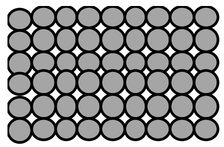
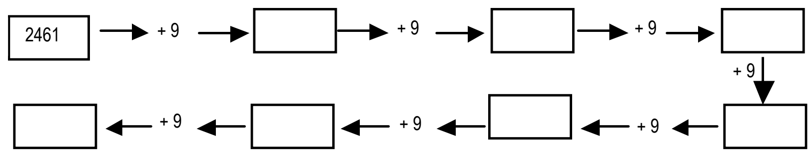
3.3.3 Clarification of content for Grade 6

GRADE 6 TERM 1				
CONTENT AREA	**TOPICS**	**CONCEPTS AND SKILLS**	**SOME CLARIFICATION NOTES OR TEACHING GUIDELINES**	**DURATION (in hours)**
NUMBERS, OPERATIONS AND RELATIONSHIPS	**Mental Mathematics**	**Mental calculations involving**: • Addition and subtraction facts of: - units - multiples of 10 - multiples of 100 - multiples of 1 000 • Multiplication of whole numbers to at least 12 x 12 • Multiplication facts of: - units and tens by multiples of 10 - units and tens by multiples of 100 - units and tens by multiples of 1 000 - units and tens by multiples of 10 000 **Number range for counting, ordering, comparing and representing, and place value of digits** • Order, compare and represent numbers at least 9-digit numbers • Represent prime numbers to at least • Recognizing the place value of digits in whole numbers to at least 9-digit numbers • Rounding off to the nearest 5, 10, 100 and 1 000 **Calculation techniques** Using a range of techniques to perform and check written and mental calculations with whole numbers including: • estimation	The mental Mathematics programme should be developed systematically over the year. Learners should not be asked to do random calculations each day. As learners cover topics and develop calculating techniques in the main part of the lesson, so aspects of these can be incorporated into the mental Mathematics programme. Concepts and skills are developed through the main lesson, and then practised, sometimes with smaller number ranges in the mental Mathematics programme. Keep the number range lower in Term 1 and increase it during the year. At the start of the year, number ranges and calculations techniques can be based on those developed in Grade 5. The mental Mathematics should systematically develop three aspects of learners' number knowledge • number facts - number bonds: addition and subtraction facts of: ◊ units ◊ multiples of 10 ◊ multiples of - times tables (multiplication of whole numbers to at least • calculation techniques - doubling and halving, - using multiplication to do division, - multiplying by 10, 100 and 1 000 - multiplying by multiples or 10, 100 and 1 000 - dividing by 10, 100 and 1 000 - building up and breaking down numbers, - rounding off to the nearest 5, 10, 100 and1 000 and compensating - adding and subtracting of units, multiples of 10, 100 and 1 000 to/from any 5-digit number • number concept - counting - ordering and comparing	**10 minutes every day**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**Mental Mathematics**	• adding, subtracting and multiplying in columns • long division • building up and breaking down numbers • rounding off and compensating • using addition and subtraction as inverse operations • using multiplication and division as inverse operations **Number range for multiples and factors** • multiples of 2-digit and 3-digit numbers • factors of 2-digit and 3-digit whole numbers • prime factors of numbers to at least 100 **Properties of whole numbers** • recognize and use the commutative; associative; distributive properties with whole numbers • 0 in terms of its additive property • 1 in terms of its multiplicative property	- place value - building up and breaking down numbers - odd and even numbers - multiples Some mental Mathematics can be done without apparatus, but it is often useful to do mental Mathematics with apparatus **Recommended apparatus** • a number line (structured, semi-structured or unstructured) • a number grid • place value cards • counting beads	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Counting, ordering, representing and place value of digits	**Number range for counting, ordering and representing, and place value of digits** • Order, compare and represent numbers up to at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 and 1 000	Although counting in whole numbers is not specified in Grade 6, learners should be proficient in the Grade 5 level of counting. In Term 1, learners should revise and consolidate work done in Grade 5 **Counting** Counting should not only be thought of as verbal counting. Learners should count using apparatus such as • counters • counting beads • number grids • structured, semi-structured and empty number lines • pictures of objects, especially pictures of large numbers of objects that are presented in a grouped or structured way. An example of a picture of objects suitable for counting is provided at the end of the Grade 5 section of Numbers, Operations and Relationships. • arrays or diagrams of arrays e.g.  • other diagrams for counting e.g.  Counting should not always start with the first multiple. Nor should it always start on any other multiple e.g. counting in 25s can start from 27 or 113 , counting in 9's can start from 2 641 or from 38 **Place value**(number range 0 to 999999) Learners should be able to break up numbers into hundreds, tens and units using • the number names (number words) • place value or flash cards • expanded notation Recommended apparatus: place value, flash cards, Dienes blocks	**2 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Counting, ordering, representing and place value of digits		**Compare and order** Here learners should be given a range of exercises • Arrange the given numbers below from the smallest to the biggest: or biggest to smallest • Fill in missing numbers in - a sequence - on a number grid ◊ Show a given number on a number line – structured or semi-structured e.g. show on a number line which number is halfway between 471 340 and 471 350. • Indicate which of two numbers is greater or smaller: 395431 or 395413? • Fill in <, = or > between the following: a)247 889 ☐ 247 898 b)784 109 ☐ 785 190 All work developed here can be practised throughout the year in the mental Mathematics programme.	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
Patterns, Functions and Algebra	**2.1** **Number sentences** (introduction to algebraic expressions)	**Number sentences** • Write number sentences to describe problem situations • Solve and complete number sentences by - inspection - trial and improvement • Check solutions by substitution	• Writing number sentences can be seen as a way of preparing learners to write algebraic equations. • Number sentences can be used to describe problem situations. • Sometimes in the Intermediate Phase learners work with number sentences in isolation from other work. However, it is more common for learners to work with number sentences together with other forms of representation e.g. problems specified in words, numbers and calculations represented in diagrams, flow diagrams. Examples are specified in appropriate places at different times of the year. • Number sentences are also a way of showing equivalence. It seems obvious that what is on the one side of the equal sign is equal to what is on the other side. However learners need to be trained to see that there are equivalent expressions on either side of the equals sign. • In Grade 6 it is useful to use number sentences, and patterns made up of number sentences to assist learners to make sense of and learn the following: - multiple operations with and without brackets and the order of operations - multiplication and division as inverse operations - the commutative, associative, and distributive properties with whole numbers and how we can use these properties together with building up and breaking down numbers when we calculate - quick mental calculation techniques especially multiplying by multiples of 10, 100, 100, 10 000 - dividing by 10, 100, 1 000 as this is useful for decimal fractions • The steps in a calculation are sets of equivalent statements. Exploring, understanding and learning the logic of the equivalent statements by working through patterns made up of number sentences, helps learners to learn calculating techniques. • In Grade 6 learners do multiple operations with and without brackets. Learners can practise completing calculations in which the number sentence is written with brackets. This removes any confusion about the order of operations. Learners thus do not have to learn rules such as BODMAS if brackets are used routinely to indicate which operations have to be done first. • Completing number sentences with multiple operations	**3 hours**

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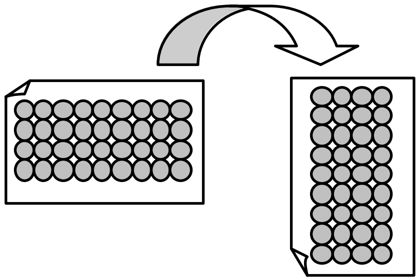
Patterns, Functions and Algebra	**2.1** **Number sentences** (introduction to algebraic expressions)		**Examples** a) 12 ÷ (4 + 2) x 5 b) (23 – 7) x (8 – 4) c) (88 ÷ 4) – (88 ÷ 11) d) (79 – 21) ÷ 2 **Example** 25 x 27 is equivalent to which of the following? a) 25 x (20 x 7) b) (20 + 5) x (20 + 7) c) 25(20 + 7) d) 20(20 + 7) + 5(20 + 7) **Example** 39 x 14 is equivalent to which of the following? a) 39 x (10 x 4) b) (30 + 9) x (10 + 4) c) 14 (40 – 1) d) 10 (40 – 1) + 4(40 – 1) e) 30 (10 + 4) + 8 (10 + 4) **Using number sentences helps learners to consolidate the commutative and associative properties** By Grade 6, learners should be familiar with the fact that you can add numbers in any order and that you can change the way you group numbers before adding them. Learners should know how to use the commutative and associative property of addition to simplify calculations. **Commutative property of multiplication** Numbers can be multiplied in any order. **Example**: 37 x 9 = 9 x 37 It is useful to confirm this by using arrays and number sentences. Learners can write a number sentence to show an array and then turn it through a right angle and write another multiplication number sentence to describe it.	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
Patterns, Functions and Algebra	**2.1** **Number sentences** (introduction to algebraic expressions)		**Example** This array shows 36 counters.  Learners can write multiplication number sentences for the array before and after it is turned. This allows them to see that 4 x 9 = 9 x4. Learners can also write division number sentences for the array e.g. 36 ÷ 4 = 9 and 36 ÷ 9 = 4. This helps learners to see that multiplication and division are inverse operations. **Multiplication and division as inverse operations** Learners can continue to use number sentences for thinking about multiplication and division as inverse operations, and how they can change any division calculation into a multiplication calculation. This is especially useful for doing division mentally e.g. if a learner forgets the answer to 49 ÷ 7, they can change this into 7 x ☐= 49 . Often this is easier to remember. **Examples:** 42 ÷ 7 = ☐ because 6 x ☐= 42 63 ÷ 7 = ☐ because 7 x ☐= 63 175 ÷ 7 = ☐ because 7 x ☐ =175 After completing a number of similar examples, learners should explain in their own words what they notice. Learners are not expected to know the names of the properties of operations e.g. commutative property. They only need to know how to use this property to make their calculations or to use equivalent statements. **Examples:** a) 27 ÷ 7 x 7 =☐ b) 38 ÷ 6 x 6 =☐ c) 7 997 ÷6 x 6 =☐	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
Patterns, Functions and Algebra	**2.1** **Number sentences** (introduction to algebraic expressions)		After completing a number of similar such examples, learners should explain in their own words what they notice. They are expected to be able to conclude "When you multiply and divide a number by the same number the number is unchanged". **Using number sentences to consolidate learners' understanding of the multiplicative properties of 1** a) 92 x 1 = ☐ b) 18 ÷ 18 = ☐ c) 67 154 ÷ 67 154 = ☐ d) ☐÷ 9 = 1 After completing a number of similar examples, learners should explain in their own words what they notice. They are expected to be able to conclude "When you multiply or divide a number by 1 it does not change the number"; "when you divide a number by itself you get one". **Associative property** You can change the way you group numbers when multiplying more than 2 numbers. Example (18 x 4) x 5 = 18 x (5 x 4) **Examples:** (8 x 7) x 3 = ☐ 8 x (7 x 3) = ☐ After completing a number of similar examples, learners should explain in their own words what they notice. Learners are not expected to know the names of the properties of operations e.g. associative property. They only need to know how to use them to simplify their calculations. **Using number sentences to consolidate learners' understanding of the additive properties of 0** **Examples:** a) 79 – 4 + 4 = ☐ b) 237 + 6 – 6 = ☐ c) 6 997 + 6 – 6 = ☐ d) 54 + 6 – ☐ = 54	

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Patterns, Functions and Algebra	**2.1** **Number sentences** (introduction to algebraic expressions)		After completing a number of similar examples, learners should explain in their own words what they notice. They are expected to say "When you add a number and then subtract the same number you get back to the number you have actually added 0". **Examples:** a) 62 + 5 = ☐ + 4 (learners can use the fact that 5 = 4 + 1, so that 62 + 5 = 63 + 4 b) 47 + 7– ☐ =46 c) 30 – 14= ☐ +14 – 14 d) True or false: 200 + 17 = 212 + 5 **Revise multiplying by multiples of ten, hundred and thousand.** **Examples:** 4 x 20 = 4 x 2 x 10 = 5 x 30 = 5 x 3 x 10 = 7 x 70 = 7 x 7 x 10 = Learners should discuss what they notice 2 x 400= 2 x 4 x 100= 6 x 500= 6 x 5 x 100= 8 x 900= 8 x 9 x 100 = Learners should discuss what they notice. Similar patterns of number sentences can be set for multiplying by multiples of 1 000. Number sentences can also be used to focus on **dividing by tens, hundreds and thousands**. Learners can draw on these techniques when converting between units of measurement and also when they work with decimal fractions. **Examples:** Dividing by 10 50 ÷ 10 = 70 ÷ 10 = 90 ÷ 10 = 500 ÷ 10 = 700 ÷ 10 = 900 ÷ 10 = 5 000 ÷ 10 = 7 000 ÷ 10 = 9 000 ÷ 10 =	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
Patterns, Functions and Algebra	**2.1** **Number sentences** (introduction to algebraic expressions)		**Examples:** Dividing by 100 600 ÷ 100 = 800 ÷ 100 = 400 ÷ 100 = 6 000 ÷ 100 = 8 000 ÷ 100 = 4 000 ÷ 100= 60 000 ÷ 100 = 80 000 ÷ 100 = 40 000 ÷ 100 = Learners discuss what they notice Similar patterns of number sentences can be set for dividing by 1 000 All concepts developed here can be practised throughout the year in the mental Mathematics programme.	
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Addition and subtraction	**Number range for counting, ordering, comparing and representing, and place value of digits** • Order, compare and represent numbers at least 9-digit numbers • Represent prime numbers to at least 100 • Recognizing the place value of digits in whole numbers to at least 9-digit numbers • Rounding off to the nearest 5, 10, 100 and 1 000 **Number range for calculations** • addition and subtraction of whole numbers with at least 6-digit number • multiple operations on whole numbers with or without brackets **Calculation techniques** Using a range of techniques to perform and check written and mental calculations with whole numbers including • estimation • adding, subtracting in columns • building up and breaking down numbers	Numbers, operations and relationships make up about half the Mathematics that learners do in the Intermediate Phase. Rather than focus on addition and subtraction once in the year, it is recommended that learners revisit addition and subtraction in the third term of Grade 6. Although learners can start by revising Grade 5 work i.e. adding and subtracting with numbers up to 5 digits, the number range should be increased to include numbers of any size and more complex problem-solving can be addressed. **Learners should solve problems in contexts and do context free calculations** It helps learners to become more confident in and more independent at Mathematics, if they have techniques • to check their solutions themselves • to judge the reasonableness of their solutions **Judging reasonableness of solutions** Learners should be trained to judge the reasonableness of solutions. One way to do this is to estimate their answers before calculating. They can round off the number involved in the calculations. • When adding or subtracting 4-digit numbers, learners can round off to the nearest 1 000. • When adding or subtracting 5-digit numbers, learners can round off to the nearest 10 000, following the same principles as the rounding they have done with rounding off to smaller numbers, or they can continue to round to 1 000 as the calculations will be sufficiently simplified to do without a calculator. **Example:** 45 678 + 12 345 Rounding off both numbers to the the nearest 1 000 gives 46 000 + 12 000 which equals 58 000. Learners should be able to do this mentally. When adding two numbers that are close to each other e.g. 3 345 and 3 340 learners can use doubling as a way of estimating their answers.	**7 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Addition and subtraction	• rounding off and compensating • using addition and subtraction as inverse operations • using a calculator **Properties of whole numbers** • Recognize and use the commutative; associative; distributive properties of whole numbers • 0 in terms of its additive property **Solving problems** • Solve problems involving whole numbers and decimal fractions, including - financial contexts - measurement contexts • Solve problems involving whole numbers, including comparing two or more quantities of the same kind (ratio)	**Checking solutions** Learners should know that they can • check an addition calculation by subtraction. **Example:** If 45 362 + 32 488 = 77 848; **then** 77 848 – 32 488 = 45 362 • check a subtraction calculation by addition **Example**: If 54 687 – 32 134 = 22 544, **then** 22 544 + 32 134 = 54 687 Using the inverse operation to check solutions is one reason for teaching addition and subtraction simulteneously. Another reason for doing the two operations at the same time is that when learners solve problems, it is sometimes possible to solve the same problem by doing either addition or subtraction. **Example**: Veli's shopping costs R163. He pays with a R200 note. How much change does he get"? Some learners may add on from R163 to get R200 as follows: R163 + R7= R170, then R170 + R30 = R200. Veli gets R37 change. **Example:** Calculate: 56 423 + 7 581 + 21 479 • **Column method for adding** By Grade 6 learners should have had enough experience with breaking up numbers to add and subtract them. The horizontal method of expanding numbers before adding them can get unwieldy when more than two 5-digit numbers are added. Term 1 learners can revisit the expanded vertical method, and then move on to the traditional column method • **Expanded vertical column method to add** 56 423 = 50 000 + 6 000 + 400 + 20 + 3 +7 581 = 7 000 + 500 + 80 + 1 +21 479 = 20 000 + 1 000 + 400 + 70 + 9 Total = 70 000 + 14 000 + 1 300 + 170 + 13 This can be written as 70 000 + 10 000 + 5 000 + 400 + 80 + 3 = 85 483	

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<tr><th>CONTENT AREA</th><th>TOPICS</th><th>CONCEPTS AND SKILLS</th><th>SOME CLARIFICATION NOTES OR TEACHING GUIDELINES</th><th>DURATION (in hours)</th></tr>
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<td>NUMBERS, OPERATIONS AND RELATIONSHIPS</td>
<td>1.1
Whole numbers
Addition and subtraction</td>
<td></td>
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• The vertical column method to add.
1 1 1 1
56 423
+ 21 479
+ 7 581
85 483
• Expanded vertical column method to subtract
Example: Calculate: 98 743 – 45 684
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<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>600</td><td></td><td>130</td><td></td><td>13</td></tr>
<tr><td>98 743</td><td>=</td><td>90 000</td><td>+</td><td>8 000</td><td>+</td><td>700</td><td>+</td><td>40</td><td>+</td><td>3</td></tr>
<tr><td>– 45 684</td><td>=</td><td>40 000</td><td>+</td><td>5 000</td><td>+</td><td>600</td><td>+</td><td>80</td><td>+</td><td>4</td></tr>
<tr><td>Total</td><td>=</td><td>50 000</td><td>+</td><td>3 000</td><td>+</td><td>0</td><td>+</td><td>50</td><td>+</td><td>9</td></tr>
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Therefore 50 000 + 3 000 + 0 + 50 + 9 = 53 059
• The vertical column method to subtract
6 13 13
98 743
– 45 684
53 059
Problems
Summation, increase and decrease, comparison by difference; comparison by ratio
See the description of problem types at the end of the Grade 6 notes
Working with calculators
• The mental Mathematics programme contains work on number concept, number facts and mental calculation techniques. Daily work on mental Mathematics combined with daily written calculations will prevent learners from becoming dependent on calculators and not knowing how to calculate without them.
Calculators are a useful way for learners to explore number patterns and when working with very large numbers.
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CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Addition and subtraction		Learners should be taught how to use calculators including how to clear an incorrectly entered number. Learners should always estimate answers before doing a calculation on a calculator. Learners should estimate whether their answers will be in tens, hundreds, thousands, ten thousands, hundred thousands or millions. For example when adding 12 345 and 87 654 they should estimate that the answer will be between 90 and 100 thousand.	

ASSESSMENT:

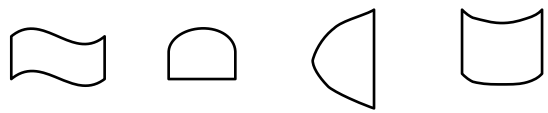
At this stage learners should have been assessed on:

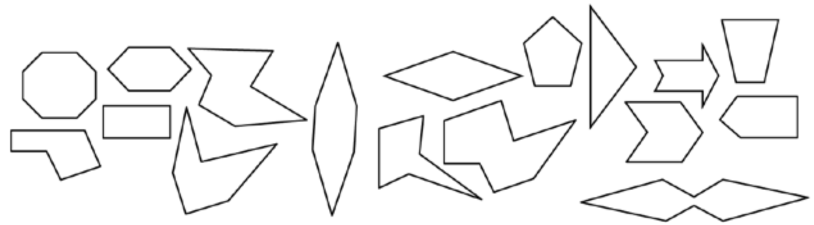
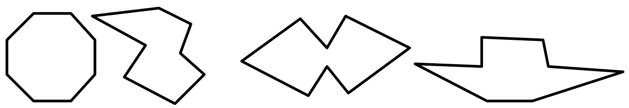
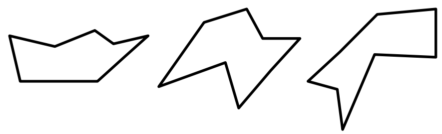
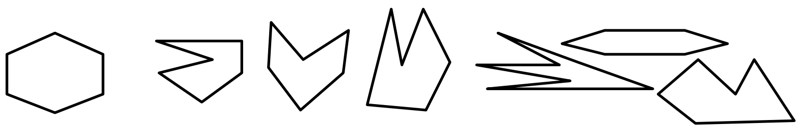
- 6-digit numbers
- adding and subtracting with 5-digit numbers
- working with number sentences

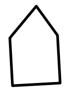
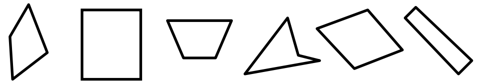
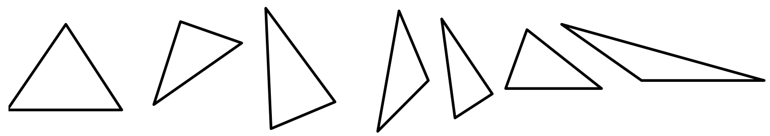
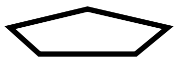
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.2** **Common fractions**	**Describing and ordering fractions:** Compare and order common fractions, including specifically tenths and hundredths **Calculations with fractions:** • Addition and subtraction of common fractions in which one denominator is a multiple of another • Addition and subtraction of mixed numbers • Fractions of whole numbers **Solving problems** Solve problems in contexts involving common fractions, including grouping and sharing **Percentages** Find percentages of whole numbers **Equivalent forms:** **Learnes should recognize** • equivalent forms of common fractions with 1-digit or 2-digit denominators (denominators which are multiples of each other) • equivalence between common fraction and decimal fraction forms of the same number • equivalence between common fraction, decimal fraction and percentage forms of the same number	**What is different to Grade 5?** • In Grade 6 learners name, order and compare all common fractions • There is a special focus on tenths and hundredths in Grade 6. This is to lay the basis for decimals and percentages. • In Grade 5 learners only added and subtracted common fractions with the same denominator. In Grade 6 they use their knowledge of equivalence and add and subtract common fractions in which one denominator is a multiple of another • When learners calculate fractions of whole numbers, the answers may contain whole numbers or fractions or both. • Decimal fractions are introduced. Learners work with decimals to 2 decimal places • Percentages are introduced. • Learners work with equivalence between - common fraction and decimal fraction forms of the same number - common fraction and percentage forms of the same number - decimal fraction and percentage forms of the same number In Term 1 learners focus on common fractions, which will then be consolidated in Term 4. Learners start by focusing on the meaning of a fraction. Learners should develop the concept of fractions in a variety of ways. Problem-solving contexts can help learners to understand many ways of thinking about fractions. A variety of problems should be given to learners. (See the types of fractions problems stated at the end of the grades notes). Learners can also work with apparatus and diagrams. Different diagrams or apparatus develop different ways of thinking about fractions: • Region or area models develop the concept of fractions as part of a whole. They can also develop the concept of a fraction as a measure. **Examples** of area models include circles cut into fraction pieces or diagrams of pies, rectangles or other geometric shapes divided into fraction pieces by paper folding, fractions using square or dotty grid paper, geoboards • Length or measurement models can be used to develop the concept of fractions as part of a whole and if used in particular ways also of a fraction as a measure **Example:** length models include fraction strips, Cuisenaire rods, number lines. • Set models develop the concept of a fraction of a collection of objects and can lay the basis for thinking about a fraction of a number e.g. $\frac{1}{3}$ of 12. **Examples** of set models include counters of any kind in different arrangements	**5 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.2 Common fractions**		Learners should not only work with one kind of model, because this can limit their understanding of fractions. For example fractions in diagram forms should include region models e.g. circles and other geometric shapes divided into fraction parts, length models including number lines and set models which show collections of objects. Special attention should be paid to tenths and hundredths as learners will need this background when they work with decimal fractions up to 2 decimal places. Learners have been naming fractions since Grade 2. Extending the range of common fractions should not cause difficulties. Time should rather be spent on equivalence, comparing fractions and doing calculations with fractions and calculating. Once learners are comfortable with equivalence, it is easy for them to compare and order fractions. **Calculations with fractions:** Learners continue to • determine fractions through grouping or sharing which is linked to understanding the relationship between division and fractions e.g. If 5 children share sweets equally, they will each get $\frac{1}{5}$ of the sweets • add fractions with the same denominators • subtract fractions with the same denominators • add and subtract mixed numbers. It is not expected that learners know rules for simplifying fractions or for converting between mixed numbers and fraction forms. Learners should know when a fraction is equal to or greater than 1. **Examples** The examples below are illustrated without contexts, but could equally arise in a problem situation. $2\frac{3}{5} + 3\frac{4}{5} = 5\frac{7}{5} = 5 + \frac{5}{5} + \frac{2}{5} = 6\frac{2}{5}$ Similarly to do subtraction, learners can first subtract the whole numbers and then use equivalence and compensation to complete the calculation. $6\frac{3}{5} - 2\frac{4}{5} = 4 + \frac{3}{5} - \frac{4}{5} = 3 + \frac{5}{5} + \frac{3}{5} - \frac{4}{5} = 3\frac{4}{5}$ Learners also find fractions of whole numbers. In Grade 6 learners should do examples in which the answer can be a whole number, a fraction or a mixed number e.g. What is $\frac{1}{4}$ of 18 ? If learners have worked with pictures of collections of objects, and they know the relationship between division and fractions, this can be done without learning a rule or method. Learners can simply draw 18 objects and then create 4 equal groups. An extention of this question would be to find $\frac{3}{4}$ of 18. Here learners first calculate $\frac{1}{4}$ of 18 and use multicplication to find the answer. Measurement is an important context through which to develop and consolidate the fraction concept. Length, mass and capacity can be used to develop the concepts of fractions, equivalence, and adding with fractions, since learners have worked with these since Grade 1.	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.4** **Time**	**Reading time and time instruments** Read, tell and write time in 12-hour and 24-hour formats on both analogue and digital instruments in • hours • minutes • seconds Instruments include clocks, watches and stopwatches **Reading calendars** **Calculations and problem-solving related to time** Solve problems in contexts involving time Read time zone maps and calculating time differences based on time zones Calculation of time intervals where time is given in • seconds and/or minutes; • minutes and/or hours • hours and /or days • days and/or weeks and/or months • years and/or decades • centuries, decades and years **History of time** Know some ways in which time was measured and represented in the past.	**What is different to Grade 5?** • Time zones are introduced. • Centuries are introduced Once learners have been taught to tell the time, this can be practised during the mental Mathematics section of the lesson. Learners continue to read calendars, and do calculations based on dates. **Calculations and problem-solving related to time include** calculations with and conversions between all the units mentioned in the column on the left.time zones Learners should be able to: • read time zone maps and do calculations using zoned maps. Help learners to understand why there are time zone differences between different places in the world • calculate time differences when given clock faces showing the times in different places.	**4 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.1** **Properties of 2-D shapes**	**Shapes learners need to know and name** • Regular and irregular polygons - triangles, squares, rectangles, parallelograms, other quadrilaterals, pentagons, hexagons, heptagons, octagons • Similarities and differences between rectangles and parallelograms **Features of shapes** Describe, sort and compare 2-D shapes in terms of • number of sides • length of sides • size of angles - acute - right - obtuse - straight - reflex - revolution **Further activities** • Draw 2-D shapes on grid paper • Draw circles, patterns in circles and patterns with circles using a pair of compasses **Angles**	**What is different to Grade 5?** • Octagons are new shapes. • Parallelograms are new shapes. • Learners to name angles according to their sizes but still do not work with protractors. Nor do they measure angles in degrees. • Learners use angles, in particular right angles to distinguish shapes. This is the case when distinguishing between rectangles and parallelograms **2-D shapes and their distinguishing features** Learners should first learn characteristics of each shape, before discussing comparisons between shapes. There are four ways in which learners distinguish shapes in Grade 6. 1. By checking whether they have straight or curved sides. 2-D shapes can be grouped as follows: • *Closed shapes with curved sides only*. **Examples**  The only 2-D shape that has curved sides that learners are expected to name is the circle. They should, however, be exposed to other shapes with curved sides which they are not expected to name: for example all these shapes have curved sides • *Closed shapes with curved and straight sides*: **Examples**  Learners are not expected to name any of these shapes.	**8 hours**

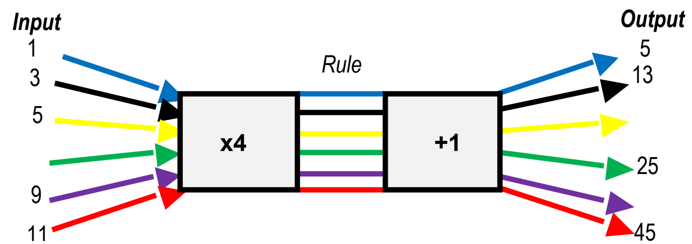
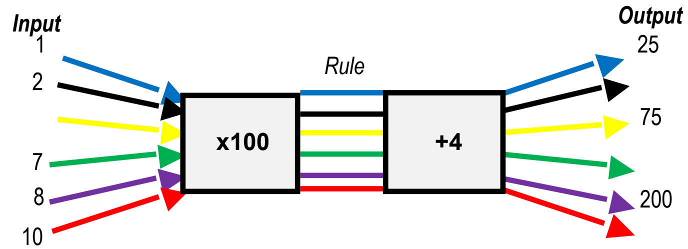
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.1** **Properties of 2-D shapes**	Recognize and name the following angles in 2-D shapes: - acute - right - obtuse - straight - reflex - revolution	• *Closed shapes with straight sides only*: **Examples** of polygons.  2. By grouping shapes with straight sides according to the number of sides. A polygon is a closed shape with only straight sides. Learners are not expected to know the name polygon. **Polygons** A regular polygon is a straight sided, closed shape with all sides the same length and all its angles the same size. Learners do not have to know the terms “regular” and “irregular”. Learners should be able to identify polygons according to their number of sides. They must be able to identify any octagon, heptagon, hexagon or pentagon. **Examples** of octagons  **Examples** of heptagons/septagons  **Examples** of hexagons 	

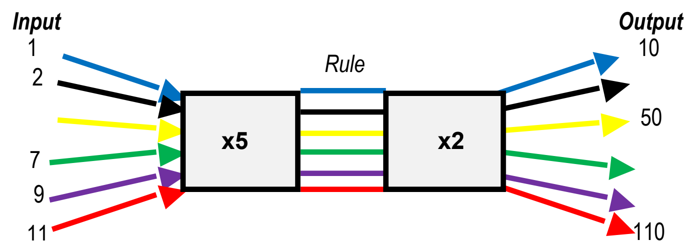
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.1** **Properties of 2-D shapes**		**Example** of pentagons  Learners need to know that all closed shapes with 4 straight sides are called quadrilaterals. **Examples** of quadrilaterals.  Learners should identify and name squares, rectangles and parallelograms. For other quadrilaterals Grade 6 learners use the group name, quadrilateral. **Triangles:** Learners should be exposed to a range of different triangles, but are not expected to name types of triangles in Grade 6  3. By looking at the length of their sides. Learners differentiate between squares and rectangles by looking at the lengths of their sides. However, learners can also discuss the lengths of the sides of other shapes e.g. a learner may say that the following shape is a pentagon whose sides are not all the same length.  4. By looking at the sizes of their angles. Here learners need to know how to check for a right angle (see notes below). They check whether shapes are rectangles or squares by checking whether all their angles are right angles. **Angles** In the Intermediate Phase learners measure angles informally. They do not use protractors or discuss angles in terms of degrees. In Grade 6 learners identify the following angles by comparing them with right angles and straight angles:	

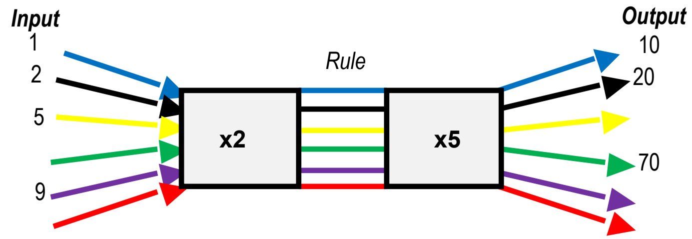
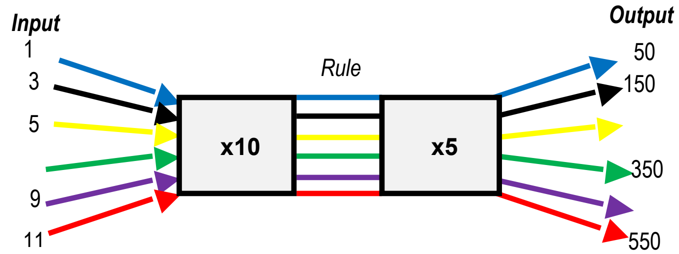
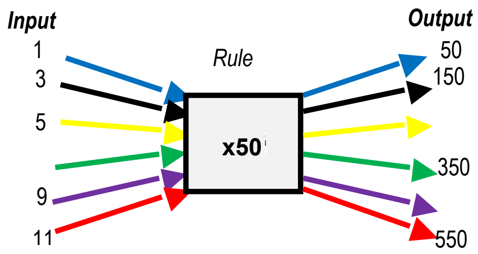
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.1** **Properties of 2-D shapes**		• An acute angle is smaller than a right angle • A right angle • An obtuse angle bigger than a right angle but smaller than a right angle • A straight angle • A reflex angle bigger than a straight angle but smaller than a revolution • A revolution a complete circle Learners can also be introduced to the size of an angle as the amount of turning between the arms or sides of the angle. Here a right angle is equivalent to a quarter turn; a straight angle is equivalent to a half turn, and a revolution is equivalent to a full turn. Learners use informal angle measurers such as the corner and side of a sheet of paper to check whether shapes or objects have right angles or straight angles. **Activities to focus learners on characteristics of shapes** Most commercially available sets of 2-D shapes do not show irregular shapes. They are however, easy to cut out of cardboard. Learners can draw irregular shapes on grid paper, or if they have geoboards, they can make irregular shapes on geoboards. Learners can also put cut-out or plastic shapes together to create composite irregular shapes. Some examples are given below (this is further described under Transformations).  **Written exercises and recording** Learners should do practical work with concrete apparatus, but they should also do written exercises. Work with pair of compasseses and drawing patterns with circles can be left until the fourth term	

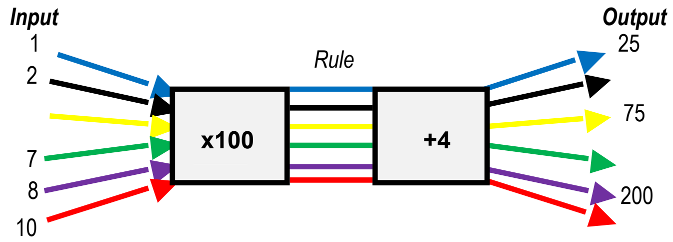
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
DATA HANDLING	**5.1** **Collecting and organising data**	**Collect data** • Use tally marks and tables for recording • Use simple questionnaires (yes/no type response) Order data from smallest group to largest group	Teachers in the phase should ensure that different topics are chosen for data collection in each of the grades. **What is different to Grade 5?** The following are new in Grade 6 • percentages – graphs can include data expressed in percentages after percentages have been covered in Term 3 (this is important in pie charts, but bar graphs can also sometimes be given in percentages) • collecting data by using simple questionnaires • double bar graphs • median **Complete data cycle including creating an individual bar graph: context environmental data** The complete data cycle includes asking a question, collecting, organising, representing, analyzing and interpreting data and reporting on the data. Work through whole data cycle to create an individual bar graph using environmental data. Suitable topics include: • how much water is used per month by families of learners in the class • amount and kinds of litter in school playgrounds • amount and kinds of recycling collected by the school **Analysing graphs** Analyse graphs on environmental or socio-economic contexts by answering questions on graphs. Both graphs and questions to be provided by teacher or textbook. Learners should work with at least • 2 pie graphs • 1 pictograph with a many to one representation Suitable topics include: • infant mortality rates per country in Southern Africa • common causes of death of children in SA • quantities of materials recycled in the town, province, country • quantities of recycling materials collected by schools around the country • amount of water stored in dams in your province	**10 hours**
	5.2 **Represent-ing data**	**Draw a variety of graphs to display and interpret data including** • pictographs with many-to-one representations • bar graphs and double bar graphs		
	5.3 **Analysing, interpreting and reporting data**	**Critically read and interpret data represented in** • words • pictographs • bar graphs • double bar graphs • pie charts **Analyse data by answering questions related to** • data categories, including data intervals • data sources and contexts • central tendencies – (mode and median) **Summarise data verbally and in short written paragraphs that include** • drawing conclusions about the data • making predictions based on the data		

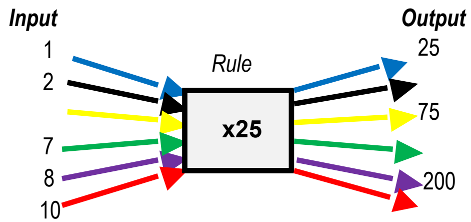
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
DATA HANDLING		**Examine ungrouped numerical data to determine** • the most frequently occurring score in the data set (mode) • the middlemost score in a data set	**Representing and analyzing data presented in words:** The data presented in words should be represented in other forms such as tally marks, tables or pictographs and then analysed. **Drawing pictographs: using data from socio-economic context** **This is recommended as the Mathematics project in Grade 6** Learners should be given socio-economic data, preferably national or regional, so that the numbers are large. This can be provided as unstructured data, in a paragraph, in a list or in a table or tally. Learners sort and order the data and draw pictographs with many to one correspondence. They then complete the rest of the data cycle. Suitable topics include: • facilities at schools in SA • sources of water of families in SA e.g. piped to house, piped to yard, piped to communal source outside the property, borehole, spring, etc. • what source / sources of lighting used by families in SA e.g. electricity, candles, paraffin, gas, etc. • kinds of homes in SA	
Assessment **Recommended form of assessment: Project**				

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.1** **Numeric patterns**	**Investigate and extend patterns** • Investigate and extend numeric patterns looking for relationships or rules of patterns: - sequences involving a constant difference or ratio - of learner's own creation • Describe observed relationships or rules in learner's own words **Input and output values** Determine input values, output values and rules for patterns and relationships using flow diagrams **Equivalent forms** Determine equivalence of different descriptions of the same relationship or rule presented • verbally • in a flow diagram • by a number sentence	**Sequences of numbers:** Examples of the above are illustrated in Term 3. **Patterns given in input-output diagrams** Input-output diagrams are sometimes called function diagrams or function machines because they are a way of introducing learners to functional relationships diagrammatically. Functional relationships become very important in the Senior Phase and FET Mathematics. The forms of input-output diagrams that learners in the Intermediate Phase work with most often are flow diagrams or spidergrams. When using flow diagrams, the correspondence between input and output values should be clear in its representational form i.e. the first input value produces the first output value, the second input produces the second output value etc. **Example 1:**  **Example 2:**  Any input-output diagram can allow learners to see or work out: • the input value, if the rule is given as well as a corresponding output value • the output value, if the rule is given as well as a corresponding input value • the rule, if the rule works for every given input value and its corresponding output value.	**4 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.1** **Numeric patterns**		Learners have already worked with tables in which the rule has been included. In grade 6 learners can work with tables in which the rule has not been stated and use patterns to find the rule. In Term 1 it is recommended that number patterns are used to develop concepts and skills that will be used in multiplication and division. The focus here can be on input-output flow diagrams. In Term 1 it is recommended that learners spend 4 hours working with flow diagrams that help them to understand and learn about • Multiplication and division as inverse operations • Multiplication of units by multiples of 10 multiples of 100 and multiples of 1 000 • The associative property with whole numbers and how to use this property when we multiply. e.g. multiplying by multiples of 10 **Using flow diagrams to help learners understand and use multiplication and division as inverse operations** Learners are not expected to use the expression “inverse operations”. They are expected to know that • multiplication can be used to do division calculations • division can be used to check division calculations **Using flow diagrams to help learners develop multiplication and division techniques** **Commutative property** Numbers can be multiplied in any order. **Example**: 13 x 5 x 2 = 13 x 2 x 5.. 	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.1** **Numeric patterns**		 Learners can discuss what they notice when they compare the examples. Learners are not required to know the name of the commutative property. They are only expected to be able to use it to simplify calculations or to use equivalent statements. **Using flow diagrams to help learners think about and use techniques for multiplying by multiples of 10:** Learners complete flow diagrams like the one below. They then explain using their own words what they notice when they compare the flow diagrams. They then discuss a short way to multiply by 50  	

<table>
<tr><th>CONTENT AREA</th><th>TOPICS</th><th>CONCEPTS AND SKILLS</th><th>SOME CLARIFICATION NOTES OR TEACHING GUIDELINES</th><th>DURATION (in hours)</th></tr>
<tr><td>PATTERNS, FUNCTIONS AND ALGEBRA</td><td>2.1
Numeric patterns</td><td></td><td>Similar pairs of flow diagrams can be used, to help learners develop techniques for multiplying by multiples of 100.
Other quick multiplication techniques can be developed in this way.
Example




Learners can develop fast mental and written techniques based on this.
All concepts developed here can be practised throughout the year in the mental Mathematics programme.</td><td></td></tr>
<tr><td colspan="4">ASSESSMENT:
At this stage learners should have been assessed on:
• fractions
• time
• 2-D shape including angles
• number patterns</td><td></td></tr>
<tr><td colspan="4">REVISION</td><td>4 hours</td></tr>
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GRADE 6 TERM 2				
CONTENT AREA	**TOPICS**	**CONCEPTS AND SKILLS**	**SOME CLARIFICATION NOTES OR TEACHING GUIDELINES**	**DURATION (in hours)**
NUMBERS, OPERATIONS AND RELATIONSHIPS	**Mental Mathematics**	**Mental calculations involving**: • Addition and subtraction facts of: - units - multiples of 10 - multiples of 100 - multiples of 1000 • Multiplication of whole numbers to at least 12x12 • Multiplication facts of: - units and tens by multiples of 10 - units and tens by multiples of 100 - units and tens by multiples of 1000 - units and tens by multiples of 10 000 **Number range for counting, ordering, representing and place value of numbers** • Order, compare and represent numbers at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbersRound off to the nearest 5, 10, 100 and 1000 **Calculation techniques** Using a range of techniques to perform and check written and mental calculations with whole numbers including: • estimation • adding, subtracting and multiplying in columns	The mental Mathematics programme should be developed systematically over the year. See Term 1 notes, but notice the increased number range in the column on the left in Term 2	**10 minutes every day**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**Mental Mathematics**	• long division • building up and breaking down numbers • rounding off and compensating • using addition and subtraction as inverse operations • using multiplication and division as inverse operations **Number range for multiples and factors** • Multiples of 2-digit and 3-digit numbers • Factors of 2-digit and 3-digit whole numbers • Prime factors of numbers to at least 100 **Properties of whole numbers** • Recognize and use the commutative; associative; distributive properties of whole numbers • 0 in terms of its additive property • 1 in terms of its multiplicative property		
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Counting, ordering, comparing, representing digits	**Number range for counting, ordering, comparing and representing, and place value of digits** - Order, compare and represent numbers to at least 9-digit numbers - Represent prime numbers to at least 100 - Recognize the place value of digits in whole numbers to at least 9-digit numbers - Round off to the nearest 5, 10, 100 and 1 000	See Term 1 notes, but notice the increased number range in the column on the left in Term 2 All concepts developed here can be practised throughout the year in the mental Mathematics programme.	**1 hour**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Multiplication	**Number range for counting, ordering, comparing and representing, and place value of digits** • Order, compare and represent numbers to at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 or 1 000 **Number range for calculations** • Multiplication of at least whole 4-digit by 3-digit numbers • Multiple operations on whole numbers with or without brackets **Calculation techniques include** • estimation • multiplying in columns • building up and breaking down numbers • rounding off and compensating • using a calculator **Number range for multiples and factors** • Multiples of 2-digit and 3-digit numbers • Factors of 2-digit and 3-digit whole numbers • Prime factors of numbers to at least 100	**What is different to Grade 5?** In Grade 5, learners multiply 3-digit by 2-digit numbers, and they still use methods in which they break up numbers. Learners in Grade 6 can start by revising this and then move on to multiply 4-digit by 3-digit numbers using column multiplication. **Learners should do context free calculations and solve problems in contexts** As the numbers learners work with get larger, learners may begin to lose track of some numbers when they break up numbers to do calculations. Using brackets is helpful to show grouping of numbers and so helps learners keep track of what they are doing. Since the operations in brackets have to be done first, it removes any confusion about the order of operations. Learners thus do not have to learn rules such as BODMAS if brackets are used routinely to indicate which operations have to be done first. **Using the distributive property to multiply** **Example:** Calculate 547 x 45 547 x 40 + 5 = 547 x 40 + 547 x 5 → (using the distributive property) = 21 880 + 2 735 = 24 615 or 547 x 50 – 5 = 547x 50 – 547 x 5 → (using the distributive property) = 27 350 – 2 735 = 24 615 Using rounding-off to estimate and judge reasonableness of answer 547 x 45 = 547 x 50 ≈ 27 350 **Using factors to multiply** **Example**: Calculate 547 x 42 547 x 42 = 547 x 6 x7 → breaking up 42 into its factors =547 x 2 x 3 x 7→ breaking up 6 into its factors =(547 x 2) x 3 x 7 =(1 094 x3) x 7 = 3 282 x 7 = 7 x 3 000+ 7 x 200+ 7 x 80+ 7 x 2 = 21 000 + 1 400 + 560 + 14 = 22 974	**5 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Multiplication	**Properties of whole numbers** • Recognize and use the commutative; associative; distributive properties of whole numbers • 0 in terms of its additive property • 1 in terms of its multiplicative property **Solving problems** • Solve problems involving whole numbers and decimal fractions, including - financial contexts - measurement contexts • Solve problems involving whole numbers, including - comparing two or more quantities of the same kind (ratio) - comparing two quantities of different kinds (rate)	Notice that as numbers get larger learners will tend to use more than one calculating strategy at the same time e.g. in the above example the multiplier is broken up into factors, but the multiplicant is broken down into place value parts. The horizontal method of expanding numbers before multiplying the parts can get unwieldy when using the number ranges recommended for Grade 6.The traditional column method helps learners to make sure that they do not lose parts of larger numbers. After about 2 hours consolidating the Grade 5 work, the number ranges can be increased to 4-digit by 3-digit numbers. **Estimation** Learners should judge the reasonableness of their solutions e.g. by estimating before calculating using rounding off to the nearest 10, 100 and 1 000. Depending on which numbers learners round off, and what they round them off to, they will get different estimations. If they round off both numbers, the calculations are easier to do mentally, but the approximation is not as close to the actual answer. **Example** 4 362 x 108 ≈ 4 000 x 100 ≈ 400 000 4 362 x 108 ≈ 4 400 x 108 ≈ 475 200 4 362 x 108 ≈ 4 362 x 100 ≈ 436 200 4 362 x 108 ≈ 4 000 x 108 ≈ 432 000 By the end of the year in Grade 6, learners should have an idea realise the impact their choice of rounding off has on the answer. This depends on how accurate they chose to be or to the numbers in the calculation. • **Use the vertical column method** 4 362 x 108 34 896 ------→ 8 x 4 362 436 200 ------→ 100 x 4 362 471 096 ------→ 108 x 4 362 **Problems** Treating groups as units, see the description of problem types at the end of the Grade 6 notes	

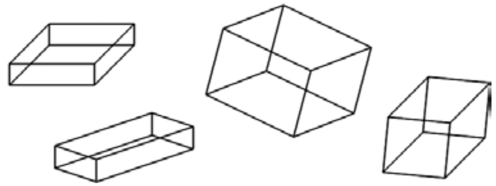
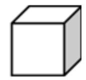
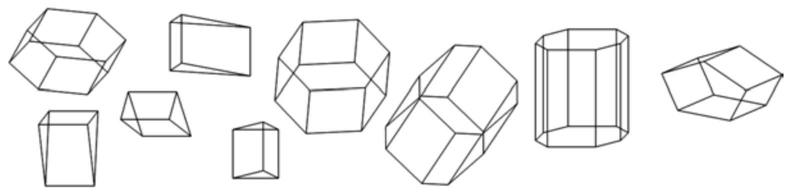
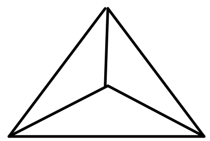
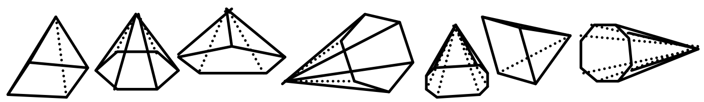
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Multiplication		**Working with calculators** The mental Mathematics programme contains work on number concept, number facts and mental calculating techniques. Daily work on mental Mathematics combined with daily written calculations will prevent learners from becoming dependent on calculators and not knowing how to calculate without them. Calculators are useful tools to explore number patterns, or when working with very large numbers, e.g. multiplying and dividing numbers with more than 4 digits. Learners should be taught how to use calculators including how to clear an incorrectly entered number. Learners should always estimate answers before doing a calculation on a calculator. Learners should estimate whether their answers will be in tens, hundreds, thousands, ten thousands, hundred thousands or millions. For example, when adding 12 345 and 87 654 they should estimate that the answer will be in the 90 thousands but closer to 100 thousand. Similarly if learners calculate 2 345 x 7, they should be able to estimate that the answer will be in the region of 2 000 x 70 or 20 000 x 7	

ASSESSMENT:

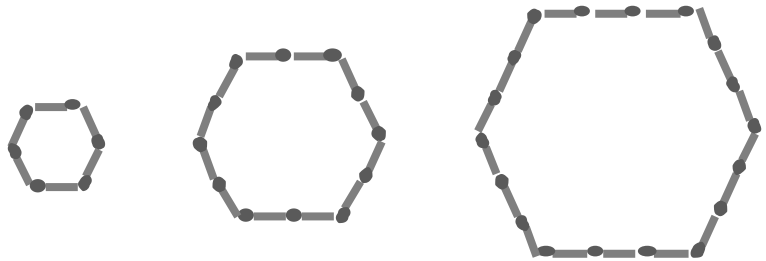
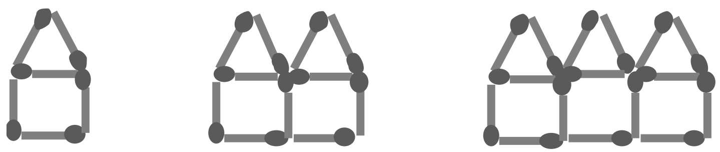
At this stage learners should have been assessed on:

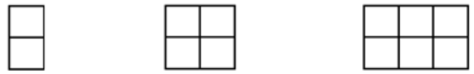
- whole number with up to 9-digits
- Multiplication of up to 4-digit by 3-digit numbers
- 3-D objects

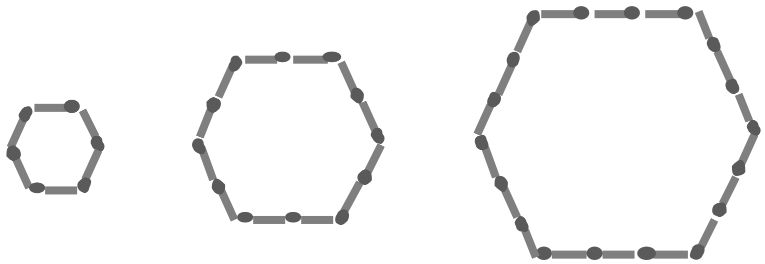
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.2** **Properties of 3-D objects**	**Objects learners need to know and name** • rectangular prisms • cubes • tetrahedrons and other pyramids • similarities and differences between tetrahedrons and other pyramids **Features learners use to distinguish, describe, sort and compare objects** Describe, sort and compare 2-D shapes and 3-D objects in terms of: • number and shape of faces • number of vertices • number of edges **Further activities to focus learners on charactaristics of objects** Make 3-D models using: • drinking straws/toothpicks, etc. to form a skeleton • nets	**What is different to Grade 5?** • Tetrahedrons are new objects • Other pyramids are new objects • Learners distinguish between tetrahedrons and other pyramids by looking at the shapes of their bases, • Learners use nets to build objects • Learners match nets with drawings of objects • Learners count the number of edges of 3-D objects • Learners build skeleton objects using drinking straws • Learners count the number of vertices of objects. **Objects and their distinguishing characteristics** There are three ways in which learners distinguish 3-D objects in Grade 6. 1. Checking whether they have flat or curved surfaces. Three dimensional objects can be grouped as follows: • *<u>Objects with a curved surface only: spheres</u>* Sphere  • *<u>Objects with flat and curved surfaces</u>* Cone  Cylinders 	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.2** **Properties of 3-D objects**		• *<u>Objects with only flat surfaces.</u>* In Grade 6 learners only identify and name the objects. Prisms **rectangular prisms**  **cubes**  **other prisms**  Pyramids: **tetrahedron or triangular pyramid**  **other pyramids** 	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.2** **Properties of 3-D objects**		2. When looking at the group of objects with flat surfaces, learners should know that the flat surfaces of 3-D objects are called faces. They describe these objects according to • the kinds and numbers of 2-D shapes that make up the flat surfaces e.g. a rectangular prism can have 6 faces that are rectangles or 4 that are rectangles and 2 that are squares. • the number of edges • the number of vertices 3. Learners can also look for right angles on the faces of objects. If the object that they are examining has faces with only right angles, then it will be either a cube or a rectangular prism. **Further activities: making models of 3-D objects** Learners create 3-D objects from nets Learners create skeletons of 3-D objects with straws / toothpicks, etc. **Interpreting drawings of 3-D objects and written exercises** Learners need to work with real objects. However they also need to do written exercises on 3-D objects. Interpreting pictures of 3-D objects is more difficult than working with the real objects. Learners should practise interpreting drawings of 3-D objects. They should identify and name 3-D objects in drawings identify everyday objects that look like geometric objects e.g. a milk carton looks like a rectangular prism, match nets of objects to drawing of objects, describe 3-D objects by stating the number of flat and curved surfaces, count the number of vertices, edges, and number and shape of faces when shown drawings of 3-D objects. In Term 2 learners focus on the kind of surface the shape number of faces of 3-D object. They also build objects using nets. In Term 4 they can consolidate what they have learned in Term 1 and build skeleton shapes with straws or toothpicks. They will then focus on the edges and vertices of the objects. This means that by the end of the year they will be able to describe 3-D geometric objects according to surfaces, faces, edges and vertices.	

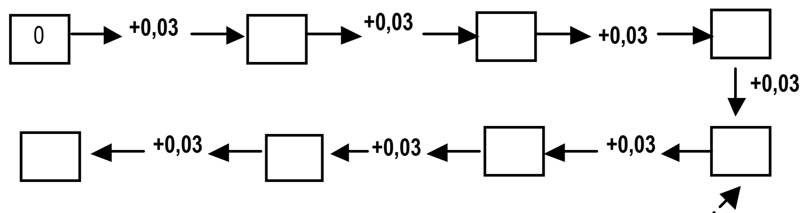
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.2** **Geometric patterns**	**Investigate and extend patterns** • Investigate and extend geometric patterns looking for relationships or rules of patterns: - represented in physical or diagram form - sequences involving a constant difference or ratio - of learner's own creation • Describe observed relationships or rules in learner's own words **Input and output values** Determine input values, output values and rules for the patterns and relationships using flow diagrams **Equivalent forms** • Determine equivalence of different descriptions of the same relationship or rule presented: - verbally - in a flow diagram - by a number sentence	Learners work with patterns that are made from 2-D shapes and 3-D objects or from drawings / diagrams of these shapes and objects. In Patterns, Functions and Algebra we choose geometric patterns that can be re-described using a number pattern this does not mean that it can't be described in words. In fact the description in words is usually the starting point. In Shape and Space learners also work with visual patterns that are geometric. However, in Shape and Space they are only required to describe the patterns using the language of geometry and to make copies of the patterns. While many of these patterns can be described using algebraic expressions, this is beyond the scope of Intermediate Phase learners. Learners show the same patterns in different ways: in a diagram, as a verbal description, as a flow diagram, a table and in a number sentence. Sometimes learners are able to see different aspects of a pattern when they change the form in which the pattern is presented. **What is different to Grade 5?** There is more emphasis on presenting patterns in tables. There is more emphasis on stating the general rule of the pattern. What kinds of geometric patterns should learners work with? The patterns shown below are in picture or diagram form. Learners can also work with patterns which are made from real shapes, or objects concrete apparatus. What kinds of patterns should learners work with? Patterns in which the shapes grow or decrease in different ways. **Examples:** • Patterns in which the shape keeps its form, but gets **larger (or smaller)** at each stage.  • Patterns in which a shape or part of a shape is **added** at each stage. 	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.2** **Geometric patterns**		In each of the examples above the patterns are made by adding the same number of matches. In the top pattern 3 matches are added each time. In the second pattern two matches are added each time. Both patterns are **patterns with a constant difference.** Most geometric patterns learners see in Grade 6 will be patterns with a constant difference**.** They are more likely to get patterns with a constant ratio when working only with number sequences. The pattern below is also a pattern with a constant difference: **two squares are added each time**  • Patterns with neither a constant difference nor a constant ratio **Examples:**  What should learners do? • Copy and extend the pattern. This helps them to understand how the pattern is formed. • Describe the pattern in words. - Different learners will describe different aspects of the pattern - Learners should describe the relationship between shapes in the sequence or rules in their own words. To do this, learners need discuss how they made the pattern or be able to answer the question “How do I get from one stage in the pattern to the next?” • Learners need to have opportunities to see that changing the form of representation e.g geometric to verbal or to a flow diagram or to a table can sometimes help them to understand the pattern in different ways. Learners should “translate” these geometric sequences into other forms of expression or representation namely: - verbally describe the pattern - draw flow diagrams or input–output diagrams - record number sequence in a table-form	

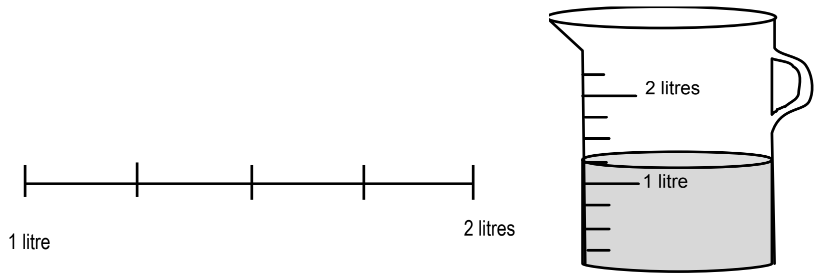
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.2** **Geometric patterns**		**Example:** Extending the pattern:  Describing the pattern in own words "It is a pattern of hexagons" "Each hexagon is bigger than the one before" Describing how they made the pattern or answering the question "How do I get from one stage to the next?" "I added one more match to each side of each hexagon" "Each hexagon has one more match in each side than the hexagon on the left" **Recording the number pattern in a table** When learners fill in a table like the one below, they can begin to see that the number of matches used for each hexagon is 6 multiplied by the position number of the hexagon in the sequence. They will see that the rule is hexagon position number multiplied by 6. Learners can then be asked to predict how many matches will be used for hexagons not built e.g. 10^{th}, 100^{th}, etc. <table><tr><td>**Hexagon number**</td><td>**1**</td><td>**2**</td><td>**3**</td><td>**4**</td><td>**5**</td><td>**10**</td></tr><tr><td>**Number of matches**</td><td>6</td><td>12</td><td>18</td><td></td><td></td><td></td></tr></table>	**6 hours**
SHAPE AND SPACE	**3.3** **Symmetry**	**Recognize, draw and describe lines of symmetry in 2-D shapes**	This should include shapes in which there is more than one line of symmetry. Drawings of 2-D shapes should include those where the line of symmetry is not necessarily vertical.	**2 hours**

<table>
<tr><th>CONTENT AREA</th><th>TOPICS</th><th>CONCEPTS AND SKILLS</th><th>SOME CLARIFICATION NOTES OR TEACHING GUIDELINES</th><th>DURATION (in hours)</th></tr>
<tr>
<td>NUMBERS, OPERATIONS AND RELATIONSHIPS</td>
<td>1.1
Whole numbers
Division</td>
<td>Number range for counting, ordering and representing, and place value of digits
• Order, compare and represent numbers up to at least 9-digit numbers
• Represent prime numbers to at least 100
• Recognize the place value of digits in whole numbers up to at least 9-digit numbers
• Round off to the nearest 5, 10, 100 and 1 000
Number range for calculations
• Division of at least whole 4-digit by 3-digit numbers
• Multiple operations on whole numbers with or without brackets
Calculation techniques
• estimation
• using the reciprocal relationship between multiplication and division
• long division
• building up and breaking down numbers
• rounding off and compensating
• using a calculator
Number range for multiples and factors
• Multiples of 2-digit and 3-digit numbers
• Factors of 2-digit and 3-digit whole numbers
• Prime factors of numbers up to at least 100</td>
<td>What is different to Grade 5?
Initially learners revise and consolidate work done in Grade 5 .i.e. learners divide at least whole 3-digit by 1-digit numbers. Then they move on to divide 4-digit numbers by 3-digit numbers.
Learners should solve problems in contexts and do context free calculations
The following problem types remain important:
sharing, grouping, rate (see the description of problem types at the end of the Grade 6 notes)
Learners should continue to be given problems with and without remainders.
Learners continue to
• check their solutions themselves, by multiplying or using a calculator
• judge the reasonableness of their solutions, by estimating before calculating.
Using multiplying to divide
Example
3 447 ÷ 17
Learners can write out a “clue board” of what they know about multiplying by 17. While they do not know the multiplication table of 17, learners should know 17 x 10 and how to use this to get multiples of 17 x 10, and 17 x 100 and how to use this to get multiples of 17 x 100.
Learners find 17 x 5 by halving 17 x 10
Learners use doubling to find 17 x 2; 17 x 4; 17 x 8.
Learners fill in other multiples as they need to use them
Learners use this to calculate by approximation. Multiplying and then subtracting.
CLUE BOARD
100 x 17 = 1 700
200 x 17 = 3 400
10 x 17 = 170
20 x 17 = 340
5 x 17 = 85
2 x 17 = 34
3 x 17 = 51
<table><tr><td>Multiply</td><td>Subtract</td></tr><tr><td>200 x 17 = 3400</td><td>3447 – 3400 = 47</td></tr><tr><td>2 x 17 = 34</td><td>47 – 34 = 13</td></tr></table>3447 ÷ 17 = 200 + 2 + remainder 13= 202 remainder 13</td>
<td>8 hours</td>
</tr>
</table>

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Division	**Properties of whole numbers** • Recognize and use the commutative; associative; distributive properties of whole numbers • 0 in terms of its additive property • 1 in terms of its multiplicative property **Solving problems** • Solve problems involving whole numbers and decimal fractions, including - financial contexts - measurement contexts • Solve problems involving whole numbers, including - comparing two or more quantities of the same kind (ratio) - comparing two quantities of different kinds (rate) - grouping and equal sharing with remainders	Learners should check their calculations by multiplying: 202x17=202x10+202 x 7 =2020+1414 = 3434 +13 (NOTE: 13 is the remainder) =3447 The size of the numbers required in Grade 6, means that methods used until now can become cumbersome. Now it is advisiableto use the traditional long division method. The skills learnt in previous methods, will now be used in long division. **The long division method:** **Example:** Calculate: 3 848 ÷ 132 26 remainder 52 132 | 3 848 - 2 640 ------▶ 132 x 20 848 - 792 ------▶ 132 x 6 52 Learners should check their calculations by multiplying with or without a calculator. Learners can also check their manual division by dividing on a calculator. **Working with calculators** The mental Mathematics programme contains work on number concept, number facts and mental calculating techniques. Daily work on mental mathematics combined with daily written calculations will prevent learners from becoming dependent on calculators and not knowing how to calculate without them. Use of calculators is a useful way for learners to explore number patterns. They are also helpful when working with very large numbers e.g. multiplying and dividing numbers with more than 4 digits. Learners should be taught how to use calculators including how to clear an incorrectly entered number. Learners should always estimate answers before doing a calculation on a calculator. Learners should estimate whether their answers will be in tens, hundreds, thousands, ten thousands, hundred thousands or millions. For example if multiplying 2 345 x 67, they should be able to estimate that the answer will be in the region of 20 000 x 70 = 140 000	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.3** **Decimal fractions**	**Recognizing, ordering and place value of decimal fractions** • Count forwards and backwards in decimal fractions to at least two decimal places • Compare and order decimal fractions to at least two decimal places • Place value of digits to at least two decimal places **Calculations with decimal fractions** • Addition and subtraction of decimal fractions of at least two decimal places • Multiply decimal fractions by 10 and 100 **Solving problems** Solve problems in context involving decimal fractions **Equivalent forms**: Recognize equivalence between common fraction and decimal fraction forms of the same number	Decimal fraction is a new topic for Grade 6 learners. Learners should already have worked with tenths and hundredths in common fraction form. They should start by rewriting and converting tenths and hundredths in common fraction form to decimal fractions. Where denominators of other fractions are factors of 10 e.g. 2, 5 or factors of 100 e.g. 2, 4, 25, 20, 50 learners can convert these to hundredths using what they know about equivalence Dividing whole numbers by 10, 100, 1 000, etc. helps to build learners' understanding of the place value of the digits in decimal fractions. Calculators can be useful tools for learners to learn about patterns when multiplying or dividing decimal fractions by 10, 100, etc. **Counting in decimals** Learners should not spend a lot of time doing verbal counting in decimals. A more useful exercise is using number chains like the one below: These counting or "adding on" exercises often help learners to increase their understanding of place value.  **Possible error**: At this point learners often lose track of the place value and instead of writing 12 hundredths as 0,12 they write it as 0,012 Exercises like the one above can be checked using calculators and learners can explain any differences between their answers and those shown by the calculator. **Equivalence between common fractions and decimal fraction forms** Learners are not expected to be able to convert all common fraction into its decimal fraction form, merely to see the relationship between tenths and hundredths in their decimal forms. **Calculating using decimals** Learners add and subtract decimal fractions. Learner should estimate their answers before calculating. They should be able to judge the reasonableness of answers and also check their own answers. Understanding place value of digits in decimals will help learners when adding and subtracting. Learners can use the column method as they do with whole numbers. All problem types that are used for whole numbers can be used for decimal fractions. During lessons on measurement, learners can practise what they know about decimals.	**10 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.3** **Capacity / volume**	**Practical measuring of 3-D objects by** estimating, measuring, recording, comparing and ordering **Measuring instruments** measuring jugs **Units** millilitre (ml); litres (l) and kilolitres (kl) **Calculations and problem-solving related to capacity/volume include:** • solving problems in context with capacity • converting between kilolitres, litres and millilitres • conversions should include fraction and decimal forms to 2 decimal places	**What is capacity? What is volume?** Capacity is the amountof substance that an object can hold or the amount of space inside the object. Volume is the amount of space an object occupies. So a bottle can have a 1 litre capacity, but it may not be filled to its full capacity It could, for example, only contain a volume of 250ml **What is different to Grade 5?** • Decimals are introduced. • Kilolitres are introduced. In Grade 6 learners continue work with litres and millilitres, but now they also work with kilolitres. Learners work with the same measuring instruments as they did in Grades 4 and 5 but less emphasis is placed on measuring spoons and cups. Learners need to: • consolidate their sense of how much 1 litre is • consolidate their sense of how much 1 millilitre is • understand and know the relationship between litres and millilitres • understand and know the relationship between kilolitres and litres and millilitres Check whether learners have a sense of which units and instruments are appropriate for measuring which sorts of capacities e.g. What units would you use if you wanted to measure • the amount of water you use in a month • the amount of water to use when mixing baby milk formula for one feed • the amount of water in a full bathtub. What instrument would you use if you wanted to measure: • liquid medicine to give to a baby • milk for a pudding recipe • water to dilute a packet of powdered cool drink. **Measuring capacity and reading capacity measuring instruments** Learners find it easy to measure with measuring spoons or measuring cups, because this only requires filling them and pouring the contents out. Measuring with calibrated measuring jugs or other instruments with numbered and un-numbered gradation lines is more difficult. Learners need to be taught the skills which include	**5 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.3** **Capacity / volume**		• knowing where to stand to read the measuring jug correctly • knowing how to read the numbered gradation lines and to calculate what the un-numbered gradation lines mean Learners need to read • different kinds of measuring jugs • measuring jugs in which the numbered intervals, gradation lines, calibration represent different intervals /amounts. • measuring jugs in which there are a different number of un-numbered intervals within each numbered interval. Learners need practice using examples in which the numbered intervals are divided into: • 2 un-numbered intervals • 4 un-numbered intervals • 5 un-numbered intervals • 10 un-numbered intervals **Example:** Here the numbered gradation lines on the jugs show 1 litre amounts. Think about the gradations as a number line.  There are 4 spaces between each litre. This means that each small space shows 1 000ml ÷ 4 = 250ml The liquid is filled to 1space above 1 litre i.e. 1 000ml + 250ml = 1 250ml It is sometimes easier and cheaper to get a range of syringes with calibrated gradation lines, than it is to get a range of measuring jugs. Learners will learn the same measurement reading skills if they work with syringes rather than jugs.	

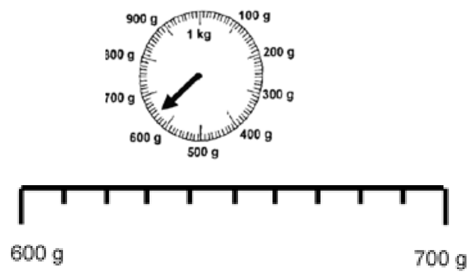
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.3** **Capacity / volume**		**Compare capacities** with up to 6 digits in millilitres and litres Learners should already in previous grades haves equenced containers marked in millilitres and/litres. Here learners need to be able to translate the decimal numbers on some packaging into fractions e.g. 1,5 litres of cool drink is the same as $1\frac{1}{2}$ litres of cool drink. Examples should be chosen to allow learners to realize that the height of a container is not directly proportional to the capacity and that learners need to take into account the diameter of the container. In Grade 6 this can be done as an exercise from the textbook. **Recording capacities** Measurement provides a context within which learners can practise what they have learned about decimal fractions. In Grade 6 they should record capacities as • kilolitres only e.g. $20l$ • litres only e.g. $5l$ • millilitres only e.g. $250ml$ • fractional parts of kilolitres or litre, written either as common or decimal fractions e.g. $2\frac{3}{4}$ litres or 2,75 litres **Calculations including conversions and problem solving** Measurement provides a context in which to practise skills acquired in Numbers, Operations and Relationships. The skills, operations and number ranges required are given below. **Estimate and calculate** using millilitres and litres • rounding numbers up or down to the most appropriate unit of capacity • rounding off to 5, 10, 100 and 1 000 Measurement especially when focusing on measuring instruments can help learners to understand the meaning behind rounding up or down • adding and subtracting numbers Calculations and problems should include fractional parts of litres or kilolitres expressed either as common fractions or decimal fractions up to 2 decimal places • multiplication of up to 4-digit by 3-digit whole numbers • division of up to 4-digit by 3-digit whole numbers • find percentages of whole numbers • multiple operations with or without brackets	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.3** **Capacity / volume**		**Solve problems** relating to capacity • including rate e.g price per liter and ratio problems e.g. increasing ingredients in a recipe by fixed ratios, or calculations where ingredients are mixed in a fixed ratio e.g. 1 part to 4 parts • problems with decimals should be limited to addition and subtraction **Convert** between units: $ml \leftrightarrow l$ $l \leftrightarrow kl$ $ml \leftrightarrow kl$ Conversions can also include converting whole numbers, fractions and decimal fractions.Decimal fraction calculations should be carefully chosen so as only to include, even in the answers, decimal fractions with one or two decimal places. Problems with decimals should be limited to addition and subtraction	
ASSESSMENT: At this stage learners should have been assessed on: • division to 4-digit by 3-digit numbers • 3-D objects				
REVISION				**5 hours**
ASSESSMENT				**6hours**

GRADE 6 TERM 3				
CONTENT AREA	**TOPICS**	**CONCEPTS AND SKILLS**	**SOME CLARIFICATION NOTES OR TEACHING GUIDELINES**	**DURATION (in hours)**
NUMBERS, OPERATIONS AND RELATIONSHIPS	**Mental Mathematics**	**Mental calculations involving**: • Addition and subtraction facts of: - units - multiples of 10 - multiples of 100 - multiples of 1000 • Multiplication of whole numbers to at least 12x12 • Multiplication facts of: - units and tens by multiples of 10 - units and tens by multiples of 100 - units and tens by multiples of 1 000 - units and tens by multiples of 10 000 **Number range for counting, ordering and representing, and place value of digits** • Order, compare and represent numbers to least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 and 1 000 **Calculation techniques** Using a range of techniques to perform and check written and mental calculations with whole numbers including: • estimation • adding, subtracting and multiplying in columns	The mental Mathematics programme should be developed systematically over the year. See Term 1 notes, but notice the increased number range in the column on the left in Term 2	**10 minutes every day**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**Mental Mathematics**	• long division • building up and breaking down numbers • rounding off and compensating • using addition and subtraction as inverse operations • using multiplication and division as inverse operations **Number range for multiples and factors** • Multiples of 2-digit and 3-digit numbers • Factors of 2-digit and 3-digit whole numbers • Prime factors of numbers to at least 100 **Properties of whole numbers** • Recognize and use the commutative; associative; distributive properties of whole numbers • 0 in terms of its additive property • 1 in terms of its multiplicative property		

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.2** **Mass**	**Practical measuring of 3-D objects by** estimating measuring recording comparing and ordering **Measuring instruments** bathroom scales (analogue and digital), kitchen scales (analogue and digital) and balances **Units** grams (g) and kilograms (kg) **Calculations and problem-solving related to mass include** Solve problems in context using mass converting between grams and kilograms conversions should include fraction and decimal forms (to 2 decimal places).	**What is different to Grade 5?** It makes sense to let learners work with digital scales, particularly ones that give readings up to one or two decimal places. Problems, calculations and conversions around mass provide a context for practising calculating with decimal fractions. Supermarkets with electronic scales often print the mass labels including decimal places e.g. 2,25kg potatoes. These contexts can be used to practise the reading, writing and understanding of decimal fractions, and for rounding off, converting, adding and subtracting decimal fractions. In Grade 6 learners work with the same units of mass they worked with in Grades 4 and 5. They also work with the same measuring instruments. Learners need to • consolidate their sense of how much is 1kg • consolidate their sense of how much is 1g • to understand and know the relationship between kilograms and grams. Learners should have a sense of which units are appropriate for measuring which different masses. For example, they need to know which units to use to state the mass of • a cow • a baby • flour for baking a cake • their own mass **Reading scales and balances** Learners need to • estimate mass in grams and kilograms • read kitchen scales (grams and kilograms) bathroom scales (kilograms) and balances scales (grams and kilograms) This includes reading the mass on: • real digital scales • pictures of decimal scales • real analogue scales • pictures of analogue scales	**5 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.2** **Mass**		The skills involved in reading analogue scales include • knowing where to stand to read the scales correctly • Knowing how to read the numbered gradation lines and to calculate what the un-numbered gradation lines indicate. Learners need to read • different kinds of measuring apparatus • apparatus in which the numbered intervals,gradation lines or calibration represent different intervals • Apparatus in which there are a different number of un-numbered intervals within each numbered interval. Learners need practice with examples in which the numbered intervals are divided into - 2 un-numbered intervals - 4 un-numbered intervals - 5 un-numbered intervals - 10 un-numbered intervals **Example:**  Here the numbered lines show 100 g intervals: 100*g*; 200*g*; 300*g*; 400*g*; 500*g*; 600*g*; 700*g*. It is sometimes useful to convert the **circular dial** into a **number line** There are 10 spaces between each 100*g*. Each 100g interval has been divided into 10 smaller spaces. This means that each un-numbered interval shows 100g ÷ 10 = 10*g*	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.2** **Mass**		**Compare, order, sequence masses** of up to 9 digits in grams and kilograms If learners have not in previous grades sequenced containers marked in grams and kilograms, it is worth doing. Choose examples that allow learners to realize that the size of a container or the volume it contains is not directly proportional to the mass because some substances have a greater density than others. Learners should do exercises from their textbook that ask them to order and compare the mass of objects including grocery items labelled in grams and kilograms. Learners should also compare, order, sequence masses stated in different units. **Calculations (including conversions) and problem-solving** Measurement provides a context in which to practise skills acquired in Numbers, Operations and Relationships. The skills, operations and number rangesusing grams and kilograms required are given below. • Rounding numbers up or down to the most appropriate unit of mass • Rounding off to 5, 10, 100 and 1 000 Measurement especially when focusing on reading analogue measuring instruments can help learners to understand the meaning behind rounding up or down • Addition and subtraction Calculations and problems should include fractional parts of kilograms expressed either as common fractions or decimal fractions- up to 2 decimal places • Multiplication of up to 4-digit by 3-digit whole numbers • Division of up to 4-digit by 3-digit whole numbers • Find percentages of whole numbers • Multiple operations with or without brackets **Solve problems** relating to mass • Including rate e.g price per kilogram and ratio problems • problems with decimals should be limited to addition and subtration **Convert** between units: $g \leftrightarrow kg$ Conversions should be given in the following forms: whole numbers, common fractions, decimal fractions up to 2 decimal places This provides a context for learners to practise multiplying and dividing by 1 000 If conversions require more than 2 decimal places e.g. 3 245 grams converted to kilograms learners can continue to write this as 3kg and 245g as in previous grades. On the whole though examples should be chosen to avoid this problem.	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Counting, ordering, comparing, representing and place value of digits	**Number range for counting, ordering, comparing and representing, and place value of digits** • Order, compare and represent numbers to at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 and 1 000	See Term 1 notes, but notice the increased number range in the column on the left in Term 2	**1 hour**
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Addition and Subtraction	**Number range for counting, ordering, comparing and representing, and place value of digits** • Order, compare and represent numbers at least 9-digit numbers • Represent prime numbers to at least 100 • Recognizing the place value of digits in whole numbers to at least 9-digit numbers • Rounding off to the nearest 5, 10, 100 and 1 000 **Number range for calculations** • Addition and subtraction of whole numbers of at least 6-digit numbers • Multiple operations on whole numbers with or without brackets **Calculation techniques** Using a range of techniques to perform and check written and mental calculations of whole numbers including: • estimation	Learners should get a lot of practice adding and subtracting large numbers. Problem situations can become more complex. Learners can also focus on multiple operations, especially in problem contexts. Learners should continue to judge the reasonableness of the solutions and to check their answers. When learners can add and subtract 6 digit numbers confidently, they may beasked to add or subtract very large numbers until more than 6 digits with or without using calculators. The mental Mathematics programme contains work on **number concept, number facts** and **mental calculating techniques**. Daily work on mental Mathematics combined with daily written calculations will prevent learners from becoming dependent on calculators and not knowing how to calculate without them.	**8 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Addition and Subtraction	• adding, subtracting in columns • building up and breaking down numbers • rounding off and compensating • using addition and subtraction as inverse operations • using a calculator **Properties of whole numbers** • Recognize and use the commutative; associative; distributive properties of whole numbers • 0 in terms of its additive property **Solving problems** • Solve problems involving whole numbers and decimal fractions, including - financial contexts - measurement contexts • Solve problems involving whole numbers, including comparing two or more quantities of the same kind (ratio)		
SPACE AND SHAPE	**3.5** **Viewing objects**	**Position and views** Link the position of viewer to views of single or composite objects, or collections of objects, can include both everyday and geometric objects	**What is different to Grade 5?** In Grade 5 learners work with views of single everyday objects or collections of everyday objects. They match views of the object or objects with the position of the viewer. In Grade 6 this is extended to geometric objects or collections of geometric objects or composite geometric objects. Learners are presented with multiple views of an everyday or geometric object or collections of objects or composite geometric objects, as well as positions of viewers in relation to the object or objects. They match each view with a viewer or viewpoint.	**3 hours**

ASSESSMENT:

At this stage learnes should have beeen assessed on:

- mass
- 9-digit numbers
- addition and subtraction of whole numbers
- views

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.1** **Properties of 2-D shapes**	**Shapes learners need to know and name** • Regular and irregular polygons - triangles, squares, rectangles, parallelograms, other quadrilaterals, pentagons, hexagons, heptagons, octagons • Similarities and differences between rectangles and parallelograms **Characteristics learners use to distinguish, describe, sort and compare shapes:** • number of sides • length of sides • size of angles - acute - right - obtuse - straight - reflex - revolution **Further activities to focus learners on characteristicsof shapes** • Draw 2-D shapes on grid paper • Draw circles, patterns in circles and patterns with circles using a pair of compasses	**What is different to Term 1?** Learners draw circles and patterns with circles using a pair of pair of compasses Learners revise and consolidate what they learned in Term 1 (see notes). They also spend time working with a pair of compasseses and drawing circles and patterns in and with circles.	**4 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.4** **Transforma-tions**	**Describe patterns** Refer to lines, 2-D shapes, 3-D objects and/or lines of symmetry and/or rotations and/or reflections and/or translations when describing patterns • in nature, • from modern everyday life • from our cultural heritage **Enlargement and reductions** Draw enlargement and reductions of 2-D shapes to compare size and shape of: • triangles • quadrilaterals	**What is different to Grade 5?** Learners are no longer required to draw composite shapes or tessellations using reflections, rotations, and translations. They are only required to use the transformation concepts in describing patterns. **Use transformation to describe patterns** Learners describe patterns by discussing the shapes they see in the pattern and how they would transform that shape if they wanted to extend the pattern • The pattern I see on the honeycomb looks like a tessellation pattern of hexagons. I can make this pattern by translating the hexagon. • The pattern I see on the bead bracelet looks like a tessellation pattern of triangles. I can make this pattern by reflecting the triangle. • I can make a pattern like the one I see on the doily by translating the parallelogram. **Use symmetry to describe patterns** Learners identify symmetry in patterns. Although learners are not required to draw the patterns in Grade 6, they often find patterns easier to describe, once they have copied or made the patterns. It is useful to link the process of making or copying patterns with the descriptions of patterns from nature, modern everyday life and our cultural heritage. Often the geometrical process you use to make a copy of the pattern is not the same as the original process used to make the pattern. Bees do not tessellate with hexagons to make a honeycomb, but if learners tessellate with a hexagon, they can make a pattern that looks similar to the pattern they see in the honeycomb. **Enlargements and reductions** This can be dealt with in Term 4	**3 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.5 Temperature**	**Practical measuring of temperature by** estimating measuring recording comparing and ordering **Measuring instruments** thermometers (analogue and digital) **Units** degrees Celsius **Calculations and problem-solving related temperature include** Solving problems in contexts related to temperatures	**What is new in Grade 6?** It makes sense to allow learners to read digital thermometers, since the reading is given in a decimal form. Recording, calculating and solving problems concerning temperature can also be used as a context for practising reading and calculating with decimal fractions. Learners need to consolidate their sense of how hot or cold things are when described in degrees Celsius. This can be achieved through learning about common temperature referents, e.g. • The freezing point of pure water is 0°C • The boiling point of pure water is 100°C • The average normal human body temperature is 37°C • daily environmental temperatures **Reading temperature measurement** Learners should read temperatures off pictures of both digital and analogue thermometers. Where possible learners should read temperatures off real of both digital and analogue thermometers. **Reading temperatures and temperature measuring instruments** Reading analogue thermometers requires learners to be able to read off the temperature at numbered and un-numbered gradation lines. In thermometers designed to read the environmental temperatures the un-numbered gradation lines often refer to whole degrees. In thermometers designed to read human body temperature the un-numbered gradation lines often refer to fractions of degrees. **Recording and reporting on temperature measurements** Learners should record and report on whole number temperature measurements read on thermometers. This may involve rounding up or down. They can also record and report temperatures by using decimal fraction notation e.g. 36,7°C **Calculations and problem-solving related to temperature** Calculations and problem-solving related to temperatures should be limited to positive whole numbers and decimal fractions	**1 hour**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.2** **Percentages**	**Calculations** Find percentages of whole numbers **Equivalent forms**: • Recognize equivalence between common fraction and decimal fraction forms of the same number • Recognize equivalence between common fraction, decimal fraction and percentage forms of the same number	**Percentages is a new topic for Grade 6 learners.** Learners have already worked with tenths and hundredths in common fraction form. They should start by rewriting and converting tenths and hundredths in common fraction form to percentages. Where denominators of other fractions are factors of 10 e.g. 2, 5 or factors of 100 e.g. 2, 4, 5, 20, 25, 50 learners can convert these to hundredths using what they know about equivalence. **Equivalence between common fractions and percentage** Learners are not expected to be able to convert any common fraction into its percentage form, merely to see the relationship between tenths and hundredths in their percentage form. Learners should be able to convert any decimal fraction in tenths or hundredths into a percentage. **Calculations** Learners should be able to find percentages of whole numbers e.g. What is 25% of R300? Here learners use what they know about both converting between percentage and common fraction form and also what they know about finding fractions of whole numbers e.g. 25% of R30 = $\frac{1}{4}$ of R300 = R75.	**5 hours**

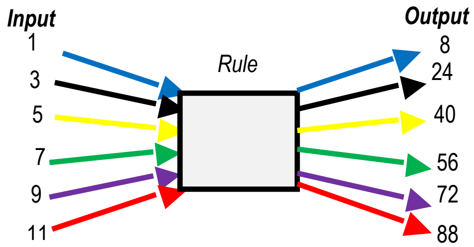
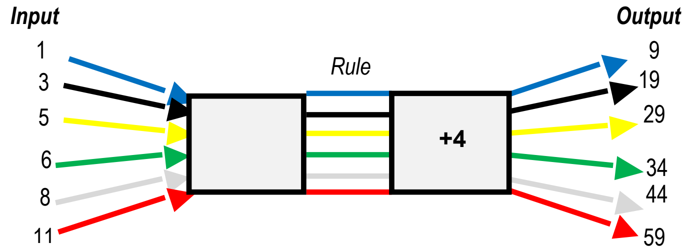
ASSESSMENT:

At this stage learners should have been assessed on:

- 2-D shapes
- transformation especially describing patterns
- temperature
- percentages

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
DATA HANDLING	**5.1** **Collecting and organising data**	Collect data using: • tally marks and tables for recording • simple questionnaires with a (yes/ no type response) order data from smallest group to largest group	Teachers in this phase should ensure that different topics are chosen for data collection in each of the grades. **What is different to Grade 5?** The following are new in Grade 6 • graphs can include data expressed in percentages. This is important in pie charts, but percentages can also be used in bar graphs or double bar graphs • collecting data by using simple questionnaires • double bar graphs • the median of a data set **Complete a data cycle including drawing a double bar graph: context personal data** **This is recommended as the Mathematics project in Grade 6** The complete data cycle includes posing a question, collecting, organising, representing, analyzing, interpreting data and reporting on the data. Learners work through the whole data cycle to make an individual double bar graph using contexts that relate to themselves, their class, their school or their family. Suitable topics include: • favourite sports / favourite movies / favourite music / favourite TV programmes / foods or cool drinks/ favourite colours, etc. Include boys versus girls • heights of learners in class. Include boys versus girls • mass of learners in class. Include boys versus girls • shoe size of learners in class. Include boys versus girls **Analysing ungrouped numerical data using measures of central tendency** Learners find the mode and median of ungrouped numerical data sets. Suitable topics include: • heights of learners in class • mass of learners in class • shoe sizes of learners in class • average time taken to get from home to school • number of people staying in homes of learners in the class • temperatures for a month	**9 hours**
	5.2 **Representing data**	Draw a variety of graphs to display and interpret data including: • pictographs (many-to-one correspondence) • bar graphs and double bar graphs		
	5.3 **Analysing, Interpreting and reporting data**	Critically read and interpret data represented in • words • pictographs • par graphs • double bar graphs • pie charts **Analyse data by answering questions related to:** • data categories, including data intervals • data sources and contexts • central tendencies (mode and median) **Summarise data verbally and in short written paragraphs that include** • drawing conclusions about the data • making predictions based on the data **Examine ungrouped numerical data to determine** • the most frequently occurring score in the data set called the mode • the middlemost score in the data set called the median of the data set		

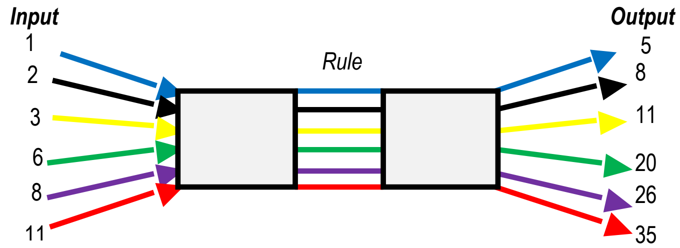
CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
DATA HANDLING			**Analysing graphs** Analyse graphs on environmental or socio-economic contexts by answering questions on graphs. Both graphs and questions must be provided by the teacher or a textbook. Learners should work with at least • 2 pie charts involving percentages • 2 double bar graphs Suitable topics include: • populations of the provinces of SA • percentage of foreign tourists from different countries visiting SA • percentage of pregnant women who are HIV positive in each province • percentage of population with access to safe drinking water in countries in Africa • infant mortality rates per country in Southern Africa • common causes of death in children in SA • quantities of materials recycled in the town, province, country • quantities of recycling materials collected by schools around the country • amount of water stored in dams in your province • comparison of the rainfall of a summer rainfall and a winter rainfall town • percentages of girls and boys who smoke in Grades 6 – 10 or age group 12 – 18 • Size of rural and urban population per province in SA • Size of rural and urban population per country in Southern Africa **Developing critical analysis skills** Learners compare graphs on the same topic but where data has been collected from different groups of people, at different times, in different places or in different ways. Here learners will be able to discuss the differences between the graphs. The aim is also for learners to become aware of factors that can impact on the data. Learners should do at least one example. Learners can summarize the findings of their comparison in a paragraph for at least one example. Examples could include: • comparing data about cars that pass the school at different times or comparing data about cars that pass different venues (busy and quiet areas, poorer and richer areas, etc.) • comparing national data from Statistics South Africa (StatsSA) to data collected at your school e.g. sources of heating, sources of lighting, sources of water • comparing data collected over a month or over a year, e.g. average rainfall figures for different towns for a month or for a year	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.1** **Numeric patterns**	**Investigate and extend patterns** • Investigate and extend numeric patterns looking for relationships or rules of patterns: - sequences involving a constant difference or ratio - of learner's own creation • Describe observed relationships or rules in learner's own words **Input and output values** Determine input values, output values and rules for patterns and relationships using flow diagrams **Equivalent forms** Determine equivalence of different descriptions of the same relationship or rule presented • verbally • in a flow diagram • by a number sentence	In Term 1 learners worked with flow diagrams in order to learn about • multiplication and division as inverse operations • multiplication of units by multiples of ten, multiples of 100 , multiplies of 1 000 • the associative property of whole numbers and how this property can be used when multiplying numbers. **Flow diagrams** are further developed in this term. Learners also work with number sequences. Learners have been working with flow diagrams since Grade 4. Towards the end of Grade 6 the focus can be on "finding the rule". First these can be flow diagrams in which there is a "one stage rule" i.e. add; or subtract or multiply or divide. **Example:** Determine the rule  Then they can work with examples which have a two-stage rule e.g. multiply and then add, where one stage is left out **Example:** Determine the rule 	**5 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.1** **Numeric patterns**			

Example where learners have to find a rule involving 2 operations

Determine the rule



Learners can do similar examples using a table format.

Start with a simple example where the rule has one operation.

Input	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Output	17	34	51		70					170

Learners should state the rule e.g. in this case “input value x17”

Then do more complicated examples where the rule invovles two operations

Input	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Output	3	3,5	4	4,5	5					7,5

Learners should not only complete the table, because this can sometimes be done by counting on. They should also try to state the rule e.g. “add 5 to the input value and then diveide by 2.

Sequences of numbers:

In the Intermediate Phase learners extend sequences of numbers. In Grade 6 they study:

- sequences involving a constant difference
- sequences involving a constant ratio
- sequences without a constant difference or ratio

Examples of patterns with a constant difference

- 125; 250; 375; 500;…
- 16; 14; 12 …

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**2.1** **Numeric patterns**		In the example above learners are subtracting 2 to create the pattern. Learners may describe it as a pattern of counting back in twos. Learners should also be given examples which do not start on a multiple of the number they are adding or subtracting. **Examples:** a)1; 4; 7; 10; … b)87; 66; 45; ... c)857; 807; 757; 707; … Patterns involving a constant ratio: In the sequence 400, 200, 100, ... all the numbers are multiples of 2 and learners must divide by 2 to get the next number. Learners should also be given examples in which the numbers in the sequence are not multiples of the number they are multiplying or dividing by, e.g. 8; 24; 72;... **Examples** of patterns without a constant difference or ratio: a)1; 2; 4; 7; 11; 16; b)1; 6; 3; 8; 5; 10; 7 ……..	
MEASUREMENT	**4.1** **Length**	**Practical measuring of 2-D shapes and 3-D objects by** estimating, measuring, recording, comparing and ordering **Measuring instruments** rulers, metre sticks, tape measures, trundle wheels **Units** millimetres (mm), centimetres (cm), metres (m), kilometres (km) **Calculations and problem-solving related to length** Solve problems in contexts related to length Conversions include converting between any of the following units: millimetres (mm), centimetres (cm), metres (m) and kilometres (km) Conversions should include fraction and decimal forms (to 2 decimal places)	In Grade 6 learners work with the same units of length that they worked with in Grades 4 & 5 .They also work with the same measuring instruments. Check whether learners understand which units and instruments are appropriate for measuring which lengths, heights and distances. Learners should understand which units are appropriate for measuring various lengths or distances. They need to know which units to use in order to find: • the length and width of a desk • the distance to the next town • the length of a nail Learners must know which instrument to use to measure: • the length and width of a desk • the length of a classroom • the length of a rugby field **What is different to Grade 6? Decimals are introduced.** This allows learners to express conversions and parts of measures in decimal fraction form to one or two decimal places. Use the contexts of length measurement to practise the reading, writing and understanding of decimal fractions, and for rounding off, converting, adding and subtracting with decimal fractions.	**5 Hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.1** **Length**		**Reading instruments for measuring lengths** Learners should measure lengths using • rulers (mm, cm) • metre sticks (m) • tape measures (m, cm, mm) • trundle wheels (in m) Learners find rulers easy to use for measuring because • centimetres are always numbered • there are always 10mm divisions in a centimetre **Stating and recording length measurements** In Grade 6 learners should be given opportunities to record their measurements using rulers, in decimal fraction from e.g. e.g. the eraser is 2,5cm long. Tape measures that are longer than 1m and 2m should also be used e.g. builder tapes or surveyor tapes can be more than 10 metres. The longer measuring tapes are more difficult to use. Learners can't only read off the number at the end of the distance. They also need to know how many metres they have unrolled the tape. For example, the distance may be 4m and 78cm, but at the end of the object / distance the tape may only show the number 78. With these longer tape measures estimation becomes even more important. Recording this in one unit of measurement can also become more complex: in this example 4,78m or 478cm. But if the measurement is 4m and 7cm, learners need to remember to convert correctly into 4,07m or 407cm **Compare and order lengths** up to 9 digits in mm, cm, m, km In the Intermediate Phase learners need to work with drawings of objects with specified lengths, or written descriptions of objects with specified lengths. In Grade 6 the focus is on comparing lengths given in decimal form **Calculations (including conversions) and problem-solving** Measurement provides a context in which to practise skills acquired in Numbers, Operations and Relationships. The skills, operations and number ranges required are given below.	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.1 Length**		**Estimate and calculate** using mm, cm, m, km • round numbers up or down to the appropriate unit of length • rounding off to 5, 10, 100, 1 000 (reading measurements from rulers and tape measures can help learners to understand the meaning behind rounding up or down) • addition and subtraction calculations can include calculations with common fractions and decimal fractions to 2 decimal places • multiplication of 4-digit by 3-digit numbers • division of 4-digit by 3-digit numbers • find percentages of whole numbers • multiple operations with or without brackets **Solve problems relating to distance and length** • Include rate and ratio problems. • Problems with decimals should be limited to adding and subtracting the numbers. **Conversions b**etween units • $mm \leftrightarrow cm$ • $cm \leftrightarrow m$ • $m \leftrightarrow km$ • $mm \leftrightarrow m$ • $mm \leftrightarrow km$ • $cm \leftrightarrow km$ using whole numbers, common fractions and decimal fractions. This provides a context for learners to practise multiplying and dividing by 10, 100 and 1 000. If conversions require more than 2 decimal places e.g. 3245m converted to kilometres, learners can continue to write this as 3km and 245m as they have in previous grades. On the whole though examples should be chosen to avoid this problem.	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
ASSESSMENT: At this stage learners should have been assessed on: • data handling • number patterns • length				
		REVISION		**3 hours**

GRADE 6 TERM 4				
CONTENT AREA	**TOPICS**	**CONCEPTS AND SKILLS**	**SOME CLARIFICATION NOTES OR TEACHING GUIDELINES**	**DURATION (in hours)**
NUMBERS, OPERATIONS AND RELATIONSHIPS	**Mental Mathematics**	**Mental calculations involving**: • Addition and subtraction facts of: - units - multiples of 10 - multiples of 100 - multiples of 1000 • Multiplication of whole numbers to at least 12x12 • Multiplication facts of: - units and tens by multiples of 10 - units and tens by multiples of 100 - units and tens by multiples of 1 000 - units and tens by multiples of 10 000 **Number range for counting, ordering and representing, and place value of digits** • Order, compare and represent numbers to at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 and 1 000 **Calculation techniques** Using a range of techniques to perform and check written and mental calculations with whole numbers including: • estimation	See the notes in Term 2, but be aware that number ranges have increased. The increased number ranges are shown in the column on the left. The mental Mathematics programme should be developed systematically over the year.	**10 minutes every day**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**Mental Mathematics**	• adding, subtracting and multiplying in columns • long division • building up and breaking down numbers • rounding off and compensating • using addition and subtraction as inverse operations • using multiplication and division as inverse operations **Number range for multiples and factors** • Multiples of 2-digit and 3-digit numbers • Factors of 2-digit and 3-digit whole numbers • Prime factors of numbers to at least 100 **Properties of whole numbers** • Recognize and use the commutative, associative and distributive properties of whole numbers • 0 in terms of its additive property • 1 in terms of its multiplicative property		

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers:** Counting, ordering and representing and place value of digits	**Number range for counting, ordering and representing, and place value of digits** • Order, compare and represent numbers at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 and 1 000 • Round off to the nearest 10, 100 and1 000.	See Term 1 notes, but notice the increased number range in the column on the left in Term 2	**1 hour**
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Multiplication	**Number range for counting, ordering and representing, and place value of digits** • Order, compare and represent numbers at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 and1 000 **Number range for calculations** • Multiplication of at least whole 4-digit by 3-digit numbers • Multiple operations on whole numbers with or without brackets **Calculation techniques** • estimation • multiplying in columns	This is further practice of multiplication of 4-digit by 3-digit numbers done in Term 2. Refer to those notes.	**5 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Multiplication	• building up and breaking down numbers • rounding off and compensating • using a calculator **Number range for multiples and factors** • Multiples of 2-digit and 3-digit numbers • Factors of 2-digit and 3-digit whole numbers • Prime factors of numbers to at least 100 **Properties of whole numbers** • Recognize and use the commutative, associative and distributive properties of whole numbers • 0 in terms of its additive property • 1 in terms of its multiplicative property **Solving problems** • Solve problems involving whole numbers and decimal fractions, including: - financial contexts - measurement contexts • Solve problems involving whole numbers, including the following types of problems: - comparing two or more quantities of the same kind (ratio) - comparing two quantities of different kinds (rate)		

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.2** **Common fractions**	**Describing and ordering fractions** • Compare and order common fractions, including specifically tenths and hundredths **Calculations using fractions** • Addition and subtraction of common fractions with denominators which are multiples of each other. • Addition and subtraction of mixed numbers • Fractions of whole numbers **Solving problems** • Solve problems in contexts involving common fractions, including grouping and sharing **Percentages** • Calculate percentages of whole numbers **Equivalent forms:** • Recognize and use equivalent forms of common fractions with 1-digit or 2-digit denominators with denominators which are multiples of each other • Recognize equivalence between common fraction and decimal fraction forms of the same number • Recognize equivalence between common fraction, decimal fraction and percentage forms of the same number	This is revision and consolidation of the concepts developed in Term 2. See Term 1 notes. However, since decimals and percentages have both been done, it is useful to practise equivalence between the common fraction, decimal fractions and percentage forms of the same number in Term 4.	**5 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
ASSESSMENT: At this stage learners should have been assessed on: • 9-digit numbers • multiplication with up to 4-digits by 3-digits • fractions				
	3.2 **3-D objects**	**Objects learners need to know and name** • Rectangular prisms • Cubes • Tetrahedrons • Pyramids • Similarities and differences between tetrahedrons and other pyramids **Charateristics which learners use to distinguish, describe, sort and compare objects** Describe, sort and compare 2-D shapes and 3-D objects in terms of: • number and shape of faces • number of vertices • number of edges **Further activities to focus learners on characteristics of objects** Create 3-D models using • drinking straws, toothpicks, etc. to make a skeleton • nets	**What is different to Term 2?** • Learners build skeleton objects using drinking straws • Learners count the number of vertices of objects. In Term 4 learners should consolidate what they learnt about 3-D objects earlier in the year. This includes working with all of the objects described in the column on the left. Learners focused on the kind of surface and the shape and number of faces. They built objects using nets in Term 2. In Term 4 learners can build skeleton shapes with straws or toothpicks. They will then focus on the edges and vertices of the objects. This means that by the end of the year they will be able to describe 3-D geometric objects according to the number and shape of faces and the number of edges and vertices of 3-D Objects. Learners need to work with real objects. However, they also need to do written exercises on 3-D objects. Interpreting pictures about 3-D objects is more difficult than working with the real objects. Learners should practise interpreting drawings of 3-D objects. They should identify and name 3-D objects in drawings; identify everyday objects that look like geometric objects (e.g. a milk carton looks like a rectangular prism), match nets of objects to drawing of objects, describe 3-D objects by stating the number of flat and/or curved surfaces, the number of vertices, edges, and number and shape of faces when shown drawings of 3-D objects.	**5 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.6** **Perimeter, area and volume**	**Perimeter** Measure perimeter using rulers or measuring tapes	Learners are not required to know or apply formulae for the perimeter, area or volume of any shape or object in the Intermediate Phase. Area and volume are only measured informally in the Intermediate Phase. **Perimeter** In Grade 6 learners measure the perimeters of shapes and spaces with rulers and measuring tapes. They are required to state and record this measurement in standard units: mm, cm, m. They are also required to work from drawings in which side lengths are specified in mm / cm / m / km. Here they add up the distances. At times in Grade 6 they will also count the lengths of the perimeters by counting the number of sides of square grids on which shapes are drawn or placed. Here learners need to know that the diagonal distances between corners of a grid square are longer than the vertical or horizontal distances between corners of a grid square. No formulae for perimeters of shapes are required	**7 hours**
		Measurement of area • Continue to find areas of regular and irregular shapes by counting squares on grids • Develop an understanding of why the area of rectangles can be described as their length multiplied by their width	**Area** In Grade 6 area measurements continue to be informal. Learners should examine the areas of • regular shapes where the sides are all the same length with straight sides • irregular shapes where the sides are not all the same length with straight sides • shapes with curved sides. Learners continue to count how many grid squares are covered by the shape. The area is stated in number of grid squares. Learners have been stating the areas of shapes in terms of squares counted since Grade 4. In Grade 6 they should investigate why the area of a rectangle can be stated as its length multiplied by its width. They are not required to know this formula off by heart, nor are they required to apply this formula in area calculations. The relationship between the area and perimeter of rectangles and squares. This investigation can be done as an Assessment Task. There are two different investigations that learners can do. • If learners are given the perimeter of a rectangle, they can draw a number of rectangles of differing areas. Does this also work with squares? Similarly if they are given the area of a square, there will only be one possibility for the length of the sides. Is this the same for rectangles? • Investigating the relationship between the areas and perimeters of squares and rectangles can be combined with the shape and space requirement. Draw enlargements and reductions of 2-D shapes using grid paper to compare their size and shape.	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
MEASUREMENT	**4.6** **Perimeter, area and volume**	**Measurement of volume** • Continue to find volume/capacity of objects (by packing or filling them. • Develop an understanding of why the volume of rectangular prisms can be described as their length multiplied by their width multiplied by their height **Investigate the:** • relationship between perimeter and area of rectangles and squares • relationship between surface area and volume of rectangular prisms	Here learners can draw a square or rectangle with specified side lengths. Then they can investigate what happens to the area of the shape, if the length of one pair of opposite sides of the shape are doubled or halved. **Volume** In Grade 6 learners continue to • count how many cubes or rectangular prisms they use to fill a container. The volume of the container is stated in number of cubes or rectangular prisms such as boxes or blocks. • make stacks with cubes or rectangular prisms. The volume of the stack is stated in number of cubes or rectangular prisms such as boxes or blocks. • interpret pictures of: - stacks made of cubes / rectangular prisms so that they are able to state the volume in terms of the number of cubes / rectangular prisms - containers filled with cubes / rectangular prisms so that they are able to state the volume in terms of the number of cubes / rectangular prisms.	
MEASUREMENT	**4.7** **History of measurement**	Know how people measured and recorded measurement in the past.	Here learners should read and discuss a short history of measurement provided in the textbook.	**1 hour**

ASSESSMENT:

At this stage learners should have been assessed on:

- 3-D objects
- area and rerimeter
- volume

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Division	**Number range for counting, ordering, comparing and representing, and place value of digits** • Order, compare and represent numbers up to at least 9-digit numbers • Represent prime numbers to at least 100 • Recognize the place value of digits in whole numbers to at least 9-digit numbers • Round off to the nearest 5, 10, 100 and 1 000 **Number range for calculations** • Division of at least whole 4-digit by 3-digit numbers • Multiple operations on whole numbers with or without brackets **Calculation techniques include** • estimation • using the reciprocal relationship between multiplication and division • long division • building up and breaking down numbers • rounding off and compensating • using a calculator **Number range for multiples and factors** • Multiples of 2-digit and 3-digit numbers • Factors of 2-digit and 3-digit whole numbers	This is further practice of division of 4-digit numbers by 3-digit numbers done in Term 2. Refer to those notes	**7 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
NUMBERS, OPERATIONS AND RELATIONSHIPS	**1.1** **Whole numbers** Division	• Prime factors of numbers to at least 100 **Properties of whole numbers** • Recognize and use the commutative, associative distributive properties with whole numbers • 0 in terms of its additive property • 1 in terms of its multiplicative property **Solving problems** • Solve problems involving whole numbers and decimal fractions, including - financial contexts - measurement contexts • Solve problems involving whole numbers, including - comparing two or more quantities of the same kind (ratio) - comparing two quantities of different kinds (rate) - grouping and equal sharing with remainders		

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**Number sentences** (introduction to algebraic expressions)	**Number sentences** • Write number sentences to describe problem situations • Solve and complete number sentences by: - inspection - trial and improvement • Check answers by substitution	This is a continuation of the work done on number sentences in Term 1. In this term learners are given practice in writing number sentences to describe problem situations. Learners have the opportunity to practise a mixture of all problem types see the notes on problem types at the end of the grade that they have encountered so far during the year. See the notes. As before, number sentences are used to develop the concept of equivalence, but they can also relate to all aspects of number work covered during the year. If learners have not had experience of answering multiple choice questions, then provide examples in the second half of the year to prepare them for this format which is commonly used in systemic external tests. A number sentence can also consolidate the idea of expressing a rule For which pair of numbers does the rule “multiply the first number by 7 and then subtract 5 to get the second number apply“? (a) 11✧2 (b) 5 ✧30 (c) 30✧ 5 (d) 3 ✧10 In Term 1 we used number sentences to focus learners’ attention on the properties of operations. Learners should now focus more on the concept of equivalence. **Examples** focusing on the properties of arithmetic Which of the following will always have the same value as 17 x ☐? a) ☐ + 17 b) ☐ – 17 c) ☐ x 17 d) 9 + ☐ Which statement below is equivalent to: (26 x 39) + (26 x 1)? a) 26 x 27 b) 400 c) 26 x 4 d) 26 x 40	**3 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
PATTERNS, FUNCTIONS AND ALGEBRA	**Number sentences** (introduction to algebraic expressions)		By how much is 34 x 17 less than 35 x 17? a) 1 b) 17 c) 35 d) 65 Which of the statements below are equivalent to: 15 x (4 x 9)= ? a) (15 x 4) x 9 b) 15 x 2 x 2 x 3 x 3 c) (15 x 4) + (15 x 9) d) (10 – 1)(15 x 4) Choose the correct answer to (48 x 48) + (48 x 2) a) 2 400 b) 4 000 c) 4 800 d) 9 600 Learners can be challenged to use what they know about equivalence and applying it to a number sentence in which the parts are not equal. Which of the following values will make the number sentence true: 4 x ☐ < 17? a) 5 b) 4 c) 3 d) 2 e) 1	

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
SPACE AND SHAPE	**3.4** **Transforma-tions**	**Describe patterns** Refer to lines, 2-D shapes, 3-D objects and/or lines of symmetry and/or rotations and/or reflections and/or translations when describing patterns • in nature • from modern everyday life • from our cultural heritage **Enlargement and reductions** Draw enlargement and reductions of 2-D shapes to compare size and shape of • triangles • quadrilaterals	**What is different to Term 3?** Learners should focus on drawing enlargements and reductions in this term. This links with work that they have done on area. Learners can revise using language of transformation to describe patterns see notes Term 3 notes. **Enlargements and reductions** Learners draw a larger or smaller copy of a triangle by increasing or decreasing the lengths of all sides by the same ratio, e.g. doubling. This is a practical geometrical ratio problem. Learners discuss what has changed and what has stayed the same regarding shape and size. Learners draw larger or smaller copies of quadrilaterals by increasing or decreasing the lengths of one or both pairs of opposite sides of quadrilaterals. See area investigation under Measurement.	**3 hours**
SPACE AND SHAPE	**3.6** **Location and directions**	**Location and directions** Locate position of objects / drawings/ symbols on grid with alpha-numeric grid references Locate positions of objects on a map by using alpha-numeric grid references Give directions to move between positions or places on a map	Cells in a grid are often labelled with a letter and a number e.g. D4; A3; E7. This is called alpha-numeric referencing. **What is different to Grade 5?** In Grade 5 learners locate objects on grids and maps using alpha-numeric codes. They follow directions to trace a path between positions on a map with a grid. In Grade 6 they give directions to move between positions on a grid or map. In Geography in Grades 4 & 5 learners give directions using left and right, landmarks, street names, and compass directions. The work is developed in Geography and practised in Mathematics. In Geography and Mathematics in Grade 4 & 5 learners work with alpha-numeric grids and maps with alpha-numeric codes. Locating positions in an alpha-numeric grid and giving directions for moving between positions on the grid are skills learners should already have mastered. These skills are merely practised and consolidated in Mathematics	**2 hours**

CONTENT AREA	TOPICS	CONCEPTS AND SKILLS	SOME CLARIFICATION NOTES OR TEACHING GUIDELINES	DURATION (in hours)
DATA HANDLING	**5.1** **Probability**	Perform simple repeated events and list possible outcomes for events such as: • tossing a coin • rolling a die • spinning a spinner Count and compare the frequency of actual outcomes for a series of trials: • Up to 50 trials	**Performing simple repeated events** Learners need to perform experiments by tossing a coin, rolling a die or spinning a spinner. Doing experiments with a coin is easier than with a die because the coin can only have two outcomes (heads or tails), while rolling the die can have 6 outcomes (numbers 1 - 6). The spinner can have any number of outcomes, depending on the number of divisions made on the spinner. Learners must first list the possible outcomes before doing the experiments. They should learn how to record the results of their experiments in a table using tally marks. Learners then count how many times heads or tails, or each number, or colour on a spinner, occurs in 20 trials. If learners do this in groups, the results from all the groups can be collated. They can then compare the number of outcomes that occur as the number of trials increase.	**2 hours**
ASSESSMENT: At this stage learners should have been assessed on: • division with up to 4-digit numbers by 3-digit numbers • number Sentences • transformations • probability				
REVSION				**6 hours**
ASSESSMENT (end of the year)				**6 hours**

Problem type	Additional notes	Examples
Summation	A sum	A man buys a specific brand of DVD players for all his stores. He buys 126 789 black, 341 567 white and 344 532 silver DVD players. How many DVD players did he buy altogether?
	Missing part of a given sum	Farm workers picked 342 345 pears during the morning. After lunch they picked some more. By the end of the day, they had 866 589 pears. How many pears did they pick after lunch?
Increase and decrease	Calculate the result	The price of anumber of containers of sugar is R268 231. Water leaked into some of the containers and the price was decreased by R43 789. Calculae the decreased price of the sugar?
	Calculate the change	A clothing factory generated R864 328 during November. During December, the amount decreased to R367 435. How much less money did the factory generate during December than in November?
	Calculate the initial result	A farmer struggled to sell his farm. He decreased the original price of his farm by R10 456. He sold the farm for R985 787. What was the original price that the farmer wanted for his farm?
Grouping	• Grouping problems that are solved with division and/or repeated subtraction • Answers to problems have or do not have remainders	A rich man gave 5375 toys packed in boxes to a school. Each box contained 126 toys. How many boxes of toys did the school get?
	• Grouping problems that are solved with multiplication and/or repeated addition • Answers to problems have or do not have remainders	This year a company gave 523 boxes of rugby balls to schools. Each box contained 3 126 rugby balls. How many rugby balls did the company give away?
	• Grouping problems in an array form • These problems can be solved using division (or repeated subtraction) or multiplication (repeated addition)	A farmer wants to plant 6 708 apple trees. He wants to plant the same number of trees in each of 156 rows. How many apple trees must he plant in each row?
Sharing	• Sharing problems can be solved using division/repeated subtraction • Smaller groups of equal size are formed from a given quantity or number • Answers to calculations that have remainders can lead to the concept of common fractions decimal fractions - see Grade 4 example	A man owns 346 shops. He bought 8 654 radios on sale and shares them equally between these shops. How many radios does each shop get?
Comparison by difference		Thombi spent R175 322 on building materials for his house. Ziggi spent R25 789 more than Thombi on building materials. How much money did Ziggi spend?
Treating groups as units		Houses in a town need new toilets. 123 toilets will cost the municipality R4 132. How much will 17 835 of these new toilets cost?

Problem type	Additional notes	Examples
Rate	• Calculate the total if given rate per object • Calculate the rate per object • First calculate the rate and then apply it to generate more information	A second hand MP3 player costs R145. How much will 3 445 of the same MP3 players cost? 156 pairs of shoes cost R7 020. How much will one pair of the same shoes cost? If 12 chairs cost R2 808, how much will 2 567 of the same chairs cost?
Comparison by ratio		Zwi collected 132 bottles for recycling. Her friend collected $\frac{5}{6}$ of this number of bottles. How many bottles did the friend collect?
Proportional sharing		Denozo works for 8 days and Chino works for 7 days at a building site. Together they are paid R6 780. How should the money be shared fairly between the two to show the number of days each worked?

Meaning of the fraction	Grade 6
Part of a whole where the whole is a single object	Susan eats one half of a chocolate bar. The remainder is equally divided between two friends. How much does each one get? Show your answer in a drawing.
Part of a whole where the whole is a collection of objects	During the holidays, Avril spends $\frac{1}{3}$ of his day watching TV and $\frac{1}{4}$ of his day sleeping. How many hours of his day are left?
Relationship	The son earns $\frac{20}{100}$ of what his father earns per month. If his father earns R18 000 per month, how much does the son earn?
Ratio	$\frac{2}{5}$ cup of milk is needed to make 40 biscuits. How many cups are needed for 2 000 biscuits? Or is 10litre of milk enough to bake 2 000 of these biscuits?
Comparison comparator	What is the longest? $\frac{6}{100}$ of a metre or $\frac{7}{10}$ of a metre of material?
Unit of measurement	Nomfundo needs $2\frac{2}{10}$ metres of rope to make a basked. How many baskets can she make with $28\frac{1}{5}$ metres of rope?
Number	Indicate the position of the numbers 0,1; $\frac{8}{10}$; $\frac{2}{5}$; $1\frac{40}{100}$ on a number line
Fractional parts put together to make a whole (iterative)	On a sports day, 500 children get: $\frac{20}{100}$ of a bottle of cool drink and $\frac{4}{10}$ of a bar of chocolate. How many bottles and chocolate bars are needed to serve all the children?
Operator	Calculate: $\frac{2}{3}$ x336