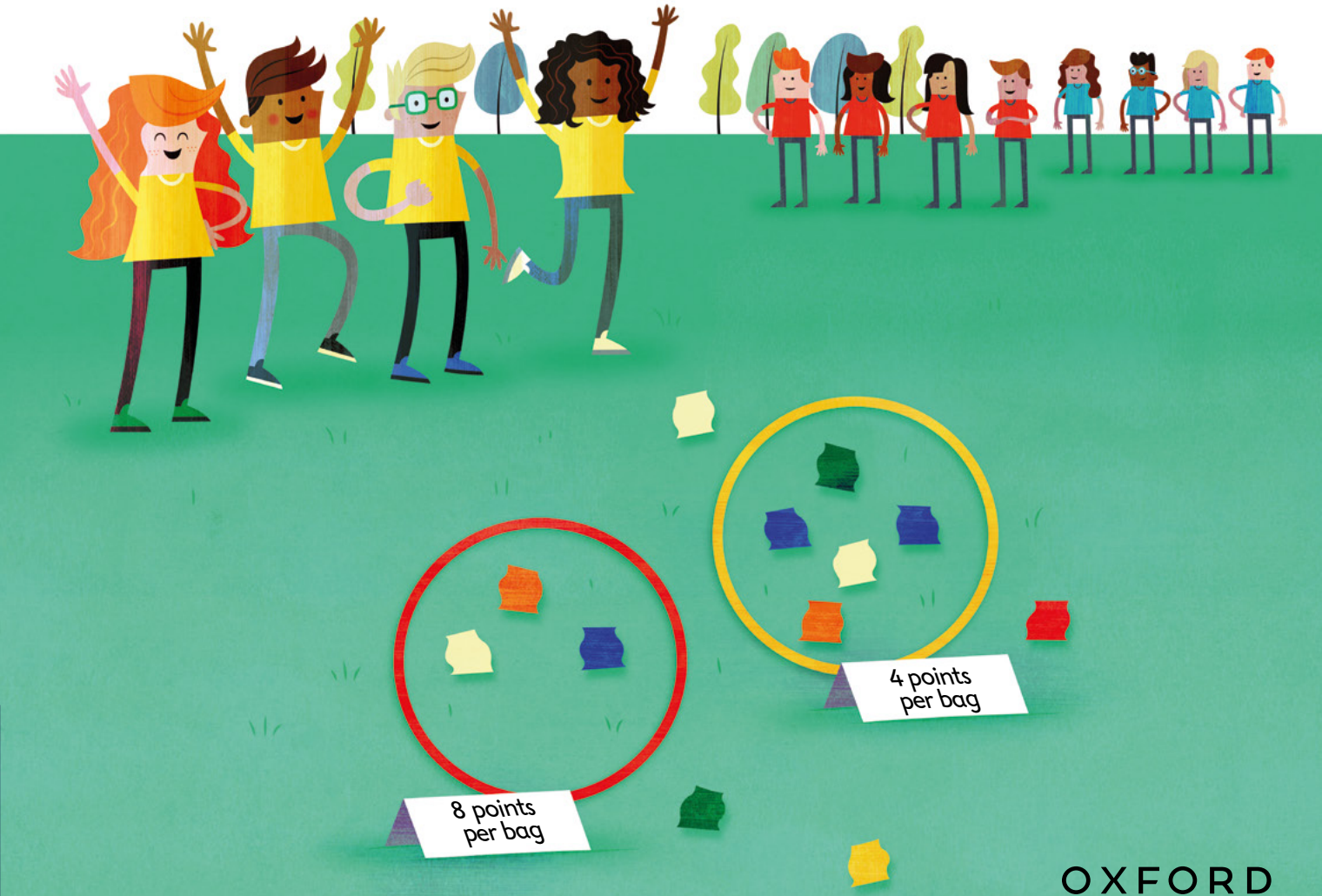
numicon

Term 1

Numicon 3 Student Book

Collaborative problem-solving activities for Year 4



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Numicon 3 Student Book

Information for Year 4 teachers

Planning for mathematical progression

This book is designed to be used alongside the Numicon 3 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:

NPC 14 This tells you which number photocopy master to use from the *Number, Pattern and Calculating 3 Teaching Resource Handbook*.

GMS 3 This tells you which number photocopy master to use from the *Geometry, Measurement and Statistics 3 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 3 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 3a*. 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 3 Milestone Tracking spreadsheet on *Numicon Online*. To support whole class discussion there are opening questions from the Student Books and Numicon Interactive Whiteboard Software. *Numicon Online* is available on the Oxford Owl website.

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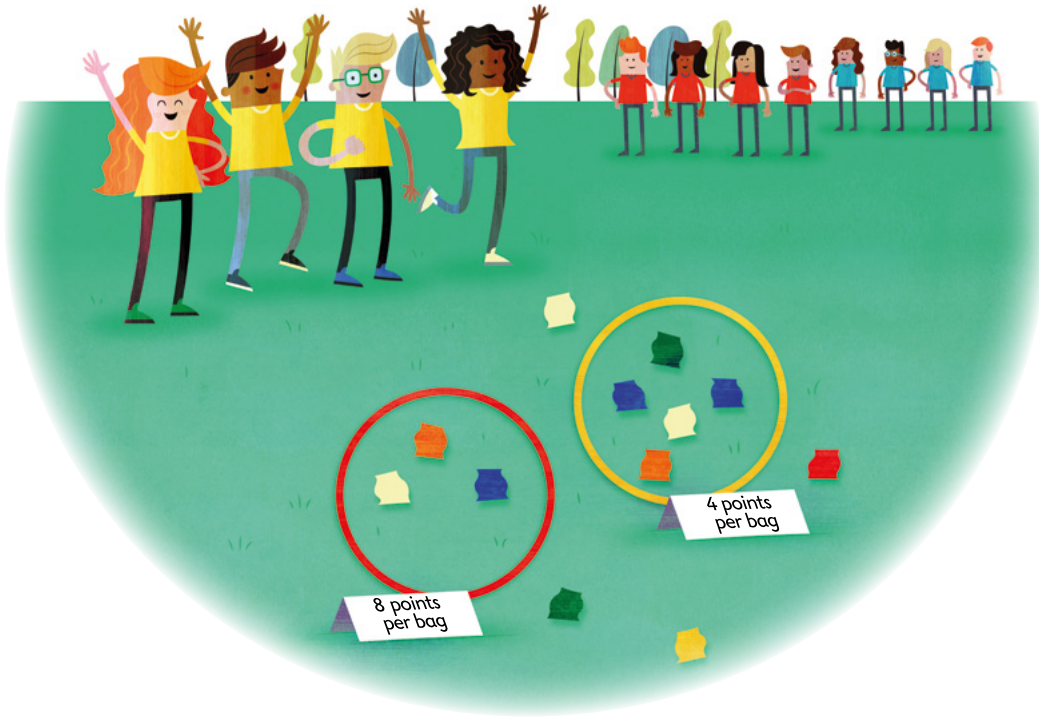
Term 1

Numicon 3 Student Book

Collaborative problem-solving activities for Year 4

Written by Ruth Atkinson, Andrew Jeffrey,
Adella Osborne, Louise Pennington, Romey Tacon
and Dr Tony Wing



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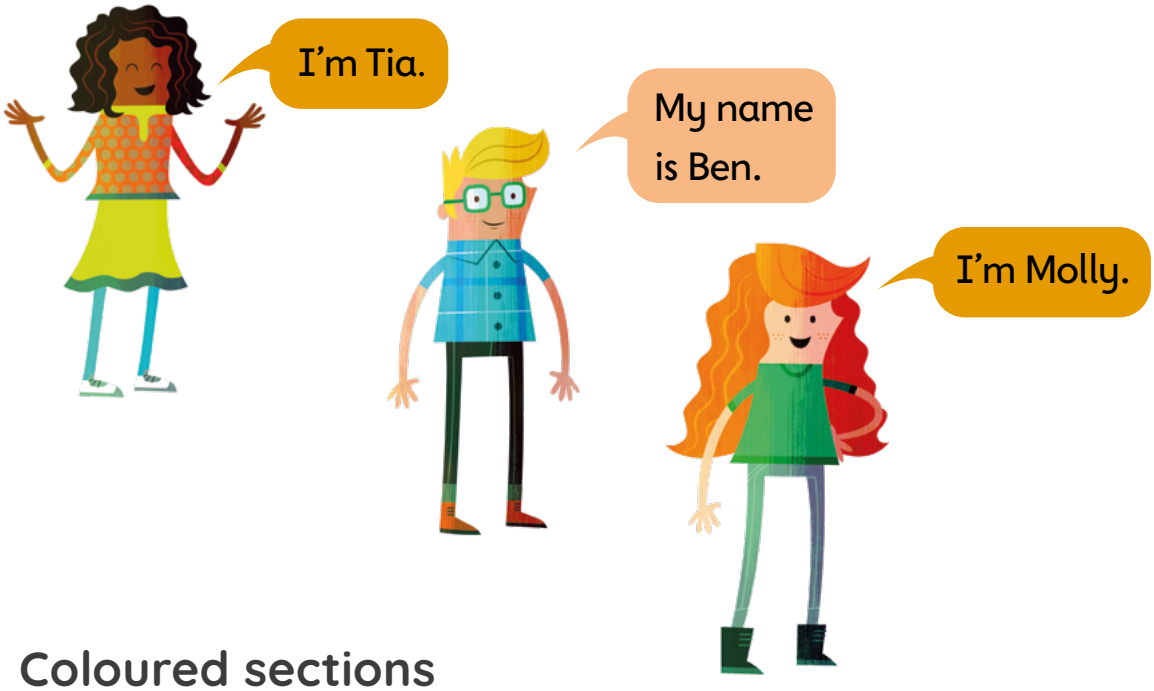
Term 1 Contents

How to use this book

Welcome to the Numicon 3 Student Book.

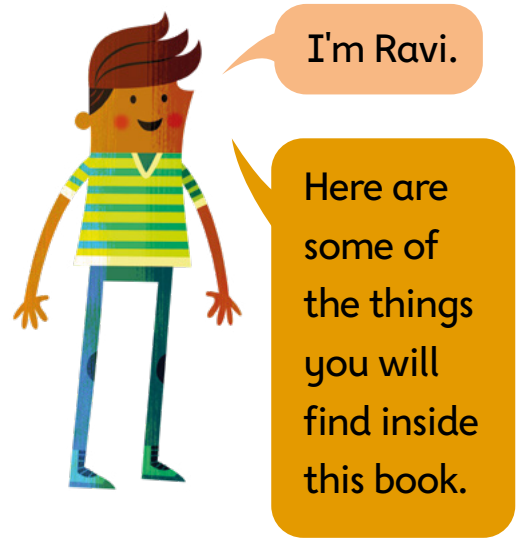


Coloured sections

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.

NPC 29 GMS 29

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.

Exploring all the combinations of numbers to 10

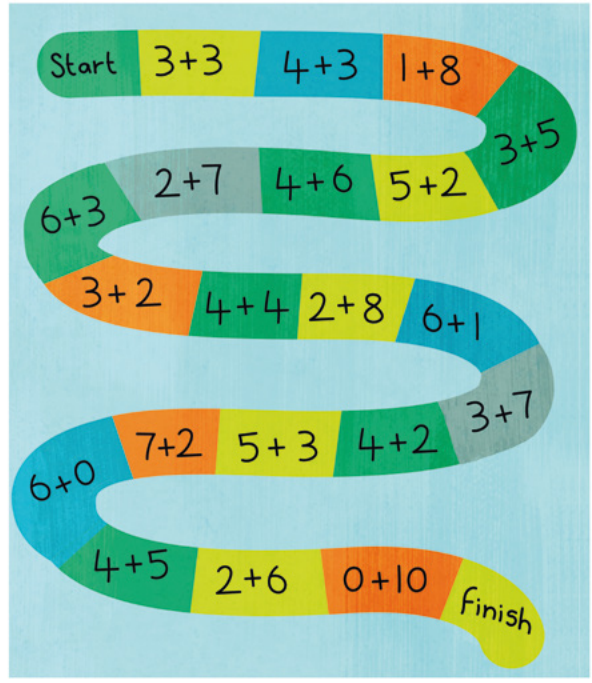
Practice

1 a How many of the adding facts on this track total 7?

b Can you find any other ways of making 7?

2 a How many adding facts on the track have a total of 9?

b What other ways can you find to make 9?



Going deeper

1 Look at **questions 1** and **2**. Can you explain to your partner how you know you have found all the ways of making 7 and 9?

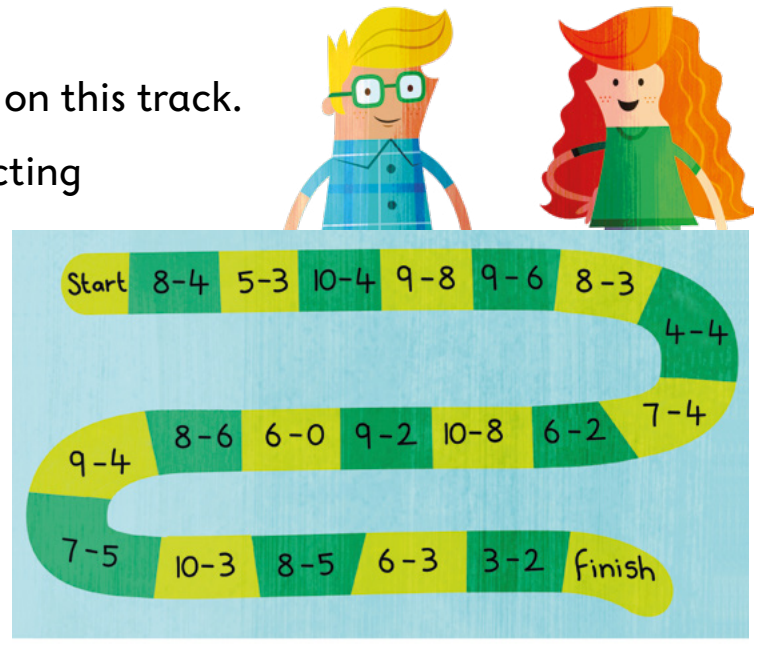
2 Which Numicon Shapes will you need to show all the combinations for making 8 with two numbers?

3 What could these two missing numbers be, if the total is less than 13?

3 + ☐ = ☐ + 8

Subtracting numbers from 10 and below

Practice



1 Look at the subtractions on this track.

a How many are subtracting from 6?

b Are there any other subtractions from 6 you can do?

2 a How many are subtracting from 8?

b Are there any other subtracting from 8 facts that you can write?

Going deeper

1 Can you pair any of the adding and subtracting facts below together?

3 + 4 = 7 | 2 + 6 = 8 | 5 − 4 = 1 | 8 − 6 = 2 | 7 − 3 = 4 | 4 + 1 = 5

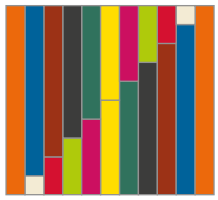
2 Look at the calculations below. Can you write a rule for each one that would help you with similar calculations?

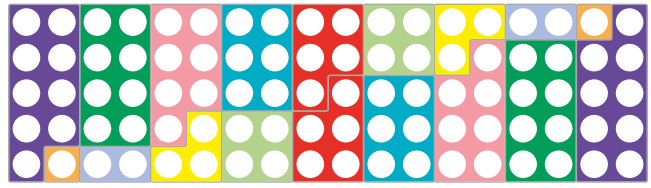
a 4 + 0 b 1 + 8 c 7 − 0

d 8 − 4 e 2 + 5 f 6 − 5

Exploring adding strategies

Sam shows facts of 10 with Numicon Shapes and number rods.



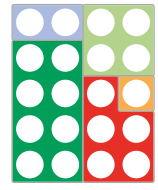


Practice

1 Can you use all the numbers on this chart once to make totals of 10? You can choose to add more than two numbers.

5	1	4	3
3	6	2	4
1	4	2	5

2 a These Numicon Shapes have been made into a rectangle. What is the total value of the Shapes?



b Can you build some rectangles using five different Numicon Shapes? Now calculate the totals.

Going deeper

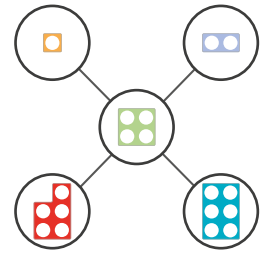
1 Decide which way you will add 6 + 15 + 4. Can you explain why?

2 Can you estimate who has the highest score below? Explain to your partner how you estimated this, then check your estimates.

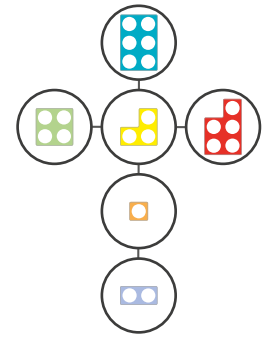
Name	Game scores	Total
Sam	2, 6, 8, 4, 9	?
Ana	5, 3, 6, 7, 5	?
Koa	1, 6, 9, 10, 5	?
Zara	7, 5, 10, 4, 3	?

Solving number puzzles

For each puzzle, you can use any number from 1 to 10 only once. You need to make each line total the target number.



Target: 11

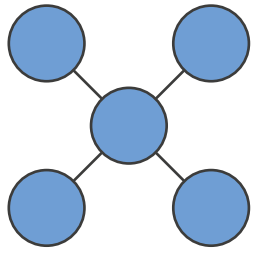


Target: 12

Practice

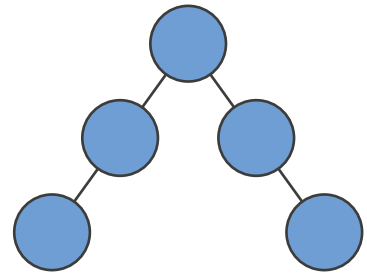
1 Can you use Numicon Shapes to help you solve these puzzles?

a



Target: 14

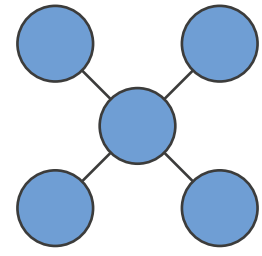
b



Target: 15

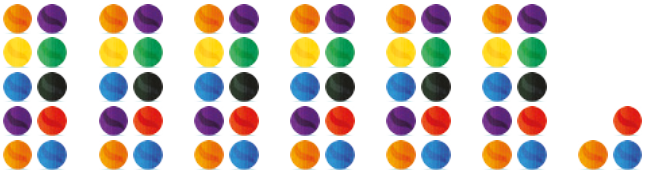
Going deeper

1 a You can use any number from 1 to 10 only once. What is the smallest and the largest total you can make on this pattern?
The total for each line must be the same.



b The rules change so you can use the same number twice. What is the smallest and largest number you can make now?

Finding how many by grouping in 10s and 100s



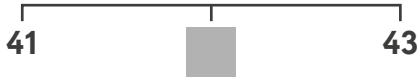
Ben

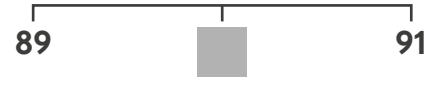
I've grouped my marbles like this to find out how many I have.

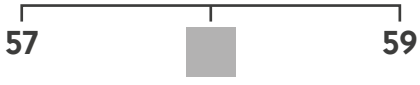
Practice

1 Take turns to get a handful of counters. Can you estimate how many you have and use Ben's method to check? How close were your estimates?

2 Choose apparatus and use it to make these missing numbers. Can you write the missing numbers in numerals and words?

a 

b 

c 

d Set each other five missing number challenges like these.

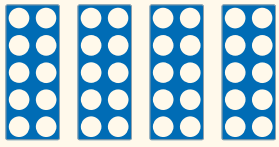
Going deeper

1 How many different ways can you show the number of marbles in Ben's collection? You can use writing, drawing and different apparatus.

2 Can you make up your own estimating problem?

Exploring a Tens and Ones frame

Tia's number of stickers

Tens	Ones
	

Ravi's number of stickers

Tens	Ones
	

Practice

1 Can you work out how many stickers Ravi collected?

2 Can you compare Tia and Ravi's number of stickers:

- a Who has fewer in the ones column?
- b Who has more tens?
- c Can you say who has more stickers in total?

Going deeper

1 Use Numicon Shapes to build a 2-digit number that has 5 tens. Which other 2-digit numbers can you build that have 5 tens? How can you be sure you have found them all?

NPC 48

2 Mike saved up to buy this baseball cap.
He thought it cost $26·00.

Does he have enough money? How could you explain what has happened?

Finding how many beyond 100

Practice

1 Use counters to show how Ravi could group his shells, to check how many he has. Can you write down how many hundreds, how many tens and how many ones he has?

2 Can you write these missing numbers in numerals and words?

a 132 ☐ 134

b 249 ☐ 251

c Now set your partner four missing number challenges like these.

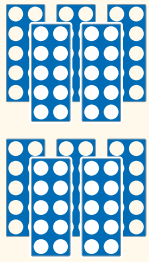
Going deeper

1 The children have a bag of coins. Ben's estimate is 164 coins, Ravi's estimate is 200. The actual number is 170. Ben says his estimate is closer. Do you agree? Explain why.

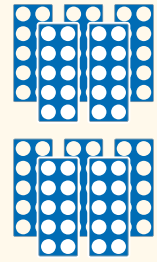
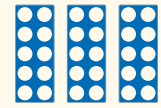
2 A cake for a 'Guess the weight of the cake' competition weighed 550 g. Ravi guessed 450 g, Tia guessed 600 g, Ben guessed 500 g and Molly guessed 525 g. Who won the cake?

Exploring a Hundreds, Tens and Ones frame

Molly's shell collection

Hundreds	Tens	Ones
		

Ben's shell collection

Hundreds	Tens	Ones
		

Practice

1 Molly said she had more shells than Ben. Do you agree? Can you explain?

2 Use these numbers: 5 2 8

a What is the highest number you can make? What is the lowest?

b Can you make the numbers that come between the highest and the lowest?

Going deeper

1 Can you explain the value of the counters in this HTO frame?

Hundreds	Tens	Ones
		

NPC 27

2 Collect ten counters and a hundreds, tens and ones place value frame. Can you find:

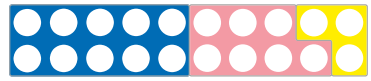
a the highest 3-digit number you can show?

b the lowest 3-digit number you can show?

c the lowest 2-digit number you can show?

Using adding facts of 10 to find other adding facts

Josh has used 7 + 3 = 10 to help him solve 17 + 3.



Practice

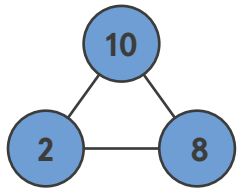
1 Which adding facts of 10 would you use to solve these?

a 4 + 16 = 20 b 20 = 15 + 5 c 20 = 8 + 12 d 20 = 11 + 9

2 These number trios show a total of 10. If the total were 20, how would you adjust the other numbers to make them correct?

Can you write your ideas as number sentences?

a



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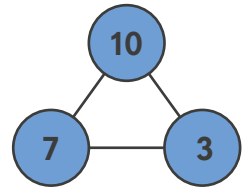


3 Can you copy and complete these number sentences? Write the adding fact of 10 that helps you.

a ☐ + 5 = 70 b 31 + ☐ = 40 c 6 + 24 = ☐

Going deeper

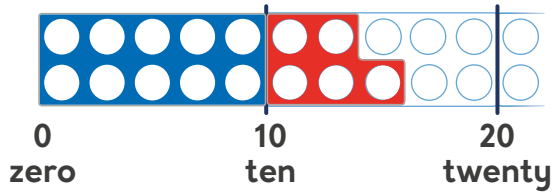
1 Without calculating, can you spot which of these calculations give a total of 20? Explain to your partner how you know.

3 + 18 16 + 4 4 + 15 3 + 17

12 + 7 16 + 3 8 + 12

Finding all combinations for teen numbers

Ellen is using Numicon Shapes to show combinations of two numbers that equal 15.



Practice

1 Can you find other combinations of two numbers that equal 15?

2 Here is the middle part of a subtracting pattern. Can you answer these calculations and then complete the pattern?

16 − 8 = ☐
16 − 9 = ☐
16 − 10 = ☐

Going deeper

1 a How can you adjust 9 + 6 = 15 to show a total of 14?

b Work with your partner to make up similar adjusting challenges for each other.

2 What do you know that would help you to answer 17 − 3?

3 What do you know that can help you to solve these calculations?

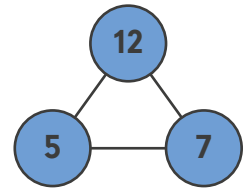
a 19 − ☐ = 14

b 18 = ☐ + 6

4 If you know the fact 4 + 3 = 7, what other adding calculations does this help you solve?

Relating adding and subtracting below 10 to adding and subtracting for teen numbers

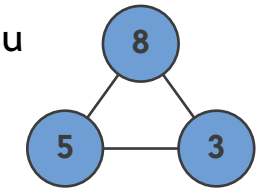
I want to find adding and subtracting facts for this number trio.



Practice

1 Can you write the adding and subtracting facts that Tia can find?

2 Add 10 to two of the numbers in this trio. Can you write the new adding and subtracting facts?



3 Can you show ways of adjusting these to make the totals correct?

a 4 + 5 = 19 b 3 + 1 = 14 c 2 + 3 = 15

Going deeper

1 Luca is saving up for a new ball which costs $18. He has saved $12.

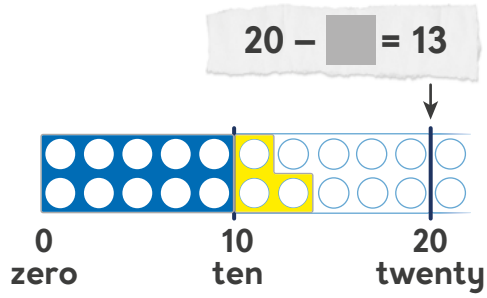
a How much more does he need to save?

b Can you write this as a number trio?

c Which calculation should he use? 18 + 12 or 18 − 12?

2 The children had a one hour lunch break. They spent half the time on the field and half on the playground. Which number sentences and number trio can you make to show this? What do you notice?

Solving missing number problems



Practice

1 Which adding fact could help you solve the problem above?

2 Which facts can help you to solve these?

a 20 – 11 = ☐

b ☐ + 8 = 20

c 20 – ☐ = 6

d 20 = ☐ + 17

e 15 = ☐ – 5

f 9 = 20 – ☐

Going deeper

1 Can you explain how you would solve 32 + ☐ = 40 and 32 = 40 – ☐ ?

2 Phil is running a 20 km race. He has run 11 kilometres.

a How much further does he have to run?

b Can you explain which of these number sentences you would use to show this and why?

11 + ☐ = 20 20 – ☐ = 11 20 – 11 = ☐

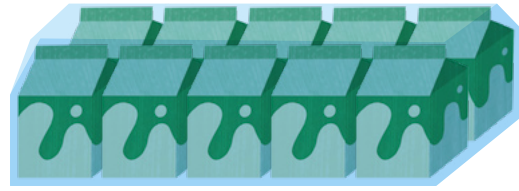
3 Tama bought a pencil that cost 60c. He paid with a $1 coin.

a Can you show how to calculate his change?

b Which coins might he receive in his change?

Exploring hundreds, tens and ones

Milk cartons come in packs of 10.



Practice

1 Can you use cubes or number rods to show how many packs of milk will be needed for these children to get a carton each?

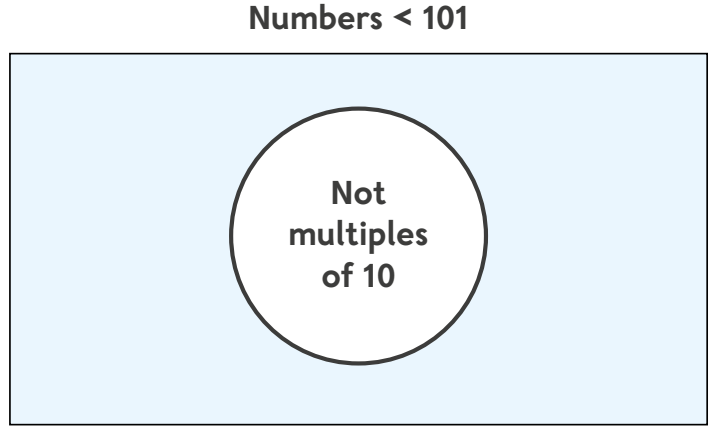
a 80 children b 50 children c 70 children

2 Look at these multiples of 10. Can you write them as 2-digit numbers and in words?

a 6 tens b 9 tens c 4 tens

Going deeper

1 Can you write two lists of 10 numbers that would go in this set diagram?



2 Can you work out how many packs of milk you would need to open to give out these numbers of cartons?

a 24 b 59 c 81 d 18 e 126

Exploring multiples of 10 further

I have started a table to show how many tens.

Number	Number of 10s
100	10
110	11
120	12
130	

Practice

1 Can you copy and continue Ben's table? Discuss what patterns you can see. Can you explain how the digits change?

2 Can you write how many tens are in these numbers?

a 190 b 240 c 750 d 80 e 610 f 330

Going deeper

1, 2, 4, 6, 7, 9, 0, 0, 0, 0

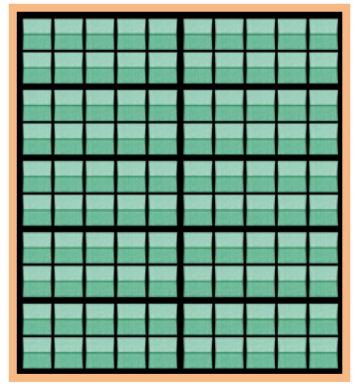
1 a Can you make different multiples of 10 using all the numerals in this list? You can only use each numeral once.

b Now compare your numbers and read each other's numbers aloud.

c Agree how many tens there are in each of your numbers.

Exploring base-ten apparatus

The milk is delivered to Eva's school in boxes. Each box holds 100 cartons of milk.



Practice

1 How many ways can you find to show the 100 milk cartons with base-ten apparatus?

2 Take turns to read a number below out loud. Can you show it with apparatus on a HTO frame?

NPC 27

178 460 nine hundred 304 fifty-six 222

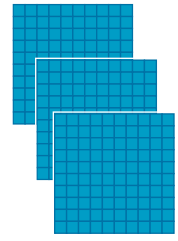
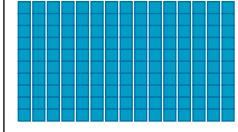
3 How many cubes are needed to cover these numbers of 100-flats from the base-ten apparatus?

a 5 b 9 c 7 d 4

Going deeper

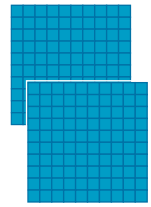
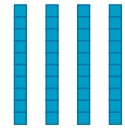
1 Paul and Mia both measure the same cupboard. Paul uses sixteen 10-sticks to measure it. Mia uses 1-cubes. How many 1-cubes does she use?

2 Can you decide whether this HTO frame is correct? If not, what could you do to correct it?

Hundreds	Tens	Ones
 3	 5	 6

Exploring hundreds, tens and ones

I've noticed that there are 24 tens and 3 ones in 243.

Hundreds	Tens	Ones
		

Practice

1 Take turns to choose numbers from this list.

195, 241, 759, 586, 612, 443

Can you say how many tens and how many ones are in them?

2 Can you write a number:

a 100 more than 723 b 200 less than 339 c 10 more than 207

d 10 less than 524 e with more 100s than 648?

Going deeper

1 How many hundreds, tens and ones are there in 469? How else could you describe it using hundreds, tens or ones?

2  =100  =10  = 1

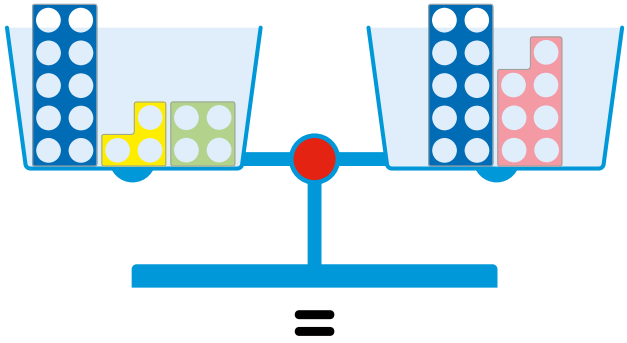
a Can you write the number shown by these counters?

b If there were 5 more yellow counters, what number would it be?

c If you double your answer to **question b**, what is your total?

d Take turns to set each other challenges like these.

Exploring adding, subtracting and equivalence



Molly

I am showing adding facts.

Practice

1 Which number trios can you write for Molly's adding fact?

2 Can you write the related adding or subtracting facts for these calculations?

18 – 4	12 + 7	16 – 9	14 + 5	2 + 15
19 – 3	13 + 5	17 – 5	16 – 11	4 + 12

Going deeper

1 If you found all the number trios for 19, how many would there be?

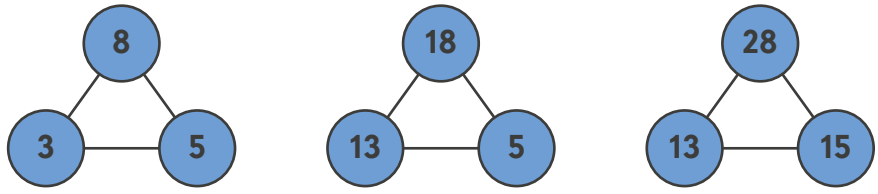
2 Jake and Lily put their savings together to buy a sticker book that cost $12. Jake pays $5.

a Can you draw a number trio to show how much Lily pays?

b Can you make up your own problem for the trio?

Relating adding and subtracting facts

Lucy has adjusted the numbers in one trio to make two new trios.



Practice

1 Talk about how Lucy has adjusted the numbers.

2 Can you write the adding and subtracting facts for Lucy's last trio?

3 Can you draw a trio to show 4 + 5 = 9? Now can you adjust the trio to make two new trios?

Going deeper

1 Work together. Can you find out what the missing number could be for each of these number trios?

a 18, 14, ☐ **b** ☐, 5, 11

2 Ben says both these additions have the same total. Can you explain why?

11 + 17 = ☐ 17 + 11 = ☐

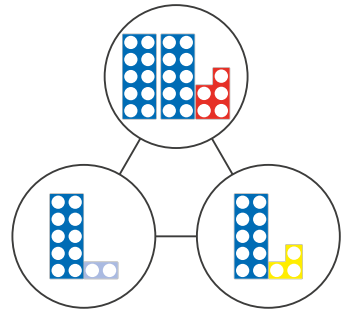
3 Ben says the sets of numbers below are related. Do you agree? Can you explain why?

12, 7, 5 32, 17, 15

Recording families of related facts

Tia

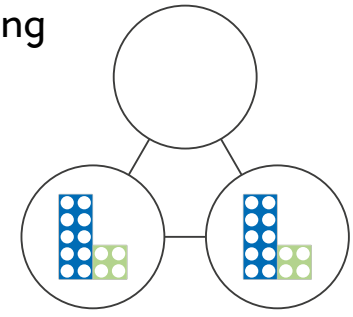
I want to see how many related facts I can find for this number trio.



Practice

1 How many related facts can Tia find?

2 Can you write or draw the missing number from this trio?
Next explore how many related facts you can find.



Going deeper

1 Why do you think there are fewer related facts for the trio you explored in **question 2** than for **question 1**?

2 Do you think these calculations are correct? Can you explain?

23 − 25 = 48 25 − 23 = 48

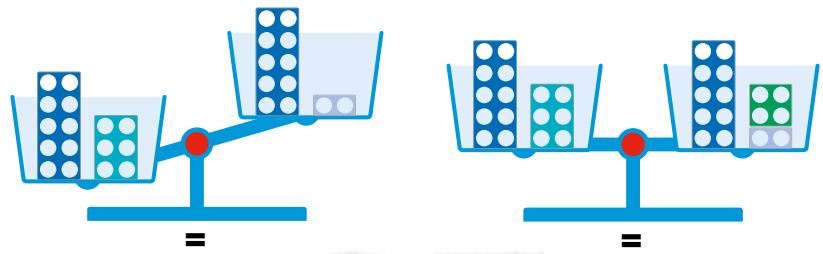
3 Can you find number trios for these problems?
What do you notice?

George counts 18 cars on the first day and 21 on the second. How many cars does he count altogether?

A car park has 39 spaces. In the morning, cars fill 21 spaces. How many more cars can park there?

Solving empty box number problems

Sanjay used a pan balance to help him solve adding problems.



16 = 12 + ☐

Practice

1 Decide how you will work out and complete these number sentences together.

a 24 + ☐ = 29 b ☐ + 23 = 27 c ☐ + 24 = 30

d 26 = 23 + ☐ e 28 = ☐ + 6 f 27 = 12 + ☐

Going deeper

1 a Can you complete this calculation and show it in a number trio?

26 = ☐ + 12

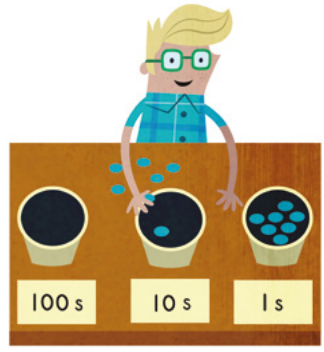
b What other missing number problems can you write for this trio?

2 Can you make number trios using these numbers? Are there any numbers you can't use?
Compare your ideas. What do you notice?

25, 3, 13, 38, 32, 18, 5, 15, 8

Keeping count

Ben and Tia found different methods of keeping count of the bikes in a race.



Practice

1 Ben used counters to show there were 145 bikes in the race. How many counters do you think were in each pot?

2 For a week, the class kept a tally chart of the number of birds visiting the garden. Can you copy and complete it?

Days of the Week	Tallies	Total
Monday	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 II	
Tuesday		25
Wednesday		36
Thursday	𝍸 𝍸 𝍸 𝍸 𝍸 III	
Friday		19

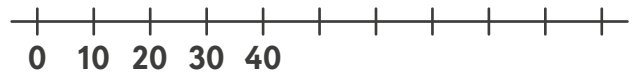
Going deeper

1 Can you explain which method you would use to count the number of lengths a swimmer swims in a pool?

2 Aisha says most children in her class prefer football to tennis. Can you find out if this is true for your class?

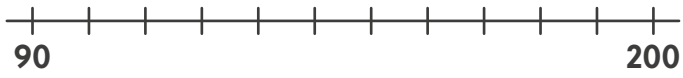
Exploring number lines

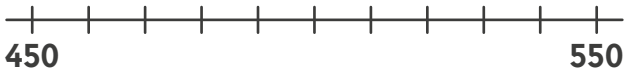
Alfie records counting in 10s on an empty number line.

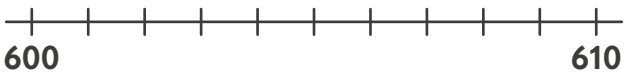


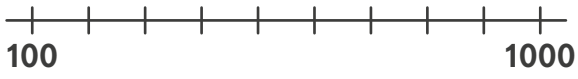
Practice

1 Which numbers are missing from these number lines?

a 

b 

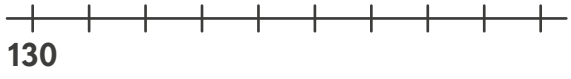
c 

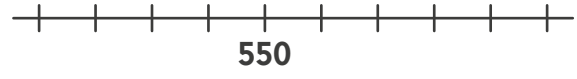
d 

2 Joe has eighteen 10-rods and six 1-rods. Which number will they reach if he lays them in a number rod track?

Going deeper

1 Talk about which numbers you think could be missing from these number lines.

a 

b 

2 Noah found that the 0–100 cm number line fits along $\frac{1}{2}$ of the length of a table.

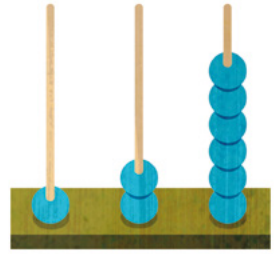
a How long was the table in metres?

b How many 10-rods would fit along it?

c How many 5-rods would fit along it?

Exploring an abacus

Amir's class found they could keep count of their marbles on an abacus.



Practice

NPC 26

1 Can you draw abacuses like the one above to show these numbers?

746, 593, 444, 68, 86, 515

2 Play a game with number cards from 1 to 10 and an abacus. Take turns to turn over a number card and add that number onto the abacus. The first player to reach 200 wins.

Going deeper

1 Can you work out the highest number you could show on a HTO abacus like the one above? How many counters would you need?

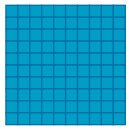
2 How many different numbers could you show on the abacus with five counters? Experiment together. What rules will you set?

3 Bo says this shows 374.
Is she correct? Can you explain your answer?

Hundreds	Tens	Ones
		

Zero as a place holder

Heidi experiments by putting 0 in different places on the hundreds, tens and ones (HTO) frame.

Hundreds	Tens	Ones
		
1	0	0

Hundreds	Tens	Ones
		
0	1	0

Hundreds	Tens	Ones
		
0	0	1

Practice

1 Take turns to choose a number from the list below. Can you make it with base-ten apparatus on a HTO frame? Find two ways to change it into a 100s number using a zero. Can you show the new numbers with apparatus?

NPC 27

62, 37, 14, 83, 26, 59

Going deeper

1 James was born on the second of January, two thousand and seven. How could you write this in numerals?

2 Malia measures how many steps she takes during the day.

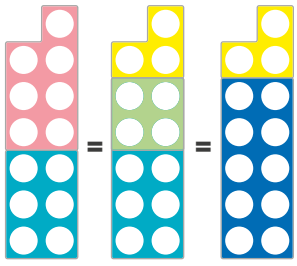
Look at the numbers on her step counter below. How would each total change as she takes the next step? What if she takes 10 more steps?

a 0001 **b** 0009 **c** 0089 **d** 0119

e 0240 **f** 0499 **g** 0709 **h** 0999

Bridging multiples of 10 when adding

Ravi adds 6 and 7 using Numicon Shapes.



Practice

1 Can you talk about and show different ways of adding 6 and 7 together? Choose any apparatus you need.

2 Choose a number from List A and from List B. Can you use Ravi's method to add them together? Try this three times.

List A	List B
9	6
8	5
7	4

Going deeper

1 Agree how you will solve 6 + 8 = ☐ + 10.

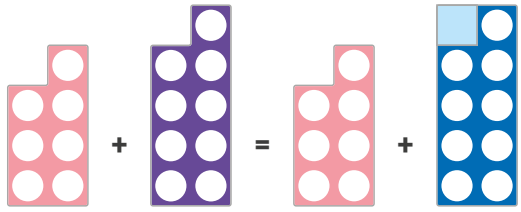
2 Can you explain how you will solve this problem? How can you check your answer?

Ravi plants 135 bean seeds, then Molly plants another 8. How many bean seeds have they planted altogether?

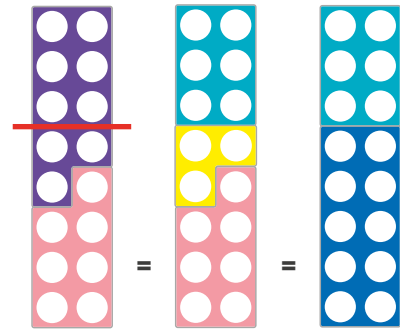
Adding 9

I have two methods for adding 9.

Method 1



Method 2



Practice

1 Molly's first method is to add 10 instead of 9. Then she adjusts the total to make it one fewer. Can you use this method to add 9 to these numbers?

23, 47, 172, 384, 96

2 Molly's second method is to reach the next multiple of 10, by adding part of the 9. Then she adds the remaining part of the 9. Can you use this method to add 9 to these numbers?

28, 39, 256, 465

Going deeper

1 Look at a 100 square together. Can you explain what happens when you add 9 to any number?

NPC 13

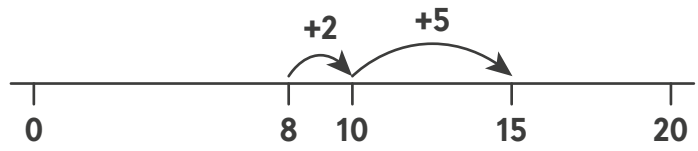
2 Can you change these calculations to make them correct?

a 43 + 9 = 50 + 1 b 376 + 9 = 380 + 6

3 Try adding 108 + 9 using both of Molly's methods. Which do you find easiest to calculate and which do you find easiest to explain?

Bridging multiples of 10

I've used an empty number line to show bridging 10.



Practice

1 Choose a number from List A and from List B to add together.
Can you draw number lines to show your calculations?
Try this three times.

A: 15, 46, 77, 88

B: 6, 7, 8, 9

2 Can you write balancing number sentences for these number rods?

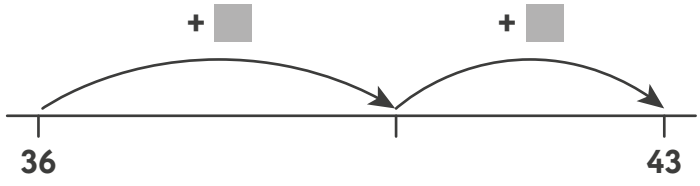
a 

b 

Going deeper

1 Can you use number rods to show your solution to 126 + 7?

2 Can you write the number sentences shown on this number line?



More bridging and adding lists of numbers

I added 7, 6 and 9. Then I used number rods to check my total.

Practice

1 Choose three or more of the number cards below and calculate the total. Take three turns each. Talk about the methods you use.
Can you find different number sentences each time?

6	7	8	9	10

2 Can you copy and complete these balancing number sentences?

a 67 + 8 = 70 + ☐ b 5 + 98 = ☐ + 100 c 150 + ☐ = 147 + 9

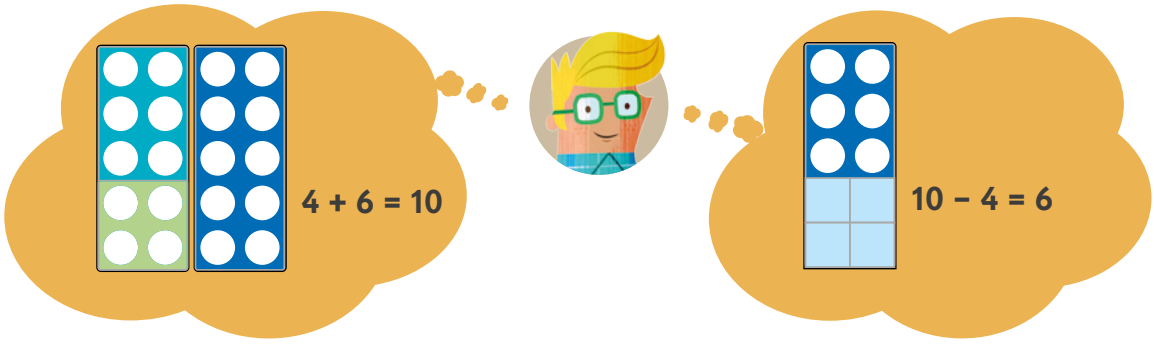
d 416 + 7 = ☐ + 3 e 4 + ☐ = 8 + 326

Going deeper

1 Can you explain how knowing 48 + 6 helps you calculate 48 + 46?

2 Can you explain how to reach from 157 to 165 in two steps?

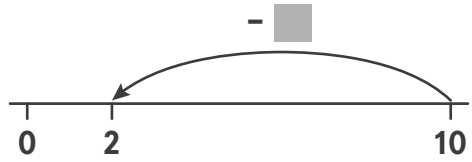
Exploring subtracting strategies



Practice

1 Can you write subtracting sentences for these calculations?

a



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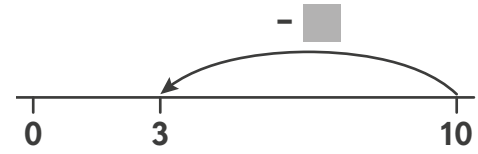
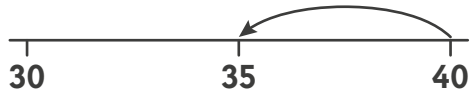


c



d

2 Group the subtracting facts that are connected.

20 – 7	620 – 7	495 – 2	350 – 7	760 – 6	290 – 2
406 – 6	90 – 2	490 – 2	60 – 6	120 – 7	460 – 6

Going deeper

1 Can you explain how knowing 70 – 4 helps you to calculate 170 – 4 and 570 – 4?

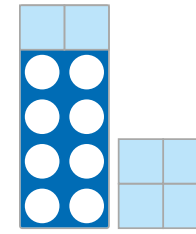
2 Can you explain how you will complete these number sentences?

a ☐ – 7 = 43

b ☐ – 5 = 165

Subtracting a single-digit number

I have found a way of subtracting 6 from 14.



Practice

1 Can you explain how Ravi has subtracted 6 from 14?

2 Can you choose a number from List A and subtract it from a number in List B? Use number rods or Numicon Shapes to help you and write your calculations as number sentences. Try this four times.

A: 6, 7, 8, 9 **B:** 12, 13, 14, 15

Going deeper

1 Do you think Ravi's method would work if you are calculating 215 – 7? Talk about your ideas.

2 Can you write an empty box calculation for this problem?

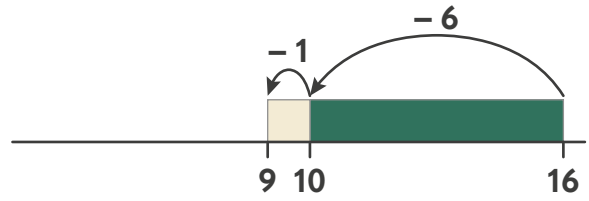
There are 7 coats left at the end of a clothes sale. 6 have been sold. How many coats were there to start with?

3 Can you make up a problem for this empty box calculation?
23 – ☐ = 5

Bridging multiples of 10 when subtracting

I have shown subtracting with rods on an empty number line.

16 – 7 = 9



Practice

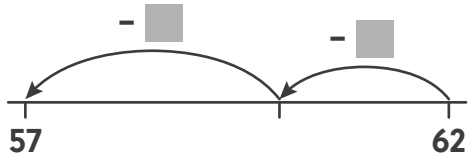
1 Can you subtract numbers in List A from numbers in List B? Show your calculations on empty number lines.

A: 6, 7, 8, 9

B: 34, 13, 42, 285

2 Can you write the number sentences shown on these number lines?

a



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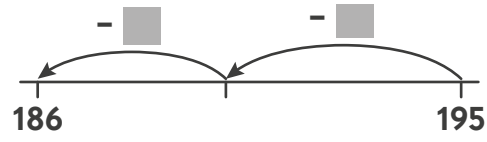


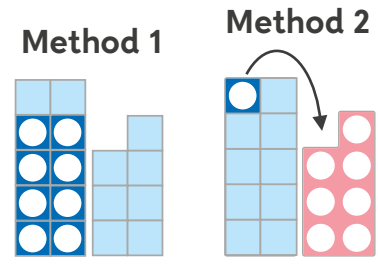
Going deeper

1 Can you make up a problem that uses the calculation in 2a?

2 Ella said she only used 63 – 7 to answer the subtraction 463 – 7. Can you explain why?

Subtracting 9

I have two methods for subtracting 9.



17 – 9 = 8

Practice

1 Talk about how to use Tia's methods to answer 26 – 9.

2 Tia's first method is to subtract part of the 9 to reach the previous multiple of 10. Then she subtracts the rest of the 9.

Can you use this method to subtract 9 from these numbers?

25, 57, 174, 93

3 Tia's second method is to subtract 10 instead of 9 and adjust the answer by adding 1.

Can you use this method to subtract 9 from these numbers?

28, 139, 56, 65, 382

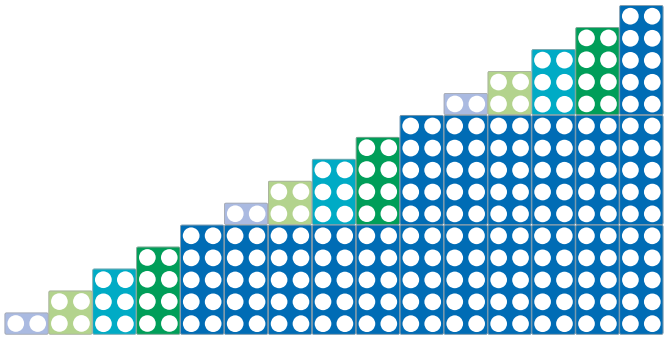
Going deeper

1 Zara writes 53 – 9 = 54 – 10. Is she correct? Explain your reasoning.

2 Can you complete these and explain what you notice happening when you subtract 9?

a 41 – 9 = ☐ b 84 – 9 = ☐ c 167 – 9 = ☐

Exploring multiples



This sequence uses multiples of 2. The 10-Shape is the 5th number in the sequence.

Practice

1 Can you work out the position of these numbers in the sequence?

16, 24, 32, 40, 62

2 Can you complete this statement?

Multiples of 2 will always _____.

3 Can you complete these sequences?

a 888, ☐, 886, ☐, ☐, 883, ☐ b 221, ☐, ☐, 218, ☐

Going deeper

1 Use a sorting diagram to sort these 3-digit numbers into **Multiples of 2** and **Not multiples of 2**.

342, 836, 469, 110, 728, 287, 694, 121, 392, 704

2 How many multiples of 2 are between 12 and 20 (including 12 and 20)? What about 42 and 50? Try 112 and 120.
Can you explain to your partner what you notice?

Exploring sequences of multiples of 3, 4 and 8

I am building sequences of multiples of 3, 4 and 8.

Practice

1 Can you copy and complete these sequences?

a 36, ☐, 42, 45, ☐, 51, ☐, ☐

b 99, ☐, ☐, 90, 87, ☐

c 117, ☐, 123, 126, ☐, ☐

2 Draw a Venn diagram with two overlapping rings. Label one **Multiples of 2** and the other **Multiples of 3**. Can you use the diagram to sort these numbers?

15, 28, 6, 94, 56, 27, 24, 123, 136, 72

3 20, 12, 36, 28, 8, 40, 32, 4, 48, 16, 44, 24

a What multiples are shown in this list?

b Choose numbers to show the sequence for multiples of 8.

Going deeper

1 Can you explain whether or not all multiples of 3 will be odd numbers?

2 Can you work out which multiple of 4 and 8 comes between 60 and 70? Explore this together.

Exploring sequences of multiples of 5 and 10

I am going to sort multiples of 5 on this Carroll diagram.

	Multiple of 5	Not multiple of 5
Odd		
Not odd		

Practice

1 Draw your own diagram like Tia's and sort these numbers.

25, 12, 49, 26, 50, 51, 35, 48, 34, 17, 75, 40, 120, 125

2 What would the 13th step in the sequence of multiples of 5 be?

Going deeper

1 Are these statements correct? Can you explain your ideas?

20 is the 4th step in the sequence of multiples of 5.
20 is the 2nd step in the sequence of multiples of 10.

2 Hita collects packs of 10 stickers. Rob collects packs of 5 stickers. They have both collected the same amount. Could both of them have collected 125 stickers? Can you explain why?

3 How many multiples of 5 are there between 0 and 50? Can this help you find how many there are between 0 and 100?

Finding sequences on the 100 square

Practice

1 Look at this 100 square. Can you find the missing numbers and name the sequence on the yellow squares?

NPC 13

2 Can you colour a pattern for the multiples of 8 sequence on a 100 square? What do you notice about the pattern?

1	2	3	4	5	6	7	8	9	10
11	12	13	14		16	17	18	19	20
	22	23	24	25	26	27	28	29	
31	32	33	34	35		37	38	39	40
41	42	43	44	45	46	47		49	50
51	52	53		55	56	57	58	59	60
61	62		64	65	66	67	68	69	70
71		73	74	75	76	77		79	80
81	82	83		85	86	87	88	89	
91	92	93	94	95	96	97	98		100

Going deeper

1 Can you explain the sequences shown on these number squares? Can you find the missing numbers?

a

	28		32
24	22		
10	12		16
	6	4	2

b

25		15	10	5
30	35		45	50
	70	65	60	
	85	90		100
				105

2 Can you explain whether these statements are true or false?

a 12 is not a multiple of 4.

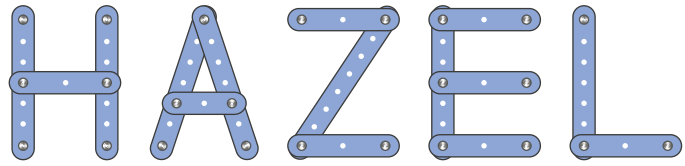
b 30 is a multiple of 5.

c 24 is a multiple of 3.

d 18 is not a multiple of 2 and 3.

Perpendicular, horizontal and vertical lines

Hazel is exploring the vertical and horizontal lines in her name with geo strips.



Practice

1 a How many vertical strips are there in Hazel's name?

b How many horizontal strips are there?

2 Can you use geo strips to make your name in capital letters? How many vertical and horizontal strips are there?

3 Can you list five capital letters with horizontal and vertical lines that are perpendicular to one another?

Going deeper

1 Can you make a word that has:

a fewer vertical and horizontal strips than 'Hazel'

b more vertical and horizontal strips than 'Hazel'?

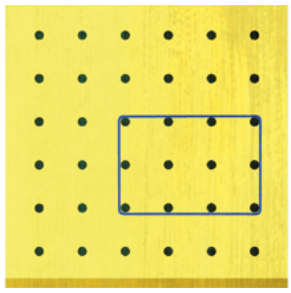
2 Which letter is described by these instructions?

> Place a strip horizontally. Then place a strip vertically down, so that it is perpendicular from the centre point of the horizontal strip.

3 Send a message to your partner. Can you give them instructions to make the letters that form your words?

Exploring parallel lines

Ravi has made a rectangle on a geo board with an elastic band.



Ravi

If I move one vertex of the rectangle in a horizontal or vertical direction, the shape will still have one set of parallel lines.

Practice

1 a Can you explore Ravi's statement? Is he correct?

GMS 7 b What new shapes can be made by this move? Can you draw them on dotty paper and name them?

GMS 7 2 Can you make or draw three polygons that have no parallel lines?

GMS 7 3 Can you make or draw a shape that has more than two sets of parallel lines?

Going deeper

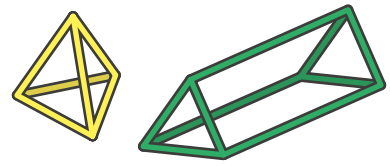
GMS 7 1 Can you move one vertex of Ravi's rectangle to make a shape that has no parallel lines but still has a set of sides that are perpendicular?

2 Can you move two vertices of Ravi's rectangle to make a shape that has parallel lines but no perpendicular lines?

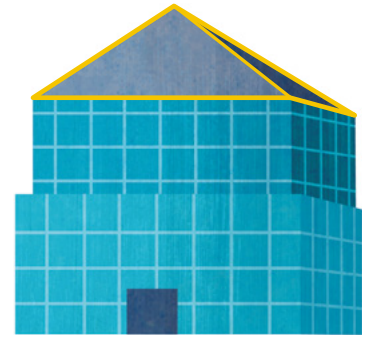
3 Can you choose sorting criteria and sort all the shapes you created in the **Practice questions**?

Building 3D shapes

Here are some skeleton 3D shapes.



Practice



1 Can you use straws or pipe cleaners to make the roof of this building as a skeleton shape?

2 Liam has 12 straws. What 3D skeleton shapes can he make using exactly 12 straws? Can you find four different shapes?

3 Can you make a 3D skeleton shape which has a face that is shaped like a pentagon? How many straws will you need?

Going deeper

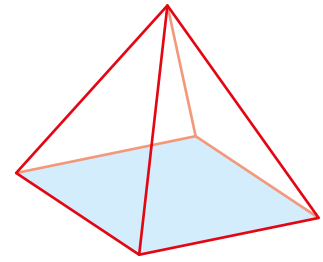
1 Kayla uses 18 straws and 12 balls of modelling dough. Can you predict what 3D skeleton shape this could make and then test out your ideas?

2 Secretly make a 3D skeleton shape using straws and modelling dough. Take it apart and give your partner the pieces. Will the model they make be the same as yours?

Investigating faces, edges and vertices

I've explored 3D shapes and have found that Faces + Vertices − Edges = 2.

Practice



1 How many faces, edges and vertices does a square-based pyramid have? Does this fit Molly's statement?

2 Can you test out Molly's statement further by exploring other shapes? Find two more examples that fit Molly's statement.

3 If Molly's statement is true, can you work out what shape she has made with 4 faces and 4 vertices? How many edges will it have?

Going deeper

1 An octahedron has 8 faces and 12 edges. Can you predict how many vertices it will have?

2 Can you make a 3D model with 9 edges and 6 vertices? How can you use Molly's statement to help you?