *interpreting* situations involving probability than on the mathematical calculation of probability. This involves developing an understanding of the concept of probability, familiarity with the different notations used in expressions of probability and developing a sense of whether a situation is more or less likely to occur. Alternative contexts outside of the realm of dice, coins and games have also been suggested to reinforce this focus.

Scope of contexts and/or content per section and grade:

<table>
<tr><th>Section</th><th>Grade 10</th><th>Grade 11</th><th>Grade 12</th></tr>
<tr><td>Expressions of probability</td><td rowspan="2">Explore probability in scenarios involving:
• games using coins and dice
• weather predictions</td><td rowspan="2">Explore probability in scenarios involving:
• games using coins and dice
• weather predictions
• tests where there is the chance of inaccurate results
• cosmetic and other products making statements regarding probability</td><td rowspan="3">Explore probability in scenarios involving:
• games using coins and dice
• weather predictions
• tests where there is the chance of inaccurate results
• cosmetic and other products making statements regarding probability
• lottery and other gambling games
• risk assessments
• newspaper articles containing references to probability</td></tr>
<tr><td>Prediction</td></tr>
<tr><td>Representations for determining possible outcomes</td><td rowspan="2">---</td><td rowspan="2">---</td></tr>
<tr><td>Evaluating expressions involving probability</td></tr>
</table>

Topic: Probability		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Expressions of probability	Work with situations involving probability, including: • games that make use of coins and dice • weather predictions	10, 11 and 12
	• tests where there is the chance of inaccurate results (e.g. *pregnancy test; drug test*) • products making statements regarding probability (e.g. *a cosmetic product that claims that 80% of the women who used the product now have less visible wrinkles*) • tables and graphs containing data and statistics*	11 and 12
	• national lotteries (e.g. *PowerBall*) • gambling scenarios (e.g. *slot machines*) • risk assessments (e.g. *in applications for car insurance*) • newspaper articles that refer to "likelihood", "chance" and/or "probability"	12
	In order to: Recognise the difference between the following terms: • event • outcome/result Recognise that probability is expressed using a scale that ranges between: • 0 (events that cannot take place - impossible events) • 1 or 100% (events that are certain to take place) Recognise that the probability of an event is expressed using fractions, percentages and decimal notation.	10, 11 and 12
	Additional comments: * In Grade 11, the scope of the data that learners are expected to work with relates to the personal lives of learners and the wider community. In Grade 12, the scope of the data relates to the personal lives of learners, the wider community, and national and global issues. For more specific examples of the types of data that learners are expected to explore in each grade, refer to the topic *Data handling* above.	

Topic: Probability		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Prediction	Work with situations involving probability, including: • games that make use of coins and dice • weather predictions	10, 11 and 12
	• tests where there is the chance of inaccurate results (e.g. *pregnancy test; drug test*) • products making statements regarding probability (e.g. *a cosmetic product that claims that 80% of the women who used the product now have less visible wrinkles*)	11 and 12
	• national lotteries (e.g. *PowerBall*) • gambling scenarios (e.g. *slot machines*) • risk assessments (e.g. *in applications for car insurance*) • newspaper articles that refer to "likelihood", "chance" and/or "probability"	12
	In order to:	
	Recognise that expressions of probability are only predictions about the outcome of an event (e.g. *Although there is always a chance that someone may win a lottery, this does not mean that there will always be a winner every time the lottery is played.*) Understand the difference between the relative frequency and the theoretical probability of an event (e.g. *The theoretical probability of a tossed coin landing on heads is ½ (50%). However, it is possible to toss a coin 10 times and for the coin to land on heads all 10 times - this is the relative frequency of that event.)*	10, 11 and 12
	Recognise that expressions of probability are predictions about the future based on events of the past (e.g. *Car insurance rates for people between the ages of 18 and 25 years are generally higher than those for people between the ages of 30 and 55 years. This is because historically there have been more motor vehicle accidents involving 18 to 25 year olds than 30 to 55 year olds.)* Recognise that expressions of probability can only predict the trend of an outcome over a long period of time (for a very large number of trials) and cannot accurately predict the outcome of single events (e.g. *Even though people aged 18 to 25 years are deemed more likely to be involved in a motor vehicle accident than any other age group, this does not necessarily mean that it is not possible that another age group might experience a higher number of accidents during the course of a year. However, based on trends in the past, it is more likely that people aged 18 to 25 years will be involved in an accident.*)	11 and 12
	Recognise the difference between situations where the outcome of one event impacts on the outcome of another and situations where the two outcomes do not impact on each other. (e.g. *If a person buys more than one lottery ticket, does this increase the chance of winning? And if a person plays a slot machine, does his or her chance of winning increase the more times he or she plays?*) Recognise the difference between predictions that are based on knowledge and intuition about a situation (e.g. *the outcome of a sports match or horse race*) and expressions of probability that are based on long-term trends in data. (e.g. *Even though we can use the historical win-lose record of two soccer teams to get a sense of who we believe might win in an upcoming match, there are simply too many other factors that impact on the performance of the teams (injuries of players; performance of the teams on the day) to be able to predict with certainty what the outcome of the match will be. Our "prediction" of who the winning team will be is based on personal preference or knowledge about the two teams rather than on long-term historical trends.*)	12

Topic: **Probability**		**Grades 10, 11 and 12**
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
Representations for determining possible outcomes	Work with situations involving probability, including: • games that make use of coins and dice • weather predictions	10, 11 and 12
	• tests where there is the chance of inaccurate results (e.g. *pregnancy test; drug test*) • products making statements regarding probability (e.g. *a cosmetic product that claims that 80% of the women who used the product now have less visible wrinkles*) • tables and graphs containing data and statistics*	11 and 12
	• national lotteries (e.g. *PowerBall*) • gambling scenarios (e.g. *slot machines*) • risk assessments (e.g. *in applications for car insurance*) • newspaper articles that refer to "likelihood", "chance" and/or "probability"	12
	In order to: Identify possible outcomes for compound events by making use of+: • tree diagrams • two-way tables.	10, 11 and 12
	Additional comments: * In Grade 11, the scope of the data that learners are expected to work with relates to the personal lives of learners and the wider community. In Grade 12, the scope of the data relates to the personal lives of learners, the wider community, and national and global issues. For more specific examples of the types of data that learners are expected to explore in each grade, refer to the topic *Data handling* above. + The sections on tree diagrams and two-way tables have been included to provide learners with exposure to different tools and representations that can be used to represent events involving probability in a graphical/pictorial way. The focus in these sections should be on using these representations to identify all of the possible outcomes of an event, especially in situations where the outcomes are not immediately obvious. Learners are not expected to have to use tree diagrams and two-way tables to perform mathematical calculations of probability (*e.g. multiplying probabilities along the branches of tree diagrams*).	

Topic: Probability	**Grades 10, 11 and 12**

Section	Content/skills to be developed in appropriate contexts	Grade
Evaluating expressions involving probability	Work with situations involving probability, including: • games that make use of coins and dice • weather predictions • tests where there is the chance of inaccurate results (e.g. *pregnancy test; drug test*) • products making statements regarding probability (e.g. *a cosmetic product that claims that 80% of the women who used the product now have less visible wrinkles*) • national lotteries (*e.g. PowerBall*) • gambling scenarios (e.g. *slot machines*) • risk assessments (e.g. *in applications for car insurance*) • newspaper articles that refer to "likelihood", "chance" and/or "probability" *In order to*: Evaluate and critique the validity of expressions and interpretations of probability presented in newspapers and other sources of information. e.g. *Discuss the validity of statements such as:* • "If you choose the same numbers every week for the lottery, then this will increase your chances of winning" • "The more tickets you buy, the higher your chances of winning" • "This team has a higher chance of winning the match than the other team".	12

Topic: Probability		Grades 10, 11 and 12
Section	**Content/skills to be developed in appropriate contexts**	**Grade**
A	**Possible assessment:** Assignment: *Unfair play* • Develop a game using coins and/or dice and make the game unfair (that is, there is a higher probability of losing) • Give the game to your classmates and ask them to determine (without doing any calculations) whether the game is fair and if not, why not.	10
	Possible assessment (incorporating all probability concepts): Investigation: *Tossing coins* • Toss a coin a small number of trials and then determine the probability of the tossed coin landing on heads for this experiment • Toss the same coin for a very large number of trials and then determine the probability of the tossed coin landing on heads for this larger experiment • Compare the probability values for the two experiments, discuss why they are different and explain how the notion that "there is a 50% chance that a tossed coin will land on either heads or tails" has been determined. OR Investigation: *Pregnancy tests* Investigate the concepts of "false positives" and "false negatives" for a pregnancy test.	11
	Possible assessment: Investigation: *Probability in the world* • Investigate how betting odds are determined for a sports event and evaluate the reliability of these odds OR • Investigate the following statements in the context of the national lottery and/or gambling: - "If you choose the same numbers every week for the lottery, then this will increase your chances of winning" - "The more tickets you buy, the higher your chances of winning." - "The probability of winning a game improves if there has not been a winner for some time" OR • Investigate the use of probability in determining "risk" in applications for car, household and life insurance.	12

SECTION 4

ASSESSMENT

4.1 Introduction

Assessment is a continuous planned process of identifying, gathering and interpreting information about the performance of learners, using various forms of assessment. It involves four steps: generating and collecting evidence of achievement; evaluating this evidence; recording the findings and using this information to understand and thereby assist the learner's development in order to improve the process of learning and teaching.

Assessment should be both informal (Assessment for Learning) and formal (Assessment of Learning). In both cases regular feedback should be provided to learners to enhance the learning experience.

Assessment of Mathematical Literacy

In accordance with the aims of the subject Mathematical Literacy assessment in Mathematical Literacy must measure the extent to which learners are able to make sense of scenarios based on authentic and realistic, familiar and unfamiliar real-life contexts by drawing on both mathematical and non-mathematical techniques and/or considerations.

As such, assessment tasks should:

- be based on authentic real-life contexts and use real-life data;
- require learners to select and use appropriate mathematical content in order to explore contexts;
- require learners to take into account possible non-mathematical considerations that may have a bearing on the desired outcome to a problem.

Some assessment tasks might more explicitly give learners the opportunity to demonstrate their understanding of specific mathematical content and/or skills (e.g. *the ability to 'solve equations' or 'calculate statistics such as mean, median and mode for different sets of data'*), while other assessment tasks might be less focused on specific mathematical content and rather draw on a range of content and/or skills from a variety of content topics to explore and make sense of an authentic context.

Teachers need to design assessment tasks that provide learners with the opportunity to demonstrate both competence in mathematical content and the ability to use a variety of both mathematical and non-mathematical techniques and/or considerations to make sense of real-life, everyday, meaningful problems.

Areas/topics of focus

Assessment in Mathematical Literacy is specifically focused on the Application Topics of Finance, Measurement, Maps, plans and other representations of the physical world, Data handling and Probability. It is expected that the Basic Skills Topics of Interpreting and communicating answers and calculations, Numbers and calculations with numbers and Patterns, relationships and representations will be integrated throughout all topics.

Although teachers may choose to use assignments, investigations and tests to exclusively test specific concepts and/or skills relating to the Basic Skills Topics, in examinations it is not expected that a whole question will be dedicated to assessing the Basic Skills Topics in isolation from the "Application Topic". Rather, the examinations will focus on

assessing the learners' ability to solve problems and explore contexts relating to the topics of Finance, Measurement, Maps, plans and other representations of the physical world, Data handling and Probability, and their ability to use number concepts and equations, tables and graphs in an integrated way in order to make sense of those contexts.

4.2 Informal Or Daily Assessment

Assessment for learning has the purpose of continuously collecting information on learners' achievement that can be used to improve their learning.

Informal assessment is a daily monitoring of learners' progress. This is done through observations, discussions, practical demonstrations, learner-teacher conferences, informal classroom interactions, etc. Informal assessment may be as simple as stopping during the lesson to observe learners or to discuss with learners how learning is progressing. Informal assessment should be used to provide feedback to the learners and to inform planning for teaching, but need not be recorded. It should not be seen as separate from learning activities taking place in the classroom. Learners or teachers can mark these assessment tasks.

Self-assessment and peer assessment actively involves learners in assessment. This is important as it allows learners to learn from and reflect on their own performance. The results of the informal daily assessment tasks are not formally recorded unless the teacher wishes to do so. The results of daily assessment tasks are not taken into account for promotion and certification purposes.

4.3 Formal Assessment

All assessment tasks that make up a formal programme of assessment for the year are regarded as Formal Assessment. Formal assessment tasks are marked and formally recorded by the teacher for progression and certification purposes. All Formal Assessment tasks are subject to moderation for the purpose of quality assurance and to ensure that appropriate standards are maintained.

Formal assessment provides teachers with a systematic way of evaluating how well learners are progressing in a grade and in a particular subject. Examples of formal assessments include tests, examinations, assignments, investigations, practical tasks, demonstrations, etc. Formal assessment tasks form part of a year-long formal Programme of Assessment in each grade and subject.

Specific details regarding the formal assessment requirements in Mathematical Literacy are given in the section titled **Programme of Assessment** below.

The forms of assessment used should be age and development level appropriate. The design of these tasks should cover the content of the subject and include a variety of tasks designed to achieve the objectives of the subject.

Formal assessments must cater for a range of cognitive levels and abilities of learners. The levels appropriate to Mathematical Literacy are described below.

Mathematical Literacy assessment taxonomy

Assessment can be pitched at different levels of cognitive demand. At one end of the spectrum are tasks that require the simple reproduction of facts, while at the other end of the spectrum tasks require detailed analysis and the use of varied and complex methods and approaches.

Complexity in Mathematical Literacy is structured around the following assessment taxonomy framework:

- Level 1: Knowing
- Level 2: Applying routine procedures in familiar contexts
- Level 3: Applying multi-step procedures in a variety of contexts
- Level 4: Reasoning and reflecting.

The levels of this taxonomy are described in Appendix 1 and are illustrated by means of references to an assessment task (*Responsible use of paracetamol*) provided in Appendix 2.

When designing assignments, investigations, and especially tests and examinations, teachers should use the following guideline for deciding on the number of marks to be allocated to questions at each of the levels of the taxonomy.

Table 1: Distribution of marks according to the levels of the Mathematical Literacy taxonomy in Formal Assessment Tasks

Levels of the Mathematical Literacy assessment taxonomy	Percentage of marks allocated to each level in an assessment
Level 1: Knowing	30% (± 5%)
Level 2: Applying routine procedures in familiar contexts	30% (± 5%)
Level 3: Applying multi-step procedures in a variety of contexts	20% (± 5%)
Level 4: Reasoning and reflecting	20% (± 5%)

It is important to point out that in order to promote the vision that Mathematical Literacy involves the use of both mathematical and non-mathematical techniques and considerations in exploring and understanding of authentic real-life scenarios, this taxonomy should not be seen as being associated exclusively with different levels of *mathematical* calculations and/or complexity. In determining the level of complexity and cognitive demand of a task, consideration should also be given to the extent to which the task requires the use of integrated content and skills drawn from different topics, the complexity of the context in which the problem is posed, the influence of non-mathematical considerations on the problem, and the extent to which the learner is required to make sense of the problem without guidance or assistance.

4.4 Programme of Assessment

4.4.1 Programme of assessment in Mathematical Literacy

The Programme of Assessment is designed to spread formal assessment tasks in all subjects in a school throughout a term.

Programme of Assessment for Mathematical Literacy in Grades 10 and 11

The Programme of Assessment for Mathematical Literacy in Grades 10 and 11 consists of *eight tasks* which are internally assessed:

- Seven of the eight tasks are completed during the school year and make up 25% of the total mark for Mathematical Literacy.

- The end-of-year examination is the eighth task and makes up the remaining 75%.

Table 2a illustrates one possible Programme of Assessment for Mathematical Literacy for Grades 10 and 11.

Table 2a: Example of a Programme of Assessment for Grades 10 and 11 showing the weighting of assessment tasks

	CONTINUOUS ASSESSMENT (25%)				EXAMINATION (75%)
	Term 1	**Term 2**	**Term 3**	**Term 4**	
Grade 10	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Examination
	Control Test (15%)	Examination (30%)	Control Test (15%)		
Grade 11	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Examination
	Control Test (15%)	Examination (30%)	Control Test (15%)		

* Teachers can choose to evaluate either an assignment or an investigation completed by the learners during each term. By the end of the year learners should have completed two assignments and two investigations.

The suggested Programme of Assessment assumes that:

- all the topics and sections are addressed throughout the year;
- the topics are weighted in accordance with the suggested minimum weightings for each topic outlined in Chapter 2 of this document;
- content and/or skills are integrated across a variety of topics throughout teaching and learning, and in the assessment activities.

Programme of Assessment for Mathematical Literacy in Grade 12

The Programme of Assessment for Mathematical Literacy in Grade 12 consists of *eight tasks*:

- Seven tasks are internally assessed and completed during the school year making up 25% of the total mark for Mathematical Literacy;
- The eighth task is an externally assessed end-of-year examination and makes up the remaining 75%.

Table 2b illustrates one possible Programme of Assessment for Mathematical Literacy for Grade 12.

Table 2b: Example of a Programme of Assessment for Grade 12 showing the weighting of assessment tasks

	CONTINUOUS ASSESSMENT (25%)				EXAMINATION (75%)
	Term 1	**Term 2**	**Term 3**	**Term 4**	
Grade 12	Assignment (10%) + Investigation (10%)	Assignment/ Investigation (10%)	Control Test (10%)		Examination
	Control Test (10%)	Examination* (25%)	Examination* (25%)		

* In Grade 12, one of the tasks in Term 2 and/or Term 3 must be an internal examination.

In instances where only one of the two internal examinations is written in Grade 12, the other examination should be replaced by a control test at the end of the term.

The suggested Programme of Assessment assumes that:

- all the topics and sections are addressed throughout the year;
- the topics are weighted in accordance with the suggested minimum weightings for each topic outlined in Chapter 2 of this document;
- content and/or skills are integrated across a variety of topics throughout teaching and learning, and in the assessment activities.

Description of assessment tasks in Mathematical Literacy

The different tasks listed in the Programme of Assessment are described as follows:

Control test

Control tests assess content under controlled examination or test conditions. Control tests are essential to prepare learners for examinations and, as such, should resemble the examinations in terms of structure and the conditions under which they are administered. Learners are expected to prepare for these tests and the content that will be tested is explicitly communicated to learners timeously, well before the test.. All information required in the test, including any real-life resources around which questions have been posed, will be provided by the teacher.

Example: Having studied how taxation is determined using tax bracket tables and tax deduction tables, learners could be set a test on determining taxation for an individual based on the salary information provided. The salary slip and any other information that is required for answering the questions in the test are provided by the teacher.

Assignment

In the context of Mathematical Literacy, an assignment is a well-structured task with clear guidelines and a well-defined outcome. An assignment could provide learners with the opportunity to consolidate a topic or section that has been covered in class, or to apply an approach or method studied in class to a new context, or to revise for tests and/or examinations. Both the content and contexts of the assignment are likely to be familiar to the learner. While the teacher may allocate classroom time to an assignment and supervise the completion, parts of an assignment should also be completed by the learner in his or her own time and/or with the assistance of other learners.

Example: If learners have determined the bank fees for a given bank statement based on the fee structure for a savings bank account for a particular month, an assignment could ask the learners to calculate the bank fees for the same bank statement but based on the fee structure for a different kind of bank account.

Investigation

In the context of Mathematical Literacy, an investigation involves a guided discovery, where learners are led through a process of discovering a particular concept or idea through leading questions. This guided discovery may include the collection of data and/or information to solve a problem.

Example: Learners are presented with two adverts showing different cell phone contract options. Questions are provided to guide them through various calculations that expose the costs involved in each contract. At the conclusion of the investigation, learners are in a position to be able to make a decision about which cell phone option is the most cost-effective for a given condition.

Summary of the formal assessment tasks listed in the CAPS document

The tables below provide a summary of the various suggested assessment tasks included in this document.

Table 3: Summary of suggested assessments listed in the CAPS document for Grades 10-12

GRADE 10			
Topic	**Section**	**Assessment Type and Title**	**Page Reference**
Numbers and calculations with numbers	Rounding	Assignment: *Exploring the impact of rounding*	31
	Proportion	Investigation: *Comparing direct and indirect proportion*	32
	Rates	Assignment: *Comparing prices*	33
	Percentages	Assignment: *Comparing actual and relative size*	34
Patterns, relationships and representations	Representations of relationships in tables, graphs and equations	Investigation: *Identifying and representing a relationship in daily life*	42
		Assignment: *Representing electricity costs graphically*	42
Finance	Financial documents	Assignment: *Making sense of a household bill*	49
	Income, expenditure, profit/ loss, income-and-expenditure statements and budgets	Assignment: *Developing a household budget*	51
Measurement	Measuring length and distance	Assignment: *Measuring accurately*	63
	Perimeter, area and volume	Assignment: *Designing and costing a small vegetable garden*	69
	Time	Assignment: *Baking a cake*	71
Maps, plans and other representations of the physical world	Scale	Investigation: *What happens if you resize a map or plan*?	73
	Maps	Assignment: *Finding your way*	75
	Plans	Assignment: *Writing instructions*	76
		Assignment: *Assembling an object*	76
Data handling	All sections	Assignment: *Electricity usage*	88
Probability	All sections	Assignment: *Unfair play*	94

GRADE 11			
Topic	**Section**	**Assessment Type and Title**	**Page Reference**
Patterns, relationships and representations	Representations of relationships in tables, graphs and equations	Assignment: *Representing cell phone costs graphically*	42
	Working with two or more relationships	Investigation: *Comparing costs on different cell phone systems*	45
Finance	Tariff systems	Investigation: *Which cell phone?*	50
	Break-even analysis	Assignment: *Running a home industry business*	52
	Interest	Investigation: *Comparing simple and compound interest graphically*	53
	Banking, loans and investments	Assignment: *Which bank?*	54
	Inflation	Investigation: *Tracing inflation in the real world*	57
	Taxation	Assignment: *Understanding UIF*	59
Measurement	Measuring mass (weight)	Investigation: *Investigating the (mass) weight status of adults*	65
	Measuring volume	Assignment: *Making and calibrating a rain gauge to monitor rainfall*	66
	Perimeter, area and volume	Assignment: *Household water consumption*	69
	Time	Assignment: *Mini-Olympics*	71
Maps, plans and other representations of the physical world	Plans, conversions, area, finance	Assignment: *Painting a classroom*	78
	Models, surface area, volume	Investigation: *Which box should you use?*	80
Data handling	All sections	Investigation: *Healthy living for adults*	88
Probability	All sections	Investigation: *Tossing coins* Investigation: *Pregnancy tests*	94

GRADE 12			
Topic	**Section**	**Assessment Type and Title**	**Page Reference**
Patterns, relationships and representations	Working with two or more relationships	Investigation: *Comparing costs on different electricity systems*	45
Finance	Financial documents	Assignment: *Understanding the "Tax Pocket Guide"*	49
	Banking, loans and investments	Assignment: *Modelling a loan*	56
	Taxation	Assignment: *Calculating personal income tax*	59
	Exchange rates	Assignment: *Planning a holiday in another country*	59
Measurement	Measuring mass (weight)	Investigation: *Investigating the weight status of children*	65
	Perimeter, area and volume	Investigation: *Tiling a floor* Investigation: *Housing density*	69
	Time, maps, finance	Assignment: *Planning a trip*	71
Maps, plans and other representations of the physical world	Maps, finance, timetables	Assignment: *Planning a trip*	75
	Plans, models, perimeter, area, volume, finance	Assignment: *Building a house*	78
	Models	Assignment: *Building a model of a school hall*	80
Data handling	All sections	Assignment: *Risky behaviour*	88
Probability	All sections	Investigation: *Probability in the world*	94

4.4.2 Examinations for Grades 10, 11 and 12

Overview

- Examination papers for Grades 10 and 11 will be internally set, marked and moderated, unless otherwise instructed by provincial departments of education.
- The Grade 12 final end-of-year examination is nationally set, marked and moderated.

Time and mark allocation

Table 4 shows the number of and stipulated mark and time allocations for examination papers (and control tests) for Grades 10-12:

Table 4: Number of examination papers and control tests with marks and duration for Grades 10-12

<table>
<tr><th></th><th colspan="2">GRADE 10</th><th colspan="2">GRADE 11</th><th colspan="2">GRADE 12</th></tr>
<tr><td>TERM 1</td><td colspan="2">Control Test</td><td colspan="2">Control Test</td><td colspan="2">Control Test</td></tr>
<tr><td rowspan="2">TERM 2</td><td rowspan="2">Paper 1
1 hour
(50 marks)</td><td rowspan="2">Paper 2:
1 hour
(50 marks)</td><td rowspan="2">Paper 1:
1½ hours
(75 marks)</td><td rowspan="2">Paper 2:
1½ hours
(75 marks)</td><td>Paper 1:
2 hours
(100 marks)</td><td>Paper 2:
2 hours
(100 marks)</td></tr>
<tr><td colspan="2">Control Test</td></tr>
<tr><td rowspan="2">TERM 3</td><td colspan="2" rowspan="2">Control Test</td><td colspan="2" rowspan="2">Control Test</td><td colspan="2">Control Test</td></tr>
<tr><td>Paper 1:
3 hours
(150 marks)</td><td>Paper 2:
3 hours
(150 marks)</td></tr>
<tr><td rowspan="2">TERM 4</td><td rowspan="2">Paper 1
1½ hours
(75 marks)</td><td rowspan="2">Paper 2
1½ hours
(75 marks)</td><td rowspan="2">Paper 1:
2 hours
(100 marks)</td><td rowspan="2">Paper 2:
2 hours
(100 marks)</td><td colspan="2">Nationally set examination</td></tr>
<tr><td>Paper 1:
3 hours
(150 marks)</td><td>Paper 2:
3 hours
(150 marks)</td></tr>
</table>

Additional information regarding examination papers

For each examination in Grades 10, 11 and 12 there are two examination papers. These papers assess the same content but are differentiated according to intention, cognitive demand and the nature of contexts included in the examinations.

Paper 1: A "skills" paper working with familiar contexts

Overview:

This examination paper assesses basic mathematical skills and competency, and primarily contains questions at the *knowing* (Level 1) and *routine procedures* (Level 2) levels. The examination also contains a small number of *multi-step procedures* (Level 3) questions, which will allow for more in-depth analysis of contexts and/or problems. The contexts included in this paper are limited to those specified in the curriculum outline section of this CAPS document.

Intention:

The intention of this paper is to assess understanding of the core content and/or skills outlined in the CAPS document in the context of authentic real-life problems. Although questions will be contextualised, the focus is primarily on assessing proficiency in a range of content topics, techniques and/or skills.

Structure and scope of content:

A Mathematical Literacy Paper 1 examination will typically consist of five questions:

- Each question will be contextualised and may focus on more than one context.
- Each question will contain sub-questions.
- The first four questions will be focused on each of the topics:
  - Finance
  - Measurement

- Maps, plans and other representations of the physical world
- Data handling

with the content and/or skills outlined in the following topics integrated throughout each question:

- Interpreting and communicating answers and calculations
- Numbers and operations with numbers
- Patterns, relationships and representations.

- The fifth question will integrate concepts and/or skills from across all the topics in the curriculum.
- The topic of Probability will be assessed in the context of one or more of these questions rather than as a question on its own.

Scope of contexts:

Contexts used in the Paper 1 examination will be limited to those specified in the Curriculum Outline section of the CAPS document thus the contexts used in this examination will be familiar to the learners.

Distribution of marks according to the taxonomy levels:

A Paper 1 examination should include questions at the different levels of the taxonomy according to the following mark distribution:

- 60% (±5%) of the marks at Level 1 (*knowing*);
- 35% (±5%) of the marks at Level 2 (*applying routine procedures in familiar contexts*);
- 5% (minimum) of the marks at Level 3 (*applying multi-step procedures in a variety of contexts*).

Comments on mark allocation:

Given the nature of this subject where there is very little recall and/or emphasis on the memorisation of facts, it is not anticipated that one-mark questions will be included in the examination. Even in situations where all that is required is for information to be read straight from a table, the information in the table has to be interpreted and the appropriate information located and identified. This process involves two steps and should be awarded two marks. It is also envisioned that a mark will be allocated for each step of working required in a calculation.

Paper 2: An "applications" paper, using both familiar and unfamiliar contexts

This examination paper is an "applications" paper and primarily contains *multi-step procedures* (Level 3) and *reasoning and reflecting* (Level 4) questions, and a small number of *routine procedures* (Level 2) questions. The purpose of the Level 2 questions in this paper is to provide learners with greater access to the contexts in which problems are situated.

Intention:

The intention of this examination paper is to assess the ability to identify and use a variety of mathematical and non-mathematical techniques and/or considerations to understand and explore both familiar and unfamiliar authentic contexts.

Structure and scope of content:

A Mathematical Literacy Paper 2 examination will typically consist of four or five questions:

- Each question will contain sub-questions.
- Each question will explore one or more contexts, drawing on content and/skills from two or more of the following topics:
    - Finance
    - Measurement
    - Maps, plans and other representations of the physical world
    - Data handling

with the content and/or skills outlined in the following topics integrated throughout each question:

    - Interpreting and communicating answers and calculations
    - Numbers and operations with numbers
    - Patterns, relationships and representations.

- The topic of Probability will be assessed in the context of one or more of these questions and not as a question on its own.
- Each question will include sub-questions consisting of a small number of questions at the *routine procedures* (Level 2) levels, and a greater number at the *multi-step procedures* (Level 3) and *reasoning and reflecting* (Level 4) levels.
- The focus of each question will be on assessing the ability to explore and understand a context(s) rather than on mathematical proficiency.

Scope of contexts:

Contexts used in a Paper 2 examination will include both familiar and unfamiliar contexts and are not limited to those specified in the Curriculum Outline section of the CAPS document.

Distribution of marks according to the taxonomy levels:

A Paper 2 examination should include questions at the different levels of the taxonomy according to the following mark distribution:

- 25% of the marks at Level 2 (*applying routine procedures in familiar contexts*);

- 35% of the marks at Level 3 (*applying multi-step procedures in a variety of contexts*);
- 40% of the marks at Level 4 (*reasoning and reflecting*).

Paper 1 and Paper 2 compared

Table 5 shows a summary of the differences between Paper 1 and Paper 2 examinations.

Table 5: Summary of the differences between Paper 1 and Paper 2

		Paper 1	Paper 2
Intention		"Basic skills" paper → assesses proficiency of content and/or skills	"Applications" paper → assesses ability to use both mathematical and non-mathematical techniques/considerations to explore familiar and unfamiliar contexts.
Structure and scope of content and/or skills		5 questions. First four questions deal with contexts relating to each of these topics: • Finance • Measurement • Maps, plans and other representations of the physical world • Data handling Fifth question integrates content from across all of these topics. Probability will be examined in the context or one or more of the other questions. The "Basic Skills" topics *Numbers and operations with numbers* and *Patterns, relationships and representations* will be integrated throughout all other questions. Each question can contain more than one context.	4 or 5 questions. Each question deals with contexts drawing integrated content from across all of these topics: • Finance • Measurement • Maps, plans and other representations of the physical world • Data handling Probability will be examined in the context of one or more of the other questions. The "Basic Skills" topics *Numbers and operations with numbers* and *Patterns, relationships and representations* will be integrated throughout all other questions. Each question can contain more than one context.
Taxonomy levels	**Level 1**	60% (±5%)	---
	Level 2	35% (±5%)	25% (±5%)
	Level 3	5% (minimum)	35% (±5%)
	Level 4	---	40% (±5%)
Contexts		"Familiar", that is, limited to the contexts listed in the CAPS document.	Both "familiar" and "unfamiliar", that is, not limited to the contexts listed in the CAPS document.

Contexts

In order to achieve the aim of Mathematical Literacy to help learners develop the ability to use a variety of mathematical and non-mathematical techniques and/or considerations to explore and understand both familiar and unfamiliar real-life contexts, it is essential that assessment items and examinations draw on realistic and authentic contexts. Learners should be asked to interpret newspaper articles, real bank statements, real plans and other authentic resources, rather than contrived problems containing only a semblance of reality.

Weightings of topics

The following weightings are stipulated for each topic in examinations:

Table 6: Weighting per topic

	Topic	Weighting (%)
Basic Skills Topics	Interpreting and communicating answers and calculations	No weighting is provided for these topics. Rather, 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% (±5%)
	Measurement	20% (±5%)
	Maps, plans and other representations of the physical world	15% (±5%)
	Data handling	25% (±5%)
	Probability	Minimum of 5%

Distribution of marks according to the taxonomy levels

Table 7 illustrates the percentage of marks to be allocated to the different taxonomy levels for Grades 10, 11 and 12.

Table 7: Percentage of marks to be allocated to the different assessment taxonomy levels in examinations in Grades 10, 11 and 12

The four levels of the Mathematical Literacy assessment taxonomy	Grades 10, 11 and 12		
	Paper 1	Paper 2	Overall allocation
Level 1: Knowing	60% (±5%)		30% (±5%)
Level 2: Applying routine procedures in familiar contexts	35%(±5%)	25% (±5%)	30% (±5%)
Level 3: Applying multi-step procedures in a variety of contexts	5% (minimum)	35% (±5%)	20% (±5%)
Level 4: Reasoning and reflecting		40% (±5%)	20% (±5%)

Additional information on the *mid-year* examainations

Much of the information relating to the structure of the examinations provided above relies on the whole curriculum having been covered and so relates primarily to examinations that take place at the end of the year. Clearly this will not be the case for the mid-year examinations, which will focus on assessing content covered in Terms 1 and 2.

It is not the intention of this document to prescribe the contents and the weighting of the various topics covered in these mid-year examinaitions. However, the following guidelines are suggested:

- Two examinations papers: Paper 1 (Basic Skills Paper) and Paper 2 (Applications Paper).
- The structure of the questions in these papers should follow the structure suggested above for Paper 1 and Paper 2 examinations (see Table 5 on page 99 above).

- The examinations should include questions on all of the topics covered in Terms 1 and 2:
    - This means that in Grade 10 teachers can choose to include questions that assess the content, skills and contexts covered in the Basic Skills topics of Numbers and calculations with numbers and Patterns, relationships and representations (both of which designated to be taught in Term 1 in the work schedule provided at the beginning of this document).
    - In Grade 11 teachers can choose to include questions that assess the content, skills and contexts covered in the Basic Skills topic of Patterns, relationships and representations (which is designated to be taught in Term 1 according to the work schedule provided at the beginning of this document).
- Teachers can decide on an appropriate weighting of the topics assessed in the examination, possibly as determined by the amount of content included in a topic or section and the amount of time taken to teach the topic or section. The table below shows an *example* of a possible weighting of topics for a *Grade 10* mid-year examination (across both Paper 1 and Paper 2).

Table 8: Example of weightings per topic in the mid-year examinations

Term	Topic / Section	Weeks allocated in suggested work schedule (on page 14 above)	Weighting (% of combined Paper 1 & Paper 2)
1	Numbers and calculations with numbers	5	10%
	Patterns relationships and representations	3	10%
	Contexts focussing on Measurement (Conversions and Time)	1	10%
2	Contexts focussing on Measurement (Measuring length/distance, mass, volume and temperature)	2	15%
	Contexts focussing on Finance (Financial docuyments and Tariff systems)	2	20%
	Contexts focussing on Maps, plans and other representations of the physical world (Scale and Maps)	2	20%
	Contexts focussing on Probability	2	15%

4.5 Recording and reporting

Recording is a process in which the teacher documents the level of a learner's performance in a specific assessment task. It indicates learner progress towards the achievement of the knowledge as prescribed in the *Curriculum and Assessment Policy Statements*. Records of learner performance should provide evidence of the learner's conceptual progression within a grade and her / his readiness to progress or to be promoted to the next grade. Records of learner performance should also be used to verify the progress made by teachers and learners in the teaching and learning process.

Reporting is a process of communicating learner performance to learners, parents, schools, and other stakeholders. Learner performance can be reported in a number of ways which include report cards, parents' meetings, school visitation days, parent-teacher conferences, phone calls, letters, class or school newsletters, etc. Teachers in all grades report in percentages against the subject. Seven levels of competence have been described for each subject listed for Grades R-12. The various achievement levels and their corresponding percentage bands are as shown in the Table below.

CODES AND PERCENTAGES FOR RECORDING AND REPORTING

RATING CODE	DESCRIPTION OF COMPETENCE	PERCENTAGE
7	Outstanding achievement	80 - 100%
6	Meritorious achievement	70 - 79%
5	Substantial achievement	60 - 69%
4	Adequate achievement	50 - 59%
3	Moderate achievement	40 - 49%
2	Elementary achievement	30 - 39%
1	Not achieved	0 - 29%

Note: The seven point scale should have clear descriptors that give detailed information for each level.

Teachers will record actual marks against the task by using a record sheet; and report percentages against the subject on the learners' report cards.

4.6 Moderation of Assessment

Moderation refers to the process which ensures that the assessment tasks are fair, valid and reliable. Moderation should be implemented at school, district, provincial and national levels. Comprehensive and appropriate moderation practices must be in place for the quality assurance of all subject assessments.

In Mathematical Literacy:

- Grade 10 and 11 tasks are internally moderated. The subject advisor will moderate a sample of these tasks during school visits to verify the standard of the internal moderation.
- Grade 12 tasks are moderated by the provincial subject advisor. This process will be managed by the provincial education department.

4. 7 Appendices

APPENDIX 1

DESCRIPTION OF THE LEVELS IN THE MATHEMATICAL LITERACY ASSESSMENT TAXONOMY

Complexity in Mathematical Literacy is structured around the following assessment taxonomy framework:

- Level 1: Knowing
- Level 2: Applying routine procedures in familiar contexts
- Level 3: Applying multi-step procedures in a variety of contexts
- Level 4: Reasoning and reflecting.

It is important to recognise that this taxonomy should not be seen as associated exclusively with different levels of *mathematical* calculations and/or complexity. In determining the level of complexity and cognitive demand of a task, consideration should also be given to the extent to which the task requires the use of integrated content and skills drawn from different topics, the complexity of the context in which the problem is posed, the influence of non-mathematical considerations on the problem, and the extent to which the learner is required to understand the problem without guidance or assistance.

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.
- Examples of the types of tasks at the *knowing* level of the Mathematical Literacy taxonomy include:
- reading information directly from a table (e.g. *the date on a bank statement; the time that a bus leaves the bus terminal*);
- performing basic operations on numbers (e.g. *subtracting income and expenditure values to determine the profit/loss for a business; adding values to show how the "Amount due" value on an electricity bill has been determined*);
- measuring accurately (e.g. *measuring the dimensions of a room on a given plan accurately using a ruler*).
- rounding answers appropriately as per a given instruction (e.g. *rounding off an answer to one decimal place when instructed to do so*);
- identifying the appropriate formula to be used in a given calculation (e.g. *identifying the formula for the area of a circle as area = π × radius2 from a given list of area formulae*);

- recognising and explaining vocabulary appropriate to a particular scenario (e.g. *"discrete" and "continuous" in the context of data; "event" and "outcome" in the context of Probability; "dependent" and "independent" variables; "debit" and "credit" in the context of finance*);
- reading values directly from the values provided on a graph or table (e.g. *reading off the cost of talking for 60 minutes on a cell phone contract from a graph showing the cost of calls over time*);
- performing conversions within the metric system (e.g. *from mm to cm to m to km; from ml to ℓ; from g to kg*; *from seconds to minutes to hours*).

Example:
In the **Responsible use of paracetamol** task in **Appendix 2** below, *Questions 1.1, 2.1.1, 3.1.1, 1.2 and 1.3* are at the *knowing* level of the taxonomy.

- Questions 1.1, 2.1.1 and 3.1.1 require the learner to interpret the given information and read information directly from the tables in the text. None of these questions require a calculation. The intention of these questions is to force learners to read the information provided in the tables and, hopefully, to help them to become more familiar and comfortable with the context.
- Questions 1.2 and 1.3 both require a basic calculation.
  - Question 1.2 requires the learner to determine the relationship between body weight and dosage of paracetamol from the information given at the start of the task and to use this relationship to determine the dosage for children of a given weight . The task requires the use of a basic operation (multiplication) and all the information is given.
  - Question 1.3 requires the learner to use the same information and operation as in Question 2 to complete a table of values.

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*).

Examples of *routine procedures* tasks include:

- substituting values into given equations (e.g. *determining the bank charge for depositing money into an account using a given formula*);
- solving equations by means of trial and improvement or algebraic processes;
- drawing graphs from given tables of values (e.g. *drawing a graph to show the cost of a call on a cell phone contract over time from a given table of time and cost values*);
- constructing a budget for a small household project;
- using tax deduction tables to determine the amount of tax to be deducted from an employee's salary;
- measuring the dimensions of the floor of a room and using the dimensions to determine how many running metres of carpeting to buy to cover the floor of the room;

- calculating the mean, median and/or modal averages of a set of data;
- increasing or decreasing an amount by a percentage (e.g. *determining how much a person will pay for a television set if a 5% discount is given);*
- estimating values from the values provided on a graph or in a table (e.g. *on a graph showing population statistics in millions for the different provinces in South Africa, estimate the population of KwaZulu-Natal*);
- converting units of measurement between different systems of measurement using given conversion tables and/or factors (e.g. *using a baking conversion table to convert from g to ml when baking a cake*);
- using a given scale to determine actual length or distance (e.g. *using a scale of 1:100 on a plan to determine the actual length and width of the walls of a room*).

In the **Responsible use of paracetamol** task in **Appendix 2** below, *Questions 1.4* and *1.5* are at the *applying routine procedures in familiar contexts* level of the taxonomy.

- Question 1.4 requires the learner to describe the relationship between input and output values in a table of data by means of an equation. Since the relationship is linear and learners from Grade 9 upwards should be familiar with this relationship, the task is one that requires the application of routine procedures.
- Question 1.5 requires the learner to draw a graph of a linear function based on a table of values and/or an equation. The knowledge and skills required to draw this graph have been developed in Grades 8 and 9 and nurtured from Grade 10 upwards in Mathematical Literacy, and hence is considered to be the application of a routine procedure.
- Since it is expected that learners will deal with a large number of contexts in which the relationship between the variables is linear, it is reasonable to suggest that the nature of the context is familiar, even if the learner has not expressly dealt with medicine as a context before.
- Notice that in Questions 1.4 and 1.5, the number of steps in every calculation is limited to one or two, or a repetition of the same calculation several times. Also notice that it is obvious from the way in which the questions are posed precisely what is required in order to complete the question.

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

Tasks at the a*pplying 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.

Examples of *multi-step procedures* tasks include:

- deciding on the most appropriate graph and an appropriate means of constructing that graph to represent a

particular scenario (e.g. *constructing a table of values to represent a tariff structure for a particular electricity system and then using the table of values to draw a graph to represent that tariff structure*);

- determining the most appropriate scale in which to draw a plan, determining dimensions according to that scale, and then drawing the plan according to those scaled dimensions;
- determining the quantity of paint needed to paint the walls of a building by determining the surface area of the walls of a building, using a conversion ratio to convert the surface area value from m^2 to litres, rounding the litres value up to the nearest whole litre and then making a decision about the most appropriate quantity of paint to be bought based on available tin sizes;
- using maps, a distance chart, weather report information and other travel resources to plan a trip, giving consideration to where to stop for petrol, estimated travelling distance and time, and estimated travel costs;
- researching the costs involved in a fund-raising activity and preparing a budget for the activity;
- using given inflation rates to investigate the estimated value of an item over a multiple time period. (E.g. *if a car is currently worth R90 000, what would the car be worth in two years' time if the value of the car depreciated by approximately 15% in the first year and 10% in the second year?)*

In the **Responsible use of paracetamol** task in **Appendix 2** below, *Questions 2.1.2* and *3.2* are at the *applying multi-step procedures in a variety of contexts* level of the taxonomy.

- Question 2.1.2 requires the learner to first determine how many mg of paracetamol is safe for a particular child and then the number of measures of the medicine to be given to this child. This is a multi-step procedure and, though not complex, the procedure is not obvious from the way the question is posed.
- Question 3.2 requires learners firstly to choose between two graphs — one for boys and one for girls — and secondly to select the appropriate line on each graph to answer the question. In this sense, the procedure is multi-step in nature. While the learner may not have seen this exact graph before, it is expected that a learner in Grade 12 will be sufficiently competent and experienced with graphs to understand the information presented in this one.
- Notice that in both Questions 2.1.2 and 3.2 it is not immediately obvious from the way the questions are posed what calculations are required to answer the questions. Also notice that multiple steps are required in these questions.

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.

In the **Responsible use of paracetamol** task in **Appendix 2** below, *Questions 3.1.2* and *3.3* are at the *reasoning and reflection* level of the taxonomy.

- Question 3.1.2 requires the learner to make inferences. Learners are expected to draw on what they have learnt about the safe use of paracetamol in the questions so far to make deductions or inferences. The answer that the learner provides will be within a range of possible values and the quality of the answer will be based on the reasoning that is evident in determining the answer.
- In Question 3.3 the learner is expected to evaluate the dosage recommended by the manufacturer. Firstly, the learner should make inferences about why the manufacturer made these recommendations. Secondly, the learner should critique the decision. In critiquing the dosage recommended by the manufacturer, the learner has to draw not only on mathematical content, but also on his or her own experiences of the world. Therefore, this question is at the highest level of the Mathematical Literacy taxonomy.

APPENDIX 2

ASSESSMENT TASK EXAMPLE:

RESPONSIBLE USE OF PARACETAMOL

ASSESSMENT TASK EXAMPLE: Responsible use of paracetamol

INFORMATION:

Paracetamol is a drug with analgesic (painkilling) properties.

Paracetamol is the active ingredient in the well-known medicine Panado that can be bought over the counter in supermarkets and pharmacies.

Paracetamol is, however, involved in many incidents of accidental poisoning through overdose.

Paracetamol dosage is based on body weight. A healthy single dose of paracetamol for children is considered to be 10 mg per kilogram of body weight, with up to four doses per day.

Question 1

1.1.

1.1.1. According to the information given above, what is considered to be a healthy dose of paracetamol for children? (1)

1.1.2. How many doses of paracetamol can be administered per day? (1)

[2]

1.2. Calculate how many mg of paracetamol each of the following children can safely take per dose.

1.2.1. Gabriella, weight 12 kg (1)

1.2.2. Ricardo, weight 20½ kg (1)

[2]

1.3. Copy and complete the table below:

Weight of patient	6 kg	7 kg	8 kg	9 kg	15 kg	25 kg	35 kg
Safe dose of paracetamol in mg							

[4]

1.4. Write an equation that can be used to determine how many mg of paracetamol is a safe dose for a child of a given wei ght. [2]

1.5. Based on your answers to 1.2 and/or 1.3, draw a graph that can be used to determine how many mg of paracetamol is a safe dose for a child of a given weight. [3]

Question 2

FURTHER INFORMATION:

Paracetamol is sold in supermarkets and pharmacies in the following concentrations:

- Infant drops: 60 mg per drop (0,6 ml)
- Syrup: 120 mg per medicine measure (medicine spoon) (5 ml)
- Tablets: 120 mg per tablet

2.1.

2.1.1. What concentration of paracetamol is found in syrup? [1]

2.1.2. Determine the following:

a. The number of infant drops in a safe dose for a child who weighs 7 kg. (2)

b. The number of medicine measures in a safe dose of syrup for a child who weighs 9½ kg. (2)

c. The number of tablets in a safe dose for a child who weighs 12,25 kg. (2)

[6]

Question 3

FURTHER INFORMATION:

The directions for use on the paracetamol syrup (120 mg/5 ml) packaging state:

- 3-12 months old: 2,5 to 5 ml per dose
- 1-5 years old: 5 to 10 ml per dose
- 6-12 years old: 10 to 20 ml per dose
- A maximum of 4 doses per day

3.1.

3.1.1. What is the maximum dosage of paracetamol that should be given to a 7-year-old child? (1)

3.1.2. According to these directions, what does the manufacturer consider the weight of a child who is 6-12 years old to be? (4)

[5]

3.2. Refer to the CDC weight-for-age percentile charts on the next page to answer the following questions:

3.2.1. According to the chart, how heavy is a 6 year-old girl whose weight is at the 25th percentile? (1)

3.2.2. According to the chart, how heavy is a 12 year-old girl whose weight is at the 75th percentile?(1)

3.2.3. According to the chart, how heavy is a 6 year-old boy whose weight is at the 75th percentile? (1)

3.2.4 According to the chart, how heavy is a 12 year-old boy whose weight is at the 25th percentile? (1)

[4]

3.3. Based on the information provided in this question (including the weight-for-age charts) discuss the following, giving reasons:

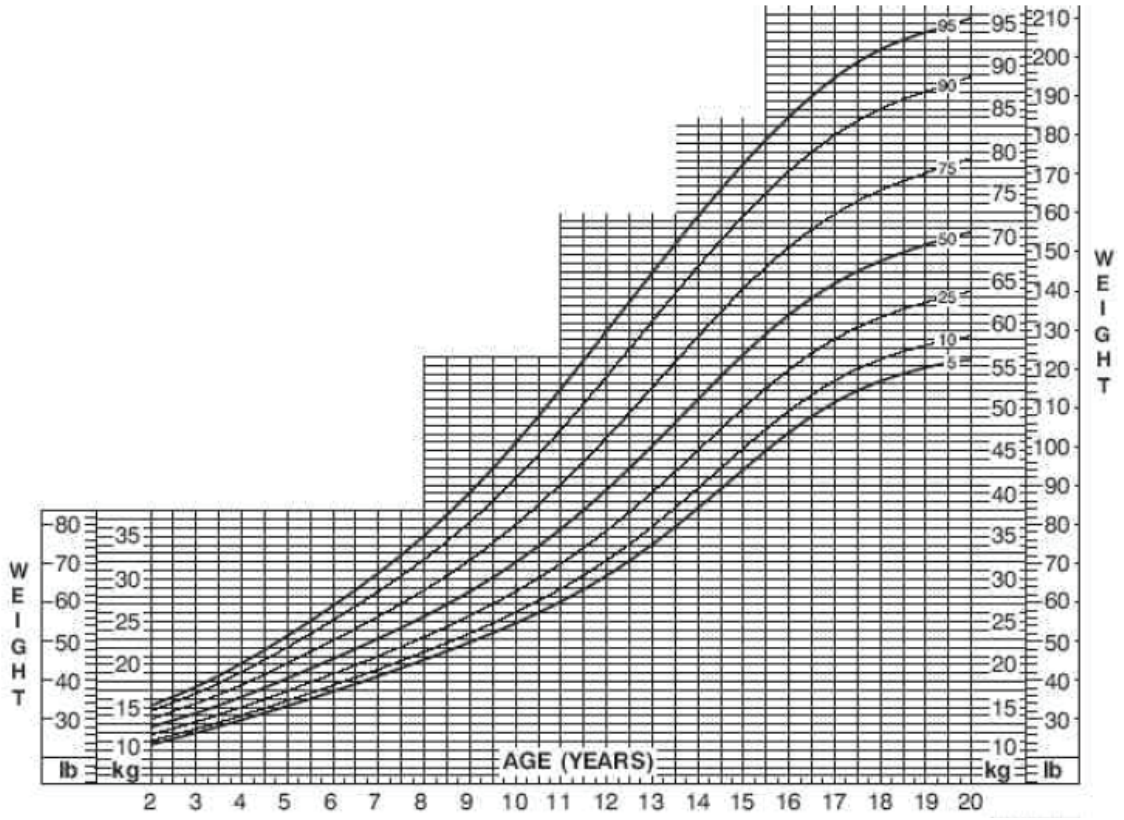
3.3.1. How the recommended dosage for paracetamol syrup has been determined (4)

3.3.2. Whether or not you think this is the most appropriate dosage to recommend (4)

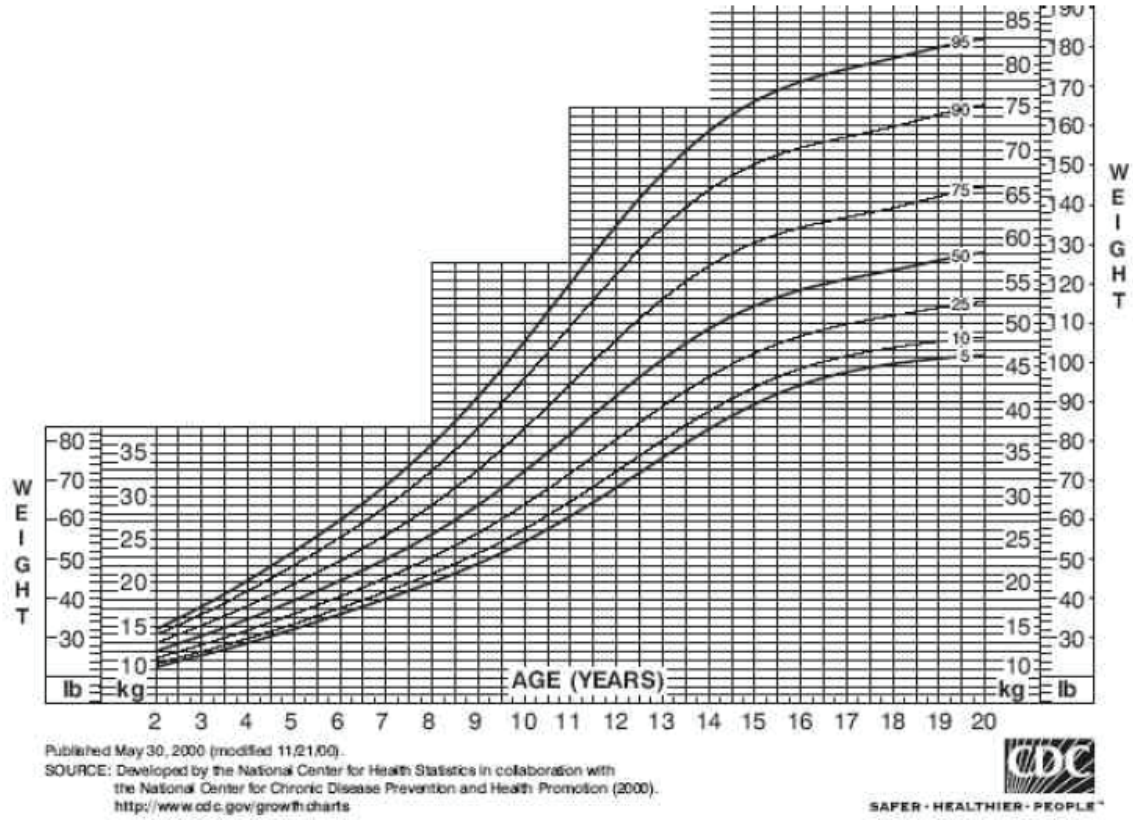
[8]

Responsible use of paracetamol (continued)

Boys: weight-for-age percentiles



Girls: weight-for-age percentiles



Published May 30, 2000 (modified 11/21/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000). http://www.cdc.gov/growthcharts

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APPENDIX 3

FURTHER INTERPRETATION OF THE DIFFERENT TAXONOMY LEVELS ACCORDING TO TOPICS

The intention of this section is to provide greater clarity about the types of questions, calculations, applications and/or contexts that fall into the different levels of the Mathematical Literacy taxonomy. **It is essential to emphasise that the tables below do not provide a comprehensive or definitive list of all possible questions, calculations and/or tasks associated with the four levels of the taxonomy. They contain examples of a small selection of questions, calculations and/or tasks from the different topics in the curriculum that can be associated with the different levels.** These examples are meant to illustrate more clearly the difference between the demands of a question at the different levels of the taxonomy.

TOPIC: FINANCE				
Section	**Level 1: Knowing**	**Level 2: Applying routine procedures in familiar contexts**	**Level 3: Applying multi-step procedures in a variety of contexts**	**Level 4: Reasoning and reflecting**
Financial documents and Tariff systems	• Read information directly from an electricity bill (e.g. *date; name of account holder; electricity consumption for the month; etc.* • Show how the "Total Due" on the electricity bill has been calculated by adding together all items listed on the bill. • Show how the VAT value listed on the electricity bill has been calculated when told that VAT is 14% of the value excluding VAT (that is, calculating a percentage of an amount.	• Use a given formula to show how the amount charged for electricity consumption shown on the bill has been determined. • Complete a table of values to show the cost of various quantities of electricity consumption. • Use the table of values to construct a graph to represent the cost of electricity consumption.	• Replicate the calculations/values shown on the bill for a different electricity consumption value. • Without any scaffolded or guiding questions, draw a graph to represent the cost of electricity on a particular electricity system.	• Choose an appropriate strategy (e.g. *tables of values, graphs, interpreting points of intersection, etc*) to compare the electricity costs for two different electricity systems and make a decision about which system is the most cost effective for a user with particular needs. • Analyse a newspaper article describing proposed increases in electricity tariffs and make deductions about the implications of these increases for consumers.
Income, expenditure, profit/loss, income-expenditure statements and budgets	• Classify items on an income and expenditure statement as fixed, variable and occasional income and expenditure. • Show how total Income, expenditure and profit/loss values on an income and expenditure statement or budget have been determined.	• Construct an income and expenditure statement for an individual or a household. • Construct a budget for a small household project.	• Construct an income and expenditure statement for a business that includes a comparison of income and expenditure values over a two year period. • Construct a budget for a large fundraising event. •	• Analyse a budget for a household or business and make recommendation as to how the expenditure should be changed to improve the finances of the household/business. • Compare income and expenditure values for a business or organisation over a two-year period and describe differences and/or trends. • Analyse projected versus actual budget values and explain differences.

TOPIC: FINANCE				
Section	**Level 1: Knowing**	**Level 2: Applying routine procedures in familiar contexts**	**Level 3: Applying multi-step procedures in a variety of contexts**	**Level 4: Reasoning and reflecting**
Cost price and selling price	• Determine the cost price of an item by adding together given cost values for the component parts of the item. • Determine the income generated from the sale of an item based on a given sales price and given sales volumes.	• Compare the difference between the cost and selling price of an item by calculating the percentage mark-up in price of the selling price from the cost price. • Construct a table of values to show how the cost price of an item changes depending on the number of items made.	• Draw graphs, without scaffolded or guiding questions, to show the costs involved in producing an item and money generated from the sale of the item. • Investigate, through research, the various costs involved in manufacturing an item, and decide on an appropriate selling price for the item.	• Conduct market research on a group of people and use the results of the research to defend a particular selling price for a product. • Interpret graphs showing the cost of production and income generated from the production and sale of an item, and use the graphs to make decisions about the business (e.g. *how many items must be manufactured and sold to cover all production costs).*
Break-even analysis	• Explain the meaning of the word "break-even" in the context in which a problem is posed (e.g. *in the context of a business, "break-even" refers to the income that must be generated to cover all expenses*).	• Determine the break-even point of a business from a given table of income and expenditure values. • When given two graphs that intersect, read off the value of the independent and dependent variables at the break-even point (point of intersection) of the graphs.	• Draw two or more graphs and identify the point of intersection of those two graphs in order to compare different options (e.g. *income vs. expenditure*; *cell phone contract options; electricity tariff systems; etc).*	• Explain the relevance of the break-even point of two graphs in relation to the problem or context for which the graphs have been drawn. • Explain the meaning of different regions on a graph (that is, between different points of intersection) in relation to the problem or context for which graphs have been drawn.
Interest	• Explain the meaning and difference between "interest" and the "interest rate". • Identify interest rate values quoted on bank statements.	• Perform simple interest calculations manually (that is, without the use of a calculator) over multiple time periods. • Read values off graphs showing simple and compound investment scenarios.	• Perform compound interest calculations manually (that is, without the use of a formula) over multiple time periods. • Complete a table that models a loan scenario and include consideration of a monthly interest calculation, monthly repayment, and monthly amount outstanding on the loan. • Draw graphs from given tables of values to represent loan scenarios.	• Construct a model of a loan or investment scenario without scaffolded or guiding questions. • Investigate and describe the impact of increasing the monthly repayments on the total cost of the loan/investment. • Investigate and describe the impact of making a lump sum payment into a loan/investment during the first half of the loan/investment period on the total cost of the loan/ investment.
Inflation	• Explain what the term "inflation" means.	• Show by calculation how the price of an item might change if affected by inflation (that is, increasing a value by a percentage).	• Show by calculation how the price of an item might change if affected by inflation over multiple time periods (that is, compound calculation).	• Describe the effect of inflation on the buying power of money. • Use knowledge of inflation rates to argue and justify a particular salary increase.

TOPIC: FINANCE				
Section	**Level 1: Knowing**	**Level 2: Applying routine procedures in familiar contexts**	**Level 3: Applying multi-step procedures in a variety of contexts**	**Level 4: Reasoning and reflecting**
Taxation	• Identify the name of the employee listed on a pay slip and the month for which the pay slip has been issued. • Identify the employee's monthly salary. • Explain how the employees "taxable income" has been determined by referring to the salary and deduction values shown on the payslip. • Explain the meaning of the terms "gross pay", "net pay", "deductions", and "taxable income" shown on a payslip.	• Read appropriate tax values from given income tax deduction tables. • Identify the income tax bracket into which an individual falls based on a given monthly and/or annual income.	• Use formulae provided on income tax bracket tables to calculate an individual's annual and monthly income tax. • Investigate through calculation how the tax rebate value is determined.	• Compare income tax tables over different financial periods and explain how an individual's tax may have changed from one period to another. • Investigate the effect that an increase in salary has on increased tax payments. • Analyse graphs showing changes in income tax over different time periods and explain differences.
Exchange rates	• Identify the exchange rate between two currencies from a given table or rate board.	• Use a given exchange rate to determine the value of one currency for a specific quantity of another currency.	• Perform currency conversion calculations, taking into account currency exchange fees charged by banks and other financial institutions.	• Explain how the "Big Mac Index" provides a tool for determining the worth of one currency in relation to another currency; • Explain why it is not necessarily accurate when a South African tourist in America exclaims that a can of cool dink that costs $2,00 (R14,00) is much cheaper in South Africa.

TOPIC: MEASUREMENT				
Section	**Level 1: Knowing**	**Level 2: Applying routine procedures in familiar contexts**	**Level 3: Applying multi-step procedures in a variety of contexts**	**Level 4: Reasoning and reflecting**
Conversions	• Convert between mm, cm, m and km. • Convert between g and kg. • Convert between ml and litres.	• Convert from °C to °F using given formulae. • Convert between different systems using given conversion factors (e.g. *convert from m^3 to litres using the fact that 1 m^3 = 1 litre*).	• Convert between different systems using given conversion tables, where it is necessary to first identify and then use an appropriate conversion factor from the table.	• Compare solutions to a problem expressed in different units and make a decision about what unit is the most appropriate or useful for the particular context in which the problem is posed.
Measure length, weight, volume and temperature	• Measure accurately using appropriate measuring instruments (e.g. *ruler; tape measure; kitchen scale; jugs; etc).*	• Perform calculations involving measured values (e.g. *working out how much longer one piece of wood is than another piece).*	• Use measured values in conjunction with other content or skills to complete a larger project (e.g. *measure the dimensions of a bedroom to determine the running metres of carpet needed for the floor).*	• Make decisions about the need for accuracy when performing a measurement in a particular context. • Interpret a measured value and make a decision based on the value (e.g. *measure the temperature of a child and decide if the child should be taken to hospital).*
Perimeter, area and volume	• Explain the meaning of terms (e.g. "*area", "perimeter", "volume", "radius", etc).* • Identify from a list of given formulae which formulae relate to perimeter calculations, which relate to area calculations, etc. • Determine the radius of a circle from a given diameter. • Know that area is expressed in units^2 (e.g. *cm^2*) and volume in units^3 (e.g. *cm^3*).	• Calculate perimeter, area and volume by substituting given values into given formulae.	• Perform preliminary calculations to determine dimensions required in perimeter/area/volume calculations and then calculate perimeter/area/volume • (e.g. *when asked to determine the volume of concrete needed for the foundations of a house, interpret top view plans of the foundation trench of a house, use the plans to determine the dimensions of the trench, and then calculate the volume of the trench).*	• Use perimeter, area and/or volume calculations to complete a project, where it is not stated specifically what type of calculation is required (e.g. *when asked to determine the amount of paint needed to paint a building, first interpret plans to determine dimensions of the walls, then calculate the surface area of the walls, then use the paint conversion ratio on the back of the paint tin to determine the required number of litres of paint required).*
Time	• Read time values on a clock or watch.	• Record time values at a school sports event and perform calculations with time in order to determine winning teams.	• Interpret time values on a bus timetable to determine departure, arrival and travelling times.	• Perform time calculations in conjunction with maps and other travel resources in order to plan a trip (e.g. *determine approximate travelling times, appropriate stopping points for refuelling, the best time to start a journey in order to arrive at a destination at a particular time, etc*).

TOPIC: MAPS, PLANS AND OTHER REPRESENTATIONS OF THE PHYSICAL WORLD				
Section	**Level 1: Knowing**	**Level 2: Applying routine procedures in familiar contexts**	**Level 3: Applying multi-step procedures in a variety of contexts**	**Level 4: Reasoning and reflecting**
Scale	• Explain the meaning of a given scale • (e.g. *explain what the scale 1 : 100 means in terms of the measurements on a plan and actual dimensions).* •	• Use a given scale to determine actual measurements when given measured values, or measured values from given actual values.	• Use a given scale in conjunction with measurement on a plan/map to determine length/dimensions. • Determine the scale of a map or plan. • Use a given scale in conjunction with other content or skills to complete a project (e.g. *use a given scale to determine the dimensions in which to draw a 2-dimensional plan of an object, and then draw the plan).*	• Critique the scale in which an object has been drawn and offer an opinion as to a more appropriate scale. • Decide on an appropriate scale in which to draw a picture or build a model, and then complete the project.
Maps	• Identify the labels/names of national roads (e.g. *N3*) that must be travelled on to travel between two locations. • Identify the names of the towns on the route between two locations. • Identify the scale of a map.	• Identify the position of two locations on a map and use given distance values on the map to determine the travelling distance between the two locations. • Interpret a given set of directions and describe what location the directions lead to. • Provide a set of directions to travel between two locations in a town using street names.	• Use a map in conjunction with a distance chart to determine the shortest route to travel between two locations. • Identify a possible route between two locations on a map, measure the distance between the locations, and use a given scale to estimate the distance between the two locations. • Estimate travelling times between two or more locations based on estimated travelling speed and known or calculated distances.	• Critique a proposed travel route in relation to distance, estimated travelling times, etc, and suggest and justify possible alternative routes. • Use maps in conjunction with other travel resources (e.g. *exchange rate information; distance chart; bus timetable; etc*) and financial information (e.g. *fare tables; petrol price; etc) to plan and cost a trip*). • Make decisions regarding appropriate stopping points during a journey based on considerations of fatigue, petrol consumption, travelling time, etc.
Plans	• Identify the scale of a plan. • Explain the meaning of terms (e.g. *floor plan; elevation plan; layout plan; etc).* • Read off the value(s) of given dimensions on the plan (e.g. *the length of the wall is 4 m).*	• Use a given key to identify the number of windows/doors/rooms shown on a plan for a building. • Identify on which plan a particular structure is shown (e.g. *the door is shown on the North elevation plan).*	• Measure dimensions on a plan and use a given scale to determine actual dimensions. • Use plans in conjunction with other content, skills or applications to complete a project (e.g. *interpret plans to determine the dimensions of a room in order to establish the amount of carpet needed for the floor of the room).*	• Describe an item represented in a plan. • Critique the design of a structure shown on a plan. • Decide on an appropriate scale in which to draw a plan and then draw the plan. • Make connections between plans showing different views of the same structure (e.g. *explain which wall shown on a floor plan is represented on a particular side view plan).*

TOPIC: MAPS, PLANS AND OTHER REPRESENTATIONS OF THE PHYSICAL WORLD				
Section	**Level 1: Knowing**	**Level 2: Applying routine procedures in familiar contexts**	**Level 3: Applying multi-step procedures in a variety of contexts**	**Level 4: Reasoning and reflecting**
Models	• Measure the dimensions of a structure for which a model or 2D drawing will be constructed.	• Build a model using a given table of dimensions or a given net/cut-out.	• Use a given scale to determine the dimensions in which to build a model or make a 2D drawing, and complete the project. • Build a model and use the model in conjunction with other content, skills or applications to solve a problem (e.g. *build a model of a container and use the model to investigate different types of packaging arrangements; or build a model of a container and determine the surface area and volume of the model to investigate the amount of storage space available in the container).*	• Decide on an appropriate scale in which to build a model or make a 2D drawing, use the scale to determine dimensions, and complete the project. • Construct and compare two models in terms of storage space and materials used and make a decision about which model will the better choice for packaging an item. • Analyse a model and critique the layout of the structure shown in the model.

TOPIC: DATA HANDLING				
Section	**Level 1: Knowing**	**Level 2: Applying routine procedures in familiar contexts**	**Level 3: Applying multi-step procedures in a variety of contexts**	**Level 4: Reasoning and reflecting**
Developing questions and collecting data	• Read information directly from a given questionnaire/survey (e.g. *the name of the organisation for which the questionnaire is being conducted*). • Complete a given questionnaire.	• Conduct a given questionnaire/ survey with a group of people.	• Decide on appropriate questions to include on a questionnaire/survey, construct and then conduct the questionnaire/survey.	• Critique the questions/layout of a questionnaire/survey. • Make a deduction about whether collected information is biased or valid based on the structure of instrument used to collect the data and the way in which the data was collected.
Classifying and organising data	• Sort data from smallest to biggest. • Count the number of values in a data set. • Explain the difference between categorical data and numerical data; discrete and continuous data.	• Sort data according to two categories (e.g. *sort a set of data separately for females and males).* • Complete a given frequency table. • Calculate percentage values to represent the relative size of different categories of data.	• When given a raw set of data, sort the data, decide on appropriate intervals (if necessary), and construct a frequency table to organise the data. If necessary, use the frequency table to draw an appropriate graph to represent the data.	• Explain with justification whether data is discrete or continuous. • Analyse data organised in tables and make deductions about trends in the data.
Measuring data	• Identify the maximum and minimum values in a set of data.	• Calculate mean, median, mode and range for sorted data and for data sets containing an even and an odd number of data values.	• Calculate the mean, median and modal average for a set of data and decide with reasons which average provides the most accurate representation of the data. • Use data presented on a graph to determine the mean, median, mode and range of a data set.	• Analyse measures of central tendency and spread and make deductions about trends in the data. • Interpret tables and charts showing percentile/quartile values and explain what those values represent in relation to the scenario represented in the table/chart. • Compare measures of central tendency/spread calculated for two sets of data and use these measures to explain differences between the data sets.
Representing data	• Read values directly from the values provided on graphs.	• Draw a specified graph from a given table of data. • Estimate values from given graphs.	• Organise data using an appropriate table, decide on the most appropriate format for representing the data (that is, actual values or percentages), and decide on the most appropriate graph needed to represent the data.	• Analyse graphs and make deductions about trends in the data and predictions for the future.

TOPIC: PROBABILITY				
Section	**Level 1: Knowing**	**Level 2: Applying routine procedures in familiar contexts**	**Level 3: Applying multi-step procedures in a variety of contexts**	**Level 4: Reasoning and reflecting**
Expressions of probability Prediction Evaluate expressions of probability	• Identify the percentage chance of rain for a particular town from a weather report in a newspaper. • Explain the meaning of terms associated with probability (e.g. *event; outcome*).	• Express the probability of an event using fraction, percentage and decimal notation. • Identify all of the possible outcomes of a particular event (e.g. *rolling a dice; gambling game).* • Explain whether or not a particular rainfall prediction indicates that it is more or less likely to rain.	• Conduct an experiment to compare the experimental probability of an event to its theoretical probability. • Identify appropriate values from a given table of data values (e.g. *on motor vehicle fatalities in South Africa*) and express the probability of certain events shown on the table. • Develop a game involving probability and play the game with another learner in the class.	• Analyse a table of rainfall data for a town and make predictions about the chance of rain in that town during a particular month during the year. • Explain whether the statement “if I take the same Lottery numbers every week then my chances of winning increase” makes sense. • Critique the use of references to probability values in newspaper articles. • Analyse a table showing risk assessment profiles for people from different age groups and explain why particular age groups are classified as higher risks than others. • Analyse a game involving probability and make a deduction about the fairness of the game.

4.8 General

This document should be read in conjunction with:

4.8.1 *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R-12*; and

4.8.2 The policy document, *National Protocol for Assessment Grades R-12.*