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CONTENTS

MATHEMATICS

Introduction

Mathematics in the Foundation Based Education (FBE) classroom is developmental. Students are actively engaged in constructing their own knowledge of mathematical concept. Math activities are therefore integrated with other relevant projects in other domain areas. Skills are acquired through discovery, projects and real life experiences. Students come to each classroom with varying levels of mathematical competence. In order to meet the developmental needs of each student, the broad goals of the mathematics program enable students to:

- Become actively involved in organizing, managing and reviewing their own learning
- Organize their own problem solving strategies
- Develop their understanding of mathematical concepts, facts and skills by exploration, acquisition, consolidation and application.
- Apply mathematics to everyday life
- Exchange points of view thoughtfully with others by using appropriate mathematical vocabulary, language, symbols, diagrams and models.
- Experience the excitement of mathematics and enjoy learning.

In planning for Mathematics the teacher should plan to:

- Provide a balanced experience that includes exploration, acquisition, consolidation and application of knowledge and skills with opportunities to use, extend and test ideas, thinking and reasoning.
- Share the excitement of learning mathematics by showing the students the unusual or unexpected; giving them examples of numbers or shapes that have special or surprising properties and showing them how mathematics can be used creatively to represent, measure, predict and extrapolate to other situations.
- Model how to explore mathematics and look for patterns, rules and properties; facilitate learning by providing examples that enable the students to observe and identify the rules and laws and deduce for themselves when they apply and help them to describe, replicate and use patterns and properties.
- Give students opportunities to consolidate their learning; introduce frequent and regular periods of practice that are short, sharp and focused on them securing, with the necessary accuracy and precision, the mathematical knowledge, understanding and skills they have learned and ensure that they recognize how their learning builds on previous learning helping them to see connections.

- Engage with student's thinking; giving them sufficient time for dialogue and discussion and space to think about their ideas, methods and mathematical representations of the real world and focus on underlying concepts and processes with prompting and probing questions.
- Demonstrate and promote the correct use of mathematical vocabulary and the interpretation and use of symbols, images, diagrams and models as tools to support thinking, problem solving, reasoning and communication.
- Provide students with the well-directed opportunity to use and apply what they have learned to solve routine and non-routine problems; highlight any properties or patterns they identify or create and make connections to other work they have done; draw on their ideas and model approaches and strategies students can use to support a line of enquiry or to interpret or explain their results and methods, using their own approaches and strategies.
- Teach students how to evaluate solutions and analyze methods, deciding if they are appropriate and successful; help students to understand why some methods are more efficient than others; provide opportunities to compare and measure objects and identify the extent to which shapes and calculations are similar or different; develop student's understanding and language of equivalence and deduction to support reasoning and explanation.
- Periodically identify the knowledge, skills and understanding students acquire; pause and take stock to review student's learning with them; highlight the strategies and processes upon which they are able to draw; provide opportunities that allow students to make connections and show how ideas in mathematics relate, and how their learning can be applied to new aspects of mathematics.
- Model with students how they identify, manage and review their own learning; highlight the learning skills they have acquired and used and draw out how these might be applied across the curriculum.

Mathematics instruction in the FBE classroom has three main components: Shared Math, Guided Math and Experiential Math.

- Shared Math is a 10 – 15 minute, whole class activity during which students explore a particular mathematical concept or problem. It gives students the opportunity to explain their thinking, develop understanding and gain confidence in their own level of development
- Guided Math is a small group activity where the teacher instructs small groups of students according to their needs and stage of development
- Experiential Math is achieved by allowing the students to engage in math activities in open-ended mathematics centres. Students should also be involved in projects, playing math games and 'Daily Living Math' such as collecting snack money; taking attendance, distributing materials and service projects.

Mathematics instruction in the FBE classroom also requires that a specific mathematics area is tackled each day. The six main areas are:

- Number and Numeration
- Operations of Whole Numbers
- Problem Solving
- Rational Numbers
- Measurement
- Geometry

When the teacher is facilitating the Guided Math session he or she plans activities that start at the **concrete le**vel using manipulatives only. Next he or she moves to the **transitional level** (semi- concrete) where manipulatives and drawings / diagrams are used. Finally, the teacher plans activities at the **abstract level** when the students are able to work without manipulatives.

This curriculum gives suggestions for activities for Shared Math, Guided Math and Math Centres as well as resources. It also gives examples of problems that can be used to teach or assess mastery of given target behaviours. This curriculum is to be used as a guide for planning instruction and as a catalyst for creating one's own instructional activities to suit the needs of the students in a particular class. The Curriculum writers hope that you will use this document to plan an enjoyable, purposeful, progressive and integrated mathematics experience for the students in your class.

MATHEMATICS (BASIC SKILLS)

SKILLS

Communication Skills:	active listening, clear and fluent speaking, writing, reading
Social Skills:	cooperating with the group, using appropriate voice level, participating, focusing on a given task, sharing, respecting rights, feelings and property of others
Critical Thinking Skills:	observing, classifying, comparing, predicting, analyzing, evaluating
Mathematical Skills:	counting, comparing, ordering, computing, predicting, measuring, estimating,

Standard 1: The student will develop basic skills and understand simple mathematical language.

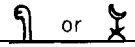
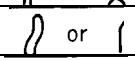
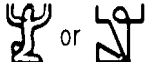
Number and Numeration

Number Concept (1.1)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
1.1 Read, write, compare and order whole numbers in figures and words **1.1(2)** 1 – 1000 **1.1(3)** 1 – 10,000 **1.1(4)** 1 – 100,000 **1.1(5)** 1 – 1,000,000	Reading, writing, comparing and ordering numbers Roman numerals Symbols <, >, =	Number, compare, order Number names from zero to one million Numeral, digit, place Greater than (>), less than (<), equal to (=) Order, sequence Numeration system	Teacher observes and records a student: • Reciting numbers in sequence: o 1 – 1000 forwards and backwards o Reciting in tens i.e. 10, 20 … - 100 o Reciting in hundreds i.e. 100, 200 … - 1,000 o Reciting in thousands i.e. 1,000, 2,000… - 10,000… -100,000 • Writing numbers in words • Writing numbers in Roman notation • Comparing given numbers and recording comparisons using signs • Ordering given sets of numbers
1.1(6) Count on from and back to zero in single-digit steps or multiples of 10		Number Number names from zero to one million Order, sequence Multiple, ones (single-digit), tens, hundreds, thousands	• Counting reliably a set of objects up to 1,000 in ones, tens, hundreds • Counting on/ back from a given number e.g. 662 in ones, tens, hundreds

Suggested Experiences

Whole Class	Small Group / Centres	Resources
Shared Math Give the prompt: Write any number with 3, 4, 5, 6 digits Fill a container with a large number of objects and let the students estimate the number of objects. For confirmation count the objects. Counting on can be done from given numbers e.g. from 678 to 800. The reading of numbers greater than 1,000 can be linked to other content areas e.g. population counts in Social Studies Students can collect references to large numbers in newspapers or magazines	***The teaching of numbers greater than 100 is closely linked with the development of the place value concept. Students can count to 1,000 in tens or hundreds. If the students do not understand place value then review work taught in Cycle One.*** Groups of students can use beans, pebbles, matchsticks etc. to make estimating containers. They must keep a record of how many objects in the container. Groups can exchange the containers and estimate how many objects are in the container and record their estimation. After everyone has had a chance to record their estimation, it is compared to the correct number. This provides opportunities for using the '>' and '<' signs, counting and comparing. During Guided Math, students can using Roman numerals or symbols from other numeration systems e.g. Egyptian	Collections: coins, stamps, plastic animals etc., natural objects, blocks, plastic bottle covers, beads, buttons, gravel, matches, straws Objects for counting, numeral cards/cut outs Containers Counting materials e.g. cubes, counters Chart with examples of other numeration systems and symbols e.g. Roman

Egyptian Numeral	Number Named	Meaning of picture
I	1	Stroke
	10	Oxen yoke
	100	Coil of rope
	1,000	Lotus plant
	10,000	Bent finger
	100,000	Tadpole
	1,000,000	A god with arms holding the sky

Roman Numeral	Value of Numeral
I	1
V	5
X	10
L	50
C	100
D	500
M	1,000

Number Patterns & Positive and Negative Integers (1.2)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
1.2(1) Recognizes, and explains given number sequences or patterns or relationships. **1.2(2)** Uses positive and negative integers in context and positions them on a number line.	Number patterns Positive and negative integers	pattern, relationship, rule, sequence positive, negative, above/below zero, compare, order temperature, below zero, difference, warmer, colder number line, position	Teacher observes and records a student: • Completing, explaining or applying a given number sequence or pattern, rule or generalization. • Extending the number line to include negative numbers • Reading and comparing the temperature to include degrees above and below zero • Using >, < and = signs to compare positive and negative numbers

	Suggested Experiences	
Whole Class	**Small Group / Centres**	**Resources**
Shared Math: *Prompt* **1.2(1)** Chose any three digits between 5 and 9 and make at least five 3-digit numbers. Sequence them. During sharing time the findings can be discussed and compared.	**1.2(1)A** Students can be given sets of numbers to sequence e.g. 657, 765, 576, 756, 675, 567 __, __, __, 44, 47, 50, __, __, __ Students can be given sets of number sentences to solve by identifying the pattern e.g. 9 – 3 = 6. What is 90 – 30, and 900 – 600? They should be encouraged to explain their reasoning. They can also be asked to justify a statement like 'All multiples of 2 & 6 are multiples of 12 and give examples. A square number always has an odd number of factors. The students can follow a rule and complete a number sequence, e.g. The first three numbers in this sequence are 2.1, 2.2, 4.3. The sequence then follows the rule: 'to get the next number, add the two previous numbers'. What are the missing numbers? 2.1, 2.2, 4.3, ___, ___, ___, ___	Copies of statements, number patterns or sequences, graph paper rules or generalizations

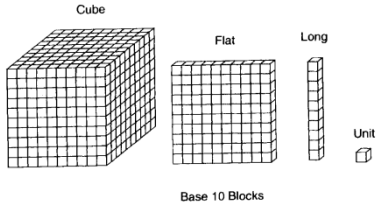
Shared Math Prompt: **1.2(2)** Write a set of negative integers. After this has been done they can be ordered. E.g. -3, -5, -1, +1 Create a number sequence that includes -3.	**1.2(2)A** Problems such as the following can be presented to the students: • The morning temperature in Holland at Christmas was above freezing point but by afternoon it had fallen by 8 degrees and was below freezing point. What could the morning and evening temperatures be? • Tell me two temperatures that lie between 0 degrees and –10degrees. Which of the two temperatures is the warmer? • What number can you put in the box to make this statement true? $\square < -3$ • Here is part of a sequence: □, –9, –5, –1, □. Explain how to find the missing numbers. • Explain how you would find the missing numbers in this sequence: 10, □, 4, 1, □, –5, □. What is the 'rule' for the sequence? The students can use the Internet to find the temperatures in 5 cities during winter in the temperate zone, order them and answer the question 'What if the temperature dropped 5 degrees, would your sequence change?'	Number lines extended beyond 0 Thermometers

Place Value (1.3)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
1.3 Demonstrate an understanding of place value **1.3(1)** 1 – 1000 **1.3(2)** 1 – 10,000 **1.3(3)** 1 – 100,000 **1.3(4)** 1 – 1,000,000	Place Value	Number names from zero to one million Ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions Base, place, digit, numeral Group, regroup place value kit, units/ones, longs/tens, flats/hundreds, blocks/thousands Notation, standard notation, expanded notation.	Teacher observes and records a student: • Modeling any three, four, five digit number using a place value kit or equivalent material • Representing any three, four, five digit number using place value charts or grid papers. • Renaming any three, four, five digit number in several ways e.g. 153 as 153 ones, 15 tens and 3 ones, 1 hundred, 5 tens and 3 ones. • Rewriting a three, four, five digit name in expanded notation • Telling the place value of any digit in numbers greater than 10,000 up to 1,000,000
1.3(5) Express place value in index form (Years 3 & 4)	Exponential Notation	*This is an abstract idea and needs a pre- requisite knowledge of factorization and base 10 place value.* Power of ten, indices, factor, power, zero power	• Rewriting multiples of 10 in exponential notation and vice versa

<table>
<tr><th colspan="3">Suggested Experiences</th></tr>
<tr><th>Whole Class</th><th>Small Group / Centres</th><th>Resources</th></tr>
<tr>
<td>Shared Math
1.3(1)A – 1.3(4)A
Prompt:
We know how to count to 100. How can we use the 100 squares to make 1,000?

Prompt:
Make as many numbers as you can from these digits (use each digit once) 0, 2, 4, 6, 8, 9 in 3 minutes. (Teacher sets a timer) Now order those numbers and write each one in 3 different ways. The number of digits can vary according to the math ability of the class.</td>
<td>1.3(1)A – 1.3(4)A
• Compare populations of Antillean Islands or Caribbean Islands or other world regions in Social Studies
• In pairs, students can write 5 numbers (over 1,000), exchange them and read each other’s numbers.
• Given numbers can be recorded on a Place value chart
• A place value chart can also be used for games in groups of four to six. Each group needs a place value chart and two each of number cards 1 – 6 for each player and a die. Turns are taken to roll the die. A number card representing the number cast is placed on the place value chart. The round ends when each player has filled his/her place value chart. The winner is the player with the largest number. The winner can gain an extra point by recording the number in another form. After a designated number of rounds the person with the most points wins the game. The game can be modified to the mathematical level of the players.
• The teacher can ask the students to show given numbers on a calculator and then rewrite them in other forms. Questions such as how much greater are the tens than the hundreds, thousands than hundreds etc. can be poised.

For on the spot assessment students can be given 4-,5-,6-7-digit numbers to explain in terms of place value, write in other forms, and create using place value kits or equivalent</td>
<td>Place value charts e.g.
<table>
<tr><td>1,000,000,000</td><td>Billions</td></tr>
<tr><td>100,000,000</td><td>Hundred Millions</td></tr>
<tr><td>10,000,000</td><td>Ten Millions</td></tr>
<tr><td>1,000,000</td><td>Millions</td></tr>
<tr><td>100,000</td><td>Hundred Thousands</td></tr>
<tr><td>10,000</td><td>Ten Thousands</td></tr>
<tr><td>1000</td><td>Thousands</td></tr>
<tr><td>100</td><td>Hundreds</td></tr>
<tr><td>10</td><td>Tens</td></tr>
<tr><td>1</td><td>Ones</td></tr>
</table>
Dice, number cards,
Place value kits,


Base 10 Blocks
Graph paper to make 100 squares, 10 strips and ones
Glue, collections of objects to count e.g. paper clips
Calculators, instruction cards for games, Social Studies texts, newspapers</td>
</tr>
</table>

<table>
<tr>
<td>Shared Math
Prompt:
1.3(5)A
Write as many 4- to 6-digit numbers on the chalkboard in as many forms as you can.</td>
<td>materials.
Gifted students[1] who understand the use of base 10 can translate numbers into other bases based on daily experiences e.g days of the week (base 10) time (base 5). It is advisable to start with base 2 (binary system) which computers use.
1.3(5)A
Students can be asked to write numbers in exponential notation
e.g. 456 = (4 x 10^2) + (5 x 10^1) + (6 x 10^0)
or translate exponential notation into standard notation
e.g. (7 x 10^3) + (8 x 10^2) + (9 x 10^1) + (3 x 10^0) = ____</td>
<td>Exponential Notation Chart
<table>
<tr><td>10^3</td><td>1,000</td><td>Thousands</td></tr>
<tr><td>10^2</td><td>100</td><td>Hundreds</td></tr>
<tr><td>10^1</td><td>10</td><td>Tens</td></tr>
<tr><td>10^0</td><td>1</td><td>Ones</td></tr>
</table>
</td>
</tr>
</table>

How to Translate a Base-ten Numeral into a Numeral in Some Other Base

1. Set up a place-value grid showing the value for each place in the grid.
2. Compare the base-ten numeral with this place-value grid to determine how many sets are to be counted in each place.

   Example: 120 into a base-seven numeral

7^3	7^2	7^1	7^0
343	49	7	1

   Questions to help the student convert:

   - *If I had 120 items can I make a set of 343?*
   - *If I had 120 items can I make a set of 49? How many sets?(Two e.g. 2 x 7^2 with 22 left over)*
   - *How many sets of 7 can be made from 22 items? (Three e.g. 3 x 7^1 with 1 left over)*
   - *There is one left over. How many sets of 1 can be made? (One e.g. 1 x 7^0)*
   - *If we write a number sentence we can see that 120_{ten} = (2 x 7^2) + (3 x 7^1) + (1 x 7^0) = 231_{seven}*

[1] See Mathematics Instruction for Gifted Learners pp 467-469 of New Directions In Elementary School Mathematics –Interactive Teaching and Learning by Emma E. Holmes – Prentice Hall, 1995

Estimating and Rounding (1.4)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
1.4(1) Use estimation for **a.** Solving problems **b**. Checking the reasonableness of results	Estimation	Estimate, approximately, about	Teacher observes and records when the student: • Uses the skill of estimation in all the mathematical sub domains • Recognizes that an estimate is appropriate • Uses estimation in problem solving • Uses estimates to check the reasonableness of results
1.4(2) Round 2 – 6 digit numbers into multiples of 10 in different ways.	Rounding to the nearest ten, hundred, thousand, any place value greater than thousands'	Round, estimate, approximately, nearest ten/hundred/thousand, nearest to, between, close to, halfway between, round, round to the nearest Ten / hundred / thousand / ten thousand / hundred thousand / million Multiple of ten	Teacher observes and records when the student can: • Round a 3-digit number to the nearest ten, then hundred • Round a 4-digit number to the nearest ten, then hundred, then thousand • Round a number with more than 4 digits to the nearest ten, then hundred, then thousand • Round a number with more than 4 digits to any place value from tens to place value greater than thousands' • Use rounding when calculating mentally • Use rounding to estimate amounts

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Shared Math Prompt **1.4(1a)A** Look at the counters in the pencils in the pot. Estimate how many pencils there are. Share how you made your estimate? What information did you use? What helped you to decide? What is 50 + 30? If we know that 50 + 30 = 80, how can this help us to estimate 53 + 27? Give me an estimate for 83 – 28, 81 – 52.	***Students who believe that Mathematics is about having the correct answer will not be motivated to estimate. The teacher will need to emphasize the importance of this skill in daily life situations e.g. shopping, budgeting etc.*** *Guided Math* **1.4(1a)A** • Estimating jars can be made by different groups and labeled. They can be put in the math centre. Over a week students can make and record estimates of the total number of items in each jar (not their own group's jar). At the end of the week the records can be collected by the teacher and the groups tell each other the actual totals in the jars. Comparisons can be made between the estimates and the actual amounts. • Estimations can be centred on school numbers e.g. students in Cycle One, total of cash sales of snacks, and absentees in a month • Estimation is an integral part of calculating using operations e.g. If you add 647 +827, you estimate 1,400 by adding the hundreds. *Review and adapt calculation strategies taught in Cycle One* • Estimation in measurement helps the student to develop their measurement sense. The students should estimate length, capacity, weight and time before using given standard or non-standard units to measure. When the actual measurement is completed comparisons can be made. • A class shop can be set up to estimate the bills to be paid and change to be received.	Containers filled with small items such as 'ones' cubes, beans, and counters for estimating quantities. Items for estimating length, width, height, Copies of sums for practicing estimation A class shop for estimations of bills.
1.4(2)A Discuss what rounding is and the steps involved in rounding e.g. 482 to nearest ten	**1.4(2)A** ***Before starting assess the students' understanding of rounding first by giving them 2- or 3-digit numbers to round to the nearest 10 or 100. Also assess place value knowledge.***	Place value chart if needed Calculators Number lines

1. Underline the digit in the place you are rounding to 4<u>8</u>2 2. Circle the digit to the right 48② 3. If the circled digit is **less than 5,** round down. If the circled digit is **more than 5,** round up 480 Let the students give numbers and round them to the nearest ten, hundred etc depending on baseline knowledge. E.g. 1, 648 to the nearest ten is 1650, to nearest hundred 1600, to the nearest thousand 2,000	• Have the students search for large numbers in the newspaper or expository texts and round them to the nearest ten, hundred, and/or thousand. • Give examples of word problems involving rounding for students to solve. • Let the students use the calculator to round numbers e.g. 456 to the nearest ten, hundred. *(The student will have to show understanding of place value in order to give the correct response.)* • Encourage students to use rounding in order to calculate mentally, e.g. 32 x 66 rounds to 30 x 70 = 2100. They can then find the product and compare answers. • They can also use rounding as a strategy for solving word problems e.g. Tom was helping to man a booth at a school fundraising event. He wanted to raise at least $150 by selling ice pops. In the morning he sold an ice-pop for 95c to 67 persons and in the afternoon he dropped the price to 90c and sold 107. Estimate if he reached his goal. Now calculate the total that he raised.	

Using and Applying Mathematics

Strands [2] ***(1.5)***

- Problem Solving: mentally and written
- Representing: analyze, record, do, check, confirm
- Enquiring plan, decide, organize, interpret, reason, justify
- Reasoning create, deduce, apply, explore, predict, hypothesize, test
- Communicating explain methods and solutions, choices, decisions, reasoning

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
Problem Solving **1.5** Solve one-, two- and multi –step problems involving numbers o **1.5 (1)** Whole numbers o **1.5(2)** Decimals o **1.5(3)** Fractions o **1.5(4)** Percents o **1.5(5)** Ratio o **1.5(6)** Measures (incl. time), o **1.5(7)** Money o **1.5(8)** The four operations **1.5(9)** Choose and use appropriate calculation strategies including a calculator	Problem Solving ***Strategies*** General • Explore • Make a Plan • Solve (carry out the plan) • Check (look back) Specific • Write an open number sentence • Act it out • Draw a diagram • Estimate and check • Work backwards • Make a list, table or chart • Look for	Problem, solution, calculate, calculation, operation, inverse operation, answer, method, explain, reasoning, Pattern, predict, estimate, approximate Add, subtract, multiply, divide, group, sum, total, difference, plus, minus, double, halve, multiple, product	Teacher observes and records when the student can solve: • One- step problems • Two- step problems • Multi-step problems Involving: • Whole numbers • Measures o Time o Money • Rational numbers o Fractions o Decimals o Percents o Ratio Choose and use the appropriate operation or calculation strategy to solve given word problems.

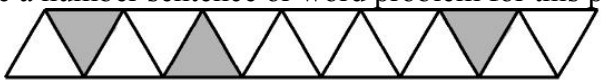
[2] All strands are interrelated and more than one may be addressed in a particular problem.

	patterns • Recall similar problems • Use logic		

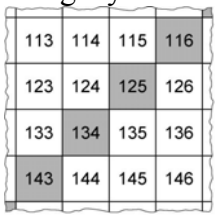
Representing
1.5(10) Represent the information from a puzzle or problem using:
o **1.5(11)** Numbers, number sentences
o **1.5(12)** Images
o **1.5(13)** Diagrams & tables
		Problem, solution, calculate, calculation, equation, method, explain, reasoning, reason, predict,
		Pattern, relationship, formula, rule, classify, property, Criterion/criteria, generalize, general statement
			Teacher observes and records when the student can
			• Represent data from a puzzle or problem using:
			  • Numbers, number sentences
			  • Images
			  • Diagrams
			  • Tables

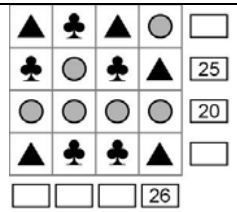
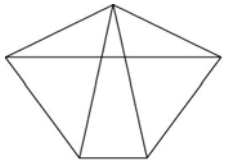
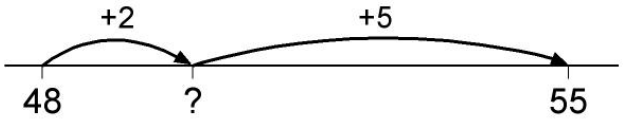
Communicating **1.5(14)** Describe and explain methods, choices and solutions to puzzles and problems: orally and /or in writing			• Communicate solutions and methods
Enquiring **1.5(15)** Decide what data is important to solve a problem Make use of lists, tables and graphs to organize and interpret the data Suggest extensions to the line of enquiry Review methods used and answer related questions		Problem, enquiry, solution, calculate, calculation, method, explain, reasoning, reason, predict, Pattern, relationship, collect, organize, compare, sort, classify, represent, interpret, effect Information, data, survey, questionnaire, table, frequency table, block graph, bar chart, Carroll diagram, Venn diagram,	• Choose and collect appropriate data to solve a problem or answer a question • Make lists, tables and graphs to organize and interpret the data. • Suggest extensions to an ongoing enquiry

Reasoning **1.5(16)** Use patterns and relationships involving numbers or shapes to solve problems Investigate a statement involving numbers and test it with examples Propose a statement and identify examples that verify it		axis/axes, horizontal axis, vertical axis, label, title, scale, interval, division	Teacher observes and records when the student can • Use patterns /relationships to solve problems and investigate statements • Propose statements • Verify and test statements by giving examples

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
1.5(1)A /1.5(7)A A shop has these special offers.  Joe wants to buy six pencils. Which is the cheaper offer: half price, or 3 packets for the price of 2? Explain how you know. You know that $1 is exchanged for Fls1.80. Using your calculator make a line graph and then tell how many dollars will you exchange for Fls40.60 *Shared Math* Prompt: **1.5(14)A** Think about the sum of five numbers in a straight line on the 100 square. What do you notice? Think about this problem and how to solve it. Share your ideas.	*Guided Math* **1.5(10)A – 1.5(13A)** *Examples of problems and questioning for problem solving and representing* • What addition calculation would you use to work out 13 – 8? Why can you use addition to work out subtraction? • 16 – □ = 9. How would you find the missing number? • All the shapes on this table except one are prisms. Which shape does not belong? How did you recognize the odd one out? • I buy two comics that cost 30c each. How much change will I get from $1?  • Write a number sentence or word problem for this picture.  • Is ½ shaded? If not complete or reduce the shading. • Sonia's parcel cost 55c to post. She stuck on eight stamps. Each stamp was either 10c or 5c. How many of each stamp did Sonia stick on her parcel? Show how you worked out your answer. **1.5(14)A** *Examples of problems and questioning for communicating* How did you decide which calculations to do? How did you know whether to add, subtract, multiply or divide? What clues did you look for? What does the answer to this step tell you? • Shadira has a 1 kg bag of flour. She uses 0.2 kg to make biscuits and 0.35 kg to bake a cake. How much flour is left in the bag?	Problem cards Graph paper Copies of Sudoku or other commercial puzzles Problem solving strategies chart (Can be given by the teacher or developed with students) Copy of the Problem Solving Wheel (various version are available from the internet.)

Prompt: Are these rules /statements true or false? Share your reasoning with the class. Give examples to justify your answer. • When you add three consecutive numbers, the sum is a multiple of 3. • The product of two odd numbers is always odd. Prompt: Imagine you have 25 beads. You have to make a 3-digit number on an abacus. You must use all 25 beads for each number you make. How many different 3-digit numbers can you make? **1.5(15)A** What question are you trying to answer? What information will you collect? Who will you ask? How will you find it? How will you communicate the results? What does this graph tell you? What makes the information in the graph easy or difficult to interpret? What were the advantages of using a computer?	• You save Fls1.35 per week. How many weeks is it before you can buy a book costing Fls.18.49? Explain how you used your calculator to work out the answer. What are the important things to remember when you solve a word problem? • This group said that to add 3 + 4 + 5 + 6 + 7 they would add the largest numbers first. Is this the method you would choose? Why or why not? (*The teacher could demonstrate looking for groups of ten; i.e. 3 +7 and 4 + 6)* **When solving problems always refer to the Problem Solving Wheel or the **Explore, Plan, Solve, Check** strategy.* **1.5(15)A** *Examples of problems and questioning for enquiry* • Magnets: Plan how to investigate whether magnets are equally strong. Choose how to record results (table, pictogram, bar chart). (*Science Link)* • You have to test the suggestion: *We think most children in our class walk to school*. What information will you collect? How? (Social Studies link) • Find out which habitat has the most living things? (Science link) • Solar System: Use data from timetables/calendars to describe sunrise, sunset, day length. Present data as a graph.	

What does the data tell you about your original question? What further information could you collect to pursue your enquiry question more fully? **1.5(16)A** Discussing problems with the class help the students to clarify their reasoning. Roy's cellular phone cost 15c, 25c or 40c per minute depending on the time of day. His monthly bill comes to $146. He also pays $27.50 per month in rental charges. How much would a call of 1 hour cost at the most expensive rate and the cheaper rate? What will be the difference? Can you work out how many minutes he used if he only called at when he paid the cheaper rate? *Questions to guide the discussion.* • What information is given?	Identify patterns. (Science Link) • What is the most popular girl's/boy's name in the school? The students can suggest extensions to the enquiry such as What were the most popular names when our parents were in school? • Forces and Motion: Measure length of elastic band with weights added to draw out patterns in data. Represent data in line graphs. Use these to predict lengths for other weights added.(Science link) • Health: How many litres of liquid does the class drink in a week? Does the class drink more water than juice or soda? Is the class keeping health rules? **1.5(16)A** *Examples of problems and questioning for reasoning* • Here is part of a number square. The shaded numbers are part of a sequence. Explain the rule for the sequence. Explain what you did to get your answer to the problem.  113 114 115 116 123 124 125 126 133 134 135 136 143 144 145 146 • Kimberly says: 'The sum of two even numbers is always a multiple of 4.' Is she correct? Give some examples to justify your answer. • Each shape stands for a number. The numbers shown are The totals of the line of four numbers in the row or column. Find the remaining totals.	

• What steps will you take to solve the problem? • What operations will you use? • What is the first, second, third… step? • Are there any rules that will help you? • Can you use estimation or rounding to help with the calculations? • Is it necessary to use a calculator?	 Tell me how you solved this problem. Did you make any notes or drawings to help you? Describe them to me. • How many triangles can you see in this diagram? How can you make sure that you have counted them all?  • Find the total of 3, 4, 5, 6 and 7. Jot down how you work it out. Which numbers did you start with? Why? Explain what you wrote down.  • Jason drew this number line to work out 48 + 7. What is the missing number? Why did he split the 7 into 2 then 5? What do you think the answer to 38 + 7 would be? • The perimeter of an equilateral triangle is 285 cm. What is the length of each side? • Place a decimal in each box to make the calculation correct: □ + □ + □ = 1. Find different ways of doing it, including some that use numbers with two decimal places. • Place an operation symbol (+, –, × or ÷) in each box to make the answer correct: (37□ 21) □ 223 = 1000.	

GLOSSARY *(Standard 1)*

Base: The base of any place-value numeration system is determined by the method of grouping in that system

Cardinal Number: A cardinal number answers the question *how many?*

Criteria/criterion: Rules for making a judgment

Digit: Any one of the numerals 0 – 9 in a whole number in a base-ten number system

Estimate: To guess or form an opinion regarding the amount, number value or answer.

Equation: A number sentence using the equal '=' sign e.g. 5 + 4 = 9, (4 x 8) + 12 = 44

Exponent: A numeral to the right of the ten that tells how many times 10 is used as a factor. E.g. 10^3 = 10 x 10 x 10

Factor: One of two whole numbers used to create a product e.g. factor x factor = product

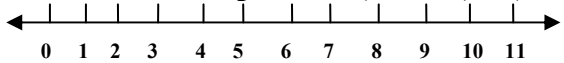
Inverse operation: An operation that 'undoes' what another one does. **Subtraction** is the **inverse** of **addition** and **division** the **inverse** of **multiplication**

Multiple: A product obtained by multiplying the set of whole numbers by a given factor (number).

Negative Integer: Negative integers are less than zero, e.g. -1, -2, -3, …

Notation: Ways of expressing a number, in the base-ten number system there are three ways:
Standard: 368: **Expanded:** (3 x 100) + (6 x 10) + (8 x 1); **Exponential:** (3 x 10^2) + (6 x 10^1) + (8 x 10^0)

Number line:



Number: A concept or idea that indicates *how many?*

Numeral: A written symbol representing a number, **0 1 2 3 4 5 6 7 8 9 10**

Numeration system: A system that uses a set of symbols to represent numbers.

Place value: The value of the numeral attached to a given position in a numeration system. E.g. The place value of the numeral 6 in 762 will be tens with a numerical value of 60.

Place: The position a numeral holds. Zero is known as the **place holder**

Positive Integer: Whole numbers greater than zero.

Power of Ten: The power of ten is represented by an exponent, e.g. in 10^3 the power is 3

Regroup: To convert a unit from one place value to another place value, keeping the value of the number constant e.g. 43 can be **regrouped** as 3 tens and 13 ones

Round To express the approximate value of a number to the nearest hundredth, tenth, ten, hundred or thousand e.g. **64 would** be rounded to **60** (nearest 10)

Whole numbers: The cardinal number of finite sets. A set of whole numbers is the set {0, 1, 2, 3.}

CHECKLIST FOR MATHEMATICAL DEVELOPMENT (Standard One)

Behaviours	Names of Children												
Write date when skill is mastered													
BASIC SKILLS													
Number Concept													
Recites numbers in sequence 1 to _____													
Recites numbers in 10s 10 to _____													
Recites numbers in 100s 100 to _____													
Recites numbers in 1,000s 1,000 - _____													
Compares given numbers from 100 to _____ and records using >, < or = signs													
Reads and writes numbers 100 –1,000													
Reads and writes numbers 1,000 -10,000													
Reads and writes numbers 10,000 – 100,000													
Reads and writes numbers 100,000 – 1,000,000													
Reads and writes numbers greater than 1,000,000													

Reads and writes number words from one hundred to _____													
Reads and writes Roman numerals up to _____													
Orders given sets of numbers from 1 to _____													
Counts reliably a set of objects up to 1,000 in ones, tens, hundreds													
Counts on from a given number in ones, tens, hundreds													
Counts back from a given number in ones, tens, hundreds													
Skip counts in 2s from ____ to _____													
Skip counts in 5's from _____ to _____													
Number Patterns													
Explains and completes a given number sequence													
Explains and completes a given pattern													
Identifies and applies generalizations and or rules to extend given number patterns / sequences													
Integers													
Extends the number line to include negative integers													
Uses >, < or = to compare positive and negative integers													

Place Value													
Models any three-, four- or five- digit number using manipulatives.													
Represents any three-, four- or five- digit number using drawings or diagrams.													
Renames any three-, four- or five- digit number in several ways.													
Writes any three-, four- or five- digit number in expanded notation.													
Identifies the place value of any digit in numbers greater than 10,000 up to 1,000,000													
Identifies the place value of any digit in numbers greater than 100,000													
Writes multiples of 10 in exponential notation													
Translates a base-ten numeral into other bases													
Estimating and Rounding													
Uses estimation in all math sub domains													
Uses estimation in problem solving													
Uses estimation to predict or check results													
Uses rounding to estimate amounts													
Uses rounding to calculate													

mentally													
Rounds 3 -digit, 4 –digit numbers to the nearest 10, 100, 1,000													
Rounds ____ -digit numbers to the nearest _____													
Using and Applying Mathematics													
Solves one, two, multi –step problems													
Solves routine problems using number sentences													
Solves non-routine problems using appropriate strategies													
Represents data from a puzzle or problem													
Communicates solutions and methods of solving problems													
Chooses and collects appropriate data to solve problems													
Makes lists, tables and or graphs to organize and interpret data													
Suggests extensions to ongoing mathematical enquiries													
Uses patterns and relationships to solve problems													
Propose and investigates statements when problem solving													
Verifies and tests statements when problem solving													

Standard 2: The student can use the four basic operations (+, -, x, ÷) according to standard procedures or variations in simple situations.

Calculation[3]

Addition and Subtraction (2.1)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
2.1 Recall and use all addition and subtraction facts for: **2.1(1)** Numbers to 20 **2.1(2)** Sums and differences of multiples of 10, 100 or 1,000 **2.1(3)** Number pairs that total 100 **2.1(4)** Identify the doubles and calculate mentally the halves of 2-digit numbers **2.1(5)** Add or subtract mentally pairs of 2- to 4-digit whole numbers **2.1(6)** Decimals to one place **2.1(7)** Use knowledge of place value and addition and subtraction of 2-digit numbers to derive sums and differences, doubles and halves of decimals	***Mental Calculation*** ***(Pre-requisites from Cycle I)*** • Addition pairs to 9 + 9 • Bonds of 10 • Multiples of 10 using bonds of 10 e.g. 6 + 7 = 13; 60 + 70 = 1300; 600 + 700 = 13,000 • Partitioning of 2- and 3- digit numbers into multiples of 100, 10 and 1 in different ways ***Laws of Mathematics*** • Associative property of addition • Commutative	Problem, solution, calculate, calculation, operation, inverse, answer, method, explain, reasoning Add, addend, subtract, subtrahend, plus, minus, sum, total, difference, plus, minus, double, halve, multiple Decimal point, decimal place, tenths, hundredths, thousands, ten thousands, hundred thousands, millions,	Teacher observes and records when the student can calculate mentally: • Addition and subtraction of o Numbers to 20 o Sums and differences of multiples of 10,100 or 1,000 o Number pairs that total 100 o Doubles and halves of 2-digit numbers extending to 3- and 4- digit numbers o Pairs of 2- to 4-digit numbers o Decimals up to at least one place o Doubles and halves of decimals to one place

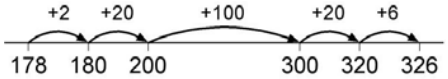
[3] As students mental methods of calculation are strengthened and refined so are their informal written methods which lead to efficient standard algorithms
By the end of Cycle II students should be equipped with mental, written and calculator methods of calculation so that they can choose the most appropriate method to solve problems and puzzles
The sub domain 'Calculation' is closely aligned with the sub-domain 'Applying and Using Mathematics'

	property of addition • Inverse operation ***Strategies*** • Reversing (based on commutative law) • Counting on/back 1, 2 or 3 • Addition/subtraction of 0 • Doubles and near doubles • Adding/subtracting to/from nearest 5 or 10		

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Give each student a piece of paper. Set a time-limit Prompt: **2.1(1)A** Give pairs of numbers that can be added or subtracted to make __. *Shared Math* Prompt Look at this number sentence: □ + ○ = 2. What could the missing numbers be? What strategies would you use to work out the answers to these calculations? Could you use a different method? Prompt: **2.1(5)A** The answer to a sum is 12.6. Make up possible sums. Prompt: **2.1(6)A** Make up a question involving addition that has the answer 0.04. Now try subtraction.	***Assess and review pre-requisite knowledge of mathematics laws and strategies that can be applied to mental calculations. Constantly give opportunities to use key number facts***[4] *Guided Math* **2.1(1)A** • Tell me two numbers that sum to 17. And another pair? • What would you add to 7 to make a total of 16? • Give me three pairs of numbers that total 19. Now tell me some of the subtraction facts that use these numbers. • What two numbers could I subtract to make 13? • What is 15 – 2? What is 15 – 4? What is 15 – 6? Can you do a similar thing but start from 17 – 2? • What is 40 + 50? What is 70 – 40? Here are four multiples of 10: 50, 80, 30, and 60. Pick one, now add another one, and then subtract another. What must I add to the answer to make 100? What would I subtract to make 30? **2.1(4)A** • What number do you need to add to 46 to make 92? How did you work it out? Is there a different way to do it? • The difference between a pair of 2-digit numbers is 13. What could the pair of numbers be? **2.1(5)A** • Work out 36+ 59 or 81 – 25 mentally. Share your way of doing it with your group. Find a way to record the methods that your group used? **2.1(6)A** • A number when doubled gives 9.2. What is the number?	Work cards / sheets containing sums and problems to solve A timer for testing or controlling response time during mental math assessment

[4] Addition and subtraction facts for each number to 10; sums and differences of multiples of 10; multiplication facts to 10 x 10;

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
2.2 Develop and use written methods to record, support or explain addition and subtraction of : **2.2(1)** 2- to 4- digit numbers **2.1(2)** Money **2.2(3)** Decimals	***Stages of Written Methods of Calculation*** • Using an empty number line to show steps involving partitioning • Partitioning e.g. 47 + 76 = 47 + 70 + 6 = 117 + 6 + 123 (recording horizontally or vertically) • Columns o Expanded o Compact	Problem, solution, calculate, calculation, equation, operation, Answer, method, explain, predict, reason, reasoning, pattern, relationship, rule, sequence Place value, partition, thousands, digit, four digit number, thousands, ten thousands, hundred thousands, millions, Decimal point, decimal place, tenths, hundredths, Positive, negative, integers Add, subtract, sum, total, difference, plus, minus,	Teacher observes and records when the student can use written methods such as: • An empty number line to addition and subtraction by partitioning • Showing partitioning horizontally or vertically (using expanded notation) • Column addition and subtraction showing addition or subtraction of tens and ones separately • Standard column addition and subtraction To solve addition and subtraction of • 2-digit to 4-numbers without regrouping • 2-digit to 4- numbers with regrouping • 2-digit to 4-digit numbers with regrouping involving zeros • Numbers with > 4 digits with or without regrouping • Decimals up to hundredth place • Money

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Use whole class sessions to demonstrate the different stages of written calculation. **Using the empty number line** to show 48 + 36 = Ask the students how they would do it and discuss responses. Give suggestions e.g.  Adding the 10s, adding up to a multiple of 10 and then the ones  Adding up to a multiple of 10 and then the remaining part of the addend Subtraction can be done by counting back from the number or counting up from the smaller number to the larger. **Using place value partitioning** 654 + 148 = 654 + 8 + 40 + 100 = 662 + 40 + 100 = 702 + 100 = 802 or 654 + 148 = 654 + 100 + 40 + 8 = 754 + 40 + 8 = 894 + 8 = 902 514 – 136 = 514 – 6 - 30 – 100 = 508 – 30 – 100 = 478 – 100 = 378 Let the students give their ideas.	***Some Cycle I students have been exposed to algorithms for addition and subtraction without the pre-requisite stages. Check for in-depth understanding of these algorithms. If it is weak go through the stages of using a number line or partitioning and recording horizontally*** *Guided Math* **2.2(1)A** Show me how you use counting up on an empty number line to work out 536 + 75 and 536 – 75. Which number did you start with? What are the important landmark numbers to use? [multiples of 10 or 100] What are the sizes of the steps? Can you show me another way you could do this on the number line? 326 – 178 can be recorded by counting up from 178 to 326.  Can you record the same sum by counting back? Here are two numbers: 584 and 267. Partition 267. What is the answer when you add 7 ones to 584? Now add the 60. Now add the 200. How will you record this? What is the answer? Show me this method for two other numbers. Here are two numbers, 781 and 284. Partition 284. What is the answer when you subtract the 4 ones from 781? How will you record this? Now subtract the 80. Now subtract the 200. What is the answer? Can you use this method to subtract 263 from 514?	Empty number lines Overhead projector if possible for whole class Copies of word problems or sums that require the students to practice written methods of calculation

Column or Vertical addition Use expanded notation to help the student move from partitioning horizontally 367 = 300 + 60 + 7 +185 = 100 + 80 + 5 400 + 140 +12 = 552 Show the students how to add ones, tens and hundreds separately. As confidence is gained stress adding ones first 367 +185 400 140 12 552 367 +185 12 140 400 552 **Compact Column - addition** 1 1 367 +185 552 **Column Subtraction** 741 – 367 700 + 40 + 1 = 600 130 11 ~~700 + 40 + 1~~ -300 + 60 + 7 = - 300 + 60 + 7 300 + 70 + 4 6 13 11 = ~~7 4 1~~ -3 6 7 3 7 4	***The amount of time spent on expanded column addition and subtraction will depend on how quickly the students recall number facts with fluency of partitioning.*** How does partitioning help to solve 436 + 247 or 436 - 247? *It is best to deal with regrouping with zeros in small Guided Math groups* Always start by reading the number, from which we are subtracting, discuss the components of the expanded notation and the exchanges. (Place value kits can be useful for some learners). Example 503 -278 500 + 60 + 3 becomes 400 + 90 + 13 -200 + 70 + 6 -200 + 70 + 8 200 + 20 + 5 The adjustment has to be done in 2 stages; 500 + 0 to 400 + 100 and then the 100 + 3 is partitioned into 90 + 13 400 90 3 400 100 3 ~~500 + 0 + 3~~ becomes 4 9 13 ~~5 0 3~~ -200 + 70 + 8 -2 7 8 200 + 20 + 5 2 2 5 I add two numbers. One has a 3 in the thousands column, the other has a 5. The answer has 9 in the thousands column. How is this possible? Work out 3275 – 1837, explaining every step that you write. **2.2(2)A** When the students learn how to record money	Copies of word problems or sums that require the students to practice column addition or subtraction (Include decimal numbers and money as well as >2 addends.)

Shared Math Prompt: **2.2(3)A** Two numbers have a difference of 1.58. One of the numbers is 4.72. What is the other? Think of pairs of numbers that have the same difference.	and decimals they use compact column methods to calculate integers and decimals up to 2 or 3 places. What is the total cost if I buy food costing $3.86 and $8.57? **2.2(3)A** Show an incorrect calculation, e.g. one with misaligned decimal points. What has this person done wrong? How would you help him/her to correct it? Calculate 13.86 + 9.481 or 0.236 – 0.154 Two numbers have a difference of 1.673 One of the numbers is 4.728. What is the other? Is this the only answer?	

Calculation
Multiplication and Division (2.3)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
2.3(1) Recall all multiplication and division facts to 10 x 10 **2.3(2)** Multiply and divide by partitioning numbers into multiples of 100, 10 and 1 in different ways **2.3(3)** Work out products such as 60 x 5, 60 x 50 or 600 x 5 or 600 x 50 or 0.6 x 5 using the related multiplication fact 6 x 5 **2.3(4)** Add 2 or more of the same single-digit number mentally and relate to multiplication facts. **2.3(5)** Recognize multiples of 1-digit numbers **2.3(6)** Recal1 quickly prime, and squared numbers **2.3(7)** Divide multiples of 10 or 100 by a single digit number using knowledge of place value and division facts. **2.3(8)** Divide mentally by using basic division facts and knowledge of place value. **2.3(9)** Divide mentally using divisibility rules **2.3(10)** Demonstrate an understanding that multiplication and division are inverse operations.	***Mental Calculation*** ***(Pre-requisites from Cycle I)*** • Multiplication facts of 1, 2, 5 and 10 x tables • Bonds of 10 • Products of multiples of 10 using 10 times table e.g. 6 x 10 = 60; 60 x 10 = 600; 600 x 10 = 6,000 • Partitioning of 2- and 3- digit numbers into multiples of 100, 10 and 1 in different ways ***Laws of Mathematics*** • Distributive property • Commutative and Associative property of multiplication • Inverse operations • Multiplication property of zero • Divisibility Rules	Multiply, times, divide, share, group, double, halve, multiple, Factor, product, divisor, dividend, quotient, remainder, Operation, inverse, answer, method, explain, reasoning square number, divisible by, Factorize, divisible, divisibility, prime, prime factor, Decimal, decimal point, decimal place	Teacher observes and records when the student can calculate mentally: o Products of single-digit numbers up to 10 x 10 o Products of multiples of 10 up to 1,000 o Doubles and halves of 2-digit numbers extending to 3- and 4- digit numbers o Quotients of up to 2-digit numbers when the divisor is a single digit number o Quotients when the divisor is 10 or a multiple of 10 o Doubles and halves of whole numbers Teacher observes and records when the student can mentally: • Multiply and divide decimals up to at least two places with single digit factors or divisors • Recall quickly: o Basic multiplication and division facts o Prime numbers up to at least 50 and later to 100 o Prime factors of numbers to at least 50 and later to 100 o Square roots of numbers up

2.3(11) Demonstrates understanding of division as repeated subtraction **2.3(12)** Identify mentally prime factors of numbers to 100 **2.3(13)** Use knowledge of division and multiplication to work out problems involving decimals mentally			to 100

<table>
<tr><th colspan="3">Suggested Experiences</th></tr>
<tr><th>Whole Class</th><th>Small Group / Centres</th><th>Resources</th></tr>
<tr>
<td>Students often enjoy competing against each other. You can use flash cards to have team games to help learn times tables.
Shared Math
Prompts:
2.3(1)A
• The product is 40. What two numbers could have been multiplied together?
• The product is 36. What two numbers have been multiplied together?
• How many multiplication and division facts can you make, using what you know about 24 (or 20, 30)? How did you work out the division facts?
2.3(2)A
• The product of two numbers is 2000. What could the two numbers be?
2.3(5)A
• Write number s that are both a multiple of 4 and a multiple of 6.
2.3(10)A
• Start from a 2-digit number with at least six factors, e.g. 56. How many different</td>
<td>It is important that mental calculation is developed alongside written calculation. Knowledge of times tables can be enhanced by having games, flash cards and puzzles in the Mathematics Centre.
Guided Math
Suggestions for problems that help develop mental calculation
2.3(1)A.
• How can you work out the 4 times table from the 2 times table? The 6 times table from the 3 times table?
• What is the relationship between 4 × 7 = 28, 6 × 7 = 42 and10 × 7 = 70?
• How can you work out the 8 times table from the 4 times table? Or the 9 times table from the 3 times table?
• What is the relationship between 8 × 7 = 56, 6 × 7 = 42 and 14 × 7 = 98?

2.3(2)A
• Multiply 4 by 10. Multiply the answer by 10. What has happened to the value of the digit 4? Can you explain what happens to the 4 when we multiply 4 by 100?
• What number is 10 times more than 70 tens? What is 10 times bigger than 23?
• Why do 6 × 100 and 60 × 10 give the same answer?
• I have 37 on my calculator display. How can I change it to 3700 in one operation? Is there another way to do it?
• What number is 10 times smaller than 2450? What number is 100 times bigger than 36?
• Write in the missing numbers.
5 × 70 = □; 600 × 4 = □; 4 × □ = 200
• What is 50 times 90?
• Work out double 47 in your head. Tell me how you did it.</td>
<td>Commercial and teacher-made games and puzzles to reinforce knowledge of tables, dice
Multiplication / 100 Squares
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
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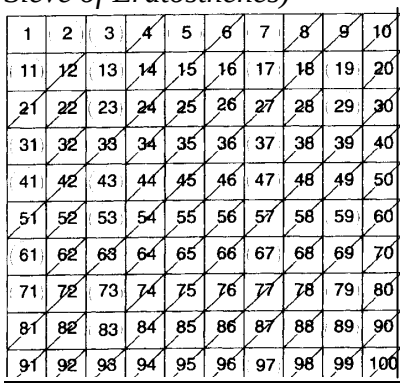
<tr><td>1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>12</td><td>14</td><td>16</td><td>18</td></tr>
<tr><td>3</td><td>0</td><td>3</td><td>6</td><td>9</td><td>12</td><td>15</td><td>18</td><td>21</td><td>24</td><td>27</td></tr>
<tr><td>4</td><td>0</td><td>4</td><td>8</td><td>12</td><td>16</td><td>20</td><td>24</td><td>28</td><td>32</td><td>36</td></tr>
<tr><td>5</td><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td><td>35</td><td>40</td><td>45</td></tr>
<tr><td>6</td><td>0</td><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td><td>36</td><td>42</td><td>48</td><td>54</td></tr>
<tr><td>7</td><td>0</td><td>7</td><td>14</td><td>21</td><td>28</td><td>35</td><td>42</td><td>49</td><td>56</td><td>63</td></tr>
<tr><td>8</td><td>0</td><td>8</td><td>16</td><td>24</td><td>32</td><td>40</td><td>48</td><td>56</td><td>64</td><td>72</td></tr>
<tr><td>9</td><td>0</td><td>9</td><td>18</td><td>27</td><td>36</td><td>45</td><td>54</td><td>63</td><td>72</td><td>81</td></tr>
</table>
*When students have mastered 55 of the 90 basic facts displayed on the multiplication square they will use the commutative property to master the remaining facts.
Timer
Flash cards with the multiplication facts up to 9 x 9</td>
</tr>
</table>

multiplication and division facts can you make using what you know about 56? What facts involving decimals can you derive? What if you started with 5.6? What about 11.2?	Is there a different way to do it? What is double 470? Double 4700? • Change Nafl10.39 to cents. **2.3(7)A** • I divide a 4-digit number by 100. The answer is between 70 and 75. What could the 4-digit number be? • Change 4527 cents into guilders. **2.3(8)A** • If I know that 8 ÷ 2 = 4. What is 80 ÷ 2 or 800 ÷ 2? • What is a quick way to multiply by 1000? To divide by 100? • How many hundreds are there in one thousand? • Divide 9300 by 100. • Write in the missing number: 3400 ÷ □ = 100 • Write what the four missing digits could be: □□□ ÷ 10 = 3□ **2.3(9)A** • Can you tell me some numbers that will divide exactly by 2? By 5? By 10? How do you know? • Which of these numbers are multiples of 2? How do you know? 18 25 40 65 120 375 468 700 **2.3(10)A** • What is the missing number in this statement: □ × 5 = 35? How do you know? • I know that 4 × 7 = 28, so what is 28 ÷ 4? • If you know that 9 × 8 = 72, what is 72 ÷ 9? What is 720 ÷ 9?	

	2.3(11)A • How would you work out 12 ÷ 4 using subtraction? **2.3(12)A** • Here are four number cards. 7 12 3 4 Which two number cards are factors of 42? • Put a ring around the numbers which are factors of 30. 4, 5, 6, 20, 60, 90 • How can you use factors to multiply 15 by 12? **2.3(13)A** • What number is ten times as big as 0.01? How do you know that it is ten times 0.01? • I divide a number by 10, and then again by 10. The answer is 0.3. What number did I start with? How do you know? • What number is ten times as big as 0.05? How do you know that it is ten times 0.05? • Divide 31.5 by 10. • A bill of $9.50 is shared equally between 5 people. How much does each person pay? • Which of these calculations would you work out mentally, using scrap paper to jot things down if you wish? 9 × 25, 14 × 6, or 96 ÷ 8 Why is it possible to solve these mentally? What clues did you look for? Explain your methods.	A hundred square to find out the prime[5] and composite numbers (*The technical name for this is the Sieve of Eratosthenes)*  The Sieve of Eratosthenes is created by circling 2 and then crossing out all numerals for numbers divisible by 2, 3, 5, and 7. The remaining numbers are prime numbers.

[5] A prime number is a number divisible only by 1.

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
2.4(1) Use practical, informal, written methods to multiply and divide 2-digit numbers **2.4(2)** Demonstrate understanding of the inverse relationship between multiplication and division by recording related division number sentences from multiplication number sentences and vice versa. **2.4** Use efficient written methods to: **2.4(3)** Record, support and explain multiplication and division of 2-digit numbers by 1-digit, including division with remainders **2.4(4)** Multiply and divide HTO[6] x O, TO x TO, O.t x O and HTO ÷ O) **2.4(5)** Multiply and divide integers and decimals by a 1-digit number and to multiply 2-digit and 3-digit integers by a 2-digit integer. **2.4(6)** Find factors of given numbers **2.4(7)** Use brackets	***Pre-requisite knowledge from Cycle I*** • Representing repeated addition and arrays as multiplication • Partitioning sets into equal subsets and uses the symbol associated with division to record partitioning ***Stages of written methods for multiplication and division*** • Informal recording of partitioning • Grid methods • Expanded short • Standard short • Standard long ***Rules for using brackets*** • Work out contents first	Multiply, times, divide, share, group, double, halve, multiple, Factor, product, divisor, dividend, quotient, remainder, Operation, inverse, answer, method, explain, reasoning square number, divisible by, Factorize, divisible, divisibility, Prime, prime factor, Decimal, decimal point, decimal place	Teacher observes and records when the student can use written methods of calculation such as: • Informally recording partitioning • Grid methods of multiplication and division • Expanded short multiplication and division • Standard short multiplication and division • Standard long multiplication and division • Factorization methods Teacher observes and records if the student • Recognizes that given word problems can be solved by multiplying or dividing • Can use brackets effectively

[6] HTO = hundreds, tens and ones e.g. 456; O.t = a decimal e.g. 6.7

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Shared Math Prompt; Use three of the digits 2, 3, 4, 5 and 6, to create multiplication sums (e.g. 34 × 6). What products can you make? What is the largest/smallest product? The distributive law of multiplication over addition[7] (not the name) can be introduced to help students mentally multiply TO x O. An example of the written recording of the mental calculation would be 38 x 7 = (30 + 8) x 7 = (30 x 7) + (8 x 7) = 210 + 56 = 266 This can also help with division. 68 ÷ 4 = (40 + 28) ÷ 4 = (40 ÷ 4) + (28 ÷ 4) = 10 = 7 = 17 97 ÷ 7 = (70 + 27) ÷ 7 = (70 ÷ 7) + (27 ÷ 7) = 10 + 3 r 6 = 13 r 6	*Guided Math* **2.4(1)A** • What is 4 × 2? What is 10 × 2? How could we use these facts to work out 14 × 2? • Tell me two multiplication facts we could use to work out 16 × 2. What is the answer? • What is 20 ÷ 2? What is 6 ÷ 2? How could we use these facts to work out 26 ÷ 2? • Tell me two division facts we could use to work out 28 ÷ 2. What is the answer? • What is 70 ÷ 5? Here are 72 cubes. Put them into groups of five. How many groups have you made? How many are left over? If you put the 72 cubes into boxes that hold five cubes, how many boxes would you need? Explain why. **2.4(3)A** • How would partitioning help you to calculate 27 × 6? • How does knowing that 10 × 6 = 60 help you to calculate the answer to 72 ÷ 6? • Make up some division questions that have no remainder. How did you do this? Why don't they have a remainder? Make up some division questions that have a remainder of 1. How did you do it? • A pack of plums costs 68c. Mark bought three packs of plums. How much change did he get from a $5 note? • How many $10 notes would you need to make $12 000? • How many 25c fruit bars can I buy with $5?	Copies of problem cards Manipulatives or other aids to help students work out sums/problems Scrap paper

[7] This law means that the product of a number and a sum can be expressed as a sum of two products e.g.4 x 23 = 4 x (20 + 3) = (4 x 20) + (4 x 3). **This should not be used with two single digit factors.**

This can then be placed as a grid. *The grid method is used well with students who are weak in mental and written calculation skills.*

×	7
30	210
8	56
	266

	30 + 8
×	7
	210
	56
	266

Using this grid and the inverse relationship will help students to see that 266 ÷ 7 = 38

The next stage in written multiplication or division is expanded short multiplication or division.

```
30 +  8                          38
x     7                          x 7
    210    30 x 7 = 210          210
     56     8 x 7 =  56           56
    266                          266
```

```
68 ÷ 4
   10 +  7
 4) 40 +28
```

The final step is standard short multiplication or division

```
 5
 38                    1 7
x 7                 4) 6²8
266
```

- How many cartons of juice costing 30c each can I buy with Nafl2?
- Emma saves £3.50 each week. How much has she saved after 16 weeks?
- Put in the missing digits

	□	4	□
×			6
2	0	5	2

- You know that 42 ÷ 6 = 7. What other division and multiplication facts can you derive from this?
- Multiply 7 by 0.6.
- What number multiplied by 8 equals 4.8?
- A length of ribbon is 2.4 m long. I need to cut it into three equal pieces. What is the length of each piece?
- Two adults and two children go to a cinema. Adult tickets are Nafl5.85 and children's tickets are Nafl2.85. How much change will they get from a 25 guilder note?
- Look at these calculations. Which of them is incorrect? Why? 12.4 × 6.6 = 71.23   48.6 ÷ 3 = 16.2
- I buy 3 large pizzas costing $10.95 each and 2 small pizzas costing $7.69 each. How much do I spend altogether?
- A DJ has storage boxes for her CDs, which are in two sizes. Small boxes hold 15 CDs. Large boxes hold 28 CDs. The DJ has 411 CDs. How could the DJ pack her CDs?

2.4(6)A

Students can examine the properties of prime numbers. They can also create factor trees to find prime factors of given numbers e.g.

The same steps can be used for multiplying TO x TO. Students can be encouraged to mentally estimate first, e.g. 56 x 27 is approximately 60 x 30 = 1,800
Dividing HTO by O can be linked to division as repeated subtraction (chunking)

e.g. 197 ÷ 6

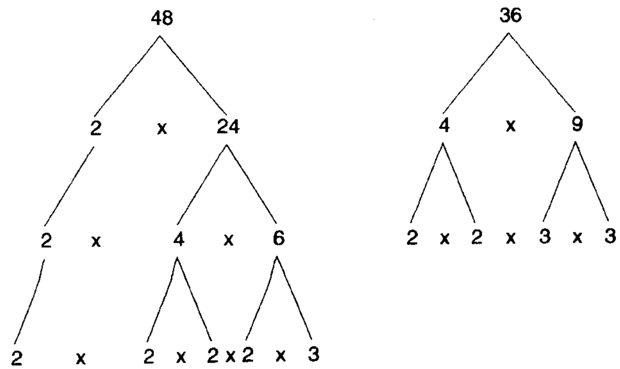
```
6) 197
  - 60   6 x 10
   137
  - 60   6 x 10
    77
  - 60   6 x 10
    17
  - 12   6 x  2
     5       32 r 5 Answer
```

For students who are confident with the multiplication and division facts, subtracting multiples of 10 mentally, partitioning and place value, short division of 3-digit numbers can be introduced.

```
   97
3)29²1
```

Long Division

```
24) 560          or     23r8
20 -480   24x20      24) 560
     80                 -480
 3 - 72   24x3            80
      8                 - 72
                           8
```



From the prime factorization of the two numbers students can work out the **greatest common factor or divisor, (12 or 2 x 2 x 3) and lowest common multiple (144 or 2 x 2 x 2 x 2 x 3 x 3)**
As students learn to divide time should be spent facilitating ***discovery*** of the ***divisibility rules.***

2.4(7)A
Give the students number sentences with brackets to solve
e.g. (125 ÷ ☐) + 2 = 27 (☐ ÷ 5) – 22 = 30
(☐ ÷ 25) – 22 = 30 (100 ÷ ☐) + 5 = 7.5
The students can use written methods or a calculator.
Number sentences such as: 2 + (3 x 10) and (2 + 3) x 10 can be solved mentally and the results compared to help the students understand the rule of working out the brackets first.
Assess understanding with number sentences with '*x*' e.g.
(3 x 10) + *x* = 35, *x* = ____; 3 x (10 + *x*) = 36, *x* = ___

Chart with the Divisibility Rules (created with the students)

Divisibility Rules

- *Any even number is divisible by 2.*
- *A number is divisible by 3 if the sum of the digits is a multiple of 3.*
- *A number is divisible by 4 if the last two places together as a number are evenly divisible by 4 e.g. 328 is divisible by 4 because 28 is a multiple of 4.*
- *A number is divisible by 5 if there is a 5 or 0 in the ones place.*
- *A number is divisible by 6 if the number is divisible by both 2 and 3.*
- *A number is divisible by 8 if the last three digits taken as a number are divisible by 8, e.g. 9864 is divisible by 8 because 864 is divisible by 8.*
- *A number is divisible by 9 if the sum of the digits is divisible by 9.*
- *A number is divisible by 10 if there is a 0 in the ones place.*

Calculation

Using the calculator

At this level calculators can be used for the following purposes:

- *Teaching students to use the calculator effectively to calculate, recognizing when it is appropriate to do so i.e. when it is more reliable than mental or written methods.*
- *Supporting the teaching and learning of mathematics where the objective is problem solving not calculation.*
- *Providing a tool to help students recognize patterns, properties and relationships in numbers*
- *Consolidating learning of number facts and strategies for calculation*

The calculator should not be used for calculating before Cycle 2, Year 2.

Target Behaviours for Calculator Use.

Year 2	Year 3	Year 4
Clear the display before starting a calculation	Estimate the likely size of an answer and check answers appropriately	Solve problems involving multi-step calculations
Correct mistaken entries by using the clear entry key	Carry out measurement calculations and interpret the answer	Recognize rounding errors
Carry out one-step and two step calculations that involve all four operations	Solve problems involving fractions	Recognize recurring decimals
Interpret the display correctly, particularly money.		Use brackets, the memory and square root key
Recognize negative numbers and use the sign-change key		

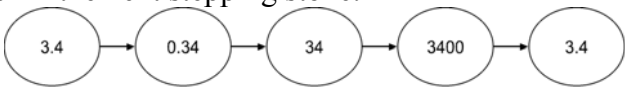
Pre-requisite Calculator Activities (Cycle 1 & Cycle 2 Year 1)

- Identifying the on/off switch and switching the calculator on recognizing that a **0** on the screen means that the calculator is on.
- Identification of numerals up to 10.
- Clearing the calculator screen
- Unstructured exploration of the calculator in the mathematics Centre.
- Games where number patterns are started by the teacher and the student completes. This can be a game for two students.

In Cycle 2, Year I the students can:

- Estimate answers to addition and subtraction problems and use the calculator to see how close their estimation is.
- Learn to add or subtract a constant number (e.g. by pressing 1 [+] [+] 2 the calculator counts in steps of 1 every time the = sign is pressed).
- Generalize rules for addition of two even, two odd or an odd and even number
- Generalize the rule for addition of 0
- Use the calculator to support learning of place value and the partitioning of 3-digit numbers e.g. The student enters 456 and is asked to eliminate the digits one by one subtracting only multiples of 100, 10 and 1 with the largest multiple being subtracted first. (-400,then 50 then 6)

Suggested Experiences			
Whole Class	**Small Group / Centres**	**Resources**	**Language**
The teacher demonstrates the use of the calculator and the features using an overhead projector by direct teaching methods	*Year 2 activities* • Put 56 on your calculator display. How can you change it to 5600 in one operation? Is there another way to do it? • If I typed in 124 on my calculator. I meant to type in 125. What keys should I press to correct my mistake? • Enter 5.3 on to your calculator display. How can you change this to 5.9 in one step (operation)? • What does the answer in the display, 22.7, mean in money? • My calculator display says 1.2. What was the question? What other possibilities are there? • What would the display of 1.2 mean if you were working with guilders? With metres? • Add these prices on your calculator. I will read them one at a time for you to enter: six guilders and seventy-six cents; nine guilders and ten cents; seven guilders and six cents.. What is the total? Did you get Nafl22.92? What do you need to add to get Nafl23? • Use a calculator to add these amounts of money: 62c, $1.50, 550c, $15, and 8c. What will you have to do before you can add them using a calculator?	Calculators	Calculator, display panel, key, enter, clear, constant

Suggested Experiences			
Whole Class	**Small Group / Centres**	**Resources**	**Language**
The teacher demonstrates the use of the calculator and the features using an overhead projector by direct teaching methods	*Year 3activities* • Use a single subtraction to change 207 070 to 205 070 on your calculator • Would you use a mental, written or calculator method to solve each of these? Explain your choice. 23.5 × □ = 176.25 • How many cartons of juice costing 30c each can I buy with $2? • What is the total cost if I buy food costing Nafl3.86 and Nafl8.57? • What calculation can you key into your calculator to solve this problem? A piece of ribbon 2.1 metres long is cut into six equal pieces. How long is each piece? What is the answer? • Play 'Stepping stones': Work out what operation to enter into a calculator to turn the number in one stepping stone into the number in the next stepping stone.  • Find the total of 1.58 m, 79cm and 1.23 cm using a calculator. Did you key in the numbers as 1.58, 79 and 1.23? Why not? What answer does the calculator give? What is the total of the three lengths? The teacher can ask the students: 'Why did you decide to use a mental/written/calculator method for this calculation? • A roll contains 10 m of tape. Four people use the tape to wrap presents. They use 1.27 m, 2.45 m, 96 cm and half a metre. How much tape is left? • How many litre cartons of juice do I need to fill 18 cups each containing 0.3 litres? • How much change will I get from $10 if I buy groceries costing $2.29, $1.42, 76c and $3.83? • How many Guilders or Euros do you get for $50?	Calculators	Calculator, display panel, key, enter, clear, constant

Suggested Experiences			
Whole Class	**Small Group / Centres**	**Resources**	**Language**
The teacher demonstrates the use of the calculator and the features using an overhead projector by direct teaching methods	*Year 4 activities* • What key presses would you make on a calculator to work out 17 + 3 × 15? • Nicola has $50. She buys three flowerpots at $12.75 each and a spade at $9.65. How much money does she have left? Show me how you used your calculator to find the answer. • A number multiplied by itself gives 2809. Find the number. • What number multiplied by itself gives 400? • My calculator shows:  My question was about money. Complete this: 3.5 means $3 and ____cent. What if my question was about length? Complete this: 3.5 means 3 metres and__ centimetres. What if my question was about weight? Complete this:3.5 means 3 kilograms and … grams. • 4.2 = □ × 7; 500 ÷ □ = 25, □ × 5.1 = 34.17 Printing charges for a book are 3c per page and 75c for the cover. • I paid $4.35 to get this book printed. Work out on your calculator how many pages there are in the book. Write down the calculations that you did. • Seeds are Nafl1.45 for a packet. I have Nafl10 to spend on seeds. What is the greatest number of packets I can buy? Show me how you used your calculator to find the answer. • Prove these generalizations by using a calculator. Record your steps: 'Dividing a number by 0.5 makes it twice as big' or 'finding 25% of an amount is the same as dividing by 4'.	Calculators	Calculator, display panel, key, enter, clear, constant

GLOSSARY *(Standard 2)*

Addends: Numbers that are added in an addition number sentence, e.g. In the sum 2 + 6 = 8, 2 & 6 are **addends**

Addition: An operation on numbers that results in a **sum.** The symbol for addition is **+. 2 + 6** results in the **sum 8**

Algorithm: The formal procedure for any mathematical operation (written) .

Array: An arrangement of rows and columns

E.g. * * * * * * * a 3 row by 7 column array
* * * * * * * *
* * * * * * * *

Associated Property: This means that the order in which addends or factors are grouped does not affect the sum or product.

Commutative Property: This means that the order of addition or multiplication of 2 addends or factors does not affect the sum or product.

Composite number: A number exactly divisible by some whole number other than itself or one e.g. 4, 6 and 9

Constant: An instruction put on a calculator that remains the same.

Difference: The number of unmatched members when one set of objects is matched with another set. The difference between 20 and 6 is 14.

Display panel: The screen that displays the numbers on a hand-held calculator

Dividend: The given product of a division sum, e.g. in the number sentence **15** ÷ 5 = 3, 15 is the **dividend.**

Divisible: A number is **divisible** by another number if there is a remainder of zero.

Division: The inverse operation of multiplication performed on a product and a factor to obtain a second factor. E.g. 15 ÷ 5 = 3 rem. 0

Divisor: The known factor by which we divide in a division sum. In the number sentence 15 ÷ **5** = 3, **5** is the **divisor.**

Factorization (factoring): This is a means of expressing a composite number as prime factors, e.g. 36 = 2 x 2 x 3 x 3

GCF or HCF-
Greatest Common Factor: The greatest or highest whole number that is a factor of each of the two numbers

Identity element for multiplication: **The identity element for multiplication is 1** because when a factor is multiplied by 1, the product is that factor. E.g. 1 x 6 = 6, 216 x 1 = 216

Identity element of zero: When zero is added to any number the sum is always that number, e.g. 6 + 0 = 6, 0 + 8 = 8

Key: A button pressed on a calculator to enter information**.** A **clear key** erases information on the **display panel.**

LCM –
Lowest Common Multiple The smallest nonzero number that is a multiple of two or more numbers

Multiple:	A product obtained by multiplying the set of whole numbers by a given factor (number).
Multiplication:	An operation on numbers that results in a **product.** The symbol for multiplication is **x.** In the sum 2 x 6 = 12, **2 & 6** are **factors** and **12** is the **product**.
Partition:	To split number or set into 2 or more numbers or subsets, e.g. 89 = 70 + 19 or 80 + 9
Prime number:	A number greater than 1 that has **only** the factors 1 and itself, e.g. 2, 3, 5, 7, 11, 13, 17
Quotient:	The 'answer' to a division sum. In this number sentence 15 ÷ 5 = 3, **3** is the **quotient.**
Regroup:	To convert a unit from one place value to another place value, keeping the value of the number constant e.g. 43 can be **regrouped** as 3 tens and 13 ones
Subset:	A set, each of whose members is a member of another set e.g. girls are a subset of the set of Grade Five students.
Subtraction:	The inverse operation of addition performed on a sum and a subtrahend to obtain a missing subtrahend. e.g. 8 – 6 = 2

CHECKLIST FOR MATHEMATICAL DEVELOPMENT (Standard Two)
OPERATIONS OF WHOLE NUMBERS

Behaviours	Names of Children												
Write date when skill is mastered													
Mental Calculation													
Addition and Subtraction													
Adds numbers to 20													
Calculates sums and differences of multiples of 10, 100 or 1,000													
Can name number pairs totaling 100													
Calculates doubles and halves of 2-digit, 3-digit, 4-digit numbers													
Adds and subtracts pairs of 2-digit, 3-digit, 4-digit numbers													
Adds and subtracts decimal numbers to at least one place													
Calculates doubles and halves of decimal numbers to at one place													

Multiplication and Division													
Calculates products of single-digit numbers up to 10 x 10													
Calculates products of multiples of 10 up to 1,000													
Calculates doubles and halves of 2-digit, 3-digit, 4-digit numbers													
Calculates quotients of up to 2-digit numbers with a single-digit divisor													
Calculates quotients when the divisor is 10, multiple of ten													
Calculates double and halves of whole numbers													
Multiplies and divides decimals up to at least two places with single-digit factors or divisors													
Recalls quickly basic multiplication and division facts													
Recalls quickly prime numbers up to 50, 100													
Recalls quickly prime factors of numbers to 50, 100													
Uses brackets correctly													

OPERATIONS OF WHOLE NUMBERS													
Behaviours	**Names of Children**												
Write date when skill is mastered													
Written Calculation													
Addition and Subtraction													
Uses an empty number line to add and subtract by partitioning													
Adds and subtract by using expanded notation													
Records using column addition and subtraction, adding tens and ones separately													
Uses standard column addition and subtraction													
Multiplication and Division													
Informally records partitioning													
Uses grid methods of recording													
Multiplies and divides by using expanded notation													
Uses standard short multiplication and division													
Uses standard long multiplication and division													
Uses factorization methods													

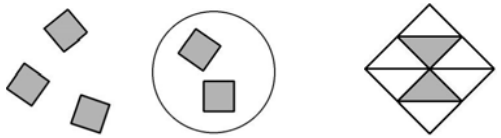
Use of the Calculator													
Uses the clear entry key													
Carries out one and two step calculations involving all operations													
Interprets the display correctly													
Identifies negative numbers													
Uses the sign-change key													
Use the calculator to estimate and check answers													
Carries out measurement calculations and interprets display answer													
Uses the calculator to solve calculations with fractions													
Uses the calculator to solve multi-step calculations													
Recognizes rounding errors													
Recognizes recurring decimals													
Uses the bracket, memory and square root keys													

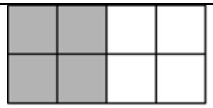
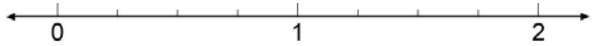
Standard 3: The student can calculate ratios, proportions, fractions, decimals and percentages.

Rational Numbers

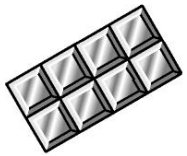
Fractions (3.1)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
3.1(1) Find unit fractions of numbers, quantities and shapes **3.1(2)** Read and write proper fractions demonstrating knowledge of 'denominator' and 'numerator'. **3.1(3)** Identify and estimate fractions of shapes **3.1(4)** Use diagrams to compare fractions identify equivalents and interpret mixed numbers. **3.1(5)** Compare fractions and identify equivalents **3.1(6)** Position fractions on a number line **3.1(7)** Identify pairs of fractions that total 1. **3.1(8)** Express a smaller whole number as a fraction of a larger one and vice versa. **3.1(9)** Simplify fractions by cancelling common factors **3.1(10)** Order a set of fractions by converting them to fractions with a common denominator. **3.1(11)** Relate fractions to multiplication and division **3.1(12)** Add, subtract, multiply and divide fractions.	***Pre-requisites from Cycle l*** • ***Naming fractions*** • ***Finding fractions by use of diagrams*** • ***Finding fractions of sets*** Fractions • Identification • Comparing • Equivalent • Use of number lines • Adding fractions to total 1 • Simplifying • Ordering • Operations • Problem Solving	Fraction, part, equal parts One whole, one half, one quarter, one fifth, one sixth, one tenth Unit fraction, mixed number, numerator, denominator, equivalent Improper fraction, proper fraction Cancel	Teacher observes and records when the student can: • Find given fractions of whole numbers, shapes or quantities • Demonstrate an understanding of numerator and denominator by reading and writing fractions • Identify fractions of partly shaded shapes • Use diagrams to: o Compare fractions o Identify equivalent fractions • Identify mixed numbers and improper fractions • Show fractions on a number-line • Identify pairs of fractions that have the sum of 1 • Express small whole numbers as a fraction of a large whole number • Express large whole numbers as a fraction of a smaller whole number • Simplify fractions • Order given fractions • Relate fractions to multiplication and division • Perform operations on fractions; add, subtract, multiply and divide

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Shared Math Prompt: **3.1(1)A** Show me a fraction Prompt: **3.1(5)A** Find a fraction that is the same size as ¾ Prompt **3.1(7)A** Can you find a pair of fractions that make one whole? Prompt: **3.1(11)A** Find different ways to complete: $\frac{\square}{\square}$ of $\square$ = 12 Prompt: The result of dividing one number by another is 4 ¾. What were the two numbers? Are there any other possibilities?	***Pre-requisites from Cycle One*** ***Students can recognize simple fractions and find halves and quarters of numbers and quantities*** *Guided Math* **3.1(1)A** • What calculation would you do to find ¼ of 12 litres? • This line is 6 cm long. Use a ruler to divide it into quarters. Find ¼ of 6 cm. • Find ½ of 16. Find ¼ of 16. Find $^1/_8$ of 16. What do you notice? • Kim uses $^1/_5$ of a 500 g bag of flour. How much flour is this? • Which is heavier: ½ of 18 kg or ¼ of 32 kg? • What is two thirds of 66? • What is three quarters of 500? **3.1(3)A** • What fraction of these tiles is circled?  • Leah says that this rectangle is divided into thirds because it is divided into three parts. Is she right? Explain your answer.  **3.1(4)A**What fraction of this shape is shaded? How do you know? Is there another way that you can describe the fraction?	Blank number-lines with different divisions. Rulers Fraction kits and disks Cut out shapes Paper Assorted problem cards Work cards Counters and other manipulatives

Before teaching students the algorithms for operations on fractions let the students use manipulatives number-lines or diagrams to find solutions to problems or sums. The next steps are: • Develop rules • Test and use rules *Addition/Subtraction Rules* • If fractions do not have the same denominator, find a common denominator and rename the fractions. • Add or subtract the numerators • Use the common denominator for the answer. • Simplify if necessary. *Multiplication Steps* • Start with problems that can be solved with repeated addition e.g. Teacher eats ½ a grapefruit every day. How many grapefruits does she eat in a week? ½ + ½ + ½ + ½ + ½ + ½ +½	 What calculation did you do to find your answer? **3.1(5)A** • Would you rather have $^1/_3$ of 30 sweets or $^1/_5$ of 40 sweets? Why? • Karen makes a fraction using two number cards. She says, 'My fraction is equivalent to ½. One of the number cards is '6' What could Karen's fraction be? Give both possible answers. • Write a fraction that is larger than $^2/_7$. • Which is larger: $^1/_3$ or $^2/_5$? Explain how you know. • Tell me a fraction that is equivalent to $^2/_3$ but has a denominator of 9. **3.1(6)A** • Draw an arrow on the number line to show 1 ¾  **3.1(7)A** • Use this 3 by 4 rectangle to find two fractions that add up to 1. • Identify pairs of fractions that total 1. **3.1(8)A** • Express 8 slices of a 5 slice pizza as a fraction. • What fraction of 9 is 6? What fraction of 90 is 60? • What fraction of $1 is 50c, 75c, 30c…? • What fraction of 1 kg is 500 g, 400 g…? • What fraction of a day is 1 hour, 12 hours, 8 hours…?	Number cards Graph paper Geo boards Overhead projector, chalkboard or white board Flip chart paper

= 3½ • Associate with multiplication e.g. 7 x ½ = 3½ • Develop a rule 7 x ½ = 3½ or $^{7}/_{1}$ x ½ = 3½ Multiply the numerators and the denominators to make a product • Test the rule • Relate the rule to the use of 'of'. E.g. Janet uses ½ of a dozen eggs to make a cake. How many eggs does she use? ½ of 12 = 6 or ½ x $^{12}/_{1}$ = 6 • Extend to multiplication of mixed numbers *Division Steps* • Start with a problem that can be solved by using repeated subtraction (measurement division) E.g. Kenneth bought 3 packs of M&Ms to put in party bags for his party. He used ¼ of a pack for each party bag. How many bags did he use? Take off a quarter until you reach 0. A number-line can be used. 3 – 12 ¼ s = 0 or 3 ÷ ¼ = 12	**3.1(10)A** • Write the two missing numbers in this sequence. ¼ , ½ , ¾ , ☐ , 1 ¼ , 1 ½ , ☐ , 2 • Place these numbers in order, smallest first: ½ , 2, 1 ¾ , 3½ , 1 ¼ **3.1(11)A** • 50 ÷ 5 = 10. Now complete: $\frac{1}{\square}$ of 50 = 10 **3.1(12)A** • The pizza was sliced into six equal slices. I ate two of the slices. What fraction of the pizza did I eat ½ , $^{1}/_{3}$, ¼ , ¾ • What is one half added to three quarters? • Max has $48. He spends ¾ of it. How much has he got left? • I ate more than ½ a pizza but less than ¾. What fraction could I have eaten? • What would you prefer: 3 pizzas shared between 4 people or 6 pizzas shared between 10 people? Explain why. • Which would you rather have: $^{1}/_{3}$ of Nafl30 or ¼ of Nafl60? Why? • There are 300 children in Sr. Borgia School. Four fifths of the children went on a field trip. How many children were left at school? • What is the missing number? $\frac{7}{10} = \frac{\square}{30}$ • One seventh of a number is 4. What is the number? • Jay buys a 2 litre bottle of soda. He drinks ¼ of the bottle and spills $^{2}/_{5}$ of the bottle. How many millilitres are left? • Kimberly has a 100 ml bottle of medicine. She takes one fifth of the medicine each day. How many days does she	Teacher made or commercial fraction kits Scrap paper for jottings Work cards

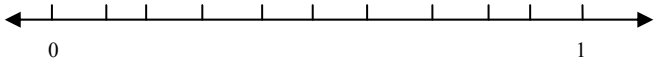
• After many problems the students should notice that the answer is gained by inverting the divisor and multiplying. E.g. $3 \div ¼ = 12$ or $^{3}/_{1} \div ¼ = 12$ Therefore $^{3}/_{1} \times {}^{4}/_{1} = {}^{12}/_{1}$ or $3 \times {}^{4}/_{1} = 12$ • Test the rule • Extend to division of mixed numbers. E.g. A serving of dog food is 5 ½ ounces. How many servings can be made from 22 ounces? ***Always have the students estimate problem solutions to judge how reasonable their answers are.***	take the medicine for? How much medicine does she take each day? What calculation did you do to work this out? • Here is a chocolate bar.  Bill eats 3 pieces and Ann eats 2 pieces. What fraction of the chocolate bar remains? How did you do it? • Barry has saved 60 guilders. He decided to spend $^{1}/_{3}$ of it. How much does he spend? • What operation would you key into a calculator to find $^{1}/_{8}$ of 256?	Calculators

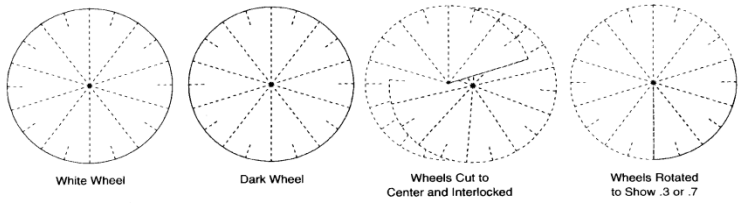
Rational Numbers
Decimals (3.2)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
3.2(1) Recognize the equivalence between decimal and unit fractions (one half, quarters, tenth, hundredth) **3.2(2)** Relate unit fractions to their decimal equivalents **3.2(3)** Compare and order decimals **3.2(4)** Use knowledge of place value, addition and subtraction to calculate sums, differences, doubles and halves of decimals **3.2(5)** Multiply and divide decimal fractions. **3.2(6)** Express a quotient as a decimal or unit fraction. **3.2(7)** Solve problems involving decimals and unit fractions by written methods or use of a calculator	Decimals • Place value • Language of decimals • Comparing and ordering decimals • Unit fractions and decimals • Operations • Problem solving	Decimal fraction, decimal, decimal place, decimal point Tenths, hundredths, thousandths	Teacher observes and records when the student can: • Give the equivalent decimal for: o Half o Quarters o Tenths o Hundredths o Other fractions • Compare given fractions • Order given fractions • Mentally: o Add and subtract decimals o Double decimals o Half decimals • Perform operations on decimals o Add o Subtract o Multiply o Divide • Express a quotient as a decimal or fraction of the divisor • Solve problems using: o Written methods o Calculators

<table>
<tr><th colspan="3">Suggested Experiences</th></tr>
<tr><th>Whole Class</th><th>Small Group / Centres</th><th>Resources</th></tr>
<tr>
<td>
Shared Math
Prompt:
Tell me fractions that are the same as 0.5.

Steps in teaching decimals
• Using manipulatives to show tenths, hundredths and thousandths
• Decimal notation, (.01 is read as one hundredth)
• Place Value and Decimals
• Comparing, ordering and estimating
• Common fraction equivalents
Decimal Hunt – The students can look at newspapers, magazines and books for decimals. Students can then write them on the chalkboard and read them
</td>
<td>
Pre-requisites for learning decimals are a thorough understanding of place value and fractions such as ½, ¼, $^1/_{10}$, and $^1/_{100}$. Decimal notation can be reinforced with currency notation.
At the higher level integrate decimal fractions, unit fractions, percents and ratio.
Guided Math
3.2(1)A The students can work in pairs. One student says, ‘Show me one hundredth’, the other student uses any manipulative to do this. This activity can be repeated with one student holding up a decimal card and the other showing the decimal
The students can position given decimals on a number line (tenths)
Can you tell me what the digit 7 represents in each of these amounts: $2.70, 7.35 m, $0.37, and 7.07 m?

3.2(2)A
• Tell me two fractions that are the same as 0.2.
• How would you write $^{37}/_{100}$ as a decimal?
• How many cents are the same as $0.25? How many hundredths are the same as 0.25? How else could
</td>
<td>
Decimal place value chart, e.g.
<table>
<tr><td>1,000</td><td>100</td><td>10</td><td>1</td><td>$^1/_{10}$</td><td>$^1/_{100}$</td><td>$^1/_{1000}$</td></tr>
<tr><td>thousands</td><td>hundreds</td><td>tens</td><td>ones</td><td>tenths</td><td>hundredths</td><td>thousandths</td></tr>
<tr><td>1,000</td><td>100</td><td>10</td><td>1</td><td>0.1</td><td>0.01</td><td>0.001</td></tr>
</table>
Graph paper
Place value kits
Decimal cards e.g.
0.1 0.01
Number-lines


Coins and bank notes
Decimal Wheels (2 of each, 1light and 1 dark) the wheels are cut to the centre and interlocked. Each wheel represents one whole, each section $^1/_{10}$ or 0.1


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In order for students to find equivalent decimals the teacher can begin with using paper strips to show given tenths or hundreds e.g. 0.600, 0.6, 0.60. After much exposure to this type of activity can be given prompts such as, Show me equivalents for 0.45 (0.450, 0.40 + 0.05, 0.4 + 0. 05 etc.). In teaching operation with decimals the students can first work the sum out in fractions, e.g. $^{3}/_{10} + {}^{4}/_{10} = {}^{7}/_{10}$ 0.3 + 0.4 = 0.7 $^{29}/_{100} - {}^{12}/_{100} = {}^{17}/_{100}$ 0.29 - 0.12 = 0.17 $^{27}/_{10}$ x $^{3}/_{10} = {}^{81}/_{100}$ 2.7 x 0.3 = 0.81 *When teaching division of decimals it is prudent to use repeated subtraction as a beginning point rather*	you write twenty-five hundredths? • Which of these fractions is the same as 0.5? • Which of these decimals means $^{7}/_{10}$? A. 70, B. 7, C. 0.7, D. 0.07 • Which of these fractions is the same as zero point four? ¼ , $^{1}/_{40}$, $^{1}/_{400,}$ $^{4}/_{10}$, $^{4}/_{100}$ **3.2(3)A** • Sequence each row of decimals from smallest to greatest 0.3, 0.19. , 0.47, 0.8, 0.5; 0.7, 0.77, 0.234, 0.63, 0.08 • Which is larger: 239c or $2.93? Why? • Put these in order: Nafl0.56, 125c, Nafl3.60, 250c, 7c, Nafl5, 205c. Which is the smallest? How do you know? Which is the largest? How do you know? • What amount of money comes next: Nafl1.76, Nafl1.86, Nafl1.96…? **3.2(4)A** For assessment purposes the teacher can ask a student to verbalize the calculations, e.g. 3.8 × 2; 0.28 + 0.46; 9.7 – 3.9 and evaluate the student's knowledge of decimals and place value.	

than fractions. The student can demonstrate understanding with the use of a number-line, manipulatives or use a calculator.

The students can also be guided to multiply the divisor and dividend by 10 or a multiple before dividing; e.g. 0.08 ÷ 0.4 = (10 x .08) ÷ (10 x 0.4) = 0.8 ÷ 4 = 2

Division is used to find decimal notation for fractions.

¼ expressed as a decimal is 0.25 because ¼ means 1 ÷4

```
  0 .25
4)1.00
  -80
   20
  -20
    0
```

¾ would be 0.25 x 3 = 0.75

Note that fractions with denominators that have factors other than 2 or 5 will give recurring decimals.

- Find half of 92. Use your answer to find half of 0.92. Explain the relationship between the two calculations.
- What number added to 0.72 gives 1? How do you know?
- What number lies exactly halfway between 0.48 and 0.74? How did you work this out?

3.2(5)A

- I think of a number, halve it, and then add 0.6. I get the answer 5.2. What number did I start with?

How did you work out your answer?

3.2(5)A.

- Make up a word problem that could be solved using these calculations: 2 m – (24.2 cm × 5) ($30.35 + $47.11) ÷ 6
- What would be the best approximation to work out 4.4 × 18.6? Give your reasons. Roughly, what answer do you expect to get? How did you arrive at that estimate? Do you expect your answer to be greater or less than your estimate? Why?
- Write in the missing number: *32.45 × □ = 253.11*

A chart for showing the common fractions as decimals can be developed by the students.

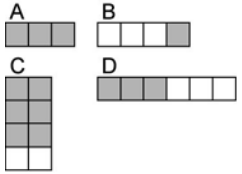
Fraction	Decimal
$^1/_{10}$	0.1
$^1/_{100}$	0.01
$^1/_{1000}$	0.001
$^1/_5$	0.2
½	0.5
¼	0.25
$^1/_8$	0.125
$^1/_3$	*0.333…
$^1/_6$	*0.1666…
$^1/_{12}$	*0.0833…
* = recurring decimals	

	3.2(7)A • Find the total length of three pieces of wood with lengths 167 cm, 2.8 m and 1008 mm. • A tree trunk is 6.5 metres long. Frank cuts the tree trunk into four equal lengths. How long is each length? • A 250 g box of washing powder costs $1.48. A 1.1 kg box of the same washing powder costs $7. Which box would you buy? Why? • What is the total cost of 3 spades at Nafl9.55 each and 2 buckets at Nafl4.73 each?	

Rational Numbers

Percents, Proportions and Ratios (3.3)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
3.3(1) Use the vocabulary of ratio and proportion to describe the relationship between two quantities. **3.3(2)** Estimate a proportion **3.3(3)** Use sequence to scale numbers up or down **3.3(4)** Solve problems involving proportions **3.3(5)** Solve problems involving direct proportion by scaling up or down **3.3(6)** Express one quantity as a percentage of another. **3.3(7)** Find equivalent percents, decimals and fractions. **3.3(8)** Calculate percentages and fractions of whole numbers or quantities	Concept of ratio Vocabulary of ratio Scaling Proportion Percent Calculating percents Equivalent percents, decimals and fractions Problem solving using ratio, proportions and percents	Proportion, in every, for every, to every, per, for, to Percentage, percent (%),	Teacher observes and records when the student can: • Use the vocabulary of ratio and proportion to describe the relationship between 2 quantities • Estimate a proportion • Use sequence to scale numbers down or up • Solve problems involving proportion • Solve problems involving direct proportion by scaling • Express one quantity as a percentage of another • Find equivalent percents, decimals and fractions • Calculate percentages of numbers and quantities

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
3.3(1)A Ratio and proportion should first be introduced in familiar contexts e.g. I spend 5 days in every week in school', means 'I spend 5 days in every 7 days at school'. 'I have 1thumb for every 4 fingers'. Students can be asked to draw a picture for a given statement like 'There are 2 apples to every 1 banana in the bowl' or design a pattern using two colours, such as blue, blue, red, blue, blue, red, and state the ratio. Ratios can be recorded with drawings e.g. △△ → △ 2 →1 or 2:1 or as a fraction $^4/_5$ **3.3(5)A** Students can be introduced to *scaling* in order to solve problems with proportions. They can continue sequences by *scaling up or down, e.g.* There are 3 red apples in every 10, (3:10) There are 6 red apples in every 20(6:20)	***Ratio can be introduced in Year 2 but computation and symbols for ratio are better introduced in Year 3.*** ***Percents can be introduced in Year 3.*** Guided Math **3.3(1)A /3.3(2)A** • One in every five of these beads is red. What fraction of the beads is red? • Create a word problem that uses the words 'in every'. • There are 10 girls and 20 boys in Jill's class. Jill said that there is one girl for every two boys. Her friend Amanda said that means ½ of all the children in the class are girls. Is Jill right? Use words or pictures to explain why. Is Amanda right? Use words or pictures to explain why. • Which diagram has 3 out of every 4 squares shaded?  • For every soda can that Mark collected, Maria collected 3. Mark collected a total of 9 soft drinks. How many did Maria collect? A 3, B 12, C 1, D 27 *Science Link* – Collect and sort living things according to any criteria and then record the grouping using the vocabulary of ratio e.g. 1 frog for every 5 tadpoles **3.3(3)A – 3.3(5)A** • Grand Marche gives 2 points for every 1 guilder spent. How much must you spend to earn 40 points? Tell me how you worked this out. • One kiwi costs 45 cents. How much would five kiwis cost?	Counters Cut-out shapes or objects Graph paper Plastic shapes, bears etc.

There are 9 red apples in every 30(9: 30)
8 dimes → 16 nickels
4 dimes → 8 nickels
2 dimes → 4 nickels
Shared Math
Prompt:
At the gym there are 4 ladies for every 2 men. Suggest some numbers of ladies and men that there might be at the club.

3.3(7)A /3.3(8)A
Teachers should help students to make the connection between fractions, decimals, ratio and percent. ***Percent*** **is a ratio of 1:100**
Problems such as Priscilla had a coupon for 25 cents off for every dollar spent on soap powder. If the soap powder costs her $2. What was the original price?
After working out several of these kinds of problems they can be introduced to the word *percent* and symbol *%*
Shared Math
Prompt:
3.3(6)A

- Paul uses 3 tomatoes for every ½ litre of sauce. How much sauce can he make from 15 tomatoes? How many tomatoes would he need for 2 litres of sauce?
- A recipe gives amounts to feed 2 people. Explain how you would change the amounts to feed 6 people.
- A pattern of tiles is organized so that there are 2 red tiles for every 3 blue tiles. How many blue tiles are needed for a pattern that contains 12 red tiles? How did you work this out?
- A recipe for 3 portions requires 150 g flour and 120 g sugar. Don's solution to a problem says that for 2 portions he needs 80 g flour and 100 g sugar. What might Don have done wrong? Work out the correct answer.

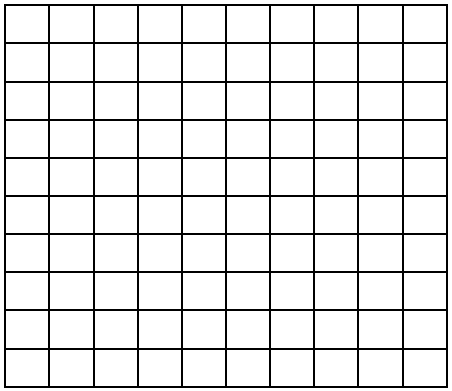
3.3(6A)

- Give the students 10 x 10 squared paper and let them shade one square. Tell them this represents 1%. Let them colour one row and ask the percentage. Other percentages can be also represented. Ensure that the students understand that 100% is the whole. Let them fill in the missing number to assess knowledge.
  $^{24}/_{100}$ =____% $^{?}/_{100}$ = 8%
  $^{4}/_{100}$ = ____% $^{?}/_{100}$ = 63%
- What percentage of $8 is $2? What percentage of €4 is €16?

3.3(7)A

- What percent is the same as $^{7}/_{10}$? Explain how you know. What is $^{31}/_{100}$ as a percent?
- Which is a better mark in a test: 61%, or 30 out of 50? How do you know?

10 x 10 squared paper can be used to show $^{1}/_{100}$ or1%



Tell me two amounts where one is 25% of the other. Now give me two amounts where one is 5% of the other. What about 40%?

3.3(8)A
Explain the steps you would take to find 35% of an amount without a calculator.
How would you find 35% of an amount using a calculator?
$^{35}/_{100} = {}^{N}/_{Amt}$
or on the calculator 35 ÷ 100 x amt.

- Complete this table

Fraction	Decimal	Percentage
½		
	0.1	
$^{3}/_{10}$		25%
		7%

3.3(8)A

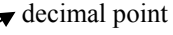
- Find 75% of 200 ml. How did you do this?
- What percentage of the bar is shaded?

- Rick says that 3% is equivalent to 3 /10. Is he right? How do you know?
- A test has 50 marks. Rory gets 40 marks. What is his percentage score?
- 25% of the apples in a basket are red. The rest are green. There are 21 red apples. How many green apples are there?
- 50,000 people visited St. Maarten one year. 40% of the people visited in April for Carnival and 15% of the people visited in August. How many people visited St. Maarten in the rest of the year?

GLOSSARY (Standard 3)

Decimal: A fraction with a denominator that is a multiple of 10 with a decimal point to the left of the numerator, e.g. **.04** (4/100)

Decimal Point: A mark used to separate the whole number from the fractional part of a number e.g. 36.65



Denominator: The number written below the fraction bar, in a fraction, which tells the number of equal pieces into which something is divided. In ¼ 4 is the denominator.

Equivalent Fractions: Fractions that name the same quantity, e.g. $^{2}/_{3,}$ $^{4}/_{6,}$ $^{8}/_{12}$

Fraction: A **fraction** is a numeral that tells a part of a whole

Improper fraction: A fraction where the numerator is greater than or equal to the denominator, e.g. $^{8}/_{4}$

Mixed Number: A numeral that consists of a whole number and a fraction, e.g. 2 ¼

Numerator: The number written above the fraction bar, in a fraction, which tells how many pieces are being considered. In $^{2}/_{4;}$ 2 is the **numerator**.

Percent: A certain number of hundredths. **25%** means 25 out of a 100.

Proper Fraction: A fraction in which the numerator is less than the denominator.

Proportion: A mathematical sentence stating that two ratios are equal, e.g. 2 to 5 = 4 to 10 = 6 to 15

Ratio: A comparison between two numbers e.g. 2:5, $^{2}/_{5}$, 2 in every 5, 2 out of every 5

Recurring Decimal: A decimal where digits are repeated endlessly e.g. **.3333…**

Simplify: To write a fraction in the form where the denominator and numerator do not have a common factor other than 1, e.g. $^{8}/_{24}$ in the **simplest form** is $^{1}/_{3}$

RATIONAL NUMBERS													
Behaviours	**Names of Children**												
Write date when skill is mastered													
Fractions													
Identifies given fractions of whole numbers, shapes or quantities													
Understands *numerator* and *denominator*													
Reads and writes fractions													
Identifies fractions of partly shaded figues													
Uses diagrams or manipulatives to compare fractions													
Uses diagrams or manipulatives to identify equivalent fractions													
Identifies *mixed numbers* and *improper fractions*													
Shows fractions on a number line													
Identifies pairs of fractions that total 1													
Expresses small whole numbers as a fraction of a larger whole number													
Simplifies fractions													

Orders given fractions													
Relates fractions to multiplication and division													
Add s and subtracts fractions													
Multiplies and divides fractions													
Rational Numbers													
Give the equivalent decimal fractions for unit fractions ½, $^1/_4$, $^1/_{10}$, $^1/_{100}$,other _____													
Compares given decimal fractions													
Orders given decimal fractions													
Mentally adds/subtracts decimal fractions													
Mentally doubles decimal fractions													
Mentally halves decimal fractions													
Expresses a quotient as a decimal or unit fraction of the divisor													
Solves problems involving decimal fractions by written or calculator methods													
Percentages, Proportions and Ratios													
Uses the vocabulary of ratio and proportion to describe the relationship between 2 quantities													
Estimates a proportion													
Uses sequence to scale numbers up or down													

Solves problems involving proportion													
Solves problems involving direct proportion by scaling													
Expresses one quantity as a percentage of another													
Identifies equivalent percents, decimal and unit fractions													
Calculates percentages of numbers and quantities													

Standard 4: The student understands the process of measurement[8].

Measurement
Time (4.1)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities

4.1(1) Read the time on a 12 hour digital clock and to the nearest 5 minutes on an analogue clock.
4.1(2) Read time to the nearest minute; use am, pm and 12 - hour clock notation
4.1(3) Read timetables and time using 24-hour clock notation
4.1(4) Estimate time intervals
4.1(5) Calculate time intervals and find start or end times for a given time interval
4.1(6) Choose units of time to measure time intervals; calculate time intervals from clocks and timetables
4.1(7) Use a calendar to calculate time intervals
4.1(8) Solve one- and two-step problems involving time.
	Telling Time
	• Analogue
	  • 5-minute intervals
	  • 1-minute intervals
	• Digital
	a.m., p.m., 24 hour clock
	Calculating time intervals
	The calendar
	Problem solving
		time, timer, clock, watch, second, minute, hour, day, week, month, year, before, after, interval, start time, end time, how long ago?, how long will it take to …?, how long will it be to …?
		am, pm, digital, analogue, timetable, arrive, depart, hour (h), minute (min), second (s) problem, solution, calculate, calculation, equation, operation, answer, method, explain, reasoning, reason,
			Teacher observes and records when the student can:
			• Tell the time on a the digital clock
			• Read the time on an analogue clock
			  o 5-minute interval
			  o 1-minute interval
			  o 24 hour clock
			• Estimate time intervals
			• Calculate time intervals from
			  o Clocks
			  o Timetables
			  o Calendars
			• Solve problems involving time
			  o One step
			  o Two step

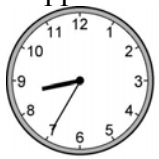
[8] Measurement includes learning about money, time, length, volume and capacity, weight or mass and temperature. Students learn basic measures and concepts, how to measure including the tools and use of scales, to estimate, to use formulas and to problem solve in each area.

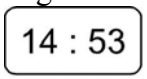
<table>
<tr><th colspan="3">Suggested Experiences</th></tr>
<tr><th>Whole Class</th><th>Small Group / Centres</th><th>Resources</th></tr>
<tr>
<td>During the day constantly refer to the time on the classroom clock.
Shared Math
Prompt: Show ‘time with drawings, figures and words.

The class could do a Social Studies project on Time as they are studying the clock

Time-lines can be developed in Social Studies to show the history of transportation.

4.1(1)A For a general quick survey each student will use a small clock to show times that are given by the teacher. The teacher can make a note of those students who have difficulties.

4.1(4)A Students find the duration of their journey to school by recording the time when they leave home and the time when they arrive at school to the nearest 1 or 5 minutes. They calculate the difference in</td>
<td>At the end of Cycle Two most students should be able to tell the time to the quarter hour on the analogue clock and translate to the digital clock. They can also identify units of time .They should also be able to count in 5s. Assess level by asking students to read and show given times on small clocks
It is very important to develop the concept of time intervals.
Guided Math
Let the students practice reading the time or showing the time at different times of the day in a time centre.
4.1(1)A
• How would this time appear on a 12hour digital clock?
 
4.1(2)A /4.1(3)A
• This time is shown on a digital clock. Draw the time on a 12-hour analogue clock. Write the time in figures and words using a.m. or p.m.
 

• How would quarter past four in the afternoon be shown on a 24hour digital clock?
They complete a simple conversion table, such as:
<table>
<tr><td>seven o’clock in the evening</td><td>19:00</td><td>7:00p.m.</td></tr>
<tr><td>quarter to ten in the morning</td><td></td><td></td></tr>
<tr><td></td><td>14:20</td><td></td></tr>
<tr><td></td><td>22:15</td><td></td></tr>
<tr><td>midnight</td><td></td><td></td></tr>
<tr><td>seventeen minutes past four in the afternoon</td><td></td><td></td></tr>
</table>
</td>
<td>Clocks, commercial and teacher/student made, that show minute and hour times
  
Digital clocks
 

Clock Bingo
Time Centre set up by students
Clock stamps
Matching card sets e.g. analogue and digital clocks showing the same time or 12-hour and twenty-four hour times
Stop watches</td>
</tr>
</table>

order to establish how long their journey lasts. Each student then cuts a strip of paper to represent the time (e.g. 1 minute per centimeter). These strips are stuck on a class bar chart. The title of the bar chart and axes labels will be decided by the students. During a follow up session the students are asked questions to allow them to interpret the information.

Who has the longest journey to school?

How many children take longer than 20 minutes to get to school?

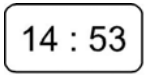
What is the difference between the shortest and longest journey times?

Guided Math

4.1(6)A

Let the students record the time at the beginning of the Math lesson. At the end of the lesson have them record the time again. They then work out the duration of the lesson. Give them problems such as:

- Kevin leaves home at quarter past 8 and arrives in school at 20 to 9. How long is his journey? How did you work this out?
- What time will this clock show in 20 minutes?



- A plane takes off for Holland on Tuesday at 22:47. It lands in Holland on Wednesday at 07:05. How long in hours and minutes is the flight?

4.1(7)A

- Here is the calendar for March 2008.

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Stephen's birthday is on the 20th. He has his party on the Sunday after his birthday. What is the date of his party? His sister's birthday is the 9th April. On what day of the week is her birthday? How many days fall between their birthdays?

4.1(8)A

Problems can be given based on a local T.V. Guide

- How many 20 minute cartoons can be saved on a 2-hour DVD?

Timetables collected by the students e.g.

Television, airplane, train

Birmingham New Street	09:40	10:05	11:05	12:35
Birmingham International	09:50	10:15	11:15	12:45
Coventry	10:10	10:30	11:30	13:00
Leamington Spa	10:25	....	11:45	13:15
Banbury	10:45	....	12:05	....
Oxford	11:05	11:20	12:25	13:55
Reading	11:30	11:55	12:50	14:25

Calendars

Time management can be developed by giving students a certain time to complete assignments. It will also help develop time awareness.	• Kim types 40 words per minute. How long will it take her to type a 160-word letter? • Rob runs 100 metres ten times. These are his times in seconds. 13.4 13.0 13.9 13.7 13.3 13.5 14.0 14.4 13.8 14.0 What is his mean (average) time? • John was calculating using hours and minutes. What does this display represent?  • Some children run a 100 metres race on Sports Day. Here are their times in seconds. Name / Time taken Sue 15.97 s Jan 16.39 s Sam 14.83 s Tom 17.00 s Raj 15.89 s What is the winner's time? Who has the time nearest to 16 seconds? *Science Link* • Changing state: Calculate differences between times liquids take to evaporate at room temperature and in other conditions e.g. in the sun, in the fridge, on a windy day (simulated with a hairdryer). • Dissolving: Compare times it takes for different types of sugars to dissolve in hot, warm, cool, cold water. Record on a graph. Students can record how many jumps, hops etc. they can do in 1 minute and record the results. They can also compare differences.	

Measurement
Money (4.2)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
4.2(1) Recognize and use money notation **4.2(2)** Recognize different Antillean coins and foreign currency used in St. Maarten **4.2(3)** Count the value of a set of coins and or notes of like and unlike values **4.2(4)** Solve one-step and two-step problems involving money.	Identification of: • Antillean currency • US currency • Euro coins Notation for money Problem Solving	Coin, bank note, currency, Antillean, Netherlands Guilder (Nafl, fl,), florin, cent Dollar ($), penny, nickel, dime, quarter, Euro (€) Notation, conversion rate, value	Teacher observes and records when the student can: • Recognize and use money notation • Identify Antillean coins and banknotes • Identify US coins and banknotes • Identify the Euro coins • State the values of Antillean and US coins and banknotes • Count sets of coins and banknotes • Identify different coins and or bank notes that are equivalent to: o Up to Nafl5, $5 o Up to Nafl25, $25 & > Nafl5 or $5 o Up to Nafl100, $100 & > Nafl25 or $25 o Up to Nafl1,000, $1,000 & > Nafl100 or $100 • Make change for amounts from Nafl20, $20 to Nafl100, $100 • Solve given money one-step and two-step problems

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Set up a class shop and let the students dramatize shopping *Shared Math* Give prompts such as: **4.2(3)A** Show me 75 cents Show me Nafl50 or $50 In my purse I have 1 guilder coins, 10 cent coins, 5 cent coins and 1cent coins. Find all the possible amounts I can make by choosing three of these coins. Can you show me different ways of making Nafl1 or $1 using only coins? *Experiential Math* Let the students take charge of selling snacks or collecting 'snack money'.	***Students from Cycle I should be able to identify all Antillean and US coins and banknotes; use money notation; give various combinations of coins equivalent to coins above 5 cent and up to Nafl1 or $1and give change up to Nafl5 or $5*** *Guided Math* **4.2(1)A** • Write a price ticket for four guilders and six cent. • Use a calculator to add these amounts of money: 62c, Nafl1.50, 550c, Nafl15, 8c. What will you have to do before you can add them using a calculator? **4.2(2)A** Give the students a set of coins from different currencies and let them sort them. *In Social Studies discuss the currencies used in the island of St. Martin* **4.2(3)A** • Kayla has three guilder coins and four 1c coins in her purse. Write down the amount of money she has altogether in words and figures. • Desiree buys a 6c candy. She pays with a 50c coin. How much change does she get? Draw the coins. • If you have a 1g, 50c, 25c, 10c, 5c, and 1c coins. Which of these amounts can you make using only two coins each time? 61c, 51c, 20c, Nafl1.05, 80c *When the students have mastered money notation and different operations they can be given problems involving money that can be used to assess other mathematical skills.*	Real and play coins Antillean and US Play bank notes Charts showing coins and notes (Antillean and US) Shop Centre with cash registers, items for sale

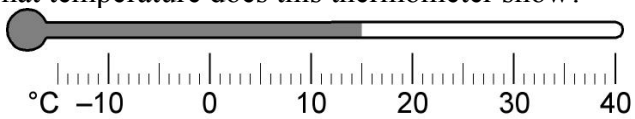
	4.2(4)A *Mental Calculation* • Three pencils cost 90c altogether. How much does each pencil cost? • One half of 32c is 16c. What is one quarter of 32c? • A CD costs between $5.50 and $5.65. How much could it cost? • Tins of dog food cost 42c. They are put into packs of 10. How much does one pack of dog food cost? 10 packs? • Which would you prefer to receive as an allowance: $^{5}/_{6}$ of $24 or $^{3}/_{7}$ of $49? Why? • A bill of Nafl9.50 is shared equally between 5 people. How much does each person pay? • How many Nafl10 notes would you need to make Nafl12 000? *Written or Calculator problems* • If two people share Nafl38 and one person gets Nafl10 more than the other, how much do they each get? • Jack wants to buy a toy car that costs $1. He saves 25c one week and 40c the next. How much more money does he need to buy the car? • I spend Nafl6.78 and Nafl2.84 on food when shopping. Work out how much I have spent altogether. Explain each step of your calculation. • For her party Angela spent $2.88 on apples, $3.38 on bananas and $3.76 on oranges. Will a $10 note cover the cost? Explain your reasoning. • Coconut 78c each Bananas $1.20 per kg  	

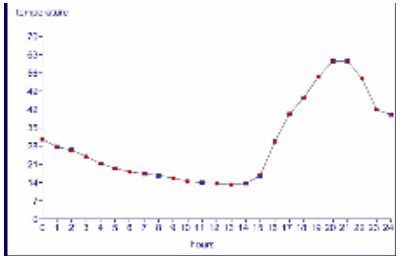
	Josh buys one coconut and half a kilogram of bananas. How much does he spend altogether? • A car costs more than $8600 but less than $9100. Tick the prices that the car could cost. $8569 □ $9090 □ $9130 □ $8999 □ • From the pie chart we estimate that 60% of our class spends more than $50 per year on sodas. How many would that be in a school of 435 children? • Two adults and two children go to a cinema. Adult tickets are Nafl5.85 and children's tickets are Nafl2.85. How much change will they get from a Nafl25 note? • Explain how making a table could help you to solve this problem. 30 children are going on a trip. It costs $5 including lunch. Some children take their own packed lunch. They pay only $3. The 30 children pay a total of $110. How many children take their own packed lunch? • Explain how you would solve these problems. Would you use a calculator? Why or why not? • The twins have saved save Nafl356. A computer game costs Nafl42. How many computer games can the twins buy? • I have saved €194.40. I plan to spend $^{5}/_{12}$ of this on a bicycle. How much will I have left? • Nicola has Nafl50. She buys three flowerpots at Nafl12.75 each and a spade at Nafl9.65. Does she get change? • Grapes cost $4.50 for 1 kg. Marie buys 200 grams of grapes. How much does she pay? • Shadira buys a pack of 24 cans of cola for €6.00. What is the cost of each can? 	

	• 185 people go to the school concert. They pay $2.35 each. How much ticket money is collected? Programs cost 15c each. Selling programs raised $12.30.How many programs are sold?	

Measurement
Temperature (4.3)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
4.3(1) Use standard units for measuring temperature with a thermometer **4.3(2)** Compare Celsius and Fahrenheit **4.3(3)** Problem solve using temperature.	The thermometer Reading the thermometer Comparison of Celsius and Fahrenheit temperature readings Problem Solving	degree Celsius (°C), temperature degree (°)	Teacher observes and records when the student can: • Use and read the thermometer in standard units o Celsius o Fahrenheit • Compare Celsius and Fahrenheit • Solve problems involving temperature

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
The thermometer can be introduced to the students during the Science lesson on Weather, Heat or Matter. Give the students the opportunity to read and record daily temperatures Students can draw pictures of different weather conditions and them match them to given	***Some Cycle I students may not have been introduced to temperature as a mathematics topic.*** *Guided Math* **4.3(1)A** • What temperature does this thermometer show?  • *Science Link*: Keeping warm: Collect data about cooling liquids over time, e.g. temperature of cooling tea every 15	Real and demonstration thermometers Magazine pictures of daily activities in different climatic zones of the world Calendar chart for recording daily temperatures Newspapers

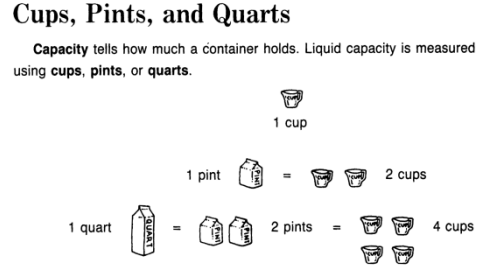
temperatures or vice versa. Students can compare and contrast temperatures for different cities in various climatic zones. (From a newspaper)	minutes. Record results in a table. • Make readings from thermometers with different scales. • Read a table showing temperatures in five different cities on the same day and put the temperatures in order from coldest to warmest. **4.3(2)A** Students can compare Celsius and Fahrenheit by reading the thermometer or by calculation. • If the temperature is 40°C what will it be in Fahrenheit? **4.3(3)A** • Look at this line graph showing the temperature in a room over 24 hours. Make up three questions that can be answered using the data that is represented. Make a line graph showing the temperature in your classroom. Decide on the time intervals.  • Record the morning and evening temperatures for two cities. Which of these places had the greatest temperature rise/fall?	

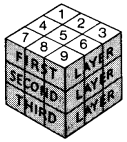
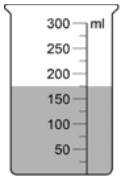
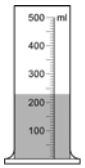
Measurement[9]

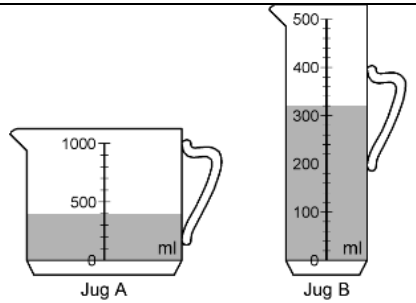
Capacity and Volume (4.4)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
4.4(1) Recognize and use standard units for capacity and volume **4.4(2)** Recognize and use notations for metric measurement **4.4(3)** Change one standard unit to another (metric/imperial) **4.4(4)** Measure using metric and imperial measures **4.4(5)** Read scales accurately **4.4(6)** Compare metric and imperial measures **4.4(7)** Problem solve **4.4(8)** Measure and calculate volume	Standard Units of measurement (metric and imperial) Notations of measures Relationship of units to each other (metric) Measuring capacity and volume Comparison of metric and imperial units Problem solving	metric unit, standard unit, litre (l), millilitre (ml), cups, pints, quart scales, capacity, volume Measuring cup, cylinder, beaker Water and other liquids	Teacher observes and records when the student can: • Recognize and use metric measures for capacity • Recognize and use abbreviations for metric measures • Change one standard metric / imperial (customary) unit to another • Measure capacity using metric and imperial units • Read scales accurately • Compare metric and imperial measures • Calculate volume • Solve problems involving capacity and volume

[9] Metric measurement is used in St. Maarten. Imperial or customary measures can be introduced in Year 4 and compared if the student is ready to do so. This can be done when cooking with recipes that use imperial or customary measures

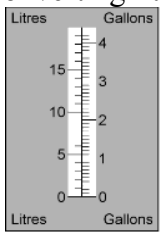
Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Shared Math Prompt: **4.4(1)A** Suggest some objects whose capacity could be measured using a 1 litre measuring jug. Suggest a sensible estimate for the capacity of a kettle. How did you decide on this estimate? Students can confirm their estimates by measuring. *Experiential Math* As a project students can **test a hypothesis** such as: *Each child in our class uses over 100 litres of water each day*. They decide what data is needed and discuss how they will collect the data. E.g. Each child may decide to keep a diary of how and when they use water during the day. Students can estimate the amount of water used for each activity and then work in groups to find the approximate amounts of water used per day. They must decide on the units that they will use to measure	***In Cycle I, students measure capacity with non-standard units. They may have been introduced to the litre in everyday situations e.g. filling the car gasoline tank and making juice. The students should be able to choose and use standard units (litre, cup, teaspoons) to estimate and measure and choose and use suitable instruments and equipment to measure.*** *Students need to be given many opportunities to measure capacity at centers during Science as well as Mathematics lessons.* *Cooking offers chances to read scales and measure accurately.* *Guided Math* **4.4(1)A** Questions such as those following assess knowledge of standard units of measurement: • What measuring instruments would you choose to measure how much water a cup will hold?' • Would you expect a teapot to hold 1 litre, 10 litres or 100 litres? • What unit would you use to measure the capacity of a jug? Of water tank? Of a coffee cup? • How much does a tea cup hold? About 15 ml, 150 ml or 1500 ml • Does a drinking glass hold about 0.2 litres, 2 litres, 20 litres or 200 litres? **4.4(2)A /4.4(3)A** • Can you tell me another way to say or write 6 litres? What about 750 millilitres?	Capacity Charts  **1,000 millilitres (ml) = 1 litre (l)** Measuring cups, spoons, beakers, cylinders Water and other liquids to measure Measuring Center for measuring projects

the actual amount of water used for some of the activities (e.g. hand washing, teeth cleaning, a typical drink). Guided by the teacher the students decide how they should record the total amount of water used by each child to help them to respond to the initial hypothesis. They report their findings and see if the original hypothesis is true. They could extend their enquiry by finding ways of saving water, trying them out and seeing if the amount used is less. **4.4(8A)** *After the students have mastered linear measurement they can be introduced to cubic units.* To find the volume of a box they can use 'ones' blocks and fill the box with layers of cubes. After many similar experiences they will deduce that volume of a cube or cuboid = length x width x height The volume of this cube is 3cm x 3cm x 3cm = $27cm^3$  	• Which measurement is equivalent to 1.3 litres: 130 ml, 1003 ml, 1300 ml or 103 ml? How do you know? • A bottle holds 2 litres of juice. How many millilitres is this? • 2 quarts = ____ pints; 2 cups = ___ pints; 1 quart = ___pints; 2 pints = ____ quarts **4.4(4)A /4.4(5)A** • Fill 5 same size containers with different amounts of liquids. Let the students measure the capacity of liquid in each container and then order them from smallest to greatest. • 50 millilitres of water are poured out from this container. How much water is left in the container?  • 180 ml of water are added to the water in this container. Draw a line to show the new level of the water in the container.  • The diagram shows the volume of water in two measuring jugs. Which jug contains more water, A or B? How much more does it contain?	



4.4(6)A

- Here is a scale for converting litres and gallons.



Approximately how many litres are there in 3 gallons? Give your answer to the nearest litre.
Approximately how many gallons are there in 7 litres? Give your answer to one decimal place.

4.4(7)A

Ask the students to show their methods for solving these problems:

- A spoonful is 5 ml. How many spoonfuls can you get from a bottle that holds one quarter of a litre?
- About how many 185 ml glasses of water can you pour from a 2 litre bottle?
- Nathalie made some fruit punch. She poured 2.4 litres of water, 1.35 litres of pineapple juice and 780 ml of mango juice into a large bowl. How much fruit punch did she make?

	• I fill 6 jugs with water. Each jug holds 2.3 litres. How much water do I have altogether? • Kate's glass holds a quarter of a litre when it is full. She fills it nearly to the top with juice. Tick the approximate amount of juice she puts in the glass. 4 millilitres ___ 20 millilitres ___120 millilitres ___ 220 millilitres ___ 420 millilitres ___ • A bottle holds 1 litre of lemonade. Rachel fills 5 glasses with lemonade. She puts 150 millilitres in each glass How much lemonade is left in the bottle?	

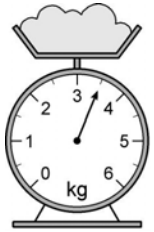
Measurement

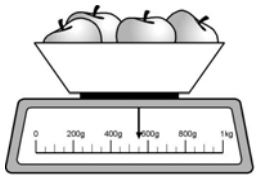
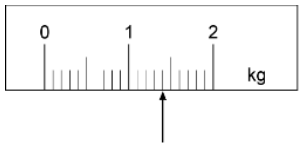
Weight[10] (Mass (4.5))

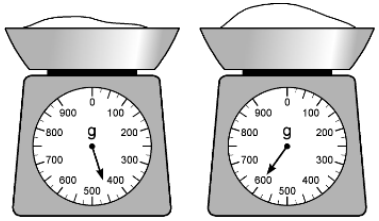
Target Behaviour	Content	Mathematical Language	Assessment Opportunities
4.5(1) Recognize standard units, their symbols and relationships with each other • Metric • Imperial **4.4(2)** Change one standard unit to another **4.4(3)** Measure weight using standard units **4.4(4)** Problem solve using standard measures of weight **4.4(5)** Compare kilograms and pounds	Standard measures of weight: metric and imperial Symbols for measure of weight Accurate measuring of weight using standard units Problem Solving Comparison of metric and imperial units of weight	Kilogram (kg), gram (g), Ounces, pounds Balance, scales, bathroom scales, measuring scale, interval, division, unit, standard unit, approximately, close, about the same as, ten times, hundred times	Teacher observes and records when the student can: • Identify metric units of weight and their symbols • Identify imperial units of weight and their symbols • Change one standard unit to another • Choose appropriate instruments and measure weight accurately • Solve problems involving weight • Compare metric and imperial measures of weight

[10] Weight is the measure of the pull of gravity. Mass is the amount of material an object contains and therefore the force needed to accelerate it. The terms are use synonymously.

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Students can be asked to collect items that weigh about 1 kilo (kilogram) Then weigh them to see if their estimates are correct. *Shared Math* Prompt Show me how many ways you can use these gram weights to total 1 kilogram. The answer is to a problem is 15.4 kg. What was the question? Students can make bar graphs of their weights. As a class the students can **plan and pursue an enquiry** related to another domain area. For example, using the theme 'Keeping healthy'; students can explore the question: *Do the children in our class eat enough fruit and vegetables in a week?* They discuss, clarify and agree what is involved in answering their question. For example, they research how many portions of fruit and vegetables are recommended. They weigh out 'portions' of particular fruit and vegetables in order to	***Cycle I students can choose and use suitable instruments and equipment to measure weight. They may or may not have been introduced to grams and kilograms.*** *The following problems can be used as a starting point for discussion or assessment in Guided Math. It is important that students estimate then weigh to develop a concept of weight.* *Guided Math* **4.5(1)A** • What is a newborn baby more likely to weigh? A. 30 g; B. 3 kg; C. 30 kg • Which is heavier: 3000 g or 4 kg? Explain how you know. • Which would you prefer: ¾ kg of gold or 700 g of gold? Why? • Look at these cards. They have weights in grams or kilograms. 5 kg, 500 g, ¼ kg, 1.5 kg, 750 g Put the cards in order from the lightest to the heaviest. How did you order the cards? Why did you put this measurement here? • A can of baked beans weighs 400 grams. How many grams less than 1 kilogram is this? • Does a bag of apples weigh 5 ounces or 5 pounds? • Does a ring weigh 2 ounces or 2 pounds? **4.5(2)A** • Complete this table  | kg	1	$\frac{1}{2}$	2	5	7	4	6	9
---	---	---	---	---	---	---	---	---
g								| • A sack of rice weighs 5 kg. How many grams is this? • Can you tell me another way to say or write 7 kilograms? What about 500 grams? • How many grams are there in 3.6 kilograms? How many	Different kinds of scales: balance, spring, bathroom, kitchen Student-made scales Weights: 1kg; 500g; 250g; 100g;50g; 25g, 10g; 5g; 1g (1 interlocking cube weighs approximately1g) Items to weigh Containers Measuring Center

develop a shared understanding before children collect individual data. They agree how to collect the necessary information. Once the data is collected, children suggest how to present the information using **pictograms or bar charts** in order to answer their question. They consider the most sensible scale to use when producing their graphs. They use the different representations to answer their question.	kilograms is 4200 grams? (Mental) **4.5(3)A** • What measuring instruments would you choose to measure the weight of an orange? • Would you prefer to use balance scales plus weights or dial scales to weigh a potato? Explain your choice. • Which units would you use to measure the weight of an egg? A. centimeters B. milliliters C. grams D. kilograms • Compare the weight of this book with this bag of sugar and with this 100 g weight. Suggest an estimate for the weight of the book. • What measurement is shown on the scale?  • Draw where the dial would go for a weight of 45 g. How do you know?  • Students can estimate the weight of food e.g. a bag of onions, then weigh them and compare the weights. • Weigh this apple to the nearest 10 grams. Approximately how many apples of a similar size together would weigh 1 kg? How did you get your answer?	

	• Here are some apples. What is the total weight of the apples?  • Which scale could you use to weigh out one portion of grapes? Which would you not use? Why? • What is each division on this scale worth? How did you work this out? How could you check that you are right?  • A piece of cheese has a mass of 350 grams. Mark an arrow on the scale to show the reading for 350 g.  • On this scale, the arrow shows the weight of a pineapple.  Here is a different scale. Mark with an arrow the weight of the same pineapple.	

	 • Find out how many beans weigh between 65 g and 70 g. • Carla is making a cake. She puts flour on the scales. She then adds sugar to the flour. How much sugar does she add?  **4.4(4)A** • Will balances a pear with three 50 g and three 20 g weights. How much does the pear weigh? • A 95 g orange is placed in some balance scales. There is 35 g in the other pan. How much needs to be added to the 35 g so that the scales balance? How did you work this out? • John has a 120 g bar of chocolate. He cuts it into six equal pieces. How much does each piece weigh? What fraction of the bar is this? • Kim uses $^{1}/_{5}$ of a 500 g bag of flour. How much flour is this? • An egg weighs about 50 grams. Roughly, how much do 6 eggs weigh? Jot down how you worked this out. • What is 26.5 kilograms in grams? • Show me your method for solving these problems and tell how will you check your answers to the problems: • Three parcels weigh 785 g, 55 g and 0.25 kg. How much do they weigh altogether?	

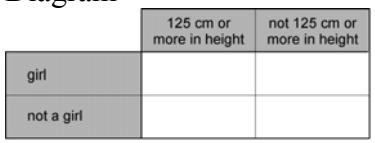
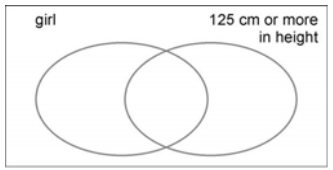
	• Three dogs weigh 850 kg altogether. The heaviest dog is 378 kg. The lightest dog is half the mass of the heaviest dog. How heavy is the middle-sized dog? • I had 0.6 kg of sugar. I have 247g left after I make a cake. How much sugar did I use? • There is 60 g of rice in one portion. How many portions are there in a 3 kg bag of rice? • A packet contains 1.5 kilograms of bird food. Ruth feeds her bird 30 grams of food each day. How many days does the packet of food last? • What measurement is 10 times as big as 0.01 kg? How do you know that it is 10 times 0.01 kg? • Two parcels together weigh 2.4 kg. One parcel weighs 1.68 kg. What is the mass of the other parcel? • Mary posts seven identical parcels. Each parcel weighs 3.2 kg. What is the total mass of the parcels? • 5 boxes of chocolates weigh 645 g. How much does each box of chocolates weigh? • What is the total mass of 235 screws each weighing 6 grams? What estimates did you make? Explain how to use your calculator to solve these problems. What key sequences will you use? • I have 9 parcels each weighing 346 g. How much do they weigh altogether? • 72 boxes of dog food weigh 38 kg each. How much do they weigh altogether? • I use 1375 g of sugar to make 5 cakes. How much sugar do I need for 1 cake? For 3 cakes? • Peter has $10. He buys 3 kg of potatoes at 87c per kg and 750 g of tomatoes at $1.32 per kg. How much money does he have left?	

Measurement
Length (4.6)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
4.6(1) Identify and use standard units, their symbols and relationship to each other • Metric • Imperial **4.6(2)** Change one unit to another • Metric • Imperial **4.6(3)** Measure accurately using appropriate units and instruments **4.6(4)** Problem solve using metric measures of length. **4.6(5)** Problem solve using customary units of length **4.6(6)** Compare metric and imperial (Customary) units of length. **4.6** Identify and measure: **4.6(7)** Perimeter of 2D shapes **4.6(8)** Circumference of a circle **4.6(9)** Area of 2D closed shapes **4.6** Develop and use formulas to calculate: **4.6(10)** Perimeter **4.6(11)** Circumference **4.6(12)** Area **4.6** Measure angles using:	Standard units of length Symbols for each unit of measure Relationship between metric units Relationship between imperial units Conversion of one metric unit to another Measurement using different instruments and appropriate units Comparison of Metric and Imperial measures (Year 4) *Identification and measurement of perimeter and circumference Formulas for measurement of perimeter, circumference and area (Year 4) **The students must have been introduced to the parts of a circle **before** any measurement is undertaken.*	Imperial. customary metric unit, standard unit, millimetre (mm), centimetre (cm), decimeter (dm), metre (m), kilometre (km), ruler, tape measure, inch, feet, foot, yard, mile length, width, height, distance, perimeter, circumference, area, surface area, formula square centimetr e (cm2), angle, degree (°), , protractor, acute angle, obtuse angle, right angle	Teacher observes and records when the student can: • Identify and use standard units of length, (Metric and Imperial) • Identify and use the symbols for units of length, (Metric and Imperial) • Demonstrate understanding of the relationship between units of length (Metric and Imperial) • Change one unit to another (metric) • Choose appropriate units and instruments to measure • Problem solve using metric measures of length, (Metric and Imperial) • Compare metric and imperial (Customary) units of length. • Identify and measure perimeter, circumference and area • Develop and use formulas to calculate perimeter, circumference and area • Measure angles using non-standard units • Measure angles using protractors.

4.6(13) Nonstandard units **4.6(14)** Protractors			

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Shared Math Prompt: **4.6(1)A** Suggest an object whose length would be measured in metres, centimeters or millimetres? The difference between the heights of two children is 37 cm. What could their heights be?	***By the end of Cycle I the students can choose and use standard units (m, cm, and inch) to estimate and measure. They can also choose and use suitable instruments and equipment to measure.*** *First assess the students' previous knowledge to find out if they are aware of the reason for having standard measures. Metric measures are widely used. Some students may have experienced using yards, feet and inches.* *Guided Math* **4.6(1)A** Give the students strips of paper measuring a *decimeter* and let them find objects of equivalent or approximate length . They can also line up smaller items such as paper clips. After much experience that can measure in centimeters. They will discover that the 'ones' in their place value kits measure 1 cm after lining up 10 alongside their decimetre strip. To introduce the *metre,* the teacher can let the students examine a metre ruler and note that 10 dm = 1 m. The students can make their own 30cm rulers using three dm strips. When the students are familiar with the terms *metre, decimeter* and *centimeter* the abbreviations for each unit can be introduced. Include experiences of measuring around *surface area s* and circular objects so that the terms *perimeter* and *circumference* can be introduced. After much discussion the Students will need to know a measurement for longer distances. The terms *kilometer* and	Different kinds of rulers marked with smaller divisions String, yarn, thread Scissors Paper strips

In an integrated unit students can explore the question *How many children are shorter than 150 cm?* This can be done at the beginning of the year and again after Christmas. Results can be compared. Students the extend the enquiry to investigate questions such as by estimation and then measurement: *How many children are more than 2 cm taller than they were in August?* *Which child has grown most since August?* Various types of tables, graphs or diagrams can be used e.g. Carroll diagram or Venn Diagram   	*mile* may be familiar to the students especially to those who have travelled by plane. Questions can be asked: **4.6(2)A** • A metre stick is how many cm long? • Which is the most sensible estimate for the length of your handspan? A. 80 cm, B. 16 m, C. 14 cm, D. 12 km • Would you expect: a door to be 1, 2 or 5 metres tall? Suggest something you would measure, in cm, m, km. • Choose the correct answer: The width of the table is about… 1.5 cm, 15 cm, 150 cm or 1500 cm • In an hour, Monica can walk… 5 mm, 5 cm, 5m or 5 km • What unit would you use to measure the distance from here to Curacao? And the length of a shoe? • Can you tell me another way to say or write 2 km? What about 4 m? And 5 cm? After the students learn about millimeters other questions can stimulate discussion • Jim, Tamara and Andre measured the same objects. Here are Jim's measurements: pencil length 16 cm; computer screen width 33 cm; door width 77 cm; cube length 1.9 cm; ruler width 3.8 cm; room length 830 cm.Tamara wrote her measurements in millimetres. What did she write? Andre wrote his measurements in metres. What did he write? What would you use? Would you use different units for different measurements? Why or why not? When the students are familiar with decimals the following can be asked: • Tell me what the digit 7 represents in each of these amounts: 7.35m, 0.37m, 2.7 cm. • Which is larger: 239 cm or 2.93m? Why? • What is 2.07m in centimeters or 75cm in metres? • Put these in order: 0.56 m, 125 cm, 3.6m. Which is the smallest? Which is the largest? How do you know?	

- Look at these cards. They have lengths in kilometres, metres, centimetres or millimetres. 1000m, 2 km, 3 cm, ½ m, 4.5m, 40 cm, 5 cm, 400mm; put the cards in order from the smallest to the largest. How did you order the cards? Why did you put this measurement here? Were any of the measurements hard to order? Why?

*Students can be taught the meaning of **kilo (one thousand), centi (one hundredth) and milli (one thousandth)**to help them remember the relationships between **kilometres, metres, centimetres and millimetres.***

- Would you use **inches** or **feet** to measure:
  - The height if a friend _____
  - The length of a toothbrush _____
  - The length of a pen _____
  - The length of a car _____

4.6(3)A

Estimation is an integral part of measurement. Students should estimate first then measure and compare results.

Measuring their own body parts is a fun activity for students working in pairs. Tables can be created

Body part	Length	Estimate	Measurement	Difference
Arm				
Head				
Leg				
Foot				

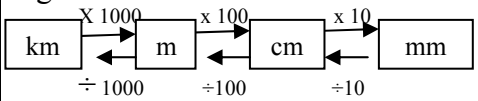
Estimate the height of the door. The width of your table.

- Is the height of the classroom about 3 m, 6 m or 12 m?
- Is the length of this crayon about 5 mm, 55 mm or 555 mm?
- Explain to someone else how to measure the length of a line that is between 4 cm and 5 cm long.

Figures can be drawn on work cards for the students to measure e.g. Estimate and then accurately measure the length of the diagonal of this square.

Charts can be developed with the students to show the relationship between units

e.g.

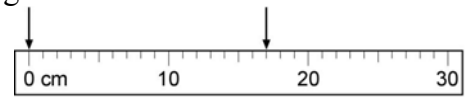


Measuring instruments e.g. centimetre rulers, inch rulers, metre rulers, tape measures (measuring tapes), trundle wheels (metre wheel),
Items to measure
String, yarn, thread

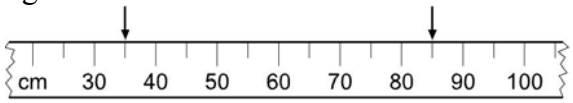
Students can complete tables where they measure then convert their measurements to other units.

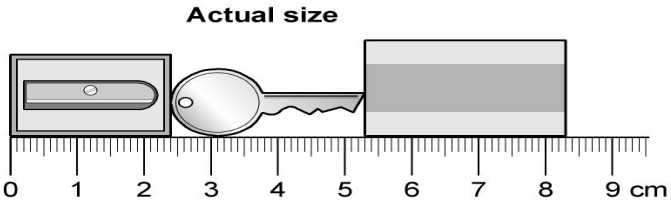
Item	Length in m	Length in dm	Length in cm
Metre stick	1	10	100
Height of door	2		
Length of room	9		

- Show me where 24 ½ cm would go on this ruler.
- What length is shown below?

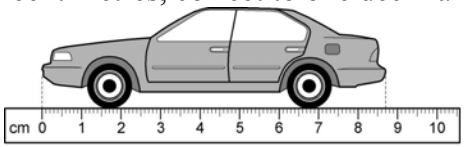


- At a higher level students read smaller divisions.



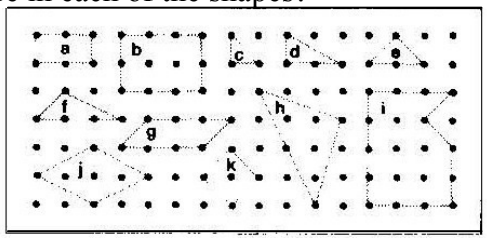


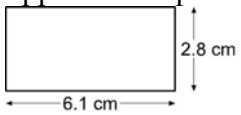
- What is the measurement of this toy car? Give your answer in centimetres, correct to one decimal place.

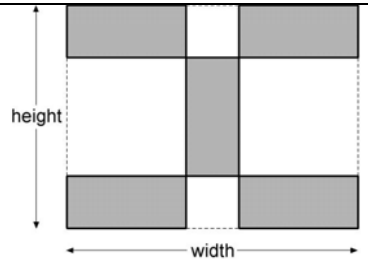


- Draw a line that is 2 cm longer than this one [a line 5 cm long].
- Use a ruler to draw a square with sides of 12 cm.
- Imagine a centimetre tape measure. The first part has been torn off and it starts at 8 centimetres. How can you use it to make a measurement in centimetres?

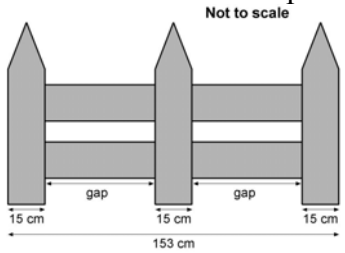
Shared Math Prompt: **4.6(4)A** A picture frame is created from a narrow length of wood 60 cm long. Suggest some possible measurements for the frame. The distance to the park is 5 km when rounded to the nearest kilometer. What can the exact distance be? *Science Links* When studying with the theme Light students can measure shadows accurately; record results in tables and present in line graphs. During a project on 'Force' students can: Measure the length of elastic bands with weights added. If the results are recorded on a line graph, predictions can be made about the length in relationship to the weight.	**4.6(4)A** Problems can be given that link measuring to computational skills taught. • Rulers are 30 cm long. If you place six of them end to end, how long a line will they make? • An 80 cm length of ribbon is cut into four equal pieces. How long is each piece? • Look at this problem: Two snakes are 56 cm and 83 cm long. What is the difference in their lengths? Draw a picture that will help you to solve the problem. What part of your picture shows the *difference*? • Altogether the four sides of a square picture frame are 60 cm long. How long is each side? What calculation did you do? How did you work it out? • How many 100 m runs would you need to do to run a total of 1 km? What calculation did you to work this out? • Tracey works out that 92 cm – 48 cm = 56 cm. How could you check whether her answer is right? • Sam is 138 cm tall. His younger brother is 47 cm shorter. How tall is Sam's brother? • Mary drove 58 km visit her brother. She then drove 238 km to see her parents. How far did Mary drive altogether? • One length of the swimming pool is 25 metres. Jane swims 5 lengths of the pool. How far does Jane swim altogether? Liz swims 225 metres in the pool. How many lengths does he swim? Explain how you solved these problems. Could you have done them differently? • Julie is 92 cm tall. Tom is 1.34 m tall. Lisa's height is halfway between Julie's height and Tom's height. Calculate Lisa's height. Write down the calculations that you did. Show me how you used your calculator to find the answer. • Find the total of 1.58 m, 79cm and 1.23 cm using a	

Solar System: Use a calculator to explore differences between the sizes of the Earth, Moon and Sun and the distances between them. **4.6(9)A** Groups of students can be given objects to find the surface area. Each group can choose a non-standard unit to use e.g., matchbox, business card, index card Etc. During plenary discussion the need for standard units can arise. *Shared Math* Prompt: Tell me something that has an area of approximately 30 m^2.	calculator. • What calculation can you key into your calculator to solve this problem? A piece of ribbon 2.1 metres long is cut into six equal pieces. How long is each piece? What is the answer? • I added three distances. Each was an odd number and my answer was 120 km. Explain why I cannot be correct. • The height of a model car is 6 centimetres. The height of the real car is 45 times the height of the model. What is the height of the real car? Give your answer in metres. **4.6(6)A** • In order to turn yards into metres take away $^{1}/_{10}$. How many metres is 5 yards? Write your answer in decimals. • To convert metres into feet multiply by 3.25. What is 6 metres in feet? **4.6(9)A** The first step is learning about area is to compare the size of the surface areas of different objects in the classroom. Students can be given different size pentagons to order After discovering the need for standard units the students can use squared paper or squares as their unit of measurement. The students can use square geoboards and rubber bands to form shapes and then answer the question 'How many 'square units are there in each of the shapes?'  *The use of squared paper strips to measure length and width of rectangular shapes will enable the students to discover the*	

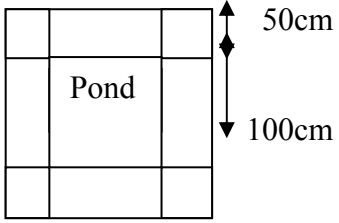
4.6(7)A /4.6(9)A Find as many rectangles as you can with whole number sides and an area of 36 cm ^{2}. Which has the smallest perimeter?	*formula for area i.e. 2 x (L + w)* **4.6(7)A /4.6(9)A** • The perimeter of a square is 28 cm. What is the length of one side? • A square pool has sides 12 m long. If you walked around the edge of it, how far would you walk? What calculation did you do? How did you work it out? • The perimeter of a regular pentagon is 285 cm. What is the length of each side? Explain your method. • The perimeter of a square field is 1300 m. It has a hedge along one side. How much fencing does the farmer have to buy to fence the other three sides? • Tell me a rule for working out the area of a rectangle. • Solve these problems: What is the area of a rectangle measuring 34 cm by 29 cm? • The area of a rectangle is of 132 m ^{2}. The shortest side is 4 m long. What is the length of the longest side? Explain how you worked out your answers. • What is the approximate perimeter and area of this rectangle?  • Each tile is 4 centimetres by 9 centimetres. Here is a design made with the tiles. Calculate the width and height of the design. Write down the calculations that you did. Did you use a written method or a calculator? Explain why.	

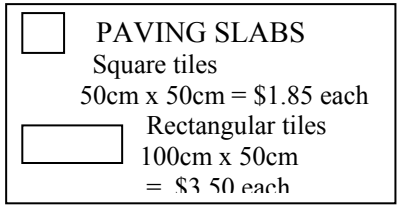


- This fence has three posts, equally spaced. Each post is 15 centimetres wide. The length of the fence is 153 centimetres. Calculate the length of one gap between two posts. Show me the calculations that you did. Did you use a written method or a calculator? Explain why.



- Mr. Richards buys paving slabs to go around his pond.He buys 4 rectangular slabs and 4 square slabs. What is the total cost of the slabs he buys? Mr Richards says: 'It would cost more to use square slabs all the way round.' Explain why Mr Richards is correct. How did you decide whether Mr. Richards was right or wrong? What calculations did you do?





4.6(13)A /4.6(14)A

Students must first compare angles. These can be drawn on work cards.

- Is angle A is smaller than angle B? Explain your answer.

Cut out 'wedges' can be used as non standard units to measure angles. These can be used to measure given angles in plane shapes. Guided by the teacher the students learn that there is a need for standard units of measurement

They are then introduced to the term degree (°) as the unit for measuring angles.

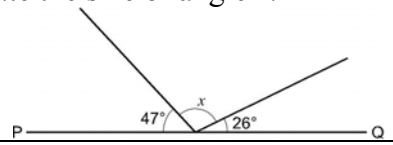
They can make protractors or use commercial ones to measure angles accurately.

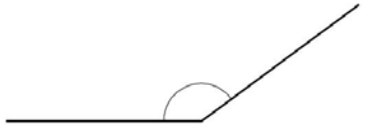
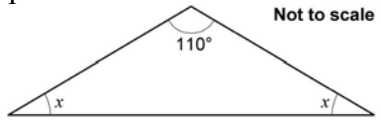
- Two of these angles are the same size. Put rings around the two angles which are the same size.

Estimate the size of each of the angles. Now use your protractor to measure the angles to the nearest 5 degrees. Which of them are acute angles? Which are obtuse angles? Are there any right angles?

Help students to discover that angles on a straight line = 180°

- Use a protractor to draw an angle of 35°. PQ is a straight line. Calculate the size of angle *x*.



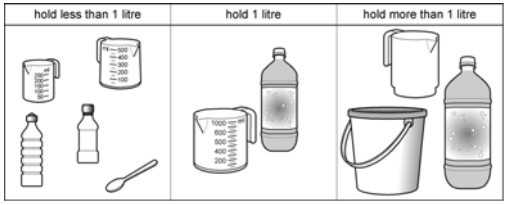
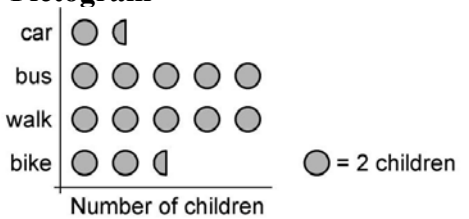
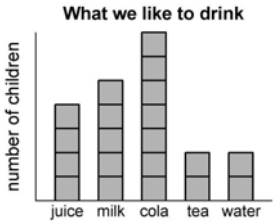
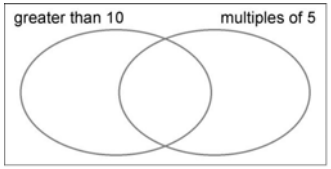
	• A pupil measured the angles in a triangle. She said: 'The angles are 30°, 60° and 100°.' Could she be correct? Give reasons • Ring the measurement that is the approximate size of the angle. 60° 90° 110° 135° 240°  • Here is an isosceles triangle. Calculate the size of angle *x*. Do not use a protractor 	

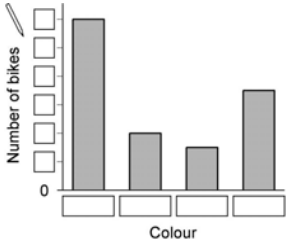
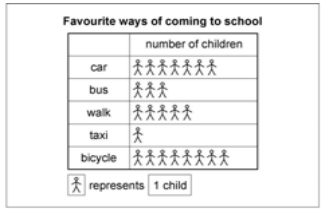
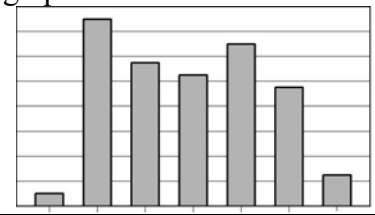
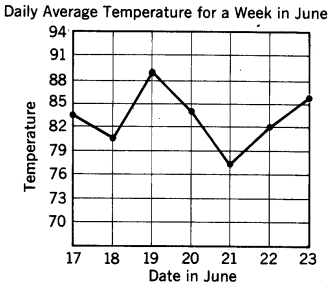
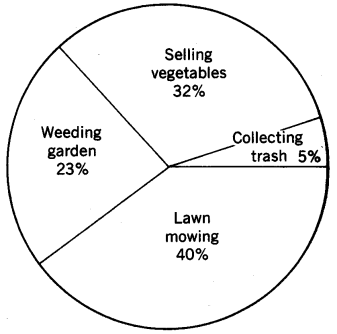
Measurement

Statistics – Handling data (4.8)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
4.8 Select appropriate ways to organize and present data using: **4.8(1)** lists, **4.8(2)** tables **4.8(3)** simple diagrams **4.8(4)** tally charts **4.8(5)** pictograms **4.8(6)** bar graph **4.8(7)** block graphs **4.8(8)** line graphs **4.8(10)** Analyze and interpret the data in tables, diagrams, tally charts, pictograms and bar charts, using ICT where appropriate **4.8(11)** Read graphic representations and record readings accurately **4.8(12)** Construct frequency tables, pictograms and bar and line graphs to represent the frequencies of events and changes over time **4.8(13)** Interpret frequency tables, bar charts with grouped discrete data, line graphs and pie charts **4.8(14)** Find and interpret the mode of a set of data	Formulation of problems or questions that require gathering of information Collection of data Organization of data Construction of different graphic representations of data Reading and interpretation of graphs and charts Mean, mode, median and range (Year 4)	Problem, question, explain, predict, pattern, collect, organize, compare, order, sort, group, classify, Same, different, property, Represent, interpret, count, tally, vote Information, data, Venn diagram, Carroll diagram, graph, table, block graph, pictogram, chart, symbol, set, list, bar graph (histogram), line graph, tally chart, pie chart Survey, questionnaire, Horizontal axis, vertical axis, axes, label, title, scale, interval, Greatest/least value maximum/minimum value Frequency, mode, , range, mean, average, median, statistics	Teacher observes and records when the student can: • Suggest, select and collect data • Present data appropriately using: o Lists o Tables o Simple diagrams o Tally charts o Pictograms o Bar charts o Block graphs o Line graphs • Analyze and interpret data from graphic representations • Read graphs accurately • Construct appropriate graphic representations to represent the frequency of events • Interpret frequency tables and charts with discrete data, line graphs and pie charts • Find and interpret the mean, median, mode and range

4.8(15) Describe and interpret results and solutions to problems using the mode, range, median and mean			

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Most enquiries will be developed from themes and projects that the students are engaged in. Collection of data can be done as a class or in small groups The teacher facilitates the collection of data but guides the students in their choice of enquiry. General questions such as: What question are you trying to answer? What information will you collect? Who will you ask? How will you find it? How will you display your data? How will you decide on the scale for this axis? What labels have you put on the axes? What titles have you given your graphs and charts? Why did you choose this type	***In Cycle I the students have had experience of using Carroll and Venn diagrams when sorting; collecting and recording information by tallying, making lists and table sand constructing block graphs and pictograms. They can also answer numerical questions by reading tallies, pictograms and block graphs*** **4.8(1)A to 4.8(9)A** • During a unit on capacity the students can present their findings on a table  • During a Health Unit the students can collect information on their favourite fruits and record the results on a pictogram. The teacher can ask questions based on the pictogram and allow the students to write number sentences for each other to complete • Carroll diagrams can be used to assess knowledge of odd and even numbers. The students place the numbers correctly Multiples of 5 up to 50 Even Numbers: 10 40 30 20 50 Odd Numbers: 15 5 25 35 45	Material for making graphs Graph paper Chart showing examples of the different forms of graphic representations e.g. **Pictogram**  **Block graph**  **Venn Diagram** 

of graph	• Students can be asked to transfer data from one kind of representation to another. This can give indications if they know the parts that make up a particular representation. In the example below the student has to fill in the *title,* the *scale* for the *vertical axis* and *labels* for the *horizontal axis.* They can also discuss which is the better way to represent the data. **Colour / Number of bikes** green 4 red 7 blue 12 pink 3  **4.8(11)A** • The teacher can pose questions such as to facilitate the drawing of conclusions What can you tell from comparing these two graphs? What do you think are the reasons for the differences?   • Look at this graph 	**Line Graph**  **Pie Graph** 

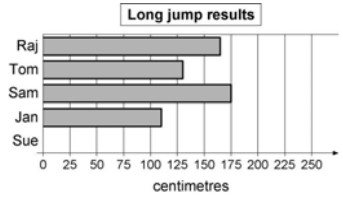
The teacher teaches the whole class the terms range, mean, mode and median using data that the students have collected, e.g.

Teacher	Number of Students
Cycle 1 A	27
Cycle 1 B	25
Cycle 1 C	25
Cycle 1 D	25
Cycle 1 E	23

The **range** is 27 – 24 = **3**
The **mean (average)** is the **sum of all the measures ÷ the number of measures** = 125÷5 =**25**
The **mode** is the most frequent measure = **25**
The **median** is the middle measure when the measures are listed in descending or ascending order = **25**.

What is this type of graph called? What is missing from it? The bar chart shows the number of tourists who rented cars at the airport each day. The highest number is 35. Complete the graph and write 3 questions that can be answered by the data shown.

4.8(11)A



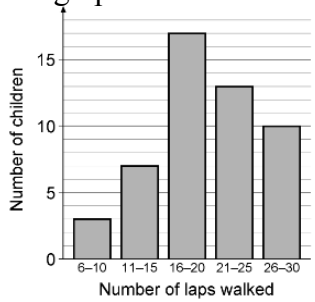
- Sue jumped 212 cm. Draw Sue's long jump result on the graph. Use the graph to estimate how much further Sam jumped than Jan

4.8(12)A / 4.8(13)A
Complete this table.

Transport	Tally	Frequency
Bus	III	3
Bike	II	2
Car		12
Walk	𝍸 III	

- Make a line graph to show the exchange rate of the guilder to the dollar (at Nafl1.80 per $1). How many guilders will you get for $50?

- State three conclusions you can draw from the information in this graph

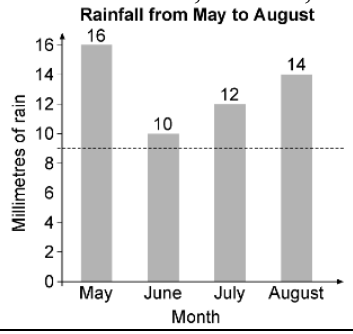


4.8(14)A /4.8(15)A

- Sam found out the shoe sizes of people in his class. The mode was 4. Explain what this means using everyday language.
- Write a number in each of these boxes so that the mode of the five numbers is 11. □□□□□□□□□□
- Carol counts the matches in 10 boxes. She works out that the mean number of matches in a box is 51. Here are her results for 9 boxes. Calculate how many matches are in the 10th box.

Number of matches in a box						
48	49	50	51	52	53	54
	✔	✔	✔	✔		✔
	✔	✔				✔
	✔					

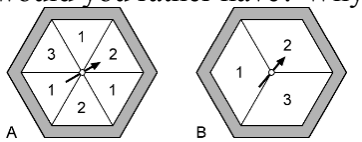
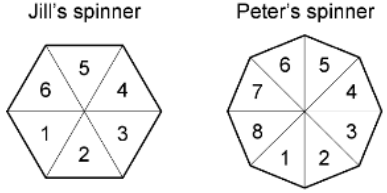
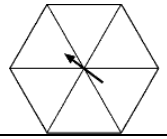
- Write a different number in each of these boxes so that the mean of the three numbers is 9. □□□□□

	• Find the mode, median, mean and range from this graph.  	

Measurement
Probability (4.9)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
4.9(1) Describe the occurrence of familiar events using the language of chance or likelihood	Probability Activities Recording outcomes by creating frequency graphs	fair, unfair, risk, doubt, likely, unlikely, likelihood, certain, uncertain, probable, possible, impossible, chance, good chance, poor chance, no chance, outcome, equal chance, even chance, outcome, biased, random	Teacher observes and records when the student can: • Use the language of probability to predict what will take place.

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Shared Math Prompt: 'It will snow tomorrow.' Suggest a place where this event is unlikely to happen and one where it is likely to happen. As a class the students can **carry out an experiment** with	***Probability is usually discussed at the end of Cycle II. In elementary school students get an introduction to probability by engaging in different activities.*** *Guided Math – discussion questions* • Tell me an event that is impossible. • When you roll a normal dice, how likely are you to roll a number bigger than 2? • Suggest an event which is *likely* for your friend but	Blank and numbered or shaded spinners Dice (blank and numbered) Colours Coins Bags Chips Small plastic items

a die labeled 1, 2, 3, 4, 5, 6. They recognize that each of the numbers 1 to 6 is equally likely to be spun. They throw the die 30 times and use a **frequency graph** to record their results. Children compare results and answer questions such as: *Which number is likely to occur most often? Which score was the mode? Are all the results the same?* The students can each put different combination of the numbers 1 – 6 on six-sided spinners, predict the likelihood of certain numbers being spun and then spin. They can make frequency charts for 30 spins and then compare results. Students can flip coins 25 times and keep a record of the number of times 'heads' appear. They can then flip the coin 50 times and compare the charts.	*unlikely* for you. • Tell me an event that is *certain*. • Suggest a way to label a blank dice so that rolling an odd number is very unlikely. • If you have to score a 3 to win the game, which of these two spinners would you rather have? Why?  • Here are two spinners. Which child is *more likely* to spin a 3? Are they both likely to spin an even number? Why / Why not?  • The students play the following game 'Play your cards right'. They shuffle 1 to 9 digit cards and turn over the top card. They discuss the probability of the next card being higher or lower, using the language of probability. They decide which of these it will be before turning the next card over. If their prediction is correct, they continue to play; if not, they start again. Children see how long a run of cards they can get. • Shade this spinner so that there is a 50% chance that the arrow will land on shaded. 	Graph paper

GLOSSARY (Standard 4)

Bar graph:	A graph that uses vertical or horizontal bars to show relationships among data
Capacity:	The amount of space a solid container will hold. The litre is a unit of capacity for liquid measurement
Data:	Information
Discrete:	Not continuous, countable,
Estimate:	To make an approximate judgment of a number, amount, measure
Frequency:	The number of times an event occurs
Graph:	A form of pictorial representation
Imperial measure:	The English system of measures used in Britain, Commonwealth countries and the United States The principal units are inches, feet, yards, mile; cup, pint, quart, gallon; ounce, pound, ton etc.
Linear Measure:	A measure of length e.g. centimeter, inch
Line graph:	A graph which uses line segments to show continuous data
Mass:	The quantity of matter anything contains.
Mean:	The average found by calculating the sum of the measures and dividing by the number of measures
Measurement:	A comparison with a known unit involving the determination of the size of something e.g if a book is 7 paper clips long. 7 shows the **measure** and the paper clips the **unit of measure.**
Median;	When measures are recorded in order from greatest to least, the **median** is the measure listed in the middle
Metric measure:	A system of measurement where the relationship between the units is based on pwers of ten The principal units are millimeter (mm), centimeter (cm), meter (m), kilometer (km); gram (g), kilogram (kg); Celsius (°) etc.
Mode:	The measure that appears with the greatest frequency in a collection of data
Perimeter:	The sum of the lengths of the sides of a plane shape or figure. The outer boundary of a figure or area
Pictogram (pictograph);	A graph using pictures to represent values
Pie or circle graph:	A graph in which sectors of a circle show proportions of data represented.
Probability:	A numerical measure of the chance that a particular event will occur, depending on the possible events. It is expressed as a ratio between the number of ways the event can occur and the number of possible events, e.g. the chance of a coin showing heads when flipped is 1:2 or 50%
Range:	The difference between the greatest and least measures in a set of data
Standard measure/unit:	A measure accepted by everybody e.g. kilogram, second, nickel, day, inch, metre, square metre etc.
Volume:	The measurement of the 'space occupied', in three dimensions, expressed in units of cubic measurement.

MEASUREMENT													
Behaviours	**Names of Children**												
Write date when skill is mastered													
Time													
Tells the time on a digital clock													
Reads the time on an analogue clock 5-minute; 1-minute intervals													
Reads the time on a 24-hour clock													
Estimates time intervals													
Calculates time intervals from Clocks; timetables; calendars													
Solves one-step; two-step problems involving time													
Money													
Recognizes and uses money notation													
Identifies Antillean coins and banknotes													
Identifies US coins and banknotes													
Identifies Euro coins													
States the value of: Antillean; US coins and banknotes and Euro coins													

Counts sets of coins and banknotes													
Identifies different coins and or banknotes that are equivalent to amounts up to _____													
Makes change for amounts from 20 guilders or dollars to 100 guilders or dollars													
Solves money, one-step; two-step problems													
Temperature													
Uses and reads the thermometer is standard units Celsius; Fahrenheit													
Solves problems involving temperature													
Capacity and Volume													
Recognizes and uses metric, capacity measures													
Recognizes notations for metric measures													
Changes one standard unit to another: metric; imperial													
Measures capacity using metric; imperial measures													
Read scales accurately													
Compares metric and imperial measures													
Calculates volume													
Solves problems involving capacity and volume													

Mass													
Identifies metric measures of weight and their symbols													
Identifies imperial measures of weight and their symbols													
Changes one standard metric unit to another													
Chooses appropriate instruments and measures weight accurately													
Solves problems involving weight													
Compares metric and imperial measures of weight													
Length													
Identify and uses standard units (metric; imperial) to measure length													
Identify and uses the symbols for standard units (metric; imperial) to measure length													
Demonstrates understanding of the relationship between units of length (metric; Imperial)													
Changes one metric measure to another													
Chooses appropriate units and instruments to measure length													
Solves problems involving length													
Compares metric and imperial units of length													

Identifies and measures perimeter; area; circumference													
Identifies and uses formulas to calculate perimeter; area; circumference													
Measures angles using non-standard units													
Measures angles using a protractor													
Handling Data - Statistics													
Suggests, selects and collects data													
Presents data using _____													
Analyzes and interprets data from graphic representations													
Reads _____ graphs accurately													
Constructs appropriate graphic representations to represent the frequency of events													
Interprets frequency tables ; charts with discrete date; line graphs; pie charts													
Calculates and interprets the mean; median; mode; range													
Probability													
Uses the language of probability to predict what will take place													

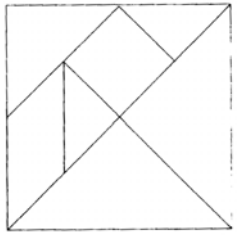
Standard 5: Based on the level of development, the student will know simple notions and concepts and can order, describe and reason geometrically.

Geometry

Basic Geometry (5.1)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
5.1 Identify: • **5.1(1)** Points • **5.1(2)** Lines • **5.1(3)** Line segments • **5.1(4)**Rays • **5.1(5)** Angles o Right angles o Acute angles o Obtuse angles **5.1** Identify and distinguish between: • **5.1(6)** Regular and irregular polygons • **5.1(7)** Quadrilaterals • **5.1(8)** Solid figures • **5.1(9)** Regions • **5.1(10)** Point, line and plane **5.1** Use the vocabulary of geometry to describe the properties of: • **5.1(11)** Regular and irregular polygons • **5.1(12)** Quadrilaterals • **5.1(13)** Solid figures • **5.1(14)** Regions	Geometric terms, definitions and vocabulary Identification, construction and drawing of regular and irregular polygons and quadrilaterals Identification, construction and measurement of: • Lines and parts • Triangles (all types) • Circles and parts (perimeter, circumference, diameter, radius, chord) • Angles (all types)	Line, point, line segment, ray, endpoint, ray Vertical, horizontal, parallel, perpendicular, intersecting angle, acute, obtuse, right angle, Simple closed curve, region, polygon, congruent triangle, scalene, isosceles, equilateral, pentagon, hexagon, octagon, decagon, quadrilateral, square, rectangle, parallelogram, rhombus, trapezoid, vertex, diagonal circle, circumference, radius, diameter, chord solids, figures, shapes, prism, pyramid, cylinder, cone, sphere, region, base face, edge, vertex, net degree (°), angle measurer, protractor, setsquare	Teacher observes and records when the student can: • Identify, draw and measure; o Points o Lines o Line segments o Rays o Angles ▪ Right angles ▪ Acute angles ▪ Obtuse angles • Identify, describe, draw or construct: o Regular and irregular polygons o Quadrilaterals o Solid figures (prism, pyramid, cylinder, cone etc.) • Use the vocabulary of geometry to describe the properties of: o Points o Lines o Line segments o Rays

5.1(15) Classify, measure and draw angles **5.1(16)** Identify, measure and calculate parts of a circle **5.1(17)** Solve problems involving basic geometrical notions			○ Angles ○ Regular and irregular polygons ○ Quadrilaterals ○ Solid figures ○ Regions • Draw, classify and measure angles: ○ On their own ○ In shapes ○ Around a point ○ Without a protractor or setsquare ○ With a protractor and setsquare • Identify and measure the diameter, radius, chord and circumference of a circle ○ Without formulas ○ With formulas • Solve problems involving basic geometry.

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Shared Math Prompt: **5.1(2)A** Draw a simple closed curve Prompt: **5.1(5)A /5.1(15A)** Draw an angle. The angles drawn can be sorted into right, obtuse and acute angles. **5.1(6)A /5.1(7)A** With the prompt 'Show me a shape' the teacher can quickly assess the student's knowledge. If the students draw them, the differences can be discussed and names, characteristics and properties that are unknown introduced.	***In Cycle I the students learn to identify basic 2D and 3D shapes. They also observe shapes in the environment, construct models using 3D shapes and describe shapes in their own words. They may have been introduced to angles as 'corners'.*** **5.1(11)A – 5.1(15)A** In the early stages students can make two points and connect them to make *line segments, rays* and *lines.* Students can search for examples of horizontal, vertical, parallel, and perpendicular lines in the classroom environment. Questions like 'How would you check if two lines are parallel? How would you check that two lines are perpendicular?' can be asked. After the students have become familiar with the terms used to describe lines then they are ready to learn more about angles. They can use strips of card joined by a split pin to create an 'anglemaker' and use it to show angles that are **less than, more than or approximately equal to a right angle**. They use a setsquare to compare given angles (for example, the angles in a 2D shape) with a right angle. They place two right angles together and realize that they form a straight line. **5.1(6)A – 5.1(14)A** In Cycle II the students begin to focus on the properties of shapes and use the language of geometry to describe them. • A game, 'What Am I' can be played in the Math Centre. The teacher prepares 36 cards with descriptions of geometric shapes or lines written on them; e.g. I am a solid with six square faces; I am lines that go in the same direction but do not meet. The cards are shuffled and divided among 4 – 6 players. Taking turns the students read the cards and name the figure or line. If the player	Paper, straws, cardstock, matches etc. to construct figures Tangrams (commercial and teacher made)  7 tangram pieces make a square Attribute blocks/ pattern blocks Pentominoes (flat shapes made of 5 congruent squares) Cards / charts with figures Pattern blocks 3D shapes Geo boards / elastic bands Grid / graph paper Instructional Charts

names the shape the card is placed in the middle of the playing area. If the player cannot name the figure the next player tries. The first player to lose all their cards wins the game.

- Use a setsquare and a ruler to draw a square with sides of 12 cm.
- Place a set of shapes in the correct place in this table.

all right angles	some right angles	no right angles

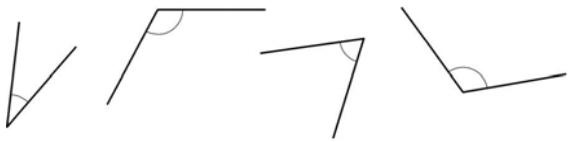
Students can construct given shapes on geo boards, dot paper or graph paper or use tangram pieces

Students can also make solid shapes out of nets or vice versa.

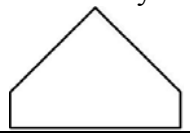
- On plain paper, use a ruler and setsquare to construct: a square with sides 56 mm a rectangle with length 6.3 cm, width 4.9 cm

5.1(15)A

- Look at these angles. Which of them are acute angles? Which are obtuse angles? How do you know?



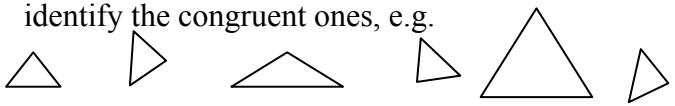
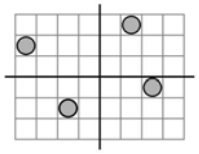
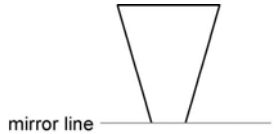
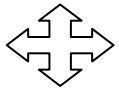
- Construct a right-angled triangle with the two shorter sides measuring 3.5 cm and 4.2 cm. What is the length of the third side?
- How many right angles are there in this pentagon? How could you check?

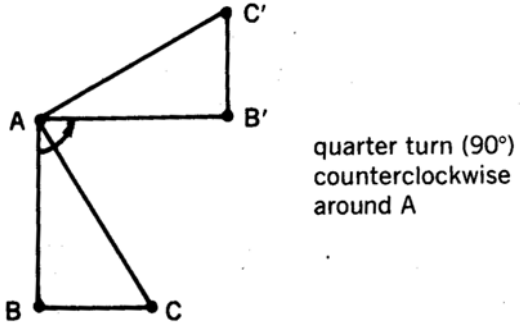
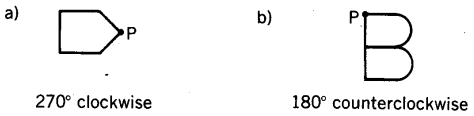


	After the students have worked on finding the circumference of a circle by direct measurement, they may be ready to be introduced to the formula for finding the circumference i.e. the circumference = π x the diameter. ***Π is not usually introduced in primary school.***	

Geometry
Spatial Sense (5.2)

Target Behaviour	Content	Mathematical Language	Assessment Opportunities
5.2(1) Identify congruent figures **5.2(2)** Identify, draw and/ or complete shapes with reflective and rotational symmetry **5.2(3)** Identify and draw the position of a shape after a rotation, reflection or translation. **5.2(4)** Describe movement about a grid using the eight compass points to describe direction **5.2(5)** Use coordinates to plot points on a grid **5.2(6)** Solve problems	Congruency Symmetry: • Reflective • Rotational Translations: • Rotations • Reflections • Translations	Congruent, symmetry, line of symmetry, rotational symmetry, reflective symmetry, mirror line Transformation, rotation, centre of rotation, reflection, translation, higher, lower position, map, plan, compass point, north (N), south (S), east (E), west (W), turn, whole turn, half turn, quarter turn, clockwise, anticlockwise, right, left, up, down, ascend, descend, forwards, backwards, sideways, across north-east (NE), north-west (NW), south-west (SW), south-east (SE), clockwise, anticlockwise, horizontal, vertical grid, coordinates, *x* coordinate, *y* coordinate, origin, *x* axis, *y* axis	Teacher observes and records when the student can: • Identify and draw congruent figures • Identify the line/lines of symmetry in 2D-figures • Draw the reflection of a shape • Rotate, reflect or translate plane figures • Use compass points to describe direction of movement. • Locate and plot points on a grid using coordinates • Solve problems involving congruence, symmetry and transformations

Suggested Experiences		
Whole Class	**Small Group / Centres**	**Resources**
Shared Math Prompt: **5.2(1)A** Draw congruent shapes **5.2(2)A** Draw figures that have rotational symmetry.	***In Cycle I students follow instructions using vocabulary related to position, direction and movement. Recognize and use right angles to describe turns and corners of shape. They can tell when something is symmetrical.*** **5.2(1)A** • Give the students a number of figures and let them identify the congruent ones, e.g.  **5.2(2)A** As a quick assessment the teacher can ask the students to draw the *lines of symmetry* on given shapes • The heavy lines are lines of symmetry. Complete the pattern.  • Draw the reflection of this shape in the mirror line.  • A letter **d** is reflected in its straight side. Its reflection is a different letter. Which one? • Does this shape have rotational symmetry? Explain why. 	Geoboards Cut out 2 –D figures Tangrams Attribute blocks Grid paper Mirrors Cut out shapes / capital block letters

Shared Math Prompt: **5.2(3)A** Find or draw examples of the 3 different transformations • Rotation • Reflection • Translation	**5.2(3)A** *In order to understand rotation the student should have the knowledge that the number of degrees around the central point of a circle is 360°. Most students will not be ready to discuss this elementary school; however students with a strong spatial intelligence may enjoy these activities.* Questions such as the following can be asked to assess knowledge. • There are nine equal angles around a point. What is the size of each angle? • There are a number of equal angles around a point. The size of each angle is 24°. How many equal angles are there? *A quarter turn is 90° (= to a right angle) and a half turn is 180°e.g.*  *Turns can be practiced in Physical Education lessons. The vocabulary **clockwise, anticlockwise, half turn, quarter turn, full turn, ninety degrees etc** can be used* • Draw each figure after a rotation around point P as suggested under each drawing.  	

c) P

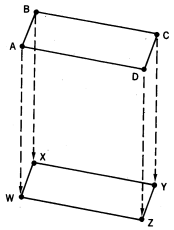
90° clockwise

d) P

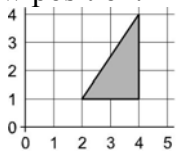
180° clockwise

- *When introducing **translations** the term **slides** can be used as it suggests the intuitive meaning of the concept.*

*In the diagram we **transform** the rectangle ABCD by matching every point on ABCD with a point below. The result is rectangle WXYZ which is a **translation** of ABCD.*

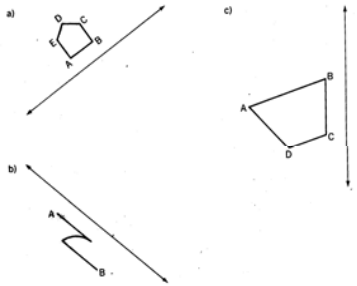


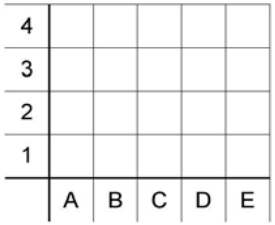
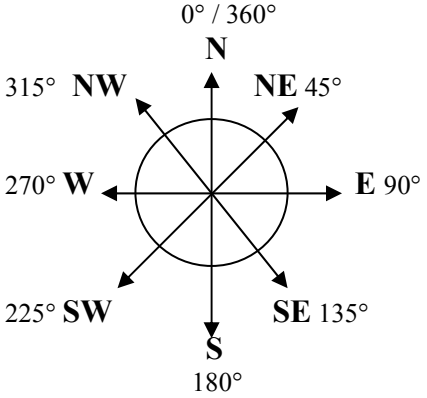
- This triangle is translated two squares to the left. Draw the triangle in its new position.

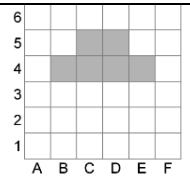


*Sometimes the words **flip over** are used to describe **transformations** by **reflection.***

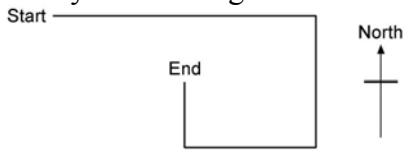
- Trace each figure on a sheet of paper, then **flip** the figure over the line and draw the **reflection**.



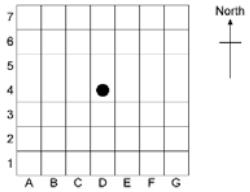
	Students can view different patterns on cloth to identify the types of transformation of shapes in the pattern. African prints are idea for this purpose. Geo boards are excellent materials for practicing transformations. **5.2(4)A / 5.2(5)A** *In Physical Education students can follow and give directions, including instructions to turn right or left through quarter and half turns. They appreciate that two quarter turns are equivalent to a half turn. They recognize that when you turn through a half turn you end up facing the opposite direction. They learn that a quarter turn is equal to a turn of 90 degrees.* • Make a compass with a card arrow and a split pin. Label it *north, south, east* and *west.* Write instructions such as: *Start with the arrow facing north. Turn it three right angles clockwise.* Decide which direction the arrow will end up facing. • Which square lies halfway between squares A3 and E3? Move a counter from square B4 to E2. Describe each move you make using the words *north*, *south*, *east* or *west.*  Working in pairs, one student creates a picture by colouring squares on graph paper. He / She then tells the partner how to draw the identical picture using compass points and other directional language.	Compass Chart with compass points A *compass rose* shows degrees and compass points  *The compass will be introduced in Social Studies when engaging in map work. The compass rose can be discussed in Mathematics when the students understand that a circle has 360°around the central point.*



- Kelly is facing north. She turns clockwise through 3 right angles. Which direction is she facing now?
- If you stand facing north, then make a half turn, what direction would you be facing?

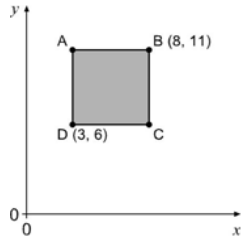


- Lisa places a counter on square D4. She moves it 2 squares east and 3 squares south. Write the position of the square she moves it to.



During hurricane season the students can track the paths of the hurricane from weather forecasts.

- Here is a shaded square. Write the coordinates for point A and point C.



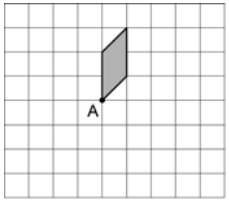
- Points A (3, 4) and B (3, 7) are joined by a straight line.

Shared Math
Prompt:
5.2(6)A
Use your toothpicks to form different kinds of triangles. *(the number of picks range from 3 – 12)*
The students can make a table to show their results

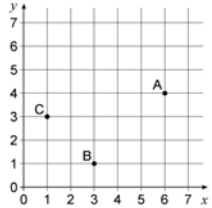
	Equilateral	Isosceles	Right
# of toothpicks			

Plot the coordinates of two points C and D so that line CD is parallel to AB. Now plot two points E and F so that line EF is perpendicular to AB.

- Draw the reflection of this shape. The shape below is rotated 90° clockwise about point A. Draw the shape in its new position on the grid and give the coordinates of each shape point.



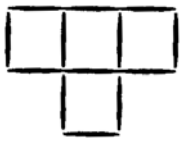
- A, B and C are three corners of a rectangle. What are the coordinates of the fourth corner?



5.2(6)A

- Take away 2 toothpicks and leave 2 squares of the same size.

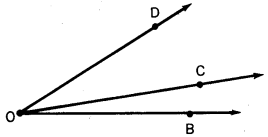
- Take away 1 toothpick and leave 3 squares of the same size.



GLOSSARY (Standard 5)

Angle: A union of two rays that have a common end point. 

- **Acute angle:** Any angle that is less than a right angle measuring less than 90°.
- **Right angle:** An angle measuring 90°. A quarter of a complete rotation (360°)
- **Obtuse angle:** Any angle measuring between 90° and 180°.
- **Adjacent angles:** Any two angles with a common vertex and a common ray (side) between them. Angles DOC and COB are **adjacent.**

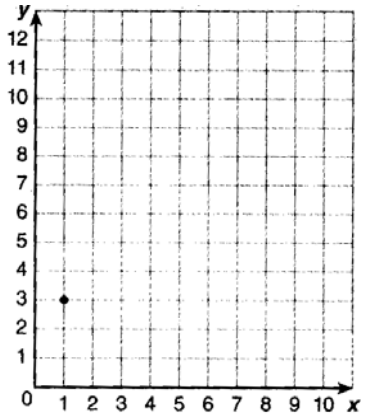


- **Complementary angles:** Two angles measuring 90°
- **Supplementary angles:** Two angles measuring 180°

Area: A measure that tells the size of a plane region in square units.

Axes: The number lines used on a grid.

- ***x*-axis** The **horizontal** number line on a grid
- ***y*-axis** The **vertical** number line on a grid.



Chord: A **line segment** that connects two points on a **circle.**

Circle: A closed figure in which every point is the same distance from a point called the centre of the circle.

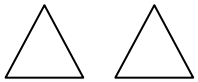
Circular region: The union of a circle and its interior.

Circumference: The distance around a circle

Closed curve: A curve that returns to its starting point

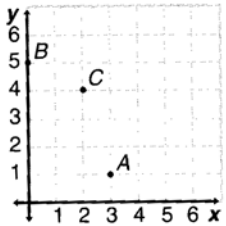
Cone: A solid shape that has a circular face and comes to a point called the **vertex.**

Congruent: Having the same size and shape.



Coordinates: An **ordered pair** of numbers e.g. (5, 4) that locates a point in a coordinate plane (grid) with reference to the *x*-axis and *y*- axis. The first number is the ***x*-coordinate;** the second number is the ***y*-coordinate**.

The coordinates for point B are (0, 5); point C (2, 4) and point A (3, 1)



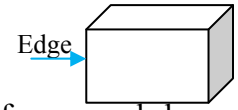
Cube: A solid figure which has six square faces of equal size.

Cylinder: A solid figure that has **parallel, congruent** circular faces.

Degree (°): A unit for measuring angles.

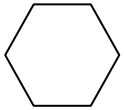
Diameter: A line segment that connects two points of a circle and passes through the centre.

Edge: The line segment where two faces of a solid figure meet.

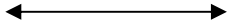


Geometry: The study of space and shapes in space

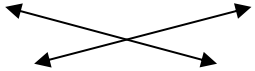
Hexagon: A six-sided **polygon**



Horizontal line: A line that runs from West to East (lies straight across)

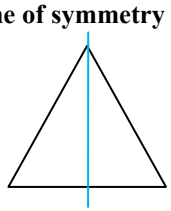


Intersecting lines: Lines which meet or cross at a common point

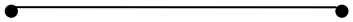


Line: A straight path that extends in opposite directions with no endpoints.

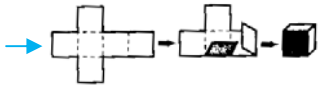
Line of symmetry: The line along which a figure can be folded so that the two halves match exactly.



Line segment: A part of a line that has two endpoints.

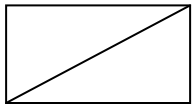


Net: A flat pattern that can be folded to make a sold shape.

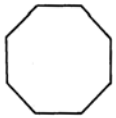


Net of a cube

Oblique (diagonal) line: A straight slanted line.

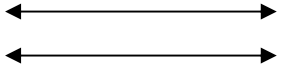


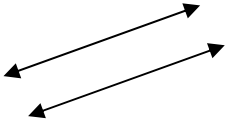
Octagon: A **polygon** with eight sides



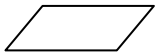
Ordered pair: A pair of numbers used to locate a point on a grid

Parallel lines: Lines that lie in the same plane and do not intersect. They are always the same distance apart.

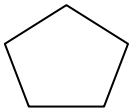




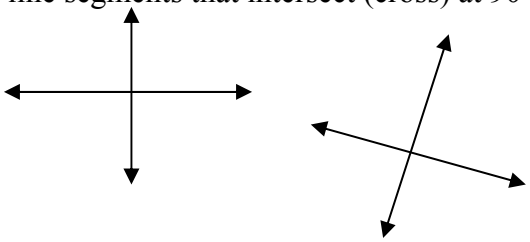
Parallelogram: A **quadrilateral** with opposite sides that are **parallel** and **equal.**



Pentagon: A **polygon** with five sides



Perpendicular: Two lines or line segments that intersect (cross) at 90°



Perimeter: The distance around the outside of a figure.

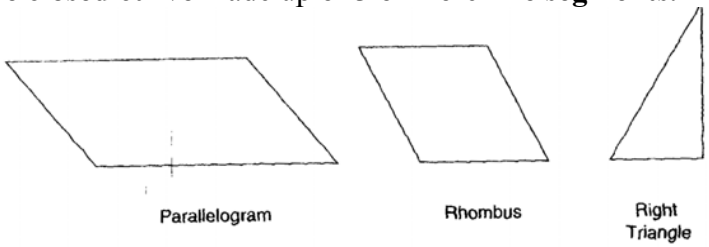
Pi (π): The **ratio** of the **circumference** of a **circle** to its **diameter.** The approximate value is 3.14

Plane: A flat surface that extends in all directions without end.

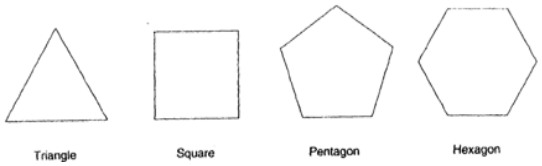
Plane figures: A shape that is on a plane (flat) or two-dimensional such as a triangle or octagon.

Point: An exact place in space represented by a dot

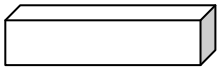
Polygon: A **simple closed curve** made up of 3 or more **line segments.**



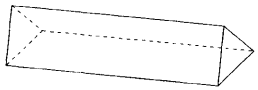
Regular Polygons: **Polygons** with sides that are the same length and angles that are the same size



Prism: A solid having a uniform cross section.

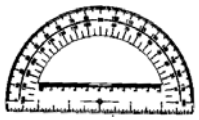


Rectangular prism (cuboid)

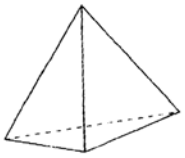


Triangular prism

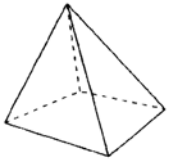
Protractor: An instrument for measuring angles



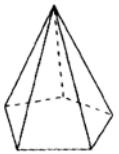
Pyramid: A **solid figure** whose **base** is any **polygon** and the sides are **triangles.**



Triangular Pyramid



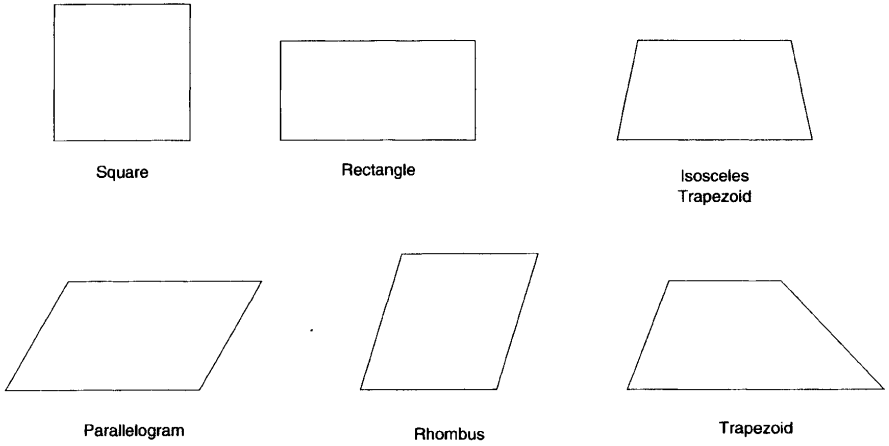
Quadrilateral Pyramid



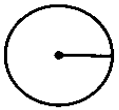
Pentagonal Pyramid

Pythagorean theory: This theory states that in a **right angle triangle** the square of the **hypotenuse** (the side opposite the right angle) is equal to the sum of the squares of the other two sides.

Quadrilateral: A **polygon** with four sides.

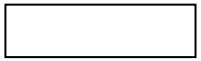


Radius: A line segment extending from the centre of a circle to any point on the circle.

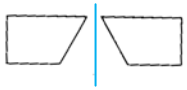


Ray: Part of a line that starts at an end point and goes on forever in one direction.

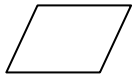
Rectangle: A **parallelogram** with 4 **right angles**.



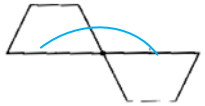
Reflection: A **transformation** makes a figure face in the opposite direction. It is also called a **flip**.



Rhombus: A **quadrilateral** with all four side **congruent** (equal).

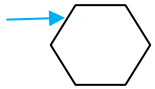


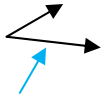
Rotation: A **transformation** that turns a figure around a point.



Rotational Symmetry: Is when a figure can be rotated about a point and remain the same

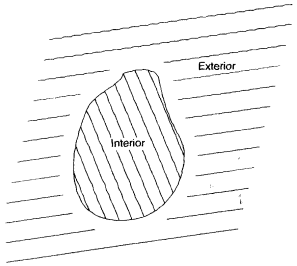
Side: One of the **line segments** that makes up a **polygon** or one of the **rays** that makes up an **angle**



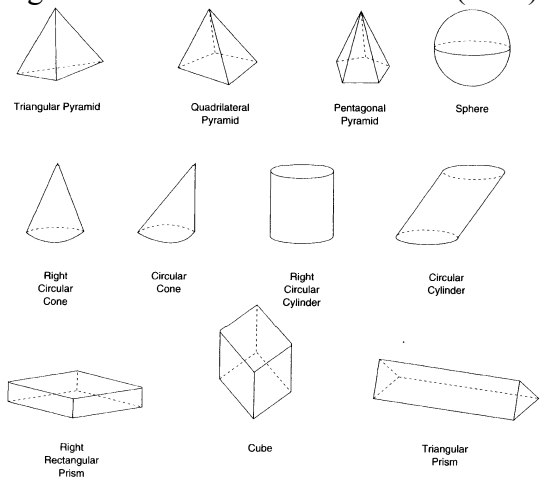


Simple Closed Curve: A **closed curve** that does not cross itself.

Simple Closed Region: The union of **a simple closed shape** and its interior.



Solid: Geometric figures that are three- dimensional (solid)

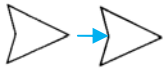


Sphere: A solid figure that is shaped like a round ball.

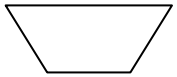
Square: A polygon with equal sides and angles.

Transformation: The collective name for rotations, reflections and translations,

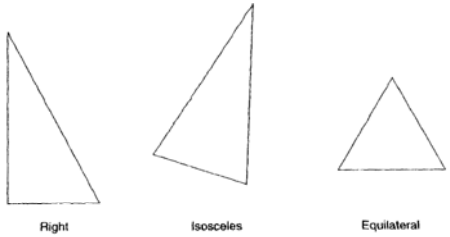
Translation: A **transformation** slides a figure in a straight line.



Trapezium: A **quadrilateral** with two **parallel** sides



Triangle: A **polygon** with three sides



Two Scalene Triangles

Acute: A **triangle** having **acute angles** only**.**
Equilateral: A **triangle** having all sides equal
Isosceles: A **triangle** having at least one pair of equal sides.
Obtuse: A **triangle** with one **obtuse angle**
Right-angle: A **triangle** with one angle that is a **right angle**
Scalene: A **triangle** without equal sides

Vertex (vertices): A point common to the rays that form an angle or a point common to the sides of a polygon.

Vertical line: A line that lies from North to South (straight up and down).

Volume: A measure of cubic units that can fit inside a container or a solid.

GEOMETRY													
Behaviours	**Names of Children**												
Write date when skill is mastered													
Basic Geometry													
Identifies, draws and measures: points; lines; line segments; rays; angles													
Identifies, describes, draws or constructs; regular polygons; irregular polygons; quadrilaterals; solid figures													
Uses the vocabulary of geometry to describe the properties of: lines; line segments; rays; angles; regular polygons; irregular polygons; quadrilaterals; solid figures; regions													
Draws, classifies and measures angles: on their own; in shapes; around a point; without a protractor or setsquare; with a protractor or set square													
Identifies and measures the diameter; radius; chord; circumference of a circle													

Uses formulas to measure the diameter; radius; chord; circumference of a circle													
Solves problems involving basic geometry													
Spatial Sense													
Identifies and draws congruent figures													
Identifies the line/lines of symmetry in 2D figures													
Draws the reflection of a shape													
Rotates, reflects or translates plane figures													
Uses compass points to describe the direction of movement													
Locates and plots points on a grid using coordinates													
Solves problems involving congruence; symmetry; transformations													

[11] ASSESSMENT

In Foundation Based Education the role of assessment is to:

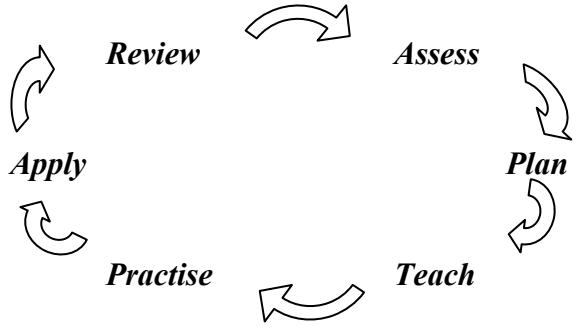
- Document the student's **successful** progress
- Support and guide the teacher's instruction
- Communicate to both the student and parents the child's successful growth.

In the curriculum there are checklists and also Assessment Opportunities that guide the teacher to look for steps reached by the student. Assessment focuses on the student **strengths** and **weaknesses**. Teachers should regularly reflect on how the student is progressing and use the results of assessment to plan for the teaching points that need to be emphasized in the next lesson. Most of the assessment that should take place on a daily basis is ***formative*** rather than ***summative.***

The key characteristics of this formative assessment are:

- It is an ***ongoing process***.
- The results are used by both teacher and student.
- It takes place ***during instruction.***
- It provides ***assessment-based feedback*** to students and teachers.
- The feedback helps teachers and students to make ***adjustments*** in order to improve successful mastery of target behaviours.

When planning for a unit in mathematics the teacher should follow a teaching and learning cycle



[11] References; 'Assessment' page 16 of 'How To use the FBE Curriculum Framework' Netherlands Antilles Curriculum Framework' – 2005
'Transformative Assessment' – W. James Popham ASCD 2008
'Renewing the Primary Framework for Mathematics' Guidance paper – 'Day-to-Day Assessment in Mathematics' – National Numeracy Framework UK – Crown copyright 2008

In order to plan well the teacher must be aware of the ***learning progression*** i.e. the sequential set of sub skills needed for mastery of a particular target behavior. This may be different for each set of students because of their readiness levels. In order to build a ***learning progression*** the teacher must:

- have a thorough understanding of the target behavior and all the all prerequisite sub skills or bodies of knowledge
- identify each student's readiness level for each prerequisite skill
- decide how to sequence the teaching of sub skills e.g. a student must know the monetary value of coins before making change from bank notes

Reviews of learning can be a key teaching and assessment tool. The aim is to assess the depth of learning and use the information to plan the next step. You can review by:

- Pausing within the lesson and asking the students to tell or demonstrate what they understand or have learnt
- Pausing while demonstrating a calculation and asking the student to tell the next step
- Using the 'Think, Pair, Share' strategy to show how to solve a problem.
- Asking probing questions
- Having extended dialogues
- Asking the students to complete short activities that draw on past learning and include the use and application of mathematics taught previously
- Asking students to develop their own problems
- Attend to responses of the students during 'Shared Mathematics'

Example

In order to *solve two-step word problems involving addition and subtraction,* the prerequisite sub skills may be:

- The ability to discuss methods and solutions to one-step problems
- The ability to identify and record appropriate number sentences for one-step word problems
- The ability to read , write and partition and order two-digit numbers explaining what each digit means
- The ability to recall all addition and subtraction facts for each number under 10, all pairs of totals to 20 and pairs of multiples of 10 with totals to 100
- The ability to add and subtract mentally pairs of one-digit numbers

To assess how well the students cope with the problem-solving skills build a problem solving activity into the first lesson in the unit. Give a one step problem to each group and let them discuss how they would solve the problem. Record which groups have difficulty and plan a Guided Math lesson to help these students overcome their difficulties. Ask the groups to write an appropriate number

sentence or sum to solve the word problem to assess computational understanding. The next step is for the students to work the sum or solve the number sentence.
When assessing mental skills by paper and pencil timed tests, inform the children why you are assessing them. You can also give them a list of sums and let them circle those that they can answer quickly within a given time frame. The teacher can then adjust instruction accordingly to deal with the facts that have not been mastered.

A sub skill for older students may be the ability *to use efficient methods to add and subtract whole numbers and decimals up to two places*
The teacher could use the following word problem to assess for learning; Nadia made some fruit punch. She used 2.4 litres of water, 1.35 litres of pineapple juice and 780 millilitres of mango juice. How much fruit punch did she make? The students must be able to show that they can interpret the word problem as an addition calculation and be able to show how to write the sum and explain their solution.

In conclusion there are basic principles which drive formative assessment and promote student learning

- The assessment is part of the planning process
- The assessment is informed by target behaviours or objectives
- The assessment engages the students in the process
- The assessment recognizes and celebrates the achievements of all the students
- The assessment takes into account the learning styles of the students
- The assessment gives immediate, constructive and positive feedback to motivate the learners and to facilitate learning or to take them to the next level.

Assessment Focuses

Assessment focuses are used to periodically review and assess student's ongoing work during *summative assessments.* They can be used year to year, school to school or level to level. These external assessment focuses provide a summary of where, in relation to national standards, the students are at a given point in time. They can be used as a base to create examinations that can be given to students by external evaluators or the principal of the school.
The following table shows the relationship to the domain areas of the curriculum.

Domain Areas	Assessment Focus Areas
Number and Numeration: • Number Patterns & Positive & Negative Integers • Place Value • **Using and Applying Mathematics** – *problem solving, communicating and reasoning*	Numbers and the number system Problem solving, communicating and reasoning
Calculation: • Addition and Subtraction – Mental and Written • Multiplication and Division - Mental and Written • Using the calculator	Operations and the relationship between them Mental calculation Written Calculation Numerical problem solving Use of the calculator
Rational Numbers: • Fractions • Decimals • Percentages, Proportions and Ratios	Fractions Decimals Percentages and Ratios
Measurement: • Time • Capacity and Volume • Weight • Length • Statistics – Handling data	Measures – time, capacity, weight and length Perimeter Area Angles Processing and representing data Interpreting data
Geometry: • Basic geometry • Spatial Sense	Properties of shape Properties of position and movement

Using the terms; **beginning, progressing** or **proficient** the person making the evaluation can decide the level of the student in each domain area by matching the student's work with the criteria (bold) and indicators (italics). If the student meets all the criterion and indicators the student is **proficient;** if the student fails to meet the criterion or meets one criterion at one or two levels the student is said to be at a **beginning** level. In order to make a judgment the evaluator must have samples of the student's work as well as paper and pencil tests.

Cycle II – End of Year 1 Assessment Focus

Number Patterns	**Place Value**	**Using and Applying Mathematics**		
		Problem Solving	***Communicating***	***Reasoning***
Counts sets of objects reliably[12] *-groups objects in multiples of 2,3, 4, 5 and 10 counts them*[13] **Recognizes sequences of numbers, including odd and even numbers**	**Understands place value in numbers to 1,000** *-represents /compares numbers using number lines, 100 squares, base 10 materials* *-demonstrates knowledge using a range of models/images* **- Uses place value to estimate and round**	**Selects the mathematics they use in some classroom activities** *-find starting point, identifying key facts/relevant information* *-uses apparatus, diagrams, role-play, etc. to represent and clarify a problem* *-uses mathematical content learnt previously* *-adopts a suggested model or systematic approach* *-makes connections and applies their knowledge to similar situations*	**Discusses their work using mathematical language** *-describes the strategies and methods they use in their work* *-engages with others' explanations, compares… evaluates…* **Begins to represent their work using symbols and simple diagrams** *-uses pictures, diagrams and symbols to communicate their thinking or demonstrate a solution or process* *-appreciates the need to record and develop their own methods of recording*	**Explains why an answer is correct, e.g.** *-'the number 12 ends in a two so twelve candies can be shared equally by 2 children* **Predict what comes next in a simple number, shape or spatial pattern or sequence and give reasons for their opinions**

[12] Bold denotes the assessment focus citeria
[13] Italics gives an indicator of success

CALCULATION			
Operations	**Mental**	**Written and Calculator**	**Problem Solving**
Uses the knowledge that subtraction is the inverse of addition *-understands subtraction as difference* *-given three numbers makes related number sentences* **Understands halving as a way of 'undoing' doubling and vice versa**	**Uses mental recall of addition and subtraction facts** *-uses addition/subtraction facts to 10 and place value to add or subtract multiples of 10 e.g. 2 + 8 = 10 so 20 + 80 = 100* **Uses mental calculation strategies to solve number problems including those with money and measures** *-recalls doubles to 10 + 10 and other significant doubles, e.g. double 50c is $1*	**Records their work in writing** *Record mental calculations as number sentences*	**Chooses the appropriate operation when solving addition and subtraction problems** *-uses repeated addition / subtraction to solve multiplication/division problems* **Solve number problems involving money and measures** *-add/subtract two-digit numbers, bridging tens where necessary in contexts using units such as cents, guilder/dollars, centimetres*

RATIONAL NUMBERS	
Fractions	**Decimals**
Uses halves and quarters *-work out halves and quarters up to 20* **Relate the concept of half of a small quantity to the concept of half of a shape** *-shade one half or one quarter of a given shape*	

MEASUREMENT		
Measures	**Processing and representing data**	**Interpreting data**
Understand angle as a measure of turn *-makes whole turns, half turns and quarter turns* **Uses everyday non-standard and standard units to measure length and mass** *-understands that numbers can be used not only to count discrete objects but also to describe continuous measures e.g. length* *-read scales to the nearest labeled division*	**Sorts objects and classifies them using more than one criteria** **Understands the vocabulary relating to handling data** *-sort, group, set, list, table, most common, most popular* **Collects and sorts data to test a simple**	**Communicates their findings, using simple lists, tables, pictograms and block graphs they have recorded** *-responds to questions about how they have sorted objects and why each object belongs in a set* *-talk about which set has the most, e.g. most children stayed at school foe community*

- know which measuring tools to use to find how much an object weighs, how tall a child is, how long it takes to run around the edge of the playground, how long it takes to fill a bucket *-make sensible estimates in relation to familiar units of measure* **Begins to use a wider range of measures** *-make and use a 'right angle checker'* *-use a time line to order daily events and ordinal numbers to describe the order of regular events*	**hypothesis** *-counts a show of hands to test the hypothesis that most children in the class are in bed by 8:30 p.m.* **Records results in simple lists, tables, pictograms and block graphs** *-presents information in lists, tables and simple graphs where one symbol or block represents one unit* *-enters data in a simple computer database*	*school* *- talk about how they represented their work and why*

GEOMETRY	
Basic	**Spatial Sense**
Uses mathematical names for common 2-D and 3-D shapes *-identifies 2-D and 3-D shapes from pictures of them in different orientations e.g. square, triangle, hexagon, pentagon, octagon, cube, cylinder, sphere, cuboid, pyramid* **Describes their properties, including number of sides and corners** *-makes and talks about shapes referring to features and properties using language such as edge, face, corner* *- sorts 2-D and 3-D according to a single criterion, e.g. shapes which are hexagons or shapes with right angles* *-visualizes frequently used 2-D and 3-D shapes* *-understands the difference between shapes with two dimensions and those with three* *-recognizes that the properties are the same even when a shape is enlarged, e.g. when comparing squares, circles, similar triangles, cubes or spheres of different sizes*	**Describes the position of objects** *-using ordinal numbers when describing shapes in a row or when giving directions* **Distinguishes between straight and turning movements** *-distinguishes between left and right and between clockwise and anticlockwise and uses these when giving directions* **Recognizes right angles in turns**

Cycle II – End of Year 2 Assessment Focus

NUMBER AND NUMERATION					
Number Patterns	**Positive & Negative Integers**	**Place Value**	**Using and Applying Mathematics**		
			Problem Solving	***Communicating***	***Reasoning***
Recognizes a range of number sequences[14] *-recognizes sequences of multiples of 2,3, 4, 5 and 10*[15]	**Recognizes negative numbers in context such as temperature and money**	**Understands place value in numbers to 1,000** *-represents /compares numbers using number lines, 100 squares, base 10 materials -recognizes that some numbers can be represented as arrays -uses knowledge of place value to make approximations -uses understanding of place value to multiply/divide whole numbers by 10* **Uses place value to estimate and round**	**Selects the mathematics they use in a wide range of activities including other domain areas** *-recognizes similarities to previous learning -restates a problem in their own words -uses mathematical content learnt previously -chooses their own equipment to solve a problem including a calculator where appropriate* **Tries different approaches and finds ways to overcome difficulties that arise** *-checks work and makes appropriate corrections -begins to look for patterns in results as they work and use them to find other possible outcomes*	**Begins to organize their work and check results** *-begins to develop their own ways of recording -develops an organized approach as they get into recording their work on a problem* **Discusses their mathematical work and begins to explain their thinking** *-uses appropriate mathematical vocabulary/symbols -talks about their findings by referring to their written work*	**Understands a general statement by finding particular examples that match it** *-makes a generalization with the assistance of probing questions and prompts* **Reviews their work and reasoning** *-responds to 'What if?' questions -when they have solved a problem thy can pose a similar problem to a partner*

CALCULATION			
Operations	**Mental**	**Written and Calculator**	**Problem Solving**
Derives associated division facts from known multiplication facts *-given a number sentence, uses*	**Adds or subtracts 2-digit numbers mentally** *-calculates 38 + 21, 65 – 27,*	**Adds and subtracts 3-digit numbers using written methods**	**Uses mental recall of addition and subtraction facts to 20 in solving problems with larger numbers**

[14] Bold denotes the assessment focus citeria
[15] Italics gives an indicator of success

understanding of operations to create related sentences e.g. given 15 x 5 = 75, creates 5 x 15= 75, 75 ÷ 5 = 15, 75 ÷ 15 = 5, 15 x 5 = 10 x 5 add 5 x 5 *-uses inverses to find missing whole numbers in problems e.g. I think of a number, double it and add 5. The answer is 37. What is my number?* **Begins to understand the role of '=', the equals sign** *-can solve balancing problems such as 6 x ☐ = 91 -*	*and complements to 100 e.g. 100 – 34* **Uses mental recall of the 2, 3, 4, 5 and 10 multiplication tables** *-multiplies a 2-digit number by 2, 3, 4 or 5* *-understands that finding ¼ of a set of objects as halving the number and halving again or dividing by 4* *-begins to learn multiplication facts for x6, x8, x9 and x7 tables*	***-uses written methods that involve bridging 10 or 100*** *-adds and subtracts decimals in the context of money, where bridging is not required* **Multiplies and divides 2-digit numbers by 2, 3, 4, 5 & 10 with whole number answers and remainders** *-calculates 49 ÷ 3*	*-chooses to calculate mentally, on paper or with apparatus* *-solves one-step whole number problems that involve addition and subtraction* *-solves two-step problems that involve addition and subtraction* ***Solves whole number problems including those involving multiplication or division that may include remainders*** *-identifies appropriate operations to use* *- round up or down after simple division, depending on context*

RATIONAL NUMBERS	
Fractions	**Decimals**
Uses simple fractions that are several parts of a whole and recognizes when two simple fractions are equivalent *-understands and use unit fractions such as ½, ¼, $^1/_3$, $^1/_5$, $^1/_{10}$ and find those fractions of shapes and sets of objects* *-recognizes and records fractions that are several parts of the whole e.g. ¾, $^3/_5$* *-recognizes some fractions that are equivalent to $^1/_2$*	**Begins to use decimal notation in contexts such as money** *-order decimals with one decimal point, or two decimal points in the context of money* *-knows that Nafls3.08 equals 308cent, $ 4.10 = 410 cent*

MEASUREMENT		
Measures	**Processing and representing data**	**Interpreting data**
Uses non-standard and standard metric units of length, capacity and weight in a range of contexts *-measures a length to the nearest ½ centimeter* *-reads simple scales, e.g. in increments of 2, 5 or 10* **Uses standard units of time** *-reads a 12 hour clock and generally calculates time durations that do not go over one hour* **Begins to use a wider range of measures**	**Asks questions , plans how to answer them and collects data**	**Extracts and interprets information presented in simple tables, lists, bar charts and pictograms** *-uses a key to interpret represented data* *-reads scales labeled in 2s, 5s and 10s, including reading between labeled divisions such as the halfway between 70 and 80 or 6 and 8* *-compares data using vocabulary such as how many*

-begins to understand area as a measure of surface and perimeter as a measure of length *-begins to find area of shapes by counting squares and explains answers as a number of squares even if not using standard units such as cm^2 or m^2* *-recognizes angles as a measure of turn and knows that one whole turn is 360 degrees*		*more…than…and recognizes the category that has most/least* *-responds to complex questions such as 'How many children took part in the survey altogether?' or 'How would the results differ if the Year 4 children took part?'* *-understands the idea of 'certain' and 'impossible' relating to probability in everyday situations such as expected rain*

GEOMETRY	
Basic	**Spatial Sense**
Classifies 3-D and 2-D shapes in various ways using mathematical properties *-sorts objects and shapes using more than one criterion, e.g. pentagon / not pentagon; edges with same length / not with same length* *-sorts the shapes which have all edges the same length and all angles the same size from a set of mixed shapes and begin to understand the terms of 'regular' and 'irregular'* *-recognizes right angles in shapes in different orientations* *-recognizes angles which are bigger or smaller than 90° and begins to use the terms 'obtuse' and 'acute'* *-recognizes right-angled and equilateral triangles* *-recognizes some common 3-D shapes, e.g. triangular prism, square-based pyramid* *- relates 3-D shapes to drawings and photographs of them including from different view points* **Begins to recognize nets of familiar 3-D shapes, e.g. cube, rectangular prism (cuboid), triangular prism, square-based pyramid**	**Recognizes shapes in different orientations** **Demonstrates that a shape has reflective symmetry by folding and recognizes when a shape does not have a line of symmetry** **Reflects shapes, presented on a grid, in a vertical or horizontal mirror line** *-reflects a shape even if the shape is at 45° to the mirror line, touching the line or not* *-begins to reflect simple shapes in a mirror line presented at 45°* **Describes position and movement** *-uses terms such as 'left/right', 'clockwise/anticlockwise', 'quarter turn','90°' to give directions along a route*

Cycle II – End of Year 3 Assessment Focus

NUMBER AND NUMERATION					
Number Patterns	**Positive & Negative Integers**	**Place Value**	**Using and Applying Mathematics**		
			Problem Solving	***Communicating***	***Reasoning***
Recognizes, describes and uses number patterns and relationships *-continues sequences involving decimals* **Recognizes and describes number relationships including multiple, factor and square** **Uses place value to multiply and divide whole numbers by 10 or 100**		**Uses understanding of place value to multiply and divide whole numbers and decimals by 10 or 100 and explain the effect**	**Develops own strategies for solving problems, e.g.** *-makes own suggestions as to how to solve a range of problems* *-makes connections to previous work* *-poses and asks questions related to a problem* *-checks answers and ensues solutions make sense in the context of the problem* *-reviews their work and approaches* **Uses their own strategies within mathematics and in applying mathematics in other domain areas**	**Presents information in a clear and organized way, e.g.** *-organizes written work e.g. recording results in order* *-begins to work in an organized way from the start* *-considers appropriate units* *-uses related vocabulary accurately*	**Searches for a solution by trying out ideas of their own** *-checks their methods and justifies answers* *-identifies patterns as they work and forms their own generalizations/rules in words*

CALCULATION			
Operations	**Mental**	**Written and Calculator**	**Problem Solving**
Uses inverse operations *-uses a calculator and inverse operations to find missing numbers, including decimals* *-understands 'balancing' sums including those using division, such as 20 + = 100 ÷☐*	**Uses a range of mental methods of computation with all operations** *-calculates complements to 1,000* **Recalls multiplication facts up to 10 x 10 and**	**Uses efficient written methods of all four operations** *-calculates 1405 +54 +167 or 1025 – 337* *-adds or subtracts numbers that do not have the same number of decimal places* *-multiplies or divides decimal numbers by a single digit number, e.g. 36.2 x 9*	**Solves problems with or without a calculator** *-solves two-step problems choosing appropriate operations* *-interprets a calculator display of 6.2 as $6.20 in*

Quickly derives division facts that correspond to multiplication facts up to 10 x 10 **Uses known facts, place value and knowledge of operations to calculate** *-calculates decimal complements to 10 or 100 e.g. 100 – 63.8* *-multiplies a 2-digit number by a single-digit e.g. 39 x 7*	**quickly derives division facts** *-uses their knowledge of tables and place value in calculations with multiples of 10 e.g. 50 x 8, 150 ÷ 3* **Adds and subtracts negative numbers in context** **Estimates using approximations**	**Understands and uses an appropriate non-calculator method for solving problems that involve multiplying and dividing any 3-digit number by any 2-digit number** **Uses a calculator where appropriate to calculate fractions of quantities / measurements** *-finds fractions of quantities such as $^{3}/_{8}$ of 980*	*context of money* **Checks the reasonableness of results with reference to the context or size of numbers**

RATIONAL NUMBERS	
Fractions & Percentages	**Decimals & Ratio**
Recognizes approximate proportions of a whole and uses simple fractions and percentages to describe these *-recognizes simple equivalence between fractions, decimals and percentages, e.g. ½, ¼, $^{1}/_{10}$, ¾* *-converts mixed numbers to improper fractions and vice versa* *-coverts fractions such as $^{2}/_{5}$ into tenths or hundredths and expresses them as decimals, percentages or vice versa* **Reduces a fraction to its simplest form by cancelling common factors**	**Orders decimals to three decimal places** *-orders decimals that have a mixture of one, or two decimal places* **Demonstrates understanding of simple ratio**

MEASUREMENT		
Measures	**Processing and representing data**	**Interpreting data**
Chooses and uses appropriate units and instruments **Interprets with appropriate accuracy, numbers on a range of measuring instruments** *-measures a length using mm to within 2mm* **Uses units of time** *-calculates time durations over an hour*	**Collects discrete data** *-tests a hypothesis about the frequency of an event by collecting data, e.g. collects dice scores to test how many times 6 is scored during 50 throws* **Groups data where appropriate, in equal class intervals** *-decides on a suitable class interval when collecting or representing data about classmates TV watching habits*	**Understands and uses the mode and range to describe sets of data** *-describes and compares two sets of basket ball results using the range and the mode* *-solves problems such as 'Find 7 numbers where the mode is 6 and the range 8* **Interprets graphs and diagrams and draw conclusions** *-interprets simple pie graphs* *-interprets the scale on bar graphs and line graphs*

-reads and interprets timetables	**Represents collected data in frequency tables** *-decides whether to use a bar chart, Venn diagram or pictogram to represent the data* **Uses Venn and Carroll diagrams to record classifying of information** *e.g. sorting numbers using properties of 'multiples of 6' and 'multiples of 8'*	*reading between the labeled divisions, e/g. 17 on a scale labeled in 5s* *-compares data sets and responds to questions, e.g. "How does our data about favourite fruits compare to the data from Year 2?"* *-describes and predicts outcomes from data using the language of chance and likelihood* *('more likely', 'equally likely', 'fair', 'unfair', 'certain')*

GEOMETRY	
Basic	**Spatial Sense**
Uses a wide range of properties of 2-D and 3-D shapes *-recognizes and names most quadrilaterals* *-recognizes right-angled, equilateral, isosceles and scalene triangles* *-uses mathematical terms such as 'horizontal', 'vertical', 'congruent', 'parallel', 'perpendicular'* *-visualizes shapes and recognizes them in different orientations* *-understands properties of shapes, e.g. knows why a square is a special rectangle* **Makes 3D models by linking given faces or edges**	**Draws common 2-D shapes in different orientations on asquared paper grid** *-completes a rectangle which has 2 sides drawn at an oblique angle to the grid* **Reflects simple shapes in a mirror line** *-begins to rotate a simple shape or object about its centre or vertex* *-translates shapes horizontally or vertically* **Begins to rotate a simple shape or object about its centre or a vertex** **Translates shapes horizontally or vertically**

Cycle II – End of Year 4 Assessment Focus

NUMBER AND NUMERATION					
Number Patterns	**Positive & Negative Integers**	**Place Value**	**Using and Applying Mathematics**		
			Problem Solving	***Communicating***	***Reasoning***
Recognizes, describes and uses number patterns and relationships *-finds two-digit prime numbers* *-makes generalizations about sequences saying whether much larger numbers will be in the sequence or not*	**Orders negative numbers in context**	**Uses understanding of place value to multiply and divide whole numbers and decimals by 10 or 100 and 1,000 and explain the effect** **Rounds decimals to the nearest decimal place**	**Identifies and obtains necessary information to carry through a task and solve mathematical problems** *-recognizes information that is important to solving the problem, determines what is missing and develops lines of enquiry* *-breaks a multi-step problem or investigation into simpler sets* *-Considers efficient methods, relating problems to previous experiences* **Checks answers to see if they are reasonable** *-checks as they work, spotting and correcting errors* *-reviews work and approaches* **Solves word problems and investigations from a range of contexts**	**Shows understanding of situations by describing them mathematically using symbols, words and diagrams** *-organizes their work from the beginning, looking for ways to record systematically* *-decides how best to represent conclusions, using appropriate recording* *-begins to understands and uses formula and symbols to represents problems*	**Draws simple conclusions of their own and gives an explanation of their reasoning** *-explains and justifies their methods and solution* *-identifies more complex patterns, making generalizations in words and begins expressing them using symbols*

CALCULATION			
Operations	**Mental**	**Written and Calculator**	**Problem Solving**
Uses known facts, place value and knowledge of operations to calculate *-calculates decimal complements to 10 or 100 e.g. 100 – 63.8*	**Estimates using approximations**	**Adds and subtracts negative integers in context** **Uses all four operations with decimals to two places, e.g.** *-adds and subtracts numbers that do not have the*	**Solves simple problems involving ordering, adding, subtracting negative numbers in context**

-multiplies a 2-digit number by a single-digit e.g. 39 x 7 **Applies inverse operations** **Uses brackets appropriately,** *-knows and uses the order of operations, including brackets*		*same number of decimal places* *-multiplies or divides decimal numbers by a single digit number, e.g. 36.2 x 9* **Understands and uses an appropriate non-calculator method for solving problems that involve multiplying and dividing any 3-digit number by any 2-digit number** **Uses a calculator where appropriate to calculate fractions/ percentages of quantities / measurements** *-finds fractions of quantities such as $^{3}/_{8}$ of 980* *-finds percentages such as 15% of 360g*	**Solves simple problems involving ratio and direct proportion** *-begins to use multiplication rather than trial and error to solve ratio problems* **Checks solutions by applying inverse operations or estimating using approximations**

RATIONAL NUMBERS	
Fractions & Percentages	**Decimals & Ratio**
Uses equivalence between fractions *- coverts fractions such as $^{2}/_{5}$ into tenths or hundredths and expresses them as decimals, percentages or vice versa* **Reduces a fraction to its simplest form by cancelling common factors** *-recognizes simple equivalence between fractions, decimals and percentages, e.g. ½, ¼, $^{1}/_{10}$, ¾* **Orders fractions** *-orders fractions with different with different denominators*	**Rounds decimals to the nearest decimal place** **Orders decimals** *-orders decimals that have a mixture of one, or two decimal places* **Demonstrates understanding of simple ratio**

MEASUREMENT		
Measures	**Processing and representing data**	**Interpreting data**
Measures and draws angles to the nearest degree, when constructing models and drawing or using shapes *-constructs a triangle given the length of two sides and the angle between them (accurate to 1mm and 2°0* **Uses language associated with angle** **Reads and interprets scales on a range of measuring instruments, explaining what each labelled division**	**Asks questions, plans how to answer them and collects data required** **In probability, selects methods based on equally likely outcomes and experimental evidence, as appropriate** *-decides whether a probability can be calculated or whether it can only be estimated from the results of the*	**Compares two simple distributions** *-solves problems such as 'Find 7 numbers where the mode is 6 and the range is 8* **Interprets graphs and diagrams including pie charts and draw conclusions** *-interprets and compares simple pie graphs where it is not necessary to measure angles*

represents **Solves problems involving the conversion of units** *-solves problems such as 1.5kg ÷ 30g* *-works out approximately how many km are equivalent to 20 miles* **Makes sensible estimates of a range of materials in relation to everyday situations** **Understands and uses the formula for the area of a rectangle and distinguishes it from perimeter** *-finds the length of a rectangle given its perimeter and width* *-finds the area or perimeter of simple L shapes, given some edge lengths*	*experiment* **Understands that different outcomes may result from repeating an experiment** **Understands and uses the mean of discrete date** *-Uses the mean of a set of measurements from a Science experiment* **Creates and interprets line graphs where the intermediate values have meaning** *-draw and use a conversion graph for guilders to dollars*	*-interprets bar graphs with grouped data* *-describes and predicts outcomes from data using the language of chance and likelihood* *('more likely', 'equally likely', 'fair', 'unfair', 'certain')* *-reads between labeled divisions on a scale e.g. read 34 on a scale labeled in tens, and find differences to answer 'How many more?'*

GEOMETRY	
Basic	**Spatial Sense**
Uses a wider range of properties of 2-D and 3-D shapes *-understands 'parallel' and begins to understand 'perpendicular' in relation to edges or faces* *-classifies quadrilaterals, including trapezium and kie , using their properties, e.g. number of parallel sides* *- reasons about special triangles and quadrilaterals, e.g. given the perimeter and one side of an isosceles triangle, find both possible triangles* *-draws a parallelogram of a given area on squared paper* **Knows and uses the angle sum of a triangle and that of angles at a point** *-calculates missing angles in triangles including isosceles or right-angled triangles, given only one/one other angle* *-calculates angles on a straight line or intersecting diagonals at the centre of a regular hexagon*	**Transforms shapes** *-reflects simple shapes in a mirror line* *-begins to rotate a simple shape or object about its centre or vertex* *-translates shapes horizontally or vertically* **Reasons about shapes, positions and movements** *-visualizes a 3-D shape from its net and matches vertices that will be joined* *-draws shapes with a fixed number of lines of symmetry*

MULTI-LEVEL PLANNING[16]

One of the principles of Foundation Based Education is cyclic education. Cycle II consists of students aged 8–12 years or Grades 3– 6. In this part of the curriculum you will find ***suggested plans*** for addressing the key target behaviours in each sub-domain area. Some target behaviours will appear in more than one block. Target behaviours in italics denote a combination or a part of key target behaviours. There are 5 blocks. Each block deals with different areas. In planning for the year the teacher can decide how best to plan for the needs of his/her students. There are some overlaps so that sufficient reinforcement is planned.

Block 1 Number and Numeration, Calculation and Rational Numbers

Unit 1 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(1), 1.5(6), **1.5(7)** Solve one-step and two-step problems involving whole numbers, measures (incl. time) and money. **1.5(9)** Choose and use appropriate calculation strategies.	**1.5(1), 1.5(6)**, **1.5(7)** Solve one-step and two-step problems involving whole numbers, measures (incl. time) and money. **1.5(9)** Choose and use appropriate calculation strategies including a calculator.	**1.5(1), 1.5(2), 1.5(8)** Solve one-step and two-step problems involving whole numbers, decimals and all four operations. **1.5(15)** Decide what data is important to solve a problem. Make use of lists, tables and graphs to organize and interpret the data. Suggest extensions to the line of enquiry. Review methods used to answer related questions.	**1.5(1), 1.5(2), 1.5(3), 1.5(4)** Solve multi-step problems involving decimals, fractions and percentages. **1.5(9)** Choose and use appropriate calculation strategies including a calculator. **1.5(10) to 1.5(12)** Represent the information from a puzzle or problem using number, number sentences, images or diagrams. **1.5(15)** Describe and explain methods, choices and solutions to puzzles and problems; orally or in writing.
1.1(1)/1.1(2) Read, write, compare and order whole numbers in figures and words to at least 1,000	*Use decimal notation for tenths and hundredths and partition decimals; relate the notation to money and measurement;*	**1.1(4)** Demonstrate an understanding of place value (by explaining what each digit represents in whole number and	*Use decimal notation for tenths, hundredths and thousands; partition, round and order decimals with up to*

[16] Adapted from planning information found at http//www.standards.dfes.go.uk/primaryframework/mathematics/planning

1.1(16) Count on and back to zero in single-digit steps or multiples of 10.	*position one-place and two-place decimals on a number line.* ***3.2(2), 3.2(3), 4.2(1), 4.4(2)***	decimals up to two places). **1.4(2)** Round 2-digit- 6-digit numbers into multiples of 10 in different ways.(Include decimals up to two places)	*three places and position them on the number line.* ***3.2(2)/ 3.2(3)***
1.3(1) Demonstrates an understanding of place value to 1,000 (by partitioning into multiples of 100, 10 and 1 in different ways)	**1.1(2)** Read, write, compare (using > & < signs) and order whole numbers in figures and words to at least 10,000 **1.2(2)** Uses positive and negative numbers in context and positions them on the number line.	**1.1(6)** Counts on from and back to zero (including whole and decimal numbers) in single-digit steps or multiples of 10. **1.2(2)** Uses positive and negative numbers in context and positions them on the number line (by counting backwards)	**1.2(2)** Uses positive and negative numbers in context. *Find the difference between a positive and negative integer, or two negative integers*
	1.1(6) Counts on from and back to zero in single-digit steps **1.2(1)** Recognizes and explains given number sequences or patterns or relationships.		
2.3(1) Recall multiplication and division facts to 10 x 10 (2, 3, 4, 5, 6 and 10 times-tables) **2.3(5)** Recognize multiples of 1-digit numbers (2, 5,or 10 up to 1,000)	**2.3(1)** Recall all multiplication and division facts to 10 x 10 **2.3(5)** Recognize multiples of 1-digit numbers (up to the tenth multiple)	**2.3(3)** Work out products such as 60 x 5, **60 x 50** or 600 x 5 or **600 x 50** or 0.6 x 5 using the related multiplication fact 6 x 5 **2.3(10)** Demonstrate an understanding that multiplication and division are inverse operations (by deriving division facts from multiplication facts)	**3.2(4)** Use knowledge of place value to derive related multiplication and division facts (including decimals)(e.g. 0.8 x 7, 4.8 ÷ 6)
2.1(1) to 2.1(3) Recall and use all addition and subtraction facts for numbers to 20; sums and differences of multiples of	*Use knowledge of addition and subtraction facts and place value to derive sums and differences of pairs of multiples*	*Use knowledge of place value, rounding, number facts and inverse operations to estimate and check calculations*	*Use approximations, inverse operations and tests of divisibility to estimate and check results.*

10 and number pairs that total 100.	*of 10, 100 or 1,000.* ***2.1(2)***	***1.3(1), 1.4(2), 2.1(1), 2.3(10)***	***1.4(1), 2.3(9), 2.3(10)***
1.4(1) Use estimation for solving problems and checking for reasonableness of results. **1.4(2)** Round 2-digit or 3-digit numbers to the nearest 10 or 100	**1.4(1)** Use estimation (including rounding) for solving problems and checking for reasonableness of results.	**2.1(7)** Use knowledge of place value and addition and subtraction of 2-digit numbers to derive sums and differences, doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34)	
	2.1(4) Identify the doubles of two-digit numbers *and then calculate mentally the doubles of multiples of 10 and 100 and the corresponding halves.*	*Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9)* ***2.3(1)/2.3(5)***	
Add or subtract mentally combinations of one- and two-digit numbers. ***2.1(1), 2.1(4), 2.1(5)***	**2.1(5)** Add or subtract mentally pairs of 2-digit whole numbers.	*Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 or 1,000* ***2.3(2), 2.4(4)***	*Calculate mentally with integers and decimals* ***2.1(15), 2.1(6), 2.4(7),3.2(4), 3.2(5)***
Multiply 1-digit and 2-digit numbers by 10 or 100 and describe the results. ***2.3(2)***	*Multiply and divide numbers to 1,000 by 10 and then 100 and demonstrate understanding of the effect; relate to scaling up and down.* ***1.4(1)*** , ***3.3(3)***	**2.1(1)** Use efficient written methods to add and subtract whole numbers and decimals up to two places	**1.5(9)** Use a calculator to solve multi-step problems.
	Use a calculator to carry out one-step and two-step calculations involving all four operations; recognize negative numbers in the display, correct mistaken entries and interpret the display correctly in the context of money. ***1.5(9)***	*Extend mental whole number calculations to multiply a 2-digit by a 1-digit number; to multiply by 25; to subtract one near multiple from another e.g. 6070 – 4097* ***2.3(3), 2.1(5)***	

		1.5(9) Use a calculator to solve problems.	

Unit 2 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(1), 1.5(6), **1.5(7)** Solve one-step and two-step problems involving whole numbers, measures (incl. time) and money. **1.5(9)** Choose and use appropriate calculation strategies.	**1.5(1), 1.5(6)**, **1.5(7)** Solve one-step and two-step problems involving whole numbers, measures (incl. time) and money. **1.5(9)** Choose and use appropriate calculation strategies including a calculator where appropriate	**1.5(1), 1.5(2)**, **1.5(8)** Solve one-step and two-step problems involving whole numbers and decimals and all four operations. **1.5(9)** Choose and use appropriate calculation strategies including a calculator.	**1.5(1), 1.5(2)**, **1.5(3), 1.5(4)** Solve multi-step problems involving decimals, fractions and percentages. **1.5(9)** Choose and use appropriate calculation strategies including a calculator.
1.5(10) to 1.5(12) Represent the information from a puzzle or problem using images or diagrams. **1.5(14)** Describe and explain methods, choices and solutions to puzzles and problems; orally or in writing.	**1.5(10) to 1.5(12)** Represent the information from a puzzle or problem using number, number sentences, images or diagrams *or symbols*.	**1.5(15)** Decide what data is important to solve a problem. Make use of lists, tables and graphs to organize and interpret the data.	**1.5(10) to 1.5(12)** Represent the information from a puzzle or problem using images or diagrams as appropriate. **1.5(14)** Describe and explain methods, choices and solutions to puzzles and problems; orally or in writing.
1.1(1)/1.1(2) Read, write, compare and order whole numbers in figures and words to at least 1,000	**1.1(16)** Counts on from and back to zero in single-digit steps **1.2(1)** Recognizes and explains given number sequences or patterns or relationships.	**1.1(16)** Counts on from and back to zero (including whole and decimal numbers) in single-digit steps or multiples of 10.	*Use decimal notation for tenths, hundredths and thousands; partition, round and order decimals with up to three places and position them on the number line.* ***3.2(2)/3.2(3)***

1.1(16) Count on and back to zero in single-digit steps or multiples of 10.		**1.2(2)** Uses positive and negative numbers in context and positions them on the number line (by counting backwards)	
1.3(1) Demonstrates an understanding of place value to 1,000 (by partitioning into multiples of 100, 10 and 1 in different ways)	*Use decimal notation for tenths and hundredths and partition decimals; relate the notation to money and measurement; position one-place and two-place decimals on a number line.* ***3.2(2), 3.2(3), 4.2(1), 4.4(2)***	**1.3(4)** Demonstrate an understanding of place value (by explaining what each digit represents in whole number and decimals up to two places). **1.4(2)** Round 2-digit- 6-digit numbers into multiples of 10 in different ways.(Include decimals up to two places)	
1.4(1) Use estimation for solving problems and checking for reasonableness of results. **1.4(2)** Round 2-digit or 3-digit numbers to the nearest 10 or 100.	**1.1(3)** Read, write, compare (using > & < signs) and order whole numbers in figures and words to at least 10,000 **1.2(2)** Uses positive and negative numbers in context and positions them on the number line.		
2.1(1) TO 2.1(3) Recall and use all addition and subtraction facts for numbers to 20; sums and differences of multiples of 10 and number pairs that total 100.	**2.3(1)** Recall all multiplication and division facts to 10 x 10 **2.3(5)** Recognize multiples of 1-digit numbers (up to the tenth multiple)	**2.1(7)** Use knowledge of place value and addition and subtraction of 2-digit numbers to derive sums and differences, doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34)	**3.2(4)**Use knowledge of place value to derive related multiplication and division facts (including decimals)(e.g. 0.8 x 7, 4.8 ÷ 6)
2.3(1) Recall multiplication and division facts to 10 x 10 (2, 3, 4, 5, 6 and 10 times-tables)	*Use knowledge of rounding, number operations and inverses to estimate and check*	*Recall quickly multiplication facts up to 10 x 10 and use them to multiply pairs of multiples of*	*Use approximations, inverse operations and tests of divisibility to estimate and*

2.3(5) Recognize multiples of 1-digit numbers (2, 5,or 10 up to 1,000)	*calculations.* ***1.3(1),1.4(2),2.1(1), 2.3(10)***	*10 and 100; derive quickly corresponding division facts.* ***2.3(1), 2.3(3), 2.3(10)***	*check results.* ***1.4(1), 2.3(9), 2.3(10), 2.4(7)***
		*Use knowledge of rounding, number operations and inverses to estimate and check calculations.****1.3(1),1.4(2),2.1(1), 2.3(10), 2.4(7)***	
		Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9) ***2.3(1), 2.3(5)***	
2.1(10) Demonstrate an understanding that multiplication and division are inverse operations (by recording related number sentences).	**2.1(5)** Add or subtract mentally pairs of 2-digit whole numbers.	**2.2(3)** Use efficient written methods to add and subtract whole numbers and decimals up to two places	*Calculate mentally with integers and decimals* ***2.1(15), 2.1(6), 2.4(7),3.2(4), 3.2(5)***
2.1(5) Add or subtract mentally combinations of 1- and 2-digit whole numbers.	**2.4(3)** Use efficient written methods to record, support and explain multiplication and division of 2-digit numbers by 1-digit numbers, including division with remainders.	**1.5(9)** Use a calculator to solve problems	*Use efficient written methods to add and subtract integers and decimals, to multiply and divide integers and decimals by a 1-digit integer, and to multiply 2-digit and 3-digit integers by a two-digit integer.* ***2.2(3), 2.4(5), 2.4(7)***
Multiply 1-digit and 2-digit numbers by 10 or 100 and describe the results. ***2.3(2)/ 2.3(3)***	*Use a calculator to carry out one-step and two-step calculations involving all four operations; recognize negative numbers in the display, correct*	*Extend mental whole number calculations to multiply a 2-digit by a 1-digit number; to multiply by 25; to subtract one near multiple from another e.g. 6070*	**1.5(9)** Use a calculator to solve multi-step problems.

	mistaken entries and interpret the display correctly in the context of money. ***1.5(9)***	*– 4097* ***2.3(3), 2.1(5)***	

Unit 3 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(1), 1.5(6), **1.5(7)** Solve one-step and two-step problems involving whole numbers, measures (incl. time) and money. **1.5(9)** Choose and use appropriate calculation strategies.	**1.5(1), 1.5(6)**, **1.5(7)** Solve one-step and two-step problems involving whole numbers, measures (incl. time) and money. **1.5(9)** Choose and use appropriate calculation strategies including a calculator where appropriate	**1.5(1), 1.5(2)**, **1.5(8)** Solve one-step and two-step problems involving whole numbers and decimals and all four operations. **1.5(9)** Choose and use appropriate calculation strategies including a calculator.	**1.5(1), 1.5(2)**, **1.5(3), 1.5(4)** Solve multi-step problems involving decimals, fractions and percentages. **1.5(9)** Choose and use appropriate calculation strategies including a calculator.
		2.1(7) Use knowledge of place value and addition and subtraction of 2-digit numbers to derive sums and differences, doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34)	**3.2(4)**Use knowledge of place value to derive related multiplication and division facts (including decimals)(e.g. 0.8 x 7, 4.8 ÷ 6)
1.4(1) Use estimation for solving problems and checking for reasonableness of results. **1.4(2)** Round 2-digit or 3-digit numbers to the nearest 10 or 100.	*Use decimal notation for tenths and hundredths and partition decimals; relate the notation to money and measurement; position one-place and two-place decimals on a number line.* ***3.2(2), 3.2(3), 4.2(1), 4.4(2)***	**1.1(6)** Counts on from and back to zero (including whole and decimal numbers) in single-digit steps or multiples of 10. **1.2(2)** Uses positive and negative numbers in context and positions them on the number line (by counting backwards).	*Use decimal notation for tenths, hundredths and thousands; partition, round and order decimals with up to three places and position them on the number line.* ***3.2(2)/ 3.2(3)***

1.1(3) Read, write, compare and order whole numbers in figures and words to at least 1,000 **1.1(6)** Count on and back to zero in single-digit steps or multiples of 10.	**1.1(6)** Counts on from and back to zero in single-digit steps **1.2(2)** Recognizes and explains given number sequences or patterns or relationships. **1.1(3)** Read, write, compare (using > & < signs) and order whole numbers in figures and words to at least 10,000 **1.2(2)** Uses positive and negative numbers in context and positions them on the number line.	**1.1(4)** Demonstrate an understanding of place value (by explaining what each digit represents in whole number and decimals up to two places). **1.4(2)** Round 2-digit- 6-digit numbers into multiples of 10 in different ways.(Include decimals up to two places)	
2.3(1) Recall multiplication and division facts to 10 x 10 (2, 3, 4, 5, 6 and 10 times-tables) **2.3(5)** Recognize multiples of 1-digit numbers (2, 5,or 10 up to 1,000)	**2.1(5)** Add or subtract mentally pairs of 2-digit whole numbers.	**2.2(1)/2.2(3)** Use efficient written methods to add and subtract whole numbers and decimals up to two places	*Calculate mentally with integers and decimals* ***2.1(15), 2.1(6), 2.4(7),3.2(4), 3.2(5)***
2.1(5) Add or subtract mentally combinations of 1- and 2-digit whole numbers.	**2.4(3)** Use efficient written methods to record, support and explain multiplication and division of 2-digit numbers by 1-digit numbers, including division with remainders.	**2.4(4)** Use efficient written methods to multiply and divide HTO x O, TO x TO, O.t x O and HTO ÷ O	*Use efficient written methods to add and subtract integers and decimals, to multiply and divide integers and decimals by a 1-digit integer, and to multiply 2-digit and 3-digit integers by a two-digit integer.* ***2.2(3), 2.4(5), 2.4(7)***
2.2(1) Develop and use written methods to record, support or explain addition and	**2.2(1)/2.2(2)** Develop and use written methods to record, support or explain addition and	*Use a calculator to solve problems, including those involving decimals or fractions*	

subtraction of 2- to 4-digit numbers.	subtraction of 2- to 4-digit numbers and money.	*e.g. to find ¾ of 150g; interpret the display correctly in the context of measurement.* ***1.5(9)***	
2.4(1) Use practical, informal, written methods to multiply and divide 2-digit numbers; *round remainders up or down depending on context*	*Use a calculator to carry out one-step and two-step calculations involving all four operations; recognize negative numbers in the display, correct mistaken entries and interpret the display correctly in the context of money.* ***1.5(9)***		**1.5(9)** Use a calculator to solve multi-step problems.

Block 2 Number and Numeration, Calculation, Rational Numbers and Geometry

Unit 1 (Time Frame 1 – 3 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(16) Use patterns and relationships involving numbers and shapes to solve problems	**1.5(16)** Use patterns and relationships involving numbers and shapes to solve problems Investigate a statement involving numbers and test it with examples.	**1.5(16)** Use patterns and relationships involving numbers and shapes to solve problems Propose a statement and identify examples that verify it.	*Represent and interpret sequences, patterns and relationships involving numbers and shapes; suggest and test a hypotheses, construct and use simple expressions and formulas in words then in numbers(e.g. the cost of x pens at 20cents each is 20x cents)* ***1.5(10), 1.5(14), 1.5(15), 1.5(16)***
1.5(10) – 1.5(12) Represent the information from a puzzle or problem using numbers, number sentences, images or	**1.5(1), 1.5(6), 1.5(7)** Solve one- and two-step problems involving numbers, measures (incl. time) or money.		

diagrams. (*Use these to find a solution and present it in context including using money or measures.)*	**1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate)*		
	1.5(14) Describe and explain methods, choices and solutions to puzzles and problems; orally and/or in writing.		
2.3(1) Recall multiplication and division facts for the 2, 3, 4, 5, 6and 10 times table. **2.3(5)** Recognize multiples of 2, 5 or 10 up to 1,000.	**2.3(1)** Recall all multiplication and division facts to 10 x 10. **2.3(5)** Recognize multiples of numbers up to 10 up to the tenth multiple.	**2.3(1)** Recall all multiplication and division facts to 10 x 10. *Use them to multiply pairs of multiples of 10 and 100* ***2.3(3)***	**2.3(6)** Recall quickly squared numbers to 12 x 12 *and derive the corresponding squares of multiples of 10.*
Use knowledge of number operations and corresponding inverses, including doubling and halving to estimate and check calculations. ***1.4(1),1.5(1),2.1(7), 2.3(10)***	*Use knowledge of rounding, number operations and inverses to estimate and check calculations.* ***1.4(2),1.5(1), 2.3(10)***	*Identify pairs of factors of 2-digit whole numbers and find common multiples for single-digit numbers.* ***2.3(1), 2.3(5), 2.3(5)***	**3.2(4)** Use knowledge of place value, *and multiplication facts to 10 x 10 to work out related multiplication and division facts involving decimals.* ***2.3(13)***
2.1(10) – 2.1(3) Recall and use all addition and subtraction facts for numbers to 20, sums and differences of multiples of 10 and number pairs that total 100.	**2.1(7), 2.1(2)** Use knowledge of place value and addition and subtraction facts to derive sums and differences *of pairs of multiples of 10,100 or 1,000.*	*Use knowledge of rounding, place value, number operations and inverses to estimate and check calculations.* ***1.4(2), 1.5(11), 2.1(7), 2.4(7) 2.3(10)***	*Use approximations, inverse operations and tests of divisibility to estimate and check results.* ***1.4(1), 1.5(1), 2.1(4), 2.3(9)***
		2.2(1), 2.2(3) Develop and use written methods to record, support or explain addition and subtraction of i. up to 4- digit numbers iii. Decimals *up to two places*	*Recognize that prime numbers have only 2 factors and identify prime numbers less than 100; Find prime numbers of 2-digit numbers.* ***2.3(6), 2.3(12)***

Relate 2-D shapes and 3-D solids to drawings of them; describe, visualize, classify, draw and make the shapes ***5.1(6) - 5.1(8), 5.1(11) - 5.1(13)***	*Visualize 3-D objects from 2-D drawings; make nets of common solids* ***5.1(6)- 5.1(8), 5.1(11) -5.1(13)*** *Draw polygons and classify them by identifying their properties including their line symmetry.* ***5.1(6) - 5.1(8), 5.1(11) - 5.1(13), 5.2(2)***	*Identify, visualize and describe properties of rectangles, triangles, regular polygons and 3-D solids; use knowledge of properties to draw 2-D shapes and identify and draw nets of 3-D shapes.* ***5.1(6) - 5.1(8), 5.1(11) - 5.1(13)***	*Describe, identify and visualize parallel and perpendicular edges or faces; use these properties to classify 2-D shapes and 3-D solids.* *5Aiib* *Make and draw shapes with increasing accuracy and apply knowledge of their properties* ***5.1(6) - 5.1(8), 5.1(11) - 5.1(13)***

Block 2 Number and Numeration, Calculation, Rational Numbers and Geometry

Unit 2 (Time Frame 1 – 3 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(16) Use patterns and relationships involving numbers and shapes to solve problems	**1.5(16)** Use patterns and relationships involving numbers and shapes to solve problems Investigate a statement involving numbers and test it with examples.	**1.5(16)** Use patterns and relationships involving numbers and shapes to solve problems Propose a statement and identify examples that verify it.	*Record systematically the information in a problem or puzzle; identify and record the steps or calculations needed to solve it, using symbols where appropriate; interpret solutions in the original context and check their accuracy* ***1.5(1),1.5(10), 1.5(15)***
1.5(10) – 1.5(12) Represent the information from a puzzle or problem using numbers, number sentences, images or diagrams. (*Use these to find a solution and present it in context including using money or measures.)*	**1.5(14)** Describe and explain methods, choices and solutions to puzzles and problems; orally and/or in writing, *using diagrams and symbols.*	**1.5(10) – 1.5(13)** Represent the information from a puzzle or problem, find *possible solutions and confirm them in the context of the problem.*	*Represent and interpret sequences, patterns and relationships involving numbers and shapes; suggest and test a hypotheses, construct and use simple expressions and formulas in words then in numbers(e.g. the cost of x pens*

			at 20cents each is 20x cents) ***1.5(10), 1.5(14), 1.5(15), 1.5(16*****)**
1.5(10) – 1.5(12) Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies			**1.5(1)** Solve multi-step problems. **1.5(9)** Choose and use appropriate calculation strategies including a calculator
2.1(1) -2.1(3) Recall and use all addition and subtraction facts for numbers to 20, sums and differences of multiples of 10 and number pairs that total 100.	*Identify the doubles of 2-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves.* ***2.1(4)***	**2.1(7)** Use knowledge of place value and addition and subtraction of 2-digit numbers to derive sums and differences, doubles and halves of decimals.	**3.2(4)** Use knowledge of place value, *and multiplication facts to 10 x 10 to work out related multiplication and division facts involving decimals.* ***2.3(13)***.
2.3(1) Recall multiplication and division facts for the 2, 3, 4, 5, 6and 10 times table. **2.3(5)** Recognize multiples of 2, 5 or 10 up to 1,000.	*Use knowledge of rounding, number operations and inverses to estimate and check calculations.* ***1.4(2), 1.5(1), 2.1(4), 2.3(10)***	*Use knowledge of rounding, number operations and inverses to estimate and check calculations.* ***1.4(1), 1.5(1), 2.1(4), 2.3(10), 2.4(7)***	*Recognize that prime numbers have only 2 factors and identify prime numbers less than 100; Find prime numbers of 2-digit numbers.* ***2.3(6), 2.3(12)***
			Use approximations, inverse operations and tests of divisibility to estimate and check results. ***1.4(1), 1.5(1), 2.1(7), 2.3(9)***
Relate 2-D shapes and 3-D solids to drawings of them; describe, visualize, classify, draw and make the shapes ***5.1(6)- 5.1(8), 5.1(11) - 5.1(13)***	*Draw polygons and classify them by identifying their properties including their line symmetry.* ***5.1(6)- 5.1(8), 5.1(11) - 5.1(13), 5.2(2)***	*Identify, visualize and describe properties of rectangles, triangles, regular polygons and 3-D solids; use knowledge of properties to draw 2-D shapes and identify and draw nets of*	*Describe, identify and visualize parallel and perpendicular edges or faces; use these properties to classify 2-D shapes and 3-D solids.* ***5.1(6) - 5.1(10), 5.1(11) - 5.1(14)***

		3-D shapes. ***5.1(6)- 5.1(8), 5.1(11) - 5.1(13)***	
5.2(2) Identify, draw and/or complete shapes with reflective symmetry; *draw the reflection of a shape in a mirror line along one side.*	*Visualize 3-D objects from 2-D drawings; make nets of common solids* ***5.1(6)- 5.1(8), 5.1(11) - 5.1(13)***	*Complete patterns with up to two lines of symmetry; draw the position of a shape after a reflection or translation.* ***5.2(2), 5.2(3)***	*Make and draw shapes with increasing accuracy and apply knowledge of their properties* ***5.1(6) - 5.1(8), 5.1(11) - 5.1(13)***.

Block 2 Number and Numeration, Calculation, Rational Numbers and Geometry
Unit 3 (Time Frame 1 – 3 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(10) – 1.5(12) Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies	**1.5(10) – 1.5(12)** Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*	**1.5(10) – 1.5(13)** Represent the information from a puzzle or problem, find *possible solutions and confirm them in the context of the problem.*	*Record systematically the information in a problem or puzzle; identify and record the steps or calculations needed to solve it, using symbols where appropriate; interpret solutions in the original context and check their accuracy* ***1.5(1), 1.5(10), 1.5(15)***
1.5(10) – 1.5(12) Represent the information from a puzzle or problem using numbers, number sentences, images or diagrams. (*Use these to find a solution and present it in context including using money or measures.)*	**1.5(14)** Describe and explain methods, choices and solutions to puzzles and problems; orally and/or in writing, *using diagrams and symbols.*	**1.5(16)** Use patterns and relationships involving numbers and shapes to solve problems Propose a statement and identify examples that verify it.	*Represent and interpret sequences, patterns and relationships involving numbers and shapes; suggest and test a hypotheses, construct and use simple expressions and formulas in words then in numbers(e.g. the cost of x pens at 20cents each is 20x cents)* ***1.5(10), 1.5(14), 1.5(15),*** **1.5(16)**

1.5(16) Use patterns and relationships involving numbers and shapes to solve problems	**1.5(16)** Use patterns and relationships involving numbers and shapes to solve problems Investigate a statement involving numbers and test it with examples.		
2.3(1) Recall multiplication and division facts for the 2, 3, 4, 5, 6and 10 times table. **2.3(5)** Recognize multiples of 2, 5 or 10 up to 1,000.	**2.3(1)** Recall all multiplication and division facts to 10 x 10. **2.3(5)** Recognize multiples of numbers up to 10 up to the tenth multiple.	**2.3(1)** Recall all multiplication and division facts to 10 x 10. *Use them to multiply pairs of multiples of 10 and 100* ***2.3(5)***	**2.3(6)** Recall quickly squared numbers to 12 x 12 *and derive the corresponding squares of multiples of 10.*
Use knowledge of number operations and corresponding inverses, including doubling and halving to estimate and check calculations. ***1.4(2), 1.5(1), 2.1(7), 2.3(10)***	*Use knowledge of rounding, number operations and inverses to estimate and check calculations.* ***1.4(2), 1.5(1), 2.1(7), 2.3(10)***	*Identify pairs of factors of 2-digit whole numbers and find common multiples for single-digit numbers.* ***2.3(1), 2.3(5), 2.3(5)***	**3.2(4)** Use knowledge of place value, *and multiplication facts to 10 x 10 to work out related multiplication and division facts involving decimals.* ***2.3(13)***.
2.1(1) – 2.1(3) Recall and use all addition and subtraction facts for numbers to 20, sums and differences of multiples of 10 and number pairs that total 100.	**2.1(7)** Use knowledge of place value and addition and subtraction facts to derive sums and differences *of pairs of multiples of 10,100 or 1,000.*	*Use knowledge of rounding, number operations and inverses to estimate and check calculations.* ***1.4(2), 1.5(1), 2.1(7), 2.3(10), 2.4(7)***	*Recognize that prime numbers have only 2 factors and identify prime numbers less than 100; Find prime numbers of 2-digit numbers.* ***2.3(5) , 2.3(12)***
	Identify the doubles of 2-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves. ***2.1(4)***	**2.1(7)** Use knowledge of place value and addition and subtraction of 2-digit numbers to derive sums and differences, doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34)	*Use approximations, inverse operations and tests of divisibility to estimate and check results.* ***1.4(1), 1.5(1), 2.1(7), 2.3(9)***

		Use a calculator to solve problems involving decimals or fractions; interpret the display correctly in the context of measurement. ***1.5(1) – 1.5(3), 1.5(9)***	**1.5(1)** Solve multi-step problems. **1.5(9)** Choose and use appropriate calculation strategies including a calculator
		2.2(1), 2.2(3) Develop and use written methods to record, support or explain addition and subtraction of i. Up to 4- digit numbers iii. Decimals *up to two places*	
Relate 2-D shapes and 3-D solids to drawings of them; describe, visualize, classify, draw and make the shapes ***5.1(6) - 5.1(8), 5.1(11) -5.1(13)***	*Draw polygons and classify them by identifying their properties including their line symmetry.* ***5.1(6)- 5.1(8), 5.1(11) - 5.1(13), 5.2(2)***	*Identify, visualize and describe properties of rectangles, triangles, regular polygons and 3-D solids; use knowledge of properties to draw 2-D shapes and identify and draw nets of 3-D shapes.* ***5.1(6) - 5.1(8), 5.1(11) -5.1(13)***	*Describe, identify and visualize parallel and perpendicular edges or faces; use these properties to classify 2-D shapes and 3-D solids.* ***5.1(6) - 5.1(10), 5.1(11) - 5.1(14)***
Use a set- square to draw right angles and to identify right angles in 2-D shapes; compare angles with a right angle; recognize that a straight line is equivalent to 2 right angles. ***5.1(5), 5.1(15)***	*Visualize 3-D objects from 2-D drawings; make nets of common solids* ***5.1(6)- 5.1(8), 5.1(11) -5.1(13)***		*Make and draw shapes with increasing accuracy and apply knowledge of their properties* ***5.1(6) - 5.1(8), 5.1(11) - 5.1(13)***.

Block 3 Number and Numeration (*Using and Applying Mathematics*) and Measurement

Unit 1 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(15) Decide what data is important to solve a problem. Make use of lists, tables and graphs to organize and interpret the data	**1.5(15)** Decide what data is important to solve a *suggested* problem. Organize and interpret *selected* data *to find solutions.*	**1.5(15)** *Plan and pursue an enquiry; present evidence by collecting* organiz*ing* and interpret*ing* the data. Suggest extensions to the line of enquiry	**1.5(15)** *Suggest, plan and develop lines of enquiry; collect,* organize and interpret the data. Review methods used and answer related questions.
	Report solutions to puzzles, giving explanations and reasoning orally and in writing, using diagrams. ***1.5(12), 1.5(14)***	*Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols.* ***1.5(10) – 1.5(14)***	
Know the relationship between kilometers and metres, metres and centimeters; kilograms and grams; litres and milliliters. Choose and use appropriate units to estimate, measure and record measurements. ***4.4(1) – 4.4(5); 4.5(1) – 4.5(3); 4.6(1) – 4.6(3)***	*Choose and use standard metric units and their abbreviations when estimating, measuring and recording capacity, weight and length. Use decimal notation to record measurements (e.g. 1.3m or 0.6kg).* ***4.4(1), 4.4(2), 4.4(4), 4.5(1), 4.5(3), 4.6(1), 4.6(3)***	*Read, choose, use and record standard metric units to estimate and measure capacity, weight and length to a suitable degree of accuracy; convert larger to smaller units using decimals to one place (e.g. change 4.7kg to 4700g).* ***4.4(1) – 4.4(5);4.5(1) – 4.5(3; 4.6(1) – 4.6(3))***	*Select and use standard metric units of measure and convert between units using decimals to two places (e.g. 6.85 litres to 6850ml or vice versa)* ***4.4(1) - 4.4(3); 4.5(1), 4.5(2; 4.6(1), 4.6(2))***
4.4(5) Read scales accurately *to the nearest division and half-division or partially numbered.*	**4.4(5)** Read scales accurately, *interpreting intervals and divisions on partially numbered scales to the nearest tenth of a unit.*	**4.4(5)** Read scales accurately, *interpreting a reading that lies between two unnumbered divisions on a scale.*	*Read and interpret scales on a range of measuring instruments, recognizing that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales when using different instruments* ***4.4(5)***

Answer a question by collecting, organizing and interpreting data. Use tally charts, frequency tables, pictograms and bar charts to represent results and illustrate observations. Use ICT to create a simple bar chart. ***1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Answer a question by identifying what data to collect. Use tally charts, tables, diagrams, pictograms, bar charts and ICT to organize, present, analyze and interpret the data..* ***1.5(10) – 1.5(13); 1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Answer a set of related questions by collecting, selecting, and organizing relevant data. Draw conclusions using ICT to present. Identify further questions to ask.* ***1.5(10) – 1.5(13); 1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate. Draw conclusions and indentify further questions to ask.* ***1.5(15), 4.8(1) – 4.8(11)***
Use Venn or Carroll diagrams to sort data and objects using more than one criterion. ***4.8(3)***		**4.8(13)** Construct frequency tables, pictograms and bar and line graphs to represent the frequencies of events and changes over time.	**4.8(14)** *Construct* and interpret frequency tables, bar charts with discrete data, line graphs and pie charts (*interpret only).*
		4.8(15) Find and interpret the mean *(average)* of a set of data.	**4.8(16)** Describe and interpret results and solutions to problems using the mode, range, median and mean.

Unit 2 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(15) Decide what data is important to solve a problem. Make use of lists, tables and graphs to organize and interpret the data	*Report solutions to puzzles, giving explanations and reasoning orally and in writing, using diagrams.* ***1.5(12), 1.5(14)***	*Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols.* ***1.5(10) – 1.5(14)***	**1.5(15)** *Suggest, plan and develop lines of enquiry; collect,* organize and interpret the data. Review methods used and answer related questions.
	1.5(15) Decide what data is important to solve a *suggested* problem. Organize and interpret *selected* data *to find solutions.*	**1.5(15)** *Plan and pursue an enquiry; present evidence by collecting* organiz*ing* and interpret*ing* the data. Suggest extensions to the line of enquiry.	

			Use a calculator to solve problems involving multi-step calculations.
Know the relationship between kilometers and metres, metres and centimeters; kilograms and grams; litres and milliliters. Choose and use appropriate units to estimate, measure and record measurements. ***4.4(1) – 4.4(5); 4.5(1) – 4.5(3); 4.6(1) – 4.6(3)***	*Choose and use standard metric units and their abbreviations when estimating, measuring and recording capacity, weight and length. Use decimal notation to record measurements (e.g. 1.3m or 0.6kg).* ***4.4(1), 4.4(2), 4.4(4), 4.5(1), 4.5(3), 4.6(1), 4.6(3)***	*Read, choose, use and record standard metric units to estimate and measure capacity, weight and length to a suitable degree of accuracy; convert larger to smaller units using decimals to one place (e.g. change 4.7kg to 4700g).* ***4.4(1) – 4.4(5);4.5(1) – 4.5(3; 4.6(1) – 4.6(3))***	*Select and use standard metric units of measure and convert between units using decimals to two places (e.g. 6.85 litres to 6850ml or vice versa)* ***4.4(1) - 4.4(3); 4.5(1), 4.5(2; 4.6(1), 4.6(2))***
4.4(5) Read scales accurately *to the nearest division and half-division or partially numbered*	**4.4(5)** Read scales accurately, *interpreting intervals and divisions on partially numbered scales to the nearest tenth of a unit.*	**4.4(5)** Read scales accurately, *interpreting a reading that lies between two unnumbered divisions on a scale.*	*Read and interpret scales on a range of measuring instruments, recognizing that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales when using different instruments* ***4.4(5)***
Answer a question by collecting, organizing and interpreting data. Use tally charts, frequency tables, pictograms and bar charts to represent results and illustrate observations. Use ICT to create a simple bar chart. ***1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Answer a question by identifying what data to collect. Use tally charts, tables, diagrams, pictograms, bar charts and ICT to organize, present, analyze and interpret the data.* ***1.5(10) – 1.5(13); 1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Answer a set of related questions by collecting, selecting, and organizing relevant data. Draw conclusions using ICT to present. Identify further questions to ask.* ***1.5(10) – 1.5(13); 1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate. Draw conclusions and indentify further questions to ask.* ***1.5(15), 4.8(1) – 4.8(11)***
Use Venn or Carroll diagrams to sort data and objects using	**4.4(5)** Read scales accurately, *comparing the impact of*	**4.8(13)** Construct frequency tables, pictograms and bar and	**4.8(14)** *Construct* and interpret frequency tables, bar charts

more than one criterion. ***4.8(3)***	*representations where scales have intervals of differing step size.*	line graphs to represent the frequencies of events and changes over time.	with discrete data, line graphs and pie charts (*interpret only).*
		4.9(1) Describe the occurrence of familiar events using the language of chance or likelihood.	**4.8(16)** Describe and interpret results and solutions to problems using the mode, range, median and mean.
			4.9(1) Describe the occurrence of familiar events using the language of chance or likelihood.

Unit 3 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(15) Decide what data is important to solve a problem. Make use of lists, tables and graphs to organize and interpret the data.	**1.5(15)** Decide what data is important to solve a *suggested* problem. Organize and interpret *selected* data *to find solutions.*	**1.5(15)** *Plan and pursue an enquiry; present evidence by collecting* organiz*ing* and interpret*ing* the data. Suggest extensions to the line of enquiry.	**1.5(15)** *Suggest, plan and develop lines of enquiry; collect,* organize and interpret the data. Review methods used and answer related questions.
	Report solutions to puzzles, giving explanations and reasoning orally and in writing, using diagrams. ***1.5(12), 1.5(14)***	*Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols.* ***1.5(10) – 1.5(14)***	**1.5(14)** Describe and explain methods, choices and solutions to puzzles and problems; orally and/or in writing
			Use a calculator to solve problems involving multi-step calculations.
Know the relationship between kilometers and metres, metres and centimeters; kilograms and grams; litres and milliliters.	*Choose and use standard metric units and their abbreviations when estimating, measuring and recording*	*Read, choose, use and record standard metric units to estimate and measure capacity, weight and length to a suitable*	*Select and use standard metric units of measure and convert between units using decimals to two places (e.g. 6.85 litres to*

Choose and use appropriate units to estimate, measure and record measurements. ***4.4(1) – 4.4(5); 4.5(1) – 4.5(3); 4.6(1) – 4.6(3)***	*capacity, weight and length. Use decimal notation to record measurements (e.g. 1.3m or 0.6kg).* ***4.4(1), 4.4(2), 4.4(4), 4.5(1), 4.5(3), 4.6(1), 4.6(3)***	*degree of accuracy; convert larger to smaller units using decimals to one place (e.g. change 4.7kg to 4700g).* ***4.4(1) – 4.4(5);4.5(1) – 4.5(3; 4.6(1) – 4.6(3))***	*6850ml or vice versa)* ***4.4(1) - 4.4(3); 4.5(1), 4.5(2; 4.6(1), 4.6(2))***
4.4(5) Read scales accurately *to the nearest division and half-division or partially numbered*	**4.4(5)** Read scales accurately, *interpreting intervals and divisions on partially numbered scales to the nearest tenth of a unit.*	**4.4(5)** Read scales accurately, *interpreting a reading that lies between two unnumbered divisions on a scale.*	*Read and interpret scales on a range of measuring instruments, recognizing that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales when using different instruments* ***4.4(5)***
Answer a question by collecting, organizing and interpreting data. Use tally charts, frequency tables, pictograms and bar charts to represent results and illustrate observations. Use ICT to create a simple bar chart. ***1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Answer a question by identifying what data to collect. Use tally charts, tables, diagrams, pictograms, bar charts and ICT to organize, present, analyze and interpret the data.* ***1.5(10) – 1.5(13); 1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Answer a set of related questions by collecting, selecting, and organizing relevant data. Draw conclusions using ICT to present. Identify further questions to ask.* ***1.5(10) – 1.5(13); 1.5(15), 4.8(1) – 4.8(6), 4.8(11)***	*Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate. Draw conclusions and indentify further questions to ask.* ***1.5(15), 4.8(1) – 4.8(11)***
Use Venn or Carroll diagrams to sort data and objects using more than one criterion. ***4.8(3)***	**4.4(5)** Read scales accurately, *comparing the impact of representations where scales have intervals of differing step size.*	**4.8(13)** Construct frequency tables, pictograms and bar and line graphs to represent the frequencies of events and changes over time.	**4.8(14)** *Construct* and interpret frequency tables, bar charts with discrete data, line graphs and pie charts *(interpret only).*
		4.8(15) Find and interpret the mode of a set of data.	**4.8(16)** Describe and interpret results and solutions to problems using the mode, range, median and mean.

		4.9(1) Describe the occurrence of familiar events using the language of chance or likelihood.	**4.9(1)** Describe *and predict outcomes from data* using the language of chance or likelihood.

Block 4 Number and Numeration, Calculation, Measurement and Geometry

Unit 1 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(1), 1.5(6), 1.5(7) Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies.	**1.5(1), 1.5(6), 1.5(7)** Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*	**1.5(1), 1.5(2), 1.5(8)** Solve one- and two-step problems involving whole numbers, decimals and the four operations. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*	**1.5(1) – 1.5(4)** Solve multi-step problems involving decimals, fractions and percentages. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*
		Use knowledge of place value, rounding, number facts and inverse operations to estimate and check calculations. ***1.3(1), 1.4(2), 2.1(1), 2.3(10)***	*Use approximations, inverse operations and tests of divisibility to estimate and check results.* ***1.4(1), 2.3(9), 2.3(10)***
2.1(15) Add or subtract mentally pairs of 1- and 2-digit numbers.	**2.1(15)** Add or subtract mentally pairs of 2-digit whole numbers.	**2.2(1), 2.2(3)** Develop and use written methods to record, support or explain addition and subtraction of *whole numbers and decimals with up to two places.*	**2.2(1), 2.2(3), 2.4(3),** Develop and use written methods to record, support or explain addition and subtraction of *whole numbers and* decimals; multiplication and division of integers and decimals by a 1-digit number and multiplication of 2- digit and 3-digit integers by a 2-digit integer.

3.1(10) Find unit fractions of numbers and quantities (e.g. ½, $^1/_3$, ¼, and $^1/_6$ of 24litres).	**2.2(1), 2.2(2)** Develop and use written methods to record, support or explain addition and subtraction of 2- and 3-digit numbers and money.	Use a calculator to solve problems, including those involving decimals or fractions; interpret the display correctly in the context of measurement.	**2.1(5), 2.1(6)** Add or subtract mentally e.g. O.t ± O.t **2.3(3), 2.3(8), 3.2(5)** Multiply and divide *integers and* decimals *mentally* e.g. TO x O, TO ÷ O, O.t x O, O.t ÷ O
		3.2(4), 3.2(5) Use knowledge of place value to *multiply and divide whole numbers and* decimals *by 10, 100 or 1,000.*	Use a calculator to solve problems involving multi-step calculations.
5.2(4) Describe movement about a grid using four compass points to describe direction.	**5.1(2)** identify lines (*horizontal and vertical)* **5.2(4)** … Use eight compass points to describe direction and *describe and identify the position of a square on a grid of squares.*	**5.2(5)** Use coordinates to plot points in a grid **5.1(2)** identify lines (*parallel and perpendicular in grids or shapes), use a set square and ruler to draw shapes with perpendicular or parallel sides.*	
Know the relationship between kilometers and metres, metres and centimeters; kilograms and grams; litres and milliliters. Choose and use appropriate units to estimate, measure and record measurements. ***4.4(1) – 4.4(5); 4.5(1) – 4.5(3); 4.6(1) – 4.6(3)***	*Choose and use standard metric units and their notations when estimating, measuring and recording capacity, weight and length. Use decimal notation to record measurements (e.g. 1.3m or 0.6kg).* ***4.4(1), 4.4(2), 4.4(4), 4.5(1), 4.5(3), 4.6(1), 4.6(3)***	*Read, choose, use and record standard metric units to estimate and measure capacity, weight and length to a suitable degree of accuracy; convert larger to smaller units using decimals to one place (e.g. change 4.7kg to 4700g).* ***4.4(1) – 4.4(5);4.5(1) – 4.5(3; 4.6(1) – 4.6(3))***	*Select and use standard metric units of measure and convert between units using decimals to two places (e.g. 6.85 litres to 6850ml or vice versa).* ***4.4(1) - 4.4(3); 4.5(1), 4.5(2; 4.6(1), 4.6(2))***
4.4(5) Read scales accurately *to the nearest division and half-division or partially numbered*	**4.4(5)** Read scales accurately, *interpreting intervals and divisions on partially numbered scales to the nearest tenth of a unit.*	**4.4(5)** Read scales accurately, *interpreting a reading that lies between two unnumbered divisions on a scale.*	*Read and interpret scales on a range of measuring instruments, recognizing that the measurement made is approximate and recording results to a required degree of*

			accuracy; compare readings on different scales when using different instruments ***4.4(5)***
	Draw rectangles and measure and calculate their perimeters. Find the area of rectilinear shapes drawn on a square grid by counting squares. ***4.6(7), 4.6(9,) 4.6(10), 5.1(6) – 5.1(7)***	**4.6(3)** *Draw and* measure *lines* accurately *to the nearest millimeter* *Measure and calculate the perimeter of regular and irregular polygons****4.6(7), 4.6(10)*** **4.6(12)** Develop and use formulas to calculate area *of a rectangle.*	*Calculate the perimeter and area of rectilinear shapes; estimate the area of an irregular shape by counting squares.* ***4.6(7), 4.6(9),4.6(10), 4.6(12)***
4.1(1) Read the time on a 12 hour digital clock and to the nearest 5 minutes on an analogue clock **4.1(5)** Calculate time intervals and find start or end times for a given time interval	**4.1(2)** Read time to the nearest minute; use am, pm and 12-hour clock notation. **4.1(6)** Choose units of time to measure time intervals from clocks and calendars.	**4.1(3)** Read timetables and time using 24-hour clock notation. **4.1(7)** Use a calendar to calculate time intervals.	**1.5(6)** Solve problems *by measuring, estimating and calculating* **4.4(8), 4.5(3), 4.6(5)** Measure and calculate *using imperial units still in everyday use.* **4.4(6), 4.5(7), 4.6(6)** Compare metric and imperial measures

Unit 2 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(1), 1.5(6), 1.5(7) Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies	**1.5(1), 1.5(6), 1.5(7)** Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*	**1.5(1), 1.5(2), 1.5(8)** Solve one- and two-step problems involving whole numbers, decimals and the four operations. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*	**1.5(1) – 1.5(4)** Solve multi-step problems involving decimals, fractions and percentages. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*

	2.3(1) Recall all multiplication and division facts to 10 x 10. **2.3(5)** Recognize multiples of 1-digit numbers.	*Use knowledge of place value, rounding, number facts and inverse operations to estimate and check calculations* ***1.3(1), 1.4(2), 2.1(1), 2.3(10)***	*Use approximations, inverse operations and tests of divisibility to estimate and check results.* ***1.4(1), 2.3(9), 2.3(10)***
	3.2(1) Recognize the equivalence between decimal and unit fractions (tenth, hundredth); *relate the notation to money and measurement* **3.2(3)** Compare and order decimals *by positioning 1- and 2-place decimals on the number line.*		
2.1(15) Add or subtract mentally pairs of 1- and 2-digit numbers	**2.2(1), 2.2(2)** Develop and use written methods to record, support or explain addition and subtraction of 2- and 3-digit numbers and money.	**2.2(1), 2.2(3)** Develop and use written methods to record, support or explain addition and subtraction of *whole numbers and decimals with up to two places.*	**2.1(5), 2.1(6)** Add or subtract mentally e.g. O.t ± O.t **2.3(3), 2.3(8), 3.2(5)** Multiply and divide *integers and* decimals *mentally* e.g. TO x O, TO ÷ O, O.t x O, O.t ÷ O.
2.2(1), 2.2(2) Develop and use written methods to record, support or explain addition and subtraction of 2- and 3-digit numbers and money.	**2.3(3)** Use efficient written methods to record, support and explain multiplication and division of 2-digit numbers by a 1-digit number including division with a remainder.	**2.4(4)** Use efficient written methods to multiply and divide HTO x O, TO x TO, O.t x O and HTO ÷ O.	**2.2(1), 2.2(3), 2.4(3)** Develop and use written methods to record, support or explain addition and subtraction of *whole numbers and* decimals; multiplication and division of integers and decimals by a 1-digit number and multiplication of 2- digit and 3-digit integers by a 2-digit integer.
2.4(1) Use practical, informal, written methods to multiply and		**3.2(4), 3.2(5)** Use knowledge of place value to *multiply and*	

divide 2-digit numbers, *round remainders up or down depending on context.*		*divide whole numbers and* decimals *by 10, 100 or 1,000.*	
3.1(10) Find unit fractions of numbers and quantities (e.g. ½, $^1/_3$, ¼, and $^1/_6$ of 24litres)		Use a calculator to solve problems, including those involving decimals or fractions; interpret the display correctly in the context of measurement.	Use a calculator to solve problems involving multi-step calculations.
Know the relationship between kilometers and metres, metres and centimeters; kilograms and grams; litres and milliliters. Choose and use appropriate units to estimate, measure and record measurements. ***4.4(1) – 4.4(5); 4.5(1) – 4.5(3); 4.6(1) – 4.6(3)***	*Choose and use standard metric units and their notations when estimating, measuring and recording capacity, weight and length. Use decimal notation to record measurements (e.g. 1.3m or 0.6kg).* ***4.4(1), 4.4(2), 4.4(4), 4.5(1), 4.5(3), 4.6(1), 4.6(3)***	*Read, choose, use and record standard metric units to estimate and measure capacity, weight and length to a suitable degree of accuracy; convert larger to smaller units using decimals to one place (e.g. change 4.7kg to 4700g).* ***4.4(1) – 4.4(5);4.5(1) – 4.5(3; 4.6(1) – 4.6(3))***	*Select and use standard metric units of measure and convert between units using decimals to two places (e.g. 6.85 litres to 6850ml or vice versa).* ***4.4(1) - 4.4(3); 4.5(1), 4.5(2; 4.6(1), 4.6(2))***
	4.4(5) Read scales accurately, *interpreting intervals and divisions on partially numbered scales to the nearest tenth of a unit.*	**4.4(5)** Read scales accurately, *interpreting a reading that lies between two unnumbered divisions on a scale.*	
	Draw rectangles and measure and calculate their perimeters. Find the area of rectilinear shapes drawn on a square grid by counting squares. ***4.6(7), 4.6(9,) 4.6(10), 5.1(6) – 5.1(7)***	**4.6(3)** *Draw and* measure *lines* accurately *to the nearest millimeter* *Measure and calculate the perimeter of regular and irregular polygons****4.6(7), 4.6(10)*** **4.6(12)** Develop and use formulas to calculate area *of a rectangle.*	

Use a set square to draw right angles and to identify right angles in 2-D shapes; compare angles with a right angle; recognize that a straight line is equivalent to two right angles. ***5.1(5), 5.1(15)***	*Know that angles are measured in degrees and that one whole turn is 360°; compare and order angles less than 180°.* ***5.1(5), 5.1(15), 4.6(13)***	*Estimate, draw and measure acute and obtuse angles using a protractor to a suitable degree of accuracy; calculate angles in a straight line.* ***5.1(5), 5.1(15), 4.6(13), 4.6(14)***	*Estimate angles and use a protractor to measure and draw them on their own or in shapes; calculate angles in a triangle or round a point.* ***5.1(5), 5.1(15), 4.6(13), 4.6(14)***
5.2(4) Describe movement about a grid using four compass points to describe direction.	**5.1(2)** identify lines (*horizontal and vertical)* **5.2(4)** … Use eight compass points to describe direction and *describe and identify the position of a square on a grid of squares.*	**5.2(5)** Use coordinates to plot points in a grid **5.1(2)** identify lines (*parallel and perpendicular in grids or shapes), use a set square and ruler to draw shapes with perpendicular or parallel sides.*	**5.2(5)** Use coordinates *to draw, locate and complete shapes that meet given properties.*
5.2(2) identify, draw and/or complete shapes with reflective and rotational symmetry; *draw the reflection of a shape in a mirror line along one side.*			*Visualize and draw on grids of different types where a shape will be after reflection, after translations or after rotation through 90° or 180° about the centre or one of its vertices.* ***5.2(3),5.2(5), 5.2(6)***

Unit 3 (Time Frame 1 – 2 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(1), 1.5(6), 1.5(7) Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies	**1.5(1), 1.5(6), 1.5(7)** Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*	**1.5(1), 1.5(2), 1.5(8)** Solve one- and two-step problems involving whole numbers, decimals and the four operations. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*	**1.5(1) – 1.5(4)** Solve multi-step problems involving decimals, fractions and percentages. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*

	3.2(1) Recognize the equivalence between decimal and unit fractions (tenth, hundredth); *relate the notation to money and measurement* **3.2(3)** Compare and order decimals *by positioning 1- and 2-place decimals on the number line.*		
Use knowledge of number operations and corresponding inverses, including doubling and halving to estimate and check calculations. ***1.4(1),1.5(1),2.1(7), 2.3(10)***		*Use knowledge of rounding, place value, number operations and inverses to estimate and check calculations.* ***1.4(2), 1.5(11), 2.1(7), 2.3(10) 2.497)***	*Use approximations, inverse operations and tests of divisibility to estimate and check results.* ***1.4(1), 1.5(1), 2.1(4), 2.3(9)***
2.1(15) Add or subtract mentally pairs of 1- and 2-digit numbers.	**2.1(15)** Add or subtract mentally pairs of 2-digit whole numbers.	**2.2(1), 2.2(3)** Develop and use written methods to record, support or explain addition and subtraction of *whole numbers and decimals with up to two places.*	**2.1(5), 2.1(6)** Add or subtract mentally e.g. O.t ± O.t **2.3(3), 2.3(8), 3.2(5)** Multiply and divide *integers and* decimals *mentally* e.g. TO x O, TO ÷ O, O.t x O, O.t ÷ O.
2.2(1) Develop and use written methods to record, support or explain addition and subtraction of 2- and 3-digit numbers.	**2.2(1), 2.2(2)** Develop and use written methods to record, support or explain addition and subtraction of 2- and 3-digit numbers and money.	**2.4(4)** Use efficient written methods to multiply and divide HTO x O, TO x TO, O.t x O and HTO ÷ O.	**2.2(1), 2.2(3), 2.4(3), 2.4(7)** Develop and use written methods to record, support or explain addition and subtraction of *whole numbers and* decimals; multiplication and division of integers and decimals by a 1-digit number and multiplication of 2- digit and 3-digit integers by a 2-digit integer.

2.4(1) Use practical, informal, written methods to multiply and divide 2-digit numbers, *round remainders up or down depending on context* **2.3(10)** Demonstrate an understanding that multiplication and division are inverse operations.	**2.3(3)** Use efficient written methods to record, support and explain multiplication and division of 2-digit numbers by a 1-digit number including division with a remainder.	Use a calculator to solve problems, including those involving decimals or fractions; interpret the display correctly in the context of measurement.	Use a calculator to solve problems involving multi-step calculations.
Use a set square to draw right angles and to identify right angles in 2-D shapes; compare angles with a right angle; recognize that a straight line is equivalent to two right angles. ***5.1(5), 5.1(15)***	*Know that angles are measured in degrees and that one whole turn is 360°; compare and order angles less than 180°.* ***5.1(5), 5.1(15), 4.6(13)***	**5.2(5)** Use coordinates to plot points in a grid. **5.1(2)** identify lines (*parallel and perpendicular in grids or shapes), use a set square and ruler to draw shapes with perpendicular or parallel sides.* **5.2(3)** Draw the position of a shape after a reflection or translation. *Complete patterns with up to two lines of symmetry.****5.2(2)***	*Estimate angles and use a protractor to measure and draw them on their own or in shapes; calculate angles in a triangle or round a point.* ***5.1(5), 5.1(15), 4.6(13), 4.6(14)***
		Estimate, draw and measure acute and obtuse angles using a protractor to a suitable degree of accuracy; calculate angles in a straight line. ***5.1(5), 5.1(15), 4.6(13), 4.6(14)***	
Know the relationship between kilometers and metres, metres and centimeters; kilograms and grams; litres and milliliters.	*Choose and use standard metric units and their notations when estimating, measuring and recording capacity, weight and length. Use decimal notation to*	*Read, choose, use and record standard metric units to estimate and measure capacity, weight and length to a suitable degree of accuracy; convert larger to*	*Select and use standard metric units of measure and convert between units using decimals to two places (e.g. 6.85 litres to 6850ml or vice versa)*

Choose and use appropriate units to estimate, measure and record measurements. ***4.4(1) – 4.4(5); 4.5(1) – 4.5(3); 4.6(1) – 4.6(3)***	*record measurements (e.g. 1.3m or 0.6kg).* ***4.4(1), 4.4(2), 4.4(4), 4.5(1), 4.5(3), 4.6(1), 4.6(3)***	*smaller units using decimals to one place (e.g. change 4.7kg to 4700g).* ***4.4(1) – 4.4(5);4.5(1) – 4.5(3; 4.6(1) – 4.6(3))***	***4.4(1) - 4.4(3); 4.5(1), 4.5(2); 4.6(1), 4.6(2))***
4.1(1) Read the time on a 12 hour digital clock and to the nearest 5 minutes on an analogue clock. **4.1(5)** Calculate time intervals and find start or end times for a given time interval.	**4.1(2)** Read time to the nearest minute; use am, pm and 12-hour clock notation. **4.1(6)** Choose units of time to measure time intervals from clocks and calendars.	**4.1(3)** Read timetables and time using 24-hour clock notation. **4.1(7)** Use a calendar to calculate time intervals.	**1.5(6)** Solve problems *by measuring, estimating and calculating.* **4.4(8), 4.5(3), 4.6(5)** Measure and calculate *using imperial units still in everyday use.* **4.4(6), 4.5(7), 4.6(6)** Compare metric and imperial measures.
4.4(5) Read scales accurately *to the nearest division and half-division or partially numbered; use the information to measure and draw to a suitable degree of accuracy.*	**4.4(5)** Read scales accurately, *interpreting intervals and divisions on partially numbered scales to the nearest tenth of a unit.*	**4.4(5)** Read scales accurately, *interpreting a reading that lies between two unnumbered divisions on a scale.*	*Read and interpret sales on a range of measuring instruments, recognizing that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales when using different instruments* ***4.4(5)***
	Draw rectangles and measure and calculate their perimeters. Find the area of rectilinear shapes drawn on a square grid by counting squares. ***4.6(7), 4.6(9,) 4.6(10), 5.1(6) – 5.1(7)***	**4.6(3)** *Draw and measure lines* accurately *to the nearest millimeter. Measure and calculate the perimeter of regular and irregular polygons.* ***4.6(7), 4.6(10)*** **4.6(12)** Develop and use formulas to calculate area *of a rectangle.*	*Calculate the perimeter and area of rectilinear shapes; estimate the area of an irregular shape by counting squares.* ***4.6(7), 4.6(9),4.6(10), 4.6(12)***

Block 5 Number and Numeration, Calculation and Rational Numbers

Unit 1 (Time Frame 1 – 3 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(10) – 1.5(12) Represent the information from a puzzle or problem using numbers, number sentences, images or diagrams. (*Use these to find a solution and present it in context including using money or measures.)*	**1.5(10) – 1.5(12)** Represent the information from a puzzle or problem using numbers, number sentences or diagrams. *(Use these to solve the problem and present and interpret the solution.)*	**1.5(10) – 1.5(12)** Represent the information from a puzzle or problem using numbers and number sentences *or calculations; find possible solutions and confirm them.*	**1.5(10) – 1.5(14)** *Tabulate* the information from a puzzle or problem, *identify and record the steps or calculations needed to solve it; interpret solutions.*
1.5(15) Decide what data is important to solve a problem. Make use of lists, tables and graphs to organize and interpret the data.		**1.5(14)** Describe, and explain methods, choices and solutions *using diagrams, graphs and text; refine ways of recording using images and symbols.*	**1.5(14)** Describe, and explain methods, choices and solutions *using words, symbols or diagrams as appropriate.*
1.5(16) Use patterns and relationships involving numbers or shapes to solve problems.		**1.5(1), 1.5(2), 1.5(8)** Solve one-step and two-step problems involving whole numbers, decimals and all four operations. **1.5(9)** Choose and use appropriate calculation strategies including a calculator.	**1.5(1) – 1.5(4)** Solve multi-step problems involving decimals, fractions and percentages. **1.5(9)** Choose and use appropriate calculation strategies including a calculator (*where appropriate).*
3.1(2) Read and write proper fractions demonstrating knowledge of 'denominator' and 'numerator'. **3.1(3)** Identify and estimate fractions of shapes.	**3.2(1)** Recognize the equivalence between decimal and unit fractions (one half, quarters, tenth, hundredth). **3.1(4)** Use diagrams to compare fractions and identify	**3.1(8)** Express a smaller whole number as a fraction of a larger one. **3.1(5)** Compare fractions and identify equivalents. **3.2(2)** Relate unit fractions to	

3.1(4) Use diagrams to compare fractions and identify equivalents.	equivalents and interpret mixed numbers. **3.1(6)** Position fractions on a number line.	their decimal equivalents.	
		3.3(3) Use sequence to scale numbers up or down. **3.3(4)** Solve problems involving proportions.	**3.3(5)** Solve problems involving direct proportion by scaling up or down.
2.3(1) Recall multiplication and division facts to 10 x 10 (2, 3, 4, 5, 6 and 10 times-tables). **2.3(5)** Recognize multiples of 1-digit numbers (2, 5,or 10 up to 1,000).	**2.3(1)** Recall all multiplication and division facts to 10 x 10. **2.3(5)** Recognize multiples of 1-digit numbers (up to the tenth multiple).	**2.3(3)** Work out products such as 60 x 5, **60 x 50** or 600 x 5 or **600 x 50** or 0.6 x 5 using the related multiplication fact, 6 x 5. **2.3(10)** Demonstrate an understanding that multiplication and division are inverse operations (by deriving division facts from multiplication facts).	**3.2(4)** Use knowledge of place value to derive related multiplication and division facts (including decimals)(e.g. 0.8 x 7, 4.8 ÷ 6).
2.1(10 – 2.1(3) Recall and use all addition and subtraction facts for numbers to 20, sums and differences of multiples of 10 and number pairs that total 100.	**3.1(7)** Identify pairs of fractions that total 1.	**2.4(6)** Find factors of *2-digit whole* numbers. **2.3(5)** Recognize *common* multiples of 1-digit numbers.	
3.1(1) Find unit fractions of numbers and quantities (e.g. ½, $^1/_3$, ¼, and $^1/_6$ of 24litres).	Use a calculator to carry out 1- and 2-step calculations that involve all four operations. Recognize negative numbers in the display. Correct mistaken entries by using the clear entry key. Interpret the display correctly,	*Multiply a 2-digit number by a 1-digit number or by 25.* ***2.3(3)*** *Subtract one near-multiple of 1,000 from another (e.g. 7080 – 3096).* ***2.1(2)***	**2.2(1), 2.2(3), 2.4(3), 2.4(7)** Develop and use written methods to record, support or explain addition and subtraction of *whole numbers and* decimals; multiplication and division of integers and decimals by a 1-digit number

	particularly money.		and multiplication of 2- digit and 3-digit integers by a 2-digit integer.
2.4(1) Use practical, informal, written methods to multiply and divide 2-digit numbers, *round remainders up or down depending on context*	**3.1(1)** Find fractions of numbers, quantities or shapes (e.g. $^1/_6$ of 36 mangoes, $^5/_8$ of a 6 by 4 rectangle)	**2.4(4)** Use efficient written methods to multiply and divide HTO x O, TO x TO, O.t x O and HTO ÷ O	**3.1(11)** Relate fractions to multiplication and division. **3.2(6)** Express a quotient as a decimal or fraction. **3.3(8)** Calculate percentages and fractions of whole numbers or quantities.
		3.1(11) Relate fractions to division *by using division to find fractions*	Use a calculator to solve multi-step calculations.
		Use a calculator to solve problems involving decimals or unit fractions. Interpret the display correctly especially measures.	

Unit 2 (Time Frame 1 – 3 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(1), 1.5(6), 1.5(7) Solve one- and two-step problems involving numbers, measures (incl. time) or money. **1.5(9)** Choose and use appropriate calculation strategies.	**1.5(10) – 1.5(12)** Represent the information from a puzzle or problem using numbers, number sentences or diagrams. *(Use these to solve the problem and present and interpret the solution).*	**1.5(10) – 1.5(12)** Represent the information from a puzzle or problem using numbers and number sentences *or calculations; find possible solutions and confirm them.*	**1.5(10) – 1.5(14)** *Tabulate* the information from a puzzle or problem, *identify and record the steps or calculations needed to solve it; interpret solutions.*
1.5(10) – 1.5(12) Represent the information from a puzzle or problem		**1.5(14)** Describe, and explain methods, choices and solutions *using diagrams,*	**1.5(14)** Describe, and explain methods, choices and solutions *using words, symbols or diagrams as*

using numbers, number sentences, images or diagrams. (*Use these to find a solution and present it in context including using money or measures.)*		*graphs and text; refine ways of recording using images and symbols.*	*appropriate.*
3.1(2) Read and write proper fractions demonstrating knowledge of 'denominator' and 'numerator'. **3.1(3)** Identify and estimate fractions of shapes. **3.1(4)** Use diagrams to compare fractions and identify equivalents.	**3.2(1)** Recognize the equivalence between decimal and unit fractions (one half, quarters, tenth, hundredth).	**3.1(8)** Express a smaller whole number as a fraction of a larger one. **3.1(5)** Compare fractions and identify equivalents. **3.2(2)** Relate unit fractions to their decimal equivalents.	**3.1(8)** Express a larger whole number as a fraction of a smaller one. **3.1(9)** Simplify fractions by cancelling common factors. **3.1(10)** Order a set of fractions by converting them to fractions with a common denominator.
	3.1(4) Use diagrams to compare fractions and identify equivalents and interpret mixed numbers. **3.1(6)** Position fractions on a number line.	**3.3(6) Express** *tenths and hundredths* as percentages *demonstrating an understanding of percentage as the number of parts in every 100.*	**3.3(6)** Express one quantity s a percentage of another. **3.3(7)** Find equivalent percentages, decimals and fractions.
	3.3(1) Use the vocabulary of ratio and proportion to describe the relationship between two quantities. **3.3(2)** Estimate a proportion.	**3.3(3)** Use sequence to scale numbers up or down. **3.3(4)** Solve problems involving proportions.	**3.3(5)** Solve problems involving direct proportion by scaling up or down.
3.1(1) Find unit fractions of numbers and quantities (e.g. ½, $^1/_3$, ¼, and $^1/_6$ of 24litres).	**3.1(1)** Find fractions of numbers, quantities or shapes (e.g. $^1/_6$ of 36 mangoes, $^5/_8$ of a 6 by 4 rectangle).	Use a calculator to solve problems involving decimals or unit fractions. Interpret the display correctly especially	**3.1(11)** Relate fractions to multiplication and division. **3.2(6)** Express a quotient as a decimal or fraction. **3.3(8)** Calculate percentages and

		measures.	fractions of whole numbers or quantities.
Multiply 1- and2-digit numbers by 10 or 100 and describe the effect. ***2.3(2)***			
2.4(1) Use practical, informal, written methods to multiply and divide 2-digit numbers, *round remainders up or down depending on context.*		**3.1(11)** Relate fractions to division *by using division to find fractions.* **3.3(8)** Calculate percentages of whole numbers or quantities.	Use a calculator to solve multi-step calculations.
2.3(10) Demonstrate an understanding that multiplication and division are inverse operations *by creating related multiplication and division number sentences.*			

Unit 3 (Time Frame 1 – 3 weeks)

Year 1	Year 2	Year 3	Year 4
1.5(1), 1.5(6), **1.5(7**) Solve one-step and two-step problems involving whole numbers, measures (incl. time) and money. **1.5(9)** Choose and use appropriate calculation strategies.	**1.5(10) – 1.5(12)** Represent the information from a puzzle or problem using numbers, number sentences or diagrams. *(Use these to solve the problem and present and interpret the solution.)*	**1.5(1), 1.5(2), 1.5(8)** Solve one-step and two-step problems involving whole numbers, decimals and all four operations. **1.5(9)** Choose and use appropriate calculation strategies.	**1.5(1), 1.5(2), 1.5(3), 1.5(4)** Solve multi-step problems involving decimals, fractions and percentages. **1.5(9)** Choose and use appropriate calculation strategies including a calculator.
1.5(16) Use patterns and relationships involving numbers or shapes to solve		**1.5(10) – 1.5(12)** Represent the information from a puzzle or problem using numbers and	**1.5(10) – 1.5(14)** *Tabulate* the information from a puzzle or problem, *identify and record*

problems. **1.5(15)** Decide what data is important to solve a problem. Make use of lists, tables and graphs to organize and interpret the data.		number sentences *or calculations; find possible solutions and confirm them.*	*the steps or calculations needed to solve it; interpret solutions.*
3.1(2) Read and write proper fractions demonstrating knowledge of 'denominator' and 'numerator'. **3.1(3)** Identify and estimate fractions of shapes. **3.1(4)** Use diagrams to compare fractions and identify equivalents.	**3.2(1)** Recognize the equivalence between decimal and unit fractions (one half, quarters, tenth, hundredth).	**3.1(8)** Express a smaller whole number as a fraction of a larger one. **3.1(5)** Compare fractions and identify equivalents. **3.2(2)** Relate unit fractions to their decimal equivalents.	**3.1(8)** Express a larger whole number as a fraction of a smaller one. **3.1(9)** Simplify fractions by cancelling common factors. **3.1(10)** Order a set of fractions by converting them to fractions with a common denominator.
1.3(1) Demonstrate an understanding of place value by *partitioning 3-digit numbers into multiples of 100, 10 and 1 in different ways.*	**3.1(4)** Use diagrams to compare fractions and identify equivalents and interpret mixed numbers. **3.1(6)** Position fractions on a number line.	**3.3(6)** Express *tenths and hundredths* as percentages *demonstrating an understanding of percentage as the number of parts in every 100.*	**3.3(6)** Express one quantity s a percentage of another. **3.3(7)** Find equivalent percentages, decimals and fractions.
	3.3(1) Use the vocabulary of ratio and proportion to describe the relationship between two quantities. **3.3(2)** Estimate a proportion.	**3.3(3)** Use sequence to scale numbers up or down. **3.3(4)** Solve problems involving proportions.	**3.3(5)** Solve problems involving direct proportion by scaling up or down.
2.3(1) Recall multiplication and division facts to 10 x 10 (2, 3, 4, 5, 6 and 10 times-tables). **2.3(5)** Recognize multiples of 1-digit numbers (2, 5,or 10 up to 1,000).	**2.3(1)** Recall all multiplication and division facts to 10 x 10. **2.3(5)** Recognize multiples of 1-digit numbers (up to the tenth multiple).	**2.3(3)** Work out products such as 60 x 5, **60 x 50** or 600 x 5 or **600 x 50** or 0.6 x 5 using the related multiplication fact 6 x 5. **2.3(10)** Demonstrate an understanding that	**3.2(4)** Use knowledge of place value to derive related multiplication and division facts (including decimals) (e.g. 0.8 x 7, 4.8 ÷ 6).

		multiplication and division are inverse operations (by deriving division facts from multiplication facts).	
2.2(1) Develop and use written methods to record, support or explain addition and subtraction of 2- to 4-digit numbers.	**2.4(3)** Use efficient written methods to record, support and explain multiplication and division of 2-digit numbers by 1-digit numbers, including division with remainders.	**2.4(4)** Use efficient written methods to multiply and divide HTO x O, TO x TO, O.t x O and HTO ÷ O.	*Use efficient written methods to add and subtract integers and decimals, to multiply and divide integers and decimals by a 1-digit integer, and to multiply 2-digit and 3-digit integers by a two-digit integer.* ***2.2(3), 2.4(5), 2.4(7)***
3.1(1) Find unit fractions of numbers and quantities (e.g. ½, $^1/_3$, ¼, and $^1/_6$ of 24litres).	**3.1(1)** Find fractions of numbers, quantities or shapes (e.g. $^1/_6$ of 36 mangoes, $^5/_8$ of a 6 by 4 rectangle).	Use a calculator to solve problems involving decimals or unit fractions. Interpret the display correctly especially measures.	Use a calculator to solve multi-step calculations.
2.4(1) Use practical, informal, written methods to multiply and divide 2-digit numbers, *round remainders up or down depending on context.*		**3.1(11)** Relate fractions to division *by using division to find fractions.* **3.3(8)** Calculate percentages of whole numbers or quantities.	**3.1(11)** Relate fractions to multiplication and division. **3.2(6)** Express a quotient as a decimal or fraction. **3.3(8)** Calculate percentages and fractions of whole numbers or quantities.

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