

Term 1

Numicon 4 Student Book

Collaborative problem-solving activities for Year 5



Numicon 4 Student Book

Information for Year 5 teachers

Planning for mathematical progression

This book is designed to be used alongside the Numicon 4 Teaching Handbooks, which can be found on the Teaching Handbooks tab of your *Numicon Online* subscription. There is a suggested order for teaching the activity groups through the year on the contents page of this Student Book. There are four Student Book pages for each activity group.

Where to find the main teaching

The main teaching to cover before children work on a page from the Student Book is shown at the top of the page. For example, before children work on page 2 of this book, teach Activity 1 and Activity 2 from Calculating 1.

Using the Student Book

The pages in the Student Book provide further practice and challenging questions to follow up the main teaching activity and deepen the learning. You can use the questions in the Student Book selectively, to meet the needs of children in your class.

Using apparatus alongside the Student Book

The Student Book questions aim to stimulate rich mathematical discussion. Children are encouraged to make use of structured apparatus and imagery in responding to the questions and communicating their ideas.



Using photocopy masters alongside the Student Book

You may choose to provide children with photocopy masters for their work on some questions. This is shown with these icons:



This tells you which number photocopy master to use from the *Number, Pattern and Calculating 4 Teaching Resource Handbook*.



This tells you which number photocopy master to use from the *Geometry, Measurement and Statistics 4 Teaching Resource Handbook*.

You can find the photocopy masters by going to the Online Index on *Numicon Online*.

Where to find answers

You can find complete answers to the questions in this book in *Numicon Student Book 4 Answers on Numicon Online*. The answer book also contains an introduction to the Student Books by Dr Tony Wing and a chart to support your planning.

Assessing understanding with the Explorer Progress Books

After completing work on an activity group, you can use the Explorer Progress Book to assess how well children have understood the key learning.

At the end of each four-page section in the Student Book, you will find a reference to the Explorer Progress Book. For example, page 5 of the Student Book links with pages 4–5 of *Numicon Explorer Progress Book 4a*. You can find the Explorer Progress Books by going to the Online Index on *Numicon Online*.

Tracking children's progress and more with Numicon Online

You can use assessment evidence from the Explorer Progress Books, and from children's work throughout the activity group as a whole, to record progress on the Numicon 4 Milestone Tracking spreadsheet on *Numicon Online*. To support class discussion, there are opening questions from the Student Books and Numicon Interactive Whiteboard Software. *Numicon Online* is available on the Oxford Owl website.

Term 1

Numicon 4 Student Book

Collaborative problem-solving activities for Year 5

Written by Jayne Campling, Adella Osborne,
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Term 1 Contents

Using adding and subtracting facts	2	Exploring dividing facts	42
<i>Calculating 1</i>		<i>Calculating 6</i>	
Estimating numbers of things	6	Exploring inverse relationships	46
<i>Numbers and the Number System 1</i>		<i>Pattern and Algebra 2</i>	
Sequences and patterns of multiples	10	Multiplying by 10 and scaling problems	50
<i>Pattern and Algebra 1</i>		<i>Calculating 7</i>	
Counting on and back	14	Symmetrical objects and patterns	54
<i>Numbers and the Number System 2</i>		<i>Geometry 2</i>	
Bridging multiples of 10 when adding	18	Introducing negative numbers	58
<i>Calculating 2</i>		<i>Numbers and the Number System 4</i>	
Estimating and rounding	22	Fractions and part-whole relationships	62
<i>Numbers and the Number System 3</i>		<i>Numbers and the Number System 5</i>	
Types of triangles	26	Using the column method of adding	66
<i>Geometry 1</i>		<i>Calculating 8</i>	
Exploring adding problems	30	Using the column method of subtracting	70
<i>Calculating 3</i>		<i>Calculating 9</i>	
Exploring subtracting problems	34	Types of angles	74
<i>Calculating 4</i>		<i>Geometry 3</i>	
Exploring multiplying facts	38	Introducing decimal fractions	78
<i>Calculating 5</i>		<i>Numbers and the Number System 6</i>	

Exploring equivalence	82	Introducing proportion	122
<i>Pattern and Algebra 3</i>		<i>Numbers and the Number System 7</i>	
A doubling strategy for multiplying	86	Introducing hundredths	126
<i>Calculating 10</i>		<i>Numbers and the Number System 8</i>	
A halving strategy for dividing	90	Working with money	130
<i>Calculating 11</i>		<i>Measurement 2</i>	
Exploring multiples	94	Measuring distance in metres	134
<i>Pattern and Algebra 4</i>		<i>Measurement 3</i>	
Multiplying in parts and the short written method	98	Calculating mass	138
<i>Calculating 12</i>		<i>Measurement 4</i>	
Using the short dividing method	102	Calculating with litres and millilitres	142
<i>Calculating 13</i>		<i>Measurement 5</i>	
Solving problems involving more than one step	106	Solving problems systematically	146
<i>Calculating 14</i>		<i>Pattern and Algebra 6</i>	
Calculating with analogue and digital times	110	Calculating perimeters of 2D shapes	150
<i>Measurement 1</i>		<i>Measurement 6</i>	
Growing number patterns	114	Exploring general rules	154
<i>Pattern and Algebra 5</i>		<i>Pattern and Algebra 7</i>	
Using coordinates	118	Glossary	158
<i>Geometry 4</i>			

How to use this book

Welcome to the Numicon 4 Student Book.



Coloured sections

You will notice that the sections of this book are coloured red, yellow, blue, green or purple.

Each colour shows a different maths theme:

Pattern and Algebra

Numbers and the Number System

Calculating

Geometry

Measurement





In this book you can try out new methods for finding answers...



... and think about how different maths ideas are connected.

Practice

These questions help you to practise and explore the new maths ideas you have learned.

Going deeper

These questions give you extra challenge and make you think deeply.



You will need to work with a partner on questions that have this symbol.

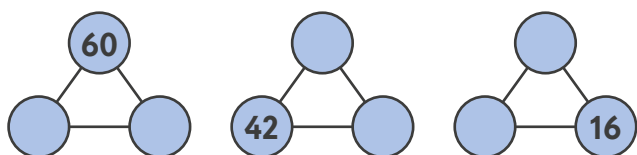


Your teacher may give you a photocopy master to use for questions with these symbols.



When you see this grey symbol, you can do these activities in the Explorer Progress Book pages online.

Using adding and subtracting facts



You get the top number here by adding the bottom numbers together.

Practice

- 1 **a** Can you copy and complete the number trios above?
The top number of each trio should be a multiple of 10.
- b** Now write the related facts for each trio.
- c** Can you find another way to complete each number trio?
- 2 Can you solve $\square + 32 = 47 + 33$?

Going deeper

- 1 Can you make your own number trio where:
 - a** the top number is a multiple of 10
 - b** the bottom left number is half the value of the bottom right?
- 2 Can you copy these adding grids and work out the missing numbers?

a

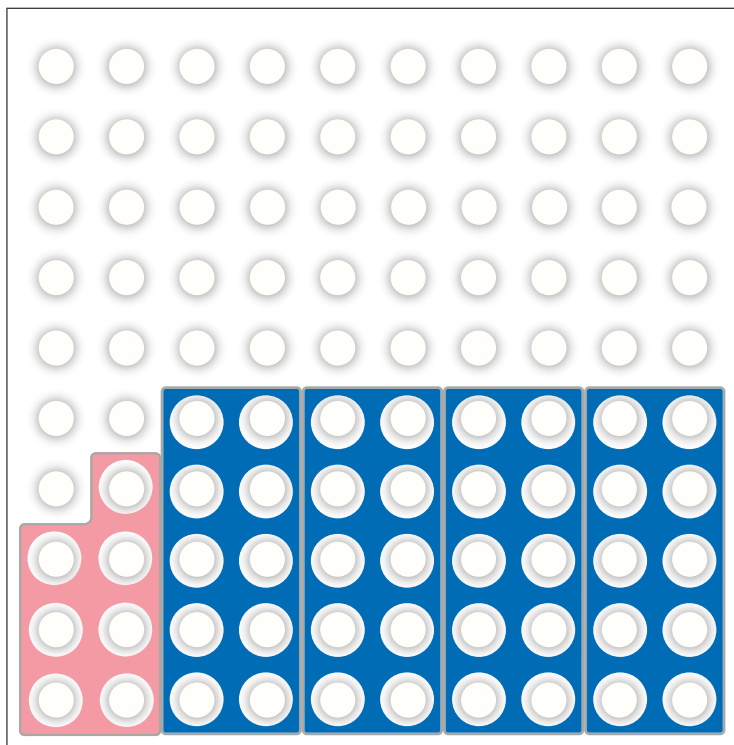
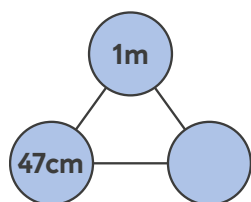
+		17
23	60	
	50	

b

+	19	
	56	70
		75

Number trios for 100

Kira has a roll of paper that is 1m long. She cuts a piece off that is 47cm long. She shows this on a baseboard.

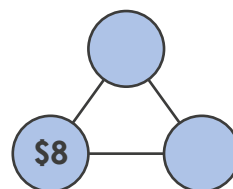


Practice

- 1 Can you explain how much paper is left on Kira's roll and show two ways that you can work this out?
- 2 Jason has 2m of paper. He cuts off 68cm. What length of paper is left?

Going deeper

- 1 Hana buys two items with a \$5 note. She receives \$2·10 change. What price could each of the items be? Can you give three possible answers?
- 2 Sam buys an item that costs \$8. He gets $\frac{1}{4}$ of the cost of his item back in change. How much did he give the shop owner?



Using number facts for measurement problems

Practice

- 1 Hazel uses her ingredients to make 10 pancakes.
 - a How much milk is left over?
 - b How much flour is left over?
- 2 If Hazel made 5 pancakes, how much milk and flour would she have left over?
- 3 Can you work out the missing numbers? Explain how you worked it out.

a $455\text{ g} + \square = 1\text{ kg}$

b $\square + 285\text{ ml} = 1\text{ L}$

c $888\text{ ml} + \square = 1\text{ L}$

Hazel's ingredients



Recipe for 10 pancakes

80 g flour

2 eggs

250 ml milk.

Going deeper

-  1 Jack has 2·272 L of milk. He uses the recipe above to make 30 pancakes. Can you work out how much milk will be left? Explain your thinking.
- 2 Ari wants to make a tropical drink. He needs 150 ml of pineapple juice for every 100 ml of orange juice. How much orange juice and pineapple juice does he need to make 1 L of tropical drink?

Problem solving using number facts to 1000

Practice

- 1 a If Ravi's missing numbers are different multiples of 10, what could his calculation be?



$$\square + \square + \square = 150.$$

- b What if one number was a single-digit number and the other numbers were 2-digit numbers?

- 2 Is it possible to make 150 with three odd numbers?
Can you explain your thinking?

-  3 Can you make an adding calculation like Ravi's above?
Give your partner clues so they can work out your three missing numbers.

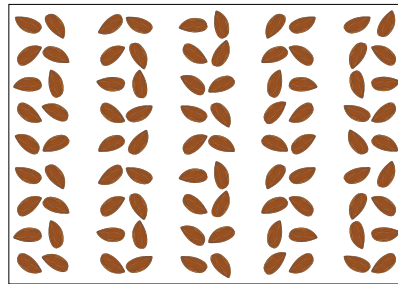
Going deeper

- 1 Look at your answer to **question 1 a**. Ravi changes the total to 180. How can you change the missing numbers to make it correct?
- 2 Molly uses a rule for her numbers to make this calculation:

$$36 + 63 + 81 = 180$$

- a What do you think her rule could be?
- b What else could it be?
- c Now use the rules to make a total of 180 in a different way.

Estimating numbers of things



Practice

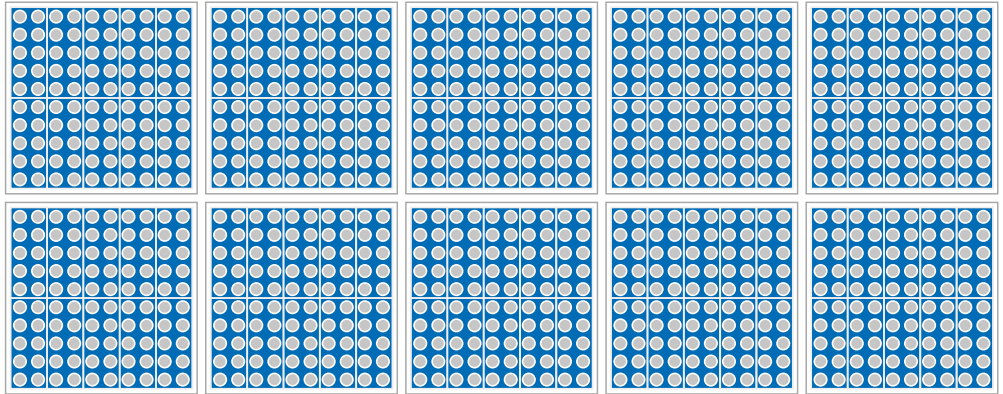
- 1 The picture above shows seeds drawn on a sheet of A4 paper.
 - a Can you estimate how many seeds are on the A4 paper?
 - b How many sheets of A4 paper do you think you would need to cover the top of your table? Roughly how many seeds would there be now?
 - c Can you explain the strategies you have used?
- 2 How many counters do you think you would need to cover the top of your table? Try laying out 10 counters in a group to help you estimate.

Going deeper

GMS
11

- 1 How many dots do you think there are on one sheet of isometric dotted paper? Can you find two different ways to estimate? Which do you think will be more accurate?
- 2 There are ten Numicon 10-shapes on one side of a pan balance. Can you estimate how many counters you would need to make it balance? Can you explain your strategies and check the answer?

Representing larger numbers in different ways

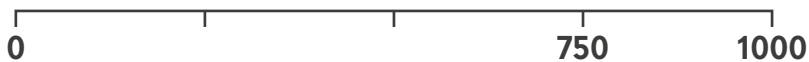


Practice

- 1 Tia is finding ways to show some large numbers.
What number do you think she is showing here?
- 2 If you drew a 0 to 1000 number line, how many hundreds markers would you need?
- 3 How could you help a friend to understand how much 500g is?

Going deeper

- 1 Copy this number line. Can you show where the numbers 300, 890 and 225 should go on it?



- 2 Can you find four different ways to show the number 670?
You might choose to use drawings, writing or apparatus.
- 3 Tia wants to draw a 0 to 1000 number line on a sheet of A4 paper. It needs to fit and use most of the space. Can you write clear instructions to help her do this?

Column values and quantities



Practice

- 1 How many different numbers can you make using all four digits above? Can you write your numbers in order from largest to smallest?
- 2 Can you copy and complete these number sentences?

a + 300 + + 6 = 2 7

b 4000 + + + 6 = 53

c + 400 + 60 + = 3 7

Going deeper

● 1000 points

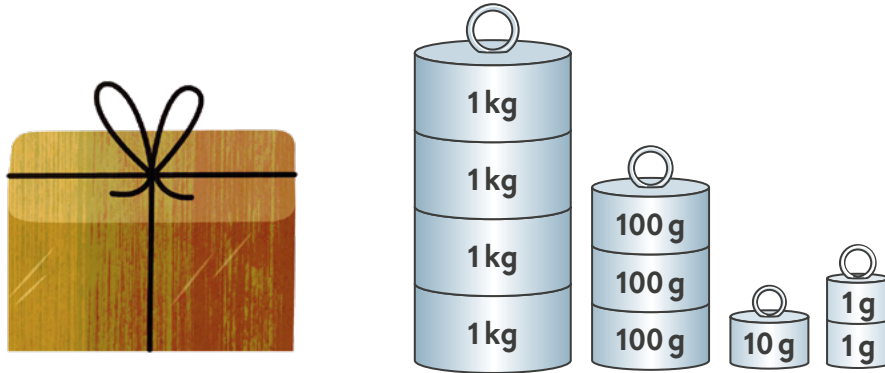
● 100 points

● 10 points

● 1 point

- 1 How many different ways can you make a score of 1674 points with these counters? You can use each counter as many times as you want.
- 2 Petra has 13 counters, and 7 of them are either green or yellow. She has the same number of red counters as blue ones. She has more than 4 green counters. How many points could her counters show?
- 3 Dev has 27 blue, 3 green and 3 yellow counters. Malia has 42 counters that total the same number of points as Dev's. Which coloured counters do you think Malia has?

Calculating with larger numbers



Practice

- 1 **a** The weights show you how much the parcel weighs. How much do you think it weighs?
- b** Another parcel weighs 200 g more. How much does it weigh?
- 2 Two parcels weigh 5763 g in total. If one of them weighs 2763 g, what does the other parcel weigh?
- 3 One parcel weighs 4 kg. Another parcel weighs 40 hundred grams. Which do you think is heavier? Can you explain why?

Going deeper

NPC
40

- 1 Can you use Roman numerals to work out the missing answer?

$$\text{LIV} + \text{XXIII} = \square$$

NPC
5

- 2 Can you use Egyptian numerals to work out the missing answer?

$$\text{𐪀𐪀𐪀𐪀} - \text{𐪀𐪀𐪀𐪀} = \square$$



Sequences and patterns of multiples

Practice



I want to find the missing terms in this sequence.

- 1 Can you help Ben find the missing 1st, 3rd, 5th, 6th and 8th terms in his sequence?

■, 24, ■, 40, ■, ■, 64, ■

- 2 Can you explain how you worked out your answers to **question 1**? What is a good strategy for working out problems like these?

- 3 What are the 1st, 2nd, 4th, 6th and 7th terms of this sequence?

■, ■, 60, ■, 36, ■, ■

Going deeper

0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, ...

Emma lists the multiples of 2 and circles the ones digit for each number. She shows the pattern it makes on this keypad.

1	2	3
4	5	6
7	8	9
	0	

- 1 Can you do this for the multiples of each number from 3 to 10?
- 2 Which multiples use all the keys? Which only use five keys?
- 3 Which multiples use the same keys? Can you explain why this is?

More sequences and patterns of multiples

2	4	6	8	10	12	14	16	18	20
12	24	36	48	60	72	84	96	108	120

Practice

- 1 What connections do you notice between the two sequences of multiples above?
- 2 How would you describe the relationship between the 4th terms of each sequence below? How about the 7th terms?

5	10	15	20	25	30	35	40	45	50
15	30	45	60	75	90	105	120	135	150

Going deeper

- 1 What do you notice about the sequences of ones digits in the sequence below? Can you explain why this is?

3	6	9	12	15	18	21	24	27	30
13	26	39	52	65	78	91	104	117	130

- 2 Can you choose another multiple that will have the same sequence of ones digits as the multiples of 4?
- 3 Without working out the 13th term for this sequence, can you say what the ones digit will be?

4, 8, 12, 16, ...

Other sequences



Practice

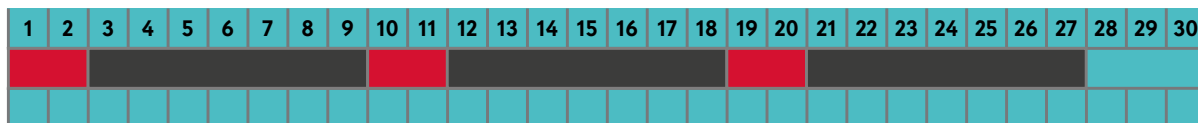
- 1 The ends of the rods mark each number in the sequence above. Can you continue the sequence?

3, 8, 11, 16, , , , , ...

- 2 Can you describe the rule for this sequence of numbers?
- 3 Can you predict what the 12th term in the sequence will be? Can you explain your answer?

Going deeper

- 1 The ends of the rods mark each number in the sequence below. Can you write the sequence? Can you predict what the 17th term will be?



- 2 Will the numbers 72, 92, 85 and 117 occur in the sequence above? Can you explain why, or why not?
- 3 Can you make a regular sequence that uses the numbers 108, 126 and 54? Choose a set of three number rods that you can use to show your sequence.

Constant differences

Practice

- 1 Can you explain what is the same and what is different about these two number sequences?

3, 6, 9, 12, 15, ...
5, 8, 11, 14, 17, ...

- 2 Can you make number rod trains for the sequences in **question 1**? Describe anything you notice that is the same and anything that is different.

- 3 Can you explain what is the same and what is different about these two number sequences?

48, 44, 40, 36, 32, ...
54, 50, 46, 42, 38, ...

Going deeper

- 1 Olivia's guinea pig eats 14 g of food each day. Olivia has one full 100 g bag of food on Sunday. What day of the week will the food run out?
- 2 This is a constant difference sequence. Can you work out the numbers that should go in the boxes?

3, , , , 27, ...

- 3 7 and 32 are the first and last numbers in a constant difference sequence. What do you think the numbers in between are?

Counting on and back



Practice

- 1 This letter has been delivered to house number 475 by mistake. Can you count back from 475 to the number on the letter?
 - 2 Can you count on in 5s from 42 to 102? What advice would you give a friend to help them do this easily?
 - 3 Can you count back in 5s from 764 to 699?
 - 4 Can you count forwards in 25s from 2250 to 2400?
-

Going deeper

- 1 Which do you find easiest, counting forwards in 1s, 2s, 5s, 10s, 25s or 50s? Does it matter which number you start at? Can you explain why?
- 2 Which do you find easier, counting forwards in 5s or backwards in 10s? Can you explain why?
- 3 Can you count forwards in 9s from 235 to 325? Can you give any advice to a friend to help them learn how to do this?
- 4 Can you count backwards in 9s from 824? Can you describe a good strategy for doing this?

Ordering numbers

Practice

- 1 Ben wants to put these numbers in order of size, starting with the smallest. Which numbers will be 2nd and 3rd?

4403 4304 4340 4034

- 2 Can you make two 4-digit numbers to fill the gaps below?
Use the digits 2, 3, 5 and 7 in each number.
For example: $2357 < 7532$. Can you find five ways to do this?

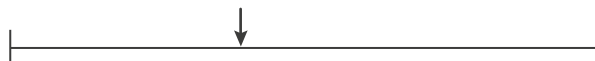
- 3** Different 4-digit numbers are made from the numbers 2, 3, 5 and 7. Which pair of numbers will have the smallest difference between them? Can you explain how you know?
- 4** Can you write four 4-digit numbers in which the thousands digit is larger than the tens digit, and all digits add up to 8?

Going deeper

- 1** Can you draw these number lines and position 7500 on each?
What do you notice? Can you explain why this happens?



- 2** If the arrow on this number line shows 1388, what do you think the end points of the number line are?



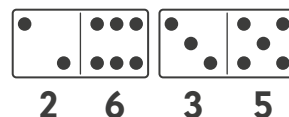
Number games



You can turn each domino around. So the domino below could be 2 6 or 6 2.

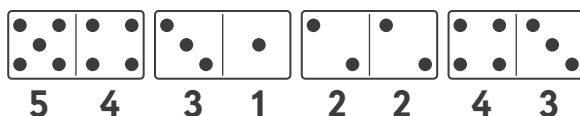
Practice

1 Use these two dominoes.



- Which two different 4-digit numbers can you make that have the smallest difference?
- Which two different 4-digit numbers can you make that have the largest difference?

2 Now use these dominoes. You can only use a domino once, for each number that you make.



- Can you make two different 4-digit numbers that have the smallest possible difference?
- Can you make two different 4-digit numbers that have the largest possible difference?

Going deeper

- Ruby chose two of the dominoes in **question 2** to make a 4-digit number. Her number is greater than 4200. The difference between the number in the tens place and the number in the ones place is 2. Which 4-digit numbers might she have made?
- Look at a full set of dominoes. Which would you choose to make two 4-digit numbers with the smallest possible difference? Is there more than one answer? Can you explain?

Finding numbers within a range



Is your number more than 3000?

Practice

- 1 **a** Tia has found out that Ravi's 4-digit number is smaller than 3500 and bigger than 3000. Write a good question for Tia to ask next.
- b** Ravi's answer to your question is 'No'. What is the biggest number he could be thinking of? What is the smallest?
- 2 Mark is thinking of 6852 and Sasha asks, "Is it bigger than 5000?". What could Sasha's next four questions be?

Going deeper

- 1 **a** Can you find four 4-digit numbers on this grid that are between 3500 and 5400? Read the digits horizontally, vertically or diagonally.
- b** Can you find five 4-digit numbers between 1000 and 2500 on the grid?
- 2 Raj is thinking of one number that lies within all of these ranges:

2	4	3	1
4	0	5	0
1	4	0	3
5	1	2	3

2500 to 3600

3500 to 4000

1000 to 3650

2000 to 3850

What are the smallest and largest numbers it could be?

Bridging multiples of 10 when adding

Tia and Ben buy sticker books. Each page holds 10 stickers.



I start with
26 stickers.



Tia

I start with
18 stickers.



Ben

Practice

- 1 **a** Tia and Ben get 8 more stickers each. How many do they each have now? How many pages in their books are full?
- b** Finally, they get an extra 17 stickers each. How many stickers does each child have?
- 2 Can you bridge a multiple of 10 to solve these problems?

a $35 + 7$
b $27 + 15$
c $48 + 16$
d $34 + 28$

Going deeper

-  1 Which of the calculations below would it be helpful to use bridging for? Can you explain why?

a $24 + 12$
b $18 + 26$
c $32 + 19$
d $42 + 17$
e $137 + 48$
- 2 Can you write balancing calculations for sums you used bridging for? For example: $58 + 17 = 60 + 15$

Bridging multiples of 10 when subtracting

Molly and Ravi also collect stickers.



I have
24 stickers.



And I
have 17
stickers.

Practice

- 1 If Molly gives 8 stickers away, how many will she have left?
- 2 If Ravi gives 9 stickers away, how many will he have left?
- 3 Start at 50 on a number line and then keep taking away 7.
At which points will you bridge a multiple of 10?
- 4 Can you solve these by bridging multiples of 10?

a $67 - 28$

b $46 - 19$

c $155 - 38$

d $172 - 26$

Going deeper

- 1 Use number cards from 50 to 100. Turn over a card. Now choose a number to subtract that will bridge a multiple of 10.
For example, for 54 you could subtract 17 or 36.
Can you write the subtracting calculation and a balancing calculation to show how you used bridging?
-  2 Can you explain when to use bridging to solve subtracting calculations? Give some examples.

Bridging through 100 when adding

These two boxes of envelopes have been opened. There are 70 left in one box and 45 left in the other.

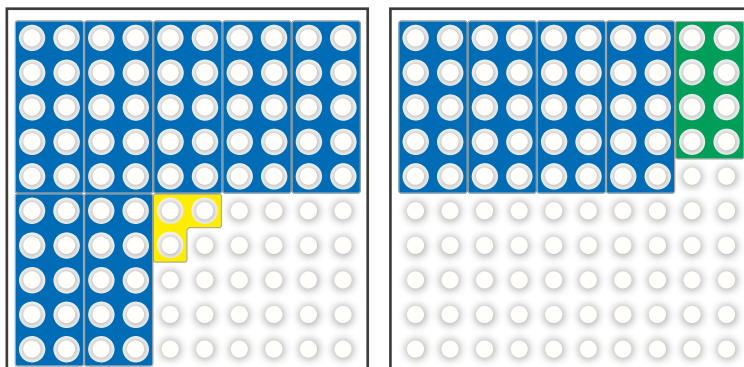


Practice

- 1 How could you rearrange the envelopes to get at least one full box of 100? Can you show your solution with a balancing calculation?
 - 2 Can you solve these calculations by bridging through 100? Can you show your workings on a number line?
- a** $80 + 38$ **b** $160 + 56$ **c** $77 + 64$ **d** $185 + 49$

Going deeper

-  1 An and Cole are adding 73 and 48.



- a** How could you combine these amounts so that one baseboard is full? Can you explain to your partner and record your strategy with a balancing calculation?
- b** Can you find another way to do this?

Bridging through 100 when subtracting

Zara has two packs of balloons. She has one full pack. There are 30 balloons left in her other pack.



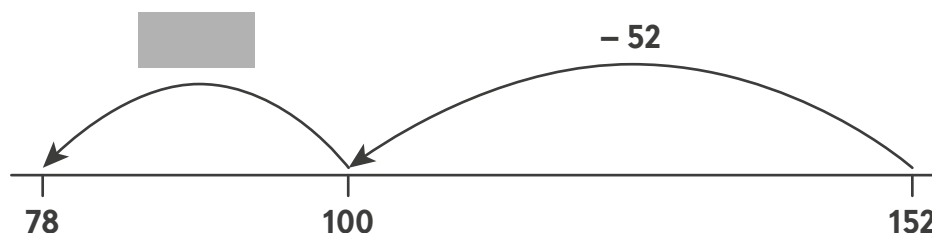
Practice

-  **1** Zara wants 45 balloons for her party. Can you work out how many balloons she will have left over? Explain this to your partner.
- 2** Can you write a balancing calculation to solve the problem in **question 1**?
- 3** Can you solve these calculations by bridging through 100?

a $150 - 78$
b $342 - 55$
c $265 - 187$

Going deeper

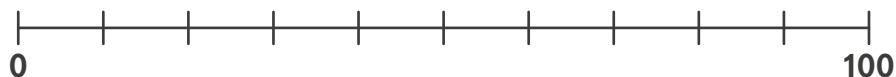
- 1** Half of all of Zara's balloons are blue. Can you find two different ways to work out how many are not blue?
- 2** Look at the number line. What number do you think is missing from the jump? What is the completed calculation?



- 3** Can you give two examples of subtracting calculations where you would bridge through 100, and two examples where you would not? Can you explain why?



Estimating and rounding



Practice

1 **a** Can you draw a 0 to 100 number line and place 58 on it?

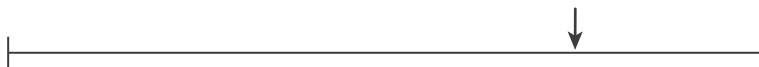
 **b** Now can you place 37 on it and explain your method?

2 Next, add these numbers to your number line:

28, 44, 66, 72, 83, 92, 12

Going deeper

1 Can you explain two different strategies for placing 75 on a 0 to 100 number line?



2 What do you think are the end points of this number line?



Rounding to the nearest 100



Practice

- 1 Can you write down roughly how long the children's see-saw is, to the nearest metre?
- 2 Sofia travels 162 cm each time her bicycle wheels go round. Sofia's wheels have gone round twice. Roughly how many metres has she travelled?
- 3 Jim travels 225 cm each time his bicycle wheels go round. Roughly how many metres will he travel if his wheels go round twice?

Going deeper

- 1 How far is 4685 cm to the nearest metre? Can you explain how you worked this out?
-  2 Jim's bicycle in **question 3** has moved 11 metres, to the nearest metre. How many times do you think the wheels have gone round? Can you explain to a partner?
- 3 When a number is rounded to the nearest 100, it is 600. When it is rounded to the nearest 10, it is 560. Can you explain which numbers it could be?

Rounding to the nearest 1000

	Mountain	Height
a	Annapurna 2	7937 m
b	K12	7428 m
c	Matterhorn	4478 m
d	Aoraki Mount Cook	3724 m
e	Ben Nevis	1345 m

Practice

- a Can you round each of these mountain heights to the nearest 1000 metres?

b Can you place these heights on a 0 to 10 000 number line?
- Raj is thinking of a whole number. It rounds to 6000 to the nearest 1000. Can you find the lowest number and the highest number it could be?

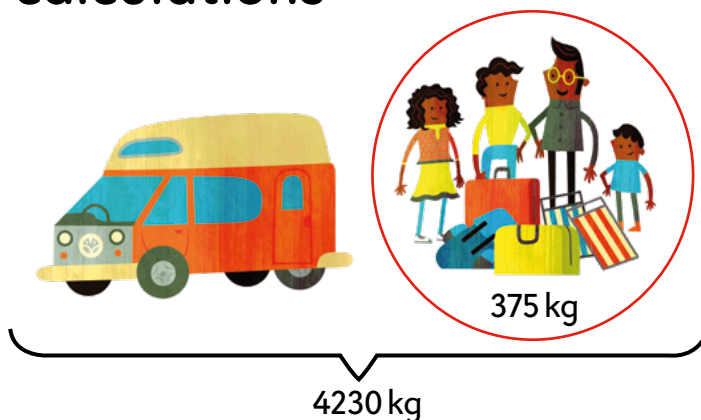
Going deeper

- What are the lowest and highest numbers you can make that round to 4000 to the nearest 1000? Use the digits below. You can only use a digit once in each number.

4, 7, 3, 5, 9

- Two different 4-digit whole numbers, that are both multiples of 100, round to 5000 to the nearest 1000. The sum of the two numbers is 10 000. What could the two numbers be? How many possibilities do you think there are?

Rounding calculations



Practice

- 1 The picture shows the weight of the family and their luggage, and the total weight of the family, their luggage and their campervan. Round each weight to the nearest 100 kg. Can you work out roughly what the campervan itself weighs?
- 2 Can you estimate answers to the following questions?

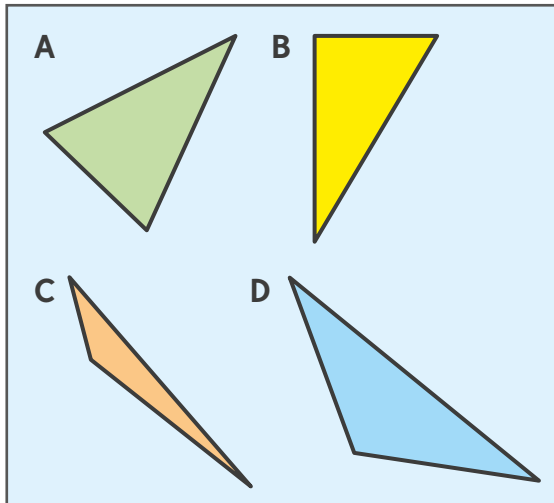
a $248 + 38$
b $182 - 59$
c 18×6
d $57 \div 19$
- 3 Do you think the exact answers to the **question 2** will be higher or lower than your estimates? Can you explain why, and check?

Going deeper

- 1 Can you write five different calculations with answers that will round to 240 to the nearest 10?
- 2 Find a number that rounds to 3000 to the nearest 1000, the nearest 100 and the nearest 10. Can you find all the numbers that round to 3000 in this way?

Types of triangles

Molly, Ben, Tia and Ravi have each made a triangle.



Molly

I have made the same type of triangle as Ben.



Ravi

Mine has a right angle.

Practice

- 1 **a** Can you work out which triangles could belong to Ben and Molly? Can you name the type of triangle?
 - b** In what way are their triangles the same?
- 2 Make or draw a triangle that is the same type of triangle as:
 - a** Ravi's triangle
 - b** Tia's triangle.
- 3 What are Ravi and Tia's triangles called?
- 4 Can you make or draw a regular triangle?

Going deeper

-  1 Create a Venn or Carroll diagram to sort the triangles above.
- 2 Is it possible to make or draw a triangle with two obtuse angles? Can you explain why, or why not?

Classifying quadrilaterals

Ben and Tia have each made a quadrilateral (4-sided shape).



Tia

My shape has parallel sides.



Ben

My shape has two sets of equal sides, but none of them are parallel.

Practice

- 1 **a** What shapes could Tia have made? Can you draw them?
b Can you label your drawings with the name of each shape?
- 2 What shape could Ben have made? Can you draw it?
- 3 Can you draw or make two different types of trapezium?

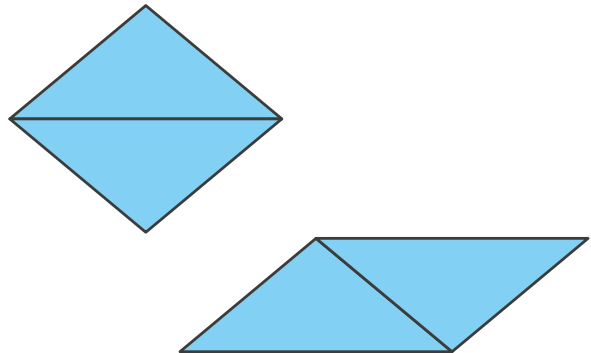
Going deeper

- 1 Can you draw a tree diagram to show how Tia's and Ben's shapes are different?
-  2 **a** Draw or make a quadrilateral without your partner looking. Now can you describe your shape to help your partner work out what it is?
b Can they draw a similar shape with the same properties?
-  3 Can you explain to your partner why:
a a square is a type of rectangle
b a rhombus is a type of parallelogram?

Making shapes with triangles



I can make quadrilaterals by putting two of the same triangles together.



Practice

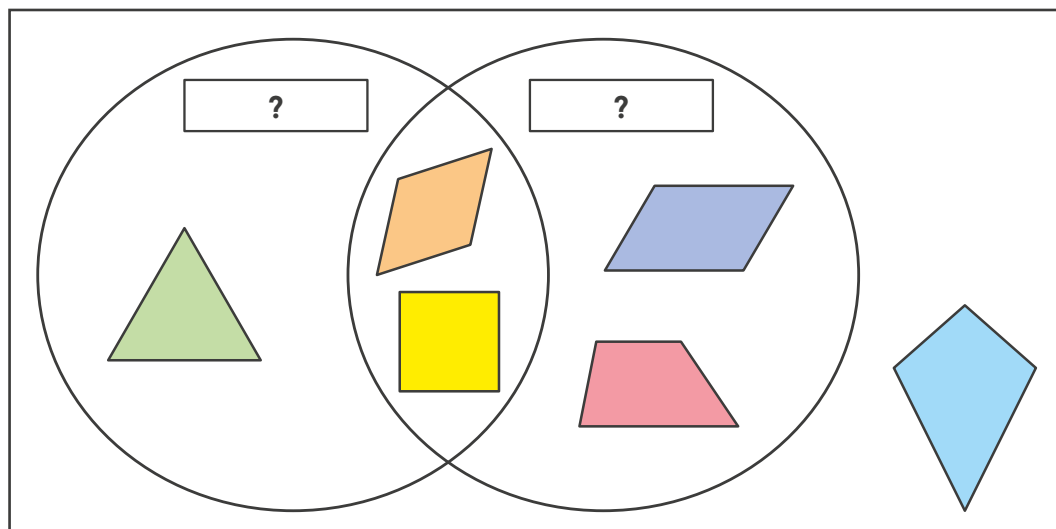
- 1 Ben wants to find all the possible quadrilaterals he can make using his two triangles. Has he found them all?
- 2 Use **three** matching equilateral triangles. What quadrilaterals is it possible to make? Is there more than one?

Going deeper

- 1 Can you explain how to make a quadrilateral using four equilateral triangles? What quadrilateral is it possible to make?
- 2 **a** Cut off one triangular corner of a rectangle. What other shape are you left with? Cut off another triangular corner of the shape. What shape are you left with now?
- b** Can you rearrange the two triangles you cut off to create new shapes? How many different shapes can you make?

Sorting and classifying triangles and quadrilaterals

Ella has made a Venn diagram and has sorted some shapes.



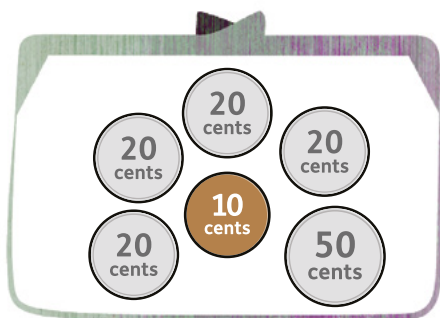
Practice

- 1 Can you work out what Ella's labels must have been?
Can you explain your thinking?
- 2 Can you draw any other shapes which could be added to each section? Where should they go?
- 3 Can you make another Venn diagram to sort the same shapes?
Choose your own labels and criteria for sorting the shapes.

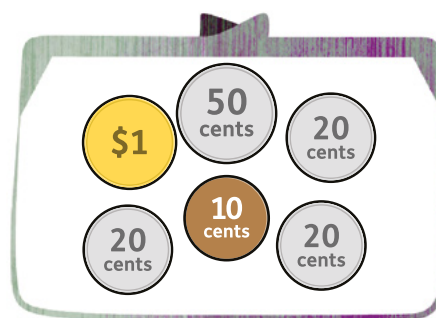
Going deeper

- 1 Show your partner your work for **question 2** but hide the labels. Can they work out what your labels must be?
- 2 Can you create a Carroll diagram to show the information in Ella's Venn diagram?

Exploring adding problems



Naomi



Samira

Practice

- 1 **a** Can you work out in your head how much Naomi and Samira have altogether?
- b** Compare your strategy with your partner's. Can you say which method you prefer, and why?
- c** Can you find another way to work out the total?
- 2 Try to do the following, calculating in your head:
 - a** $1\text{m } 55\text{cm} + 32\text{cm}$ **b** $2\text{m } 89\text{cm} + 50\text{cm}$ **c** $1\text{m } 25\text{cm} + 2\text{m } 65\text{cm}$

Did you use the same strategy each time? If not, why not?

Going deeper

- 1 The total of two purses is \$3. Each purse contains 7 coins. What coins could be in each purse? How many ways can you find?
- 2 Can you make \$15 using a combination of coins and notes? How many different ways can you find? Record your answers.

Adding by rounding and adjusting

Plastic cups in the classroom are kept in stacks of 10.



Practice

- 1 **a** A teacher gives 32 cups to Tui Class and 29 to Kiwi Class. Can you work out how many cups are needed altogether? Can you explain, using rounding and adjusting?
- b** Can you write a balancing calculation to show this?
- 2 Can you solve these sums using the same method? Write a balancing calculation for each one.

a $49 + 79$
b $78 + 53$
c $102 + 219$

Going deeper

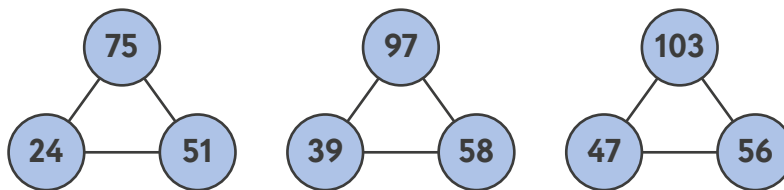
- 1 Can you explain why these calculations balance and show this with apparatus?

a $48 + 12 = 50 + 10$
b $21 + 42 = 20 + 43$
-  2 Look at the calculations below. Can you discuss which strategy is best for solving each calculation? Can you generalize?

a $54 + 72$
b $39 + 63$
c $18 + 26$
d $65 + 45$

Reasoning skills

Look at these number trios.



Practice

- 1 Can you adjust one of the numbers in each trio by 1, 2, 3 or 4 to make the calculation easier? What else should change to keep the trios adding to the same total?
- 2 Can you solve these empty box problems without adding the numbers on the left?

a $48 + 74 = 50 + \square$

b $97 + 46 = 100 + \square$

Going deeper

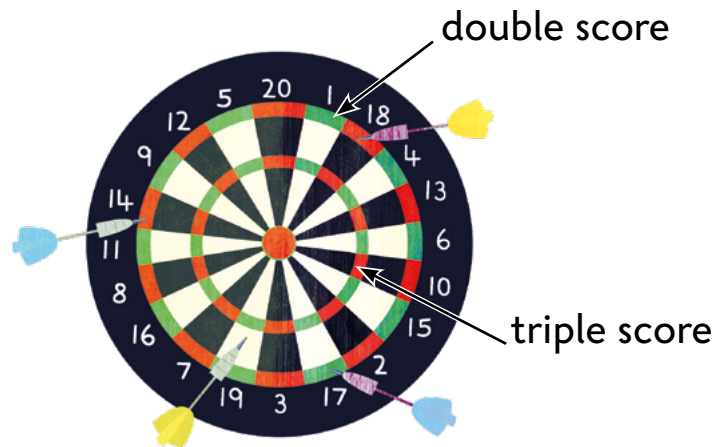
- 1 Use the number trios above and adjust the numbers.
Can you make three adding calculations which each use the number 50? What do you need to do to the other numbers to keep each trio total the same?

-  2 Sarah is thinking of two 2-digit numbers. If she rounds them both to the nearest 10, then she has $60 + 30$, which still gives the same total.

What two numbers could she be thinking of? Can you explain your thinking?

Choosing strategies to solve problems

Harper's darts are yellow and Jay's are blue. A dart in the outer ring scores double. A dart in the inner ring scores triple.



Practice

- 1 **a** Can you work out in your head what Harper scored?
- b** Can you work out in your head what Jay scored?
- c** Can you explain how you worked out each total?
- 2 **a** Harper throws again and gets 13. What is her new score?
- b** Jay throws again and gets 15. What is his new score?

Going deeper

- 1 **a** What does Harper's 4th dart need to land on so that she scores exactly 80 in total? Is there more than one way she can score this? List the different ways.
- b** What does Jay's 4th dart need to land on to score exactly 80 in total?
- 2 How could Jay get the same score as in **question 1** using just two darts? Can you find two different ways?
- 3 If you throw 6 darts, what are the smallest and the largest totals you could get?

Exploring subtracting problems

I've saved
\$2·50.



Tia

I've saved
\$3·30.



Ben

I've saved
\$5·20.



Ravi

I've saved
\$4·80.



Molly

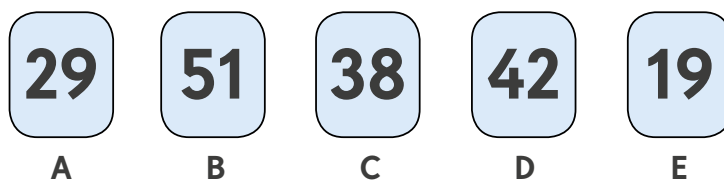
Practice

-  **1 a** How much more money has Ravi saved than Ben? Can you explain how you worked this out and write the calculation?
- b** If Tia spends \$1·80, how much money does she have left?
- c** Molly wants to buy a toy that costs \$8·50. How much more money does she need?
- 2** Now check your calculations for **question 1** using a different method.
-

Going deeper

- 1 a** Which two children have the biggest difference in the amount they have saved?
- b** Which two children have the smallest difference in the amount they have saved?
- 2** If $68 - 40 = 28$, can you use this to write two other calculations you can solve easily?

Using rounding and adjusting to subtract



Ben and Tia each start with 120 points and choose three of these cards. They subtract each number, one at a time, and need to get as close to zero as they can.

Practice

- 1 Ben chooses cards B, C and E in that order. Can you write each subtracting calculation in the order he chooses the cards and work out what number he finishes on?
- 2 Tia chooses C, then A and then one other card and finishes on 11. What was the third card she chose?
- 3 Can you copy and complete these calculations?

a $124 - 36 = 120 - \blacksquare$

b $52 - \blacksquare = 50 - 25$

Going deeper

- 1 Zac chooses three of the cards shown above and finishes on a number between 20 and 25. Can you work out what combination of cards he might have chosen?
- 2 Which two combinations of three cards will take you below zero? Can you find a different way of working this out?

Using partitioning to subtract



I can take away the tens first (30) and then the ones (7), or partition 84 into 70 + 14 and then complete the subtraction.

$$84 - 37$$

Practice

-  **1** Can you model what Molly is suggesting to your partner?
You can use apparatus to help you.

- 2** Can you use partitioning to solve these calculations?

a $54 - 26$

b $103 - 68$

c $152 - 75$

Going deeper

- 1** Can you explain three different ways of solving $84 - 37$?
- 2** Craig has chosen two number cards. The difference between them is 26. One of the numbers is a multiple of 8. What could the two numbers be? Can you find three possibilities?

-  **3 a** Look at these calculations. Discuss which you would use partitioning for, which you would solve using rounding and adjusting, and which you would use another method for.

$107 - 84$

$72 - 36$

$135 - 18$

$93 - 25$

- b** Now try to use the methods you chose to solve them.

Subtracting to solve problems and puzzles

Ravi's class have been measuring the height of the beans they are growing.

	Week 1	Week 2	Week 3
Fred	8 mm	15 mm	32 mm
Alice	10 mm	18 mm	43 mm
Li	6 mm	13 mm	28 mm



For each Practice question, write the calculation and use a good method to find the answer.

Practice

- Whose bean grew the most between week 1 and week 3?
How much did it grow?
- How much shorter was Fred's bean than Alice's at week 3?
- How many more millimetres does each bean need to grow to reach 65 mm?

Going deeper

- Can you follow this number trail? Complete and record the subtracting calculations as you go.

Start
150 → - 32 → - 8 → - 54 → - 15 → ?
Finish

- Can you solve these calculations? Discuss your strategies with your partner.

a $154 - \square = 87$

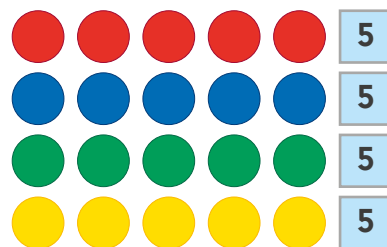
b $78 = \square - 26$

c $127 - \square = 49$

Exploring multiplying facts

Practice

- 1 How many different ways can you find to describe the number of counters in this array?



- 2 Can you draw these marbles arranged in an array?



How many different ways can you show this?

- 3 Each player in a game needs three cards. How many cards will be needed for:

a 4 players

b 8 players

c 0 players?

- 4 Can you write your answers to **question 3** as repeated adding sentences and as multiplying sentences?

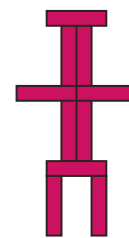
Going deeper

-  1 Joe and May each have 12 shells. Joe says there is only one way to arrange all the shells into an array, but May doesn't agree. Who do you think is correct?
- 2 A game has 24 cards and each player needs an equal number of cards. How many players could there be if they use all the cards? Would an array help you to work this out?
-  3 How would you explain what an array is to your partner? What would you say is important about arrays?

Writing multiplying sentences

Practice

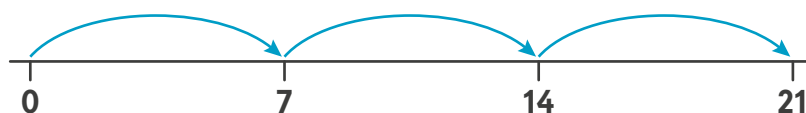
- 1 Can you make rod pictures for these calculations and work out the answers?



$$10 \times 4 = 40$$

a 8×3 b 8×6 c 12×3 d 12×6

- 2 What patterns do you notice in your answers for **question 1**?
 3 Write a multiplying sentence to describe this number line.



- 4 Can you solve these empty box problems and show them on a number line?

a $4 \times 7 = \square$ b $8 \times 7 = \square$ c $\square \times 8 = 56$

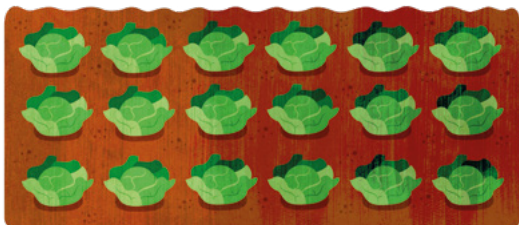
d What you notice about these questions?

Going deeper

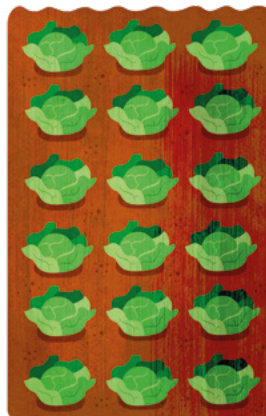
- 1 Sofia thinks of a number and multiplies it by 7. She gets a product of 63. Can you work out what Sofia's number is? Can you write this as a multiplying sentence?

-  2 Can you make up more puzzles like these? Write your answers as number sentences for your partner to check.
- 3 Ava multiplies two mystery numbers to get 32. What might her mystery numbers be? Can you find all of the possible answers and write them as multiplying sentences?

Arrays and the commutative property



Neela's garden



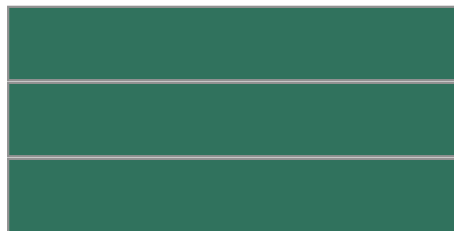
Tom's garden

Practice

- 1 Who do you think grows the most cabbages? Can you explain?
- 2 Tom plants sunflower seeds in 3 rows of 12. Neela plants the same number of seeds but makes 12 rows.
 - a How many seeds will be in each of Neela's rows?
 - b Can you write multiplying sentences for both arrays?

Going deeper

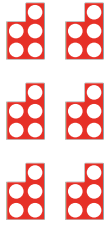
- 1 Ben thinks that six 3-rods would fit on top of this array of 6-rods. Do you think he is correct? Why?
- 2 Can you think of different ways to show that $4 + 4 + 4 + 4 + 4 + 4 = 6 + 6 + 6 + 6$?



Can you write this using multiplying facts?

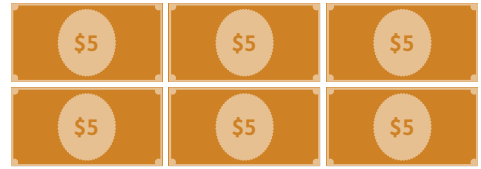
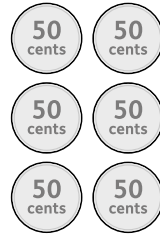
- 3 In your own words, can you describe the commutative property of multiplying? How does it help with multiplication tables?

Improving fluency



6 lots of 5 = 30

$$6 \times 5 = 30$$



Practice

- 1 **a** Can you write a number sentence and a matching multiplying fact for the 50c coins and the \$5·00 notes?
- b** Imagine there are twice as many coins and notes. How does this change your multiplying sentences and answers?

Going deeper

- 1 Can you find these products and then explain how the facts are related?

a $4 \times 3 =$

b $8 \times 3 =$

c $16 \times 3 =$

d $3 \times 32 =$

- 2 The children are working out 6×8 .

I did $5 \times 8 + 1 \times 8$.



Molly

I did $10 \times 8 - 4 \times 8$.



Tia

I did 3×8 and doubled it.



Ben

Whose method do you prefer and why? Can you think of any other ways of finding 6×8 ?