

Mathematics: Senior Phase

Preamble

The Multi-grade toolkit for Mathematics is designed to assist teachers in multi-grade schools to teach effectively and cover the curriculum adequately. In the past, teachers in the multi-grade schools were expected to use the mono-grade curriculum and adapt it to meet the needs and demands of learners in a multi-grade class. Some teachers did not have the requisite skills to carry out this demanding task and it resulted in content being either too scantily covered or completely ignored, thus compromising the content knowledge and skills that learners needed to acquire at all levels of schooling. To obviate such situations in our multi-grade schools and ensure that learners in the multi-grade schools receive quality education, the Department of Basic Education developed a multi-grade toolkit for teachers.

The toolkit comprises of the following documents:

- A generic manual which provides literature about multi-grade teaching, methodologies, management, etc.
- A Multi-grade Annual Teaching Plan (MATP) informed by and aligned to the Curriculum and Assessment Policy Statement (CAPS) to support teachers with lesson planning;
- Exemplar lesson plans to assist teachers in developing, managing and adapting lessons to suit their own individual context. The activities in the lesson plans were taken from the
 - **DBE workbooks for Grades 4 to 9** (the same worksheets numbers are used in the lesson plans).
 - **Sasol-Inzalo workbooks for Grades 7 – 9** (chapters were cited).

More activities can be added by the individual teacher using a book of his or her own choice.

- Exemplar Assessment tasks to assist teachers in designing their own individual tasks to suit their own specific context.

The MATP was developed and designed according to topics that could lend themselves for robust discussion in the Mathematics class without compromising the content thereof. Each topic was carefully chosen and linked to each other in each grade. A common thread was carefully identified across the topics before they were aligned together, for example the topic ***Numeric and Geometric Patterns cuts across all the grades in the Intermediate Phase. A teacher can introduce a concept to all the learners and then pitch to different levels as dictated to by CAPS.***

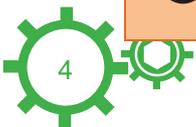


Through the “Whole Class” teaching methodology, the teacher can easily introduce each topic and engage learners in discussion before embarking on teaching specific grades in a multi-grade class through small group teaching.



Multi-Grade Annual Teaching Plans





TIME (HOURS)	GRADE 7	GRADE 8	GRADE 9
9	<p>Whole numbers (9)</p> <ul style="list-style-type: none"> • Properties • Calculations • Calculation techniques • Multiples and factors • Solving problems • Ratio and rate • Financial mathematics 	<p>Whole numbers(6)</p> <ul style="list-style-type: none"> • Properties • Calculations • Calculation techniques • Multiples and factors • Solving problems • Ratio and rate • Financial mathematics 	<p>Whole numbers (4.5)</p> <ul style="list-style-type: none"> • Properties • Calculations • Calculation techniques • Multiples and factors • Solving problems • Ratio, rate & proportion • Financial mathematics
9	<p>* Integers (9)</p> <ul style="list-style-type: none"> • Counting, ordering and comparing • Calculations • Properties • Solving problems 	<p>Integers(9)</p> <ul style="list-style-type: none"> • Counting, ordering and comparing • Calculations • Properties • Solving problems 	<p>Integers (4.5)</p> <ul style="list-style-type: none"> • Counting, ordering and comparing (Revision) • Calculations (Revision) • Properties (Revision) • Solving problems
9	<p>Exponents (9)</p> <ul style="list-style-type: none"> • Comparing and representing • Calculations • Solving problems 	<p>Exponents (9)</p> <ul style="list-style-type: none"> • Comparing and representing • Calculations (include laws of exponents) • Solving problems 	<p>Exponents (5)</p> <ul style="list-style-type: none"> • Comparing and representing • Calculations (include laws of exponents) • Solving problems
1	<p>Formal SBA Task: Assignment</p>	<p>Formal SBA Task: Assignment</p>	<p>Formal SBA Task: Assignment</p>
6	<p>Numeric and geometric patterns (6)</p> <ul style="list-style-type: none"> • Investigate and extend 	<p>Numeric and geometric patterns (6)</p> <ul style="list-style-type: none"> • Investigate and extend 	<p>Numeric and geometric patterns (6)</p> <ul style="list-style-type: none"> • Investigate and extend
<p>IMPORTANT NOTE: Always consult the CAPS to establish a detailed progression across the grades and the depths within the grade regarding topics, concepts and skills.</p>			
4	<p>Functions and relationships (3)</p> <ul style="list-style-type: none"> • Input and output values • Equivalent forms 	<p>Functions and relationships (3)</p> <ul style="list-style-type: none"> • Input and output values • Equivalent forms 	<p>Functions and relationships (4)</p> <ul style="list-style-type: none"> • Input and output values • Equivalent forms
4	<p>Graphs (4)</p> <ul style="list-style-type: none"> • Interpreting 	<p>Graphs(4)</p> <ul style="list-style-type: none"> • Interpreting 	<p>Graphs (4)</p> <ul style="list-style-type: none"> • Interpreting

	• Drawing	• Drawing	• Drawing
2	Formal SBA Task: Test	Formal SBA Task: Test	Formal SBA Task: Test
6	Revision	Revision	Revision
50			

IMPORTANT NOTE: Always consult the CAPS to establish a detailed progression across the grades and the depths within the grade regarding maths topics, concepts and skills.



TERM 2

TIME (HOURS)	GRADE 7	GRADE 8	GRADE 9
5	Construction of geometric figures (5) <ul style="list-style-type: none"> Measuring angles Construction 	Construction of geometric figures (4) <ul style="list-style-type: none"> Construction Properties 	Construction of geometric figures (4) <ul style="list-style-type: none"> Construction Properties
10	Geometry of 2D shapes (10) <ul style="list-style-type: none"> Classify Similarity and congruency Solve problems 	Geometry of 2D shapes (8) <ul style="list-style-type: none"> Classify Similarity and congruency Solve problems 	Geometry of 2D shapes (9) <ul style="list-style-type: none"> Classify Similarity and congruency Solve problems
1	Formal SBA Task: Investigation		
9	Geometry of straight lines (2) <ul style="list-style-type: none"> Definition of lines and line relationships 	Geometry of straight lines (9) <ul style="list-style-type: none"> Angle relationships Solving problems 	Geometry of straight lines (9) <ul style="list-style-type: none"> Angle relationships Solving problems
9	Algebraic expressions (3) <ul style="list-style-type: none"> Algebraic language 	Algebraic expressions (9) <ul style="list-style-type: none"> Algebraic language Expand and simplify 	Algebraic expressions (9) <ul style="list-style-type: none"> Algebraic language Expand and simplify Factorization
1	Formal SBA Task: Test		
8	Algebraic equations (3) <ul style="list-style-type: none"> Number sentences 	Algebraic equations (3) <ul style="list-style-type: none"> Equations 	Algebraic equations (8) <ul style="list-style-type: none"> Equations
2	Formal SBA Task: Examination		
5	Revision		
50	Revision		

IMPORTANT NOTE: Always consult the CAPS to establish a detailed progression across the grades and the depths within the grade regarding maths topics, concepts and skills.

TERM 3

TIME (HOURS)	GRADE 7	GRADE 8	GRADE 9
8	<p>Common fractions</p> <ul style="list-style-type: none"> Ordering, comparing and simplifying Calculations with fractions Calculation techniques Solving problems Percentages Equivalent form 	<p>Common fractions</p> <ul style="list-style-type: none"> Calculations with fractions Calculation techniques Solving problems Percentages Equivalent forms 	<p>Common fractions</p> <ul style="list-style-type: none"> Calculations with fractions Calculation techniques Solving problems Equivalent forms
8	<p>Decimal fractions</p> <ul style="list-style-type: none"> Ordering and comparing Calculations with decimal fractions Calculation techniques Solving Problems Equivalent forms 	<p>Decimal fractions</p> <ul style="list-style-type: none"> Ordering and comparing Calculations with decimal fractions Calculation techniques Solving Problems Equivalent forms 	<p>Decimal fractions</p> <ul style="list-style-type: none"> Ordering and comparing Calculations techniques Solving Problems Equivalent forms
7	<p>Data handling</p> <ul style="list-style-type: none"> Collect data Organise and summarise data Represent data Interpret data Analyse data Report data 	<p>Data handling</p> <ul style="list-style-type: none"> Collect data Organise and summarise data Represent data Interpret data Analyse data Report data 	<p>Data handling</p> <ul style="list-style-type: none"> Collect data Organise and summarise data Represent data Interpret data Analyse data Report data
1	<p>Formal SBA Task: Project</p>	<p>Formal SBA Task: Project</p>	<p>Formal SBA Task: Project</p>
5	<p>2D Geometry</p> <ul style="list-style-type: none"> Classifying 2D shapes Area of square, rectangle and triangle 	<p>Theorem of Pythagoras</p> <ul style="list-style-type: none"> Develop and use Theorem of Pythagoras 	<p>Theorem of Pythagoras</p> <ul style="list-style-type: none"> Solve problems using the theorem of Pythagoras



7	<p>Area and perimeter of 2D shapes</p> <ul style="list-style-type: none"> • Area and perimeter • Calculations and solving problems 	<p>Area and perimeter of 2D shapes</p> <ul style="list-style-type: none"> • Area and perimeter • Calculations and solving problems 	<p>Area and perimeter of 2D shapes</p> <ul style="list-style-type: none"> • Area and perimeter
1	<p>Formal SBA Task: Assignment</p>	<p>Formal SBA Task: Assignment</p>	<p>Formal SBA Task: Assignment</p>
8	<p>Surface area and volume of 3D objects</p> <ul style="list-style-type: none"> • Surface area and volume • Calculations and solving problems 	<p>Surface area and volume of 3D objects</p> <ul style="list-style-type: none"> • Surface area and volume • Calculations and solving problems 	<p>Surface area and volume of 3D objects</p> <ul style="list-style-type: none"> • Surface area and volume
2	<p>Formal SBA Task: Test</p>	<p>Formal SBA Task: Test</p>	<p>Formal SBA Task: Test</p>
3	<p>Revision</p>	<p>Revision</p>	<p>Revision</p>
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IMPORTANT NOTE: Always consult the CAPS to establish a detailed progression across the grades and the depths within the grade regarding maths topics, concepts and skills.

TERM 4

TIME (HOURS)	GRADE 7	GRADE 8	GRADE 9
6	Functions and relationships <ul style="list-style-type: none"> Input and output values Equivalent forms 	Functions and relationships <ul style="list-style-type: none"> Input and output values Equivalent forms 	Functions and relationships <ul style="list-style-type: none"> Input and output values Equivalent forms
2	Graphs <ul style="list-style-type: none"> Interpret graphs Draw graphs 	Graphs <ul style="list-style-type: none"> Interpret graphs Draw graphs 	Graphs <ul style="list-style-type: none"> Interpret graphs Draw graphs
1	Formal SBA Task: Investigation	Formal SBA Task: Investigation	Formal SBA Task: Investigation
5	Construction of geometric shapes <ul style="list-style-type: none"> Measuring of angles Constructions 	Construction of geometric shapes <ul style="list-style-type: none"> Constructions Investigating properties of geometric figures 	Construction of geometric shapes <ul style="list-style-type: none"> Constructions Investigating properties of geometric figures
9	Transformation geometry <ul style="list-style-type: none"> Transformations Enlargement and Reduction 	Transformation geometry <ul style="list-style-type: none"> Transformations Enlargement and Reduction of geometric figures. 	Transformation geometry <ul style="list-style-type: none"> Transformations Enlargement and Reduction
1	Formal SBA Task: Assignment	Formal SBA Task: Assignment	Formal SBA Task: Assignment
9	Geometry of 3D objects <ul style="list-style-type: none"> Classifying 3-D objects Building 3-D models 	Geometry of 3D objects <ul style="list-style-type: none"> Classifying 3-D objects Building 3-D models 	Geometry of 3D objects <ul style="list-style-type: none"> Classifying 3-D objects Building 3-D models
4.5	Probability	Probability	Probability
4	Revision	Revision	Revision
3	Formal Task: End of year Examination	Formal Task: End of year Examination	Formal Task: End of year Examination

IMPORTANT NOTE: Always consult the CAPS to establish a detailed progression across the grades and the depths within the grade regarding maths topics, concepts and skills.



LESSON PLANS: TERM 1



MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 1

TERM 1

Date : from to		Time: 9 hours	
Grade	7	8	9
Topic	WHOLE NUMBERS		
CAPS pages	40 - 42	75 - 77	119 - 121
Skills and Knowledge	<p>Ordering and comparing whole numbers Revise the following done in Grade 6:</p> <ul style="list-style-type: none"> • Order, compare and represent numbers to at least 9-digit numbers • Recognise and represent prime numbers to at least 100 • Rounding off numbers to the nearest 5, 10, 100 or 1 000 <p>Properties of whole numbers Revise the following done in Grade 6:</p> <ul style="list-style-type: none"> • Recognise and use the commutative; associative; distributive properties with whole numbers • Recognise and use 0 in terms of its additive property (identity element for addition) • Recognise and use 1 in terms of its multiplicative property (identity element for multiplication) <p>Calculations with whole numbers Revise the following done in Grade 6, without use of calculators:</p> <ul style="list-style-type: none"> • Addition and subtraction of whole numbers to at least 6 –digit numbers 	<p>Ordering and comparing whole numbers Revise Prime numbers to at least 100</p> <p>Properties of whole numbers Revise:</p> <ul style="list-style-type: none"> • The commutative; associative; distributive properties of whole numbers • 0 in terms of its additive property (identity element for addition) • 1 in terms of its multiplicative property (identity element for multiplication) • Recognise the division property of 0, whereby any number divided by 0 is undefined <p>Calculations using whole numbers Revise: Calculations using all four operations on whole numbers, estimating and using calculators where appropriate</p>	<p>Properties of numbers Describe the real number system by recognising, defining and distinguishing properties of:</p> <ul style="list-style-type: none"> • natural numbers • whole numbers • integers • rational numbers • irrational numbers <p>Calculations using whole numbers Revise: Calculations using all four operations on whole numbers, estimating and using calculators where appropriate</p>

- Multiplication of at least whole 4-digit by 2-digit numbers
- Division of at least whole 4-digit by 2-digit numbers

Perform calculations using all four operations on whole numbers, estimating and using calculators where appropriate

Calculation techniques

Use a range of techniques to perform and check written and mental calculations of whole numbers including:

- Estimation
- adding, subtracting and multiplying in columns
- long division
- rounding off and compensating
- using a calculator

Multiples and factors

Revise the following done in Grade 6:

- Multiples of 2-digit and 3-digit whole numbers
- Factors of 2-digit and 3-digit whole numbers
- Prime factors of numbers to at least 100

List prime factors of numbers to at least 3-digit whole numbers

Find the LCM and HCF of numbers to at least 3-digit whole numbers, by inspection or factorisation

Calculation techniques

Use a range of strategies to perform and check written and mental calculations with whole numbers including:

- Estimation
- adding, subtracting and multiplying in columns
- long division
- rounding off and compensating
- using a calculator

Multiples and factors

Revise:

- Prime factors of numbers to at least 3-digit whole numbers
- LCM and HCF of numbers to at least 3-digit whole numbers, by inspection or factorisation

Calculation techniques

Use a range of strategies to perform and check written and mental calculations of whole numbers including:

- Estimation
- adding, subtracting and multiplying in columns
- long division
- rounding off and compensating
- using a calculator

Multiples and factors

Use prime factorisation of numbers to find LCM and HCF

	<p>Solving problems Solve problems involving whole numbers, including:</p> <ul style="list-style-type: none"> • Comparing two or more quantities of the same kind (ratio) • Comparing two quantities of different kinds (rate) • Sharing in a given ratio where the whole is given <p>Solve problems that involve whole numbers, percentages and decimal fractions in financial contexts such as:</p> <ul style="list-style-type: none"> • Profit, loss and discount • Budgets • Accounts • Loans • Simple interest 	<p>Solving problems Solve problems involving whole numbers, including:</p> <ul style="list-style-type: none"> • Comparing two or more quantities of the same kind (ratio) • Comparing two quantities of different kinds (rate) • Sharing in a given ratio where the whole is given • Increasing or decreasing of a number in a given ratio <p>Solve problems that involve whole numbers, percentages and decimal fractions in financial contexts such as:</p> <ul style="list-style-type: none"> • Profit, loss, discount and VAT • Budgets • Accounts • Loans • Simple interest • Hire Purchase • Exchange rates 	<p>Solving problems Solve problems in contexts involving ratio and rate</p> <ul style="list-style-type: none"> • direct and indirect proportion <p>Solve problems that involve whole numbers, percentages and decimal fractions in financial contexts such as:</p> <ul style="list-style-type: none"> • profit, loss, discount and VAT • budgets • accounts and loans • simple interest and hire purchase • exchange rates and commission • Rentals • compound interest
Suggested methodology	<p>Ordering and comparing numbers Learners should be given a range of exercises such as:</p> <ul style="list-style-type: none"> • Arrange given numbers from the smallest to the biggest or biggest to smallest • Fill in missing numbers in a sequence; on a number grid; on a number line e.g. which whole number is halfway between 471 340 and 471 350. • Fill in $<$, $=$ or $>$ <p>Examples:</p> <ol style="list-style-type: none"> 247 889 * 247 898 784 109 * 785 190 <p>Properties of whole numbers</p> <ul style="list-style-type: none"> • Revising the properties of whole numbers should be the starting point for work with whole numbers. The properties of numbers should provide the motivation for why and how operations with numbers work. 		

- When learners are introduced to new numbers, such as integers for example, they can again explore how the properties of numbers work for the new set of numbers.
- Learners also have to apply the properties of numbers in algebra, when they work with variables in place of numbers.
- Learners should know and be able to use the following properties:
 - The commutative property of addition and multiplication:
 - ◆◆ $a + b = b + a$
 - ◆◆ $a \times b = b \times a$
 - The associative (grouping) property of addition and multiplication:
 - ◆◆ $(a + b) + c = a + (b + a)$
 - ◆◆ $(a \times b) \times c = a \times (b \times c)$
 - The distributive property of multiplication over addition and subtraction:
 - ◆◆ $a(b + c) = (a \times b) + (a \times c)$
 - ◆◆ $a(b - c) = (a \times b) - (a \times c)$
 - Addition and subtraction as inverse operations
 - Multiplication and division as inverse operations
 - 0 is the identity element for addition: $t + 0 = t$
 - 1 is the identity element for multiplication: $t \times 1 = t$

Illustrating the properties with whole numbers

Examples

- a) $33 + 99 = 99 + 33 = 132$
- b) $51 + (19 + 46) = (51 + 19) + 46 = 116$
- c) $4(12 + 9) = (4 \times 12) + (4 \times 9) = 48 + 36 = 84$
- d) $(9 \times 64) + (9 \times 36) = 9 \times (64 + 36) = 9 \times 100 = 900$
- e) If $33 + 99 = 132$, then $132 - 99 = 33$ and $132 - 33 = 99$
- f) If $20 \times 5 = 110$, then $110 \div 20 = 5$ and $110 \div 5 = 20$

Calculations with whole numbers

- Learners should do context free calculations and solve problems in contexts
- Learners should become more confident in and more independent at mathematics, if they have techniques
 - to check their solutions themselves, e.g. using inverse operations; using calculators
 - to judge the reasonableness of their solutions e.g. estimate by rounding off; estimate by doubling or halving;
- Adding, subtracting and multiplying in columns, and long division, should only be used to practice number facts and calculation

techniques, and hence should be done with familiar and smaller number ranges. For big and unwieldy calculations, learners should be encouraged to use a calculator.

Multiples and factors

- Practice with finding multiples and factors of whole numbers are especially important when learners do calculations with fractions. They use this knowledge to find the LCM when one denominator is a multiple of another, and also when they simplify fractions or have to find equivalent fractions.
- Factorising whole numbers lays the foundation for factorisation of algebraic expressions.
- Using the definition of prime numbers and emphasize that 1 is not classified as a prime number

Examples

- a) The multiples of 6 are 6, 12, 18, 24,... or $M_6 = \{6; 12; 18; 24; \dots\}$
- b) LCM of 6 and 18 is 18 and LCM of 6 and 7 is 42
- c) The factors of 24 are 1, 2, 3, 4, 6, 12 and 24 by inspection and, the prime factors of 24 are 2 and 3
- d) The factors of 140 are 1, 2, 5, 7, 10, 14, 28, 35, 70 and 140
- e) Determine the HCF of 120; 300 and 900

Learners do this by finding the prime factors of the numbers first.

$$120 = 5 \times 3 \times 2^3. \text{ Initially learners may write this as: } 5 \times 3 \times 2 \times 2 \times 2$$

$$300 = 5^2 \times 3 \times 2^2$$

$$900 = 5^2 \times 3^2 \times 2^2$$

$$\text{HCF} = 5 \times 3 \times 2 = 60 \text{ (Multiply the common prime factors of the three numbers)}$$

Solving problems

Solving problems in contexts should take account of the number ranges learners are familiar with.

- Contexts involving ratio and rate should include speed, distance and time problems.
- In financial contexts, learners are **not** expected to use formulae for calculating simple interest.

In Grade 8, revising the properties of whole numbers should be the starting point for work with whole numbers. The properties of numbers should provide the motivation for why and how operations with numbers work. When learners are introduced to new numbers, such as integers for example, they can again explore how the properties of numbers work for the new set of numbers. Learners also have to apply the properties of numbers in algebra, when they work with variables in place of numbers.

In Grade 9 learners consolidate number knowledge and calculation techniques for whole numbers, developed in Grade 8. The focus in Grade 9 should be on developing an understanding of different number systems and the properties of operations that apply for different number systems. The contexts for solving problems should be more complex and varied, involving whole numbers, integers and rational numbers. Financial contexts are especially rich in this regard. Learners should be given a clear indication of when the use of calculators is permissible or not. Calculators should be used routinely for calculations with big numbers and where knowledge of

number facts or concepts is not explicitly assessed. However, guard against learners becoming dependent on calculators for all calculations. Calculators remain a useful tool for checking solutions. Competency in finding multiples and factors, and prime factorisation of whole numbers, remains important for developing competency in factorising algebraic expressions and solving algebraic equations.

By distinguishing the properties of different number systems, learners should recognize that natural numbers is a subset of whole numbers, which in turn is a subset of integers, which in turn is a subset of rational numbers. All of these numbers form part of the real number system.

Note that 0 may sometimes be included in the set of natural numbers.

Learners should recognize the following distinguishing features of the number systems

- **integers** extend the **natural** and **whole number systems** by including the operation $a - b$, where $a < b$.
- **rational numbers** extend the set of **integers** by including the operation $\frac{a}{b}$ where $a < b$
- **rational numbers** are defined as numbers that can be written in the form $\frac{a}{b}$ where a and b are integers and $b \neq 0$
- since **integers** are a subset of **rational numbers**, every integer, can be expressed as a rational number a
- **irrational numbers** are numbers that cannot be expressed as **rational numbers**
- **Pi (π)** is an **irrational number**, even though we use $\frac{22}{7}$ or 3,14 as rational number approximations for π in calculations

Ratio and rate problems include problems involving speed, distance and time. Learners should be familiar with the following formulae for these calculations:

- a) $\text{speed} = \frac{\text{distance}}{\text{time}}$
- b) $\text{distance} = \text{speed} \times \text{time}$
- c) $\text{time} = \frac{\text{distance}}{\text{speed}}$

Speed is usually given as constant speed or average speed. Make sure learners recognize and are able to convert correctly between units for time and distance.

Examples

- a) A car travelling at a constant speed travels 60 km in 18 minutes. How far, travelling at the same constant speed, will the car travel in 1 hour 12 minutes?
- b) A car travelling at an average speed of 100 km/h covers a certain distance in 3 hours 20 minutes. At what constant speed must the car travel to cover the same distance in 2 hours 40 minutes?

Direct and Indirect proportion

Grade 9 learners should be familiar with the following relationships:

- x is directly proportional to y if $\frac{x}{y} = \text{constant}$
- x and y are directly proportional if, as the value of x increases the value of y increases in the same proportion, and as the value of x decreases the value of y decreases in the same proportion
- The direct proportional relationship is represented by a straight line graph
- x is indirectly or inversely proportional to y if $x \cdot y = a \text{ constant}$. In other words $y = \frac{c}{x}$
- x and y are indirectly proportional if, as the value of x increases the value of y decreases and as the value of x decreases the value of y increases
- an indirect proportional relationship is represented by a non-linear curve

Financial contexts

Once Grade 9 learners have done sufficient calculations for simple and compound interest through repeated calculations, they could use given formulae for these calculations.

Examples

- Calculate the simple interest on R600 at 7% p.a for 3 years using the formula $SI = \frac{Pnr}{100}$ or $SI = P \cdot n \cdot i$ for $i = \frac{i}{100}$.
- R800 invested at $r\%$ per annum simple interest for a period of 3 years yields R168. Calculate the value of r
- How long will it take for R3 000 invested at 6% per annum simple interest to grow to R4 260?
- Temoso borrowed R500 from the bank for 3 years at 8% p.a. compound interest. Without using a formula, calculate how much Temoso owes the bank at the end of three years.
- Use the formula $A = P(1 + \frac{r}{100})^n$ to calculate the compound interest on a loan of R3 450 at 6,5% per annum for 5 years.

LTSM

Resources

Calculators, number line.

Grade 7

Grade 7 WB 1 Activities

(R2a&b; R3; R4; R5a&b; R6; 17-23 R13

Grade 8

Grade 8 WB 1 Activities

(1; 2a&b; 3-5; 6-10)

Grade 9

Grade 9 WB 1 Activities

(1a&b; 3a&b - 9)



<p>Textbook reference</p>			
<p>HOMEWORK</p>			
<p>ASSESSMENT E.g. Informal assessment</p>			

MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 2

TERM 1

Date : from to		Time: 9 hours	
Grade	7	8	9
Topic	INTEGERS		
CAPS pages	67 – 68	78 - 80	121
Skills and Knowledge	<p>Counting, ordering and comparing integers</p> <ul style="list-style-type: none"> Count forwards and backwards in integers for any interval Recognize, order and compare integers <p>Calculations with integers</p> <ul style="list-style-type: none"> Add and subtract with integers <p>Properties of integers</p> <ul style="list-style-type: none"> Recognize and use commutative and associative properties of addition and multiplication for integers 	<p>Counting, ordering and comparing integers</p> <p>Revise:</p> <ul style="list-style-type: none"> counting forwards and backwards in integers for any interval recognizing, ordering and comparing integers <p>Calculations with integers</p> <p>Revise:</p> <ul style="list-style-type: none"> perform calculations involving all four operations with integers perform calculations involving all four operations with numbers that involve the squares, cubes, square roots and cube roots of integers <p>Properties of integers</p> <p>Revise:</p> <ul style="list-style-type: none"> commutative, associative and distributive properties of addition and multiplication for integers additive and multiplicative inverses for integers 	

	Solving problems • Solve problems in contexts involving addition and subtraction of integers • addition and subtraction of integers	Solving problems Solve problems in contexts involving multiple operations with integers	Solving problems Solve problems in contexts involving multiple operations with integers
Suggested methodology	<p>Integers are new numbers introduced in Grade 7.</p> <p>Counting, ordering and comparing integers</p> <p>Counting should not only be thought of as verbal counting. Learners can count using:</p> <ul style="list-style-type: none"> • structured, semi-structured or empty number lines • chain diagrams for counting <p>Learners should be given a range of exercises such as:</p> <ul style="list-style-type: none"> • arrange given numbers from the smallest to the biggest: or biggest to smallest • fill in missing numbers in a sequence; on a number grid; or on a number line • fill in $<$, $=$ or $>$ <p>Example: $-425 * -450$</p> <p>Calculations using integers</p> <ul style="list-style-type: none"> • Start calculations using integers in small number ranges. • Develop an understanding that subtracting an integer is the same as adding its additive inverse. <p>Example: $7 - 4 = 7 + (-4) = 3$ OR $-7 - 4 = -7 + (-4) = -11$ So too, $7 - (-4) = 7 + (+4) = 11$ OR $-7 - (-4) = -7 + (+4) = -3$ Here the use of brackets around the integers is useful.</p> <p>Properties of integers</p> <ul style="list-style-type: none"> • Learners should investigate the properties for operations using whole numbers on the set of integers. • These properties should serve as motivation for the operations they can perform using integers. • Learners should see that the commutative property for addition holds for integers e.g. $8 + (-3) = (-3) + 8 = 5$ • Learners should see that they can still use subtraction to check addition or vice versa. Example: If $8 + (-3) = 5$, then $5 - 8 = -3$ and $5 - (-3) = 8$ • Learners should see that the associative property for addition holds for integers. Example: $[(-6) + 4] + (-1) = (-6) + [4 + (-1)] = -3$ • Learners should only explore the distributive property once they can multiply with integers 		

In Grade 8 learners:

- Consolidate number knowledge and calculation techniques for integers, developed in Grade 7.
- Multiply and divide with integers
- Perform all four operations with integers
- Perform all four operations with squares, cubes, square and cube roots of integers

Counting, ordering and comparing integers

- Learners should continue practising counting, ordering and comparing integers. Counting should not only be thought of as verbal counting. Learners can count using:
 - structured, semi-structured or empty number lines
 - chain diagrams for counting
- Learners should be given a range of exercises They should
 - Arrange given numbers from the smallest to the biggest: or biggest to smallest
 - Fill in missing numbers in a sequence; on a number grid; or on a number line
 - Fill in $<$, $=$ or $>$ e.g. $-425 * -450$;

Calculations using integers

See notes for Grade 7 above.

A useful strategy is to use repeated addition and number patterns to show learners the reasonableness of rules for the resultant sign for multiplication with integers.

- Example:**
- a) Repeated addition of (-3) : $(-3) + (-3) + (-3) = -9 = 3 \times (-3)$
 - b) Repeated addition of (-2) : $(-2) + (-2) + (-2) + (-2) + (-2) = -8 = 4 \times (-2)$
 - c) Counting down in intervals of 3 from 9:
 $3 \times 3 = 9$
 $3 \times 2 = 6$
 $3 \times 1 = 3$
 $3 \times 0 = 0$
 $3 \times -1 = -3$
 $3 \times -2 = ?$
 $3 \times -3 = ?$

Hence the rule: a positive integer \times a negative integer = a negative integer

d) Using the rule that a positive integer x a negative integer = a negative integer, established from examples above, the following pattern can be used:

- $-1 \times 3 = -3$
- $-1 \times 2 = -2$
- $-1 \times 1 = -1$
- $-1 \times 0 = 0$
- $-1 \times -1 = 1$
- $-1 \times -2 = ?$
- $-1 \times -3 = ?$

Hence the rule: a negative integer x a negative integer = a positive integer

Use the inverse operation for multiplication and division to develop a rule for the resultant sign for division with integers .

Example:

- a) If $4 \times (-2) = -8$, then $-8 \div 4 = -2$ and $-8 \div (-2) = 4$
- b) If $(-1) \times (-3) = 3$, then $3 \div (-1) = -3$ and $3 \div (-3) = -1$

Hence the rules: division of a positive and negative integer equals a negative integer and division of two negative integers equal a positive integer.

Finding the squares, cubes, square roots and cube roots of integers are also opportunities to check that learners know the rules for resultant signs when multiplying integers. Therefore, make sure that learners understand why you cannot find the square root of a negative integer, and that the square of a negative integer is always positive.

Example:

- a) $(-5)^2 = (-5) \times (-5) = 25$
- b) $(-4)^3 = (-4) \times (-4) \times (-4) = -64$
- c) $\sqrt[3]{-27} = -3$ because $-3 \times -3 \times -3 = -27$

Properties of integers

Learners should investigate the properties for operations with whole numbers on the set of integers. These properties should serve as motivation for the operations they can perform with integers. Learners should:

- see that the commutative property for addition and multiplication holds for integers, e.g. $8 + (-3) = (-3) + 8 = 5$; $8 \times (-3) = (-3) \times 8 = -24$
- see that they can still use subtraction to check addition or vice versa, e.g. if $8 + (-3) = 5$, then $5 - 8 = -3$ and $5 - (-3) = 8$
- see that the associative property for addition holds for integers, e.g. $[(-6) + 4] + (-1) = (-6) + [4 + (-1)] = -3$

	<ul style="list-style-type: none"> see that the inverse operation for multiplication and division holds for integers, e.g. if $5 \times (-6) = -30$, then $-30 \div 5 = -6$ and $30 \div (-6) = 5$ develop the rules, through patterning, for resultant signs when multiplying and dividing integers: Examples $(+5) \times (+5) = (+25)$; $(-5) \times (-5) = (+25)$; $(-5) \times (+5) = (-25)$; $(+25) \div (+5) = (+5)$; $(-25) \div (-5) = (+5)$; $(-25) \div (+5) = (-5)$; <p>In Grade 9 learners :</p> <ul style="list-style-type: none"> consolidate number knowledge and calculation techniques for integers, developed in Grade 8. work with integers mostly as coefficients in algebraic expressions and equations. <p>They are expected to be competent in performing all four operations with integers and using the properties of integers appropriately where necessary.</p>						
LTSM							
Resources	Number line with negative and positive numbers, thermometer, measuring jugs, ice, charts.						
	<table border="1"> <thead> <tr> <th data-bbox="863 1279 924 1816">Grade 7</th> <th data-bbox="863 687 924 1279">Grade 8</th> <th data-bbox="863 91 924 687">Grade 9</th> </tr> </thead> <tbody> <tr> <td data-bbox="924 1279 1029 1816">Grade 7 WB 2 Activities (105 - 113)</td> <td data-bbox="924 687 1029 1279">Grade 8 WB 1 Activities (1; 11; 12; 13)</td> <td data-bbox="924 91 1029 687">Grade 9 WB 1 Activities (R4)</td> </tr> </tbody> </table>	Grade 7	Grade 8	Grade 9	Grade 7 WB 2 Activities (105 - 113)	Grade 8 WB 1 Activities (1; 11; 12; 13)	Grade 9 WB 1 Activities (R4)
Grade 7	Grade 8	Grade 9					
Grade 7 WB 2 Activities (105 - 113)	Grade 8 WB 1 Activities (1; 11; 12; 13)	Grade 9 WB 1 Activities (R4)					
Workbook reference							
Textbook reference							
HOMEWORK							
ASSESSMENT E.g. Informal assessment – test 15 marks max							

MATHEMATICS SENIOR PHASE
MULTIGRADE LESSON PLAN 3

TERM 1

Date: from..... to.....		Time: 9 hours	
Grade	7	8	9
Topic	EXPONENTS		
CAPS pages	43 – 44	81 – 84	124 – 126
Skills and Knowledge	<p>Comparing and representing numbers in exponential form</p> <p>Compare and represent whole numbers in exponential form:</p> <ul style="list-style-type: none"> $a^b = a \times a \times a \dots$ for b number of factors <p>Calculations using numbers in exponential form</p> <ul style="list-style-type: none"> Recognize and use the appropriate laws of operations with numbers involving exponents and square and cube roots 	<p>Comparing and representing numbers in exponential form</p> <ul style="list-style-type: none"> Revise compare and represent whole numbers in exponential form Compare and represent integers in exponential form Compare and represent numbers in scientific notation, limited to positive exponents <p>Calculations using numbers in exponential form</p> <ul style="list-style-type: none"> Establish general laws of exponents, limited to natural number exponents: <ul style="list-style-type: none"> $a^m \times a^n = a^{m+n}$ $a^m \div a^n = a^{m-n}$ $(a^m)^n = a^{m \times n}$ $(a \times t)^n = a^n \times t^n$ $(a)^0 = 1$ Recognize and use the appropriate laws of operations using numbers 	<p>Comparing and representing numbers in exponential form</p> <ul style="list-style-type: none"> Revise: <ul style="list-style-type: none"> compare and represent integers in exponential form compare and represent numbers in scientific notation Extend scientific notation to include negative exponents <p>Calculations using numbers in exponential form</p> <ul style="list-style-type: none"> Revise the following general laws of exponents: <ul style="list-style-type: none"> $a^m \times a^n = a^{m+n}$ $a^m \div a^n = a^{m-n}$, if $m > n$ $(a^m)^n = a^{m \times n}$ $(a \times t)^n = a^n \times t^n$ $a^0 = 1$ Extend the general laws of exponents to include integer exponents <ul style="list-style-type: none"> $a^{-n} = \frac{1}{a^n}$

	<ul style="list-style-type: none"> Perform calculations involving all four operations using numbers in exponential form, limited to exponents up to 5, and square and cube roots <p>Solving problems Solve problems in contexts involving numbers in exponential form</p>	<p>involving exponents and square and cube roots</p> <ul style="list-style-type: none"> Perform calculations involving all four operations with numbers that involve squares, cubes, square roots and cube roots of integers Calculate the squares, cubes, square roots and cube roots of rational numbers <p>Solving problems Solve problems in contexts involving numbers in exponential form.</p>	<ul style="list-style-type: none"> Perform calculations involving all four operations using numbers in exponential form <p>Solving problems Solve problems in contexts involving numbers in exponential form, including scientific notation</p>
Suggested methodology	<p>Although Grade 7 learners may have encountered square numbers in Grade 6, they were not expected to write these numbers in exponential form.</p> <p>Comparing and representing numbers in exponential form Learners need to understand that in the exponential form a^b, the number is read as 'a to the power b', where a is called the base and b is called the exponent or index.(b) indicates the number of factors that are multiplied.</p> <p>Example:</p> <p>a) $a^3 = a \times a \times a$; b) $a^5 = a \times a \times a \times a \times a$</p> <p>Learners can represent any number in exponential form, without needing to compute the value.</p>		

Example:

$$50 \times 50 \times 50 \times 50 \times 50 \times 50 = (50)^7$$

Make sure learners understand that square roots and cube roots are the inverse operations of squaring and cubing numbers.

Examples:

$$3^2 = 9 \text{ therefore } \sqrt[3]{9} = 3$$

Make sure learners understand that any number raised to the power 1 is equal to the number.

Example:

$$m^1 = m$$

At this point, learners do not need to know the rule for raising a number to the power 0. This will only be introduced in Grade 8 when they use other laws of exponents in calculations. To avoid common misconceptions, emphasize the following with examples:

- $(12)^2 = 12 \times 12$ and not 12×2
- 1^3 means $1 \times 1 \times 1$ and not 1×3
- $100^1 = 100$
- $\sqrt[2]{81} = 9$ because $9^2 = 81$
- $\sqrt[3]{27} = 3$ because $3^3 = 27$
- The square of $9 = 81$, whereas the square root of $9 = 3$

Learners should use their knowledge of representing numbers in exponential form when simplifying and expanding algebraic expressions and solving algebraic equations

Calculations using numbers in exponential form

Knowing the rules of operations for calculations involving exponents is important.

Examples:

a) $(7 - 4)^3 = 3^3$ **and NOT** $7^3 - 4^3$

b) $\sqrt{16 + 9} = \sqrt{25}$, **and NOT** $\sqrt{16} + \sqrt{9}$

In Grade 8:

- Integers and rational numbers in exponential form

- Scientific notation of numbers

Laws of exponents

The laws of exponents should be introduced through a range of numeric examples first, then variables can be used. In other words, the numbers are replaced with letters, but the rules work the same. The following laws of exponents should be introduced, where m and n are natural numbers and a and t are not equal to 0 :

- $a^m \times a^n = a^{m+n}$ if $m > n$

Examples

- $2^3 \times 2^4 = 2^{3+4} = 2^7$
- $x^3 \times x^4 = x^{3+4} = x^7$

- $a^m \div a^n = a^{m-n}$ if $m > n$

Examples

- $3^5 \div 3^2 = 3^3 = 27$
- $x^5 \div x^3 = x^{5-3} = x^2$

- $(a^m)^n = a^{m \times n}$

Examples:

- $(2^3)^2 = 2^{3 \times 2} = 2^6$
- $(x^3)^2 = x^{3 \times 2} = x^6$

- $(a \times t)^n = a^n \times t^n$

Examples:

a) $(3 \times x^2)^3 = 3^3 \times (x^2)^3 = 27x^6$

b) $(2^3 \times 5^2)^2 = (2^3)^2 \times (5^2)^2 = 8^2 \times 25^2 = 64 \times 625 = 4000$

- $(a)^0 = 1$

Examples:

a) $(37)^0 = 1$

b) $(4x^2)^0 = 1$

Make sure that learners understand the laws of exponents reading from both sides of the equal sign i.e. if the LHS = RHS, then the RHS = LHS.

The law $(a)^0 = 1$ can be derived by using the law of exponents for division in a few examples.

$$a^4 \div a^4 = \frac{a \times a \times a \times a}{a \times a \times a \times a} = 1 \quad \text{therefore } a^{4-4} = a^0 = 1$$

Learners should be able to use the laws of exponents in calculations and for solving simple exponential equations as well as expanding or simplifying algebraic expressions.

Look out for the following **common misconceptions** where:

- Learners multiply unlike bases and add the exponent.

Example:

a) $x^m \times y^n = (xy)^{m+n}$

- Learners multiply like bases and add the exponents

Example:

$2^5 \times 2^7 = 2^{5+7} = 4^{12}$ Instead of the correct answer 2^{12} .

- Learners forget, for example, that when squaring a binomial there is a middle term.

Example:

$$(x + y)^m = x^m + y^m$$

- Learners confuse adding the exponents and adding the terms

Example:

$$x^m + x^n = x^{m+n} \text{ or } x^{mn}$$

Calculations using numbers in exponential form

Knowing the rules of operations for calculations involving exponents are important, e.g.

- a) $(7 - 4)^3 = 3^3$ **and NOT** $7^3 - 4^3$
 b) $\sqrt{16 + 9} = \sqrt{25}$, **and NOT** $\sqrt{16} + \sqrt{9}$

Learners can also do simple calculations where the numerator and denominator of a fraction are written in exponential form, e.g.,

$$\begin{aligned} \frac{2^3}{2^2} &= \frac{2 \times 2 \times 2}{2 \times 2} \\ &= \frac{8}{4} \\ &= 2 \end{aligned}$$

Learners can also find squares, cubes, square roots and cube roots of decimal and common fractions by inspection.

Examples

a) $(0,7)^2 = 0,49$

b) $(0,1)^3 = 0,001$

c) $\sqrt{0,09} = 0,3$

d) $\frac{2^3}{2^2} = \frac{3^2}{4^2} = \frac{9}{16}$

e) $\frac{\sqrt{9}}{\sqrt{25}} = \frac{\sqrt{9}}{5} = \frac{3}{5}$

Scientific notation

When writing numbers in scientific notation, learners have to understand the relationship between the number of decimal places and the index of 10

Examples:

a) $25 = 2,5 \times 10^1$

b) $250 = 2,5 \times 10^2$

c) $2\,500 = 2,5 \times 10^3$

Scientific notation limited to positive exponents, includes writing very large numbers in scientific notation.

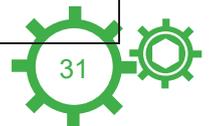
Example:

$25 \text{ million} = 2,5 \times 10^7$

Learners practice writing large numbers in scientific notation, they will realize they have encountered these in Natural Science. It is useful to refer to these contexts when talking about scientific notation.

In Grade 9 learners

- Consolidate number knowledge and calculation techniques for exponents, developed in Grade 8.
- Do additional laws of exponents involving integer exponents



- Do scientific notation for numbers, including negative exponents

Laws of exponents involving integer exponents

$$a^{-m} = \frac{1}{a^m}$$

Examples:

$$5^{-3} = \frac{1}{5^3} = \frac{1}{125}$$

a) $7^3 \div 7^5 = 7^{3-5} = 7^{-2} = \frac{1}{7^2} = \frac{1}{49}$

b)

Look out for the following **common misconceptions** where:

Learners confuse the exponent of the variable and the coefficient, e.g.,

$$2x^{-3} = \frac{1}{2x^3} \text{ instead of } 2\frac{1}{x^3}$$

Calculations and simple equations using numbers in exponential form

The calculations and equations should provide opportunities to apply the laws of exponents and should not be unduly complex.

Examples

a) Calculate: $2^{-1} \times 6^3 \times 3^{-2}$

b) Simplify: $(-2x^2)(-2x)^{-2}$

c) Solve x: $3^x = 9$

d) Solve x: (i) $2^x = \frac{1}{4}$

	<p>(ii) $5^{x+1} = 1$</p> <p>Scientific notation</p> <ul style="list-style-type: none"> When writing numbers in scientific notation, learners have to understand the relationship between the number of decimal places and the index of 10. Example: $25 = 2.5 \times 10^1$ and $250 = 2.5 \times 10^2$ Scientific notation that extends to negative exponents includes writing very small numbers in scientific notation Example: <i>25millionth</i> $= 2.5 \times 10^{-5}$ <p>Learners practice writing small and large numbers in scientific notation, which they might already have encountered in Natural Science. It is useful to refer to these contexts when discussing scientific notation.</p> <p>Calculations can be done with or without a calculator.</p> <p>Examples</p> <ol style="list-style-type: none"> Calculate: $2.6 \times 10^5 \times 9 \times 10^7$ without using a calculator and give answer in scientific notation. Write in scientific notation: 0,00053 Calculate: $5.8 \times 10^{-4} + 2.3 \times 10^{-5}$ without using a calculator. 						
LTSM							
Resources	Charts.						
Workbook reference	<table border="1"> <thead> <tr> <th data-bbox="1209 1294 1273 1841">Grade 7</th> <th data-bbox="1209 698 1273 1294">Grade 8</th> <th data-bbox="1209 94 1273 698">Grade 8</th> </tr> </thead> <tbody> <tr> <td data-bbox="1273 1294 1396 1841">Grade 7 WB 1 Activities (14; 15; 16; 17; 18;19)</td> <td data-bbox="1273 698 1396 1294">Grade 8 WB 1 Activities (R3a&b; 14 – 24; 26)</td> <td data-bbox="1273 94 1396 698">Grade 9 WB 1 Activities (R3a&b; 22-26a&b)</td> </tr> </tbody> </table>	Grade 7	Grade 8	Grade 8	Grade 7 WB 1 Activities (14; 15; 16; 17; 18;19)	Grade 8 WB 1 Activities (R3a&b; 14 – 24; 26)	Grade 9 WB 1 Activities (R3a&b; 22-26a&b)
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Textbook reference			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – test 15 marks max			

**MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 4**

TERM 1

Date : from to		Time: 6 hours	
Grade	7	8	9
Topic	NUMERIC AND GEOMETRIC PATTERNS		
CAPS pages	58 – 61; 68	85 – 88	126 - 129
Skills and Knowledge	<p>Investigate and extend patterns</p> <ul style="list-style-type: none"> • Investigate and extend numeric and geometric patterns looking for relationships between numbers, including patterns: <ul style="list-style-type: none"> ○ represented in physical or diagram form ○ not limited to sequences involving a constant difference or ratio ○ of learner's own creation ○ represented in tables • Describe and justify the general rules for observed relationships between numbers in own words 	<p>Investigate and extend patterns</p> <ul style="list-style-type: none"> • Investigate and extend numeric and geometric patterns looking for relationships between numbers, including patterns: <ul style="list-style-type: none"> ○ represented in physical or diagram form ○ not limited to sequences involving a constant difference or ratio ○ of learner's own creation ○ represented in tables ○ represented algebraically • Describe and justify the general rules for observed relationships between numbers in own words or in algebraic language 	<p>Investigate and extend patterns</p> <ul style="list-style-type: none"> • Investigate and extend numeric and geometric patterns looking for relationships between numbers including patterns: <ul style="list-style-type: none"> ○ represented in physical or diagram form ○ not limited to sequences involving a constant difference or ratio ○ of learner's own creation ○ represented in tables ○ represented algebraically • Describe and justify the general rules for observed relationships between numbers in own words or in algebraic language
Suggested methodology	<p>In the Senior Phase the emphasis is less on merely extending a pattern, and more on describing a general rule for the pattern or sequence and being able to predict unknown terms in a sequence using a general rule. Investigating number patterns is an opportunity to generalize – to give general algebraic descriptions of the relationship between terms and its position in a sequence and to justify solutions. The range of number patterns are extended to include patterns integers, square numbers and cubic numbers</p> <p>As learners become used to describing patterns in their own words, their descriptions should become more precise and efficient with the use of algebraic language to describe general rules of patterns. It is useful also to introduce the language of 'term in a sequence' in order to distinguish the term from the position of a term in a sequence</p>		

Kinds of numeric patterns

Provide a sequence of numbers; learners have to identify a pattern or **relationship between consecutive terms** in order to extend the pattern.

Examples

Give a rule to describe the relationship between the numbers in the sequences below. Use this rule to give the next three numbers in the sequence:

- a) 3 ; 7 ; 11 ; 15 ; ... ; ...
- b) 120 ; 115 ; 110 ; 105 ; ... ; ...
- c) 2 ; 4 ; 8 ; 16 ; ... ; ...
- d) 1 ; 2 ; 4 ; 7 ; 11 ; 16 ; ... ; ...

Here learners could identify the constant difference between consecutive terms in order to extend the pattern. These patterns can be described in learners' own words as

- a) 'adding 4' or 'counting in 4s' or 'add 4 to the previous number in the pattern'
- b) 'subtracting 5' or 'counting down in 5s', or 'subtract 5 from the previous number in the pattern'.
- c) Here learners could identify the constant ratio between consecutive terms. This pattern can be described in learners' own words as 'multiply the previous number by 2'.
- d) This pattern has neither a constant difference nor constant ratio. This pattern can be described in learners' own words as 'increase the difference between consecutive terms by 1 each time' or 'add 1 more than was added to get the previous term'. Using this rule, the next 3 terms will be 22 , 29 , 37.

Provide a sequence of numbers; learners have to identify a pattern or **relationship between the term and its position in the sequence**. This enables learners to predict a term in a sequence based on the position of that term in the sequence. It is useful for learners to represent these sequences in tables so that they can consider the position of the term.

Examples:

- a) Provide a rule to describe the relationship between the numbers in this sequence: 1; 4; 9; 16;... ... Use the rule to find the 10th term in this sequence.
 Firstly, learners have to understand that the '10th term' refers to position 10 in the number sequence. They have to find a rule in order to determine the 10th term, rather than continuing the sequence to the tenth term. This sequence can be represented in the following table:

Position in sequence	1	2	3	4	10
Term	2	5	10	17	?

Learners should recognize that each term in the bottom row is obtained by squaring the position number in the top row. Thus the 10th term will be '10 squared' or 10^2 which is 100. Using the same rule, learners can also be asked what term number or position will 625 be? If the term is obtained by squaring the position number of the term, then the position number can be obtained by finding the square root of the term. Hence, 625 will be the 25th term in the sequence since $\sqrt{625} = 25$.

b) Provide a rule to describe the relationship between the numbers in this sequence: 4 ; 7 ; 10 ; 13 ; Use the rule to find the 20th term in the sequence.

If learners consider only the relationship between consecutive terms, then they can continue the pattern ('add 3 to previous number') to the 20th term to find the answer. However, if they look for a relationship or rule between the term and the position of the term, they can predict the answer without continuing the pattern. Using number sentences can be useful to find the rule:

$$1\text{st term: } 4 = 3(1) + 1$$

$$2\text{nd term: } 7 = 3(2) + 1$$

$$3\text{rd term: } 10 = 3(3) + 1$$

$$4\text{th term: } 13 = 3(4) + 1$$

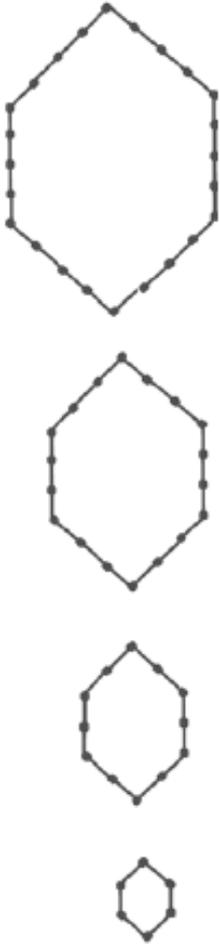
The number in the brackets corresponds to the position of the term. Hence, the 20th term will be: $3(20) + 1 = 61$ The rule in learners' own words can be written as '3 x the position of the term + 1'. These types of numeric patterns develop an understanding of functional relationships, in which you have a dependent variable (position of the term) and independent variable (the term itself), and where you have a unique output for any given input value.

Kinds of geometric patterns

- Geometric patterns are number patterns represented diagrammatically. The diagrammatic representation reveals the structure of the number pattern.
- Hence, representing the number patterns in tables, makes it easier for learners to describe the general rule for the pattern.

Example

Consider this pattern for building hexagons with matchsticks. How many matchsticks will be used to build the 10th hexagon?



The rule for the pattern is contained in the structure (construction) of the successive hexagonal shapes:

- (1) add 1 on matchstick per side
- (2) there are 6 sides, so
- (3) add on 6 matchsticks per hexagon as you proceed from a given hexagon to the next one.

For the 2nd hexagon, you have 2 x 6 matches; for the 3rd hexagon you have 3 x 6 matches. Using this pattern for building hexagons, the 10th hexagon will have 10 x 6 matches. Learners can also use a table to record the number of matches used for each hexagon. This way they can look at the number pattern related to the number of matches used for each new hexagon.

Position of hexagon in pattern	1	2	3	4	5	6	10
Number of matches	6	12	18				

Describing patterns

It does not matter if learners are already familiar with a particular pattern. Their descriptions of the same pattern can be different when they encounter it at different stages of their mathematical development.

Example

The rule for the sequence: 4 ; 7 ; 10 ; 13 can be described in the following ways:

- a) add three to the previous term
- b) 3 times the position of the term + 1 or 3 x the position of the term + 1
- c) $3(n) + 1$, where n is the position of the term
- d) $3(n) + 1$, where n is a Natural number.

In Grade 8:

- The range of number patterns are extended to include patterns with multiplication and division with integers, numbers in exponential form
- As learners become used to describing patterns in their own words, their descriptions should become more precise and efficient with the use of algebraic language to describe general rules of patterns

- It is useful also to introduce the language of 'term in a sequence' in order to distinguish the term from the position of a term in a sequence
- Investigating number patterns is an opportunity to generalize – to give general algebraic descriptions of the relationship between terms and their position in a sequence and to justify solutions.

Kinds of numeric patterns

Given a sequence of numbers, learners have to identify a **pattern** or **relationship between consecutive terms** in order to extend the pattern.

Examples

Provide a rule to describe the relationship between the numbers in the sequences below. Use this rule to provide the next three numbers in the sequence:

a) $-3 ; -7 ; -11 ; -15 ; \dots ; \dots$

Here learners should identify the constant difference between consecutive terms in order to extend the pattern. This pattern can be described in learners' own words as 'adding -4 ' or 'counting in -4 ' or 'add -4 to the previous number in the pattern'.

b) $2 ; -4 ; 8 ; -16 ; 32 ; \dots ; \dots$

Here learners should identify the constant ratio between consecutive terms. This pattern can be described in learners' own words as 'multiply the previous number by -2 '.

c) $1 ; 2 ; 4 ; 7 ; 11 ; 16 ; \dots ; \dots$

This pattern has neither a constant difference nor constant ratio. This pattern can be described in learners' own words as 'increase the difference between consecutive terms by 1 each time' or 'add 1 more than was added to get the previous term'. Using this rule, the next 3 terms will be 22 ; 29 ; 37.

Given a sequence of numbers, learners have to identify a **pattern** or **relationship between the term and its position in the sequence**. This enables learners to predict a term in a sequence based on the position of that term in the sequence. It is useful for learners to represent these sequences in tables so that they can consider the position of the term.

In Grade 9:

- Learners consolidate work involving numeric and geometric patterns done in Grade 8.
- Investigating number patterns is an opportunity to generalize – to give general algebraic descriptions of the relationship between terms and their position in a sequence and to justify solutions.

Kinds of numeric patterns

Given a sequence of numbers, learners have to identify a pattern or **relationship between consecutive terms** in order to extend the pattern.

Examples

Provide a rule to describe the relationship between the numbers in the sequences below. Use this rule to give the next three numbers in the sequence:

a) $-1; -1,5; -2; -2,5 \dots$

Here learners should identify the constant difference between consecutive terms in order to extend the pattern. This pattern can be described in learners' own words as 'adding $-0,5$ ' or 'counting in $-0,5$ ' or 'add $-0,5$ to the previous number in the pattern'.

b) $2; -1; 0,5; -0,25; 0,125 \dots$

Here learners should identify the constant ratio between consecutive terms. This pattern can be described in learners' own words as 'multiply the previous number by $-0,5$ '.

c) $1; 0; -2; -5; -9; -14 \dots$

This pattern has neither a constant difference nor constant ratio. This pattern can be described in learners' own words as 'subtract 1 more than was subtracted to get the previous term'. Using this rule, the next 3 terms will be $-20, -27, -35$

Given a sequence of numbers, learners have to identify a pattern or **relationship between the term and its position in the sequence**. This enables learners to predict a term in a sequence based on the position of that term in the sequence. It is useful for learners to represent these sequences in tables so that they can consider the position of the term.

Examples

a) Refer to examples given above.

b) Provide a rule to describe the relationship between the numbers in this sequence: $-2; -5; -8; -11; \dots$. Use this rule to find the 20th term in this sequence.

If learners consider only the relationship between consecutive terms, then they can continue the pattern ('add -3 to previous number') up to the 20th term to find the answer. However, if they look for a relationship or rule between the term and the position of the term, they can predict the answer without continuing the pattern. Using number sentences can be useful to find the rule:

1st term: $-2 = -3(1) + 1$

2nd term: $-5 = -3(2) + 1$

3rd term: $-8 = -3(3) + 1$

4th term: $-11 = -3(4) + 1$

The number in the brackets corresponds to the position of the term. Hence, the 20th term will be: $-3(20) + 1 = -59$. The rule in learners'

own words can be written as $-3n + 1$ or $-3n + 1$, where n is the position of the term. These types of numeric patterns develop an understanding of functional relationships, in which there is a dependent variable (position of the term) and an independent variable (the term itself), and where you have a unique output for any given input value.

Kinds of geometric patterns

Geometric patterns are number patterns represented diagrammatically. The diagrammatic representation reveals the structure of the number pattern. • Hence, representing the number patterns in tables makes it easier for learners to describe the general rule for the pattern.

Example

Consider this pattern for building hexagons using matchsticks. How many matchsticks will be used to build the 10th hexagon?



Provide an expression to describe the general term for this number sequence. The rule for the pattern is contained in the structure (construction) of the successive hexagonal shapes:

- (1) add on 1 matchstick per side
- (2) there are 6 sides, so
- (3) add on 6 matchsticks per hexagon as you proceed from a given hexagon to the next one.

So, for the 2nd hexagon, you have 2 x 6 matches; for the 3rd hexagon you have 3 x 6 matches. Using this pattern for building hexagons, the 10th hexagon will have 10 x 6 matches. Learners can also use a table to record the number of matches used for each hexagon. This way the number pattern is related to the number of matches used for each new hexagon.

Position of hexagon in pattern	1	2	3	4	5	6	10
Number of matches	6	12	18				

The n th term for this sequence can be written as $6n$ or $6 + (n - 1)6$

LTSM			
Resources	Charts with pictures or patterns and numbers, toothpicks, match sticks, pattern blocks.		
	Grade 7	Grade 8	Grade 9
Workbook reference	WB 1 Activities (R9a&b) WB 2 Activities (65 -71; 114 – 117; 141)	WB 1 Activities (27)	WB 1 Activities (27; 28)
TEXTBOOK REFERENCE			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – test 15 marks max			

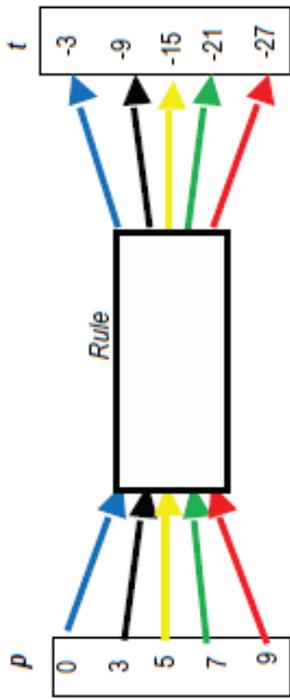
MATHEMATICS SENIOR PHASE

MULTI GRADE LESSON PLAN 5

TERM 1

Date : from to		Time: 4 hours	
Grade	7	8	9
Topic	FUNCTIONS AND RELATIONSHIPS		
CAPS pages	62	88 - 89	129
Skills and Knowledge	<p>Input and output values Determine input values, output values or rules for patterns and relationships using:</p> <ul style="list-style-type: none"> • flow diagrams • tables • formulae <p>Equivalent forms Determine, interpret and justify equivalence of different descriptions of the same relationship or rule presented:</p> <ul style="list-style-type: none"> • verbally • in flow diagrams • in tables • by formulae • by number sentences 	<p>Input and output values Determine input values, output values or rules for patterns and relationships using:</p> <ul style="list-style-type: none"> • flow diagrams • tables • formulae • equations <p>Equivalent forms Determine, interpret and justify equivalence of different descriptions of the same relationship or rule presented:</p> <ul style="list-style-type: none"> • verbally • in flow diagrams • in tables • by formulae • by equations • by graphs on a Cartesian plane 	<p>Input and output values Determine input values, output values or rules for patterns and relationships using:</p> <ul style="list-style-type: none"> • flow diagrams • tables • formulae • equations <p>Equivalent forms Determine, interpret and justify equivalence of different descriptions of the same relationship or rule presented:</p> <ul style="list-style-type: none"> • verbally • in flow diagrams • in tables • by formulae • by equations • by graphs on a Cartesian plane
Suggested methodology	<p>In this phase, it is useful to begin to specify whether the input values are natural numbers, or integers or rational numbers. This builds learners' awareness of the domain of input values. Hence, to find output values, learners should be given the rule/formula as well as the domain of the input values.</p> <p>In Grade 7, the focus is on finding output values for given formulae and input values. Note, when learners find input or output values for given rules or formulae, they are actually finding the numerical value of algebraic expressions using substitution.</p>		

	<p>Examples Use the formula for the area of a rectangle: $A = l \times b$ to calculate the following:</p> <ol style="list-style-type: none"> The area, if the length is 4 cm and the width is 2 cm The length, if the area is 20 cm² and the width is 4 cm The width, if the area is 24 cm² and the length is 8 cm <p>Learners can write these as number sentences, and solve by inspection.</p> <p>In Grade 8:</p> <ul style="list-style-type: none"> The focus is on finding input or output values using given equations The rules and number patterns for which learners have to find input and output values are extended to include patterns with multiplication and division of integers and numbers in exponential form. <p>Flow diagrams are representations of functional relationships. Hence, when using flow diagrams, the correspondence between input and output values should be clear in its representational form i.e. the first input produces the first output; the second input produces the second output, etc.</p> <p>Examples</p> <ol style="list-style-type: none"> Use the given rule to calculate the values of t for each value of p, where p is a natural number. In this kind of flow diagram, learners can also be asked to determine the value of p for a given t value.  <ol style="list-style-type: none"> Determine the rule for calculating the output value for every given input value in the flow diagram below.
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In flow diagrams such as these, more than one rule might be possible to describe the relationship between input and output values. The rules are acceptable if they match the given input values to the corresponding output values.

- c) If the rule for finding y in the table below is $y = -3x - 1$, calculate y for the given x values:

x	0	1	2	5	10	50	100
y							

- d) Describe the relationship between the numbers in the top row and bottom row in the table. Then write down the value of m and n

x	-2	-1	0	1	2	12	n
y	-5	-4	-3	-2	-1	m	34

In tables such as these, more than one rule might be possible to describe the relationship between x and y values. The rules are acceptable if they match the given input values to the corresponding output values. For example, the rule $y = x - 3$ describes the relationship between the x values and given y values. To find m and n , learners have to substitute the corresponding values for x or y in the rule and solve the equation by inspection.

In **Grade 9**, learners consolidate work with input and output values done in Grade 8. They should continue to find input or output values in flow diagrams, tables, formulae and equations. Learners should begin to recognize equivalent representations of the same relationships shown as an equation, a set of ordered pairs in a table or on a graph.

Examples

a). If the rule for finding in the table below is $y = \frac{1}{2}x + 1$, determine the values of y for the given x values:

x	0	1	2	4	10	50	100
y							

b). Describe the relationship between the numbers in the top row and those in the bottom row in the table. Then write down the value of m and n

x	-2	-1	0	1	2	12	n
y	-7	-5	-3	-1	1	m	27

In tables such as these, more than one rule might be possible to describe the relationship between x and y values. The rules are acceptable if they match the given input values to the corresponding output values. For example, the rule $y = 2x - 3$ describes the relationship between the given values for x and y . To find m and n , learners have to substitute the corresponding values for x or y into the rule and solve the equation by inspection.

LTSM							
Resources	Charts, square papers.						
Workbook reference	<table border="1"> <tr> <td>Grade 7</td> <td>Grade 8</td> <td>Grade 9</td> </tr> <tr> <td>WB 2 Activities (65 - 70)</td> <td>WB 1 Activity (R7; 28)</td> <td>WB 1 Activities (R7)</td> </tr> </table>	Grade 7	Grade 8	Grade 9	WB 2 Activities (65 - 70)	WB 1 Activity (R7; 28)	WB 1 Activities (R7)
Grade 7	Grade 8	Grade 9					
WB 2 Activities (65 - 70)	WB 1 Activity (R7; 28)	WB 1 Activities (R7)					
Textbook reference							
HOMEWORK							
ASSESSMENT							

E.g. Informal assessment – test 15 marks max	
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MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 6

TERM 1

Date : from to	Time: 4 hours		9
Grade	8	GRAPHS	
Topic	114		
CAPS pages	65	145	
Skills and Knowledge	<p>Interpreting graphs Analyse and interpret global graphs of problem situations, with special focus on the following trends and features:</p> <ul style="list-style-type: none"> • linear or non-linear • constant, increasing or decreasing 	<p>Interpreting graphs Revise the following done in Grade 7:</p> <ul style="list-style-type: none"> • Analyse and interpret global graphs of problem situations, with a special focus on the following trends and features: <ul style="list-style-type: none"> ◆◆ linear or non-linear ◆◆ constant, increasing or decreasing • Extend the focus on features of graphs to include: <ul style="list-style-type: none"> ◆◆ maximum or minimum ◆◆ discrete or continuous <p>Drawing graphs</p> <ul style="list-style-type: none"> • Draw global graphs from given descriptions of a problem situation, identifying features listed above • Use tables of ordered pairs to plot points and draw graphs on the Cartesian plane 	<p>Interpreting graphs Revise the following done in Grade 8:</p> <ul style="list-style-type: none"> • Analyse and interpret global graphs of problem situations, with a special focus on the following trends and features: <ul style="list-style-type: none"> ◆◆ linear or non-linear ◆◆ constant, increasing or decreasing ◆◆ maximum or minimum ◆◆ discrete or continuous • Extend the above with special focus on the following features of linear graphs: <ul style="list-style-type: none"> ◆◆ x-intercept and y-intercept ◆◆ gradient <p>Drawing graphs</p> <p>Revise the following done in Grade 8:</p> <ul style="list-style-type: none"> • draw global graphs from given descriptions of a problem situation, identifying features listed above. • use tables of ordered pairs to plot points and draw graphs on the Cartesian plane • Extend the above with a special focus on: <ul style="list-style-type: none"> ◆◆ drawing linear graphs from given equations ◆◆ determine equations from given linear graphs

Suggested methodology

In the Intermediate Phase learners encountered graphs in the form of data bar graphs and pie charts. This means they do have some experience reading and interpreting graphs. However, in the Senior Phase, they are introduced to line graphs that show functional relationships described in terms of dependent and independent variables.

In **Grade 7**, the focus is on drawing, analysing and interpreting global graphs only. That is, learners do not have to plot points to draw graphs and they focus on the features of the global relationship shown in the graph.

Examples of contexts for global graphs include:

- the relationship between time and distance travelled
- the relationship between temperature and time over which it is measured
- the relationship between rainfall and time over which it is measured, etc.

In **Grade 8**:

- New features of global graphs, namely, maximum and minimum; discrete and continuous, are introduced
- Learners plot points to draw graphs

See Grade 7 above for examples of contexts for global graphs.

Examples of drawing graphs by plotting points

a) Complete the table of ordered pairs below for the equation $y = x + 3$

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

Now, plot the above co-ordinate points on the Cartesian plane. Join points to form a graph.

b) Complete the table of ordered pairs below for the equation $y = x^2 + 3$

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

Now, plot the above co-ordinate points on the Cartesian plane. Join points to form a graph.

In **Grade 9**,

- x-intercept, y-intercept and gradient of linear graphs are introduced
 - Learners draw linear graphs from given equations
 - They determine equations of linear graphs
- Learners should continue to analyse and interpret graphs of problem situations.

Investigating linear graphs

- To sketch linear graphs from given equations, learners should first draw up a table of ordered pairs, that includes the intercept points (x; 0) and (0; y), and then plotting the points.
- Learners should investigate gradients by comparing $\frac{\text{vertical change}}{\text{horizontal change}}$ between any two points on a straight line graph.
- Learners should also investigate the relationship between the value of the gradient and the coefficient of x in the equation of a straight line graph.
- Learners should compare y-intercepts of linear graphs to the value of the constant in the equation of the straight line graph.

Examples of linear graphs

- Sketch and compare the graphs of: $y = 4$ and $x = 4$
- Sketch and compare the graphs of: $y = x$ and $y = -x$
- Sketch and compare the graphs of: $y = 2x$; $y = 2x + 1$; $y = 2x - 1$
- Sketch and compare the graphs of: $y = 3x$; $y = 4x$; $y = 5x$
- Sketch the graphs of: $y = -3x + 2$; using the table method
- Determine the equation of the straight line passing through the following points:

x	-4	-3	-2	-1	0	1	2	3	4
y	-1	0	1	2	3	4	5	6	7

LTSM

Resources

Graph paper, charts, rulers, colour pens.

Grade 7

Workbook reference

WB 2 Activities (80 - 85)

Grade 8

WB 1 Activities (R9)
Grade 9 WB Activities (R9)

Grade 9

WB 1 Activities (R9)
Grade 9 WB Activities (R9)

Textbook reference			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – test 15 marks max			

LESSON PLANS: TERM 2



MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 1

TERM 2

Date: from to		Time: 5 hours	
Grade	7	8	9
Topic	CONSTRUCTION OF GEOMETRIC FIGURES		
CAPS pages	45	95	134
Skills and Knowledge	<p>Measuring angles Accurately use a protractor to measure and classify angles:</p> <ul style="list-style-type: none"> • $< 90^\circ$ (acute angles) • Right-angles • $> 90^\circ$ (obtuse angles) • Straight angles • $> 180^\circ$ (reflex angles) <p>Constructions Accurately construct geometric figures appropriately using compass, ruler and protractor, including:</p> <ul style="list-style-type: none"> • angles, to one degree of accuracy • circles • parallel lines • perpendicular lines 	<p>Constructions Accurately construct geometric figures appropriately using a compass, ruler and protractor, including:</p> <ul style="list-style-type: none"> • Bisecting lines and angles • Perpendicular lines at a given point or from a given point • Triangles • Quadrilaterals • Angles of 30°, 45° and 60° and their multiples without using a protractor <p>Investigating properties of geometric figures By construction, investigate the angles in a triangle, focusing on:</p> <ul style="list-style-type: none"> • the sum of the interior angles of triangles • the size of angles in an equilateral triangle • the sides and base angles of an 	<p>Constructions</p> <ul style="list-style-type: none"> • Accurately construct geometric figures appropriately using a compass, ruler and protractor, including bisecting angles of a triangle • Construct angles of 45°, 30°, 60° and their multiples without using a protractor <p>Investigating properties of geometric figures</p> <ul style="list-style-type: none"> • By construction, investigate the angles in a triangle, focusing on the relationship between the exterior angle of a triangle and its interior angles • By construction, explore the minimum

Suggested methodology		<p>isosceles triangle</p> <p>By construction, investigate sides and angles in quadrilaterals, focusing on:</p> <ul style="list-style-type: none"> the sum of the interior angles of quadrilaterals the sides and opposite angles of parallelograms 	<p>conditions for two triangles to be congruent</p> <ul style="list-style-type: none"> By construction, investigate sides, angles and diagonals in quadrilaterals, focusing on the diagonals of rectangles, squares, parallelograms, rhombi and kites By construction explore the sum of the interior angles of polygons
<p>In Grade 7, learners</p> <ul style="list-style-type: none"> Measure angles with a protractor Do geometric constructions using a compass, ruler and protractor <p>Measuring angles</p> <ul style="list-style-type: none"> Learners have to be shown how to place the protractor on the arm of the angle to be measured. Learners also have to learn how to read the size of angles on a protractor. <p>Constructions</p> <ul style="list-style-type: none"> Constructions provide a useful context to explore or consolidate knowledge of angles and shapes. Learners have to be shown how to use a compass to draw circles, although they might have done this in Grade 6. Learners should be aware that the centre of the circle is at the fixed point of the compass and the radius of the circle is dependent on how wide the compass is opened up. Make sure learners understand that arcs are parts of the circles of a particular radius. Initially, learners have to be given careful instructions about how to do the constructions of the various shapes Once they are comfortable with the apparatus and can do the constructions, they can practise by drawing patterns, for example of circles or parallel lines. <p>In Grade 8, all the constructions are new. In Grade 7, learners only constructed angles, perpendicular and parallel lines. Grade 8 learners also use constructions to explore properties of triangles and quadrilaterals</p> <p>Constructions</p> <ul style="list-style-type: none"> Constructions provide a useful context to explore or consolidate knowledge of angles and shapes Make sure learners are competent and comfortable with the use of a compass and know how to measure and read angle 			

	<p>sizes on a protractor</p> <ul style="list-style-type: none"> • Revise the constructions of angles if necessary before proceeding with the new constructions • Start with the constructions of lines, so that learners can first explore angle relationships on straight lines. • When constructing triangles learners should draw on known properties and construction of circles. • Construction of special angles without protractors are done by: <ul style="list-style-type: none"> ○ bisecting a right angle to get 45° ○ drawing an equilateral triangle to get 60° ○ bisecting the angles of an equilateral triangle to get 30° <p>In Grade 9, learners:</p> <ul style="list-style-type: none"> • Bisect angles in a triangle • Construct 30° without a protractor • Investigation of new properties of triangles, quadrilaterals and polygons <p>Constructions Same as for Grade 8.</p>						
LTSM							
Resources	Mathematical Instruments set.						
Workbook reference	<table border="1"> <thead> <tr> <th data-bbox="903 1832 978 2121">Grade 7</th> <th data-bbox="903 1290 978 1832">Grade 8</th> <th data-bbox="903 96 978 1290">Grade 9</th> </tr> </thead> <tbody> <tr> <td data-bbox="903 1832 978 1290">WB 1 Activities (20 - 25)</td> <td data-bbox="903 1290 978 96">WB 1 Activities (45 - 51)</td> <td data-bbox="903 96 978 1290">WB 1 Activities (39 - 47)</td> </tr> </tbody> </table>	Grade 7	Grade 8	Grade 9	WB 1 Activities (20 - 25)	WB 1 Activities (45 - 51)	WB 1 Activities (39 - 47)
Grade 7	Grade 8	Grade 9					
WB 1 Activities (20 - 25)	WB 1 Activities (45 - 51)	WB 1 Activities (39 - 47)					
Textbook reference							
HOMEWORK							
ASSESSMENT E.g. Informal assessment – Test: marks max							

MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 2

TERM 2

Date : from to		Time: 10 hours	
Grade	7	8	9
Topic	GEOMETRY OF 2D SHAPES		
CAPS pages	46 - 47	96 - 98	135 - 136
Skills and Knowledge	<p>Classifying 2D shapes Describe, sort, name and compare triangles according to their sides and angles, focusing on:</p> <ul style="list-style-type: none"> • equilateral triangles • isosceles triangles • right-angled triangles <p>Describe, sort, name and compare quadrilaterals in terms of:</p> <ul style="list-style-type: none"> • length of sides • parallel and perpendicular sides • size of angles (right-angles or not) <p>Describe and name parts of a circle</p> <p>Similar and congruent 2D shapes Recognize and describe similar and congruent figures by comparing:</p> <ul style="list-style-type: none"> • shape • size <p>Solving problems Solve simple geometric problems involving unknown sides and angles in triangles and</p>	<p>Classifying 2D shapes Identify and write clear definitions of triangles in terms of their sides and angles, distinguishing between:</p> <ul style="list-style-type: none"> • equilateral triangles • isosceles triangles • right-angled triangles <p>Identify and write clear definitions of quadrilaterals in terms of their sides and angles, distinguishing between:</p> <ul style="list-style-type: none"> • Parallelogram • Rectangle • Square • Rhombus • Trapezium • Kite <p>Similar and congruent 2-D shapes</p> <ul style="list-style-type: none"> • Identify and describe the properties of congruent shapes • Identify and describe the properties of similar shapes <p>Solving problems Solve geometric problems involving</p>	<p>Classifying 2D shapes Revise properties and definitions of triangles in terms of their sides and angles, distinguishing between:</p> <ul style="list-style-type: none"> • equilateral triangles • isosceles triangles • right-angled triangles <p>Revise and write clear definitions of quadrilaterals in terms of their sides, angles and diagonals, distinguishing between:</p> <ul style="list-style-type: none"> • Parallelogram • Rectangle • Square • Rhombus • Trapezium • Kite <p>Similar and congruent triangles</p> <ul style="list-style-type: none"> • Through investigation, establish the minimum conditions for congruent triangles • Through investigation, establish the minimum conditions for similar triangles <p>Solving problems Solve geometric problems involving</p>

	quadrilaterals, using known properties.	unknown sides and angles in triangles and quadrilaterals, using known properties and definitions.	unknown sides and angles in triangles and quadrilaterals, using known properties of triangles and quadrilaterals, as well as properties of congruent and similar triangles
Suggested methodology	<p>In Grade 7, learners are:</p> <ul style="list-style-type: none"> • Distinguishing and naming triangles in terms of their sides and angles • Distinguishing quadrilaterals in terms of parallel and perpendicular sides • Distinguishing similar and congruent figures • Using known properties of shapes to solve geometric problems <p>Triangles Learners should be able to distinguish between an equilateral triangle (all the sides are equal), an isosceles triangle (at least two equal sides) and a right-angled triangle (one right-angle).</p> <p>Quadrilaterals Learners should be able to sort and group quadrilaterals in the following ways:</p> <ul style="list-style-type: none"> • all sides equal (square and rhombus) • opposite sides equal (rectangle, parallelogram, square, rhombus) • at least one pair of adjacent sides equal (square, rhombus, kite) • all four angles right angles (square, rectangle) • perpendicular sides (square, rectangle) • two pairs of opposite sides parallel (rectangle, square, parallelogram) • only one pair of opposite sides parallel (trapezium) <p>Circles Parts of a circle learners should know:</p> <ul style="list-style-type: none"> • radius • circumference • diameter • chord • segments 		

- sectors

Similarity and congruency

Similarity and congruency can be explored with any 2D figures.

- Learners should recognize that two or more figures are congruent if they are equal in all respects i.e. angles and sides are equal.
- Learners should recognize that two or more figures are similar if they have the same shape, but differ in size i.e. angles are the same, but sides are proportionally longer or shorter. Similar figures are further explored when doing enlargements and reductions. Refer to “Clarification Notes” under 3.4 Transformation Geometry.

Solving problems

At this stage learners can solve simple geometric problems to find unknown sides in equilateral and isosceles triangles, and unknown sides and angles in quadrilaterals. Learners should give reasons for their solutions.

Examples

- If $\triangle ABC$ is an equilateral triangle, and side AB is 3 cm , what is the length of BC ? Here learners should answer: $BC = 3\text{ cm}$, because the sides of an equilateral triangle are equal.
- If $ABCD$ is a kite, and $AB = 2,5\text{ cm}$ and $BC = 4,5\text{ cm}$, what is the length of AD and DC ? Learners should use the property for kites, that adjacent pairs of sides are equal, to find the unknown sides.

In Grade 8:

- New properties in terms of angles of triangles
- Learners write clear definitions of the properties of triangles and quadrilaterals
- They use definitions to solve geometric problems
- They investigate conditions for 2D shapes to be congruent or similar

Triangles

Constructions serve as a useful context for exploring properties of triangles (See notes on Constructions). Properties of triangles learners should know include:

- the sum of the interior angles of triangles = 180°
- an equilateral triangle has all sides equal and all interior angles = 60°
- an isosceles triangle has at least two equal sides and its base angles are equal
- a right-angled triangle has one angle that is a right-angle
- the side opposite the right-angle in a right-angled triangle, is called the hypotenuse
- in a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides (Theorem of Pythagoras).

Quadrilaterals

Constructions serve as a useful context for exploring properties of triangles (See notes on Constructions). The classification of quadrilaterals should include the recognition that:

- rectangles and rhombi are special kinds of parallelograms
- a square is a special kind of rectangle and rhombus.

Properties of quadrilaterals learners should know include:

- the sum of the interior angles of quadrilaterals = 360°
- the opposite sides of parallelograms are parallel and equal
- the opposite angles of parallelograms are equal
- the opposite angles of a rhombus are equal
- the opposite sides of a rhombus are parallel and equal
- the size of each angle of rectangles and squares is 90°
- a trapezium has one pair of opposite sides parallel
- a kite has two pairs of adjacent sides equal

Similarity and congruency

Refer to “Clarification Notes” under 3.3 Transformation Geometry and notes for Grade 7 above..

Examples:

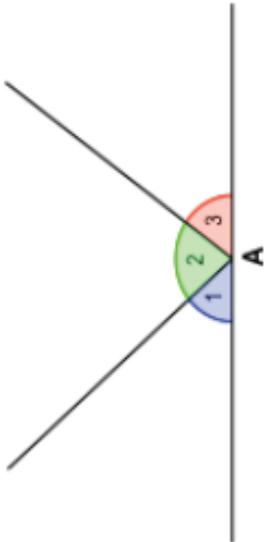
- Comparing squares to other rectangles, learners can ascertain that having corresponding angles equal does not necessarily imply that the sides will be of proportional length. Hence having equal angles alone, is not a sufficient condition for figures to be similar.
- Comparing rhombii with sides proportional, learners can ascertain that having sides proportional does not necessarily imply that the corresponding angles will be equal. So only having sides of proportional length is not a sufficient condition for similarity

Solving problems

- Learners can solve geometric problems to find unknown sides and angles in triangles and quadrilaterals, using known definitions as well as angle relationships on straight lines (see notes on Geometry of Straight lines.)
- For right-angled triangles, learners can also use the Theorem of Pythagoras to find unknown lengths.
- Learners should give reasons and justify their solutions for every written statement.

Note that solving geometric problems is an opportunity to practise solving equations.

Example:



$\hat{A}1$, $\hat{A}2$, $\hat{A}3$ and are three angles on a straight line. $\hat{A}2 = 75^\circ$, $\hat{A}3 = 55^\circ$. What is the size of $\hat{A}1$?

Learners can find $\hat{A}1$ by solving the following equation:

$\hat{A}1 + 75^\circ + 55^\circ = 180^\circ$ (because the sum of angles on a straight line = 180°)

$\hat{A}1 = 180^\circ - 130^\circ$ (add -55° and -75° to both sides of the equation)

$\hat{A}1 = 50^\circ$

In Grade 9, learners revise and write clear descriptions of angle relationships on straight lines. **Angle relationships learners should know include:**

- the sum of the angles on a straight line is 180°
- If lines are perpendicular lines, then adjacent supplementary angles are each equal to 90°
- If lines intersect, then vertically opposite angles are equal.
- if parallel lines are cut by a transversal, then corresponding angles are equal
- if parallel lines cut by a transversal, then alternate angles are equal
- if parallel lines cut by a transversal, then co-interior angles are supplementary

The above angles have to be identified and named by learners.

Solving problems

See notes in the above sections

Congruent triangles

Constructions are a useful context for establishing the minimum conditions for two triangles to be congruent. See notes on Constructions above. Conditions for two triangles to be congruent:

- three corresponding sides are equal (S,S,S)
- two corresponding sides and the included angle are equal (S,A,S)
- two corresponding angles and a corresponding side are equal (A,A,S)
- right-angle, hypotenuse and one other corresponding side are equal (R,H,S)

	<p>Similar triangles Constructions are a useful context for establishing the minimum conditions for two triangles to be similar. See notes on Constructions above.</p> <p>Solving problems See notes and examples above.</p>
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LTSM				
Resources	2D shapes and charts.			
	Grade 7	Grade 8	Grade 9	
Workbook reference	WB 1 Activities (26 - 29)	WB 1 Activities (R11a&b; R13) WB 2 Activities (52 - 60)	WB 1 Activities (48 - 52)	
Textbook reference				
HOMEWORK				
ASSESSMENT E.g. Informal assessment – Test: marks max				

**MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 3**

TERM 2

Date: from to		Time: 9 hours	
Grade	7	8	9
Topic	GEOMETRY OF STRAIGHT LINES		
CAPS pages	46	98	137
Skills and Knowledge	<p>Define:</p> <ul style="list-style-type: none"> • Line segment • Ray • Straight line • Parallel lines • Perpendicular lines 	<p>Angle relationships Recognise and describe pairs of angles formed by:</p> <ul style="list-style-type: none"> • perpendicular lines • intersecting lines • parallel lines cut by a transversal <p>Solving problems Solve geometric problems using the relationships between pairs of angles described above</p>	<p>Angle relationships Revise and write clear descriptions of the relationship between angles formed by:</p> <ul style="list-style-type: none"> • perpendicular lines • intersecting lines • parallel lines cut by a transversal <p>Solving problems Solve geometric problems using the relationships between pairs of angles described above.</p>

Suggested methodology

Grade 7 learners should know that:

- Line segment is a set of points with a definite starting-point and an end-point.
- Ray is a set of points with a definite starting-point and no definite end-point.
- Line is a set of points with no definite starting-point and end-point.
- If two lines on the same plane are a constant distance apart, then the lines are parallel.

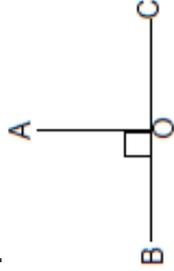
Example:



This is written as $EF \parallel GH$

- If vertical line AO meets or intersects with horizontal line BC at right angle, then AO is perpendicular to BC.

Example:



This is written as $AO \perp BC$

In Grade 7 learners only defined line segment, ray, straight line, parallel lines and perpendicular lines. In Grade 8, **angle relationships learners should know** include:

- the sum of the angles on a straight line is 180°
- If lines are perpendicular, then adjacent supplementary angles are each equal to 90° .
- If lines intersect, then vertically opposite angles are equal.
- if parallel lines are cut by a transversal, then corresponding angles are equal
- if parallel lines cut by a transversal, then alternate angles are equal
- if parallel lines cut by a transversal, then co-interior angles are supplementary

The above angles have to be identified and named by learner

Solving problems

Learners should solve geometric problems to find unknown angles using the angle relationships above, as well as other known properties of triangles and quadrilaterals. Learners should give reasons and justify their solutions for every written statement.

Note that solving geometric problems is an opportunity to practise solving equations.

Example:

\hat{A} , B and \hat{C} are three angles on a straight line. $\hat{A} = 55^\circ$, $B = 75^\circ$. What is the size of \hat{C} ?

Learners can find \hat{C} by solving the following equation:

$$55^\circ + 75^\circ + \hat{C} = 180^\circ \text{ (because the sum of angles on a straight line} = 180^\circ)$$

$$\hat{C} = 180^\circ - 130^\circ \text{ (add } -55^\circ \text{ and } -75^\circ \text{ to both sides of the equation)}$$

$$\hat{C} = 50^\circ$$

Grade 9 learners revise and write clear descriptions of angle relationships on straight lines. **Angle relationships learners should know** are the same as for Grade 8.

Solving problems

See Grade 7 and 8 notes.

Example:

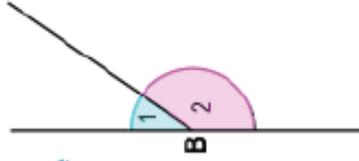
$B1$ and $B2$ are two angles on a straight line. $B1 = 35^\circ$. What is the size of $B2$?

Learners can find $B2$ by solving the following equation:

$$35^\circ + B2 = 180^\circ \text{ (because the sum of angles on a straight line} = 180^\circ)$$

$$B2 = 180^\circ - 35^\circ \text{ (add } -35^\circ \text{ to both sides of the equation)}$$

$$B2 = 145^\circ$$



LTSM

Resources

Protractor, charts, rulers, colour pens.

Grade 7

Grade 8

Grade 9

Workbook reference	WB 1 Activities (24)	WB 1 Activities (61 - 63)	WB 1 Activities (53 - 57)
Textbook reference			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – Test: marks max			

**MATHEMATICS SENIOR PHASE
MULTIGRADE LESSON PLAN 4**

TERM 2

Date : from to		Time: 9 hours	
Grade	7	8	9
Topic	ALGEBRAIC EXPRESSIONS		
CAPS pages	63 & 69	(130 – 131) & (142 – 144)	
Skills and Knowledge	<p>Algebraic language</p> <ul style="list-style-type: none"> • Recognize and interpret rules or relationships represented in symbolic form • Identify variables and constants in given formulae and equations 	<p>Algebraic language</p> <ul style="list-style-type: none"> • Revise the following done in Grade 7: <ul style="list-style-type: none"> ○ recognize and interpret rules or relationships represented in symbolic form ○ identify variables and constants in given formulae and equations • Recognize and identify conventions for writing algebraic expressions • Identify and classify like and unlike terms in algebraic expressions • Recognize and identify coefficients and exponents in algebraic expressions <p>Expand and simplify algebraic expressions</p> <p>Use commutative, associative and distributive laws for rational numbers and laws of exponents to:</p> <ul style="list-style-type: none"> • Add and subtract like terms in algebraic expressions. • Multiply integers and monomials by: <ul style="list-style-type: none"> ◆◆ monomials ◆◆ binomials ◆◆ trinomials • Determine the squares, cubes, square roots and cube roots of single algebraic 	<p>Algebraic language</p> <ul style="list-style-type: none"> • Revise the following done in Grade 8: <ul style="list-style-type: none"> ○ Recognize and identify conventions for writing algebraic expressions ○ Identify and classify like and unlike terms in algebraic expressions ○ Recognize and identify coefficients and exponents in algebraic expressions • Recognize and differentiate between monomials, binomials and trinomials <p>Expand and simplify algebraic expressions</p> <p>Revise the following done in Grade 8, using the commutative, associative and distributive laws for rational numbers and laws of exponents to:</p> <ul style="list-style-type: none"> • add and subtract like terms in algebraic expressions • multiply integers and monomials by: <ul style="list-style-type: none"> ◆◆ monomials ◆◆ binomials ◆◆ trinomials

		<ul style="list-style-type: none"> terms or like algebraic terms Determine the numerical value of algebraic expressions by substitution 	<ul style="list-style-type: none"> divide the following by integers or monomials: <ul style="list-style-type: none"> ◆◆ monomials ◆◆ binomials ◆◆ trinomials Simplify algebraic expressions involving the above operations Determine the squares, cubes, square roots and cube roots of single algebraic terms or like algebraic terms Determine the numerical value of algebraic expressions by substitution Extend the above algebraic manipulations to include: <ul style="list-style-type: none"> ○ multiply integers and monomials by polynomials ○ divide polynomials by integers or monomials ○ the product of two binomials ○ the square of a binomial <p>Factorize algebraic expressions</p> <ul style="list-style-type: none"> Factorize algebraic expressions that involve: <ul style="list-style-type: none"> ○ common factors ○ difference of two squares ○ trinomials of the form: <ul style="list-style-type: none"> ◆◆ $x^2 + bx + c$ ◆◆ $ax^2 + bx + c$, where a is a common factor Simplify algebraic expressions that involve the above factorization processes Simplify algebraic fractions using factorization
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Suggested methodology			
	<p>GRADE 7 This is an introduction to formal algebraic language and is new in the Senior Phase. The use of symbolic language helps to develop an understanding of variables. Learners have opportunities to write and interpret algebraic expressions when they write general rules to describe relationships between numbers in number patterns, and when they find input and output values for given rules in flow diagrams, tables and formulae.</p> <p>Examples</p> <p>a) What does the rule $2 \times n - 1$ mean for the following number sequence: 1; 3; 5; 7; 9; Here learners should recognize that $2 \times n - 1$ represents the general term in this sequence, where n represents the position of the term in the sequence. Thus it is the rule that can be used to find any term in the given sequence</p> <p>b) The relationship between a boy's age (x yrs old) and his mother's age is given as $25 + x$. How can this relationship be used to find the mother's age when the boy is 11 years old? Here learners should recognize that to find the mother's age, they should substitute the boy's given age into the rule $25 + x$. They should also recognize that the given rule means the mother is 25 years older than the boy. See further examples given for functions and relationships.</p> <p>Algebraic expressions should include integers in the rules or relationships represented in symbolic form.</p> <p>GRADE 8 In grade 8 learners will be doing the following:</p> <ul style="list-style-type: none"> • Introduction to conventions of algebraic language. • Manipulating algebraic expressions. <p>Learners have opportunities to write and interpret algebraic expressions when they write general rules to describe relationships between numbers in number patterns, and when they find input or output values for given rules in flow diagrams, tables, formulae and equations.</p> <p>Examples of interpreting algebraic expressions</p> <p>a) What does the rule 2^n mean for the following number sequence: 2; 4; 8; 16; 32.... Here learners should recognize that 2^n represents the general term in this sequence, where n represents the position of the term in the sequence. Thus, it is the rule that can be used to find any term in the given sequence.</p> <p>b) The relationship between a boy's age (x yrs old) and his mother's age is given as $25 + x$. How can this relationship be used to find the mother's age when the boy is 11 years old? Here learners should recognize that to find the mother's age, they must substitute the boy's given age into the rule $25 + x$. They should also recognize that the given rule means the mother is 25 years older than</p>		

the boy

GRADE 9

Grade learners will do the following algebraic manipulations which include:

- multiply integers and monomials by polynomials
- divide polynomials by integers or monomials
- the product of two binomials
- the square of a binomial

Manipulating algebraic expressions

Make sure learners understand that the rules for operating with integers and rational numbers, including laws of exponents, apply equally when numbers are replaced with variables. The variables are numbers of a given type (e.g. integers or rational numbers) in generalized form. When multiplying or dividing expressions, make sure learners understand how the distributive rule works. The associative rule allows for grouping of like terms when adding. Look out for the following **common misconceptions**:

- $x + x = 2x$ **and NOT** x^2 . Note the convention is to write $2x$ rather than x^2
- $x^2 + x^2 = 2x^2$ **and NOT** $2x^4$
- $a + b = a + b$ **and NOT** ab
- $(-2x^2)^3 = -8x^6$ **and NOT** $-6x^5$
- $-x(3x + 1) = -3x^2 - x$ **and NOT** $-3x^2 + 1$
- $\frac{6x^2+1}{x^2} = 6 + \frac{1}{x^2}$ **and NOT** $6 + 1$
- If $x = 2$ then $-3x^2 = -3(2)2 = 3 \times 4 = 12$ **and NOT** $(-6)2$
- If $x = -2$ then $-x^2 - x = -(-2)^2 - (-2) = -4 + 2 = -2$ **and NOT** $4 + 2 = 6$
- $\sqrt{25x^2 - 9x^2} = \sqrt{16x^2} = 4x$ **and NOT** $5x - 3x = 2x$
- $(x + 2)^2 = x^2 + 4x + 4$ **and NOT** $x^2 + 4$

See CAPS p. 131 for examples of expressions a Grade 9 learner should be able to simplify.

Resources	Charts.		
	Grade 7	Grade 8	Grade 9
Workbook reference	WB 2 Activities (74 – 76; 120 - 122)	WB 1 Activities (R8; 29 – 31; 40 - 41)	WB Activities (R8; 35 - 36)
Textbook reference			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – Test: marks max			

**MATHEMATICS SENIOR PHASE
MULTIGRADE LESSON PLAN 5**

TERM 2

Date : from to		Time: 8 hours	
Grade	7	8	9
Topic	ALGEBRAIC EQUATIONS		
CAPS pages	64 & 69	91 & 94	132 - 133 & 144
Skills and Knowledge	<p>Number sentences</p> <ul style="list-style-type: none"> • Write number sentences to describe problem situations • Analyse and interpret number sentences that describe a given situation • Solve and complete number sentences by: <ul style="list-style-type: none"> ○ inspection ○ trial and improvement • Identify variables and constants in given formulae or equations • Determine the numerical value of an expression by substitution. 	<p>Equations</p> <ul style="list-style-type: none"> • Revise the following done in Grade 7: <ul style="list-style-type: none"> ○ set up equations to describe problem situations ○ analyse and interpret equations that describe a given situation ○ solve equations by inspection ○ determine the numerical value of an expression by substitution. ○ identify variables and constants in given formulae or equations • Extend solving equations to include: <ul style="list-style-type: none"> ○ Using additive and multiplicative inverses ○ Using laws of exponents • Use substitution in equations to generate tables of ordered pairs 	<p>Equations</p> <ul style="list-style-type: none"> • Revise the following done in Grade 8: <ul style="list-style-type: none"> ○ Set up equations to describe problem situations ○ Analyse and interpret equations that describe a given situation ○ Solve equations by: <ul style="list-style-type: none"> ◆◆ inspection ◆◆ using additive and multiplicative inverses ◆◆ using laws of exponents ○ Determine the numerical value of an expression by substitution. ○ Use substitution in equations to generate tables of ordered pairs • Extend solving equations to include: <ul style="list-style-type: none"> ○ using factorisation ○ equations of the form: a product of factors = 0
Suggested methodology	<p>GRADE 7 In Grade 7, the number sentences that learners can solve are extended to include number sentences with integers, square numbers and cubic numbers. Number sentences are used here as a more familiar term for Grade 7 learners than equations. However, the term equation will be used instead of number sentences in later grades.</p>		

Learners have opportunities to write, solve and complete number sentences when they write general rules to describe relationships between numbers in number patterns, and when they find input and output values for given rules in flow diagrams, tables and formulae. Rather than use formal algebraic processes, learners solve number sentences by inspection or determine the numerical value of expressions by substitution. In this phase, it is useful when solving equations to begin to specify whether x is a natural number, integer or rational number. This builds learners' awareness of the domain of x .

Examples

- Solve x if $x + 4 = 7$, where x is a natural number. (What must be added to 4 to give 7?)
- Solve x if $x + 4 = -7$, where x is an integer. (What must be added to 4 to give -7 ?)
- Solve x if $2x = 30$, where x is a natural number. (What must be multiplied by 2 to give 30?)
- Write a number sentence to find the area of a rectangle with length 4,5 cm and breadth 2 cm.
- If $y = x^2 + 1$, calculate y when $x = 3$.

GRADE 8

Up to and including Grade 7 learners use the term 'numbers sentences'. From Grade 8 the term 'equations' is used. Solving equations using additive and multiplicative inverses as well as laws of exponents

Again, learners have opportunities to write and solve equations when they write general rules to describe relationships between numbers in number patterns, and when they find input or output values for given rules in flow diagrams, tables and formulae. In this Grade, learners are introduced to:

- Solving equations using additive and multiplicative inverses as well as laws of exponents

Learners have opportunities to write and solve equations when they write general rules to describe relationships between numbers in number patterns, and when they find input or output values for given rules in flow diagrams, tables and formulae.

Examples of equations

EQUATION	HINT
a) Solve x if $x + 6 = -9$	Add -6 to both sides of the equation.
b) Solve x if $-2x = 8$	Divide both sides of the equation by -2 .
c) Solve x if $-x = -5$	Divide both sides of the equation by -1
d) Solve x if $3x + 1 = 7$	Add -1 to both sides of the equation and then divide both sides of the equation by 3 .
e) Provide an equation to find the area of a rectangle with length $2x$ cm and width $(2x + 1)$ cm	
f) If the area of a rectangle is $(4x^2 - 6x) \text{ cm}^2$, and its width is $2x$ cm, what will be its length in terms of x ?	
g) If $y = x^2 + 1$, Calculate y when $x = 4$.	
h) Thandi is 6 years older than Sophie. In 3 years' time Thandi will be twice as old as Sophie. How old is Thandi now?	

GRADE 9

Grade 9 learners are taught:

- Solving equations using factorization
- Solving equations of the form: a product of factors = 0

Again learners have opportunities to write and solve equations when they write general rules to describe relationships between numbers in number patterns, and when they find input or output values for given rules in flow diagrams, tables and formulae.

In Grade 9, learners can be given equations where they have to expand, simplify or factorize expressions first, before solving the equation. For equations of the form: a product of two factors = 0, learners have to understand that if the product of two factors equals 0, then at least one of the factors must be equal to 0. Hence to solve the equation, each factor must be written as an equation equal to 0, and therefore more than one solution for x is possible. When working with algebraic fractions, learners must be reminded that the denominator cannot equal 0, so any value of x that makes the denominator 0 cannot be a solution to the equation.

Examples of equations

See CAPS page 132 and 144

Resources				
	Grade 7	Grade 8	Grade 9	
Workbook reference	WB 2 Activities(77 – 79; 123 - 125)	WB 1 Activities (32 - 38) WB 2 Activities (111-113)	WB Activities (81 - 86)	
Textbook reference				
HOMEWORK				
ASSESSMENT E.g. Informal assessment – Test: marks max				

LESSON PLANS: TERM 3

**MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 1**

TERM 3

Date : from to		Time: 8 hours	
Grade	7	8	9
Topic	COMMON FRACTIONS		
CAPS pages	49 - 51	100 - 102	122
Skills and Knowledge	<p>Ordering, comparing and simplifying fractions</p> <ul style="list-style-type: none"> • Compare and order common fractions, including specifically tenths and hundredths • Extend to thousandths <p>Calculations with fractions</p> <ul style="list-style-type: none"> • Revise the following done in Grade 6: <ul style="list-style-type: none"> ○ addition and subtraction of common fractions, including mixed numbers, limited to fractions with the same denominator or where one denominator is a multiple of another ○ finding fractions of whole numbers • Extend <ul style="list-style-type: none"> ○ addition and subtraction to fractions where one denominator is not a multiple of the other 	<p>Calculations with fractions</p> <ul style="list-style-type: none"> • Revise: <ul style="list-style-type: none"> - addition and subtraction of common fractions, including mixed numbers - finding fractions of whole numbers - multiplication of common fractions, including mixed numbers • Divide whole numbers and common fractions by common fractions • Calculate the squares, cubes, square roots and cube roots of common fractions 	<p>Calculations with fractions</p> <ul style="list-style-type: none"> • All four operations with common fractions and mixed numbers • All four operations, with numbers that involve the squares, cubes, square roots and cube roots of common fractions

	<ul style="list-style-type: none"> ○ multiplication of common fractions, including mixed numbers, not limited to fractions where one denominator is a multiple of another <p>Calculation techniques</p> <ul style="list-style-type: none"> ● Convert mixed numbers to common fractions in order to perform calculations with them ● Use knowledge of multiples and factors to write fractions in the simplest form before or after calculations ● Use knowledge of equivalent fractions to add and subtract common fractions <p>Solving problems</p> <ul style="list-style-type: none"> ● Solve problems in contexts involving common fractions and mixed numbers, including grouping, sharing and finding fractions of whole numbers 	<p>Calculation techniques</p> <ul style="list-style-type: none"> ● Revise: <ul style="list-style-type: none"> - convert mixed numbers to common fractions in order to perform calculations with them - use knowledge of multiples and factors to write fractions in the simplest form before or after calculations - use knowledge of equivalent fractions to add and subtract common fractions ● Use knowledge of reciprocal relationships to divide common fractions <p>Solving problems</p> <ul style="list-style-type: none"> ● Solve problems in contexts involving common fractions and mixed numbers, including grouping, sharing and finding fractions of whole numbers 	<p>Calculation techniques</p> <ul style="list-style-type: none"> ● Revise: <ul style="list-style-type: none"> - convert mixed numbers to common fractions in order to perform calculations with them - use knowledge of multiples and factors to write fractions in the simplest form before or after calculations - use knowledge of equivalent fractions to add and subtract common fractions - use knowledge of reciprocal relationships to divide common fractions <p>Solving problems</p> <ul style="list-style-type: none"> ● Solve problems in contexts involving common fractions, mixed numbers and percentages
	<p>Percentages</p> <ul style="list-style-type: none"> ● Revise the following done in Grade 6: <ul style="list-style-type: none"> - Finding percentages of whole numbers ● Calculate the percentage of part of a whole ● Calculate percentage increase or decrease of whole numbers ● Solve problems in contexts involving percentages 	<p>Percentages</p> <ul style="list-style-type: none"> ● Revise: <ul style="list-style-type: none"> - finding percentages of whole numbers - calculating the percentage of part of a whole - calculating percentage increase or decrease ● Calculate amounts if given 	

	<p>Equivalent forms Revise the following done in Grade 6:</p> <ul style="list-style-type: none"> • recognize and use equivalent forms of common fractions with 1-digit or 2-digit denominators (fractions where one denominator is a multiple of the other) • recognize equivalence between common fraction and decimal fraction forms of the same number • recognize equivalence between common fraction, decimal fraction and percentage forms of the same number 	<p>percentage increase or decrease</p> <ul style="list-style-type: none"> • Solve problems in contexts involving percentages <p>Equivalent forms Revise equivalent forms between:</p> <ul style="list-style-type: none"> • common fractions (fractions where one denominator is a multiple of the other) • common fraction and decimal fraction forms of the same number • common fraction, decimal fraction and percentage forms of the same number 	<p>Equivalent forms Revise equivalent forms between:</p> <ul style="list-style-type: none"> • common fractions where one denominator is a multiple of another • common fraction and decimal fraction forms of the same number • common fraction, decimal fraction and percentage forms of the same number
<p>Suggested methodology</p>	<p>Calculations with fractions</p> <ul style="list-style-type: none"> • Learners should do context free calculations and solve problems in contexts. • It is not expected that learners know rules for simplifying fractions or for converting between mixed numbers and fraction forms. Learners should know from working with equivalence, when a fraction is equal to or greater than 1. • LCM's have to be found when adding and subtracting fractions of different denominators. Here learners use knowledge of common multiples to find the LCM i.e. what number can both denominators be divided into. • To simplify fractions, learners use knowledge of common factors i.e. what can divide equally into the numerator and denominator of a fraction. Emphasize that when simplifying, the fractions must remain equivalent. • Learners should recognize that finding a 'fraction of a whole number' or 'finding a fraction of a fraction' means multiplying the fraction and the whole number or the fraction with the fraction. • When learners find fractions of whole numbers, the examples can be chosen to result either in whole numbers or fractions or both. • Learners should also use the convention of writing the whole number as a fraction over when multiplying. 		

Calculation using percentages

- Learners should do context free calculations and solve problems in contexts.
- When doing calculations using percentages, learners have to use the equivalent common fraction form, which is a fraction with denominator 100.

Learners should become familiar with the equivalent fraction and decimal forms of common percentages like

- To calculate percentage of part of a whole, or percentage increase or decrease, learners have to learn the strategy of multiplying by 100. It is useful for learners to learn to use calculators for some of these calculations where the fractions are not easily simplified.
- When using calculators, learners can also use the equivalent decimal fraction form for percentages to do the calculations.

Grade 8

What is different to Grade 7?

- Divide by common fractions
- Squares, cubes, square roots and cube roots of common fractions

Multiplication

- For multiplication of fractions, learners should be encouraged to simplify fractions by dividing numerators and denominators by common factors.
- Learners should note the difference between adding or subtracting fractions, and multiplying fractions
- When learners find fractions of whole numbers, the examples can be chosen to result either in whole numbers or fractions or both.
- Learners should also use the convention of writing the whole number as a fraction over when multiplying.

	<p>Division</p> <ul style="list-style-type: none"> The technique of 'invert and multiply' applies to division in general and not just to division by fractions. Hence, a useful way of making learners comfortable with division by fractions is to start with examples of division by whole numbers. Learners have to understand that dividing by a number is the same as multiplying by the reciprocal of the number i.e. the reciprocal of n is $\frac{1}{n}$ Knowing the rules of operations for calculating squares, cubes, square roots and cube roots of common fractions is important, once learners are comfortable doing all the operations with fractions, calculations do not have to be restricted to positive fractions. <p>Grade 9</p> <p>What is different to Grade 8?</p> <p>In Grade 9, learners work with decimal fractions mostly as coefficients in algebraic expressions and equations. They are expected to be competent in performing multiple operations using decimal fractions and mixed numbers, applying proper-ties of rational numbers appropriately. They are also expected to recognize and use equivalent forms for decimal fractions appropriately in calculations.</p>
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LTSM		
Resources	Number lines: 0 – 120, Structured -, semi-structured -, unstructured number lines; Counters, Pictures, arrays/ diagrams, Flash cards, Base 10 blocks, 100 charts, multiplication table	
	Grade 7	Grade 8
Workbook reference	1 Activities (30 - 43)	WB 1 Activities (R5; R6) WB 2 Activities (65 - 68)
Textbook reference		

**MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 2**

TERM 3

Date : from to		Time: 8 hours	
Grade	7	8	9
Topic	DECIMAL FRACTIONS		
CAPS pages	51 - 53	103 - 105	123
Skills and Knowledge	<p>Ordering and comparing decimal fractions</p> <ul style="list-style-type: none"> • Revise the following done in Grade 6: <ul style="list-style-type: none"> - count forwards and backwards in decimal fractions to at least two decimal places - compare and order decimal fractions to at least two decimal places - place value of digits to at least two decimal places - rounding off decimal fractions to at least 1 decimal place • Extend all of the above to decimal fractions to at least three decimal places and rounding off to at least 2 decimal places 	<p>Ordering and comparing decimal fractions</p> <ul style="list-style-type: none"> • Revise: <ul style="list-style-type: none"> - ordering, comparing and place value of decimal fractions to at least 3 decimal places - rounding off decimal fractions to at least 2 decimal place 	<p>Ordering and comparing decimal fractions</p> <ul style="list-style-type: none"> • Revise: <ul style="list-style-type: none"> - ordering, comparing and place value of decimal fractions to at least 3 decimal places - rounding off decimal fractions to at least 2 decimal place

	<p>Calculations with decimal fractions</p> <ul style="list-style-type: none"> • Revise the following done in Grade 6: <ul style="list-style-type: none"> - addition and subtraction of decimal fractions of at least two decimal places - multiplication of decimal fractions by 10 and 100 • Extend addition and subtraction to decimal fractions of at least three decimal places • multiply decimal fractions to include: <ul style="list-style-type: none"> - decimal fractions to at least 3 decimal places by whole numbers - decimal fractions to at least 2 decimal places by decimal fractions to at least 1 decimal place • Divide decimal fractions to include decimal fractions to at least 3 decimal places by whole numbers <p>Calculation techniques</p> <ul style="list-style-type: none"> • Use knowledge of place value to estimate the number of decimal places in the result before performing calculations • Use rounding off and a calculator to check results where appropriate <p>Solving problems</p> <ul style="list-style-type: none"> • Solve problems in context involving decimal Fractions 	<p>Calculations with decimal fractions</p> <ul style="list-style-type: none"> • Revise: <ul style="list-style-type: none"> - addition, subtraction, multiplication and of decimal fractions to at least 3 decimal places - division of decimal fractions by whole numbers • Extend multiplication to 'multiplication by decimal fractions' not limited to one decimal place • Extend division to 'division of decimal fractions by decimal fractions' • Calculate the squares, cubes, square roots and cube roots of decimal fractions <p>Calculation techniques</p> <ul style="list-style-type: none"> • Use knowledge of place value to estimate the number of decimal places in the result before performing calculations • Use rounding off and a calculator to check results where appropriate <p>Solving problems</p> <ul style="list-style-type: none"> • Solve problems in context involving decimal fractions 	<p>Calculations with decimal fractions</p> <ul style="list-style-type: none"> • multiple operations with decimal fractions, using a calculator where appropriate • multiple operations with or without brackets, with numbers that involve the squares, cubes, square roots and cube roots of decimal fractions <p>Calculation techniques</p> <ul style="list-style-type: none"> • Use knowledge of place value to estimate the number of decimal places in the result before performing calculations • Use rounding off and a calculator to check results where appropriate <p>Solving problems</p> <ul style="list-style-type: none"> • Solve problems in context involving decimal fractions
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	<p>Equivalent forms</p> <ul style="list-style-type: none"> • Revise the following done in Grade 6: <ul style="list-style-type: none"> - recognize equivalence between common fraction and decimal fraction forms of the same number - recognize equivalence between common fraction, decimal fraction and percentage forms of the same number 	<p>Equivalent forms</p> <ul style="list-style-type: none"> • Revise equivalent forms between: <ul style="list-style-type: none"> - common fraction and decimal fraction forms of the same number - common fraction, decimal fraction and percentage forms of the same number 	<p>Equivalent forms</p> <ul style="list-style-type: none"> • Revise equivalent forms between: <ul style="list-style-type: none"> - common fraction and decimal fraction forms of the same number - common fraction, decimal fraction and percentage forms of the same number
<p>Suggested methodology</p>	<p>Ordering, counting and comparing decimal fractions</p> <ul style="list-style-type: none"> • Counting should not only be thought of as verbal counting. Learners can count in decimal intervals using: <ul style="list-style-type: none"> - structured, semi-structured or empty number lines - chain diagrams for counting • Learners should be given a range of exercises such as: <ul style="list-style-type: none"> - arrange given numbers from the smallest to the biggest: or biggest to smallest - fill in missing numbers in <ul style="list-style-type: none"> ◆ a sequence ◆ on a number grid ◆ on a number line ◆ fill in $<$, $=$ or $>$ example: $0,4 * 0,04 * 0,004$ (note grade 8 do up to 3 decimal places) <p>Counting exercises in chain diagrams can be checked using calculators and learners can explain any differences between their answers and those shown by the calculator.</p>		

Calculating with decimal fractions

- Learners should do context free calculations and solve problems in contexts.
- Learners should estimate their answers before calculating, especially with multiplication by decimal fractions. They should be able to judge the reasonableness of answers relating to how many decimal places and also check their own answers.
- multiplication by decimal fractions should start with familiar numbers that learners can calculate by inspection, so that learners get a sense of how decimal places are affected by multiplication.

Equivalence between common fractions and decimal fractions

- Learners are not expected to be able to convert any common fraction into its decimal form, merely to see the relationship between tenths, hundredths and thousandths in their decimal forms.
- Learners should start by rewriting and converting tenths, hundredths and thousandths in common fraction form to decimal fractions. Where denominators of other fractions are factors of 10 e.g. 2, 4, 20, 25 learners can convert these to hundredths using what they know about equivalence.

It is useful to use calculators to help learners convert between common fractions and decimal fractions (here learners will use what they know about the relationship between fractions and division).

- Dividing whole numbers by 10, 100, 1 000, etc. can help to build learners' understanding of place value with decimals. This is also useful to do on the calculator – learners can discuss the patterns they see when dividing.
- Similarly calculators can be useful tools for learners to learn about patterns when multiplying decimals by 10, 100 or, 1 000 etc.

Grade 8

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What is different to Grade 7?

- Multiplication by decimal fractions not limited to one decimal place
- Division of decimal fractions by decimal fractions
- Squares, cubes, square roots and cube roots of decimal fractions

	<p>Calculating using decimal fractions</p> <ul style="list-style-type: none"> For division by decimal fractions without calculators, learners have to use their knowledge of multiplication by 10 or multiples of 10 to make the divisor a whole number. Hence start with familiar numbers that learners can calculate by inspection, so that learners get a sense of how decimal places are affected by division. For bigger and unfamiliar decimal fractions, learners should use calculators for multiplication and division, but still judge the reasonableness of their solutions. Similarly, finding squares, cubes, square roots and cube roots for decimal fractions should start with familiar numbers that learners can calculate by inspection. Once learners are comfortable with all the operations using decimal fractions, calculations should not be restricted to positive decimal fractions. <p>Grade 9</p> <p>What is different to Grade 8?</p> <p>In Grade 9, learners work with decimal fractions mostly as coefficients in algebraic expressions and equations. They are expected to be competent in performing multiple operations using decimal fractions and mixed numbers, applying properties of rational numbers appropriately. They are also expected to recognize and use equivalent forms for decimal fractions appropriately in calculations.</p>
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L T S M		
Resources	Number lines, flash cards, charts.	
Workbook reference	<p>Grade 7</p> <p>WB 1 Activities (44 - 46)</p>	<p>Grade 8</p> <p>WB 1 Activities (R6a&b) WB 2 Activities (71 - 74)</p>
Textbook reference		<p>Grade 9</p> <p>WB 1 Activities (R6; 16 - 17)</p>

HOMEWORK			
ASSESSMENT E.g. Informal assessment – Test: marks max			

MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 3
TERM 3

Date : from to		Time: 7 hours	
Grade	7	8	9
Topic	DATA HANDLING		
CAPS pages	70 – 72	109 - 111	149 - 151
	<p>Organize and summarize data</p> <ul style="list-style-type: none"> Organize (including grouping where appropriate) and record data using <ul style="list-style-type: none"> - tally marks - tables - stem-and-leaf displays Group data into intervals Summarize and distinguishing between ungrouped numerical data by determining: <ul style="list-style-type: none"> - mean 	<p>Organize and summarize data</p> <ul style="list-style-type: none"> Organize (including grouping where appropriate) and record data using <ul style="list-style-type: none"> - tally marks - tables - stem-and-leaf displays Group data into intervals Summarize data using measures of central tendency, including: <ul style="list-style-type: none"> - mean - median 	<p>Organize and summarize data</p> <ul style="list-style-type: none"> Organize numerical data in different ways in order to summarize by determining: <ul style="list-style-type: none"> - measures of central tendency - measures of dispersion, including extremes and outliers Organize data according to more than one criteria

	<ul style="list-style-type: none"> - median - mode • Identify the largest and smallest scores in a data set and determine the difference between them in order to determine the spread of the data (range) <p>Represent data</p> <ul style="list-style-type: none"> • Draw a variety of graphs by hand/technology to display and interpret data (grouped and ungrouped) including: <ul style="list-style-type: none"> - bar graphs and double bar graphs - histograms with given intervals - pie charts <p>Interpret data</p> <ul style="list-style-type: none"> • Critically read and interpret data represented in: <ul style="list-style-type: none"> - words - bar graphs - double bar graphs - pie charts - histograms 	<ul style="list-style-type: none"> - mode • Summarize data using measures of dispersion, including: <ul style="list-style-type: none"> - range - extremes <p>Represent data</p> <ul style="list-style-type: none"> • Draw a variety of graphs by hand/technology to display and interpret data including: <ul style="list-style-type: none"> - bar graphs and double bar graphs - histograms with given and own intervals - pie charts - broken-line graphs <p>Interpret data</p> <ul style="list-style-type: none"> • Critically read and interpret data represented in: <ul style="list-style-type: none"> - words - bar graphs - double bar graphs - pie charts - histograms - broken-line graphs 	<p>Represent data</p> <ul style="list-style-type: none"> • Draw a variety of graphs by hand/technology to display and interpret data including: <ul style="list-style-type: none"> - bar graphs and double bar graphs - histograms with given and own intervals - pie charts - broken-line graphs - scatter plots <p>Interpret data</p> <ul style="list-style-type: none"> • Critically read and interpret data represented in a variety of ways • Critically compare two sets of data related to the same issue

	<p>Analyse data</p> <ul style="list-style-type: none"> • Critically analyse data by answering questions related to: <ul style="list-style-type: none"> - data categories, including data intervals - data sources and contexts - central tendencies (mean, mode, median) - scales used on graphs <p>Report data</p> <ul style="list-style-type: none"> • Summarize data in short paragraphs that include <ul style="list-style-type: none"> - drawing conclusions about the data - making predictions based on the data - identifying sources of error and bias in the data - choosing appropriate summary statistics for the data (mean, median, mode) 	<p>Analyse data</p> <ul style="list-style-type: none"> • Critically analyse data by answering questions related to: <ul style="list-style-type: none"> - data categories, including data intervals - data sources and contexts - central tendencies (mean, mode, median) - scales used on graphs - samples and populations - dispersion of data - error and bias in the data <p>Report data</p> <ul style="list-style-type: none"> • Summarize data in short paragraphs that include <ul style="list-style-type: none"> - drawing conclusions about the data - making predictions based on the data - identifying sources of error and bias in the data - choosing appropriate summary statistics for the data (mean, median, mode, range) - the role of extremes in the data 	<p>Analyse data</p> <ul style="list-style-type: none"> • Critically analyse data by answering questions related to: <ul style="list-style-type: none"> - data collection methods - summary of data - sources of error and bias in the data <p>Report data</p> <ul style="list-style-type: none"> • Summarize data in short paragraphs that include <ul style="list-style-type: none"> - drawing conclusions about the data - making predictions based on the data - making comparisons between two sets of data - identifying sources of error and bias in the data - choosing appropriate summary statistics for the data (mean, median, mode, range) - the role of extremes and outliers in the data
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The following are new in Grade 7

- samples and populations
- multiple choice questionnaires
- stem-and-leaf displays
- grouping data in intervals
- mean
- range
- histograms
- scales on graphs

Data sets and contexts

Learners should be exposed to a variety of contexts that deal with social and environmental issues, and should work with given data sets, represented in a variety of ways, that include big number ranges, percentages and decimal fractions. Learners should then practice organizing and summarizing this data, analysing and interpreting the data, and writing a report about the data

Complete a data cycle

Learners should complete at least one data cycle for the year, starting with posing their own questions, selecting the sources and method for collecting data, recording the data, organizing the data, representing the data, then analysing, summarizing, interpreting and reporting the data. Challenge learners to think about what kinds of questions and data need to be collected to be represented in a histogram, pie chart, bar graph or a line graph.

Representing data

- Drawing pie charts to represent data do not have to be accurately drawn with a compass and protractor, etc. Learners can use any round object to draw a circle, then divide the circle into halves and quarters and eighths if needed, as a guide to estimate the proportions of the circle that need to be shown to represent the data. What is important is that the values or percentages associated with the data, are shown proportionally on the pie chart.
- Drawing, reading and interpreting pie charts is a useful context to re-visit equivalence between fractions and percentages, e.g. 25% of the data is represented by a $\frac{1}{4}$ sector of the circle.

- It is also a context in which learners can find percentages of whole numbers e.g. if 25% of 300 learners like rugby, how many (actual number) learners like rugby?
- Histograms are used to represent grouped data shown in intervals on the horizontal axis of the graph. Point out the differences between histograms and bar graphs, in particular bar graphs that represent discrete data (e.g. favourite sports) compared to histograms that show categories in consecutive, non-overlapping intervals, (e.g. test scores out of 100 shown in intervals of 10). The bars on bar graphs do not have to touch each other, while in a histogram they have to touch since they show consecutive intervals.

Developing critical analysis skills

- Learners should compare the same data represented in different ways e.g. in a pie chart or a bar graph or a table, and discuss what information is shown and what is hidden; they should evaluate what form of representation works best for the given data.
- Learners should compare graphs on the same topic but where data has been collected from different groups of people, at different times, in different places or in different ways. Here learners should discuss differences between the data with an awareness of bias related to the impact of data sources and methods of data collection on the interpretation of the data.
- Learners should compare different ways of summarising the same data sets, developing an awareness of how data reporting can be manipulated; evaluating which summary statistics best represent the data.
- Learners should compare graphs of the same data, where the scales of the graphs are different. Here learners should discuss differences with an awareness of how representation of data can be manipulated; they should evaluate which form of representation works best for the given data.

Learners should write reports on the data in short paragraphs.

Grade 8

What is different to Grade 7?

The following are new in Grade 8

- extremes
- broken line graphs
- dispersion of data
- error and bias in data

Representing data

- Broken-line graphs refer to data graphs that represent data points joined by a line and are not the same as straight line graphs that are drawn using the equation of the line.
- Broken-line graphs are used to represent data that changes continuously over time, e.g. average daily temperature for a month. Each day's temperature is represented with a point on the graph, and once the whole month has been plotted, the points are joined to show a broken-line graph.
- Broken-line graphs are useful to read 'trends' and patterns in the data, for predictive purposes e.g. will the temperatures go up or down in the next month.

Developing critical analysis skills

- Learners should compare data on the same topic, where one set of data has extremes, and discuss differences with an awareness of the effect of the extremes on the interpretation of the data, in particular, extremes affect the range.
- Learners should write reports on the data in short paragraphs.

Grade 9

What is different to Grade 8?

- Organizing data according to more than one criteria
- Outliers
- Scatter plots

Complete a data cycle

All what is done grade 8 plus scatter **plot**.

Representing data

All what is done in grade 7 and 8 including what is mentioned below

- A scatter plot is used to represent data that involves two different criteria and the graph is used to look at the relationship between the two criteria. e.g. How does the performance of learners in mathematics compare to their performance in English? Each point on the graph represents the results of one learner in Mathematics and English. After all the results have been plotted, you can compare the relationship between performance in English and mathematics for all the learners i.e. if they score high in Mathematics, do they also score high in English? or, if they score high in mathematics do they score low in English, or is there no relationship between what they score on mathematics to what they score in English?
- The scatter plot allows one to see trends and make predictions, as well as identify outliers in the data.

LTSM			
Resources	Charts, square papers, colour pens.		
	Grade 7	Grade 8	Grade 9
Workbook reference	WB 1 Activities (R15, 16) WB 2 Activities (126 - 140)	WB 1 Activities (R16a&b) WB 2 Activities (92 - 104)	WB 1 Activities (R16a&b) WB 2 Activities (123 – 143)
Textbook reference			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – Test: marks max			



MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 4

TERM 3

Date : from to		Time: 5 hours	
Grade	7	8	9
Topic	2D GEOMETRY & PROPERTIES OF TRIANGLES AND THEOREM OF PYTHAGORAS		
CAPS pages	46 and 55	105	138
Skills and Knowledge	<p>Classifying 2D shapes</p> <ul style="list-style-type: none"> Describe, sort, name and compare triangles according to their sides and angles, focusing on: <ul style="list-style-type: none"> - equilateral triangles - isosceles triangles - right-angled triangles Use appropriate formulae to calculate the area of: <ul style="list-style-type: none"> - squares - rectangles - triangles 	<p>Develop and use the theorem of Pythagoras</p> <ul style="list-style-type: none"> Investigate the relationship between the lengths of the sides of a right-angled triangle to develop the Theorem of Pythagoras Determine whether a triangle is a right-angled triangle or not if the length of the three sides of the triangle are known Use the Theorem of Pythagoras to calculate a missing length in a right-angled triangle, leaving irrational answers in surd form 	<p>Solve problems using the theorem of Pythagoras</p> <ul style="list-style-type: none"> Use the Theorem of Pythagoras to solve problems involving unknown lengths in geometric figures that contain right-angled triangles
Suggested methodology	<p>Triangles</p> <ul style="list-style-type: none"> Learners should be able to distinguish between an equilateral triangle (all the sides are equal), an isosceles triangle (at least two equal sides) and a right-angled triangle (one right-angle). Formulae learners should know and use are: <ul style="list-style-type: none"> - area of a square = l^2 - area of a rectangle = $l \times b$ - Area of a triangle = $\frac{1}{2}(b \times h)$ 		

	<p>Grade 8 and 9</p> <ul style="list-style-type: none"> The theorem of Pythagoras is new in Grade 8. It is important that learners understand that the Theorem of Pythagoras applies only to right-angled triangles. The Theorem of Pythagoras is basically a formula to calculate unknown length of sides in right-angled triangles. In the FET phase, the Theorem of Pythagoras is crucial to the further study of Geometry and Trigonometry In particular, the Theorem of Pythagoras can be the first step in calculations of perimeters or areas of composite figures, when one of the figures is a right-angled triangle with an unknown length. Grade 9 will solve problems involving geometric figures 		
LTSM			
Resources	Charts with pictures and shapes.		
Workbook reference	Grade 7	Grade 8	Grade 9
	WB 1 Activities (R10) WB 2 (142)	WB 2 Activities (77- 81)	WB 1 Activities (58; 59)
Textbook reference			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – Test: marks max			

MATHEMATICS SENIOR PHASE
GRADE LESSON PLAN 5

TERM 3

Date : from to		Time: 7 hours	
Grade	7	8	9
Topic	AREA AND PERIMETER OF 2D SHAPES		
CAPS pages	56	106 - 107	139 - 140
Skills and Knowledge	<p>Area and perimeter</p> <ul style="list-style-type: none"> • Calculate the perimeter of regular and irregular polygons • Use appropriate formulae to calculate perimeter and area of: <ul style="list-style-type: none"> - squares - rectangles - triangles 	<p>Area and perimeter</p> <ul style="list-style-type: none"> • Use appropriate formulae to calculate perimeter and area of: <ul style="list-style-type: none"> - squares - rectangles - triangles - circles • Calculate the areas of polygons, to at least 2 decimal places, by decomposing them into rectangles and/or triangles • Use and describe the relationship between the radius, diameter and circumference of a circle in calculations <p>Use and describe the relationship between the radius and area of a circle in calculations</p> <p>Calculations and solving problems</p> <ul style="list-style-type: none"> • Solve problems involving perimeter and area of polygons 	<p>Area and perimeter</p> <ul style="list-style-type: none"> • Use appropriate formulae and conversions between SI units, to solve problems and calculate perimeter and area of: <ul style="list-style-type: none"> - polygons - circles • Investigate how doubling any or all of the dimensions of a 2D figure affects its perimeter and its area

	<ul style="list-style-type: none"> Calculate to at least 1 decimal place Use and convert between appropriate SI units, including: <ul style="list-style-type: none"> $mm^2 \leftrightarrow cm^2$ $cm^2 \leftrightarrow m^2$ 	<ul style="list-style-type: none"> Calculate to at least 2 decimal places Use and describe the meaning of the irrational number Pi (π) in calculations involving circles Use and convert between appropriate SI units, <ul style="list-style-type: none"> including: $mm^2 \leftrightarrow cm^2 \leftrightarrow m^2 \leftrightarrow km^2$ 	
Suggested methodology	<p>Formulae learners should know and use are:</p> <ul style="list-style-type: none"> perimeter of a square = $4s$ perimeter of a rectangle = $2(l + b)$ or $2l + 2b$ area of a square = l^2 area of a rectangle = $l \times b$ area of a triangle = $\frac{1}{2} (b \times h)$ <p>Solving equations using formulae</p> <ul style="list-style-type: none"> The use of formulae provides a context to practice solving equations by inspection. <p>Example</p> <ol style="list-style-type: none"> If the perimeter of a square is 32 cm what is the length of each side? Learners should write this as: $4s = 32$ and solve by inspection by asking: 4 times what will be 32? If the area of a rectangle is 200 cm^2, and its length is 50 cm what is its width? Learners should write this as: $50 \times b = 200$ and solve by inspection by asking: 50 times what will be 200? <p>For areas of triangles:</p> <ul style="list-style-type: none"> Make sure learners know that the height of a triangle is a line segment drawn from any vertex perpendicular to the opposite side. Point out that every triangle has 3 bases, each with a related height or altitude. 		

• **For conversions, note:**

- if $1\text{ cm} = 10\text{ mm}$ then $1\text{ cm}^2 = 100\text{ mm}^2$
- if $1\text{ m} = 100\text{ cm}$ then $1\text{ m}^2 = 10\,000\text{ cm}^2$

Grade 8

What is different to Grade 7?

- Areas of polygons by decomposition
- Circumference and area of a circle
- **Formulae** learners should know and use:
 - diameter of a circle: $d = 2r$
 - circumference of circle: $c = \pi d$ or $2\pi r$
 - area of a circle: $A = \pi r^2$

Solving equations using formulae

The use of formulae provides a context to practise solving equations by inspection or using additive or multiplicative inverses

Circles

- make sure learners can identify the centre, radius, diameter and circumference of the circle.
- Spend time investigating the relationship between radius, circumference and diameter, so that learners develop a sense of where the irrational number Pi (π) is derived from.
- Develop an understanding of π , making sure learners understand that:
 - π represents the value of the circumference divided by the diameter, for any circle
 - π is an irrational number and is given as 3,141 592 654 correct to 9 decimal places on the calculator

$$\frac{22}{7} \quad \text{or } 3,14 \quad \text{are approximate rational values of } \pi \text{ in everyday use.}$$

	<p>Grade 9</p> <p>What is different to Grade 8?</p> <ul style="list-style-type: none"> The calculations are the same as in Grade 8, but learners can find perimeters and areas of more composite and complex figures Polygons can include trapeziums, parallelograms, rhombi and kites <p>Formula for learners to know and use.</p> <ul style="list-style-type: none"> <i>Area of a rhombus</i> = <i>length</i> × <i>height</i> <i>Area of a kite</i> = $\frac{1}{2}$ (<i>diagonal 1</i> × <i>diagonal 2</i>) <i>Area of a parallelogram</i> = <i>base</i> × <i>height</i> <i>Area of a trapezium</i> = $\frac{1}{2}$ (<i>sum of parallel side</i>) × <i>height</i> <p>The use of formulae provides a context to practise solving equations by inspection or using additive or multiplicative inverses. Explanation of the effect of doubling of any dimensions of 2D.</p>						
LTSM							
Resources	Meter stick, trundle wheel, meter stick, charts, square papers.						
Workbook reference	<table border="1"> <thead> <tr> <th data-bbox="927 1818 999 2136">Grade 7</th> <th data-bbox="927 1245 999 1818">Grade 8</th> <th data-bbox="927 91 999 1245">Grade 9</th> </tr> </thead> <tbody> <tr> <td data-bbox="999 1818 1139 2136">WB 1 Activities (52 - 55)</td> <td data-bbox="999 1245 1139 1818">WB 1 Activities (R14) WB 2 Activities (82 - 86)</td> <td data-bbox="999 91 1139 1245">WB 1 Activities (R14; 60-64)</td> </tr> </tbody> </table>	Grade 7	Grade 8	Grade 9	WB 1 Activities (52 - 55)	WB 1 Activities (R14) WB 2 Activities (82 - 86)	WB 1 Activities (R14; 60-64)
Grade 7	Grade 8	Grade 9					
WB 1 Activities (52 - 55)	WB 1 Activities (R14) WB 2 Activities (82 - 86)	WB 1 Activities (R14; 60-64)					
Textbook reference							
HOMEWORK							
ASSESSMENT E.g. Informal assessment – Test: marks max							



**MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 6**

TERM 3

Date : from to		Time: 8 hours	
Grade	7	8	9
Topic	SURFACE AREA AND VOLUME OF 3D		
CAPS pages	57	108	146
Skills and Knowledge	<p>Surface area and volume</p> <ul style="list-style-type: none"> Use appropriate formulae to calculate the surface area, volume and capacity of: <ul style="list-style-type: none"> - cubes - rectangular prisms Describe the interrelationship between surface area and volume of the objects mentioned above <p>Calculations and solving problems</p> <ul style="list-style-type: none"> Solve problems involving surface area, volume and capacity 	<p>Surface area and volume</p> <ul style="list-style-type: none"> Use appropriate formulae to calculate the surface area, volume and capacity of: <ul style="list-style-type: none"> - cubes - rectangular prisms - triangular prisms Describe the interrelationship between surface area and volume of the objects mentioned above <p>Calculations and solving problems</p> <ul style="list-style-type: none"> Solve problems, with or without a calculator, involving surface area, volume and capacity 	<p>Surface area and volume</p> <ul style="list-style-type: none"> Use appropriate formulae and conversions between SI units to solve problems and calculate the surface area, volume and capacity of: <ul style="list-style-type: none"> - cubes - rectangular prisms - triangular prisms - cylinders Investigate how doubling any or all the dimensions of right prisms and cylinders affects their volume

	<ul style="list-style-type: none"> Use and convert between appropriate SI units, including: <ul style="list-style-type: none"> $mm^2 \leftrightarrow cm^2$ $cm^2 \leftrightarrow m^2$ $mm^3 \leftrightarrow cm^3$ $cm^3 \leftrightarrow m^3$ Use equivalence between units when solving problems: <ul style="list-style-type: none"> $1\ cm^3 \leftrightarrow 1\ ml$ $1\ m^3 \leftrightarrow 1\ kl$ 	<ul style="list-style-type: none"> Use and convert between appropriate SI units, including: <ul style="list-style-type: none"> $mm^2 \leftrightarrow cm^2 \leftrightarrow m^2 \leftrightarrow km^2$ $mm^3 \leftrightarrow cm^3 \leftrightarrow m^3$ $ml(cm^3) \leftrightarrow l \leftrightarrow kl$ 	
Suggested methodology	<p>What is different to Grade 6?</p> <ul style="list-style-type: none"> Formulae learners should know and use: <ul style="list-style-type: none"> the volume of a prism = the area of the base x the height the surface area of a prism = the sum of the area of all its faces the volume of a cube = β^3 the volume of a rectangular prism = $l \times b \times h$ For conversions, note: <ul style="list-style-type: none"> if $1\ cm = 10\ mm$ then $1\ cm^3 = 1\ 000\ mm^3$ and if $1\ m = 10\ cm$ then $1\ m^3 = 1\ 000\ 000\ mm^3$ or $1\ 000\ 000$ or $10^6\ cm^3$. an object with a volume of $1\ cm^3$ will displace exactly $1\ ml$ of water; and an object with a volume of $1\ m^3$ will displace exactly $1\ kl$ of water 		

- Emphasize that the amount of space inside a prism is called its capacity; and the amount of space occupied by a prism is called its volume.
- Investigate the nets of cubes and rectangular prisms in order to deduce formulae for calculating their surface areas.

Grade 8

What is different to Grade 7?

- Surface area and volume of triangular prisms
- **Formulae** learners should know and use:
 - the volume of a triangular prism = $(\frac{1}{2} b \times h) \times \text{height of prism}$
- For conversions, note:
 - if $1 \text{ cm} = 10 \text{ mm}$ then $1 \text{ cm}^3 = 1\,000 \text{ mm}^3$ and
 - if $1 \text{ m} = 100 \text{ cm}$ then $1 \text{ m}^3 = 1\,000\,000 \text{ cm}^3$ or 10^6 cm^3
 - an object with a volume of 1 cm^3 will displace exactly 1 ml of water
 - an object with a volume of 1 m^3 will displace exactly 1 kl of water.
- Emphasize that the amount of space inside a prism is called its capacity; and the amount of space occupied by a prism is called its volume.
- Investigate the nets of cubes and rectangular prisms in order to deduce formulae for calculating their surface areas.

	<p>Grade 9</p> <p>What is different to Grade 8?</p> <ul style="list-style-type: none"> • Surface area and volume of cylinders • Formulae learners should know and use: <ul style="list-style-type: none"> - the volume of a cylinder = $(\pi r^2) \times$ the height of the cylinder • For conversions, note: <ul style="list-style-type: none"> - if 1 cm = 10 mm then $1 \text{ cm}^3 = 1\,000 \text{ mm}^3$; and - if 1 m = 100 cm then $1 \text{ m}^3 = 1\,000\,000 \text{ or } 10^6 \text{ cm}^3$ <p style="text-align: right;">7</p>						
LTSM							
Resources	Empty boxes, geosolids, measuring jugs, cubes.						
Workbook reference	<table border="1"> <thead> <tr> <th data-bbox="895 1296 965 1841">Grade 7</th> <th data-bbox="895 696 965 1296">Grade 8</th> <th data-bbox="895 91 965 696">Grade 9</th> </tr> </thead> <tbody> <tr> <td data-bbox="965 1296 1131 1841">WB 1 Activities (56 - 64) WB 2 Activity (143)</td> <td data-bbox="965 696 1131 1296">WB 1 Activities (R15a&b) WB 2 Activities (87 - 91)</td> <td data-bbox="965 91 1131 696">WB 1 Activities (R15a&b) WB 2 Activities (100 – 104)</td> </tr> </tbody> </table>	Grade 7	Grade 8	Grade 9	WB 1 Activities (56 - 64) WB 2 Activity (143)	WB 1 Activities (R15a&b) WB 2 Activities (87 - 91)	WB 1 Activities (R15a&b) WB 2 Activities (100 – 104)
Grade 7	Grade 8	Grade 9					
WB 1 Activities (56 - 64) WB 2 Activity (143)	WB 1 Activities (R15a&b) WB 2 Activities (87 - 91)	WB 1 Activities (R15a&b) WB 2 Activities (100 – 104)					
Textbook reference							
HOMEWORK							
ASSESSMENT E.g. Informal assessment – Test:							

**MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 7**

TERM 3

Date : from to		Time: 4 hours	
Grade	7	8	9
Topic	GRAPHS		
CAPS pages	65	114	145
Skills and Knowledge	<p>Interpreting graphs Analyse and interpret global graphs of problem situations, with special focus on the following trends and features:</p> <ul style="list-style-type: none"> • linear or non-linear • constant, increasing or decreasing 	<p>Interpreting graphs Revise the following done in Grade 7:</p> <ul style="list-style-type: none"> • Analyse and interpret global graphs of problem situations, with a special focus on the following trends and features: <ul style="list-style-type: none"> ◆◆ linear or non-linear ◆◆ constant, increasing or decreasing ◆◆ Extend the focus on features of graphs to include: <ul style="list-style-type: none"> ◆◆ maximum or minimum ◆◆ discrete or continuous <p>Drawing graphs</p> <ul style="list-style-type: none"> • Draw global graphs from given descriptions of a problem situation, identifying features listed above 	<p>Interpreting graphs Revise the following done in Grade 8:</p> <ul style="list-style-type: none"> • Analyse and interpret global graphs of problem situations, with a special focus on the following trends and features: <ul style="list-style-type: none"> ◆◆ linear or non-linear ◆◆ constant, increasing or decreasing ◆◆ maximum or minimum ◆◆ discrete or continuous • Extend the above with special focus on the following features of linear graphs: <ul style="list-style-type: none"> ◆◆ x-intercept and y-intercept ◆◆ gradient <p>Drawing graphs Revise the following done in Grade 8:</p> <ul style="list-style-type: none"> • draw global graphs from given descriptions of a problem situation,

		<ul style="list-style-type: none"> Use tables of ordered pairs to plot points and draw graphs on the Cartesian plane 	<p>identifying features listed above.</p> <ul style="list-style-type: none"> use tables of ordered pairs to plot points and draw graphs on the Cartesian plane Extend the above with a special focus on: <ul style="list-style-type: none"> drawing linear graphs from given equations determine equations from given linear graphs 																				
<p>Suggested methodology</p>	<p>In the Intermediate Phase learners encountered graphs in the form of data bar graphs and pie charts. This means they do have some experience reading and interpreting graphs. However, in the Senior Phase, they are introduced to line graphs that show functional relationships described in terms of dependent and independent variables.</p> <p>In Grade 7, the focus is on drawing, analysing and interpreting global graphs only. That is, learners do not have to plot points to draw graphs and they focus on the features of the global relationship shown in the graph.</p> <p>Examples of contexts for global graphs include:</p> <ul style="list-style-type: none"> the relationship between time and distance travelled the relationship between temperature and time over which it is measured the relationship between rainfall and time over which it is measured, etc. <p>In Grade 8:</p> <ul style="list-style-type: none"> New features of global graphs, namely, maximum and minimum; discrete and continuous, are introduced Learners plot points to draw graphs <p>See Grade 7 above for examples of contexts for global graphs.</p> <p>Examples of drawing graphs by plotting points</p> <p>a) Complete the table of ordered pairs below for the equation $y = x + 3$</p> <table border="1" data-bbox="1273 891 1393 1877"> <tr> <td>x</td> <td>-4</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>y</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>			x	-4	-3	-2	-1	0	1	2	3	4	y									
x	-4	-3	-2	-1	0	1	2	3	4														
y																							

Now, plot the above co-ordinate points on the Cartesian plane. Join points to form a graph.

b) Complete the table of ordered pairs below for the equation $y = x^2 + 3$

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

Now, plot the above co-ordinate points on the Cartesian plane. Join points to form a graph.

In Grade 9,

- x-intercept, y-intercept and gradient of linear graphs are introduced
- Learners draw linear graphs from given equations
- They determine equations of linear graphs

Learners should continue to analyse and interpret graphs of problem situations.

Investigating linear graphs

- To sketch linear graphs from given equations, learners should first draw up a table of ordered pairs, that includes the intercept points ($x; 0$) and ($0; y$), and then plotting the points.
- Learners should investigate gradients by comparing $\frac{\text{vertical change}}{\text{horizontal change}}$ between any two points on a straight line graph.
- Learners should also investigate the relationship between the value of the gradient and the coefficient of x in the equation of a straight line graph.
- Learners should compare y-intercepts of linear graphs to the value of the constant in the equation of the straight line graph.

Examples of linear graphs

- Sketch and compare the graphs of: $y = 4$ and $x = 4$
- Sketch and compare the graphs of: $y = x$ and $y = -x$
- Sketch and compare the graphs of: $y = 2x$; $y = 2x + 1$; $y = 2x - 1$
- Sketch and compare the graphs of: $y = 3x$; $y = 4x$; $y = 5x$
- Sketch the graphs of: $y = -3x + 2$; using the table method
- Determine the equation of the straight line passing through the following points:



LESSON PLANS: TERM 4



LESSON PLANS: TERM 4
MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 1
TERM 4

Date : from to		Time: 4 hours	
Grade	7	8	9
Topic	FUNCTIONS AND RELATIONSHIPS		
CAPS pages	62	88 - 89	129
Skills and Knowledge	<p>Input and output values Determine input values, output values or rules for patterns and relationships using:</p> <ul style="list-style-type: none"> • flow diagrams • tables • formulae <p>Equivalent forms Determine, interpret and justify equivalence of different descriptions of the same relationship or rule presented:</p> <ul style="list-style-type: none"> • verbally • in flow diagrams • in tables • by formulae • by number sentences 	<p>Input and output values Determine input values, output values or rules for patterns and relationships using:</p> <ul style="list-style-type: none"> • flow diagrams • tables • formulae • equations <p>Equivalent forms Determine, interpret and justify equivalence of different descriptions of the same relationship or rule presented:</p> <ul style="list-style-type: none"> -- verbally -- in flow diagrams -- in tables -- by formulae -- by equations 	<p>Input and output values Determine input values, output values or rules for patterns and relationships using:</p> <ul style="list-style-type: none"> • flow diagrams • tables • formulae • equations <p>Equivalent forms Determine, interpret and justify equivalence of different descriptions of the same relationship or rule presented:</p> <ul style="list-style-type: none"> • verbally • in flow diagrams • in tables • by formulae • by equations • by graphs on a Cartesian plane
Suggested methodology	<p>In this phase, it is useful to begin to specify whether the input values are natural numbers, or integers or rational numbers. This builds learners' awareness of the domain of input values. Hence, to find output values, learners should be given the rule/formula as well as the domain of the input values.</p> <p>In Grade 7, the focus is on finding output values for given formulae and input values. Note, when learners find input or output values for</p>		

given rules or formulae, they are actually finding the numerical value of algebraic expressions using substitution.

Examples

Use the formula for the area of a rectangle: $A = l \times b$ to calculate the following:

- The area, if the length is 4 cm and the width is 2 cm
- The length, if the area is 20 cm² and the width is 4 cm
- The width, if the area is 24 cm² and the length is 8 cm

Learners can write these as number sentences, and solve by inspection.

In Grade 8:

- The focus is on finding input or output values using given equations
- The rules and number patterns for which learners have to find input and output values are extended to include patterns with multiplication and division of integers and numbers in exponential form.

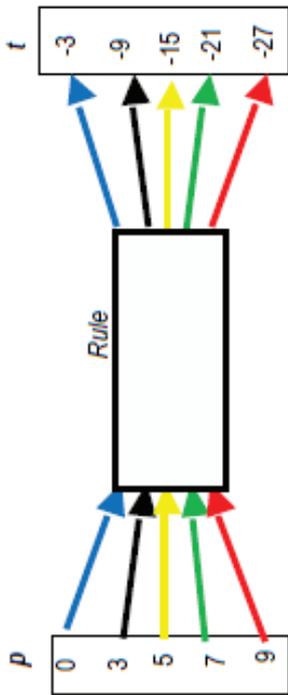
Flow diagrams are representations of functional relationships. Hence, when using flow diagrams, the correspondence between input and output values should be clear in its representational form i.e. the first input produces the first output; the second input produces the second output, etc.

Examples

- Use the given rule to calculate the values of t for each value of p , where p is a natural number. In this kind of flow diagram, learners can also be asked to determine the value of p for a given t value.



- Determine the rule for calculating the output value for every given input value in the flow diagram below.



In flow diagrams such as these, more than one rule might be possible to describe the relationship between input and output values. The rules are acceptable if they match the given input values to the corresponding output values.

c) If the rule for finding y in the table below is $y = -3x - 1$, calculate y for the given x values:

x	0	1	2	5	10	50	100
y							

b) Describe the relationship between the numbers in the top row and bottom row in the table. Then write down the value of m and n

x	-2	-1	0	1	2	12	n
y	-5	-4	-3	-2	-1	m	34

In tables such as these, more than one rule might be possible to describe the relationship between x and y values. The rules are acceptable if they match the given input values to the corresponding output values. For example, the rule $y = x - 3$ describes the relationship between the x values and given y values. To find m and n , learners have to substitute the corresponding values for x or y in the rule and solve the equation by inspection.

In Grade 9, learners consolidate work with input and output values done in Grade 8. They should continue to find input or output values in flow diagrams, tables, formulae and equations. Learners should begin to recognize equivalent representations of the same relationships shown as an equation, a set of ordered pairs in a table or on a graph.

Examples

- a) If the rule for finding in the table below is $y = \frac{1}{2}x + 1$, determine the values of y for the given x values:

x	0	1	2	4	10	50	100
y							

- b) Describe the relationship between the numbers in the top row and those in the bottom row in the table. Then write down the value of m and n

x	-2	-1	0	1	2	12	n
y	-7	-5	-3	-1	1	m	27

In tables such as these, more than one rule might be possible to describe the relationship between x and y values. The rules are acceptable if they match the given input values to the corresponding output values. For example, the rule $y = 2x - 3$ describes the relationship between the given values for x and y . To find m and n , learners have to substitute the corresponding values for x or y into the rule and solve the equation by inspection.

LTSM

Resources

Charts.

Grade 7

Grade 8

Grade 9

Workbook reference

WB 1 Activities (48 - 51)
WB 2 Activities (72 - 73)

WB 2 Activities (72 - 73)

Textbook reference

HOMEWORK

ASSESSMENT

E.g. Informal
assessment – Test:
marks max

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**MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 2**

TERM 4

Date : from to		Time: 4 hours	
Grade	7	8	9
Topic	GRAPHS		
CAPS pages	65	114	145
Skills and Knowledge	<p>Interpreting graphs Analyse and interpret global graphs of problem situations, with special focus on the following trends and features:</p> <ul style="list-style-type: none"> • linear or non-linear • constant, increasing or decreasing 	<p>Interpreting graphs Revise the following done in Grade 7:</p> <ul style="list-style-type: none"> • Analyse and interpret global graphs of problem situations, with a special focus on the following trends and features: <ul style="list-style-type: none"> ◆◆ linear or non-linear ◆◆ constant, increasing or decreasing ◆◆ Extend the focus on features of graphs to include: <ul style="list-style-type: none"> ◆◆ maximum or minimum ◆◆ discrete or continuous 	<p>Interpreting graphs Revise the following done in Grade 8:</p> <ul style="list-style-type: none"> • Analyse and interpret global graphs of problem situations, with a special focus on the following trends and features: <ul style="list-style-type: none"> ◆◆ linear or non-linear ◆◆ constant, increasing or decreasing ◆◆ maximum or minimum ◆◆ discrete or continuous • Extend the above with special focus on the following features of linear graphs: <ul style="list-style-type: none"> ◆◆ x-intercept and y-intercept ◆◆ gradient
	<p>Drawing graphs Draw global graphs from given descriptions of a problem situation, identifying features listed above</p>	<p>Drawing graphs Draw global graphs from given descriptions of a problem situation, identifying features listed above</p> <ul style="list-style-type: none"> • Use tables of ordered pairs to plot points and draw graphs on the Cartesian plane 	<p>Drawing graphs Revise the following done in Grade 8:</p> <ul style="list-style-type: none"> • draw global graphs from given descriptions of a problem situation, identifying features listed above. • use tables of ordered pairs to plot points and draw graphs on the Cartesian plane • Extend the above with a special focus on: <ul style="list-style-type: none"> ◆◆ drawing linear graphs from given equations ◆◆ determine equations from given linear graphs

In the Intermediate Phase learners encountered graphs in the form of data bar graphs and pie charts. This means they do have some experience reading and interpreting graphs. However, in the Senior Phase, they are introduced to line graphs that show functional relationships described in terms of dependent and independent variables.

In Grade 7, the focus is on drawing, analysing and interpreting global graphs only. That is, learners do not have to plot points to draw graphs and they focus on the features of the global relationship shown in the graph.

Examples of contexts for global graphs include:

- the relationship between time and distance travelled
- the relationship between temperature and time over which it is measured
- the relationship between rainfall and time over which it is measured, etc.

In Grade 8:

- New features of global graphs, namely, maximum and minimum; discrete and continuous, are introduced
- Learners plot points to draw graphs

See Grade 7 above for examples of contexts for global graphs.

Examples of drawing graphs by plotting points

c) Complete the table of ordered pairs below for the equation $y = x + 3$

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

Now, plot the above co-ordinate points on the Cartesian plane. Join points to form a graph.

d) Complete the table of ordered pairs below for the equation $y = x^2 + 3$

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

Now, plot the above co-ordinate points on the Cartesian plane. Join points to form a graph.

In Grade 9,

- x-intercept, y-intercept and gradient of linear graphs are introduced
- Learners draw linear graphs from given equations
- They determine equations of linear graphs

Learners should continue to analyse and interpret graphs of problem situations.

Investigating linear graphs

- To sketch linear graphs from given equations, learners should first draw up a table of ordered pairs, that includes the intercept points (x ; 0) and (0; y), and then plotting the points.
- Learners should investigate gradients by comparing $\frac{\text{vertical change}}{\text{horizontal change}}$ between any two points on a straight line graph.
- Learners should also investigate the relationship between the value of the gradient and the coefficient of x in the equation of a straight line graph.
- Learners should compare y -intercepts of linear graphs to the value of the constant in the equation of the straight line graph.

Examples of linear graphs

- Sketch and compare the graphs of: $y = 4$ and $x = 4$
- Sketch and compare the graphs of: $y = x$ and $y = -x$
- Sketch and compare the graphs of: $y = 2x$; $y = 2x + 1$; $y = 2x - 1$
- Sketch and compare the graphs of: $y = 3x$; $y = 4x$; $y = 5x$
- Sketch the graphs of: $y = -3x + 2$; using the table method
- Determine the equation of the straight line passing through the following points:

x	-4	-3	-2	-1	0	1	2	3	4
y	-1	0	1	2	3	4	5	6	7

LTSM			
Resources	Graph papers, rulers, colour pens.		
	Grade 7	Grade 8	Grade 9
Workbook reference	WB 2 Activities (80 - 85)	WB 2 Activities (114 - 120)	WB 1 Activities (88 – 99)
Textbook reference			
HOMEWORK			
ASSESSMENT			
E.g. Informal assessment – Test: marks max			

**MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 3**

TERM 4

Date: from to		Time: 5 hours	
Grade	7	8	9
Topic	CONSTRUCTION OF GEOMETRIC FIGURES		
CAPS pages	45	95	134
Skills and Knowledge	<p>Measuring angles Accurately use a protractor to measure and classify angles:</p> <ul style="list-style-type: none"> • $< 90^\circ$ (acute angles) • Right-angles • $> 90^\circ$ (obtuse angles) • Straight angles • $> 180^\circ$ (reflex angles) <p>Constructions Accurately construct geometric figures appropriately using compass, ruler and protractor, including:</p> <ul style="list-style-type: none"> • angles, to one degree of accuracy • circles • parallel lines • perpendicular lines 	<p>Constructions Accurately construct geometric figures appropriately using a compass, ruler and protractor, including:</p> <ul style="list-style-type: none"> • Bisecting lines and angles • Perpendicular lines at a given point or from a given point • Triangles • Quadrilaterals • Angles of 30°, 45° and 60° and their multiples without using a protractor 	<p>Constructions</p> <ul style="list-style-type: none"> • Accurately construct geometric figures appropriately using a compass, ruler and protractor, including bisecting angles of a triangle • Construct angles of 45°, 30°, 60° and their multiples without using a protractor
		Investigating properties of geometric figures	Investigating properties of geometric figures

Suggested methodology		<p>By construction, investigate the angles in a triangle, focusing on:</p> <ul style="list-style-type: none"> the sum of the interior angles of triangles the size of angles in an equilateral triangle the sides and base angles of an isosceles triangle <p>By construction, investigate sides and angles in quadrilaterals, focusing on:</p> <ul style="list-style-type: none"> the sum of the interior angles of quadrilaterals the sides and opposite angles of parallelograms 	<ul style="list-style-type: none"> By construction, investigate the angles in a triangle, focusing on the relationship between the exterior angle of a triangle and its interior angles By construction, explore the minimum conditions for two triangles to be congruent By construction, investigate sides, angles and diagonals in quadrilaterals, focusing on the diagonals of rectangles, squares, parallelograms, rhombi and kites By construction explore the sum of the interior angles of polygons
	<p>In Grade 7, learners</p> <ul style="list-style-type: none"> Measure angles with a protractor Do geometric constructions using a compass, ruler and protractor <p>Measuring angles</p> <ul style="list-style-type: none"> Learners have to be shown how to place the protractor on the arm of the angle to be measured. Learners also have to learn how to read the size of angles on a protractor. <p>Constructions</p> <ul style="list-style-type: none"> Constructions provide a useful context to explore or consolidate knowledge of angles and shapes. Learners have to be shown how to use a compass to draw circles, although they might have done this in Grade 6. Learners should be aware that the centre of the circle is at the fixed point of the compass and the radius of the circle is dependent on how wide the compass is opened up. Make sure learners understand that arcs are parts of the circles of a particular radius. Initially, learners have to be given careful instructions about how to do the constructions of the various shapes Once they are comfortable with the apparatus and can do the constructions, they can practise by drawing patterns, for example of circles or parallel lines. <p>In Grade 8, all the constructions are new. In Grade 7, learners only constructed angles, perpendicular and parallel lines. Grade 8 learners also use constructions to explore properties of triangles and quadrilaterals</p>		

	<p>Constructions</p> <ul style="list-style-type: none"> • Constructions provide a useful context to explore or consolidate knowledge of angles and shapes • Make sure learners are competent and comfortable with the use of a compass and know how to measure and read angle sizes on a protractor • Revise the constructions of angles if necessary before proceeding with the new constructions • Start with the constructions of lines, so that learners can first explore angle relationships on straight lines. • When constructing triangles learners should draw on known properties and construction of circles. • Construction of special angles without protractors are done by: <ul style="list-style-type: none"> ○ bisecting a right angle to get 45° ○ drawing an equilateral triangle to get 60° ○ bisecting the angles of an equilateral triangle to get 30° <p>In Grade 9, learners:</p> <ul style="list-style-type: none"> • Bisect angles in a triangle • Construct 30° without a protractor • Investigation of new properties of triangles, quadrilaterals and polygons <p>Constructions Same as for Grade 8.</p>						
LTSM							
Resources	Mathematical instruments, geometric sets, colour pens, charts.						
	<table border="1"> <thead> <tr> <th data-bbox="957 1310 1029 1444">Grade 7</th> <th data-bbox="957 660 1029 1310">Grade 8</th> <th data-bbox="957 89 1029 660">Grade 9</th> </tr> </thead> <tbody> <tr> <td data-bbox="1029 1310 1117 1444">WB-1 Activities (25)</td> <td data-bbox="1029 660 1117 1310">WB 2 Activities (132 - 133)</td> <td data-bbox="1029 89 1117 660">WB 1 Activities (39 – 46) WB 2 Activities (121 – 122)</td> </tr> </tbody> </table>	Grade 7	Grade 8	Grade 9	WB-1 Activities (25)	WB 2 Activities (132 - 133)	WB 1 Activities (39 – 46) WB 2 Activities (121 – 122)
Grade 7	Grade 8	Grade 9					
WB-1 Activities (25)	WB 2 Activities (132 - 133)	WB 1 Activities (39 – 46) WB 2 Activities (121 – 122)					
Workbook reference							
Textbook reference							
HOMEWORK							
ASSESSMENT E.g. Informal assessment – Test: marks max							

MATHEMATICS SENIOR PHASE

MULTI GRADE LESSON PLAN 4

TERM 4

Date : from to		Time: 6 hours	
Grade	7	8 (6 hours)	9
Topic	TRANSFORMATION GEOMETRY		
CAPS pages	65	115	129
Skills and Knowledge	<p>Transformations</p> <ul style="list-style-type: none"> Recognise, describe and perform translations, reflections and rotations with geometric figures and shapes on squared paper. Identify and draw lines of symmetry in geometric figures <p>Enlargements and reductions</p> <ul style="list-style-type: none"> Draw enlargements and reductions of geometric figures on squared paper and compare them in terms of shape and size 	<p>Transformations</p> <ul style="list-style-type: none"> Recognise, describe and perform transformations with points on a co-ordinate plane, focusing on: <ul style="list-style-type: none"> Reflecting a point in the X-axis or Y-axis Translating a point within and across quadrants Recognise, describe and perform transformations with triangles on a co-ordinate plane, focusing on the co-ordinates of the vertices when: <ul style="list-style-type: none"> Reflecting a triangle in the X-axis or Y-axis Translating a point within and across quadrants Rotating a triangle around the origin <p>Enlargements and reductions</p> <ul style="list-style-type: none"> Use proportion to describe the effect of enlargement or reduction on area and 	<p>Transformations</p> <ul style="list-style-type: none"> Recognise, describe and perform transformations with points, line segments and simple geometric figures on a co-ordinate plane, focusing on: <ul style="list-style-type: none"> Reflecting a point in the X-axis or Y-axis Translating a point within and across quadrants Reflecting in the line $y = x$ Identify what the transformation of a point is, if given the co-ordinates of its image. <p>Enlargements and reductions</p> <ul style="list-style-type: none"> Use proportion to describe the effect of enlargement or reduction on area and perimeter of geometric figures.

		perimeter of geometric figures.	<ul style="list-style-type: none"> Investigate the co-ordinates of the vertices of figures that have been enlarged or reduced by a given scale factor.
Suggested methodology	<p>What is different to Grade 6 Unlike in Grade 6,</p> <ul style="list-style-type: none"> Learners in Grade 7 have to do transformations on squared paper for accuracy and for enabling them to compare the shape and size of figures. <p>All Grades</p> <ul style="list-style-type: none"> Learners should recognize that translations, reflections and rotations only change the position of the figure and not the shape or size. They should recognize that the above transformations produce congruent figures. They should recognize that enlargements and reductions change size of figures by increasing or decreasing the length of sides, but keeping angles the same, producing similar rather than congruent figures. They should also be able to work out the factor of enlargement or reduction. <p>Grade 8 and 9</p> <ul style="list-style-type: none"> Doing transformations on a co-ordinate plane focuses attention on the coordinates of points and vertices of shapes. Learners do not have to learn general rules for the transformations at this stage, but should explore the way the co-ordinates of points change when performing different transformations with lines or shapes. <p>Examples of transformation problems</p> <ul style="list-style-type: none"> Plot point $A(4;3)$ and A', its image, after reflection in: <ol style="list-style-type: none"> the x-axis the y-axis. Write down the co-ordinates of T' if $T(-2;3)$ is translated 4 units downwards. The perimeter of square $abcd = 48cm$ <ol style="list-style-type: none"> Write down the perimeter of the square if the length of each side is doubled. Will the area of the enlarged square be twice or four times that of the original square? 		
	Grade 9 What is different to Grade 8?		

	<ul style="list-style-type: none"> • Reflection in the line $y = x$ • Identify transformations from co-ordinate points of the image • Co-ordinates of vertices <p>Co-ordinate plane</p> <ul style="list-style-type: none"> • Doing transformations on the co-ordinate plane is an opportunity to practise reading and plotting points with ordered pairs, and links to drawing algebraic graphs. • Make sure learners know how to plot points on the co-ordinate plane and can read the co-ordinates of points off the x-axis and y-axis. • Make sure learners know the convention for writing ordered pairs $(x; y)$ • Point out the differences between the axes in the four quadrants. <p>Focus of transformations</p> <ul style="list-style-type: none"> • Doing transformations on a co-ordinate plane focuses attention on the coordinates of points and vertices of shapes. • Learners should begin to see patterns in terms of the co-ordinate points, for the different transformations, such as: <ul style="list-style-type: none"> -- for translations to the right or left, the x-value changes and y-value stays the same -- for translations up or down, the y-value changes and the x-value stays the same -- for reflections in the y-axis, the x-value changes sign and the y-value stays the same -- for reflections in the x-axis, the y-value changes sign and the x-value stays the same -- for reflections in the line $y = x$, the x-value and y-value are interchanged. • Learners should also be able-- reflection in the line $y = x$ • Identify what the transformation of a point is, if given the co-ordinates of its image <p>Enlargements and reductions</p> <ul style="list-style-type: none"> • Use proportion to describe the effect of enlargement or reduction on area and perimeter of geometric figures • Investigate the co-ordinates of the figures that have been enlarged or reduced by a given scale factor Learners should also be able to work out the factor of enlargement or reduction of a figure.
	LTSM
Resources	Rulers, square paper, dotted paper.

	Grade 7	Grade 8	Grade 9
Workbook reference	WB 2 Activities (86 - 94)	WB 1 Activities (R12) WB 2 Activities (121 - 126)	WB 1 Activities (R12) WB 2 Activities (105 – 113)
Textbook reference			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – Test: marks max			

MATHEMATICS SENIOR PHASE

MULTI GRADE LESSON PLAN 5

TERM 4

Date: from to		Time: 9 hours	
Grade	7	8	9
Topic	GEOMETRY OF 3-D OBJECTS		
CAPS pages	66	116	148
Skills and Knowledge	<p>Classifying 3-D objects</p> <ul style="list-style-type: none"> Describe, sort and compare polyhedra in terms of <ul style="list-style-type: none"> shape and number of faces number of vertices number of edges <p>Building 3-D model</p> <ul style="list-style-type: none"> Revise using nets to create models of geometric solids, including: <ul style="list-style-type: none"> cubes prisms 	<p>Classifying 3-D objects</p> <ul style="list-style-type: none"> Describe, name and compare the 5 Platonic solids in terms of the shape and number of faces, the number of vertices and the number of edges <p>Building 3-D models</p> <ul style="list-style-type: none"> Revise using nets to make models of geometric solids, including: <ul style="list-style-type: none"> cubes prisms pyramids 	<p>Classifying 3-D objects</p> <ul style="list-style-type: none"> Revise properties and definitions of the 5 Platonic solids in terms of the shape and number of faces, the number of vertices and the number of edges Recognize and describe the properties of: <ul style="list-style-type: none"> spheres cylinders <p>Building 3-D models</p> <ul style="list-style-type: none"> Use nets to create models of geometric solids, including: <ul style="list-style-type: none"> cubes prisms pyramids cylinders

GRADE 7**What is different to Grade 6?**

- Most of this work consolidates what has been done in Grade 6.

Polyhedra

Examples of sorting or grouping categories:

- cubes (only square faces)
- rectangular prisms (only rectangular faces)
- triangular prisms (only triangular and rectangular faces)
- pyramids (square and triangular faces)
- cylinders (circular and rectangular faces).

Using and constructing nets

- Using and constructing nets are useful contexts for exploring or consolidating properties of polyhedra.
- Learners should recognize the nets of different solids.
- Learners should draw sketches of the nets using their knowledge of shape and number of faces of the solids, before drawing and cutting out the nets to build models.
- The construction of nets is based on the number and shape of faces of the solids, and do not require measuring of internal angles of polygons.
- Learners have to work out the relative position of the faces of the nets, and use trial and error to match up the edges and vertices, in order to build the 3D object.

GRADE 8**What is different to Grade 7?**

- Naming and comparing Platonic solids
- Nets of pyramids

Platonic solids

- Platonic solids are a special group of polyhedra that have faces that are congruent regular polygons.
- There are only 5 Platonic solids:
 - Tetrahedron
 - Hexahedron (cube)
 - Octahedron
 - Dodecahedron
 - Icosahedrons
- The name of each Platonic solid is derived from its number of faces.
- Platonic solids provide an interesting context in which to investigate the relationship between the number of faces, vertices and edges.

By listing these properties for all the Platonic solids, learners can investigate the pattern that emerges, to come up with the general rule: $V - e + f = 2$, where V = number of vertices; e = number of edges; f = number of faces.

Using and constructing nets

- Using and constructing nets are useful contexts for exploring or consolidating properties of polyhedra.
- Learners should recognize the nets of different solids.
- Learners should make sketches of the nets using their knowledge of the shape and number of faces of the solids, before drawing and cutting out the nets to build models.
- Since learners have more knowledge about the size of angles in equilateral triangles, and can measure angles, their constructions of nets should be more accurate.
- Learners have to work out the relative position of faces of the nets in order to build the 3D model.

GRADE 9

What is different to Grade 8?

- Properties of spheres and cylinders
- Nets of cylinders

Platonic solids (Same as Grade 8)

Using and constructing nets (Same as Grade 9)

L TSM													
Resources	Solids, 3D objects.												
	<table border="1"> <thead> <tr> <th>Grade 7</th> <th>Grade 8</th> <th>Grade 9</th> </tr> </thead> <tbody> <tr> <td>WB 2 Activities (96 - 104)</td> <td>WB 2 Activities (127 - 132)</td> <td>WB 2 Activities (114; 122)</td> </tr> <tr> <td>Textbook reference</td> <td></td> <td></td> </tr> <tr> <td>HOMEWORK</td> <td></td> <td></td> </tr> </tbody> </table>	Grade 7	Grade 8	Grade 9	WB 2 Activities (96 - 104)	WB 2 Activities (127 - 132)	WB 2 Activities (114; 122)	Textbook reference			HOMEWORK		
Grade 7	Grade 8	Grade 9											
WB 2 Activities (96 - 104)	WB 2 Activities (127 - 132)	WB 2 Activities (114; 122)											
Textbook reference													
HOMEWORK													

<p>ASSESSMENT E.g. Informal assessment – Test: marks max</p>			
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MATHEMATICS SENIOR PHASE
MULTI GRADE LESSON PLAN 6

TERM 4

Date: from to		Time: 4.5 hours	
Grade	7	8	9
Topic	PROBABILITY		
CAPS pages	73	117	152
Skills and Knowledge	<p>Probability</p> <ul style="list-style-type: none"> • Perform simple experiments where the possible outcomes are equally likely and: <ul style="list-style-type: none"> ○ list the possible outcomes based on the conditions of the activity ○ determine the probability of each possible outcome using the definition of probability 	<p>Probability</p> <ul style="list-style-type: none"> • Consider a simple situation (with equally likely outcomes) that can be described using probability and: <ul style="list-style-type: none"> ○ list all the possible outcomes ○ determine the probability of each possible outcome using the definition of probability ○ predict with reasons the relative frequency ○ of the possible outcomes for a series of trials based on probability ○ compare relative frequency with probability and explains possible differences 	<p>Probability</p> <ul style="list-style-type: none"> • Consider situations with equally probable outcomes, and: <ul style="list-style-type: none"> ○ determine probabilities for compound events using two-way tables and tree diagrams ○ determine the probabilities for outcomes of events and predict their relative frequency in simple experiments ○ compare relative frequency with probability and explains possible differences
Suggested methodology	<p>GRADE 7 Probability experiments In the Intermediate Phase learners did experiments with coins, dice and spinners. In this grade experiments can be done with other objects, like, different coloured buttons in a bag; choosing specific cards from a deck of cards, etc.</p> <p>Example If you toss a coin there are two possible outcomes (head or tail). The probability of a head is $\frac{1}{2}$ which is equivalent to 50% (since it is one out of two possible).</p>		

GRADE 8

Probability experiments

In the Intermediate Phase and Grade 7 learners did probability experiments with coins, dice and spinners. In Grade 8 doing actual trials of experiments become less important, and learners should consider probability for hypothetical events e.g. the probability of white as a successful outcome on a roulette table, or the probability of getting a Coca Cola at the shop if you know what the total number of drinks is that they stock and how many cans of Coca Cola they have.

Comparing relative frequency and probability

- The relative frequency is the observed number of successful outcomes for a finite sample of trials.
- For example, if you toss a coin 50 times, the results are 27 heads and 23 tails. Define a head as a successful outcome. The relative frequency of heads is: $\frac{27}{50} = 54\%$
- The probability of a head is 50% (one of two likely outcomes). The difference between the relative frequency of 54% and the probability of 50% is due to small sample size.
- The more trials you do, the closer the relative frequency gets to the probability. This can be compared in class by combining results from trials done in groups or pairs.

GRADE 9

Probability experiments

In Grades 8 and 9 probability experiments are less important, and learners should consider probability for hypothetical events. In Grade 9, learners have to consider outcomes of compound events and use two-way tables and tree diagrams to work out the probability of an outcome.

Probability of compound events

For example, what is the probability of a woman giving birth to two boys after each other? A two-way table can be used:

First Birth	Second Birth	
	Boy	Girl
Boy	BB	BG
Girl	GB	GG

Two boys after each other (BB) is 1 of 4 possible outcomes, so the probability of two boys is 1 out of 4, or 25%. How does this probability change if you ask what is the probability of giving birth to three boys after each other? A tree diagram can then be used. See an example of a tree diagram on CAPS p. 152

LTSM			
Resources	Dice, spinners, marbles, bag.		
	Grade 7	Grade 8	Grade 9
Workbook reference	WB 1 Activities (R15) WB 2 Activities (140)	WB 2 Activities (135 - 138)	WB 2 Activities (138 - 1430)
Textbook reference			
HOMEWORK			
ASSESSMENT E.g. Informal assessment – Test: marks max			

TASKS & MEMORANDA

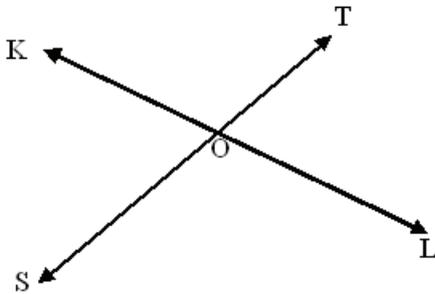
INVESTIGATION EXEMPLAR: GRADE 7

TERM 2

ACTIVITY: INTERSECTING LINES

Intersecting lines are any lines that cut each other at a point, and that point where they cut each other is called the *point of intersection*.

Example



a) Describe the above diagram (diagram in the example) to a friend who does not see it.

(2)

b) Draw **at least** three diagrams with two intersecting lines and label the lines and the diagrams (Diagram 1, Diagram 2, etc.). Label the points of intersection too. The lines in all the sets should **not** be perpendicular to each other

(3)

c) Measure ALL angles that are formed at the points of intersection. Record your measurements in the table like the one drawn below.

DIAGRAM	ANGLE NAME	SIZE

(3 x 4)

d) Explain what you notice about these angles

(1)

e) Which angles are equal in each diagram?

(1)

f) Describe the position of equal angles in relation to each other. [Hint: **Are they next to each other OR on opposite sides of the common vertex?**]

_____ (1)

g) How many sets of equal angles are there in each diagram?

_____ (1)

h) The equal pairs of angles in the diagram are called VERTICALLY OPPOSITE ANGLES. In your own words, define what vertically opposite angles are.

_____ (2)

i) From the observations made during the activity, what conclusion can one make about vertically opposite angles formed by intersecting lines?

_____ (2)

TOTAL 25

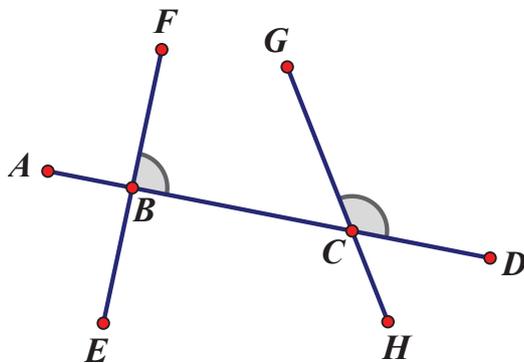
INVESTIGATION EXEMPLAR: GRADE 8

TERM 2

Activity: Corresponding angles

A transversal is a line that is drawn such that it intersects other lines. Angles on the same side of the transversal, and also on the same side of the lines cut by the transversal are called corresponding angles.

Example



In the diagram, AD is a transversal. Angles FBC and GCD are corresponding angles.

Activity

Use the diagrams below for the activity. Parallel lines and corresponding angles are indicated.

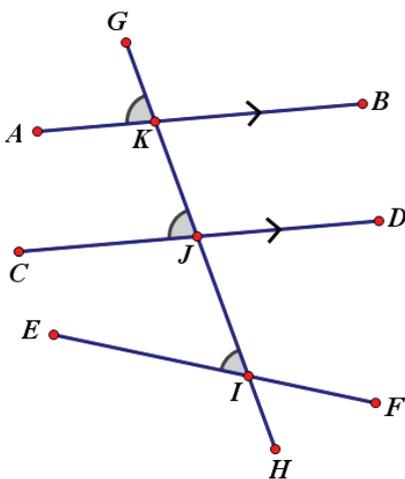


Diagram 1

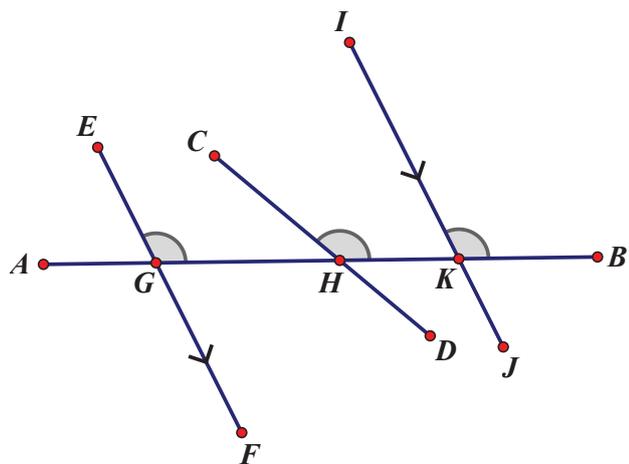


Diagram 2

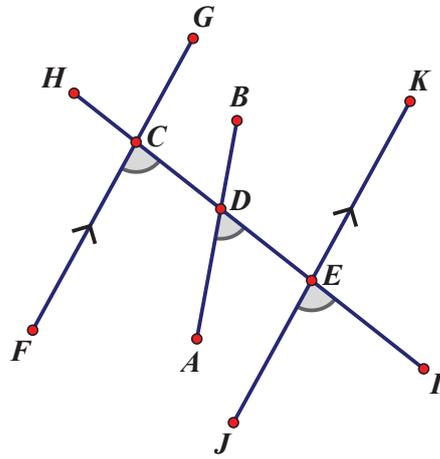


Diagram 3

j) Measure ALL corresponding angles and then complete the table that follows.

DIAGRAM	ANGLE NAME	SIZE
1		
2		
3		

(9)

k) Specify equal pairs of corresponding angles in each diagram.

(3)

l) Which lines form equal corresponding angles if cut by a transversal?

(1)

m) Construct and label your own parallel lines that are cut by a transversal.

(2)

n) Measure and compare corresponding angles

(3)

o) From the observations made during the activity, what conclusion can one make about corresponding angles formed if parallel lines are cut by a transversal?

(2)

TOTAL 25

INVESTIGATION EXEMPLAR: GRADE 9

Relating angles in a triangle

In the diagram 1 below, the marked angle ACD is an exterior angle of triangle ABE . An exterior angle is formed by producing one of the sides. The marked angles BAC and ABC are interior, opposite angles to the exterior angle ACD .

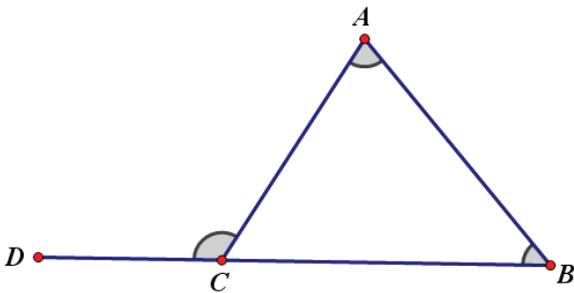


Diagram 1

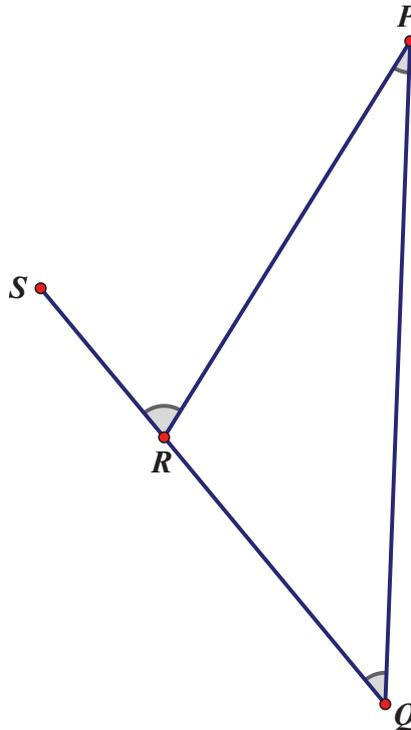


Diagram 2

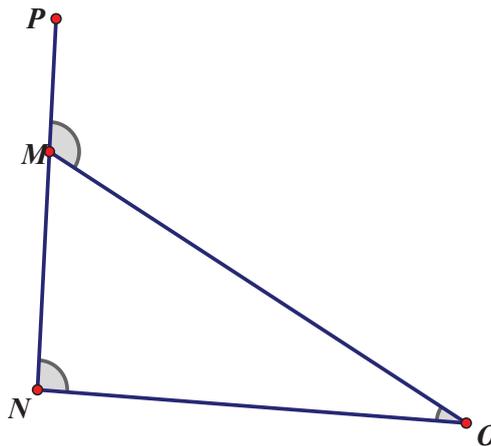


Diagram 3

(a) Measure the marked angles and complete the table below.

Diagram	Interior angle 1	Interior angle 2	Exterior angle	Sum of interior angles
1				
2				
3				

(12)

(b) How does the exterior angle compare to the sum of the interior opposite angles?

_____ (1)

(c) Draw your own triangle with one side produced to form an exterior angle.

(d) Measure and record the size of the exterior angle and the interior opposite angles.

_____ (3)

(e) Is the exterior angle equal to the sum of the interior angle?

_____ (1)

(f) What conclusion can be drawn from the activities?

_____ (1)

TOTAL 25

MULTIGRADE FORMAL ASSESSMENT

MATHEMATICS GRADE 7, 8, 9: FORMAL ASSESSMENT TASK: TERM 1 TEST

Examiner: _____

Time: 1 Hour

Moderator: _____

Date: _____

Total Grade 7 40

Total Grade 8 50

Total Grade 9 75

INSTRUCTIONS:

- Answer all the questions underneath each other.
- Leave a line open between every sum.
- Show all your calculations.
- Write legibly.
- Round off to 2 decimal digits.
- Answer the questions relevant to your grade

QUESTION 1

1.1 Calculate:

GRADE	No		Marks
7,8,9	1.1.1	$-10 + (18)$	(1)
8,9	1.1.2	$(-2)^2(-3)^3$	(3)
8,9	1.1.3	$-4 \times 5 + (-5)^2$	(3)
8,9	1.1.4	$\sqrt[3]{-64} + (-2)^3$	(3)
7,8,9	1.1.5	$\left(\frac{3}{7}\right)^2$	(2)
8,9	1.1.6	$\sqrt{2\frac{7}{9}}$	(3)
9	1.1.7	$-4^2 + (-4)^3$	(3)
9	1.1.8	$\sqrt{169} - \sqrt[3]{-0,064}$	(3)
9	1.1.9	$\sqrt{1\frac{9}{16} \times 1\frac{2}{3} \div 9,3}$	(4)

7	1.1.10	$7\ 836\ 524 + 4\ 853\ 477$	(2)
7	1.1.11	$42\ 746 \div 274$	(2)
7,8	1.2	Arrange the following numbers in ascending order 20; -18; -22; 2; -8; 6	(2)
7,8,9	1.3	Write 54 as the product of its prime factors	(3)
		Grade 7	[7]
		Grade 8	[15]
		Grade 9	[25]
9	1.4	Use prime factors and determine the HCF of 112 and 210	(3)
7,8,9	1.5.1	Write the following ratios in their simplest form $20 : 24 : 44$	(1)
7,8,9	1.5.2	Divide R2500 in the ratio of 2 : 3	(3)
7,8,9	1.6.1	You cover a distance of 18km in 2h30 min. What is your average speed in km/h?	(3)
7,8,9	1.6.2	John buys and sells T-shirts. He buys the shirts at a cost of R50. He sells them at a profit of 70%. Calculate his selling price.	(2)
		Grade 7	[9]
		Grade 8	[9]
		Grade 9	[12]

QUESTION 2

	2.1	Use the number sequence below to answer the questions that follow: $1; 4; 9; 16; \dots$	
7,8,9	2.1.1	Write down the next term in the number sequence.	(1)
7,8,9	2.1.2	Determine the 7 th term in the number sequence.	(2)
7,8,9	2.1.3	State the rule in words of the number sequence.	(1)
7,8,9	2.2	Calculate the value of the following expression if : $a = -2$; $b = 3$ and $c = -1$ Expression: $a + b - (2c)^2$	(2)

- 7,8,9 2.3 Write the following relationship as a symbolic formula:
To calculate the output number (y), 7 is subtracted from the input number(x) and the answer is multiplied by 5. (2)
- 7,8,9 2.4 Write 620 000 000 000 in scientific notation. (2)
- Grade 7 [10]**
Grade 8 [10]
Grade 9 [10]

QUESTION 3

- 3.1 Consider the following expression and answer the questions that follow.
$$2x^4 + y - 3x + 5 + 2y$$
- 7,8,9 3.1.1 How many terms does the expression have? (1)
- 7,8,9 3.1.2 Write down two terms which are alike. (1)
- 7,8,9 3.1.3 What is the exponent of x in the first term? (1)
- 7,8,9 3.1.4 Which term is a constant? (1)
- 8,9 3.1.5 What is the coefficient of the third term? (1)
- Grade 7 [4]**
Grade 8 [5]
Grade 9 [5]

QUESTION 4

- 4.1 Consider the following pattern that is built with matches and answer the questions.

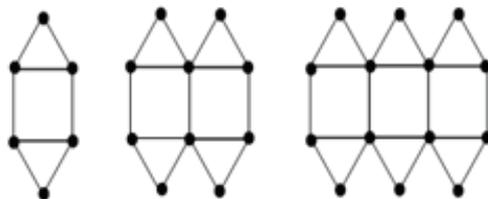


figure 1 figure 2 figure 3

- 7,8,9 4.1.1 Draw the next figure (Fig 4) in the pattern. (1)
- 7,8,9 4.1.2 Consider the following table and write down the values of a and b. (2)
- | | | | | | |
|-------------------------------------|---|----|----|----------|----------|
| Figure (n) | 1 | 2 | 3 | 4 | 10 |
| Number of matches (T _n) | 8 | 15 | 22 | a | b |
- 8,9 4.1.3 Write down the formula for the nth term. (2)
- 7,8,9 4.1.4 Which figure will consist of 50 matches? (2)

7,8,9	4.1.5	How many matches will be needed to make the 25 th figure?	(1)
			Grade 7 [6]
			Grade 8 [8]
			Grade 9 [8]

QUESTION 5

5.1 You receive R2500 from your father on your birthday. You decide to invest the money in the bank for you studies four years from now. The bank gives you the following two options.

OPTION A:

Invest with 8% compound interest per year for four years.

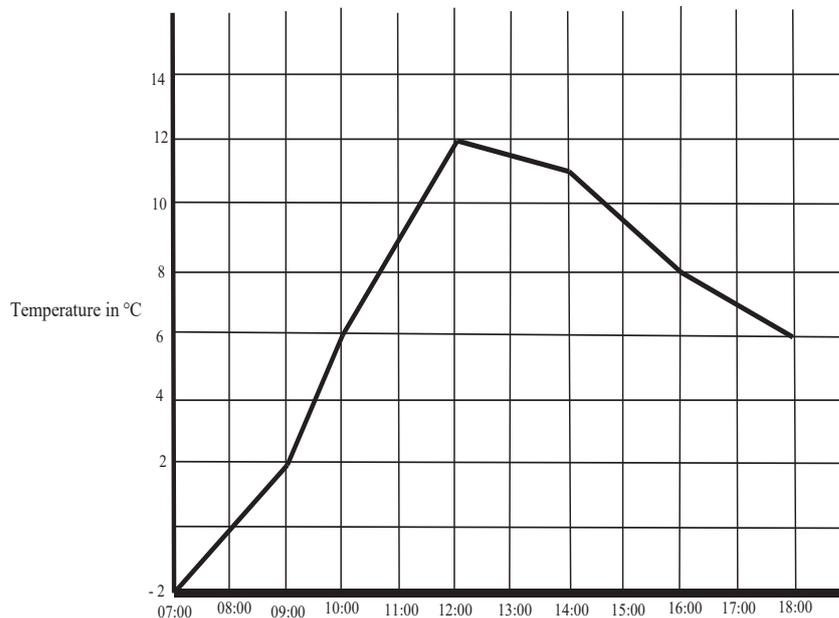
OPTION B:

Invest at 7,5% simple interest rate for four years.

9	5.1.1	Decide which one will generate more money in the given time period.	(7)
9	5.1.2	Calculate the percentage increase if the price of diesel increases from R11,21 per litre to R12,30 per litre. Round your answer off to 2 decimal places.	(4)
9	5.1.3	An aircraft travels at a speed of $0,9 \times 10^3$ km/h for 24 hours. How far has the aircraft travelled? Give the answer in scientific notation.	(3)
		Grade 9	[14]

QUESTION 6

6.1 Study the weather temperature graph provided and answer the questions that follow



7,8	6.1.1	What was the temperature at 7 am?	(1)
7,8	6.1.2	What was the maximum day temperature?	(1)
7,8	6.1.3	What is the difference in temperatures at 18:00 and at 8:00?	(1)
7,9	6.1.4	During which period did the temperature increase?	(1)

Grade 7 [4]

Grade 8 [3]

Grade 9 [1]

TOTAL Grade 7 [40]

TOTAL Grade 8 [50]

TOTAL Grade 9 [75]

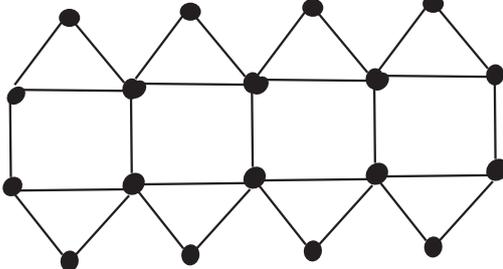
TEST
TERM 1
Gr 7,8,9

M	Method
S	Simplification
KA / CA	Constant accuracy
A	Answer

QUESTION 1		
1.1.1	$-10 + (18)$ $= 8 \checkmark \mathbf{A}$	A= 1 mark
1.1.2	$(-2)^2(-3)^3$ $4\checkmark \mathbf{A} \times -27\checkmark \mathbf{A}$ $= -108 \checkmark \mathbf{CA}$	A=2 marks CA = 1 mark
1.1.3	$-4 \times 5 + (-5)^2$ $= -20 \checkmark \mathbf{S} + 25\checkmark \mathbf{S}$ $= 5\checkmark \mathbf{CA/KA}$	S = -20 1 mark S = 25 1 mark CA/KA = 5 1 mark
1.1.4	$-4 \checkmark \mathbf{S} + (-8) \checkmark \mathbf{S}$ $= -12\checkmark \mathbf{CA/KA}$	S = -4 1 mark S = -8 1 mark CA/KA = -12 1 mark
1.1.5	$\frac{9}{49} \checkmark \mathbf{A} \checkmark \mathbf{A}$	A = 9 1 mark A = 49 1 mark (Answer must be a fraction)

1.1.6	$= \sqrt{\frac{25}{9}}$ $= \frac{5}{3} \checkmark \mathbf{S} \checkmark \mathbf{A} \checkmark \mathbf{A}$	S = 25/9 1 mark A = 5 1 mark A = 3 1 mark
1.1.7	$-4^2 + (-4)^3$ $= -16\checkmark -64 \checkmark \mathbf{M}$ $= -80 \checkmark \mathbf{KA/CA}$	-16: 1 mark -64: 1 mark answer: 1 mark
1.1.8	$\sqrt{169} - \sqrt[3]{-0,064}$ $= 13\checkmark - (-0,4) \checkmark \mathbf{M}$ $= 13 + 0,4$ $= 13,4 \checkmark \mathbf{KA/CA}$	13: 1 mark -0,4: 1 mark/answer: 1 mark
1.1.9	$\sqrt{1\frac{9}{16}} \times 1\frac{2}{3} \div 9\frac{1}{3} \checkmark \mathbf{M}$ $= \sqrt{\frac{25}{16}} \times \frac{5}{3} \div \frac{28}{3} \checkmark \mathbf{M}$ $= \frac{4}{5} \times \frac{5}{3} \times \frac{3}{28} \checkmark \mathbf{M}$ $= \frac{25}{112} \checkmark \mathbf{KA/CA}$	$9\frac{1}{3}$: 1 mark $\sqrt{\frac{25}{16}}$: 1 mark reciprocal: 1 mark answer: 1 mark

1.1.10	$\begin{array}{r} 7\ 836\ 542 \\ + 4\ 853\ 477 \\ \hline 12\ 690\ 019 \end{array}$	019 - 1 mark 12 690 – 1 mark																																			
1.1.11	$42\ 746 \div 274 = 156\ r\ 2$	156 – 1 mark Remainder 2 – 1 mark																																			
1.2	-22 ; -18 ; -8 ; 2 ; 6 ; 20 $\checkmark A$ $\checkmark A$	A = -22 ; -18 ; -8 1 mark A = 2 ; 6 ; 20 1 mark																																			
1.3	<table border="1" style="display: inline-table; vertical-align: top;"> <tbody> <tr><td>2</td><td>54</td></tr> <tr><td>3</td><td>27</td></tr> <tr><td>3</td><td>9</td></tr> <tr><td>3</td><td>3</td></tr> <tr><td></td><td>1</td></tr> </tbody> </table> $\checkmark M$ $\checkmark M$ $2 \times 3 \times 3 \times 3 = 54$ $\checkmark CA$	2	54	3	27	3	9	3	3		1	M = correctly divide 2 (1 mark) M = correctly divide 3 (1 mark) CA/KA = Write as a product (1 mark)																									
2	54																																				
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1.4	<table border="1" style="display: inline-table; vertical-align: top;"> <tbody> <tr><td>2</td><td>112</td><td></td><td>2</td><td>210</td></tr> <tr><td>2</td><td>56</td><td></td><td>3</td><td>105</td></tr> <tr><td>2</td><td>48</td><td></td><td>5</td><td>35</td></tr> <tr><td>2</td><td>24</td><td></td><td>7</td><td>7</td></tr> <tr><td>7</td><td>14</td><td></td><td></td><td>1</td></tr> <tr><td>7</td><td>7</td><td></td><td></td><td></td></tr> <tr><td></td><td>1</td><td></td><td></td><td></td></tr> </tbody> </table> $\checkmark S$ $\checkmark S$ $2 \times 7 = 14$ $\checkmark S$	2	112		2	210	2	56		3	105	2	48		5	35	2	24		7	7	7	14			1	7	7					1				S = 112 correctly divide by prime numbers (1 mark) S = 210 correctly divide by prime numbers (1 mark) A = GGF / HCF = 14
2	112		2	210																																	
2	56		3	105																																	
2	48		5	35																																	
2	24		7	7																																	
7	14			1																																	
7	7																																				
	1																																				
1.5.1	5 : 6 : 11 $\checkmark A$	A = 4 : 6 : 11 (1 A punt/mark)																																			
1.5.2	$\frac{2}{5} \times 2500 = 1000$ $\checkmark M$ $\checkmark A$ $\frac{3}{5} \times 2500 = 1500$ $\checkmark A$	M = $\frac{2}{5} \times 2500$ (1 mark) A = R1000 (1 mark) A = R1500 (1 mark)																																			
1.6.1	Average speed = $\frac{18\ km}{2,5\ h} = 7,2\ km/h$ $\checkmark M$; $\checkmark C$; $\checkmark CA/KA$	M = formula (1 mark) C = convert to 2,5 h (1 mark) CA/KA = 7,2 km(1 mark)																																			
1.6.2	$\frac{70}{100} \times R50 = R35$ $\checkmark S$ $= R50 + R35 = R85$ OF /OR $1,7 \checkmark S \times 50 = R85$ $\checkmark CA/KA$	S = R35/1,7 (1 mark) CA/KA = R85 (1 mark)																																			
QUESTION 2																																					
2.1.1	25 $\checkmark A$	A = 1 mark																																			
2.1.2	$T_7 = 49$ $\checkmark \checkmark A$	A = 2 marks																																			
2.1.3	Each term number is squared. $\checkmark A$	A = 1 mark																																			
2.2	$= -2 + 3 - (2 \cdot -1)^2$ $\checkmark S$ $= -2 + 3 - 4$ $= -3$ $\checkmark CA / KA$	S = 1 mark CA/KA = 1 mark																																			
2.3	$y = 5(x - 7)$ $\checkmark A \checkmark A$	A = 2 marks																																			
2.4	$\checkmark A$ $6,2 \times 10^{11}$ $\checkmark A$	A = 2 marks																																			

QUESTION 3		
3.1		
3.1.1	5 ✓ A	A = 1 mark
3.1.2	$y + 2y$ ✓ A	A = 1 mark
3.1.3	4 ✓ A	A = 1 mark
3.1.4	4 th term ✓ A	A = 1 mark
3.1.5	-3 ✓ A	A = 1 mark
QUESTION 4		
4.1.1		correct pattern (1)
4.1.2	$a = 29$ ✓ $b = 71$ ✓	value of a (1) value of b (1)
4.1.3	$T_n = 7n + 1$ ✓ ✓	$7n$ (1) 1 (1)
4.1.4	$T_n = 7n + 1$ $50 = 7n + 1$ ✓ $n = 7$ ✓	substitution of 50 (1) (CA) answer (1)
4.1.5	$T_{25} = 7(25) + 1$ $= 176$ ✓	correct answer (1)

QUESTION 5		
5.1.1	Option A: $A = P(1 + i)^n$ ✓ M $= 2\,500(1 + 0,08)^4$ ✓ M $= R3\,401,22$ ✓ KA/CA Option B: $A = P(1 + in)$ ✓ M $= 2\,500(1 + 0,75 \times 4)$ ✓ M $= R3\,250$ ✓ KA/CA \therefore Option A is better ✓ KA/CA	formula: 1 mark substitution: 1 mark answer: 1 mark formula: 1 mark substitution: 1 mark answer: 1 mark Option A: 1 mark
5.1.2	$\% \text{ verhoging / increase} = \frac{NP - OP}{OP} \times 100$ $= \frac{12,30 - 11,21}{11,21} \times 100$ $= 9,72\%$	$12,30 - 11,21$: 1 mark $11,21/\text{divide by } 11,21$: 1 mark $\times 100$: 1 mark answer: 1 mark If answer not rounded off to 2 dec places: only $\frac{3}{4}$
5.1.3	distance = speed \times time ✓ M $= 0,9 \times 10^3 \times 24$ ✓ M $= 2,16 \times 10^4 \text{ km}$ ✓ KA/CA	Formula/: 1 mark $0,9 \times 10^3 \times 24$: 1 mark answer: 1 mark

EXEMPLAR TEST GRADE 8 TERM 1

Marks : 60

Instructions to learners:

1. Read all the instructions carefully.
2. Answer Questions 1 – 8 in the spaces or frames provided.
3. Show all working on the question paper.
4. The test duration is 90 minutes.

QUESTION 1

Calculate each of the following:

1.1	$235\,292 + 782\,354$ _____ _____ _____	(2)
1.2	$9\,634\,567 - 6\,546\,321$ _____ _____ _____	(2)

1.3	$12\,421 \times 25$ <hr/> <hr/> <hr/> <hr/>	
	<hr/> <hr/>	(3)
1.3	$12\,421 \times 25$ <hr/> <hr/> <hr/> <hr/>	
	<hr/> <hr/>	(3)
1.4	$10\,625 \div 25$ <hr/> <hr/> <hr/> <hr/>	
	<hr/> <hr/>	(3)
1.5	$90 + 18 \div 2 \times 8 - 13$ <hr/> <hr/> <hr/>	
	<hr/> <hr/>	(3)

QUESTION 2

Given the following numbers: 144 and 150	
2.1	Write down the first 5 multiples of 144 and 150 <hr/> <hr/> <hr/>
	(2)

2.2	Write 144 and 150 as product of their prime factors.	(2)
2.3	Write down the HCF of 120 and 144	(2)
QUESTION 3		
3.1	Lucy earned R4500 and gave 10% of it to her mother. How much did she give to her?	(2)
3.2	Tshepo invested R1 500 into his savings account. The investment grew/increased by 10% simple interest per year. How much was the investment worth at the end of the third year?	(1)
3.3	Thobeka wants to order a book that costs \$56,67. The rand-dollar exchange rate is R11 to a dollar. What is the price of the book in rands?	(3)
3.4	Calculate a discount of 6% on each of the following marked prices of article R3 600.	(3)
QUESTION 4		
4.1	Write down the ratio 15 : 27 as a fraction and then simplify if possible. _____ _____ _____	(2)
4.2	Tom has R7 and Lucy has R9; what is the ratio of the money Tom has to Lucy? _____	(1)
4.3	The ratio of boys to girls in a class is 7 : 5. If there are 36 learners in a class, how many are boys and how many are girls? _____ _____ _____	(4)
4.4	Divide 24 in the ratio 1 : 2 : 5 _____ _____ _____	(3)
4.5	If 5kg of nuts cost R40 how much will 7kg cost? _____ _____ _____	(2)

QUESTION 5

5.1	Arrange the following sets of numbers in an ascending order. 63 ; - 49 ; - 56 ; 0 ; - 28 _____	(1)
5.2	Fill in < , > , =	

	5.2.1	0 ____ - 999	(1)
	5.2.2	- 5,5 ____ 0,5	(1)
	5.2.3	67 ____ 60 + 7	(1)
5.3	Fill in the missing numbers: 3; 12, 48; -----; -----		(2)

5.4	Calculate each of the following.		
5.4.1	4 + (-1) - (-9)	_____	(1)
5.4.2	200 ÷ (+4) × (-2)	_____	(1)
			[8]

QUESTION 6

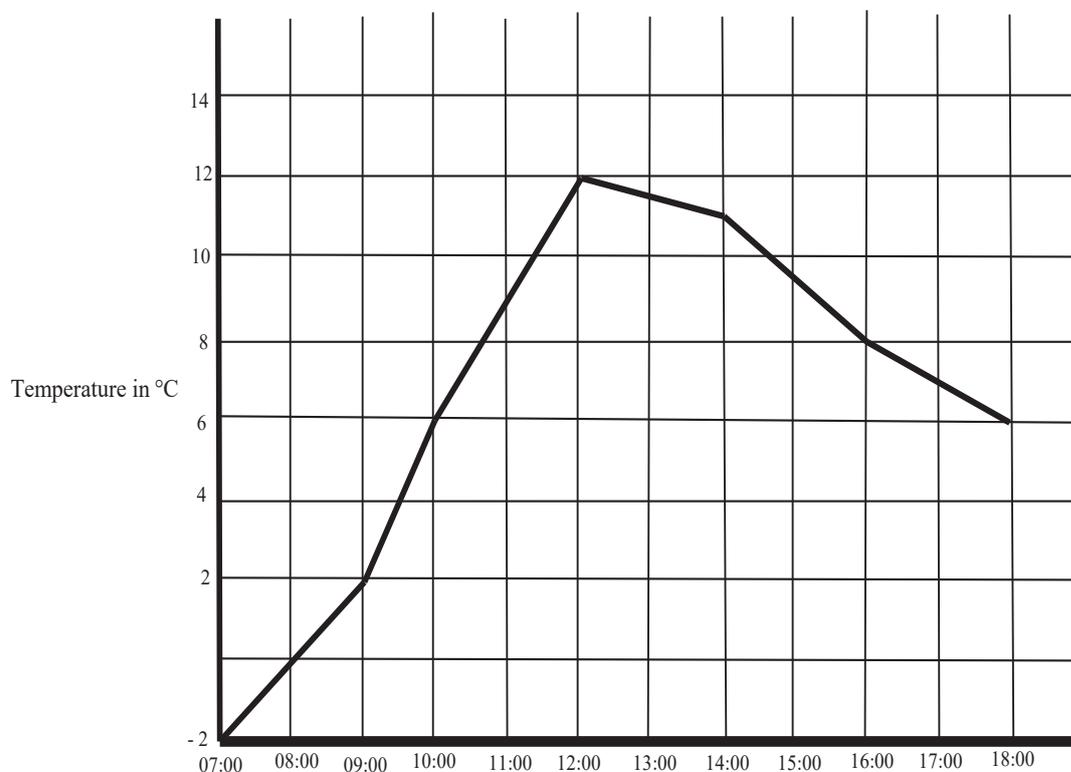
6.1	$(-6)^2$	_____	(1)
6.2	$\sqrt[3]{125}$	_____	(1)
			[2]

QUESTION 7

7.1	Determine the rule and solve m and n .																				
	<table border="1" style="margin-left: 20px;"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td style="background-color: #cccccc;"></td> <td>m</td> <td>15</td> <td></td> <td></td> </tr> <tr> <td>y</td> <td>1</td> <td>4</td> <td>9</td> <td style="background-color: #cccccc;"></td> <td>64</td> <td>n</td> <td></td> <td></td> </tr> </table>	x	1	2	3		m	15			y	1	4	9		64	n			<p>_____</p> <p>_____</p> <p>_____</p>	(3)
x	1	2	3		m	15															
y	1	4	9		64	n															

QUESTION 8

Study the weather temperature graph provided and answer the questions that follow



8.1	What was the temperature at 7 am? _____	(1)
8.2	What was the maximum day temperature? _____	(1)
8.3	What is the difference in temperatures at 18:00 and at 8:00? _____	(1)
8.4	During which period did the temperature increase? _____	(1)
8.5	Do you think the graph represents a summer or winter day in South Africa? Give a reason for your answer.	(2)

EXEMPLAR TEST MEMO GRADE 8 TERM 1

Marks : 60

QUESTION 1

1.1	$\begin{array}{r} 235\ 292 \\ + 782\ 354 \\ \hline 1\ 017\ 646 \\ \hline \end{array}$ <p align="center">√ √</p>	For the correct answer: full marks. (2)
1.2	$\begin{array}{r} 9\ 634\ 567 \\ - 6\ 546\ 321 \\ \hline 3\ 088\ 246 \\ \hline \end{array}$ <p align="center">√ √</p>	For the correct answer: full marks. (2)
1.3	$\begin{array}{r} 12\ 421 \\ \times 25 \\ \hline 62\ 105 \\ + 248\ 420 \\ \hline 310\ 525 \\ \hline \end{array}$ <p align="center">√ √ √</p>	For the correct answer: full marks. (3)
1.4	$10\ 625 \div 25$ $\begin{array}{r} 425 \\ 25 \overline{)10625} \\ \underline{100} \\ 0062 \\ \underline{0050} \\ 00125 \\ \underline{00125} \\ 00000 \end{array}$ <p align="center">√√√</p>	For the correct answer: full marks. (3)
QUESTION 2		
1.5	$90 + 18 \div 2 \times 8 - 13$ $= 90 + 9 \times 8 - 13$ $= 90 + 72 - 13$ $= 149$	For the correct answer: full marks. (3)
2.1	Write down the first 5 multiples of 144 and 150 Multiples of 144 = {144 ; 288 ; 432 ; 576 ; 720} √ Multiples of 150 = {150 ; 300 ; 450 ; 600 ; 750} √	(2)
2.2	$120 = 2^3 \times 3 \times 5$ $144 = 2^4 \times 3^2$	(2)
2.3	HCF of 120 and 144 = 24 √	(1)
[5]		

QUESTION 3

3.1	10% of R4 500 $= 10\% \times 4\,500 \checkmark$ $= 450$ She gave her mother R450. \checkmark	(2)
3.2	$SI = \frac{Pnr}{100}$ $= \frac{1\,500 \times 3 \times 10}{100} \checkmark$ $= R450 \checkmark$ At the end of the third year the investment was worth R1 950. \checkmark	(3)
3.3	$11 \times 56,67 = R623,37 \checkmark\checkmark\checkmark$	(3)
3.4	$\frac{6}{100} \times 3600$ $= R216$	(3)
		[8]

QUESTION 4

4.1	Write down the ratio 15 : 27 as a fraction and then simplify if possible. $\frac{15}{27} = \frac{5}{9} \checkmark\checkmark$	(2)
4.2	7 : 5	(1)
4.3	$\frac{7}{12} \times 36 \checkmark$ $= 21 \text{ boys } \checkmark$ $\frac{5}{12} \times 36 \checkmark$ $= 15 \text{ girls. } \checkmark$	(4)
4.4	$\frac{1}{8} \times 24$ $= 3 \checkmark$ $\frac{2}{8} \times 24$ $= 6 \checkmark$ $\frac{5}{8} \times 24$ $= 15 \checkmark$	(3)
4.5	If 5kg of nuts cost R40 how much will 7kg cost? 5kg costs R40 1kg cost R8 $\therefore 7\text{kg will cost } 7 \times R8 = R56 \checkmark\checkmark$	(2)

QUESTION 5

5.1		- 56 ; - 49 ; ; - 28 ; 0 ; 63	(1)
5.2			
	5.2.1	$0 > - 999$	(1)
	5.2.2	$- 5,5 < 0,5$	(1)
	5.2.3	$67 = 60 + 7$	(1)
5.3		3; 12, 48; 192; 768 $\sqrt{\sqrt{\quad}}$	(2)
5.4			
	5.4.1	$4 + (-1) - (-9) = 12$	(1)
	5.4.2	$(+6) - (-2) = + 8$	(1)
	5.4.3	$(+4) + (-1) - (-9)$ $= 4 - 1 + 9$ $= 12 \checkmark$	(1)
	5.4.4	$200 \div 4 \times (-2)$ $= - 100 \checkmark$	(1)
			[10]

QUESTION 6

6.1		$(- 6)^2 = 36 \checkmark$	(1)
6.2		$\sqrt[3]{125} = 5 \checkmark$	(1)
			[2]

QUESTION 7

			[3]																		
		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 10%;">x</td> <td style="width: 10%;">1</td> <td style="width: 10%;">2</td> <td style="width: 10%;">3</td> <td style="width: 10%; background-color: #cccccc;"></td> <td style="width: 10%;">m</td> <td style="width: 10%;">15</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> <tr> <td>y</td> <td>1</td> <td>4</td> <td>9</td> <td style="background-color: #cccccc;"></td> <td>64</td> <td>n</td> <td></td> <td></td> </tr> </table>	x	1	2	3		m	15			y	1	4	9		64	n			
x	1	2	3		m	15															
y	1	4	9		64	n															
		Rule $y = x^2 \checkmark$																			
		$m = 8 \checkmark$																			
		$n = 225 \checkmark$																			

QUESTION 8

8.1		- 2°C	(1)
8.2		12°C	(1)
8.3		$6^\circ\text{C} - 0^\circ\text{C} = 6^\circ\text{C}$	(1)
8.4		From 7:00 to 12:00	(1)
8.5		The graph represents a winter day in South Africa. The maximum temperature of 12°C is very cold.	(2)
			[6]

GRADE 9 EXEMPLAR TEST - TERM 1

Marks : 60

Instructions to learners:

1. Read all the instructions carefully.
2. Answer Questions 1 – 8 in the spaces or frames provided.
3. Show all working on the question paper.
4. The test duration is 90 minutes

QUESTION 1

Calculate each of the following.

1.1	$81\,892 + 321\,456$ _____ _____ _____	(2)
-----	---	-----

1.2	$1\,234\,567 - 654\,321$ _____ _____ _____	(2)
-----	---	-----

1.3	$26\,342 \times 32$ _____ _____ _____ _____	(3)
-----	---	-----

1.4	$7550 \div 25$ _____ _____ _____ _____	(3)
-----	--	-----

1.5	$60 + 10 \div 2 \times 5 - 1$ _____ _____ _____	(2)
-----	--	-----

		[12]
--	--	-------------



QUESTION 2

Given the following numbers: 120 and 144		
2.1	Write 120 and 144 as products of their prime factors. _____ _____ _____	(2)
2.2	Write down the LCM and HCF in 120 and 144 _____ _____ _____ _____	(2)
		[4]

QUESTION 3 [calculators may be used]

3.1	Lucy earned R4500 and gave 15% of it to her mother, how much did she give to her? _____ _____ _____	(2)
3.2	Tshepo invested R1 500 into his savings account. The investment grew /increased by 10 % compound interest per year. How much was the investment worth at the end of the third year? _____ _____ _____ _____	(3)
3.3	The marked prices of an article is R850. A discount of 15% is offered to customers who pay cash. Calculate how much a customer who pays cash will actually pay.	(3)
3.4	Sara buys a flat screen television on hire purchase. The cash price is R4 199. She has to pay a deposit of R950 and 12 monthly instalments of R360. Calculate the total hire purchase price.	(4)
3.5	Tim bought £650 at the foreign exchange desk at Gatwick Airport in the UK at a rate	(4)

	of R15,66 per £1. The desk also charged 2,5% commission on the transaction. How much did Tim spend to buy the pounds?	
		(16)
QUESTION 4		
4.1	Write down the ratio 45 : 60 as a fraction and then simplify if possible. _____ _____ _____	(2)
4.2	To make biscuits of a certain kind, 5 parts of flour has to be mixed with 2 parts of oatmeal, and 1 part of cocoa powder. How much oatmeal and how much cocoa powder must be used if 500 g of flour is used? _____ _____ _____	(4)
4.4	Divide 60 in the ratio 3 : 2 : 1 _____ _____ _____	(3)
4.5	If 7kg of nuts cost R50 how much will 16kg cost? _____ _____ _____	(2)
		[11]
QUESTION 5		
5.1	Calculate $-15 + (-14) - 9$ _____	(2)
5.2	Calculate: $(-30) \times (-10) - (-30) \times (-8)$	(2)
5.3	Calculate each of the following: $4p - 6q + (-5p) - (4q)$	(2)
		[6]

QUESTION 6

Determine the values of each of the following.

6.1

$$(-6)^2$$

(1)

6.2

$$\sqrt{100 - 36}$$

(1)

[2]

QUESTION 7

7.1

Study the table below.

x	1	2	3		m	15		
y	2	5	10		65	n		

7.1.1 Determine the value of m and n

7.1.2 Write down the rule you use to calculate m and n .

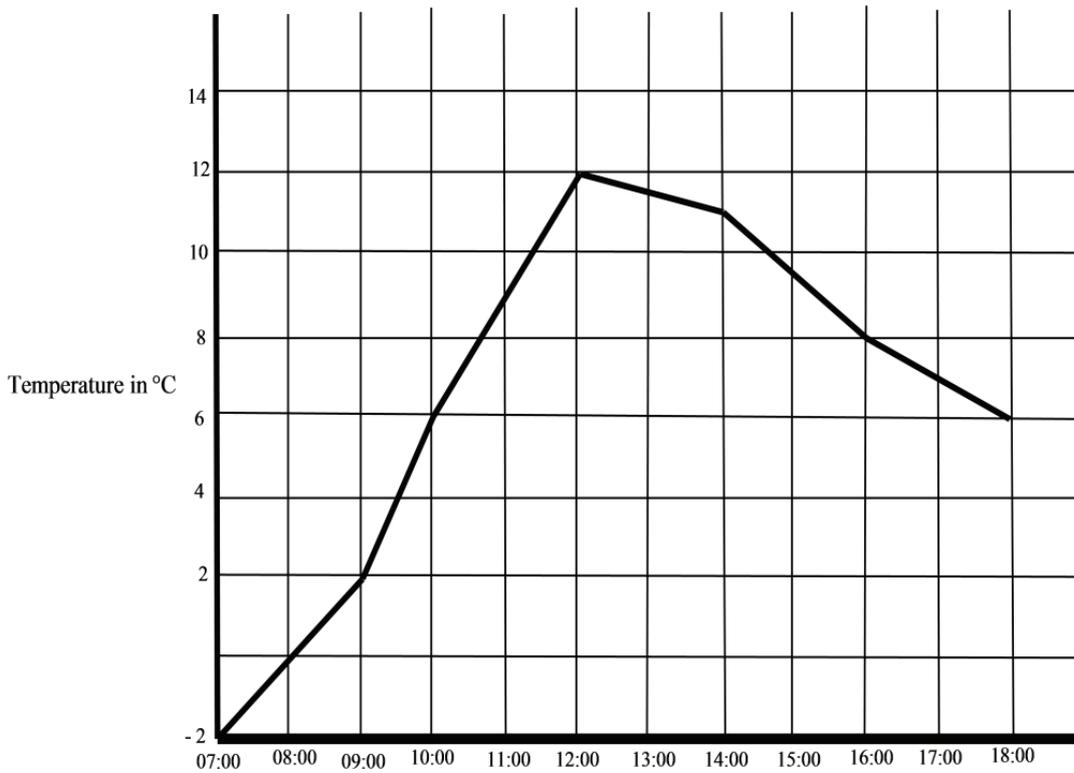
(2)

(1)

[3]

QUESTION 8

Study the weather temperature graph provided and answer the questions that follow



8.1	What was the temperature at 7 am? _____	(1)
8.2	What was the maximum day temperature? _____	(1)
8.3	What is the difference in temperatures at 18:00 and at 8:00? _____	(1)
8.4	During which period did the temperature increase? _____	(1)
8.5	Do you think the graph represents a summer or winter day in South Africa? Give a reason for your answer. _____ _____	(2)
		[6]

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8		%		Req %
	12	6	11	12	8	2	3	6	60	100		
R	12	6		5			3		26	43		45
CP			11	7					18	30		20
K					6	2		6	14	23		25
PS					2				2	3		10

GRADE 9 EXEMPLAR TEST MEMO - TERM 1

Marks : 60

QUESTION 1

1.1	$\begin{array}{r} 81\ 892 \\ + 321\ 456 \\ \hline 403\ 348 \\ \checkmark \quad \checkmark \end{array}$	For the correct answer: full marks. (2)
1.2	$\begin{array}{r} 1\ 234\ 567 \\ - 654\ 321 \\ \hline 580\ 246 \\ \checkmark \quad \checkmark \end{array}$	For the correct answer: full marks. (2)
1.3	$\begin{array}{r} 26\ 342 \\ \times 32 \\ \hline 52\ 684 \\ + 790\ 260 \\ \hline 842\ 944 \\ \checkmark \quad \checkmark \end{array} \quad \checkmark$	For the correct answer: full marks. (3)
1.4	$7550 \div 25$ $\checkmark\checkmark\checkmark$	For the correct answer: full marks. (3)
1.5	$60 + 10 \div 2 \times 5 - 1$ $= 60 + 25 - 1 \quad \checkmark$ $= 84 \quad \checkmark$	For the correct answer: full marks. (2)
		[12]

QUESTION 2

2.1	$120 = 2 \times 2 \times 2 \times 3 \times 5 \quad \checkmark$ $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \quad \checkmark$	(2)
2.2	LCM of 120 and 144 = 720 \checkmark HCF of 120 and 144 = 24 \checkmark	(2)
		[4]

QUESTION 3

3.1	$15\% \text{ of R4 500}$ $= 15\% \times 4\ 500 \quad \checkmark$ $= 675$ She gave her mother R675. \checkmark	(2)
-----	--	-----



3.2	$CI = P(1+i)^n$ $= 1500(1+0,1)^3 \quad \checkmark$ $=$ $= R1996,50 \quad \checkmark$ At the end of the third year the investment was worth R1996,50. \checkmark	(3)
3.3	$R850 \times 15 \div 100 = R 127,50 \checkmark$ $= R850 - R127,50 \checkmark$ $= R722,50 \checkmark$	(3)
3.4	$R950 + (R360 \times 12) \checkmark \checkmark$ $= R950 + R4320 \checkmark$ $= R5270 \checkmark$	(4)
3.5	$R15,66 \times \text{£}650 = R 10 179 \times 2,5 \div 100$ $= R 254,48 \checkmark \checkmark$ $= R254,48 + R 10 179 = R10 433, 48 \checkmark \checkmark$	(4)
		[16]
QUESTION 4		
4.1	Write down the ratio 15 : 27 as a fraction and then simplify if possible. $= \frac{15}{27} \checkmark$ $= \frac{5}{9} \checkmark$	(2)
4.2	200 g of oatmeal, $\checkmark \checkmark$ and 100g of cocoa powder. $\checkmark \checkmark$	(4)
4.4	$60 \times 3 \div 6 = 30 \quad \checkmark$ $60 \times 2 \div 6 = 20 \checkmark$ $60 \times 1 \div 6 = 10 \quad \checkmark$	(3)
4.5	If 5kg of nuts cost R40 how much will 7kg cost? 5kg costs R40 1kg cost R8 7kg will cost $7 \times R8 = R56 \quad \checkmark \checkmark$	(2)
		[11]

QUESTION 5

5.1	$-15 + (-14) - 9 \checkmark$ $= -15 - 14 - 9 = -38 \checkmark$	(2)
5.2	$(-30) \times (-10) - (-30) \times (-8)$ $= 300 - 240 \checkmark$ $= 60 \checkmark$	(2)
5.3		
5.3.1	$4p - 6q + (-5p) - (4q)$ $= 4p - 5p - 6q - 4q$ $= -p - 10q$	(2)
		[6]

QUESTION 6

6.1	$(-6)^2 = 36 \checkmark$	(1)
6.2	$= \sqrt{100 - 36}$ $= \sqrt{64}$ $= 8$	(1)
		[2]

QUESTION 7

	<table border="1"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td></td> <td>m</td> <td>15</td> <td></td> <td></td> </tr> <tr> <td>y</td> <td>2</td> <td>5</td> <td>10</td> <td></td> <td>65</td> <td>n</td> <td></td> <td></td> </tr> </table>	x	1	2	3		m	15			y	2	5	10		65	n			(2)
x	1	2	3		m	15														
y	2	5	10		65	n														
	7.1.1 $m = 8 \checkmark$ and $n = 226 \checkmark$	(1)																		
	7.1.2 square the value of "x" and add 1 or $y = x^2 + 1 \checkmark$																			
		[3]																		

QUESTION 8

8.1	-2°C	(1)
8.2	12°C	(1)
8.3	6°C - 0°C = 6C	(1)
8.4	From 7:00 to 12:00	(1)
8.5	The graph represents a winter day in South Africa. The minimum temperature is -2°C maximum temperature of 12°C is very cold.	(2)
		[6]

GRADE 9 EXEMPLAR TEST MEMO - TERM 1

Marks : 60

QUESTION 1

1.1	$\begin{array}{r} 81\ 892 \\ + 321\ 456 \\ \hline 403\ 348 \\ \checkmark \quad \checkmark \end{array}$	For the correct answer: full marks. (2)
1.2	$\begin{array}{r} 1\ 234\ 567 \\ - 654\ 321 \\ \hline 580\ 246 \\ \checkmark \quad \checkmark \end{array}$	For the correct answer: full marks. (2)
1.3	$\begin{array}{r} 26\ 342 \\ \times 32 \\ \hline 52\ 684 \\ + 790\ 260 \\ \hline 842\ 944 \\ \checkmark \quad \checkmark \end{array} \quad \checkmark$	For the correct answer: full marks. (3)
1.4	$7550 \div 25$ $\checkmark\checkmark\checkmark$	For the correct answer: full marks. (3)
1.5	$60 + 10 \div 2 \times 5 - 1$ $= 60 + 25 - 1 \quad \checkmark$ $= 84 \quad \checkmark$	For the correct answer: full marks. (2)
		[12]

QUESTION 2

2.1	$120 = 2 \times 2 \times 2 \times 3 \times 5 \quad \checkmark$ $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \quad \checkmark$	(2)
2.2	LCM of 120 and 144 = 720 \checkmark HCF of 120 and 144 = 24 \checkmark	(2)
		[4]

QUESTION 3

3.1	$15\% \text{ of R4 500}$ $= 15\% \times 4\ 500 \quad \checkmark$ $= 675$ She gave her mother R675. \checkmark	(2)
3.2	$CI = P(1+i)^n$	

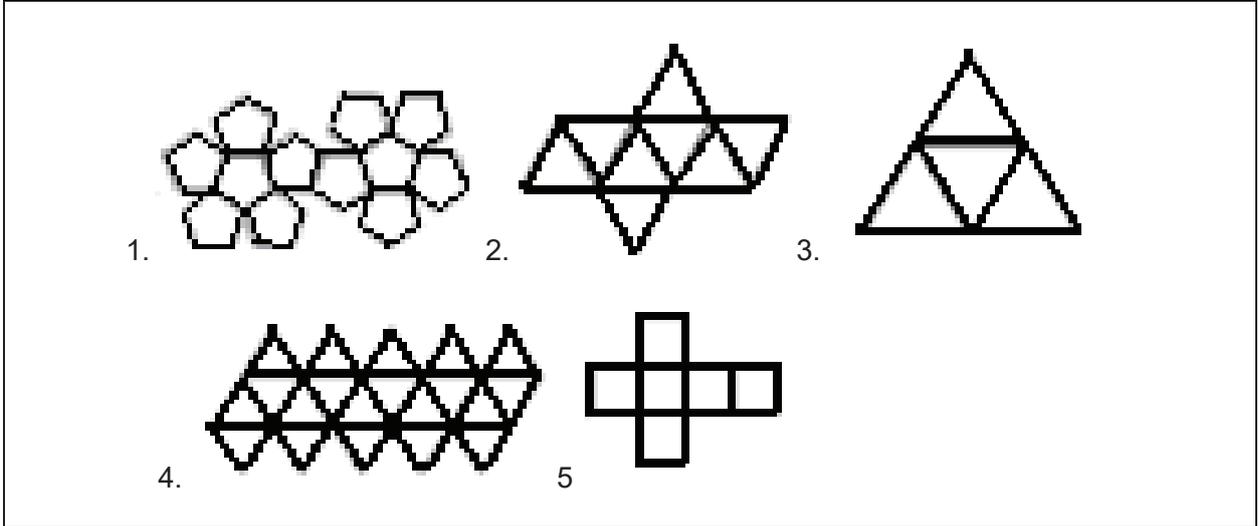
	$= 1500(1+0,1)^3 \quad \checkmark$ $=$ $= R1996,50 \quad \checkmark$ <p>At the end of the third year the investment was worth R1996,50. \checkmark</p>	(3)
3.3	$R850 \times 15 \div 100 = R 127,50 \checkmark$ $= R850 - R127,50 \checkmark$ $= R722,50 \checkmark$	(3)
3.4	$R950 + (R360 \times 12) \checkmark \checkmark$ $= R950 + R4320 \checkmark$ $= R5270 \checkmark$	(4)
3.5	$R15,66 \times \text{£}650 = R 10 179 \times 2,5 \div 100$ $= R 254,48 \checkmark \checkmark$ $= R254,48 + R 10 179 = R10 433, 48 \checkmark \checkmark$	(4)
		[16]
QUESTION 4		
4.1	<p>Write down the ratio 15 : 27 as a fraction and then simplify if possible.</p> $= \frac{15}{27} \checkmark$ $= \frac{5}{9} \checkmark$	(2)
4.2	200 g of oatmeal, $\checkmark \checkmark$ and 100g of cocoa powder. $\checkmark \checkmark$	(4)
4.4	$60 \times 3 \div 6 = 30 \quad \checkmark$ $60 \times 2 \div 6 = 20 \checkmark$ $60 \times 1 \div 6 = 10 \quad \checkmark$	(3)
4.5	<p>If 5kg of nuts cost R40 how much will 7kg cost?</p> <p>5kg costs R40 1kg cost R8 7kg will cost $7 \times R8 = R56 \quad \checkmark \checkmark$</p>	(2)
		[11]
QUESTION 5		
5.1	$-15 + (-14) - 9 \quad \checkmark$ $= -15 -14 - 9 = - 38 \quad \checkmark$	(2)

5.2	$(-30) \times (-10) - (-30) \times (-8)$ $= 300 - 240 \checkmark$ $= 60 \checkmark$	(2)																		
		(2)																		
5.3																				
5.3.1	$4p - 6q + (-5p) - (4q)$ $= 4p - 5p - 6q - 4q$ $= -p - 10q$	(2)																		
		[6]																		
QUESTION 6																				
6.1	$(-6)^2 = 36 \checkmark$	(1)																		
6.2	$= \sqrt{100 - 36}$ $= \sqrt{64}$ $= 8$	(1)																		
		[2]																		
QUESTION 7																				
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td style="background-color: #cccccc;"></td> <td>m</td> <td>15</td> <td></td> <td></td> </tr> <tr> <td>y</td> <td>2</td> <td>5</td> <td>10</td> <td style="background-color: #cccccc;"></td> <td>65</td> <td>n</td> <td></td> <td></td> </tr> </tbody> </table> <p>7.1.1 $m = 8 \checkmark$ and $n = 226 \checkmark$</p> <p>7.1.2 square the value of "x" and add 1 or $y = x^2 + 1 \checkmark$</p>	x	1	2	3		m	15			y	2	5	10		65	n			(2)
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SENIOR PHASE EXEMPLAR PROJECT

QUESTION 1

Study the nets provided. [Grade 8 and 9 only]



Which net would you link to each of the polyhedra listed below? Write the number of the net next to the name of the correct polyhedron. Explain each answer

- a) A tetrahedron -

- b) A hexahedron/Cube -

- c) An octahedron -

- d) A dodecahedron -

- e) An icosahedron -

(10)

f) What is the collective name for the group of polyhedra above?
_____ (1)

g) What is common in the group of polyhedra provided above? Name any TWO things.

_____ (4)

QUESTION 2 [All Grades]

Cut out each of the nets provided and build each polyhedron. You will need a pair of scissors and glue to complete this section. You may need to use cardboard to make your polyhedra rigid. Marks will be awarded for:

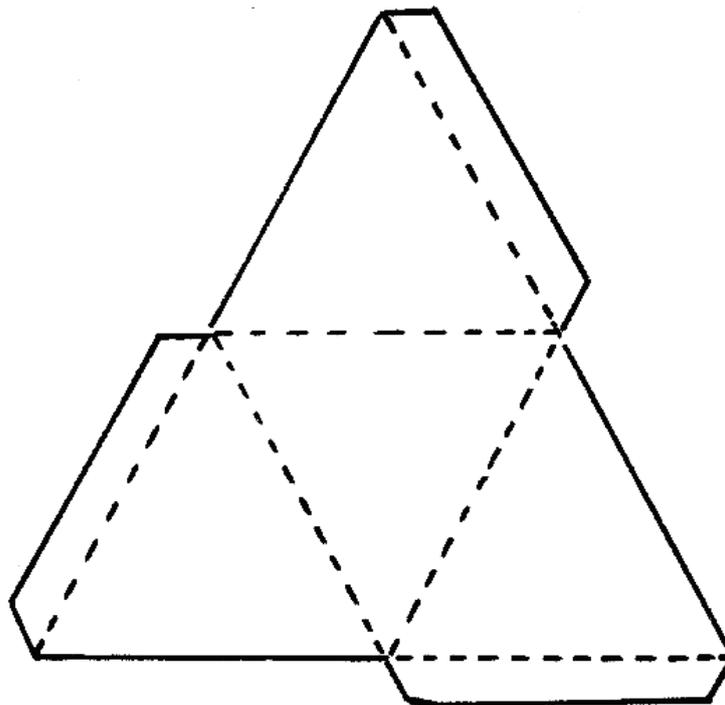
- Cutting correctly leaving flaps for folding.
- Accuracy
- Neatness

QUESTION 3 [All Grades]

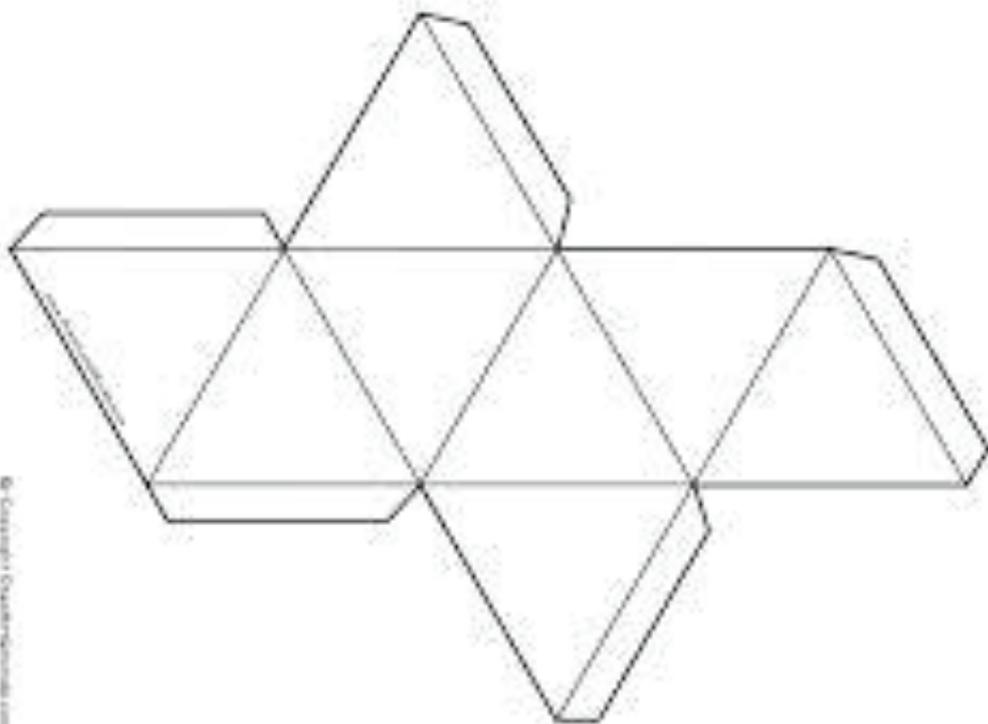
a) Complete the table below using the model of objects you made.

Polyhedron	Number of faces (F)	Number of vertices (V)	Number of Edges (E)
Tetrahedron			
Cube			
Octahedron			
Dodecahedron			
Icosahedron			

b) From your results in Question 3(a), write down an equation which relates the values F, V and E.



Octahedron



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