education

Department of Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CURRICULUM STATEMENT GRADES 10-12

SUBJECT:
MATHEMATICS

TEACHER TRAINING MANUAL
2006

CONTENTS

PROGRAMME

PERIOD: **Monday to Friday**

DURATION: 36 – 37 hours

5-DAY PROGRAMME FOR TEACHERS-

SESSION	ACTIVITY	TIME	DAY
1. Introducing the National Curriculum Statement (NCS) and the National Senior Certificate (NSC)	Activity 1: Introduction of participants	08:30 – 08:45	Monday
	Activity 2: Overview of the week	08:45 – 09:00	
	Activity 3: Introduction to the NCS and NSC	09:00 – 10:30	
	TEA BREAK	10:30 – 11:00	
1. Introducing the National Curriculum Statement (NCS) and the National Senior Certificate (NSC)	Activity 3: Introduction to the NCS and NSC	11:00 – 12:00	Monday
2. Introducing the Subject Statement	Activity 1: Introduction to Mathematics	12:00 – 13:00	Monday
	LUNCH BREAK	13:00 – 14:00	
2. Introducing the Subject Statement	Activity 1: Introduction to Mathematics	14:00 – 15:30	Monday
	TEA BREAK	15:30 –16:00	
2. Introducing the Subject Statement	Activity 2: Learning Outcomes and Assessment Standards	16:00 – 18:30	Monday
2. Introducing the Subject Statement	Activity 3: Content and Context for attaining Assessment Standards Part A	08:30 – 10:30	Tuesday
	TEA BREAK	10:30 – 11:00	
2. Introducing the Subject Statement	Activity 3 Part A Cont.	11:00 –13:00	Tuesday
	LUNCH BREAK	13:00 – 14:00	
2. Introducing the Subject Statement	Activity 3 Part B	14:00 – 15:30	Tuesday
	TEA BREAK	15:30 – 16:00	
2. Introducing the Subject Statement	Activity 3 Part B Cont.	16:00 – 18:00	Tuesday
2. Introducing the Subject Statement	Activity 3 Part C	08:30 – 10:30	Wednesday
	TEA BREAK	10:30 – 11:00	
2. Introducing the Subject Statement	Activity 3 Part C	11:00 – 13:00	Wednesday
	LUNCH BREAK	13:00 – 14:00	
2. Introducing the Subject Statement	Activity 3 Part D	13:00 – 15:30	Wednesday
	TEA BREAK	15:30 – 16:00	

2. Introducing the Subject Statement	Activity 3 Part D	16:00 – 17:30	Wednesday
2. Introducing the Subject Statement	Activity 4: recommendations and closure	08:30 – 09:00	Thursday
3. Planning for teaching subjects in the NCS	Activity 1: Introduction to the planning cycle	09:00 – 10:00	
TEA BREAK 10:00 – 10:30			
3. Planning for teaching subjects in the NCS	Activity 2: Introduction to the Grade 11 Work Schedule	10:30 – 11:30	Thursday
	Activity 3: Critique the Grade 11 Work Schedule	11:30 – 13:00	
LUNCH BREAK 13:00 – 14:00			
3. Planning for teaching subjects in the NCS	Activity 3: Cont.	14:00 – 15:30	Thursday
TEA BREAK 15:30 – 16:00			
3. Planning for teaching subjects in the NCS	Activity 3: Cont.	16:00 – 17:30	Thursday
3. Planning for teaching subjects in the NCS	Activity 4: Report back	08:00 – 09:00	Friday
	Activity 5: Development of the first Lesson Plan for Grade 11	09:00 – 10:00	
TEA BREAK 10:00 – 10:30			
4. Annual assessment plan	Activity 1: introduction to Assessment in the NCS	10:30 – 10:45	Friday
	Activity 2: Programme of Assessment for Grade 10 and 11	10:45 – 12:00	
	Activity 3: Development of A grade 11 annual Assessment Plan	12:00 – 13:00	
LUNCH BREAK 13:00 – 14:00			

SESSION 1 –
Introducing the National Curriculum Statement (NCS) and the National Senior Certificate (NSC) (3 – 4 hours)

ACTIVITY 1: Introduction of training participants

FORM OF ACTIVITY: Introductions

ACTIVITY 2: Overview of the week of training / documents provided

FORM OF ACTIVITY: Presentation

RESOURCES: The 5-day training programme (PowerPoint)
A hard copy of each document referred to-
- National Senior Certificate Policy
- Subject Statement
- Subject Assessment Guidelines
- Learning Programme Guidelines
- Teacher Guide – only applicable to Mathematical Literacy and Life Orientation
- National Protocol on Assessment
- Higher Education admission requirements

CONTENT:
- Training programme for the week and house rules
- Documents making up the National Curriculum Statement policy and documents supporting the National Curriculum Statement policy – purpose and status of each

ACTIVITY 3: Introduction to the NCS and NSC

<u>Part 1</u>:   **20 Questions**

FORM OF ACTIVITY: Test and discussion

RESOURCES: PowerPoint Presentation, Laptop, and Data Projector

CONTENT:
- 20 questions focusing on the NCS and NSC

INSTRUCTIONS:
- Allow the participants to record their responses to each question as individuals
- Discuss the answers with the group as a whole, inviting participants to offer answers before discussing them

Part 2:   **NCS and NSC**

FORM OF ACTIVITY: Presentation and discussion

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, a hard copy of each document referred to in the presentation-
- National Senior Certificate Policy
- Subject Statement
- Subject Assessment Guidelines
- Learning Programme Guidelines
- National Protocol on Assessment

CONTENT:
- Overview of the NCS, including principles and Critical and Developmental Outcomes
- National Senior Certificate: Requirements, structure and details

Part 3:   **Requirements for Higher Education study**

FORM OF ACTIVITY: Open-book and presentation

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, HE admission requirements

CONTENT:
- Requirements for certificate, diploma and degree programmes

INSTRUCTIONS:

Introduction
- While the Higher Education document is not part of NCS policy, it provides teachers with indicators on required learner performance in NCS subjects for entry into Higher Education
- The 3-year NSC programme is the key to Higher Education study and teachers need to be aware of the admission requirements for different programmes offered at Higher Education Institutions

Open-book activity
- Ask participants to study the HE document and identify the requirements for certificate, diploma and degree programmes

Report back and discussion
- Allow one report back
- Present the requirements (see PowerPoint Presentation)
- Discuss the designated list of subjects, noting that learners already have 3 of the designated subjects in their NSC package – two languages and Mathematics or Mathematical Literacy

SESSION 2 –
Introducing the Subject Statement (20 hours)

ACTIVITY 1: Introduction to Mathematics (2.5 hours)

Time Allocation:

Presentation: 20 minutes
Group Discussions: 1 hour
Report back from each group: 1 hour
Facilitator's wrap up: 10 minutes

FORM OF ACTIVITY: Presentation, group discussions, and report back.

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, and Subject
Statement.

CONTENT:

- Overview of the subject: Definition, purpose and scope of the subject, and its origin.
- Learning Outcomes (LOs) for the subject – briefly discuss the relationship of the LOs with the Critical and Developmental Outcomes and the NCS principles.
- The Assessment Standards of Mathematics.
- Time allocation for Mathematics in the school timetable.
- Incremental implementation of the Mathematics curriculum for Grades 10 – 12.

Facilitator makes a PowerPoint presentation of the Definition, purpose and scope of the subject, and its origin using key words.

In addition to the above, the facilitator will emphasise the following points:

- Mathematics is an essential element in the curriculum of any learner who intends to pursue a career in the physical, mathematical, computer, life, earth, space and environmental sciences or in technology.
- Mathematics in the FET builds on has been learnt in the GET (Numeracy, Space and Shape, Statistics, Financial issues) and prepares learners for further study.
- Mathematics, thus, provides a platform for linkages to Mathematics in Higher Education institutions as well as linkages to Mathematics of a complementary nature but specific to the needs of the individual in appropriate FET sites of learning.

INSTRUCTIONS FOR THE ACTIVITY:

- The relationship between the Learning Outcomes, and the Critical and Developmental Outcomes? See Appendix 2 Activity 2.1B
- The main differences between Report 550 syllabus for Mathematics and the Subject Statement for Mathematics. See Appendix 2 Activity 2.1C

Facilitator makes a presentation on Incremental implementation of Mathematics curriculum.

ACTIVITY 2: Learning Outcomes and Assessment Standards for Mathematics

Time Allocation: 2½ hours

Presentation: 20 minutes
Group Discussions: 1 hour
Report back from each group: 1 hour
Facilitator's wrap up: 10 minutes

FORM OF ACTIVITY: Presentation, analysis, group discussions, and report back.

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, Subject Statement, Learning Programme Guidelines, and Syllabus.

CONTENT:

- Learning Outcomes.
- Assessment Standards.

INSTRUCTIONS FOR THE ACTIVITY:

In your groups (5 to 6 members per group):

- Do a critical study of the Grade 10 – 12 Assessment Standards for Mathematics as provided in all four Learning Outcomes in the Subject Statement (Chapter 3 pp 16 – 43).
- What is the emphasis of each Learning Outcome?
- How are the Learning Outcomes related to each other?
- Does the Assessment Standards show progression? Motivate your answer.
- What is the best approach in teaching and learning these Learning Outcomes? Is it per Learning Outcome or integration of Learning Outcomes? Choose the best approach and motivate why you think the approach you chose is the best.

Groups will be expected to report their responses to the whole group.

ACTIVITY 3: Content and Context for the attainment of Assessment Standards (Subject Statement pp 34-54) (14.5 hours)

Note:

This activity is based on all four Learning Outcomes. The time allocation for each Learning outcome is as indicated in Part A – D of the activity (i.e. Part A refers to Learning Outcome 1). Repeat the instructions as given below for each part of the activity (for each LO).

FORM OF ACTIVITY: Presentation, analysis, group discussions, and report back.

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, Subject Statement, Learning Programme Guidelines, and Syllabus.

CONTENT:

- Content for Mathematics Grades 10 – 12.
- Possible contexts for Mathematics Grades 10 – 12.
- Gap analysis.
- Design and presentation of activities.
- How these activities can be assessed.

INSTRUCTIONS FOR THE ACTIVITIES:

- Do a critical study of the Grade 10 – 12 Content and Context for Mathematics provided in the Subject Statement (Chapter 3 pp 44 – 62) as well as pp 11 – 13 of the Learning Programme Guidelines.
- What are the main differences between Report 550 syllabus for Mathematics and the Subject Statement for Mathematics in terms of content and contexts? Do a gap analysis. See Appendix 2 Activities (Section 1) 2.3A – 2.3D.
- Develop an activity based on an Assessment Standards / Assessment Standards of each Learning Outcome. See Appendix 2 Activities (Section 2) 2.3A – 2.3D.
- What kind of teaching, learning and assessment approach is required to teach, learn and assess this activity?
- Assessing the activity: How, when, who and what to assess in this activity – make suggestions of the assessment tools or rubrics that can be used to assess learner performance in the activity and who should carry out the assessment.
- Does the activity address the Assessment Standards of Learning Outcome with respect to the skills, knowledge and values that will be acquired through exposure to the activity?
- What LTSM is required to teach the content of each Learning Outcome to achieve the skills, knowledge and values indicated in the Assessment Standards?
- Each group should present their activity to all participants.
- What are the main challenges in developing the activities?

Part A
LO1:   Number and Number Relationships

Time Allocation: 4 hours

Presentation: 15 minutes
Group Discussions: 2 hours
Report back from each group: 1.25 hour
Facilitator's wrap up and discussions on the activities: 30 minutes

Part B
LO2:   Functions and Algebra

Time Allocation: 4 hours

Presentation: 15 minutes
Group Discussions: 2 hours
Report back from each group: 1.25 hour
Facilitator's wrap up and discussions on the activities: 30 minutes

Part C
LO3:   Space, Shape and Measurement

Time Allocation: 4 hours

Presentation: 15 minutes
Group Discussions: 2 hours
Report back from each group: 1.25 hour
Facilitator's wrap up and discussions on the activities: 30 minutes

Part D
LO4:   Data Handling and Probability

Time Allocation: 2.5 hours

Presentation: 15 minutes
Group Discussions: 1 hour
Report back from each group: 45 minutes
Facilitator's wrap up and discussions on the activities: 30 minutes

ACTIVITY 4: Recommendations and closure (30 minutes)

- Participants are requested to comment on highlights and challenges on activities covered in Session 2. See Appendix 2 Activity 2.4
- The facilitator calls on a sample of participants to respond and wraps up Session 2.
- Activities, which were developed by the NCTT members, are distributed to the participants for reference and as additional resource materials.

ACTIVITY 1: Introduction to the planning cycle (½ hour)

FORM OF ACTIVITY: Presentation and discussion

RESOURCES: PowerPoint Presentation, Laptop, and Data Projector

CONTENT:

- Three stages of planning
- Purpose, role-players and duration per stage
- Issues to consider when developing a Learning Programme
- Brief overview of the key activities and development process per stage

ACTIVITY 2: Introduction to the Grade 11 Work Schedule (1 hour)

FORM OF ACTIVITY: Presentation and discussion

RESOURCES: OHP of Grade 11 Work Schedule, OHP Projector, OHP Pens, OHP Sheets, Subject Assessment Guidelines, Learning Programme Guidelines, and Subject Statement

CONTENT:

- Elements of design
- Process of design
  - o Integration: What, how and why?
  - o Sequencing: What, how and why?
  - o Pacing: What, how and why?
  - o Suggested assessment tasks: What and why? – will return to this in Session 4
  - o LTSM: What and why?

ACTIVITY 3: Critique the Grade 11 Work Schedule (4½ hours)

FORM OF ACTIVITY: Interactive, report back and discussion

RESOURCES: Grade 11 Work Schedule, Subject Statement, Learning
                        Programme Guidelines, and Subject Assessment Guidelines

CONTENT:

- Grade 11 Work Schedule

INSTRUCTIONS:

- Participants study the example of the Grade 11 Work Schedule (See LPG pp)
  provided and critique it:
  o Does the Work Schedule cover all the Assessment Standards (i.e. content)?
  o Integration: Are the Assessment Standards appropriately linked?
  o Are the Assessment Standards covered in sufficient detail and depth?
  o Pacing: Is the time allocation across the 40 weeks appropriate?
  o Sequencing: Is the content presented in the correct order?
  o Are relevant LTSM listed? If not, list the LTSM required.
  o How can the Work Schedule be improved?

ACTIVITY 4: Report back (1 hour)

FORM OF ACTIVITY: Report back and discussion

RESOURCES: Subject Statement, Learning Programme Guidelines

CONTENT:

- Improved Grade 11 Work Schedule

INSTRUCTIONS:

- Allow different groups to present their improved version of the exemplar Work
  Schedule for Grade 11
- Engage participants in a discussion after each presentation

ACTIVITY 5: Development of the first Lesson Plan for Grade 11 (1 hour)

FORM OF ACTIVITY: Presentation, interactive, report back and discussion

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, Subject Statement, and Learning Programme Guidelines

CONTENT:

- Grade 11 Lesson Plan
  - Elements of design
  - Process of design

INTRODUCTION:

- Lesson Plan: What it is and its duration
- Pointers on deciding on the number of Lesson Plans to be written
- Elements and design of a Lesson Plan
- Teaching method: What and why
- Assessment strategy: Who, when, how and form of assessment
- Expanded opportunities: Inclusive approach to accommodate all learners

INSTRUCTIONS:

- Provide an overview of the elements and the design process of a Lesson Plan
- Engage participants in the development of the first Lesson Plan that will be presented for the first 2 – 5 weeks of the school year according to the Grade 11 Work Schedule critiqued in Activity 3. See Appendix 3 Activity 3.3
- Allow one group to present and then discuss their presentation

SESSION 4 –
Annual assessment plan (8 hours)

ACTIVITY 1: Introduction to assessment in the NCS (¼ hour)

FORM OF ACTIVITY: Presentation and discussion

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, and National Protocol on Assessment

CONTENT:

- Approach to assessment: Criteria-driven
- Recording process: Record one global mark / code per task and refer to the Subject Assessment Guidelines for guidance on how to arrive at the final mark for the subject
- Reporting process: 7 codes and percentages
- Portfolios: Teacher and learner

ACTIVITY 2: Programme of Assessment for Grades 10 and 11

FORM OF ACTIVITY: Presentation and discussion

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, and Subject Assessment Guidelines

CONTENT:

- Programme of Assessment for Grades 10 and 11 (Section 2 of the Subject Assessment Guidelines): Number of tasks
- Nature of tasks: Forms of assessment suitable to the subject (Section 3 of the Subject Assessment Guidelines) and suitable tools
- Weighting of tasks for the formal Programme of Assessment and mark allocation

ACTIVITY 3: Development of a Grade 11 annual assessment plan

FORM OF ACTIVITY: Presentation, interactive and discussion

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, and Subject Assessment Guidelines

CONTENT:

- Programme of Assessment for Grade 11: Tasks, topics, tools and dates

INSTRUCTIONS:

- Engage participants in the compilation of a Grade 11 annual assessment plan in which they indicate:
  o Eight tasks: 2 Tests, 2 Examinations, 2 Investigation, 1 Assignment and 1 Project.
  o Assessment tools for each task
  o Date and duration of each task
- Ask participants to revisit the Grade 11 Work Schedule (Session 3: Activity 3) and to align the annual assessment plan for Grade 11 with the assessment tasks listed in the Work Schedule

APPENDIX 1 – Session 1

ACTIVITY 1.3 – PART 1

Make use of your knowledge of the NCS and related documents to answer the following questions.
- *Fill in the answers as quick as possible*
- *Keep answers short and to the point.*

No	Answer
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

ACTIVITY 1.3 – PART 3

Study the HE document and identify the requirements for certificate, diploma and degree programmes

HIGHER CERTIFICATE	DIPLOMA	BACHELOR'S DEGREE

Activity 2.1B: Relationship of LOS to COs and DOs and the NCS principles

Work in groups of 5 - 6. You are requested to do the following in your groups:

Make a study of the learning outcomes for mathematics and briefly discuss the relationship of the learning outcomes with the critical and developmental outcomes (COs and DOs) and the NCS principles. Use the following format to record your responses:

Note: Learning outcomes: pp 12 -14 of subject statement
        COs and DOs: page 2 of subject statement
        NCS principles: pp 1- 4 of subject statement

Learning outcome	COs and DOs	NCS principle/s
1		
2		
3		
4		

Report your findings to the whole group

Activity 2.1C: Main differences between the Report 550 syllabus and the NCS mathematics for grades 10-12.

Work in groups of 5 - 6. You are requested to do the following in your groups:
List the main differences between the NATED 550 syllabus for Mathematics and NCS Mathematics: Select your own criteria

Criteria	NATED 550	NCS

Report your findings to the whole group.

Activity 2.3: Content and Context for the attainment of Assessment Standards

Activity 2.3A (Sec. 1): Content, Context and Gap Analysis for Learning Outcome 1

Work in groups of 5 – 6. Each group should:

- Read page 62 of the Subject Statement and pages 11 – 13 of the LPG for Mathematics to identify possible contexts for the proposed content.

- Compare the proposed content for grade 11 Mathematics (Learning Outcome 1) with the NATED 550 Syllabus grade 10 – 12 to identify content that has been retained and new content (gap analysis).

Use the following format to record your responses:

CONTENT	CONTEXT (if any)	New to grade 11 (be specific)	Was content in NATED 550?
1			
2			
3			
4			
5			
6			
7			

Activity 2.3A (Sec. 2): Designing and assessing activities for Learning Outcome 1

Work in groups of 5/6. Each group should:

- Develop an activity based on one or more Assessment Standards of Learning Outcome 1. These Assessment Standards will be allocated by the Facilitator.

- Indicate the teaching and learning approach that is required to teach and learn this activity.

- Indicate how the activity will be assessed.

Use the following format to record your responses:

Learning Outcome: **1**

Assessment Standards (Identify the noun: Content for lesson)	Nature of Activity (Identify the verb which will generate the evidence)	Teacher Actions (What activity will teacher give learner to produce evidence)	Method of Assessment (Who will assess?)	Learner Actions (What will learner do to generate expected evidence: Form of Assessment)	Assessment Tool (for assessing learner performance: e.g. rubric, observation sheet, memo, etc)

Now answer the following questions based on the activity you designed:

- What LTSM will be required for the activity?
- What skills, knowledge and values will be acquired through exposure to the activity?
- What are some of the challenges in developing the activity?

Each group should present the following in their report back:

(1) The table on content, context and gap analyses
(2) The activity they designed
(3) Responses to the questions on their activity.

Discussion on Activity 2.3A and wrapping up by facilitator.

Activity 2.3B (Sec. 1): Content, Context and Gap Analysis for Learning Outcome 2

Work in groups of 5/6. Each group should:

- Read page 62 of the Subject Statement and pages 11 – 13 of the LPG for Mathematics to identify possible contexts for the proposed content.

- Compare the proposed content for grade 11 Mathematics (Learning Outcome 2) with the NATED 550 Syllabus grade 10 – 12 to identify content that has been retained and new content (gap analysis).

Use the following format to record your responses:

CONTENT	CONTEXT (if any)	New to grade 11 (be specific)	Was content in NATED 550?
1			
2			
3			
4			
5			
6			
7			

Activity 2.3B (Sec. 2): Designing and assessing activities for Learning Outcome 2

Work in groups of 5/6. Each group should:

- Develop an activity based on one or more Assessment Standards of Learning Outcome 2. These Assessment Standards will be allocated by the Facilitator.

- Indicate the teaching and learning approach that is required to teach and learn this activity.

- Indicate how the activity will be assessed.

Use the following format to record your responses:

Learning Outcome: **2**

Assessment Standards (Identify the noun: Content for lesson)	Nature of Activity (Identify the verb which will generate the evidence)	Teacher Actions (What activity will teacher give learner to produce evidence)	Method of Assessment (Who will assess?)	Learner Actions (What will learner do to generate expected evidence: Form of Assessment)	Assessment Tool (for assessing learner performance: e.g. rubric, observation sheet, memo, etc)

Now answer the following questions based on the activity you designed:

- What LTSM will be required for the activity?
- What skills, knowledge and values will be acquired through exposure to the activity?
- What are some of the challenges in developing the activity?

Each group should present the following in their report back: (1,25 hours)

(1) The table on content, context and gap analyses
(2) The activity they designed
(3) Responses to the questions on their activity.

Activity 2.3C (Sec. 1): Content, Context and Gap Analysis for Learning Outcome 3

Work in groups of 5/6. Each group should:

- Read page 62 of the Subject Statement and pages 11 – 13 of the LPG for Mathematics to identify possible contexts for the proposed content.

- Compare the proposed content for grade 11 Mathematics (Learning Outcome 3) with the NATED 550 Syllabus grade 10 – 12 to identify content that has been retained and new content (gap analysis) .

Use the following format to record your responses:

CONTENT	CONTEXT (if any)	New to grade 11 (be specific)	Was content in NATED 550?
1			
2			
3			
4			
5			
6			
7			

Activity 2.3C (Sec. 2): Designing and assessing activities for Learning Outcome 3

Work in groups of 5/6. Each group should:

- Develop an activity based on one or more Assessment Standards of Learning Outcome 3. These Assessment Standards will be allocated by the Facilitator.

- Indicate the teaching and learning approach that is required to teach and learn this activity.

- Indicate how the activity will be assessed.

Use the following format to record your responses:

Learning Outcome: **3**

Assessment Standards (Identify the noun: Content for lesson)	Nature of Activity (Identify the verb which will generate the evidence)	Teacher Actions (What activity will teacher give learner to produce evidence)	Method of Assessment (Who will assess?)	Learner Actions (What will learner do to generate expected evidence: Form of Assessment)	Assessment Tool (for assessing learner performance: e.g. rubric, observation sheet, memo, etc)

Now answer the following questions based on the activity you designed:

- What LTSM will be required for the activity?
- What skills, knowledge and values will be acquired through exposure to the activity?
- What are some of the challenges in developing the activity?

Each group should present the following in their report back: (1,25 hours)

(1) The table on content, context and gap analyses
(2) The activity they designed
(3) Responses to the questions on their activity.

Activity 2.3D (Sec. 1): Content, Context and Gap Analysis for Learning Outcome 4

Work in groups of 5/6. Each group should:

- Read page 62 of the Subject Statement and pages 11 – 13 of the LPG for Mathematics to identify possible contexts for the proposed content.

- Compare the proposed content for grade 11 Mathematics (Learning Outcome 4) with the NATED 550 Syllabus grade 10 – 12 to identify content that has been retained and new content (gap analysis) .

Use the following format to record your responses:

CONTENT	CONTEXT (if any)	New to grade 11 (be specific)	Was content in NATED 550?
1			
2			
3			
4			
5			
6			
7			

Activity 3D (Sec. 2): Designing and assessing activities for Learning Outcome 4

Work in groups of 5/6. Each group should:

- Develop an activity based on one or more Assessment Standards of Learning Outcome 4. These Assessment Standards will be allocated by the Facilitator.

- Indicate the teaching and learning approach that is required to teach and learn this activity.

- Indicate how the activity will be assessed.

Use the following format to record your responses:

Learning Outcome: **4**

Assessment Standards (Identify the noun: Content for lesson)	Nature of Activity (Identify the verb which will generate the evidence)	Teacher Actions (What activity will teacher give learner to produce evidence)	Method of Assessment (Who will assess?)	Learner Actions (What will learner do to generate expected evidence: Form of Assessment)	Assessment Tool (for assessing learner performance: e.g. rubric, observation sheet, memo, etc)

Now answer the following questions based on the activity you designed:

- What LTSM will be required for the activity?
- What skills, knowledge and values will be acquired through exposure to the activity?
- What are some of the challenges in developing the activity?

Each group should present the following in their report back: (45 min)

 (1) The table on content, context and gap analyses
 (2) The activity they designed
 (3) Responses to the questions on their activity.

Now compare your responses to Section 1 of Activity 3 Parts A – D with those given in the table below (pages 28 – 30).
- Do you agree with this analysis? Give more suggestions.

Activity 2.4: Summary of Session 2

Participants comment on highlights and challenges of activities covered in Session 2 using the following table:

Feature	Highlights	Challenges
1. Introduction to mathematics		
2. Unpacking learning outcomes		
3. Progression of assessment standards		
4. Content and context		
5. Designing activities		
6. Assessment of activities		
7. Content		

Facilitator calls on a sample of participants to respond and wraps up Session 2

	Report 550	NCS	Gaps	Methodology	ICT	Assessment
G R A D E 10	Products; Factors; Algebraic Fractions; Equations and inequalities in one unknown; Formulae; Functions; Solutions of systems of linear equations in two unknowns; exponents; Geometry; Trigonometry;	LO 1: Number patterns, simple and compound growth, exponents, surds, Foreign exchange rates LO 2: Functions; algebraic manipulation; Solution of; rate of change of a function. LO 3: Effects on the Volume and surface area; Investigation of polygons; Alternative definition of polygons; Co-ordinate Geometry; Transformation geometry, trigonometry, research into the history of the development of geometry and trigonometry LO 4: Data handling (calculations and representation); Probability	LO 1: Number patterns; Foreign exchange rates LO 2: NONE LO 3: NONE LO 4: Probability	The following issues drives the change in methodology: The principles of the NCS and its impact on classroom practice (this includes an OBE approach)	Learners need to exit the FET Band with a functional computer literacy. This means that they should be confident and competent in the use of word-processing, spreadsheets, e-mail and the internet. In general across all subjects learners should be exposed to these skills.	Outcomes based assessment implies amongst others the use of a variety of assessment methods and instruments The NCS also requires new ways of: • Recording and reporting learner achievement • Managing portfolios • Moderation
	Algebra: Absolute Value; Functions; Linear programming;	LO 1: Number patterns, Exponents, surds, Simple and compound decay; Different periods of compound growth and decay	LO: 1 Number patterns	The educational philosophy underpinning the Subject statement and its	Where available and appropriate for the	

	Report 550	NCS	Gaps	Methodology	ICT	Assessment

G R A D E 11	Quadratic equations and inequalities; the remainder and factor theorem; Systems of equations; exponents. **Trigonometry**: Six Trig ratios; Function values; Graphs; Use of calculator; Identities; Formulae **Geometry:**	LO 2: Functions; Conversion between numerical, graphical, verbal and symbolic representations; Investigation on the effects of the parameters on the functions; Graphs; Algebraic manipulation; Solution of, Average gradient, Linear programming
		
		LO 3: Apply the formulae of Volume and surface area; Euclidean Geometry; Co-ordinate Geometry; Transformation geometry, Trigonometry, Research into the history of the development of geometry and trigonometry in various cultures. LO 4: Calculations and data representation; Probability
			LO: 2 Study of functions including investigation of the effects of different parameters on these functions. Conversion between numerical, graphical, verbal and symbolic representations. **Imported from Grade 10 & 12:** Linear programming
			
			LO: 3 Transformation geometry, Research into the history of the development of geometry and trigonometry in various cultures.
			
			LO: 4 Calculations and data representation; Probability
				pedagogical implications such as:
				  - Learner centredness
				  - A problem
				  centred
				  approach
				
				- Mathematical modelling Managing diversity (equity in terms of addressing the differential needs of learners)
					subject: The use of different technologies (ICTs), in particular computers, scientific and/or graphic calculators. Available Software packages, especially customised software e.g. Geometers Sketchpad	

G	**Algebra:** Logarithms; Compound increase and decrease; Sequences and	LO 1: Logarithm; Number patterns, arithmetic and geometric sequences and series, calculation of growth and decay formulae; sigma	LO: 1 Annuities, bond repayments and sinking funds, with or without the use of the formulae, Loan			

	Report 550	NCS	Gaps	Methodology	ICT	Assessment
R A D E 12	series **Differential Calculus:** Average gradient; limits; rules for differentiating; applications **Trigonometry:** Trig functions; function values; Trig equations; **Geometry** **Analytical Geometry in a plane**	notation, proof and application of the formulae for sum of series, recursive formulae, Annuities, bond repayments and sinking funds, loan options LO 2: Functions; sketch graphs, Algebraic manipulation; Solution of..; Factorise third – degree polynomials, Differential Calculus, Linear programming LO 3: Euclidean Geometry; Co-ordinate geometry; Transformation geometry, Trigonometry, Research into the history of one or more geometries (spherical, taxi-cab, fractals) LO 4: Content from previous grades as used in statistical investigation; Sampling, Linear regression, Regression functions and correlation for bivariate data, normal distribution of data, probability problems using the fundamental counting principle	options LO: 2 NONE LO 3: Transformation geometry; Research into the history of one or more geometries (spherical, taxi-cab, fractals) LO: 4 Sampling, Linear regression, Regression functions and correlation for bivariate data, normal distribution of data, probability problems using the fundamental counting principle			

Activity 2.5 Some Mathematical Content

1. **The interrelated nature of mathematics: (3 independent solutions to the same problem).**
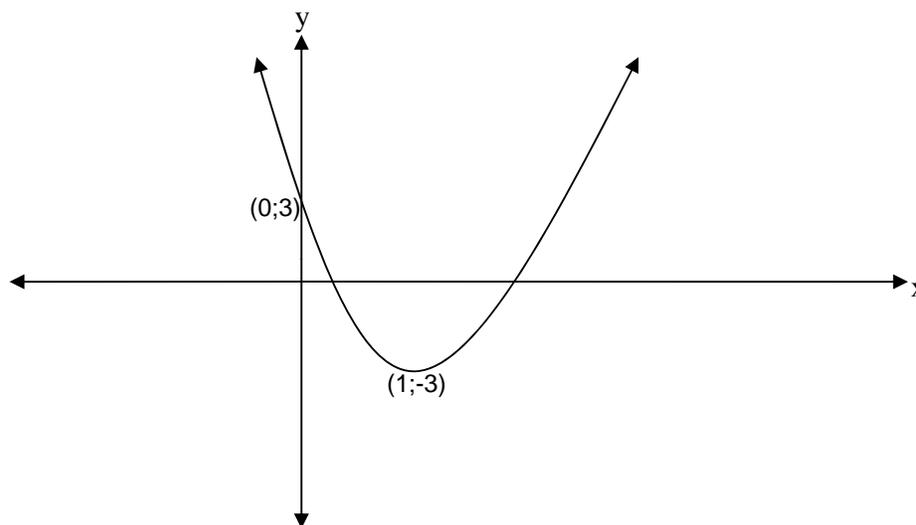
Find 3 independent ways of finding the equation of the quadratic function (parabola) in the above diagram. State the Learning Outcome/s and Assessment Standard/s addressed by each solution. (Grades 10 – 12)

2. **Mathematical Modelling**

In converting oven temperatures from degrees Celsius to degrees Fahrenheit some cookbooks suggest doubling the Celsius temperature reading to get the equivalent Fahrenheit temperature reading.

They, therefore use the equation:

$$F = 2C \qquad \text{(a)}$$

whereas the correct equation for the conversion is:

$$F = \tfrac{9}{5} C + 32. \qquad \text{(b)}$$

How justified is this convenient practice of "doubling – up"?
Draw the graphs of (a) and (b) on the same system of axes for the domain $[0^0; 360^0]$ and compare your graphs for the normal operating temperature of an oven.

State the Learning Outcome/s and Assessment Standard/s addressed by this problem. (Grade 11)

3. Venn Diagrams and tree diagrams

3.1. Venn diagrams can also be used to solve probability problems.

At a recent university registration, 120 students were interviewed. 75 of them indicated that they registered for a mathematics course; 21 stated they registered for a history course and 15 said they were registered for both mathematics and history. What is the probability that a student in this survey registered:

(a) only for mathematics
(b) for neither mathematics nor history
(c) only for history   (use a Venn diagram)

3.2 Tree diagrams can be used to solve probability problems

3.2.1 What is the probability that the children in a family of 3 children will be born in the order girl, boy, girl?

3.2.2 A box contains 2 blue marbles and 1 red marble. A marble is selected at random but not returned to the box and then a second marble is selected. What is the probability of selecting:
(a) 2 blue marbles?
(b) a red then a blue marble?
(c) a blue then a red marble?   (use a tree diagram)

State the Learning Outcome/s and Assessment Standard/s addressed by problems in 3.1 and 3.2 (Grade 11)

4. Enlargement of polygons

4.1 On graph paper draw a square with its vertices having the following
co-ordinates. (1;1); (1;-1); (-1;-1) and (-1;1).

4.1.1   What is the length of the side of the square?
4.1.2   On the same system of axes, draw another square with sides that are twice the sides of the original square. Write down the coordinates of the vertices of this square?
4.1.3   Now draw another square (on the same system of axes) with sides that are 3 times the sides of the original square. Write down the coordinates of this square?
4.1.4   What conclusion can you draw about the coordinates of the enlarged squares in relation to the coordinates of the original square?

4.2 Draw a pentagon with vertices A(1;1), B (1;-1), C(0:-2), D(-2;-1) and E(-1;1)

    4.2.1 On the same system of axes draw another pentagon FGHIJ with sides double
        that of pentagon ABCDE. (check order)
    4.2.2 Write down the coordinates of the vertices of pentagon FGHIJ.
    4.2.3 What do you notice about the coordinates of pentagon FGHIJ in comparison to
        the coordinates of pentagon ABCDE?
    4.2.4 Write another statement about the sides of the pentagons:
    4.2.5 Write the coordinates of another pentagon with sides 4 times the sides of
        pentagon ABCDE (without drawing the pentagon)

    State the Learning Outcome/s and Assessment Standard/s addressed by 4.1 and 4.2
    (Grade 11)

5. Number Patterns

5.1 For each of the following sets of sequences write down the next 4 terms:

5.1.1 2; 5; 8; ....
5.1.2 -6; -11; -16; …
5.1.3 2; 4; 8; …
5.1.4 -1; 3; -9; …

5.2. Write down the nth term of each of the above sets of sequences:

5.3 Now for each of the following sets of sequences write down the next 4 terms:

5.3.1 2; 5; 9; …
5.3.2 5; 8; 13; 20; …
5.3.3 3; 6; 13; 24; ….
5.4 How would you find the nth term of the sequences in 5.3?

6. The effect of parameters a, p and q on $y = \dfrac{a}{(x+q)} + p$ **and y = ab^{x+p} + q; b > 0)**

6.1 Sketch, on the same system of axes, the graphs of:

6.1.1 $y = {}^1/_x$
6.1.2 $y = {}^3/_x$
6.1.3 $y = ({}^3/_x) +2$
6.1.4 $y = ({}^3/_{x-2})$
6.1.5 $y = ({}^3/_{x-2}) + 2$
6.1.6 $y = ({}^3/_{x-2}) -2$

What is the effect of the parameters a, p and q on the graphs drawn

6.2 Sketch, on the same system of axes, the graphs of:

6.2.1 $y = 2^x$
6.2.2 $y = 3^x$
6.2.3 $y = 3.2^x$
6.2.4 $y = 3.2^x - 2$
6.2.5 $y = 3.2^{x+1}$
6.2.6 $y = 3.2^{x+1} - 2$

What is the effect of the parameters a, b, p and q on the graphs drawn

Which Learning Outcomes and Assessment Standards are addressed by 6.1 and 6.2

APPENDIX 3 – Session 3

Activity 3.3 Critique the Grade 11 Work Schedule

- Study the example of the Grade 11 Work Schedule provided and critique it:
  - Does the Work Schedule cover all the Assessment Standards (i.e. content)?
  - Integration: Are the Assessment Standards appropriately linked?
  - Are the Assessment Standards covered in sufficient detail and depth?
  - Pacing: Is the time allocation across the 40 weeks appropriate?
  - Sequencing: Is the content presented in the correct order?
  - Are relevant LTSM listed? If not, list the LTSM required.
  - How can the Work Schedule be improved?

Activity 3.5 Development of the first Lesson Plan for Grade 11

- Provide an overview of the elements and the design process of a Lesson Plan
- Engage participants in the development of the first Lesson Plan that will be presented for the first 2 – 5 weeks of the school year according to the Grade 11 Work Schedule critiqued in Activity 3.3
- Allow one group to present and then discuss their presentation

APPENDIX 4 – Session 4

ACTIVITY 4.3: Development of a Grade 11 annual assessment plan

- Engage participants in the compilation of a Grade 11 annual assessment plan in which they indicate:
  - 7 tasks (excluding Final Exam)
  - Topics for each task
  - Assessment tools for each task
  - Date and duration of each task
- Ask participants to revisit the Grade 11 Work Schedule (Session 3: Activity 3) and to align the annual assessment plan for Grade 11 with the assessment tasks listed in the Work Schedule

APPENDIX 3

ACTIVITY 3.5
FIRST GRADE 11 LESSON PLAN

Subject: Mathematics		Grade 11	
Lesson Plan: 1		Number of activities:	
Duration: ___ hours		Week/Date:	
Context:			
Link with previous lesson:		Link with next lesson:	
Core content: (KSVs):			
	Activity 1	Activity 2	Activity 3
LOs & ASs			
Core content:			
Detail of activity:			
Teaching method			
Assessment Strategy			
Expanded opportunities			
Resources			
Teacher reflection			

NCS TEACHER TRAINING MANUAL 2006: MATHEMATICS

ACTIVITY 3: Development of a Grade 11 annual assessment plan

FORM OF ACTIVITY: Presentation, interactive and discussion

RESOURCES: PowerPoint Presentation, Laptop, Data Projector, and Subject
                        Assessment Guidelines

CONTENT:
- Programme of Assessment for Grade 11: Tasks, topics, tools and dates

INSTRUCTIONS:
- Engage participants in the compilation of a Grade 11 annual assessment plan in which they indicate:
  - 7 tasks (excluding Final Exam)
  - Topics for each task
  - Assessment tools for each task
  - Date and duration of each task
- Ask participants to revisit the Grade 11 Work Schedule (Session 3: Activity 3) and to align the annual assessment plan for Grade 11 with the assessment tasks listed in the Work Schedule

APPENDIX 4

ACTIVITY 4.3
ANNUAL ASSESSMENT PLAN FOR GRADE 11

SUBJECT: Mathematics　　　　　**GRADE:　11**　　　　　**YEAR:　2007**

TERM 1	TERM 2	TERM 3	TERM 4
Investigation 1 / Test	**Investigation 2 / Test**	**Project / Test**	**Assignment / Test**
LO(s) and ASs:: Form: Date: Duration: Tool:	LO(s) and ASs: Form: Date: Duration: Tool:	LO(s) and ASs: Form: Date: Duration: Tool:	LO(s) and ASs: Form: Date: Duration: Tool:
Test	**Exam (June)**	**Test**	**END OF YEAR EXAM**
LO(s) and ASs : Form: Date: Duration: Tool:	LO(s) and ASs: Form: Date: Duration: Tool:	LO(s) and ASs: Form: Date: Duration: Tool:	LO(s) and ASs: Form: Date: Duration: Tool: