GAUTENG DEPARTMENT OF EDUCATION
DIRECTORATE:
EXAMINATIONS AND ASSESSMENT

GUIDELINE DOCUMENT FOR
CONTINUOUS ASSESSMENT (CASS)
PORTFOLIO

MATHEMATICS

GRADE 12
2008

GAUTENG DEPARTMENT OF EDUCATION

CONTINUOUS ASSESSMENT

CONTENTS

1.   What is a portfolio?

A portfolio is a collection of a learner's work and is determined by the Subject Assessment Guidelines (SAG).

A variety of items are organised in a certain format that will then form the learner's portfolio. It should **always** be available in the classroom, so that the learners can work on it whenever they find it necessary to do so. Items, which can be included in such a portfolio, include investigation tasks, small projects, tests and examinations, which are collected over a period of time and which serve a specific purpose.

Portfolios are also defined as an ongoing systemic collection of evidence that represent milestones in the learner's journey towards excellence. This collection includes items, which represent the whole curriculum, and also shows how the learner's journey has progressed towards completion of the curriculum.

The collection of portfolio activities serves as a summary of the learner's progress throughout the year. Portfolios enable the teacher to find out more about the learner as an individual, but the learners also find out more about themselves.

Arter and Spandel summarise the main characteristics of portfolios when they describe it as follows: *"A portfolio is a purposeful collection of student work that tells the story of the student's efforts, progress or achievement in given area(s)."*

It is thus emphasised that a portfolio is an arrangement of the characteristics of authentic assessment. It makes continuous assessment possible and includes a rich variety of items as evidence of what the students know and can do. The content of portfolios can be created within realistic contexts. In addition, it can also be a reflection of the process of product development. It provides an excellent opportunity to transform assessment into a learning experience. Think of the portfolio as a mechanism whereby a story is told – a story that will communicate something about the learner to the reader.

2.   Purpose

The primary reasons for using portfolios as a collection of evidence include:

- Authentic assessment of the learner's accomplishment of learning outcomes
- Authentic assessment of the quality of learners' sustained work
- Allowing learners to turn their own special interests and abilities into a show-case
- Encouraging the development of qualities such as pride in quality workmanship, ability to self-evaluate, and ability to accomplish meaningful tasks
- Providing a document learners may use in the future for college or university application and job seeking
- Documenting improvement in learners' work

3.   Assessment in Grade 12

In Grade 12, assessment consists of two components: a Programme of Assessment which makes up 25% of the total mark for Mathematics and external assessment which makes up the remaining 75%. The Programme of Assessment for Mathematics comprises seven tasks that are internally assessed. The external assessment components comprises of Paper 1, Paper 2 and Paper 3. Paper 3 will be optional to all learners in grade 12 from 2008 to 2010. It is anticipated that those assessment standards identified as optional will in time (after 2010) become compulsory. Paper 1 and 2 will be used for progression purposes, while Paper 3 will be recorded as an optional extra subject and will not affect the average of the learner.

For the benefits of their learners, educators are strongly encouraged to work towards teaching the content and reasoning required by the Optional Assessment Standards as soon as possible.

Together the Programme of Assessment and the external assessment component make up the annual assessment plan for Grade 12.

The following table shows the annual assessment plan for Mathematics:

Annual assessment plan for Mathematics: Grade 12

TERM	TASKS	WEIGHT (%)
Term 1	Test	10
	Investigation or Project	20
	Assignment	10
Term 2	Assignment	10
	Examination	15
Term 3	Test	10
	Examination	25
Internal assessment mark		100

4. Content of portfolios

The content for portfolios of Mathematics is guided by the programme of assessment as stipulated in the Subject Assessment Guidelines (SAG).

The portfolio comprises of:
- Two tests (First and Third term)
- Two written Examinations (Mid-year and Prelim)
- Investigation or Project (First term)
- Two Assignments (First and Second term)

5. Programme of Assessment in Grade 12

5.1 Tests

Two of the assessment activities should be tests written under controlled conditions at a specified time. A test should last at least 60 minutes and count a minimum of 50 marks. Standardised tests must be conducted under controlled exam or test conditions. Learners are expected to prepare for these tests and the content that will be tested must be explicitly communicated to the learners before the test.

5.2 Assessment Tasks

The assessment tasks should be carefully designed tasks that give learners multiple opportunities to research and explore the subject in exciting and varied ways.

5.2.1 Assignment

An assignment in the context of Mathematics is a well-structured task with clear guidelines and well-defined solutions. While the educator may allocate classroom time to supervise the completion of an assignment, parts of an assignment could also be completed by the learner in his or her own time.

5.2.2 Investigation

An investigation in the context of Mathematics may take the form of a research task wherein data and / or information is collected to solve a problem.

5.2.3 Project

A project, in the context of Mathematics, is an extended task where the learner is expected to select appropriate Mathematical content to solve a context-based problem.

5.3 Examinations

The National Senior Certification process includes a formal External Assessment at the end of Grade 12. The formal external examinations assess the Assessment Standards of Grade 10, 11 and 12. The Assessment will consist of two compulsory papers (Paper 1 and Paper 2) and one Optional Paper (Paper 3).

The Preparatory Examination needs to be closely related to the final examination in terms of time allocation, layout of the paper and subject requirements.

See the Subject Assessment Guidelines for an outline of Grade 12 examination paper.

6. Learner's portfolio

The learners' portfolios should be well planned, organised and presented in a neat manner, for example, a file. It should include the following:
- A contents page;
- A continuous moderation report; (school, cluster & district)
- A declaration by the learner;
- A summary of marks;
- The tests, examinations and assessment tasks each clearly separated by sub-dividers (No plastic sleeves or flip files may be used).

7. Teacher's portfolio

It is required from the Department of Education that a teacher's portfolio should accompany the learners' portfolios. This portfolio should include the following:
- A contents page;
- The formal Programme of Assessment;
- The requirements of each of the assessment tasks (e.g. Standardized tests, Assignments, Investigation or Project and Examination papers);
- The tools used for assessment for each task (e.g. memoranda, checklists, rubrics)
- Record sheets for each class (working mark sheets).
- It should contain model answers to all assessment tasks.
- It should follow the same logical order as the learners' portfolio.

8. Evaluating portfolios

Periodic evaluation of portfolios should be conducted at a time predetermined by the teacher and the learners. Logical times for evaluation would be at the conclusion of a project, the end of a programme or unit, term or academic year.

The teacher must ensure that every assessment task is marked and captured. Marks on the teacher's record sheets must correspond with the marks in the learners' portfolios.
Moderation of the assessment tasks should take place at three levels during the year, namely school, cluster and provincial level.

8.1 School moderation

The Programme of Assessment should be submitted to the Head of Department or Subject Head and School Management Team before the start of the academic year. The Learning Programme must also be submitted. Each task that will be used for the Programme of Assessment should also be submitted to the Head of Department or Subject Head for moderation before it is given to the learners to do. A minimum of 10% of the learners' portfolios should be moderated **at least once** per term by the Head of Department /Subject Head or by his or her delegates.

8.2 Cluster moderation

Teacher portfolios and a sample of learners' portfolios will be moderated at least three times during the first three terms. The final selection of portfolios by Province must be moderated after the Preparatory Examinations. Cluster leaders or district subject coordinators can also do the moderation.

8.3 Provincial moderation

At the end of the academic year pre-selected learners' portfolios will be submitted and moderated at provincial level.

SKILLS AND PERFORMANCE INDICATORS

The following table lists some of the skills that may be assessed in formative assessment. The performance indicators given alongside may assist educators to identify the instances where the skills are demonstrated.

SKILLS	PERFORMANCE INDICATORS
	This will be evident when learners:
Problem solving	Complete the task adequately by providing an acceptable solution and explanation and contextual interpretation
Investigative skills	Complete the task adequately by providing an acceptable solution and explanation and further questions arising from the task
Accessing and processing data	Consider all possibilities Ensure that they work with an adequate spread of data Representative sample Execute required calculations Interpreting results Appropriate representation of data of results
Research skills	Planning and execution of the required steps Considering constraints Evaluating results
Management skills	Complete the task in the set time Effective use of available resources Use appropriate technologies
Conjecturing	Observing patterns or regularities Formulate and justify general formula or rule
Logical reasoning	Recognise patterns and make and justify conjectures
Critical reasoning	See beyond the superficial elements of the task Considering alternative approaches Considering merits of different approaches
Communication	Present project clearly Use of appropriate diagrams and illustrations Use appropriate mathematical language
Representing	Draw appropriate diagrams Supply appropriate labels, annotations, captions
Finding patterns	Systematically execute the investigation Describing patterns Looking for common features Looking for differences
Generalising	Formulate conclusions and produce a general formula or rule Explain or justify formula or rule

LEARNER'S CUMULATIVE MARK SHEET   **MATHEMATICS**

PLACE THIS AT THE FRONT OF THE LEARNER'S PORTFOLIO

NAME	

CENTRE NAME	

CENTRE NO.							

EXAM NO.												

PART A	MAX	MARK	MODERATION
1. EXAMINATIONS			
1.1. MID-YEARLY EXAM	**15**		
1.2. PREPARATORY EXAMINATION	**25**		
2. TESTS			
2.1. TEST 1	**10**		
2.2. TEST 2	**10**		
TOTAL OF PART A	**60**		

PART B	MAX	MARK	MODERATION
3. INVESTIGATION OR PROJECT	**20**		
4. ASSIGNMENTS			
4.1 ASSIGNMENT 1	**10**		
4.2 ASSIGNMENT 2	**10**		
TOTAL PART B	**40**		
TOTAL (PART A + PART B)	**100**		

DECLARATION OF OWNERSHIP OF PORTFOLIO

NAME												
EXAMINATION NUMBER												
CENTRE NUMBER												

DECLARATION OF OWNERSHIP OF WORK DONE IN THIS PORTFOLIO

Declaration by the Educator:

I declare that all the work done in this portfolio is the sole work of this learner, unless he/she was required to work as part of a group.

Signed: _____   Date: _____

Declaration by the Learner:

I declare that all the work done in this portfolio is my own work, unless I have been required to work as part of a group.

Signed: _____   Date: _____

	FET: MATHEMATICS					EDU-CATOR			CASS				
	CONSOLIDATED MARKSHEET								APPENDIX D				
	CENTRE NO.												
	EXAM NO.	SURNAME & INITIALS	MID	PREP.	TEST 1	TEST 2	TOTAL	INVEST	ASS 1	ASS 2	TOTAL	TOTAL
			EXAMS	EXAMS			PART A	PROJECT			PART B	A + B
			15	25	10	10	60	20	10	10	40	100
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

APPENDIX E

CONTROL LIST FOR MATHEMATICS PORTFOLIO FOR PROVINCIAL MODERATION

TO BE PLACED IN THE FRONT OF THE EDUCATOR'S FILE

CENTRE NUMBER						

NAME OF CENTRE:

_____

1.	**EDUCATOR'S FILE**		
	Centre number on Educator's file	**YES**	**NO**
	CONSOLIDATED MARKSHEET of whole group **(APPENDIX D)**	**YES**	**NO**
	EVIDENCE OF CLUSTER MODERATION SHEETS	**YES**	**NO**
	Prescribed sections in file		
	a) Mid- Year Examination b) Preparatory Examination c) Two tests (Term 1 and Term 3) d) Investigation or Project (Term 1) e) Assignment 1 f) Assignment 2	**YES** **YES** **YES** **YES** **YES** **YES**	**NO** **NO** **NO** **NO** **NO** **NO**
	Sections separated with coloured dividers	**YES**	**NO**
	File bound	**YES**	**NO**
	School Moderation	**YES**	**NO**

2.	**LEARNER'S FILE**		
	Sections separated with coloured dividers	**YES**	**NO**
	File bound	**YES**	**NO**
	Declaration of own work	**YES**	**NO**
	Prescribed sections in file		

		YES	NO
(a) Mid-Year Examination	(Term2)	YES	NO
(b) Preparatory Examination	(Term 3)	YES	NO
(c) Two tests	(Term 1 and Term 3)	YES	NO
(d) Investigation or Project	(Term 1)	YES	NO
(e) Assignment 1	(Term1)	YES	NO
(f) Assignment 2	(Term 2)	YES	NO

3.	CUMULATIVE MARK SHEET OF LEARNER (APPENDIX B)		
	In front of Learner's file	YES	NO
	Learner's centre number and exam number	YES	NO
	Mark allocation for each section corresponds	YES	NO

4. CANDIDATES IDENTIFIED FOR MODERATION BY GDE:

	EXAMINATION NUMBER	CANDIDATE'S NAME	AVERAGE % MARK A + B	MODERATED % MARK FOR A + B
1.				
2.				
3.				
4.				
5.				
6.				
7				

5.	STANDARD OF EXAMINATIONS / TESTS / ACTIVITIES		

6.	STANDARD OF MARKING		TOO LENIENT	TOO STRICT
7.	WORK SIGNED BY EDUCATOR		YES	NO
8.	STANDARD OF CANDIDATE'S WORK	GOOD	ACCEPTABLE	POOR

9.	*MARKS ACCEPTABLE*	YES	NO
	(Comment if not acceptable)		

10.	**GENERAL COMMENTS BY EVALUATOR**

SIGNATURE OF EVALUATOR: **DATE:**

11.	**SENIOR / INTERNAL MODERATOR'S COMMENT**

SIGNATURE OF MODERATOR: **DATE:**

# APPENDICES

APPENDIX F

ACTIVITIES

ASSIGNMENT 1

1. Write down the domain and range of g(x) = -x^2 as intervals of $(-\infty;-\infty)$.(2)

2. If the domain of f(t) = 2^t is the set {0;1;2;3;4;5;6} what is the range of f ? (2)

3. Write down the domain and range of h(x) = $\dfrac{1}{x}$ as intervals of $(-\infty;-\infty)$. (2)

4. Is the relation s^2 = 9t and t$\in(0;\infty)$ a function or a non-function ? Give a
   reason.   (2)

5. Apply the vertical line test to check which of the following graphs represent
functions. Also write down the domain and range show by each graph.
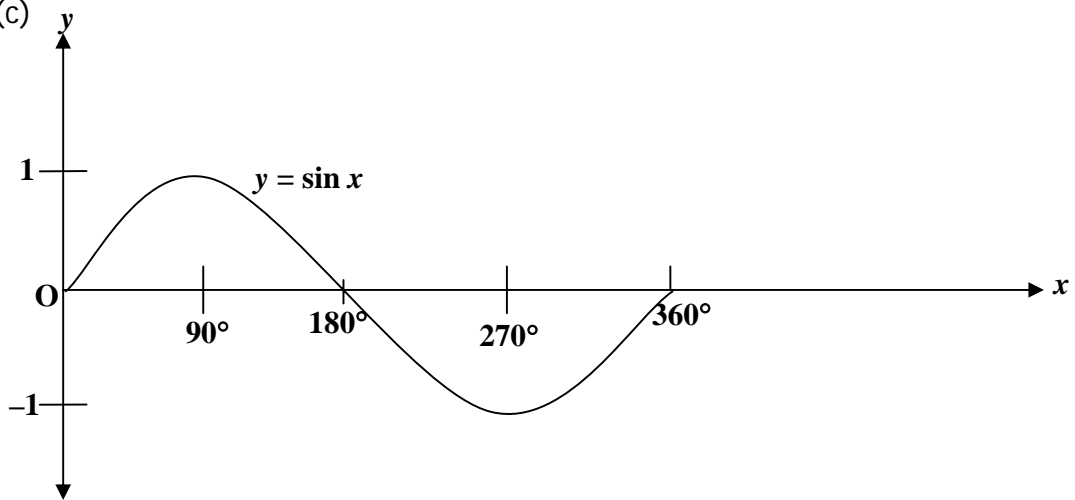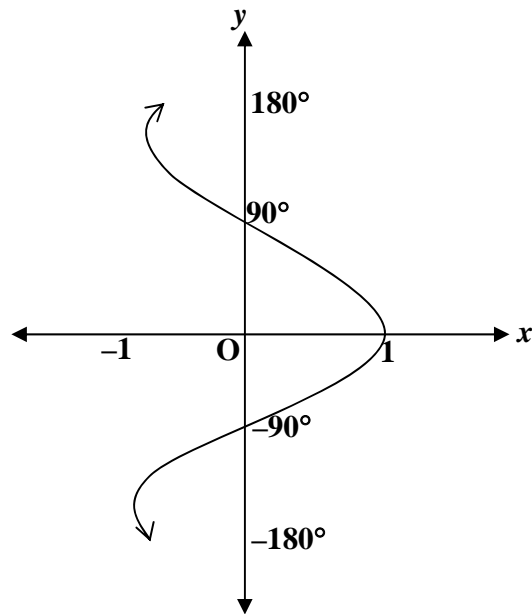
(a) $y = x^2$

(3)

(b)

(3)

(c)

$y = \sin x$
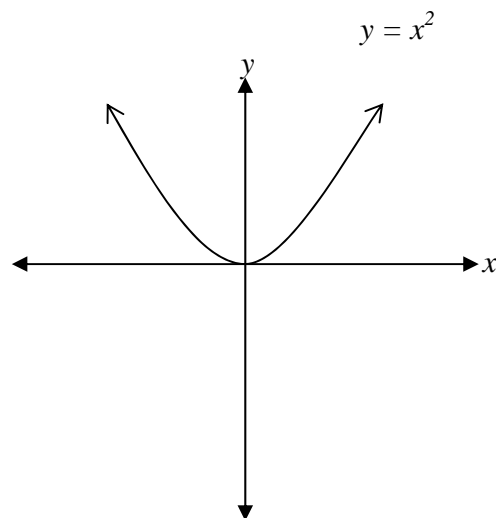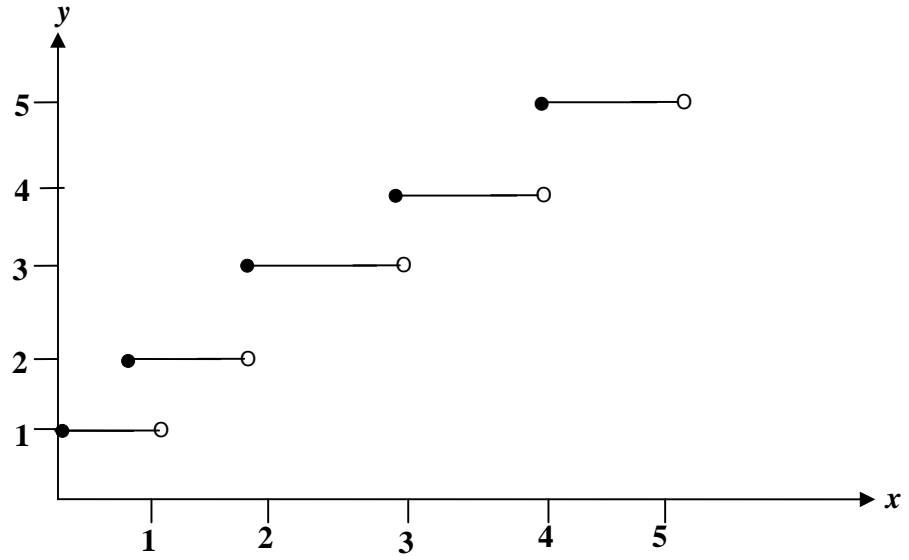
(3)

(3)

6. (a) Draw sketch graphs of the function f, (x) = - $(2)^x$ and f_2 (x) = - $(\frac{1}{2})^x$ on the

   same set of axes.   (4)

   (b) Write down notes about y-intercepts, x – intercepts, asymptote, domain, range, increase and decrease of $f_1(x)$ and f_2 (x).   (5)

   (c) Are the graphs of f_1 and f_2 mirror images of each other and, if so, in which line?   (1)

MARKS: 30

ASSIGNMENT 2

1. Calculate the mean, median and mode of each of the following data sets:
   (a) 15; 16; 18; 20; 21; 22; 29   (4)
   (b) 44; -21; 39; 98; 25; 28; 39; 67; -72; -95   (4)

2. Calculate the range, Q_1 and Q_3 for each of the data sets in number 1.   (10)

3. Calculate the variance and the standard deviation of this data set: -
   11; -4; 0; 5; 6; 8; 9; 21; 27; 29; 31   (5)

4. For the data set in number 3, find the:
   (a) 15th percentile   (2)
   (b) 85th percentile   (2)

5 Give an example of a data set with the following characteristics:
   There are five values in the data set. The range is 49 and the median is 25.
   The mode is 31 and the mean is 26.   (3)

Marks: 30

INVESTIGATION 1

To investigate the inverses of exponential graphs

Copy and complete the following table and draw the graphs on the given functions on the same set of axes

y	-3	-2	-1	0	1	2
$x = 2^y$						
$y = x$						

x	-3	-2	-1	0	1	2
$y = 2^x$						

(3)

$x = 2^y$, $y = x$ and $y = 2^x$

In a group answer the following questions:
1. Where does each graph cut the x-axis? (3)
2. Where does each graph cut the y-axis? (3)
3. What is the domain of each graph? (3)
4. What is the range of each graph? (1)
5. Which graph forms the axis of symmetry? (1)
6. Discuss the relationship between $x = 2^y$ and $y = 2^x$. (2)
7. Compare the equation of a logarithm function to its graph. (1)
8. Change the base of the logarithm function and examine how the graph changes in response. (2)
9. Use the line $y = x$ to compare the associated exponential function. (1)
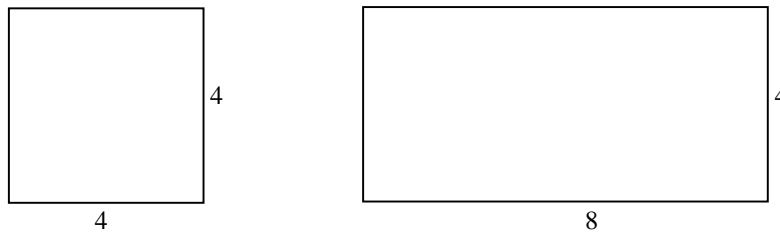
TOTAL: 20

(A memorandum can be used to assess the investigation)

INVESTIGATION 2

The following investigations need to be done in a group.

2.1   Area and perimeter

The statement is made: *"As the perimeter of a rectangle increases, the area increases. For example, look at these rectangles:*

Perimeter = 2(4+4) =16   Perimeter = 2 (8+4) =24
Area   = 4 x 4 =16   Area   = 8 x 4 =32

Investigate the statement (Show all the calculations and formulae used, as well as supporting tables).
Compare rectangles with the squares pertaining to the same lengths and breadths, using at least five different sizes.

2.2   *Matches*

Sipho builds triangles as shown. How many matches does he need to build 100 such triangles?
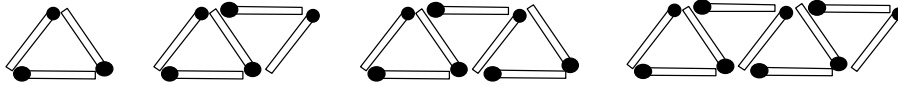
Complete the following table:

# triangles	1	2	3	4	100	n
# matches						

Write down an equation between the number of the matches and the number of triangles, thus a general conjecture.

Rubric to assess Investigation 2:

Criteria	Not achieved	Partially achieved	Achieved	Excellent
Formulae	No formulae are correct	Part of the formulae is correct	Either the formula for perimeter or area is correct	Formulae are correct
Perimeter and area calculations	Can not do any calculations	Some calculations are correct	Either the perimeter or the area is correct	Both perimeter and area are correct
Comparison between perimeter and area	No comparison could be made.	A comparison could be made, but incorrect	A comparison could be made, without a logical conclusion.	A logical, correct comparison could be made
Completion of table	Only 1 or 2 columns completed	At least 4 columns completed	At least 5 columns completed	All columns completed
Conjecture	No attempt to find a conjecture	An attempt is made, but no logical explanation	Logical explanation, but not correct	Correct conjecture with constructive explanation
				Total: 20

PROJECT

The cost of post Grade 12 studies

Work in groups: You have two weeks to complete this project.

You are in your last year of study at school. Suppose your intention is to study further next year at the university, FET College or any other institution. Find out what the fees will be for the particular course you intend to do. The cost of your studies for the first year will be the current amount. This amount will most certainly be increased the following year. In order to find out what the increased amount will be, you need to find out what the amount was for the past three years. These amounts will give you an indication of the percentage increase for the next year.

Use the table to work out the percentage increase:

Note: The following formula may help you to calculate the percentage increase for one year:

Percentage increase = $\dfrac{\text{New fees} - \text{Old fees}}{\text{Old fees}}$ x 100 %

1.

YEAR	FEES	PERCENTAGE INCREASE
Year before last (200 ..)		
Last year (200 ..)		
Current year (200 ..)		

Thus, the average increase is: _____

2. (a) Use this average percentage increase to calculate the following:

Money	Current amount (this year)	New amount (Next year)
Application fee		
Tuition fee (first year)		
Accommodation (per month x 12)		
Transport (per month x 12)		
Food (per month x 12)		
Books (give average amount)		
Extras (example pocket money)		
TOTAL		

Note: Only fuel, food and accommodation will be paid, if you will be living on campus, away from home.

(b) Draw a double bar graph to represent the amounts reflected in the above table (excluding the TOTAL).

3. (a) How will you source the money needed for further study ?

Money coming from	Amount
Bursary	
Loan (from bank)	
Parents/relatives	
Other	

(b) Draw a pie chart to represent the amount in the above table.

4. (a) Examine the proposed tuition fees for your course (next year). If the
     average increase remains the same for the next three years, how much will
     you have to pay for tuition fees in your:

     2nd year of study:_____

     3rd year of study:_____

     4th year of study:_____   (If your course lasts for three
     years)

   (b) Draw a line graph to represent the information in 4(a). (Do not forget to
     include the fees for the first year)

5. Suppose you get a loan from a bank, for the 3 or 4 years of your study, to
   cover your tuition fees. If the bank charges an interest rate of 12% p.a.,
   compounded monthly, how much will you owe the bank after you have
   completed your studies (assume that you pass all the years).

6. Reflect on this project:
   (a) Was it easy to get information from the Universities/Colleges/other
       institutions? Explain.
   (b) Are post-grade 12 studies accessible to all? Explain.

(c) What can be done to assist learners that are very capable of further studies, but do not have money to do so?

(d) What will you do to ensure that you are accepted for further study and that you have the money to do so?

RUBRIC TO ASSESS THE PROJECT

Criteria	7 Outstanding	6 Meritorious	5 Substantial	4 Adequate	3 Moderate	2 Elementary	1 Not achieved
1. Access information from universities, etc. and make necessary calculations question 1 – 2	Can access information correctly; all calculations accurate.	Nearly all information and calculations correct.	Most of the information and calculations correct.	Adequate attempt made at accessing information and completing calculations.	Some attempts made but there are some errors.	Attempt made but largely inaccurate.	Very poor attempt; information is vague and lacks authenticity.
2. Completion of calculations, tables in question 3 – 5.	All calculations, graphs and tables accurate.	Nearly all calculations, graphs and tables accurate.	Most calculations, graphs and tables accurate.	Adequate attempt made in calculations and completions of graphs and tables.	Some attempts made but there are some errors.	Attempt made but largely inaccurate.	Very few attempt; too many mistakes make little sense.
3.Reflection of project (question 6)	Addressed all aspects of questions succinctly and with insight.	A response full of merit.	A substantial effort in the reflection of the project.	The reflection is adequate and there is room for improvement.	A moderate attempt made; room for improvement.	The attempt is fairly elementary and lacks insight.	Very poor attempt; largely meaningless.