Grade 5

MATHEMATICS CONTENT BOOKLET: TARGETED SUPPORT

Term 4

A MESSAGE FROM THE NECT

NATIONAL EDUCATION COLLABORATION TRUST (NECT)

Dear Teachers,
This learning programme and training is provided by the National Education Collaboration Trust (NECT) on behalf of the Department of Basic Education (DBE)! We hope that this programme provides you with additional skills, methodologies and content knowledge that you can use to teach your learners more effectively.

What is NECT?
In 2012 our government launched the National Development Plan (NDP) as a way to eliminate poverty and reduce inequality by the year 2030. Improving education is an important goal in the NDP which states that 90% of learners will pass Maths, Science and languages with at least 50% by 2030. This is a very ambitious goal for the DBE to achieve on its own, so the NECT was established in 2015 to assist in improving education and to help the DBE reach the NDP goals.

The NECT has successfully brought together groups of relevant people so that we can work collaboratively to improve education. These groups include the teacher unions, businesses, religious groups, trusts, foundations and NGOs.

What are the Learning programmes?
One of the programmes that the NECT implements on behalf of the DBE is the 'District Development Programme'. This programme works directly with district officials, principals, teachers, parents and learners; you are all part of this programme!

The programme began in 2015 with a small group of schools called the Fresh Start Schools (FSS). Curriculum learning programmes were developed for Maths, Science and Language teachers in FSS who received training and support on their implementation. The FSS teachers remain part of the programme, and we encourage them to mentor and share their experience with other teachers. The FSS helped the DBE trial the NECT learning programmes so that they could be improved and used by many more teachers. NECT has already begun this embedding process.

Everyone using the learning programmes comes from one of these groups; but you are now brought together in the spirit of collaboration that defines the manner in which the NECT works. Teachers with more experience using the learning programmes will deepen their knowledge and understanding, while some teachers will be experiencing the learning programmes for the first time.

Let's work together constructively in the spirit of collaboration so that we can help South Africa eliminate poverty and improve education!

www.nect.org.za

Contents

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:

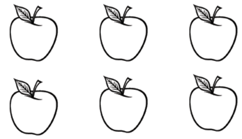
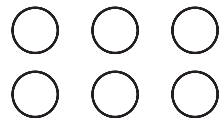
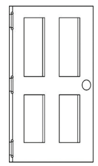
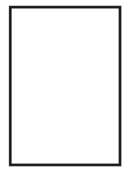
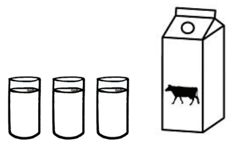
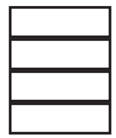
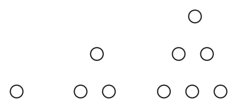
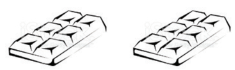
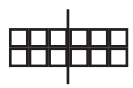
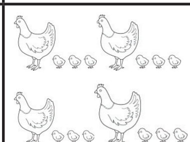
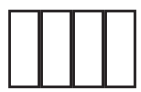
- Using some of the time of topics with a more generous time allocation, to assist learners to form a deeper understanding of a concept, but also to catch up on time missed due to remediating and re-teaching of a previous topic.
- Giving out revision work to learners a week or two prior to the start 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

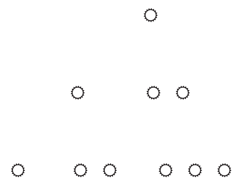
- The SEQUENTIAL TEACHING TABLE lays out the knowledge and skills covered in the previous grade, in the current grade and in the next grade.
- The LOOKING BACK and LOOKING FORWARD summarises the relevant knowledge and skills that were covered in the previous grade or phase and that will be developed 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 $2+2+2=6$ or $\frac{1}{2}$ of $6 = 3$ 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	SHOW IT - embody	SYMBOL IT - enable
	• To introduce terminology • To support auditory learning • To link mathematics to real life	• To help storing and retrieving ideas • To help visual learning • To condense information to one image	• 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 a □ b ○ ab □○ a^2 ■ a^2b ■○	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: ADDITION AND SUBTRACTION

INTRODUCTION

- Together, the first two topics on whole number run for 6 hours.
- It is part of the content area ‘Numbers, Operations and Relationships’ an area which is allocated 50% of the total weight shared by the five content areas in Grade 5.
- For Term 4, this unit covers the range of 6 digits for general number concepts and 5 digits for addition and subtraction operations.
- The purpose of this unit is to revise and consolidate the work of the previous three terms.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• General number concept up to 5 digit numbers • Round off to multiples of 10, 100 and 1 000 • Represent odd and even numbers to 1 000 • Add and subtract whole numbers of 4 digits • Use four calculation strategies	• General number concept up to 6 digit numbers • Round off to multiples of 5, 10, 100 and 1 000 • Represent odd and even numbers to 10 000 • Add and subtract whole numbers of 5 digits • Use five calculation strategies	• General number concept up to 9 digit numbers • Round off to multiples of 5, 10, 100, up to 1 000 000 • Represent prime numbers to 100 • Add and subtract whole numbers of 6 digits • Use six calculation strategies

GLOSSARY OF TERMS

Term	Explanation/Diagram
Whole numbers	Whole numbers include counting numbers and zero (0,1,2,3...) and negative numbers (like those used to measure temperature).
Digit, number, place value and number value	Digit: A digit is a symbol that is used to represent a quantity. Number: We use the ten digits in the base ten number system in different positions to build numbers: 524 is a three-digit number. Place value: In the number 524, for example, the digit 2 is in the position with a place value of tens (10's). Number value: In the number 524, for example, the digit 2 in the tens position has a number value of 20.
Building up and breaking down	We break down (expand) a number into the numbers that were added to build it up, e.g. 36 = 30 + 6. We build up a number by writing those numbers as one number, like 30 + 6 = 36.
Rounding up or rounding down	Rounding involves either increasing or decreasing a number by writing it as an approximate closest to a given "round" number.
Compensating	Compensating is a strategy to add and subtract (mostly used in mental maths) where you change the second number to a "friendly number". For example in 133 - 68, we change 68 to 70 by rounding it up and then you adjust the answer.
Column method to add and subtract	Also called the "standard algorithm" or the vertical method for addition and subtraction.
Inverse operations	Inverse operations are opposite operations that undo each other. Addition and subtraction are inverse operations.
Estimation	A close guess of the actual answer. Some thinking and some calculation are done mentally but we do not actually calculate the answer. Rounding is a handy way of estimating.

SUMMARY OF KEY CONCEPTS

Introduction

Facts that learners need to know in Grade 5 are:

Identity property of zero for addition and subtraction:
When we add zero to, or subtract zero from any number, the number stays the same (69 + 0 = 69 and 72 – 0 = 72)

The commutative property of number for addition:
It does not matter in which order we add numbers (15 + 16 = 16 + 15). This does not apply for subtraction.

The associative property of number for addition:
In addition, the grouping does not matter
15 + (3 + 5) = (15 + 3) + 5. This does not apply for subtraction.

Rounding up or down to the nearest multiple of 5

1. Round up to the next multiple of 5 or down to the previous multiple of 5 as follows:

   0, 1, 2<|>3, 4, **5**, 6, 7<|>8, 9, **10**, 11, 12<|>13, 14, **15**, 16, 17<|>23, 24, **25**, 26, 27<|>...

Estimating by rounding

In context free sums and in context learners can estimate through rounding.

Example:
Estimate the total price of a tumble dryer at R3 299 and a fridge at R4 799.

R3 299 ≈ R3 000 and R4 799 ≈ R5 000, therefore R3 299 + R4 799 ≈ R8 000

Rounding to the nearest one hundred would also be an option.

3300 + 4800 = R8100

Rounding and compensating

Change the second number to a friendly number (round up or down) and adjust the answer.

Examples:

a. 394 + 58 (round up) → 394 + 60 → 454 (adjust) → 454 – 2 = 452

Note: Rounding up in addition is compensated for by subtracting the difference.

b. 488 + 33 (round down) → 488 + 30 → 518 (adjust) → 518 + 3 = 521

Note: Rounding down in addition is compensated for by adding the difference.

c. 394 – 58 (round up) → 394 – 60 → 334 (adjust) → 334 + 2 = 336

Note: Rounding up in subtraction is compensated for by adding the difference.

d. 482 – 33 (round down) → 482 – 30 → 452 (adjust) → 452 – 3 = 449

Note: Rounding down in subtraction is compensated for by subtracting the difference.

Addition and subtraction strategies

1. ADDITION

There are two ways to use the expanded notation in addition:

a. Both parts are broken down or expanded
   (i) horizontal
   (ii) vertical

b. Only the second part is broken down (expanded)

a. Expanded notation: break-down method (both parts expanded)

(i) Horizontal

Example:

52 713 + 28 224

= 50 000 + 2 000 + 700 + 10 +3 + 20 000 + 8 000 + 200 + 20 + 4 (expand both numbers)

= 50 000 + 20 000 + 2 000 + 8 000 + 700 + 200 + 10 + 20 + 3 + 4 (group)

= 70 000 + 10 000 + 900 + 30 + 7 (add like terms)

= 80 937

(ii) Vertical

Example:

52 813 + 28 324

3 +	4 =	7	add units horizontally
10 +	20 =	30	add tens horizontally
800 +	300 =	1 100	add hundreds horizontally
2 000 +	8 000 =	10 000	add thousands horizontally
50 000 +	20 000 =	70 000	add ten thousands horizontally
52 813 +	**28 324 =**	**81 137**	**add totals vertically**

b. Expanded notation: break-down method (only one part expanded)

Example:

24 435 + 18 749

24 435 + 10 000 → 34 435 + 8 000 → 42 435 + 700 → 43 135 + 40 → 43 175 + 9 → 43 184

b. Expanded notation: break-down method (only one part expanded)

Example:

24 435 + 18 749

24 435 + 10 000 → 34 435 + 8 000 → 42 435 + 700 → 43 135 + 40 →

43175 + 9 → 43 184

c. Column method (standard algorithm)

In this method, write numbers vertically below each other, units in one column, tens in one column, etc. Calculate from right to left, starting at the units. If the sum of digits in a column has two digits e.g. 5 + 9 =14, the second digit is "carried" to the next column to add there.

Example:

		HT	Th	H	T	U
		$^{1}8$	$^{1}8$	$^{1}4$	$^{1}3$	8
+		6	2	7	9	4
	1	5	1	2	3	2

2. SUBTRACTION

There are two ways to use the expanded notation in subtraction:

a. Both parts are broken down (expanded)

   (i) horizontally

   (ii) vertically

b. Only the second part is expanded or broken down

a. Expanded notation (break-down method, both parts expanded)

(i) Horizontal: Expanded notation (break-down method, both parts expanded)

Example:

45 232 – 18 438

= (40 000 + 5 000 + 200 + 30 + 2) –10 000 – 8 000 – 400 – 30 – 8

= (40 000 – 10 000) + (5 000 – 8 000) + (200 – 400) + (30 – 30) + (2 – 8)

= (40 000 – 10 000) + (5 000 – 8 000) + (200 – 400) + (**20** – 30) + (12 – 8)

= (40 000 – 10 000) + (5 000 – 8 000) + (**100** – 400) + (120 – 30) + 4

= (40 000 – 10 000) + (**4 000** – 8 000) + (1 100 – 400) + 90 + 4

= (**30 000 – 10 000**) + (14 000 – 8 000) + 700 + 90 + 4

= (30 000 – 10 000) + 6 000 + 700 + 90 + 4

= 20 000 + 6 000 + 700 + 90 + 4

= 26 794

(ii) Vertical: Expanded notation (break-down method, both parts expanded)

Teaching tip: Leave lines open in between!

START SUBTRACTING FROM THE UNITS

Example:

84 232 – 61 438

	2	–	8	=	(cannot)	
	12	–	8	=	4	← Open line, filled in if/when needed
+20	30	–	30	=	(cannot)	
	120	–	30	=	90	← Open line, filled in if/when needed
+100	200	–	400	=	(cannot)	
	1 100	–	400	=	700	← Open line, filled in if/when needed
+3 000	4 000	–	1 000	=	2 000	
						← Open line, filled in if/when needed
+	80 000	–	60 000	=	20 000	
				=	22 794	

b. Expanded notation (break-down method, second number expanded)

(i) Horizontal

NB: START SUBTRACTING FROM THE LARGEST, IN THIS CASE THE THOUSANDS

Example:

84 232 – 61 438

84 232 – 60 000 → 24 232 – 1 000 → 23 232 – 400 → 22 832 – 30 → 22 802 – 8 → 22 794

OR 84 232 – 60 000 – 1 000 – 400 – 30 – 8

= 24 232 – 1 000 – 400 – 30 – 8

= 23 232 – 400 – 30 – 8

= 22 832 – 30 – 8

= 22 802 – 8

= 22 794

c. Standard algorithm (column- or vertical method).

In this method, numbers are written below each other, with all units in one column, all tens in one column and so on. Calculate from right to left, starting at the units. If the first number in the column is smaller than the second, we “borrow” from the next column to make the calculation possible.

Example:

	HTh	Th	H	T	U
	^{4}~~5~~	^{3}~~4~~	^{11}~~2~~	^{12}~~3~~	^{1}~~2~~
–	1	4	3	8	4
	3	9	8	4	8

TOPIC 2: PROPERTIES OF 3D OBJECTS

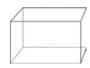
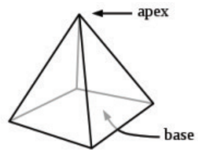
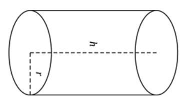
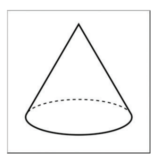
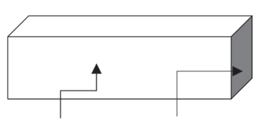
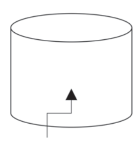
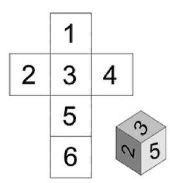
INTRODUCTION

- This unit runs for 5 hours.
- It is part of the content area 'Space and Shape' and together with the other topics in this content area count for 15% of the total weight allocated to the five content areas in Grade 5.
- The unit covers 3-D knowledge and skills pertaining to geometrical shapes and related concepts and terminology.
- The purpose of this unit is to confirm learners' knowledge and experience with objects of the third spatial dimension and some of their qualities in their everyday lives.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Range of 3D shapes: • spheres • rectangular prisms • cylinders • cones • square based pyramids • Properties of 3D objects • 2D shape of faces • flat/curved surfaces • Make 3D models out of polygons	• Range of 3D shapes: • various prisms • cubes • cylinders • pyramids • cones • Compare cubes and rectangular prisms • Properties of 3D objects • 2D shape of faces • number of faces • flat/curved surfaces • Make 3D models out of polygons • Cut open boxes, trace and describe their nets	• Range of 3D shapes: • rectangular prisms • cubes • tetrahedrons • pyramids • Compare pyramids and tetrahedrons • Properties of 3D objects • shape of faces • number of faces • number of vertices • number of edges • Make 3D models using nets and drinking straws

GLOSSARY OF TERMS

Term	Explanation/Diagram
Three-dimensional geometrical shape (3D objects)	Objects that occupy space and have form and which can be measured in three directions or dimensions like a box, of which the length, breadth and height can be measured.
Properties	The qualities by which we recognise and describe things.
Prism	A 3D object which has two ends that are the same shape and size, and sides that are rectangles. 
Pyramid	A 3D object with a base of any shape and triangular sides that all meet at one point at the top in an apex. 
Apex	The vertex of a pyramid or a cone which is its highest point when it stands on its base, or the top point opposite the base.
Rectangular prism	A 3D object of which all sides are rectangles and all sides meet at a right angle. A brick or a shoebox is a rectangular prism.
Cube	A 3D shape or object with six equal square sides. 
Cylinder	A 3D object with two flat ends equal in size that are circles and one curved side. For example, a tin. 
Cone	A 3D object with a circular flat base joined to a curved side that ends in an apex on top 
Flat surface	A flat suface is a straight 2D shape, called a face. 3D objects with flat surfaces have edges, like a box.
Curved face or surface	An object with surfaces which are rounded There are no edges or corners, like an egg. 
Face	A face is the side of a solid shape (flat or curved side).  Flat faces  Curved face
Net	A flattened out 3D object showing the 2D shapes that form its faces. When this net is folded up, it forms the 3D object. 

SUMMARY OF KEY CONCEPTS

Introduction

Learners in Grade 5 learn about 3D shapes by understanding some of their properties.

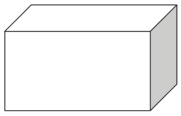
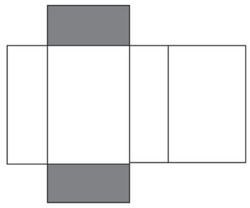
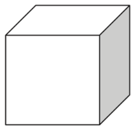
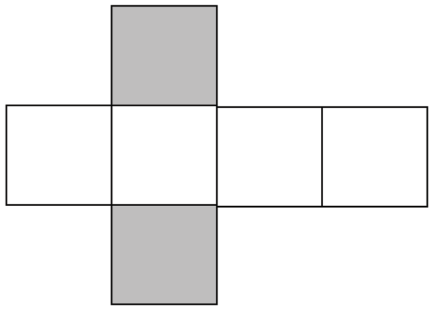
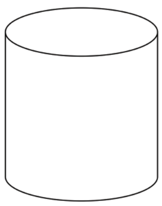
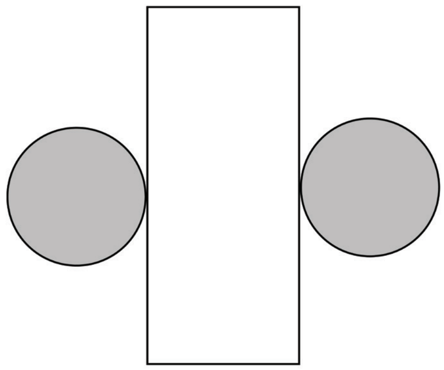
Distinguishing different prisms from each other

Learners need to be able to:

- Identify what type of prism an object is.
- Name a prism starting with the name of the 2D shape of its base.
- Describe the 2D net of the prism. Show (i) where the two bases of the prism are and (ii) where the sides of the prism are.
- Describe the difference(s) between a rectangular prism and a cube.

Learners should do exercises similar to the one on the next page.

They should count the number of faces, know the names of the face shapes as well as the 3D object and state whether they are curved or flat.

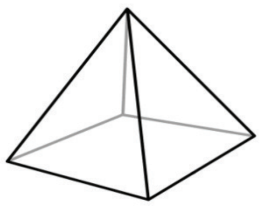
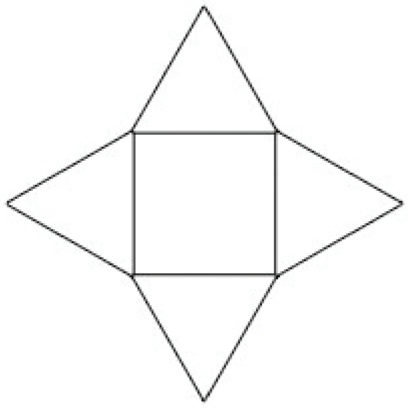
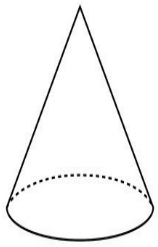
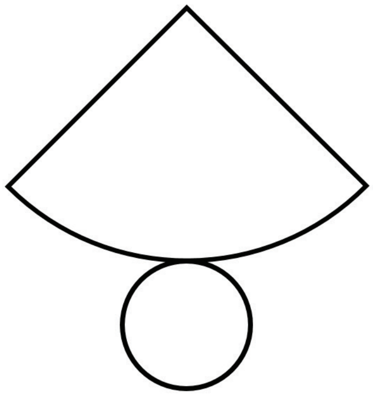
PRISM	3D SHAPE	2D NET OF THE SHAPE
Rectangular based prism		
Square based prism (cube)		
Circular based prism (cylinder)		

Learners should note that all of the above shapes are right prisms because their sides are at right angles to their base. This also means that the base has a matching shape (at the 'top') which is identical and parallel to the base.

Distinguishing prisms from pyramids

Learners need to be able to:

- Identify the differences between a prism and a pyramid.
- Describe the 2D nets of pyramids.
    - Show where the base of the pyramid is.
    - Show where the sides of the pyramid are.
- Why are the sides of a prism rectangular and the sides of a pyramid are triangular?

PYRAMID	3D SHAPE	2D NET OF THE SHAPE
Square based pyramid		
Circular based pyramid (cone)		

Learners should note that the sides of a pyramid and a cone slope upwards from the base. The sides form an acute angle with the base. These sides meet at a central point (the vertex).

Linking between 3D objects and their 2D surfaces

Learners need to be able to:

- Cut out the 2D nets of shapes.
- Fold shapes up to form a 3D object.
- Label the object with its geometrical name.
- Count the faces, name them and describe whether the surfaces are flat or curved.

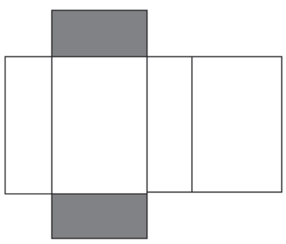
Teaching tip: Learners may cut tabs ("wings") if they want to glue the shapes together. These are not provided because we want to emphasise the actual faces of the shape.

Teaching tip: To draw nets of 3D objects, a good start is at the base(s) of the shape.

Example:
Rectangular based prism:

Step 1:
Draw two rectangular bases

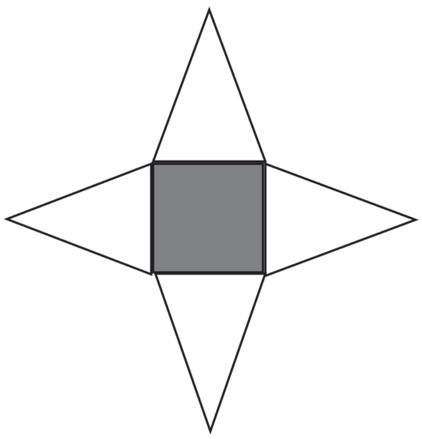
Step 2:
Insert the rectangular sides



Example:
Square based pyramid:

Step 1:
Draw the square base

Step 2:
Add four equal triangular sides



Learners should bring a box to school and unfold it carefully and look at the 2D shapes formed once it has been flattened out.

Nets should be provided so learners can perform an exercise similar to the one below:

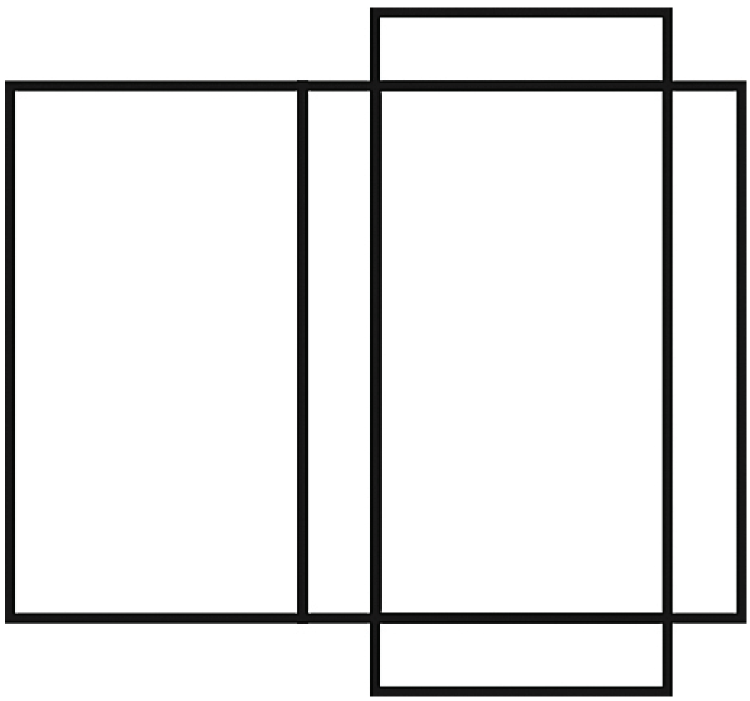
a. Cut out these four nets.

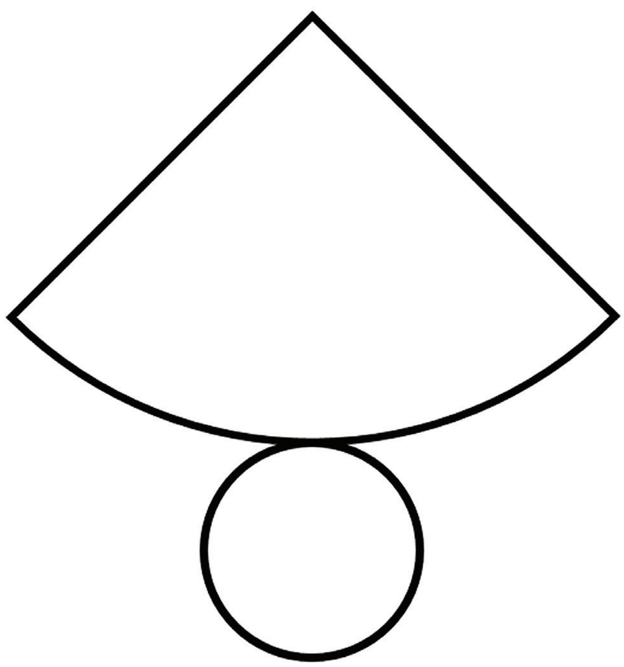
b. Describe all the faces.

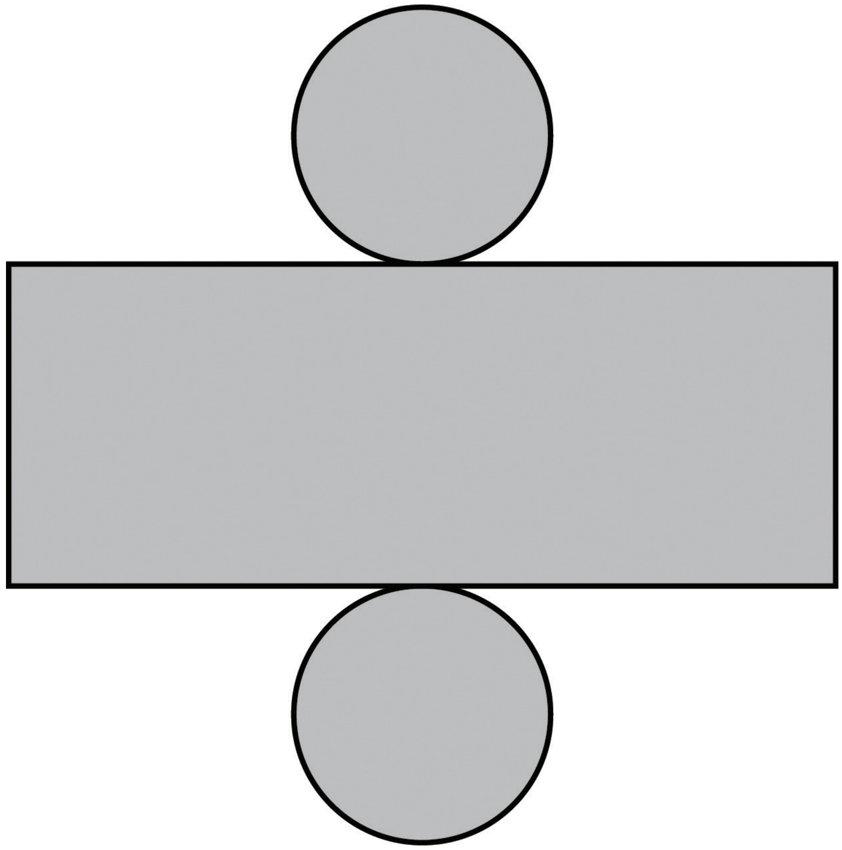
c. Fold up the net to form a 3D object.

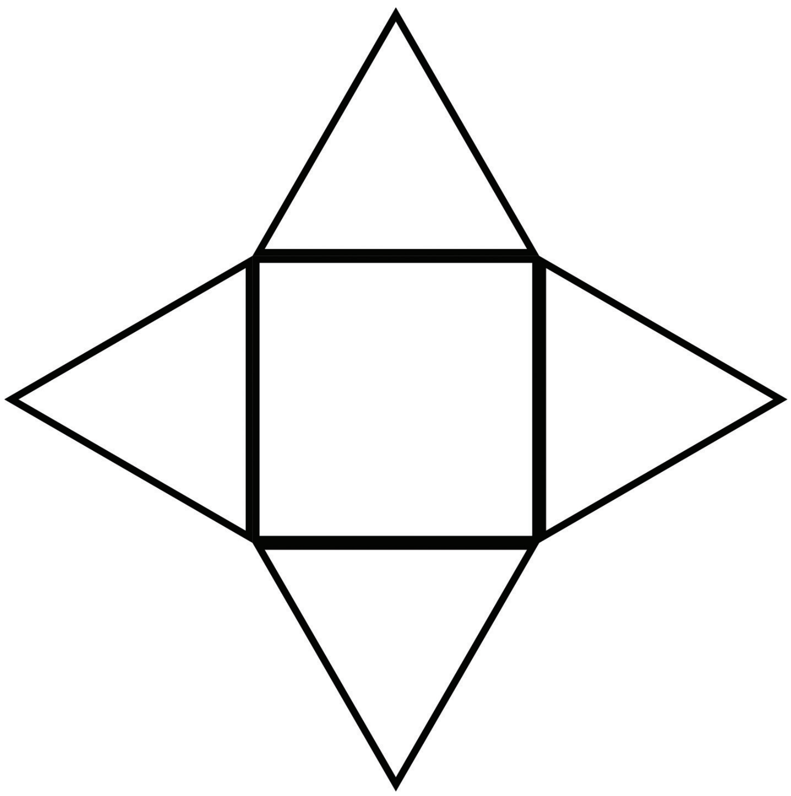
d. Name the object and state whether it is a pyramid or a prism.

e. Explain why the shape is a pyramid or a prism.









TOPIC 3: COMMON FRACTIONS

INTRODUCTION

- This unit runs for 5 hours.
- It is part of the Content Area 'Numbers, Operations and Relationships', an area which is allocated 50% of the total weight shared by the five content areas in Grade 5.
- For Term 4, one skill is added, namely to add and subtract mixed numbers.
- The purpose of this unit is to consolidate the knowledge and calculations with fractions built up over the year.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Compare, order the fractions halves, thirds, quarters, fifths, sixths, sevenths and eighths • Describe and compare common fractions in diagram form • Add fractions with the same denominators • Recognise and describe that division and fractions are equivalent concepts • Solve fraction problems in context including grouping and equal sharing • Recognise and describe equivalent fraction forms where denominators are multiples of each other	• Count forwards and backwards in fractions • Compare, order common fractions to at least twelfths • Add and subtract fractions with same denominators • Add and subtract mixed numbers • Add and subtract fractions which result in whole numbers • Recognise, describe and use the equivalence of division and fractions • Solve problems with fractions including equal sharing and grouping • Recognise and describe equivalent forms of fractions of which the denominator is a multiple of another	• Compare, order fractions including hundredths • Add and subtract fractions of which one denominator is a multiple of the other • Add and subtract mixed numbers • Determine fractions of whole numbers • Solve problems with fractions including equal sharing and grouping • Find percentages of whole numbers • Recognise and describe equivalent forms of fractions with denominators (1- or 2 digit) which are multiples of another • Recognise percentage and decimal fraction forms of a common fraction

GLOSSARY OF TERMS

Term	Explanation / Diagram
Common fraction	a. A fraction is a part or parts of a whole that has been shared equally into a number of pieces. b. A fraction can also be a part of a number of things that have been divided into equal groups.
Denominator	The number under the fraction line, which tells us the number of equal parts into which one whole has been divided, or the number of equal smaller groups into which a bigger group has been divided.
Numerator	The number above the fraction line that tells us how many parts or groups we are dealing with.
Fractions and whole	When the numerator of a fraction is smaller than the denominator, the number of parts have not yet formed or exceeded a whole. When the numerator and the denominator are the same, we have a whole.
Mixed numbers	A fraction of something refers to less than a whole, but where we have more than a whole, the numerator (the number in the top part of the fraction) is bigger than the denominator (the number in the bottom part).
Simplify fractions	We can simplify fractions, or write them in their simplest form: If the numerator is larger than the denominator, we bring the fraction to a mixed number: $\frac{23}{6} = 2\frac{1}{6}$ If the numerator and the denominator can both be divided by the same number, we do that: $\frac{6}{8} = \frac{3}{4}$ because both 6 and 8 can be divided by 2
Equivalent fractions	Equivalent fractions are fractions that are equal in size but have different names. The numerator and the denominator of one of the equivalent fractions is always a multiple of the numerator and the denominator of the other one of the equivalent fraction. This means that $\frac{6}{24}$ is the same as $\frac{3}{12}$ and it is the same as $\frac{1}{4}$; $\frac{3}{8}$ is the same as $\frac{9}{24}$.

SUMMARY OF KEY CONCEPTS

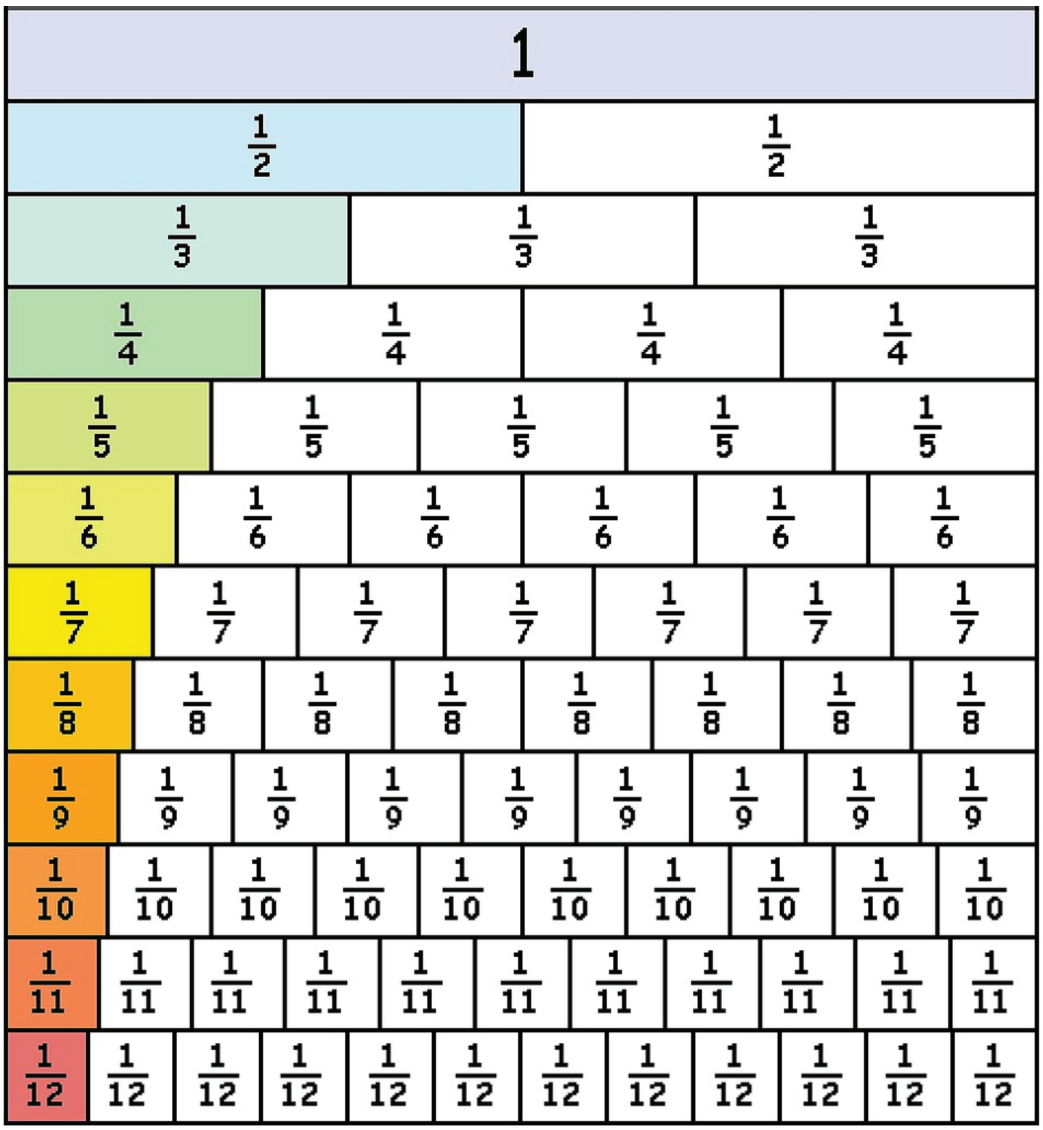
Introduction

The focus for this term is still on fractions in the range up to twelfths. Learners need an understanding of fractions as being another way of writing a division sum. The new skill covered this term is to add and subtract mixed numbers.

Comparing fractions using a fraction wall

A fraction wall is a visual way to compare the sizes of different fractions.

Below is a completed fraction wall.



Note how the first fraction of every row is shaded which assists learners in also seeing the size (or value) of each of the fractions.

Learners should be able to answer questions similar to the ones below. They can use the fraction wall to assist them if necessary.

Examples:

1. Name two fractions which are larger than $\frac{3}{8}$?

2. Name two fractions which are smaller than $\frac{1}{4}$?

3. Name two fractions which are equal to $\frac{2}{3}$?

   Solution: Solution: $\frac{4}{6}$ and $\frac{8}{12}$

4. Complete the comparison <, = or >

   a. $\frac{2}{5}$ ☐ $\frac{5}{12}$

      Solution: $\frac{2}{5} < \frac{5}{12}$

   b. $\frac{3}{4}$ ☐ $\frac{9}{12}$

      Solution: $\frac{3}{4} = \frac{9}{12}$

   c. $\frac{5}{6}$ ☐ $\frac{8}{10}$

      Solution: $\frac{5}{6} > \frac{8}{10}$

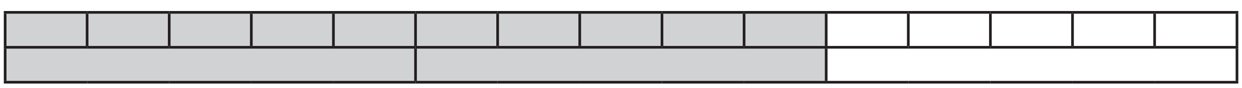
5. Write the fractions in ascending order: $\frac{6}{10}$; $\frac{5}{8}$; $\frac{4}{6}$ and $\frac{7}{12}$

   Solution: $\frac{7}{12}$; $\frac{6}{10}$; $\frac{5}{8}$; $\frac{4}{6}$

Calculating fractions of whole numbers

Follow the pattern below and do the examples:

1. Calculate by means of a diagram: $\frac{2}{3}$ of 15 oranges



Example:

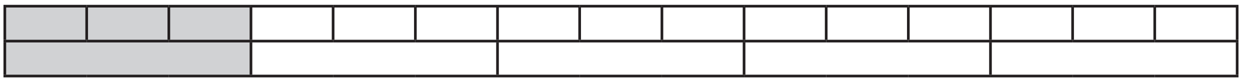
a. Calculate by means of a diagram: $\frac{5}{6}$ of 18 apples

   Solution: 15 apples

b. Calculate by means of a diagram: $\frac{3}{8}$ of 24 sweets

   Solution: 9 sweets

2. Calculate by means of a diagram: what fraction is 3 oranges of 15 oranges



Example:

a. Calculate by means of a diagram: what fraction is 12 apples of 16 apples

   Solution: $\frac{12}{16}$ or $\frac{3}{4}$

b. Calculate by means of a diagram: what fraction is 6 learners of 9 learners

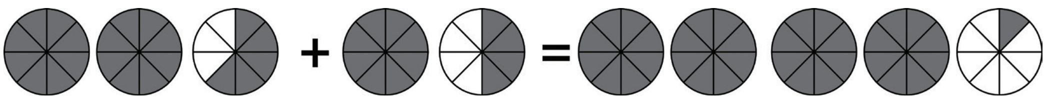
   Solution: $\frac{6}{9}$ or $\frac{2}{3}$

Adding and subtracting mixed numbers

Keeping in mind that a whole number is made up of all the parts that it has been divided into, addition and subtraction of mixed numbers should not be difficult to understand. Again, diagrams can assist in this regard:

Example:

$2\frac{5}{8}+1\frac{4}{8}=4\frac{1}{8}$



Calculate the following:

- $\frac{22}{5}-\frac{14}{5}$

  Solution: $\frac{22}{5}-\frac{14}{5} = \frac{8}{5} = 1\frac{3}{5}$

- $1\frac{5}{6}+1\frac{5}{6}$

  Solution: $1\frac{5}{6}+1\frac{5}{6}=\frac{11}{6}+\frac{11}{6} = \frac{22}{6} = 3\frac{4}{6} = 3\frac{2}{3}$

- $3\frac{1}{2}-1\frac{1}{4}$

  Solution: $3\frac{1}{2}-1\frac{1}{4} = \frac{7}{2}-\frac{5}{4} = \frac{14}{4}-\frac{5}{4} = \frac{9}{4} = 2\frac{1}{4}$

- $15\frac{5}{12}+4\frac{7}{12}$

  Solution: $15\frac{5}{12}+4\frac{7}{12} = 19\frac{12}{12} = 20$

Solving problems that involve fractions

Teaching tip:
To solve word problems with fractions, learners can make use of diagrams.

Example:
Thabo has R35. That is a quarter of what his mother has in her purse. How much money does Thabo's mother have in her purse?

Thabo has R35			
His mother has R35	R35	R35	R35

Draw diagrams to help you to solve the following problems:

- Bess does homework for $2\frac{1}{4}$ hours on Monday, $1\frac{1}{2}$ hour on Tuesday, 2 hours on Wednesday and $1\frac{3}{4}$ hour on Thursday. How much time altogether has she spent doing homework during these four days?
  Solution: $2\frac{1}{4}+1\frac{1}{2}+2+1\frac{3}{4} = \frac{9}{4}+\frac{6}{4}+\frac{8}{4}+\frac{7}{4} = \frac{30}{4} = 7\frac{2}{4} = 7\frac{1}{2}$ hours
- $\frac{5}{8}$ of the Grade 5 class of 32 learners are eleven years old. How many learners are eleven years old?
  Solution: $\frac{5}{8}$ of $32 = 32 \div 8 \times 5 = 4 \times 5 = 20$
- Thembi earns R720 per week and she spends $\frac{1}{3}$ of that money on transport. How much money does she have left over?
  Solution: $\frac{1}{3}$ of R720 = R720 ÷ 3 = R240; she has R720 - R240 left over = R480

Work covered previously in this year can be revised from the Term 2 and Term 3 booklet.

- The difference between fractions, whole numbers and mixed numbers
- Counting in fractions from a given number on
- Describing fractions in various ways by words, symbols and diagrams
- Adding and subtracting common fractions with the same denominator
- Equivalent fractions
- Understanding the fractions tenths and hundredths

TOPIC 4: WHOLE NUMBERS: DIVISION

INTRODUCTION

- This unit runs for 7 hours.
- It forms part of the content area: 'Numbers, Operations and Relationships' and counts a part of 50% allocated to this content area in the final exam.
- The unit covers division of a whole 3-digit number by a 2-digit number, using various calculation strategies and problem solving in written and oral form.
- The purpose of this unit is for learners to deepen their understanding of division and refine their calculation skills.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Divide at least 3 digit numbers by 1 digit numbers • Solve problems involving equal sharing and grouping with remainders • Solve problems of equal sharing and grouping leading to solutions that are fractions	• Divide at least 3 digit numbers by 2 digit numbers • Solve problems involving equal sharing and grouping with remainders • Solve problems of equal sharing and grouping leading to solutions that are fractions	• Divide at least 4 digit numbers by 3 digit numbers • Solve problems involving equal sharing and grouping with remainders • Recognise rate as a form of division • Divide by means of the standard vertical algorithm

GLOSSARY OF TERMS

Term	Explanation / Diagram
Division	Sharing out of a quantity into a number of equal portions or groups. Examples: a. Equal sharing: Share 35 sweets among 7 children (35 ÷ 7 = 5) b. Equal groups: Pack 35 sweets in packets of 5 (35 ÷ 5 = 7)
Terms Used in a Division Equation	72 ÷ 6 = 12 ↓ ↓ ↓ dividend divisor quotient
Multiples	Multiples of a certain number (eg. 5) are the products when we multiply that number by any natural number. 15 is a multiple of 5, since 5 x 3 = 15
Factors	The numbers that were multiplied to get another number. 3 was multiplied by 12 to get 36 and therefore 3 and 12 are factors of 36. Also, 9 and 4 were multiplied to get 36, therefore they are factors of 36 too. Another factor pair of 36 is 2 and 18. When we multiply 6 by 6 we also get 36, but we count 6 as a factor only once. We take 1 and 36 as factors of 36 too, therefore all factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18 and 36.
One – Multiplicative Property	One multiplied by, or divided into a number does not change that number: one is the identity element for multiplication and division.

SUMMARY OF KEY CONCEPTS

Dividing by 1, 10s and 100s

1. Dividing by 1

   When we divide any number by 1, the number stays the same.

   Example:
   I have 14 sweets. I give it to one child. How many sweets does the child get?
   14 ÷ 1 = 14 The child gets all 14 sweets, because she was the only one.

   Talking about digits moving one column to the left when you multiply by 10 is certainly conceptually better than talking about moving the decimal place or ‘adding zeroes’, but learners often find this difficult to grasp.

   The aid below should assist learners with this. If it is possible, they should have cut out squares with various digits on which they could place below the main headings (from 10 000 to 1/1000).

   The arrows at the bottom assist them in in knowing which way the digits move when multiplying or dividing by powers of 10.

   If it is not possible for each learner to have their own then you can make one large copy to stick up on the chalkboard and allow learners to have in turns to come up and perform the calculation.

<u>Multiplying and Dividing by 10, 100 and 1000</u>

10 000	1000	100	10	1 ●	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
				●			

<u>Multiplying</u>

X 10 digits move LEFT **1** space
X 100 digits move LEFT **2** spaces
X 1000 digits move LEFT **3** spaces

←

<u>Dividing</u>

÷ 10 digits move RIGHT **1** space
÷ 100 digits move RIGHT **2** spaces
÷ 1000 digits move RIGHT **3** spaces

→

a. 7 × 10 =

b. 13 × 10 =

c. 5.43 × 10 =

d. 34.1 × 100 =

e. 32 × 100 =

f. 1.234 × 100 =

g. 3.2 × 1000 =

h. 0.32 × 1000 =

i. 0,0001 × 1000 =

j. 43 ÷ 10 =

k. 432 ÷ 10 =

l. 0.2 ÷ 10 =

m. 432 ÷ 100 =

n. 121.3 ÷ 100 =

o. 0.2 ÷ 100 =

Using (b) as an example:

A ‘1‘ and ‘3’ will be placed in the tens (10) and units column (1).

To multiply by 10, the rule is to move the digits one place to the left. This leaves an empty space in the units (1) column – this will therefore require a zero as a place holder.

Dividing 0 by any number

There is nothing to divide, so the answer is 0.

Example:
If I have no sweets, no matter how many people I would like to share them amongst. Therefore 0 ÷ any number = 0 and nobody gets anything.

Dividing any number by zero

We cannot divide any number of items by zero. This is something we cannot even imagine to do – it is an unreal thing to do.

Factorising

Learners have to understand that a composite number is the product of its factors. They also have to find pairs of factors for numbers.

Example:

a. Write all the factor pairs which have 60 as their product.

   1 x 60 = 60; 2 x 30 = 60; 3 x 20 = 60; 4 x 15 = 60; 5 x 12 = 60; 6 x 10 = 60

b. Then write all the factors of 60.
   Factors of 60 are: 1; 2; 3; 4; 5; 6; 10; 12; 15; 20; 30; 60

Example:

Write 60 as the product of its smallest (prime) factors.

60 = 6 x 10 = (2 x 3) x (2 x 5) = 2 x 3 x 2 x 5 or 2 x 2 x 3 x 5

Finding multiples

Learners apply their knowledge of multiples to find multiples in a given range.

Example

Find all the multiples of 5 between 13 and 28.

Teaching tip:

Use a number line.

1 2 3 4 **5** 6 7 8 9 **10** 11 12 13 14 **15** 16 17 18 19 **20** 21 22 23 24 **25** 26 27 28 29 **30**

The multiples of 5 between 13 and 28 are 15; 20; 25.

Writing division- and multiplication facts

To apply the idea of inverse operations, learners write the opposite of a given statement.

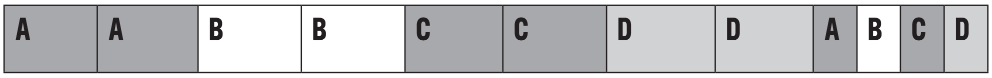
Example:

a. Write two division statements from 23 x 24 = 552
   (552 ÷ 23 = 24 and 552 ÷ 24 = 23)

b. Write a multiplication fact from 552 ÷ 23 = 24 (23 x 24 = 552)

Dividing through equal sharing resulting in fractions

This type of division was learned at Grade 4 by diagrams or pictures.
Example: Share 9 chocolate bars equally amongst 4 children, A, B, C, and D.



In Grade 5 the fraction resulting from division can be written in symbols. In the above example, 9 ÷ 4 = 2 with a remainder of 1 can be written as
$9 \div 4 = 2\frac{1}{4}$

Example:
$15 \div 4 = 3\frac{3}{4}$ (Note that the remainder is the numerator and the dividend is the denominator of the fraction, because a fraction is actually a division calculation).

Division Strategies

1. Estimation
   Estimate by rounding both numbers to "friendly" numbers which will allow a mental calculation, because the idea of estimation is that it is done without written calculation.

   Example:
   $178 \div 19 \approx 180 \div 20 \approx 9$

2. Breaking down the number(s) and building up the answer
   a. Breaking down the first number (the dividend)

      Example:
      $$\begin{aligned} 624 \div 12 &= (600 + 24) \div 12 \\ &= (600 \div 12) + (24 \div 12) \\ &= 50 + 2 \\ &= 52 \end{aligned}$$

   b. Breaking down the second number (the divisor)

      Example:
      $$\begin{aligned} 315 \div 15 &= 315 \div 5 \div 3 \\ &= 63 \div 3 \\ &= 21 \end{aligned}$$

3. Clue Board
   For a clue board, use the divisor to write down a few multiples of that number.

Example: 369 ÷ 13:

20 x 13 = 260   369–260= 109
\+ 5 x 13 = 65   109 – 65 = 44
\+ 3 x 13 = 39   44 – 39 = 5
28 with a remainder of 5

$$369 \div 13 = 28\frac{5}{13}$$

2 x 13 = 26
3 x 13 = 39
5 x 13 = 65
10 x 13 = 130
20 x 13 = 260

4. Using multiplication to divide
   If two numbers are multiplied, the product can be divided by any of the two numbers and the other number is the answer.

Example:
6 x 7 = 42
Therefore 42 ÷ 7 = 6 and 42 ÷ 6 = 7

Finding the dividend or the divisor (linking division with algebra)

A sense for division is cultivated if learners find the missing number:

Example:

660 ÷ ☐ = 33   ☐ ÷ 7 = 80   450 ÷ 50 = ☐

Solution: 660 ÷ 20 = 33; 560 ÷ 7 = 80; 450 ÷ 50 = 9

Seeing rate as division

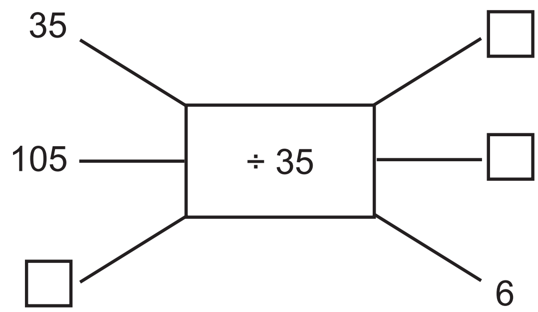
In the problems that learners solve, we can introduce rate as a form of division.

Example:
Dad fills his car with petrol. The tank takes 45 litres. He pays R540 for the petrol.
What is the price of the petrol per litre?
R540 ÷ 45 litre = R12/litre

Example:
Bobby receives a wage of R1 250 per week for five working days.
How much does he earn per day?
R1 250 ÷ 5 days = R250/day
The unit of the divisor and the unit of the dividend are divided to form the unit of the rate.

Dividing in flow diagrams

Flow diagrams are useful to practice and understand multiples of numbers:



This will also assist in consolidating the concept that multiplication is the inverse operation of division when learners have to work in reverse.

TOPIC 5: AREA, PERIMETER AND VOLUME

INTRODUCTION

- This unit runs for 7 hours.
- It is part of the content area 'Measurement' . Together with other topics in this content area, it counts 15% of the total weight allocated to the five content areas in Grade 5.
- The unit covers measurement in three dimensions of perimeter, area and volume.
- The purpose of the unit is to practice and consolidate the knowledge and skills that have been learned in Grade 4.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Measure the perimeter of shapes • Find the area of shapes by counting squares on a grid • Find the volume of objects by packing and/or counting cubes or blocks	• Measure and calculate perimeter in standard units • Find area of shapes using squares on a grid • Understand square units • Find volume/capacity of containers and objects by counting cubes or blocks • Understand cubic units	• Measure and calculate perimeter in standard units • Find area of regular and irregular shapes using squares on a grid • Develop rules for calculating area • Understand square units • Investigate relationships between perimeter and area of rectangles and squares • Find volume/capacity of containers and objects by counting cubes or blocks • Understand cubic units

GLOSSARY OF TERMS

Term	Explanation/Diagram
Dimensions	A measurement of length, breadth or height. A line has one dimension (length), called distance. A plane has two dimensions (length and breadth) which can lead to finding area of the two-dimensional shape. A solid object has three dimensions (length, breadth and height) which can lead to finding the volume of the three-dimensional object.
Perimeter	The total distance around the outside of a shape.
Measurement units of perimeter	The one dimension of the distance around a shape is measured in units of length, with a ruler or measuring tape.
Area	The amount of space that a two-dimensional shape covers.
Measurement units of area	The two dimensions of the area of a shape are measured in square units of length, with a ruler or measuring tape. Both dimensions are measured separately and the area is calculated.
Volume	The amount of space that an object takes up. If the object is hollow on the inside, it has a capacity to contain something like flour or water.
Measurement units of volume	The three dimensions of a solid object are measured in cubic units of length like kilometre, metre, centimetre or millimetre.
Capacity	The amount of substance like milk or soup or water that a container can hold in its inside, or the space that is inside a container, measured in units of capacity, like litre for a fluid.
Measurement units of capacity	Capacity is measured in units of capacity, like kilolitre, litre and millilitre.

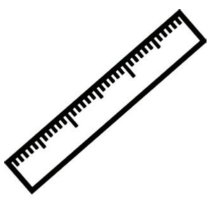
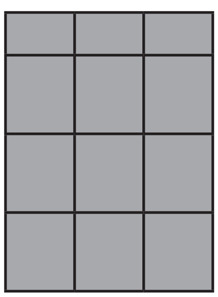
SUMMARY OF KEY CONCEPTS

Introduction

Learners build on their knowledge of the properties of shapes and objects and in this unit they add the properties of distance (length) size (area) or amount of space (volume).

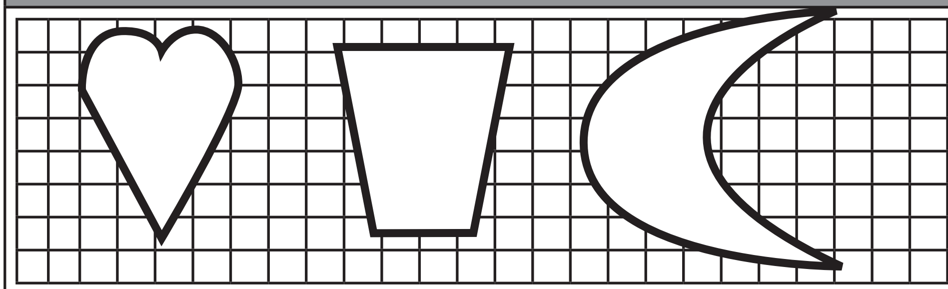
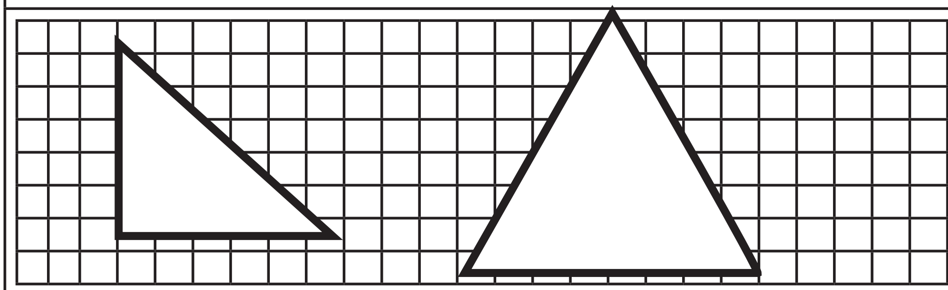
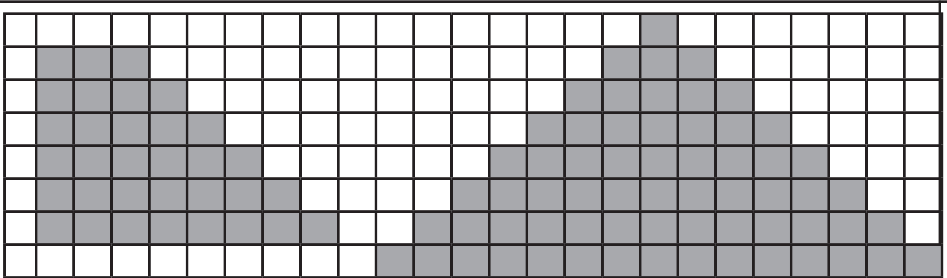
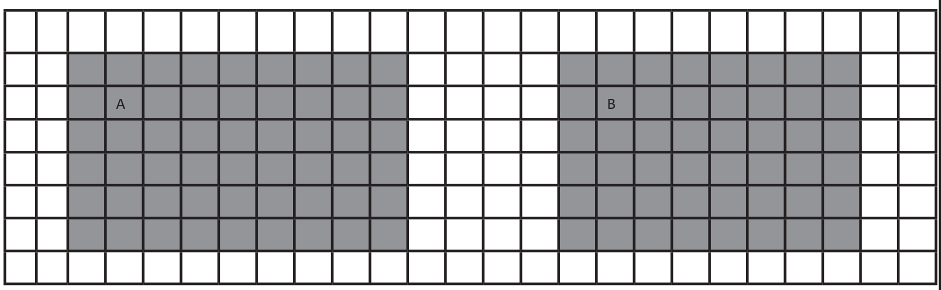
Perimeter

Practically, learners can measure and record the length around a shape, both of real objects and of the picture of a shape, in formal units of length.

SHAPE	INSTRUCTIONS	PERIMETER IN UNIT OF LENGTH
Cup 	Use a string and go all around the top end of the cup. Cut the string and lay it on your ruler to measure the distance in centimetres. Do the same for the bottom end of the cup and calculate the difference.	The distance around the top end of the cup is _____ cm. The distance around the bottom end of the cup is _____ cm. The difference in the distance around the top end and the bottom end of the cup is _____ cm.
Ruler 	Use a string and go all around the outside edge of the ruler. Cut the string and lay it on your ruler to measure the distance in centimetres.	The distance around the ruler is _____ cm. Why is the perimeter more than twice the length of the ruler? ______________________________
The picture of a shape 	Use this table (the larger one, not the small image here to the left) as a rectangle. Measure it's length and breadth (width) then find the perimeter Use the horizontal edges as the breadth of the rectangle and the vertical edges as the length of the rectangle. Record all the distances in centimetres.	Measured perimeter of this table: The breadth of this table is _____cm. The length of this table is _____cm. The perimeter of this table is _____cm. Calculated perimeter of the table: Breadth __________ cm Length __________ cm Breadth __________ cm Length __________ cm Perimeter ________ cm
Own choice	Draw a shape of any form in your class work book. It may have straight- or curved sides. Measure and record the perimeter of the shape.	

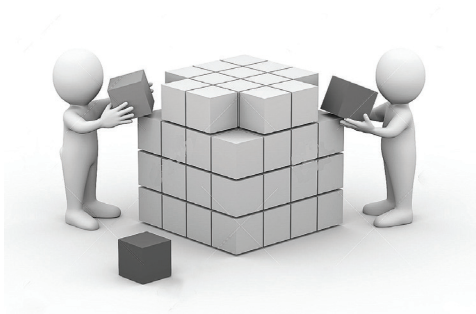
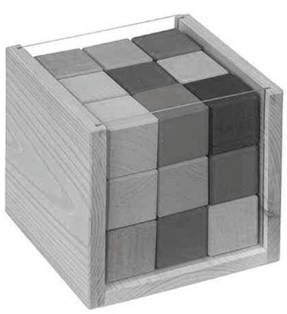
Area

Tiling is how learners learned to cover a surface in Grade 4. In Grade 5 they measure area by estimating, counting and reporting the number of square units needed to cover it.

PICTURES OF THE SQUARE UNITS THAT COVER AN AREA	NUMBER OF SQUARE UNITS
	Estimate the area of the shapes and write it in square units.
	Either count the square units that cover these triangles, or estimate the square units.
	a. Count the square units that cover the shaded shapes. b. Find the perimeter of both shapes in units of length.
 Length (L) rectangle A Length (L) rectangle B Breadth (B) rectangle A Breadth (B) rectangle B a. Perimeter rectangle A b. Perimeter rectangle B L + B + L + B L + B + L + B ___ + ___ + ___ + ___ = ____units ___ +___ +___ +___ = ____units b. Area rectangle A b. Area rectangle B L x B L x B ___ x ___ = ____ square units ___ x ___ = ____ square units	a. Measure the length and width of the rectangles by counting the units. Calculate their perimeters. b. Measure the areas of the rectangles by counting the square units that their surfaces cover.

Volume

1. Learners still need to stack and count physical cubes to confirm their concept of volume and capacity. When they stack cubes, they measure the volume and when they pack cubes into a container, they measure the capacity of the container (They later learn that 1 cubic centimetre holds 1 ml).
2. The pictures of 3D objects and cubes require another skill, that is a visual skill of interpreting a "flat" picture as three-dimensional. If learners struggle with this, they need to go back to physical objects to understand the idea of volume and capacity.

PICTURE OF HOW 3D OBJECTS ARE MADE UP OF CUBIC UNITS	NUMBER OF CUBES AND EXPLANATION
What is the volume of the object in the picture below? **Explain in words why you say so.** 	
What is the volume of the object in the picture below? **What do we call the object?** 	
How many cubic units are in this object? **What is the capacity of the container that holds the cubes?** 	

TOPIC 6: POSITION AND MOVEMENT

INTRODUCTION

- This unit runs for 2 hours.
- It is part of the Content Area 'Space and Shape (Geometry)' an area which is allocated 15% of the total weight shared by the five content areas in Grade 5.
- This unit covers the location and positions of objects with grid references and on maps.
- The purpose of this unit is practical, for learners to find their way on, and directions from a diagrammatic representation.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Locate positions of objects following alpha-numeric grid references • Locate positions of objects on a map using alpha-numeric references	• Locate positions of objects, drawings and symbols following alpha-numeric references on grids and on a map • Follow directions by tracing a path between positions on a map	• Locate positions of objects, drawings and symbols following alpha-numeric references on grids and on a map • Give directions to move between positions or places on a map

GLOSSARY OF TERMS

Term	Explanation/diagram
Grid	A pattern of blocks or cells running sideways (in rows) and downwards (in columns). The rows are labelled with numbers (1, 2, 3…) and the columns are labelled with letters (A, B, C…)
Grid reference position	A particular cell in a grid, where a column and a row meet. The name of that cell is the label of that column and the label of that row.
Alpha-numeric grid	A grid with letters from the alphabet for the columns and counting numbers for the rows.
Reference	A position on a grid that can be shown or pointed to.
Coordinate	A reference showing the exact position of an object or place.
Scale	Scale is used in plans of houses and for area maps, to draw something in a way that it is a small image of something large.

SUMMARY OF KEY CONCEPTS

Introduction

In Grade 5, the idea is to link grid references to coordinate points. Scale on a map is also used, as it links with Geometry. Learners are not yet creating maps and directions, but have to be able to interpret and follow directions on a map.

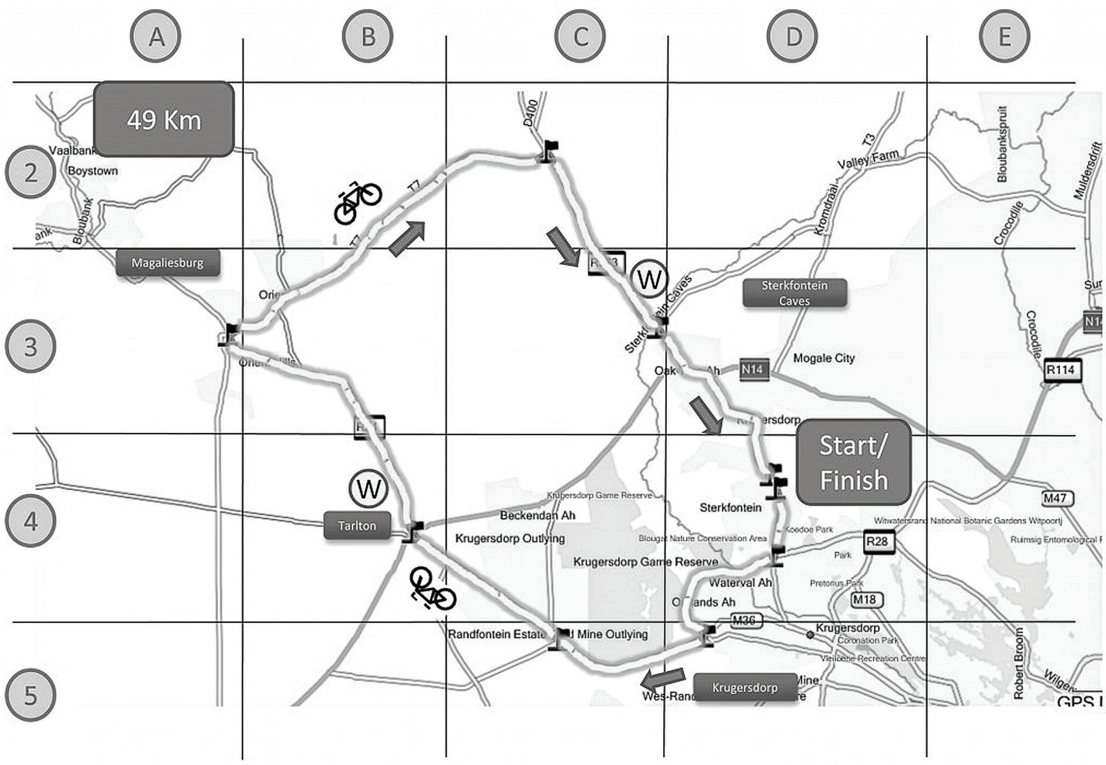
Locating places on a map using grids

Learners must be able to answer questions similar to those in the example below.

Encourage learners to first read horizontally (the letters in the case of the example below) and then vertically (the numbers in the case of the example below). This will assist them in the senior phase when they learn to read coordinates from a Cartesian plane.

Example:

1. Write down the grid reference points (the coordinates) of the following places and points on the cycling route:



a. The reference point for Krugersdorp (D5)

b. The reference point for The Sterkfontein Caves (careful!) (D3)

c. The reference point for the northernmost point of the race (C2)

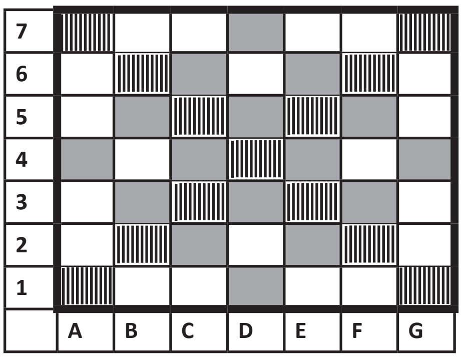
d. The reference point of the two water points on the route marked **W** (C3 and B4)

e. If the route is 49 km, estimate how far it is from the Tarlton- to the Magaliesberg flags (approximately 10km)

f. At which points does the route cross the N14? Give the coordinates (D3 and B4)

2. Explain the race route to a person who is doing the race for the first time

Finding a coordinate pattern in a tile pattern



a. Write down the coordinates per row of all the cells with vertical stripes

A7; A1; B6; B2; C5; C3; D4; E5; E3; F6; F2; G7; G1

b. Write down the coordinates per row of all the cells shaded in grey

A4; B5; B3; C6; C2; D7; D1; E6; E2; F5; F3; G4

c. Explain by the coordinates, how these two sets of tiles are symmetrical

A vertical line of symmetry through the middle of column D would result in two symmetrical halves, and so would a horizontal line through the middle of row 4 as well as diagonals to both sides of the rectangle.

TOPIC 7: TRANSFORMATIONS

INTRODUCTION

- This unit runs for 4 hours.
- It is part of the Content Area 'Space and Shape' an area which is allocated 15% of the total weight shared by the five content areas in Grade 5.
- The unit covers the creation of composite 2D shapes, including their lines of symmetry.
- The focus of this unit is tessellations and describing patterns in real life.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Recognise, draw and describe lines of symmetry in 2D shapes • Create composite 2D shapes by putting together various 2D shapes with line symmetry • Tessellate patterns with 2D shapes, some with line symmetry • Describe patterns in terms of line symmetry with an informal idea of reflection, translation and rotation • Observe and recognise symmetry and transformations in nature and in the environment	• Recognise, draw and describe lines of symmetry in 2D shapes • Use transformations to build composite 2D shapes by tracing and by rotating, translating or reflecting 2D shapes • Use transformations to tessellate patterns with 2D shapes • Observe and recognise symmetry and transformations in nature and in the environment • Use reflection, rotation and translation • Describe patterns	• Continue the work and concepts learned in Grade 4 and 5 • Transform 2D shapes through reflection, translation, rotation, enlargement and reduction • Use transformations to describe shapes in the world, in nature and from our cultural heritage • Describe transformations in terms of reflection, rotation, translation, enlargement and reduction

GLOSSARY OF TERMS

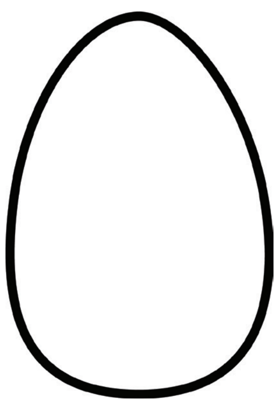
Term	Explanation / Diagram
Symmetry	The quality of having two parts that match each other.
Tessellation	A pattern made of one or more shapes: • the shapes must fit together without any gaps • the shapes should not overlap
Transformation	A change in a 2D shape, where its direction, position or orientation changes. Different types of transformation are reflection, translation and rotation.
Reflection	A transformation in which a geometric figure is reflected across a line, creating a mirror image.
Translation	A type of transformation where the original image is repeated, but has moved its position to the left or the right, and/or up or down.
Rotation	The original image is turned around about a point, clockwise or anticlockwise.
Composite shapes	Shapes that are made up from a number of other shapes.
Pattern	A design that is repeated, mostly to decorate something, for example on furniture, fabric or paper.

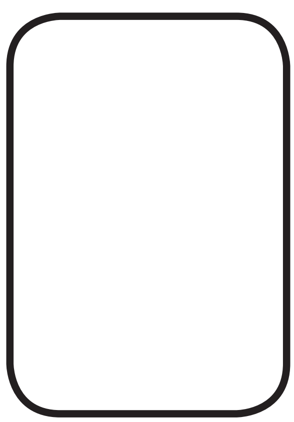
SUMMARY OF KEY CONCEPTS

Recognising and drawing lines of symmetry in nature and in pictures

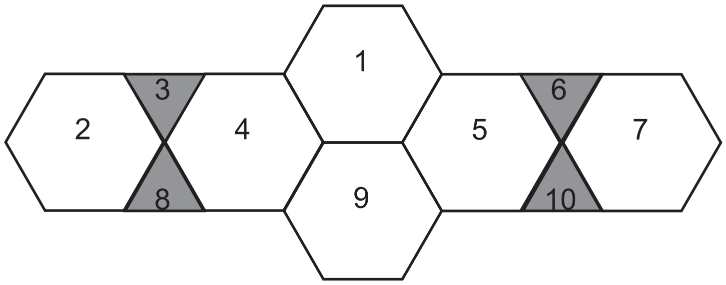
Learners need to be able to draw in any lines of symmetry that they can find on a number of shapes. For example:

Draw the line(s) of symmetry in the leaf and the egg. In the blank frame, draw a tree with a vertical line of symmetry.





Tessellating through transformation



a. Describe the transformation that moved the hexagon from position 1 to position 7.

   Solution: Hexagon 1 was rotated (or reflected) once clockwise and then translated two positions to the right

b. Describe two transformations that could move the hexagon from position 1 to position 9

   Solution: Hexagon 1 can be reflected or translated one position down.

c. Are the triangles in position 3 and position 8 symmetrical to triangles in position 6 and position 10? If so, draw the line of symmetry.

   Yes, they are. The line of symmetry would run through the middle of hexagon 1 and 9, vertically

d. Are the hexagons in position 2 and position 4 reflections of each other? Which other pair(s) of hexagons are reflections of each other?

   Yes, they are. 4 and 5; 1 and 9; 2 and 7; 5 and 7

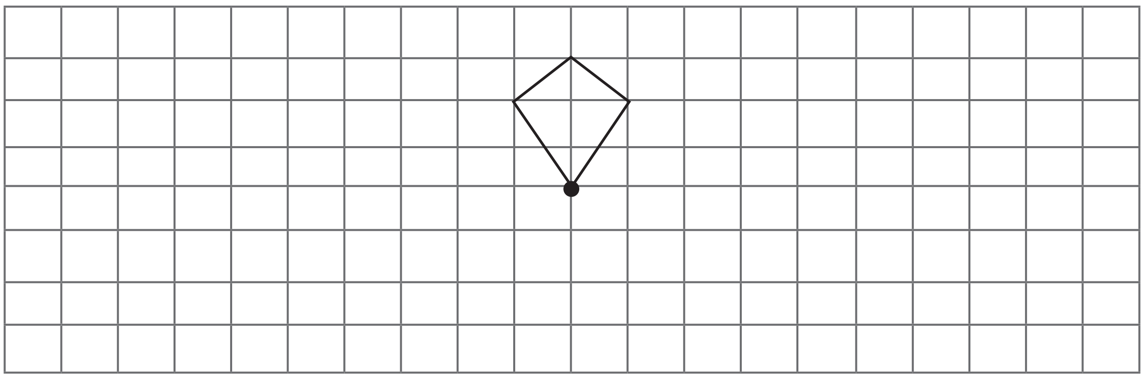
e. Translate the hexagon in position 7 one position to the left and one down and draw it into the given tessellation.

Recognising and drawing tessellating patterns from given 2D shapes

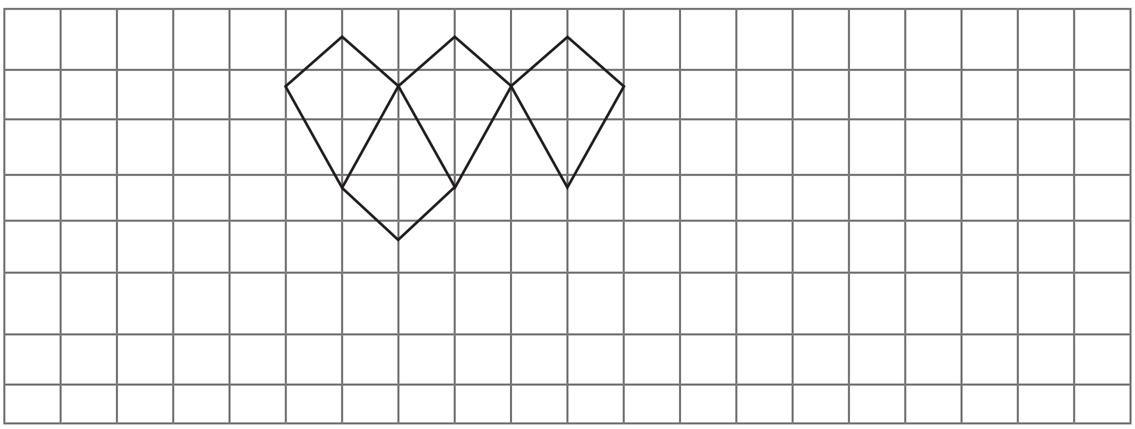
As mentioned in the Term 3 booklet, when dealing with rotations, allow learners to trace the shape then hold it on top of the original shape.

They should then use a pencil to 'pin' onto the point of rotation. Once this is in place they can slowly turn the shape stopping as many times as indicated in the instruction.

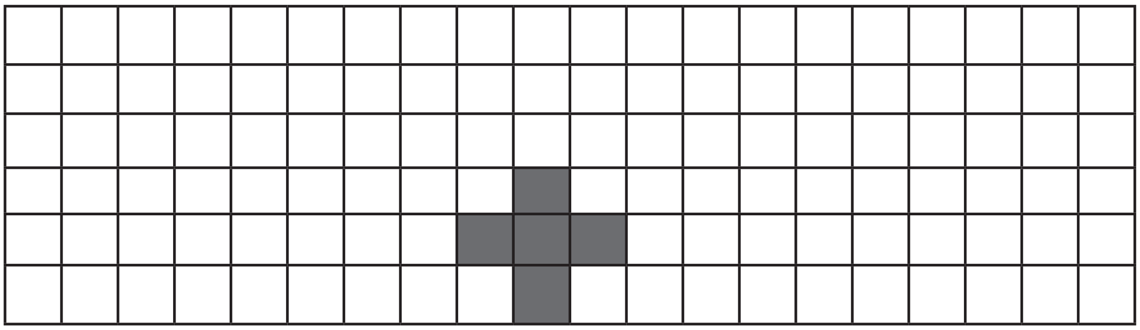
a. Rotate the kite below three times about the point at its bottom:



b. Tessellate with two more kites in the first row, three more in the second row and three in the third row.



c. Work out a tessellation with the shape given below. Colour each further cross shape a different colour.



TOPIC 8: GEOMETRIC PATTERNS

INTRODUCTION

- This unit runs for 2 hours.
- It is part of the Content Area 'Patterns, Functions and Algebra' an area which is allocated 10% of the total weight shared by the five content areas in Grade 5.
- This unit covers the same work as in Term 2, namely geometric (visual) patterns, distinguishing the nature of sequences and finding the rules for the pattern. The purpose of this unit is to develop a sense of function, or rule-bound patterns.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Extend geometric patterns • Identify a sequence in a geometric pattern • Find rules in a sequence • Use flow diagrams with a geometric pattern • Design own geometric patterns	• Extend geometric patterns • Identify a sequence in a geometric pattern • Find rules in a sequence • Use flow diagrams to describe geometric patterns • Design own geometric patterns	• Extend geometric patterns • Identify a sequence in a geometric pattern • Find rules in a sequence • Use flow diagrams and tables to describe geometric patterns • Design own geometric patterns

GLOSSARY OF TERMS

Term	Explanation/diagram
Pattern	A sequence of shapes or numbers arranged according to a rule.
Geometric pattern	An ordered list of shapes or a sequence that follows a certain pattern.
Term	The position of a shape in the sequence.
Rule	The rule of the pattern is a description of the constant change that happens to every following term.
Constant difference	If the pattern changes by adding the same number each time or by subtracting the same number each time, there is a constant difference between all the terms in the sequence.
Constant ratio	If the pattern changes by multiplying each term by the same number or by dividing each term by the same number, there is a constant ratio between all the terms in the sequence.
Representation of geometric pattern	The shapes in a geometric pattern form a pattern because of their arrangement and structure. We can represent this structure in various ways like words, a flow diagram or numbers.
Flow diagram	A visual way to represent a geometric pattern, with the term to the left, the rule in the middle and the number value of the geometric pattern to the right.

SUMMARY OF KEY CONCEPTS

Geometric patterns with a constant ratio

1. Pictures or geometrical shapes that repeat in a way by which they change a number of times more or less, are said to have a constant ratio. Complete Row number 5 and read the various representations of this pattern afterwards.

   The rule of the pattern is that start with 2 and we multiply each term by 2. We can represent this pattern in various ways:

   a. The pattern in words: Starting with 2, the number in every row is multiplied by two.

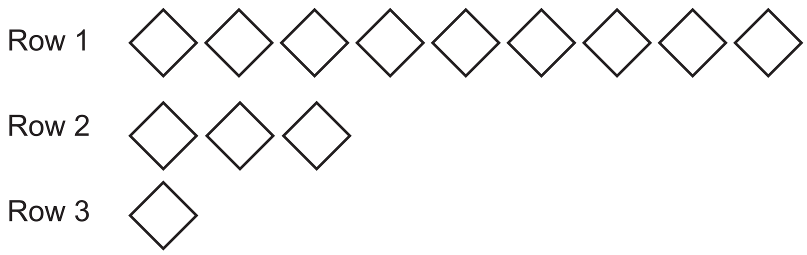
   b. This pattern as a story: There were two more men who could make hats. They each trained two more men to make hats. Each of those men trained two other men, and so it went on.

   c. The pattern in numbers: 2 x 2 = 4; 4 x 2 = 8 and so on.

   d. The pattern in a table:

Row number	1	2	3	4	5	10
Number of men	2	4	8			

2. Investigate the geometric pattern below. What type of pattern is it? Describe the number of diamond shapes in words, in a rule and in a table:



   (divide by three)

Geometric patterns with a constant ratio

1. This pattern tells the story of the school's tennis club and their tennis balls. In week 2, 3 and 4 the coach found that 5 balls disappeared each week. How many balls were there in week 1 and how many will there be in week 5?

Week 1:

Week 2:

☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯

Week 3:

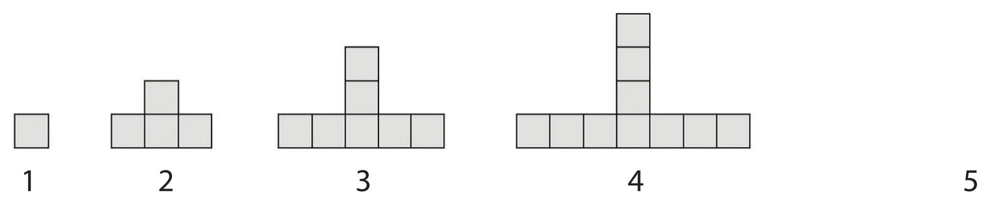
☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯☯

Week 4:

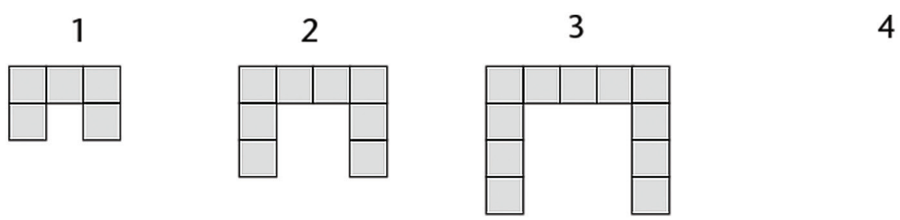
☯☯☯☯☯☯☯☯☯☯☯☯☯

Week 5:

2. Give number values to the pattern below in words and in numbers. For each pattern, say how many squares will be in the following one.



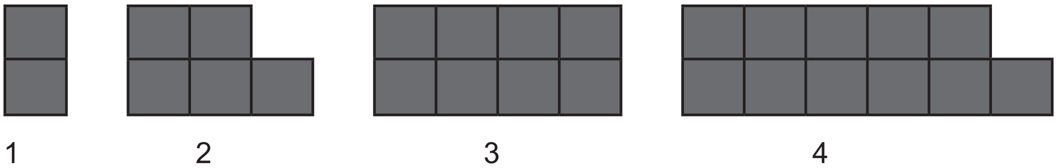
(1 ; 4 ; 7 ; 10 - the rule is add 3 each time. The 5th pattern will have 13 squares)



(5 ; 8 ; 11 - the rule is to add three each time. The 4th pattern will have 14 squares)

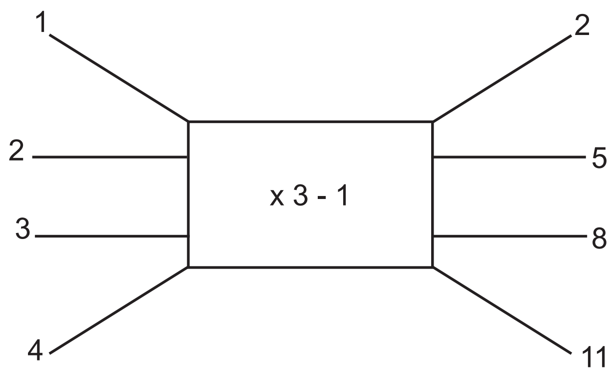
Flow diagram

Find the rule and represent the geometric sequence below in a flow diagram:



Rule: Start at 2 and add three each time.

Teaching tip: Start to find the rule by multiplying the term number with the constant difference, as in the example below:



NOTE: Each consecutive term increases by 3 (therefore x 3) but the first term started with two, which is one less than three. That 1 has to be subtracted each time (therefore - 1).

TOPIC 9: NUMBER SENTENCES

INTRODUCTION

- This unit runs for 3 hours.
- It is part of the Content Area 'Patterns, Functions and Algebra' an area which is allocated 10% of the total weight shared by the five content areas in Grade 5.
- This unit covers the transformation of a verbal mathematical problem, to a mathematical statement containing all the elements of the problem and solving the problem.
- The purpose of this unit is to strengthen learners' skill of writing number sentences to describe problem situations.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Write number sentences to describe a problem situation • Solve and complete number sentences by inspection and trial and improvement • Check solution by substitution	• Write number sentences to describe a problem situation • Solve and complete number sentences by inspection and trial and improvement • Check solution by substitution	• Write number sentences to describe a problem situation • Solve and complete number sentences by inspection and trial and improvement • Check solution by substitution

GLOSSARY OF TERMS

Term	Explanation / Diagram
Mathematical Problem	A problem that can be written and solved with numbers and with the methods of mathematics. It can be a problem in a real world context or a number problem without context. Example of a problem in context: Thato read 78 pages in 3 hours. How many pages did he read in an hour? Example of a problem without context: How much more is 234 than 123?
Solving by Inspection	A method of solving a number sentence by looking at it carefully and thinking logically what the solution can be without written calculation.
Trial and improvement	A method of solving a number sentence by trying out several methods or possible solutions until you are satisfied with the answer.
Algebraic Expression or Number Sentence (without an = sign)	An algebraic expression is a number sentence that can contain ordinary numbers, an unknown which we write as ☐ and operators (like add, subtract, multiply, and divide). Example: ☐ + 4 (We do not know what the value in ☐ is)
Algebraic Equation or Number Sentence (with an = sign)	An algebraic equation is a number sentence with an equal sign, but where one or more of the elements are unknown. Example: ☐ + 4 = 7 (Now find the value in ☐)
Substitution	Substitution is a method to solve a problem or to check if your solution is correct. After solving the unknown in an equation, then we substitute that solution in the equation to see if it is the solution that makes the equation true.

SUMMARY OF KEY CONCEPTS

Setting up number sentences for problems in context

There are various ways to see the problem, which are not necessarily wrong, as long as the missing piece of information is represented by the block and the operation leads to the correct answer. For example, we do not insist that it must be an addition sum, if learners demonstrate that they are comfortable with subtraction being the inverse of addition.

a. Addition problems:

- First number (unknown) + second number (known) = sum (known)

  Example:
  Jim had some money and he received R25 more, now he has R68. How much money did Jim have in the beginning?
  Number sentence: ☐ + R25 = R68

  Alternatives: R25 + ☐ = R68 OR R68 – R25 = ☐

- First number (known) + second number (unknown) = sum (known)

  Example:
  Jim had R43 and he received some more money, now he has R68. How much money did Jim receive?
  Number sentence: R43 + ☐ = R68

  Alternatives: ☐ + R43 = R68 OR R68 – R43 = ☐

- First number (known) + second number (known) = sum (unknown)

  Example:
  Jim had R43. He received R25 more. How much money does Jim have now?
  Number sentence: R25 + R43 = ☐

b. Subtraction: First number – second number = difference

- First number (unknown) – second number (known) = difference (known)

  Example:
  Thabo's father had a number of sheep and after he sold 37 of them, he was left with 56 sheep. How many sheep did Thabo's father have?
  Number sentence: □ – 37 = 56

  Alternative: 37 + 56 = □

- First number (known) – second number (unknown) = difference (known)

  Example:
  Thabo's father had 93 sheep and after he sold some of them, he was left with 56 sheep. How many sheep did Thabo's father sell?
  Number sentence: 93 – □ = 56

  Alternatives: R56 + □ = R93 OR R93 – R56 = □

- First number (known) – second number (known) = difference (unknown)

  Example:
  Thabo's father had 93 sheep and he sold 37 of them. How many sheep did Thabo's father have left?
  Number sentence: 93 – 37 = □

  Alternatives: □ + R37 = R93 OR R37 + □ = R93

  It is important that learners notice how sometimes an addition question needed subtraction skills to find the answer and that sometimes a subtraction question needed addition skills to find the answer. Inverse operations are the key to solving many problems.

c. Multiplication: First number x second number = product

- First number (unknown) x second number (known) = product (known)

  Example:
  School B has 216 Grade 4 learners, which is 6 times as many as School A. How many Grade 5 learners does School A have?
  Number sentence: □ x 6 = 216

- First number (known) x second number (unknown) = product (known)

  Example:
  School A has 36 Grade 5 learners and School B has 216. How many times more learners does School B have than School A?
  Number sentence: 36 x □ = 216

  Alternative: □ x 36 = 216
  OR 216 ÷ □ = 36

- First number (known) x second number (known) = product (unknown)

  Example:
  School A has 36 Grade 5 learners and School B 6 times more Grade 4 learners than School A. How many Grade 5 learners does school B have?
  Number sentence: 36 x 6 = □

  Alternatives: □ ÷ 36 = 6 OR □ ÷ 6 = 36 OR 6 x 36 = □

d. Division: First number ÷ second number = quotient

- First number (unknown) ÷ second number (known) = quotient (known)

  Example:
  Susan makes up packets of 7 apples from a box of apples and she makes up exactly 13 packets. How many apples were in the box?
  Number sentence: □ ÷ 7 = 13

  Alternatives: □ ÷ 13 = 7 OR 7 x 13 = □

- First number (known) ÷ second number (unknown) = quotient (known)

  Example:
  Su packs 13 bags from a box of 91 apples. How many apples are in each bag?
  Number sentence: 91 ÷ □ = 13

  Alternatives: 91 ÷ 13 = □ OR 13 x □ = 91

- First number (known) ÷ second number (known) = quotient (unknown)

Example:
From a box with 91 apples, Susan makes up packets of 7 apples each. How many packets of apples does she make up?
Number sentence: 91 ÷ 7 = □

Alternatives: 91 ÷ □ = 7 OR 7 x □ = 91

It is important that learners notice how sometimes a multiplication question needed division skills to find the answer and that sometimes a division question needed multiplication skills to find the answer. Inverse operations are the key to solving many problems.

Setting up number sentences from number problems without context

Learners must be able to set up number sentences from context free number problems.

Example:
A number is 15 less than 38. What is that number?
38 – 15 = □ OR □ + 15 = 38

Example:
There is a number that is 7 times more than 22. What is that number?
22 x 7 = □ OR □ ÷ 7 = 22

Solving given number sentences

To do the following types of questions successfully, learners will need to recognise that inverse operations will be required.

For the first example, learners may ask, what number subtract 15 gives me 59? Or some may notice that this is the same as 59 subtract 15, then the new calculation required would be 4 x □ = 44

Now learners would ask, what multiplies by 4 to get 44? Or some may even realise that they could also ask, 44 divided by what gives me 4?

These skills are essential to being confident in mathematics through to the senior phase.

Example:
4 x □ + 15 = 59

Solution: 4 x 11 + 15 = 59

Example:
15 x (3 + □) = 75

Solution: 15 x [3 + 2] = 75

Example:
□ ÷ $\frac{1}{4}$ = 2

Solution: $\frac{1}{2}$ ÷ $\frac{1}{4}$ = 2

Solving by inspection:

Example:
When we look at this equation: 15 + □ = 19, we can "see" that the solution is 4 without calculating.

Solving by trial and improvement

Example:
In the number sentence 543 – □ = 456

Trial:	Subtract 100 (543 -100 = 443)
	This is 13 too much
Improvement:	Subtract 13 less than 100, ie 87 (543 – 87 = 456)

Substitution

After solving the problem, learners can substitute the solution into the number sentence to check for correctness of the solution:

For example, in the first of the three examples on page 65, if 11 is the answer that learners decided was correct, they could now write

4 x 11 + 15. They should do this calculation and if the solution is 59 then they will know that they have the correct answer.

If not, they need to be encouraged to try again as most learning is done through making mistakes.

Example:

□ + 4 = 7

Solution: □ = 3

Substitute 3 in □: 3 + 4 = 7 ✔

TOPIC 10: PROBABILITY

INTRODUCTION

- This unit runs for 2 hours.
- It is part of the Content Area 'Data Handling' an area which is allocated 10% of the total weight shared by the five content areas in Grade 5.
- This unit extends the idea that there are possible outcomes of experiments by recording the outcomes in numerical terms.
- The purpose of this unit is to investigate various possibilities in the outcomes of experiments.

SEQUENTIAL TEACHING TABLE

GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE	GRADE 6 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Perform simple experiments • List the possible outcomes of events • Use tallies to record outcomes	• Perform simple repeated experiments • List the possible outcomes of events or experiments • Make tally tables to record actual outcomes • Count and compare the frequency of outcomes	• Perform simple repeated experiments • List the possible outcomes of up to 50 trials • Make tally tables to record actual outcomes • Count, compare frequency of outcomes up to 50 trials of an experiment

GLOSSARY OF TERMS

Term	Explanation / Diagram
Experiment	Something you do to find out what will happen, like tossing a coin twenty times to see how many times it lands on each side.
Trial	An activity you do in an experiment, like tossing the coin once.
Outcome	The result of a trial, like when I tossed the coin, it landed heads up, therefore the outcome of the trial is "heads up".
Event	A trial together with its outcome is called an event.
Frequency	The number of times that an event occurred.
Probability	The chance that a specific event will occur during an experiment.
Possible outcomes	The number of outcomes that may occur, like rolling a die has six possible outcomes.
Impossible	An outcome that will never happen, like the die can never land on 7 because there is no 7 on the die.
Likely	When there are many chances that something could happen. For example, it is likely that a learner will wear a jersey to school in winter.
Unlikely	When there are many chances that something will not happen. For example, it is unlikely that learners will wear something warm to school on a hot summer's day.

SUMMARY OF KEY CONCEPTS

Calculating probability

Probability is the chance that an event will occur when we do an experiment. This chance is calculated out of all the possible outcomes. The coin may land heads up or tails up, which are two possible outcomes. The probability to land heads up is one out of two, or $\frac{1}{2}$.

Example:

a. The chance that a die will land with a 2 on top, is 1 out of 6 ($\frac{1}{6}$) because there is one two and six numbers altogether on the die.

b. The chance that a die will land with an odd number on top, is 3 out of 6 ($\frac{3}{6}$) because there are three odd numbers on a die out of a total of six numbers.

Using frequency tables

A frequency table has to have a column for all the possible outcomes, may have a column for the tallies and should have a column for the number of times that that outcome occurred (the frequency), and a row underneath for the total number of trials that were conducted, where all the frequencies are added.

Example:

Jim did an experiment with a spinner with five colours. He did fifty trials and recorded the results in a frequency table.

Experiment with a spinner with five colours		
Possible outcomes	**Tallies**	**Frequency**
Red	~~////~~ ////	9
Green	~~////~~ ~~////~~ //	12
Yellow	~~////~~ ~~////~~ /	11
Blue	~~////~~ ///	8
Brown	~~////~~ ~~////~~	10
Total number of trials that were conducted		**50**

a. How many times did the spinner land on yellow?

Solution: 11 times

b. How many times did the spinner NOT land on brown?

Solution: 40 times

c. How many times did the spinner land on red OR green?

Solution: 21 times

d. If Dudu did the same experiment, would she also find that the spinner landed on red nine times?

Solution: not necessarily

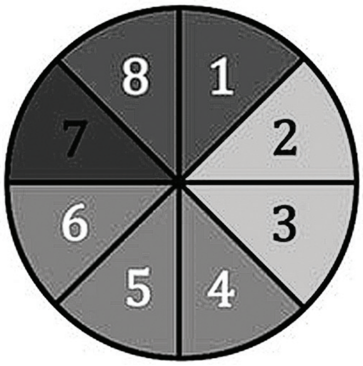
e. If this was considered to be a fair spinner (in other words not weighted in anyway and all the coloured segments are exactly the same size), how many times would you expect that the spinner would land on each colour?

Solution: ten times

Doing an experiment and recording the outcomes

Make a spinner from this template and stick a pin though its middle point.
Spin it 40 times.

(8 and 1 are purple; 2 and 3 are yellow; 4, 5 and 6 are blue and 7 is red).



Draw a frequency table and record all trials.

Once learners have completed their experiment, let them switch partners and ask each other questions similar to those in the exercise on the previous page. They can ask actual questions about what happened in their particular experiment and they could also ask questions about what the probability of landing on a certain colour SHOULD be if all is fair with the spinner.