Grade 4

CONTENT BOOKLET: TARGETED SUPPORT MATHEMATICS

Term 2

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.

The NECT has successfully brought together groups of people interested in education 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). The FSS helped the DBE trial the NECT Maths, Science and language learning programmes so that they could be improved and used by many more teachers. NECT has already begun this scale-up process in its Provincialisation Programme. The FSS teachers remain part of the programme, and we encourage them to mentor and share their experience with other teachers.

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!

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Contents

TOPIC 1: ADDITION & SUBTRACTION

INTRODUCTION

- This unit initially runs for 5 hours, with a further 4 hours later in the term.
- It is part of the Content Area ‘Numbers, Operations and Relationships,’ which is allocated half of the total weight shared by the five content areas in Grade 4.
- This unit covers number concepts, addition and subtraction strategies within specified ranges.
- The purpose of this unit is to strengthen and expand learners’ existing number concepts and operations as a basis to master more complex ideas and calculations in the future.

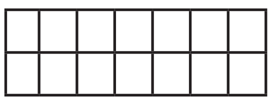
SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD

• Count forwards and backwards in 1s, 2s, 3s, 4s, 5s, 10s from any multiple between 0 and 500 and in 50s, 100s to at least 1000
• Compare numbers up to 500 using words and arrange in ascending and descending order
• Recognize place value of numbers up to 500
• Add and subtract whole numbers to 999
• Add and subtract word problems in context up to 400, explain solution
• Use the following strategies:
  • building up/ breaking down
  • using number lines
  • rounding off in 10s
  • doubling, halving
	• Count forwards and backwards in 2s, 3s, 5s, 10s, 25s, 50s, 100s to at least 10 000
	• Order, compare and represent numbers to at least 4 digits
	• Round off to the nearest multiple of 10, 100 or 1 000
	• Represent odd and even numbers to 1 000
	• Recognize place value of digits in 4 digit numbers
	• Add and subtract whole numbers of at least 4 digits
	• Use the following strategies:
	  • estimating
	  • building up/breaking down
	  • using number lines
	  • rounding/compensating
	  • doubling and halving
	  • addition/subtraction as inverse operations
		• Count forwards and backwards in whole number intervals up to at least 10 000
		• Order, compare and represent numbers to at least 6 digits
		• Round off to the nearest multiple of 5, 10, 100 or 1 000
		• Represent odd and even numbers to 1 000
		• Recognize place value of digits in 6 digit numbers
		• Add and subtract whole numbers of at least 5 digits
		• Use the following strategies:
		  • estimating
		  • building up/breaking down
		  • using number lines
		  • rounding/compensating
		  • doubling and halving
		  • using addition/subtraction as inverse operations
		  • calculating in columns

GLOSSARY OF TERMS

<table>
<tr><th>Term</th><th>Explanation / Diagram</th></tr>
<tr><td>Whole numbers</td><td>Whole numbers are the numbers you use to count with, including zero: 0, 1, 2, 3, 4....
(A fraction is not a whole number – it is a part of a whole number)</td></tr>
<tr><td>Number line</td><td>On a number line, numbers are marked at equal intervals, starting at 0 on the left and going up in ones to the right, eg.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21</td></tr>
<tr><td>Number grid</td><td>A number grid is a block containing smaller squares with ordered numbers in each small square. A hundred chart is one such grid, used to help addition and subtraction calculations. A times table chart is another number grid, helping with multiplication and division calculations, like the one below.
<table>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>12</td><td>14</td><td>16</td><td>18</td><td>20</td></tr>
<tr><td>3</td><td>6</td><td>9</td><td>12</td><td>15</td><td>18</td><td>21</td><td>24</td><td>27</td><td>30</td></tr>
<tr><td>4</td><td>8</td><td>12</td><td>16</td><td>20</td><td>24</td><td>28</td><td>32</td><td>36</td><td>40</td></tr>
<tr><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td><td>35</td><td>40</td><td>45</td><td>50</td></tr>
<tr><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td><td>36</td><td>42</td><td>48</td><td>54</td><td>60</td></tr>
<tr><td>7</td><td>14</td><td>21</td><td>28</td><td>35</td><td>42</td><td>49</td><td>56</td><td>63</td><td>70</td></tr>
<tr><td>8</td><td>16</td><td>24</td><td>32</td><td>40</td><td>48</td><td>56</td><td>64</td><td>72</td><td>80</td></tr>
<tr><td>9</td><td>18</td><td>27</td><td>36</td><td>45</td><td>54</td><td>63</td><td>72</td><td>81</td><td>90</td></tr>
<tr><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td><td>100</td></tr>
</table></td></tr>
<tr><td>Ordering</td><td>To put numbers in their order of size or quantity, in ascending order from smaller to bigger or fewer to more, in descending order from bigger to smaller or more to fewer.</td></tr>
<tr><td>Comparing numbers</td><td>When comparing numbers, you may find one is bigger, smaller or the same as another; or you may find out by how much they differ.</td></tr>
<tr><td>Digit</td><td>A digit is a symbol that we use to represent a quantity. There are ten digits: 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. We use these in different positions to build up numbers. 36 is a two-digit number, of which the 3 and the 6 are both digits, 3 in a position in the number that makes it worth 30 and 6 in a position that makes its value six.</td></tr>
<tr><td>Place value and number value</td><td>Place value is the value a digit has because of its position in a number. In 3 234, the position of the first 3 gives it a place value of thousands and a number value of 3 000; the position of the second 3 gives it a place value of tens and a number value of 30.</td></tr>
<tr><td>Rounding off</td><td>Rounding is writing a number as an approximate, understood to be "about", "almost" or "closest to" a given number. We can round numbers to the nearest multiple of ten for example, or to the nearest multiple of hundred or thousand. We can round up to the next multiple or round down to the previous multiple. We indicate that we have rounded a number by using the symbol $\approx$, eg $38 \approx 40$</td></tr>
<tr><td>Building up and breaking down</td><td>We can write all whole numbers bigger than one (>1) in terms of their parts. The parts of the number 153 are 100, 50 and 3. From the bigger number, we can break down, decompose or expand a number into its terms. From the smaller numbers we can build up the bigger number by composing or contracting the terms into a whole, therefore we can write 100, 50 and 3 as the single number, 153.</td></tr>
</table>

Expanded Notation	Expanded notation is the form of writing a number to show its breakdown: 153 written in expanded notation is 100 + 50 + 3
Inverse operations	An operation's inverse reverses that operation, therefore two inverse operations undo each other. If you add 8 to 15, the sum is 23; if you subtract 8 from 23, the difference is 15. If you multiply 8 by 15, the product is 120; if you divide 120 by 15, the quotient is 8. Addition and subtraction are each other's inverse operations and multiplication and division are each other's inverse operations.
Commutative property	The commutative property of numbers means that you can change the **order** of the numbers when adding or multiplying and the answer will not change: 2 x 3 x 4 = 4 x 2 x 3.
Associative property	The associative property of numbers means that you can change the **grouping** of the numbers when adding or multiplying them and the answer will not change: 3 x (4 x 5) = (3 x 4) x 5
Multiples	Multiples of a certain number (eg. 5) are the products when we multiply that number by any whole number: 15 is a multiple of 5, because 5 x 3 = 15
Even and odd numbers	Even numbers can exactly be divided into two equal groups of whole numbers (halved), like 18 which can be exactly divided (halved) into two groups of 9. All even numbers end with the digits 0, 2, 4, 6 or 8. Odd numbers cannot be divided into two equal groups, like 17 which cannot be exactly halved into two equal groups of whole numbers – one remains when trying to halve it. Odd numbers end with the digits 1, 3, 5, 7 or 9.
Halving and doubling	Halving is to divide a number into two equal parts, which is the same as dividing the number by two: when we halve 14, we have two equal parts of 7 each. An even number can be halved, but an odd number cannot be halved using whole numbers.  Doubling is to multiply a number by 2, or to add the same number to it, so that the answer is twice as many as the number: When we double 7, we have 14. A doubled number is always even.

SUMMARY OF KEY CONCEPTS

Counting

1. Learners developed some knowledge of number words and symbols in the Foundation Phase and they can now do the following:

   - Make symbol-verbal transitions (recognise a symbol).

     Example:
     14 means 'fourteen'

   - Make verbal-symbol transitions (write a symbol).

     Example:
     The word 'fourteen' is written 14

   - Say number words in sequence, forward and backward.

   - Say number words skip-counting in 1s, 2s, 3s, 4s, 5s, 10s from any multiple between 0 and 500 and in 50s, 100s to at least 1000.

   - Count forward and backward from a given number.

   - Count objects using one-to-one correspondence and know how many there are.

   - Use counting skills to add and subtract

2. In Grade 4, we extend these counting skills, as follows:

   - Count in, or skip by 2s, 3s, 5s, 10s, 25s, 50s, 100s.

     Example:
     Count in 25s from 0: 0, 25, 50, 75, 100...

   - Count in these numbers from a given number on, not always from zero.

     Example:
     Count in 50s from 650: 650, 700, 750, 800..

   - Count backwards in these numbers, down from a given number.

     Example:
     Count backwards in 25s from 400: 400, 375, 350, 325...

   - Count on from any number.

     Example:
     Count on in 5s from 84: 89, 94, 99, 104...

Comparing and Ordering Whole Numbers

1. For learners to compare whole numbers, they must know the following facts:

   - Place value and number value of digits in a number.
   - The symbols < (less than), > (greater than), ≈ (approximately) and = (equal to or the same as).
   - The meaning of the words ‘ascending’ and ‘descending’.

2. For learners to order whole numbers, they must master the following skills with understanding:

   - Group together the numbers with the same amount of digits in the required order.

     Example:
     Arrange in descending order:
     666; 143; 90; 55; 624; 36; 9; 3570; 6; 4192

     Learners group the same amount of digits:
     3570; 4192; 143; 624; 666; 55; 36; 90; 6; 9

   - Know that the leftmost digit tells which number in the set is greater, because its place value is the highest; if those are the same, the second digit tells which is greater, and so on.

     Example:
     In the above set, 4192; 3570; 666; 624; 143; 90; 55; 36; 9; 6

   - When we have two expressions to compare, we do the calculation before we compare the answers. This is not easy for young learners to understand.

     Example:
     Which answer is bigger,
     8 – 3 or 7 – 3?’
     8 – 3 = 5 and 7 – 3 = 4,
     therefore 8 – 3 > 7 – 3

     a. Which one is smaller:
        432 – 234 or 765 – 567?’
        432 – 234 = 198 and 765 – 567 = 198,
        therefore 432 – 234 = 765 – 567

Rounding off Numbers

1. Rounding is writing a number as an approximate, understood to be “about”, “almost” or “closest to” a given number. Numbers can, for example, be rounded to the nearest multiple of ten or hundred or thousand and can therefore be rounded up or rounded down to the nearest multiple of ten or the nearest multiple of hundred or the nearest multiple of thousand. We show that we have rounded a number by using the symbol ≈, e.g. 38 ≈ 40 and 345 ≈ 300.

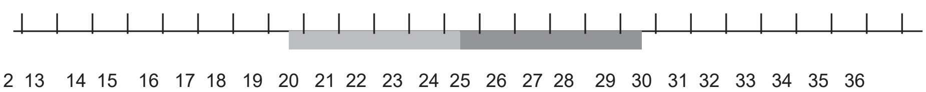
Teaching Tip: For comparing, ordering, and rounding, it is helpful for learners to know where a number is positioned on a number line in relation to another number or in relation to a specific multiple of ten.

Example:
In this example we are focusing on the space between 20 and 30.

a. ‘Is 27 closer to 20 or closer to 30?’

b. ‘Which one of 24 and 25 is closer to 30?’

c. ‘Which number is in the middle of 20 and 30?’



Numbers ending in 1, 2, 3 and 4 are closer to the previous multiple of ten (are therefore rounded down). Numbers ending in 6, 7, 8 and 9 are closer to the next multiple of ten (are therefore rounded up).

The rule is that we group the 5 with the bigger numbers, therefore a number ending in 5 is rounded up, 25 ≈ 30, but 24 ≈ 20 (rounded down).

2. To learn rounding to numbers other than multiples of ten, the idea of unit intervals on a number line is extended in Grade 4. An interval on a number line can represent various amounts. A number line with intervals of 10 can now be used, where the markers go in multiples of ten.

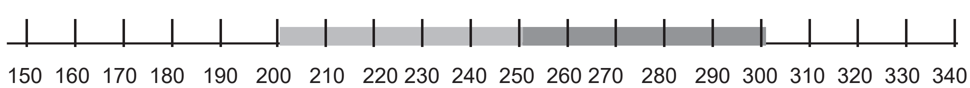
Example:

In this example we are focusing on the space between 200 and 300.

a. Is 273 closer to 200 or closer to 300?’

b. ‘Which one of 245 and 250 is closer to 300?’

c. ‘Which number is in the middle between 200 and 300?’



Numbers ending in 01 to 49 are closer to the previous multiple of hundred (are therefore rounded down). Numbers ending in 50-99 are closer to the next multiple of hundred (are therefore rounded up).

The rule is that we group 50 with the bigger numbers, therefore a number ending in 50 is rounded up, 250 ≈ 300, but 249 ≈ 200 (rounded down).

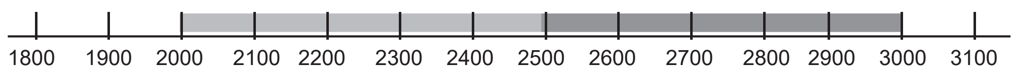
3. A number line with intervals of 100 is marked in multiples of hundred.

Example:
In this example we focus on the space between 2000 and 3000.

a. 'Is 2735 closer to 2000 or closer to 3000?'

b. 'Which one of 2479 and 2500 is closer to 3000?'

c. 'Which number is in the middle between 2000 and 3000?'

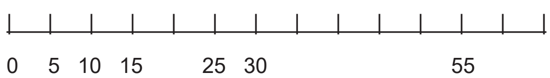


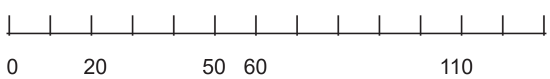
Numbers ending in 001 to 499 are closer to the previous multiple of thousand (therefore rounded down). Numbers ending in 500-999 are closer to the next multiple of thousand (are therefore rounded up).

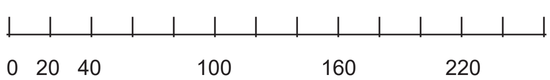
The rule is that we group the 500 with the bigger numbers, therefore a number ending in 500 is rounded up, 2500 ≈ 3000, but 2499 ≈ 2000 (rounded down).

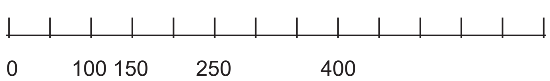
Teaching Tip: A common activity at this stage is to leave out some markers on number lines with various intervals, which learners have to fill in. It would be unreasonable to expect of them to complete such number lines without proper guidance to help them understand the variations in intervals.

Examples:
Number lines with various intervals for completing open spaces.

a.


b.


c.


d.


Even and Odd Numbers

1. The idea that numbers can be either odd or even, was introduced in the Foundation Phase. In Grade 4 learners must actively engage with these numbers and investigate odd and even numbers.

Teaching Tip:

A way of engaging with odd and even numbers is by cutting “cards” of odd and even numbers up to 20 from a quad page and manipulating them in addition and subtraction calculations. (Resource 1)

Doubling and Halving

1. Following odd and even numbers is doubling and halving. Learners know that any number, odd or even, when doubled, ends up in an even number, but only even numbers can be halved exactly.

2. Doubling and halving also provide an opportunity to introduce multiplication and division. If we alternate our words for halving and doubling, we plant the idea of multiplying by two and dividing by two.

   Examples:

   a. ‘You received R15 for Christmas, but for your birthday you received double/twice/two times that amount. How much money did you receive for your birthday?’

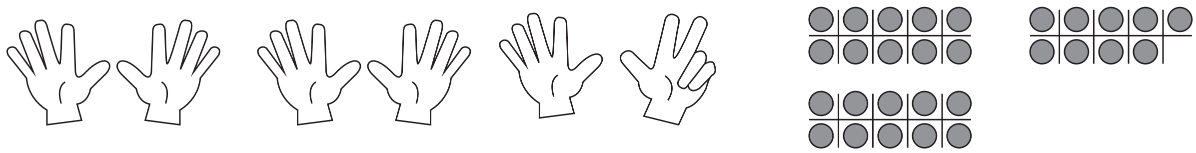
   b. ‘Mom has R26 in her purse. She gives half to you and half to your sister. How much money do each of you have now?’ or ‘She divides it in two equal parts’ or ‘She shares it equally between the two of you’ or ‘She divides it in half between your sister and you’.

Understanding Place Value

1. Learners in Grade 3 have already written two digit numbers so as to show the structure of a number.

Teaching Tip: We can link ten-frames with showing numbers with hands. They correspond with hands. Blank ten-frames are quick to draw – one horizontal line and four shorter intersecting vertical lines.

Example:
Use ten-frames on paper instead of showing the number with hands. Two whole hands and another two hands showed two tens, while one hand and three fingers showed eight. Write it as 28, knowing that the digit '2' stands for two tens; the digit '8' stands for eight.



2. We extend the learning tasks for place value in Grade 4 to include two new positions in the base ten number system, namely hundreds and thousands. In preparation for that, learners should get an idea of how many 100 is and of how many 1 000 is.

Teaching tip:

Cutting blocks from quad paper is easy, quick and effective. (Resource 2)

3. Learners' place value concepts can be strengthened further, using Flard cards (number builders). All learners should have a set which they use to build up and expand numbers. (Resource 3)

4. Based on the building of numbers, we can introduce place value headings for any number.

Example:

13 579 in a table with place value headings is written as follows:

Ten thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Units (U)
1	3	5	7	9

Topic 1: Addition & Subtraction

Expanded Notation

1. Expanded notation links spontaneously with the idea of place value in the base ten number system. This is the form in which we write a number to show its breakdown. If learners know how to compose numbers, using the Flard cards, they will know how to decompose numbers into the parts they are made up of. There are calculation strategies in all four operations, addition, subtraction, multiplication and division, that make use of expanded notation.

Example:
7 531 written in expanded notation is 7 000 + 500 + 30 + 1.

Calculation Techniques

2. Addition: Method 1 – Breaking down both numbers
Break down both numbers, all parts separated by + signs, then group together the thousands, hundreds, tens and units to add.

Example:

4 537 + 2 213	Add 2 213 to 4 537
= 4000 + 500 + 30 + 7 + 2 000 + 200 + 10 + 3	Break down both numbers
= (4 000 + 2 000) + (500 + 200) + (30 + 10) + (7 + 3)	Group to add
= 6 000 + 700 + 40 + 10	Add the answers
= 6 750	Write down the final answer

3. Addition: Method 2 – Breaking down the number you want to add

Break down the second number, add the parts separately.

Example:

4 537 + 2 213	Add 2 213 to 4 537
= 4 537 + 2 000 + 200 + 10 + 3	Break down second number
(4 537+2 000→6 537+200→6 737+10→6 747+3→6 750)	Keep on adding
4 537 + 2 213	
= 6 750	Write down the final answer

4. Addition: Method 3 – Compensating

This method needs special attention and must be done slowly and carefully. There are two cases, in the first you round the first number up and in the second, you round it down, as follows:

a. Rounding up and adding

3 287 + 68

= (3 287 + 13) + (68 -13)

= 3 300 + 55

= 3 355

b. Rounding down and adding

4 912 + 87

= (4 912 – 12) + (87 + 12)

= 4 900 + 99

= 4 999

5. Subtraction: Method 1 – Breaking down both numbers

Break down both numbers. Separate the parts of the first number by + signs. All the parts of the number which you are subtracting, have minus signs. Group together thousands, hundreds, tens and units to subtract.

Example:

4 537 – 2 213	Subtract 2 213 from 4 537
= 4000 + 500 + 30 + 7 – 2 000 – 200 – 10 – 3	Break down both numbers
= (4 000 – 2 000) + (500 – 200) + (30 – 10) + (7 – 3)	Group to subtract
= 2 000 + 300 + 20 + 4	Add the answers
= 2 324	Write down the final answer

6. Subtraction: Method 2 – Breaking down and "borrowing"

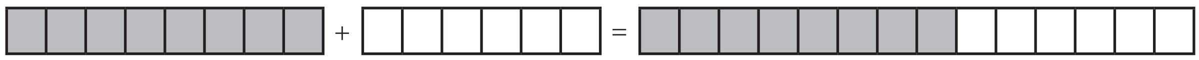
Example:

7 414 – 2 751	Subtract 2 751 from 7 414
= 7 000 + 400 + 10 + 4 - 2000 - 700 - 50 - 1	Break down both numbers
= (7 000 – 2 000) + (400 – 700) + (10 – 50) + (4 – 1)	Group to subtract
= (7 000–2 000) + (300–700) + (110–50) + 3	Work from the back
= (6 000 – 2 000) + (1 300 – 700) + 60 + 3	Borrow from first number in brackets
= 4 000 + 600 + 60 + 3	Add answers
= 4 663	

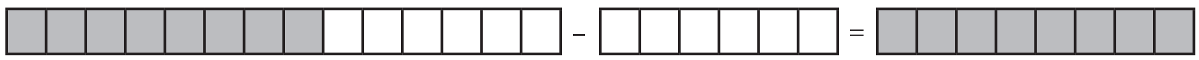
Using Inverse Operations to Check Answers

1. The idea that addition and subtraction are inverse operations and multiplication and division are inverse operations, provides a tool for checking whether answers are correct or not.

Example:
We can explain the idea of addition and subtraction being each other's inverse visually by using the part-part-whole idea:



8 + 6 = 14



14 − 6 = 8

Solving Money Problems using Addition and Subtraction

Learners use money in their daily lives and in Grade 4 they solve money problems using their addition and subtraction skills. They are solving context free problems as well as problems in a real context, and they are working with whole numbers only.

Examples:

a. R5 432 – R3 456

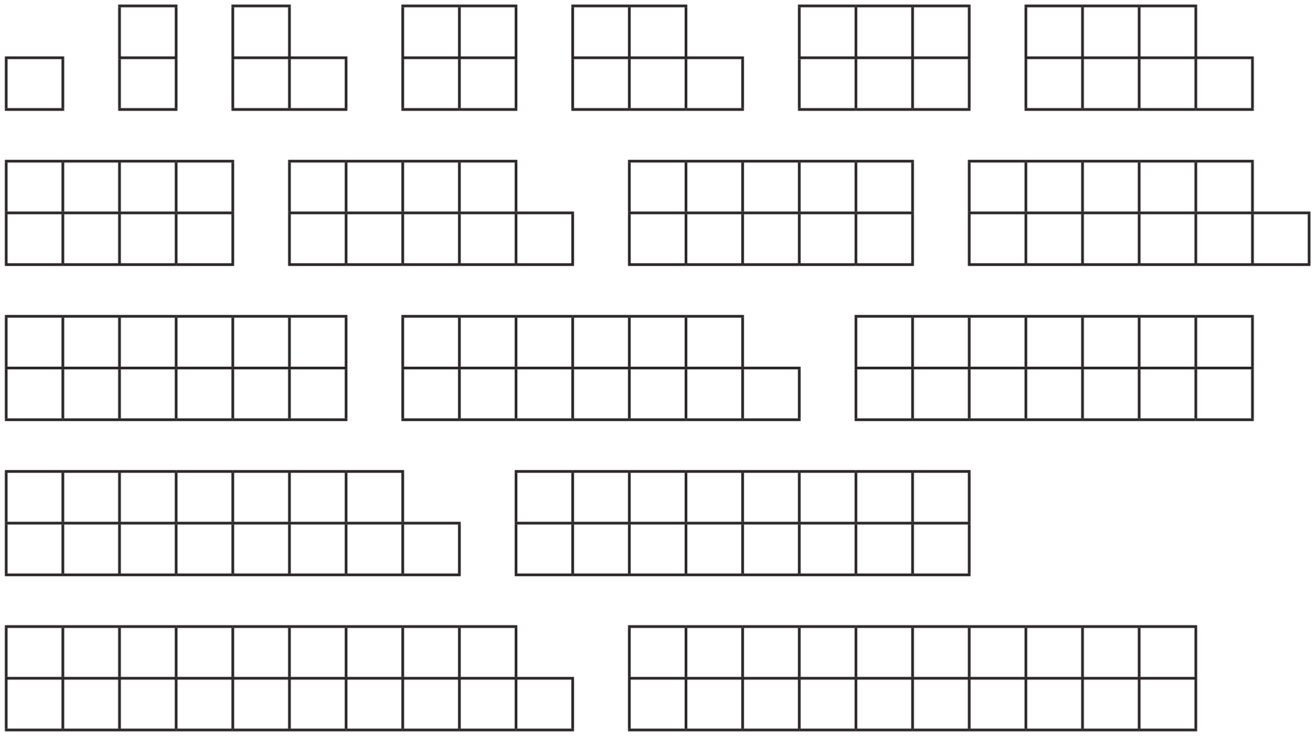
b. R6 543 + R2 345

c. Manny buys shoes for his sons for R1 345 and he pays with R1 500. How much change must he receive?

d. Fanny buys groceries for R1 867 and books for R569. How much does she spend altogether?

RESOURCES

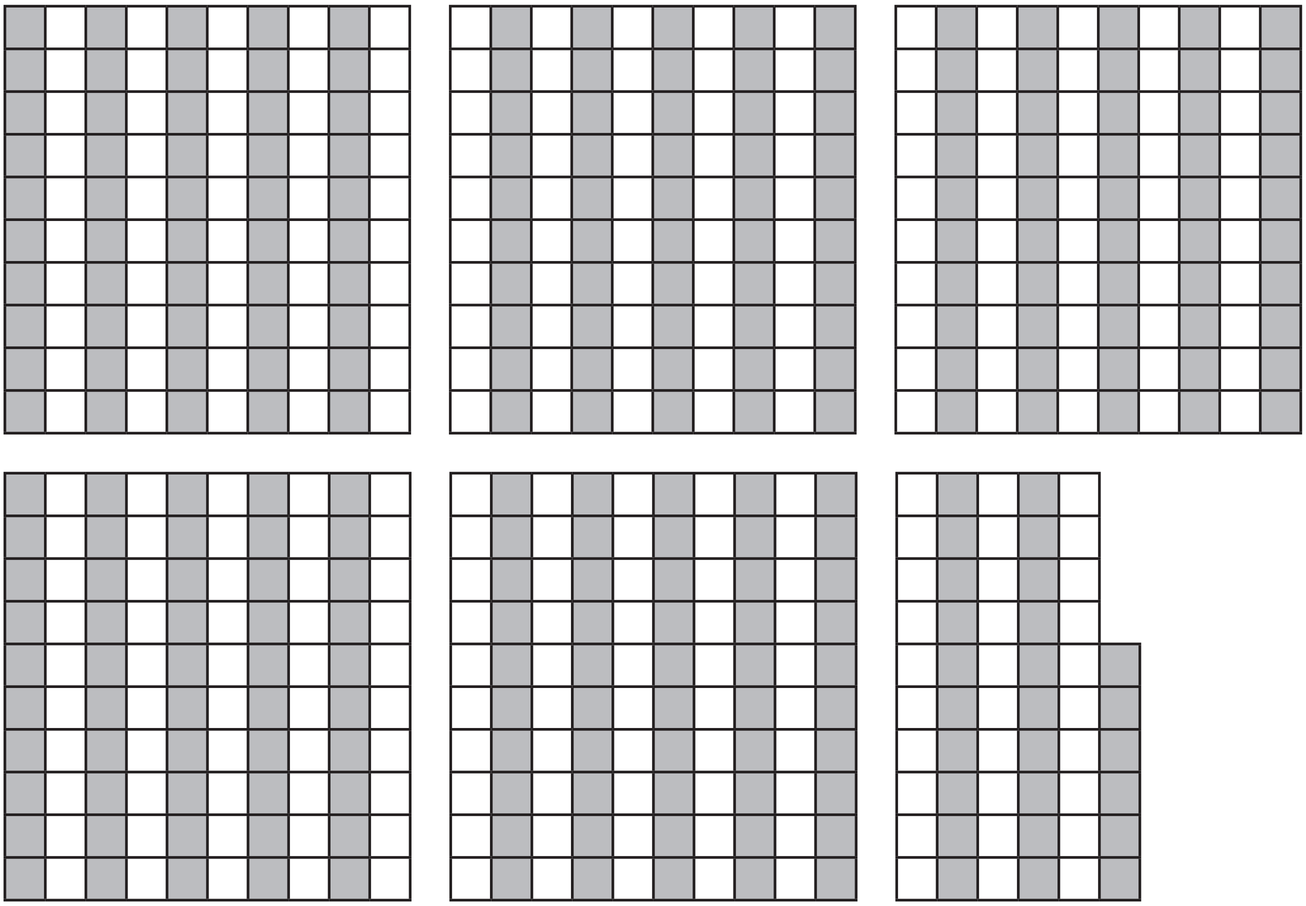
Resource 1 Odd and Even Cards



1. Learners rotate the cards and “click” them into each other. Two odd parts form an even whole.
2. Learners fold a part of the number to subtract. An even number becomes odd when subtracting an odd part from it; an odd number becomes even when subtracting an odd number from it.
3. Odd and even cards support the idea of halving. One can fold even numbers lengthwise to give two parts that are exactly the same. The odd numbers always leave an odd one standing out.
4. Consecutive numbers are formed by adding a single unit.

Resource 2 Place Value: 100's Blocks from Quad Paper

1. Learners cut blocks of 100 in quad paper to see that 100 is built up of ten tens.
2. Ten such blocks give them the impression of how many 1 000 is.
3. To make it easier to see numbers at a glance, columns of ten can be shaded or coloured in.
4. Parts of blocks can be used to show a specific number like the one below, showing 556.



Resource 3 Place Value: Flard Cards

1	2	3	4	5	6	7	8	9
10	20	30	40					
50	60	70	80					
90	100	200						
300	400	500						
600	700	800						
900	1000							
2000	3000							
4000	5000							
6000	7000							
8000	9000							
10000								

TOPIC 2: COMMON FRACTIONS

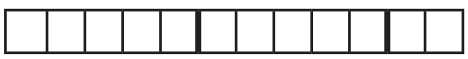
INTRODUCTION

- This unit runs for 6 hours.
- It is part of the ‘Numbers, Operations and Relationships’ content area, which is allocated half of the weight shared by the five content areas.
- The focus of this unit is common fractions.
- This unit covers basic concepts about fractions, and should serve as a transition from whole numbers to rational numbers. At this stage, it is really more about shaping fraction concepts as opposed to whole number concepts, than becoming fluent in calculating with fractions.
- This unit should therefore be approached in a practical way, linking to learners’ experiences of the world. All physical and visual aids should resemble real world situations.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Use and name unitary and non-unitary fractions in familiar contexts, including halves, quarters, eighths, thirds, sixths, fifths • Recognise fractions in diagram/picture form • Start recognising two halves and three thirds as being one whole • Start recognising that some fractions are equivalent • Write simple fractions like ½ and ¾	• Compare and order fractions with different denominators (halves, thirds, quarter, fifths, sixths, sevenths, eighths) • Describe and compare fractions in diagram form • Recognise, describe and use the equivalence of division and fractions • Add fractions with the same denominator • Recognize and use equivalent forms of common fractions where denominators are multiples of each other • Solve problems in contexts involving fractions, including grouping and equal sharing	• Describe, compare and order common fractions to at least twelfths • Count forwards and backwards in fractions • Recognise, describe and use the equivalence of division and fractions • Add common fractions with the same denominator • Recognize and use equivalent forms of common fractions where denominators are multiples of each other • Solve problems in contexts involving fractions, including grouping and equal sharing

GLOSSARY OF TERMS

Term	Explanation / Diagram
Common Fraction	A fraction is a part or parts of something or a number of objects that are divided into groups. This bar is divided into five equal parts, two are shaded and three are unshaded.  We write common fractions with one digit above and one below a fraction line.
Denominator	The digit telling the number of equal parts into which a whole is divided, or the number of equal small groups into which a big group is divided. We write this digit under the fraction line, like in $\frac{2}{5}$ The '5' shows that the above bar is divided in five equal parts.
Numerator	The digit which tells us how many parts or groups we are dealing with from those into which the whole is divided. That number appears above the fraction line, like $\frac{2}{5}$. The '2' shows how many parts are shaded in the above bar.
Mixed Number	A mixed number represents one or more wholes as well as part of a whole. For example, $\frac{12}{5}$. This is two wholes and two fifths. This is written as $2\frac{2}{5}$, which has a whole number and a fraction. 
Diagram	A drawing or a picture used to make something clear and simple. The "fraction wall" is a diagram showing how one whole can be divided in any number of parts.
Fraction wall	A diagram showing one whole in each row, divided into 2, 3, 4, 5 parts and so on. Using a ruler downwards, one can for example see on a fraction wall that two thirds is the same as (or equivalent to) four sixths, that two quarters is equivalent to a half and so on.

Fractions wall

1											
$\frac{1}{2}$	$\frac{1}{2}$										
$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$									
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$								
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$							
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$						
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$				
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$		
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

SUMMARY OF KEY CONCEPTS

Introduction

1. Learners in Grade 4 have to move from mainly recognising fraction parts visually and talking about them, to also writing them and working with them.
   - They still talk about fractions and describe them.
   - They can physically work with them – cutting an apple or sharing out numbers of objects equally.
   - They can see them in pictures or diagrams, leaning more to diagrams from now on.
2. This topic is supported by resource sheets at the end of this section.

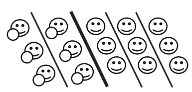
Understanding New Fraction Concepts

1. In the Foundation Phase learners started learning about fractions as a part or a slice of one whole. This idea is now extended to include fractions as ratios too, where the group is seen as the whole, and also to the idea that the parts can be more than a whole.

   Example:

   a. Two-fifths of the bar is shaded (not the whole bar, only a part of the bar is shaded).

   b. Two-fifths of the class are playing soccer (not the whole class is playing soccer, only a part of the whole class).



This fraction is written $\frac{2}{5}$ and is said 'two fifths'

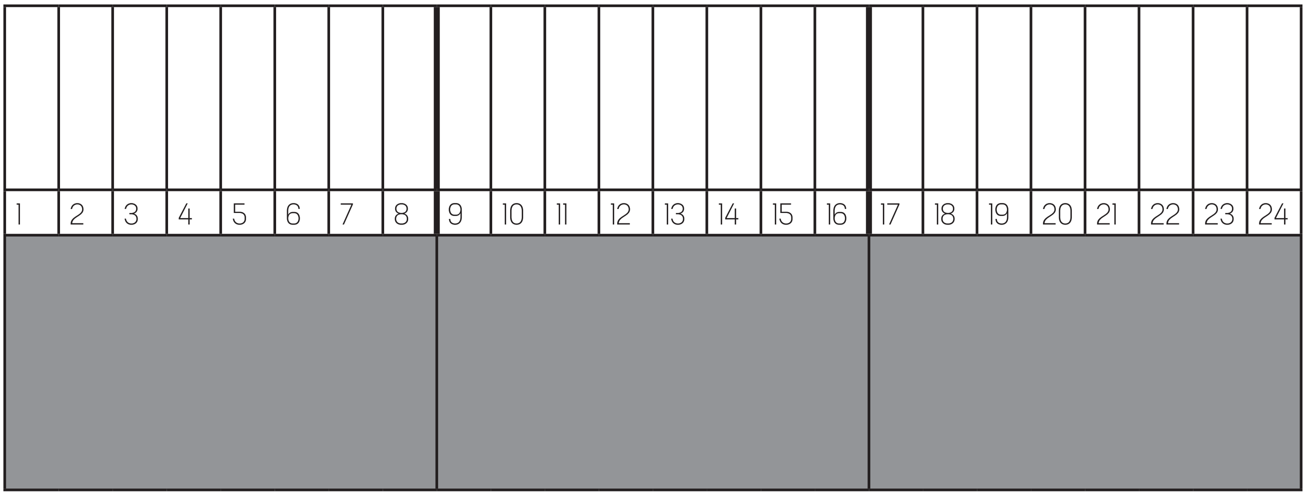
Example:
From the bars below, we have shaded twelve fifths.

This fraction is written $\frac{12}{5}$ and is said 'twelve fifths'

Teaching Tip: Because 'fractions' has a reputation of being a difficult topic, we take special care that fractions are understood in the real world before, and every time, we write fractions as number symbols. Learners must see fractions as something that 'happens' and appears in their lives and engage with fraction concepts along with writing them down.

2. Let learners spend dedicated time creating and ‘seeing’ fractions, and learning to recognise and say the fraction part names. They fold strips of paper (Resource 1). On the unlined side, they fold the whole into a given number of parts. When they fold the paper open, it shows the ratio out of the total number.

Example:
First fold the strip of paper along the long horizontal line.
Then fold it in thirds or in three equal parts along the vertical lines.
Fold it open and see that one third of 24 is 8.



Common fraction names

Learners know fraction names from the Foundation Phase. In Grade 4, they learn that we call the fraction after the number of parts into which we divide something, just with a ‘th’ sound following the number, like fifths and sixths. Halves, thirds and quarters do not follow this way of naming.

Teaching Tip: While learners are engaging with the fractions (Resource 1 and Resource 2), they say the fraction names, they read the written symbols for the fraction names and lastly they write the symbols themselves.

Common Fraction Parts: Numerator and Denominator

The names of the parts of fractions are facts that learners must repeat, know, and use.

Teaching Tip: While learners do the fraction activities in Resource 1 and Resource 2, we consistently refer to the parts of fractions using the correct terminology.

Equivalent Fractions

We aim for understanding of equivalence before we start writing the symbols in equations. Learners discover equivalence while engaging with activities as in Resource 2 or using the fraction wall.

Comparing Fractions

Learners must understand that the more parts something is divided up into, the smaller the parts become. The fraction wall should show learners that fractions with a larger denominator, indicate a smaller fraction.

Adding Common Fractions With the Same Denominator

The idea of adding fractions with the same denominator seems to come fairly naturally.

Teaching Tip: It helps to start by saying the sum out loud, consistently stressing the numerator and under-emphasising the denominator. This way we are establishing the idea that the numerators are added, but the denominator is the 'kind' of things that are added and therefore remains the same:

Example:
Just as we would say any problem where the same kinds are added, like

'We are adding **TWO biscuits** to **FIVE biscuits**. **HOW MANY biscuits** do we have now?'

'We are adding **TWO eighths** to **FIVE eighths**. **HOW MANY eighths** do we have now?'

Improper Fractions and Mixed Numbers

An improper fraction is a term used to describe a fraction where the parts have formed more than a whole. This term is not used in the CAPS document, we rather show and describe this type of fraction in a picture or in writing, where the numerator is bigger than the denominator, like in this example:

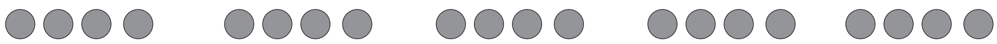
As an improper fraction we write it as $\frac{12}{5}$, and as a mixed number (whole and fraction) we write it as $2\frac{2}{5}$.

Finding a fraction of a group

We do not only get a fraction of a whole, but also a fraction of a group, as is demonstrated in the paragraph “Understanding New Fraction Concepts” above. Learners need to do some exercises on this as well:

Example:

Find $\frac{1}{5}$ of twenty marbles.



Two halves = 1 whole, three thirds = 1 whole, etc

Again, the fraction wall can assist to bring home this idea which learners need to understand in Grade 4.

Problem solving involving fractions

1. Problem solving that involves fractions, must always be given in the context of learners’ life experience. We have to make it sound natural, in a way under-emphasising the fact that we are talking of fractions here.

Example:

a. We have eighteen boys in this class. A third of them are playing soccer. How many boys are playing soccer?

b. And what if half of the boys were playing soccer? How many would that be?

c. Mom uses two thirds of a loaf of bread to make us lunch for school. How much of the bread is left?

d. How many loaves is Mom using in two days? And in three days?

RESOURCES

Resource 1: Folding in Fractions

Fold strips in half lengthwise. Paste the shaded half back to back to the numbered half.

a. Thirds of 6: I fold my paper strip in three. I call the parts that I have folded, thirds. My paper strip is 6 units long. One third of 6 is two. Two thirds of 6 is 4. Three thirds of 6 is 6!

1	2	3	4	5	6

b. Thirds of 9: I fold my paper strip in three. I call the parts that I have folded, thirds. My paper strip is 9 units long. One third of 9 is three. Two thirds of 9 is 6. Three thirds of 9 is 9!

1	2	3	4	5	6	7	8	9

c. Thirds of 15: I fold my paper strip in three. I call the parts that I have folded, thirds. My paper strip is 15 units long. One third of 15 is five. Two thirds of 15 is 6. Three thirds of 15 is 15!

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

d. Halves of 6: I fold my paper strip in two parts. I call the parts that I have folded, halves. My paper strip is 6 units long. One half of 6 is 3. Two halves of 6 is 6!

1	2	3	4	5	6

e. Quarters of 8: I fold my paper strip in four. I call the parts that I have folded, quarters. My paper strip is 8 units long. One quarter of 8 is 2. Two quarters of 8 is 4. Oh! two quarters of 8 is also half of my paper strip! Three quarters of 8 is 6.
Four quarters of 8 is 8!

1	2	3	4	5	6	7	8

f. Fifths of 15: I fold my paper strip in five. I call the parts that I have folded, fifths. My paper strip is 15 units long. One fifth of 15 is three. Two fifths of 15 is 6. Three fifths of 15 is 9. Four fifths of 15 is 12. Five fifths of 15 is 15!

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

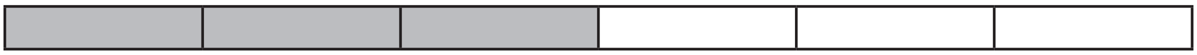
Resource 2:

Equivalent Fractions

1. These strips all have exact halves.

In this strip, there are two quarters in one half: 2/4 = 1/2

In this strip, there are ______ sixths in one half: /6 = 1/2

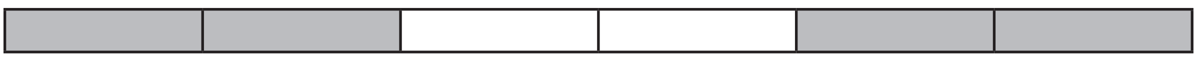


In this strip, there are ______ eighths in one half: /8 = 1/2

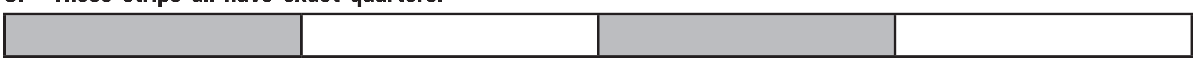
2. These strips all have exact thirds

In this strip, there are two sixths in one third: 2/6 = 1/3

In this strip, there are four sixths in two thirds: 4/6 = 2/3



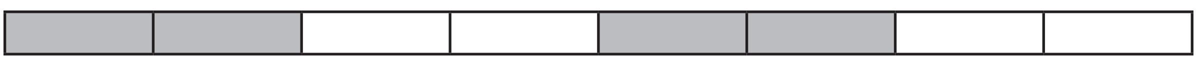
3. These strips all have exact quarters.



In this strip, there are _____ eighths in one quarter: /8 = 1/4

In this strip, there are _____ eighths in two quarters: /8 = 2/4 (What other fraction is it also?)

In this strip, there are _____ eighths in three quarters: /8 = 3/4



TOPIC 3: LENGTH

INTRODUCTION

- This unit runs for 7 hours.
- This unit is part of the content area ‘Measurement’, which counts 15% of the final exam.
- The emphasis is on formal measuring of 2D shapes and 3D objects.
- The required knowledge includes measurement facts (various measurement units) and the required skills include the use of measurement instruments.
- Problem solving centres around situations in everyday contexts.
- Conversions between units of length are introduced in Grade 4.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Measure informally in non-standard units like body parts • Estimate, compare, order and record informal measurements • Describe length by counting and reporting the number of units • Use language to talk about length (long, short, wide, tall, etc) • Measure formally in standard units of length, metre and centimetre • Estimate, compare, order and record formal measurements • Investigate and use measuring instruments	• Measure 2D shapes and 3D objects formally in standard units of length • Estimate, compare, order and record formal measurements • Use and discern standard units of length: millimetre (mm), centimetre (cm), metre (m) and kilometre (km) • Use measuring instruments rulers, metre sticks, tape measures, trundle wheels • Solve problems in context involving length • Convert between mm and cm; between cm and m; and m and km	• Measure 2D shapes and 3D objects formally in standard units of length • Estimate, compare, order and record formal measurements • Use and discern standard units of length: millimetre (mm), centimetre (cm), metre (m) and kilometre (km) • Use measuring instruments rulers, metre sticks, tape measures, trundle wheels • Solve problems in context involving length • Convert between any units of length including mm, cm, m and km

GLOSSARY OF TERMS

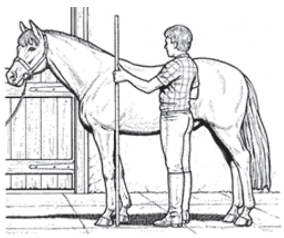
Term	Explanation / Diagram
Length	A one-dimensional measurement along a line which indicates the distance between two points.
Measuring Instruments	A device or a system that is used to measure a physical quantity, in this case, length. The instrument is usually calibrated or marked in intervals of standard units, in this case units of length.
Conversion	Changing a unit of measurement to a different but equal unit of measurement. Example: 1 cm = 10 mm 100 cm = 1 m
Estimate	Judging something (length in this case) without measuring or calculating it. Estimation is based on knowledge and experience about that which is estimated.
Unit of length	A single standard distance from one point to another, bearing a specific name like a centimetre.

SUMMARY OF KEY CONCEPTS

Practical measuring by estimating, measuring, recording, comparing and ordering

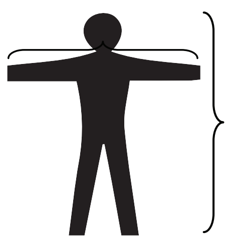
1. Learners make a transition from measuring with non-standard instruments to standardised instruments. A little history about measuring length is always intriguing, especially when measuring with body parts which could become unfair and will certainly be innacurate.

   Example:
   The height of a horse is measured with hands. One farmer's hand is 12 cm wide and another farmer's hand is 9 cm wide. The first farmer would measure and find the horse is 12 hands high. The second farmer would find the same horse is 16 hands high. (Why is that so?) Now they have made a rule that a hand is almost exactly 10 cm wide and they put those units on a measure stick. The standard measurement tells both farmers that the same horse is 14½ hands high.



2. Learners can compare two lengths.

   Example:
   Measure two lengths with a string: the first one, from the tip of the left (outstretched) hand to the tip of the right (outstretched) hand; compare this string to a string used to measure the second length, from the top of the head to the feet on the floor. Measure both strings with a ruler. It is almost the same length, or a few centimetres different.



3. From the start, learners must understand that length does not always go along a straight line but it can also be measured along a curve or all around a two- or three-dimensional object.

Example:

a. Measure the circumference of a soccer ball with a piece of string, lay out (not stretch) the string and measure it with a ruler in centimetres. Compare the circumference of a tennis ball.

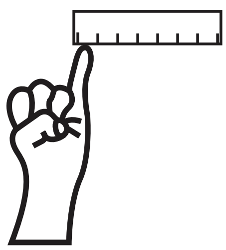
b. Measure the perimeter of an exercise book with a piece of string, lay out (not stretch) the string and measure it with a ruler in centimetres. Compare the perimeter of a calculator.

4. Estimations can be taught according to a few handy approximates in everyday life. These approximates may help learners to make better judgements and more reasonable estimations. While preparing our approximation instruments, we may introduce conversions at the same time.

Example:

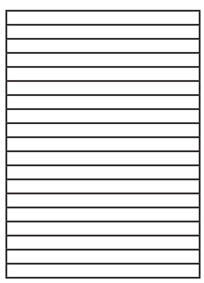
a. Millimetre: Let learners draw a single short line with their pencils: | The width of that line is approximately one millimetre, or ‘it is about one millimetre thick’. If they make ten of them very close to each other, it should (together) be approximately one centimetre wide ||||||||||

b. Centimetre: Let learners put their little fingers on a centimetre on their rulers and see that the width of their little fingers is about one centimetre.

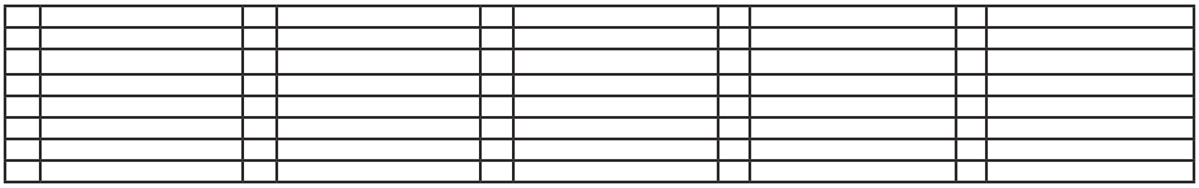


Teaching Tip: We can use these handy approximations to start introducing conversions. Just as their little fingers fit onto one centimetre on their rulers, they will also fit onto their ten (mm) pencil lines. This means that 10 mm = 1 cm. Then we use our 10 cm approximate to form an idea of a metre, and so on.

c. 10 Centimetres: Let learners fold a page in their A4 exercise books lengthwise and see that the width of the half page is about 10 cm.
They can ‘measure’ the width of the folded page with their little fingers, to see that about ten of their little fingers’ width fit into 10 cm.



d. Metre: Let learners cut one A4 page in 5 equal strips and Sellotape them together. Each strip is about 20 cm long, and together they make about a metre.



Counting in tens, they can use their half folded pages which are approximately 10 cm wide, to 'measure' off their meter strip. They will find that ten of their 10 cm widths fit into their metre, meaning that 100 cm = 1 metre.

Measurement Facts to Know

Metre is our standard unit for measuring length. We use the letter 'm' for short when we mean metres.

When a metre is divided up into a hundred parts, the small parts are called centimetres. We use the letters 'cm' for short when we mean centimetres. One metre is the same length as one hundred centimetres (1 m = 100 cm).

Measurement Instruments

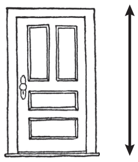
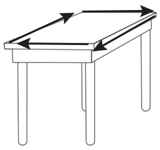
1. All textbooks have pictures and descriptions of some standard measuring instruments, what they are used for to measure and how you measure with them.
   Consult the Planner and Tracker.

2. Learners must know how to choose the correct instruments for the measuring of given lengths, from a ruler, a tape measure, a metre stick, a trundle wheel and the odometer of a car, even if they cannot do it themselves. Their most available instrument is the ruler and we have to to do as much as possible with a ruler.

Teaching tip: Collapse a few measurement tasks into a single assignment

- Estimating the length before measuring it
- Choosing the suitable measurement instrument for the specific task
- Selecting the appropriate measurement unit
- Measuring actually and accurately
- Recording measurements
- Using the correct units of measurement when writing down
- Converting measurements

Combined Assignment: Measuring Length

Object	Estimate	Instrument	Record	Conversion
Example: Width of a chair 	50 cm	Ruler	50 cm	50cm is the same as half a metre
Height of your classroom door 	in cm			cm to m
Perimeter of (length around) a table 	in m			m to cm

TOPIC 4: MULTIPLICATION

INTRODUCTION

- This unit runs for 5 hours.
- It forms part of the content area 'Numbers, Operations and Relationships' and counts along with the other topics in this content area, for 50% of the marks in the final examination.
- This unit extends skills to multiplication of 2-digit whole numbers by 2-digit whole numbers.
- Learners solve multiplication problems in life situations, applying the prescribed strategies.
- Learners must round answers up or down and estimate to check for reasonability of answers.

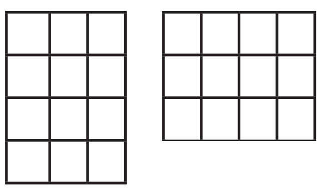
SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD

• Multiply 2, 3, 4, 5 and 10 to a total of 100
• Use appropriate symbols
• Add repeatedly, leading to multiplication
• Represent multiplication as arrays
• Understand the commutative law for multiplication
• Use a number line to show multiplication
• Use flow diagrams to represent multiplication
• Know the language of multiplication and the meaning of 'multiple'.
• Multiply 2-digit- by 1-digit numbers
	• Multiply 2-digit- by 2-digit numbers
	• Estimate the answer to a multiplication calculation
	• Use the following strategies to multiply:
	  • building up and breaking down numbers
	  • using a number line
	  • rounding off, compensating
	  • doubling and halving
	• Know multiples and factors of numbers to 100
	• Recognise, use commutative property of number
	• Recognise and use associative property of number
	• Recognise and use distributive property of number
	• Solve problems with whole numbers in a financial context
	• Compare quantities of the same kind (ratio) and quantities of different kinds (rate)
		• Multiply 3- by 2-digit numbers
		• Estimate the answer to a multiplication calculation
		• Use the following strategies to multiply:
		  • building up and breaking down numbers
		  • using a number line
		  • rounding off, compensating
		  • doubling and halving
		• Know multiples and factors of two digit numbers to 100
		• Know additive property of 0 and multiplicative property of 1
		• Recognise, use commutative property of number
		• Recognise and use associative property of number
		• Recognise and use distributive property of number
		• Solve problems with whole numbers in financial and measurement contexts
		• Compare quantities of the same kind (ratio)

Topic 4: Multiplication

GLOSSARY OF TERMS

Term	Explanation / Diagram
Multiplication	A short way of adding more than one of the same number together. Example: 4 + 4 + 4 + 4 + 4 + 4 + 4 = 28 or 7 x 4 = 28
Multiples	A number formed by multiplying two other numbers. Example: 28 is the seventh multiple of 4, since 7 x 4 = 28. 28 is also the fourth multiple of 7, since 4 x 7 = 28. The number itself is its own first multiple: 7 is the first multiple of 7 (1 x 7 = 7)
Factors	Whole numbers that divide exactly into another number, or numbers that were multiplied to make that number, like 7, 2, 14 and 4 are factors of 28.
Multiplicative Property of One	One multiplied by, or divided into a number does not change that number: one is the identity element for multiplication and division: 14 x 1 = 14; 14 ÷ 1 = 14.
Distributive Property of Multiplication over Addition	If we multiply a number by numbers that are added together, it is the same as multiplying the number by each of the other numbers. Example: Five learners each have three brothers and two sisters. To save time and space, we can write it: 5 times (+) or in numbers = 5(3 + 2) = 15 + 10 = 25 siblings altogether.
Terminology Used in Multiplication Equations or Calculations	9 x 4 = 36 ↓ ↓ ↓ Multiplicand x Multiplier = Product The product is the answer to a multiplication sum.
Inverse Property	Multiplication is the inverse of division. Division is the inverse of multiplication. Example: 4 x 7 = 28 28 ÷ 7 = 4 ∴ 28 ÷ 7 = 4 and also ∴ 4 x 7 = 28 and also 28 ÷ 4 = 7 7 x 4 = 28
Commutative Law	The order of numbers in addition and multiplication may change and the answer will remain the same. Example: Rectangle a. has three blocks to the side and four down (3 x 4). Rectangle b. has four blocks to the side and three down (4 x 3). Both have 12 blocks altogether because 3 x 4 = 12 and 4 x 3 = 12 

Term	Explanation / Diagram
Halving	To divide a number into two equal parts, which is the same as dividing the number by two: when we halve 14, we have two equal parts of seven each.
Doubling	To multiply a number by two, or add the same number to it, so that the answer is twice as many as the number: when we double seven, we have fourteen. A double number is always even.
Rounding off Symbol	When one number is not exactly equal to, or the same as another number, we use the symbol $\approx$ to indicate that it is approximately, or almost the same as the other when we round off or estimate.
Financial Context	Calculating money is a calculation in a financial context. We calculate it in the currency we use, like rands and cents in South Africa.
Buying and selling	Buying is the process of getting something by paying for it with money. Selling is the process of giving something to someone else in exchange for money.
Ratio	Comparing the sizes of two or more quantities, not always of the same kind.
Rate	Rate is also a ratio. It is used to compare two quantities of things that depend on each other – if one quantity changes, the other is also changing. Price and speed are instances of rate that are familiar in learners' everyday life.

SUMMARY OF KEY CONCEPTS

Multiplication of at least a 2-digit number by a 2-digit number.

1. To do multiplication as repeated addition, is a strategy that can only really be used with small multipliers. It becomes too long (and dangerous) when the multiplier is a 2-digit number.

   Example:
   246 x 4

   = (200+200+200+200)+(40+40+40+40)+(6+6+6+6)

   = 800 + 160 + 24

   = 984

2. In Grade 4 we can use various ‘break-down’ strategies to multiply, but we need to be extremely careful how we treat the multiplier in any of these methods. There are three options: regarding the multiplier as the sum, the difference or the product of two numbers.

Teaching tip: Spend some time talking to learners about the multiplier and how the multiplier was built up or made, as follows:

Example:
In our two examples we are firstly going to use 12 and 35 as multipliers. These numbers were made in various ways. We either added some numbers to make the number, or we multiplied two numbers to make the same number:

12 = 10 + 2 (broken down into its terms) 12 = 3 x 4 (broken down into its factors)
35 = 30 + 5 (broken down into its terms) 35 = 7 x 5 (broken down into its factors)

Using the terms of the multiplier to multiply a. Sum of the terms	Using the factors of the multiplier to multiply b. Product of factors
16 x 12 = 16 x (10 + 2) = (16 x 10) + (16 x 2) Distributive property = 160 + 32 = 192	16 x 12 = 16 x 3 x 4 We don't need brackets = $\underbrace{16 \times 3} \times 4$ = 48 x 4 = 192
88 x 35 = 88 x (30 + 5) = (88 x 30) + (88 x 5) Distributive property = 2 640 + 1 440 = 3 080	88 x 35 = 88 x 7 x 5 = $\underbrace{88 \times 7} \times 5$ = 616 x 5 = 3 080

3. In the third strategy of breaking down the multiplier, we regard the multiplier as the difference between two numbers. This means we are still working with terms, but in a way where a number came about as a result of subtraction. This method is also called rounding up and compensating.

Using the terms of the multiplier to multiply: c. Difference of the terms	Teaching tip: Be extremely careful that learners understand what they are doing:
16 x 18 = 16 x (20 – 2) = (16 x 20) – (16 x 2) = 320 – 32 = 288	18 is closer to 20, so we think of 18 as 20 – 2. We put it in brackets to see this is our 18. We multiply 16 by 20 but we know it is too much. We have to subtract two times 16 from that to make sure we actually multiplied by 18.
288 x 35 = 288 x (40 – 5) = (288 x 40) – (288 x 5) = 11 520 – 1 440 = 10 080	35 is closer to 40, so we think of 35 as 40 – 5. We put it in brackets to see this is our 35. We multiply 288 by 40 but we know it is too much. We have to subtract two times 288 from that to make sure we actually multiplied by 35.

4. We can use doubling and halving in some cases to multiply, but that works well only in cases where one of the numbers is a multiple of 2, 4, 8 or 16.

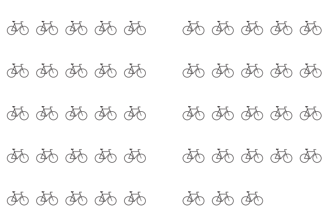
Example:
288 x 35

Halving	Doubling
288	35
144	70
72	140
36	280
18	560
9	1 120
9 x 1 120 = 10 080	

Rounding Off Symbol

When one number is not exactly equal to, or the same as another number, we use the symbol ≈ to indicate that it is approximately, or almost the same as the other when we round off or estimate.

Example:



There are 48 bicycles at school.
That is very close to 50 bicycles.
It is almost 50 bicycles
48 ≈ 50

Additive property of 0

Example:

Four spiders sit on a wall. No spider comes to join them.

So they remain four because 4 + 0 = 4

 + 0 = 

Example:

Four spiders sit on a wall. None of them walk away.

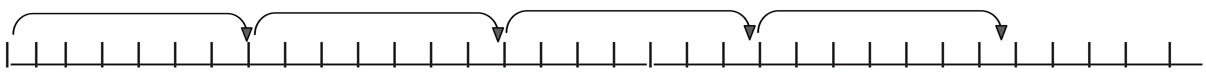
So they remain four because 4 – 0 = 4

 – 0 = 

The same is not true of zero's influence in multiplication or division.

Multiplication by 0

Teaching tip: Explain this multiplication fact with a number line:



0 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 31 32

7 is the first multiple of 7; 14 is the second multiple of 7; 21 is the third multiple of 7; 28 is the fourth multiple of 7.

7 x 0 = 0   7 x 1 = 7   7 x 2 = 14   7 x 3 = 21   7 x 4 = 28

Multiplication by 1

One multiplied by, or divided into a number does not change that number: one is the identity element for multiplication and division.

Example:

Four spiders all have one head.

So four spiders have four heads 4 x 1 = 4

Example:

Four spiders are sharing one web.

The web has four spiders staying in it now, because 4 ÷ 1 = 4

Topic 4: Multiplication

Factors and factorising

A factor is a whole number that will divide exactly into another number. The factors of a number are those numbers that were multiplied to make that number.

Example:

7 x 4 = 28, so two factors of 28 are 7 and 4.

It is also true that 28 = 2 x 2 x 7 or 2 x 14, therefore 2 and 14 are also factors of 28.

All numbers have 1 and themselves as factors too. All factors of 28 are:

1; 2; 4; 7; 14; 28

1 and 28 are a factor pair of 28 because 1 x 28 = 28
2 and 14 are a factor pair of 28 because 2 x 14 = 28
4 and 7 are a factor pair of 28 because 4 x 7 = 28

Estimating by Rounding

Learners can use three ways to estimate the answer to a multiplication sum by rounding, or to check whether their answers are reasonable:

a. Round both numbers to the nearest 10:
   38 x 15 ≈ 40 x 20 ≈ 800

b. Round only the number that is closest to a multiple of 10:
   38 x 15 ≈ 40 x 15 ≈ 600

c. Round only the other number:
   38 x 15 ≈ 38 x 20 ≈ 740

The answer of 38 x 15 is 570, which shows that option b) is the closest approximation.

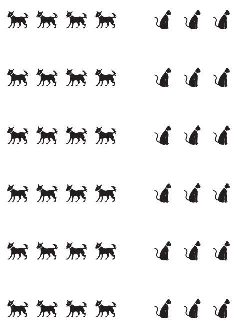
Problem solving in financial contexts

All textbooks have multiplication problems involving money (rands and cents). Word sums in a life context can be used, or context free calculations involving multiplication with whole rands can be given as exercises.

Ratio

Ratio is used to compare the sizes of two or more quantities, not always of the same kind. The key to understanding ratio is to understand that we are comparing the size or magnitude of two or more sets of objects.

Example:
Where we stay, there are 24 dogs and 18 cats.



24 dogs : 18 cats

The ratio of dogs to cats is 24:18 (say twenty four to eighteen).

If we group them in as many equal groups as we can, we see that we can make six equal groups where each group has four dogs and three cats. That means that our ratio is now more simple and we can say that 24:18 is the same as 4:3. (We actually divided both numbers by a factor that they have in common, that is 6).

24 = 6 x 4 and 18 = 6 x 3, therefore the ratio 24:18 = 4:3

Rate

Rate is also a ratio, but of a special kind. It is used to compare two quantities of things that depend on each other – if one quantity changes, the other is also changing. Price and speed are instances of rate that are familiar in learners' everyday life.

Examples

a. The price of one bag of potatoes is R65.
   (We write it as the price of potatoes is R65/bag, and say R65 per bag)
   The price of six bags of potatoes is R65 x 6 = R390

b. The taxi goes 330 km in three hours.
   In one hour the taxi goes 110 km.
   (We write the speed of the taxi as 110km/h, and say 110 km per hour)

TOPIC 5: PROPERTIES OF 3D OBJECTS

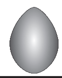
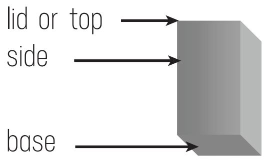
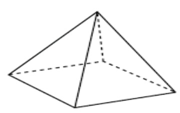
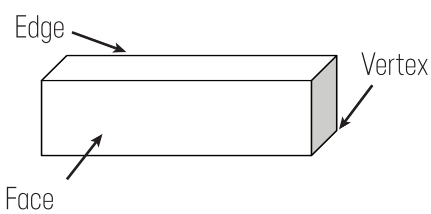
INTRODUCTION

- 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, it counts for 15% in the final exam.
- This unit covers 3D knowledge and skills pertaining to geometrical shapes and related concepts and terminology.
- The purpose of this unit is to extend learners' knowledge and experience to include objects of the third spatial dimension and their qualities in their everyday lives.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Recognise and name • ball shapes (spheres) • box shapes (prisms) • cylinders • Describe, sort, compare 3D objects ito • 2D shapes that make up their faces • flat or curved surfaces • Observe and build 3D objects concretely • Know 2D shapes • circles • triangles • squares • rectangles • Describe, sort, compare 2D shapes in terms of: • shape • straight sides • round/curved sides	• Know and name • spheres • rectangular prisms • cylinders • cones • square-based pyramids • Distinguish, describe, sort, compare 3D objects in terms of: • 2D shapes that make up their faces • flat or curved surfaces • Create 3D models from cut-out 2D polygons	• Know and name • cubes • rectangular prisms • other prisms • cylinders • cones • pyramids • similarities between cubes and rectangular prisms • Distinguish, describe, sort, compare 3D objects in terms of: • 2D shapes of faces • number of faces • flat or curved surfaces • Create 3D models • make models from cut-out 2D polygons • cut open boxes to describe their nets

GLOSSARY OF TERMS

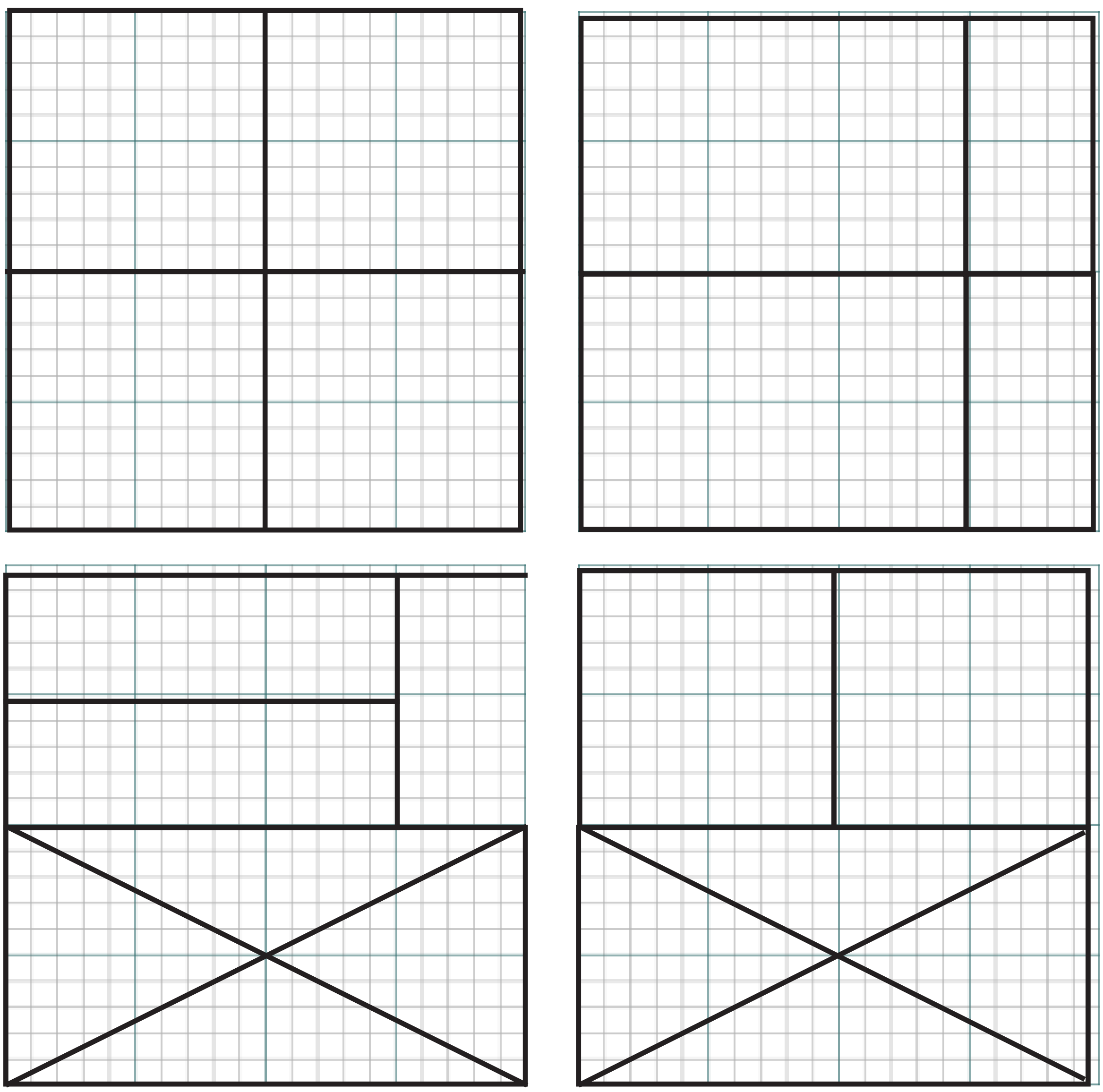
Term	Explanation / Diagram
Three-dimensional geometrical object (3D object)	Objects that occupy space and have form. We can measure such objects in three dimensions like a box, of which the length, breadth and height can be measured. We call it a 3D object.
Characteristics or Properties	The qualities of something, by which we recognise it, like its height, its form, etc. This is how we would describe the shape and what it looks like.
Curved surface	An object or diagram can have surfaces which are rounded and not straight, like an egg: 
Flat surface	An object or diagram with a flat suface is not curved but straight, meaning it has edges, like a box. A flat surface has a 2D shape called a face. This box has 6 rectangular faces and 12 edges. 
Prism	A solid object with a base and a top (lid) that are the same shape and each of the pairs of opposite sides are rectangles of the same size 
Pyramid	 A solid object with a base of any shape, like a square, and sides that slope up to meet in one point on top. If the base has straight edges, the sides of a pyramid are triangle shaped.
Face **Edge** **Vertex**	A face is a flat side of a solid shape. The edge of an object is where two faces meet or where it is folded. A vertex is a point where three or more faces meet (corner) 

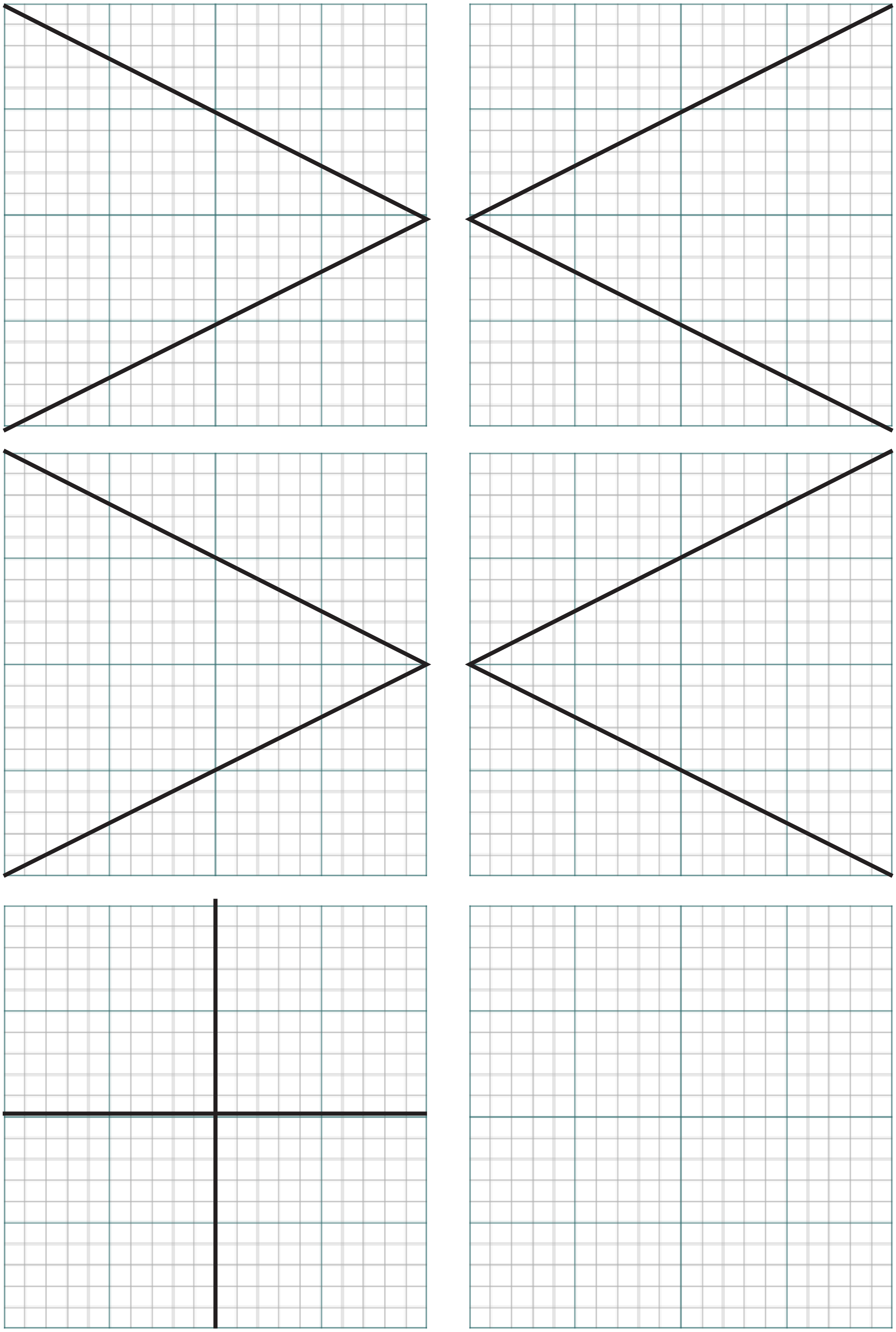
SUMMARY OF KEY CONCEPTS

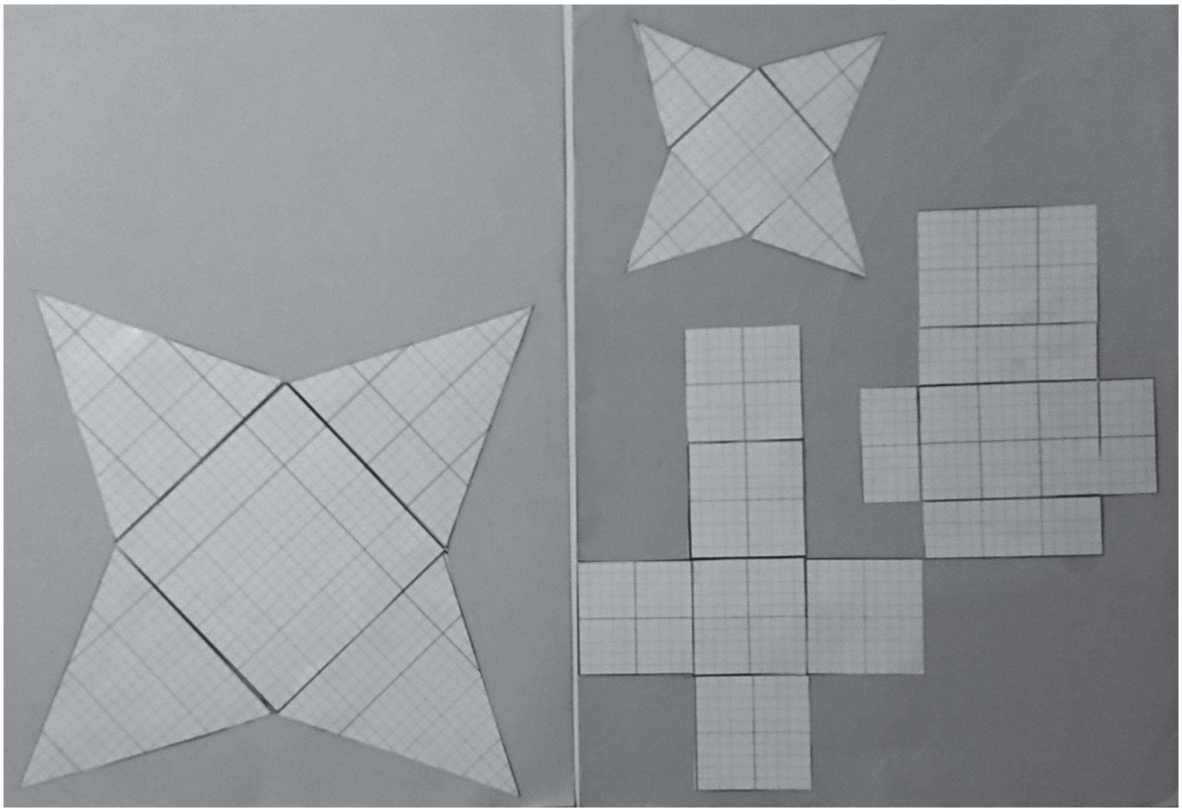
Revision of 2D Shapes

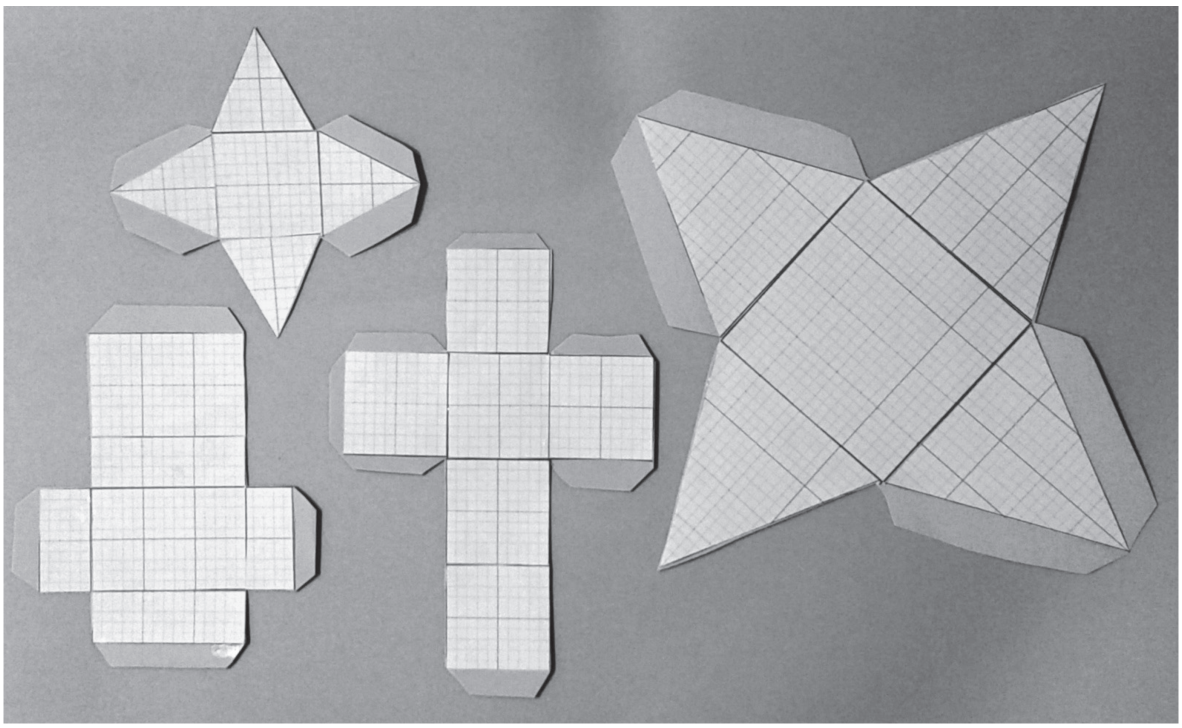
1. The aim of doing revision of 2D shapes in this topic, is for learners to build up 3D shapes from those. The traditional way of introducing 3D shapes is by showing pictures of the shapes and then require of learners to imagine the characteristics of the objects.

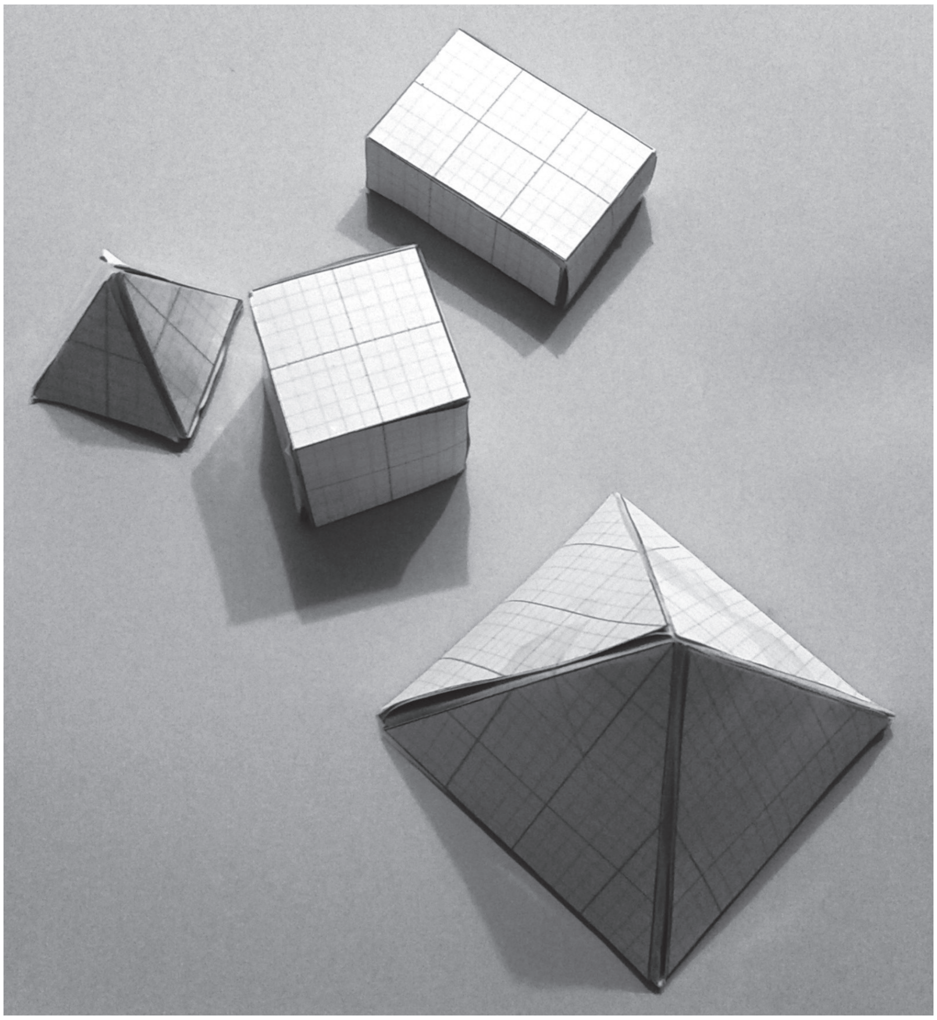
Teaching Tip: We are going to turn this order around and start using the familiar 2D shapes to build our own 3D objects. Firstly, learners cut out the shapes on these pages, then follow the pictures to build nets and to build their own 3D objects from the basis of their familiar 2D shapes.









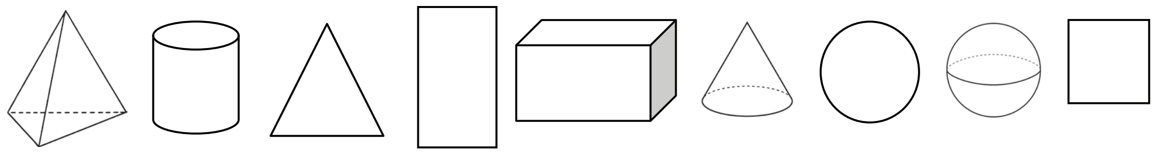


Hold the objects that you have built in your hand, inspect them and then complete the following table:

Name of the object	Number of faces	Number of edges	Number of vertices

Identify, describe and sort 3D objects

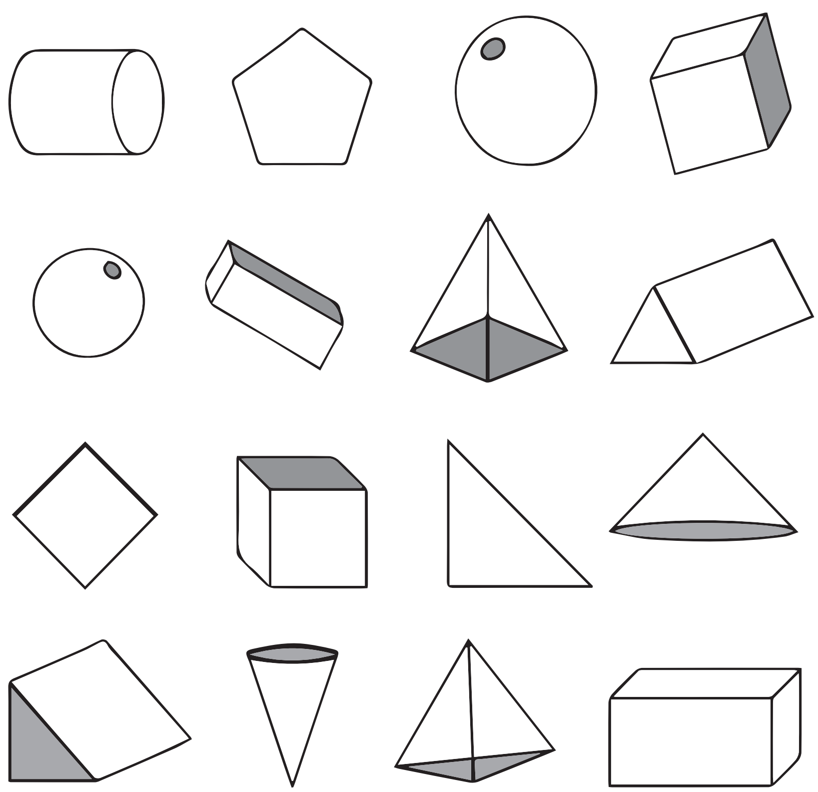
1. Learners need to distinguish 2D shapes from the pictures (representations) of 3D shapes.



   a. Ask learners to tell what makes the shape 2D and what makes the object 3D
   b. Talk about the sides (straight or curved) of the 2D shapes
   c. Talk about the faces of the 3D objects
   d. Find shapes and objects in the environment corresponding with those above

Distinguish prisms from pyramids

1. In Grade 4 learners need to recognise and distinguish prisms and pyramids.
2. Refer to the Glossary of Terms for the explanations and definitions.
3. Visually, they can discern by comparing these two types and selecting shapes and objects from a sheet like the one below, and talk about the qualities that make them prisms and pyramids:



TOPIC 6: SYMMETRY

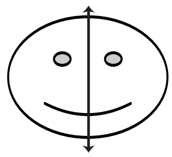
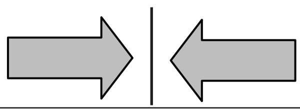
INTRODUCTION

- This unit runs for 2 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 at Grade 4.
- This unit covers the symmetry between and within shapes including lines of symmetry.

SEQUENTIAL TEACHING TABLE

GRADE 3 INTERMEDIATE PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Recognise, draw and describe lines of symmetry in 2D shapes • Fold 2D shapes on paper to find lines of symmetry	• Recognise, draw and describe lines of symmetry in 2D shapes	• Recognise, draw and describe lines of symmetry in 2D shapes

GLOSSARY OF TERMS

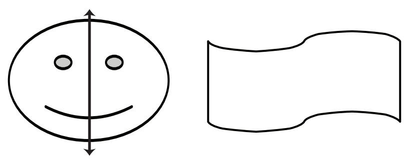
Term	Explanation / Diagram
Symmetry	Symmetry in a 2D shape means that it is made up of exactly similar parts facing each other around an axis or a line of symmetry. Example: 
Line of symmetry	The line that separates two parts of a 2D shape into exactly equal parts or that separates two shapes that are an exact reflection of each other.
Reflection	When an original image is repeated, as if in a mirror. We reflect the image along a horizontal axis or a vertical axis, or a diagonal axis. Reflections are symmetrical. Example:  arrows reflecting along a vertical axis

SUMMARY OF KEY CONCEPTS

Recognise lines of symmetry

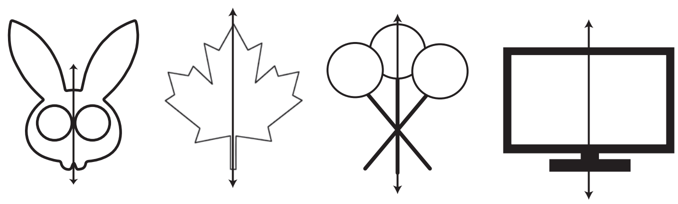
1. Many shapes have two halves that match exactly equal parts, which we call symmetry, if one half looks exactly like the other half, but they are facing each other.

Example:



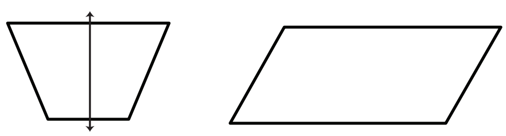
The second shape has no symmetry, although the parts appear to be similar.

Example:



All of these shapes have symmetry.

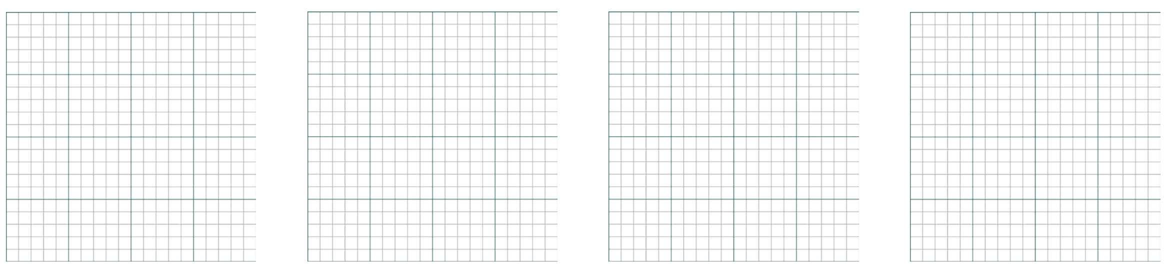
Example:



This shape has no symmetry, although the parts appear similar.

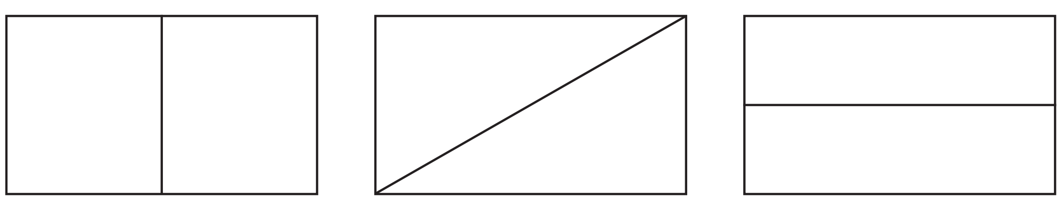
Some shapes have more than one line of symmetry.

Example:
See if you can fold each of these squares in a different way to form two exactly equal halves. The fold lines are the lines of symmetry.



Example:

Say which of the lines in these rectangles are lines of symmetry and which are not. Explain why you say so.

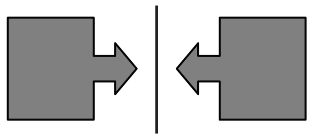


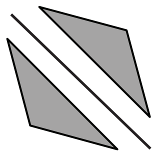
Reflection

1. Reflection happens when the original image is repeated, as if in a mirror. We can reflect the image along a horizontal axis, along a vertical axis, or along a diagonal axis. Reflections are symmetrical. The images are facing each other and the axes are the same as the lines of symmetry.

Examples:

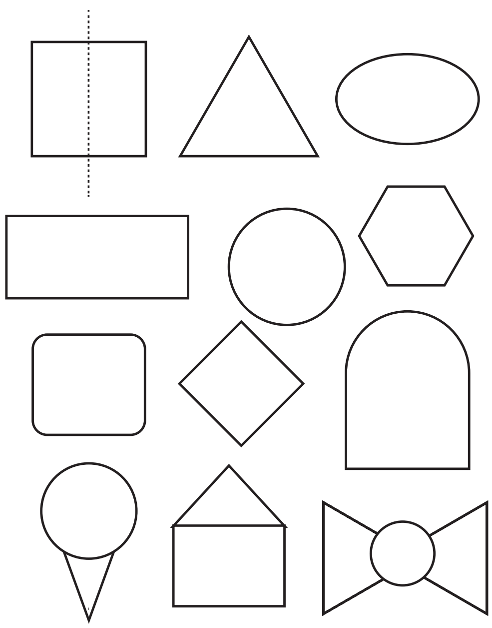

Along a horizontal axis

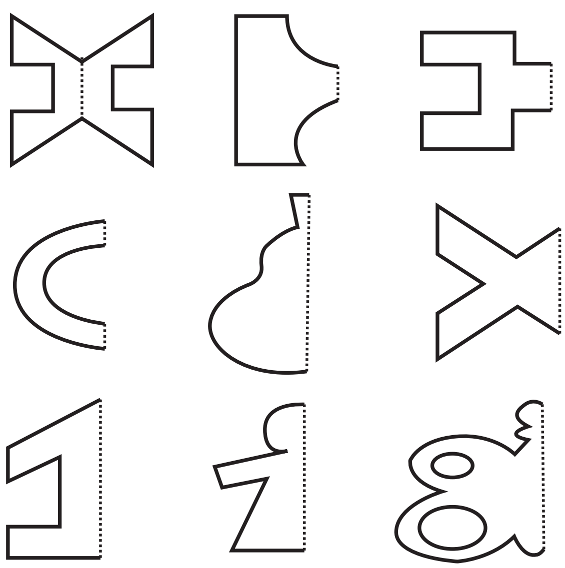

Along a vertical axis


Along a diagonal axis

Drawing reflections and finding lines of symmetry

1. Into the group of 2D shapes on the left, draw as many lines of symmetry as you can.
2. Onto the group of 2D shapes on the right, add a reflection to the part that is shown in the picture.





TOPIC 7: GEOMETRIC PATTERNS

INTRODUCTION

- This unit runs for 4 hours.
- It forms part of the content area 'Patterns, functions and algebra' and together with other similar topics, counts for 10% in the final exam.
- This unit deals with geometric (visual) patterns. Learners advance to represent these visual patterns in number form and in a diagrammatic form. They also have to find or understand the rule according to which the pattern is built.
- The purpose of this unit is to develop a sense of function, or rule-bound patterns.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Copy, extend and describe in words • Simple physical patterns • Simple picture patterns • Copy, extend and describe in words • Patterns where shapes repeat in the same way • Patterns where shapes increase regularly • Create patterns • With physical objects • With drawings • Identify, copy and describe in words • Patterns in nature • Modern patterns • Cultural patterns	• Investigate and extend patterns looking for relationships and rules in • physical or diagram form • sequences with a constant difference • learners' own created patterns • Describe rules and relationships in own words • Determine input- and output values and rules for patterns and relationships using flow diagrams • Determine equivalence of different descriptions of the same relationship or pattern • verbally • in a flow diagram • by a number sentence	• Investigate and extend patterns looking for relationships and rules in • physical or diagram form • sequences with a constant difference • learners' own created patterns • Describe rules and relationships in own words • Determine input- and output values and rules for patterns and relationships using flow diagrams • Determine equivalence of different descriptions of the same relationship or pattern • verbally • in a flow diagram • by a number sentence

GLOSSARY OF TERMS

Term	Explanation / Diagram
Pattern	A pattern is a sequence of shapes, pictures or numbers that are arranged according to a rule.
Numerical Pattern	4; 7; 10; 13 ...is a numerical pattern. Each term of the pattern has its own position and the pattern is a pattern, because all terms adhere to a general rule. The first term is important, because that is where the pattern starts. Each term's position is important and also the rule of the pattern.
Geometric Pattern	An ordered repetition of geometric shapes. Some shapes form a pattern because of their arrangement, and other form a pattern because there is a number value that we can attach to each term of the pattern.
Input Value	The input value for geometric- or number patterns is the number of the position in which the term appears in the pattern.
Output Value	The output value for geometric- or number patterns is the number value that a term of the pattern has, after we have applied the rule to the input number.
Flow Diagram	A diagram is a display of an operation or a series of operations that are performed on a number or a set of numbers. We find linear flow diagrams and the so-called 'spider diagrams'.
Relationships	In a number pattern each term has a specific relationship with the previous- and also with the next term in the pattern. This relationship is determined by the rule for the pattern.
Flow Chart	An alternative for a flow diagram, is a flow chart. This is a table that organises the number pattern and requires that any of the input values, output values or the rule has to be found.

SUMMARY OF KEY CONCEPTS

Number Patterns

In a number pattern, each term of the pattern has its own position. The basic idea behind a pattern is that all terms adhere to a general rule. The first number, the position of a term of the pattern, and the rule are the three most important elements of the number pattern.

Geometrical Patterns

1. An ordered repetition of shapes used in Geometry is called a geometrical pattern. Some geometrical shapes form a pattern only because of their arrangement, and other form a pattern because there is a numerical value that we can attach to each term of the pattern.

Example 1:

▲◊ ▲▲◊ ▲▲▲◊ ▲▲▲▲◊

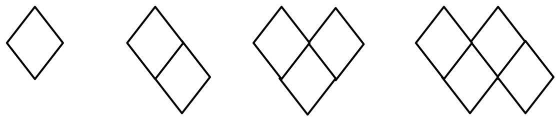
In this pure geometrical (picture) pattern,

- the first term has one black triangle and one white diamond;
- the second term has two black triangles and one white diamond;
- the third term has three black triangles and one white diamond;
- the fourth term has four black triangles and one white diamond.

Teaching Tip: When we talk through the pattern in this way, learners hear the rule while they see the pattern. From what they hear, they know that the 18th term will have eighteen black triangles and one white diamond.

2. Learners come from Grade 3 having done such geometrical patterns as in the above example. Now we are extending those skills of pattern recognition and formation and we add another element to the geometrical pattern: number value.

Example 2:



This geometrical pattern is also made up of shapes. However, here is something more. If a property of the shape is countable or numerical, we use that property to convert the geometrical pattern and express it as a number pattern. In this case, we are going to give the sides of the shape a numerical value.

- We can give the first term of this pattern the number value of 4;
- The second term can be given a number value of 7;
- The third term has a number value of 10;
- The fourth term has a number value of 13.

Example 3:

▲◊ ▲▲◊ ▲▲▲◊ ▲▲▲▲◊

This pattern can be interesting if we attach a numerical value to each term.

- If this geometrical (picture) pattern is expressed in numerical form,
- Term 1 with one triangle and one diamond, has 7 straight sides altogether;
- Term 2 with two triangles and one diamond, has 10 straight sides altogether;
- Term 3 with three triangles and one diamond, has 13 straight sides altogether;
- Term 4 with four triangles and one diamond, has 16 straight sides altogether.

3. In Example 2 and Example 3, we see the same (constant) difference between the terms of the pattern. There is even similarity between the number values of the two patterns. However, they start at two different points. The first terms in both patterns are different, therefore the value 7 is the number value of term 2 of the pattern in Example 2, where it is the number value of term 1 of the pattern in Example 3. **This is an important difference!**

4. Although the constant difference between the terms of both patterns is the same, they are two different patterns because they start at different points. (The reason why they both go up in threes, also differs, but that is not so important for now).

Teaching Tip: When we learn how to make a rule for a geometrical pattern, let us get learners into a habit of saying: ‘The rule for this pattern is that we are adding ... each time, starting at ...’ For Example 2 we say: ‘The rule for this pattern is that we are adding three each time, starting at four.’ For Example 3 we say: ‘The rule for this pattern is that we are adding three each time, starting at seven.’

Input Value

The input value for geometric- or number patterns like those in our examples, is the number of the position in which the term of the pattern appears.

Output Value

The output value for geometric- or number patterns like those in our examples, is the number value that a term of the pattern has, after we have applied the rule to the input number.

Flow Diagrams

1. A diagram is a display of an operation or a series of operations that are performed on numbers.
2. In a flow diagram, learners either find the rule that regulates the pattern, or they calculate the change that happens as the number pattern progresses, based on a given rule. We have various forms of flow-diagrams: a linear one such as in Examples 1 and 2; and the so-called ‘spider diagram’.

   a. In the linear flow-diagram (diagram flowing in a line) the rule is repeated every time and the terms follow each other in consecutive sequence.

Example 1:
The **start number** and the <u>rule</u> are provided. The following terms of the pattern must be found.

4 + 5 → $\boxed{}$ + 5 → $\boxed{}$ + 5 → $\boxed{}$ + 5 → $\boxed{}$

Note that the rule is not only ‘5’, but ‘+5’.

Example 2:

The **start number** and the <u>next terms</u> of the pattern are provided.
The rule must be found.

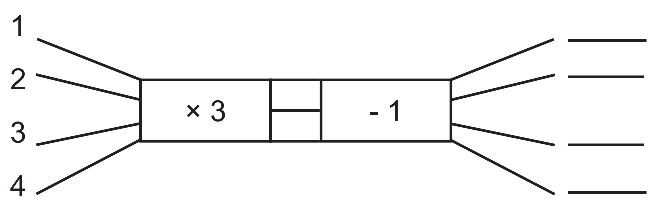
5 ____ → 9 ____ → 17 ____

b. In the spider-diagram, the rule appears once only, in a central position, the input values are to the left, the output values to the right. The input-values are following in a sequence like the term numbers.

c. EITHER the **input value** and the <u>rule</u> are provided and the <u>output values</u> must be found; OR the **input value** must be found while the <u>rule</u> and the <u>output values</u> are provided. All of this happens in the same diagram. (Spider diagrams prepare the way for functions).

Example 3:

Find the output values for a pattern following the rule x 3; – 1.

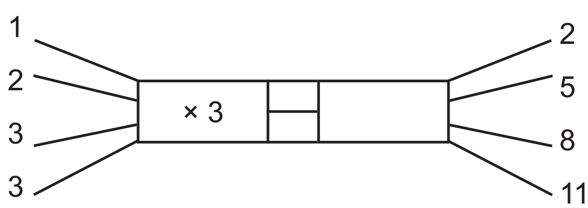


More challenging at this stage is this form of spider diagrams:

The <u>input values</u> and the <u>output values</u> are provided and the **rule** must be found.

Example 4:

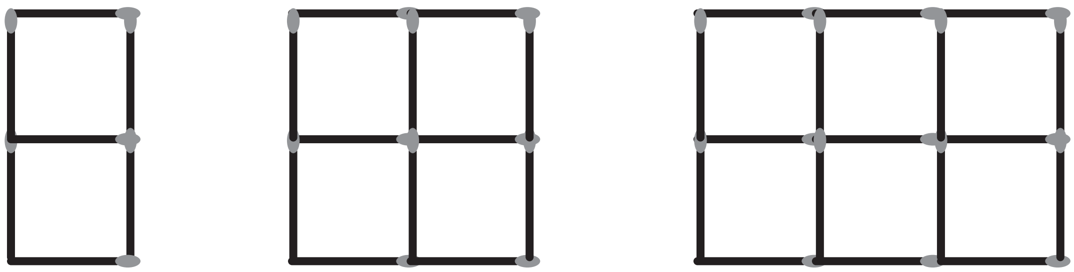
Find the rule for the pattern: 2; 5; 8; 11...



Teaching Tip: Before the above example can be given, start this type of spider diagram with either a single rule, or one of the two blocks for the rule containing a part of the rule.

3. An alternative for a flow diagram, is a flow chart. This is a table that organises the number pattern and requires that any of input values, output values or the rule has to be found.

Example:
Complete the flow chart for the pattern below and write down the rule. How many matchsticks will the eighth term of this pattern have? Which term will have 37 matchsticks?



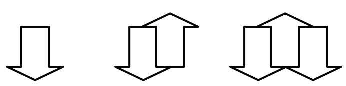
Input	1	2	3	8		Rule:
Output					37	

Various pattern structures

1. Patterns may develop in ascending order (with a positive difference) or in descending order (with a negative difference). Some classical geometric pattern structures are:

   a. Constant difference: Ascending order

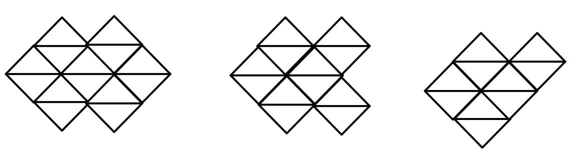
Example:
Difference: + one arrow in the opposite direction



T1 T2 T3

Constant difference: Descending order

Example:
Constant difference – two triangles



T1 T2 T3

TOPIC 8: DIVISION

INTRODUCTION

- This unit runs for 4 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.
- It covers division of whole 3-digit- by 1-digit numbers through various calculation strategies.

PRIOR KNOWLEDGE REQUIRED

<table>
<tr><th>GRADE 3
FOUNDATION PHASE</th><th>GRADE 4
INTERMEDIATE PHASE</th><th>GRADE 5
INTERMEDIATE PHASE</th></tr>
<tr><th>LOOKING BACK</th><th>CURRENT</th><th>LOOKING FORWARD</th></tr>
<tr>
<td>• Solve and explain problems that involve equal sharing and grouping up to 100 with answers that may include remainders
• Divide numbers up to 100 by 2, 3, 4, 5, 10
• Use appropriate symbols</td>
<td>• Solve problems in contexts involving grouping and equal sharing with remainders
• Compare two or more quantities of the same kind (ratio)
• Compare two quantities of different kinds (rate)
• Divide at least whole 3-digit by 1-digit numbers
• Use the following strategies:
  • estimation
  • clue board
  • building up, breaking down
  • rounding off and compensating
  • doubling and halving
  • multiplication and division as inverse operations
• Know multiples of 1-digit numbers to at least 100
• Use properties of whole numbers
• Solve problems in financial and measurement contexts</td>
<td>• Solve problems in contexts involving grouping and equal sharing with remainders
• Compare two or more quantities of the same kind (ratio)
• Compare two quantities of different kinds (rate)
• Divide at least whole 3-digit by 2-digit numbers
• Use the following strategies:
  • estimation
  • building up, breaking down
  • rounding off and compensating
  • doubling and halving
  • multiplication and division as inverse operations
• Know multiples, factors of 2-digit numbers to at least 100
• Use properties of whole numbers and multiplicative property of 1
• Know multiplication facts of multiples of 10 and 100</td>
</tr>
</table>

GLOSSARY OF TERMS

Term	Explanation / Diagram
Division	Sharing out of a quantity into a number of equal portions or groups. Equal sharing, equal groups, rate and ratio are all extensions of the same idea. 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) c. Rate: Five packets of sweets cost R35, therefore the price per packet is R35 ÷ 5 = R7 (R7/packet) d. Ratio: There are 45 girls and 54 boys in Grade 4. This is a ratio of 45 : 54 or 5 : 6 if we divide each part by their highest common factor, which is 9. The girls form $\frac{5}{11}$ of the grade and the boys form $\frac{6}{11}$ of the grade.
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 whole number: 15 is a multiple of 5, because 5 x 3 = 15
Factors	A whole number that divides exactly into another number. Factor pairs are those numbers that were multiplied to make a number. The numbers 2, 14, 7 and 4 are factors of 28; 2 and 14 are a pair, 4 and 7 are a pair.
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, 10 and 100

Teaching Tip: We used the multiplication grid to discover what happens to a number when it is multiplied by 10: observe the pattern in the multiples of one, ten and twenty. Now we use the multiplication grid to discover what happens to a number when it is divided by 10:

Example:
Because 7 x 10 = 70, therefore 70 ÷ 10 = 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	57	54	57	60
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160
9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220
12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	227	239	247	260
14	28	42	65	70	84	98	112	126	140	154	168	182	196	210	224	238	252	266	280
15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300
16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320
17	34	57	68	85	102	119	136	153	170	187	204	227	238	255	272	289	306	323	340
18	36	54	72	90	108	126	144	162	180	198	216	239	252	270	288	306	324	342	360
19	38	57	76	95	114	133	152	171	190	209	228	247	266	285	304	323	342	367	380
20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400

1. **Dividing by 0:** We cannot do that, the number will be too large to define. The answer is undefined.

   Example:
   I have 4 sweets. I give it to no children. How many sweets does each child get?
   4 ÷ 0 is undefined, because I could not give it, there were no children.

2. **Dividing by 1:** When we divide any number by 1, the number stays the same.

Example:
I have 4 sweets. I give it to one child. How many sweets does the child get?
4 ÷ 1 = 4
The child gets all 4 sweets, because she was the only one.

3. **Dividing by 10:** When we divide a number that ends in a zero by 10, the answer will appear as if we have removed one zero, for example 40 ÷ 10 = 4

Example:
I have 40 sweets. I give the sweets to to ten children. How many sweets does each child get? 40 ÷ 10 = 4. Each of the ten children gets 4 sweets, because 4 x 10 = 40

4. **Dividing by 100:** When we divide a number ending in zeros by 100, the answer will appear as if we have removed two zeros, for example 400 ÷ 100 = 4

Example:
I have 400 sweets. I give the sweets to one hundred children. How many sweets does each get? 400 ÷ 100 = 4. Each of the hundred children gets 4 sweets, because 4 x 100 = 400

5. **Dividing 0**:There is nothing to divide, so the answer is 0.

Example:
I have no sweets. I give the sweets to four children. How many sweets does each child get? 0 ÷ 4 = 0. Each child gets no sweets, because there were no sweets.

Division Strategies

1. **Repeated subtraction or addition (use any subtraction or addition strategy)**
   Learners who were introduced to division in the Foundation Phase, would probably have used a numberline to divide. The strategies in Grade 4 and further, become more advanced.

   a. **Repeated subtraction – jumping backwards on a number line**

Example:
18 ÷ 5 = 3 with a remainder of 3

1_2_3_4_5_6_7_8_9_10_11_12_13_14_15_16_17_18

   b. **Repeated addition – jumping forwards on a number line**

Example:
18 ÷ 5 = 3 with a remainder of 3

1_2_3_4_5_6_7_8_9_10_11_12_13_14_15_16_17_18

c. Subtracting repeatedly

Example:

57 ÷ 15 = 3 with a remainder of 12

First time: 57 – 15 = 42

Second time: 42 – 15 = 27

Third time: 27 – 15 = 12 (12 is too small to go a fourth time to subtract another 15)

d. Adding repeatedly

Example:

57 ÷ 15 = 3 with a remainder of 12

15 + 15 → 30 + 15 → 45

(1x) (2x) (3x)

57 – 45 = 12

2. **Clue board:** For a clue board, use the divisor to write down a few multiples of that number.

Example 1:

2 x 7 = 14
3 x 7 = 21
5 x 7 = 35
10 x 7 = 70
20 x 7 = 140

224 ÷ 7:

20 x 7 = 140	224–140= 84
+ 10 x 7 = 70	84 – 70 = 14
+ 2 x 7 = 14	14 – 14 = 0
32	

224 ÷ 7 = 32

Example 2:

2 x 6 = 12
3 x 6 = 18
5 x 6 = 30
10 x 6 = 60
20 x 6 = 120
30 x 6 = 180
50 x 6 = 300

497 ÷ 6:

50 x 6 = 300	497 – 300 = 197
+ 30 x 6 = 180	197 – 180 = 19
+ 2 x 6 = 12	17 – 12 = 5
82	

497 ÷ 6 = 82 with a remainder of 5

Teaching tip: Note that if the clue board is set up like this, it becomes easy to see that

2 x 6 = 12 and 20 x 6 = 120;

3 x 6 = 18 and 30 x 6 = 180;

5 x 6 = 30 and 50 x 6 = 300

3. **Estimate by rounding**: Learners can estimate a division calculation by rounding. This time it is easier to round to a multiple ten times the number you are dividing by than rounding to the nearest multiple of 10.

Example:

583 ÷ 8

Round 583 to the multiples of 8 that are below and above 583:

560 ÷ 8 = 70 and 640 ÷ 8 = 80

This answer should be between 70 and 80

4. **Expanding the dividend number:** This strategy should be handled with great care to make sure learners know and understand what they are doing, and why.

Example 1: **435 ÷ 5 = 400 ÷ 5 + 30 ÷ 5 + 5 ÷ 5**		
Divide each number	Multiply answer by divisor: add answers	Calculate remainder
400 ÷ 5	80 x 5 = 400	400 - 400 = 0
30 ÷ 5	6 x 5 = 30	30 - 30 = 0
5 ÷ 5	1 x 5 = 5	5 - 5 = 0
435 ÷ 5 =	87	

Example 2: **852 ÷ 6 = 800 ÷ 6 + 50 ÷ 6 + 2 ÷ 6**		
Divide each number	Multiply answer by divisor: add answers for final answer	Calculate remainder: carry to next number
800 ÷ 6	100 x 6 = 600	800 – 600 = 200
50 + 200 = 250 250 ÷ 6	40 x 6 = 240	250 – 240 = 10
2 + 10 = 12 12 ÷ 6	2 x 6 = 12	
852 ÷ 6 =	142	

Example3 : 456 ÷ 7 = 400 ÷ 7 + 50 ÷ 7 + 6 ÷ 7		
Divide each number	Multiply answer by divisor	Calculate remainder and carry on
400 ÷ 7	50 x 7 = 350	400 – 350 = 50
50 + 50 = 100 100 ÷ 7	10 x 7 = 70	100 – 70 = 30
6 + 30 = 36 36 ÷ 7	5 x 7 = 35	36 – 35 = 1
456 ÷ 7 =	65 rem 1 OR 65 1/7	

5. Checking the answer by multiplying

Because multiplication is the inverse of division, learners can check their answers by multiplying and adding the remainder.

Example:

Check the answer above

456 ÷ 7 = 65 remainder 1

65 x 7

= (60 x 7) + (5 x 7)

= 420 + 35

= 455

455 + 1 = 456