education

Department:
Education
REPUBLIC OF SOUTH AFRICA

National Curriculum Statement Assessment Guidelines

for General Education and Training (Intermediate and Senior Phases)

Mathematics

PREAMBLE

The Assessment Guidelines are part of a developmental process that is aimed at increasing the capacity of the education system, teachers, school management teams and departmental officials to enhance the effective implementation of the National Curriculum Statements and the *National Policy on Assessment and Qualifications for Schools in the General Education and Training Band* by developing an authentic assessment system that is congruent with outcomes based education in general and the NCS in particular.

We expect a critical engagement with these documents, as they do not reflect a "zero defect" nor a "one answer" solution and we encourage all who use these documents to alert the Department of Education to any inconsistencies, highly impractical suggestions or any other elements that may detract from the goal of establishing an effective assessment system. We also appeal to you to offer alternative solutions, ideas and suggestions you may have for dealing with issues you may have raised in your input. In particular, examples of good assessment tasks that enhance classroom teaching and learning will be valued.

We encourage you to be as rigorous and as vigorous as you can and have complete faith in your professionalism to expect that your responses, however critical, would be framed in a constructive manner that is geared towards arriving at a shared solution and is not a simplistic listing of problems and concerns.

We look forward to an exciting, growth promoting and stimulating engagement with you all.

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1. INTRODUCTION TO THE MATHEMATICS LEARNING AREA

This document provides guidelines for assessment in Mathematics in the intermediate and senior phases of the National Curriculum Statement. It provides teachers with information on assessment as well as ways of implementing assessment in Mathematics. The assessment guidelines for Foundation Phase will be a separate document.

This document should be read in conjunction with the *Mathematics Learning Area Statement,* the *National Policy on Assessment and Qualifications for Schools in the General Education and Training Band; Teacher's Guide for the Development of Learning Programmes in Mathematics* and any other current assessment policies.

2. ASSESSMENT IN THE NATIONAL CURRICULUM STATEMENT

Assessment in the National Curriculum Statement is an integral part of teaching and learning and should be included at all levels of planning. In the NCS, assessment is not simply an 'add on' or something that happens at the end of the learning process.

The Assessment Standards in each Learning Area define the minimum requirement for achieving the Learning Outcomes at a specific grade. We teach towards Learning Outcomes and the activities to achieve an Assessment Standard or a clustered group of Assessment Standards can be varied. At the same time we can assess in many different ways depending on what we would like to find out.

Assessment is a **process** of collecting, synthesising and interpreting information to assist teachers, parents and other stakeholders in making decisions about the progress of learners. It involves gathering and organising information **(evidence of learning)**, in order to review what learners have achieved. It informs decision making with respect to teaching, and helps teachers to establish whether learners are making progress towards the required levels of performance (or **standards**), as outlined in the **Assessment Standards** of the NCS.

Before addressing the different *types* of assessment, it is helpful to list some general purposes of assessment. In terms of the National Curriculum Statement, any assessment in the GET Band should achieve at least one of the following purposes:

- Develop learners' knowledge, skills and values
- Identify the needs of learners
- Enable teachers to reflect on their practice
- Identify learners' strengths and weaknesses
- Provide additional support to learners
- Revisit or revise certain sections where learners seem to have difficulties
- Motivate and encourage learners.
- Provide information or data to a variety of stakeholders
- Demonstrate the effectiveness of the curriculum or a teaching strategy

These purposes can be linked to different types of assessment of which the following five are listed in the National Curriculum Statement (GET: Grades R–9)

Type of assessment	Description and uses
Baseline Assessment	Baseline assessment is assessment usually used at the beginning of a phase, grade or learning experience to establish what learners already know. It assists educators with the planning of learning programmes and learning activities.
Formative Assessment	Formative assessment is developmental and is used to inform teachers and learners about their progress. It improves teaching and learning by giving teachers direction and enabling them to adapt to learners' needs. Formative assessment or 'assessment for learning' involves both teacher and learner in a process of continual reflection and self-assessment. Formative assessment is interactive in that the teacher uses thought provoking questions to stimulate learner thinking and discussion.
Summative Assessment	Summative assessment gives an overall picture of learners' progress at a given time, for example, at the end of a term. It usually results in judgements about learner performance and can involve high stakes for learners (e.g. Senior Certificate). As much as there is a place for summative assessment in the GET band, it is certainly not the only from of assessment to be used.
Diagnostic Assessment	Diagnostic assessment, is used to identify, scrutinise and classify learning difficulties so that appropriate remedial help and guidance can be provided. It should be administered by specialists and is followed by expert guidance, support and intervention strategies.
Systemic Assessment	Systemic assessment is an external way of monitoring the education system by comparing learners' performance to national indicators of learner achievement. It involves monitoring of learner attainment at regular intervals, using nationally or provincially defined measuring instruments. This form of evaluation compares and aggregates information about learner achievements so that it can be used to assist in curriculum development and evaluation of teaching and learning. For the General Education and Training Band Systemic Evaluation will be conducted at the phase exit levels i.e. Grade 3, Grade 6 and Grade 9 by the Provincial and/or National Education Departments.

3. THE NATURE OF ASSESSMENT IN THE MATHEMATICS LEARNING AREA

Assessment in the NCS should always be seen as integral to teaching and learning, it is therefore important for teachers to be familiar with the Subject Statement and the philosophy that underpins it so that the assessment can reflect the purpose of the Learning Area.

3.1 Learning Outcomes and Assessment Standards

As stated in the *Teacher's Guide for the Development of Learning Programmes,* the Learning Outcomes (LOs) and the Assessment Standards (ASs) in the Mathematics Subject Statement have been selected with needs of the learner as citizens in mind. Compared with earlier curricula, there is, among other changes:

- An increased focus on data and data handling.
- A shift in the focus of early algebra from algebra as an exercise in manipulation to algebra as a tool for describing situations in order to understand them and make predictions about them.
- A shift in the study of space and shape (geometry) from Euclidean geometry to transformational geometry – the geometry of position and movement.

Knowledge, skills and values are organized through five Learning Outcomes in the Mathematics Subject Statement. Since the purpose of the Mathematics is to equip learners to participate in and contribute to the world in which they live, they should be expected to work with real-life experiences that involve managing their own life in a well-informed and responsible manner. This approach to Mathematics should also be reflected in assessment which needs to be relevant and where possible **practical** with learners developing through the experience, acquiring knowledge, life skills and values necessary for living in a democratic and changing society.

The wording of the Assessment Standards often gives an indication of the most appropriate **form of assessment** to be used to gather evidence of learner performance.

For example, the Grade 5 (LO3) Assessment Standard (below) is well suited to being assessed by means of an investigation and/or project:

Investigates and compares (alone and/or as a member of a group or team) two-dimensional shapes and three-dimensional objects studied in this grade according to properties listed above by:

- *making models of geometric objects using polygons they have cut out;*
- *cutting open models or geometric objects (e.g. boxes) to trace their nets;*
- *drawing shapes on grid paper.*

That said, the form of assessment to be used to assess the various Assessment Standards is neither prescribed nor fixed and teachers should make their own professional judgement to select the form of assessment that is most appropriate for the purpose of the assessment. Apart from the Assessment Standards, there are other factors that influence the choice of the form of assessment, namely time available for the assessment, available resources, the point of departure (where are you with the work), for example if you are starting to develop a new concept, then you will give an investigation, or if learners have already mastered a concept, then give an assignment or a project or a mind map (metacognitive), etc.

3.2 Weighting of Learning Outcomes

Although the *Teacher's Guide for the Development of Learning Programmes* (DoE, 2003) provides guidance on the weighting of the Learning Outcomes for each phase and for the different Grades in the Senior Phase, this does not mean that all five Learning Outcomes need to be assessed in each assessment task. One assessment activity might focus on Learning Outcome 1, another on Learning Outcome 2, etc. The annual assessment programme should, however, reflect this weighting. Assessment should where possible address the Assessment Standards in an integrated way.

3.3 Assessment Standards in Mathematics

Assessment Standards are defined for each grade and describe the depth and breadth of what learners should know and be able to do, while simultaneously providing criteria through which educators can judge how well learners are able to achieve the Mathematics Learning Outcomes in each grade. The Assessment Standards do not prescribe content.

4. CONTINUOUS ASSESSMENT IN THE MATHEMATICS LEARNING AREA

The purpose of assessment in the National Curriculum Statement is to gather information about the learner's development. Since assessment is integral to teaching and learning and teachers are dependent on information gathered through assessment for the improvement of their practice, assessment needs to be on-going (continuous). Learning is a on-going/continuous process and learners learn in different ways and at different paces – assessment needs to be responsive to this. We will only get a good picture of the learner's development if we assess the learning process on an ongoing basis this is done both informally and formally.

4.1 The Characteristics of Continuous Assessment

The characteristics of Continuous Assessment are found in Chapter 5, (page 93) of Mathematics Learning Area Statement (NCS policy, 2002). Continuous Assessment covers all the outcomes-based education assessment principles. We should ensure that assessment:

- Takes place over a period of time and is on-going
- Supports the growth and development of learners
- Provides feedback from learning and teaching
- Allows for integrated assessment
- Uses strategies that cater for a variety of learners needs
- Allows for summative assessment

4.1.1 Continuous Assessment (CASS) Framework

A simplified framework illustrating the difference between Grade 9 and the other Grades in the Intermediate and the Senior Phases is provided in Table 1 below.

Table 1. CASS Framework

Grade	CASS component school-based	Common tasks for assessment externally set
Grades 4 to 8	100%	Not Applicable
Grade 9	75%	25%

4.2 Continuous Assessment in Grades 4 to 8

In Grades 4 to 8 internal school-based CASS comprises 100% of the final Mathematics mark or level of achievement. The final mark or level of achievement is based on the formal assessment tasks and is used to determine progression to the next grade. The assessment tasks should give learners the opportunity to explore varied knowledge, skills, values embodied with the Mathematics Learning Area over the year. In addition to the formal tasks, it is expected that teachers will conduct informal assessment on a day to day basis throughout the year (see description of informal assessment on pages 7 and 8).

4.3 Continuous and External Assessment in Grade 9

In Grade 9, the CASS component consists of (a) internal school-based tasks undertaken during the school year which together make up 75% of the final Grade 9 mark or level of achievement and (b) externally set assessment tasks or Common Tasks for Assessment which make up the other 25% of the final Grade 9 mark or level of achievement. The marks that arise from the formal Assessment Programme which comprises various forms of appropriate assessment in Grade 9 should be reflected in the teacher and learner portfolios. In addition to the formal tasks, it is expected that teachers will conduct informal assessment on a day to day basis throughout the year (see description of informal assessment on pages 7 and 8).

The formal CASS programme in Mathematics in Grade 9 consist of 9 tasks, that is 3 tasks per term for each of the first three terms, as well as .the CTA which will be administered during the forth term.

Term	1	2	3	4
No of tasks	3	3	3	CTA

4.3.1 Common Tasks for Assessment in Grade 9

The Common Tasks for Assessment (CTA) is an external assessment tool intended to sample learner performance against the Assessment Standards of the Learning Outcomes. The CTA, in all Learning Areas, should consist of both performance-based tasks and pen-and-paper tasks. The pen-and-paper task will be conducted under controlled conditions and schools will follow a national timetable. The performance-based tasks should be designed in such way that they are completed or administered over a period of time and not as a once-off event.

The performance-based tasks should form an integral part of the normal teaching and learning school programme They could be done in the classroom or as homework and can include projects, orals, pen-and-paper activities and so on. Learners should also be required to do tasks as individuals, in pairs and some in groups. All Grade 9 learners in all schools will be assessed through the CTA in all the 8 Learning Areas including the Additional Language, during the fourth term.

4.3.2 Administration of CTA

4.3.2.1 *Roles and responsibilities of the teacher*

Learners bring valuable experiences into the classroom. The teacher's role is to initiate discussion and reflection, in which learners' prior knowledge is both acknowledged, and then valued.

In a CTA, the teacher will:

- contextualise the CTA
- discuss the flow chart with the learners
- explain the criteria for assessment to all learners before the commencement of each activity

- guide brainstorming sessions, where appropriate
- organise manageable groups, where necessary
- help allocate group roles
- ensure the activities are completed within specified time frames
- supervise the process
- intervene and troubleshoot where and when necessary
- be responsible for the inclusion of the tasks and the various forms of assessment in the learners' portfolios
- engage interactively with learners
- distribute the worksheets provided to learners per activity
- mark the relevant sections of the CTA

4.3.2.2 *Recording of CASS/CTA marks*

Teachers and schools can develop their own recording sheet according to their needs, provided that such record sheets reflect the marks for all of the formal assessment tasks and the CTA mark. An **exemplar** of a possible recording sheet is provided below.

Recording Sheet													
Grade 9 ……..		**Date: ……**					**School: ……**						
No	**Names of learners**	Term 1: Task 1	Term 1: Task 2	Term 1: Task 3	Term 2: Task 1	Term 2: Task 2	Term 2: Task 3	Term 3: Task 1	Term 3: Task 2	Term 3: Task 3	**CASS TOTAL Converted mark**	**CTA TOTAL Converted mark**	**TOTAL**
											75	**25**	**100**

4.4 Informal and Formal Assessment

While both informal and formal assessment are used throughout the year, only the formal tasks or activities are recorded for purposes of progression and promotion. The characteristics of informal and formal assessment are described in paragraphs 9-10 (page 24) of the Policy: Assessment and Qualification for the General Education and Training Band. Informal assessment is very important; it should be used to complements and supports formal assessment. It is used for formative purposes to assist teachers with their daily planning and to enable then to make professional judgments on learner performance.

4.4.1 Informal daily assessment

Learner progress should be monitored during daily learning activities. This informal daily monitoring of progress can be done through question and answer sessions; reflection, observations, short assessment tasks completed during the lesson by individuals, pairs or groups or homework exercises and so on. Lesson planning should incorporate such informal assessment tasks and activities.

Self-assessment, peer assessment and group assessment actively involve learners in assessment. These forms of assessment are important as they allow learners to learn from and reflect on their own performance. The results of informal daily assessment tasks are not formally recorded unless the teacher wishes to do so. In such instances, a simple checklist may be used to record this assessment. While teachers may use learners' performance in these informal assessment tasks to provide verbal or written feedback to learners, other teachers and even parents, neither promotion nor progression decisions will be based on this feedback. Such feedback is particularly important if barriers to learning or poor levels of participation are encountered.

Informal assessment is particularly useful to assess the attitudes of learners and those skills that are difficult to assess in a formal task. Such attitudes and skills could include:

- Attitude to Mathematics
- Working in a group
- Application of Mathematics learnt to real contexts
- Attitudes to constitutional values such as equality, equity and democracy

4.4.1.1 *How do I implement informal assessment?*

It is important to remember that formative assessment is not an unstructured unplanned activity. Informal assessment usually probes the levels of learning taking place in the classroom. Questioning is the most common and also most effective way to assess informally. Open-ended questions lead to further questions, both from the learners to the teacher and from learners to other learners. Critical questions lead to further thought and extended responses. The process results in learners and teachers:

- thinking more deeply about their own thinking and knowledge
- realising their strengths and weaknesses in their skills and knowledge

- self expression
- having dialogue and collective reflection

Through mere observation of learners, important information can be gathered. The teachers can observe how the learners do their tasks and what they are struggling with. The teachers can also observe how the learners work together and how the learning tasks could be changed to maximise learning.

The importance of informal assessment in Mathematics. The purpose of informal assessment is mainly formative and for this reason it is important that time be set aside for the reflection on the findings of the assessment. During reflection the teacher should discuss the assessment with the learners and the questions like the following can be asked:

- What does the assessment task show about what I have learned?
- How can I improve my learning?

The teachers should also think about how they could improve their teaching to enhance the learning.

4.4.2 Formal assessment

This section reflects different approaches to the assessment process as determined by the various Learning Areas.

4.4.2.1 *Formal assessment tasks in Mathematics*

The Policy: Assessment and Qualification for the GET Band describes an assessment task as *"an assessment activity or activities that is/are designed to assess a range of skills and competencies".*

Over the year the assessment tasks in a learning area must reflect varied forms of assessment and assess a variety of skills (informed by the Assessment Standards in that grade). The assessment tasks must weighted collectively to cover all the LOs & ASs for the grade as per the weighting described in the *Teacher's Guide for the Development of Learning Programmes.*

Assessment tasks, by their definition, range from being fairly short in time and limited in content so that they can be completed within a period, to being considerably longer, involving a number of activities and taking longer to complete. It is important that the assessment tasks are appropriate for the age and grade of the learners being assessed. Assessment Standards should inform the appropriateness of the assessment tasks. The results from the assessment of these tasks will be formally recorded.

Assessment tasks provide learners with an opportunity to demonstrate their acquired competencies in Mathematics. Collectively over the year the assessment tasks should enable the teacher to make informed judgments about various levels of performance and learner competence in Mathematics.

Table 2: Number of formal recorded assessment tasks for Grades 4–6

Learning Area	Term 1	Term 2	Term 3	Term 4	Total
Mathematics	2	2	2	2	8

Table 3: Number of formal recorded assessment tasks for Grades 7–8

Learning Area	Term 1	Term 2	Term 3	Term 4	Total
Mathematics	3	3	3	3	12

Table 4: Number of formal recorded assessment tasks for Grade 9

Learning Area	Term 1	Term 2	Term 3	Term 4	Total
Mathematics	3	3	3	**CTA**	9

4.5 Planning for Assessment

Planning for assessment happens at all three 3 levels of planning: Learning Programmes; Work Schedules and Lesson Plans.

Planning for assessment in the **Learning Programme** should give you a good indication of the **resources and time** needed for assessment in that phase. To do this teachers will need to know what **knowledge, skills and values** learners are expected to acquire so that they can integrate the assessment programme into the teaching and learning activities.

In planning assessment at **Learning Programme level** teachers need to:

- List the main forms of assessment they are likely to use in determining the
- achievement of Learning Outcomes and to meet the Assessment Standards in Mathematics
- List the key resources they are likely to need
- Consider the context in which they are taught and the core knowledge and concepts that need to be learned
- Indicate the time that will be required for appropriate and authentic assessment.
- Ensure tasks are fairly distributed so as not to overburden learners.

Planning for assessment in the Work Schedule:

How do I plan for assessment in the work schedule?

When Mathematics teachers of a particular grade meet to plan their work schedules they need to plan the formal assessment tasks that the learners will do for the year as part of the work schedule. This plan is called the **Programme of Assessment**

When teachers plan assessment at this level, they should consider the following questions:

A. What is the purpose of the assessment task?

Fundamentally, the purpose of the assessment task is to establish what we can about each learner's attainment/achievement of the Learning Outcomes at their grade level i.e. the attainment/achievement of the relevant Assessment Standards in order to improve their learning. This purpose should drive the design of the assessment task. Having established what progress the learner is making enables the teacher in assisting them to improve learning. For this reason all assessment plays an important formative role. However, formal assessment tasks must also meet summative requirements as well so that we can give feedback to the learner, his/her parents and other interested parties on his/her progress.

B. Which Learning Outcomes and Assessment Standards will be assessed by the assessment task?

The NCS policy document lists the Learning Outcomes and Assessment Standards that need to be actively pursued. This means that the teaching and learning programme should, by the end of the year have addressed each of the Learning Outcomes and all of the Assessment Standards. All Assessment Standards need to be assessed. That said, it is not necessary to include every single Assessment Standards in the formal assessment tasks as some might be assessed informally. In this way while learners are assessed against all Assessment Standards, performance is not recorded for all of the Assessment Standards may be assessed informally. To be clear, it is not expected that teachers will record performance against Assessment Standards.

C. Which task(s) will the teacher do in his/her class?

The teacher's Assessment Plan for Mathematics, which is part of the work schedule, should reflect the formal assessment tasks for each year. When conceptualising the Mathematics assessment tasks for the year, consider the full scope of content, including knowledge, skills and values described in the Learning Outcomes and Assessment Standards as well as the different forms of assessment available to the teacher and suited to the Learning Area.

D. What will be the focus of the assessment task?

Identify the Learning Outcomes and Assessment Standards within the Mathematics Learning Area Statement, and decide which core knowledge and skills the assessment task will focus on. The assessment tasks over the year should reflect the full range of knowledge and skills described in the Mathematics Learning Area Statement. The contexts of the schools and the learners in the grade should also be considered when developing selecting foci.

The focus can also be linked to:

- The context of the school (e.g. HIV/AIDS, 2010 World Cup; Clean water, etc)
- Specific knowledge, skills and values in the Learning Area
- Previous knowledge and skills and/or activities you want to strengthen, extend or wrap up
- Introduction to new topic

E. Which forms of assessment will suit the focus?

It is expected that a range of different forms of assessment will be used throughout the Programme of Assessment. The forms selected should be appropriate to the knowledge and skills being assessed while simultaneously taking account of the learners' context.

When selecting a form, teachers should consider:

- What do you want to assess? It is important to match the form of assessment to the knowledge/skills listed in the Learning Outcomes and Assessment Standards being assessed.
- Why you want to assess? What are you hoping to learn from the response by the learner to the task?

F. When will the assessment task be done and how long will it take?

Teachers should discuss with their colleagues the timing of the assessment tasks. The load on the learners should be considered and as far as it is possible it is desirable to spread the tasks from the different Learning Areas over the year. It is also important to consider the resources needed to complete a task. This may impact on scheduling e.g. seasons, plants in season, link to special days, environmental days (water week in March) etc. Furthermore, if learners need to do research time should be made available so that the learners can go to a library.

Example of a Mathematics teacher assessment plan extracted from a Work Schedule

	LOs & ASs	Assessment Task	Focus	Form	When
TERM ONE	**LEARNING OUTCOMES:** **LO 2: The learner will be able to recognise, describe and represent patterns and relationships, as well as to solve problems using algebraic language a nd skills.** **ASSESSMENT STANDARDS:** We know this when the learner: • Investigates, in different ways, a variety of numeric and geome-tric patterns and relationships by representing and generalising them, and by explaining and justifying the rules that generate them (including patterns found in natural and cultural forms and patterns of the learner's own creation) **LO 3** The learner will be able to describe and represent characteristics and relationships between two-dimensional shapes and three-dimensional objects in a variety of orientations and positions **ASSESSMENT STANDARDS** We know this when the learner: Recognises, visualizes and names geometric figures and solids in natural and cultural settings, including: regular and irregular polygons and polyhedra; Spheres; cylinders.	**Task1: Example: Grade 8 task** Numeric and geometric patterns	Learners are expected to look for rules or relationships and describe the rules in their own words. Learners also create own patterns. This can be different for each classroom and community/school.	Assignment	4 weeks March
		Task 2		Project	
		Task 3		Assignments Short investigation	
		Task 4		Presentation and test	

Planning for assessment in the Lesson Plan:

When teachers plan the assessment tasks for their class, they should identify the activity listed in the Programme of Assessment. As they plan and develop the actual tasks, the following should be considered:

- The Mathematics Assessment Standard to be addressed by the task identify the knowledge, skills, and values to be assessed. Make links between these and, where appropriate, the context.
- Having identified the knowledge, skills and value to be assessed from the Assessment Standard, determine the most appropriate form of assessment.
- Develop the teaching and learning activities that support the assessment task, providing clear guidelines to the learners of what they are required to do. Indicate resources for all activities. The assessment task should
  - Be appropriate to the age of the learners;
  - Consider what barriers to learning exist and how can they be addressed; and Consider which resources are available to learners and teachers?
- Examine all the different elements/smaller activities that the assessment task is comprised off, and decide for each activity;
  - Who assesses (peer, self, and/or teacher)
  - Role of the teacher and role of the learners
  - Type of evidence collected
  - An appropriate scoring procedure or the criteria that will be used to evaluate the final product e.g. provide the learners with a rubric (where applicable) for discussion. The criteria are sourced mainly from the focus, which is the core content as well as from the Assessment Standards.

Note: This planning will highlight the various roles of the teacher throughout the assessment task. This should go into the teacher portfolio as it provides important details and information on the task.

Teachers should also consider the **context** of the class, e.g.:

- Which barriers are present
- The levels of enthusiasm and commitment in the class
- Where the school is situated, and what resources are available and accessible to learners and the teacher

Exemplar Mathematics assessment tasks

Two exemplar tasks follow. The first is in the form of a teaching and learning activity, based on investigation. The second is an example of a project.

<table>
<tr><th colspan="3">Grade 8: Investigation of Packaging[1]</th></tr>
<tr><td colspan="3">This lesson series described here is intended (a) to model the investigative process to learners, and (b) to teach the assessment standards listed below. The outline below is a suggested progression of activities and teacher may need to be flesh it out as appropriately.</td></tr>
<tr><td>Learning Outcome 1: Numbers, Operations and Relationships
The learner is able to recognize, describe and represent numbers and their relationships, and counts, estimates, calculates and checks with competence and confidence in solving problems</td><td>Learning Outcome 3: Space and Shape (Geometry)
The learner is able to describe and represent characteristics and relationships between 2-D shapes and 3-D objects in a variety of orientations and positions</td><td>Learning Outcome 4: Measurement
he learner is able to use appropriate measuring units, instruments and formulae in a variety of contexts</td></tr>
<tr><td rowspan="3">• Solves problems in contexts inclu-ding contexts that may be used to build awareness of other learning areas, and human rights, social, economic and environmental issues such as:
▸ Financial (e.g. profit and loss; budgets; accounts; loans; simple interest, hire purchase; exchange rates)
▸ Measurements in Natural Science and Technology contexts
• Solves problems that involve ratio and rate</td><td>• Uses a pair of compasses, ruler & protractor to accurately construct geometric figures for investigation of their properties and design of nets</td><td rowspan="2">• Solves problems involving:
▸ Length
▸ Perimeter and area of polygons and circles
▸ Volume and surface area of rectangular prisms and cylinders
• Solves problems using a range of strategies including:
▸ Estimating
▸ Calculating to at least 2 decimal places
▸ Using and converting between appropriate S.I. units</td></tr>
<tr><td>• Designs and uses nets to make models of geometric solids studied up to and including this grade.</td></tr>
<tr><td>• Uses transformations (rotations, reflections & translations) and symmetry to investigate (alone and/or as a member of a group or team) properties of geometric figures.</td></tr>
<tr><td></td><td>• Use proportion to describe the effect of enlargement and reduction on properties of geometric figures</td><td>• Calculates by selecting and using appropriate formulae:
▸ Perimeter of polygons and circles
▸ Area of triangles, rectangles, circles and polygons by decomposition into triangles and rectangles
▸ Volume of triangular and rectangular based prisms and cylinders</td></tr>
<tr><td></td><td>• Uses a pair of compasses, ruler & protractor to accurately construct geometric figures for investigation of their properties and design of nets</td><td></td></tr>
<tr><td></td><td></td><td>• Converts between:
▸ $mm^2 \leftrightarrow cm^2 \leftrightarrow m^2 \leftrightarrow km^2$
▸ $mm^3 \leftrightarrow cm^3 \leftrightarrow m^3$
▸ $ml\ (cm^3) \leftrightarrow l \leftrightarrow kl$</td></tr>
<tr><td></td><td></td><td>• Describes the meaning of and uses π in calculations involving circles and discusses its historical development in measurement</td></tr>
<tr><td></td><td></td><td>• Estimates, compares, measures and draws angles accurate to one degree using protractors</td></tr>
</table>

[1] First developed by Aarnout Brombacher and trialed at Westerford High School (Cape Town)

		• Investigates (alone and/or as a member of a group or team) the relationship between the sides of a right angled triangle to develop the Theorem of Pythagoras
		• Uses the Theorem of Pythagoras to calculate a missing length in a right angled triangle leaving irrational answers in surd form ($\sqrt{}$)

Investigation

Consider different possibilities for packaging 4 tennis balls.

In investigating the different possibilities you need to consider the economy of the packaging in terms of both materials used to package the balls and space taken up by the packaging.

Note: While the problem is posed as a tennis ball problem, it could just as well be about Ping-Pong balls. Ping-Pong balls may even be more appropriate because it us suggested that as each different "box" is investigated it must also be constructed by the students for homework and tennis balls may result in "boxes" that are too big.

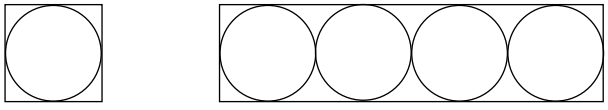
Clearly there are teaching opportunities for important ideas such as vocabulary that present themselves throughout the activities which follow but which are not listed expressly.

Activity 1: Brainstorm and record a list of possible packaging arrangements–both in terms of the arrangement of the balls and the shape of the wrapping.

It is suggested that this be conducted as a whole class discussion and that the different ideas be recorded on newsprint and that the newsprint is hung on the wall. Once this is completed it is suggest that the teacher takes the lead in deciding the order in which the various suggestions get researched (the activities which follow suggest an obvious order).

Teachers would do well to consider the cases that follow so that they can ensure that these appear on the newsprint.

Activity 2: Case one: a rectangular based prism.

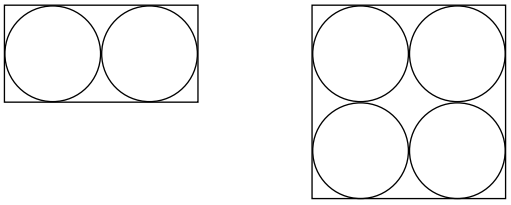


This is clearly the easiest case and should present no difficulties at all. The case does, however, present an opportunity to review: nets, surface area, and volume.

Suggested teaching events:

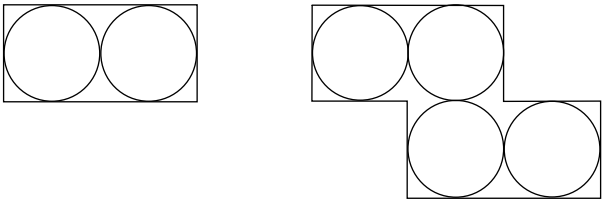
1. Design the net and build the box paying careful attention to accuracy. This is the opportunity to teach construction of perpendicular and parallel lines.
2. Determine the surface area of the box. This is the opportunity to review area of quadrilaterals with supplementary exercises chosen from a textbook.
3. Determine the volume of the box. This is the opportunity to review the volume of rectangular prisms with supplementary exercises chosen from a textbook.

Activity 3: Case two: a square based prism



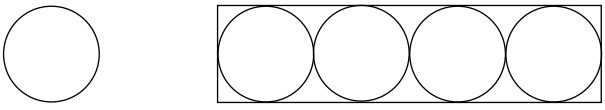
This case is probably as easy as case one and serves only to consolidate the ideas learnt there. The suggested teaching events are exactly as above.

Activity 3A: An unusually shaped "rectangular" prism



This unusual case is not that difficult from the surface area or volume perspectives but is quite challenging in terms of drawing the net for the container. It is suggested that this case be treated as an additional challenge.

Activity 4: Case three: a circular based prism (cylinder)

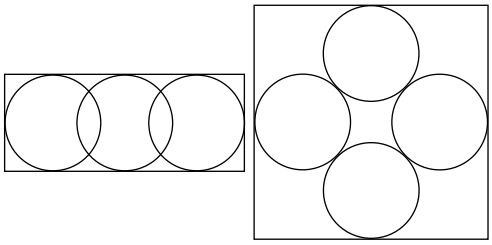


This case provides a great opportunity for teaching the various properties of a circle such as perimeter and area.

Suggested teaching events:

1. Draw a rough outline of the net of the cylinder. Identify the problem that we need to be able to determine the circumference of a circle before we can draw an accurate net.
2. Teach the relationship between the circumference of a circle and the radius of the circle. Although many students will "know" this relationship, this is nonetheless an opportunity to explore the historical development of π.
3. Determine the circumference of the ball, design an accurate net and build the cylinder.
4. Supplementary exercise on circumference can be chosen from a textbook.
5. Determine the surface area of the cylinder. Identify the problem that we need to be able to determine the area of a circle before we can determine the surface area.
6. Teach the area of a circle formula. Although many students will "know" this formula, this is nonetheless an opportunity to explore the development of the formula.
7. Determine the surface area of the cylinder. Supplementary exercises on the area of a circle can be chosen from a textbook.
8. Determine the volume of the box. Supplementary exercises on the area of a circle can be chosen from a textbook.

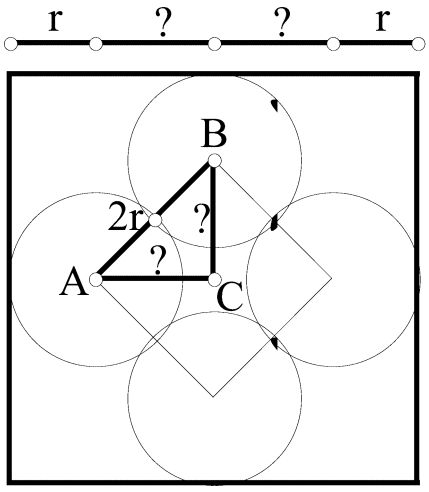
Activity 5: Case four: another square based prism



While this case may not be that realistic, and you may need to make some argument for its inclusion, it serves as the opportunity to introduce the Theorem of Pythagoras.

Suggested teaching events:

1. Draw a rough outline of the net of the prism. Identify the problem that we need to be able to determine the length of the side of the square and that we do not have a technique other than accurate construction. The sketch alongside summarises what we already know by observation and what we want to know (?) to be able find the side of the square.

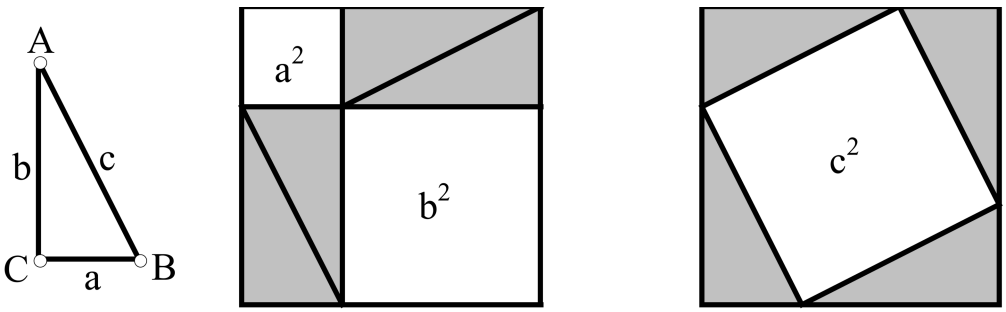


2. At this stage we can introduce the idea that while accurate construction will help us to determine the unknown (?), we would prefer to have a more systematic/mathematical approach. It is suggested that you simply tell the class that Pythagoras was a

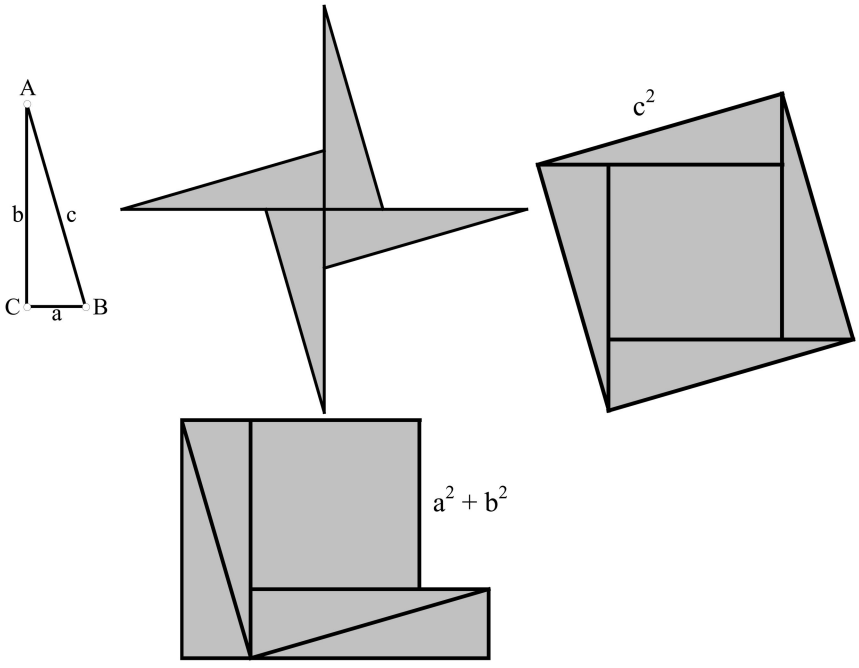
Greek mathematician who established a relationship between the sides on a right angled triangle and teach the Theorem of Pythagoras. There are a number of ways that you could be used. Two such ways are described below.

Teaching Pythagoras:

Approach 1:

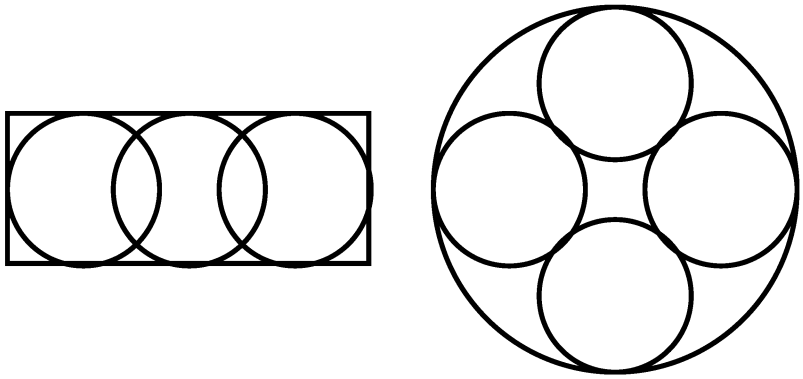


Approach 2: It is argued that Pythagoras saw the pattern below in the tilings on the walls and floors of the homes in which he moved around and that he also saw it relating to the points of the compass. It is really quite similar to the ideas of Worksheet 2, but the arrangement of the "tiles" is different (GSP file: *pythagco*).



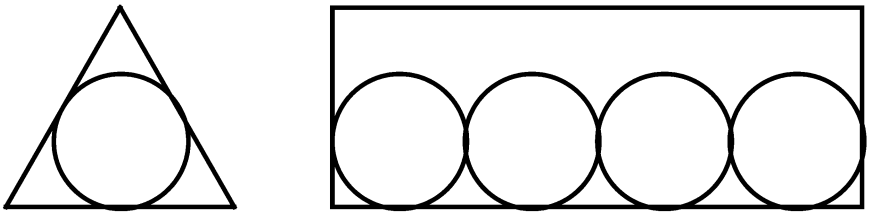
3. Determine the side of the square; build the box and determine the surface area and volume.
4. Supplementary exercises on the Theorem of Pythagoras can be chosen from a textbook.

Activity 6: Case five: a circular based prism



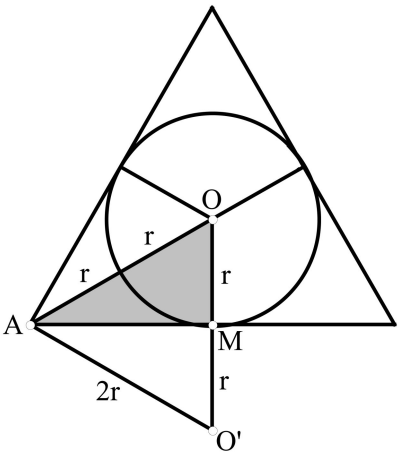
This case is probably not that difficult at this stage BUT it provides a good opportunity to review both the application of the Theorem of Pythagoras as well as the properties of circles already dealt with. This case should be treated as an assessment task – that is it could be set as an in-class activity to be completed in an hour by students working individually (it would probably be appropriate for them to work with their exercise books as a reference source. Students would be expected to hand in the "box" and their working at the end of the hour.

Activity 7: Case six: a triangular based prism



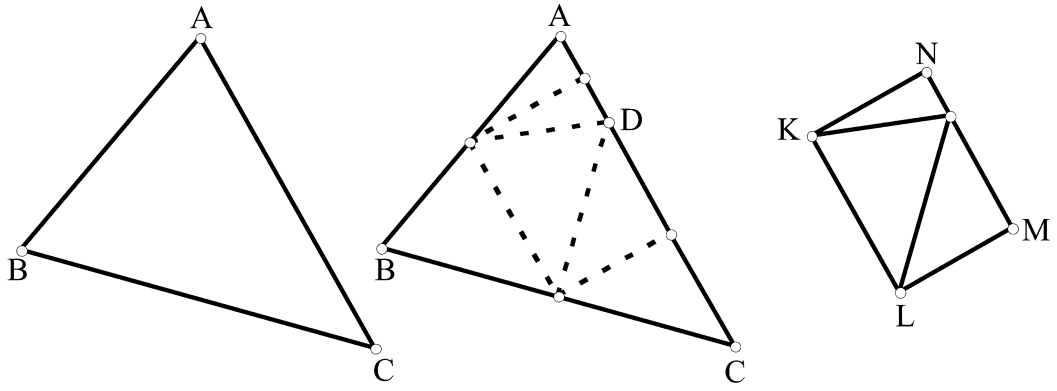
This case is deceptive in that it appears quite easy but the challenge is to be able to determine the length of the side of the equilateral triangle.

1. Draw the net and establish the length of the side of the equilateral triangle. The sketch alongside may help in that it may be a good idea to think of DAOM as being one half of the equilateral triangle DAOO' and then AM can be established using the Theorem of Pythagoras.
2. Build the box.
3. Before determining the surface area and volume of the box, you may need to revise the formula for the area of a triangle. Again many students may "know" this but again it may be instructive to illustrate some derivation of the formula. There



are two nice techniques: the one involves paper folding and the other involves cutting up the triangle and re-pasting the pieces in the form of a rectangle. Both are illustrated below.

Area of a triangle through paper folding:



Take one of the vertices: B and fold it to the opposite side in such a way that the fold is parallel to the opposite side: AC. Next fold the remaining vertices: A and C, to the point: D where B meets AC. Which leads to:

$$\text{Area KLMN} = KN \times NM$$

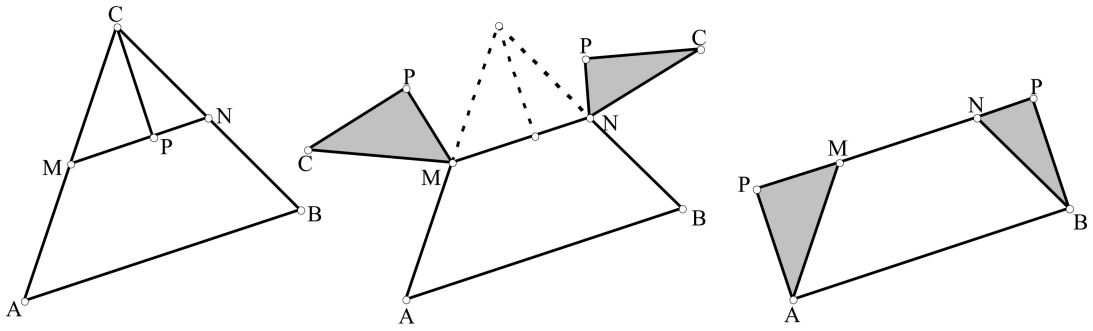
$$\text{Area KLMN} = \frac{1}{2}(\text{ht}\,BD) \times \frac{1}{2}(\text{base}\,AC)$$

$$\text{Area KLMN} = \frac{1}{4}\text{ht}\,BD \times \text{base}\,AC$$

$$\text{BUT Area } \Delta\text{ABC} = 2 \times \text{ Area KLMN}$$

$$\therefore \text{Area}\,\Delta\text{ABC} = \frac{1}{2}\text{ht}\,BD \times \text{base}\,AC$$

Area of triangle through decomposition:

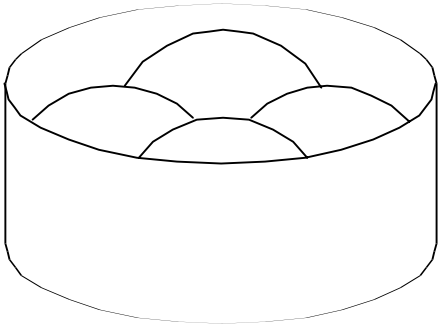


Construct M and N: the midpoints of AC and BC. Join MN and construct CP: the altitude of DCMN. Next cut along MN and CP and re-position the two triangles as shown. The derivation of the area of DABC is similar to the one above.

1. Determine the surface area and volume of the box.
2. Supplementary exercises on the area of triangles can be chosen from a textbook.

PACKAGING ASSESSMENT ACTIVITY
GRADE 8

Time: 50 minutes



In this activity you must design and build a box in the shape of a circular based prism to hold your four ping-pong balls.

You may refer to your notes on the various boxes that we have already built,

You must hand in the following (marks are shown alongside):

1. A piece of paper on which;
   - You have drawn a rough sketch of the net of the box you have built. This rough sketch should include the dimensions of the net.
   - You should show how you determined the various dimensions of the box, and
   - On which you calculate both the volume and total surface area of the box.

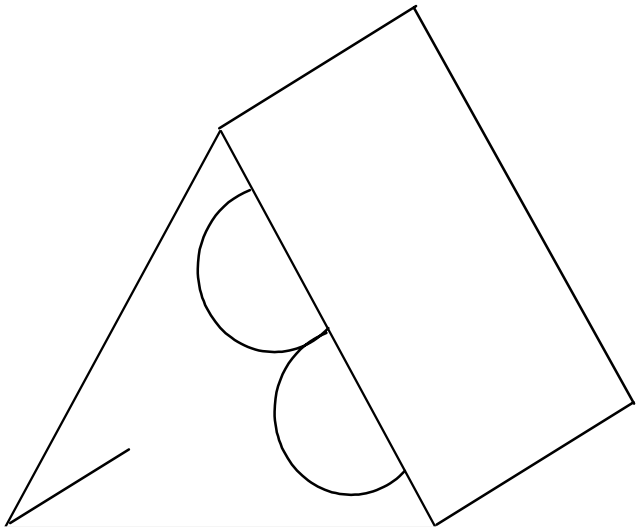
2. The box that you have manufactured which will be marked as follows:
   - Accuracy:
     - Do the pieces of the box fit together?
     - Has the box been neatly built?
     - Is the wall at a right angle to the base?
   - Do the four ball fit snugly as intended?

Side view

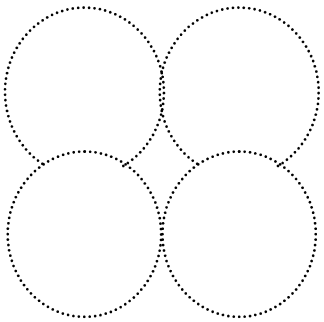
Top view

PACKAGING ASSESSMENT ACTIVITY
GRADE 8

Time: 50 minutes



Side view



In this activity you must design and build a box in the shape of a triangular based prism to hold six ping-pong balls. The box should have lids so that it can be closed.

You may refer to your notes on the various boxes that we have already built,

You must hand in the following:

1. A piece of paper on which;
   - You have drawn a rough sketch of the net of the box you have built. This rough sketch should include the dimensions of the net.
   - You should show how you determined the various dimensions of the box, and
   - On which you calculate both the volume and total surface area of the box.

2. The box that you have manufactured which will be marked as follows:
   - Accuracy:
     - Do the pieces of the box fit together?
     - Has the box been neatly built?
     - Is the wall at a right angle to the base?
   - Do the four ball fit snugly as intended?

The following rubric may be used to assess any project or assignment

	1	2	3	4
Maths knowledge/ skills/values	• No relevant response or response has major errors • Omits significant parts or all the questions	• Contains an incom-plete response and/or carries out mathematical responses with errors • Explanation muddled • Shows some understanding of mathematical concepts	• Contains a complete response, the mathematical responses is carried out correctly and completely • Satisfies the requirements of the immediate problem	• Shows clear understanding of relevant mathematical concepts. • Able to compare and contrast • Carries out mathematical operations accurately and completely • Goes beyond the immediate requirements
Maths reasoning	• No logical reasoning	• Explanations/arguments incorrect or ineffective or unclear • Inconsistent analyses and interpretation	• Able to reach a consistent conclusion without contra-diction • Attempts supporting argu-ments • Consistent analyses and appropriate interpretation	• Proper logical reasoning • Consistent analyses and appropriate interpretation with strong supporting arguments/counter arguments (e.g. proofs) • Identify more than one strategy
Maths communication	• Uses no mathematical language or notation • No charts or tables in presentations • Cannot follow explanation	• Some attempt made to use mathematical language and notation • Attempt to use representa-tions in the presentation • Explanation is tedious to follow	• Uses correct mathematical language and notation (e.g. diagrams, graphs, notations, etc) • Uses correct representations • Uses appropriate explanations	• Uses appropriate and correct mathematical language and notations • Uses representations appro-priately and effectively.(e.g. diagrams, graphs, notations, etc.) • Explanations are easy to follow
Context	• No comprehension of the context	• Some aspects of context are comprehended • No awareness of social, poli-tical, ethical and economic issues	• Pertinent aspects of context are comprehended • An awareness of social, political, ethical and economic issues	• Clear understanding of the context in which the problem is situatedo ◆ Identifies social, political, ethical and economic issues and the implica-tions thereof

***Note:** The Mathematics Learning Outcomes need not all be addressed in one task. You need to specify which Learning Outcomes are applicable.

Evidence

Gather evidence on learner performance

Some of the things that a teacher should consider about the evidence he/she is going to collect,

- How will he/she gather the evidence in a manner that is fair and reliable?
- What tools will he/she use to gather the evidence and are they appropriate to the knowledge, skillsa and attitudes being assessed
- How much assistance will learners need?
- Will learners work in pairs or groups and how will individuals be monitored?
- Who will assess? Will there be certain sections where learners will assess each other, e.g. cooperation and sections that the teacher will assess, e.g. factual correctness, effort.

Evaluate evidence on learner performance

Appropriateness of evidence – Is the evidence gathered reflecting learner competence in the Mathematics Learning Outcomes? Does it provide information about learner competence linked to the Mathematics LOs and ASs in the task? Teachers need to ensure that their evaluation is focused on Mathematical competencies and to ensure that other issues (e.g. presentation, language) do not take over.

Record

Record the learner's performance against the assessment task. Each learner's performance is recorded as a mark and/or code for the assessment task, along with an indication of the Learning Outcomes being addressed. Comments may be written for support purposes when and where appropriate.

Making a decision on learner achievement

From all the available evidence (as depicted in the example above) and teacher observation, the Mathematics teacher will make a professional judgement about learner competence against the LOs and ASs assigned for the task.

TASK 1:

Teacher examines all the evidence learners produced from the assessment task, and looks at the evidence against the LOs and ASs for the assessment task, he/she then make a professional judgement on learner competence.

Record learner performance

Recording sheets developed by the Mathematics teacher must include the following:

- Names of learners
- Date of assessment task
- Forms of assessment used
- Learning Outcomes LOs/ASs covered in the task
- Learner achievement in code or percentage against the assessment task

In addition, teachers may wish to record supportive comments, which clarify and expand on assessment given. These comments should be developed from and reflective of competence in assessment. The completed tasks should also be kept in the learner portfolio. All evidence of learner engagement could be kept as evidence in the portfolio.

An example of a possible record sheet

Note: While this example provides space for comments and while teachers may choose to write these, there is no expectation that all teachers will do so.

Enter marks per task in a term.

Name of Learner	Term One			Term Two			Term Three			CTA		Total	Code
	Task 1	Task 2	Task 3	Task 1	Task 2	Task 3	Task 1	Task 2	Task 3	Section A	Section B		
	LO 2 AS LO 3 AS LO 4	LO 2 AS LO 3 AS											
Duncan	3	3											
	Understanding of PATTERNS, FUNCTIONS & ALGEBRA but unable to interpret with depth and apply.	Understanding of SPACE & SHAPE and MEASURE-MENT but unable to interpret with depth and apply.											
Lucy	4	4											
Palesa													

Codes and percentages for recording and reporting in Grades 7–9

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

Reporting on learner performance

The Mathematics teacher is responsible for reporting on learner progress to all relevant stakeholders (learners, parents). Reports should include:

- The levels at which learners has performed
- The time period on which the educator is reporting
- Any supportive comments where appropriate

Reflect

Reflect on the learning process **and follow up with interventions** where necessary. If learners are experiencing serious difficulties in achieving the Assessment Standards, you may need to provide additional support **with follow-up interventions**. Reflect on how the learners performed and why they did so. Adjust your teaching and assessment accordingly. Follow-up interventions may include:

- Creating more opportunities for learning
- Giving learners more examples
- Building on prior activities
- Giving learners more exercises to achieve certain skills

Reflect on your practice and consider if the form of assessment and tools you used gathered the evidence you wanted to gather.

Process questions to reflect on:

- *Does the evidence collected reflect learner competence?*
- *Is the form of assessment used appropriate for the information to be gathered?*
- *Does informal assessment corroborate formal assessment?*

4.6 Management of Assessment

Each school should have a **School Assessment Programme,** which outlines how CASS is planned and implemented. It includes:

- How records are kept, stored and accessed
- Assessment codes
- Internal verification
- Moderation
- Frequency and method of reporting
- Monitoring of assessment processes
- Training of staff

Each school should also have a **School Assessment Plan,** which is a compilation of all the grade assessment plans.

Each teacher should also have a **Teacher Assessment Plan,** which is derived from the Work Schedules and indicate the details of assessment per grade.

5. FORMS OF ASSESSMENT IN THE MATHEMATICS LEARNING AREA

The following forms of assessment are recommended in Mathematics

- Mathematical Investigation
- Projects
- Assignment
- Tests and examinations
- Classwork and homework

There are other forms of assessment that can be useful in the assessment process as listed here:

- Presentations
- Brainstorm
- Simulations
- Observations
- Interviews
- Structured questions
- Questionnaires

- ***A mathematical investigation***

  Rationale:
  Mathematical investigation
  - aids construction of new knowledge
  - gives learners an opportunity to use various logical processes to formulate, test and justify conjectures
  - could be used to discover rules for number and geometric patterns, formulae, theorems, etc
  - may involve:
    - inductive reasoning: observe and analyse 3 or more specific examples
    - the identification of a pattern or a relationship

- testing whether the identified pattern holds for other cases
- formulating a conjecture (formula, rule, theorem)
- developing deductive arguments

Criteria:

- instructions to learners should be clear
- criteria for assessment should be given to learners prior to the investigation.

Examples of mathematical investigations:

- Example 1: Number patterns

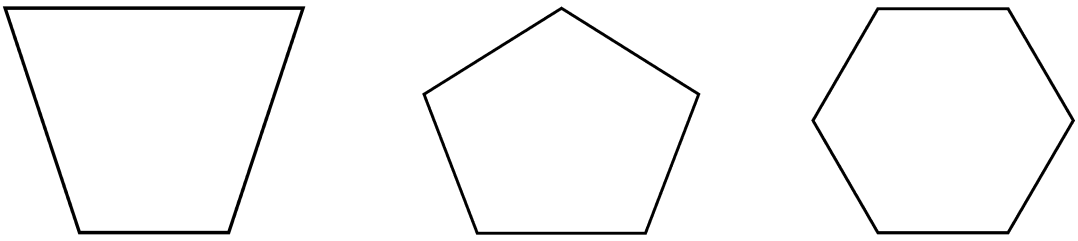
  Investigate a rule for the addition of any set of consecutive natural numbers. The following sequences might be used:

  1+2+3 =

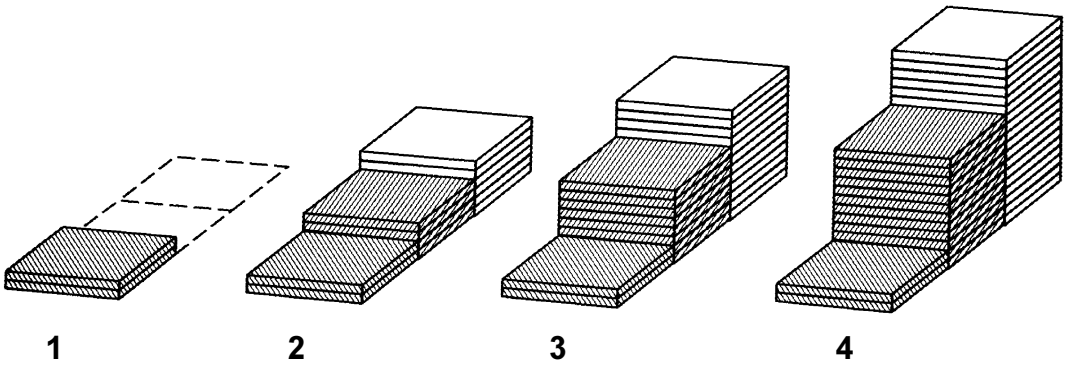
  1+2+3+4 =

  1+2+3+4+5 =

- Example 2: Geometric patterns: Investigate a rule for the number of all diagonals in polygons



- Example 3: Tiles



Above are four groups of tiles.

1. Draw group number 5. Explain in words what group number 5 would look like. How many tiles would be in group number 5?
2. How many tiles would group number 6 and 7 have each? How do you know?
3. Write a rule or formula to describe the number of grey tiles if you know the group number

4. Write a rule or formula to describe the number of white tiles if you know the group number.
5. Now write a rule or formula to describe the total number of tiles if you know the group number.

- ***Project***

Like investigation activities, projects allow for a holistic assessment of learners' abilities to apply knowledge, skills and values in the context of a project. You can assess different stages of the project separately, or you can assess the entire project.

A project in Mathematics should:

- Be problem-oriented
- Give opportunities to analyse Mathematics phenomena.

A project can have different forms. The following activities can be part of a project:

- Research
- Excursions
- Site visits
- Demonstrations
- Exhibitions

Examples of a project:

- Example 1: Calculating the cost of painting classroom(s)

A local business person has offered to sponsor the painting of the classrooms in your school. He wants the Grade 9 learners to find out the total cost for painting the classrooms. The learners are requested to provide the following information:

1. Total area of the surface that needs painting
2. Total quantity of paint (in litres) needed
3. Total cost of the paint (Quotation from at least two shops)
4. Labor cost in painting the rooms.
5. Total cost of painting the classroom(s).
6. You should also write a letter to the sponsor to show your appreciation of the sponsorship and to inform him of the total cost.

Your project should show:

1. the number of classroom(s) to be painted
2. a sketch of the building showing the number of classroom(s) with the doors, windows etc.
3. the size of the classroom(s)
4. the area(s) of different surfaces to be painted
5. the different types of paints needed with reason for using the different types of paints
6. the choice of the particular make paints
7. the number tins of different types of paints
8. the total cost of the different types of paint

9. the labour cost and
10. the total cost of painting the building.

- Your calculations must be justified in terms of the number of classrooms and the area of walls to be painted, the number of tins of paint needed, the cost of the paint per tin. You should also state whether you will employ a painter from outside or you will paint the rooms to generate some funds for the cultural programmes in the school etc
- You should complete and submit the project within (2 months).
- You should also read through the assessment tools to get more clarity on the project. It may throw more light on what is expected of you in this project.

- Example 2: finding out the most popular drink in your school tuckshop

  A local soft drinks dealer is willing to supply the soft drinks needed for one month in your school tuck-shop on credit. He wants to find out the most popular drink in the tuck-shop and the number of cans/ bottles of different flavours of drinks sold every week in the tuck shop in one month.

  Instruction to learners:

  1. Analyse the problem and make plans to solve the problem
  2. Conduct a research with questionnaire(s) and other recording tools
  3. Recording the information
  4. Present the information using charts/ diagrams/ tables
  5. Identifying the most popular drink based on the research findings
  6. Calculate the purchase price and selling price of the supply for one month and calculate the profit
  7. Make a formal presentation of the findings with necessary diagrams/ charts/ tables and calculations.

Hints to teachers
A rubric similar to the one used for Project 1 can be used for assessing the project. Projects similar to Project 2 can be given to learners to find out the most popular car in town; the most popular dress colour in a village; the most popular size of shoes worn by learners in a grade/school; the number of absentee learners in a school on a weekly basis for one month etc. The aim of these projects is to acquaint laners with data management as part of research.

- ***Assignments***

  Assignments are written problem-solving exercises given after instruction with clear guidelines and with a specified time allocation.

  They include short exercises used formatively to assess learners' skills development.

  For example, **daily** assignments may include routine exercises such as:
  - Calculations
  - Applying formulae

- Solving simultaneous equations
- Drawing and interpreting graphs, etc.

Example of an assignment

The example that follows is not intended to be prescriptive in any way but it is meant to give ideas which will assist the educator and will in turn adapt the ideas to suit his/her learners.

- Example: Planning a birthday party

1. You have been given R300 to organise your birthday party. You are allowed to invite 10-20 guests.
2. List 10 party treats, 6 decorations and 3 types of entertainment that you would want for your party.

No.	**Treats**	**Quantity**	**Price**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total			
No.	**Decor**	**Quantity**	**Price**
1			
2			
3			
4			
5			
6			
Total			
No.	**Entertainment**	**Quantity**	**Price**
1			
2			
3			
Total			

3. Now add up your total expense for your party
4. Total expense
5. Did you budget correctly?

Have a great birthday party!!!

6. ASSESSMENT TOOLS FOR RECORDING LEARNER ACHIEVEMENT IN THE MATHEMATICS LEARNING AREA

There are many different assessment tools that can be used to record learner achievement. The most widely used ones are indicated in the information sheet below

Checklists	These are useful for assessing products and processes against a list of criteria
Rubrics	Consists of criteria and levels of competency (performance). Each level has clear descriptions against each criterion
Marking memoranda	Marking memoranda set 'model answers' which can be used as baseline information against which learners' work is assessed.
Observation sheets (with criteria)	Observation sheets are similar to checklists, but they are used when observing learners. Observations allow the teacher to focus on what the learners are doing and how they are behaving in a particular activity or context.

Example of a checklist

Mathematics: Learning Outcome 1
Number, Operations and Relationships

	JB	SM	PS	JV	PP	GV
Plans an action						
Can make a decision independently						
Analyses critically						
Work effectively with others as a member of a group						
Organise and manage themselves and their activities responsibly						
Communicate effectively using visual, symbolic and language skills						

Rubrics

A rubric is a type of rating scale. It provides a scoring guide, which uses pre-established performance criteria to assess learner performance.

There are two types of rubrics: holistic and analytic.

A **holistic rubric** requires the teacher to score the overall process or product as a whole, without judging the component parts separately (Nitko, 2001).

Template for a holistic rubric

Score	Description
4	Demonstrates complete understanding of the problem. All requirements of task are included in response.
3	Demonstrates considerable understanding of the problem. All requirements of task are included.
2	Demonstrates partial understanding of the problem. Most requirements of task are included.
1	Demonstrates little/no understanding of the problem. Many requirements of task are missing.

An **analytic rubric,** the teacher scores separate, individual parts of the product or performance first, then sums the individual scores to obtain a total score (Moskal, 2000; Nitko, 2001). Holistic rubrics assess the overall process or the product as a whole. They give a global picture of the standard required and are mostly used in summative assessment.

Template for an analytic rubric

	Not Achieved 1	Partially Achieved 2	Achieved 3	Exceptional/Outstanding 4	Score
Criteria 1	Description reflecting beginning level of performance	Description reflecting movement toward mastery level of performance	Description reflecting achievement of mastery level of performance	Description reflecting highest level of performance	
Criteria 2	Description reflecting beginning level of performance	Description reflecting movement toward mastery level of performance	Description reflecting achievement of mastery level of performance	Description reflecting highest level of performance	
Criteria 3	Description reflecting beginning level of performance	Description reflecting movement toward mastery level of performance	Description reflecting achievement of mastery level of performance	Description reflecting highest level of performance	
Criteria 4	Description reflecting beginning level of performance	Description reflecting movement toward mastery level of performance	Description reflecting achievement of mastery level of performance	Description reflecting highest level of performance	

Note: There are other assessment tools for judging evidence besides rubrics. Teachers do not always have to use rubrics.