

# Numicon Pupil Books

Challenge your children, deepen their conceptual understanding, and develop mastery



# Welcome to numicon Pupil Books

*Numicon Pupil Books* are full of rich, exciting questions to make children think more deeply about the mathematics they are learning.



## **Pupil Books fit perfectly with the Numicon teaching resources.**

Teach the activities from the *Numicon Teaching Handbook* before using the accompanying sections in the Pupil Books for rich, follow-up work. Each section is four pages long and includes one activity on each page. All four pages and activities are linked to the same Activity Group in the relevant *Numicon Teaching Handbook*.

The Activity Groups are organised into five different colour strands:

- Calculating
- Pattern and Algebra
- Numbers and the Number System
- Geometry
- Measurement

There is a glossary of key maths vocabulary in the back of each Pupil Book. Here children can look up the meaning of any words they may have forgotten.

Accompanying answers are provided in a printed booklet and are also available online. The key learning for each section is given in the answer materials to help save time and make assessment easier.

The example below shows you what you can find within each four-page section.

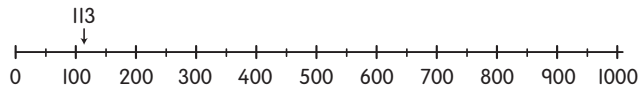
Practice questions give children a chance to practise and build on what they have learnt in class.

Numbers and the Number System 5-8, 5-9 & 5-10

## Working with number lines



Molly realised that labelling fifties and hundreds on the number line helped her to find number ranges.



Find the focus activities that each page fits with at the top of each page

### Practice

1 Tia was disappointed to find the pages 434–441 missing from her book. How many pages were missing?


2 Choose a number range for each of these pairs of numbers.

8 49

73 99

121 134

156 182

 3 Can you explain to your partner how to correct these?

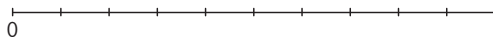
a  $827 > 872$

b 486 falls in the range 301–399


Opportunities for partner work are highlighted.

### Going deeper

1 Choose different number ranges for this empty number line.



Going deeper questions are more challenging and allow children to think more deeply.

 2 1000 cyclists in the London to Brighton bike ride set off in groups of 50. How many groups are there altogether?

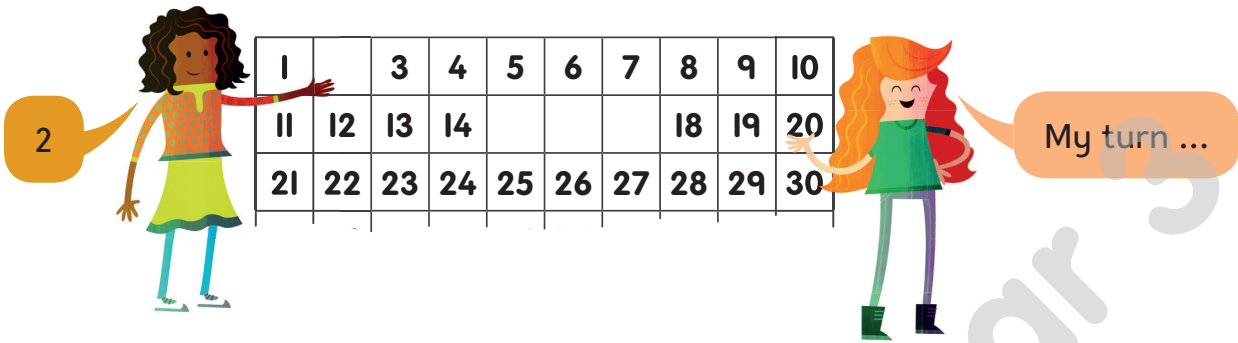
Discuss with your partner how you might work this out.

 Explorer Progress Book 3b, pages 10–11

Links to the relevant *Numicon* Explorer Progress Book pages are included in each section.

Turn over  
to start  
exploring...

# Ordering numbers to 1000



## Practice

- 1 Use an empty 100 square and work with your partner to find where these pairs of numbers should go.

27 28

63 73

50 51

42 62

- 2 Take turns to choose other pairs of numbers for your partner. Explain how you know where to place them.

- 3 Use an empty 16 square and work with your partner to find where these numbers should go.

5, 11, 16

## Going deeper

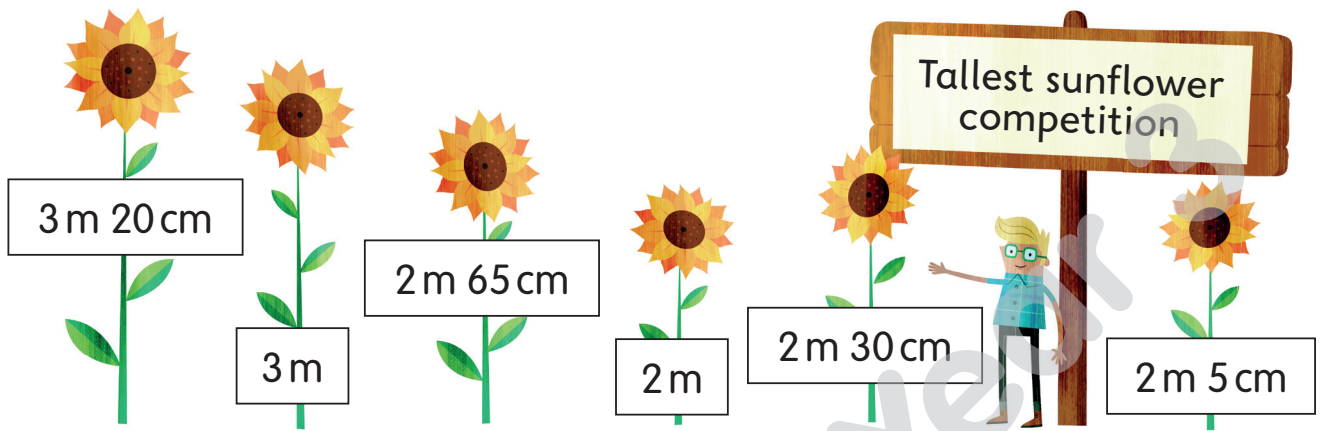
- 1 These numbers are part of a number square. Work out which number square they belong to.

2
7
18

- 2 Use an empty 100 square. If 100 is in the top left hand corner, can you explain where 1 will be?

- 3 Discuss what happens to any patterns you have noticed if you put 100 in another corner.

## Comparing heights and lengths



### Practice

- 1 Work with a partner to put the sunflowers in height order.
- 2 Write the height of all the sunflowers above in centimetres?
- 3 Choose two sunflowers and show the comparison using  $>$  and  $<$ .

### Going deeper

- 1 Tia's mum needs 7 m 50 cm of carpet for the stairs. The carpet shop has stair carpets for sale in the following lengths:

740 cm, 780 cm, 8 m, 760 cm

- a Which pieces would be long enough?
  - b Which is the best buy?
- 2 How many metre sticks, 10-rods and 1-rods are needed to show:
    - a 95 cm
    - b 215 cm

## Ordering 3-digit numbers




Molly and Ravi kept a record of how many steps they walked around school each day with a pedometer.

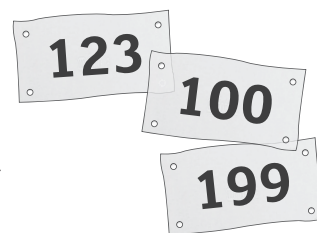
	Monday	Tuesday	Wednesday	Thursday	Friday
Molly	793	645	985	839	876
Ravi	569	782	953	891	974

### Practice

- 1 Which day did Ravi walk the furthest?
- 2 Who took the fewest steps on Friday?
- 3 Who walked the closest number of steps to 1000 in one day?
- 4 Write Molly's daily number of steps in order using  $>$  symbol.

### Going deeper

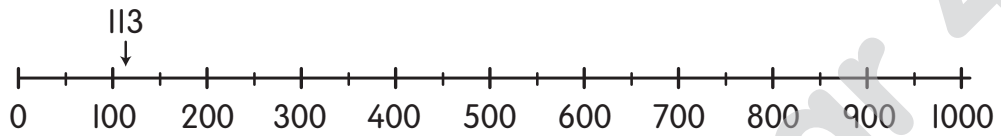
- 1  All the runners in a marathon wear a number. Discuss how these help the marshalls check that everyone finished the race.
- 2  With your partner, work out how to explain the rules you follow to put three digit numbers in order.
- 3  Play 'Make the highest number'.
  - Shuffle two packs of 0–9 number cards.
  - Put the cards face down and take three cards each.
  - Make the highest possible number with your cards.
  - Who has the highest number?



## Working with number lines



Molly realised that labelling fifties and hundreds on the number line helped her to find number ranges.



### Practice

- 1 Tia was disappointed to find the pages 434–441 missing from her book. How many pages were missing?
- 2 Choose a number range for each of these pairs of numbers.

8 49

73 99

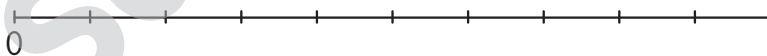
121 134

156 182

- 3 Can you explain to your partner how to correct these?
  - a  $827 > 872$
  - b 486 falls in the range 301–399

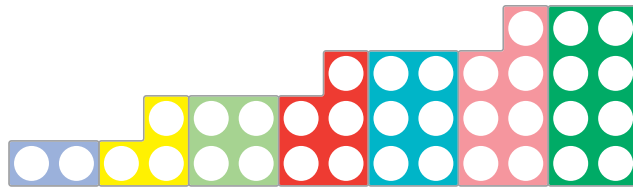
### Going deeper

- 1 Choose different number ranges for this empty number line.



- 2 1000 cyclists in the London to Brighton bike ride set off in groups of 50. How many groups are there altogether?  
Discuss with your partner how you might work this out.

# Logic and reasoning



## Practice

- Can you work out the total of all the numbers 2 to 8? Can you check your answer by working out the total in another way?
- Can you solve the adding problem below in two different ways? Can you explain?

$$\frac{1}{5} + \frac{3}{5} + 1 = \blacksquare$$

- What is your favourite method for solving the problem below? Can you explain why?

$$4 \cdot 0 + 4 \cdot 2 + 4 \cdot 4 + 4 \cdot 6 + 4 \cdot 8 = \blacksquare$$

## Going deeper

- How many different ways can you find to calculate these totals?  
**a**  $35 + 42 + 49 = \blacksquare$     **b**  $16 + 24 + 32 = \blacksquare$     **c**  $12 + 18 + 24 + 30 + 36 = \blacksquare$
- Do you notice anything special about the numbers in each calculation in **question 1**? Can you explain?
- Can you work out this problem in two different ways? What is your favourite method for solving this?

$$18 + 27 + 36 + 45 = \blacksquare$$



# Testing general statements



If you add two numbers together, you get the same result as when you multiply them.

## Practice

- 1 Do you think Ravi's statement is always, sometimes or never true? Can you explain why, using examples?
- 2 Can you think of a way of changing Ravi's statement so that it will **never** be true? Can you explain?
- 3 Do you think Molly's statement is always, sometimes or never true? Can you explain why, using examples?
- 4 How could you change Molly's statement to make it **always** true? Can you explain?



The more digits a number has, the larger it is in value.

## Going deeper

- 1 Choose any row, column, diagonal or block of four squares and say why one of the numbers in it is the 'odd one out'. Try to do this as many times as you can.
- 2 "If you add three numbers together you get the same answer as when you multiply them together." Is this statement always, sometimes or never true? Can you explain why, using examples?
- 3 Can you write a statement about numbers that is **always** true?
- 4 Can you write a statement about shapes that is **sometimes** true?
- 5 Can you write a statement about numbers that is **never** true?


76	99	77	44
83	51	13	23
24	25	9	16
8	18	27	3

# Trial and improvement

There are three different Numicon Shapes in the bag and their total is 10. Two of them add up to the third one.

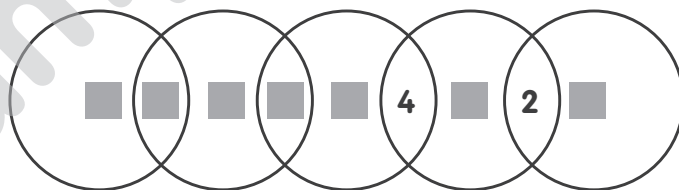


## Practice

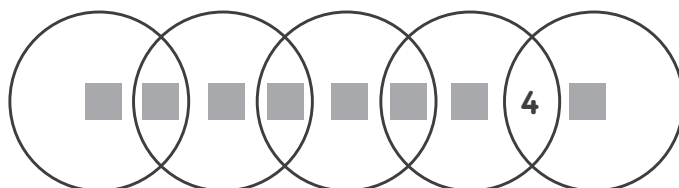
- 1 Can you work out which Numicon Shapes are in the bag? Is this the only solution? How do you know? Can you explain?
- 2 Can you think of three different Numicon Shapes, where two add up to the third and whose total is 14? How many solutions can you find?
- 3 For **questions 1** and **2**, did the fact that two Numicon Shapes add up to the third help you to quickly cut down the number of possibilities to explore? Can you explain?
-  4 Can you make up another problem with clues like this but choosing numbers from the 0–100 Numeral Cards, for your partner to solve?

## Going deeper

- 1 Copy these circles and the numbers. Using the numbers 1, 3, 5, 6, 7, 8 and 9 only once, can you make each circle add up to 11?

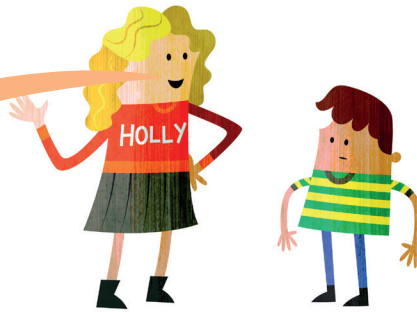


- 2 Copy these circles and the number 4. Using the numbers 1, 2, 3, 5, 6, 7, 8 and 9 only once, can you make each circle add up to 13?



# Reasoning about numbers

I am 10 years old, and in 2 years' time I will be twice as old as my little brother.



## Practice

- 1 How old do you think Holly's brother is now? Can you use number rods to help you explain how you know?
- 2 Toy cars cost \$4. Toy lorries cost \$9. Chi spends exactly \$48. How many cars and how many lorries does Chi buy?
- 3 Jeremy's age is now a multiple of 6, and in 3 years' time it will be a multiple of 5. Can you work out how old Jeremy is now? Can you explain?

## Going deeper

- 1 If the same number goes in each of the empty boxes below, can you work out what number it is? Can you show that you are correct using a double number line?

$$(4 \times \square) + 2 = (3 \times \square) + 27$$

- 2 Archie has three disco lights. The lights are switched on and all three lights come on together. The blue light shines for 2 seconds, then is off for 2 seconds. The red light shines for 3 seconds, then is off for 3 seconds. The green light shines for 5 seconds, then is off for 5 seconds.
  - a When is the first time that all three lights will be off?
  - b After the lights are switched on, when is the next time that all three lights will be on together?

# Using long dividing to solve sharing problems



We have 512 books to share equally between 16 classes.

			3	2
1	6	45	1	2
		4	8	↓
			3	2
			3	2
				0

## Practice

- 1 a** Can you explain how to use the long written method of dividing to share the books equally? Use the words below.

hundreds    exchange    share    tens    units

- b** Can you use the inverse to check the answer?
- 2** There are 1296 bottles of orange squash and 18 crates. Can you work out how many bottles are in each crate?

## Going deeper

- 1** Can you write a sharing word problem for the calculations below, and then solve them?

**a**  $216 \div 12$

**b**  $780 \div 15$

**c**  $1508 \div 26$

- 2** Can you choose one number from each box to make three different dividing sentences that are correct? Do some estimating first.

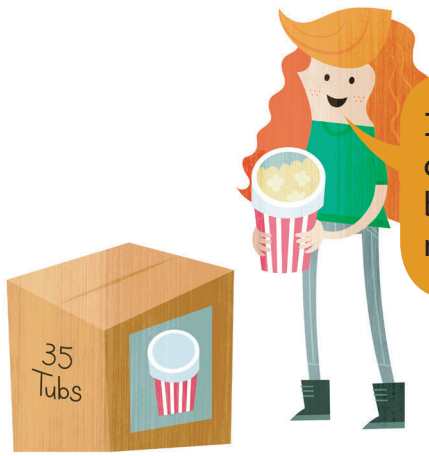
315	1476	888
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12	18	21
----	----	----

82	15	74
----	----	----

# Using long dividing to solve grouping problems

Popcorn tubs come in boxes of 35 and a cinema needs 945 tubs.



I've worked out how many boxes the cinema needs to order.

			2	7	
3	5	)	9	4	5
			7	0	0
					(20 × 35)
			2	4	5
			1	7	5
					(5 × 35)
				7	0
				7	0
					(2 × 35)
				0	

## Practice

- a** Can you explain Molly's method for solving the problem above?

**b** Can you use the inverse to check Molly's answer?

**c** If the cinema needs 1500 tubs, how many boxes should it order?
- On a trip, every group of 12 children must go with 1 adult. How many adults are needed if there are 200 children?
- Theatre tickets cost \$56 and a drama club has \$1800. How many tickets can they buy?

## Going deeper

- Dan is checking some of Anita's dividing calculations by multiplying. Can you work out what the dividing calculations must have been?

**a**  $22 \times 126 + 13$                       **b**  $12 \times 254 + 8$
- Which calculations below do you think will leave a remainder? Can you explain your reasoning and then solve each calculation?

**a**  $3572 \div 25$                       **b**  $1236 \div 12$                       **c**  $2740 \div 19$                       **d**  $928 \div 16$

# Solving dividing problems with remainders

We have raised \$678 and want to share this between 12 different charities.



Ben



Tia

We have raised \$852 and want to share this between 16 different charities.





Molly





Ravi

## Practice

-  **1** How much will each charity receive from Ben and Tia? Can you explain how to divide the remaining whole pounds between their 12 charities?
-  **2** Can you estimate how much Molly and Ravi's charities will each receive and then work out the exact amounts?
- 3** Can you solve  $1302 \text{ cm} \div 24$ ? Try estimating first. How close were you?
- 4** Can you solve  $2455 \text{ ml} \div 25$ ? Try estimating first. How close were you?

## Going deeper

-  **1** Ben and Tia raise a further \$69. How much will each of their 12 charities receive now? Can you explain your thinking to a partner?
- 2** Molly and Ravi raise a further \$300. How much extra will each of the 16 charities receive?
-  **3** Look at these partially completed calculations. Can you work out the missing amounts (dividends) for each?

**a**

			2	1	·	5	cm				
3	6	)	■	■	■						

**b**

			1	8	0	·	2	5	ml		
2	8	)	■	■	■	■					

## Dividing decimals equally using long or short dividing

A different number of people shared each bill. Each table total divided exactly, so that each person on that table paid the same amount.



### Practice

- 1 **a** Match the number of people who were sitting at each table with the correct bill. Can you explain your thinking and your calculations?
- b** For each bill amount, can you find three other divisors that you could divide the amount by, resulting in equal shares?
- 2 If a plank of wood is 3.85 m long and is divided into 14 equal pieces, can you work out how long each piece will be in centimetres?

### Going deeper

- 1 Can you write three other table bill totals that will divide between a number of people to give exactly equal shares?
- 2 **a** Can you find five different divisors that will divide \$24.80 exactly?  
**b** Can you find three different divisors that will divide \$135.25 exactly?
- 3 How many different ways can you divide 5.6m of string exactly into equal pieces of at least 20cm? Use whole numbers of centimetres. Can you say how long each piece will be?