Numicon 2/NZ Year 3 Planning

The overviews and links in this document will help you to get the most out of your subscription to *Numicon Online NZ*.

You can follow *Numicon* as a complete teaching programme using the long-term plan provided here.

You can also access the rich bank of activities and resources to supplement your teaching. Pick a topic on the long-term plan, click on it for details and to open it in the online handbook.

Contents

Click on a link below to go straight there!

Long-term plan for Numicon 2 (NZ Year 3)

There are two Numicon teaching handbooks for each year group – Number Pattern Calculating (NPC) and Geometry measurement and Statistics (GMS). Subscribers to *Numicon Online NZ* have access to a digital version of these. Print versions are also available (visit: www.edushop.nz). The units in these books are called Activity Groups. They contain a collection of activities you can use with your class.

This long-term plan shows you the recommended order for teaching the Activity Groups over the school year.
- Click on a heading in the **left** column to get all the information for that Activity Group.
- Click on an Activity Group title in the **right** column to go straight to those activities in the online handbooks.

Milestones

To help you monitor learning, the skills and understanding children need to be secure with as they progress through the programme have been captured in a series of milestone statements. Click on the milestone icons to see these. Extra support to help you use these is provided at the end of this document.

Number, Pattern and Calculating 2

Geometry, Measures and Statistics 2

Statistics and Probability Booklet 2

Each Activity Group should take around one week. However, some may take more/less time than others, so please use your professional judgment to fit the Activity Groups into your school year.

Strand and Activity Group Number		Activity Group Title
Getting Started		Getting started with Number, Pattern and Calculating 2
Numbers and the Number System	1	Counting to 100 and beyond
Pattern and Algebra	1	Exploring different patterns
		NPC Milestone 1
Calculating	1	Adding and writing adding sentences
Calculating	2	Subtracting and writing subtracting sentences
Numbers and the Number System	2	2-digit numbers
		NPC Milestone 2
Calculating	3	Ordering adding and subtracting facts
Pattern and Algebra	2	Exploring the inverse relationship between adding and subtracting within 10
Numbers and the Number System	3	More 2-digit numbers
Numbers and the Number System	4	Comparing and ordering numbers to 100
Pattern and Algebra	3	Exploring equivalence – introducing empty box notation
		NPC Milestone 3
Measurement	1	Introducing centimetres
Calculating	4	Adding and subtracting whole tens
Statistics and Probability	1	Collecting, using and understanding categorical data
Geometry	1	Making and classifying polygons
Geometry	2	Identifying the faces, edges and vertices of solid 3D shapes
Calculating	5	Adding and subtracting 1 and 10
Geometry	3	Investigating symmetry
		GMS Milestone 1
Pattern and Algebra	4	Odd and even
Calculating	6	Partitioning into tens and units to answer adding and subtracting problems
Pattern and Algebra	5	Patterns and sequences of 2s, 3s, 5s and 10s
		NPC Milestone 4

Strand and Activity Group Number		Activity Group Title
Calculating	7	Adding and subtracting 1-digit numbers to and from 2-digit numbers
Measurement	2	Introducing more coins
Measurement	3	Introducing more coins and notes
		GMS Milestone 2
Calculating	8	Introducing multiplying as repeated adding
Calculating	9	Learning times tables and about multiplying through arrays
Numbers and the Number System	5	Rounding
Calculating	10	Mental strategies for near doubles and adding and subtracting 9
		NPC Milestone 5
Calculating	11	Bridging through multiples of 10
Geometry	4	Recognizing and naming prisms and cylinders
Calculating	12	Adding three or more 1-digit numbers
Calculating	13	Adding and subtracting 2-digit numbers to 100
Measurement	4	Introducing metres
		GMS Milestone 3
Calculating	14	Adding and subtracting to 20
		NPC Milestone 6
Calculating	15	Introducing dividing as 'How many … in … ?'
Pattern and Algebra	6	Logic
Calculating	16	Halves, quarters and thirds of wholes
Pattern and Algebra	7	Finding all possibilities
Numbers and the Number System	6	Introducing fractions as numbers
		NPC Milestone 7
Measurement	5	Introducing kilograms and grams
Measurement	6	Introducing litres and millilitres, and units of temperature
Measurement	7	Telling the time and adding and subtracting with units of time
Geometry	5	Investigating and describing rotation
		GMS Milestone 4

Getting Started: Getting started with Number, Pattern and Calculating 2

Key mathematical ideas Counting, Place value, Grouping, Mathematical thinking and reasoning

Educational context

This group of activities is designed to help all children make the connections between Numicon Shapes and Numicon Shape patterns, number rods, number names and numerals that support children as they work with Numicon.
Depending on children's previous experiences, you may need to allow up to two weeks to cover these activities.
Activities 1, 5 and 8 and the corresponding Independent practices are for children meeting Numicon Shapes and/or number rods for the first time. These children are likely to need more time on the remaining activities than those who have worked with Numicon before. Some may need to repeat Activity 3, until they can quickly and accurately build the Numicon Shape pattern for each Numicon Shape and label it with its number name without counting. Children who are familiar with Numicon are likely to benefit from revising the activities involving number rods.
The activities provide opportunities to observe how children approach their mathematics work, and assess their reasoning and their understanding of cardinal and ordinal number ideas.

Learning opportunities

• To instantly link the Numicon Shapes with number names and numerals.
• To notice patterns in number relationships reflected in physical materials and imagery.
• To learn to describe number relationships using the terms for children to use.

Terms for children to use

number names (one, two…), pattern, next, before, after, in between, ordinal number words, words for comparing (small, smaller than, smallest, long, longer than, longest, big, bigger than, biggest, more than, less than, few, fewer than, fewest), set, equal, visualize

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion.
• Refer to Numicon Shapes and number rods using cardinal number names.
• Notice patterns in the ordered sequence of Numicon Shapes and use these to predict what the next Shape in the sequence might look like.
• Build Numicon Shape patterns with objects, without counting.
• Consistently order the Numicon Shapes and/or number rods and label them with number names and numerals.
• Describe relationships between the Numicon Shapes or the number rods using words for comparing.
• Build teen numbers with Numicon Shapes and number rods, name them and label them with numerals.

Explorer Progress Book 2a, pp. 2–3

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 1: Star Numbers

After completing work on Activity 4, give children Explore More Copymaster 1: Star Numbers to take home.

Focus activities

1. Exploring the Numicon Shapes
2. Cover the Baseboard with Numicon Shapes
3. Building Numicon Shape patterns
4. Drawing Numicon Shape patterns
5. Exploring the Numicon Display Number Line
6. Building, naming and ordering numbers 0–20 with Numicon Shapes
7. Looking at the structure of numbers to 20
8. Exploring number rods
9. Naming number rods and labelling them with numerals
10. Building, naming and labelling numbers to 20 with number rods
11. Describing relationships between Numicon Shapes/number rods (essential preparatory work for Activity 12)
12. What Shape/rod is in the Feely Bag?

Numbers and the Number System 1: Counting to 100 and beyond

Key mathematical ideas Counting, Place value, Mathematical thinking and reasoning

Educational context

The activities in this group address three important aspects of children's learning about our number system: the counting sequence of number names; grouping in tens; and early place value notation. Selected activities from whole-class counting practice should feature in children's daily experiences throughout the year in order to consolidate and extend their counting ranges to 100 and beyond. The 'grouping in tens' activities build on children's earlier work on the structure of 2-digit numbers, as collections of objects are arranged into Numicon 10-patterns to find out 'how many?', and include a quick revision of the teen numbers that so many children find difficult. The activities move on to grouping larger collections of objects, exchanging groups of 10 objects for Numicon 10-shapes or 10-rods. Illustrating numbers in this way, with structured apparatus, helps children to recognize and compare cardinal values of numbers and to understand the column value seen in place value notation. It is, therefore, important preparation for calculating with 2- and 3-digit numbers. Writing numerals by forming them correctly is an important skill and children will need to practise for short periods until they have mastered them. Similarly, children need to learn to read and write number words, but this should not take over children's mathematical time.

Learning opportunities

- To continue to extend the counting range to 100 and beyond:
  - To recite number names in order, forwards and backwards, to 100.
  - To recognize numbers written in numerals and in words to at least 50, progressing to 100.
  - To know which numbers fall between non-consecutive numbers.
- To know which numbers come before and after any number in their counting range.
- To give a sensible estimate of a number of objects or pictures up to 50.
- To begin to understand cardinal values of numbers to 100.
- To consolidate understanding that grouping objects into tens is a more efficient way of finding 'how many?' than counting in ones.
- To learn when counting is useful.

Terms for children to use

names for numbers from zero to one hundred and beyond, forwards, backwards, count on, count back, turn, change direction, between, next, before, after, estimate, guess, about, nearly, approximately, arrange, group, more, less, multiple of 10

Assessment opportunities

Look and listen for children who:
- Use the terms for children to use effectively in discussion.
- Say number names to 100 clearly without confusing 'teen' and 'ty'.
- Explain that there is a pattern in number names to 100.
- See 'how many?' by looking at objects grouped into Numicon Shape patterns.
- Say the two numbers that are before and after any number in their counting range.
- Represent a total with Numicon Shapes and number rods.

For guidance on assessing children's individual counting please see the Number, Pattern and Calculating 2 Implementation Guide.

NPC Milestone 1

- Recite number names in order to 100 and beyond (NPC 2:1a)
- Know which numbers come before and after any number in their counting range (NPC 2:1b)
- Give a sensible estimate up to 50 (NPC 2:1c)
- Know that grouping objects into tens is a more efficient way of finding 'how many' than counting in ones (NPC 2:1d)
- Use counting in everyday situations (NPC 2:1e)

Explorer Progress Book 2a, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages.
As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 9: Finding Treasure

After completing work on Activity 4, give children Explore More Copymaster 9: Finding Treasure to take home

Focus activities

1. How many children are here today?
2. How old are you?
3. How many pennies in the money box?
4. Finding 'how many?' by tagging and grouping into Numicon Shape patterns
5. Finding 'how many?' by tagging and grouping with number rods
6. Revising strategies for finding numbers on the number line

Pattern and Algebra 1: Exploring different patterns

Key mathematical ideas Pattern, Mathematical thinking and reasoning

Educational context

The activities in this group start by re-establishing class routines in the first few weeks of teaching. These familiar routines provide opportunities for discussion about predicting from pattern and using prepositions associated with pattern, which so often cause difficulties for children.

The activities progress to extend children's earlier work on different types of pattern. Cyclical patterns are introduced through the cycle of the seasons and the cycle of the months of the year. Children are reminded about the idea of growing patterns with the ordered sequence of number rods and Numicon Shapes. Work on repeating patterns in numbers is introduced by assigning number values to repeating sequences, for example, in necklaces or decorated borders. Children may have met some of these sorts of patterns in Number, Pattern and Calculating 1, but now the thinking and the mathematical language moves on. In all the examples, the emphasis is on encouraging children to spot the pattern, to describe it, explain what can be seen 'always happening' with that pattern, and then to predict what happens next. In each case, links are made between the pattern and numbers.

This important work on pattern lays the foundation for identifying rules, predicting and generalizing – skills that children will need in their mathematics work throughout their school days and beyond. It is therefore essential that children have plenty of opportunities to become skilful with this important aspect of generalizing.

Learning opportunities

- To describe sequences of events.
- To predict what will happen next in familiar routines.
- To spot regularities in sequences and predict from them.
- To recognize that 'cyclical', 'repeating' and 'growing' are different types of pattern.

Terms for children to use

times of the day (morning, afternoon, lunchtime, etc.), names of the seasons, months and days, pattern, sequence, predict, rule, step, growing pattern, repeating pattern, cycle, 'what comes next?', 'what came before?', before, after, between, nearly, routine, order, repeat, sequence, events, cyclic, ordinal number words, increase, decrease

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Recognize various patterns and predict from them.
- Devise their own repeating cyclic patterns and assign numbers to them.
- Devise different growing patterns.

NPC Milestone 1

- Identify and represent numbers 0–30 and beyond using Numicon Shapes, number rods, numerals and number lines (NPC 2:1f)
- Order Numicon Shapes and describe relationships between them (NPC 2:1g)
- Spot regularities in sequences and predict from them (NPC 2:1h)

Explorer Progress Book 2a, pp. 6–7

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 2: Growing Patterns

After completing work on Activity 5, give children Explore More Copymaster 2: Growing Patterns to take home.

Focus activities

1. Setting the routine for a 'morning maths meeting'
2. Patterns in daily routines
3. The cycle of months of the year
4. The cycle of the seasons
5. Repeating patterns with apparatus and numerals
6. Patterns that grow in steps of 1
7. Patterns that grow in steps of 2

Calculating 1: Adding and writing adding sentences

Key mathematical ideas Adding, Pattern, Mathematical thinking and reasoning

Educational context

This activity group provides a comprehensive revision of adding. Children may already know some adding facts but these activities will help to consolidate and extend their language for adding, their repertoire of known facts, and their understanding of the two adding structures: combining quantities (aggregation) and increasing by adding more (augmentation). The activities are set in contexts to help children recognize when to add and that the commutative property can be helpful. For children who are new to Numicon, the use of signs for adding and equals (using arm movements) and the symbols '+' and '=' are revisited. The focus activities are intended to be a quick revision; children should spend longer on the practice activities to help them develop fluent recall of adding facts within 10. Until children achieve this, weekly practice of these facts should continue. Children's involvement in solving adding problems that arise during the day helps them to realize when to use these adding facts.

When children start working with Numicon Shapes, they need to handle them for all activities. As they begin to understand more about number relationships they 'use their eyes' and refer to images displayed in the classroom. Later they develop their own mental imagery and visualize the Shapes 'in their mind's eye'. We do, of course, want children to visualize number lines and number rods as well, because this rich mental imagery supports their mathematical understanding. Some children may need a gentle reminder to try to visualize, but remember all children will continue to handle and use the Shapes when they meet new ideas.

Learning opportunities

- To understand adding as combining 'together'.
- To understand adding as 'more of' something.
- To use the correct words and terms for adding.
- To experience situations when it is useful to add and to
- understand the operation of adding through solving problems.
- To be able to tell an adding number story and illustrate it with 'objects', structured apparatus and a written adding sentence using the '+' and '=' symbols.
- To add whole numbers without counting, using recall, Numicon Shapes or number rods.
- To understand that adding can be done in any order.

Terms for children to use

combine, add, and, plus, altogether, together, more, total, in total, makes, equals, pattern, larger Shape/longer rod, larger amount, number sentence, adding sentence, adding, adding story

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Understand that adding things together or gaining more means you have a larger amount/an increase.
- See a total without counting by putting Numicon Shapes/number rods together to form a larger Shape/longer rod.
- Are able to say an adding sentence/story and show it with apparatus.
- Read an adding sentence.
- Write an adding sentence from apparatus and from an everyday problem.
- Know when to add within their daily routines and when faced with mathematical problems.
- Know how and when to use their knowledge of the commutative property to help solve problems.
- Know when to use the '+' symbol.
- Are confident with the '=' symbol, showing understanding of equivalence.

NPC Milestone 2

- Understand when and how to add; illustrate with structured apparatus, adding without counting in ones and writing appropriate adding sentences using '+' and '=' (NPC 2:2e)
- Understand the commutative property, i.e. that numbers can be added in any order and the total remains the same (NPC 2:2f)

Explorer Progress Book 2a, pp. 8–9

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 15: Space Rockets

After completing work on Activity 3, give children Explore More Copymaster 15: Space Rockets to take home.

Focus activities

1. Revising adding structures (working within 10)
2. Creating adding number stories
3. Writing and reading adding number sentences
4. Revising the commutative property of adding
5. Thinking about visualizing
6. Parts and wholes
7. Adding mentally
8. Target Board with numerals

Calculating 2: Subtracting and writing subtracting sentences

Key mathematical ideas Adding, Pattern, Mathematical thinking and reasoning

Educational context

These activities will help children recognize that we write subtracting number sentences in response to four different types of real world subtracting situations. They do this by exploring circumstances where the four subtracting structures (take away, decrease, comparison, and inverse of adding) apply. This will help children learn when to subtract (for further detail see the Key mathematical ideas section of *the Number, Pattern and Calculating 2 Implementation Guide*). The activities will also help children to develop recall of some subtracting facts, and prepare them for forthcoming work on the inverse relationship that exists between adding and subtracting. Children are encouraged to use Numicon Shapes and number rods to illustrate relationships between the numbers they are working with. You can further extend children's understanding of when subtracting is useful by using opportunities as they occur, e.g. 'There were twenty- five children in the classroom. Now five children have gone to music. What could we do to find how many children are left?'

Learning opportunities

- To know that subtracting number sentences can represent different subtracting situations, e.g. involving 'take away', 'comparing to find the difference', 'reducing' and 'finding how many more to reach a given amount'.
- To recognize when to subtract.
- To understand that the order in which numbers are subtracted from each other matters.
- To be able to make up subtracting number stories set in different situations.
- To be able to use the '–' and '=' symbols appropriately.
- To subtract whole numbers using Numicon Shapes or number rods without counting.
- To begin to develop recall of subtracting number facts.

Terms for children to use

subtract, take away, leaves, equals, is, makes, 'how many left/remain?', less, fewer, reduce by, decrease by, go down by, the difference between, 'what is the difference?', 'how much less?', 'how many fewer?', 'how many more?'

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Understand that subtracting has a decreasing effect.
- Show understanding of when to subtract by making the subtracting action and saying the subtracting number sentence in response to 'take away', 'finding the difference', 'reducing', and 'finding how many more to reach …' problems.
- Illustrate subtracting stories with structured apparatus.
- Read and write subtracting number sentences using the '–' and '=' symbols.
- Are beginning to recall subtracting facts.

NPC Milestone 2

- Know that subtracting number sentences can represent different subtracting situations, e.g. 'take away' or 'comparing to find the difference', and know when to subtract (NPC 2:2g)
- Illustrate a subtracting story with objects and structured apparatus, subtracting without counting in ones, and saying and writing the number sentence using '–' and '=' (NPC 2:2h)

Explorer Progress Book 2a, pp. 10–11

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 16: Number Stars

After completing work on Activity 3, give children Explore More Copymaster 16: Number Stars to take home.

Focus activities

1. Subtracting by 'taking away'
2. Subtracting by 'reducing'
3. Subtracting to find the 'difference'
4. Comparing to find 'how many more to …?'
5. Finding 'how many more to …?' when giving change

Numbers and the Number System 2: 2-digit numbers

Key mathematical ideas Counting, Pattern, Place value, Equivalence, Order, Mathematical thinking and reasoning

Educational context

The activities in this group begin by consolidating work with 2-digit numbers from 20 to 30. Children need to be confident about the pattern in the number names to 30 and then use their knowledge to make generalizations about number names to 100. The activities include naming, labelling and building 2-digit numbers with Numicon Shapes and number rods, and involve exploring relationships between the numbers so that children can extend their understanding of the number system and number line representation. Children have already used the term 'tens and ones' to describe the structure of 2-digit numbers; they now continue to develop their understanding of place value and the equivalence between quantity value and column value (e.g. the quantity value of the '2' in 20 is '20' and its column value is '2 tens'). The Numicon Shapes and number rods illustrate this distinction very clearly, enabling children to see the size of the number as well as its structure of tens and ones. In this activity group, children start to use the term 'multiples of 10' for the numbers they have previously called 'tens numbers'. Some work on using the empty number line is also included.

Learning opportunities

- To read, write and build 2-digit numbers.
- To understand the quantity value and column value of 2-digit number names.
- To understand the term 'multiple of 10'.
- To read and begin to write 2-digit number words.

Terms for children to use

number names, tens numbers, ones, tens, multiple(s) of ten, more, continue, next, numeral, count, between, find, check, equal, quantity, value

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Make the common error of describing 2-digit numbers as, e.g. 'two and eight' for 28. Correct this by reminding them of the imagery of Numicon Shapes or number rods showing what the 2 represents and modelling the phrases 'two tens and eight ones' or 'twenty and eight'.
- Build 2-digit numbers with Numicon Shapes when they hear the number name or see the numerals written.
- Read 2-digit number names from numerals.
- Write numerals for 2-digit numbers when they hear the number name.
- Say and write the 2-digit number name from seeing it built with Numicon Shapes or number rods.
- Say how many 'ones' there are in a 2-digit number.
- Describe the column values of 2-digit numbers, e.g. '2 tens and 5 ones' for 25.
- Understand the equivalence between quantity and column value.
- Understand the structure of multiples of 10.

NPC Milestone 2

- Read, say, and build 2-digit numbers confidently from seeing numerals to 40 (NPC 2:2a)
- Build (using Shapes and rods) and write a 2-digit number confidently from hearing its number name to 40 (NPC 2:2b)
- Name and write the numerals from seeing it built with Numicon Shapes (NPC 2:2c)
- Understand the term 'multiple of 10' and the structure of a multiple of 10 (NPC 2:2d)

Explorer Progress Book 2a, pp. 12–13

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 10: Saving Pennies

After completing work on Activity 5, give children Explore More Copymaster 10: Saving Pennies to take home.

Focus activities

1. Hearing, writing and building 2-digit numbers to 30
2. Numicon Shape Bingo and number rod Bingo – building, writing and hearing 2-digit numbers
3. Finding numbers on the Numicon 0–100 cm Number Line and the Numicon 1–100 cm Number Rod Track
4. Using the Numicon 10s Number Line and the Numicon 1–100 cm Number Rod Track to compare numbers
5. Quantity value and column value using coins
6. Multiples of 10
7. Knowing the column and quantity values of each digit in a 2-digit number

Calculating 3: Ordering adding and subtracting facts

Key mathematical ideas Adding, Subtracting, Pattern, Mathematical thinking and reasoning

Educational context

This activity group prepares children for finding 'all possibilities' in later work, beginning here with ordering adding and subtracting facts. It provides children with opportunities to work systematically. It starts with finding all combinations of the adding facts within 4, and although this can seem simple for some children, the challenge arises from the fact that there are only a few possible combinations, making it more difficult for them to see a pattern. All activities should be explored with all the numbers 4–10 so children have many opportunities to gain fluent recall of adding and subtracting facts. Some children spot the patterns and are able to work through these activities very quickly; other children may need a week to complete them. This activity group differs from most others in that there are no separate independent practice activities. This is because, after the focus activities have been introduced, children will need time to continue the investigations independently. Some children will extend the investigations to find all possibilities, others will find some possibilities.

Children's individual responses and explanations will give teachers insight into their reasoning and how far they are thinking mathematically.

Learning opportunities

- To experience arranging sets of adding and subtracting sentences in a logical order.
- To have the opportunity to spot patterns and predict, and to work systematically.
- To continue to develop recall of adding and subtracting facts.

Terms for children to use

combinations, 'how many possibilities?', pattern, order, add, altogether, together, more, total, equals, subtract, take away, minus, increasing, decreasing

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Are able to write adding and subtracting sentences in order.
- Work systematically.
- Spot patterns and make predictions from them.
- Know when to use a pattern to solve a problem.
- Understand that putting things in a logical order helps to ensure nothing has been left out.
- Spot the missing combination.
- Have fluent recall of adding and subtracting facts for each number to 10.

NPC Milestone 3

- Understand that putting things in order is a systematic way to work, e.g. write adding and subtracting sentences in order (NPC 2:3j)
- Have fluent recall of nearly all adding and subtracting facts for each number to 10 (NPC 2:3k)

Explorer Progress Book 2a, pp. 14–15

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 17: Looking for Patterns

After completing work on Activity 6, give children Explore More Copymaster 17: Looking for Patterns to take home.

Focus activities

1. Finding combinations and putting them in order
2. Using Numicon Shapes and number rods to show adding to 4
3. Finding combinations using the Numicon Pan Balance
4. Generalizing possibilities and creating stories
5. Finding combinations for each number, 5–10
6. Writing a pattern with subtracting sentences
7. Subtracting patterns with number rods
8. Subtracting patterns with Numicon Shapes
9. Finding all possibilities to complete subtracting patterns
10. Using order to find missing combinations

Pattern and Algebra 2: Exploring the inverse relationship between adding and subtracting within 10

Key mathematical ideas Inverse, Adding, Subtracting, Mathematical thinking and reasoning

Educational context

This group of activities builds on children's previous work on adding and subtracting. It introduces the inverse relationship between these two operations through problems in which children explore the adding and subtracting relationships between sets of three numbers. Children will benefit from spending plenty of time on the practice activities. The activities become more challenging as children are asked to decide when to add and when to subtract, and to relate the two operations. All the activities provide further opportunities for children to use and learn adding and subtracting facts and to develop the idea of part-whole relationships. The activities help children develop reasoning skills and the understanding of triadic number relationships they will need when exploring equivalence and empty box notation.

Learning opportunities

- To reason about number relationships.
- To begin to use the inverse relationship between adding and subtracting.
- To consolidate adding and subtracting facts and associated language.
- To develop mental imagery.

Terms for children to use

put together, take apart, do, undo, inverse, rebuild, add, plus, subtract, take away, minus, more, fewer, equals

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Say and write a subtracting sentence connected to an adding sentence.
- Say and write an adding sentence connected to a subtracting sentence.
- Are beginning to understand that using the inverse relationship between adding and subtracting can be helpful when solving problems.

NPC Milestone 3

- Begin to use the inverse relationship between adding and subtracting, e.g. write a subtracting sentence connected to an adding sentence (NPC 2:3a)

Explorer Progress Book 2a, p16–17

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 3: Three Leaf Clover

After completing work on Activity 2, give children Explore More Copymaster 3: Three Leaf Clover to take home.

Focus activities

1. Beginning to see connections between subtracting and adding
2. Exploring connections between adding and subtracting
3. Using the structure of Numicon Shapes to organize a problem
4. Exploring inverse in a 'comparing' subtraction problem
5. Learning related adding and subtracting facts for numbers to 10
6. Exploring part–whole relationships

Numbers and the Number System 3: More 2-digit numbers

Key mathematical ideas Counting, Place value, Equivalence, Pattern, Order, Mathematical thinking and reasoning

Educational context

The activities in this group continue to develop children's understanding of 2-digit numbers, including place value, as they explore the idea of zero as a place holder and the equivalence between quantity value and column value. A tens and ones frame is introduced to support children in their understanding of the term 'ones' and to help with connecting ideas about place value. Activities involve exploring relationships between numbers, and looking at their relative positions on the number line and an empty number line. Some of the assessment opportunities involve very small steps. This is because, if children have difficulty with any one of these steps, they will not have a sufficiently firm foundation on which to build later ideas about place value, e.g. decimal notation.

Learning opportunities

- To read, write and build 2-digit numbers.
- To correctly position numbers on an empty number line.
- To understand the equivalence between quantity value and column value of 2-digit numbers.
- To understand zero used as a place holder.

Terms for children to use

number words zero to one hundred (zero, one, two…), ordinal number words (first, second…), 2-digit numbers, 1-digit numbers, numeral, tens numbers, multiples of 10, tens, ones, order, more, continue, next, before, after, between, column

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Build 2-digit numbers with Numicon Shapes or number rods when they hear the number name or see the written numeral.
- Read 2-digit number names from numerals.
- Write numerals for 2-digit numbers when they hear the number name.
- Say and write the 2-digit number name from seeing it built with Numicon Shapes or number rods.
- Build 2-digit numbers with Numicon Shapes or number rods and write the numerals from seeing the written number words.
- Describe the equivalence between quantity value and column value of 2-digit numbers.
- Describe column and quantity value of each digit in a 2-digit number.
- Explain why zero is important in 2-digit numbers.
- Approximately position numbers on an empty number line.

NPC Milestone 3

- Read, say, write and build 2-digit numbers confidently from seeing numerals and hearing number names to 100 (NPC 2:3e)
- Name and write the numerals from seeing them built with Numicon Shapes (NPC 2:3f)
- Understand the quantity value and column value of 2-digit numbers (NPC 2:3g)

Explorer Progress Book 2a, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 11: Rolling Tens and Units

After completing work on Activity 4, give children Explore More Copymaster 11: Rolling Tens And Units to take home.

Focus activities

1. Learning the term 'ones' and introducing the tens and ones frame
2. Connecting grouping in tens with place value
3. Recognizing the structure of and writing 2-digit numbers
4. Putting numerals in the right places
5. Putting numerals in the right positions on an empty number line
6. Zero as a place holder
7. Zero as a place holder when exchanging ones for a 10
8. What's in the bag?

Numbers and the Number System 4: Comparing and ordering numbers to 100

Key mathematical ideas Counting, Pattern, Order, Place value, Equivalence, Mathematical thinking and reasoning

Educational context

This group of activities focuses on reasoning to make comparisons between number values which can then be used in the context of measures. Children have opportunities to continue to use the symbols for greater than (>) and less than (<) to record comparisons. As children compare and order higher numbers they will need to have a clear understanding of place value, i.e. that the place of a digit tells us its value. Comparing and ordering Numicon Shapes and number rods makes visible the important regularity in the order of numbers, which is a crucial step towards understanding the system of whole numbers. Listen for any children who do not speak clearly and run 'than' into the previous word, e.g. saying 'biggeran' instead of 'bigger than', as 'than' is a key word used in a comparison.

Learning opportunities

- To recognize when it is helpful to use the order of numbers to organize or find things.
- To use the '<' and '>' symbols when comparing Numicon Shapes, number rods and numerals.
- To compare and order numbers to 100.

Terms for children to use

tens, ones, more, less, between, nearly, next, before, after, forwards, backwards, larger than, greater than, bigger than, smaller than, more than, less than, fewer than, higher, lower, 'I know this, so I know that'

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Enunciate the word 'than' clearly to say, e.g. 'larger than' and not 'largeran'.
- Are well-organized and recognize order.
- Describe comparisons and infer, e.g. 'I know this, so I know that.'
- Use the '<' and '>' symbols to record comparisons.
- Explain that numbers with more tens are larger than numbers with fewer tens.
- Use the word 'between' effectively.
- Make size comparisons between numbers in the range 0–100.
- Can put a list of up to seven numbers from the range 0–100 in order.
- Spell number words at a level consistent with their spelling knowledge.

NPC Milestone 3

- Explain that numbers with more tens are larger than numbers with fewer tens (NPC 2:3h)
- Compare and order (seven) non-consecutive numbers to 100 and use the '<' and '>' symbols (NPC 2:3i)

Explorer Progress Book 2a, pp. 20–23

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.
Children will also have the opportunity to complete their Learning Log (pp. 22–23) where they can reflect on the mathematics they have done so far.

Explore More Copymaster 12: Biggest Number

After completing work on Activity 3, give children Explore More Copymaster 12: Biggest Number to take home.

Focus activities

1. Revising comparison and order of numbers in the range 0–30
2. Comparing and ordering numbers in the range 0–100
3. Connecting number lines with number squares
4. Comparing numbers on the 100 square
5. Comparing and ordering more than two numbers in the range 0–100
6. Comparing and ordering with money

Pattern and Algebra 3: Exploring equivalence – introducing empty box notation

Key mathematical ideas Equivalence, Inverse, Adding, Subtracting, Mathematical thinking and reasoning

Educational context

Understanding that equivalence means 'is of equal value' is an essential foundation for all children's mathematics. The idea of equals/equivalence is carefully introduced in Number, Pattern and Calculating 1 using Numicon Shapes in the Numicon Pan Balance. This avoids children misinterpreting the '=' symbol as an instruction to write the answer. This is a common misinterpretation that leads to many later difficulties (the '=' key on an electronic calculator does not help in this respect). This activity group extends work on the inverse from Pattern and Algebra 2. Children will encounter number sentences in which 'missing' numbers are represented by an empty box (□). Children are supported in this work by their recall of adding and subtracting facts, the development of their understanding of the inverse relationship between adding and subtracting and the use of combinations of Numicon Shapes in the Numicon Pan Balance.

Learning opportunities

- To know that equivalent combinations of Numicon Shapes will balance.
- To use the symbol '=' to show balance.
- To realize that, in adding sentences, the total can appear on the left or right of the '=' symbol.
- To recognize that a symbol such as □ can stand for an unknown number.

Terms for children to use

balances, the same amount, the same number, equals, is equal to, has the same value as, is of equal value to, amount, number, unknown, missing, position, adjust, represent, combinations, empty box

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Compare two different initial amounts (bigger/smaller, more than/less than) and then make adjustments to change them into equivalent amounts.
- Show equivalent amounts using Numicon Shapes and Number Rods in the Numicon Pan Balance.
- Complete adding and subtracting sentences that have missing numbers shown as □.
- Devise equivalent adding and subtracting sentences within their working range, e.g. 3 + 3 = 9 − 3.

NPC Milestone 3

- Use the symbol '=' to show balance and know that in adding sentences the total can appear on the left or right of this symbol (NPC 2:3b)
- Recognize that a symbol such as □ can stand for an unknown number (NPC 2:3c)
- Devise equivalent adding and subtracting number sentences within their working range, e.g. 3 + 3 = 9 – 3 (NPC 2:3d)

Explorer Progress Book 2b, pp. 2–3

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 4: Train Dominoes

After completing work on Activity 5, give children Explore More Copymaster 4: Train Dominoes to take home.

Focus activities

1. Comparing groups of objects and adjusting by adding to make them equal
2. Comparing groups of objects and adjusting by subtracting to make them equal
3. Finding equivalent adding facts for 10
4. How many are missing? Introducing empty box notation
5. Finding solutions to 'missing number' problems
6. Comparing groups and adjusting by adding and subtracting to make them equal

Measurement 1: Introducing centimetres

Key mathematical ideas Length, Ordering, Standard units

Educational context

In this activity group, children begin to use centimetres, as initial 'standard' units of length, in a range of practical situations. The contexts are varied, but in each case the measurement task has a problem-solving purpose, whether showing how a caterpillar grows in a story, contributing to research into fish habitats or making hats.

Children begin by revisiting work from the *Geometry, Measurement and Statistics 1 Teaching Resource Handbook*, comparing and ordering lengths and using non-standard units. The importance of aligning to a common starting point is emphasized when children create a graph to show growth and compare pairs of lengths using <, > and = symbols.

Children are then introduced to centimetres, including the 'cm' abbreviation, and use the already familiar length of a 1-rod to begin estimating and making measurements in centimetres. Encourage them to recognize the usefulness of standard units for communicating – in Activity 3, for example, because they are making measurements in centimetres, they can be confident that the researcher they are sending their findings to will understand.

They are also introduced to centimetre rulers as measuring instruments. Children may take some time to appreciate the importance of 'starting from 0' when measuring with a ruler; allow for plenty of practice and discussion. Finally, children also address the problem of how to measure non-straight lengths, for example using ribbon or string.

Learning opportunities

- To compare two lengths using <, > and = symbols; and to compare and order more than two lengths.
- To understand how to use a ruler.
- To estimate lengths in centimetres.
- To construct a simple pictogram.
- To use a table to record data.

Terms for children to use

length, width, height, depth, longer, longest, shorter, shortest, deeper, deepest, thicker, thickest, thickness, distance, dimension, compare, align, same, different, mark, label, straight, direct, indirect, graph, centimetre (cm), bar chart, block graph

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Align lengths to measure and compare them accurately.
- Check accuracy by e.g. repeating or comparing measurements.
- Construct a basic table and use it to read and record data independently.
- Measure a length using a ruler, and record the length accurately in centimetres.
- Can construct and interpret a pictogram using a many-to-one correspondence.

GMS Milestone 1

- Compare and order lengths using <, > and = symbols (GMS 2:1a)
- Measure straight and curved lengths to the nearest cm, choosing suitable equipment, e.g. ruler, tape measure, cm cubes (GMS 2:1b)
- Record measurement data in a simple table and pictogram or block graph (GMS 2:1c)

Explorer Progress Book 2, pp. 2–3 and 30

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 6: Caterpillar Lengths

After completing work on Activity 2, give children Explore More Copymaster 6: Caterpillar Lengths to take home.

Focus activities

1. Comparing increasing lengths
2. Ordering lengths
3. Introducing centimetres
4. Presenting data in a pictogram
5. Measuring non-straight lengths
6. Investigating centimetre rulers

Calculating 4: Adding and subtracting whole tens

Key mathematical ideas Adding, Subtracting, Pattern, Mathematical thinking and reasoning

Educational context

There are many activities in this group, because children are now applying all that they have learnt about adding and subtracting within 10 to add and subtract whole tens. This activity group is an important first step for children in calculating with 2-digit numbers. For success with this and all further calculating activities in Number, Pattern and Calculating 2 and beyond, children need to have secure understanding of the column value and quantity value of multiples of 10. They also need to have recall of most adding and subtracting facts within 10. Until all this understanding is in place and children can use it confidently, it is strongly recommended that work on earlier activity groups is continued. Without it, children are unlikely to be able to generalize or think about efficient solutions to the problems in these activities.

Learning opportunities

- To learn that adding and subtracting facts within 10 can help when adding and subtracting multiples of 10.
- To make connections between coin values less than £1 and multiples of 10.
- To begin to write whole tens adding and subtracting sentences in columns.

Terms for children to use

adding, subtracting, equals, tens, whole tens, tens numbers, multiples of 10, ones, value, altogether, left over, difference, 'how many more?', compare, so (Note: Children have been introduced to the term 'multiples of 10' but some may still use the terms 'tens numbers' and 'whole tens', so all these terms are included here.)

Assessment opportunities

Look and listen for children who:
- Use the terms for children to use effectively in discussion.
- Have fluent recall of adding and subtracting facts within 10.
- Use these facts when adding and subtracting whole tens.
- Write adding and subtracting facts in columns.
- Understand column and quantity values of multiples of 10.
- Connect adding and subtracting multiples of 10 with coin values.

NPC Milestone 4

- Recall fluently most adding and subtracting facts within 10 and use them when adding and subtracting multiples of 10 (NPC 2:4a)
- Recognize the place value of each digit in a 2-digit number (NPC 2:4d)

Explorer Progress Book 2b, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group.
Refer to the assessment opportunities for assistance.

Explore More Copymaster 18: Memory

After completing work on Activity 8, give children Explore More Copymaster 18: Memory to take home.

Focus activities

1. Beginning to use adding facts within 10 to add whole tens
2. Using adding facts within 10 to add whole tens
3. Using a tens and ones frame for adding
4. Beginning to use subtracting facts within 10 to subtract whole tens
5. Using subtracting facts within 10 to subtract whole tens
6. Using a tens and ones frame for subtracting
7. Finding the difference between whole tens numbers
8. Finding 'how many more?' with whole tens
9. Learning whole tens adding facts to 100
10. Learning whole tens subtracting facts from 100
11. Whole tens adding facts with money
12. Whole tens subtracting facts with money (take away structure)
13. 'More than' and 'less than' problems with whole tens facts

Geometry 1: Making and classifying polygons

Key mathematical ideas Describing parts and properties of shapes invariant under transformations, Classifying shapes

Educational context

This activity group builds on the work children did on 2D shapes in the *Geometry, Measurement and Statistics 1 Teaching Resource Handbook* to introduce a wider range of shapes and identify their parts and properties more precisely, and to begin to address the conventional hierarchical classification of these shapes.

Children begin by exploring what shapes are in order to arrive at a working definition of a 'polygon' – a closed 2D shape made up of straight lines – as well as a 'nonpolygon'. They investigate the variety of polygons they can make, also naming these as separate subcategories of polygons, that is, as triangles, squares, oblongs, pentagons, hexagons, heptagons, and so on. Children practise identifying, naming and sorting polygons, and in doing so encounter the terms 'congruent' and 'similar', used to distinguish shapes which are exactly the same as each other from those that are bigger or smaller versions of each other. This provides an informal introduction to the basic geometrical transformation of 'scaling'. (Children also meet the other three transformations – translation, rotation and reflection – in the other Geometry activity groups; for further discussion of transformations and their significance, see the Key Mathematical Ideas section of the *Geometry, Measurement and Statistics 2 Implementation Guide*.)

During this work children are asked to use a variety of traditional, conventional terms and to make increasingly fine category distinctions. An emphasis on sharing their ideas and thinking out loud is particularly important in helping them to develop and consolidate their understanding. Explaining word origins (for instance 'poly-' derives from a word meaning 'many', and '-gon' from a word meaning 'angled') is one way of supporting their geometrical thinking and communicating.

Learning opportunities

- To describe and sort polygons and non-polygons.
- To recognize polygons as closed shapes with straight lines.
- To recognize different polygons by their number of sides and vertices.
- To use a range of apparatus to make polygons.
- To draw polygons with a given number of sides.
- To recognize that any polygon has an equal number of sides, vertices and angles.

Terms for children to use

angle, side, vertex, vertices, polygon, non-polygon, triangle, oblong, rectangle, square, hexagon, heptagon, octagon, pentagon, circle, half circle, semicircle, straight, curved, congruent, similar

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Describe a polygon in terms of number of sides and vertices.
- Describe a non-polygon as having at least one curved side.
- Sort polygons from non-polygons.
- Describe the number of sides and vertices in a pentagon, hexagon, heptagon or octagon.
- Identify and name (both regular and irregular) hexagons, pentagons, heptagons and octagons.
- Identify shapes which are congruent and shapes which are similar.

GMS Milestone 1

- Make, draw and name different polygons, showing straight sides and lines joined at corners, e.g. pentagon, octagon (GMS 2:1d)
- Identify 2D shapes that are not polygons e.g. semi-circle, oval (GMS 2:1e)
- Sort collections of polygons into 'congruent' and 'similar' groups (GMS 2:1f)

Explorer Progress Book 2, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 1: Exploring Polygons

After completing work on Activity 2, give children Explore More Copymaster 1: Exploring Polygons to take home.

Focus activities

1. Introducing polygons and angles
2. Making and naming pentagons, hexagons, heptagons and octagons
3. Identifying polygons and recognizing congruent and similar shapes
4. Identifying and classifying polygons and non-polygons

Geometry 2: Identifying the faces, edges and vertices of solid 3D shapes

Key mathematical ideas Describing parts and properties of shapes invariant under transformations

Educational context

In the *Geometry, Measurement and Statistics 1 Teaching Resource Handbook* children built up practical experience and knowledge of the parts, properties and conventional names of common flat 2D and solid 3D shapes. In this activity group they continue their active exploration of solid 3D shapes, making the connections and distinctions between shapes in two and three dimensions more precise and explicit.

Children begin by using sold 3D shapes to make prints in paint and sand. They use their findings to identify the flat 'faces' of 3D shapes, and name the 2D shapes they consist of. The curved 'surfaces' of 3D shapes remain distinct (preparing the way for children's classification of 'polyhedra' and 'non- polyhedra' in *the Geometry, Measurement and Statistics 3 Teaching Resource Handbook*).

Children also identify and name 'edges' as parts specific to 3D shapes, corresponding to but again distinct from the 'sides' of 2D shapes. They begin to investigate the number of faces, edges and vertices in 3D shapes.

Throughout this activity group emphasize children's geometrical communicating, prompting them to recognize and refine the categorizations and distinctions they are making through discussion and 'thinking out loud' with others.

Learning opportunities

- To recognize and name common flat 2D and solid 3D shapes.
- To identify faces, surfaces, edges and vertices on solid 3D shapes.
- To begin to recognize and visualize the 2D faces of 3D shapes.
- To use a table to organize information.

Terms for children to use

face, surface, edge, vertex, vertices, triangle, square, oblong, circle, cube, cuboid, pyramid, sphere, cone, cylinder, straight, curved, round, triangular, circular, left, right, top, middle, bottom, nearer, further, longer, shorter, larger, bigger, smaller

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Confidently and accurately name 2D and 3D shapes.
- Identify which 3D shapes could have been used to make 2D prints.
- Identify a 3D shape given certain properties, e.g. the number and shape of its faces.
- Identify and count the faces, edges and vertices of a 3D shape.
- Describe 2D and 3D shapes using appropriate mathematical language, including the terms 'edge', 'face', 'surface' and 'vertex/vertices'.
- Can read, organize and record data in a simple table.

GMS Milestone 1

- Describe 3D shapes in terms of curved faces or the 2D shape of flat faces (GMS 2:1g)
- Investigate systematically the number of faces, edges or vertices of 3D shapes (GMS 2:1h)

Explorer Progress Book 2, pp. 6–7

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 2: Exploring 3D Shapes

After completing work on Activity 4, give children Explore More Copymaster 2: Exploring 3D Shapes to take home.

Focus activities

1. Exploring faces of solid geometric 3D shapes – printing in paint
2. Exploring edges of solid geometric 3D shapes – shape prints in sand
3. Exploring curved surfaces and edges of solid geometric 3D shapes – printing in paint
4. Identifying faces, edges and vertices

Calculating 5: Adding and subtracting 1 and 10

Key mathematical ideas Adding, Subtracting, Place value, Mathematical thinking and reasoning

Educational context

This activity group can appear simple but children will need to have a distinct understanding of column and quantity values to add and subtract 10 or 1. The patterns on a 100 square can be helpful, but children should not be reliant on them. They need to understand for themselves the structure and cardinal value of each number in relation to others to calculate efficiently.
Once children have understood these ideas and are able to competently use all the language connected with them, they should have a good foundation for further calculating with tens and ones. The activity group also looks at empty box notation and finishes with some patterns of similar calculations relating to adding and subtracting 10.

Learning opportunities

• To have quick recall of 1 more and 1 fewer than a given 2-digit number.
• To have quick recall of 10 more and 10 fewer than a given 2-digit number.

Terms for children to use

adding, subtracting, difference, equals, tens, whole tens, 2- digit numbers, ones, digit, numeral, more, fewer, before, after, next, represents, column, row, multiple

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion.
• Understand that adding 1 (to any whole number) gives the next number and that subtracting 1 (from any whole number) gives the previous number.
• Understand that, when adding or subtracting 1 to or from a 2-digit number, only the ones change; the tens remain the same (unless subtracting from a multiple of 10 or adding to a number with 9 ones).
• Understand that, when adding or subtracting 10 to or from a 2-digit number, only the tens change; the ones remain the same.
• Make a general statement when they have noticed something always happening.
• Organize their work systematically.

NPC Milestone 4

• Have quick recall of 1 more and 1 fewer and 10 more and 10 fewer than a given 2-digit number (NPC 2:4b)
• Partition 2-digit numbers into tens and ones, e.g. for 35 say 3 tens + 5 ones (column value), and write adding sentences, e.g. 10 + 10 + 10 + 5 = 35 (quantity value) (NPC 2:4e)

Explorer Progress Book 2b, pp. 6–7

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 19: Smiley Faces

After completing work on Activity 7, give children Explore More Copymaster 19: Smiley Faces to take home.

Focus activities

1. Adding 1 to a 2-digit number
2. Adding 1 to numbers before and after multiples of 10
3. Subtracting 1 from a 2-digit number
4. Finding the difference
5. Subtracting 1 and finding the difference of 1 from a multiple of 10
6. Adding 10 to a 2-digit number
7. Subtracting 10 from a 2-digit number
8. Looking at a difference of 10
9. Adding and subtracting multiples of 10 – using empty box notation
10. Marking the pattern when adding and subtracting 10
11. Writing patterns of similar calculations

Geometry 3: Investigating symmetry

Key mathematical ideas Rotation, Reflection, Translation, Equivalence

Educational context

This activity group focuses on reflective symmetry (also called bilateral symmetry, line symmetry or mirror symmetry). Reflection is one of the four basic types of geometrical 'movement' (or transformation), which children begin to explore very early on. It is also an informal part of their early learning about geometry, as they 'flip' and turn over shapes and objects, for example, or recognize when objects or elements in a pattern 'mirror' each other.

The activities in this group begin to formalize this learning and connect ideas that children might not at first recognize as related. After being introduced to the word 'symmetry', they begin by looking at real-life instances, for example in clothing, leaves and butterflies. They use a variety of active approaches to investigate and explore the ideas involved, including using mirrors, cutting and folding images and shapes, and making and completing symmetrical patterns and pictures using a range of apparatus.

They then move on to investigate symmetry as a property of some flat 2D shapes, identifying those which are symmetrical and the position of lines of symmetry. Children begin to generalize and to reason about symmetry in order to sort and classify shapes according to their symmetry.

Prompt children to develop their geometrical reasoning as they explore the activities. For example, if they are folding different oblongs to see whether they all have two lines of symmetry (as in Activity 4, Step 3), encourage them to consider why this might be the case (that is, encourage them to move on from testing particular instances of oblongs to trying to reason about a general oblong).

Learning opportunities

- To recognize symmetry in real-life objects, images, flat 2D shapes and patterns.
- To check whether an image, pattern or shape is symmetrical, for example by folding, cutting or using a mirror.
- To create and complete symmetrical patterns and pictures.
- To recognize which shapes are symmetrical and find lines of symmetry.
- To begin to sort shapes based on their symmetry.

Terms for children to use

reflection, reflect, reflecting, flipped, opposite, side, half, halves, equal halves, same, matching, identical, mirror, mirror image, mirror line, symmetry, symmetrical, line of symmetry, horizontal, vertical, rectangle, square, circle, triangle

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Cut out and match or fold halves of pictures, shapes or patterns to identify which are symmetrical.
- Use a mirror to identify pictures, shapes and patterns which are symmetrical.
- Make or complete a symmetrical pattern or picture without using a mirror.
- Visualize or predict the result of a reflection.
- Fold shapes to identify which are symmetrical, and, where appropriate, to show the line of symmetry.
- Visualize or predict which shapes are symmetrical, and the position of the line or lines of symmetry.

GMS Milestone 1

- Make or complete symmetrical patterns and pictures (GMS 2:1i)
- Visualize or test which 2D shapes are symmetrical and show the position of at least one line of symmetry (GMS 2:1j)

Explorer Progress Book 2, pp. 8–9

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 3: Reflecting Shapes

After completing work on Activity 1, give children Explore More Copymaster 3: Reflecting Shapes to take home.

Focus activities

1. Exploring symmetry in the world around us
2. Making symmetrical patterns with Numicon apparatus
3. Making symmetrical patterns with other apparatus
4. Folding to find lines of symmetry

Pattern and Algebra 4: Odd and even

Key mathematical ideas Pattern, Adding, Subtracting, Mathematical thinking and reasoning

Educational context

Even though children might already be using the terms ‘odd’ and ‘even’, it is important for them to work through the activities in this group because the idea continues to be useful during much of their later work. Recognizing and understanding factors, prime numbers and divisibility can helpfully begin with work on odds and evens; and counting on and back in twos will always involve sequences of either odd or even numbers. Using Numicon Shapes, young children can make generalizations about odd and even numbers that are much more obscure when they are working just with numerals. There is also plenty of opportunity to work systematically and to develop mathematical reasoning through investigations with odd and even numbers.

Learning opportunities

• To look for patterns and notice that it is easier to spot them when one’s work is organized systematically.
• To use the terms ‘odd’ and ‘even’ when referring to numbers and totals.
• To understand odd and even numbers within 10 and to generalize this understanding to numbers between 10 and 100.
• To explore what happens when odd and even numbers are added and subtracted.

Terms for children to use

odd, even, next, pattern, add, more, plus, equals, every other, because, cannot be, never, always

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion.
• Recognize that it is important to be well organized and to work systematically, e.g. look for those who use numbers in order, to avoid missing any out.
• Use ‘odd’ and ‘even’ as descriptive number terms.
• Name odd and even numbers to 30 and beyond.
• Realize that a general statement can be made after they have noticed something always happening.

NPC Milestone 4

• Make a general statement when they have noticed something always happens (NPC 2:4c)
• Use the terms ‘odd’ and ‘even’ when referring to numbers and totals, and generalize understanding about odd and even numbers within 10 to numbers to 100 (NPC 2:4j)

Explorer Progress Book 2b, pp. 8–9

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 5: Bingo!

After completing work on Activity 2, give children Explore More Copymaster 5: Bingo! to take home.

Focus activities

1. Exploring odd and even with Numicon Shapes
2. Continuing the sequence of even numbers
3. Continuing the sequence of odd numbers
4. Using number rods to find odd and even numbers
5. Sorting odd and even numerals
6. Investigating which numbers will give partners
7. Symmetrical patterns
8. Making 10 with even numbers
9. Adding with odd and even numbers
10. Subtracting with odd and even numbers

Calculating 6: Partitioning into tens and ones to answer adding and subtracting problems

Key mathematical ideas Adding, Subtracting, Place value, Pattern, Mathematical thinking and reasoning

Educational context

The activities in this group extend earlier work on place value by encouraging children to look closely at the structure of 2-digit numbers and to use their understanding of column and quantity values to partition numbers. Understanding these ideas is essential before children move on to further calculating with numbers with two or more digits. As Numicon Shapes and number rods can illustrate the structure of tens and ones very well, they provide good support for children's understanding of the column value and quantity value.

Children will need to become very familiar with the key terms 'partition' and 'inverse', but at this stage they may have difficulty using these terms themselves. It is important to use these terms with children, but be aware that they will take time to assimilate their meanings.

Learning opportunities

• To partition a 2-digit number into 'lots of tens' and ones and to write adding sentences which show the partitioning, e.g. 10 + 10 + 10 + 5 = 35 or 3 tens + 5 ones (column value).
• To partition a 2-digit number into a multiple of 10 and ones and to write adding and subtracting sentences to show the two parts and their whole value, e.g. 30 + 5 = 35 (quantity value).
• To partition a 2-digit number in different ways.
• To use known facts to solve new problems (to add or subtract using facts of 10 within any decade to 100).
• To use patterns to partition systematically.

Terms for children to use

adding, subtracting, equals, tens, whole tens, multiples of ten, ones, partition, inverse, value, quantity

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion (see the Educational context for exceptions).
• Know how to partition a number into 'lots' of tens and ones and can write this as an adding sentence, e.g. for 37 write 10 + 10 + 10 + 7.
• Know how to partition a number into a multiple of 10 and ones and can write this as an adding sentence, e.g. 30 + 7 = 37 or 37 = 7 + 30.
• Know how to partition a number in different ways, e.g. 10 + 27 = 37 or 37 = 20 + 17.
• Use the parts and wholes relationship, e.g. 37, 30, 7, to devise inverse adding and subtracting number sentences, such as 30 + 7 = 37 and 37 − 7 = 30.
• Connect adding tens and ones using Numicon Shapes or number rods with adding coin values, e.g. three 10- shapes and a 5- shape equals 35, so three 10p coins and a 5p equals 35p.
• Add single digits to whole tens and whole tens to single digits without counting on in ones.
• Subtract a single digit from a 2-digit number to leave a multiple of 10.
• Subtract whole tens from a 2-digit number to leave a 1- digit number.

NPC Milestone 4

• Partition a 2-digit number into a multiple of ten and ones, and derive possible adding and subtracting sentences, e.g. 30 + 5 = 35, 35 – 30 = 5, 35 – 5 = 30 (NPC 2:4f)
• Use part-whole relationships, e.g. between 37, 30 and 7, to devise inverse adding and subtracting number sentences (NPC 2:4g)
• Realize that the inverse relationship between adding and subtracting can be used to check calculations (NPC 2:4h)

Explorer Progress Book 2b, pp. 10–11

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 20: Number Detectives

After completing work on Activity 4, give children Explore More Copymaster 20: Number Detectives to take home.

Focus activities

1. Partitioning 2-digit numbers into tens and ones'
2. More partitioning into tens and ones
3. Different ways to partition into tens and ones
4. Partitioning 2-digit numbers into multiples of 10 and ones
5. Partitioning and subtracting
6. Using parts and wholes with multiples of 10 and ones
7. Finding patterns when adding a single digit to multiples of 10
8. Finding patterns when subtracting
9. Using the context of money for partitioning

Pattern and Algebra 5: Patterns and sequences of 2s, 3s, 5s and 10s

Key mathematical ideas Pattern, Mathematical thinking and reasoning

Educational context

This activity group improves children's ability to recite the multiples of 2, 3, 5 and 10 and increases their understanding of relationships between numbers to 100. These numbers are referred to with children as multiples of 2, 3, 5, and 10 – or sometimes just simply as 'the 2s numbers', etc. Where appropriate, the activities use 2p, 5p and 10p coins as the starting point. A variety of number lines and the 100 square are used to help children realize that the same patterns and sequences can be illustrated in different ways. This activity group also serves as a springboard for multiplying through repeated adding and for further work on pattern and sequences in Number, Pattern and Calculating 3 and beyond.

Learning opportunities

• To be able to build sequences of multiples of 2, 3, 5 and 10 in order with structured apparatus and on number lines.
• To notice and explain patterns in numerals for the sequences of multiples of 2, 3, 5 and 10.
• To illustrate the same sequences of numbers with Numicon Shapes, number rods, numerals and coins, and on 0–100 Number Lines and on a 100 square.

Terms for children to use

repeat, next, predict, pattern, sequence, build, multiple, hundred square, vertically, horizontally, number line, organize, next

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion.
• Say and build the multiples of 2, 3, 5 and 10 in order with Numicon Shapes and number rods, and write the sequence in numerals.
• Say the next number when counting in multiples of 2, 3, 5 and 10.
• Connect counting 2p, 5p and 10p coins with the multiples of 2, 5 and 10.
• Explain the connection between the multiples of 5 and 10.
• Record the multiples of 5 and 10 on the 100 square.

NPC Milestone 4

• Understand connections between coin values and multiples of 10 and connect adding tens and units with structured apparatus to adding with coin values (NPC 2:4i)
• Notice and explain patterns and connections in and between the sequences of multiples of 2, 3, 5 and 10 and say the next number in the sequence (NPC 2:4k)

Explorer Progress Book 2b, pp. 12–13

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what kind of progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 6: 100 Square Patterns

After completing work on Activity 7, give children Explore More Copymaster 6: 100 Square Patterns to take home.

Focus activities

1. Multiples of 2 using 2p coins
2. Exploring multiples of 2 with Numicon Shapes
3. Exploring multiples of 2 with number rods
4. Exploring the sequence of 3s using Numicon Shapes and the Numicon 10s Number Line
5. Exploring multiples of 3 with Numicon Shapes
6. Exploring the sequence of multiples of 3 with number rods
7. Exploring the sequence of 5s using 5p coins
8. Relating the multiples of 5 to the clock face
9. Relating the sequences of 5s and 10s with Numicon Shapes
10. Relating the sequences of 5s and 10s with number rods
11. Exploring multiples of 10 on the 100 square
12. Exploring multiples of 5 on the 100 square

Calculating 7: Adding and subtracting 1-digit numbers to and from 2-digit numbers

Key mathematical ideas Adding, Subtracting, Pattern, Place value, Mathematical thinking and reasoning

Educational context

This activity group requires children to have a secure understanding of the column value and quantity value of 2-digit numbers, and also uses children's knowledge of number facts within 10, as they will need to use both to find efficient solutions to the problems in these activities. It is important for children to feel secure and to recognize what they already know so they can use their knowledge as they meet new sorts of calculating problems. In these activities, children are encouraged to use an empty number line effectively to support calculating rather than inefficiently counting in ones; to do so they will be drawing on their understanding of number relationships. Again, there are opportunities to look for and continue patterns in calculations, as well as using part-whole relationships, number facts and the inverse relationship between adding and subtracting to solve empty box problems.

Learning opportunities

• To use the facts for 10 to add and subtract 1-digit numbers to and from multiples of 10.
• To use adding and subtracting facts within 10 to find efficient solutions when adding and subtracting 1-digit numbers to and from 2-digit numbers.
• To use understanding of place value to add and subtract 1-digit numbers to and from 2-digit numbers.
• To further develop understanding of adding and subtracting in columns.

Terms for children to use

adding, subtracting, equals, multiples of 10, tens, ones, tens number, 2-digit number, difference

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion.
• Have fluent recall of adding and subtracting facts within 10 and can use these to add and subtract 1- digit numbers to and from a 2- digit number.
• Use their understanding of place value to add and subtract 1-digit numbers to and from 2-digit numbers.
• Record adding and subtracting of 1-digit numbers to and from a 2-digit number in columns.

NPC Milestone 5

• Recall known facts and place value understanding to add and subtract single digits to and from 2-digit numbers (NPC 2:5I)

Explorer Progress Book 2b, pp. 14–15

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 21: Number Triangles

After completing work on Activity 4, give children Explore More Copymaster 21: Number Triangles to take home.

Focus activities

1. Adding 1-digit numbers to reach the next multiple of 10
2. Using an empty number line for adding
3. Subtracting 1-digit numbers from a multiple of 10
4. Writing patterns when subtracting 1-digit numbers from a multiple of 10
5. Adding a 1-digit number to a 2-digit number
6. Subtracting a 1-digit number from a 2-digit number
7. Subtracting to find the difference between a 1-digit number and a 2-digit number
8. Patterns of similar calculations

Measurement 2: Introducing the 20p, 50p and £1 coins

Key mathematical ideas Money, Equivalence, Scaling

Educational context

This activity group builds on children's work with smaller coin denominations – 1p, 2p, 5p and 10p – in the Geometry, Measurement and Statistics 1 Teaching Resource Handbook and introduces them to 20p, 50p and £1 coins. The scenario of a trip to a leisure centre places the activities in a meaningful everyday context.

Children make a thorough investigation of the relative values of the different coins, using structured apparatus as needed to count to 100p in steps, find totals and explore equivalences. They reason to work out how to pay with the fewest coins and to find different combinations of coins making a given total. They encounter the important equivalence 100p = £1, and work out how many coins of each denomination are needed to make £1.

Along with this specific, practical work on money and exchange, using coins in number work – for comparing and ordering numbers, counting in multiples of 2, 5 and 10, calculating and partitioning, and so on – is a further way of promoting children's familiarity and fluency with money amounts. Activity groups in the Number, Pattern and Calculating 2 Teaching Resource Handbook regularly make use of coins alongside other structured apparatus.

Learning opportunities

- To use vocabulary related to money ('pence' and 'pounds').
- To count up to 100p in steps of 1p, 2p, 5p and 10p.
- To understand the value of 20p, 50p and £1.
- To recognize and extend patterns using coins.
- To recognize coins instantly.
- To exchange coins for more or fewer coins, making the same value.
- To find all the possible combinations of coins to make a particular amount and work towards being systematic in their approach.

Terms for children to use

money, pence (p), coin, coins, penny, pound (£), more, less, fewer, make, spend, price, cost, buy, pay, change, total, altogether

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Count in multiples of 5p and 10p to a pound.
- Make any amount using all available coins up to £1.
- Make any amount of money, using the fewest coins possible.
- Recognize double and half amounts of money, e.g. 50p and £1.
- Understand that £1 is greater than, e.g. 90 pence.
- Understand and use notation for coins, that is, pounds (£) and pence (p).
- Find several possible coin combinations for a specified amount.

GMS Milestone 2

- Identify and sort all notes and coins correctly, e.g. comparing total values of each type of coin in a purse (GMS 2:2a)
- Find all possible ways to make a given total in pence, e.g. ways to make 45p with only 5p, 10p and 20p coins (GMS 2:2b)
- Explain the relative values of notes and coins, e.g. why £1 is greater than 90p (GMS 2:2c)

Explorer Progress Book 2, pp. 10–13

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learing Log (pp.12–13) where they can reflect on the mathematics they have done so far.

Explore More Copymaster 7: Choosing Coins

After completing work on Activity 4, give children Explore More Copymaster 7: Choosing Coins to take home.

Focus activities

1. Counting in steps of 5p and 10p up to 100p
2. Introducing the 20p coin
3. Making the same total with different combinations of coins
4. Making and combining money amounts which are not multiples of 5
5. Introducing the 50p coin
6. Understanding the value of £1

Measurement 3: Introducing the £2 coin and the £5, £10 and £20 notes

Key mathematical ideas Money, Equivalence, Scaling

Educational context

In this activity group children continue their exploration of money in Measurement 2, this time to look at £2 coins and £5, £10 and £20 notes in the continued scenario of a trip to a leisure centre.

They investigate the relative value of the different coins and notes, using structured apparatus as needed to find totals and equivalences, to work out how to pay with the fewest coins and notes, and to find different combinations of coins and notes making a given total. They then move on to look at giving and getting change in more detail, calculating how much change is owed using the difference structure of subtraction. The role-play activities and practices in this group will help children recognize the relevance and importance of the money-handling skills they are learning. You might reinforce and extend this by inviting parents and carers to involve children in simple transactions when out shopping, for example by helping to calculate totals, pay and work out change.

As in Measurement 2, you can also use coins, notes and money amounts in number work, further promoting children's familiarity and fluency with handling money. Money is used in the Number, Pattern and Calculating 2 Teaching Resource Handbook as a context for learning times tables, rounding, and adding and subtracting 2-digit numbers, for example (see Calculating 9 and 13, and Numbers and the Number System 5).

Learning opportunities

- To recognize coins and notes.
- To understand the value of each coin and note up to £20.
- To exchange coins and/or notes for other coins and/or notes, making the same value.
- To solve problems about shopping including giving correct change.
- To find all the possible combinations to make a particular amount and work towards being systematic in their approach.

Terms for children to use

money, pence (p), coin, penny, pound (£), more, less, fewer, spend, price, cost, buy, sell, pay, change, total, rounding, calculate, add, subtract, half, double, most, least

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Sort and identify coins correctly.
- Know the value of £1 and £2 coins in relation to each other and to £5, £10 and £20 notes.
- Make an amount of money, up to £10, using coins and notes.
- Give change from £1 and £2 coins, and £5 and £10 notes.
- Make any amount of money, using the fewest coins possible.
- Understand the notation for pounds (£) and pence (p).
- Use the skill of rounding to calculate the approximate total amount of small items.

GMS Milestone 2

- Label amounts of money using pounds (£) or pence (p) notation, e.g. 45p or £2 (not mixed units) (GMS 2:2d)
- Round the value of small items to calculate an approximate total amount in pence (GMS 2:2e)
- Use mathematical apparatus to model and discuss simple money problems, including finding totals and giving change (GMS 2:2f)

Explorer Progress Book 2, pp. 14–15 and 31

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 8: Giving Change

After completing work on Activity 4, give children Explore More Copymaster 8: Giving Change to take home.

Focus activities

1. Understanding the value of £1 and £2 coins
2. Exchanging coins for notes
3. Understanding the value of £5 and £10 notes
4. Calculating change

Calculating 8: Introducing multiplying as repeated adding

Key mathematical ideas Adding, Multiplying, Mathematical thinking and reasoning

Educational context

This group of activities builds on the sequences of 2s, 3s, 5s and 10s explored in Pattern and Algebra 5 to introduce multiplying. The word 'times' is used initially because children will already have met it often in cases such as, 'We went to the park three times last week.' It is also used when children learn to recite multiplying tables. Teachers need also to use the word 'times' in all sorts of informal ways, e.g. 'I've noticed you have done something three times today', 'We need to eat fruit and vegetables five times a day', and in PE lessons with instructions such as, 'Run around the hall three times.' Include instructions for 'zero times' and 'one time' occasionally, as multiplying by 0 and 1 can present difficulties for some children. Children explore how repeated adding can be represented by multiplying, and meet the '×' symbol, before meeting the word 'product'. The activities help to prepare children for important links between multiplying and measures, e.g. when children are learning to tell the time, we can point out that when the minute hand goes round 3 times, 3 hours will have passed; when we record standard measures, '3 m' or '3 kg' are shorthand for '3 times a metre' or '3 lots of one metre', and '3 times a kilogram' or '3 lots of one kilogram'; later, in formal algebra, children will use the same shorthand, e.g. 2*b* meaning 2 x *b*, or 2 'lots' of *b*.

Learning opportunities

- To understand that 'times' means how often an object or action is repeated.
- To understand that multiplying is calculating we do instead of repeated adding.
- To learn that the '×' symbol is called the 'multiplying sign' (or 'multiplying symbol').
- To learn that, when we multiply, the outcome is called the 'product'.
- To make connections between counting in steps of 2, 3, 5 and 10 and multiplying.

Terms for children to use

add/adding, times, 'how many times?', repeat, group, set, sign, symbol, multiply/multiplying, lots of, total, altogether, product

Assessment opportunities

Look and listen for children who:
- Use the terms for children to use effectively in discussion.
- Make the connection between repeated adding and multiplying, and who can explain that multiplying is what we do instead of repeated adding.
- Explain e.g. '2 times the 5- shape/rod' as 2 lots of 5 and record it as '2 × 5'.
- Connect the sequences of 2s, 3s, 5s and 10s with multiplying by 2, 3, 5 and 10.
- Read and write multiplying number sentences.
- Respond to and use the word 'product' to describe the outcome of multiplying.
- Know when to calculate.

NPC Milestone 5

- Understand that multiplying is a form of calculating used instead of repeated adding (NPC 2:5f)
- Know that 'times' means how often an object or action is repeated and that the '×' symbol is conventionally called the multiplying sign (or symbol) (NPC 2:5g)
- Read and write multiplying sentences using the '×' symbol and understand and use the word 'product' (NPC 2:5h)

Explorer Progress Book 2b, pp. 16–17

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 22: How Many Times?

After completing work on Activity 8, give children Explore More Copymaster 22: How Many Times? to take home.

Focus activities

1. Introducing the word 'times' with repeated adding
2. Repeating actions a number of 'times' in PE
3. Using the word 'times' with repeated Numicon Shapes
4. Introducing the '×' symbol with the sequence of 2s
5. Finding products with the sequence of 2s
6. Using the '×' symbol and finding products with the sequence of 3s
7. Using the '×' symbol and finding products with the sequence of 5s
8. Using the '×' symbol and finding products with the sequence of 10s

Calculating 9: Learning times tables and about multiplying through arrays

Key mathematical ideas Multiplying, Equivalence, Mathematical thinking and reasoning

Educational context

This activity group builds on the introduction to the repeated adding structure of multiplying introduced in Number, Pattern and Calculating 2, Calculating 8, with the emphasis on helping children to develop recall of the 2, 3, 5 and 10 times tables. The remaining activities look at the commutative property of multiplying in a money context and then at the array as a model for multiplying. The space travel context is continued with children building arrays to find how seats could be arranged in moon buggies using the familiar multiples of 2, 3, 5 and 10. Children then write two number sentences for each array to encourage understanding of the commutative property of multiplying.

Learning opportunities

- To begin to develop recall of the 2, 3, 5 and 10 times tables.
- To realize that multiplying can be represented by building arrays.
- To understand that multiplying has a commutative property.

Terms for children to use

array, product, multiplying sentence, commutative property, balances, equal, equivalent, equation, times table, multiplication table

Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Recall some multiplying facts from 2, 3, 5 and 10 times tables.
- Work in an organized way to build arrays.
- Describe an array with two multiplying sentences.
- Derive a corresponding commutative fact when given a multiplying sentence.

NPC Milestone 5

- Recall multiplying facts from 2, 3, 5 and 10 times tables (NPC 2:5i)
- Derive a commutative fact from a multiplying sentence (NPC 2:5j)

Explorer Progress Book 2b, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 23: Times Table Lotto

After completing work on Activity 6, give children Explore More Copymaster 23: Times Table Lotto to take home.

Focus activities

1. Using '× 2', '× 5' and '× 10' to calculate amounts of money with 2p, 5p and 10p coins
2. Understanding the term 'times tables'
3. Writing the 10 times table
4. Writing the 2 times table
5. Writing the 3 times table
6. Writing the 5 times table
7. Beginning to notice that multiplying is commutative using money
8. Making arrays for 6 noticing the commutative property of multiplying
9. Making arrays for 10

Numbers and the Number System 5: Rounding

Key mathematical ideas Counting, Pattern, Mathematical thinking and reasoning

Educational context

In this activity group, children are introduced to rounding through estimation and continue working on the concept of being 'near' a target number. They then investigate how near a number is to a target using adding or subtracting and number lines; they explore the concept of 'halfway'. This preparation allows children to be introduced to the rules of rounding; when to round up and when to round down. In later activities they are given a basic introduction to situations in which rounding might be useful. The activities bring together children's understanding of the structure and relationships between multiples of 10 and other numbers. We often need to use rounding in everyday life, particularly when shopping, e.g. to decide whether to offer a £5 note or £10 note when paying for something. Rounding is also useful in calculating, both when estimating the range of numbers within which a total is likely to fall and when deciding which calculating strategy to use.

Learning opportunities

- To compare and order numbers to 100.
- To be able to round any 2-digit number to the nearest multiple of 10.
- To continue to develop understanding of the place value system for naming numbers.

Terms for children to use

estimate, guess, about, nearly, closer, exactly, tens, ones, more, less, between, nearer to, lower, higher, compare, round to, round up, round down, previous, almost, because, halfway between

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Use strategies for finding numbers on the number line.
- Are able to explain relationships between the positions of numbers on the number line.
- Can make comparisons between numbers in the range 0–100.
- Know the previous and next multiples of 10 confidently.
- Round any 2-digit number to the nearest multiple of 10.

NPC Milestone 5

- Round any 2-digit number to the nearest multiple of 10 (NPC 2:5a)
- Explain relationships between the positions of numbers on the number line and positions of numbers on a 100 square (NPC 2:5b)
- Make comparisons between numbers in the range 0 to 100 (NPC 2:5c)

Explorer Progress Book 2b, pp. 20–23

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learning Log (pp. 22–23) where they can reflect on the mathematics they have done so far.

Explore More Copymaster 13: Rounding

After completing work on Activity 7, give children Explore More Copymaster 13: Rounding to take home.

Focus activities

1. Understanding 'nearly'
2. Nearest to 10
3. Estimating how many objects
4. Finding halfway between in PE
5. Finding halfway between multiples of 10
6. Introducing rounding to the nearest multiple of 10
7. Rounding to the nearest multiple of 10

Calculating 10: Mental strategies for near doubles and adding and subtracting 9

Key mathematical ideas Adding, Subtracting, Pattern, Mathematical thinking and reasoning

Educational context

This activity group continues to develop work on doubles and related subtracting (halving) facts from Number, Pattern and Calculating 1, Calculating 5, Activities 3–6, and the relationship between doubling and halving. The activities then move on to develop the calculating strategies of using near doubles, and adjusting (compensating) when adding and subtracting 9, giving the opportunity to extend this with higher numbers. An important emphasis is put on children considering what they know before they tackle a problem. Children are also encouraged to look carefully at the numbers involved in a calculation, and use what they recognize in the relationships between the numbers to think flexibly and decide whether the numbers could be adjusted to make the calculation easier.

Learning opportunities

- To know doubles of each number to 10 and to derive related subtracting facts.
- To understand the inverse relationship between doubling and halving.
- To know how to adjust calculations and compensate when adding and subtracting 9.
- To use inverse relationships to work efficiently.

Terms for children to use

adding, subtracting, equals, tens, ones, double(s),double facts, halve(s), half, part, whole, inverse, adjust, one more, one less

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Have recall of double facts for each number to 10.
- Derive the related subtracting fact from their knowledge of a double.
- Solve a near double problem because they know the double fact.
- Add 9 by adding 10 and subtracting 1.
- Subtract 9 by subtracting 10 and adding 1.
- Know when to use the relationship between 9 and 10 to add and subtract.
- Work systematically.
- Calculate double facts for higher numbers.

NPC Milestone 5

- Know doubles of each number to 10 and derive related subtracting facts (NPC 2:5d)
- Know how to adjust calculations and compensate when adding and subtracting 9 and when to use this relationship (NPC 2:5e)
- Explain the inverse relationship between doubling and halving (NPC 2:5k)

Explorer Progress Book 2c, pp. 2–3

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 24: Number Jungle

After completing work on Activity 8, give children Explore More Copymaster 24: Number Jungle to take home.

Focus activities

1. Doubles
2. Subtracting from a double
3. Parts and wholes with doubles
4. Doubling higher numbers
5. Halving higher numbers
6. Relating ‘near doubles’ to doubles
7. Adding 9 to a 1-digit number
8. Adding 9 to a 2-digit number
9. Subtracting 9 from a teen number
10. Subtracting 9 from a 2-digit number
11. Adjusting higher numbers

Calculating 11: Bridging through multiples of 10

Key mathematical ideas Adding, Subtracting, Place value, Pattern, Mathematical thinking and reasoning

Educational context

This activity group explores what happens when adding and subtracting calculations involve crossing multiples of 10. Children will be using their understanding of adding, subtracting and place value and knowledge of adding and subtracting facts for all numbers to 10. The bridging process is such a useful and widely used strategy in mental calculating that teachers should take the opportunity to model the different steps in the process with Numicon Shapes and number rods before moving on to modelling the steps on an empty number line. The use of Numicon Shapes, Numicon Shape patterns and number rods to illustrate their bridging calculations enables children to calculate without counting in ones. Once they are familiar with the bridging process, the imagery of the Numicon Shapes and number rods can be a helpful stepping stone for children, giving them confidence to begin to work mentally.

Learning opportunities

• To recognize that multiples of 10 are useful landmarks on the number line when calculating.
• To realize that knowing adding and subtracting facts for numbers to 10 helps when adding or subtracting numbers greater than 10.
• To learn how to bridge through a multiple of 10 when adding or subtracting.

Terms for children to use

add/adding, subtract/subtracting, equals, tens, whole tens, tens number, multiples of 10, completing a multiple of 10, reaching a multiple of 10, 'bridging a multiple of 10', adjust, ones

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion.
• Are adding and subtracting without resorting to counting in ones.
• Have fluent recall of adding and subtracting facts within 10 and can use these facts when calculating.
• Are using the inverse relationship with adding to solve subtracting questions.
• Realize some problems cannot be solved by recalling the answer and understand that sometimes there are several steps involved.

NPC Milestone 6

• Bridge through a multiple of 10 when adding or subtracting and explain how this was done, in two steps using adding and subtracting facts (NPC 2:6a)

Explorer Progress Book 2c, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 25: Vegetable Patch

After completing work on Activity 4, give children Explore More Copymaster 25: Vegetable Patch to take home.

Focus activities

1. Adding two 1-digit numbers and bridging 10
2. Subtracting a 1-digit number from a teen number and bridging 10
3. Adding and bridging through multiples of 10
4. Subtracting and bridging through multiples of 10
5. Using an empty number line

Geometry 4: Recognizing and naming prisms and cylinders

Key mathematical ideas Describing parts and properties of shapes invariant under transformations, Classifying shapes, Equivalence

Educational context

In this activity group children continue the exploration of the parts and properties of flat 2D shapes and solid 3D shapes they began in Geometry 1 and 2, building on their understanding of the connections and distinctions between shapes in two and three dimensions to distinguish, understand, classify and name prisms and cylinders.

They investigate cubes, cuboids and triangular, pentagonal, hexagonal and octagonal prisms using a variety of resources and contexts, and compare them to non-prisms such as cones, spheres and pyramids. They are introduced to the idea of cross-section and use this to help them to recognize prisms and sort them from other 3D shapes, naming them according to their cross-sectional polygonal shape. They also consider the particular case of the cylinder, which shares some similarities with prisms, its cross-section being the same all the way through, determining that it is not called a prism because it does not have polygonal faces.

The emphasis here is on developing children's 'mental geometry', encouraging them to visualize shapes and three-dimensional transformations by, for example, thinking about how best to pack prisms into a given space, imagining how a cylinder looks from inside, or predicting the 2D shapes that can be printed using the faces of a particular prism. This lays the foundations for later work, for example on the 'nets' of 3D shapes, by encouraging children to generalize and reason logically about shape and space.

As ever, children's communicating is key. Encourage them to talk, define and reason about what they are doing and seeing, and guide them into the habit of using terms correctly – for example 'edge' for 3D shapes and 'side' for 2D shapes, and 'face' and 'surface' for flat and curved surfaces, respectively.

Learning opportunities

- To recognize the cross-sectional shape of a prism and so name it as e.g. a triangular prism.
- To visualize a prism from a description.
- To use terms like 'face', 'edge' and 'cross-section' to describe a prism.
- To understand the similarities and differences between cylinders and prisms.
- To use a table to organize information.

Terms for children to use

prism, cross-section, face, surface, edge, vertex, vertices, side, square prism, cube, cuboid, cylinder, cone, sphere, curved, round, circular, flat, straight, square

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Describe and recognize a prism.
- Identify the cross-sectional shape of a prism.
- Identify and name prisms in their everyday environment.
- Sort prisms from a collection of solid geometric 3D shapes and real-life objects.
- Recognize a cube as a prism because of its square cross-section.
- Recognize oblong and square prisms as cuboids.
- Can read, organize and record data in a table.

GMS Milestone 3

- Identify the 2D cross-sectional shape of cylinders and prisms, and name prisms e.g. triangular prism, cuboid (GMS 2:3a)
- Discuss similarities and differences between cylinders and prisms, and know that prisms have only flat faces (GMS 2:3b)
- Recognize prisms and cylinders in the everyday environment, and consider the properties that make these shapes useful (GMS 2:3c)
- Investigate the faces of different prisms, and discuss how the number of faces relates to the cross-sectional shape (GMS 2:3d)

Explorer Progress Book 2, pp. 16–17

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 4: Prisms

After completing work on Activity 4, give children Explore More Copymaster 4: Prisms to take home.

Focus activities

1. Investigating the solid 3D shapes of real-life objects
2. Visualizing and exploring the parts and properties of prisms
3. Investigating cross-sectional shapes and naming prisms
4. Investigating the faces of a prism

Calculating 12: Adding three or more 1-digit numbers

Key mathematical ideas Adding, Pattern, Mathematical thinking and reasoning

Educational context

This activity group gives children opportunities to consider different ways of adding three or more 1- digit numbers and strategies that might be helpful. The strategies involve mental recall of number bonds, particularly adding facts for numbers to 10 and double facts. They give opportunities for children to adjust numbers and be flexible when adding. The activities in this group include looking at the commutative property of adding and, in particular, calculations involving more than three numbers. Some of the activities provide the opportunity to be systematic in finding all possibilities within a situation.

Learning opportunities

- To add more than two numbers together without counting in ones.
- To experience situations when it is useful to use adding facts for numbers to 10 and double facts.
- To use a wide range of strategies when adding at least three numbers that total 20 or less.
- To know that numbers can be added in any order and the total remains the same.
- To write a list of numbers in columns and show understanding of the importance of keeping the tens and ones in the correct columns.

Terms for children to use

combine, add/adding, plus, total, equals, number/adding facts, pattern, combination, adjust, score, possibilities, order, whole ten, double

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Have recall of number facts to 10 and who know when to use these to help with adding problems.
- Have recall of doubles of numbers 1–10 and know when to use these to help with adding problems.
- Explain that numbers can be added in any order and the total remains the same.
- Choose strategically which pair of numbers to add first.
- Calculate rather than count in ones to find a total.
- Understand that the tens and ones must be in the correct columns when writing column additions.

NPC Milestone 6

- Use a range of strategies when adding at least three numbers that total less than 20, looking for relationships between numbers, to help decide the most efficient method for calculating (NPC 2:6b)
- Calculate rather than count in ones to find a total (NPC 2:6c)

Explorer Progress Book 2c, pp. 6–7

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 26: Adding ‘T’

After completing work on Activity 1, give children Explore More Copymaster 26: Adding ‘T’ to take home.

Focus activities

1. Adding three 1-digit numbers
2. Using a tens and ones frame for adding
3. Finding three Numicon Shapes or number rods for a given total and using the commutative property of adding
4. Using adding facts to 10 to add without counting
5. Shopping with 20p
6. Finding totals with money
7. More totals with money
8. Finding totals with five or more Numicon Shapes or number rods
9. Scoring 20

Calculating 13: Adding and subtracting 2-digit numbers to 100

Key mathematical ideas Adding, Subtracting, Place value, Mathematical thinking and reasoning

Educational context

There are ten activities in this group in order to give children opportunities to use and apply their knowledge of adding and subtracting structures when solving adding and subtracting problems using two 2-digit numbers. These activities now include the inverse of adding structure for subtracting in contexts of giving change and finding a missing number. Though the activities do not involve crossing multiples of 10, they are challenging and are a further important stage in children's growing ability to calculate efficiently. Solving the problems posed in the activities often involves taking two steps, and these are illustrated with Shapes, rods and empty number lines, not as simply methods to find answers but to support children as they think through the problem, drawing on what they know already that will help them. In this work, children will use their fluency with adding and subtracting facts, their earlier work in Number, Pattern and Calculating 2, Calculating 4 and 6, and their earlier work on place value and partitioning. They will also need to have secure understanding of numbers in terms of their quantity and column value. This activity group may take longer than a week to complete.

Learning opportunities

- To learn that looking at relationships between numbers being added or subtracted helps us to decide the most efficient method for calculating.
- To use understanding of place value and partitioning to add or subtract higher numbers up to 100.
- To use knowledge of number facts to 10 to add or subtract multiples of 10 to or from a 2-digit number.
- To use knowledge of number facts to 10 to add or subtract 2-digit numbers to or from 2-digit numbers without crossing a multiple of 10.
- To know when it is helpful to write adding and subtracting sentences in columns.

Terms for children to use

add/adding, subtract/subtracting, equals, tens, whole tens, tens numbers, multiples of 10, ones, combining, partitioning, empty box, 'how many more?', 'how many less?'

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Have fluent recall of adding and subtracting facts within 10 and can use these when adding and subtracting higher numbers.
- Use partitioning into quantity and column values when adding and subtracting 2-digit numbers.
- Communicate effectively about different strategies they use for calculating.
- Write additions and subtractions in columns when it supports the mental strategy for finding the answer.

NPC Milestone 6

- Explain that they use adding and subtracting facts within 10 and understanding of place value to find efficient solutions when adding and subtracting multiples of 10 and 1-digit numbers to and from 2-digit numbers (without crossing multiples of 10) (NPC 2:6d)
- Use knowledge of facts within 10 to add and subtract 2-digit numbers to and from 2-digit numbers without bridging a multiple of 10 (NPC 2:6e)
- Confidently use different strategies for calculating and communicate effectively about them (NPC 2:6f)

Explorer Progress Book 2c, pp. 8–9

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 27: Snack Time

After completing work on Activity 3, give children Explore More Copymaster 27: Snack Time to take home.

Focus activities

1. Adding multiples of 10 to 2-digit numbers
2. Subtracting multiples of 10 from 2-digit numbers
3. Using the 100 square when adding or subtracting multiples of 10 to or from 2-digit numbers
4. Finding the difference and 'how many more?' between 2-digit numbers and multiples of 10
5. 2-digit numbers added to 2-digit numbers without bridging a multiple of 10
6. 2-digit numbers subtracted from 2-digit numbers without bridging a multiple of 10
7. Finding the difference and consolidating 'how many more/less?' between two 2-digit numbers in the same decade
8. How many more to 100?
9. Equivalent coins
10. Finding change from £1

Measurement 4: Introducing metres

Key mathematical ideas Length, Equivalence, Standard units

Educational context

In these activities children build on their work in Measurement 1 to explore further contexts and problems involving measurement of length in centimetres, and they begin to use metres as a standard unit of length suitable for measuring larger objects and longer distances.
They begin by revisiting the idea (first encountered in the Geometry, Measurement and Statistics 1 Teaching Resource Handbook) that a variety of terms can be used to refer to length (or 'linear extension') in different contexts, including 'length', 'width', 'height', 'depth' and 'distance'. They use this to help them to record the various dimensions of books, to help solve a librarian's storage problem.
Metres, the abbreviation 'm' and metre rulers as standardized measuring instruments are introduced in the context of measuring a person's height. As part of this task, children investigate the relationship between metres and centimetres to discover the equivalence 100 cm = 1 m, and begin to use mixed units, e.g. '1 m 16 cm', as they become useful. Make sure, in this respect, that children understand metres and centimetres as distinct units – as separate categories – for example that 1 m and 16 cm cannot be added to make 17 of anything.

Learning opportunities

- To compare two lengths using <, > and = symbols; and to compare and order more than two lengths.
- To choose centimetres and/or metres, as appropriate, to estimate and measure length.
- To choose an appropriate measuring instrument for measuring a length.
- To estimate lengths in centimetres or metres.
- To measure in centimetres, metres, or metres and centimetres.
- To collect and record simple data.

Terms for children to use

length, width, height, depth, thickness, distance, dimension, compare, longer, longest, shorter, shortest, wider, widest, deeper, deepest, thicker, thickest, centimetre (cm), metre (m), align, together, same, different, straight, bar chart

Assessment opportunities

Look and listen for children who:
- Use the terms for children to use effectively.
- Choose an appropriate instrument for measuring length.
- Choose appropriately whether to measure length in centimetres or metres.
- Recognize the main factors affecting accuracy of measurements of length, e.g. whether measurement is in a straight line. Check accuracy by, e.g. repeating measurements.
- Can construct a table and use it to record data independently.
- Can read, interpret and compare data presented in a table.

GMS Milestone 3

- Use measurement vocabulary to describe the different dimensions of objects, e.g. length, height, width (GMS 2:3e)
- Choose appropriate units and measure accurately in cm, m, or m and cm (GMS 2:3f)

Explorer Progress Book 2, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 9: Measuring Shapes

After completing work on Activity 2, give children Explore More Copymaster 9: Measuring Shapes to take home.

Focus activities

1. Comparing length, width and height
2. Estimating, comparing and measuring lengths in centimetres
3. Introducing metres
4. Measuring in metres and centimetres

Calculating 14: Adding and subtracting to 20

Key mathematical ideas Adding, Subtracting, Place value, Pattern, Mathematical thinking and reasoning

Educational context

This activity group applies children's knowledge of adding and subtracting facts for numbers to 10 to build their understanding and fluency when adding and subtracting to 20. Adding and subtracting facts for 14 are considered in detail including work using empty box notation (Activities 1–4 and Independent practice). These should be used as a guide for work with facts for 13, 15, 16, 17, 18 and 19 (11 and 12 are covered in Number, Pattern and Calculating 1, Calculating 8, but some children may need to revise facts for 11 and 12 by using these activities). Facts for 20 are covered in Activities 6 and 7. Opportunities are also given for children to look closely at facts for other numbers and to consider how to use facts they know strategically when solving problems. Children's work should be supported with Numicon Shapes or number rods, to encourage them to calculate mentally. Effective use of an empty number line depends upon children understanding relationships between numbers; at this stage it is used to illustrate children's calculating ideas. Some children may need longer than a week to complete all of the activities. (If children need help to see the 'teen' numbers as 'whole numbers', grey Numicon Shapes can be used; alternatively the component Shapes or rods can be stuck together with adhesive tack.)

Learning opportunities

- To develop fluent recall of adding and subtracting facts to 20 and to use efficient strategies to calculate those not known.
- To use adding and subtracting facts to 10 to find efficient solutions when adding and subtracting to 20.
- To become more confident about using different strategies to solve adding and subtracting problems.
- To use an empty number line to illustrate calculating with shapes and/or to show mental calculating.

Terms for children to use

add/adding, subtract/subtracting, take away, minus, difference, different, similar, equals, tens, ones, bridging, adjusting

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Have fluent recall of adding and subtracting facts to 10 and can use these when adding and subtracting to 20.
- Work in an organized way to show adding or subtracting facts in a logical order, both when illustrating them with apparatus and when writing them down.
- Choose for themselves different strategies to solve adding and subtracting problems.
- Know that there can often be several ways to reach a solution.
- Illustrate their calculating on an empty number line.
- Are beginning to have fluent recall of adding and subtracting facts to 20.

NPC Milestone 6

- Recall adding and subtracting facts within 20 fluently and use efficient strategies to calculate those not known (NPC 2:6g)

Explorer Progress Book 2c, pp. 10–11

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 28: Falling Leaves

After completing work on Activity 5, give children Explore More Copymaster 28: Falling Leaves to take home.

Focus activities

1. Investigating adding facts for 14
2. Solving adding facts for 14
3. Subtracting facts for 14 using the inverse of adding
4. Empty box notation and using empty number lines
5. Working with numbers 13, 15, 16, 17, 18 and 19
6. Adding facts for 20
7. Subtracting facts for 20 using the inverse of adding
8. Solving empty box problems about 20
9. Change from 20p

Calculating 15: Introducing dividing as ‘How many … in …?’

Key mathematical ideas Dividing, Grouping structure, Inverse, Multiplying, Mathematical thinking and reasoning

Educational context

This activity group introduces division as the inverse of multiplying, building on previous work on patterns and sequences (Pattern and Algebra 5) and on multiplying (Calculating 8 and 9). The activities use the same space travel context as was introduced in Calculating 8. The inverse relation between multiplying and dividing is introduced to help children see that, whereas when we are multiplying we build products by putting equal groups together, when dividing we ‘undo’ this. This grouping structure of dividing is sometimes called the quotition structure. The dividing symbol is introduced in Activity 2, and throughout all the activities there are many opportunities for conversations involving the specific language for dividing. This activity group prepares children for meeting remainders and the sharing structure for dividing in Number, Pattern and Calculating 3. Children will need plenty of practice to build their confidence and understanding of the difficult language of dividing.

Learning opportunities

• To begin to understand dividing as finding ‘how many groups are there in … ?’
• To realize that there is an inverse relation between multiplying and dividing.
• To realize that knowing multiplying tables can help with finding solutions to dividing problems.
• To learn an action sign for dividing and to read and write the ‘÷’ symbol.
• To begin to realize that dividing can be useful for finding out how many of something we can afford to buy.

Terms for children to use

multiplying fact, inverse, connection, product, ‘dividing … into … ’, ‘How many groups of … in … ?’, ‘How many … in … ?’

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion.
• Explain multiplying as putting lots of equal groups together and dividing as undoing this by breaking the product up into equal-sized groups or parts.
• Use the inverse relationship between multiplying and dividing to help them think about dividing questions.
• Recognize that dividing can be expressed in different words, e.g. ‘by’, ‘how many … in?’, ‘divided into’.
• Use their knowledge of the 2s, 3s, 5s and 10s sequences to model their working on number lines.
• Are able to read and write dividing sentences to express their solutions.

NPC Milestone 7

• Recognize that dividing can be expressed as finding ‘how many groups are there in … ?’ and read and write dividing number sentences using the ‘÷’ symbol (NPC 2:7c)
• Explain and use the inverse relation between multiplying and dividing (with the sequences of 2s, 3s, 5s and 10s) (NPC 2:7d)
• Interpret a realistic context as one inviting either ‘multiplying’ or ‘dividing’ (NPC 2:7e)
• Know that multiplying has a commutative property (and dividing does not) and use this to help when solving dividing questions (NPC 2:7f)

Explorer Progress Book 2c, pp. 12–13

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 29: Dividing Problems

After completing work on Activity 7, give children Explore More Copymaster 29: Dividing Problems to take home.

Focus activities

1. Exploring ‘how many … in … ?’ with sequences of 5s, 2s, 3s and 10s
2. Introducing the dividing symbol
3. Using the inverse relationship between multiplying and dividing with the 10s sequence
4. Using the inverse relationship between multiplying and dividing with the 5s sequence
5. Using inverse to solve empty box multiplying number sentences
6. Working with 10p coins, finding ‘how many tens in … ?’
7. Working with 5p coins, finding ‘how many fives in … ?’

Pattern and Algebra 6: Logic

Key mathematical ideas Pattern, Mathematical thinking and reasoning

Educational context

This activity group gives children the opportunity to develop a logical approach to solving problems. Seeing the importance of being systematic and learning to work in an organized way are helpful life skills as well as important tools for solving mathematical problems. The group begins with activities to help children understand the attributes of the universal sets they will be using. It then revises work on sets, including 'not' sets, and the importance of knowing rules for sets and following them consistently (from Number, Pattern and Calculating 1, Pattern and Algebra 4). Children are then introduced to different diagrams (Venn, Carroll and tree) for sorting, first by one attribute and then by two. They will also benefit from developing this idea in other curriculum areas, e.g. science. They progress from sorting bricks to sorting numbers according to mathematical attributes. This activity group also gives children the opportunity to develop a logical approach to solving problems with number ideas and to consider whether a set is complete. You may decide to use the ideas from Activity 11, on creating structured sets, and Activities 12–14, on sorting number ideas, at different times. This activity group differs from most of the others in that there are no separate independent practice activities; after the focus activities have been introduced, children will need time to practise the sorting activities independently. Since almost all classrooms have them, the majority of the activities are based around using at least one structured universal set of 36 interlocking toy building bricks. A suggested set would include sets of bricks that have: 4, 6 and 8 bumps; two thicknesses – thin and thick; a single row of bumps and a double row of bumps; and at least three different colours, e.g. red, yellow and blue.

Learning opportunities

- To describe objects and numbers according to their attributes.
- To learn how to use those attributes to help solve problems.
- To look for patterns and notice that it is easier to spot them when work is organized systematically.

Terms for children to use

pattern, similar, the same, different, organize, systematic, attribute, group, set, 'not' set, subset, thin, thick, large, small, double, single, rule, because, cannot be, always, belong, is part of, sometimes, never, 'it could be … because …', 'it could not be … because …'

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively in discussion.
- Recognize that it is important to be well organized and to work systematically.
- Make a general statement after they have noticed something regularly happening.
- Develop their own ways of recording systematically and also use conventional organizations, e.g. an ordered list or table.
- Are beginning to understand a general statement and can find particular examples to fit a rule.

NPC Milestone 7

- Describe objects and number ideas according to their attributes and use these to help solve problems (NPC 2:7a)
- Understand a general statement and find particular examples to fit the rule (NPC 2:7b)

Explorer Progress Book 2c, pp. 14–15

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 7: Sorting Numbers

After completing work on Activity 13, give children Explore More Copymaster 7: Sorting Numbers to take home.

Focus activities

1. Using attributes to identify a specific brick
2. Playing a 'one difference' game
3. Playing a 'gatekeeper' game (sorting by one attribute)
4. Venn diagrams and the 'not' set
5. Introducing a Carroll diagram
6. Tree diagrams
7. Sorting the bricks into intersecting sets
8. Carroll diagrams with two attributes
9. Tree diagrams with two attributes
10. Using a grid or table to organize sets
11. Creating structured sets (optional, as you will need a set of sorting apparatus)
12. Attributes of numbers
13. Sorting numbers into sets on diagrams
14. A complete set of numbers?

Calculating 16: Halves, quarters and thirds of wholes

Key mathematical ideas Fractions as operators, Multiplying, Dividing, Equivalence, Mathematical thinking and reasoning

Educational context

In these activities, earlier work on halving and quartering shapes (Number, Pattern and Calculating 1, Calculating 5) and dividing (Number, Pattern and Calculating 2, Calculating 15) is extended. Children are encouraged to make connections between dividing and fractions and to begin to generalize that dividing by two equates to finding half. Connections are also made between the dividing symbol and fraction notation.

Work on finding half and quarters is now extended to include thirds, building on earlier work on the 3s sequence (Pattern and Algebra 5), multiplying by 3 (Calculating 8) and dividing by 3 (Calculating 15). The use of number rods is recommended for this work rather than Numicon Shapes, as the equal parts to whole relationships are more easily seen with number rods.

Children also meet the idea that the size of the parts is proportional to the size of the whole, and that $\frac{1}{2}$ is equivalent to $\frac{2}{4}$. These ideas of proportionality and equivalence in the context of fractions are very challenging and the work in this activity group lays the foundations for children's further work on fractions in Number, Pattern and Calculating 3 and beyond. Therefore it is important to give all children time to assimilate these ideas and to bear in mind that children who are secure in relationships between whole numbers will be better able to meet these challenges with confidence.

Learning opportunities

- To generalize that two equal halves are equivalent to one whole shape, and to four equal quarters, whatever the size of the whole shape.
- To connect dividing into two parts with finding half.
- To understand that $\frac{2}{4}$ denotes 2 of 4 equal parts and that this is equivalent to $\frac{1}{2}$.
- To understand that three quarters denotes 3 of 4 equal parts.
- To connect finding $\frac{1}{3}$ with dividing into three equal parts.
- To read and write $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{3}$.

Terms for children to use

part, whole, equal, halve, half, quarter, third, equal size, equal amount, ' … is one half of … ', 'one half of … is … ', '… is one quarter of …', 'one quarter of … is …', '… is one third of …', one third of … is …', divide into, share between, 'divide into equal parts'

Assessment opportunities

Look and listen for children who can:

- Use the terms for children to use effectively.
- Explain in their own way that when a whole is split into equal parts, the absolute size of the parts depends upon the size of the whole.
- Find a quarter of a shape by halving and halving again.
- Explain the connection between dividing by two and finding half.
- Explain the equivalence between $\frac{1}{2}$ and $\frac{2}{4}$.
- Explain connections between the dividing symbol '÷' and fraction notation.
- Read and write $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{3}$.
- Explain the connection between dividing by three and finding thirds.

NPC Milestone 7

- Know that 'one quarter' means one of four equal parts of a whole and 'one third' means one of three equal parts (NPC 2:7h)
- Explain the equivalence between $\frac{1}{2}$ and $\frac{2}{4}$ (NPC 2:7j)
- Understand $\frac{3}{4}$ as three of four equal parts (NPC 2:7k)

Explorer Progress Book 2c, pp. 16–17

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 30: Colouring Flags

After completing work on Activity 2, give children Explore More Copymaster 30: Colouring Flags to take home.

Focus activities

1. Understanding fractions of a whole
2. Understanding fractions of shapes
3. Relating dividing by two to finding half
4. Explaining fraction notation
5. Finding thirds and meeting $\frac{1}{3}$ notation
6. Finding quarters and generalizing to $\frac{1}{4}$ notation
7. Thinking about $\frac{3}{4}$

Pattern and Algebra 7: Finding all possibilities

Key mathematical ideas Adding, Subtracting, Mathematical thinking and reasoning

Educational context

The activities in this group are all about problem solving. They give children opportunities to find out that, when working on a problem, it is easier to keep track of the possibilities tried if work is organized in some sort of system. Children will also need to reason logically as they explain the system they have used, and to check they have found all the possibilities. The activities all use small numbers and simple adding and subtracting facts, so children can concentrate on reasoning and develop their systematic working. Using small numbers also limits the number of possibilities involved so that children can see the investigations through to a satisfactory conclusion. This activity group differs from most of the others in that there are no separate independent practice activities; after the focus activities have been introduced, children will need time to continue the investigations independently. Some children will extend the investigations to find all possibilities, others will find some possibilities. Children's individual responses and explanations will give teachers insight into their reasoning and how far they are thinking mathematically.

Learning opportunities

• To realize that, when finding all possibilities, it is helpful to have a system.
• To devise a system in order to keep track of the possibilities that have been tried, and to establish that all possibilities have been found.
• To be able to explain the system that has been followed to order an investigation.

Terms for children to use

investigate, find out, combinations, all possibilities, 'all the ways', organize, system, systematically, prove, 'keep track of', table, 'I know because … so …'.

Assessment opportunities

Look and listen for children who:
• Use the terms for children to use effectively in discussion.
• Discuss and plan how to start their investigation.
• Reason that it is helpful to organize their work systematically so they know they have found all possibilities.
• Develop their own ways of recording systematically.
• Check their results.

NPC Milestone 7

• Devise ways of organizing and recording their work systematically, when finding all possibilities and explain how they know they have found all possibilities (NPC 2:7g)

Explorer Progress Book 2c, pp. 18–19

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 8: Ice Cream Cone

After completing work on Activity 6, give children Explore More Copymaster 8: Ice Cream Cone to take home.

Focus activities

1. Finding possible combinations of two numbers equalling 10
2. Exploring possible adding and subtracting facts
3. Finding all possible ways of making 5 with numbers 1–5
4. Finding all possibilities when working with 4
5. How many different ways can you pay for something that costs 10 p or £1?
6. Finding possibilities – pirate costumes
7. Finding all possibilities with a set of Numicon Shapes 1–4

Numbers and the Number System 6: Introducing fractions as numbers

Key mathematical ideas Fractions as numbers, Mathematical thinking and reasoning

Educational context

In this activity group, children will be building on earlier work on fractions as operators (Number, Pattern and Calculating 2, Calculating 16), where they investigated relationships between one unit or whole and its equal parts (halves and quarters) and found equivalences in terms of equal parts of shapes and quantities. They now meet fractions as numbers, placing them on the continuous length of the number line and, in an everyday context, labelling distances travelled using fraction notation, e.g. quarter of the way, halfway, three quarters of the way, etc. In this way, they are supported to read, write, order and count in fractions. In Number, Pattern and Calculating 2, children meet some very challenging ideas involved with fractions for the first time. It is helpful to continue to bear in mind that children who are secure in relationships between whole numbers will be better able to meet these challenges with confidence and that all children will need time to assimilate the ideas they are meeting in this activity group. When children are working on number lines it is important to model its continuity by extending it beyond 0 to the left, and to the right beyond the last number shown. It is for this reason that all the Numicon Number Lines are extended in this way.

Learning opportunities

- To meet the idea that fractions have places on the number line between whole numbers (integers).
- To relate halving and quartering to distances travelled on a number line.
- To use fraction notation to label distances along a number line from zero.

Terms for children to use

half, quarter, three quarters, quarter of the way, halfway, three quarters of the way, parts, whole, fraction, 'one of four equal parts', 'one of two equal parts', along

Assessment opportunities

Look and listen for children who can:
- Use the terms for children to use effectively.
- Explain where to mark halves and quarters on a number line and can do this consistently.
- Count on and back in fractions of halves to 10.
- Count on and back in fractions of quarters and halves to 10.

NPC Milestone 7

- Recognize, find, read and write $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$ and $\frac{3}{4}$, and explain that fractions are between whole numbers on the number line (NPC 2:7i)

Explorer Progress Book 2c, pp. 20–23

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learning Log (pp. 22–23) where they can reflect on the mathematics they have done so far.

Explore More Copymaster 14: School Bus

After completing work on Activity 2, give children Explore More Copymaster 14: School Bus to take home.

Focus activities

1. Thinking about 'halfway' and 'quarter way'
2. Marking half and quarters between 0 and 1 on a number line
3. Spacing whole numbers evenly along the number line
4. Marking halfway between whole numbers
5. Counting in fractions from 0–10

Measurement 5: Introducing kilograms and grams

Key mathematical ideas Mass and weight, Equivalence, Standard units

Educational context

The activities in this group introduce kilograms and grams as standard units, in the practical context of weighing food items. For details on the distinction between 'mass' and 'weight' see the Key Mathematical Ideas section of the Geometry, Measurement and Statistics 2 Implementation Guide.

Children begin by revisiting some of the ideas and methods they first encountered in Geometry, Measurement and Statistics 1 Teaching Resource Handbook – comparing and ordering amounts by weighing them in their hands, and distinguishing between heaviness and size (that is, weight and volume) as measurement categories. They further develop their skills in using pan balance scales by doubling and halving baking ingredients to adjust a recipe to make more or fewer servings.

Children are then introduced to the kilogram (and its 'kg' abbreviation), and use the doubling and halving method with the pan balance to turn a 1 kg amount into weights that are a fraction of a kg, which they then use to weigh out ingredients. They learn about grams (g) as a standard unit useful for measuring smaller amounts, and use 100 g bars of soap to investigate and establish the relationship between grams and kilograms.

Ensure that children's understanding of the numbers used in these activities is secure, in particular that they are comfortable with doubling and halving, and familiar with fraction notation and the relationship between halves and quarters (covered, for example, in the Number, Pattern and Calculating 2 Teaching Resource Handbook, Calculating 10 and Numbers and the Number System 6).

Learning opportunities

- To recall the weight of 1 kilogram and 1 gram.
- To appreciate the relative heaviness of 100 g compared to 1 g, 500 g and 1 kg.
- To know the abbreviations 'kg' and 'g' and be able to record amounts in kilograms and grams.
- To be able to compare and order amounts measured in grams and kilograms.
- To make weights to measure in grams and kilograms and use them to weigh another object using balance scales.
- To use balance scales to weigh out a given amount.
- To solve problems involving weighing.

Terms for children to use

weigh, balance scales, weighing scales, pan, light, lighter, lightest, heavy, heavier, heaviest, kilogram (kg), half kilogram, quarter kilogram, gram (g), scale, compare, decide, estimate, more than, less than, equal to amount

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Understand that the size of an object alone does not determine how heavy it is.
- Compare up to five items and order them from lightest to heaviest or vice versa.
- Estimate amounts in kilograms or grams, as appropriate.
- Demonstrate and describe how to use balance scales.
- Read and write amounts in fractions and multiples of kilograms and grams.

GMS Milestone 4

- Describe the relative heaviness of 1 kg compared to 100 g, or 1 g (GMS 2:4a)
- Use balance scales to estimate and order unknown amounts, using a known amount, e.g. lighter than $\frac{1}{2}$ kg, heavier than1 kg (GMS 2:4b)
- Weigh, read and write amounts in fractions, or multiples of, 1 kg, e.g. $\frac{1}{4}$ kg, 3 kg (GMS 2:4c)

Explorer Progress Book 2, pp. 20–21

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 10: How Much Does It Weigh?

After completing work on Activity 2, give children Explore More Copymaster 10: How Much Does It Weigh? to take home.

Focus activities

1. Doubling and halving amounts
2. Introducing kilograms
3. Using the kilogram to make weights and measure amounts
4. Introducing grams

Measurement 6: Introducing litres and millilitres, and units of temperature

Key mathematical ideas Capacity and volume, Equivalence, Standard units

Educational context

In this activity group children begin to use litres (ℓ) and millilitres (ml) as units of capacity and volume. They revisit ideas previously encountered in the Geometry, Measurement and Statistics 1 Teaching Resource Handbook, including the difficulty of comparing and estimating the capacity of different containers 'by eye'. They use their understanding of capacity to help them investigate the litre as a quantity, and make a measuring vessel with a scale labelled in fractions of a litre from a bottle with a known capacity of 1 ℓ. They are introduced to millilitres as units suitable for measuring smaller volumes.

In the course of these activities children also encounter the word 'volume', as describing the amount of liquid in a container. Encourage them to appreciate the distinction between 'volume' and 'capacity' by using these terms consistently, to mean the amount of space an amount occupies and the amount of space available inside a container, respectively.

Finally, the general idea of a measurement scale is further explored via focus and practice activities about temperature. Temperature also provides a ready illustration of the usefulness of agreed, standard units of measurement – without them, it's difficult to agree on how 'hot' or 'cold' something is.

For the number content of these activities, ensure children are confident with doubling and halving, also with fraction notation and the relationship between halves and quarters (covered, for example, in the Number, Pattern and Calculating 2 Teaching Resource Handbook, Calculating 10 and Numbers and the Number System 6).

Learning opportunities

- To estimate capacities of 1 ℓ, $\frac{1}{2}$ ℓ and $\frac{1}{4}$ ℓ.
- To know the abbreviations 'ℓ' and 'ml' and be able to record capacity and volume in litres and millilitres.
- To compare and order containers by measuring their capacity.
- To use a scale marked in fractions of a litre to find a volume of liquid.
- To use a thermometer or illustrated scale to record and read a temperature in ºC.
- To use tally charts and pictograms to record and present data.

Terms for children to use

capacity, volume, estimate, approximate, measure, exact, accurate, full, empty, holds, contains, litre (ℓ), millilitre (ml), container, scale, greater than, more than, less than, same, equal, equivalent, funnel, beaker, temperature, thermometer, degrees Celsius (ºC)

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Understand that the shape of a container does not determine its capacity.
- Give a reasonable estimate of the capacity of a container, in fractions of a litre.
- Demonstrate and describe how to use a scale for measuring volume or temperature.
- Read and write capacities in litres and above-zero temperatures in ºC.
- Understand that higher temperatures are warmer and lower temperatures are cooler.
- Correctly interpret and use tally charts and simple pictograms for measuring and recording.

GMS Milestone 4

- Give a reasonable estimate of the capacity of a container, in whole litres or fractions of a litre (GMS 2:4d)
- Compare and order the capacity of unmarked containers by measuring using a scale marked with fractions of a litre (GMS 2:4e)
- Read and write above-zero temperatures using the interval scale on a thermometer (GMS 2:4f)
- Record data using tally charts, when measuring volumes of liquids or capacities of containers (GMS 2:4g)

Explorer Progress Book 2, pp. 22–23

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 11: Pouring and Measuring

After completing work on Activity 3, give children Explore More Copymaster 11: Pouring and Measuring to take home.

Focus activities

1. Measuring capacity
2. Introducing litres and making a measuring scale
3. Introducing millilitres
4. Measuring temperature

Measurement 7: Telling the time and adding and subtracting with units of time

Key mathematical ideas Time Duration, Ordering, Equivalence

Educational context

In this activity group children continue their work from the Geometry, Measurement and Statistics 1 Teaching Resource Handbook to tell the time on an analogue clock, to 5-minute intervals, and to calculate with simple time intervals such as an hour earlier or later.

They revisit the idea of linear time, in the form of a timeline, to consider 'quarter past', 'half past' and 'quarter to' the hour in terms of fractions and connect this with the circular clock face. There is an opportunity to make links, here, with multiplication and the 3 times table. Children then make a more detailed investigation of the movement of the minute hand, which leads them to explore the number of minutes in an hour (counting or multiplying with intervals of 5 to discover that 1 hour = 60 minutes), consider equivalent language such as 'half- past ten' and 'ten thirty', and read and show times to 5-minute intervals. Unlike length, mass or capacity, time cannot be experienced directly through handling or observing objects in physical space and is measured in units which cannot be sensed directly (and which may seem to us to pass more quickly or slowly depending on the circumstances). Support children to develop and refine their understanding of time by encouraging them to make full use of illustrative resources and instruments available.

You could also adjust the numbers and steps involved to offer children a level of challenge appropriate to their growing understanding and fluency. This applies in particular to the final activities in the group, which invite children to begin to calculate with durations in order to solve problems involving time.

Learning opportunities

- To read, set and draw clocks showing 'o'clock', 'half past', 'quarter past' and 'quarter to'.
- To notice that the minute hand moves more quickly than the hour hand.
- To calculate with elapsed time, e.g. to find the difference between two times or to find an earlier or later time.
- To solve problems involving time and duration.

Terms for children to use

clock, hour, minute, half past, quarter to, quarter past, o'clock, hour hand, minute hand, clockwise, turn, straight up, straight down, left, right, time difference, earlier, later

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Understand the roles of the short (hour) and long (minute) hands on a clock.
- Understand that the hour and minute hands move at different speeds.
- Recognize and show 'o'clock' , 'half past', 'quarter past' and 'quarter to' times on an analogue clock.
- Understand that the numbers on a clock face refer to the hours and that the minute numbers are not shown.
- Count in five minute intervals around the clock.
- Tell the time to the nearest five minute interval.
- Calculate simple time intervals such as an hour earlier and later.

GMS Milestone 4

- Recognize and show 'o'clock', 'half past', 'quarter past' and 'quarter to' times on an analogue clock (GMS 2:4h)
- Count in five-minute intervals around the clock and use this to tell the time to the nearest five-minute interval (GMS 2:4i)
- Compare and order durations of time with different units, e.g. 2 weeks, 40 minutes, half an hour, 1 day (GMS 2:4j)
- Calculate simple time intervals, including finding an hour earlier, or later, than a given time (GMS 2:4k)

Explorer Progress Book 2, pp. 24–25

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 12: Telling the Time

After completing work on Activity 2, give children Explore More Copymaster 12: Telling the Time to take home.

Focus activities

1. Telling the time: quarter past
2. Telling the time: quarter to
3. Understanding how many minutes in an hour, half an hour and a quarter of an hour
4. Telling the time in 5-minute intervals
5. How many hours earlier or later?

Geometry 5: Investigating and describing rotation

Key mathematical ideas Rotation, Reflection, Equivalence

Educational context

This activity group brings together several areas of children's learning in geometry around the theme of rotation. This focus on one of four basic types of geometrical 'movement' (or transformation) encourages children to think mathematically, and to connect ideas which they might not at first recognize as being related. They begin by revisiting the context of giving directions from the Geometry, Measurement and Statistics 1 Teaching Resource Handbook, with a particular focus on making turns, now also identified as 'rotations'. They begin to distinguish rotation from straight-line movement (translation), understanding it as a change of orientation. Programmable robots, if available, can be used here to help children shift away from the 'first person' perspective of themselves making turns, and towards a more visual, graphic representation of rotation which begins to connect turns with angles and shapes. This leads into illustrating the rotation of the minute hand of a clock, and linking quarter turns with right angles (as well as clearly identifying the clockwise and anticlockwise directions of turn).

Based on this experience, children then go on to explore the rotation of shapes, creating sequences in which shapes are repeatedly rotated through the same angle. This involves them in discovering, among other things, equivalent rotations, and different ways of producing the same design through rotation. Throughout the activity group, emphasize exploration and experimentation. Give children time to practise making, recognizing, visualizing and discussing rotation in its different forms. Encourage them to relate it to their experiences in other activities and activity groups, and to their knowledge of everyday life, e.g. of objects that rotate and of pattern and design.

Learning opportunities

- To describe position, direction and movement precisely.
- To describe direction in terms of turn and movement in a straight line.
- To recognize that four quarter turns in the same direction make one full (whole) turn.
- To make and visualize quarter, half, three-quarter and full turns.
- To recognize the directions right and left, clockwise and anticlockwise.
- To recognize that a three-quarter turn clockwise leads to the same result as a quarter turn anticlockwise.
- To realize that two quarter turns are equal to a half turn.
- To recognize right angles when making turns or turning objects.
- To make sequences based on turning shapes through quarter turns and, by predicting and generalizing, to identify rules for these sequences.
- To make patterns by rotating shapes.

Terms for children to use

turn, turning, rotate, rotating, rotation, clockwise, anticlockwise, quarter/half/three-quarter/full/whole turn, angle, right angle, right way up, upside down, backwards, forwards, right, left, up, down, below, above, beside, next to, opposite

Assessment opportunities

Look and listen for children who:

- Use the terms for children to use effectively.
- Make and identify different sizes of turn.
- Identify right and left, clockwise and anticlockwise.
- Turn objects and shapes through given turns in either direction.
- Recognize the size and direction of turns made with objects.
- Recognize a right angle in the context of turning, or turning objects.
- Visualize the result of a given turn without performing it.
- Recognize objects which are rotations of each other.
- Generalize to predict any given shape in a sequence of rotated shapes.

GMS Milestone 4

- Give instructions to describe direction, in terms of right-angle turns, and movement in a straight line (GMS 2:4l)
- Visualize and record sequences by rotating 2D shapes through a chosen turn, e.g. quarter turn anticlockwise (GMS 2:4m)

Explorer Progress Book 2, pp. 26–29

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learning Log (pp. 28– 29) where they can reflect on the mathematics they have done so far.

Explore More Copymaster 5: Rotating Patterns

After completing work on Activity 3, give children Explore More Copymaster 5: Rotating Patterns to take home.

Focus activities

1. Giving directions and making turns
2. Rotating clock hands
3. Rotating Numicon Shapes
4. Recognizing quarter turns and right angles and making designs with rotation

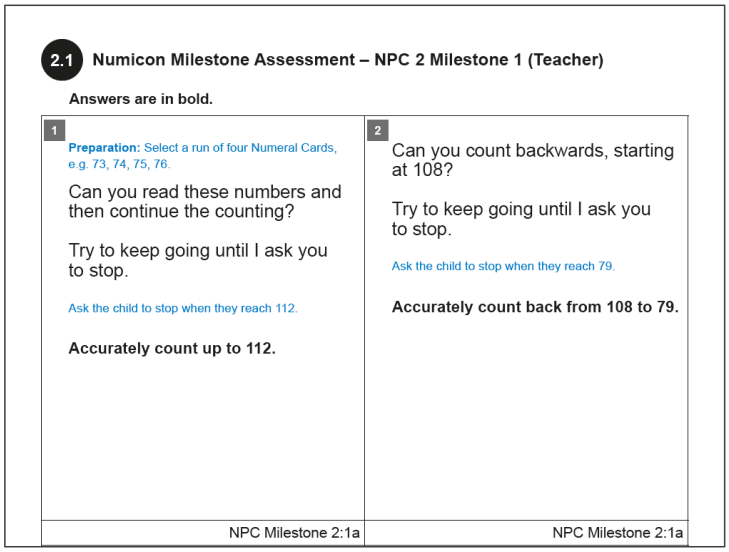
Assessment support

The Explorer Progress Book pages will help you record and assess learning throughout the programme. Here are two additional tools to support you with assessment. Log on to your Numicon Online NZ subscription and click on the name of the resource below to open it.

Milestone Assessment cards

Materials for children's self-assessment: question cards, category cards, a quick guide, milestone statements, Teaching Progression and answers. NOTE: This resource is provided as a zip file. Download, right-click and click 'Extract' to open the files.

The question cards are also provided on the next page of this document.



2.1 Numicon Milestone Assessment – NPC 2 Milestone 1 (Teacher)

Answers are in bold.

1	2
Preparation: Select a run of four Numeral Cards, e.g. 73, 74, 75, 76. Can you read these numbers and then continue the counting? Try to keep going until I ask you to stop. Ask the child to stop when they reach 112. **Accurately count up to 112.**	Can you count backwards, starting at 108? Try to keep going until I ask you to stop. Ask the child to stop when they reach 79. **Accurately count back from 108 to 79.**
NPC Milestone 2:1a	NPC Milestone 2:1a

Milestone Assessment Tracking

A detailed tracking sheet for assessing your class.

Milestone	Code	NPC / GM	Numicon strand	AG	NC strand	
Number, Pattern & Calculating 2 Milestone 1						N
By this point, children should be able to:						
• Recite number names in order to 100 and beyond	NPC 2:1a	NPC	NNS	NNS1	Number & place value	
• Know which numbers come before and after any number in their counting range	NPC 2:1b	NPC	NNS	NNS1	Number & place value	
• Give a sensible estimate up to 50	NPC 2:1c	NPC	NNS	NNS1	Number & place value	
• Know that grouping objects into tens is a more efficient way of finding 'how many' than counting in ones	NPC 2:1d	NPC	NNS	NNS1	Number & place value	
• Use counting in everyday situations	NPC 2:1e	NPC	NNS	NNS1	Number & place value	
• Identify and represent numbers 0–30 and beyond using Numicon Shapes, number rods, numerals and number lines	NPC 2:1f	NPC	P&A	P&A1,	Number & place value	
• Order Numicon Shapes and describe relationships between them	NPC 2:1g	NPC	P&A	P&A1	Number & place value	
• Spot regularities in sequences and predict from them	NPC 2:1h	NPC	P&A	P&A1	Number & place value	
Number, Pattern & Calculating 2 Milestone 2						N
By this point, children should be able to:						
• Read, say, and build 2-digit numbers confidently from seeing numerals to 40	NPC 2:2a	NPC	NNS	NNS2	Number & place value	
• Build (using Shapes and rods) and write a 2-digit number confidently from hearing its number name to 40	NPC 2:2b	NPC	NNS	NNS2	Number & place value	
• Name and write the numerals from seeing it built with Numicon Shapes	NPC 2:2c	NPC	NNS	NNS2	Number & place value	

Milestone Assessment cards

Click on a Numicon milestone below to jump to the question cards that relate to it.

Milestone	Milestone statements	
NPC Milestone 1	Recite number names in order to 100 and beyond	NPC 2:1a
	Know which numbers come before and after any number in their counting range	NPC 2:1b
	Give a sensible estimate up to 50	NPC 2:1c
	Know that grouping objects into tens is a more efficient way of finding 'how many' than counting in ones	NPC 2:1d
	Use counting in everyday situations	NPC 2:1e
	Identify and represent numbers 0–30 and beyond using Numicon Shapes, number rods, numerals and number lines	NPC 2:1f
	Order Numicon Shapes and describe relationships between them	NPC 2:1g
	Spot regularities in sequences and predict from them	NPC 2:1h
NPC Milestone 2	Read, say, and build 2-digit numbers confidently from seeing numerals to 40	NPC 2:2a
	Build (using Shapes and rods) and write a 2-digit number confidently from hearing its number name to 40	NPC 2:2b
	Name and write the numerals from seeing it built with Numicon Shapes	NPC 2:2c
	Understand the term 'multiple of 10' and the structure of a multiple of 10	NPC 2:2d
	Understand when and how to add; illustrate with structured apparatus, adding without counting in ones and writing appropriate adding sentences using '+' and '='	NPC 2:2e
	Understand the commutative property, i.e. that numbers can be added in any order and the total remains the same	NPC 2:2f
	Know that subtracting number sentences can represent different subtracting situations, e.g. 'take away' or 'comparing to find the difference', and know when to subtract	NPC 2:2g
	Illustrate a subtracting story with objects and structured apparatus, subtracting without counting in ones, and saying and writing the number sentence using '–' and '='	NPC 2:2h
NPC Milestone 3	Begin to use the inverse relationship between adding and subtracting, e.g. write a subtracting sentence connected to an adding sentence	NPC 2:3a
	Use the symbol '=' to show balance and know that in adding sentences the total can appear on the left or right of this symbol	NPC 2:3b
	Recognize that a symbol such as ☐ can stand for an unknown number	NPC 2:3c
	Devise equivalent adding and subtracting number sentences within their working range, e.g. 3 + 3 = 9 – 3	NPC 2:3d
	Read, say, write and build 2-digit numbers confidently from seeing numerals and hearing number names to 100	NPC 2:3e
	Name and write the numerals from seeing them built with Numicon Shapes	NPC 2:3f
	Understand the quantity value and column value of 2-digit numbers	NPC 2:3g
	Explain that numbers with more tens are larger than numbers with fewer tens	NPC 2:3h
	Compare and order (seven) non-consecutive numbers to 100 and use the '<' and '>' symbols	NPC 2:3i
	Understand that putting things in order is a systematic way to work, e.g. write adding and subtracting sentences in order	NPC 2:3j
	Have fluent recall of nearly all adding and subtracting facts for each number to 10	NPC 2:3k

Milestone	Milestone statements	
GMS Milestone 1	Compare and order lengths using <, > and = symbols	GMS 2:1a
	Measure straight and curved lengths to the nearest cm, choosing suitable equipment, e.g. ruler, tape measure, cm cubes	GMS 2:1b
	Record measurement data in a simple table and pictogram or block graph	GMS 2:1c
	Make, draw and name different polygons, showing straight sides and lines joined at corners, e.g. pentagon, octagon	GMS 2:1d
	Identify 2D shapes that are not polygons e.g. semi-circle, oval	GMS 2:1e
	Sort collections of polygons into 'congruent' and 'similar' groups	GMS 2:1f
	Describe 3D shapes in terms of curved faces or the 2D shape of flat faces	GMS 2:1g
	Investigate systematically the number of faces, edges or vertices of 3D shapes	GMS 2:1h
	Make or complete symmetrical patterns and pictures	GMS 2:1i
	Visualize or test which 2D shapes are symmetrical and show the position of at least one line of symmetry	GMS 2:1j
NPC Milestone 4	Recall fluently most adding and subtracting facts within 10 and use them when adding and subtracting multiples of 10	NPC 2:4a
	Have quick recall of 1 more and 1 fewer and 10 more and 10 fewer than a given 2-digit number	NPC 2:4b
	Make a general statement when they have noticed something always happens	NPC 2:4c
	Recognize the place value of each digit in a 2-digit number	NPC 2:4d
	Partition 2-digit numbers into tens and units, e.g. for 35 say 3 tens + 5 units (column value), and write adding sentences, e.g. 10 + 10 + 10 + 5 = 35 (quantity value)	NPC 2:4e
	Partition a 2-digit number into a multiple of ten and units, and derive possible adding and subtracting sentences, e.g. 30 + 5 = 35, 35 – 30 = 5, 35 – 5 = 30	NPC 2:4f
	Use part-whole relationships, e.g. between 37, 30 and 7, to devise inverse adding and subtracting number sentences	NPC 2:4g
	Realize that the inverse relationship between adding and subtracting can be used to check calculations	NPC 2:4h
	Understand connections between coin values and multiples of 10 and connect adding tens and units with structured apparatus to adding with coin values	NPC 2:4i
	Use the terms 'odd' and 'even' when referring to numbers and totals, and generalize understanding about odd and even numbers within 10 to numbers to 100	NPC 2:4j
	Notice and explain patterns and connections in and between the sequences of multiples of 2, 3, 5 and 10 and say the next number in the sequence	NPC 2:4k
GMS Milestone 2	Identify and sort all notes and coins correctly, e.g. comparing total values of each type of coin in a purse	GMS 2:2a
	Find all possible ways to make a given total in pence, e.g. ways to make 45p with only 5p, 10p and 20p coins	GMS 2:2b
	Explain the relative values of notes and coins, e.g. why £1 is greater than 90p	GMS 2:2c
	Label amounts of money using pounds (£) or pence (p) notation, e.g. 45p or £2 (not mixed units)	GMS 2:2d
	Round the value of small items to calculate an approximate total amount in pence	GMS 2:2e
	Use mathematical apparatus to model and discuss simple money problems, including finding totals and giving change	GMS 2:2f

Milestone	Milestone statements	
NPC Milestone 5	Round any 2-digit number to the nearest multiple of 10	NPC 2:5a
	Explain relationships between the positions of numbers on the number line and positions of numbers on a 100 square	NPC 2:5b
	Make comparisons between numbers in the range 0 to 100	NPC 2:5c
	Know doubles of each number to 10 and derive related subtracting facts	NPC 2:5d
	Know how to adjust calculations and compensate when adding and subtracting 9 and when to use this relationship	NPC 2:5e
	Understand that multiplying is a form of calculating used instead of repeated adding	NPC 2:5f
	Know that 'times' means how often an object or action is repeated and that the '×' symbol is conventionally called the multiplying sign (or symbol)	NPC 2:5g
	Read and write multiplying sentences using the '×' symbol and understand and use the word 'product'	NPC 2:5h
	Recall multiplying facts from 2, 3, 5 and 10 times tables	NPC 2:5i
	Derive a commutative fact from a multiplying sentence	NPC 2:5j
	Explain the inverse relationship between doubling and halving	NPC 2:5k
	Recall known facts and place value understanding to add and subtract single digits to and from 2-digit numbers	NPC 2:5l
GMS Milestone 3	Identify the 2D cross-sectional shape of cylinders and prisms, and name prisms e.g. triangular prism, cuboid	GMS 2:3a
	Discuss similarities and differences between cylinders and prisms, and know that prisms have only flat faces	GMS 2:3b
	Recognize prisms and cylinders in the everyday environment, and consider the properties that make these shapes useful	GMS 2:3c
	Investigate the faces of different prisms, and discuss how the number of faces relates to the cross-sectional shape	GMS 2:3d
	Use measurement vocabulary to describe the different dimensions of objects, e.g. length, height, width	GMS 2:3e
	Choose appropriate units and measure accurately in cm, m, or m and cm	GMS 2:3f
NPC Milestone 6	Bridge through a multiple of 10 when adding or subtracting and explain how this was done, in two steps using adding and subtracting facts	NPC 2:6a
	Use a range of strategies when adding at least three numbers that total less than 20, looking for relationships between numbers, to help decide the most efficient method for calculating	NPC 2:6b
	Calculate rather than count in ones to find a total	NPC 2:6c
	Explain that they use adding and subtracting facts within 10 and understanding of place value to find efficient solutions when adding and subtracting multiples of 10 and 1-digit numbers to and from 2-digit numbers (without crossing multiples of 10)	NPC 2:6d
	Use knowledge of facts within 10 to add and subtract 2-digit numbers to and from 2-digit numbers without bridging a multiple of 10	NPC 2:6e
	Confidently use different strategies for calculating and communicate effectively about them	NPC 2:6f
	Recall adding and subtracting facts within 20 fluently and use efficient strategies to calculate those not known	NPC 2:6g

Milestone	Milestone statements	
NPC Milestone 7	Describe objects and number ideas according to their attributes and use these to help solve problems	NPC 2:7a
	Understand a general statement and find particular examples to fit the rule	NPC 2:7b
	Recognize that dividing can be expressed as finding 'how many groups are there in … ?' and read and write dividing number sentences using the '÷' symbol	NPC 2:7c
	Explain and use the inverse relation between multiplying and dividing (with the sequences of 2s, 3s, 5s and 10s)	NPC 2:7d
	Interpret a realistic context as one inviting either 'multiplying' or 'dividing'	NPC 2:7e
	Know that multiplying has a commutative property (and dividing does not) and use this to help when solving dividing questions	NPC 2:7f
	Devise ways of organizing and recording their work systematically, when finding all possibilities and explain how they know they have found all possibilities	NPC 2:7g
	Know that 'one quarter' means one of four equal parts of a whole and 'one third' means one of three equal parts	NPC 2:7h
	Recognize, find, read and write $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$ and $\frac{3}{4}$ and explain that fractions are between whole numbers on the number line	NPC 2:7i
	Explain the equivalence between $\frac{1}{2}$ and $\frac{2}{4}$	NPC 2:7j
	Understand $\frac{3}{4}$ as three of four equal parts	NPC 2:7k
GMS Milestone 4	Describe the relative heaviness of 1kg compared to 100 g, or 1 g	GMS 2:4a
	Use balance scales to estimate and order unknown amounts, using a known amount, e.g. lighter than $\frac{1}{2}$ kg, heavier than 1 kg	GMS 2:4b
	Weigh, read and write amounts in fractions, or multiples of, 1 kg, e.g. $\frac{1}{4}$ kg, 3 kg	GMS 2:4c
	Give a reasonable estimate of the capacity of a container, in whole litres or fractions of a litre	GMS 2:4d
	Compare and order the capacity of unmarked containers by measuring using a scale marked with fractions of a litre	GMS 2:4e
	Read and write above-zero temperatures using the interval scale on a thermometer	GMS 2:4f
	Record data using tally charts, when measuring volumes of liquids or capacities of containers	GMS 2:4g
	Recognize and show 'o'clock', 'half past', 'quarter past' and 'quarter to' times on an analogue clock	GMS 2:4h
	Count in five-minute intervals around the clock and use this to tell the time to the nearest five-minute interval	GMS 2:4i
	Compare and order durations of time with different units, e.g. 2 weeks, 40 minutes, half an hour, 1 day	GMS 2:4j
	Calculate simple time intervals, including finding an hour earlier, or later, than a given time	GMS 2:4k
	Give instructions to describe direction, in terms of right-angle turns, and movement in a straight line	GMS 2:4l
	Visualize and record sequences by rotating 2D shapes through a chosen turn, e.g. quarter turn anticlockwise	GMS 2:4m

2.1 Numicon Milestone Assessment – NPC 2 Milestone 1 (Pupil)

Answers are on the next page.

1

Can you read these numbers and then continue the counting?

Try to keep going until I ask you to stop.

NPC Milestone 2:1a

2

Can you count backwards, starting at 108?

Try to keep going until I ask you to stop.

NPC Milestone 2:1a

3

Can you read the number on this card?

What number comes **after** this number?

NPC Milestone 2:1b

4

Can you read the number on this card?

What number comes **before** this number?

NPC Milestone 2:1b

2.1 **Numicon Milestone Assessment – NPC 2 Milestone 1 (Pupil)**

Answers are on the answer pages that follow.

5

How many pegs do you think there are in the pot?

Do you want to change your estimate now?

Can you count them to see how close you were?

NPC Milestone 2:1c

6

Can you estimate how many coins there are?

Now count the coins.

Did you make a good estimate?

NPC Milestone 2:1c

7

Can you group these pegs into tens?

Why do you think it is easier to count the total number of pegs like this?

NPC Milestone 2:1d

8

Do you know a quick way to find out how many cubes there are?

Try not to count in ones.

NPC Milestone 2:1d

2.1 Numicon Milestone Assessment – NPC 2 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

9

Can you count how many children there are in our class today?

NPC Milestone 2:1e

10

How many books are there on the top shelf of the bookcase?

NPC Milestone 2:1e

11

Can you find this number on the number line?

Can you make the number using Numicon Shapes?

Can you make it using number rods?

Can you write it in numbers?

NPC Milestone 2:1f

12

How many different ways can you find to show me this number?

You can use anything on the table.

NPC Milestone 2:1f

Numicon Milestone Assessment – NPC 2 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

13

Can you tell me the numbers that are shown by the Numicon Shapes?

Can you put them in order?

What pattern can you see?

NPC Milestone 2:1g

14

Can you tell me the numbers that are shown by the Numicon Shapes?

Can you put them in order?

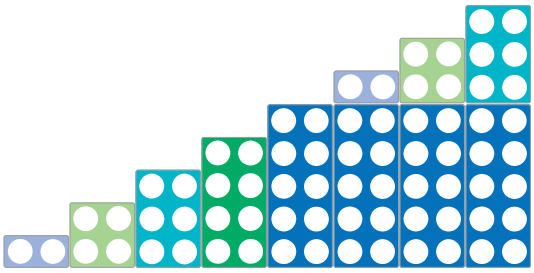
What pattern can you see?

NPC Milestone 2:1g

15

Look at this number pattern, which is shown with Numicon Shapes.

What do you think the next three numbers will be?

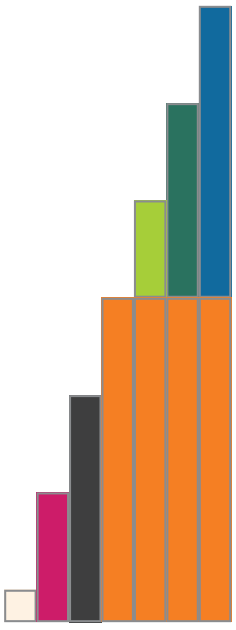


NPC Milestone 2:1h

16

Look at this number pattern, which is shown with rods.

What do you think the next three numbers will be?



NPC Milestone 2:1h

2.1 Numicon Milestone Assessment – NPC 2 Milestone 1 (Teacher)

Answers are in bold.

1

Preparation: Select a run of four Numeral Cards, e.g. 73, 74, 75, 76.

Can you read these numbers and then continue the counting?

Try to keep going until I ask you to stop.

Ask the child to stop when they reach 112.

Accurately count up to 112.

NPC Milestone 2:1a

2

Can you count backwards, starting at 108?

Try to keep going until I ask you to stop.

Ask the child to stop when they reach 79.

Accurately count back from 108 to 79.

NPC Milestone 2:1a

3

Preparation: Have ready Numeral Cards 56, 79 and 109.

Turn over the first card.

Can you read the number on this card?

What number comes **after** this number?

Repeat with the other cards.

57, 80, 110

NPC Milestone 2:1b

4

Preparation: Have ready Numeral Cards 30, 63 and 90.

Turn over the first card.

Can you read the number on this card?

What number comes **before** this number?

Repeat with the other cards.

29, 62, 89

NPC Milestone 2:1b

2.1 Numicon Milestone Assessment – NPC 2 Milestone 1 (Teacher)

Answers are in bold.

5

Preparation: Provide a pot of 42 Numicon Pegs.

How many pegs do you think there are in the pot?

Tip them onto the tabletop.

Do you want to change your estimate now?

Can you count them to see how close you were?

42. Agree that 40 is a good estimate. Look for children giving a sensible estimate.

NPC Milestone 2:1c

6

Preparation: Provide a pot of 28 plastic 1p coins.

Tip the coins onto the tabletop.

Can you estimate how many coins there are?

Now count the coins.

Did you make a good estimate?

Agree that 30 is a good estimate. Look for children giving a sensible estimate.

NPC Milestone 2:1c

7

Preparation: Preparation: Provide 48 Numicon Pegs and a Numicon Baseboard.

Can you group these pegs into tens?

Why do you think it is easier to count the total number of pegs like this?

The pegs are grouped into 4 groups of 10 and 1 group of 8 to show 48 pegs. Explanations will show if children think that counting in tens is a more efficient way of finding how many objects there are than counting in ones.

NPC Milestone 2:1d

8

Preparation: Put 35 cubes on the tabletop.

Do you know a quick way to find out how many cubes there are?

Try not to count in ones.

The cubes should be grouped into 3 towers of 10 and 1 tower of 5.

NPC Milestone 2:1d

2.1 Numicon Milestone Assessment – NPC 2 Milestone 1 (Teacher)

Answers are in bold.

9

Can you count how many children there are in our class today?

Use your professional judgement to determine whether the child is accurate with this question.

NPC Milestone 2:1e

10

Preparation: Arrange approximately 30 books, with their spines showing, on the top shelf of a bookcase.

How many books are there on the top shelf of the bookcase?

Use your professional judgement to determine whether the child is accurate with this question.

NPC Milestone 2:1e

11

Preparation: Provide a set of Numicon Shapes, number rods, a Numicon 0–100 cm Number Line, two whiteboards and a pen.

Write 'fifty-eight' on one of the whiteboards.

Can you find this number on the number line?

Can you make the number using Numicon Shapes?

Can you make it using number rods?

Can you write it in numbers?

58 represented in all formats.

NPC Milestone 2:1f

12

Preparation: Provide a set of Numicon Shapes, number rods, a Numicon 0–100 cm Number Line, two whiteboards and a pen.

Write 'fifteen' on one of the whiteboards.

How many different ways can you find to show me this number?

You can use anything on the table.

Children should find different ways to represent 15. Check that they can write it in numerals, show it on a number line and build it accurately with both Numicon Shapes and number rods.

NPC Milestone 2:1f

2.1 Numicon Milestone Assessment – NPC 2 Milestone 1 (Teacher)

Answers are in bold.

13

Preparation: Arrange the following Numicon Shapes in a random order:
3, 6, 9, 12, 15, 18.

Can you tell me the numbers that are shown by the Numicon Shapes?

Can you put them in order?

What pattern can you see?

3, 6, 9, 12, 15, 18. Explanations will vary, e.g. they go up in 3s.

NPC Milestone 2:1g

14

Preparation: Arrange the following Numicon Shapes in a random order:
5, 10, 15, 20, 25.

Can you tell me the numbers that are shown by the Numicon Shapes?

Can you put them in order?

What pattern can you see?

5, 10, 15, 20, 25. Explanations will vary, e.g. they go up in 5s.

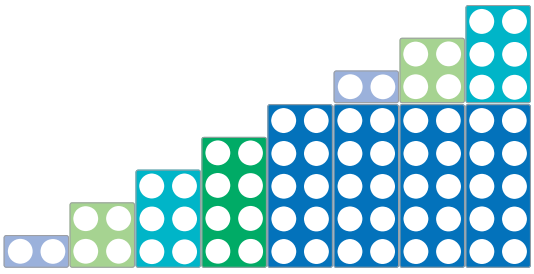
NPC Milestone 2:1g

15

Preparation: Set out Numicon Shapes going up in 2s from 2–16 as shown in the diagram. Provide a set of Numicon Shapes and some extra 10-shapes.

Look at this number pattern, which is shown with Numicon Shapes.

What do you think the next three numbers will be?



18, 20, 22. Some children may choose to show these numbers using the Numicon Shapes.

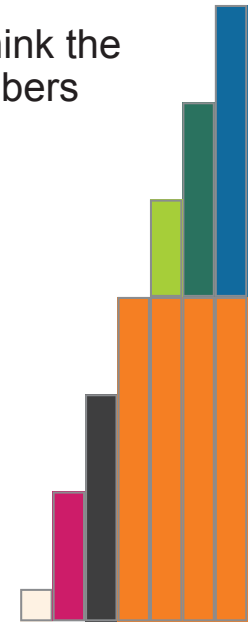
NPC Milestone 2:1h

16

Preparation: Set out number rods going up in 3s from 1–19 as shown in the diagram. Provide a set of number rods, some extra 10-rods and photocopy master 11, 'Number Rods Number Line'.

Look at this number pattern, which is shown with rods.

What do you think the next three numbers will be?



22, 25, 28. Some children may choose to show these numbers using the number rods and number line.

NPC Milestone 2:1h

2.2 Numicon Milestone Assessment – NPC 2 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

1

Can you read the number on the card?

Can you make this number using number rods?

NPC Milestone 2:2a

2

Can you read the number on the card?

Can you make this number using Numicon Shapes?

NPC Milestone 2:2a

3

Can you make the number nineteen using Numicon Shapes?

Can you write it on your whiteboard?

NPC Milestone 2:2b

4

Can you make the number thirty using number rods?

Can you write it on your whiteboard?

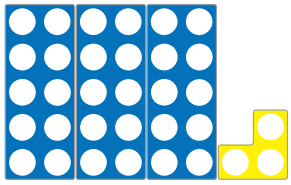
NPC Milestone 2:2b

Numicon Milestone Assessment – NPC 2 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

5

What number have I made?

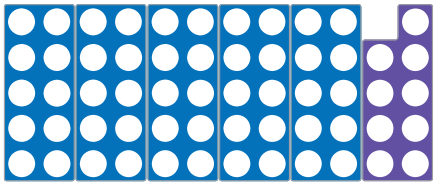


Can you write it on your whiteboard?

NPC Milestone 2:2c

6

What number have I made?



Can you write it on your whiteboard?

NPC Milestone 2:2c

7

Can you show me the seventh multiple of 10 using the number rod track?

What number is it?

NPC Milestone 2:2d

8

How many tens are equal to 80 ones?

NPC Milestone 2:2d

Numicon Milestone Assessment – NPC 2 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

9

Can you show me 23 add 14 using Numicon Shapes?

Can you work out the answer and explain how you did this?

NPC Milestone 2:2e

10

Eva has 12 blue stickers and 3 yellow stickers.

How many stickers does she have altogether?

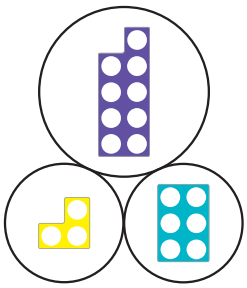
Can you show me how to work this out with Numicon Shapes?

Can you write the number sentence?

NPC Milestone 2:2e

11

Can you write some adding sentences for this parts and wholes model?



What do you notice about your sentences?

NPC Milestone 2:2f

12

Roll the dice to get two numbers.

Can you use the numbers in an adding sentence?

Now can you use the numbers in a different adding sentence?

What do you notice about the total?

NPC Milestone 2:2f

2.2 Numicon Milestone Assessment – NPC 2 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

13

Pick two different number rods out of the bag.

Can you find the difference between your rods?

Use the cards and any other rods you need to show this.

NPC Milestone 2:2g

14

I have 9 stickers.

I use 4 of them.

How many stickers do I have left?

Can you show me this subtracting story using Numicon Shapes?

NPC Milestone 2:2g

15

I have 10 cherries.

I eat 6 cherries.

How many cherries do I have left?

Can you write a number sentence for this story?

Can you show the story using Numicon Shapes?

NPC Milestone 2:2h

16

I have £7.

I spend £5.

How much money do I have left?

Can you write a number sentence for this story?

Can you use number rods and a parts and wholes model to show the story?

NPC Milestone 2:2h

2.2 Numicon Milestone Assessment – NPC 2 Milestone 2 (Teacher)

Answers are in bold.

1

Preparation: Provide some number rods and Numeral Card 29.

Can you read the number on the card?

29

Can you make this number using number rods?

Answer

NPC Milestone 2:2a

2

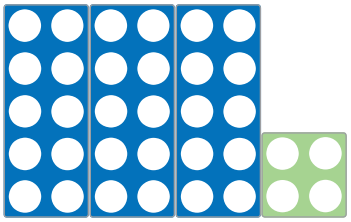
Preparation: Provide some Numicon Shapes and Numeral Card 34.

Can you read the number on the card?

34

Can you make this number using Numicon Shapes?

Answer



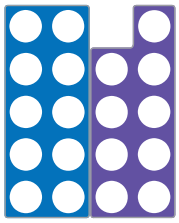
NPC Milestone 2:2a

3

Preparation: Provide some Numicon Shapes and a whiteboard and pen. Read these questions. Do not show the question card as the child needs to hear the number.

Can you make the number nineteen using Numicon Shapes?

Can you write it on your whiteboard?



19

NPC Milestone 2:2b

4

Preparation: Provide some number rods and a whiteboard and pen. Read these questions. Do not show the question card as the child needs to hear the number.

Can you make the number thirty using number rods?

Can you write it on your whiteboard?

30

NPC Milestone 2:2b

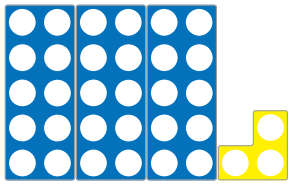
2.2 Numicon Milestone Assessment – NPC 2 Milestone 2 (Teacher)

Answers are in bold.

5

Preparation: Make the number 33 using Numicon Shapes. Provide a whiteboard and pen.

What number have I made?



Can you write it on your whiteboard?

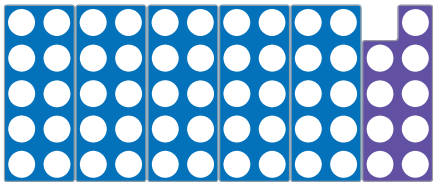
33

NPC Milestone 2:2c

6

Preparation: Make the number 59 using Numicon Shapes. Provide a whiteboard and pen.

What number have I made?



Can you write it on your whiteboard?

59

NPC Milestone 2:2c

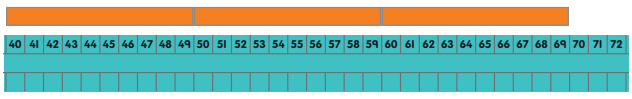
7

Preparation: Provide some number rods and a Numicon 1–100 cm Number Rod Track.

Can you show me the seventh multiple of 10 using the number rod track?

What number is it?

Answer



70

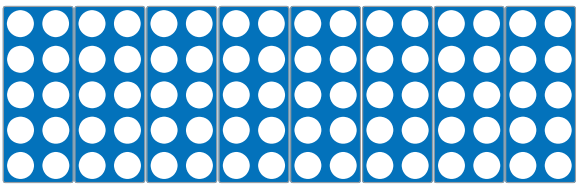
NPC Milestone 2:2d

8

Preparation: Provide some Numicon Shapes. Children may choose to use these (optional).

How many tens are equal to 80 ones?

8 tens



NPC Milestone 2:2d

2.2 Numicon Milestone Assessment – NPC 2 Milestone 2 (Teacher)

Answers are in bold.

9

Preparation: Provide some Numicon Shapes.

Can you show me 23 add 14 using Numicon Shapes?

Can you work out the answer and explain how you did this?

Explanations will vary, e.g. I put the tens together which makes 30 and then added the ones which is 7. Altogether that is 37.

NPC Milestone 2:2e

10

Preparation: Provide some Numicon Shapes.

Eva has 12 blue stickers and 3 yellow stickers.

How many stickers does she have altogether?

Can you show me how to work this out with Numicon Shapes?

Can you write the number sentence?

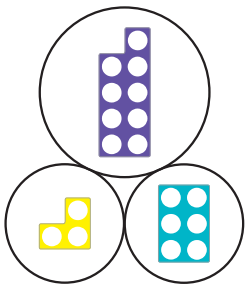
12 + 3 = 15

NPC Milestone 2:2e

11

Preparation: Set up a parts and wholes diagram, as shown, using a copy of photocopy master 13, 'Parts and Wholes – Large' and some Numicon Shapes.

Can you write some adding sentences for this parts and wholes model?



3 + 6 = 9

6 + 3 = 9

What do you notice about your sentences?

Children should notice that the two numbers can be added in any order and the total remains the same.

NPC Milestone 2:2f

12

Preparation: Provide two Numicon Dice 5–10.

Roll the dice to get two numbers.

Can you use the numbers in an adding sentence?

Now can you use the numbers in a different adding sentence?

What do you notice about the total?

Answers will vary, e.g. the total is always the same.

NPC Milestone 2:2f

2.2 Numicon Milestone Assessment – NPC 2 Milestone 2 (Teacher)

Answers are in bold.

13

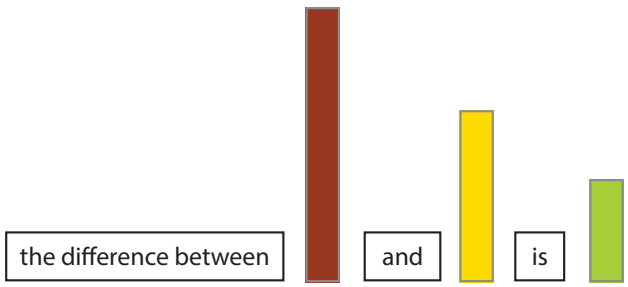
Preparation: Cut out cards from photocopy masters 31–32, 'Words and Symbols for Calculating'. Put a set of number rods in a Numicon Feely Bag and provide an extra set of rods.

Pick two different number rods out of the bag.

Can you find the difference between your rods?

Use the cards and any other rods you need to show this.

Answers will vary, e.g.



NPC Milestone 2:2g

14

Preparation: Provide some Numicon Shapes, and Numicon Pegs or covers cut from photocopy master 27, 'Subtracting Covers'.

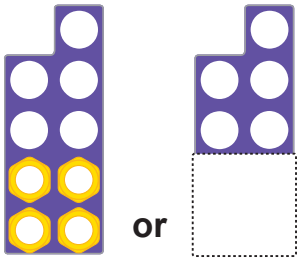
I have 9 stickers.

I use 4 of them.

How many stickers do I have left?

5

Can you show me this subtracting story using Numicon Shapes?



NPC Milestone 2:2g

2.2 Numicon Milestone Assessment – NPC 2 Milestone 2 (Teacher)

Answers are in bold.

15

Preparation: Provide some Numicon Shapes, and Numicon Pegs or covers cut from photocopy master 27, 'Subtracting Covers'.

I have 10 cherries.

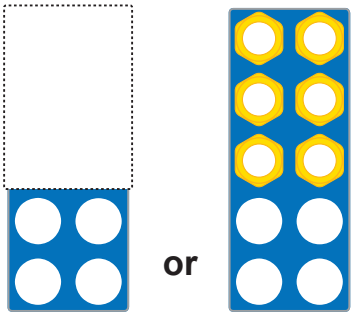
I eat 6 cherries.

How many cherries do I have left?

Can you write a number sentence for this story?

Can you show the story using Numicon Shapes?

10 – 6 = 4



NPC Milestone 2:2h

16

Preparation: Provide some number rods and a copy of photocopy master 13, 'Parts and Wholes – Large'.

I have £7.

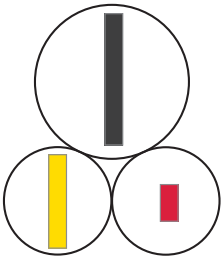
I spend £5.

How much money do I have left?

Can you write a number sentence for this story?

Can you use number rods and a parts and wholes model to show the story?

£7 – £5 = £2



NPC Milestone 2:2h

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Pupil)

Answers are on the next page.

1

Can you write number sentences to answer these questions?

4 birds are sitting on a wall.
6 more birds join them.
How many birds are there?

Now 4 birds fly away.
How many birds are left?

NPC Milestone 2:3a

2

Can you write number sentences to answer these questions?

There are 6 green apples and 2 red apples.

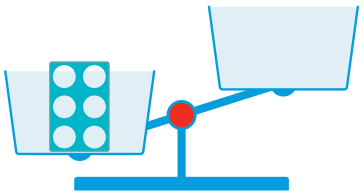
How many apples are there altogether?

If I eat the red apples, how many apples are left?

NPC Milestone 2:3a

3

I have put a 6-shape in the pan balance.



Can you find two Numicon Shapes that will balance with 6?

Can you write this as a number sentence?

NPC Milestone 2:3b

4

Can you finish this sentence?

9 is the same

as ☐ add ☐ .

Now can you write this as a number sentence?

NPC Milestone 2:3b

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Pupil)

Answers are on the next page.

5

Can you solve these calculations?

$6 + \square = 7$

$\square = 4 + 4$

$\square + 3 = 10$

NPC Milestone 2:3c

6

There are two Numicon Shapes in this bag.

Their total is 7.

One is a 2-shape.

Can you write a number sentence to show this?

You can show the Numicon Shape you don't know by drawing a box like this $\square$.

NPC Milestone 2:3c

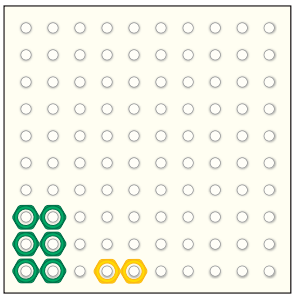
2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

7

Choose two cards and make the numbers with pegs on a baseboard.

Example:



Now can you move some pegs so that both numbers are equal?

Can you write a balancing number sentence to show this?

NPC Milestone 2:3d

8

Can you fill in these boxes to write some balancing number sentences?

$4 + 3 = \square + \square$

$\square + \square = 4 + 3$

$4 + 3 = \square - \square$

$\square - \square = 4 + 3$

NPC Milestone 2:3d

9

Can you read this number?

Can you write it using numerals?

Now can you make it using Numicon Shapes?

NPC Milestone 2:3e

10

Can you use the tens and ones frame and the number rods to build 87?

Can you write this number?

NPC Milestone 2:3e

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

11

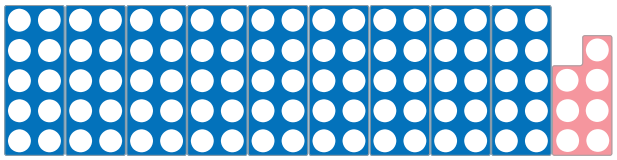
What number have I made with the Numicon Shapes?

Can you write the number in words and numerals?

NPC Milestone 2:3f

12

What number have I made with the Numicon Shapes?



Can you write the number in words and numerals?

NPC Milestone 2:3f

13

What number is in the bag?

Can you make it using number rods on the tens and ones frame?

NPC Milestone 2:3g

14

Can you show me 24 on the tens and ones frame?

Now can you find a way of making 24 on the 10s number line using different Numicon Shapes?

Can you tell me how you did this?

NPC Milestone 2:3g

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

15

Look at the two numbers.

Which one is larger?

Can you explain how you know?

54 **45**

NPC Milestone 2:3h

16

Look at the two numbers that I've covered up.

41	42	43	44	45	46	47	48	49	50
31	32	33	34	35	36	37	38	39	40
21	22	23	24	25	26	27	28	29	30

Which one is larger?

Can you explain how you know?

NPC Milestone 2:3h

17

Can you use the 'greater than' and 'less than' symbols between these numbers?

NPC Milestone 2:3i

18

I have put the 'greater than' and 'less than' symbols between these numbers.

Can you check that I am correct?

$54 < 66 < 39 < 86 > 29 < 27$

NPC Milestone 2:3i

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

19

Can you use number rods to find all the adding sentences for 8?

How do you know you have not missed any?

NPC Milestone 2:3j

20

Can you use Numicon Shapes to find all the subtracting sentences for 5?

How do you know you have not missed any?

NPC Milestone 2:3j

21

Do you know all of the adding and subtracting facts for 6?

Can you tell me these or write them down?

NPC Milestone 2:3k

22

Do you know all of the adding and subtracting facts for 9?

Can you tell me these or write them down?

NPC Milestone 2:3k

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Teacher)

Answers are in bold.

1

Can you write number sentences to answer these questions?

4 birds are sitting on a wall.
6 more birds join them.
How many birds are there?

Now 4 birds fly away.
How many birds are left?

4 + 6 = 10

10 – 4 = 6

NPC Milestone 2:3a

2

Can you write number sentences to answer these questions?

There are 6 green apples and 2 red apples.

How many apples are there altogether?

If I eat the red apples, how many apples are left?

6 + 2 = 8

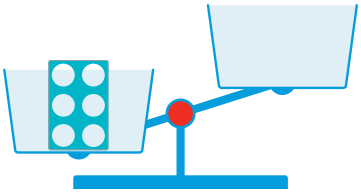
8 – 2 = 6

NPC Milestone 2:3a

3

Preparation: Provide some Numicon Shapes and a Numicon Pan Balance.

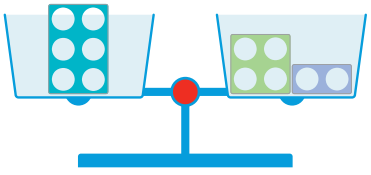
I have put a 6-shape in the pan balance.



Can you find two Numicon Shapes that will balance with 6?

Can you write this as a number sentence?

Answers will vary, e.g.



6 = 4 + 2

NPC Milestone 2:3b

4

Preparation: Provide some Numicon Shapes.

Can you finish this sentence?

9 is the same as ☐ add ☐.

Now can you write this as a number sentence?

Answers will vary, e.g.

9 is the same as 6 add 3.

6 + 3 = 9.

NPC Milestone 2:3b

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Teacher)

Answers are in bold.

5

Preparation: Provide some Numicon Shapes, and Numicon Pegs or covers cut from photocopy master 27, 'Subtracting Covers'.

Can you solve these calculations?

6 + ☐ = 7

☐ = 4 + 4

☐ + 3 = 10

1, 8, 7

NPC Milestone 2:3c

6

Preparation: Put a 5-shape and a 2-shape into a Numicon Feely Bag.

There are two Numicon Shapes in this bag.

Their total is 7.

One is a 2-shape.

Can you write a number sentence to show this?

You can show the Numicon Shape you don't know by drawing a box like this ☐.

2 + ☐ = 7 or ☐ + 2 = 7 or 7 = 2 + ☐ or 7 = ☐ + 2

NPC Milestone 2:3c

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Teacher)

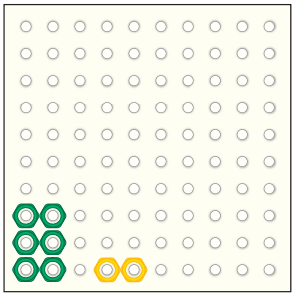
Answers are in bold.

7

Preparation: Provide Numeral Cards 2, 4, 6, 8 and 10 cut from 'Numeral Cards 0–10', photocopy master 12, a Numicon Baseboard and Numicon Pegs of two colours.

Choose two cards and make the numbers with pegs on a baseboard.

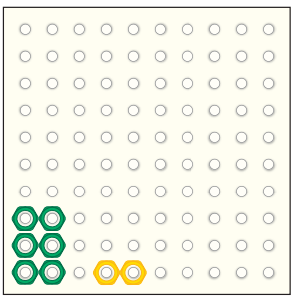
Make sure that children use different-coloured Pegs for each number.

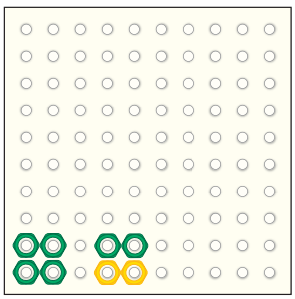


Now can you move some pegs so that both numbers are equal?

Can you write a balancing number sentence to show this?

Answers will vary, e.g.





6 – 2 = 2 + 2

NPC Milestone 2:3d

8

Preparation: Provide children with a whiteboard and pen. Allow them to explore the problem using Numicon Shapes, cubes or number rods.

Can you fill in these boxes to write some balancing number sentences?

$4 + 3 = \square + \square$

$\square + \square = 4 + 3$

$4 + 3 = \square - \square$

$\square - \square = 4 + 3$

Answers will vary, e.g.

4 + 3 = 2 + 5

1 + 6 = 4 + 3

4 + 3 = 9 – 2

8 – 1 = 4 + 3

NPC Milestone 2:3d

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Teacher)

Answers are in bold.

9

Preparation: Provide some Numicon Shapes, two whiteboards and a pen.

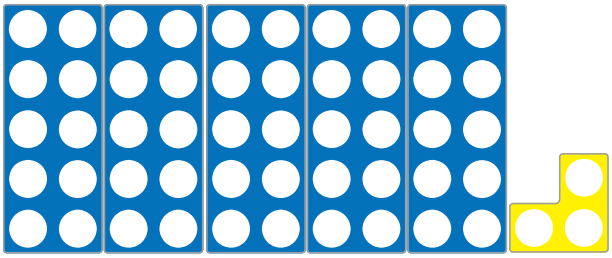
Write 'fifty-three' on one of the whiteboards.

Can you read this number?

Can you write it using numerals?

Now can you make it using Numicon Shapes?

53



NPC Milestone 2:3e

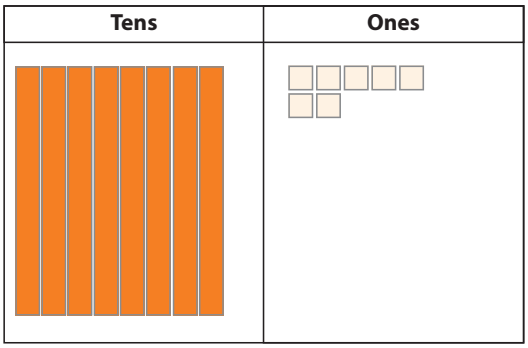
10

Preparation: Provide some number rods and photocopy master 29, 'Tens and Ones Frame'.

Can you use the tens and ones frame and the number rods to build 87?

Can you write this number?

Answer



87

NPC Milestone 2:3e

11

Preparation: Make the number 45 using Numicon Shapes.

What number have I made with the Numicon Shapes?

Can you write the number in words and numerals?

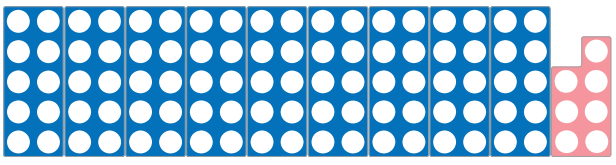
45, forty-five

NPC Milestone 2:3f

12

Preparation: Make the number 97 using Numicon Shapes.

What number have I made with the Numicon Shapes?



Can you write the number in words and numerals?

97, ninety-seven

NPC Milestone 2:3f

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Teacher)

Answers are in bold.

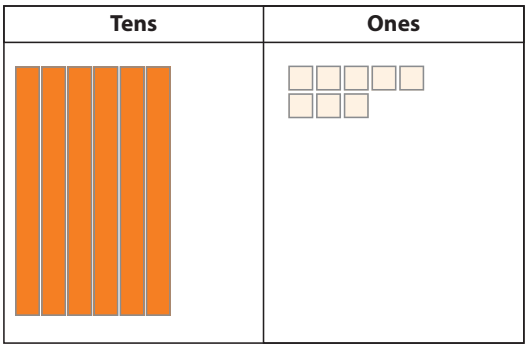
13

Preparation: Put six 10-shapes and an 8-shape into a Numicon Feely Bag. Provide number rods and photocopy master 29, 'Tens and Ones Frame'.

What number is in the bag?

Can you make it using number rods on the tens and ones frame?

68



NPC Milestone 2:3g

14

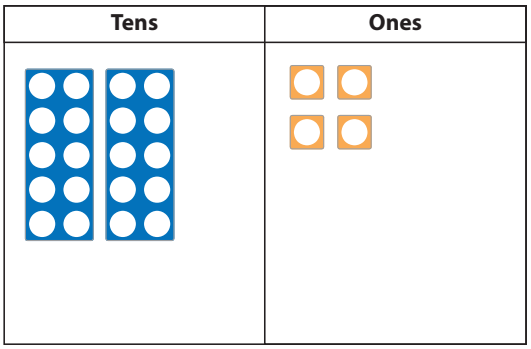
Preparation: Numicon Shapes, Numicon 10s Number Line, and photocopy master 29, 'Tens and Ones Frame'.

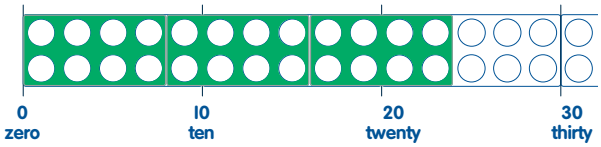
Can you show me 24 on the tens and ones frame?

Now can you find a way of making 24 on the 10s number line using different Numicon Shapes?

Can you tell me how you did this?

Explanations will vary, e.g. column value groups the number into tens and ones. Look for children who understand the quantity value and the column value of the number.





NPC Milestone 2:3g

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Teacher)

Answers are in bold.

15

Preparation: Place Numeral Cards 54 and 45 on the tabletop.

Look at the two numbers.

Which one is larger?

Can you explain how you know?

An explanation that describes that 54 has more tens than 45.

NPC Milestone 2:3h

16

Preparation: Place two Numicon Pegs on a Numicon 1–100 Card Number Track, as shown.

Look at the two numbers that I've covered up.

41	42	43	44	45	46	47	48	49	50
31	32	33	34	35	36	37	38	39	40
21	22	23	24	25	26	27	28	29	30

Which one is larger?

Can you explain how you know?

An explanation that describes that 42 has more tens than 24.

NPC Milestone 2:3h

17

Preparation: Place Numeral Cards 15, 67, 93, 45, 76, 24 and 31, in that order, on a tabletop. Provide multiple copies of the '<' and '>' cards cut from photocopy master 32, 'Words and Symbols for Calculating'.

Can you use the 'greater than' and 'less than' symbols between these numbers?

15 < 67 < 93 > 45 < 76 >24 < 31

NPC Milestone 2:3i

18

Preparation: Place Numeral Cards 54, 66, 39, 86, 29 and 27, in that order, on a tabletop. Put the '<' and '>' cards cut from photocopy master 32, 'Words and Symbols for Calculating' in between, as shown.

I have put the 'greater than' and 'less than' symbols between these numbers.

Can you check that I am correct?

54 < 66 < 39 < 86 > 29 < 27

54 < 66 > 39 < 86 > 29 > 27

NPC Milestone 2:3i

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Teacher)

Answers are in bold.

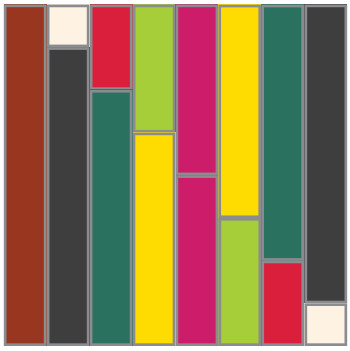
19

Preparation: Provide at least two sets of number rods.

Can you use number rods to find all the adding sentences for 8?

How do you know you have not missed any?

Answer



Check whether children approach this systematically. Encourage them to tell you the number sentences (they should include 8 + 0 and 0 + 8). Look out for children who explain the importance of doing this in order so that they can find all the possible answers without missing any.

NPC Milestone 2:3j

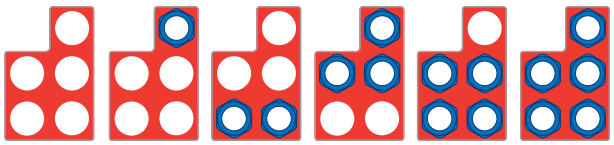
20

Preparation: Provide some Numicon Shapes, and Numicon Pegs or covers cut from photocopy master 27, 'Subtracting Covers'.

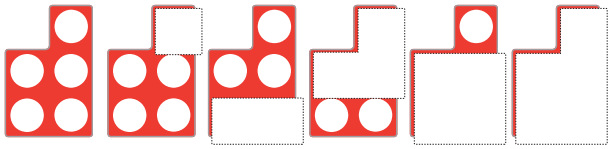
Can you use Numicon Shapes to find all the subtracting sentences for 5?

How do you know you have not missed any?

Answer



or



Check whether children approach this systematically. Encourage them to tell you the number sentences (they should include 5 – 0 and 5 – 5). Look out for children who explain the importance of doing this in order so that they can find all the possible answers without missing any.

NPC Milestone 2:3j

2.3 Numicon Milestone Assessment – NPC 2 Milestone 3 (Teacher)

Answers are in bold.

21

Do you know all of the adding and subtracting facts for 6?

Can you tell me these or write them down?

0 + 6	**6 – 0**
1 + 5	**6 – 1**
2 + 4	**6 – 2**
3 + 3	**6 – 3**
4 + 2	**6 – 4**
5 + 1	**6 – 5**
6 + 0	**6 – 6**

Order can be reversed but should be systematic.

NPC Milestone 2:3k

22

Do you know all of the adding and subtracting facts for 9?

Can you tell me these or write them down?

0 + 9	**9 – 0**
1 + 8	**9 – 1**
2 + 7	**9 – 2**
3 + 6	**9 – 3**
4 + 5	**9 – 4**
5 + 4	**9 – 5**
6 + 3	**9 – 6**
7 + 2	**9 – 7**
8 + 1	**9 – 8**
9 + 0	**9 – 9**

Order can be reversed but should be systematic.

NPC Milestone 2:3k

2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

1

Can you use the <, > and = symbols to compare the lengths of these strips of paper?

GMS Milestone 2:1a

2

Can you use the <, > and = symbols to compare the lengths of these pieces of string?

GMS Milestone 2:1a

3

Which line do you think is the longest?

How could you check which is longest?

GMS Milestone 2:1b

4

Look at the lines.

Which one do you think measures 12 cm?

How could you check?

GMS Milestone 2:1b

Numicon Milestone Assessment – GMS 2 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

5

Can you get a cube out of the bag and record its colour in the table?

Put the cube back and try this 11 more times.

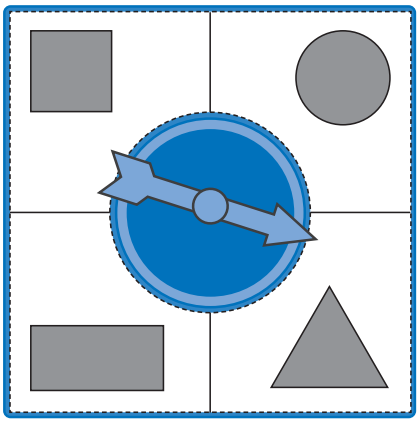
Which colour came out the most times?

GMS Milestone 2:1c

6

Can you make a pictogram?

Spin the spinner ten times.



Show the shapes that you spin on your pictogram.

Were there any shapes that you didn't spin?

GMS Milestone 2:1c

7

Can you make three different polygons that have more than four sides?

Which polygons did you make?

GMS Milestone 2:1d

8

Can you draw a pentagon, a hexagon and a heptagon?

How do you know your drawings are correct?

GMS Milestone 2:1d

2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

9

Can you say which of these shapes are not polygons?

GMS Milestone 2:1e

10

Can you tell me some differences between a polygon and a non-polygon?

You can use the shapes to help you to explain.

GMS Milestone 2:1e

11

Can you find all the shapes that are similar?

GMS Milestone 2:1f

12

Can you find all the shapes that are congruent?

GMS Milestone 2:1f

Numicon Milestone Assessment – GMS 2 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

13

Can you tell me about the faces on this 3D shape?

How many faces are there?

Do you know the name of this shape?

GMS Milestone 2:1g

14

I'm thinking of a 3D shape.

It has at least one face that is a circle.

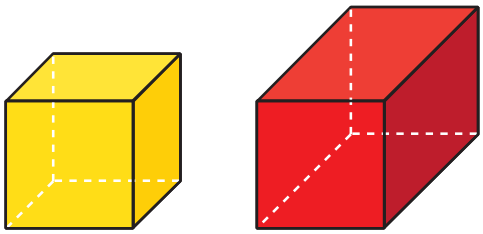
What could it be?

Are there any other shapes it might be?

GMS Milestone 2:1g

15

Here is a picture of two different 3D shapes.



Can you find the models that match?

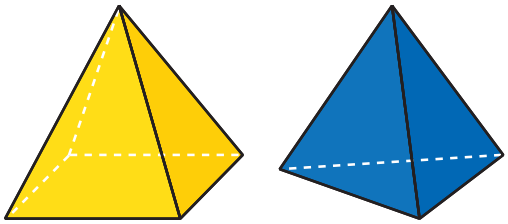
Now can you find out how many faces, edges and vertices each shape has?

What do you notice?

GMS Milestone 2:1h

16

Here is a picture of two different 3D shapes.



Can you find the models that match?

Now can you find out how many faces, edges and vertices each shape has?

What do you notice?

GMS Milestone 2:1h

Numicon Milestone Assessment – GMS 2 Milestone 1 (Pupil)

Answers are on the answer pages that follow.

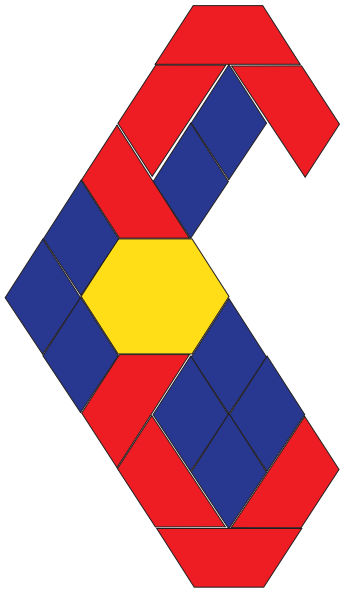
17

Can you use the Numicon Shapes to make a symmetrical pattern on the baseboard?

GMS Milestone 2:1i

18

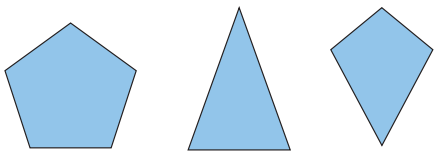
Can you finish this symmetrical design?



GMS Milestone 2:1i

19

Look at these 2D shapes.



Do you think they have any lines of symmetry?

Use the mirror to check your thinking.

GMS Milestone 2:1j

20

Look at the pattern blocks.

Which ones do you think have more than three lines of symmetry?

Can you use the paper shapes to see if you are correct?

GMS Milestone 2:1j

2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Teacher)

Answers are in bold.

1

Preparation: Cut out the four strips from photocopy master 4, 'Different Lengths' and the <, > and = cards from photocopy master 34, 'Words and Symbols for Comparing Measuring 2'.

Can you use the <, > and = symbols to compare the lengths of these strips of paper?

Use your professional judgement to determine whether the child is accurate with this question.

GMS Milestone 2:1a

2

Preparation: Provide four pieces of string or ribbon of different lengths, one that is only slightly longer or shorter than one of the others. Cut out the <, > and = cards from photocopy master 34, 'Words and Symbols for Comparing Measuring 2'.

Can you use the <, > and = symbols to compare the lengths of these pieces of string?

Use your professional judgement to determine whether the child is accurate with this question. Do not accept = for the pieces that are slightly different.

GMS Milestone 2:1a

3

Preparation: Provide a copy of photocopy master 5, 'Different Curved Lengths', some number rods, strips of paper, string and ribbon, scissors and a Numicon 1–100 cm Number Rod Track.

Which line do you think is the longest?

How could you check which is longest?

Use your professional judgement to determine whether the child is accurate with this question. (The curved lines have the following measurements from top to bottom on the page: 17 cm, 25 cm, 12 cm.)

GMS Milestone 2:1b

4

Preparation: Provide a copy of photocopy master 6, 'Different Line Lengths' and some number rods, strips of paper, string and ribbon, scissors and a Numicon 1–100 cm Number Rod Track.

Look at the lines.

Which one do you think measures 12 cm?

How could you check?

Use your professional judgement to determine whether the child is accurate with this question. (The bottom line measures 12 cm.)

GMS Milestone 2:1b

2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Teacher)

Answers are in bold.

5

Preparation: Put four different-coloured cubes into a Numicon Feely Bag. Provide a copy of photocopy master 3, 'Data in a Table' with the cube colours written in the first column. Show the cubes to the child before putting them into the bag.

Can you get a cube out of the bag and record its colour in the table?

Put the cube back and try this 11 more times.

Which colour came out the most times?

Use your professional judgement to determine whether the child is accurate with this question.

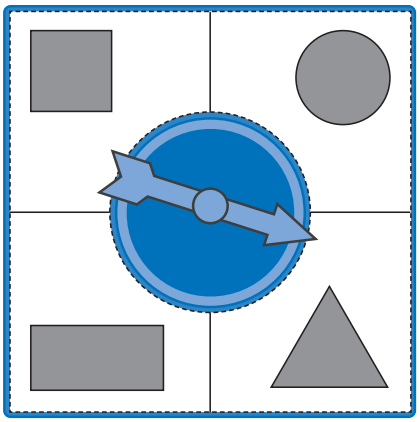
GMS Milestone 2:1c

6

Preparation: Make a shape spinner, using the overlay from photocopy master 25, 'Spinner Overlays 1'. Provide the shapes cut from photocopy master 2, 'Data in a Pictogram'.

Can you make a pictogram?

Spin the spinner ten times.



Show the shapes that you spin on your pictogram.

Were there any shapes that you didn't spin?

Use your professional judgement to determine whether the child is accurate with this question

GMS Milestone 2:1c

2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Teacher)

Answers are in bold.

7

Preparation: Provide some geo strips. These could be cut from the 'Geo Strips' photocopy masters 9–10.

Can you make three different polygons that have more than four sides?

Which polygons did you make?

Answers will vary, but should include flat geometric shapes with straight sides, e.g. regular or irregular pentagons, hexagons, heptagons and octagons.

GMS Milestone 2:1d

8

Preparation: Provide some dotty paper (you can use photocopy master 7, 'Dot Paper – Square'), a pencil and a ruler.

Can you draw a pentagon, a hexagon and a heptagon?

How do you know your drawings are correct?

Answers will vary, but they should include straight lines joined at corners and the correct number of sides.

GMS Milestone 2:1d

9

Preparation: Provide a selection of 2D shapes including polygons and non-polygons.

Can you say which of these shapes are not polygons?

Answers will vary, but should include circles, semicircles, ovals, etc.

GMS Milestone 2:1e

10

Preparation: Provide a selection of 2D shapes including polygons and non-polygons.

Can you tell me some differences between a polygon and a non-polygon?

You can use the shapes to help you to explain.

Explanations will vary, but reference should be made to polygons being a closed shape with straight sides and non-polygons having at least one curved side.

GMS Milestone 2:1e

2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Teacher)

Answers are in bold.

11

Preparation: Provide a selection of 2D polygons including some congruent and similar shapes.

Can you find all the shapes that are similar?

Use your professional judgement to determine whether the child is accurate with this question.

GMS Milestone 2:1f

12

Preparation: Provide a selection of 2D polygons made with geo strips (you could use photocopy masters 9–10, 'Geo Strips'), including some congruent and similar shapes.

Can you find all the shapes that are congruent?

Use your professional judgement to determine whether the child is accurate with this question.

GMS Milestone 2:1f

13

Preparation: Have a selection of 3D shapes ready. Select one of the shapes to begin with, e.g. a cuboid, and then repeat the question for the other shapes.

Can you tell me about the faces on this 3D shape?

How many faces are there?

Do you know the name of this shape?

Answers will vary, e.g. it has faces that are oblongs. There are 6 faces. It is a cuboid.

GMS Milestone 2:1g

14

I'm thinking of a 3D shape. It has at least one face that is a circle.

What could it be?

Are there any other shapes it might be?

Cylinder, cone, hemisphere (not mentioned in Geometry 2 but you may have introduced it if you have a 3D model).

GMS Milestone 2:1g

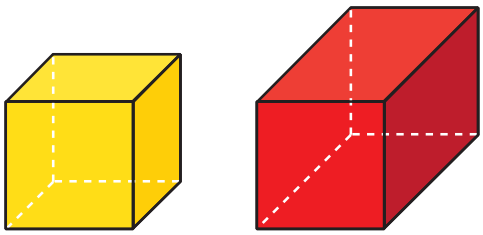
2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Teacher)

Answers are in bold.

15

Preparation: Provide a selection of 3D shape models, including a cube and a cuboid.

Here is a picture of two different 3D shapes.



Can you find the models that match?

Now can you find out how many faces, edges and vertices each shape has?

What do you notice?

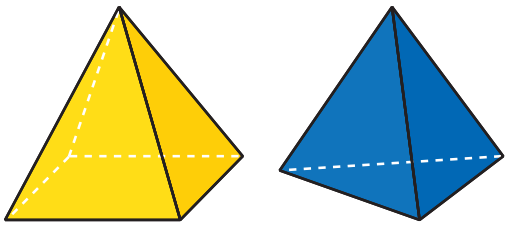
Answers will vary, but should identify 6 faces, 8 vertices and 12 edges. The child should realize that this is the same for both models.

GMS Milestone 2:1h

16

Preparation: Provide a selection of 3D shape models, including a tetrahedron and a square-based pyramid.

Here is a picture of two different 3D shapes.



Can you find the models that match?

Now can you find out how many faces, edges and vertices each shape has?

What do you notice?

Answers will vary, but should identify that each pyramid has different properties: 4 or 5 faces, 4 or 5 vertices and 6 or 8 edges.

GMS Milestone 2:1h

2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Teacher)

Answers are in bold.

17

Preparation: Provide a Numicon Baseboard and some Numicon Shapes.

Can you use the Numicon Shapes to make a symmetrical pattern on the baseboard?

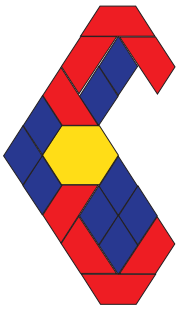
Answers will vary. Some children may cover the board symmetrically; others may just do a symmetrical design.

GMS Milestone 2:1i

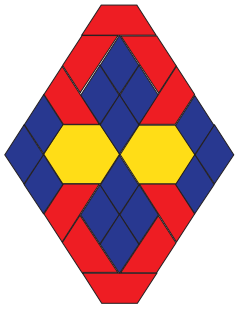
18

Preparation: Provide a selection of pattern blocks or cut out the shapes from photocopy masters 14–19, 'Pattern Blocks'.

Can you finish this symmetrical design?



Answer



GMS Milestone 2:1i

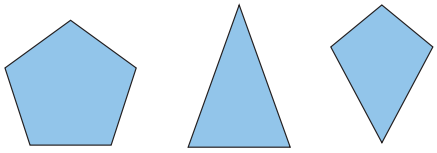
2.1 Numicon Milestone Assessment – GMS 2 Milestone 1 (Teacher)

Answers are in bold.

19

Preparation: Provide mirrors so the child can check the symmetry of the shapes.

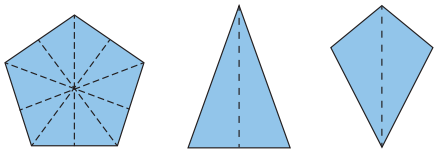
Look at these 2D shapes.



Do you think they have any lines of symmetry?

Use the mirror to check your thinking.

Children may not find all the lines for the pentagon.



GMS Milestone 2:1j

20

Preparation: Provide a selection of pattern blocks or cut out the shapes from photocopy masters 14–19, 'Pattern Blocks'.

Look at the pattern blocks.

Which ones do you think have more than three lines of symmetry?

Can you use the paper shapes to see if you are correct?

Hexagon, square, triangle

GMS Milestone 2:1j

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

1

Which one of these number sentences helps you to solve 60 + 20?

5 + 3 = 8

7 + 1 = 8

6 + 2 = 8

4 + 4 = 8

Can you explain why this number sentence is helpful?

NPC Milestone 2:4a

2

Can you explain how to solve these number sentences?

80 – 30

60 – 20

90 – 50

NPC Milestone 2:4a

3

What number is 1 fewer than 56?

What number is 1 more than 56?

What number is 10 fewer than 56?

What number is 10 more than 56?

NPC Milestone 2:4b

4

I'm thinking of a number.

49 is 1 more than my number.

47 is 1 fewer than my number.

What's my number?

Can you make up a puzzle like this for a new number?

NPC Milestone 2:4b

Numicon Milestone Assessment – NPC 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

5

Are these numbers even or odd?

If you add 2 to each number, is the total even or odd?

Can you explain what you have found out?

NPC Milestone 2:4c

6

Can you find different pairs of numbers that make 10?

Are the numbers in each pair odd or even?

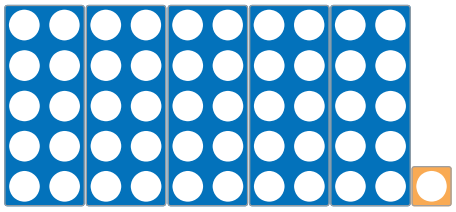
What do you notice about the pairs of numbers?

NPC Milestone 2:4c

7

Ross used Numicon Shapes to show the number on the card.

15



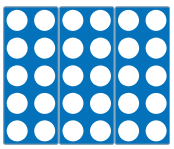
Did he show it correctly?

Why do you think that?

NPC Milestone 2:4d

8

Can you use Numicon Shapes and number cards to make these sentences correct?

 ___ = ___ 8

2 ___ = ___ 

___  = 6 ___

NPC Milestone 2:4d

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

9

Can you turn over each card in turn and tell me the tens and ones adding sentence?

NPC Milestone 2:4e

10

Can you think of three numbers that add together to make 79?

Can you find another way?

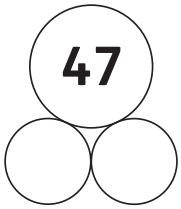
Can you find a way with four numbers?

NPC Milestone 2:4e

11

Can you find two parts of 47?

One part is a multiple of 10 and one part is a ones number.



Can you write two adding sentences to show this?

Can you write two inverse number sentences?

NPC Milestone 2:4f

12

Look at this subtracting sentence.

52 − **2** = **50**

Can you use the same numbers to write another subtracting sentence and two adding sentences?

NPC Milestone 2:4f

Numicon Milestone Assessment – NPC 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

13

Can you make two adding and two subtracting number sentences with these cards?

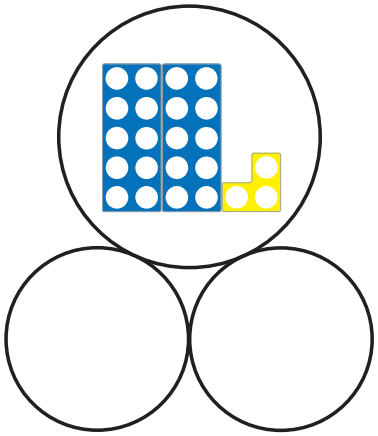
78	8	70

NPC Milestone 2:4g

14

23 is the whole.

Can you find different ways to show 23 in parts on the model?



Can you use the model to tell me two subtracting sentences?

Do you know the inverse adding sentences?

NPC Milestone 2:4g

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

15

Ali wrote these subtracting sentences.

34 – 10 = 24

59 – 20 = 29

88 – 30 = 50

Can you write adding sentences to check if he is right?

NPC Milestone 2:4h

16

Gemma wrote these adding sentences.

27 + 20 = 37

81 + 10 = 91

62 + 30 = 91

Can you write subtracting sentences to check if she is right?

NPC Milestone 2:4h

17

How many 10p coins are equal to 40p?

How many 5p coins are equal to 40p?

How many 2p coins are equal to 40p?

Can you use Numicon Shapes to prove your answers?

NPC Milestone 2:4i

18

Can you solve these calculations?

28p + 30p

50p + 39p

65p + 20p

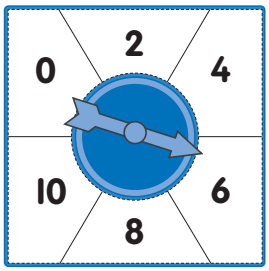
Can you use Numicon Shapes and coins to show your answers?

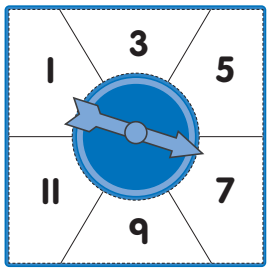
NPC Milestone 2:4i

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

19





Spin the odd number and the even number spinners.

Can you find the difference between the two numbers you spin?

Is it odd or even?

Try some other numbers.

What did you find out?

NPC Milestone 2:4j

20

Turn over the first card.

Do you think the number is odd or even?

Use the Numicon Shapes to see if you are correct.

Now try the other cards.

Is there a quick way to work out if the number is odd or even?

NPC Milestone 2:4j

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

21

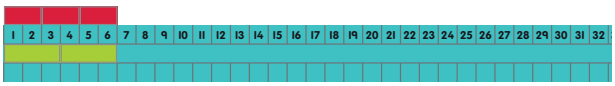
Can you find out how many tens there are in 60?

How many fives are there in 60?

Do you see a pattern?

NPC Milestone 2:4k

22



Can you tell me about the pattern made with the number rods?

Can you tell me the number where the rods will line up again?

Check to see if you are correct.

Can you tell me the next number where the rods will line up again?

NPC Milestone 2:4k

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

Answers are in bold.

1

Preparation: Write the calculations below on flashcards. Place the flashcards face up on a tabletop.

Which one of these number sentences helps you to solve 60 + 20?

5 + 3 = 8

7 + 1 = 8

6 + 2 = 8

4 + 4 = 8

Can you explain why this number sentence is helpful?

Answers will vary, e.g. 6 ones add 2 ones makes 8 ones, 6 tens add 2 tens makes 8 tens, which is 80.

NPC Milestone 2:4a

2

Preparation: Write the calculations below on flashcards. Place the flashcards face up on a tabletop.

Can you explain how to solve these number sentences?

80 – 30

60 – 20

90 – 50

Explanations will vary, but should make reference to calculating with ones, e.g. 8 ones subtract 3 ones is 5 ones, so 8 tens subtract 3 tens is 5 tens, which is 50.

NPC Milestone 2:4a

3

What number is 1 fewer than 56?

What number is 1 more than 56?

What number is 10 fewer than 56?

What number is 10 more than 56?

55, 57, 46, 66

NPC Milestone 2:4b

4

I'm thinking of a number.

49 is 1 more than my number.

47 is 1 fewer than my number.

What's my number?

Can you make up a puzzle like this for a new number?

48

Use your professional judgement to determine whether the child is accurate with this question.

NPC Milestone 2:4b

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

Answers are in bold.

5

Preparation: Place Numeral Cards 10, 12, 14, 16 and 18 on a tabletop, along with the corresponding Numicon Shapes. Provide a small pile of Numicon 2-shapes for children to use if they wish.

Are these numbers even or odd?

If you add 2 to each number, is the total even or odd?

Can you explain what you have found out?

Explanations will vary, e.g. When I add 2 to an even number it makes an even total.

NPC Milestone 2:4c

6

Preparation: Provide a set of Numicon Shapes.

Can you find different pairs of numbers that make 10?

Are the numbers in each pair odd or even?

What do you notice about the pairs of numbers?

Explanations will vary, e.g. two odd numbers make 10 and two even numbers make 10.

NPC Milestone 2:4c

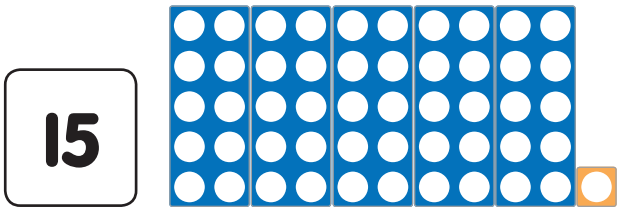
2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

Answers are in bold.

7

Preparation: Place Numeral Card 15 face up next to Numicon Shapes that show the number 51.

Ross used Numicon Shapes to show the number on the card.



Did he show it correctly?

Why do you think that?

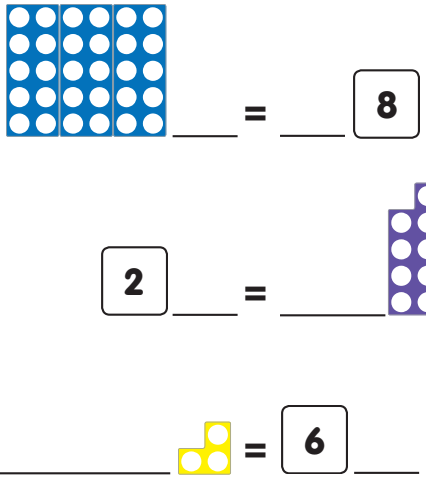
Explanations will vary but should include reference to 15 having 1 ten and 5 ones, not 5 tens and 1 one.

NPC Milestone 2:4d

8

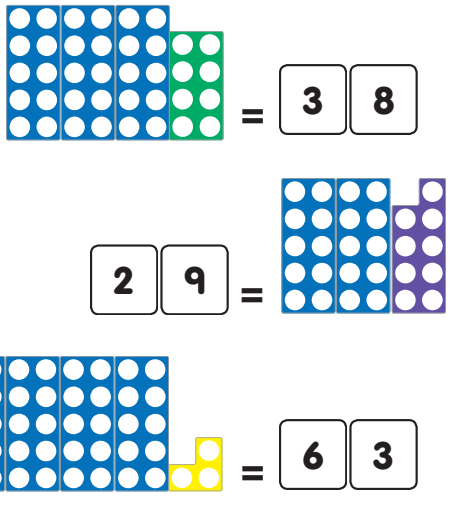
Preparation: Print out at A3 size photocopy masters 20–22, 'Place Value Sentences', and provide Numicon Shapes and Numeral Cards 1–10.

Can you use Numicon Shapes and number cards to make these sentences correct?



_____ = 6 ___

Answer



NPC Milestone 2:4d

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

Answers are in bold.

9

Preparation: Place Numeral Cards 61, 40 and 56 face down on a tabletop.

Can you turn over each card in turn and tell me the tens and ones adding sentence?

6 tens + 1 one

4 tens + 0 ones

5 tens + 6 ones

NPC Milestone 2:4e

10

Preparation: Use the Numicon Interactive Whiteboard software to present the following sentences, one at a time. Alternatively, you could write them one at a time, on paper or on the board.

☐ + ☐ + ☐ = 79

☐ + ☐ + ☐ = 79

☐ + ☐ + ☐ + ☐ = 79

Can you think of three numbers that add together to make 79?

Can you find another way?

Can you find a way with four numbers?

Answers will vary, e.g. 70 + 5 + 4, 40 + 30 + 9, 30 + 30 + 10 + 9.

NPC Milestone 2:4e

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

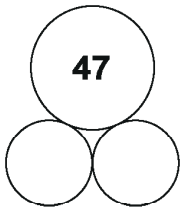
Answers are in bold.

11

Preparation: Provide a copy of photocopy master 13, 'Parts and Wholes – Large'. Write 47 in the top circle.

Can you find two parts of 47?

One part is a multiple of 10 and one part is a ones number.



Can you write two adding sentences to show this?

Can you write two inverse number sentences?

40 + 7 = 47, 7 + 40 = 47

47 – 40 = 7, 47 – 7 = 40

NPC Milestone 2:4f

12

Preparation: Write the subtracting sentence below on a piece of paper, with space below it for children to write their own sentences using the same numbers.

Look at this subtracting sentence.

52 – 2 = 50

Can you use the same numbers to write another subtracting sentence and two adding sentences?

52 – 50 = 2

50 + 2 = 52

2 + 50 = 52

NPC Milestone 2:4f

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

Answers are in bold.

13

Preparation: Place Numeral Cards 78, 8 and 70 face up on a tabletop.

Can you make two adding and two subtracting number sentences with these cards?

78 = 8 + 70, 78 = 70 + 8

78 – 8 = 70, 78 – 70 = 8

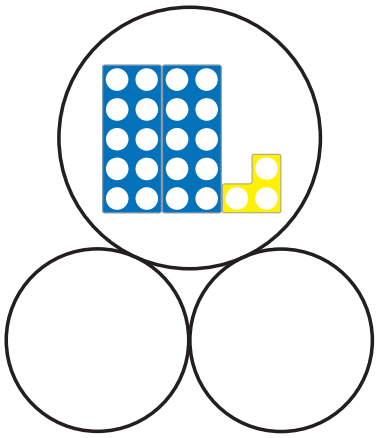
NPC Milestone 2:4g

14

Preparation: Provide a copy of photocopy master 13, 'Parts and Wholes – Large'. Use Numicon Shapes to make the number 23, in the top circle.

23 is the whole.

Can you find different ways to show 23 in parts on the model?



Can you use the model to tell me two subtracting sentences?

Do you know the inverse adding sentences?

Answers will vary, e.g.

23 – 7 = 16, 23 – 16 = 7

7 + 16 = 23, 16 + 7 = 23

NPC Milestone 2:4g

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

Answers are in bold.

15

Preparation: Write the number sentences below on a large piece of paper or display them on the board.

Ali wrote these subtracting sentences.

34 – 10 = 24

59 – 20 = 29

88 – 30 = 50

Can you write adding sentences to check if he is right?

24 + 10 = 34

29 + 20 = 49 not 59

50 + 30 = 80 not 88

NPC Milestone 2:4h

16

Preparation: Write the number sentences below on a large piece of paper or display them on the board.

Gemma wrote these adding sentences.

27 + 20 = 37

81 + 10 = 91

62 + 30 = 91

Can you write subtracting sentences to check if she is right?

37 – 20 = 17 not 27

91 – 10 = 81

91 – 30 = 61 not 62

NPC Milestone 2:4h

17

Preparation: Provide Numicon Shapes and some plastic 10p, 5p and 2p coins.

How many 10p coins are equal to 40p?

How many 5p coins are equal to 40p?

How many 2p coins are equal to 40p?

Can you use Numicon Shapes to prove your answers?

Four 10p coins

Eight 5p coins

Twenty 2p coins

NPC Milestone 2:4i

18

Preparation: Provide Numicon Shapes and some plastic 10p, 5p, 2p and 1p coins.

Can you solve these calculations?

28p + 30p

50p + 39p

65p + 20p

Can you use Numicon Shapes and coins to show your answers?

58p, 89p, 85p

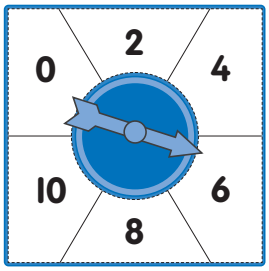
NPC Milestone 2:4i

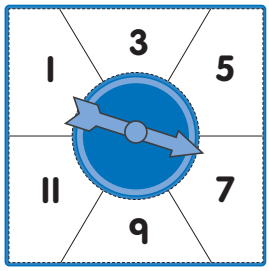
2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

Answers are in bold.

19

Preparation: Provide two spinners, one with odd numbers and the other with even, both from photocopy master 25, 'Spinner Overlays 1' or using the Numicon Interactive Whiteboard software.





Spin the odd number and the even number spinners.

Can you find the difference between the two numbers you spin?

Is it odd or even?

Try some other numbers.

What did you find out?

Explanations will vary, e.g. the difference between an odd number and an even number is always odd. If children go on to explore the difference between two odd numbers or two even numbers they may find that the difference between two odd numbers or two even numbers is always even.

20

Preparation: Place Numeral Cards 72, 43, 66 and 59 face down on a tabletop. Provide some Numicon Shapes.

Turn over the first card.

Do you think the number is odd or even?

Use the Numicon Shapes to see if you are correct.

Now try the other cards.

Is there a quick way to work out if the number is odd or even?

Explanations will vary, e.g. it is the ones digit that tells you if a number is odd or even. If using the Numicon Shapes the child may refer to the 'sticking up bit' on the odd numbers.

2.4 Numicon Milestone Assessment – NPC 2 Milestone 4 (Teacher)

Answers are in bold.

21

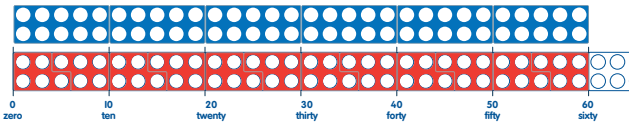
Preparation: Provide a Numicon 10s Number Line and some 5- and 10-shapes.

Can you find out how many tens there are in 60?

How many fives are there in 60?

Do you see a pattern?

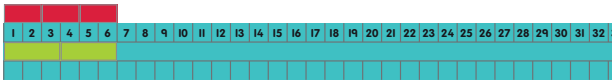
Explanations will vary, e.g. there are twice the number of fives as tens.



NPC Milestone 2:4k

22

Preparation: Provide a Numicon 1–100 cm Number Rod Track and some 2 and 3 number rods. Place three 2-rods and two 3-rods on the track, as shown.



Can you tell me about the pattern made with the number rods?

Can you tell me the number where the rods will line up again?

Check to see if you are correct.

Can you tell me the next number where the rods will line up again?

12, 18. Explanations will vary. Children may notice that the rods don't line up until the second 3-rod and predict the rods will line up at every second 3-rod / every third 2-rod. Writing out the numbers (multiples of 2 and 3) may also help children to see the pattern and predict.

NPC Milestone 2:4k

2.2 Numicon Milestone Assessment – GMS 2 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

1

There are three pieces of money in the bag and each has a different value.

Can you work out what they are from these clues?

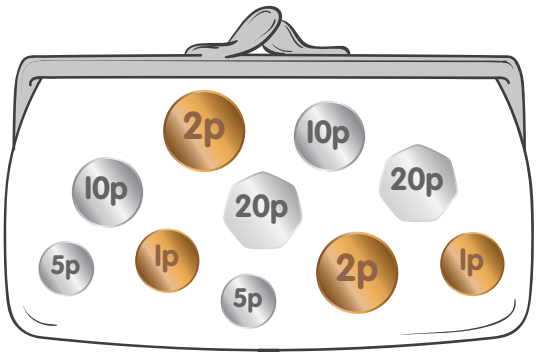
The first is the highest value silver coin, which has 7 sides.

The second is the blue note.

The final one is the smallest sized coin of all.

GMS Milestone 2:2a

2



Can you work out how much money is in this purse?

GMS Milestone 2:2a

3

Can you find all the different ways to make 40p with 5p and 10p coins?

You can use the number rods and track to help you show your answers.

GMS Milestone 2:2b

4

Can you find all the different ways to make 25p with 2p and 5p coins?

You can use Numicon Shapes and the number line to help you show your answers.

GMS Milestone 2:2b

Numicon Milestone Assessment – GMS 2 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

5

Would you prefer to have a 50p, a 20p and a 20p, or sixteen 5p pieces?

Can you explain why?

You can use Numicon Shapes to help you.

GMS Milestone 2:2c

6

How many £5 notes are equal to £10, £20 and £50?

You can use the number rods and track to help you to prove your answer.

GMS Milestone 2:2c

7

How much money is this?

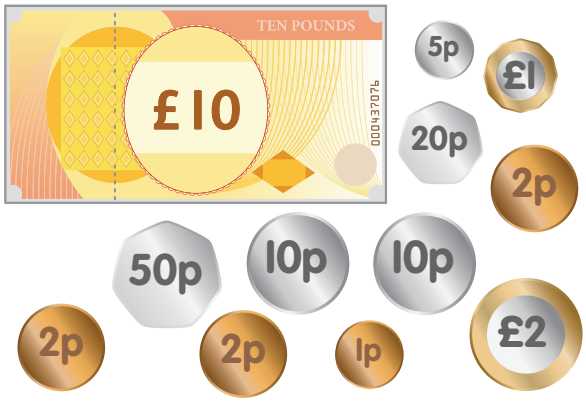
Can you write the amount in pounds?

Can you write the amount in pence?

GMS Milestone 2:2d

8

How much money is this?



Can you write the amount in pounds?

Can you write the amount in pence?

GMS Milestone 2:2d

Numicon Milestone Assessment – GMS 2 Milestone 2 (Pupil)

Answers are on the answer pages that follow.

9

Can you use rounding to tell me an approximate price for 2 balls?

Ball

19p

GMS Milestone 2:2e

10

Can you use rounding to tell me an approximate price for a pear, a banana and an apple?

Pear | Banana | Apple



13p | 28p | 17p

GMS Milestone 2:2e

11

Orange | Apple | Banana



8p | 17p | 28p

Ben buys an orange, two apples and two bananas.

How much change will he get from £1?

Use the number line and Numicon Shapes to help you find out.

GMS Milestone 2:2f

12

Boat | Car


18p | 36p

Tia has 50p.

Does she have enough money to buy the boat and the car?

Can you explain how you worked this out?

GMS Milestone 2:2f

2.2 Numicon Milestone Assessment – GMS 2 Milestone 2 (Teacher)

Answers are in bold.

1

Preparation: Place the following plastic money in a Numicon Feely Bag: a £5 note, a 50p coin and 5p coin.

There are three pieces of money in the bag and each has a different value.

Can you work out what they are from these clues?

The first is the highest value silver coin, which has 7 sides.

The second is the blue note.

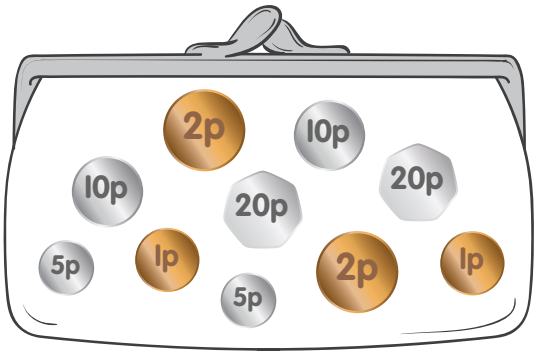
The final one is the smallest sized coin of all.

50p, £5, 5p

GMS Milestone 2:2a

2

Preparation: Put two each of the following plastic coins in a purse: 20p, 10p, 5p, 2p, 1p, or use a purse cut out from photocopy master 23, 'Purses'.



Can you work out how much money is in this purse?

76p

GMS Milestone 2:2a

2.2 Numicon Milestone Assessment – GMS 2 Milestone 2 (Teacher)

Answers are in bold.

3

Preparation: Provide some plastic 5p and 10p coins, some 5 and 10 number rods and a Numicon 1–100 cm Number Rod Track.

Can you find all the different ways to make 40p with 5p and 10p coins?

You can use the number rods and track to help you show your answers.

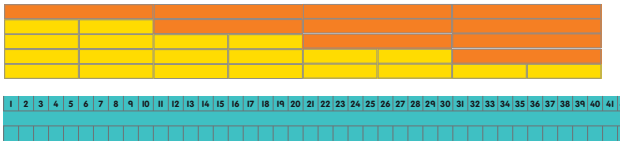
5p + 5p + 5p + 5p + 5p + 5p + 5p + 5p

5p + 5p + 5p + 5p + 5p + 5p + 10p

5p + 5p + 5p + 5p + 10p + 10p

5p + 5p + 10p + 10p + 10p

10p + 10p + 10p + 10p



GMS Milestone 2:2b

4

Preparation: Provide some plastic 2p and 5p coins, some Numicon 2-shapes and 5-shapes, and a Numicon 10s Number Line.

Can you find all the different ways to make 25p with 2p and 5p coins?

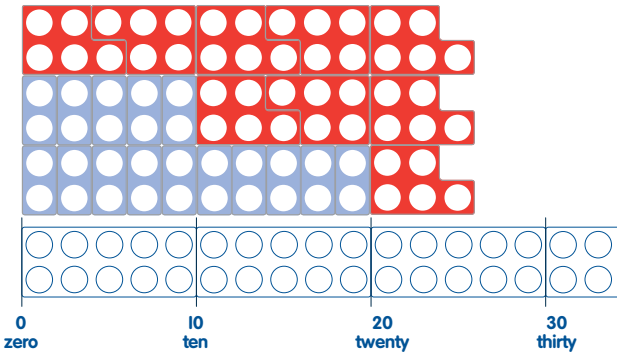
You can use Numicon Shapes and the number line to help you show your answers.

Example answers:

5 lots of 5p

5 lots of 2p + 3 lots of 5p

10 lots of 2p + 5p



GMS Milestone 2:2b

5

Preparation: Provide Numicon Shapes.

Would you prefer to have a 50p, a 20p and a 20p, or sixteen 5p pieces?

Can you explain why?

You can use Numicon Shapes to help you.

Explanations will vary,
e.g. 50p + 20p + 20p = 90p
16 × 5p = 80p

GMS Milestone 2:2c

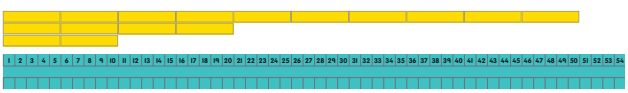
6

Preparation: Provide a Numicon 1–100 cm Number Rod Track and some number rods.

How many £5 notes are equal to £10, £20 and £50?

You can use the number rods and track to help you to prove your answer.

£10 = 2, £20 = 4, £50 = 10



GMS Milestone 2:2c

2.2 Numicon Milestone Assessment – GMS 2 Milestone 2 (Teacher)

Answers are in bold.

7

Preparation: Set out the following plastic coins: £2, 50p, two 20p, 10p, 5p and 2p.

How much money is this?

Can you write the amount in pounds?

Can you write the amount in pence?

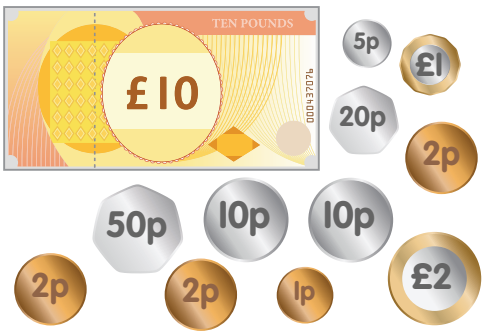
£3·07, 307p

GMS Milestone 2:2d

8

Preparation: Set out the following plastic money: £10 note, £2, £1, 50p, 20p, two 10p, 5p, three 2p and a 1p.

How much money is this?



Can you write the amount in pounds?

Can you write the amount in pence?

£14·02, 1402p

GMS Milestone 2:2d

9

Can you use rounding to tell me an approximate price for 2 balls?

19p

40p

GMS Milestone 2:2e

10

Can you use rounding to tell me an approximate price for a pear, a banana and an apple?

13p 28p 17p

60p

GMS Milestone 2:2e

2.2 Numicon Milestone Assessment – GMS 2 Milestone 2 (Teacher)

Answers are in bold.

11

Preparation: Provide Numicon Shapes and a Numicon 10s Number Line.

8p 17p 28p

Ben buys an orange, two apples and two bananas.

How much change will he get from £1?

Use the number line and Numicon Shapes to help you find out.

2p

GMS Milestone 2:2f

12

Preparation: Provide a Numicon 1–100 cm Number Rod Track and some number rods.

18p 36p

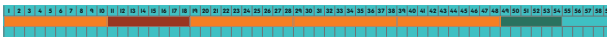
Tia has 50p.

Does she have enough money to buy the boat and the car?

Can you explain how you worked this out?

Explanations will vary, e.g. No, Tia is 4p short. I rounded the cost of the boat up to 20p which gave me 20p + 36p = 56p, and then I took off the extra 2p, which gave me 54p.

If using the number rods the child may show that the two prices added together comes to more than 50p.



GMS Milestone 2:2f

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

1

Can you round these numbers to the nearest 10?

23	15	38	42	77

NPC Milestone 2:5a

2

Can you tell me five numbers that round to 40?

You can use anything on the tabletop to help you show this.

NPC Milestone 2:5a

3

Can you put a peg on 57 on the number track?

Now use the 100 square to find 7 more than 57.

NPC Milestone 2:5b

4

Use the number tracks.

Can you put a sticker on all the multiples of 10?

What do you notice about the position of the stickers?

Now put the number tracks together to make a 100 square.

What do you notice about the position of the stickers now?

NPC Milestone 2:5b

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

5

50 15 51 55

Can you make these numbers using number rods?

Can you compare the numbers by putting the < or > symbols between them?

NPC Milestone 2:5c

6

Read the first number and then pick another number from the pile.

Is this greater than or less than the first number?

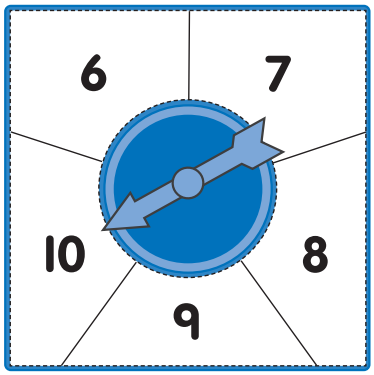
Pick one more card.

Can you tell me if this is greater than or less than the second number?

NPC Milestone 2:5c

7

Spin the spinner.



Can you double the number you land on?

Now have two more goes at spinning, and double the number each time.

NPC Milestone 2:5d

8

Can you build a doubling staircase from double 1 to double 10?

Does your staircase help you to answer these questions?

18 – 9 =

14 – 7 =

16 – 8 =

NPC Milestone 2:5d

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

9

Can you explain how to solve 44 – 9?

Use Numicon Shapes to help you.

NPC Milestone 2:5e

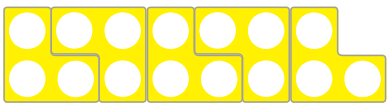
10

Can you explain how to solve 58 + 9?

Draw a number line to help you.

NPC Milestone 2:5e

11



Can you write a times number sentence for these Numicon Shapes?

NPC Milestone 2:5f

12

Stickers come in packs of 10.

If I buy 5 packets, how many stickers will I have?

Can you show this with rods on the track?

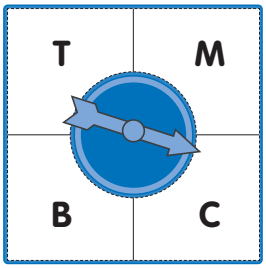
Can you write an adding number sentence and a multiplying number sentence to show this?

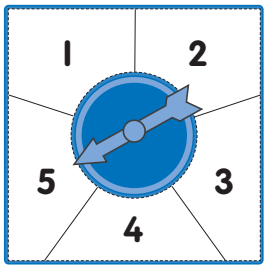
NPC Milestone 2:5f

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

13





The first spinner tells you which instrument to play.

The second spinner tells you how many times to play it.

Spin each spinner three times.

Can you use the multiplying sign to write down what you need to play?

NPC Milestone 2:5g

14

Can you tell me what sort of number sentence you could write for these counters?

Now can you write the sentence?

NPC Milestone 2:5g

15

Can you tell me the product of 7 and 5?

Can you write the number sentence?

Can you show this using number rods?

NPC Milestone 2:5h

16

Can you read these number sentences?

$80 = 8 \times 10$

$1 \times 10 = 10$

$10 = 5 \times 2$

$10 \times 5 = 50$

Which sentences have 10 as a product?

NPC Milestone 2:5h

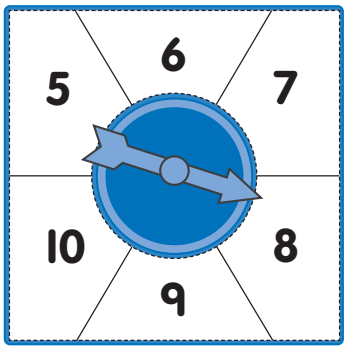
2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Pupil)

Answers are on the answer pages that follow.

17

Spin the spinner.

Can you multiply the number by 2, by 10, by 5 and by 3?



NPC Milestone 2:5i

18

Can you answer these questions?

$9 \times 10 =$

$6 \times 3 =$

$9 \times 3 =$

$7 \times 5 =$

$8 \times 2 =$

NPC Milestone 2:5i

19

Use Numicon 2-shapes in one side of the pan balance and Numicon 5-shapes in the other.

Can you make the pans balance?

Can you fill in this multiplying sentence to show this?

$\square \times 2 = \square \times 5$

NPC Milestone 2:5j

20

Here is a model for 3×10.

Can you make a model for 10×3?

What do you notice about these two number sentences?

NPC Milestone 2:5j

Numicon Milestone Assessment – NPC 2 Milestone 5 (Pupil)

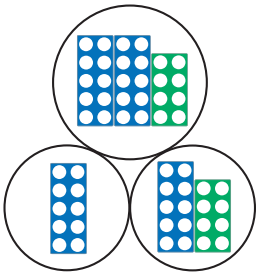
Answers are on the answer pages that follow.

21

Can you use number rods to explain the link between doubling and halving?

NPC Milestone 2:5k

22



Jodie makes this parts and wholes model to find half of 28.

Do you think her model is correct?

Can you explain your thinking?

NPC Milestone 2:5k

23

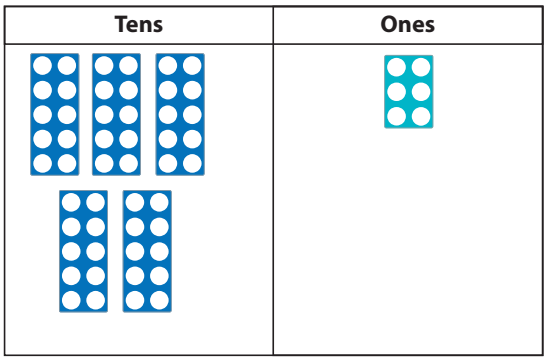
$$32 + 7 =$$

Can you solve this number sentence?

Can you explain how you worked out the answer?

NPC Milestone 2:5l

24



Can you explain how to subtract 4 from this number?

NPC Milestone 2:5l

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

1

Preparation: Provide a Numicon 1–100 Card Number Track for support if needed (optional).

Can you round these numbers to the nearest 10?

23 15 38 42 77

20, 20, 40, 40, 80

NPC Milestone 2:5a

2

Preparation: Provide a Numicon 10s Number Line and some Numicon Shapes.

Can you tell me five numbers that round to 40?

You can use anything on the tabletop to help you show this.

Five numbers from the range 35–44.

NPC Milestone 2:5a

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

3

Preparation: Provide a Numicon 1–100 Card Number Track from 31–60, some Numicon Pegs and photocopy master 1, '100 Square'.

Can you put a peg on 57 on the number track?

Now use the 100 square to find 7 more than 57.

Answer

51	52	53	54	55	56	57	58	59	60

64

4

Preparation: Provide a Numicon 1–100 Card Number Track, joined in a long line, and small, removable stickers (or Numicon Pegs but these will be harder to keep in place).

Use the number tracks.

Can you put a sticker on all the multiples of 10?

What do you notice about the position of the stickers?

Now put the number tracks together to make a 100 square.

What do you notice about the position of the stickers now?

Explanations will vary, e.g. between numbers that have a 9 and 1 in the ones place on the track. In a 100 square the multiples of 10 are now at the end of each row.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

NPC Milestone 2:5b

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

5

Preparation: Put Numeral Cards 50, 15, 51 and 55 face up on a tabletop. Provide comparison symbols (< and >) cut from photocopy master 32, 'Words and Symbols for Calculating', and some number rods.

Can you make these numbers using number rods?

Can you compare the numbers by putting the < or > symbols between them?

50 > 15 < 51 < 55

NPC Milestone 2:5c

6

Preparation: Provide shuffled Numeral Cards 10–100 face down in a pile, and comparison symbols (< and >) cut from photocopy master 32, 'Words and Symbols for Calculating'.

Turn over the top card and place it on a tabletop.

Read the first number and then pick another number from the pile.

Is this greater than or less than the first number?

Pick one more card.

Can you tell me if this is greater than or less than the second number?

Use your professional judgement to determine whether the child is accurate with this question.

NPC Milestone 2:5c

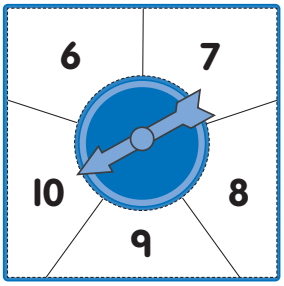
2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

7

Preparation: Prepare a Numicon Spinner using the 6–10 overlay cut from photocopy master 25, 'Spinner Overlays 1', or use the one on the Numicon Interactive Whiteboard software.

Spin the spinner.



Can you double the number you land on?

Now have two more goes at spinning, and double the number each time.

Use your professional judgement to determine whether the child is accurate with this question.

NPC Milestone 2:5d

8

Preparation: Provide two sets of Numicon Shapes.

Can you build a doubling staircase from double 1 to double 10?

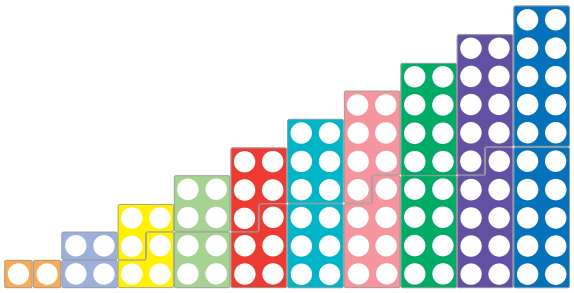
Does your staircase help you to answer these questions?

18 – 9 =

14 – 7 =

16 – 8 =

Answer



9, 7, 8

NPC Milestone 2:5d

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

9

Preparation: Provide multiple sets of Numicon Shapes.

Can you explain how to solve 44 − 9?

Use Numicon Shapes to help you.

35

Explanations will vary, but should refer to an adjustment strategy, e.g. I took 10 away which is 1 more than 9 so I added 1 back on.

NPC Milestone 2:5e

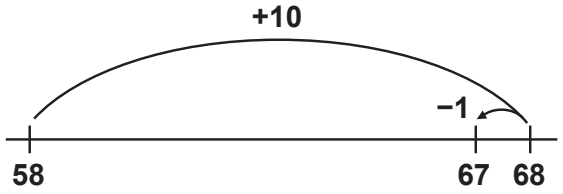
10

Preparation: Provide paper and a pencil or whiteboard and pen.

Can you explain how to solve 58 + 9?

Draw a number line to help you.

67

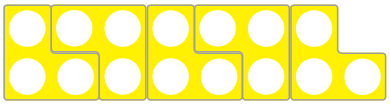


Explanations will vary, but should refer to an adjustment strategy, e.g. I added 10 which is 1 more than 9, so then I took 1 away.

NPC Milestone 2:5e

11

Preparation: Arrange five 3-shapes as shown.



Can you write a times number sentence for these Numicon Shapes?

5 × 3

Do not accept 3 × 5.

NPC Milestone 2:5f

12

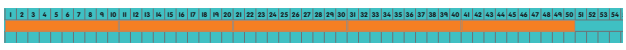
Preparation: Provide some number rods and a Numicon 1–100 cm Number Rod Track.

Stickers come in packs of 10.

If I buy 5 packets, how many stickers will I have?

Can you show this with rods on the track?

Can you write an adding number sentence and a multiplying number sentence to show this?



10 + 10 + 10 + 10 + 10

5 × 10

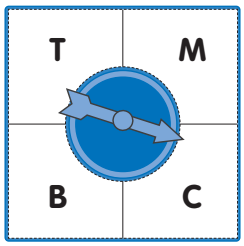
NPC Milestone 2:5f

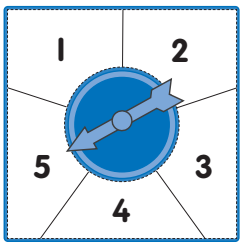
2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

13

Preparation: Provide some percussion instruments, e.g. maracas, bells, a chime bar and a triangle. Using photocopy master 26, 'Spinner Overlays 2', make a 1–5 spinner and, using the blank overlay, make a spinner to match the instrument names.





The first spinner tells you which instrument to play.

The second spinner tells you how many times to play it.

Spin each spinner three times.

Can you use the multiplying sign to write down what you need to play?

Encourage children to play the music they have spun and recorded.

Answers will vary, e.g.

M × 3

B × 2

T × 5

So children would shake the maracas three times, ring the bells twice and strike the triangle five times.

NPC Milestone 2:5g

14

Preparation: Set out some counters on a tabletop, as shown.

Can you tell me what sort of number sentence you could write for these counters?

Now can you write the sentence?

Explanations will vary, but should include 4 × 5 or 4 times 5 counters. If children suggest an adding sentence, encourage them to think about multiplying too.

NPC Milestone 2:5g

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

15

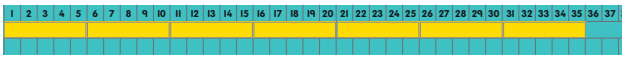
Preparation: Provide some number rods and a Numicon 1–100 cm Number Rod Track.

Can you tell me the product of 7 and 5?

Can you write the number sentence?

Can you show this using number rods?

35; 7 × 5 = 35



NPC Milestone 2:5h

16

Can you read these number sentences?

80 = 8 × 10

1 × 10 = 10

10 = 5 × 2

10 × 5 = 50

Which sentences have 10 as a product?

1 × 10 = 10

10 = 5 × 2

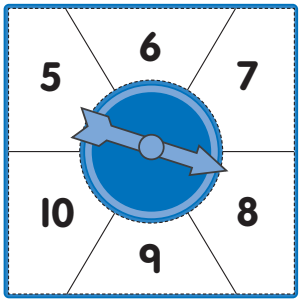
NPC Milestone 2:5h

17

Preparation: Make a spinner using the 5–10 overlay cut from photocopy master 26, 'Spinner Overlays 2'.

Spin the spinner.

Can you multiply the number by 2, by 10, by 5 and by 3?



Use your professional judgement to determine whether the child is accurate with this question.

NPC Milestone 2:5i

18

Can you answer these questions?

9 × 10 =

6 × 3 =

9 × 3 =

7 × 5 =

8 × 2 =

90, 18, 27, 35, 16

NPC Milestone 2:5i

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

19

Preparation: Provide a Numicon Pan Balance and some Numicon 2-shapes and 5-shapes.

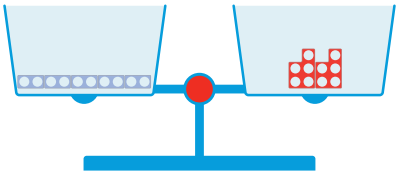
Use Numicon 2-shapes in one side of the pan balance and Numicon 5-shapes in the other.

Can you make the pans balance?

Can you fill in this multiplying sentence to show this?

$\square \times 2 = \square \times 5$

5 × 2 = 2 × 5 or scaled models of this arrangement.



NPC Milestone 2:5j

20

Preparation: Provide some number rods. Make sure there are at least ten 3-rods.

Here is a model for 3 × 10.

Can you make a model for 10 × 3?

What do you notice about these two number sentences?

Explanations will vary, e.g. they both have a product of 30.

NPC Milestone 2:5j

21

Preparation: Provide a set of number rods.

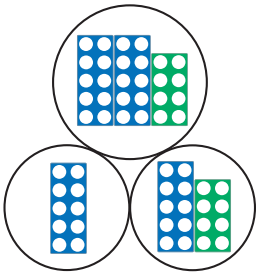
Can you use number rods to explain the link between doubling and halving?

Explanations will vary, e.g. double red (2) is pink (4) and half of pink (4) is red (2). Double means two of the same and halving means two equal parts.

NPC Milestone 2:5k

22

Preparation: Set up a parts and wholes model as shown below using Numicon Shapes and photocopy master 13, 'Parts and Wholes – Large'.



Jodie makes this parts and wholes model to find half of 28.

Do you think her model is correct?

Can you explain your thinking?

Explanations will vary, e.g. she has halved the tens but not the ones. There should be 14 in each part.

NPC Milestone 2:5k

2.5 Numicon Milestone Assessment – NPC 2 Milestone 5 (Teacher)

Answers are in bold.

23

32 + 7 =

Can you solve this number sentence?

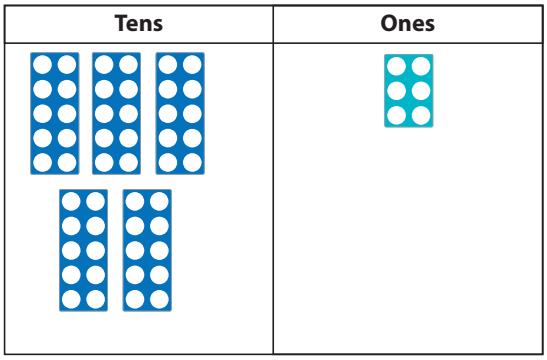
Can you explain how you worked out the answer?

Explanations will vary, e.g.
I know that 2 + 7 is 9,
therefore 32 + 7 is 39.

NPC Milestone 2:5l

24

Preparation: Use photocopy master 29, 'Tens and Ones Frame' and some Numicon Shapes and set them out as shown.



Can you explain how to subtract 4 from this number?

Explanations will vary, e.g.
6 take away 4 is 2, so 56 – 4 = 52.

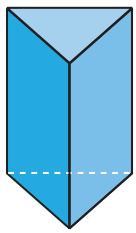
NPC Milestone 2:5l

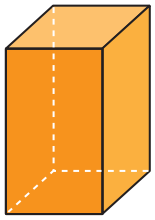
2.3 Numicon Milestone Assessment – GMS 2 Milestone 3 (Pupil)

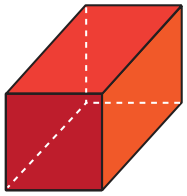
Answers are on the answer pages that follow.

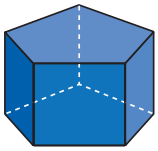
1

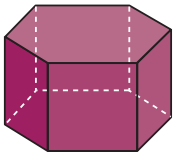
Can you tell me the names of these 3D shapes?

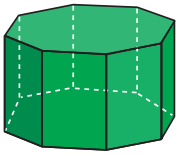












GMS Milestone 2:3a

2

If I cut each shape in half to get a cross-section, what face would you see?

Can you draw these faces?

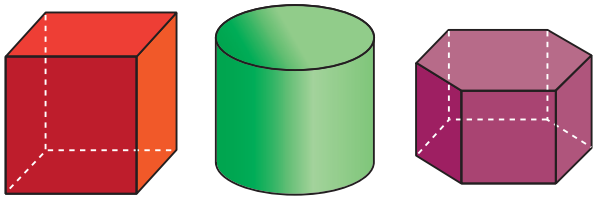
GMS Milestone 2:3a

Numicon Milestone Assessment – GMS 2 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

3

Look at these three 3D shapes.

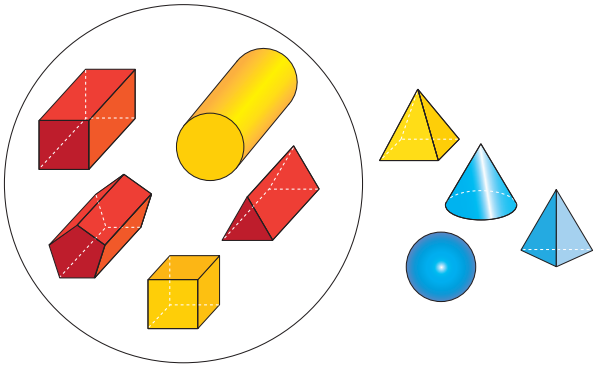


Can you think of a reason why each of these three shapes could be the odd one out?

GMS Milestone 2:3b

4

Samaa has sorted the shapes into prisms and non-prisms.



Do you agree with her sorting?

Can you explain why or why not?

GMS Milestone 2:3b

5

Why do you think some food packaging is cuboid in shape?

Explain your thinking.

GMS Milestone 2:3c

6

Why do you think drink cans and tins are shaped like cylinders?

Explain your thinking.

GMS Milestone 2:3c

Numicon Milestone Assessment – GMS 2 Milestone 3 (Pupil)

Answers are on the next page.

7

Can you tell me the shape of the faces on this prism?

How many faces are there altogether?

Can you tell me how many oblong faces there are on this triangular prism without counting them?

Can you explain your thinking?

GMS Milestone 2:3d

8

Look at the different prisms.

Do you have a way of knowing how many oblong faces there will be on each one without counting?

Can you explain your thinking?

GMS Milestone 2:3d

9

Choose two of these books.

Can you tell me about the different lengths you could measure on each book?

GMS Milestone 2:3e

10

I want to find out how big the room is.

Can you tell me which dimensions I should measure?

Which dimensions could you walk along?

Which dimensions could you not walk along?

GMS Milestone 2:3e

Numicon Milestone Assessment – GMS 2 Milestone 3 (Pupil)

Answers are on the next page.

11

What measuring equipment would you use to measure the thickness of the door?

What measuring equipment would you use to measure the width of the door?

Can you explain your choices and then try measuring?

GMS Milestone 2:3f

12

What measuring equipment would you use to measure the distance a toy car can travel with one push?

Can you explain your choice and then try measuring?

GMS Milestone 2:3f

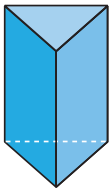
2.3 Numicon Milestone Assessment – GMS 2 Milestone 3 (Teacher)

Answers are in bold.

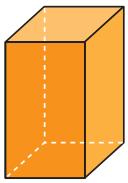
1

Preparation: Provide a variety of boxes or 3D shape models, including a triangular prism, an oblong prism, a square prism, a pentagonal prism, a hexagonal prism and an octagonal prism.

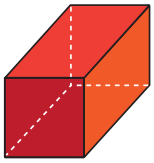
Can you tell me the names of these 3D shapes?



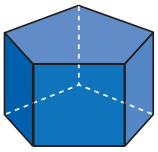
Triangular prism



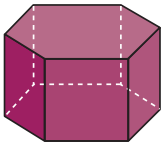
Oblong prism



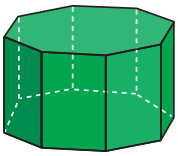
Square prism



Pentagonal prism



Hexagonal prism



Octagonal prism

Note:
Both the orange and red shapes above can be called rectangular prisms (or cuboids). When at least two of the lengths in a rectangular prism are equal, it can be called a square prism, so the red shape is a square prism. The cross-section of that shape will be a square.

GMS Milestone 2:3a

2

Preparation: Provide a cylinder and a selection of prisms, e.g. triangular prism, square prism.

If I cut each shape in half to get a cross-section, what face would you see?

Can you draw these faces?

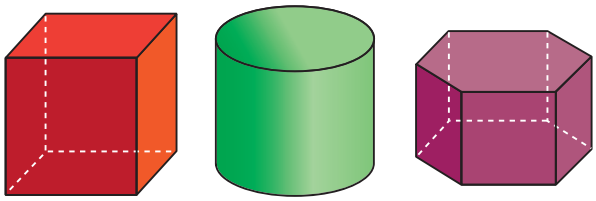
Answers will vary depending on the prisms provided, e.g. a triangular prism would have a triangle face in its cross-section.

GMS Milestone 2:3a

3

Preparation: Provide a variety of boxes or 3D shape models, including a square prism, a cylinder and a hexagonal prism.

Look at these three 3D shapes.



Can you think of a reason why each of these three shapes could be the odd one out?

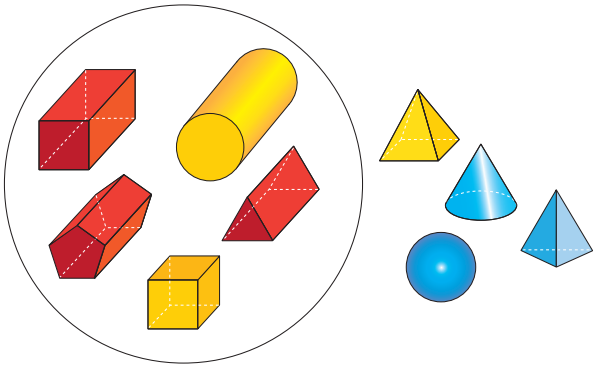
Explanations will vary, e.g. the hexagonal prism is the odd one out as it has 8 faces; the cylinder is the odd one out as it has a curved face; the square prism is the odd one out because all its faces are rectangles.

GMS Milestone 2:3b

4

Preparation: Sort some 3D shapes into two groups using a sorting hoop if available, as shown.

Samaa has sorted the shapes into prisms and non-prisms.



Do you agree with her sorting?

Can you explain why or why not?

Explanations will vary, but should include reference to a cylinder not being a prism as prisms are made of polygons/straight-sided faces.

GMS Milestone 2:3b

2.3 Numicon Milestone Assessment – GMS 2 Milestone 3 (Teacher)

5

Preparation: Provide a collection of real-life cuboids, e.g. cereal boxes, juice cartons.

Why do you think some food packaging is cuboid in shape?

Explain your thinking.

Explanations will vary, e.g. cuboids are easy to stack and pack without spaces between them.

GMS Milestone 2:3c

6

Preparation: Provide a collection of real-life cylinders, e.g. drinks cans, tins.

Why do you think drink cans and tins are shaped like cylinders?

Explain your thinking.

Explanations will vary, e.g. cylinders are easy to hold, the circular face is easy to open with a tin opener, easy to stack, etc.

GMS Milestone 2:3c

2.3 Numicon Milestone Assessment – GMS 2 Milestone 3 (Teacher)

Answers are in bold.

7	8
Preparation: Provide a variety of boxes or 3D shape models, including a pentagonal prism and a triangular prism. Point to the pentagonal prism. Can you tell me the shape of the faces on this prism? How many faces are there altogether? Point to the triangular prism. Can you tell me how many oblong faces there are on this triangular prism without counting them? Can you explain your thinking? **Pentagon, oblong; 7 faces.** **Explanations will vary,** **e.g. a triangular prism will have 3 oblongs as a triangle has 3 sides; these are the edges the oblongs join.**	**Preparation:** Provide a variety of boxes or 3D shape models of various prisms. Look at the different prisms. Do you have a way of knowing how many oblong faces there will be on each one without counting? Can you explain your thinking? **Explanations will vary,** **e.g. a hexagonal prism will have 6 oblongs as a hexagon has 6 sides; these are the edges the oblongs join.**
GMS Milestone 2:3d	GMS Milestone 2:3d

2.3 Numicon Milestone Assessment – GMS 2 Milestone 3 (Teacher)

Answers are in bold.

9	10
Preparation: Provide a selection of books of various sizes arranged in different orientations. Choose two of these books. Can you tell me about the different lengths you could measure on each book? **Explanations will vary, e.g. this is the length, the width and the height. Depending on the orientation, thickness might also be used rather than height.**	**Preparation:** Choose a rectangular room in your school to discuss measure, using length, height and width. I want to find out how big the room is. Can you tell me which dimensions I should measure? Which dimensions could you walk along? Which dimensions could you not walk along? **Answers will vary, e.g. I can walk along the width and the length of the room but not the height.**
GMS Milestone 2:3e	GMS Milestone 2:3e

2.3 Numicon Milestone Assessment – GMS 2 Milestone 3 (Teacher)

Answers are in bold.

11

Preparation: Provide some measuring equipment, e.g. rulers, metre sticks, measuring tape.

What measuring equipment would you use to measure the thickness of the door?

What measuring equipment would you use to measure the width of the door?

Can you explain your choices and then try measuring?

A ruler will be the most accurate to measure the thickness of the door and a measuring tape to measure the width. Some children may realize it is easier to measure the width of the door at carpet level rather than across the door itself.

Encourage children to think about the units they have chosen to measure in and why these are suitable.

GMS Milestone 2:3f

12

Preparation: Provide some measuring equipment, e.g. rulers, metre sticks, measuring tape. Also provide a toy car and an open space for the car to travel in, e.g. a hall or playground.

What measuring equipment would you use to measure the distance a toy car can travel with one push?

Can you explain your choice and then try measuring?

A metre stick or measuring tape would be a sensible measuring tool. A starting line will also need to be considered and whether it is the front or the rear of the car that marks the distance.

Encourage children to think about the units they have chosen to measure in and why these are suitable.

GMS Milestone 2:3f

2.6 Numicon Milestone Assessment – NPC 2 Milestone 6 (Pupil)

Answers are on the answer pages that follow.

1

How can you solve this calculation using bridging?

27 + 6

Can you use Numicon Shapes to show this?

NPC Milestone 2:6a

2

Look at the question below.

There are 32 strawberries.

I eat 7 of them.

How many strawberries are left?

Can you use Numicon Shapes to show me how to find the answer?

NPC Milestone 2:6a

3

Can you explain how you would solve these number sentences?

8 + 4 + 6 =

5 + 3 + 2 + 6 =

NPC Milestone 2:6b

4

Look at these calculations.

6 + 6 + 3 =

8 + 9 + 2 =

Do you think it is easier to add up the numbers in the order they are written or to change the order?

Can you explain your thinking?

NPC Milestone 2:6b

2.6 Numicon Milestone Assessment – NPC 2 Milestone 6 (Pupil)

Answers are on the answer pages that follow.

5

Can you explain how to solve these number sentences?

$43 + 5 =$

$31 + 9 =$

NPC Milestone 2:6c

6

Can you explain how to find the total of each number sentence?

$28 + 12 =$

$15 + 15 =$

NPC Milestone 2:6c

7

Can you use a pencil and paper to solve these number sentences?

$38 + 50 =$

$60 + 29 =$

NPC Milestone 2:6d

8

Can you use a pencil and paper to solve these number sentences?

$65 - 30 =$

$78 - 60 =$

NPC Milestone 2:6d

Numicon Milestone Assessment – NPC 2 Milestone 6 (Pupil)

Answers are on the answer pages that follow.

9

Can you use a pencil and paper to solve these calculations?

$33 + 26 =$

$48 + 51 =$

NPC Milestone 2:6e

10

Can you use a pencil and paper to solve these calculations?

$87 - 25 =$

$79 - 34 =$

NPC Milestone 2:6e

11

Can you solve this calculation?

$67 + \square = 100$

Now can you solve it in a different way?

Which way do you think is better?

NPC Milestone 2:6f

12

Can you solve this calculation?

$100 - 46 =$

Now can you solve it in a different way?

Which way do you think is better?

NPC Milestone 2:6f

2.6 Numicon Milestone Assessment – NPC 2 Milestone 6 (Pupil)

Answers are on the next page.

13

Can you calculate all the subtracting facts for 19?

NPC Milestone 2:6g

14

Can you answer these questions?

$12 + \square = 16$

$\square - 7 = 6$

$\square + 9 = 15$

$18 - \square = 5$

$3 + \square = 17$

NPC Milestone 2:6g

2.6 Numicon Milestone Assessment – NPC 2 Milestone 6 (Teacher)

Answers are in bold.

1

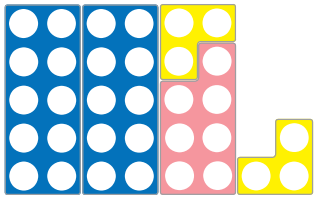
Preparation: Provide some Numicon Shapes.

How can you solve this calculation using bridging?

27 + 6

Can you use Numicon Shapes to show this?

33



NPC Milestone 2:6a

2

Preparation: Provide some Numicon Shapes.

Look at the question below.

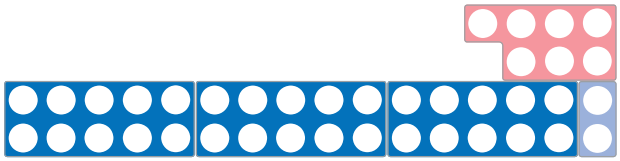
There are 32 strawberries.

I eat 7 of them.

How many strawberries are left?

Can you use Numicon Shapes to show me how to find the answer?

25



NPC Milestone 2:6a

3

Can you explain how you would solve these number sentences?

8 + 4 + 6 =

5 + 3 + 2 + 6 =

Explanations will vary,
e.g. 6 add 4 = 10; 10 add 8 = 18
3 + 2 + 5 = 10; 10 + 6 = 16

NPC Milestone 2:6b

4

Look at these calculations.

6 + 6 + 3 =

8 + 9 + 2 =

Do you think it is easier to add up the numbers in the order they are written or to change the order?

Can you explain your thinking?

Use your professional judgement to determine whether the child chooses an efficient strategy.

NPC Milestone 2:6b

2.6 Numicon Milestone Assessment – NPC 2 Milestone 6 (Teacher)

Answers are in bold.

5

Can you explain how to solve these number sentences?

43 + 5 =

31 + 9 =

Children should calculate the total rather than counting in ones. Explanations will vary,
e.g. 40 + 3 + 5 = 40 + 8 = 48
30 + 1 + 9 = 30 + 10 = 40

NPC Milestone 2:6c

6

Can you explain how to find the total of each number sentence?

28 + 12 =

15 + 15 =

Children should calculate the total rather than counting in ones. Explanations will vary,
e.g. 20 + 10 + 8 + 2 = 30 + 10 = 40
10 + 10 + 5 + 5 = 20 + 10 = 30

NPC Milestone 2:6c

7

Preparation: Provide some paper and a pencil.

Can you use a pencil and paper to solve these number sentences?

38 + 50 =

60 + 29 =

Strategies will vary, e.g.

38 + 50 = 88
3 + 5

60 + 20 + 9 = 89

NPC Milestone 2:6d

8

Preparation: Provide some paper and a pencil.

Can you use a pencil and paper to solve these number sentences?

65 − 30 =

78 − 60 =

Strategies will vary, e.g.

65 − 30 = 35
6 − 3

70 – 60 + 8 = 18

NPC Milestone 2:6d

2.6 Numicon Milestone Assessment – NPC 2 Milestone 6 (Teacher)

Answers are in bold.

9

Preparation: Provide some paper and a pencil.

Can you use a pencil and paper to solve these calculations?

33 + 26 =

48 + 51 =

Strategies will vary, e.g.

3 tens + 2 tens = 5 tens

33 + 26 = 59

3 + 6 = 9

59, 99

NPC Milestone 2:6e

10

Preparation: Provide some paper and a pencil.

Can you use a pencil and paper to solve these calculations?

87 − 25 =

79 − 34 =

Strategies will vary, e.g.

8 tens − 2 tens = 6 tens

87 − 25 = 62

7 − 5 = 2

62, 45

NPC Milestone 2:6e

11

Can you solve this calculation?

67 + ☐ = 100

Now can you solve it in a different way?

Which way do you think is better?

Strategies will vary, e.g. using an empty number line to count up to 100 or subtracting 60 then subtracting 7.

NPC Milestone 2:6f

12

Can you solve this calculation?

100 − 46 =

Now can you solve it in a different way?

Which way do you think is better?

Strategies will vary, e.g. using an empty number line to count up to 100 or subtracting 40 then subtracting 6.

NPC Milestone 2:6f

2.6 Numicon Milestone Assessment – NPC 2 Milestone 6 (Teacher)

Answers are in bold.

13

Preparation: Provide a copy of photocopy master 28, 'Subtracting Facts for 19' and ask the child to complete the sheet.

Can you calculate all the subtracting facts for 19?

19 – 19 = 0	**19 – 9 = 10**
19 – 18 = 1	**19 – 8 = 11**
19 – 17 = 2	**19 – 7 = 12**
19 – 16 = 3	**19 – 6 = 13**
19 – 15 = 4	**19 – 5 = 14**
19 – 14 = 5	**19 – 4 = 15**
19 – 13 = 6	**19 – 3 = 16**
19 – 12 = 7	**19 – 2 = 17**
19 – 11 = 8	**19 – 1 = 18**
19 – 10 = 9	**19 – 0 = 19**

NPC Milestone 2:6g

14

Can you answer these questions?

12 + ☐ = 16

☐ – 7 = 6

☐ + 9 = 15

18 – ☐ = 5

3 + ☐ = 17

12 + 4 = 16

13 – 7 = 6

6 + 9 = 15

18 – 13 = 5

3 + 14 = 17

NPC Milestone 2:6g

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Pupil)

Answers are on the answer pages that follow.

1

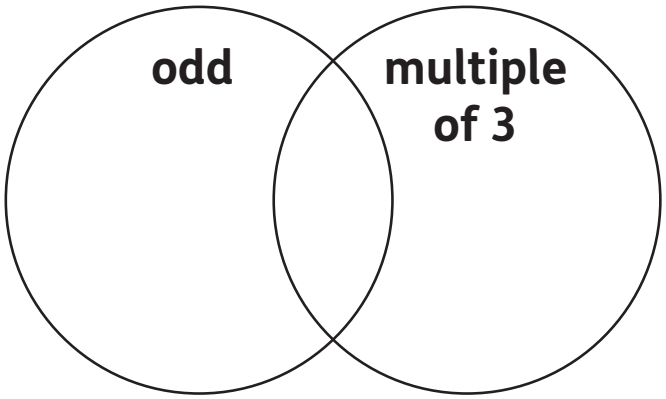
I have chosen a number.

Can you work out what the number is by asking me questions?

You can use the 100 square to help you mark off the numbers it cannot be.

NPC Milestone 2:7a

2



Can you sort the numbers and put them on this diagram?

NPC Milestone 2:7a

3

Can you work out my number from the clues?

It is a multiple of 5.

It is odd.

It is greater than 50.

It is less than 60.

NPC Milestone 2:7b

4

Meera says, “The sum of three odd numbers is always odd.”

Do you agree with Meera?

Can you use examples to explain your thinking?

NPC Milestone 2:7b

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Pupil)

Answers are on the answer pages that follow.

5

How many groups of 5 are there in 45?

Can you use number rods to show me?

Can you write the number sentence?

NPC Milestone 2:7c

6

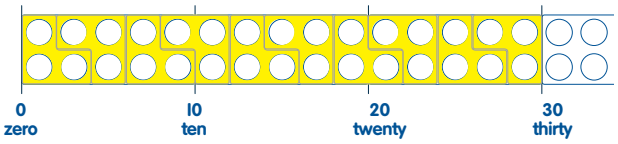
$24 \div 2$

What does this number sentence mean?

Can you use Numicon Shapes to show this?

NPC Milestone 2:7c

7



Can you write a dividing number sentence for my model?

Can you write a multiplying number sentence for my model?

NPC Milestone 2:7d

8

6	10	60

Only use the numbers on these cards.

Can you write some multiplying number sentences and some dividing number sentences?

Can you explain how you did this?

NPC Milestone 2:7d

Numicon Milestone Assessment – NPC 2 Milestone 7 (Pupil)

Answers are on the answer pages that follow.

9

Harry has 60p worth of 5 pence coins.

How many coins does he have?

Can you explain your thinking?

Can you write a number sentence for this problem?

NPC Milestone 2:7e

10

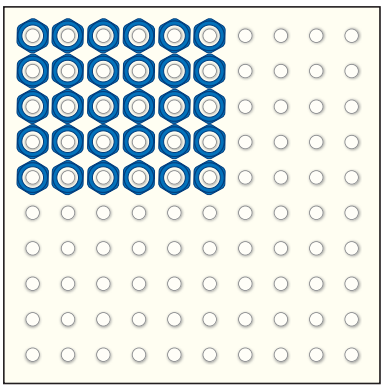
There are 40 marbles for Ade and his 4 friends to share.

Can you work out how many marbles they will each get?

Can you write a calculation for this problem?

NPC Milestone 2:7e

11



Can you tell me two multiplying sentences for this array?

Can you use these to tell me some dividing facts?

NPC Milestone 2:7f

12

Holly writes these number sentences.

$20 \div 2 = 10$

$2 \div 20 = 10$

$10 \times 2 = 20$

$2 \times 10 = 20$

Do you think she is correct?

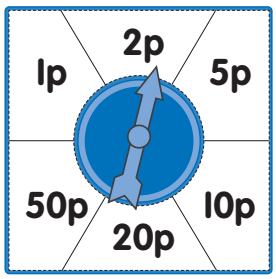
Can you explain your thinking?

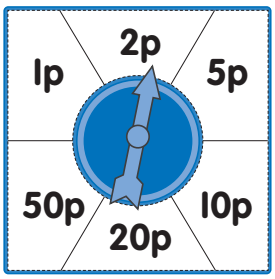
NPC Milestone 2:7f

Numicon Milestone Assessment – NPC 2 Milestone 7 (Pupil)

Answers are on the answer pages that follow.

13





Spin each spinner once and add the two amounts together.

What different combinations of two coins could you spin that add up to less than 20p?

How do you know you have found all the different ways?

NPC Milestone 2:7g

14

There are three odd Numicon Shapes in a bag and they are all different.

If the total is greater than 12, what Shapes could they be?

Can you find all of the possible combinations?

How do you know you have found them all?

NPC Milestone 2:7g

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Pupil)

Answers are on the answer pages that follow.

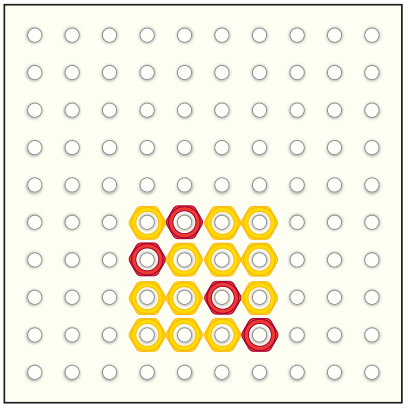
15

Can you cut one-third off this oblong?

Can you explain how you know it is one-third?

NPC Milestone 2:7h

16

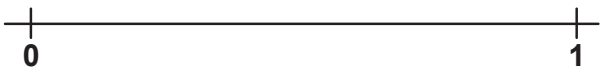


What fraction of the pegs is red?

Can you explain your thinking?

NPC Milestone 2:7h

17



Can you mark one-third on the number line?

Can you explain where it should go?

NPC Milestone 2:7i

18

Can you use the number line to count in quarters from 1 and a half to 3 and a half?

Which whole numbers will you mark on the line?

NPC Milestone 2:7i

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Pupil)

Answers are on the answer pages that follow.

19

Can you use the pegs to show me one-quarter on this 8-shape?

Can you show me two-quarters on the same Shape?

Now use a different 8-shape to show me one-half.

What do you notice about these models?

NPC Milestone 2:7j

20

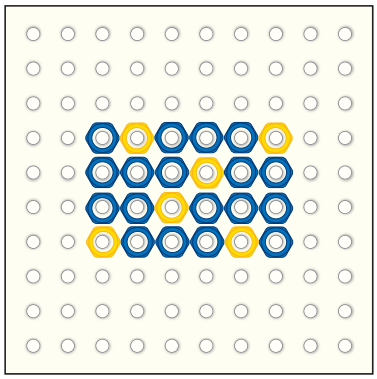
Can you colour one-half of this circle?

Can you split this circle into quarters and colour two quarters?

What do you notice about these circles?

NPC Milestone 2:7j

21

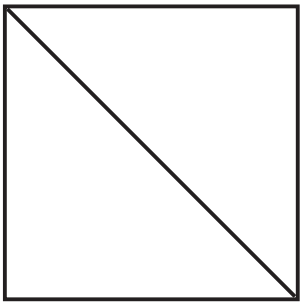


What fraction of the pegs is blue?

How do you know?

NPC Milestone 2:7k

22



Ravi started to divide this rectangle to show quarters.

Can you finish it and colour in three-quarters?

NPC Milestone 2:7k

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Teacher)

Answers are in bold.

1

Preparation: Provide a Numicon Card Number Track arranged as a 100 square, some Numicon Pegs and Numeral Cards 1–100. Select one numeral card but do not show the child.

I have chosen a number.

Can you work out what the number is by asking me questions?

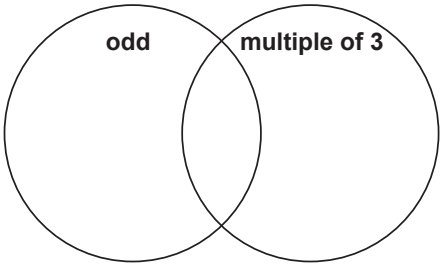
You can use the 100 square to help you mark off the numbers it cannot be.

Questions will vary and you may need to encourage children to think of some that help to eliminate many numbers.

NPC Milestone 2:7a

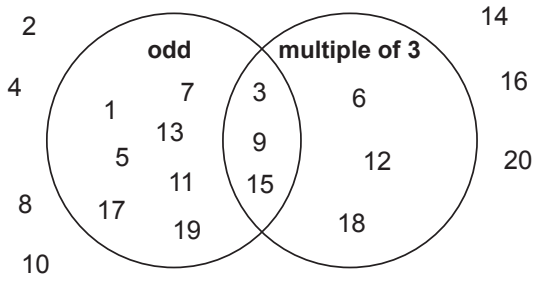
2

Preparation: Use photocopy master 30, 'Venn Diagram – Overlapping Rings' (enlarged to A3) and label it as shown below. Provide a set of Numeral Cards 1–20.



Can you sort the numbers and put them on this diagram?

Answer



NPC Milestone 2:7a

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Teacher)

Answers are in bold.

3

Preparation: Provide photocopy master 1, '100 Square' and some Numicon Pegs.

Can you work out my number from the clues?

It is a multiple of 5.

It is odd.

It is greater than 50.

It is less than 60.

55

NPC Milestone 2:7b

4

Preparation: Provide photocopy master 1, '100 Square' and some Numicon Pegs.

Meera says, "The sum of three odd numbers is always odd."

Do you agree with Meera?

Can you use examples to explain your thinking?

Examples will vary, e.g.

1 + 1 + 1 = 3

1 + 3 + 3 = 7

Some children might explain that the 'odd' 1 pairs with another 'odd' to make an even but with three 'odd' numbers the sum will always be odd.

NPC Milestone 2:7b

5

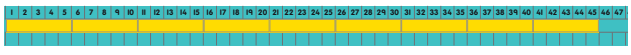
Preparation: Provide some number rods, including multiple 5-rods.

How many groups of 5 are there in 45?

Can you use number rods to show me?

Can you write the number sentence?

Answer



45 ÷ 5 = 9

If children provide a multiplying number sentence, ask if they can also show this with a dividing number sentence.

NPC Milestone 2:7c

6

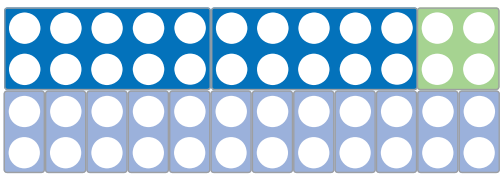
Preparation: Provide some Numicon Shapes, including multiple 2-shapes.

24 ÷ 2

What does this number sentence mean?

Can you use Numicon Shapes to show this?

Answers will vary, e.g. How many groups of 2 in 24? Dividing 2s into 24; 24 divided by 2.



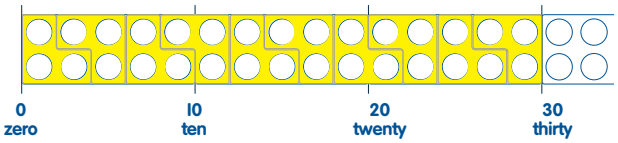
NPC Milestone 2:7c

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Teacher)

Answers are in bold.

7

Preparation: Use a Numicon 10s Number Line and some Numicon 3-shapes to make the model below.



Can you write a dividing number sentence for my model?

Can you write a multiplying number sentence for my model?

30 ÷ 3 = 10

10 × 3 = 30

NPC Milestone 2:7d

8

Preparation: Place Numeral Cards 6, 10 and 60 face up on a tabletop.

Only use the numbers on these cards.

Can you write some multiplying number sentences and some dividing number sentences?

Can you explain how you did this?

60 ÷ 6 = 10; 60 ÷ 10 = 6

10 × 6 = 60; 6 × 10 = 60

Explanations will vary, but look for children who talk about the inverse relationship between multiplying and dividing.

NPC Milestone 2:7d

9

Preparation: Put a pile of plastic 5p coins on a tabletop.

Harry has 60p worth of 5 pence coins.

How many coins does he have?

Can you explain your thinking?

Can you write a number sentence for this problem?

Explanations will vary, e.g. I counted in 5s until I got to 60; 12 × 5 = 60.

NPC Milestone 2:7e

10

There are 40 marbles for Ade and his 4 friends to share.

Can you work out how many marbles they will each get?

Can you write a calculation for this problem?

40 ÷ 5 = 8 or 8 × 5 = 40

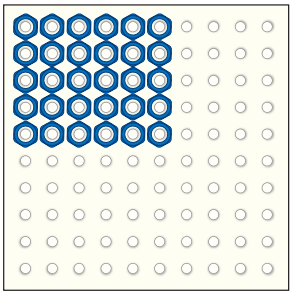
NPC Milestone 2:7e

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Teacher)

Answers are in bold.

11

Preparation: Provide a Numicon Baseboard and Numicon Pegs set out in the array shown below.



Can you tell me two multiplying sentences for this array?

Can you use these to tell me some dividing facts?

6 × 5 = 30; 5 × 6 = 30

30 ÷ 5 = 6; 30 ÷ 6 = 5

NPC Milestone 2:7f

12

Holly writes these number sentences.

20	÷	2	=	10
2	÷	20	=	10
10	×	2	=	20
2	×	10	=	20

Do you think she is correct?

Can you explain your thinking?

Explanations will vary, e.g. She has mixed up the numbers in the second dividing question; you need to start with the largest number.

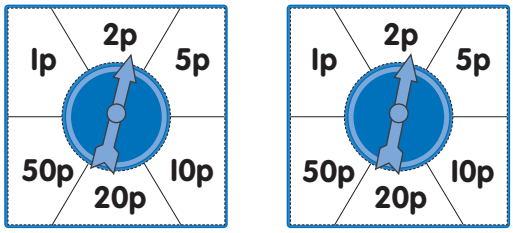
NPC Milestone 2:7f

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Teacher)

Answers are in bold.

13

Preparation: Make two money spinners cut from photocopy master 26, 'Spinner Overlays 2'.



Spin each spinner once and add the two amounts together.

What different combinations of two coins could you spin that add up to less than 20p?

How do you know you have found all the different ways?

Explanations will vary, e.g. I looked at the coins that total less than 20 and worked through systematically.

1p + 1p = 2p	1p + 2p = 3p	1p + 5p = 6p
1p + 10p = 11p	2p + 2p = 4p	2p + 5p = 7p
2p + 10p = 12p	5p + 5p = 10p	5p + 10p = 15p

NPC Milestone 2:7g

14

Preparation: Provide some Numicon Shapes to help the child explore possible answers.

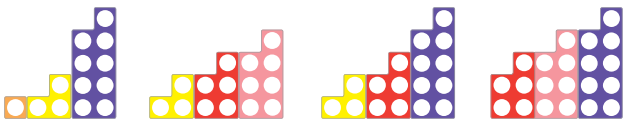
There are three odd Numicon Shapes in a bag and they are all different.

If the total is greater than 12, what Shapes could they be?

Can you find all of the possible combinations?

How do you know you have found them all?

Explanations will vary, e.g. I chose different odd Numicon Shapes that totalled more than 12. I worked in a systematic order.



NPC Milestone 2:7g

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Teacher)

Answers are in bold.

15

Preparation: Provide a small oblong piece of paper, a ruler, a pencil and some scissors.

Can you cut one-third off this oblong?

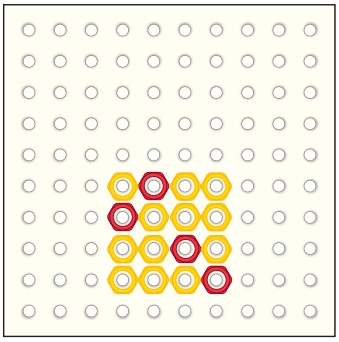
Can you explain how you know it is one-third?

Explanations should specify that one-third is one equal part of three equal parts.

NPC Milestone 2:7h

16

Preparation: Provide a Numicon Baseboard with Numicon Pegs arranged on it as shown.



What fraction of the pegs is red?

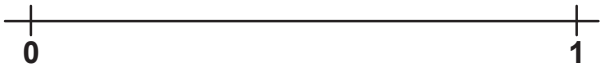
Can you explain your thinking?

Explanations will vary, e.g. one-quarter, there is one red peg for every three yellow pegs.

NPC Milestone 2:7h

17

Preparation: Draw a 0–1 number line on the board or on a piece of paper.



Can you mark one-third on the number line?

Can you explain where it should go?

Explanations will vary, e.g. the line needs to be split into three equal parts.

NPC Milestone 2:7i

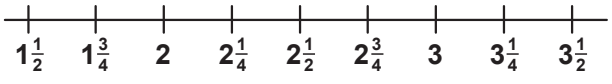
18

Preparation: Cut out one half of the number line from photocopy master 8, 'Empty 0–21 Number Line'.

Can you use the number line to count in quarters from 1 and a half to 3 and a half?

Which whole numbers will you mark on the line?

Answer



2 and 3

NPC Milestone 2:7i

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Teacher)

Answers are in bold.

19

Preparation: Provide two Numicon 8-shapes and some Numicon Pegs.

Can you use the pegs to show me one-quarter on this 8-shape?

Can you show me two-quarters on the same Shape?

Now use a different 8-shape to show me one-half.

What do you notice about these models?

Explanations will vary, e.g. two-quarters and one-half are the same.

NPC Milestone 2:7j

20

Preparation: Provide two small paper circles, a ruler and some coloured pencils.

Point to the first circle.

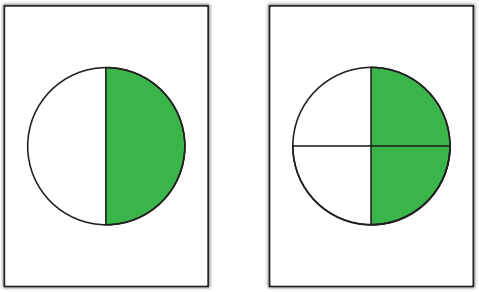
Can you colour one-half of this circle?

Point to the second circle.

Can you split this circle into quarters and colour two quarters?

What do you notice about these circles?

Explanations will vary, e.g. two-quarters and one-half are the same or equivalent.



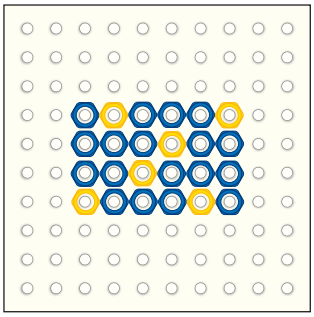
NPC Milestone 2:7j

2.7 Numicon Milestone Assessment – NPC 2 Milestone 7 (Teacher)

Answers are in bold.

21

Preparation: Provide a Numicon Baseboard with Numicon Pegs set out on it as shown.



What fraction of the pegs is blue?

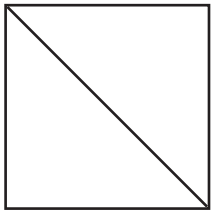
How do you know?

Three-quarters of the pegs are blue.
There are 24 pegs in total:
6 yellow pegs and 18 blue pegs.
One-quarter of 24 is 6, so
18 is three-quarters.

NPC Milestone 2:7k

22

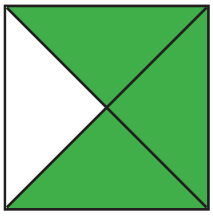
Preparation: Draw a diagonal line on a small paper square, as shown or children can use the image on this card. Provide a ruler and some coloured pencils.



Ravi started to divide this rectangle to show quarters.

Can you finish it and colour in three-quarters?

Answer



NPC Milestone 2:7k

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

1

How many 100 grams are there in 1 kilogram?

Can you use the pan balance to check?

GMS Milestone 2:4a

2

How many 1 grams are equal to 1 kilogram?

How many 1 grams are equal to 100 grams?

GMS Milestone 2:4a

3

Which parcels weigh greater than $\frac{1}{2}$ kg and which weigh less than $\frac{1}{2}$ kg?

Use the pan balance to help you.

Can you use the signs to show your answers?

GMS Milestone 2:4b

4

Can you find three things in the classroom that have a mass of less than 200 g?

Use the pan balance to check if you are correct.

GMS Milestone 2:4b

Numicon Milestone Assessment – GMS 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

5

Can you find the mass of each item, in kilograms?

Now can you write down each mass, starting with the heaviest?

GMS Milestone 2:4c

6

Can you use the weights to write five balancing number sentences?

You can use the pan balance to help you.

GMS Milestone 2:4c

7

Look at these containers.

Find the two containers that don't have labels.

What do you think their capacity will be?

Can you explain your thinking?

GMS Milestone 2:4d

8

This small container holds 250 ml.

How many of these small containers do you think you could fill from this large container?

Can you check?

Was it more or fewer than you thought?

GMS Milestone 2:4d

Numicon Milestone Assessment – GMS 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

9

Can you put these containers in order from the smallest capacity to the greatest capacity?

Use the measuring cylinder to help you.

GMS Milestone 2:4e

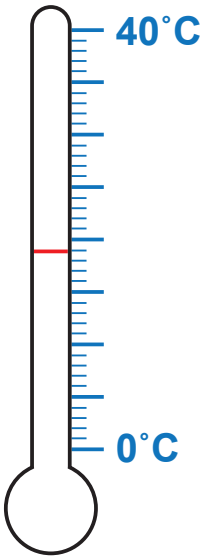
10

Can you put these containers in order from the one that holds the most to the one that holds the least?

Now use the measuring cylinder to check your answer.

GMS Milestone 2:4e

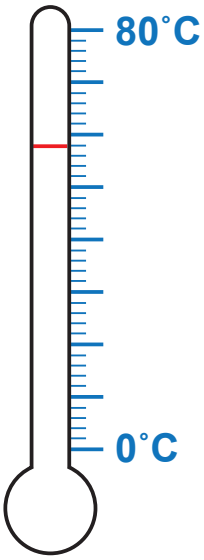
11



Can you read the temperature on the thermometer?

GMS Milestone 2:4f

12



Can you read the temperature on the thermometer?

Can you write the temperature shown on the thermometer scale?

GMS Milestone 2:4f

Numicon Milestone Assessment – GMS 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

13

Can you find out how many cups of water it takes to fill each container?

Can you record your findings in the table?

Container	Tally	Capacity (in cups)
A		
B		
C		
D		

GMS Milestone 2:4g

14

Can you find out how many cups of water are in the washing-up bowl?

Can you record your findings in the table?

Tally	Capacity (in cups)

GMS Milestone 2:4g

15

Can you use the clock to show me half past 4?

Now can you show me midday?

How else could you say midday?

GMS Milestone 2:4h

16

Can you use the clock to show me quarter past 6?

Now can you show me quarter to 10?

GMS Milestone 2:4h

Numicon Milestone Assessment – GMS 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

17

Can you tell me the time in minutes past the hour?

GMS Milestone 2:4i

18

Can you tell me how many minutes past or to the hour this is?

If the minute hand is pointing to 7 and the hour hand is almost at 9, what time will it be?

GMS Milestone 2:4i

19

Can you put these times in order from longest to shortest?

1 day

1 month

3 weeks

28 hours

GMS Milestone 2:4j

20

Can you put these times in order from shortest to longest?

100 minutes

1 hour

50 hours

1 day

GMS Milestone 2:4j

Numicon Milestone Assessment – GMS 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

21

On Saturday I visit my friend.

I arrive at 3 o'clock in the afternoon and leave at 8 o'clock in the evening.

How long is my visit?

GMS Milestone 2:4k

22

What time is 6 hours before 2 o'clock in the afternoon?

Can you explain how you worked this out?

GMS Milestone 2:4k

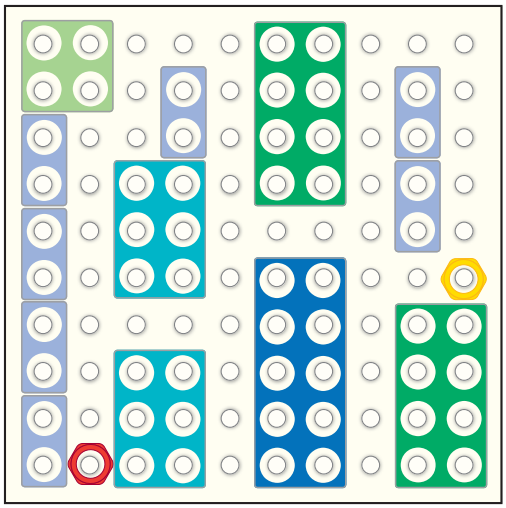
23

Can you see where the book is?

Can you give me directions to help me get to it?

GMS Milestone 2:4l

24



Can you give me directions on how to move the red peg to the yellow peg?

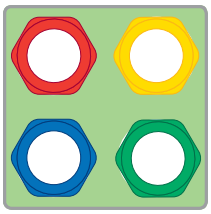
You cannot go through the Numicon Shapes and you must keep the pegs on the baseboard.

GMS Milestone 2:4l

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Pupil)

Answers are on the answer pages that follow.

25



Look at the Numicon 4-shape.

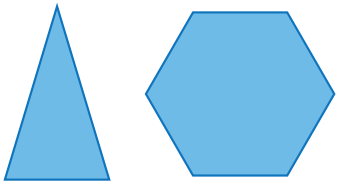
I want to turn the Shape so that the red peg is where the blue peg is now.

Can you tell me two different ways to do this?

GMS Milestone 2:4m

26

Look at these two shapes.



What will they will look like if I turn them a quarter-turn anti-clockwise?

Can you draw this?

GMS Milestone 2:4m

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Teacher)

Answers are in bold.

1

Preparation: Provide a Numicon Pan Balance, a 1 kg weight and fifteen 100 g weights.

How many 100 grams are there in 1 kilogram?

Can you use the pan balance to check?

100 g × 10 = 1 kg

GMS Milestone 2:4a

2

Preparation: Provide a 1 kg weight, a 100 g weight and a 1 g weight.

How many 1 grams are equal to 1 kilogram?

How many 1 grams are equal to 100 grams?

1000 × 1 g = 1 kg

100 × 1 g = 100 g

GMS Milestone 2:4a

3

Preparation: Provide a Numicon Pan Balance, $\frac{1}{2}$ kg weight, three mystery parcels, one with a mass less than $\frac{1}{2}$ kg and two with masses greater than $\frac{1}{2}$ kg, and < and > cards, cut from photocopy master 33, 'Words and Symbols for Comparing Measuring 1'.

Which parcels weigh greater than $\frac{1}{2}$ kg and which weigh less than $\frac{1}{2}$ kg?

Use the pan balance to help you.

Can you use the signs to show your answers?

Use your professional judgement to determine whether the child is accurate with this task.

GMS Milestone 2:4b

4

Preparation: Provide a Numicon Pan Balance and a 200 g weight.

Can you find three things in the classroom that have a mass of less than 200 g?

Use the pan balance to check if you are correct.

Use your professional judgement to determine whether the child is accurate with this task.

GMS Milestone 2:4b

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Teacher)

Answers are in bold.

5

Preparation: Provide some food items that weigh fractions or multiples of 1 kg, e.g. 1 kg bag of pasta, $\frac{1}{4}$ kg tin or a bag of flour with $\frac{1}{4}$ kg left inside, $\frac{1}{2}$ kg sugar, Numicon Pan Balance, weights of various grams.

Can you find the mass of each item, in kilograms?

Now can you write down each mass, starting with the heaviest?

Answers will vary depending on the mass of the items. Make sure children include the units.

GMS Milestone 2:4c

6

Preparation: Provide a Numicon Pan Balance, a 1 kg weight, two $\frac{1}{2}$ kg weights, four $\frac{1}{4}$ kg weights and ten 100 g weights. Also provide some paper and a pencil.

Can you use the weights to write five balancing number sentences?

You can use the pan balance to help you.

Answers will vary, e.g.

$\frac{1}{2}$ kg + $\frac{1}{2}$ kg = 1 kg

100 g + 100 g + 100 g + 100 g + 100 g = $\frac{1}{2}$ kg

GMS Milestone 2:4c

7

Preparation: Provide a selection of containers for liquid: one approximately $\frac{1}{4}$ ℓ and one approximately $\frac{3}{4}$ ℓ, both unlabelled. Also provide labelled $\frac{1}{2}$ ℓ and 1 ℓ containers as reference points.

Look at these containers.

Find the two containers that don't have labels.

What do you think their capacity will be?

Can you explain your thinking?

Explanations will vary. Use your professional judgement to determine whether the child is accurate with their estimations.

GMS Milestone 2:4d

8

Preparation: Provide a 2 ℓ container and a container with a capacity of 250 ml.

This small container holds 250 ml.

How many of these small containers do you think you could fill from this large container?

Can you check?

Was it more or fewer than you thought?

Use your professional judgement to determine whether the child is accurate with their estimations.

GMS Milestone 2:4d

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Teacher)

Answers are in bold.

9

Preparation: Provide a washing-up bowl, a jug of water and four unmarked containers, with different capacities of between 250 ml and 500 ml. Also provide a measuring cylinder with fractions of a litre marked on.

Can you put these containers in order from the smallest capacity to the greatest capacity?

Use the measuring cylinder to help you.

Use your professional judgement to determine whether the child is accurate with this question.

GMS Milestone 2:4e

10

Preparation: Provide a washing-up bowl, a jug of water and four different-sized containers of different proportions and a measuring cylinder with fractions of a litre marked on.

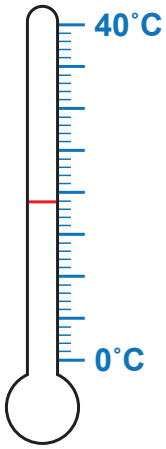
Can you put these containers in order from the one that holds the most to the one that holds the least?

Now use the measuring cylinder to check your answer.

Use your professional judgement to determine whether the child is accurate with this question.

GMS Milestone 2:4e

11

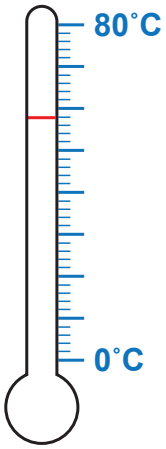


Can you read the temperature on the thermometer?

19˚C

GMS Milestone 2:4f

12



Can you read the temperature on the thermometer?

Can you write the temperature shown on the thermometer scale?

58˚C

GMS Milestone 2:4f

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Teacher)

Answers are in bold.

13

Preparation: Provide four different-sized, unmarked containers labelled A, B, C, D, a cup, a washing-up bowl and a jug of water, and photocopy master 24, 'Recording Capacity Data in a Table'.

Can you find out how many cups of water it takes to fill each container?

Can you record your findings in the table?

Container	Tally	Capacity (in cups)
A		
B		
C		
D		

Use your professional judgement to determine whether the child is accurate with this task.

GMS Milestone 2:4g

14

Preparation: Fill a washing-up bowl with water. Provide a cup and ensure that you are close to a sink or provide an additional bucket to empty water into. The child will write their answer in the table below.

Can you find out how many cups of water are in the washing-up bowl?

Can you record your findings in the table?

Tally	Capacity (in cups)

Use your professional judgement to determine whether the child is accurate with this task.

GMS Milestone 2:4g

15

Preparation: Provide a geared analogue clock.

Can you use the clock to show me half past 4?

Now can you show me midday?

How else could you say midday?

Clock showing 4:30; if a non-geared clock is used, ensure that the hour hand is halfway between 4 and 5. Midday is also noon or 12 o'clock.

GMS Milestone 2:4h

16

Preparation: Provide a geared analogue clock.

Can you use the clock to show me quarter past 6?

Now can you show me quarter to 10?

If a non-geared clock is used, check the position of the hour hand.

GMS Milestone 2:4h

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Teacher)

Answers are in bold.

17

Preparation: Provide a geared analogue clock.

Start at 3 o'clock and move the minute hand to show the following times, pausing so the child can read each time: 3:05, 3:10, 3:15, 3:20, 3:25, 3:30, 3:35, 3:40, 3:45, 3:50, 3:55.

Can you tell me the time in minutes past the hour?

3 o'clock, 5 minutes past 3,
10 minutes past 3, 15 minutes past 3,
20 minutes past 3, 25 minutes past 3,
30 minutes past 3, 35 minutes past 3,
40 minutes past 3, 45 minutes past 3,
50 minutes past 3, 55 minutes past 3.
If the quarters, half and o'clock are given, ask how many minutes past is this equal to.

GMS Milestone 2:4i

18

Preparation: Provide a geared analogue clock.

Point to 12, then move clockwise pointing to each number in turn. At each number pause and ask the question.

Can you tell me how many minutes past or to the hour this is?

If the minute hand is pointing to 7 and the hour hand is almost at 9, what time will it be?

5 minutes past, 10 minutes past,
15 minutes past, 20 minutes past,
25 minutes past, 30 minutes past,
25 minutes to, 20 minutes to,
15 minutes to, 10 minutes to,
5 minutes to, 0 minutes to or o'clock.

25 to 9

GMS Milestone 2:4i

19

Preparation: Write and cut out the following as cards: 1 day, 1 month, 3 weeks, 28 hours.

Can you put these times in order from longest to shortest?

1 day

1 month

3 weeks

28 hours

1 month, 3 weeks, 28 hours, 1 day

GMS Milestone 2:4j

20

Preparation: Write and cut out the following as cards: 100 minutes, 1 hour, 50 hours, 1 day.

Can you put these times in order from shortest to longest?

100 minutes

1 hour

50 hours

1 day

1 hour, 100 minutes, 1 day, 50 hours

GMS Milestone 2:4j

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Teacher)

Answers are in bold.

21

Preparation: Provide a geared analogue clock and encourage children to use paper and a pencil as needed.

On Saturday I visit my friend.

I arrive at 3 o'clock in the afternoon and leave at 8 o'clock in the evening.

How long is my visit?

5 hours

GMS Milestone 2:4k

22

Preparation: Provide a geared analogue clock and encourage children to use paper and a pencil as needed.

What time is 6 hours before 2 o'clock in the afternoon?

Can you explain how you worked this out?

8 o'clock in the morning.
Explanations will vary.

GMS Milestone 2:4k

23

Preparation: Set up a scenario in the classroom that will involve having to move around desks or other obstacles in right-angle turns, and changing directions to get from a starting place to a given object.

Can you see where the book is?

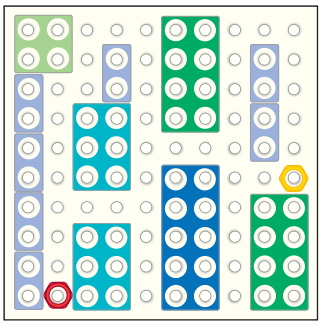
Can you give me directions to help me get to it?

Use your professional judgement to determine whether the child is accurate with their directions.

GMS Milestone 2:4l

24

Preparation: Use a Numicon Baseboard, Numicon Shapes and Numicon Pegs to set up a maze as shown below.



Can you give me directions on how to move the red peg to the yellow peg?

You cannot go through the Numicon Shapes and you must keep the pegs on the baseboard.

Use your professional judgement to determine whether the child is accurate with their directions.

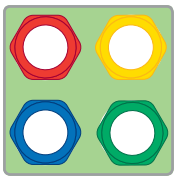
GMS Milestone 2:4l

2.4 Numicon Milestone Assessment – GMS 2 Milestone 4 (Teacher)

Answers are in bold.

25

Preparation: Prepare a Numicon 4-shape with one Numicon Peg of each colour, as shown below.



Look at the Numicon 4-shape.

I want to turn the Shape so that the red peg is where the blue peg is now.

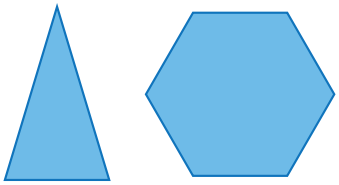
Can you tell me two different ways to do this?

Three-quarter turn clockwise or one-quarter turn anti-clockwise.

GMS Milestone 2:4m

26

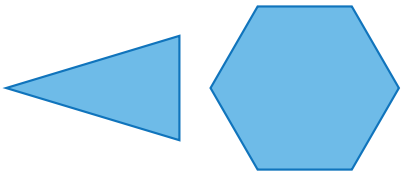
Look at these two shapes.



What will they will look like if I turn them a quarter-turn anti-clockwise?

Can you draw this?

Answer



GMS Milestone 2:4m