Grade 6

MATHEMATICS CONTENT BOOKLET: TARGETED SUPPORT

Term 4

Foreword

Dear Mathematics Teachers,

Welcome to the NECT Term 4 Learning Programme. In preparation for the training, you will have received:

- A Term 4 Planner and Tracker
- A Term 4 Content Booklet

Please remember that each of these documents has a particular purpose:

- The Planner and Tracker is designed to help you with pacing and curriculum coverage. It breaks down the CAPS content and concepts for the term into weeks and lessons. Each of the approved LTSM is then aligned to this breakdown, so that you can see exactly what to teach in each lesson.
- The Content Booklet is designed to support you, the teacher, as you prepare to teach the Term 4 curriculum. It is not designed to replace the textbook, or as a handout for your learners.

The Term 4 Content Booklet and Training Session, focus on three principles of mathematics teaching: teaching mathematics developmentally; teaching mathematics multi-modally; and, sequential teaching. In addition, the training will engage with some of the more challenging aspects of the curriculum for Term 4.

Use this opportunity to ensure that you are completely comfortable with the content and concepts that you are required to teach. Your trainer is there to support and develop you as a Mathematics teacher.

We hope that you enjoy the session and find it useful. We wish you well as you prepare to teach the Term 4 curriculum.

The NECT Team

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INTRODUCTION: THREE PRINCIPLES OF TEACHING MATHEMATICS

PRINCIPLE 1: TEACHING MATHEMATICS DEVELOPMENTALLY

What is developmental teaching and what are the benefits of such an approach?

- The human mind develops through phases or stages which require learning in a certain way and which influence whether a child is ready to learn something or not.
- If learners are not ready to learn something, it may be due to the fact that they have not reached that level of development yet or they have missed something previously.
- The idea that children's thinking develop from concrete to abstract (Piaget, 1969), was refined (Miller & Mercer, 1993) to include a middle stage, namely the "concrete-representational-abstract" stages. This classification is a handy tool for mathematics teaching. We do not need to force all topics to follow this sequence exactly, but at the primary level it is especially valuable to establish new concepts following this order.
- This classification gives a tool in the hands of the teacher, not only to develop children's mathematical thinking, but also to fall back to a previous phase if the learner has missed something previously.
- The need for concrete experiences and the use of concrete objects in learning, may gradually pass as learners develop past the Foundation Phase. However, the representational and abstract development phases are both very much present in learning mathematics at the Intermediate and Senior Phases.

How can this approach be implemented practically?

The table on page 7 illustrates how a developmental approach to mathematics teaching may be implemented practically, with examples from several content areas.

What does this look like in the booklet?

Throughout the booklets, within the topics, suggestions are made to implement this principle in the classroom:

- Where applicable, we suggest an initial concrete way of teaching and learning a concept and we provide educational resources at the end of the lesson plan or topic to assist teachers in introducing the idea concretely.
- Where applicable, we provide pictures (representational/semi-concrete) and/or diagrams (representational/semi-abstract). It may be placed at the clarification of terminology section, within the topic itself or at the end of the topic as an educational resource.
- In all cases we provide the symbolic (abstract) way of teaching and learning the concept, since this is, developmentally speaking, where we primarily aim to be for learners to master mathematics.

PRINCIPLE 2: TEACHING MATHEMATICS MULTI-MODALLY

What is multi-modal teaching and what are the benefits of such an approach?

- We suggest that teachers present mathematics topics in three forms to provide for all learners' learning styles and preferences. They (a) explain the idea by speaking about a topic, (b) illustrate it by showing pictures or diagrams and finally (c) present the idea by symbolising it in numbers and mathematical symbols.
- Teaching in more than one form (multi-modal teaching) includes hearing the same mathematical idea in spoken words (auditory mode), seeing it in a picture or a diagram (visual mode) and writing it in a mathematical way (symbolic mode).
- Learners differ in the way they learn and understand mathematical ideas. For one learner it is easier to understand through hearing and for the other through seeing. That is why we open both pathways to the symbolic mode – because here they do not have a choice, they all have to reach that mode, be it through hearing or seeing.

How can this approach be implemented practically?

The table on page 8 illustrates how a multi-modal approach to mathematics teaching may be implemented practically, with examples from several content areas.

What does this look like in the booklet?

Throughout the booklets, within the topics at the Senior Phase, we suggest ways to apply this principle in the classroom:

- The verbal explanations under each topic and within each lesson plan, provide the "speak it" or auditory mode.
- The pictures and diagrams give suggestions for the "show it" mode (visual mode).
- The calculations, exercises and assessments under each topic and within each lesson plan, provide the "symbol it" or symbolic mode of representation.

PRINCIPLE 3: SEQUENTIAL TEACHING

What is sequential teaching and what are the benefits of such an approach?

- Learners with weak basic skills in mathematics will find future topics increasingly difficult. A solid foundation is required for a good fundamental understanding.
- In order to build a solid foundation in maths, we teach concepts systematically. If we teach concepts out of that order, it can lead to difficulties in grasping concepts.
- Systematic teaching according to CAPS builds progressive understanding and skills.
- In turn, this builds confidence in the principles of a topic before he/she is expected to apply the knowledge and proceed to a higher level.
- We have to continuously review and reinforce previously learned skills and concepts.
- If learners link new topics to previous knowledge (past), understand the reasons why they learn a topic (present) and know how they will use the knowledge in their lives ahead (future), it can help to motivate them and to remove many barriers to learning.

How can this approach be implemented practically?

If a few learners in your class are not grasping a concept, you as the teacher need to take them aside and teach them the concept again (perhaps at a break or after school).

If the entire class are battling with a concept, it will need to be taught again, however this could cause difficulties in trying to keep on track and complete the curriculum in time.

To finish the year's work within the required time and to also revise topics, we suggest:

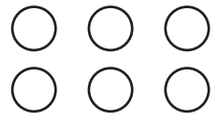
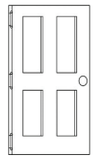
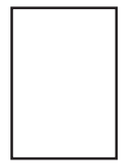
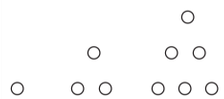
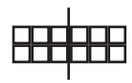
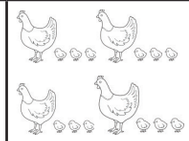
- Using some of the time of topics with a more generous time allocation, to assist learners to form a deeper understanding of a concept, but also to catch up on time missed due to remediating and re-teaching of a previous topic.
- Giving out revision work to learners a week or two prior to the start of a new topic. For example, in Grade 8, before you are teaching Data Handling, you give learners a homework worksheet on basic skills from data handling as covered in Grade 7, to revise the skills that are required for the Grade 8 approach to the topic.

What does this look like in the booklet?

At the beginning of each topic, there are two parts that detail

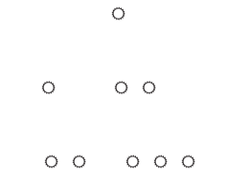
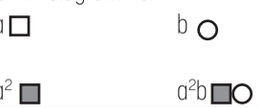
- The SEQUENTIAL TEACHING TABLE lays out the knowledge and skills covered in the previous grade, in the current grade and in the next grade.
- The LOOKING BACK and LOOKING FORWARD summarises the relevant knowledge and skills that were covered in the previous grade or phase and that will be developed in the next grade or phase.

THREE-STEP APPROACH TO MATHEMATICS TEACHING: CONCRETE-REPRESENTATIONAL-ABSTRACT

CONCRETE: IT IS THE REAL THING		REPRESENTATIONAL: IT LOOKS LIKE THE REAL THING		ABSTRACT: IT IS A SYMBOL FOR THE REAL THING	
Mathematical topic	Real or physical For example:	Picture	Diagram	Number (with or without unit)	Calculation or operation, general form, rule, formulae
Counting	Physical objects like apples that can be held and moved			6 apples	$2 \times 3 = 6$ or $\frac{1}{2}$ of $6 = 3$ $2+2+2=6$ or $\frac{2}{3}$ of $6 = 4$
Length or distance	The door of the classroom that can be measured physically			80 cm wide 195 cm high	Perimeter: $2L + 2W = 390 + 160$ $= 550cm$ Area: $L \times W = 195 \times 80$ $= 15\,600cm^2$ $= 1.56m^2$
Capacity	A box with milk that can be poured into glasses			1 litre box 250 ml glass	$4 \times 250ml = 1\,000ml$ $= 1\ litre$ *or* $1\ litre \div 4 = 0.25\ litre$
Patterns	Building blocks			1; 3; 6...	$\frac{n(n+1)}{2}$
Fraction	Chocolate bar			$\frac{6}{12}$	$\frac{6}{12} = \frac{1}{2}$ or $\frac{1}{2}$ of $12 = 6$
Ratio	Hens and chickens			4:12	$4 : 12 = 1 : 3$ Of 52 fowls ¼ are hens and ¾ are chickens, ie 13 hens, 39 chickens
Mass	A block of margarine			500g	$500g = 0{,}5\ kg$ or calculations like 2 ½ blocks = 1.25kg

Teaching progresses from concrete -> to -> abstract. In case of problems, we fall back <- to diagrams, pictures, physically.

MODES OF PRESENTING MATHEMATICS WHEN WE TEACH AND BUILD UP NEW CONCEPTS

Examples	**SPEAK IT - explain** • To introduce terminology • To support auditory learning • To link mathematics to real life	**SHOW IT - embody** • To help storing and retrieving ideas • To help visual learning • To condense information to one image	**SYMBOL IT - enable** • To promote mathematical thinking • To convert situations to mathematics • To enable calculations
IP: Geometric patterns	"If shapes grow or shrink in the same way each time, it forms a geometric pattern or sequence. We can find the rule of change and describe it in words. If there is a property in the shapes that we can count, each term of the sequence has a number value" "You will be asked to draw the next term of the pattern, or to say how a certain term of the pattern would look. You may also be given a number value and you may be asked, which term of the pattern has this value?**"**	 T1 T2 T3 T4 Question: (a) Draw the next term in this pattern. (b) Describe this pattern. What is the value of the 9th term of this pattern (T9)? **Which term has a value of 120?** To draw up to the 9th term of the sequence and to find out which term has a value of 120, is slow. One is now almost forced to deal with this problem in a symbolic way.	Say out loud: 1; 3; 6... 1; 3; 6; 10... 1; 3; 6;10;15 Inspect the number values of terms: T1: 1 = 1 T2: 3 = 1+2 T3: 6 = 1+2+3 T4: 10 = 1+2+3+4 T9: 45 = 1+2+3+4+5+6+7+8+9 General rule: The value of term n is the sum of n number of consecutive numbers, starting at 1.
SP: Grouping the terms of an algebraic expression	"We can simplify an algebraic expression by grouping like terms together. We therefore have to know how to spot like terms. Let us say we have to sort fruit in a number of baskets and explain the variables or the unknowns in terms of fruits. Try to imagine the following pictures in your mind:"	Although not in a real picture, we can paint a mind picture to help us understand the principle of classification: • Basket with green apples (a) • Basket with green pears (b) • Basket with green apples and green pears (ab) • Basket with yellow apples (a^2) • Basket with yellow apples and green pears (a^2b) Or in diagram form 	Group and simplify the following expression: $4b - a^2 + 3a^2b - 2ab - 3a + 4b + 5a - a - 2ab + 2a^2b + a^2b$ $= -3a + 5a - a + 4b + 4b - 2ab - 2ab - a^2 + 3a^2b + 2a^2b + a^2b$ $= a + 8b - 4ab - a^2 + 6a^2b$

TOPIC 1: WHOLE NUMBERS

INTRODUCTION

- This unit runs for 1 hour.
- It is part of Content Area, 'Numbers, Operations and Relationships' and counts for 50 % in the final exam.
- The unit covers revision of the content taught in detail in Term 2.
- It is important to ensure that learners have a clear understanding and an adequate ability to perform all the required calculations with numbers up to 9 digits.
- Although learners have been working with various calculation techniques throughout the intermediate phase by the end of Grade 6 learners must be using preferred method for large numbers.
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE / GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	**CURRENT**	**LOOKING FORWARD**
• Order, compare and represent numbers to at least 6-digit numbers • Represent odd and even numbers to at least • 1 000. • Recognize the place value of digits in whole numbers to at least 6 digit numbers. • Round off to the nearest 5, 10, 100 and 1 000	• Order, compare and represent numbers to at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 and 1 000	• These operations are performed in Algebraic context later in the senior and FET phases.

LOOKING BACK

Learners must be able to:

- Order, compare and represent numbers to at least 6-digit numbers
- Represent odd and even numbers to at least 1 000.
- Recognize the place value of digits in whole numbers to at least 6 digit numbers.
- Round off to the nearest 5, 10, 100 and 1 000

LOOKING FORWARD

- Learners must be able to perform these operations with ease as they will be required to perform these same operations in Algebraic context.

GLOSSARY OF TERMS

Term	Explanation / Diagram
Whole Numbers	The numbers in the set {0, 1, 2, 3, ...} are called whole numbers. Whole numbers are counting numbers including zero.
Place Value	The value of the digit depends on its order in the number. In 65 314 728, the 2 is in the 'tens' position, so it shows a value of 20.
Rounding Off	Numbers are either rounded up or down to the nearest 10, 100 or 1 000. 0,1, 2, 3 and 4 means that the 10,100 or 1 000 is rounded down. 5,6,7,8 or 9 means the 10, 100 or 1 000 is rounded up.
Digit	A single character used in a numbering system. In the decimal system digits are 0 to 9.
Inverse Operations	Addition can be checked by subtraction. Multiplication can be checked by division
Order Of Operation	BODMAS When there are multiple operations in the same sum there is a particular order: 1. Brackets [ ] 2. Of means multiply or to apply and exponential increase 3. Division and multiplication: work left to right 4. Addition and subtraction: work left to right
Estimation	The best guess arrived at after considering all the information given in a problem. To estimate is to find an answer that is very close to the exact answer
Million	A million is 1 000 000 or 1000 thousands

SUMMARY OF KEY CONCEPTS

Counting in millions, ten millions and hundred millions

1. There are many ways to practice counting and it is very important to have learners count in the given interval such as millions without always starting with the first multiple or with zero.
2. Counting can be done orally at the start of a lesson or grids can be used. Learners can write number sets where they work with these counting sets in various forms.

Examples:

Counting in millions:

1 000 000, 2 000 000, 3 000 000…
1 340 000, 2 340 000, 3 340 000…

Counting in ten millions:

10 000 000, 20 000 000, 30 000 000…
1 000 000, 11 000 000, 12 000 000…
12 300 000, 22 300 000, 32 300 000…

Counting in hundred millions:

100 000 000, 200 000 000, 300 000 000…
102 000 000, 202 000 000, 203 000 000…

3. Learners must be able to count forwards and backwards. If learners are finding this difficult, use place value tables and charts to help them see how to order the numbers correctly.

Numbers up to one hundred million in words and in numeric form

	HM Hundred Million	TM Ten Million	M Million	HT Hundred Thousand	TT Ten Thousand	T Thousand	H Hundred	T Ten	U Units (One)
Digits	5	6	5	3	1	4	7	2	8
What the digit means in terms of its position	This represents 5 hundred millions	This represents 6 ten millions	This represents 5 millions	This represents 3 hundred thousands	This represents 1 ten thousand	This represents 4 thousands	This represents 7 hundreds	This represents 2 tens	This represents 8 ones or units
Numeric	500 000 000	60 000 000	5 000 000	300 000	10 000	4000	700	20	8
How you would say it	Five hundred million	Sixty million	Five million	Three hundred thousand	Ten thousand	Four thousand	Seven hundred	Twenty	Eight
What the value of each digit is in the number	The digit 5 has a value of 500 000 000	The digit 6 has a value of 60 000 000	The digit 5 has a value of 5 000 000	The digit 3 has a value of 300 000	The digit 1 has a value of 10 000	The digit 4 has a value of 4000	The digit 7 has a value of 700	The digit 2 has value of 20	The digit 8 has a value of 8

1. In Numerals: **565 314 728**
2. In Words:
   Five hundred and sixty five million, three hundred and fourteen thousand, seven hundred and twenty-eight.
3. Expanded Form:
   500 000 000 + 60 000 000 + 5 000 000 + 300 000 + 10 000 + 4000 + 700 + 20 +8
4. Identify the place and value of each digit in a number up to hundred millions (9 digits)

565 314 728

The digit 5 is in the **hundred million** place
The digit 6 is in the **ten million** place
The digit 5 is in the **million** place
The digit 3 is in the **hundred thousand** place
The digit 1 is in the **ten thousand** place
The digit 4 is in the **thousand** place
The digit 7 is in the **hundred** place
The digit 2 is in the **tens** place
The digit 8 is in the **unit /ones** place

Teaching Tip:
ICON S Learners often misread or write numbers incorrectly when they have a lot of zeros. This can be prevented by working with place value tables and if educators emphasise the importance of zeros as place holders in the number. Learners must know that if hundred millions are mentioned there will be at least 9 digits in the number. Learners can practice reading numbers in sets of three and making a point of stating that each space represents a word. Example: 234 567 123 is two hundred and thirty-four million five hundred and sixty seven thousand one hundred and twenty three.

Compare numbers within hundred millions (9 digits):

1. Learners must compare and order numbers according to their value working with place value tables and writing numbers directly below each other is a good strategy that will help learners make accurate comparisons.
2. Smaller than: <



Example:
Which number is smaller, 467 237 981 or 467 230 600?
When comparing numbers look at the value of each digit starting from the left and gradually moving to the right of the number.

HM Hundred Million	TM Ten Million	M Million	HT Hundred Thousand	TT Ten Thousand	T Thousand	H Hundred	T Ten	U Units (One)
4	6	7	2	3	7	9	8	1
4	6	7	2	3	0	6	0	0

0 thousands is smaller than 7 thousands. So, 467 230 600 is smaller than 467 237 981.
This must be written as 467 230 600 < 467 237 981

Teaching Tip:
The best way to help learners remember the correct sign to use in these comparisons is to let them think of a crocodile. The open end of the sign can be an open crocodile mouth and crocodiles are greedy and always want to eat the bigger share or number. This is a technique used in the foundation phase but it is very effective throughout the intermediate phase as well.

3. Greater than: >

Example:
Which number is greater, 300 712 935 or 300 712 846?

HM Hundred Million	TM Ten Million	M Million	HT Hundred Thousand	TT Ten Thousand	T Thousand	H Hundred	T Ten	U Units (One)
3	0	0	7	1	2	9	3	5
3	0	0	7	1	2	8	4	6

A table makes it easier to work out which number is bigger/smaller than. Work from left to right. If they are the same, continue to compare until the values of the digits are not the same.

The values of the digits in the hundreds place are not the same.

9 hundred is **greater** than **8** hundred. So 300 712 **9**35 is **greater** than 300 712 **8**46.

This must be written as 300 712 935 > 300 712 846

4. Arrange the numbers from smallest to biggest **(ascending order)**

Example:
324 688, 32 468, 3 246 880, 324 560 004

Look at which number has the **least** digits and this will become the first number. It will help if leaners use a place value table and write numbers underneath each other.

Answer: 32 468, 324 688, 3 246 880, 324 560 004

5. Arrange the numbers from biggest to smallest **(descending order)**

324 688, 32 468, 3 246 880, 324 560 004

Look at which number has the **most** digits this becomes the first number in the sequence and is then followed by the next biggest number and so on.

Answer: 324 560 004, 3 246 880, 324 688, 32 468

Rounding off

This section is often difficult for learners to grasp, but remember the rules below and do a lot of oral work and mental maths with this concept.

1. Decide which digit is the last one you need to keep. You will know this because it is the digit in the place you are asked to round off to.
2. Leave it the same if the next digit is less than 5



Example:
Round 74 to the nearest 10

We want to keep the 7 in the 10s place
The next digit is 4 it is less than 5, so no change is needed to 7
= 70
74 gets rounded down

3. Increase it by 1 if the next digit is 5 or more



Example:
Round 86 to the nearest 10

We want to keep the 8 in the 10s place
The next digit is 6 which is 5 or more, so increase the 8 by 1 to 9
= 90
86 gets rounded up

4. Learners must be able to round to the nearest 5, 10, 100 or 1000. These are skills that must be practiced so that learners can perform rounding off without error.

TOPIC 2: MULTIPLICATION

INTRODUCTION

- This unit runs for 5 hours.
- It is part of Content Area, 'Numbers, Operations and Relationships' and counts for 50 % in the final exam.
- The unit covers revision of techniques covered in Term 2 where the emphasis is on working with the multiplication of 4-digit by 3-digit numbers.
- Learners have been performing these operations throughout the intermediate phase and it is very important that learners develop good strategies that can be applied in a variety of contexts and so that their strategies can be adapted when working with even larger numbers.
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE / GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Multiplication of whole 3 digit numbers by whole 2 digit numbers.	• Multiplication of whole 4-digit numbers by whole 3-digit numbers • Multiple operations on whole numbers with and without brackets	• These operations are performed in Algebraic context later in the senior and FET phases.

LOOKING BACK 

Learners must be able to:

- Multiply whole 3-digit numbers by whole 2-digit numbers using a variety of strategies
- Build up and break down numbers when applying their strategies for multiplication.
- Recognize the importance of using strategies learnt previously and apply them to a variety of contexts.
- Estimation as a technique for calculations related to multiplication.

LOOKING FORWARD 

- Learners must be able to perform these operations with ease as they will be required to perform these same operations in Algebraic context.

GLOSSARY OF TERMS

Term	Explanation / Diagram
Factor	A factor is an integer that divides into another integer exactly. If any integer is divided into another integer without any remainder then that integer is a factor of the other.
Multiple	A multiple of a number is exactly divisible by that number without any remainders.
Product	The result when two or more numbers are multiplied together.
Multiply/Times	The process of adding a quantity to itself a certain number of times. It is the inverse of division.
Multiplication	The process of finding the total number of items in a given number of groups, where each group has the same number of items.
Distributive Property	The product of a number and a sum is equal to the sum of the individual product of addends* and a number
Addend	In an addition calculation the numbers being added together are called addends

SUMMARY OF KEY CONCEPTS

Factors and multiples:

1. Learners must be able to break numbers into the various factors that produce the number, when numbers must be broken into factors to assist with multiplication of larger numbers.



2. EXAMPLE:
The factors of 24 are {1, 2, 3, 4, 6, 8, 12, 24}

2. Multiples are also essential knowledge for leaners when using the distributive property to calculate the product of much larger numbers



EXAMPLE:
The multiples of 24 are {24, 48, 72; 96…..} Multiples continue and are infinite (meaning they do not end. This will mean multiples are an open and continuing set.

Partitioning (breaking up) numbers to multiply them

1. Using the distributive property to multiply



EXAMPLE:
How many bottles of water are there in 237 boxes, if each box contains 24 bottles?
The number 237 can be broken up into 200 + 30 + 7 and now the distributive property can be used to complete the problem.

$$(200 \times 24) + (30 \times 24) + (7 \times 24)$$
$$= 4800 + 720 + 168$$
$$= 5688$$



The distributive property can be used further in the example should learners need to work with smaller components to make multiplication easier. This is the method learners have been using in the intermediate phase.



EXAMPLE:

237 = 200 + 30 + 7 and 24 = 20 + 4. This would mean the calculation of the example would have far more parts.
(200×20)+(200×4)+(30×20)+(30×4)+(7×20)+(7×4)
=4000+800+600+120+140+28
=5688

Both method result in the correct answer of 5688 bottles in total.

Long multiplication techniques also make use of the distributive property when calculating.

	3	5	2	
×		2	7	
2	4	6	4	352×7
7	0	4	0	352×20
9	5	0	4	

This final step is the addition of two products using distribution

2. Using factors to multiply



EXAMPLE:

There are 256 people at the soccer game. If each person spends R 24, how much money was made?
The factors of 24 can be 6 and 4 and these can each be factored more where 4 is 2×2 and 6 is 2×3
This means multiplication can occur by doing the following:

$(256 \times 2) \times 2 \times 2 \times 3$

$=(512 \times 2) \times 2 \times 3$

$=(1024 \times 2) \times 3$

$=2048 \times 3$

$=6144$



These are not new skills and learners have practiced them in previous grades. It is very important that learners practice decomposing numbers into factors and if learners can decompose numbers into prime factors then the final multiplication is much easier

Estimating an answer to help with multiplication



The skill of rounding off must be revised before this method is attempted. Some learners may want to round everything off it is important to stress that too much rounding makes the answer less accurate.



EXAMPLE:

5325×108=575 100

5000×108=540 000 Not suitably rounded as the answer is too far off

5300×108=572 400 Rounding is more suitable as it results in a much closer answer.

5320×108=574 560 This is the best choice but learners may find this calculation difficult.

5325×100=532 500 Not suitably rounded as the answer is too far off

5325×110=585 750 Not suitably rounded as the answer is too far off



Learners must understand that the smaller the rounding value is (rounding to the nearest 10, 100 or 1000) the closer the answer is going to be to the actual answer. Learners must understand that they choose the rounding value based on how accurate they wish to be and also on the numbers used in the calculation.

The column method for multiplication

This method of multiplication is suitable for the large numbers that learners should be able to multiply by the end of Grade 6. It also helps learners use acceptable methods that will empower them to perform horizontal multiplication calculations.

M	Hth	Tth	Th	H	T	U	
			5	4	6	9	
				1	8	7	
		3	8	2	8	3	× 7
	4	3	7	5	2	0	× 80
	5	4	6	9	0	0	× 100
1	0	2	2	7	0	3	Remember to add each of the products to give the final answer



Learners must be comfortable with tables, factors and multiples. This method is best taught to learners using a board as the numbers are far too large to teach this section practically. Learners can work on multiplying two-digit by two-digit numbers and then gradually increasing the size of each number until learners are comfortable and can meet the requirement and are multiplying four-digit numbers by three-digit numbers.

TOPIC 3: COMMON FRACTIONS

INTRODUCTION

- This unit runs for 5 hours.
- It is part of Content Area, 'Numbers, Operations and Relationships' and counts for 50 % in the final exam.
- The unit covers revision of all the calculations done in Term 2 relating to Common Fractions, although the greater emphasis this term should be on the comparison of equivalent forms.
- It is important to ensure that learners can perform the operations with ease and that they have a good understanding of the topics covered on Decimal Fractions and Percentages.
- This section is covered in multiple stages throughout the intermediate phase so it is important to ensure that learners are leaving each Grade with the necessary understanding so they can perform the necessary calculations in the next Grade.
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE/GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	**CURRENT**	**LOOKING FORWARD**
• Describing and ordering of fractions to at least twelfths • Performing a variety of calculations that involve fractions with the same denominators • Solving problems in contexts that involve grouping and sharing. • Recognising equivalent forms when the denominators are multiples of each other.	• Comparing and ordering common fractions including tenths and hundredths. • Performing a variety of calculations with fractions where the denominators are multiples of each other • Solving problems in a variety of contexts involving fractions. • Finding percentages of whole numbers • Working with decimal fractions • Equivalent forms including decimals and percentages	• Performing a variety of calculations using fractions that may or may not have the same denominator or denominators that are multiples of each other. • Application of all calculation principles relating to fractions as well as applying the principle to algebraic contexts later in the Senior and FET phases.

LOOKING BACK

Learners must be able to:

- Describe and order fractions to at least twelfths
- Perform a variety of calculations that involve fractions with the same denominators
- Solve problems in contexts that involve grouping and sharing.
- Recognise equivalent forms when the denominators are multiples of each other.

LOOKING FORWARD

- Performing a variety of calculations using fractions that may or may not have the same denominator or denominators that are multiples of each other is an essential component to the pre-algebra content that learners must understand.
- Application of all calculation principles relating to fractions as well as applying the principle to algebraic contexts later in the Senior and FET phases is vital and extends into Calculus in the later stages of the FET phase and in tertiary education.

GLOSSARY OF TERMS

Term	Explanation / Diagram
Numerator	This is the number at the top of a fraction.
Denominator	This is the number at the bottom of the fraction.
Proper Fractions	A fraction that has a numerator that is smaller than the denominator.
Improper Fractions	A fraction that has a numerator that is larger than the denominator.
Mixed Numbers	These fractions represent complete "wholes" as well as excess parts of a further "whole".
Equivalent Fractions	These are fractions that represent equivalent parts of a whole when compared to each other.
Lowest Common Denominator (LCD)	This is the denominator that actually represents the Lowest common multiple that can be found comparing the various denominators in the calculation.
Percentage	A percentage is a part of a whole represented as 100 parts.

SUMMARY OF KEY CONCEPTS

Fractions:

1. Revision of Term 2 concepts must be done to ensure that learners have a good understanding of all the basic concepts before new concepts are taught. This is also the best time to revise the rules relating to the simplification of fractions as this will be very important later on in this section.

2. Simplification of fractions involves writing the fraction in its simplest form and makes use of all the division rules and skills learners have been taught previously in Term 1 and 2.

EXAMPLE:

$$\frac{10}{15} = \frac{(10 \div 5)}{(15 \div 5)} = \frac{2}{3}$$

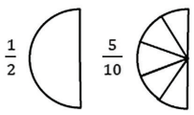
This fraction is in its simplest form as the numerator and the denominator cannot be made any smaller.

It is very important that enough revision is done so that learners can identify improper and mixed number fractions.

Teaching Tip:
Various simple tools can make this section less boring and can encourage learners to engage with the topic. Resources such as a wall chart or number line can be used in this section. The more examples you give

Equivalent Fractions

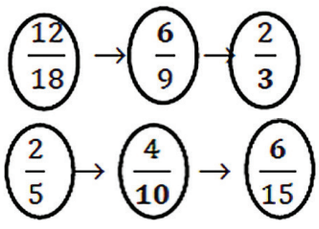
1. Learners must be able to recognise and determine equivalent fractions. Simplification of fractions is a really important part of understanding the equivalence of fractions. Equivalent fractions are fractions that equal each other. This is the section that should be focussed on this term.



To change $\frac{1}{2}$ to $\frac{5}{10}$ we multiply the numerator and the denominator each by 5 like this:

$$\frac{1 \times 5}{2 \times 5} = \frac{5}{10}$$

The value of $\frac{5}{5}$ is 1 so we are not changing the value of the fraction, only it appearance.



2. Learners must be shown that the numerator and the denominator must always be multiplied or divided by the same amount as this is the only way to obtain equivalent fractions.

EXAMPLE:

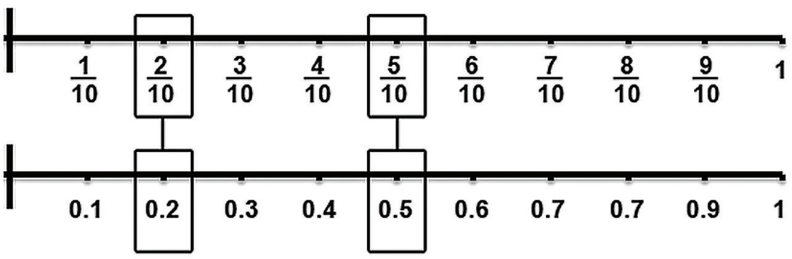
$$\frac{10}{15} = \frac{(10 \times 4)}{(15 \times 4)} = \frac{40}{60}$$

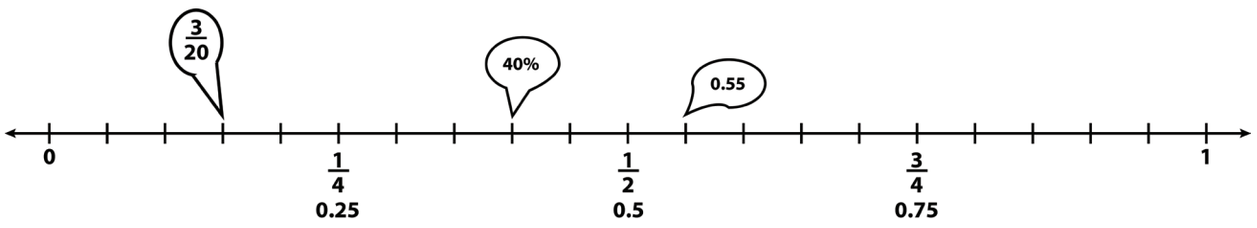
Teaching Tip:
This section can be demonstrated very easily by using blank paper and folding it to represent various parts. This is a simple method that shows the same piece of paper “broken into” a varying number of parts. Using concrete apparatus to demonstrate this to learners is important as it gives a fixed idea of the concept.

Try to make use of some real examples and not just the ones in a textbook. Make very sure that your learners know where the numerator is and where the denominator is in a fraction as many learners cannot identify where these are and this means they make errors when calculating with fractions.(numerator/(denominator))

Equivalent forms of fractions must be discussed and leaners must be able to look at a common fraction, decimal fraction and percentage that relates to the same number and see that they are equivalent.

Learners must know how to compare fractions in various forms. Comparisons made with proper, improper and mixed fractions in the set will ensure that the concept is completely understood.





3. Learners must be able to compare fractions using <, > and = in their comparison.



Teaching Tip:
Using examples where the value of items are represented as fractions can help give some realistic examples that will help learners to understand. Sales are a really good real – life concept that will be useful in this section of work. Example: James wants to buy a new pair of basketball shoes. Two shops stock the shoes and he is very lucky because they are also both having sales on the shoes he wants. The original price for the shoes is R 500. One shop offers a saving of 2/3 off the price, the other offers a saving of 7/12 off the price. Which store offers the best saving? As both shops offer the shoes at the same price learners can compare the fractions and determine which fraction is greater. This is also a good opportunity to have learners check that their answer is sensible and is correctly calculated. Savings cannot be more than the original price.

TOPIC 4: PROPERTIES OF 3D OBJECTS

INTRODUCTION

- This unit runs for 5 hours.
- It is part of Content Area, 'Space and Shape' and counts for 15 % in the final exam.
- The unit deals with the consolidation and extension of knowledge relating to 3D shapes. In Term 2 learners had to build shapes using nets but now we need learners to build skeleton versions of the 3D shapes so that they can compare edges, faces and vertices and how these would determine the classification of the particular shape.
- Although learners have worked on this topic previously it is important that learners are able to not only work with real 3D shapes but can also complete written exercises relating to 3D shapes. Interpreting pictures is more difficult than working with real shapes.
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE/GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	**CURRENT**	**LOOKING FORWARD**
• Recognise, visualise and name 3D objects in the environment and geometric settings • Describe 3D objects focussing on the shape of faces, number of faces and whether they have flat or curved edges. • Make 3D models from cut out polygons. • Trace nets of boxes that have been cut open	• Recognise, visualise and name 3D objects in the environment and geometric settings • Focussing on: • Rectangular prisms • Cubes • Tetrahedrons • Pyramids • Similarity and differences of pyramids and other tetrahedrons • Describe 3D objects focussing on the shape of faces, number of faces, number of vertices and the number of edges. • Make 3D models in skeletal form using straws, toothpicks or cocktail sticks and using nets to make the 3D shapes.	• These skills are applied to geometric understanding and the complete understanding of measurement later in the senior and FET phases. • This section is also integrated into the subject areas of CAD and EGD in the FET phase.

LOOKING BACK

Learners must be able to:

- Recognise, visualise and name 3D objects in the environment and geometric settings with a focus on shapes such as rectangular prisms, cubes, cylinders, cones and pyramids.
- Similarities and differences between rectangular prisms and cubes.
- Describe 3D objects focussing on the shape of faces, number of faces and whether they have flat or curved edges.
- Make 3D models from cut out polygons.
- Trace nets of boxes that have been cut open to see the shape as it would look in 2D.

LOOKING FORWARD

- These skills are applied to geometric understanding and the complete understanding of measurement later in the senior and FET phases.
- This section is also integrated into the subject areas of CAD and EGD in the FET phase.

GLOSSARY OF TERMS

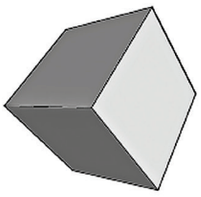
Term	Explanation / Diagram
Three-dimensional (3D) Object	3D objects are figures that do not lie in a plane. These objects have length, width (breadth) and height.
Prism	A polyhedron* consisting of two parallel, congruent faces called bases that are joined with rectangular faces.
Polyhedron	A solid figure that has several polygon faces
Pyramid	A special type of polyhedron. It has a solid base that is a polygon and the other faces are triangles that meet at an apex.*
Apex	The highest point of a pyramid
Tetrahedron	A solid made up of four triangular faces. It can also be considered a pyramid with a triangular base. The regular tetrahedron is also a platonic solid.*
Platonic Solid	5 Regular polyhedrons that have identical faces and the same number of edges meeting at each vertex.*
Face	The flat surface or side of a solid shape.
Edge	The intersection of the faces of a 3D shape
Vertex	The corner of a shape or solid. The place where two edges of a shape meet, or where three or more faces of a solid meet, is a vertex.
Net	A 2D pattern of a 3D shape that can be folded to result in the 3D object.
Sphere	A perfectly round ball. This is a shape that is made of only curved edges. Every point on the surface of the sphere is the same distance away from the centre of the shape.
Cone	A cone is a pyramid with a circular base
Cylinder	A 3D shape with a parallel circle at each end and is joined by a curved surface.

SUMMARY OF KEY CONCEPTS

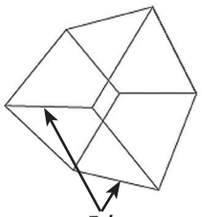
Classifying 3D objects

1. The focus of the classification of 3D objects is the classification by means of faces, edges and vertices.

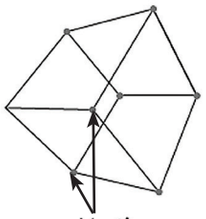
Example:



Faces



Edges

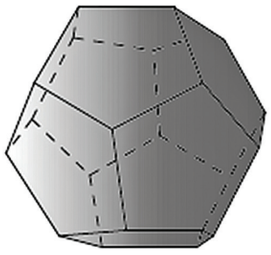


Vertices

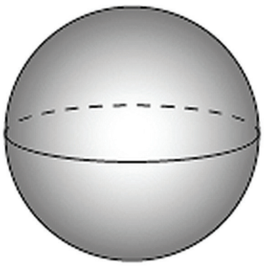
2. Learners must know that most objects are polyhedra but there are shapes such as cylinders that do not fall into this classification as the curved side joining the circular faces is not a flat surface.

Example:

Polyhedron



Not a polyhedron



3. Learners must be able to name a given object as well as describe the reason for the name they have chosen for the object.

Tetrahedrons and Pyramids

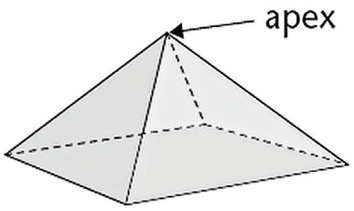
1. Learners must be able to identify and distinguish tetrahedrons and a pyramid.

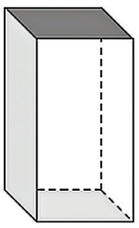
Teaching Tip:
Learner would have investigated these differences so that they can determine further distinguishing characteristics in later grades

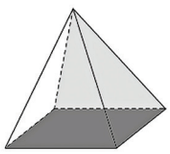
Teaching Tip:
Many learners find it easier to distinguish between objects if they can touch the actual object. It is a good idea for the teachers to construct a large cardboard model of the objects. Students can touch and discover the differences and this helps them visualise the actual structure of the objects they are learning about.

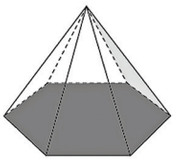
It is vital to discuss the properties of pyramids thoroughly and then discuss the properties of other polyhedra thoroughly as this will ensure a very clear understanding of each individual type of object before learners are expected to tell them apart.

2. Examples of pyramids:





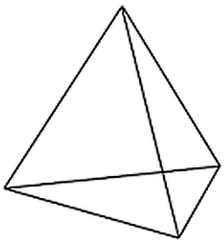




Square-based pyramid
It has 5 faces:
1 square,
4 triangles

Hexagonal-based pyramid
It has 7 faces:
1 hexagon,
6 triangles

3. Tetrahedron



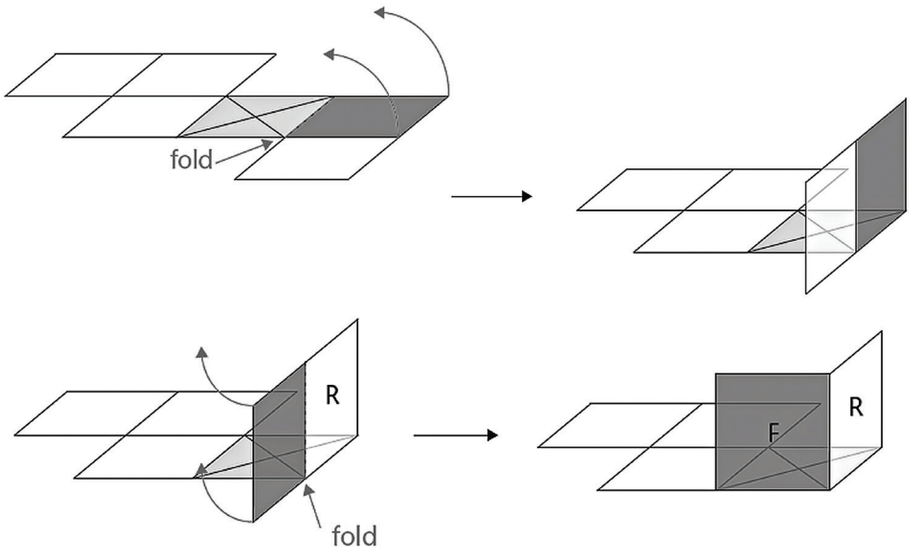
This shape is actually a triangular based pyramid.

Building 3D models

1. Learners are expected to produce models of 3D objects using nets.
2. This also means that learners should be able to identify which nets will deliver the shape they wish to construct.

Teaching Tip:
In Grade 5 learners would have traced nets of a variety of boxes that they have deconstructed. Learners must revisit the requirements for a good net, such as tabs, to ensure their success in constructing these 3D models. It will also help if learners are given clear instructions when they are constructing their shapes.

Example:



3. Learners must also be capable of constructions using items such as straws and toothpicks so that they can look at edges and vertices in a lot more detail. These are skeletal form constructions where the emphasis is on the edges and vertices and not on the face of the shape..

Teaching Tip:
Boxes used for packaging can be used to demonstrate shapes broken down into their nets. Smartie boxes, Astro boxes, milk cartons, almost any object that comes packaged in cardboard is a good net to show learners how to visualize the net they wish to draw when given a shape.

Teaching Tip:
Putting up posters with pictures and descriptions of these objects help learners in internalise the properties of these shapes and makes comparison much easier. Learners must start comparing shapes that are representations as they cannot become completely dependent on working with real objects.

TOPIC 5: AREA, PERIMETER AND VOLUME

INTRODUCTION

- This unit runs for 7 hours.
- It is part of Content Area, 'Measurement' and counts for 15 % in the final exam.
- The unit covers perimeter, area and volume of shapes. It also has reference to the history of measurement.
- It is important to understand that learners in grade 6 are not required to use formulae when calculating perimeter and area but should be measuring using rulers and tape measures. Learners are only expected to start developing an understanding of the calculations that are used for area (only squares and rectangle) and volume (only rectangular prisms).
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE/GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Measuring perimeter using rulers and tape measures. • Finding area using square grids which develops the understanding of square units. • Finding volume by filling or packing items into a 3D shape and thus developing an understanding of cubic units.	• Measuring perimeter using rulers and tape measures. • Finding area of regular and irregular shapes using square grids that allow learners to count squares. • Developing rules for the calculation of area of squares and rectangles. • Finding volume by filling or packing items into a 3D shape. • Developing an understanding for the calculation of volume of rectangular prisms using length multiplied by breadth multiplied by height. • Investigating the relationship between perimeter and area of squares and rectangles. • Investigating the relationship between surface area and volume of rectangular prisms.	• Understanding the relationship between area and volume is required for the calculation that are performed relating to 3D objects later in the senior and FET phases. • The understanding of how changes to single or multiple dimensions of a 3D object can influence the area or volume without having to perform complicated calculations but determining them by inference is beneficial to learners in the FET phase.

LOOKING BACK

Learners must be able to:

- Measure perimeter using rulers and tape measures.
- Find area using square grids to draw/print the shapes on which develops the understanding of square units.
- Find volume by filling or packing items into a 3D shape and thus developing an understanding of cubic units. Usually packing smaller cubes into larger cubes or rectangular prisms.

LOOKING FORWARD

- Understanding the relationship between area and volume is required for the calculation that are performed relating to 3D objects later in the senior and FET phases.
- The understanding of how changes to single or multiple dimensions of a 3D object can influence the area or volume without having to perform complicated calculations but determining them by inference is beneficial to learners in the FET phase

GLOSSARY OF TERMS

Term	Explanation / Diagram
Two-dimensional (2D)	The name given to flat shapes that occupy a space and thus have area that can be calculated.
Regular Polygon	A polygon whose sides are all the same length and whose angles are all the same size.
Irregular Polygon	A polygon that does not have sides that area the same lenth nor are the angles the same size
Perimeter	The distance around the polygon.
Formula	An expression or equation that is used to express the relationship between certain quantities.
Standard Unit (SI Unit)	A unit is the standard quantity which is used to measure other quantities.
Area	The surface of a shape or object. It can also be defined as the number of square units that a shape covers.
Composite Shape	An irregular shape that is made up of parts or whole components of other shapes.
Solid Figure	A 3D shape that has length, breadth and height (or depth).
Cube	A 3D figure with 6 identical square faces.
Prism	A 3D shape that has two polygon faces that are parallel and joined by rectangular sides.
Rectangular Prism	A prism made of 6 rectangular faces.
3 dimensional (3D)	These are figures that do not lie in a plane. The figures have length, breadth and height or depth.
Surface Area	The sum of the areas of each of the faces of a 3D shape.
Volume	The amount of space contained inside a shape. That means volume is the space that can be filled with other items. Volume has cubic units.
Capacity	The amount of a liquid that a 3D shape can hold. It is measured in ml or l.
Net	A 2D pattern that folds to form a 3D shape. It is helpful when calculating surface area as it makes all faces visible so that they are not omitted from the calculation.

SUMMARY OF KEY CONCEPTS

Determining perimeter

1. Learners must be able to use a variety of measuring instruments these would include rulers and tape measures accurately.

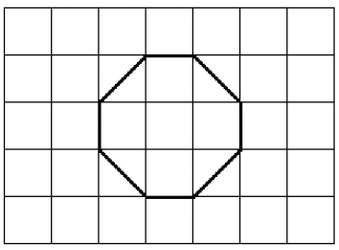
   Learners spent most of the earlier terms this year learning how to read scales and use measuring equipment correctly. It is vital that these basic rules for measurement are discussed at the beginning of this section.

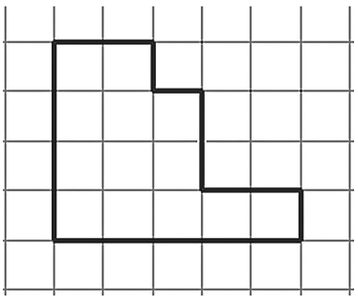
2. Please note that learners are not expected to use any formulae when finding perimeter at this stage, they are determining perimeter by measurement or by adding the given edge lengths in an exercise. Although learners should be measuring to determine perimeter, they must also be exposed to a variety of exercises that vary the techniques used.

Area of shapes

1. Learners must be able to determine the area occupied by a shape that has been drawn on grid paper by counting the squares the shape occupies.
2. These shapes should have flat edges in Grade 6 so that learners can accurately determine the area. Should the shape not occupy the entire block, half blocks can be added to make a whole block.

   Examples:

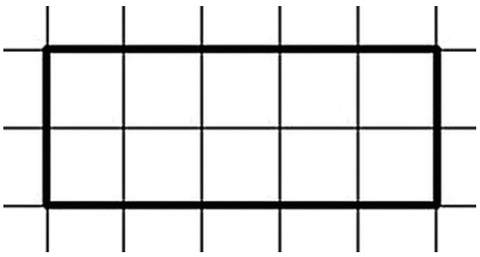




3. Learners must estimate the area covered by the shape by taking the following rules into account:
   a. Count the whole squares
   b. Combine half squares to make whole squares
   c. Count any parts bigger than a half as a whole square
   d. Ignore the parts that are less than half of the square in size.

4. Learners must remember that estimates are not accurate and are also not a wild guess but an educated accurate determination of an amount using skills relating to measurement.

Area of rectangles



1. Learners can determine area by counting the squares on grid paper now learner must start to see the relationship between the number of rows (breadth) multiplied by number of blocks per row (length) and the area that they counted before.
2. Exercises that consolidate this skill should allow for counting and using the basic rule given above.
3. The focus should only be on the development of the idea and not on learners using formulae for area.
4. These exercises must be limited to rectangular shapes only.

Investigating the relationship between perimeter and area of rectangles and squares

1. Learners must be able to make some basic conclusions regarding the relationship between area and perimeter by investigating if there is an existing relationship

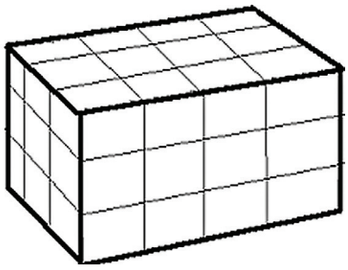
Teaching Tip:
This is best determined by providing learners with a variety of squares and rectangles on grid paper and allowing them to investigate by determining perimeter and then area and finding any relationship should it exist.

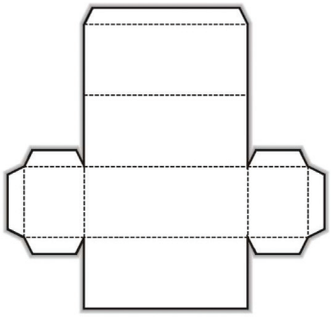
Determining surface area

1. Learners must be able to determine the surface area of rectangular prisms.
2. Learners should deconstruct the rectangular prism into six rectangles that are given with grids displayed and this is how they would determine the area of the rectangle.
3. Learners would now start to determine the surface area by adding together the areas of each of the rectangles.
4. Make sure that learners are aware of the relationship between the visible and hidden sides of a 3D rectangular prism.

Learners have worked with nets of shapes previously this is the foundation of the understanding of surface area and must be recapped to ensure that learners understand the relatability to the work on surface area.

EXAMPLES

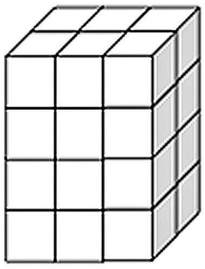




5. Please note that learners are not expected to use any formulae but can start relating to the area as number of rows multiplied by number of blocks per row. This is the idea that should be developing by the end of grade 6.

Volume of rectangular prisms

1. Learners must be able to determine the number of blocks that would occupy the volume of a 3D rectangular prism.
   EXAMPLE



This shape has 2 layers of 4rows of 3 blocks in a row. That makes 12 blocks in a layer. There are 24 block that make up the whole shape. So the volume is 24 cubic units.

2. Learners are expected to start developing an understanding as to the relationship between length multiplied by width (breadth) multiplied by height and the number of blocks that occupy the volume of the rectangular prism.

Learners will be expected to use formulae that are developed gradually in the later stages of the senior phase and the FET phase to determine volume of a vast number of shapes so a clear understanding of this basic relationship that is being developed in this section.

Investigating the relationship between surface area and volume of rectangular prisms

1. Learners must be able to make some basic conclusions regarding the relationship between surface area and volume by investigating if there is an existing relationship

Teaching Tip:
Real life examples relating to packaging would be helpful to assist learners to determine and understand the reason for this type of investigation. Have learners deconstruct cereal boxes and then determine surface area and volume to investigate the relationship between them.

The History of measurement

1. Learners should know some historical methods of measurement and how measurement was recorded.
2. Understanding that historically the body was used to measure items.



Teaching Tip:
Have learners investigate the history related to where the length a meter came from, or a litre or the mass unit kilogram. The more learners investigate a variety of historical facts the more they can share their knowledge with each other and thus learn a greater number of historical facts on measurement.

TOPIC 6: DIVISION

INTRODUCTION

- This unit runs for 7 hours.
- It is part of Content Area, 'Numbers, Operations and Relationships' and counts for 50 % in the final exam.
- The unit revises the content on division covered in Term 2.
- It is important to ensure that learners have mastered the required skills for division of whole 4 digit numbers by whole 3 digit numbers. Learners must develop acceptable strategies that can at later stages of the senior phase be developed further to accommodate larger numbers.
- Although learners have the opportunity to use calculators it is still vital that these calculations are done without too much dependence on the calculator.
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE/GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
Division of whole 3 digit numbers by whole 2 digit numbers. Using a variety of techniques such a repeated subtraction to determine quotient.	Division of whole 4 digit numbers by whole 3 digit numbers. Long division Developing a strong strategy that can be applied to a variety of contexts and can be expanded later in the senior phase.	Using these skills and techniques to work in algebraic contexts. Development of a clear understanding that will become the basic component of factorising and differentiation.

LOOKING BACK 

Learners must be able to:

- Divide whole 3 digit numbers by whole 2 digit numbers.
- Use a variety of techniques such a repeated subtraction or determine quotient.

LOOKING FORWARD 

- These skills and techniques will be required to work in algebraic contexts.
- Development of a clear understanding that will become the basic component of factorising and differentiation

GLOSSARY OF TERMS

Term	Explanation / Diagram
Share	To portion or divide something between varying numbers of groups
Group	To place items together using criteria that relates the items to each other.
Prime Number	A positive integer that has only two factors, 1 and the number itself. This does not include 1 as it is an identity number.
Composite Number	Any number that has multiple factors.
Long Division	Long division is a process of division in arithmetic, usually used when the divisor is a large number, in which each step of the division is written out.
Ratio	A comparison of two numbers using division that can only be done if both the numbers have the same unit.
Remainder	What is left over when you try to share a whole out into a particular number of equal parts.
Divisor	The number we are dividing by in a division calculation.
Dividend	The number being divided
Quotient	The answer to a division calculation.
Inverse	The opposite operation being performed. In this section the inverse of division is multiplication.
Divisible	A number is divisible by another if there is no remainder after division.

SUMMARY OF KEY CONCEPTS

Working with factors to understand division

1. Learners must recap the basic regarding factors that were taught earlier in Grade 6 and in previous grades.
2. Writing numbers in factored form is the basis of division.



EXAMPLE:
What are the factors of 125?
{1, 5, 125} are all the factors of 125.

In order to get these answers division had to occur as factors match a partners that when multiplied result in the original number.

3. It is important in this section to teach learners the divisibility rules. These should have been covered in earlier grades although it is always beneficial to remind learners of these rules.

Divisibility rules

Dividing by 2

1. All even numbers are divisible by 2.



EXAMPLE:
All numbers ending in 0,2,4,6 or 8.

Dividing by 3

1. Add up all the digits in the number.
2. Find out what the sum is. If the sum is divisible by 3, so is the number



EXAMPLE:
12123 (1+2+1+2+3=9) 9 is divisible by 3, therefore 12123 is too!

Dividing by 4

1. Are the last two digits in your number divisible by 4?
2. If so, the number is too!



EXAMPLE:
358912 ends in 12 which is divisible by 4, thus so is 358912.

Dividing by 5

1. Numbers ending in a 5 or a 0 are always divisible by 5.

Dividing by 6

1. If the Number is divisible by 2 and 3 it is divisible by 6 also. You can also think about all multiples of 3 that are even numbers are also divisible by 6. You can therefore use the divisibility rule of 3 and then check if the number is even or odd. If it is even then it is also divisible by 6.

Dividing by 7 (2 Tests)

1. Take the last digit in a number.
2. Double and subtract the last digit in your number from the rest of the digits.
3. Repeat the process for larger numbers.



EXAMPLE:
357 (Double the 7 to get 14. Subtract 14 from 35 to get 21 which is divisible by 7 and we can now say that 357 is divisible by 7.

NEXT TEST

1. Take the number and multiply each digit beginning on the right hand side (ones) by 1, 3, 2, 6, 4, 5. Repeat this sequence as necessary
2. Add the products.
3. If the sum is divisible by 7 - so is your number.



EXAMPLE:
Is 2016 divisible by 7?
$6(1) + 1(3) + 0(2) + 2(6) = 21$
21 is divisible by 7 and we can now say that 2016 is also divisible by

Dividing by 8

1. This one's not as easy, if the last 3 digits are divisible by 8, so is the entire number.



EXAMPLE:
6008 - The last 3 digits are divisible by one, therefore, so is 6008.

Dividing by 9

1. Almost the same rule and dividing by 3. Add up all the digits in the number.
2. Find out what the sum is. If the sum is divisible by 9, so is the number.



EXAMPLE:
43785 (4+3+7+8+5=27) 27 is divisible by 9, therefore 43785 is too!

Dividing by 10

1. If the number ends in a 0, it is divisible by 10

These rules will assist learners in determining divisibility of number no matter how large the numbers are.

Multiplication used to help with division

1. For learners to use this method effectively learners would start by drawing up a clue board. This is a collection of multiplication facts related to the numbers they are working with. Learners then solve the division calculation by using approximation and subtraction as well as by referring to the clue board for facts that are relevant.



EXAMPLE:

3 450 ÷ 17

Multiply	Subtract
$200 \times 17 = 3400$	$3450 - 3400 = 50$
$2 \times 17 = 34$	$50 - 34 = 16$

Clue board

100×17=1700
200×17=3400
2×17=34
3×17=51
10×17=170

Therefore *3 450 ÷ 17 = 202* remainder 16



Teaching Tip:
This method works very well if learners can work on rough paper or on white boards because it is a trial and error method and does take long, learners should not do too many of these. This strategy does assist learners should they continue to struggle with long division. Always let learners check their answers by using multiplication and reversing the process. The size of certain numbers can make methods previously taught very difficult to apply.

Long division

1. This is the traditional method of division and it remains the best method used to determine the quotient when dividing. It works well even with very large numbers.
2. Learners must divide number that result in no remainder as well as numbers that leave a remainder.



EXAMPLE:

```
                2   4          remainder 59
146  |  3   5   6   3
   - 2   9   2              2 × 146
     6   4   3
   - 5   8   4              4 × 146
         5   9
```

Learners can be taught a simple rhyme that reminds them of the steps they need to follow to complete long division simply.

Daddy – Divide the dividend by the divisor
Mommy – Multiply by the divisor the factor
Sister – Subtract the numbers
Brother – Bring down the next number in the dividend.

3. Encourage learners to check answers using a calculator until they are confident and feel that they have grasped long division completely.



Teaching Tip:
Throughout the intermediate phase learners have worked with division in varying grades of difficulty but learners should develop a good strategy for division that can be applied to a variety of contexts.



It is vital that learners are exposed to word problems that require division and these should be real life word problems that hold realistic context and can be related to by the learners. Examples would include: How many chocolates could you buy if you had R 50 and each chocolate cost R 8, How many burgers would you buy from spur, if you had R 350 and a burger cost R 25 or if the school has 2500 books and each class has 40 children, how many book would each class get and how many books would go into the library?

TOPIC 7: NUMBER SENTENCES

INTRODUCTION

- This unit runs for 3 hours.
- It is part of Content Area, 'Patterns, Functions and Algebra' and counts for 10 % in the final exam.
- The unit is an extension of the work that was covered in Term 1 and is an introduction to algebraic concepts.
- This term learners are expected to develop number sentences to describe problem situations and focus more on the equivalence in number sentences than the properties of operations.
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE/GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Write number sentences to describe problem situations and focussing on the properties of operations. • Solve and complete number sentences by inspection and trial and improvement. • Check answers for number sentences by substitution	• Write number sentences to describe problem situations and focussing on the equivalence of number sentences. • Solve and complete number sentences by inspection and trial and improvement. • Check answers for number sentences by substitution	• Algebraic concepts such as algebraic expressions and equations. • Solving word problems in a variety of contexts using algebraic knowledge.

LOOKING BACK

Learners must be able to:

- Write number sentences to describe problem situations and focussing on the properties of operations.
- Solve and complete number sentences by inspection and trial and improvement.
- Check answers for number sentences by substitution

LOOKING FORWARD

- Algebraic concepts such as algebraic expressions and equations.
- Solving word problems in a variety of contexts using algebraic knowledge.

GLOSSARY OF TERMS

Term	Explanation / Diagram
Number Sentence	This is a way to represent a rule that can be used to solve a problem.
Equivalence	When two number sentences result in the same amount they are equivalent to each other.
Order of Operations	Applying the rule of BODMAS or BEDMAS to solve a number sentence.

SUMMARY OF KEY CONCEPTS

Number sentences and equivalence

1. The basic start to equations. Number sentences are used to write a problem in mathematical terms so that the problem can be solved.
2. The focus this term is on the equivalence of number sentences and not on the properties of operations
3. Learners must be given examples that have multiple choice answers to prepare them for this format as it is used in standardised external tests.



EXAMPLE:
Which of the following would have the same value as ___ × 17?

a. ____ + 17
b. ____ - 17
c. 17 ×____
d. 17 + ____

4. A number sentence is used to consolidate the idea of expressing a rule.
5. Where possible learners should use number sentences to solve word problems in a large variety of real life context.
6. When learners write number sentences they are still encouraged to use symbols to represent the unknown values and should not be using algebraic notation yet.



EXAMPLE:
A certain number multiplied by 2 is equal to 26 minus 4. What is the number?

____ × 2 = 26 – 4

TOPIC 8: TRANSFORMATIONS

INTRODUCTION

- This unit runs for 3 hours.
- It is part of Content Area, 'Space and Shape (Geometry)' and counts for 15 % in the final exam.
- The unit extends the work covered in Term 3 on Transformations where the greater focus is on enlargement and reduction of shapes.
- Learners must revise the language they have learnt that relates to Transformation Geometry. Learners must be capable of describing the transformations that they see happening.
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE/GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Describing lines of symmetry in 2D and 3D objects found in nature. • Describing rotational symmetry of shapes • Enlargement/reductions of basic shapes (quadrilaterals and triangles only)	• Recognize, describe and identify transformations that result in patterns both man-made and natural environments. • Enlarge and reduce triangles and quadrilaterals • Understanding geometrical ratio	• Transformations performed on a variety of shapes including 3D shapes. • Multiple transformations performed on a single shape • Glide reflections performed on shapes • Transformations performed on functions (graphs).

LOOKING BACK 

Learners must be able to:

- Describe lines of symmetry in 2D and 3D objects found in nature, modern everyday life and in our cultural heritage.
- Describe rotational symmetry of shapes
- Enlarge/reduce basic shapes (quadrilaterals and triangles only)

LOOKING FORWARD 

- Transformations performed on a variety of shapes including 3D shapes.
- Multiple transformations performed on a single shape
- Glide reflections performed on shapes
- Transformations performed on functions (graphs).

GLOSSARY OF TERMS

Term	Explanation / Diagram
Transformation	A change in the position, orientation or size of an object or shape
Rigid Transformation	Transformations in which size and shape are preserved (that means they do not change)
Object	The original shape before a transformation has been made
Image	The resulting shape after a transformation has been made
Enlargement	A transformation where the shape of the object is maintained but the size is increased.
Reduction	A transformation where the shape of the object is maintained but the size is decreased.
Centre Of Enlargement / Reduction	The point from which an enlargement takes place or the point towards which a reduction occurs
Scale Factor	The number of times the image is larger or smaller than the original object
Congruent	Absolutely identical to each other

SUMMARY OF KEY CONCEPTS

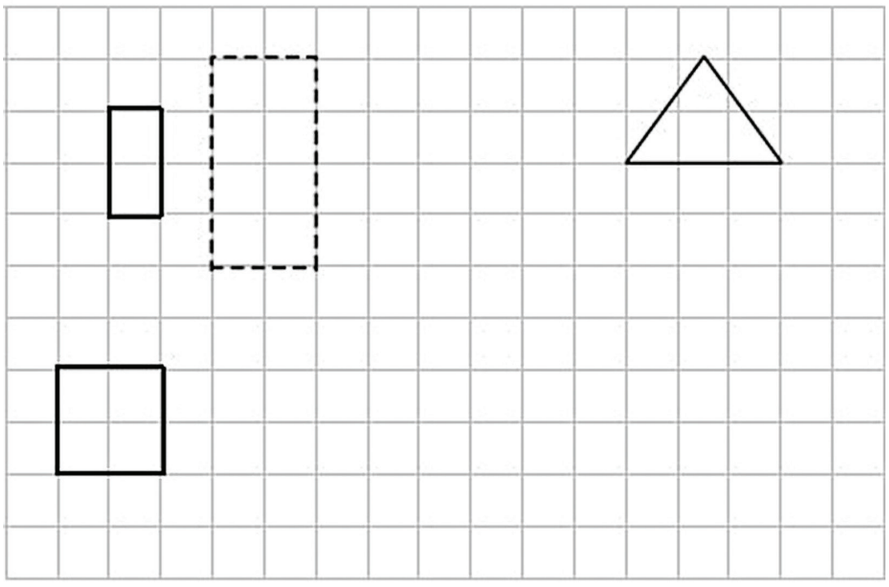
Enlargements and reductions

1. Most other transformations usually result in congruent images, but this transformation changes the size of the object and therefore the image is similar to the object and is no longer congruent. This transformation must be performed on squared paper.

Teaching Tip:
A good understanding of scale factor will be useful when scaled drawings must be done later in the senior phase. Learners must understand that scale factors larger than one result in enlargements and scale factors between zero and one result in reduced images. It is therefore vital that educators explain that scale factor is always multiplied by the original size to result in the image. It is therefore better to say the image is half the size of the original object as this makes it relatable to learners when the scale factor is times by 1/2.

2. Learners are expected to enlarge and reduce only triangles and quadrilaterals and this would be expanded in the later stages of the senior phase and the FET phase.

Example:



Teaching Tip:
Learners will be enlarging and reducing a variety of shapes in Grade 7 it is very important that the skills are mastered on basic shapes in Grade 6 to ensure they can perform the same task on more complex shapes later.

TOPIC 9: POSITION AND MOVEMENT

INTRODUCTION

- This unit runs for 2 hours.
- It is part of Content Area, 'Space and Shape (Geometry)' and counts for 15 % in the final exam.
- The unit covers the location of objects, drawings and symbols using alpha-numeric referencing.
- Learners should also be capable of locating places on a map that has a grid with alpha-numeric referencing.
- Learners are extended in Grade 6 to having to give directions to move from one position to another.
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own. This is component has direct relatability to geography and learners are consolidating their knowledge from this subject area in the Mathematics classroom.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE/GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Locate position of objects, drawings or symbols using grid referencing in the alpha-numeric context. • Locate a position on a map using alpha-numeric reference. • Follow directions to trace a path between positions on a map.	• Locate position of objects, drawings or symbols using grid referencing in the alpha-numeric context. • Locate a position on a map using alpha-numeric reference. • Give directions to move between positions or places on a map.	• This skill is applied in transformation geometry and analytical geometry later in the senior and FET phases. • The skill of grid referencing is also applied extensively in Geography and Mathematical Literacy

LOOKING BACK

Learners must be able to:

- Locate position of objects, drawings or symbols using grid referencing in the alpha-numeric context.
- Locate a position on a map using alpha-numeric reference.
- Follow directions to trace a path between positions on a map

LOOKING FORWARD

- This skill is applied in transformation geometry and analytical geometry later in the senior and FET phases.
- The skill of grid referencing is also applied extensively in Geography and Mathematical Literacy

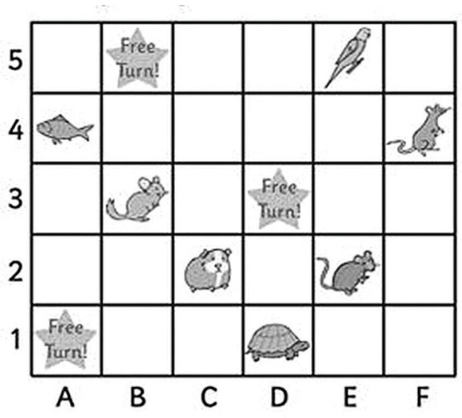
GLOSSARY OF TERMS

Term	Explanation / Diagram
Alpha-numeric Grid	A grid with alphabet letters for the columns and numbers for the rows, in which every position on the grid has a specific reference.
Grid Reference Position	Refers to a particular cell on the grid for example C2 is the cell in column C and row 2

SUMMARY OF KEY CONCEPTS

Grid Reference of position on a map

1. Finding the position of a specific object or symbol on the map using alpha-numeric reference.



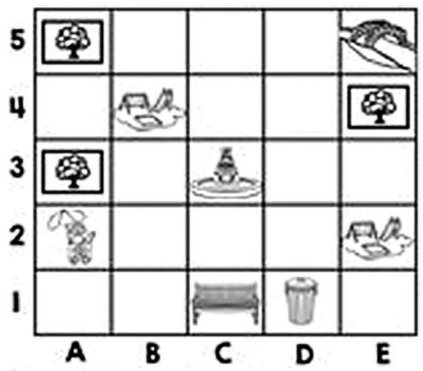
The fish is located in A5 and the turtle in D1

2. Learners can play games to concrete this idea. Games such as battleships or treasure hunts can help learners develop a full understanding of grid referencing.

Describing a change in position on a grid

1. Learners must be able to describe the movement an object makes to change position in the grid

EXAMPLE:

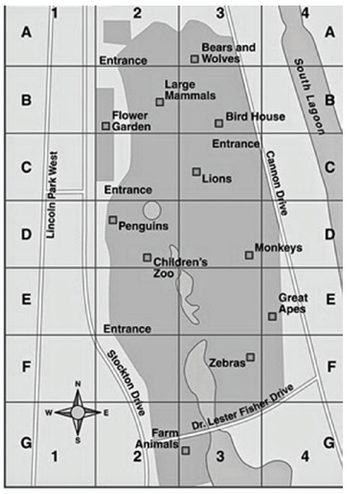


The tree moves upwards 2 blocks from A3 to reach A5, then the tree moves 4 blocks to the right and down 1 block to reach E4.

Working with maps that have grid references

1. Learners must be able to identify places on a map by determining the grid reference and must be able to give direction (compass direction) to reach another location in a different section of the grid.

EXAMPLE:



Give the grid reference for the farm animals?
In what direction would you walk from the children's zoo in D2 to the monkeys in D3?

2. Learners must be able to give direction as a cardinal direction on the compass and extend their ability from merely left, right or such as means for giving directions.

TOPIC 10: PROBABILITY

INTRODUCTION

- This unit runs for 2 hours.
- It is part of Content Area, 'Data Handling' and counts for 10 % in the final exam.
- The unit extends the knowledge of basic chance that was introduced in earlier grades in the Intermediate Phase.
- This topic lays the foundation for a clear and definite understanding of Probability and Theoretical Probability in the senior and FET phase and expands the learners' knowledge base from mere experimental ideas related to probability to making theoretical assumptions related to chance.
- Learners must be encouraged to perform experiments using dice, coins and spinners
- Practice as much as possible – if the textbook used does not have enough exercises in, re-do some, find some more or make up a worksheet of your own. This is a practical section and learners must experience the outcomes and discuss the different outcomes when compared to other sets of experiments.

SEQUENTIAL TEACHING TABLE

INTERMEDIATE PHASE/GRADE 5	GRADE 6	SENIOR / FET PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Perform single repeated events and list the possible outcomes for experiments such as rolling a die. flipping a coin and spinning a simple spinner. • Count and compare the frequency of actual outcomes for a series of trials up to 20 trials.	• Perform single repeated events and list the possible outcomes for experiments such as rolling a die. flipping a coin and spinning a simple spinner. • Count and compare the frequency of actual outcomes for a series of trials up to 50 trials.	• Relative frequency experiments and theoretical probability. • The application of theoretical probability to determine chance. • Venn diagrams and proving chance by calculations.

LOOKING BACK 

Learners must be able to:

- Perform single repeated events and list the possible outcomes for experiments such as rolling a die, flipping a coin and spinning a simple spinner.
- Count and compare the frequency of actual outcomes for a series of trials up to 20 trials.

LOOKING FORWARD 

- Relative frequency experiments and theoretical probability.
- The application of theoretical probability to determine chance.
- Venn diagrams and proving chance by calculations

GLOSSARY OF TERMS

Term	Explanation / Diagram
Experiment	Something we do to find out what will happen
Trial	The activity that is used to determine what will happen
Outcome	The result of the trial
Frequency	How often the outcome occurs

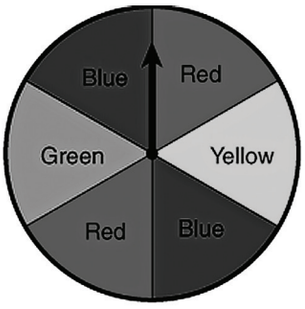
SUMMARY OF KEY CONCEPTS

Listing outcomes from trials

1. Learners should be able to list outcomes that could occur if a certain trial is attempted:

EXAMPLE:

Spinning a spinner

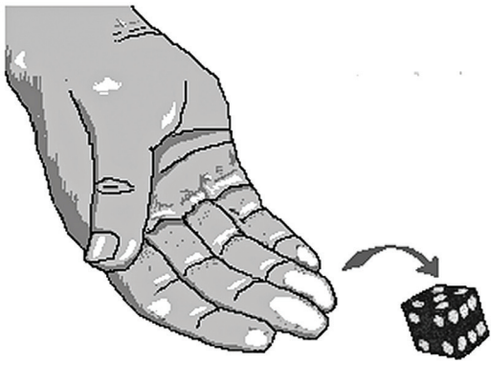


The spinner could land on red or blue twice but on yellow or green only once each.

Flipping a coin



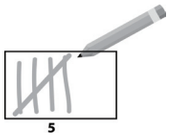
Rolling a die



Recording outcomes for up to 50 trials

1. Learners must use tallies to record the outcomes from up to 50 trials in a table and must understand that each set could deliver different results as the outcome is based on chance.

Teaching Tip
Learners must be reminded how to tally correctly.



Learners will use this skill later when they are working with relative frequency in the senior phase. It is very important to make sure that learners understand what they are recording and that they are recording accurately.

Notes

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