Province of the Eastern Cape
DEPARTMENT OF EDUCATION
ISEBE LEZEMFUNDO
DEPARTMENT VAN ONDERWYS

MATHEMATICS

TERM 1

SENIOR PHASE LESSON PLAN EXEMPLARS

JUNE 2009

INTRODUCTION

The Eastern Cape Department of Education, Curriculum Chief Directorate in collaboration with the District curriculum personnel developed this document to support teachers' planning, teaching and assessment for effective implementation of the National Curriculum Statement in the GET Band.

The document contains exemplars of lesson plans with activities on each assessment standard in all learning outcomes. It is prepared with the intention to give necessary guidance for lesson planning for Term 1 in accordance with the provincial work schedule.

This document must be used as a guide in collaboration with the following documents: National Curriculum Statement. NCS Teacher's Guide for the development of Learning Programmes, National Assessment Policy, Provincial Assessment Guidelines, Provincial Planning Document. This can be adapted to suite the teacher's condition and contextual demands of the school.. It is a guide to assist teachers in lesson planning. An exemplar is an illustration of how planning could be done, it is not cast on stone. Critical engagement with the document is encouraged.

NOTE TO THE TEACHER

Ensure that Mathematics is taught **daily** for **1 Hour** as according to policy. **Daily classwork and homework** should be given, marked and feedback be given to learners in order to ensure effective remedial work is done. **Informal assessment tasks** that culminate into **Formal assessment tasks** should be given at regular intervals.

Consult as many text books as possible as well as other support material including internet, where possible when developing lessons.
Please do **not rely on one textbook only when planning lesson activities.** Whenever possible, learners should be encouraged to get messy, in order to formulate their own meaningful concepts. . The teacher should assist learners in formalising their crude formulations as meaningful learning is the construction of the learner embedded in his previous experience **.Learners misconceptions should be attended to before they become solidified.** The teacher should challenge misconceptions with engaging discourse Some of the lesson plans encourage investigative approach to learning whenever possible.

Activities in the lesson plan exemplars are a guide that helps to scaffold the teacher in developing other related activities. This guide is not cast on stone as context and other critical factors might have an influence. Critical engagement with the document is encouraged.

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GRADE 7 MATHEMATICS LESSON PLAN EXEMPLARS:
CONTENT OVERVIEW

TERM 1	TERM 2	TERM 3	TERM 4
LO1 Counting backwards and forwards in decimal intervals and integers Description and illustration of historical development of numbers (e.g integers, common fractions) Recognition, classification and representation of numbers (integers, decimals to at least 3 dec place) fractions and percentages in order to describe and compare them. Factors including prime factors of 3 digit numbers Recognition and use of equivalent forms of rational numbers. Recognition, description and use of: equivalent fractions including common fractions, decimals and percentages **LO2** Investigation and extension of numeric and geometric patterns to find relationships and to formulate rules, not limited to	**LO 1** Profit & loss, budgets, accounts, loans, simple interest, higher purchase, exchange rates, ratio and rates. **LO2** Draw tables , flow diagrams to describe relationships, Look for pattern, describe in own words the relationship and make conjectures Mathematical Modelling in various context Problem solving **LO3** Transformation (rotation, reflection, and translation) and symmetry to investigate properties of geometric figures Recognition and description of and differentiation between congruent and similar figures **LO4** Calculations on perimeter, of	**LO1** Rounding off numbers to at least 1 decimal place. Multiple operations with integers Addition, subtraction and multiplication of decimal fractions and common fractions. Division of positive decimals by whole numbers Percentages Exponents. Mental calculations involving squares to at least 12^2 and cubes to at least 5^3 **LO2** Determination, analysis and interpretation of the equivalence of the same rule in different ways (verbally, in flow diagrams, in tables and by equations or expressions). **LO3** Drawing and interpretation of	**LO1** Calculations using a range of techniques involving the commutative , associative and distributive properties with positive rational numbers and zero; also a calculator. Use of algorithms to find equivalent fractions **LO 2** Description of a situation by interpreting graphs Drawing of graphs **LO 3** **Consolidation** Drawing and interpretation of sketches of solids in different perspective.

sequences involving constant difference or ratio; (In the natural and cultural contexts or learners' own creation) Learners justify their conjectures **LO3** Naming and exploring geometric shapes Similarities and differences between different polyhedra,and all quadrilaterals. Classification of geometric figures and solids in terms of properties. Construction of geometric figures and designing of nets to make models **LO4** Problem solving including : Time , distance, speed , length , Perimeter of polygons **LO5** Selection and use of appropriate methods to collect data. Designing and using of questionnaires to collect data, record using tables and stem-and leaf displays Samples and populations	various polygons Area of a square and surface area rectangle square triangle . Volume of the following right prisms: Triangular and Rectangular and cube **LO 5** Determination and identification of measures of central tendency viz.: Median, mode, range and mean Drawing of graphs viz.: bar graphs histograms pie charts line and broken line graphs Critical reading and interpretation of data to draw conclusions and make predictions.	sketches of solids in different perspective. Location of positions on co-ordinate systems and maps using Cartesian plane and compass directions **LO 4** Interrelationship between perimeter, area, surface area and volume in geometric solids **LO5** Theory of probability - listing possible outcomes and determine relative frequency.	Location of positions on co-ordinate systems and maps using compass direction **LO4** Classification of different angles into acute, right, obtuse, straight, reflex and revolution Estimation, comparison, measurement and drawing of angles accurate to one degree using protractors. **LO5** **Consolidation:** Theory of probability -listing possible outcomes and determine relative frequency

LESSON PLAN EXEMPLARS – GRADE 7
TERM 1

WEEK	LOs & ASs	CONTENT	ACTIVITIES
1-3	7.1.1 Counts backwards and forwards in the following ways: • In decimal intervals • in integers for any intervals. 7.1.2 Describes and illustrates the historical and cultural development of numbers (e.g. integers, common fractions) 7.1.3 Recognises , classifies and represents the following numbers in order to describe and compare them: • integers • decimals (to at least three decimal places), fractions and percentages ; • factors including prime factors of 3-digit whole numbers; • numbers in exponential form including squares of natural numbers to at least 12^2, cubes of natural numbers to at least 5^3 , and their square and cube roots . 7.1.4 Recognises and uses equivalent forms of	. Counting in: decimal intervals and integers Description and illustration of historical development of integers and common fractions Recognition, classification and representation of numbers integers, 3 dec place numbers, fractions and percentages, factors of 3digit whole numbers exponential form, square and cube roots in order to describe and compare them. Equivalent forms of common fractions, decimals and percentages	**Activity 1** Counting forwards and backwards **Activity 2** Introduction of negative integers **Activity 3** Recap on common fractions and equivalence between decimals, common fractions and percentage **Activity 4**

	the rational numbers listed above ;including ; • common fractions; • decimals ; • percentages .		
	<u>Activity 1</u> • Teacher divides learners into groups • Give different groups different work sheets(others counting forwards and others counting backwards in both whole numbers and decimals) Learners have to complete the following task : a) 0,90; 0,75 ; ---;---;---. b) 1,25; 1,10; ----; ---- ;---. c) 2,125; 2,155; --- ;---; ---. d) 6175;6300;;---; ---; ---. e) 43 400; 43 175; ---; ---;---. • Exchange the worksheets among groups **<u>Activity 2</u>** Introduce the idea of <u>negative whole numbers</u> by referring to concrete examples that learners are already familiar with , e.g.		

- Temperatures in very cold regions in South Africa and other parts of the world.
- Bank statements may reflect a negative balance if you owe the bank money.
- It may refer to how deep a ditch is below the surface of the ground .
- Learners are prompted to give more examples.

Learners give the first five elements of the following sets :

i) Natural numbers

ii) Counting numbers

iii) Negative whole numbers

The teacher explains that negative whole numbers together with the counting numbers form a set of Integers.

- Represent the integers as an Infinite set :

  Z= {….. -3; -2 ; -1; 0; +1; =2 ; +3; ……}
- Represent the set of integers on a number line.
- Note: It is a good idea to view the number line in a vertical position initially so that the idea of order may easily be explained. (As an object moves up the line , the height of the object becomes greater)
- In the horizontal position numbers become larger as we move to the right and smaller as we move to the left.

Activities should include the following types of questions :

a) Indicate the position of the following numbers on the number line : 7; -12; 0 ; -8.

b) Arrange in order of increasing size :

-56; 45; 0; 11; -28

c) Use the > and < signs to show which of the following is bigger or smaller than :

i) -5 …..5

ii) -7 ….. -8

iii) 0 …… -6

Activity 3

- Revise the concept of common fractions as a part of the whole e.g. a loaf divided into four equal parts – each part is a quarter.
- Extend to other examples within the same approach :

  1/3; 1/8; 2/5; …
- These are also known as proper fractions
- Learners are guided to differentiate between proper and improper fractions ,

  such as 4/7; 8/3; …..
- They define these types of fractions
- Sometimes we write improper fractions as :

  7/4=4/4 +3/4 = 1+3/4=1 ¾
- 1 ¾ is a mixed fraction.
- Introduction of the concept of percentages , e.g. 12 % means 12 out of a hundred or 12/100 .

Complete the table below

Percentage	Common fraction	Decimal fraction
	……$^{3}/_{8}$	……
15	……	…….
	…….	……2,4….

Activity 4

Divide learners into groups

- Each group is given four natural numbers above 20
- Learners are required to investigate which other natural numbers can divide the given natural numbers without a remainder
- From the learner's responses, the teacher introduces factors

Example:

No	Factors of 15
15	1; 3; 5; 15

- Oral exercises, e.g. Give / what are the factors of 30; 27 56, 99

  Extend to 3 digit numbers 125, 512,720… etc
- Learners are required to give different types of numbers (e.g. whole , natural , odd , etc) and describe each.

Activity 6

- The teacher asks learners questions about the long and short way of writing a number if it repeatedly multiplies itself

  e.g. 2 x 2 x 2 x 2 x 2 = 2^5

	$3 \times 3 = 3^2$ $1 \times 1 \times 1 = 1^3$ • The teacher introduces exponential form b y explaining powers (base and index/exponent) • Introduce a square as a number multiplied by itself once e.g. $3x3 = 3^2 = 9$. Thus 9 is a square . A cube is a number multiplied by itself 3 times e.g. $3x3\ x3 = 3^3 = 27$. Thus 27 is a cube Learners list the squares of the first twenty natural numbers and cubes of the first ten natural numbers.
	RESOURCES:
	ASSESSMENT:
	PROVISION FOR BARRIERS TO LEARNING:
	EXPANDED OPPORTUNITIES: .
	TEACHER REFLECTION :

WEEK	LOs & ASs	CONTENT	ACTIVITIES
4-5	<u>Cluster 1:LO2</u> 7.2.1 Investigates and extends numeric and geometric patterns looking for a relationships or rules, including patterns: • Represented in physical or diagrammatic form; • not limited to sequences involving constant difference or ratio; • in natural and cultural contexts or • Of the learners` own creation • represented in tables 7.2.2 Describes, explains and justifies observed relationships or rules in own words.	Investigation and extension of numeric and geometric patterns to find relationships and to formulate rules . Identifying constant difference or ratio.	ACTIVITY 1 Completion of simple numeric patterns ACTIVITY 2 Use of sticks to extend patterns and drawing flow diagrams ACTIVITY 3 Learners create their own patterns to discover their rules and formulae .
	<u>ACTIVITY 1</u> The teacher revises numeric patterns where learners are asked to complete the following number patterns orally : i) 4; 8; 12; ……; …….; …….. ii) 2; 4; 8; …..; ……; …….. iii) 200; 100; ….; 25; ……; …….		

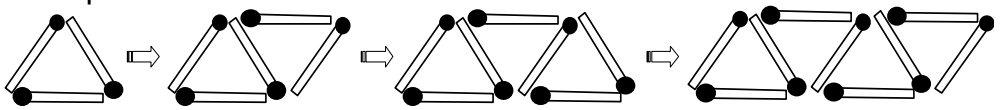
iv) 78; 70; 62; ……..; ……; ……

v) 2; 6; 18; …..; …..; …..

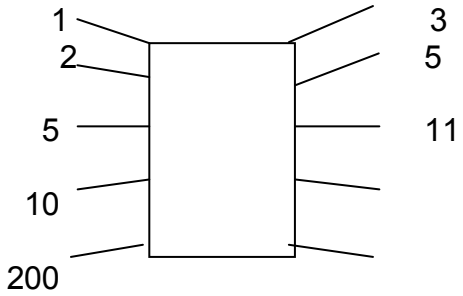
Learners are asked to explain how they find the missing numbers.

ACTIVITY 2

Learners in groups are given matchsticks to make the following triangles and to extend the pattern further to 2 more patterns



Learners are asked to complete the flow diagram below where the question mark inside the box is asking what they did to find the output or answers.



Learners are given chance to report what they did in their groups to find the answers and the general rule or formula is discovered i.e. 2 x n + 1 where “n” is the number of triangles .

Learners are then asked to fill in the gaps in the table below :

No. of triangles	1	3	5	50	75	100
No. of matchsticks	3	-	-	-	-	-

	ACTIVITY 3 Learners are supplied with matchsticks and cubes to: i) construct and create their own patterns in groups ii) include large numbers in their tables where a rule or a formula will be used in finding answers to those numbers ; iii) come up with rules for their patterns and explain how generated those rules ; All the activities done in different groups will be discussed in class and the teacher helps and guides learners where necessary.
	RESOURCES: Matchsticks ; cubes , workbooks
	ASSESSMENT: Investigation , classwork, homework
	PROVISION FOR BARRIERS TO LEARNING: Heterogeneous cooperative groups will be used in most activities.
	EXPANDED OPPORTUNITIES: A variety of patterns including those with powers of 2 will be done by learners.
	TEACHER REFLECTION :

WEEK	LOs & ASs	CONTENT	ACTIVITIES
6-7	<u>Cluster 1:LO3</u> 7.3.1 Recognises, visualises and names geometric figures and solids in natural and cultural forms and geometric settings, including those previously dealt with as well as focussing on; • similarities and between different polyhedral. ; • similarities and differences between all quadrilaterals including kites and trapeziums. 7.3.2 In contexts 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); • parallel and perpendicular sides. 7.3.3 Uses a pair of compasses, ruler and protractor to accurately construct geometric figures for investigation of own property and designs of nets. 7.3.4 Designs and uses nets to make models of geometric solids studied up to and including this grade.	Geometric shapes Similarities and differences between polyhedra ; quadrilaterals 2 Dimensional shapes 3 Dimensional shapes Design of nets	**<u>ACTIVITY 1</u>** Recognising shapes **<u>ACTIVITY 2</u>** Classification of shapes **<u>ACTIVITY 3</u>** Properties of different types of triangles <u>ACTIVITY 4</u> Construction of triangles <u>ACTIVITY 5</u> Constructing 3 D shapes <u>ACTIVITY 6</u> Drawing of nets

ACTIVITY 1
The teacher gives learners in groups worksheets that have shapes.
Learners are asked to write the names of the shapes inside each shape using pencils.
The teacher asks each group to report on what they did while other groups ask questions.

ACTIVITY 2
Learners in groups are asked to classify the shapes the way they want to. Each group then motivates its classification citing the criteria used to the whole class. Learners debate the classifications if necessary.

ACTIVITY 3
The teacher asks the groups to take only the triangles and write everything they notice in these triangles. Identify various types of triangles according to their properties.

ACTIVITY 4

(a) The teacher asks learners in groups to construct equilateral triangle.

Draw a line and label it.
Set your compass with the radius to the line you have drawn.
With the sharp end of the compass on one end of the line, construct another arc that will intersect with the first one.
From where the two arcs meet draw lines that are formed.

(b) The teacher asks learners in groups to construct isosceles triangles.
Draw a line and line label it .
Set your compass with the radius that is a little more or less than the original line.
With the sharp end of the compass on one end of the line construct an arc above the line and do the same on the other end of the line
The two arcs constructed above the line must intersect.
Join the original line and the point where the two arcs meet and complete a triangle.
Measure the sides and the angles of the triangle formed.

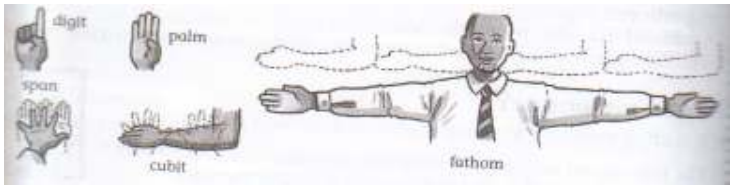
(c) Learners in groups are asked to construct a scalene triangle.
Draw a line and label it
Set your compass with any radius, which is not equal to the original line, with the sharp end of the compass on one

	end of the line Construct an arc above the line. Set another radius on the compass with the sharp end on the end of the line and construct an arc to intersect the first one. Join the first line to where the two arcs meet and complete a triangle. Measure the sides and angles of your triangle. What can you deduce about the relationship between the angles and sides of your triangle? **ACTIVITY 5** Learners are given a dotty (Sqaure grids and isometric) paper to construct different kinds of solids. The teacher may demonstrate this exercise by drawing a cube and thereafter skill. **ACTIVITY 6** Learners are to bring boxes (e.g. toothpaste box, beef/chicken cube box, of various shapes etc) to class. Each learner is then required to open up one box at a time along the glued or stapled edges and drawing the shape that comes up. The teacher introduces the concept of nets. The learners are then given pictures of different solids and nets. They have to match solid shapes with nets . After that the teacher gives the learners the name of a solid and they have to draw the net of that particular solid. (these polyhedral should include platonic solids as well). Learners can also use drinking straws to make nets and join edges with prestik.
	RESOURCES: Drinking straws, prestik, Mathematical instruments sets, square grid and isometric papers
	ASSESSMENT: Investigation , classwork, homework mini assignment
	PROVISION FOR BARRIERS TO LEARNING: Heterogeneous cooperative groups will be used in most activities.
	EXPANDED OPPORTUNITIES: . Give more complicated activities
	TEACHER REFLECTION :

WEEK	LO's & AS's	CONTENT	ACTIVITIES
8-9	Cluster 1:LO 4 7.4.1 Solves problems involving time, including relating time, distance and speed. 7.4.2 Solves problems involving length, perimeter and area of polygons; volume and surface area of rectangular prisms. 7.4.3 Solves problems using a range of strategies including estimation, calculating to at least two decimal places; using and converting between appropriate S.I. units. 7.4.4 Describes and illustrates ways of measuring in different cultures throughout history including metric and other formal measuring systems.	Problem solving including time, distance, speed, length, perimeter and area of polygons. Volume and surface area of rectangular prisms. Problem solving, estimation, calculation and conversions between S.I. units. Description and illustration of formal measuring systems in different contexts.	Activity 1 Measuring without using the forma measuring instruments. Activity 2 Estimation of distance and time to school by each learner. Activity 3 Using a project of fencing to calculate time in days. Activity 4 Conversions between S.I. units. Activity 5 Measuring using formal measuring instruments and thereafter calculating perimeter and area of polygons, volume and surface area of rectangular prisms.

Activity 1

In groups learners are required to measure various lengths of various objects (desks, classroom etc) without using any formal measuring instruments.



Let`s go back in history and calculate a few dimensions. The Bible gives this account of Solomon`s temple in Jerusalem: He made a bronze altar twenty cubits long, twenty cubits wide and ten cubits high.
A cubit is about 20,67 inches or 0,525metres .One foot is 12 inches.
Determine the dimensions of the altar in :

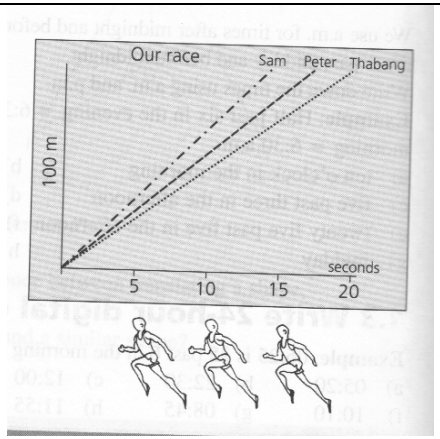
a) Inches b) feet c) metres.

Activity 2A

Learners can conduct a real life experiment to derive the meaning of speed as Speed = $\frac{\text{Distance}}{\text{Time}}$

Ten learners have to race for a distance of 100m while other ten learners use stop watches to time the racing learners (depending on the size of the class). Each time keeper targets one racer. After the race the times are recorded next to each learner. The speed of each learner is then calculated and compared against the position of that particular racer.

Note: The teacher must introduce to learners
The definitions of speed and time
The use of formula regarding distance, speed and time i.e.
Speed = $\frac{\text{Distance}}{\text{Time}}$ Distance = Speed x Time and Time= ????



The teacher can then use other examples like the speed of a car, air plane, etc.

(Teacher to give more activities)

Activity 2B

The teacher asks general questions from the learners like:

1. What is the distance travelled by each learner from home to school?
2. Illustrate this information on a bar graph.
3. How much time does each learner take travelling to school?
4. Find a learner in the class who travels the same distance and time as yours.
5. Calculate the average distance travelled by all the learners in the class.

The teacher selects one of the distances and times above for the calculation of the average speed. Example:

- If Siziwe travels 500m for 7minutes to school every day, calculate the average speed with which she travels.
- How much time would she take if she was living 3km away from school assuming that she travels at the same pace?

Activity 3

Two teams of workers are constructing a fence around a mealie field. Tukela's team constructs 9m of fencing each day while Mimi's team constructs 7m of fencing daily. Both teams start working on a Monday.

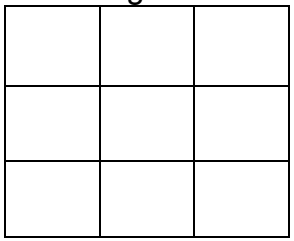
- On what day of the week will Tukela's team have completed 54m of fencing?
- How many meters of fencing will Mimi's team have completed on that day?
- If each team works 8 hours a day, how much time in hours will each team have worked on the day above?
- Calculate the rate at which each team is working.

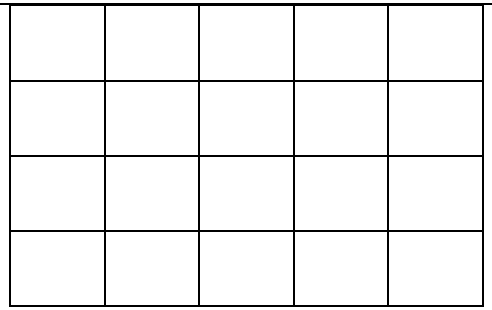
Activity 4

Learners measure the width of their finger nails in mm.
Convert your answer to cm.
Learners can also measure the lengths of their books in cm and then convert your answer to mm.
They further measure the perimeter of their vegetable garden in metres. Convert your answers to cm then mm.
(More conversions to be consolidated by teachers)

Activity 5A

Assuming that each block represents $1cm^2$, learners write down the areas of these shapes :



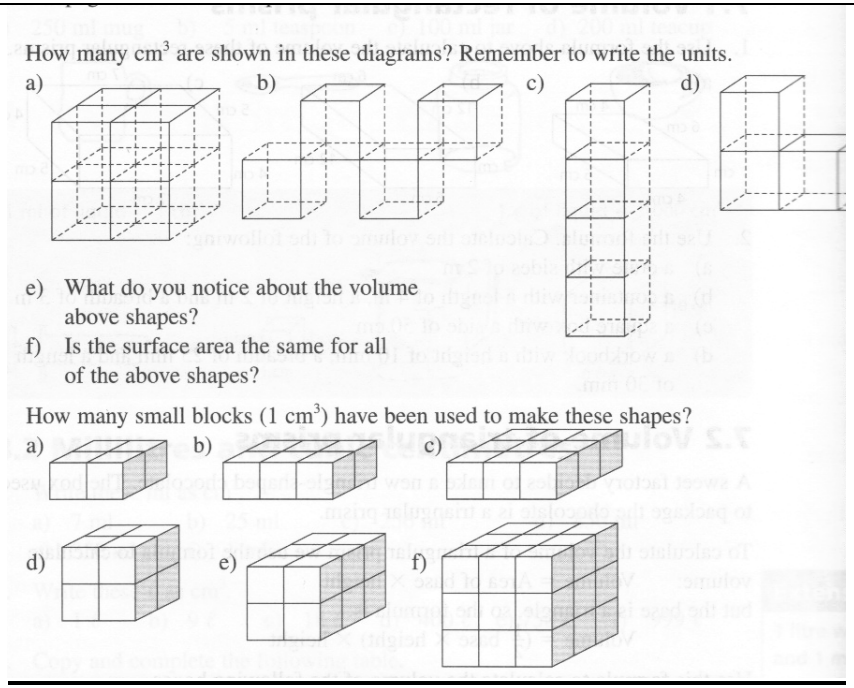


Learners are required to measure the area of school hall and calculate the number of boxes needed to tile the floor .If already tiled count the number of tiles used and convert that to square metres that tiled the floor.
Note : More activities on perimeter and area of various .polygons

Activity 5B
Teacher recaps on volume

Learners should be able to link are to volume for all right prisms

Volume of a prism= Base area x Height



Find the total surface area and volume of d and f above
How much air is enclosed in a box of length 28cm, breadth 12cm and height 13cm
More problems are given

RESOURCES: Desks, Classroom, Stop watches, Measuring Instruments
INTEGRATION:
ASSESSMENT: Classwork , homework Investigation, Project
PROVISION FOR BARRIERS TO LEARNING: Learners are grouped so that they can assist each other.
EXPANDED OPPORTUNITIES: Learners are given tasks on the measurement of capacity.
TEACHER REFLECTIONS:

WEEK	LOs & ASs	CONTENT	ACTIVITIES
10-11	CLUSTER 1: LO 5 7.5.1 Poses questions relating to human rights, social, economic, environmental and political issues in own environment. 7.5.2 Selects appropriate sources for the collection of data (including peers, family, newspapers, books, magazines). 7.5.3 Uses simple questionnaires (with a variety of possible responses) and designs and uses questionnaires (with yes/no type responses) in order to collect data (alone and/or as a member of a group or team) to answer questions. 7.5.4 Distinguishes between samples and populations , and suggests appropriate samples for investigation (including random samples) 7.5.5 Organises (including where appropriate) and records data using tallies, tables and stem-and- leaf displays. 7.5.6 Summarises ungrouped numerical data by determining mean, median and mode as measures of central tendency and distinguishes between them.	Selection and use of appropriate methods to collect data. Designing and using questionnaires to collect data, record using tables and stem-and –leaf displays Distinguish between samples and populations Mean, median and mode,	**ACTIVITY 1** RECAP ON DATA COLLCETION **ACTIVITY 2** UNPACKING TERMINOLOGY AND ORGANISING DATA **ACTIVITY 3** STEM AND LEAF DISPLAYS

Activity1

There are 3 main methods of collecting data using a questionnaire:

- Face-to-face interview
- By post
- By telephone

Questions should be planned carefully and must be clear and precise, non ambiguous and relevant . for example, if you want to collect data on human rights or social , economic, environmental or political issues questions should address that particular context

The teacher unpacks and does demonstration on the 3 main methods of collecting data

Activity 2

Example

The teacher uses the example below to unpack terminology such as population , sample, and teach various concepts like tallies frequency stem and leaf

In a town of approximately 50 000 people a sample of 50 people was randomly picked

In this survey,these people were asked about the number of people in their families. Their responses were as follows::

5 ;3 ;4; 6; 5; 4 ; 6; 7; 2 ; 3; 4; 1; 8; ;4; 2; 6; 5 ; 4
4 ;4; 2; 3, 1 ;5; 4; 2; 4; 3 ;7; 1 ; 2; 4; 3; 4 5; 4
4; 2; 4; 3 4 4; 5; 6; 4; 1; 4; 3; 2; 4

a) Complete the tally table below to organise the data above

Family Size	Tally	Frequency
1	𝍸	5
2	𝍸 II	7
3		
4		
5		
6		
7		
8		
	Total	

Which number was the most common:?

What is the least number of family members?

What is highest number of family members

Activity 3

CONSTRUCTING A STEM-AND-LEAF PLOT

The following results were obtained by 35 Grade 7 learners in a Maths test out of 50 .
23; 40;: 35;25; 34; 50; 20; 19; 26; 34;34; 49; 41; 46; 34;37; 42; 47; 45; 48.
30; 34; 22; 34; 36;25; 37; 40; 32; 35;34; 31;34;40; 31

Note Write down the lowest and the highest data value.
Since the lowest value in the data set = 19 therefore smallest stem = 1.
And the highest value in the data set = 50, therefore the largest stem = 5

Secondly :Separate each number into a stem and a leaf.
Since these are all two digit numbers, the tens digit is the stem and the units digit is the leaf i.e. with the number 34, the 3 is the stem and the 4 is the leaf.
Complete the table below using the test scores above in the numbers on the table

Stem	Leaf
1	9
2	3;5;0; 6;2;5;
3	
4	
5	0

List the leaves from the smallest to the largest.

Stem	Leaf
1	
2	
3	
4	
5	

What do you notice about data spread.?
Discuss your impression about this data

	Activity 4 Using the same data in activity 3 find a) The mean = $\frac{\text{total of all the values}}{\text{number of values}}$ b) The Mode (the most common number) c) The Median: *(most middle value when the items are placed in numerical order* The teacher gives more activities for learners to understand these concepts
RESOURCES: Exemplars of questionnaires, worksheets	
ASSESSMENT: classwork, homework project	
PROVISION FOR BARRIERS TO LEARNING: Learners are grouped so that they can assist each other.	
EXPANDED OPPORTUNITIES:.Give more compound problems	
TEACHER REFLECTIONS:	

GRADE 8 LESSON PLAN EXEMPLARS

GRADE 8 MATHEMATICS LESSON PLAN EXEMPLARS:

CONTENT OVERVIEW

TERM 1	TERM 2	TERM 3	TERM 4
LO 1 Description and illustration of the historical development of numbers (e.g. irrational numbers) Integers, Decimals, fractions and percentages, Numbers written in exponential form including squares and cubes of natural numbers and their square and cube roots; Large numbers in scientific notation;Additive and multiplicative inverses; Multiples and factors; Irrational numbers in the context of measurement e.g. π and square and cube roots of non-perfect squares and cubes commutative, associative and distributive properties of	**LO2** Interpretation and use of basic algebraic vocabulary in context: Term, Expression, Coefficient Exponent, Base, Constant Equation, Formula/rule Commutative, associative and distributive laws, Classification of terms, multiplication and division of algebraic expressions, Simplification of algebraic expressions given in bracket notation ; Comparing different representations of algebraic expressions, Use simple, equivalent forms of algebraic expressions, formulae and equations Solving equations by: Inspection, Trial and improvement/algebraically (additive and multiplicative inverses) Solutions checked by substitution	**LO1** Profit & loss, budgets, accounts, loans, simple interest, higher purchase, exchange rates, ratio and rates (consolidation) **Problem – solving** involving finances, ratio & rate, Problem – solving involving time, distance and speed. **LO2:** Mathematical Modelling**:** Problem – solving involving equations Graphical representation of a problem situation Interpretation of Graphs Interpretation of different descriptions of the same relationship or rule	**LO4** Ways of measuring in different cultures throughout history (e.g. determining the right- angles using knotted string, leading to the Theorem of Pythagoras. Problem-solving using the theorem of Pythagoras Calculate a missing length in a right-angled triangle leaving irrational answers in surd form. **LO3** Plotting of points on a Cartesian plane. move between positions using: Horizontal and vertical change; Ordered pairs; Compass direction Transformations (e.g. rotations, reflections and translations

rational numbers Exponents Properties of Geometric shapes in natural and cultural forms. regular and irregular polygons and polyhedron :The platonic solids (tetrahedron, cube, octahedron, dodecahedron, icosahedrons) t Designing and of use nets to make models of geometric of solids and Accurate constructions **LO 2:** Investigation of numeric and geometric patterns: (natural and cultural contexts) represented in physical and diagrammatic form. not limited to sequences involving constant difference or ratio, learner's own creation. represented in tables. algebraically	**LO3:** Vocabulary based on parallel lines cut by a transversal. Different angles emanating from parallel lines cut by a transversal. Angle relationships of triangles made from parallel lines cut by two or more transversals. **LO 4:** Estimating angles Comparing angles Measuring angles Drawing angles Constructing lines and angles Classification of angles	**LO 4:** **Problem – solving** involving measurement of geometric figures (perimeter, area & volumes) Meaning and use of pi and its historical development in measurement Conversion between SI units **LO 5**: Critical reading and interpretation of the graphs : -Bar graphs and double bar graphs • Histograms with given and own intervals; • Pie charts • Line and broken-line graphs • Scatter plots;-	enlargements and reduction Drawing and interpretation of sketches of geometric solids from different perspectives with attention to the preservation of properties **LO 5** Probability Relative frequency of actual outcomes for a series of trials;

LESSON PLAN EXEMPLARS

WEEK	LOs & ASs	CONTENT	ACTIVITIES
1 – 4	LO 1 Numbers, operations and relationships <u>Cluster 1</u> 8.1.1 Describes and illustrates the historical and cultural development of numbers(e.g. irrational numbers) 8.1.2 Recognises ,classifies and represents the following numbers in order to describe and compare them: ✓Integers ✓Decimals, fractions and percentages ✓Numbers written in exponential form including squares and cubes of natural numbers and their square and cube roots. ✓Large numbers in scientific notation ✓Additive and multiplicative inverses	Rational numbers Scientific notation Decimals, fractions and percentages Exponents Square roots and cube roots Additive and multiplicative inverse Multiples and factors Equivalent forms of rational numbers Irrational numbers in the context of measurement	<u>Activity 1</u> Revision on historical and cultural development of numbers done in Grade 7 <u>Activity 2</u> Introduction of irrational numbers <u>Activity 3</u> Revision on decimals fractions and percentages done in Grade 7. <u>Activity 4</u> Revision on numbers written in exponential form including squares and cubes <u>Activity 5</u> Introduction of large numbers in scientific notation. <u>Activity 6</u> Introduction of additive and multiplicative inverses. <u>Activity 7</u> Revision on equivalent forms of rational numbers.

	✓Multiples and factors ✓Irrational numbers in the context of measurement(e.g. pi and square and cube roots of non – perfect squares and cubes 8.1.3 Recognises and uses equivalent forms of the rational numbers listed above		Activity 8 Application of irrational numbers in the context of measurement

Activity 1

The teacher gives learners a revision activity on Gr7 work e.g

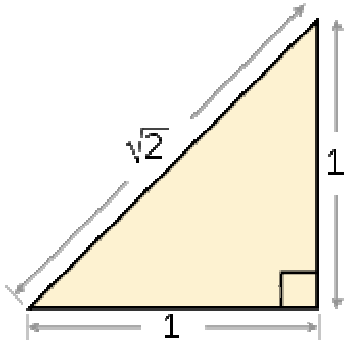
a) Express each number in Greek numeral: 3,15,87,176,1994
b) Write the following numbers in Mayan symbols: 7,18,32,84,100
c) Write the following Roman numbers in our way of writing numbers: vii, x, xix , L

The teacher gives more examples since mostly this was done in the previous grade.

Activity 2

The teacher then introduces the concept of irrational numbers e.g $\sqrt{2}$, pi etc
Learners investigate the historical development of these numbers as a mini project, such as $\sqrt{2}$ below

It is important to differentiate between rational and irrational numbers in order to develop the whole Real Number System



Activity 3

Learners are given a revision activity on fractions, decimals and percentages e.g

a) Half a loaf of bread is divided among 4 people , write as a fraction what each will get.

b)

c) Draw diagrams to show that you understand the meaning of the following fractions:

$\frac{1}{8}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{4}{5}$, $\frac{7}{9}$,

Express the above fractions as decimals and percentages.

d) Arrange the following in ascending order

e) (more examples on percentages)

(i) If Maria received a $\frac{7}{8}$ of a loaf of bread, what percentage did she get ?

(ii) A survey was done with 50 learners. Twenty one of them like watching TV. What percentage is this ?

(iii) A dress costs R239.99. When I pay it cash, I get a discount of 20%. How much do I pay ?

The teacher gives more examples of this nature.

Activity 4

Example 1

Learners are given the following to write in exponential form: (i) 2 x 2 (ii) 7 x 7 x 7 (iii) a x a (iv) b x b x b

Example 2

Learners are required to get the squares and cubes of each of the following numbers:

3, 4, 7, 10

Example 3

The teacher uses prime factors to get the square and cube roots of numbers.

Note $\sqrt{a^n} = a^{n/2}$

$\sqrt[p]{a^n} = a^{n/2}$

$\sqrt{16} = \sqrt{2x2x2x2}$

$= 2 \times 2$

$= 4$

$\sqrt[3]{216} = \sqrt[3]{2x2x2x3x3x3}$

$= 2 \times 3$

$= 6$

Teacher gives more

As an introduction the teacher recaps on exponents of base 10 and division by 10 e.g. 10^2, 10^3

Activity 5

The teacher explains to the learners that it is difficult to work with very large numbers even when using a calculator. For example: -

56 248 x 1 250 000. Learners use a calculator to work out the calculation.

The learners will see that the answer is 7,031 x 10^{10}. He then tells the learners that the answer is expressed in scientific notation or standard notation because it is a very big number that cannot even be displayed on the calculator.

He further explains that to write a number in scientific notation express it as a number between 1 and 10 multiplied by power of 10 e.g. 5 632 000 000 = 5,632 x 10^9. Even the small numbers can be written in scientific notation e.g. (a) 47x1=47/10 x10 = 4,7 x 10^1

(b) 470 = 4,7 x 10^2 (c) 4 700 = 4,7 x 10^3 and so on. The teacher gives the learners the following to do:

(i) Write the following in scientific notation: Speed of light = 299 800 km/s

Diameter of sun = 1 392 000 km

Population of Asia = 108 200 000

(ii) Express following as ordinary numbers , also write them in words

(a) 1,7 x 10^5 (b) 2,58 x 10^6 (c) 5,23x10^7 (d) 6,37x10^9

The teacher gives more activities to the learners.

(iii) Express the following in scientific notation and also write them in words

(a) 234 000 (b) 17 000 000 (c) 214 000 000 (d) 3 097 000 000

Activity 6
Additive inverse

The teacher recaps on the following partially worked out examples as they were done in the previous grades.

i. (+5) + (+2) = +7
ii. (0) + (-5) = …….
iii. (-2) + (-4) = ……..

He then asks the learners whether the order of the addends has an effect on the final answer.
He further deals with the concept of additive inverse by extending the above exercise as shown below:

i. (-5) + (+5) =…….
ii. (+2) + (-2) = …….
iii. (-10) + (+10) = ……
What do you notice?

Learners should be able to generalize that any number
n - n= 0 and $^{n}/_{m} \times {}^{m}/_{n} = 1$

Multiplicative inverse

The teacher gives the following to the learners to observe what is happening each time:

i. +2 x ½ = …….
ii. +7 x $^{1}/_{7}$ = ……..
iii. + 4 x ¼ = ……..
iv. $^{7}/_{8} \times {}^{8}/_{7}$ =
v. $^{a}/_{b} \times {}^{b}/_{a}$ =

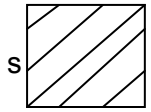
The teacher gives more examples, and emphasizes terminology of multiplicative inverse or reciprocal as synonymous

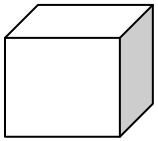
Activity 7
Application of irrational numbers in the context of measurement

a) Learners can be given circles of different diameters and circumferences to measure such as
C=22cm; D= 7cm
C=44 cm D=14 cm
C= 11cm D= 3,5cm
and many more to find the ratio C/D

b) The teacher can do some recap on area of a square and volume of a cube
In the context of measurement learners draw various squares whose area is 1 or 4 or 9 or 16, or 25 etc
They then use a calculator to find the side of the square and explain what they notice?
They do the same with area of 2 or 3 or 5 or 6 or7 or 8 etc They explain what they notice
They also draw cubes whose volume is 1or 8 or 27 or 64 find the side?

What happens when the volume is say 4, 5, 7, 21,76, 98? They use their calculators and explain what they notice





In the context of measurement it is crucial that learners see square root as a side of a square and the cube root as the side of a cube

The teacher consolidates the concept of irrational numbers from the activity above

Integration: LO 4 AS 3 & 4
Resources: Calculators, Square and Isometric Grid papers
Assessment: Classwork, Homework, Assignment, Test
Expanded opportunity: Give more challenging activities
Barriers to learning: Start with relatively smaller numbers before including big numbers and use as much concrete material as possible
Teacher reflections:

WEEK	LOs & ASs	CONTENT	ACTIVITIES
5-6	LO 1: Number, operations and relationships. 8.1.7: Uses a range of techniques to perform calculations including: • Using commutative, associative and distributive properties with rational numbers; • Using a calculator. 8.1.9: Recognises, describes and uses: • Algorithms for finding equivalent fractions; • Commutative, associative, distributive properties with rational numbers (the expectations is that learners will be able to use these properties and not necessarily to know the names of properties).	Calculations including commutative, associative and distributive properties of rational numbers. Using algorithms to find equivalent fractions. Performs calculations using a calculator.	**Activity 1** Teacher recaps on activities involving commutative, associative and distributive properties. **Activity 2** The teacher does revision activities on the use of equivalent fractions to simplify fractions. **Activity 3** The teacher asks learners to use calculators to work out the activities given.

Activity 1

Also use a calculator to verify use these properties as done in Gr7

Simplify the following:

a) 2 364 + 79 + 220 (using different positions e. g. 2+3=5 and 3+2=5) What is this property called?

b) $\frac{1}{2} + \frac{3}{7} + \frac{3}{4}$

c) $\frac{2}{3} \times \frac{3}{8}$

d) 8(3 + 5), show another way of writing this expression, what is this property called?

e) (16 x 3) – 26, what is this property called?

f) a(a+b-c)
g) 2a +3b -5c+a-2b -5c
h) 2(3m-2n)-7n
i) $\frac{2}{x}(4x-3y)$
j) $-\frac{1}{x} - \frac{2}{y}$

Teacher gives more activities to consolidate these properties

Activity 2

(a) $\frac{1}{2} - \frac{2}{3}$

(b) $3\frac{1}{3} + \frac{3}{6} + \frac{5}{9}$

Note: Equivalent fractions lead to writing the same fraction in a variety of ways.
When simplifying fractions either by addition or subtraction, make them equivalent by making the denominators the same and then add/subtract numerators
e.g. $\frac{1}{2} \times \frac{3}{3} - \frac{2}{3} \times \frac{2}{2}$

Give more activities of this nature.

Activity 3

Use a calculator to simplify the following:

a) 167,89 + 34,23 – 12,03
b) $(0,12)^2 \times (3,6)^3$
c) $3,2 \times (1,3)^3 \times 12,34$
d) – 300 + 50 + 36 + 120

More activities must be given.

Integration: **Resources:** Calculators
Integration: LO2 AS 8 & LO2 AS 8
Assessment: Classwork / Homework, Test
Expanded opportunity: Learners may be introduced to use technology tools to perform calculations efficiently and accurately.
Barriers to learning: Use fraction strips to consolidate concept of equivalence .
Teacher reflections:

WEEK	LOs & ASs	CONTENT	ACTIVITIES
6	LO 1 AS 8.16 Estimates and calculates by selecting and using operations appropriate to solving problems that involve: • Rounding off • Multiple operations with rational numbers (including division with fraction and decimals) • exponents	Problem solving involving rounding off Multiple operations with rational numbers Exponents	**Activity1** Problem solving involving rounding off **Activity 2** Problem solving involving multiple operations with rational numbers **Activity3** Problem solving involving exponents

Activity 1

Note :This is application of these concepts as they were done in the previous grades

The teacher needs to contextualize rounding off, rational numbers and exponents in a real life setting to solve problems

Example
A chemist is making a certain mixture of medicine that needs $^{3}/_{8}$ g of iodine to make a bottle. He has 100g of iodine how many bottles Can he make?
Your lemonade jar can hold 18 cups total. If the ratio of lemon juice to water is 9 to 4, how many cups of lemon juice do you need if you want to make enough lemonade to fill the jar
Round to nearest tenth and use the Algebraic way

Give more problems

Activity 2
Example
a) Nomusa spends 7 hrs of day at school, 2 hrs playing, 2,5 hrs watching TV, 1,5 doing homework, 8 hrs sleeping What fraction

of the day is she left with to do other things

b) Nomusa's mother works in a clothing company she earns $^{8}/_{9}$ of her immediate supervisor Mrs Qonda and $^{2}/_{3}$ of the senior supervisor Mrs Lilo who earns R9 180.00

(i) Calculate How much Nomusa's mother earns

(ii) How much does Mrs Qonda earn?

Give more problems

Activity 3

Example

A certain mine produced coal in the 4 months in the following way

June: $4{,}6 \times 10^6$ kg; July: $8{,}32 \times 10^5$ kg; August: 2.3×10^6 ; September : $1{,}06 \times 10^7$ kg. Calculate the total coal mined over the 4 months

Give more problems

Integration: Within LO 4 AS 8.4.6

Resources: Calculator

Assessment: Classwork/homework , assignment

Barriers to learning: Start with less complicated problems

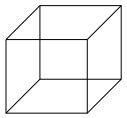
Expanded opportunity:.Learners can formulate own real life problems and solve them

Teacher reflection:

WEEK	LOs & Ass	CONTENT	ACTIVITIES
7-8	LO 3 Space and shape 8.3.1 Recognises, visualizes and names geometric figures and solids in natural and cultural forms and geometric settings, including: ❖ Those previously dealt with ❖ The platonic solids(tetrahedron, cube, octahedron, dodecahedron, icosahedrons) 8.3.4 Uses a pair of compasses, ruler and protractor to accurately construct geometric figures for investigation of own property and design of nets. 8.3.4 Designs and uses nets to make a model of geometric solids studied up to and including this grade 8.3.2 In contexts that include those that may build awareness of social ,cultural and environmental issues ,describes and classifies geometric figures and solids in terms of properties, including: sides, angles and diagonals and their interrelationships with focus on triangles and quadrilaterals(e.g. types of triangles and quadrilaterals)	Geometric shapes in natural and cultural forms. Regular and irregular polygons and polyhedron together with their properties as well as models of solids Identify platonic solids, their properties and draw their nets	Activity 1 Revision on shapes and names of several polygons covered in Gr.7. Identification of polygons around us. Activity 2 Revision on polyhedrons previously dealt with in grade 7. Activity 3 Revision on using a pair of compasses, ruler and protractor to construct geometric figures done in Gr.7 and make their nets and models.
Activity 1 In groups of four or five learners are to look around in the classroom and discuss , draw and name the geometric shapes they see e.g. Rectangular windows, square table tops, etc. Activity 2.1 a)Learners are asked to discuss in groups the meanings of **polyhedron**, **polyhedra**, **faces**, **edges** and **vertices** of **polyhedron**. They are given various polyhedral including platonic solids to draw their nets and describe their properties. Learners as a small assignment they make their own polyhedra from the nets they develop			

Activity 2.2

Learners complete a table showing the features of the solids e.g

Polyhedron	Name	No. of faces	No. of vertices	No. of edges
				
				
				
				
				
				

Learners investigate relationship between vertices, edges and faces in the activity above

Activity 3

Teacher to recap and extend on construction of geometric figures for investigation and design of nets and to make models of the geometric solids.

EXAMPLE

Construct ΔABC if AB = 3 units ,AC = 5 units and BAC = 30^o.

Note that <A is enclosed by the two sides AB and AC.

Teacher to help learners in the construction of nets and making of geomertric of geometric solids e.g. tetrahedron

Note: Teacher to choose as many geometric shapes as possible for doing the above activities.

Learners construct regular polygons such as equilateral triangle,square, hexagon. Octagon

e.g Construction of an equilateral triangle and hexagon

Learners draw a circle with a radius of their choice not too big nor too small. Using the same radius they make equal arc To construct an equilateral triangle they join every alternative arc and all the arcs for a regular hexagon

Integration: Maths LO 4 AS 7

Resources: Maths set, cartridge paper, cardboards,scissors

Assessment: Classwork and homework,Assignment, Test

Barriers to learning: Learners may have a problem with measuring accurately, therefore, more time and examples should be given.

Expanded opportunity: Learners have to go out and investigate and compare the properties of geometric figures in the environment.

Teacher reflection:

WEEK	LOs & ASs	CONTENT	ACTIVITIES
9-11	**CLUSTER 1 (LO2)** *8.2.*1: Investigates and extends numeric and geometric patterns, looking for relationships or rules, including patterns: • Represented in physical and in diagrammatic form • Not limited to sequences involving constant difference and ratio • Found in natural and cultural contexts • Of the learner's own creation • Represented in tables • Represented algebraically 8.2.2: Describes, explains and justifies observed relationships or rules in own words or in algebra.	Investigating and extending numeric and geometric patterns; Finding rules; Representing patterns in tables and algebraically.	**Activity 1** Recap on Grade 7 work generalization of level 1 patterns * **Activity 2** Investigating Non routine patterns

Activity 1

Firstly, the teacher revises patterns studied in Grade 7 where definitions are emphasized. The teacher further revises the mathematical patterns found in the environment which the learners are familiar with.

* The teacher, after he had made several examples, draws up tables to come up with general rules and patterns starting with …

Example1

The bricks below are cemented with a mortar joint as follows: e.g.

The learners will be required to redraw the pattern and further extend it to the next two diagrams of the sequence, and complete the table below:

No. of bricks	1	2	3	4	5	6	n
No. of joints	0	1	2	?	?	?	k

The common difference is 1, and therefore:

1 x 1- 1 = 0

2 x 1- 1 = 1

3 x 1- 1 = ?

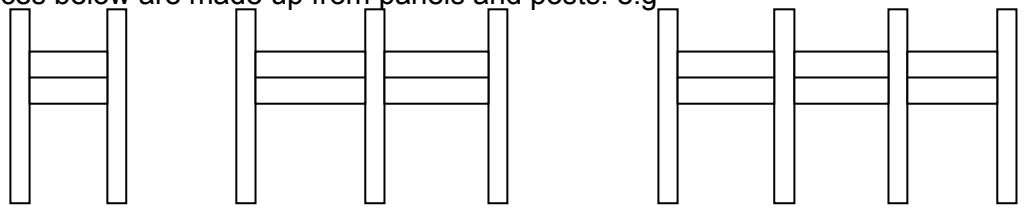
4 x 1- 1 = ?

Then, continue in this way. What do you notice?

Find the rule and explain the rule in your own words.

Step 1:

The fences below are made up from panels and posts: e.g



The learners are required to redraw the patterns to the next two (02) diagrams of the sequence. The learners must write down the sequence generated by the number of post in each diagram algebraically. The learners must also describe and write in own words how the pattern continues in relation to the diagrams.

Step 2

Learners are required to represent the pattern shown above in the table below:

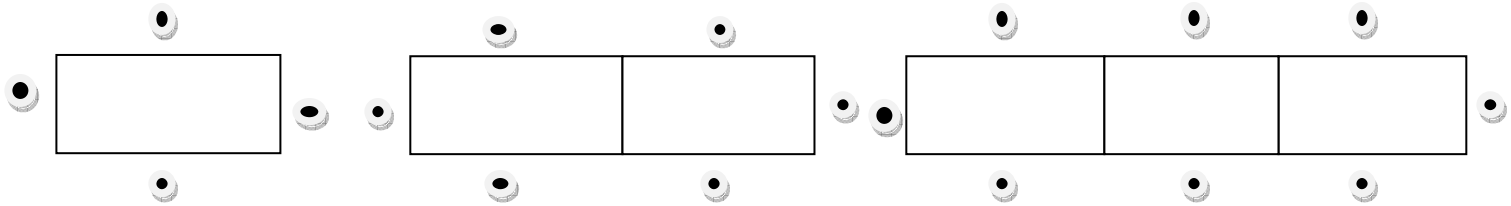
Panels	1	2	3	4	5
Posts	2	3	4	……	……

Example 2

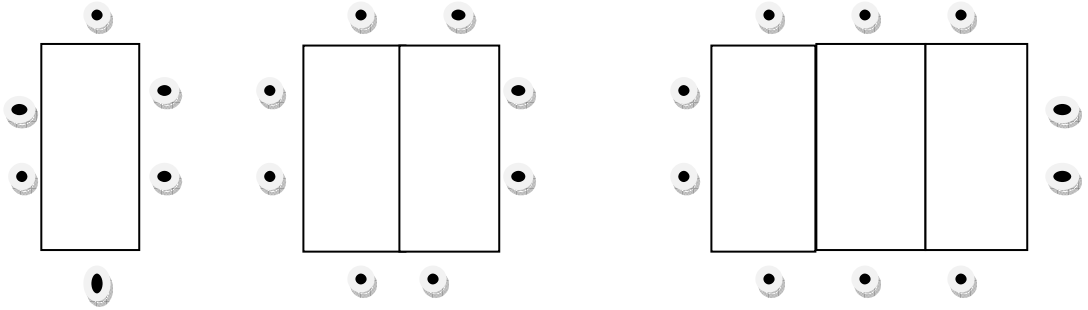
The teacher introduces the learners to a more common scenario , seating arrangement at the tables and the two seating arrangements are depicted as – (a) and (b) leading to algebraic way of writing patterns.

AAt a restaurant, customers can be seated around different tables as shown below:

(a)



(b)



The learners must copy the above patterns “a” and “b” and draw the next 3 diagrams of each table pattern and seating arrangement.

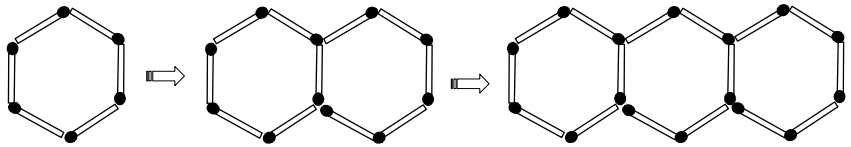
They must determine the general rule, describe, explain and justify if by their own words and algebraically.

No of tables	1	2	3	4	5	6	7	n
No of customers	6	8	10	12	14	?	?	k

The common difference is 2
1 x 2 + 4 = 6
2 x 2 + 4 = 8
3 x 2 + 4 = ?
4 x 2 + 4 = ?
Continue in this way what do you notice?
For any number of tables what is the number of customers?
Therefore generally the rule is **2n+4 or 2(n+2**)

Teacher to accept any form of the general rule i.e. **2n+4 or 2(n+2**)

(c)
Nomsa forms **hexagon** patterns with matches as shown below:



The teacher must ensure that learners form a structure for all level 1 common difference patterns. Learners should be able to link the common difference with the coefficient of x in functions of f(x)= ax +b same as mx+c in order to link it to the gradient of linear graphs later on

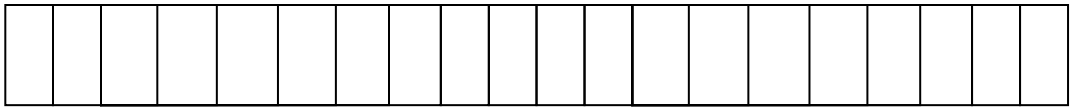
(i) Draw the next two patterns
(ii) How many matches does Nomsa need to build 10 **hexagons**?
(iii)Do you notice any common difference? If so what is it?
(iv)If Nomsa has 211 matches how many patterns can she form

(v) Generalise this pattern for any number of patterns

The teacher gives more to include simple quadratic functions (those with a common difference in the 2nd level
e.g. 1; 4; 9; 16…
0;3; 8; 17…
1;3; 6; 10; 15…

Activity 2
Examples of non routine problems

(a) How many rectangles are there in this figure?
(It is not 20! There are *20 small rectangles!)*



(b) **Number Activities**
Interesting Sums
(i)Add consecutive natural numbers Continue for the next 4 patterns What do you notice? Generalize this pattern
1; 1+2; 1+2+3; 1+2+3+4: …

(ii)Continue the table by adding 3 more consecutive odd numbers and find their sum . Predict the sum of 10 and 100 such numbers. Generalise the pattern

Number of Consecutive Odd Numbers	Sum
1	1
2	1+3 = 4
3	1+3+5 =9

Continue the table of the cubes of integers below. Add a column of the sum of the consecutive cubes. Conjecture about the entries in this sum of consecutive cubes column. Generalise this pattern

N	N cubed	Sum
1	1	1
2	8	1+8=9
3	27	1+8+37 = 36
4	…	
5	…	
6	…	

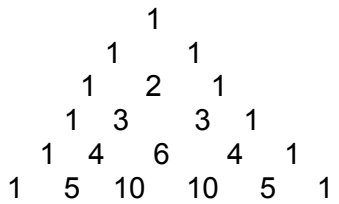
(b)
Learners investigate 3X3 magic squares whose sum of numbers horizontally, vertically and diagonally give the same value Learners discuss what has happened what emerging patters Is this the only way to arrange these numbers.

2	9	4
7	5	3
6	1	8

Investigate more whose centre number is 6 then 7 Investigate a general rule to formulate any 3X3 magic square

(c)
Four friends Xola, Mfundo, Gert and Justin have a tendency of always sitting next to one another. Investigate how many possible sitting arrangements can they form? If they are joined by 2 more friends how many ways can they sit? Generalise this pattern for any number of friends.

(d)



Extend this to 3 more rows
Investigate patterns found in the Pascal's triangle above and generalize if possible

RESOURCES: Mathematical sets

INTEGRATION: Maths LO1 AS 6 & 8

ASSESSMENT: Classworks/Homeworks, Investigation, Assignment

BARRIERS TO LEARNING: Learners may experience difficulty in deriving rules and simple language be used.

EXPANDED OPPORTUNITY: Learners should be exposed to more patterns which lead to quadratic equations.

TEACHER REFLECTION:

GRADE 9 MATHEMATICS LESSON PLAN EXEMPLARS

GRADE 9 MATHEMATICS LESSON PLAN EXEMPLARS

CONTENT OVERVIEW

TERM 1	TERM 2	TERM 3	TERM 4
LO 1 Description and illustration of historical development of numbers. Recognition, uses and representation of rational numbers. Calculations using various techniques: including laws and meaning of exponents **LO 2** Investigation of Patterns and justification of rules. Identify patterns in the environment. Learners design their own patterns Determination and representation of input and out-put values: verbally, in Flow diagrams, and in tables in order to formulate rules. Construction of mathematical Models that represent, describes	**LO 1** Calculations using various techniques: including laws and meaning of exponents. **LO2** Simplify and solve expressions / equations using exponential laws Different types of expressions. Product of two binomials. Factorization of algebraic expressions. Simplification and solution of equations **LO3** Drawing solids in perspective Description and representation of position in a Cartesian plane **LO 4** Solving problems involving measurement Development of measuring	**LO 1** Problem solving including profit and loss, budgets, hire purchase, accounts, loans, exchange rate, compound and simple interest, commission, rentals and banking Problem solving on ratio, rate and proportion, time, distance and speed **LO3** Problem – solving using Pythagoras Theorem Investigation and application of straight line Geometry and triangles to solve problems **LO5** Probability using two way tables and tree diagrams. Represent and uses relationships between variables.	Revision and CTA (EAT) administration

and provide solutions to problem situations. Problem solving equations and multiplicative inverse, factorisation Drawing of graphs and use of tables Interprete relationships **LO3** Recognition of geometric shapes in natural and cultural forms. Construction and drawing of geometric figures. Making of models to investigate their properties Transformation Congruency, similarity Application of Pythagoras theorem Problem solving using the geometry of straight lines and triangles. **LO 5** Selection and use of appropriate methods to collect data, Organisation of numerical data Measure of central tendency	instruments from different cultures **LO 5** Drawing bar graphs, histograms, pie charts line and broken line graph as well as scatter plots Interpretation of data		

GRADE 9 MATHEMATICS LESSON PLAN EXEMPLARS

WEEK	LOs & ASs	CONTENT	ACTIVITIES
1 – 2	LO1 Cluster 1:Number Recognition 9.1.1 Describes and illustrates the historical development of number systems in a variety of historical and cultural contexts (including local). 9.1.2 Recognises, uses and represents rational numbers (including very small numbers written in scientific notation), moving flexible between equivalent forms in appropriate context. Cluster 4 : Properties of numbers 9.1.7 Recognises, describes and uses the properties of rational numbers.	Description and illustration of historical development of numbers. Recognition, usage and representation of rational numbers. Properties of rational numbers	Activity 1 The teacher does revision on development of rational numbers as they were dealt with in Grade 8 (8.1.3) & introduces the historical development of number systems. Activity 2 The teacher does revision on scientific notation and also writing numbers in fraction form as well as decimal form as it was dealt with in Grade 8 & then introduces how to write rational numbers, including very small numbers in scientific notation. Activity 3 The teacher does revision on rational number dealt with in Grade 8, and then introduces the properties of rational numbers.

Activity 1

1.1 The teacher revises the different types of numbers with learners

Complete the table below as illustrated in the first row :-

Numbers	**TYPES OF NUMBERS**				
	Natural numbers	Integers	Rational	Irrational	Real
-3	X	√	√	X	√
4/2					
√-1					
π					
√7					
0,8					

1.2 The teacher familiarises learners with different number systems e.g. Egyptians, Hindus, Romans etc. and ask learners to illustrate them using our number systems and vice versa. This could be a mini research project.

Activity 2

2.1. The teacher does revision on writing large numbers in scientific notation and vice versa

WORDS	EXPONENTIAL NOTATION	SCIENTIFIC NOTATION (correct to one decimal place)
a) Three hundred thousand		
b)	20×10^6	
c) Thirteen trillion		
d) Sixty seven million		
e)	13×10^9	

f)	27×10^4	
g)	$143\ 637 \times 10^3$	

2.2. The teacher revises with learners on converting fractions to decimals and vice versa:-
Examples

1. Complete the table below:-

WORDS	FRACTION	DECIMAL
a) Sixty seven thousandths		
b)	$\frac{75}{1000\ 000}$	
c)		0, 475

2.3. The teacher familiarises learners with the concept of writing decimals in exponential form (power notation) with the aim of writing very small numbers in scientific notation.
Examples :-

Words	Fraction	Decimal	Power notation	Scientific notation
Seven hundred and twenty six hundredths	$\frac{726}{10\ 000}$	0, 0726	$\frac{726}{10^4}$ or 726×10^{-4}	$7{,}26 \times 10^{-2}$

More examples of this nature must be given to learners, they must move flexibly between numbers (decimals, fractions, scientific notation)

b) The earth-moon distance is about 380 000 km. Write this distance in metres using Scientific notation
c) The red blood cell has a diameter of approximately 7,5 micrometres. One micrometer is one millionth of a metre.
Write down the following in scientific notation :-
(i) diameter in m (ii) circumference in m (iii) the area in m^2

	Give more of the examples that are in context Activity 3 3.1 The teacher revises with the learners the rational numbers dealt with in the previous grades with the aim of using the properties of numbers. a) Write the following as squares then find square roots:- 4 ; 16 ; 25 ;100 b) From (a) above try to find the square roots of the following: - $\sqrt{a^2}$; $\sqrt{x^2}$; $\sqrt{y^8}$; $\sqrt{x^6y^{10}}$ 3.2 The teacher works with learners on properties of rational numbers e.g. $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$, and $\sqrt{a} + \sqrt{b}$ Example:- $\sqrt{60} = \sqrt{4 \times 15} = \sqrt{4} \times \sqrt{15} = 2\sqrt{15}$ a) Simplify the following, correct to 2 decimal places where necessary:- (i) $\sqrt{7,3 \times 10^6}$ (ii) $\sqrt{380\ 000}$
RESOURCES : Number-lines, Number grids, calculators	
INTERGRATION : Within : LO4 As 2	
ASSESSMENT : Tests and Assignment	
PROVISION FOR LEARNERS WITH BARRIERS TO LEARNING: Start with simple numbers then go to complex. Spend more time giving more examples to learners with difficulties in understanding numbers.	
EXPANDED OPPORTUNITIES: Learners will be able to differentiate between numbers and work with any types of numbers. They will be able to read/ describe different types of number systems and will be able to interpret very small numbers written in scientific notation	
TEACHER REFLECTION :	

WEEK	LO's & AS's	CONTENT	ACTIVITIES
3 – 4	<u>Cluster 1(LO2 Patterns)</u> 9.2.1 Investigates, in different ways, a variety of numeric and geometric patterns and relationships by representing and generalizing them, and by explaining and justifying the rules that generate them(including patterns of the learner's own creation) 9.2.2 Represents and uses relationships between varieties in order to determine input and/or output values in a variety of ways using: • Verbal description • Flow diagram • Tables • Formulae and equations. <u>Cluster 5 (LO 2 Equivalent Representation)</u> 9.2.6 Determines, analyses and interprets the equivalence of different descriptions of the same relationship or rule presented: • Verbally • In flow diagrams • In tables • By equations or expressions • By graphs on the Cartesian plane in order to select the most useful representation for a given situation.	Investigation of numeric and geometric patterns. Represents and uses relationships between varieties in order to determine input and/or output values in a variety of ways.	<u>Activity 1</u> Investigates numeric patterns involving a common difference. Extend these investigations to geometric patterns and simple non-linear patterns. <u>Activity 2</u> Generating patterns using the general formula. Use the method of investigation to discover a shorter method of determining the general formula for any linear pattern. <u>Activity 3</u> Extend activity 2 to include quadratic functions <u>Activity 4</u> Plotting of graphs (linear or non-linear) and discovering methods that would allow for determining the equations of given graphs.
	<u>Activity</u>		

Recap on linear patterns covered in grade 8.

Example 1

NOTE: 1; 2; 3; … has general term n

0; 1; 2; 3; … has general term n+1

What about :

-1; 0; 1; 2; 3?

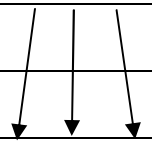
-2; -1; 0; 1; 2?

Example:2

a) 1; 2; 3; 4
b) 3; 5; 7; 9
c) 3; 7; 11; 15

Ask prompting and probing questions such as:

1. Is there anything that these 3 sequences have in common?
2. Complete the following table in order to find a general formula for the nth term.

n	Terms	Expanded expression for each term.	Simplified expanded expression.
1	3	3	3 + 0(2)
2	5	3+2	3 + 1(2)
3	7	3+2+2	3 + 2(2)
4	9		
…			
n	General term (T_n)		3 + (n-1).2

Note that it is easy to see using the knowledge gained in example 1
that the general term above must be 3+(n-1).2 or 2n+1

3. Another interesting question is: will the above general formula remain the same if the sequence changed from 3; 5; 7; 9 … to 5; 7; 9; 11?
4. Can you see an easy method of finding the general formula by using the first term and the common difference only? State your method or rule used in words or in a flow diagram?

NOTE: Now that the groundwork is done, learners may apply the knowledge above in more complex problems including geometric patterns where the numerical sequence must be derived from the particular growing or shrinking geometric shapes.

ACTIVITY 2
Investigation: To determine a shorter method of finding the general term for a linear sequence.
Complete the table below and answer the questions that follow:

General formula	Sequence generated	Common difference	Term preceding the "first term"
2n+3	5; ……	……..	…….
7n-10	……	……..	…….
-2n-1			

1. What do you notice?
2. State the rule that you have discovered in words.
3. Use the rule to find the general formula for each of the following sequences"
   a) 8; 15; 22; ..
   b) 100; 80; 60; ..
   c) 20; 40; 60; …
4. What is the value of the 10^{th} term, 100^{th} term in a) above?
5. Which term has a value of 141 in a) above?

Note that there is an easy relationship between the common difference and the term that fits in right in front of the first term. These concepts can now be applied geometric patterns as well as simple non-linear patterns. Encourage learners to generate their own patterns.

Activity 3
The same procedure is followed in deriving various rule for quadratic functions
Teacher can start with simple pattern such as

1; 4; 9; 16; 25;36 ...
Ask learners to predict the next 3 terms
What is the 20th term
If the number is 225 what position in the sequence is that number?
Generate a rule
Other related activities to develop a structure can be given
e.g.
0; 3; 8; 15; 24; 35...

2;5;10;17;26;37...
2;8; 18;32; 50; 72...
3;9;19;33;51;72..
1;3;6;10;15...
2;6;12;20;30
0;2;5;9;14...
This can be further extended to cubic functions depending on the learners ability

The teacher can gradually introduces the concept of the 2nd level difference and relate the difference to the coefficient of a in ax^2 bx+c

ACTIVITY 4
Linear Graphs (By Plotting)
Explain the following terminology: Gradient; y-intercept; linear; non-linear.
Use the table below to plot the graphs resulting from the tables below on the same set of axes.
Table 1 (Graph 1)

x	-3	-2	-1	0	1	2	3
y	-6	-4	-2	0	2	4	6

Table 2 (Graph 2)

x	-3	-2	-1	0	1	2	3
y	-5	-3	-1	1	3	5	7

Table 3 (Graph 3)

x	-3	-2	-1	0	1	2	3
y	-3	-1	1	3	5	7	9

Complete the table below after plotting the graphs.

Graphs	Shape of the graph (Linear;non-linear)	Equation of the graph	Gradient of the graph	y-intercept
Graph 1				
Graph 2				
Graph 3				

Questions:

1. Did you notice any pattern or rule?
2. How will this rule help you to draw a line graph if you are given the equation of the graph.
3. What can deduce about line graphs that have the same gradient?

NOTE: There are many different methods of drawing line graphs (Using tables and plotting; dual-intercept method; gradient intercept method). Many of these methods may be discovered by the learners while practicing the plotting method. This particular section lends itself to the investigative approach. Learners are expected to determine the equations from given graphs using the rules discovered above.

Non-linear graphs and Modelling

Example:

Give learners some material on health related issues and particularly heart disease and its causes. Focus on the aspect of obesity and give a brief description of the meaning of the Body Mass Index.

Body Mass Index	HEALTH STATUS	NORMS
	Underweight	BMI is less than 20
	Healthy	BMI is between 20 and 25
	Overweight	BMI is between 25 and 30
	Obese	BMI is more than 30

Use the equation to calculate the Body Mass Index of a person to complete the table below:

$$BMI = \frac{mass\ (kg)}{height^2}$$

Use your graph paper to plot TWO graphs of individuals with a healthy BMI (Graph 1 ; BMI=20 and Graph 2; BMI=25) by first calculating the corresponding masses in the table below:

Graph 1	Healthy mass in kg BMI=20					
	Height in meters	1.5 m	1.6 m	1.7 m	1.8 m	1.9 m
Graph 2	Healthy mass in kg BMI=25					
	Height in meters	1.5 m	1.6 m	1.7 m	1.8 m	1.9 m

Use your graph above to make decisions on the Health status of the people in the table below:

Name of learners	Helen	Thabisa	Piet	Julius	Jackie	Jacob
Mass (m)	70 kg	90 kg	120 kg	70 kg	95 kg	100kg
Height (h)	1,5m	1,78 m	1,88m	1.92 m	1,8 m	1,92 m

NOTE: Learners should be encouraged to appreciate the value of graphs since it facilitates easy decision making. Note that it is not necessary to calculate the BMI for each of the individuals above.

1. Name the person/people who have a healthy BMI.
2. How much mass should Jacob lose in order to have a healthy BMI?
3. Give an example that shows that BMI does not only depend on mass only.
4. Name one way in which the BMI can be decreased.
5. Calculate your BMI and interpret its meaning.

RESOURCES: Calculators; textbooks; magazines, graph paper
INTEGRATION: LO3, Space and shape
ASSESSMENT: Investigation; mini- project
EXPANDED OPORTUNITY Investigations including various forms of patterns such as magic squares of 4x4 and cubic functions
BARRIERS TO LEARNING: Use concrete material at first
TEACHER REFLECTIONS

WEEK	LO's & AS's	CONTENT	ACTIVITIES
5-6	9.2.4 Solves equations by inspection, trial and improvement or algebraic processes (additive and multiplicative inverses and factorisation), checking the solutions by substitution.		

Activity 1

Learners are expected to solve simple equations by inspection as follows:

Example 1

$x + 10 = 15$: *What plus* 10 *gives me* 15? $\leftrightarrow x = 5$

Example 2

$2x = 20 \rightarrow 2 \times \text{what?} = 20 \rightarrow x = 10$

Example 3

$3x + 5 = 26 \rightarrow What + 5 = 26 \rightarrow 21 = 3x \rightarrow x = 7$

Example 4

$\frac{2x-4}{8} = 2 \rightarrow what + 8 = 2? \rightarrow \therefore 16 = 2x - 4 \rightarrow what\ minus\ 4\ is\ 16? \rightarrow \therefore 20 = 2x \leftrightarrow x = 10$

Make sure that learners have fun doing these exercises that need no more than a working knowledge of primary school arithmetic. Learners may always rely on this method when they get stuck in the algebraic manipulation later. Encourage them to check the answer everytime.

Exercises

Solve for the unknown variable through trial and improvement and check solutions by substitution.

1. $20 - x = 12$
2. $9x - 7 = -11$
3. $12 + 7y = 2$
4. $\frac{2k-3}{6} = 4$

Activity 2

Recap on work done in grade 8

Example 1

Solve for x:

The equation: $5(x+3) = 4(x-1)$ is not so easily solved using the inspection method. It is thus necessary to multiply out brackets and simplify by adding all the like terms and placing the unknown on one side and the knowns on the other side.

$\therefore 5x + 15 = 4x - 4$

$\therefore x = -19$

Example 2

Solve for y:

$(x-3)(x+2) = x^2 + 2x$

$\therefore x^2 - x - 6 = x^2 + 2x$

$\therefore -6 = 3x$

$-2 = x$

After learners are proficient in solving simple linear equations, they are ready to attempt linear equations where expressions need to be simplified by multiplying out brackets as in example 2.
NOTE: In linear equations, the unknown variable must be isolated as example 1 and example 2.

Example 3

Solve for m:

$3m^2 + 9m = 0 \rightarrow 3m(m+9) = 0 \rightarrow 3m = 0 \; or \; m + 9 = 0$

$\therefore m = 0 \; or \; m = -9$

Note that the above equation is not a linear equation (it is quadratic). We have to recognise that in our number system, if AxB=0 it means that either A=0 or B=0. Therefore the above equation must be expressed as AxB=0 by factorisation.

RESOURCES: Meter stick, ruler, pencil, watch/ stop watch etc.
INTEGRATION: Maths LO 1 As 5
ASSESSMENT: Classwork, Homework, Assignment
BARRIERS TO LEARNING: Start with simpler examples
EXPANDED OPPORTUNITY: Relate the solutions to linear equations to the points of intersection of line graphs. Learners may be
TEACHER REFLECTIONS:

WEEK	LO's & AS's	CONTENT	ACTIVITIES
7	Cluster 3 (LO 2 Graphs) 9.2.5 Draws graphs on the Cartesian plane for given equations (in two variables), or determines equations or formulae from given graphs using tables where necessary. 9.2.3 Constructs mathematical models that represent, describes and provide solutions to problem situations, showing responsibility toward the environment and the health of others (including problems within human rights, social, economic, cultural and environmental contexts).	Draws graphs on the Cartesian plane. Constructs mathematical models.	Activity 1 Draws graphs by plotting points. Activity 2 Use your graph above to make decisions

ACTIVITY 1

Non-linear graphs: By Plotting

Example:
Give learners some material on health related issues and particularly heart disease and its causes. Focus on the aspect of obesity and give a brief description of the meaning of the Body Mass Index.

Body Mass Index	HEALTH STATUS	NORMS
	Underweight	BMI is less than 20
	Healthy	BMI is between 20 and 25
	Overweight	BMI is between 25 and 30
	Obese	BMI is more than 30

Use the equation to calculate the Body Mass Index of a person to complete the table below:

$$BMI = \frac{mass\ (kg)}{height^2}$$

Use your graph paper to plot TWO graphs of individuals with a healthy BMI (Graph 1 ; BMI=20 and Graph 2; BMI=25) by first calculating the corresponding masses in the table below:

Graph 1	Healthy mass in kg BMI=20					
	Height in meters	1.5 m	1.6 m	1.7 m	1.8 m	1.9 m
Graph 2	Healthy mass in kg BMI=25					
	Height in meters	1.5 m	1.6 m	1.7 m	1.8 m	1.9 m

Activity 2

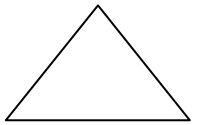
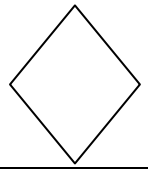
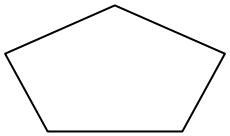
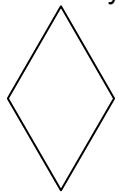
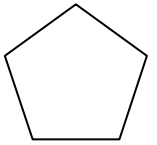
Use your graph above to make decisions on the Health status of the people in the table below:

Names of Learners	**Helen**	**Thabisa**	**Piet**	**Julius**	**Jackie**	**Jacob**
Mass (m)	70 kg	85 kg	120 kg	70 kg	112 kg	130 kg
Height (h)	1,2 m	1,78 m	1,6 m	1.92 m	1,8 m	1,59 m

NOTE: Learners should be encouraged to appreciate the value of graphs since it facilitates easy decision making. Note that it is not necessary to calculate the BMI for each of the individuals above.

6. Name the people who have a healthy BMI.
7. How much mass should Jacob lose in order to have a healthy BMI?
8. Give an example that shows that BMI does not only depend on mass.
9. Name one way in which the BMI can be decreased.
10. Calculate your BMI and interpret its meaning.

RESOURCES: Calculators; textbooks; magazines, graph paper
INTEGRATION: Social Sciences: Historical Interpretation
ASSESSMENT: Investigation; mini- project
EXPANDED OPORTUNITY:Include quadratic functions and
BARRIERS TO LEARNING: Unpack language embedded in mathematical modelling
TEACHER REFLECTIONS:

WEEK	LO's & AS's	CONTENT	ACTIVITIES
8-9	Cluster 3 (Shapes and Objects) 9.3.1 Recognises, visualises and names geometric figures and solids in natural and cultural forms and geometric settings, including: Regular and irregular polygons and polyhedra; Spheres and Cylinders. 9.3.4. Draws and /or constructs geometric figures and makes models of solids in order to investigate and compare their properties and model situations in the environment.	Recognises, visualises and names geometric figures. Draws and /or constructs geometric figures.	Activity 1 Learners recap on the naming and identification of different geometric figures. Activity 2 Recaps on construction of geometric figures. Focus on regular and irregular polygons; polyhedra, spheres and cylinders. Activity 3 Make models of solids.
	Activity 1 Learners recap on the identification/naming of different geometric figures. This knowledge may then be used to identify these geometric shapes in local or international art such as paintings, beading and architecture. Activity 2 Learners may be provided with different polygons and are expected to be able to distinguish between regular and irregular polygons and justify their answers. Use a ruler and a protractor to identify which shapes are regular and irregular and give a reason for your answer. a)  b)  c)  d)  e) 		

	Activity 3 Provide learners with polyhedra (regular tetrahedron, pentagonal prism, square pyramid etc.) Questions: a) Name all the different polygons that make up the particular polyhedron. b) Draw an accurate net of the solid (scale 1:1) c) Is the above polyhedron a prism or a pyramid. Give a reason for your answer. d) Make a model of the polyhedron. Note that learners are expected to make models of solids by accurately constructing all the different polygons that form the faces of the solid and then sticking them together. This could be a problem solving activity.
RESOURCES: Calculators; textbooks; magazines, graph paper	
INTEGRATION: Technology LO1 As 1	
ASSESSMENT: Investigation; mini- project	
EXPANDED OPORTUNITY: Learners may investigate the relationship between the faces, vertices and edges of a any polyhedron. In addition learners could use the formula for the circumference of a circle to accurately build cylinders.	
BARRIERS TO LEARNING: Give learners shapes to manipulate	
TEACHER REFLECTIONS:	

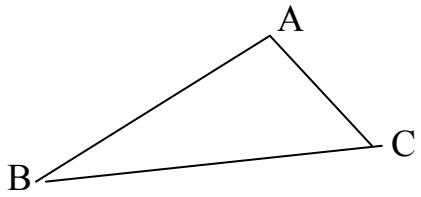
WEEK	LO's & AS's	CONTENT	ACTIVITIES
10	Cluster 2 (LO3) Transformations, congruency and similarity. 9.3.2 In contexts that include those that may be used to build awareness of social, cultural and environmental issues, describes the interrelationships of the properties of geometric figures and solids with justification, including: • Congruence and straight line geometry; • Transformations 9.3.5 Uses transformations, congruence and similarity to investigate, describe and justify (alone and/or as a member of a group or team) properties of geometric figures and solids, including tests for similarity and congruence of triangles.	Describes the interrelationships of the properties of geometric figures and solids. Uses transformations, congruence and similarity to investigate properties of geometric figures and solids, including tests for similarity and congruence of triangles.	Activity 1 Recap on the concepts of congruency and similarity by accurate construction. Activity 2 Allow learners to discover the differen properties of polygons by using the above concepts.

Activity 1

- Learners may be asked to construct triangles according to certain specifications. Learners must then investigate whether these specifications necessarily imply that the triangles are congruent.
- The same investigation may be done to discover which conditions are necessary for two or more triangles to be similar.

Example:

Consider the triangle below:



ΔABC has the following measurements:

Instruction: Construct triangles with the specifications below, cut out the resulting shape and compare with cut-out shapes of other learners. Make a decision based on your observations and tick the appropriate box in the table below:

Specifications	Congruent	Similar
$\angle A = 50^0; \angle B = 70^0; \angle C = 60^0$		
$\angle A = 30^0; \angle B = 80^0; BC = 3cm$		
$AB = 7cm; BC = 6cm; AC = 4cm$		
$\angle A = 90^0; BC = 5cm; AC = 3cm$		
$\angle A = 120^0; AB = 7{,}5cm; AC = 3cm$		
$\angle B = 115^0; BC = 7cm; AC = 5cm$		

Questions:

1. Are congruent triangles always similar? Explain.
2. Are similar triangles always congruent? If not, show counter example by using your cuttings.
3. Is it enough to know that if two triangles have all their corresponding angles equal that they are congruent? Are they similar? Explain.

4. Are the following statements TRUE or FALSE

The following statements are necessary conditions for congruency.	TRUE	FALSE
Any angle and two sides are equal in both triangles.		
The included angle and its adjacent sides are equal in both triangles.		
Each triangle has a right- angle, hypotenuse and any other side equal.		
Each triangle has 2 angles and a side in common.		
Each triangle has 2 sides and an angle (not included angle) in common.		

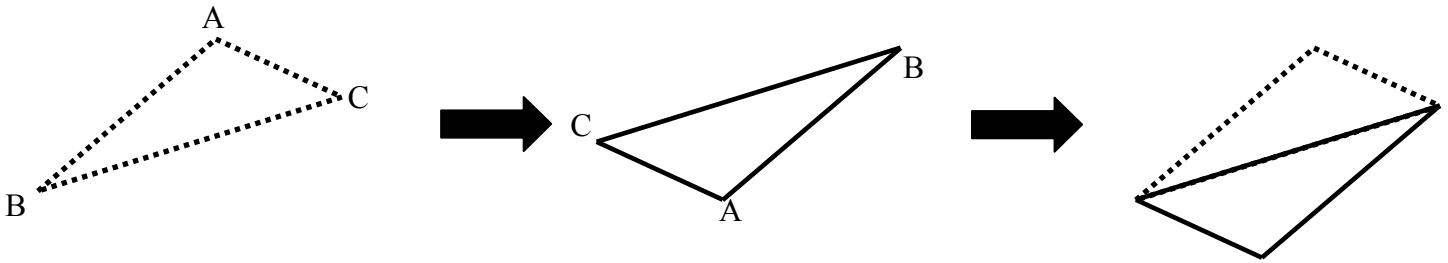
Activity 2

Use the concepts of transformations (reflections, translations and rotations) and congruency to discover properties of polygons e.g. quadrilaterals.

Consider the triangle below. Learners are now asked to use a pair of congruent triangles used in the above activity. A particular triangle, when marked off on paper using a compass or pencil can now be rotated about the midpoint of BC(use a drawing pin). The resulting shape is then marked off. The combined shape thus forms a parallelogram as illustrated below:

Instructions

Label the vertices of the resulting parallelogram.



Questions:

1. Which sides are equal to each other?
2. Which angles are equal to each other?
3. Are the opposite interior angles of a parallelogram equal? Explain.
4. Does the diagonal necessarily bisect the opposite angles. If not, under which conditions will this occur?
5. Does the diagonal halve the area of the parallelogram? Explain.

NOTE: The same method could be used to discover the properties of other quadrilaterals or polygons in general. In this case of a Rhombus, the original shape (an isosceles triangle) could be reflected about the base side. Learners may use their own strategies which could involve a combination of rotations and reflections/translations investigate the properties of polygons and solids.

RESOURCES: A pair of scissors, a ruler, compass, protractor, coloured paper, grid paper and drawing pins.

INTEGRATION: Within 9.2.5 Draws graphs on a Cartesian plane for given equations

ASSESSMENT: Investigation; mini- project

EXPANDED OPORTUNITY: More challenging problems involving transformations, such as Escher's compound tessellations should be given

BARRIERS TO LEARNING: Simpler concrete figures should be given first for learners to master these concepts

TEACHER REFLECTIONS:

WEEK	LO's & AS's	CONTENT	ACTIVITIES
11	LO5 Data Handling 9.5.1 Poses questions relating to human rights, social, economic, environmental and political issues in South Africa. 9.5.2 Selects, justifies and uses appropriate methods for collecting data (alone and/or as a member of a group or team) which include questionnaires and interviews, experiments, and sources such as books, magazines and the Internet in order to answer questions and thereby draw conclusions and make predictions about the environment. 9.5.3 Organises numerical data in different ways in order to summarize by determining: • Measures of central tendency • Measures of dispersion	Selection and use of appropriate methods to collect data. Drawing conclusions and making predictions from data collected. Organization of data in different ways and determining measures of central tendency and measures of dispersion.	Activity 1 The teacher revises with the learners on how to design a questionnaire that can be used to interview respondents in own environment as dealt with in Grade 8 and then extends it to South Africa Activity 2 The teacher familiarises the learners with different methods of collecting data with the aim of drawing conclusions and making predictions from the data. Activity 3 The teacher revises with the learners on organizing numerical data using the different ways and then introduces the measures of central tendency and dispersion
	Activity 1 Work in groups to design a questionnaire you would use to interview the respondents. The questionnaire should enable you to gather the following information: • Does the respondent have a television? • What is the gender of the respondent? • In which years did the respondent watch the Soccer World Cup?		

	• Open-ended question which will explain the respondents' impressions about Bafana-bafana. i Activity 2 Learners are asked to use the questionnaire they have developed to gather information in Activity 1 through interviewing ten people with t aim of revising the work done in grade 8 on Data collection and recording. the information using various methods such as tallies or tables. Copies of completed questionnaires must be submitted with your answer book. Activity 3 The teacher asks the learners to organise data collected and record it using tallies, tables and stem and leaf-displays as dealt with in Grade 8. Teacher asks them the following questions as a form of revision: Example:- 3.1 Calculate the mode, mean and median of the data collected above.
RESOURCES : Books; Magazines; Internet; Human resource; Questionnaires	
ASSESSMENT : Classwork, homework, projects and assignments	
PROVISION FOR LEARNERS WITH BARRIERS TO LEARNING: Spend more time with learners that are experiencing difficulties in understanding the lesson.	
EXPANDED OPPORTUNITIES : Learners will be able to design questionnaires with the aim of collecting data and organise it using various ways and as well as calculating the measures of central tendency	
TEACHER REFLECTION :	