Grade 4

CONTENT BOOKLETS: TARGETED SUPPORT

Term 1

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: WHOLE NUMBERS

INTRODUCTION

- This unit runs for 2 hours.
- This unit is part of the content area 'Numbers, Operations and Relationships', an area which counts for 50% of the final exam.
- This unit covers whole numbers into the thousands (4 digit numbers). Learners need to understand different kinds of numbers, the relationship between numbers, as well as how to calculate using different operations (addition, subtraction, multiplication and division); and see how the operation has changed the original number.
- The purpose of this section is to further develop functional number sense.

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 and 10s from any multiple between 0 and 500; and in 50s and 100s to at least 1 000
• Compare numbers up to 500 using words and arrange numbers in ascending and descending order
• Recognize place value of numbers up to 500
• Add and subtract word problems in context up to 400, and explain the 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 and 100s to at least 10 000
	• Order, compare and write numbers to at least 1 000 (4-digit numbers)
	• Round off to the nearest 10, 100 or 1 000
	• Write 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
	  • 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 (i.e., 2s, 3s, 4s, 5s etc)
		• Order, compare and write numbers to at least 100 000 (6 digits)
		• Round off to the nearest 5, 10, 100 or 1 000
		• write 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
		  • number lines
		  • rounding/compensating
		  • doubling and halving
		  • addition/subtraction as inverse operations
		  • adding and subtracting in columns

GLOSSARY OF TERMS

Term	Explanation / Diagram
Whole numbers	The numbers you use to count with. They are the positive integers. A fraction is not a whole number.
Place Value	The value of the digit depends on its position in the number. In 14 728, the 2 is in the 'tens' position, so it shows a value of 20.
Rounding off	Rounding is writing a number as an approximate. Numbers are rounded up or down to the nearest multiple of 5, 10, 100, 1 000 etc. Numbers with a rounding indicator of 1, 2, 3 or 4 means they are rounded down. Numbers with a rounding indicator of 5, 6, 7, 8 or 9 means they are rounded up. i.e., 24 is rounded down to 20 (rounding indicator is 4); 88 is rounded up to 90 (rounding indicator is 8).
Digit	There are ten digits, 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. They are used to build up numbers, for example in the number 502 the digits 5, 0 and 2 are used to build up a number that is worth 500 + 2. The zero holds the place for the tens, of which this number does not have any.
Counting	Counting on does not have to start at the first multiple of the number in which counting on takes place, for example counting in 2s can begin from a number like 27 or 344.
Ordering Numbers	Arranging numbers from greatest to smallest (descending) or smallest to greatest (ascending) and understanding that < represents "smaller than" and > represents "greater than": 5 < 9 and 9 > 5. The signs < and > are inequality signs.
Number line	A line with whole numbers at regular intervals from 0 to any given number. It can run vertically (starting with 0 at the bottom) or horizontally (starting with 0 on the left).
Number grid	A hundred chart like the one below, is a number grid that is often used to establish a sense of the base ten number system.

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	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Term	Explanation / Diagram
Breaking down and building up numbers	Separating numbers into expanded form to make a calculation easier, for example **breaking down** numbers to add: 134 + 63 = 100 + 30 + 4 + 60 + 3 = 100 + 90 + 7 And then **building up** these numbers to form a single number: 100 + 90 + 7 = 197
Inverse operations	Inverse operations are opposite (or reverse) operations that undo each other. Addition and subtraction are inverse operations, so that 8 + 9 = 17 and 17 – 9 = 8. Multiplication and division are inverse operations, so that 6 x 4 = 24 and 24 ÷ 4 = 6.
Multiples	A multiple is a number that is formed by multiplying together two or more numbers, for example 2 x 3 x 5 = 30 and 30 is the multiple. A multiple is made up of its factors, so 30 = 2 x 3 x 5 and 30 = 6 x 5 and 30 = 2 x 15 and 30 = 10 x 3.
Commutative Property of arithmetic	This property applies to numbers and to two of the four operations and it says that you can change the order of numbers in addition or multiplication and the answer will not change, for example 5 + 6 = 11 and 6 + 5 = 11; 5 x 6 = 30 and 6 x 5 = 30.
Odd and even numbers	 9 is odd. It cannot be divided by 2 without remainder  6 is even, it can be divided by 2 without a remainder  Even + odd = odd (6 + 9 = 15)  Even + even = even (6 + 8 = 14)  Odd + odd = even (9 + 7 = 16)

SUMMARY OF KEY CONCEPTS

Counting

1. Counting in twos:

   2, 4, 6, 8…

   or you could start at a different number

   12, 14, 16, 18, 20…

2. Counting in tens and counting on in tens:

   10, 20, 30…

   650, 660, 670…

   547, 557, 567…

3. Counting in hundreds and counting on in hundreds:

   100, 200, 300…

   110, 210, 310…

   475, 575, 675…

4. The same principles apply for counting in threes, fives, twenty- fives, fifties, and hundreds.

This can be done orally, using a grid and filling in missing numbers, using a flow chart or table or learners could play Hop Scotch.

Comparing and Ordering Whole Numbers

1. In table form

Place value	T Thousand	H Hundred	T Ten	U Units (One)
Numeric	4	7	2	8
The digit stands for	4 thousand	7 hundred	2 tens	8 ones or units
Expanded notation	4 000	700	20	8
In words	Four thousand	Seven hundred	Twenty	Eight

2. In numerals it is: 4 728
3. In words it is: four thousand, seven hundred and twenty-eight.
4. The digit 4 is in the thousands place

   The digit 7 is in the hundreds place

   The digit 2 is in the tens place

   The digit 8 is in the units/ones place

Odd and Even Numbers

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	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Odd and even numbers to 100:

white blocks = odd numbers

grey blocks = even numbers

Compare numbers within 999

1. Arrange from greatest to smallest or smallest to greatest.

   a. Smaller than: <

   Which number is smaller, 981 or 560?
   When we compare numbers we look at the value of each digit starting from the left.

T Thousand	H Hundred	T Ten	U Units (One)
	9	8	1
	5	6	0

   500 is less than 900, therefore 560<981

   b. Greater than: >

   Which number is greater: 614 or 681?

H Hundred	T Ten	U Units (One)
6	1	4
6	8	1

   Compare the values of the digits starting from the left.
   If they are the same, continue to compare until the values of the digits are not the same.
   The values of the digits in the tens place are not the same.

   8 tens is **greater** than **1** ten. So 681 is **greater** than 614.

   c. Arrange the numbers from **smallest to greatest**:

   688, 468, 684

   Compare the values of the digits starting from the left. If the value of two numbers on the left are the same, move to the next digit.
   For example, compare 688 and 684. The number in the hundreds place, 6, is the same. The number in the tens place, 8, is also the same, so move to the units digit to compare, 8 is greater than 4.

   Answer: 468, 684, 688

d. Arrange the numbers from **greatest to smallest**:

688, 468, 684

As above, compare 688 and 684. The number in the hundreds place, 6, is the same. The number in the tens place, 8, is also the same, so move to the units digit to compare, 8 is greater than 4.

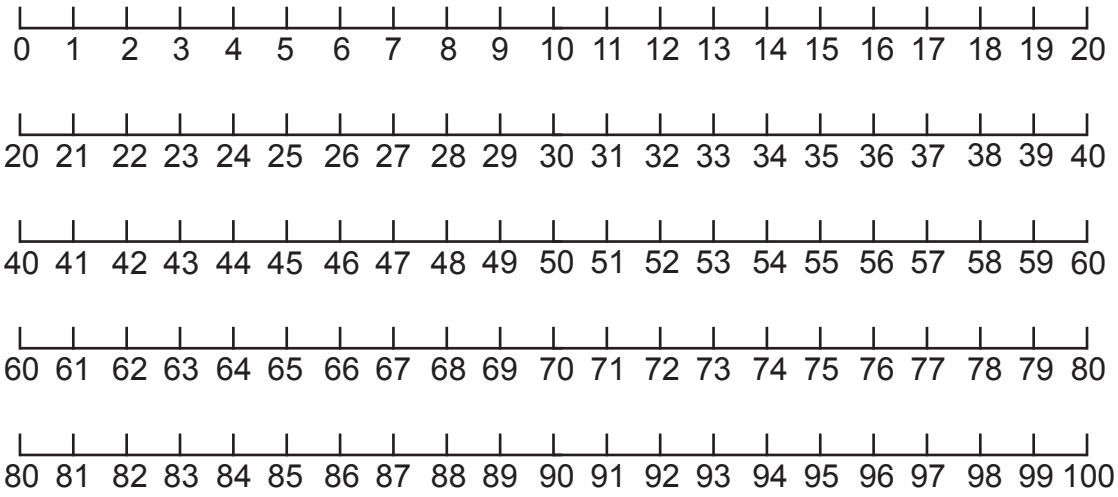
Answer: 688, 684, 468

Filling in missing numbers on a number line or number grid

1. Use a number grid such as the one below for learners to discover patterns. More exercises can be set, for example, learners can find all even numbers, all odd numbers, multiples of 3, 5, etc.

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	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

2. Use number lines such as the ones below (cut out and stuck together) to help learners to discover number patterns, multiples and bonds.



Rounding off numbers to the nearest 10, 100 and 1 000

1. Round 63 to the nearest 10.

   The focus needs to be on the 6 (as it is in the 10s position).
   The digit to the right is 3, which is less than 5. This means that the 6 will not be rounded up to 7, but instead remain as it is. The unit position will be changed to zero.

   Answer: 60… as 63 is rounded down.

2. Round 571 to the nearest 100.

   The focus needs to be on the 5 (as it is in the 100s position).
   The digit to the right is is 7, which represents 70, and is rounded up to the next hundred as it is greater than 50.

   Answer: 600… as 571 is rounded up.

   The table below outlines when to round up, when to round down and when to leave as is when rounding to the nearest multiple of ten.

Round down				Round up					Leave as is
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	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

In the NECT GRADE 4-9 MATHEMATICS TRAINING HANDOUT TERM 1&2 2019 find a sheet marked: **GRADE 4: TERM 1: TOPIC 1: WHOLE NUMBERS.**

This template can be duplicated and used regularly for learners to get used to the properties of whole numbers. A worked example shows what is expected of learners.

TOPIC 2: NUMBER SENTENCES

INTRODUCTION

- This unit runs for 3 hours.
- This unit is part of the content area 'Numbers, Operations and Relationships', an area which counts for 50% of the final exam.
- The unit covers the use of zero (0) and inverse operations.
- The number range has increased from Grade 3 and concepts are formalized.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
	• Introduction to algebraic expressions. • Write number sentences to describe a problem situation. • Solve and complete number sentences by inspection, trial and improvement. • Check solution using substitution.	• Write number sentences to describe a problem situation. • Solve and complete number sentences by inspection, trial and improvement. • Check solution using substitution.

GLOSSARY OF TERMS

Term	Explanation / Diagram
Inverse Operations	Addition and subtraction are inverse operations. Addition can be used can be used to check subtraction, and subtraction can be used to check addition. e.g. 26 + 15 = 42 so 42 – 15 = 26 378 – 32 = 346 so 346 + 32 = 378
Properties of Zero	If a number is subtracted from itself, the answer will always be 0. e.g. 67 – 67 = 0 If 0 is subtracted from a number the number does not change. e.g. 525 – 0 = 525
Associative Property in Addition	No matter how numbers are grouped, the answer will be the same. e.g [45 + 125] +18 = 188 and 45 + [125 + 18] = 188
Commutative Property in Addition	The answer in addition will always be the same no matter what order the numbers are added in.
Order of Subtraction	The rules we saw above do not apply to subtraction. 386 - 27 = 359 but you DO NOT get the same answer by saying 27 – 386 =...
Calculation	Using the four basic operations of +, x, - and ÷.

SUMMARY OF KEY CONCEPTS

Solve and complete number sentences

1. ___ represents a missing number.

   4 + 5 = ___ 123 – 123 = ___ 47 - ___ = 47

   The blanks must be filled in.

2. Commutative property.

   7 + 9 = ___ and 9 + 7 = ___

   Learners can see that the commutative property of addition is true. The answer stays the same.

3. Associative property.

   (7 + 6) + 9 = and 7 + (6 + ___)

   Learners can see that the associative property of addition is true. The answer stays the same.

   BUT 8 – (5 – 2) is NOT the same as (8 – 5) – 2. The associative property is not true for subtraction.

4. Finding patterns in addition and subtraction number bonds.

   e.g. 8 – 3 = ___ 18 – 3 = ___ 38 – 3 = ___ 48 – 3 = ___

   e.g. 10 + 25 =___ 20 + 25 = ___ 60 + 25 = ___ 130 + 25 = ___

   These number sentences are used to help learners find patterns in bonds.

   This is an extension of the fixed number bond calculations that learners completed in Grade 2 and 3.

   Learners need to find patterns in bonds that have varied results as this creates a greater understanding of numbers (number sense).

5. Writing number sentences for groups of numbers.

   Learners must write number sentences when given a group of numbers using + and -.

   e.g. 12; 8; 20

   Answer: 12 + 8 = 20 8 + 12 = 20 20 – 8 = 12 20 – 12 = 8

6. Order of subtraction

   7 – 2 = ___ but this would not give the same result if numbers are swopped around: 2 – 7 = ___

Constructing number sentences

At this point it is advisable to expose learners to the construction of their own number sentences. Give them a few simple situations to set up a number sentence, using addition and subtraction. The following examples can be used. Do not be too strict when they swop addition and subtraction, but their number sentence still makes sense. This actually means that they understand that addition and subtraction are inversely related.

a. Mpumi has R18 and gets another R25 from her dad.
   18 + 25 = ☐ or 25 + 18 = ☐ or 18 + 25 = 43 or 25 + 18 = 43
b. Ben has many pencils and he gives three to his sister, now he has 15 pencils left.
   3 + 15 = ☐ or 3 + 15 = 18 or ☐ – 3 = 15
c. Busi walks to the shop and back. The shop is 3km from her house.
   3 + 3 = ☐ or 3 + 3 = 6
d. There are 25 peaches on the tree and the birds eat 13 of them.
   25 – 13 = ☐ or 25 – 13 = 12

TOPIC 3: WHOLE NUMBERS – ADDITION AND SUBTRACTION

INTRODUCTION

- This unit runs for 8 hours.
- This unit is part of the content area 'Numbers, Operations and Relationships', an area which counts for 50% of the final exam.
- Addition and subtraction concepts and skills are covered in the section.
- The purpose of this section is to develop the concept of the nature and magnitude of change that happens to numbers when other numbers are added or subtracted.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
NOTE: All number ranges in CAPS indicate the minimum requirement ["to at least ..."]		

• General number concept up to 3-digit numbers [100s].
• Order numbers in ascending or descending order
• Add and subtract whole numbers of 3 digits
• Use the following strategies:
  • building up/breaking down
  • number lines
  • rounding off to tens
	• General number concept up to 4-digit numbers [1 000s].
	• Round off to 10, 100 and to 1 000
	• Represent odd and even numbers to 1 000
	• Add and subtract whole numbers of 4 digits
	• Use the following strategies:
	  • building up/breaking down
	  • number lines
	  • rounding off/ compensating
	  • using addition/ subtraction as inverse operations
		• General number concept up to 6-digit numbers [100 000s].
		• Round off to 5, 10, 100 and 1 000
		• Represent odd and even numbers to 10 000
		• Add and subtract whole numbers of 5 digits
		• Use the following strategies:
		  • building up/breaking down
		  • number lines
		  • rounding off/compensating
		  • using addition/subtraction as inverse operations
		  • adding/subtracting in columns

GLOSSARY OF TERMS

Term	Explanation / Diagram
Digit	The symbol used in a number: 7 is a digit in the number 178.
Addition	The process of calculating the total of two or more numbers.
Subtraction	Reducing a number by another number and in so doing, finding the difference between the two numbers. For example, 15 – 4 means that I reduce 15 by 4 and I find that the difference between 15 and 4 is 11.
Commutative Property	The sum of numbers remains the same, no matter what order the numbers are added in. For example 15 + 27 = 42 and 27 + 15 = 42 The commutative property does not work for subtraction.
Associative Property	The sum of numbers remains the same, no matter how they are grouped, for example (45 + 125) +18 = 188 and 45 + (125 +18) = 188 The associative property does not work for subtraction.
Doubling	Doubling enlarges a number by its own size. It is the same as multiplying by 2.
Halving	Halving reduces a number in a way such that the part that is removed, is the same size as the part that remains. Halving is the same as dividing by 2.
Estimating	Making a reasonable guess without calculating.

SUMMARY OF KEY CONCEPTS

Doubling and halving

1. Doubling is the same as multiplying by 2.

   Example: Double 48

   Option 1: Learners may use their **own strategies** to double.

   For **example**, they may reason:

   Break 48 up into tens and units: 40 + 8

   Double both numbers: 80 + 16

   Add them up: 96

   48 doubled is equal to 96

Option 2: They may also want to represent the change **graphically**, for **example**:

48	48

Option 3: They may want to reason as follows:

48 is 2 away from 50.

If I doubled 50, I would get 100

If I double 48, I will have 4 less than 100, which is 96.

2. Halving is the same as dividing by 2.

   Example: Halve 56

   Option 1: Learners may use their **own strategies** to halve, for example, they may reason:

   Break 56 up into tens and units: 50 + 6

   Halve both numbers: 25 + 3

   Add them up: 28

   56 halved is equal to 28

Option 2: They may also want to represent the change **graphically**, for **example:**

25	25

3	3

Option 3: They may want to reason as follows:

56 is 4 away from 60.

If I halved 60, I would get 30.

If I halve 56, I will have 2 less than 30, which is 28.

Estimating

Estimating the answer is a skill that demonstrates number sense. This skill requires learners to have a sense of the magnitude of number and the change that operations will bring to the number. In Grade 4, learners round two-digit numbers off to the nearest multiple of ten and three-digit numbers to the nearest multiple of 100.

Example: Estimate the sum of 67 and 31

Learners should develop their **own strategies**, for example they may reason:

Round 67 to 70

Round 31 to 30

70 + 30 = 100

The actual answer is 98

Note: Although the sign ≈ for approximate answers is not formally included in the Grade 4 curriculum, it can do no harm to get learners into a habit of writing 67 + 31 ≈ 100

Example: Estimate the answer to 589 – 137

Learners may want to reason as follows:

Round 589 to 600

Round 137 to 100

600 – 100 = 500

589 – 137 ≈ 500

The actual answer is 452

Note: As a rule we round 2-digit numbers to the nearest multiple of 10 and 3-digit numbers to the nearest multiple of 100.

Some ways to add and subtract

Addition

a. Grouping: Because learners know the associative law by now, as well as bonds of ten, they may want to group together the pairs of numbers that add up to 10

Example: 13 + 28 + 37 + 11

(13 + 37) + (28 + 11)

= 50 + 38

= 88

b. Rounding and compensating: Numbers can be rounded downwards or upwards, and the amount by which they are rounded, can be compensated for by doing the inverse operation:

Example of rounding up:	**Example** of rounding down:
154 + 38	438 + 43
154 + 40 = 194 (2 was added)	438 + 40 = 478 (3 was subtracted)
194 – 2 = 192 (2 is subtracted)	478 + 3 = 481 (3 is added)

c. Breaking down and building up numbers to add: Both numbers can be broken down to add and then built up again, or only one number can be broken down, as follows:

Example of both numbers broken down:	**Example** of one number broken down:
527 + 262	527 + 262
= 500 + 20 + 7 + 200 + 60 + 2	= 527 + 200 + 60 + 2
= 500 + 200 + 20 + 60 + 7 + 2	= 727 + 60 + 2
= 700 + 80 + 9	= 787 + 2
= 789	= 789

Subtraction

a. Rounding and compensating: Numbers can be rounded down or up, and the amount by which they are rounded, can be compensated for by doing the same operation:

Example of rounding up:	**Example** of rounding down:
154 – 38	438 – 43
154 – 40 = 114 (2 was added)	438 – 40 = 398 (3 was subtracted)
114 + 2 = 116 (2 is added)	398 – 3 = 395 (3 is subtracted)

b. Breaking down and building up numbers to subtract: It is a complex process to break down both numbers in subtraction and it should be done with caution. Compare this process to breaking down one number. Decide for yourself which one makes the calculation easier.

Example of both numbers broken down:	**Example** of one number broken down:
527 – 262	527 – 262
= 500 + 20 + 7 – 200 – 60 – 2	= 527 – 200 – 60 – 2
= 500 – 200 + 20 – 60 + 7 – 2	= 327 – 60 – 2
= ~~300~~ 200 + 120 – 60 + 5	= 267 – 2
= 200 + 60 + 5	= 265
= 265	

Subtracting 3-digit numbers and checking by addition

Example: 743 – 681: Learners may want to use the breaking down and building up strategy.

= 700 + 40 + 3 – 600 – 80 – 1

= (700 – 600) + (40 – 80) + (3 – 1)

= 100 + (40 – 80) + 2

= ~~100~~ 140 – 80 + 2

= 60 + 2

= 62

Check by using addition:

62 + 681

= 60 + 2 + 600 + 80 + 1

= 600 + 140 + 2 + 1

= 743

TOPIC 4: NUMERIC PATTERNS

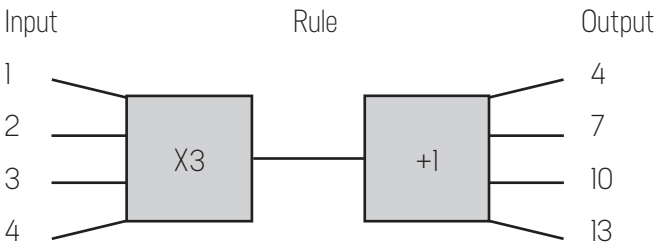
INTRODUCTION

- This unit runs for 4 hours.
- This unit is part of the content area Patterns, Functions and Algebra, a content area that counts for 10% of the final exam.
- This unit covers the concept of numeric patterns. Learners need to use flow-charts and tables to calculate. They should understand and develop the use of input values, rules and output values.
- The purpose of this unit is to develop skills needed for algebra.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Complete, extend and describe simple number sequences in words • Create and describe own patterns	• Investigate and extend numeric patterns looking for relationships and rules • Find a constant difference in a numeric pattern • Find a constant ratio in a numeric pattern • Describe the relationship in learner's own words • Create and describe own patterns • Complete flow diagrams with two actions/double rule • Understand that the input value is derived from the inverse operations than those of the rule	• Investigate and extend numeric patterns looking for relationships and rules • Find a constant difference in a numeric pattern • Find a constant ratio in a numeric pattern • Describe the relationship in learner's own words • Create and describe own patterns • Complete flow diagrams with two actions or a double rule • Understand that the input value is derived from the inverse operations of the rules.

GLOSSARY OF TERMS

Term	Explanation / Diagram
Pattern	A sequence of numbers where each consecutive term follows a rule so that the pattern repeats in a predictable manner. Example: 4, 7, 10, 13...
Rule	The calculation(s) applied to given numbers.
Input value	A given number to which a rule (specific operations) will be applied.
Output value	The result when a rule (specific operations) was applied to an input number. Example: In the above pattern, the input values 1, 2, 3, 4... may be given, and the rule applied: multiply by 3 and add 1, which then gives the output numbers 4, 7, 10, 13...
Flow diagram	A diagram which flows horizontally from the input number(s) through the rule (operations) to the output number(s). Example: In the above pattern a flow diagram would be as follows: 
Relationships	Consecutive terms have a relationship with each other. In the example above, 3 has been added each time (there is a constant difference of 3). The output numbers have a relationship with the input numbers. This relationship is determined by the rule. In the above example, 'times 3 and add 1' is the relationship.
Flow Chart	A flow chart is used in the same sense as a table where input-output values are related vertically, but the rule does not appear. A flow chart is helpful to create coordinate pairs for graphing and also to deduct the rule for the pattern. Example:

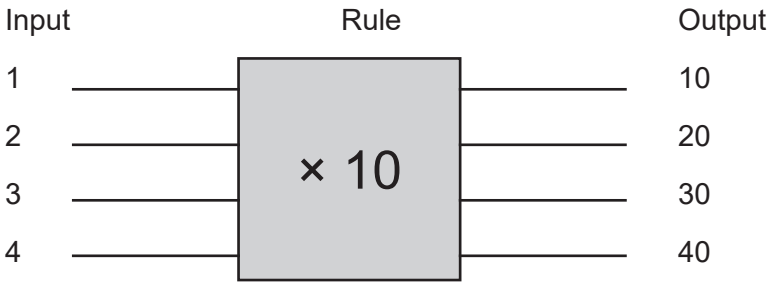
Input	1	2	3	4
Output	4	7	10	13

SUMMARY OF KEY CONCEPTS

Input-output diagrams

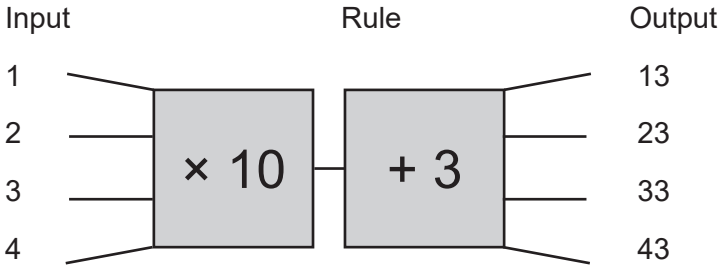
1. The flow diagram below shows the relationships between input and output numbers in the number sequence 10, 20, 30, 40…

   Example:



2. Input-output diagrams with two-part rules:

   Example:



Multiplying input numbers by 2, 4 and 8

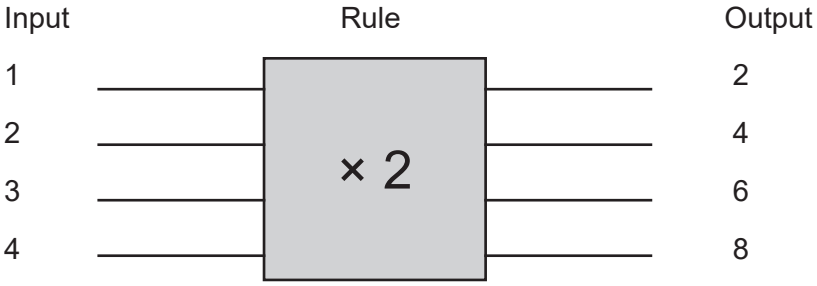
1. When multiplying the input number by 2, 4 and 8, the following number sequences result:

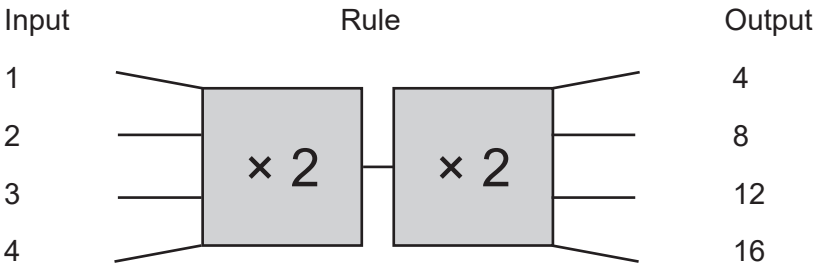
   2, 4, 6, 8…

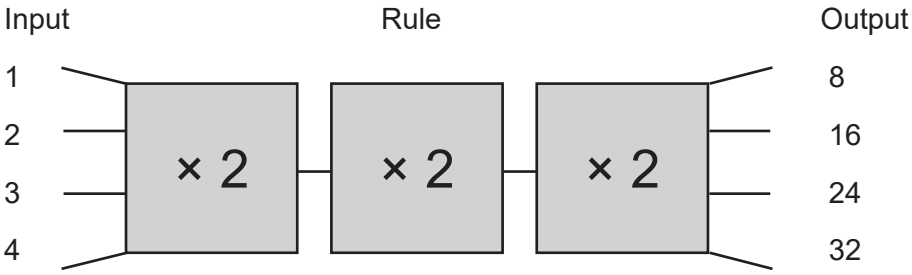
   4, 8, 12, 16…

   8, 16, 24, 32…

2. In a flow diagram, the number sequence can be represented as follows:







Multiplying the input number by 3, 6 and 9

1. When multiplying the input number by 3, 6 and 9, the following number sequences result:

   3, 6, 9, 12…

   6, 12, 18, 24…

   9, 18, 27, 36…

2. In a flow diagram, the number sequence can be represented as follows:

Input	Rule	Output
1	× 3	3
2		6
3		9
4		12

Input	Rule	Output
1	× 2 then × 3	6
2		12
3		18
4		24

Input	Rule	Output
1	× 3 then × 3	9
2		18
3		27
4		36

TOPIC 5: WHOLE NUMBERS – MULTIPLICATION AND DIVISION

INTRODUCTION

- This unit runs for 6 hours.
- This unit forms part of the content area Numbers, Operations and Relationships, an area which counts for 50% of the final exam.
- The unit covers multiplication and division.
- The range of numbers being used increases.
- The purpose of this section is to develop concepts in the multiplicative field.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Multiply 3-digit by one-digit numbers	• Multiply at least 2-digit by 2-digit numbers	• Multiply at least 3-digit by 2-digit numbers
• Multiply through addition, estimating, doubling and halving, building up and breaking down	• Multiply using estimation, doubling and halving, building up and breaking down, rounding off and compensating	• Multiply using estimation, doubling and halving, building up and breaking down, rounding off and compensating
• Round off and estimate up to 999	• Round off and estimate up to at least 9 999	• Round off and estimate up to at least 99 999
• Divide numbers up to 100 by 2, 3, 4, 5 and 10	• Divide at least 3-digit numbers by a 1-digit number	• Divide at least 3-digit numbers by 2-digit numbers.
• Use appropriate symbols [÷ and =]	• Solve problems involving equal sharing, unequal sharing and grouping with remainders	• Solve problems involving equal sharing and grouping with remainders
	• Use rounding and inverse operations to estimate and check solutions	• Solve problems of equal sharing and grouping leading to solutions that are fractions
	• Solve problems of equal sharing and grouping leading to solutions that are fractions	

GLOSSARY OF TERMS

Term	Explanation / Diagram
Multiples	A multiple is formed when two or more numbers are multiplied by each other/one another. The product is a multiple of all those numbers and all their combinations, for example 2 x 3 x 5 = 30, so 30 is a multiple of 2, 3, 5, 6, 10 and 15.
Factors	The factors of a number are all the numbers that can be divided perfectly into that number (without a remainder). For example, the factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30.
0 – Additive Property	If we add or subtract 0 to any number, it remains the same. Zero does not change numbers when it is added or subtracted from those numbers. It is called the identity element of addition.
1 – Multiplicative Property	If we multiply or divide any number by 1, it remains the same; 1 does not change numbers when it is multiplied with or divided into those numbers. It is called the identity element of multiplication.
Distributive Property	A number that appears before a set of numbers in brackets, is multiplied with all the numbers in the brackets, for example 3(4 + 5) = 3 x 4 + 3 x 5. This is called the distributive property of multiplication over addition.
Parts of a Multiplication Sum	3 x 5 = 15 multiplicand multiplier product
Parts of a Division Sum	15 ÷ 3 = 5 divisor dividend quotient
Inverse Operations	Multiplication can be checked by its inverse operation, division 8 x 9 = 72 and 72 ÷ 8 = 9
Commutative Law or the commutative property of addition and multiplication	The order of numbers in addition and multiplication does not matter regarding the sum or product, for example 4 + 2 = 6 and 2 + 4 = 6 4 x 5 = 20 and 5 x 4 = 20 This law does not work for subtraction or division.

SUMMARY OF KEY CONCEPTS

1, 0 and multiples

- Any number multiplied by 1 remains the same.
  Example: 4 x 1 = 4
- Any number multiplied by 0 is 0.
  Example: 4 x 0 = 0
- Any number divided by itself is 1.
  Example: 4 ÷ 4 = 1
- Any number divided by 1 gives the same number.
  Example: 4 ÷ 1 = 4
- 0 divided by any number is 0.
  Example: 0 ÷ 4 = 0
- No number can be divided by zero. This is undefined.

Multiplying 2-digit numbers by a 2-digit number

1. Repeated addition is practical when double digits are multiplied by single digits.

   Example: 23 x 6

   23 + 23 + 23 + 23 + 23 + 23

   = 120 +18

   = 138

2. When it comes to multiplying double digits by double digits however, the process is too long and further strategies must be found, for example breaking up one number. There are two ways in which to break up a number: 14 for example is 10 + 4 but it is also 7 x 2. Learners need exposure and practice to see numbers in both ways. We can use both ways to multiply:

   Example: 32 x 14

   a) 32 x (10 + 4)

   = 320 + 128

   = 448

   b) 32 x (7 x 2)

   = 224 x 2

   = 448

Note: 15 = 10 + 5 and also 5 x 3; 24 = 20 + 4 and also 6 x 4; 28 = 20 + 8 and also 7 x 4, etc.

Methods for division

1. Breaking up the first number as was done in Grade 3, works only for numbers of which both digits are completely divisible by the dividend, for example 39 ÷ 3 = (30 + 9) ÷ 3.

2. Breaking up the second number is only possible where the divisor is divisible by the dividend without a remainder, for example 68 ÷ 4 = 68 ÷ 2 ÷ 2. The requirement for Grade 4 is that learners divide, irrespective of the answer having a remainder of not.

A **clue board** seems to be one of the most workable strategies for division of three digits by one digit. This is a strategy that makes provision for remainders. When setting up a clue board, it is usually quite adequate to have the dividend multiplied by 2, 3, 5, 10, 20, 30, 50 and 100. Study the following example:

572 ÷ 6

50	x	6	= 300	[572 – 300 = 272]
30	x	6	= 180	[272 – 180 = 92]
10	x	6	= 60	[92 – 60 = 32]
5	x	6	= 30	[32 – 30 = 2]
95	x	6	= 570	

572 ÷ 6 = 95 with a remainder of 2

6 x 2 = 12
6 x 3 = 18
6 x 5 = 30
6 x 10 = 60
6 x 20 = 120
6 x 30 = 180
6 x 50 = 300
6 x 100 = 600

In the NECT GRADE 4-9 MATHEMATICS TRAINING HANDOUT TERM 1&2 2019

find a sheet marked: **GRADE 4: TERM 1: TOPIC 5: MULTIPLICATION AND DIVISION.**

TOPIC 6: TIME

INTRODUCTION

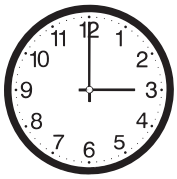
- This unit runs for 4 hours.
- This unit is part of the content area, ‘Measurement’, an area which counts for 15% of the final exam.
- Learners need to understand different ways of telling time, calculate time intervals and read calendars and timetables as part of daily life.
- The purpose of this unit is to develop the concept of time and measuring time.

SEQUENTIAL TEACHING TABLE

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

• Tell 12 hour time in hours, half hours, quarter hours and minutes on clocks, watches and cell phones
• Read dates on calendars
• Place birthdays and events on calendar
• Calculate and solve problems with time in:
  • days, weeks and months
  • convert between days and weeks
  • convert between weeks and months
• Calculate length of time in hours, half hours and quarter hours
	• Read time and time instructions:
	  • read, tell and write time using 12 hour and 24 hour notation
	  • understand digital and analogue instructions (clocks and watches) in hours, minutes and seconds
	• Read calendars
	• Calculate and solve problems involving time in:
	  • number of days between two dates
	  • number of hours and minutes between two times
	• History of time
	• Know some ways in which time was measured and represented in the past
		• Read time and time instructions:
		  • read, tell and write time in 12 hour and 24 hour notation
		  • understand digital and analogue instructions (clocks and watches) in hours, minutes and seconds
		• Read calendars
		• Calculate and solve problems involving time in:
		  • number of days between two dates
		  • number of hours and minutes between two times
		  • number of days, weeks and months in a time interval
		  • Number of years and decades in a time interval
		  • History of time
		• Know some ways in which time was measured and represented in the past

GLOSSARY OF TERMS

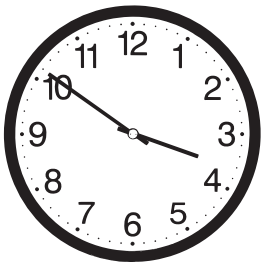
Term	Explanation / Diagram
Analogue Clock **(12 hour clock)**	This clock has a face and two hands, the short one for hours and the long one for minutes. The hands move in a circle (clockwise) to point to the time. The twelve hours are indicated by numbers, but the sixty minutes are markings only. Any reading is done in terms of the minutes and the hours. It is not possible to see whether it is before, or after noon on a twelve-hour clock. The cycle repeats every twelve hours, meaning that the exact same image is seen twice during a 24-hour period (a day). Some analogue clocks have a third (normally red) hand that moves fast to indicate seconds. 
Digital Clock **(24 hour clock)**	On the left-hand side of the digital display, this clock uses the numbers 00 to 24 to indicate the hour of the day. This is followed by a colon and the numbers 00 to 60 are used to indicate the minutes. Some digital clocks have another colon followed by the numbers 00 to 60, to indicate seconds: 16:25:09 Because the digital instrument indicates the time in 24 hours, it is possible to tell, for example in the display above, that it is 25 minutes past four in the afternoon.
Hour	An hour is the time unit into which a day is divided. There are 24 hours in a day. 1 hour = 60 minutes
Half-hour	Half-hour = 30 minutes
Quarter-hour	Quarter hour = 15 minutes
Measuring Periods of Time	Millennium = 1000 years Century = 100 years Decade = 10 years Year = 12 months or 365 days except for a leap year, which has 366 days. Month = anything from 28 - 31 days depending on the month. Week = 7 days Day = 24 hours Hour = 60 minutes Minute = 60 seconds
Calendar	A chart or pages showing the days, weeks and months of a specific year – which vary for each consecutive year.

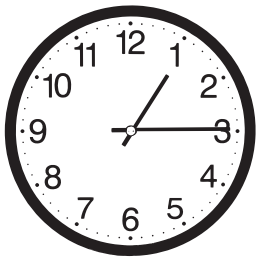
SUMMARY OF KEY CONCEPTS

Telling the time in analogue and digital format

Learners need to understand that the same time of day, morning, noon or night, can be expressed in two internationally acceptable ways. In the 12-hour way, an analogue instrument shows the hour and minutes, but it needs to be specified by telling whether this time points to a time before, or after noon (am or pm). The hours of the times on the two analogue clocks below are shaded on the 24-hour grid.This is to show both possibilities as the time could be before noon (AM) or after noon (PM).

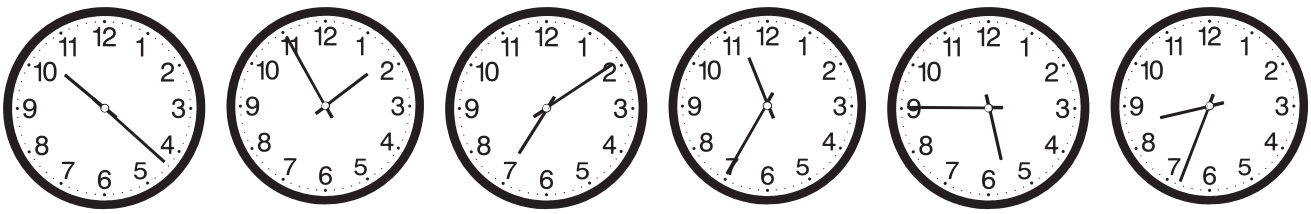
- In words: nine minutes to four
- In digits: 03:51 or 15:51
- In words: fifteen minutes past 1
- In digits: 01:15 or 13:15





12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
			am												pm								
	am												pm										

Learners can complete the grid below to convert 12-hour time to 24-hour time (both am and pm):



12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Saying time in five-minute intervals in 24-hour time and in 12-hour time

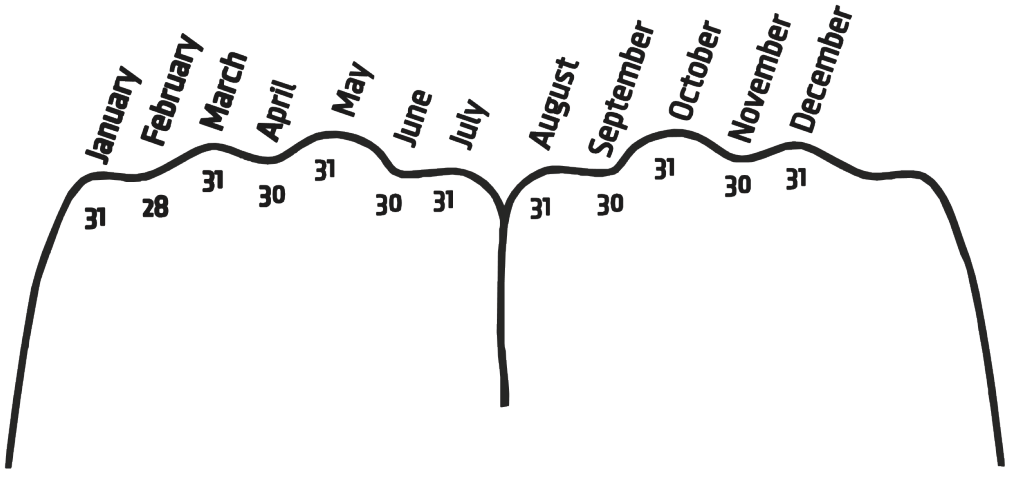
Below are the ways that time is said in the two ways indicated:

DIGITAL	24-HOUR CLOCK	12-HOUR CLOCK
09:00 09:05	nine o'clock nine o'five	nine o'clock five past nine
09:10	nine ten	ten past nine
09:15	nine-fifteen	quarter past nine
09:20	nine-twenty	twenty past nine
09:25	nine twenty-five	twenty-five past nine
09:30	nine thirty	half past nine
09:35	nine thirty-five	twenty-five to ten
09:40	nine forty	twenty to ten
09:45	nine forty-five	quarter to ten
09:50	nine fifty	ten to ten
09:55	nine fifty-five	five to ten

Let learners inspect the table above and make sense out of the two ways of expressing time. Also, make sure that they understand the "past" and "to" part in expressing analogue time.

The number of days in each month

Make fists with your hands and hold them up next to each other, like in the diagram below. On the knuckle is 31 days and in between knuckles is 30 days, except February.



Writing the date

There are many ways to write the date, which are all internationally acceptable:

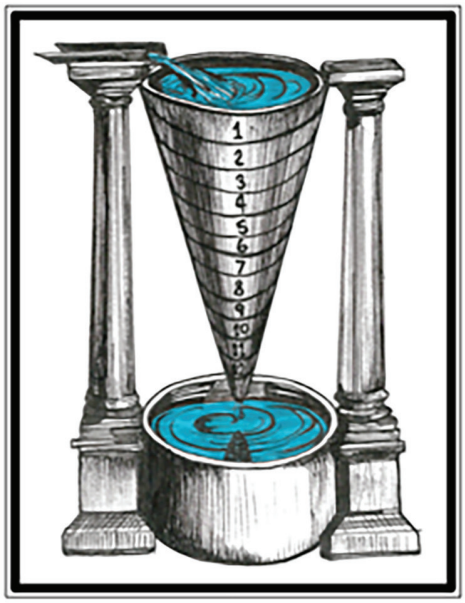
- 25 September 2015
- 2015 September 25
- September 25, 2015
- 25/9/2015
- 25.09.2015
- 09.25.2015
- 2015.09.25

As a teacher, you need to ensure learners recognise and are able to read all possibilities.

Clocks used long ago

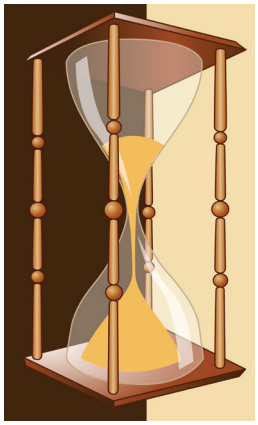
The following clocks were used long ago:

- A water clock: Water is poured in at the top of the funnel and runs out at the bottom through a small hole. The funnel is marked to indicate what time lapsed as the water reduces.

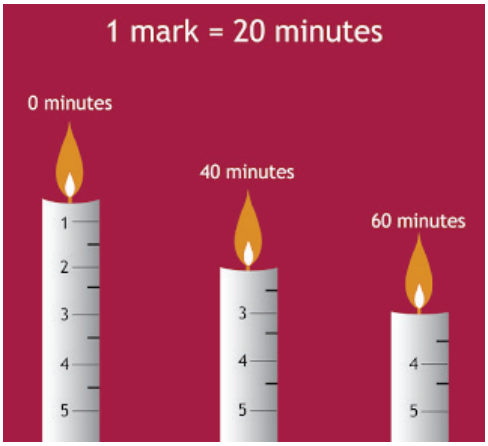


- A shadow clock or a sundial: A sundial is a device that tells the time of day when there is sunlight. This is done by the position of the sun in the sky. It consists of a flat plate (the dial) and a gnomon, which casts a shadow onto the dial. As the sun appears to move across the sky, the shadow aligns with different hour-lines, which are marked on the dial to indicate the time of day.

- A sand clock: An hourglass is a device used to measure the passage of time. It has two glass bulbs connected vertically by a narrow neck that allows a regulated trickle of sand from the upper bulb to the lower one. Each sand clock or hour glass is devised to run a specific period of time, for example 5 minutes of an hour.



- A candle clock: A candle clock is a thin candle with equally spaced markings (usually with numbers), that when burned, indicate the passage of periods of time.



Reading timetables

A good lesson in reading timetables can be integrated into the first day of Grade 4 where learners can be assisted with reading their timetable. Bus and train timetables are difficult examples to start with, because their departure and arrival times can be confusing. The ballet classes timetable below is easier to comprehend and to interpret.

MONDAY	TUESDAY	WEDNESDAY		THURSDAY		FRIDAY	SATURDAY
STUDIO 1	STUDIO 1	STUDIO 1	STUDIO 2	STUDIO 1	STUDIO 2	STUDIO 1	STUDIO 1
3 - 3:45PM **Ballet Beginners** *(6 - 9 years)*	3 - 3:45PM **Ballet Level 1** *(7 - 10 years)*	3 - 3:45PM **Ballet Beginners** *(6 - 9 years)*		3 - 3:45PM **Ballet Level 1** *(7 - 10 years)*	3:30 - 4PM **Ballet Level 3** *Stretch Class*		*Additional rehearsals for RAD exams, Eisteddfod and shows.*
3:45 - 4:45pm **Ballet Level 4** *(10 - 14 years)*	4 - 4:45pm **Ballet Level 3** *(9 - 12 years)*	3:45 - 4:45pm **Ballet Level 4** *(10 - 14 years)*		4 - 4:45pm **Ballet Level 3** *(9 - 12 years)*	4 - 4:30pm **Inter. Foundation** *Pointe*	4:15 - 5:15pm **Intermediate** *& Pointe*	
4:45 - 5:45pm **Intermediate** *(12 years & up)*	4:45 - 5:45pm **Inter. Foundation** *(11 years & up)*	4:45 - 5:45pm **Intermediate** *(12 years & up)*	5 - 5:30PM **Ballet Level 4** *Stretch Class*	4:45 - 5:45pm **Inter. Foundation** *(11 years & up)*			

Various questions can be based on such a timetable, for example:

- How many times a week is there a class for 9-12 year olds?
- For how long does the ballet beginners practice each week?
- On which days of the week are there stretch classes?
- On which days and times are both studios used?

TOPIC 7: DATA HANDLING

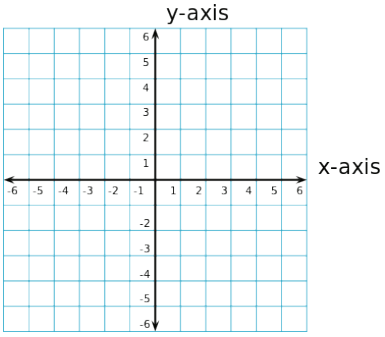
INTRODUCTION

- This unit runs for 10 hours.
- This unit falls under the content area 'Data Handling', an area which counts for 10% of the final exam.
- The unit covers data handling, collecting data, graphing and reading graphs.
- The purpose of this section is to develop the skills of representing data in graphic form and to interpret ready given graphs containing data.

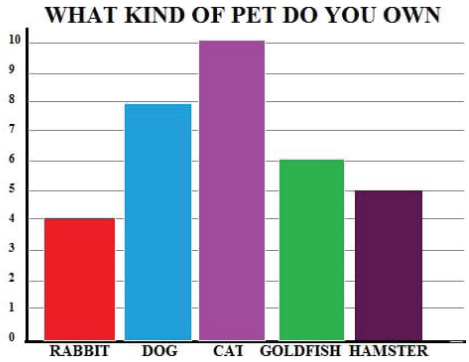
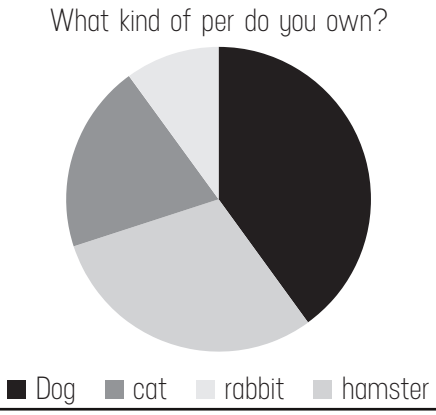
SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Collect data through tally-marks • Represent data in bar graphs and pictograms (one-to-one correspondence) • Answer questions about the represented data	• Collect and record data through tally-marks • Represent data in words, bar graphs and pictograms (one-to-one correspondence) • Read and interpret the above representations as well as pie charts • Answer questions related to data categories • Critically read and interpret data • Summarise data verbally and written	• Arrange data from the smallest to the largest group • Represent data in words, pictograms (many-to-one correspondence), bar graphs, double bar graphs and pie charts • Answer questions related to data categories, sources and contexts • Critically read and interpret data • Summarise data verbally in writing, draw conclusions and make predictions • Determine the mode of the data set

GLOSSARY OF TERMS

Term	Explanation / Diagram
x axis and y axis	On a coordinate plane, also called a Cartesian plane, there is a coordinate system where a horizontal x-axis is marked from a zero point to the left in negative numbers and to the right in positive numbers. This axis is crossed at the zero point at right angles by a y-axis, which is marked from the zero point upwards in positive whole numbers and downwards in negative numbers. 
Tally	 5 The word tally is used both as a verb and a noun. To tally simply means to keep a count and the tally is the written counting. Let us say for example one counts the cars passing at a robot, you draw a line for each car that passes and to make the calculation of the total of your lines easier, you cross out every four vertical lines by a horizontal line, which is your 5th count.
Tally table	A completed tally table looks like this: the item being counted appears in the first column, the grouped tally marks in the second column and the number of tally marks in the last column.

Pet	Tally Marks	Number
	𝍸 𝍸 𝍸 𝍸	20
	𝍸 𝍸 𝍸	15
	𝍸	5
	𝍸 𝍸 𝍸	15

<table>
<tr><th>Term</th><th>Explanation / Diagram</th></tr>
<tr><td>Pictograph
One-to-One
Representation</td><td>A pictograph uses pictures instead of tallies: in this pictogram each paw represents one animal.
<table><tr><td>Cat</td><td>🐾🐾🐾🐾🐾🐾</td></tr><tr><td>Dog</td><td>🐾🐾🐾🐾</td></tr><tr><td>Hamster</td><td>🐾🐾🐾🐾</td></tr><tr><td>Rabbit</td><td>🐾</td></tr><tr><td colspan="2">🐾 represents 1 pet</td></tr></table></td></tr>
<tr><td>Bar graph</td><td>This type of graph uses bars to show the data. That which is measured, appears on the x-axis and the number or measurement is indicated on the y-axis, for example the bar graph below, shows the outcome of a survey about people's pets:
 
</td></tr>
<tr><td>Pie graph</td><td>A pie chart is a circular statistical graphic, which is divided into slices to illustrate numerical proportion. In a pie chart, the size of each slice is proportional to the quantity it represents. The pie chart below represents similar data as in the bar graph above, in another form.
 
</td></tr>
<tr><td>Data</td><td>Data is information that is presented in a numerical form and represented in various forms.</td></tr>
<tr><td>Analysing and
Interpreting data</td><td>Inspecting the data and its representations to understand and explain what is being communicated and what the relationships between the data elements are.</td></tr>
</table>

SUMMARY OF KEY CONCEPTS

The data cycle

Data handling follows a step by step process, starting with data collection, recording, ordering, representing, analysing and interpreting the data.

Collecting data

Data can be collected in different ways. The simplest way is observation.

Example: You want to find how many cars pass by a certain point on a road in an hour. To find out, you stand at that point on the road, and count the cars that pass by in an hour's time.

Tally marks and tables for recording

This is how you tally items:

To do tallies for various items, as we have done for the dice exercise, a frequency table can be set up where the item label, the tallies and the totals appear.

Yellow	𝍸	**4**
Red	𝍸	**5**
Blue	𝍸 |	**6**
Green	|	**1**
Pink	𝍸	**4**

Ordering a data set

Data can be ordered in an ascending- or descending order or according to the groups:

- The test results of a class would be ordered from the lowest to the highest
- The preferences of a group could be ordered from highest to lowest.
- The rainfall for a year would not be ordered, because the groups (the months) are set.

Pictograph

The pictures that represent numbers in this pictogram have a one-to-one correspondence - each icon represents one item. This must be stated at the bottom of the pictograph as a key. The pictograph must have a title or heading, describing what the graph is about.

The Pets of Grade 4 Learners

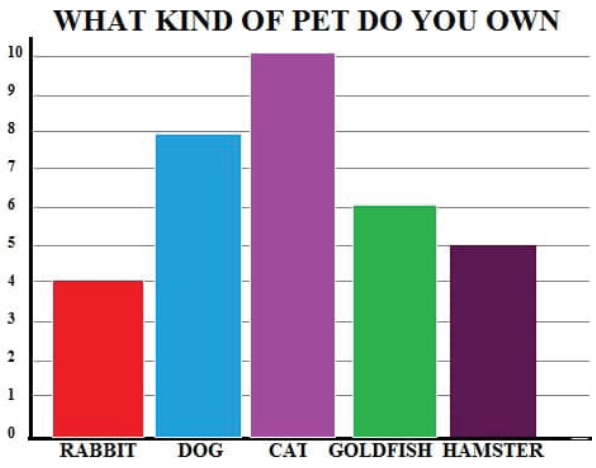
Cat	🐾 🐾 🐾 🐾 🐾 🐾
Dog	🐾 🐾 🐾 🐾
Hamster	🐾 🐾 🐾
Rabbit	🐾 🐾

🐾 represents 1 pet

1. Choose a topic.
2. Create and populate your data collection using a tally table.
3. Choose a symbol to show what you want to represent.
4. Set out the categories on your pictograph and draw the symbols to represent your findings.
5. Insert a key.

Bar graph

Learners need to read and understand bar graphs and also be able to create them. If they are collecting or given a data set, they should be able to follow the steps below to set up a bar graph:



To draw a bar graph:

1. Work out your scale (for Grade 4 it is best to use quad paper) so that it is equally spaced and can fit on your page. You might need to go up in ones, fives, tens, or hundreds.
2. Give the graph a heading.
3. Start at 0.
4. Label the x and y axes.
5. Label each column.
6. Draw the columns and leave an equal space between each.
7. Colour the columns in.

Analysing and Interpreting Data

We advise that teachers guide learners into analysis and interpretation of data sets and their representative forms, pictograms, pie charts or bar graphs. This is not a spontaneous, innate skill, but should be cultivated with care. Included in interpretation is also comparing various representations of the same data set. S

The data cycle

The data cycle can be described in four phases:

- Ask a question (what is the problem or situation you will investigate?)
- Collect and record data (through observation, questionnaires, experiments, test, etc)
- Calculate, order and represent the data (in forms like a pie chart, a bar graph etc.)
- Analyse and interpret the findings (understand the trends, patterns and implications)

It is preferable to let learners go through all phases with a data set, rather than to fragment the elements of the cycle without links to the previous or next phase.

TOPIC 8: PROPERTIES OF 2D SHAPES

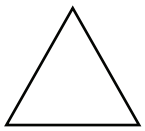
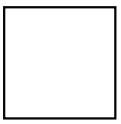
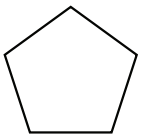
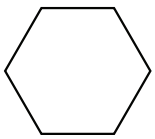
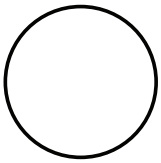
INTRODUCTION

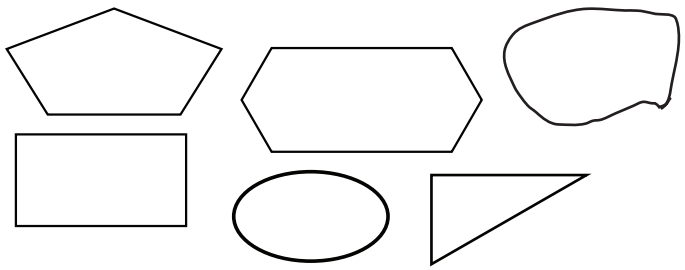
- This unit is 4 hours.
- Properties of 2D Shapes is part of the content area "Space and Shape", an area which counts for 15% of the final exam.
- The unit covers the properties of 2D shapes, which form the basis of geometry.
- The purpose of this section is to develop geometric (spatial) thinking.

SEQUENTIAL TEACHING TABLE

GRADE 3 FOUNDATION PHASE	GRADE 4 INTERMEDIATE PHASE	GRADE 5 INTERMEDIATE PHASE
LOOKING BACK	CURRENT	LOOKING FORWARD
• Range of 2D shapes includes circles, triangles, squares and rectangles • Recognise and name circles, triangles, squares and rectangles • Draw 2D shapes, including: circles, triangles, squares and rectangles • Describe, sort and compare 2D shapes in terms of straight and curved sides	• Range of 2D shapes includes circles, squares, and rectangles, regular and irregular polygons, triangles, pentagons and hexagons • Recognise, visualise and name 2D shapes in the environment and in geometric settings • Describe, sort and compare properties of 2D shapes in terms of straight and curved sides and the number of sides	• Range of 2D shapes includes circles, squares, rectangles, triangles, regular/irregular polygons, pentagons, hexagons and heptagons • Recognise, visualise and name 2D shapes in the environment and in geometric settings with focus on regular and irregular 2D shapes • Describe, sort and compare properties of 2D shapes in terms of straight and curved sides and the number of sides, length of sides, angles in shapes, limited to right angles, acute angles and obtuse angles

GLOSSARY OF TERMS

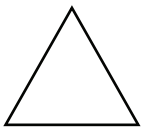
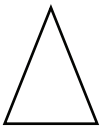
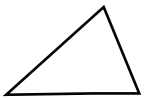
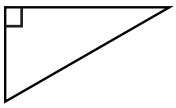
Term	Explanation / Diagram
2-Dimensional shapes or objects	2-D objects take up an area on a flat surface, called a plane. It can be measure in two directions, for example the length and the width of a rectangle can be measured. The sides of the shape are lines – straight or curved.
Line	In geometry a line: • Can be drawn between two points • Or can close in on itself like a circle • Can be straight or curved • Has no thickness, therefore does not take up space • Can extend in both directions without end
Regular Shapes	A regular shape means that all the angles are equal in size and all the sides are of equal length. A regular triangle is an equilateral triangle, with all sides equal and all angles 60°  A regular quadrilateral is a square, with all sides equal and all angles 90°  A regular pentagon has all sides equal and all angles 108°  A regular hexagon has all sides equal and all angles 120°  A circle is also a regular shape although we cannot speak of angles. 

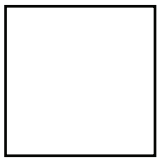
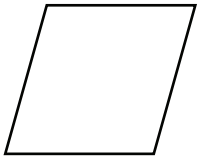
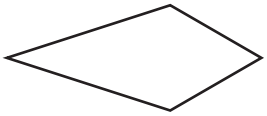
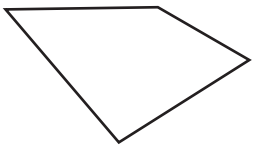
Term	Explanation / Diagram
Irregular Shapes	An irregular shape is made up of polygons which do not have equal sides and where the angles are not equal. 
Polygons	2-D shapes enclosed within at least 3 straight sides, such as triangles and parallelograms.
Triangle	Three-sided polygon
Quadrilateral	Four-sided polygon
Square	Regular quadrilateral
Parallelogram	Quadrilateral with two pairs of parallel and congruent sides (congruent – same length)
Rectangle	Right parallelogram
Pentagon	Five-sided polygon
Hexagon	Six-sided polygon
Circle	A closed curve where each point on the curve is exactly the same distance from the centre.

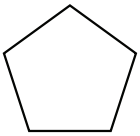
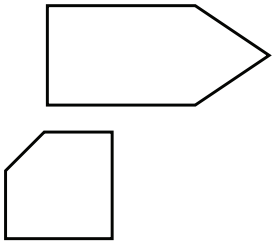
SUMMARY OF KEY CONCEPTS

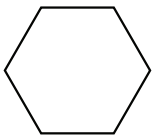
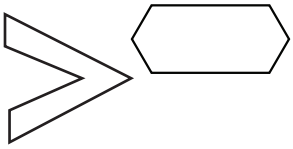
At the development age that learners have reached in Grade 4, they are able to compare 2-D shapes on the basis of properties. They can put two or more shapes next to each other, identify and describe the differences and the similarities.

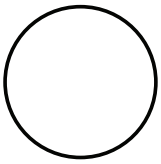
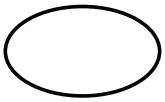
For the benefit of concept development, we are now going to formally compare and list similarities and differences between various shapes that learners must master in Grade 4. This list will also be used and extended in Grade 5 and 6. Time spent on these concepts will be worthwhile.

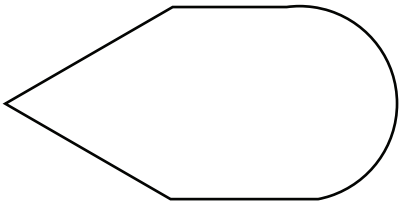
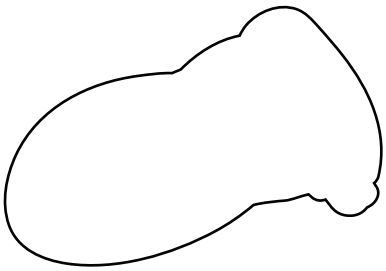
Name of shape	Diagram of shape	Properties of shape
Triangles		
Equilateral triangle		a. Three straight sides b. All sides equal length c. All angles equal in size
Isosceles triangle		a. Three straight sides b. Two sides equal length c. Two angles equal in size
Scalene triangle		a. Three straight sides b. All three sides different lengths c. All three angles different sizes.
Right triangle		a. Three straight sides b. One angle right

Quadrilaterals		
Square		a. Four straight sides b. All sides equal length c. All angles equal in size (90°) d. Two pairs of parallel sides
Rectangle		a. Four straight sides b. All angles equal in size (90°) c. Two pairs of parallel sides d. Two pairs of opposite sides equal length
Rhombus		a. Four straight sides b. All sides equal length c. Two pairs of parallel sides d. Two pairs of opposite angles equal in size.
Parallelogram		a. Four straight sides b. Two pairs of parallel sides c. Two pairs of opposite sides equal length d. TTwo pairs of opposite angles equal in size.
Trapezium		a. Four straight sides b. One pair of parallel sides
Kite		a. Four straight sides b. Two pairs of adjacent sides equal c. One pair of opposite angles equal in size.
Scalene quadrilateral		a. Four straight sides

Pentagons		
Regular pentagon		a. Five straight sides b. All sides equal length c. All angles equal in size.
Irregular pentagon		a. Five straight sides

Hexagons		
Regular hexagons		a. Six straight sides b. All sides equal length c. All angles equal in size.
Irregular hexagons		a. Six straight sides

2-D shapes with curved sides		
Circles		a. Closed shape with curved side b. Each point on the curve is exactly the same distance form the centre
Irregular shapes with curved side		a. Closed shape with curved side

2-D shapes with curved, straight or irregular sides		
Irregular 2-D shapes with curved and straight sides		a. Closed shape with curved and straight sides
Irregular 2-D shape		a. Closed shape

Notes