

# **PROMOTING SPACE & SHAPE IN MATHEMATICS AT SCHOOL**

Grades 4 to 7

**SHORT LEARNING PROGRAMME (SLP)  
GUIDE**

## Introduction

This 100 notional hour programme is offered to educators, departmental officials and persons involved in education. It has been developed in response to the need expressed by educators in the Port Elizabeth area, as these teachers have indicated that there is a great need for computer literacy. As such, the SLP attempts to empower individuals to respond to their needs of developing real life computer skills to empower them to use the computer.

These 100 hours notional hours implies that it should take the average student approximately 100 hours to successfully complete the short learning programme (SLP). The 100 hours include practical computer contact time, practical computer non-contact time and the practical test(s).

The accompanied study guide / notes are designed to assist you to practice computer skills and for referencing purposes. Additional study material may be recommended to you by your lecturer from time to time and, depending on copyright conditions being fulfilled, may be provided.

Contact time	40 hours
Preparation	20 hours
Suggested non-contact preparation and reading time	16 hours
Assignments	10 hours
Portfolio	10 hours
Class tests	2 hours
Final test	2 hours

## General Outcome

To empower the educators, departmental officials and any other persons involved with basic space and shape mathematics skills for the Intermediate Phase.

## Critical Cross-Field Outcomes

On completion of this module, successful participants will be better equipped to be able to:

- Participate as citizens and contribute to discourses based on computer literacy;
- Solve problems which require computer literacy skills;
- Work effectively as a member of a team by assisting their fellow peers during contact sessions;
- Display effective information management skills through the presentation of their mathematics artefacts
- Demonstrate an understanding of the implications of societal decisions which are taken and which presume a higher level of scientific literacy;
- Communicate effectively by using the computer as a tool to create artefacts.

## Learning Outcomes of the NCS and addressed by this SLP

The Mathematics Learning Area of the NCS has five learning outcomes. Each of these outcomes is clarified in their respective Assessment Standards. It is important that you refer to these assessment standards constantly as you prepare lessons for classroom teaching.

### Learning Outcome 1: Numbers, Operations and Relationships

.... recognise, describe and represent numbers and their relationships, and counts, estimates, calculates and checks with competence and confidence in solving problems.

### Learning Outcome 2: Patterns, Functions and Algebra

... recognise, describe and represent patterns and relationships, and solve problems using algebraic language and skills.

### Learning Outcome 3: Space and Shape

... describe and represent characteristics and relationships between 2-D shapes and 3-D objects in a variety of orientations and positions.

### Learning Outcome 4: Measurement

... use appropriate measuring units, instruments and formulae in a variety of contexts.

### Learning Outcome 5: Data Handling

... collect, summarise, display and critically analyse data to draw conclusions and make predictions, and to interpret and determine chance variation.

The content of this SLP relates specifically to the NCS Mathematics Learning Area Outcomes 3 and 4 (related to figures). The focus is on grade 4 to 6 and grade 7. However, some extra material is also covered to enable you to move beyond grade 6 and 7.

Below you will find a breakdown of LO3 for grade 6, 7 and 8. We have deliberately not indicated grade 4 and 5, as grade 6 encompass all the knowledge and skills that a learners should be able to have accomplished. Grade 6 is also the last grade in the Intermediate Phase.

#### **GRADE 6 (Grade 6 implies that the outcomes of grades 4 and 5 have been covered)**

- *Recognize, visualize and name two-dimensional shapes and three-dimensional objects in natural and cultural forms and geometric settings including those previously dealt with and focusing on similarities and differences between tetrahedrons and other pyramids and similarities and differences between rectangles and parallelograms.*
- *Describe and classify two-dimensional shapes and three-dimensional objects in terms of properties including faces, vertices and edges, length of sides and angle sizes of corners.*
- *Investigate and compare (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 three-dimensional models using, drinking straws to make a skeleton or nets provided by the teachers, drawing shapes on grid paper or using a pair of compasses to draw circles, patterns in circles and patterns with circles.*
- *Use the vocabulary and properties of rotations, reflections and translations to describe the relationships between distinct two-dimensional shapes and three-dimensional objects within patterns (including transformations and symmetry).*
- *Draw enlargements and reductions of two-dimensional shapes (at least quadrilaterals and triangles) using grid paper to compare their size and shape.*
- *Recognize and describe natural and cultural two-dimensional shapes, three-dimensional objects and patterns in terms of geometric properties.*
- *Draw and interpret sketches of simple three-dimensional objects from different positions (perspectives)*
- *Locate positions on a coded grid, describes how to move between positions on the grid and recognizes maps as grids.*

## **GRADE 7**

- *Recognize, visualize and name geometric figures and solids in natural and cultural forms and geometric settings, including those previously dealt with as well as focusing on similarities and differences between different polyhedra, similarities and differences between all quadrilaterals including kites and trapeziums.*
- *In context that include those that may be used to build awareness of social, cultural and environmental issues, describes and classifies geometric figures and solids in terms of properties, including faces, vertices and edges, sides and angles of polygons (with focus on, but not limited to, triangles and quadrilaterals) and parallel and perpendicular sides.*
- *Use a pair of compass, ruler and protractor to accurately construct geometric figures for investigation of own property and design of nets.*
- *Design and use nets to make models of geometric solids studied up to and including the grade.*
- *Use transformations (rotations, reflections and translations) and symmetry to investigate (alone And/or as a member of a group or team) properties of geometric figures.*
- *Recognize and describe the properties of similar and congruent figures and the difference between them.*
- *Draw and interprets sketches of solids from different perspectives.*
- *Locate positions on co-ordinate systems (ordered grids) and maps using, horizontal and vertical change and compass directions.*

## **GRADE 8**

- *Recognize, visualize and name geometric figures and solids in natural and cultural forms and geometric settings, include those previously dealt with and the platonic solids (tetrahedron, cube, octahedron, dodecahedron, icosahedron).*
- *In context that includes that may be used to build awareness of social, cultural and environmental issues, describe and classify geometric figures and solids in terms of properties, including sides, angles and their interrelationships, with focus on triangles and quadrilaterals (e.g. types of triangles and quadrilaterals).*
- *Use vocabulary to describe parallel lines, intersecting lines and triangles in terms of angle relationships (e.g. vertically opposite and corresponding).*
- *Use a pair of compass, ruler and protractor to accurately construct geometric figures for investigation of own property and design of nets.*
- *Design and use nets to make a model of geometric solids studied up to and including this grade.*
- *Use transformations (rotations, reflections and translations) and symmetry to investigate (alone and/or as a member of a group or team) properties of geometric figures.*
- *Use proportion to describe the effect of enlargement and reduction on properties of geometric figures.*
- *Draw and interpret sketches of geometric solids from different perspectives with attention to the preservation of properties.*
- *Locate positions on co-ordinate systems (ordered grids). Cartesian plane (first quadrant) and maps, and describe how to move between positions using, horizontal and vertical change, ordered pairs and compass directions.*

**LO4: Measurement and construction of figures**

**GRADE 6 (Grade 6 implies that the outcomes of grades 4 and 5 have been covered)**

- Recognizes and describes angles in two-dimensional shapes, three-dimensional objects and the environment in terms of:
  - ✓ Right angles;
  - ✓ Angles smaller than right angles;
  - ✓ Angles greater than right angles.

**GRADE 7**

- Classify angles into acute, right, obtuse, straight, reflex or revolution.
- Estimates, compares, measures and draws angles accurate to one degree using protractors.

## Requirements

- Portfolio file
- Stationary and scissors
- Geometry set

## Short Learning Programme: Summary of Units and coverage

This SLP contains the following Units, based upon the Learning Outcomes of the NCS:

- Unit 1: The importance of teaching geometry
- Unit 2: Angles, measurement & drawings
- Unit 3: Sorting and classification of geometric shapes
- Unit 4: Constructions
- Unit 5: Calculations of angles
- Unit 6: Nets
- Unit 7: Investigating symmetry around us in nature
- Unit 8: Tessellations
- Unit 9: Coded grids

## Units covered: Detail

- **Unit 1: The importance of teaching geometry**

Duration: 3 hours

Purpose of the unit

This unit investigates the importance of the Space and Shape learning outcome by focusing on the Van Hiele levels of geometric thought. It also introduces the students to tanagrams, pentonimoes and hexiamonds. Students are also introduced to the historical background of geometry and geometrical terminology.

Outcomes

- ✓ Name the five mathematics outcomes
- ✓ Explain what is geometry
- ✓ Have a sound understanding of historical geometric aspects
- ✓ Name and discuss the Van Hiele levels of geometric thought
- ✓ Explain each of the different Van Hiele levels and link it to the phases at school level

- ✓ Provide examples of how to facilitate geometry learning in the classroom
- ✓ Recognize geometrical shapes in immediate surroundings
- ✓ Link geometry with shapes in road safety
- ✓ Explain what a tanagram is
- ✓ Explain the difference between a hexiamond and a pentonimo
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

- **Unit 2: Angles, measurement & drawings**

Duration: 3 hours

Purpose of the unit

This unit investigates how to measure and draw angles, as well as how to classify angles according to its size. It also provide opportunities for the student to explore how an analogue watch can be used to teach the different types of angles and how to calculate the size of an angle. Furthermore, the different types of triangles are explored and identified based upon their sides and/or angles.

Outcomes

- ✓ Identify and explain geometrical terms and symbols e.g. point, straight line, line, line segment and a ray
- ✓ Explain what is meant by the term 'angle'
- ✓ Practically make an angle guide to assist with the classification of angles
- ✓ Identify and name the different types of angles
- ✓ Investigate triangles and classify triangles based upon their sides and/or angles
- ✓ Measure angles
- ✓ Draw angles of a specific size
- ✓ Investigate how to use a analogue clock to teach angles
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

- **Unit 3: Sorting and classification of geometric shapes**

Duration: 3 hours

Purpose of the unit

This unit introduces the student to the classification and sorting of shapes. The terms polygon and quadrilateral are also introduced.

Outcomes

- ✓ Explain what the difference is between a polygon and a regular polygon
- ✓ Sort polygons into different categories
- ✓ Classify quadrilaterals
- ✓ Calculate the angles of polygons (straight lines, triangles angles, quadrilaterals)
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

- **Unit 4: Constructions**

Duration: 3 hours

Purpose of the unit

This unit focuses primarily on constructions. The student has to use his/her mathematical instruments (compass, protractor, etc.) to draw various constructions.

Outcomes

- ✓ Draw circular constructions
- ✓ Copy an angle by using mathematical instruments
- ✓ Bisect an angles by using mathematical instruments
- ✓ Draw a perpendicular line by using mathematical instruments
- ✓ Draw a perpendicular line from a given point on a line by using mathematical instruments
- ✓ Draw a perpendicular line from a point outside the line segment by using mathematical instruments
- ✓ Construct various shapes, including triangles, by using mathematical instruments
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

- **Unit 5: Calculation of angles**

Duration: 3-6 hours

Purpose of the unit

This unit focuses primarily on calculations of angles.

Outcomes

- ✓ Investigate and explain the concepts parallel lines, transversal, vertically opposed angles, alternate angles, corresponding angles and co-interior angles
- ✓ Make deductions from figures concerning vertically opposed angles, alternate angles, corresponding angles and co-interior angles
- ✓ Investigate and explain the terms congruency and similarity
- ✓ Practically calculate various unknown angles
- ✓ Investigate and calculate the size of vertex angles in the different regular polygons e.g. triangle, rectangle, pentagon, hexagon, etc.
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

- **Unit 6: Nets and faces, edges and vertices**

Duration: 3-6 hours

Purpose of the unit

This unit focuses primarily on the classification of the number of faces, edges and vertices in prisms and pyramids

Outcomes

- ✓ Explain the difference between the faces, vertices and edges in objects
- ✓ Explain the difference between a shape and an object
- ✓ Name a specific object and Investigate the number of faces, vertices and edges in that object
- ✓ Name the specific object if a net of an object is given
- ✓ Draw the net of a specific object
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

- **Unit 7: Symmetry**

Duration: 3-6 hours

Purpose of the unit

This unit focuses primarily on symmetry and the two types thereof.

Outcomes

- ✓ Investigate what the concept symmetry entails
- ✓ Explain the difference between rotational and line symmetry
- ✓ Design practical activities related to symmetry
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

- **Unit 8: Tessellations**

Duration: 3-6 hours

Purpose of the unit

This unit introduces the concept tessellations to the student as well as how we tessellate. The different types of tessellations are also introduced.

Outcomes

- ✓ Explain what a tessellation is
- ✓ Practically experience the different types of tessellations
- ✓ Identify the types of tessellations, namely edge-to-edge tessellations, regular tessellations and semi-regular tessellations
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

- **Unit 9: Coded grids**

*Duration:* 3-6 hours

*Purpose of the unit*

This unit introduces the student to concepts or terminology such as columns, rows, horizontal and vertical axis, regions, coordinated pairs, etc.

*Outcomes*

- ✓ Locate positions on a map
- ✓ Design coded-grid activities
- ✓ Compose questions for coded grid activities
- ✓ Explain how coded grid activities relate to other learning areas of the NCS
- ✓ Discuss why coded grids are important
- ✓ Plan and discuss how to plan lessons pertaining to the above aspects

## **ASSESSMENT**

An overall passing mark is 50% for the practical test at the end of the programme.

To be able to qualify for a certificate, the following is required:

- Be officially registered for this SLP
- Have attended at least 75% of the contact time, and
- Have obtained at least the 50% pass mark of the CASS (continuous assessment) which could consists of the following:
  - Class test
  - Formal semester test(s)
  - Assignments
  - Lesson plans
  - Portfolio
  - Attendance
- Obtain a minimum of 50% in the final examination

**END**