Scheme of Learning

Year 3

#MathsEveryoneCan

White Rose Maths

Contents

Welcome

Welcome to the White Rose Maths' new, more detailed schemes of learning for 2017-18.

We have listened to all the feedback over the last 2 years and as a result of this, we have made some changes to our primary schemes. *They are bigger, bolder and more detailed than before.*

The new schemes still have the *same look and feel* as the old ones, but we have tried to provide more detailed guidance. We have worked with enthusiastic and passionate teachers from up and down the country, who are experts in their particular year group, to bring you additional guidance. *These schemes have been written for teachers, by teachers.*

We all believe that every child can succeed in mathematics. Thank you to everyone who has contributed to the work of White Rose Maths. It is only with your help that we can make a difference.

We hope that you find the new schemes of learning helpful. As always, if you or your school want support with any aspect of teaching maths.

If you have any feedback on any part of our work, do not hesitate to get in touch. Follow us on Twitter and Facebook to keep up-to-date with all our latest announcements.

White Rose Maths Team

#MathsEveryoneCan

White Rose Maths contact details

support@whiterosemaths.com

@WhiteRoseMaths

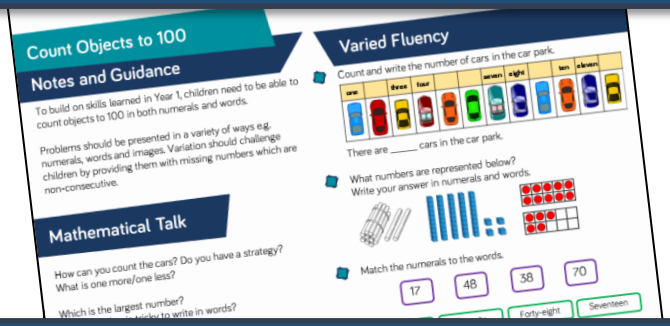
White Rose Maths

What's included?

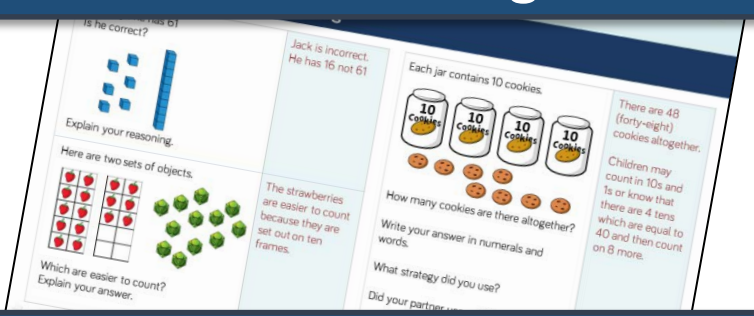
Our schemes include:

- Small steps progression. These show our blocks broken down into smaller steps.
- Small steps guidance. For each small step we provide some brief guidance to help teachers understand the key discussion and teaching points. This guidance has been written for teachers, by teachers.
- A more integrated approach to fluency, reasoning and problem solving.
- Answers to all the problems in our new scheme.
- This year there will also be updated assessments.
- We are also working with Diagnostic Questions to provide questions for every single objective of the National Curriculum.

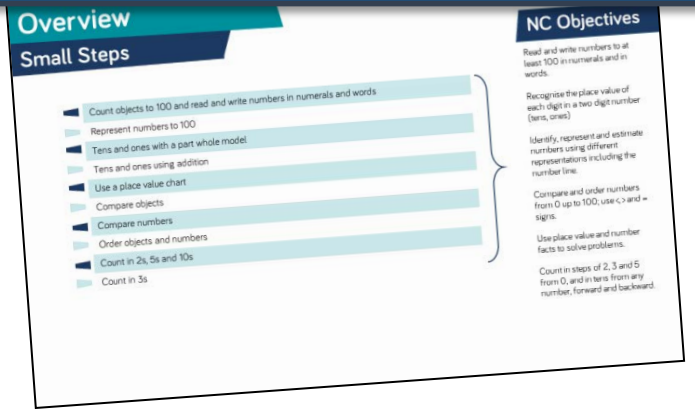
Teaching notes and examples



Answers to Reasoning Questions



Small Steps Guidance



Meet the Team

The schemes have been developed by a wide group of passionate and enthusiastic classroom practitioners.

Caroline Hamilton

Beth Smith

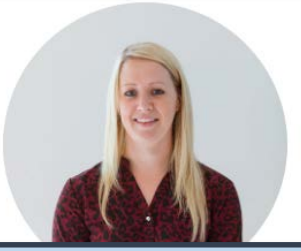
Kelsey Brown

Julie Matthews

Faye Hirst

Emma Davison

Mary-Kate Connolly



Kate Henshall

Sam Shutkever

Rachel Otterwell

Jenny Lewis

Stephen Monaghan

Special Thanks

The White Rose Maths team would also like to say a huge thank you to the following people who came from all over the country to contribute their ideas and experience. We could not have done it without you.

Year 2 Team

Chris Gordon
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Year 6 Team

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Kayleigh Parkes
Shahir Khan
Sarah Howlett

How to use the small steps

We were regularly asked how it is possible to spend so long on particular blocks of content and National Curriculum objectives.

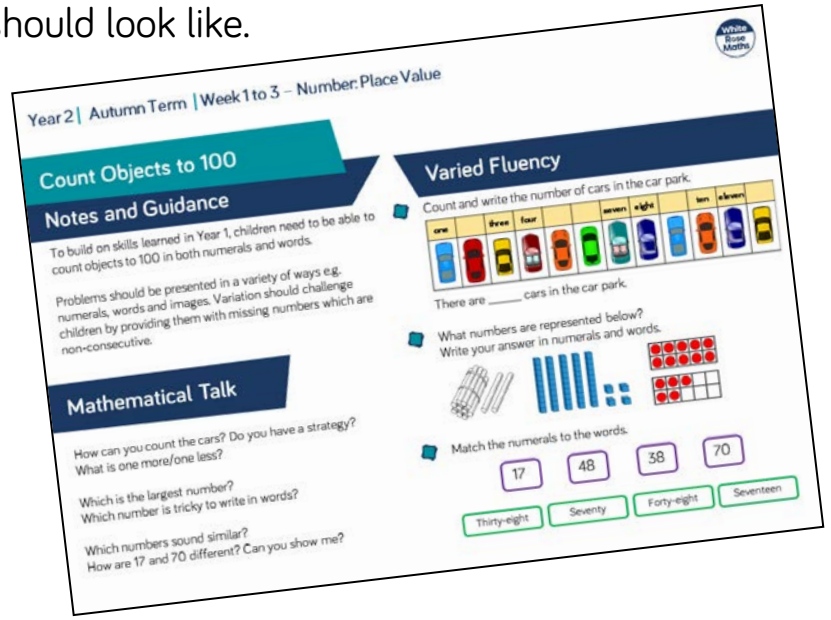
We know that breaking the curriculum down into small manageable steps should help children understand concepts better. Too often, we have noticed that teachers will try and cover too many concepts at once and this can lead to cognitive overload. In our opinion, it is better to follow a small steps approach.

As a result, for each block of content we have provided a "Small Step" breakdown. We recommend that the steps are taught separately and would encourage teachers to spend more time on particular steps if they feel it is necessary. Flexibility has been built into the scheme to allow this to happen.

Teaching notes

Alongside the small steps breakdown, we have provided teachers with some brief notes and guidance to help enhance their teaching of the topic. The "Mathematical Talk" section provides questions to encourage mathematical thinking and reasoning, to dig deeper into concepts.

We have also continued to provide guidance on what varied fluency, reasoning and problem solving should look like.



Assessments

Alongside these overviews, our aim is to provide an assessment for each term's plan. Each assessment will be made up of two parts:

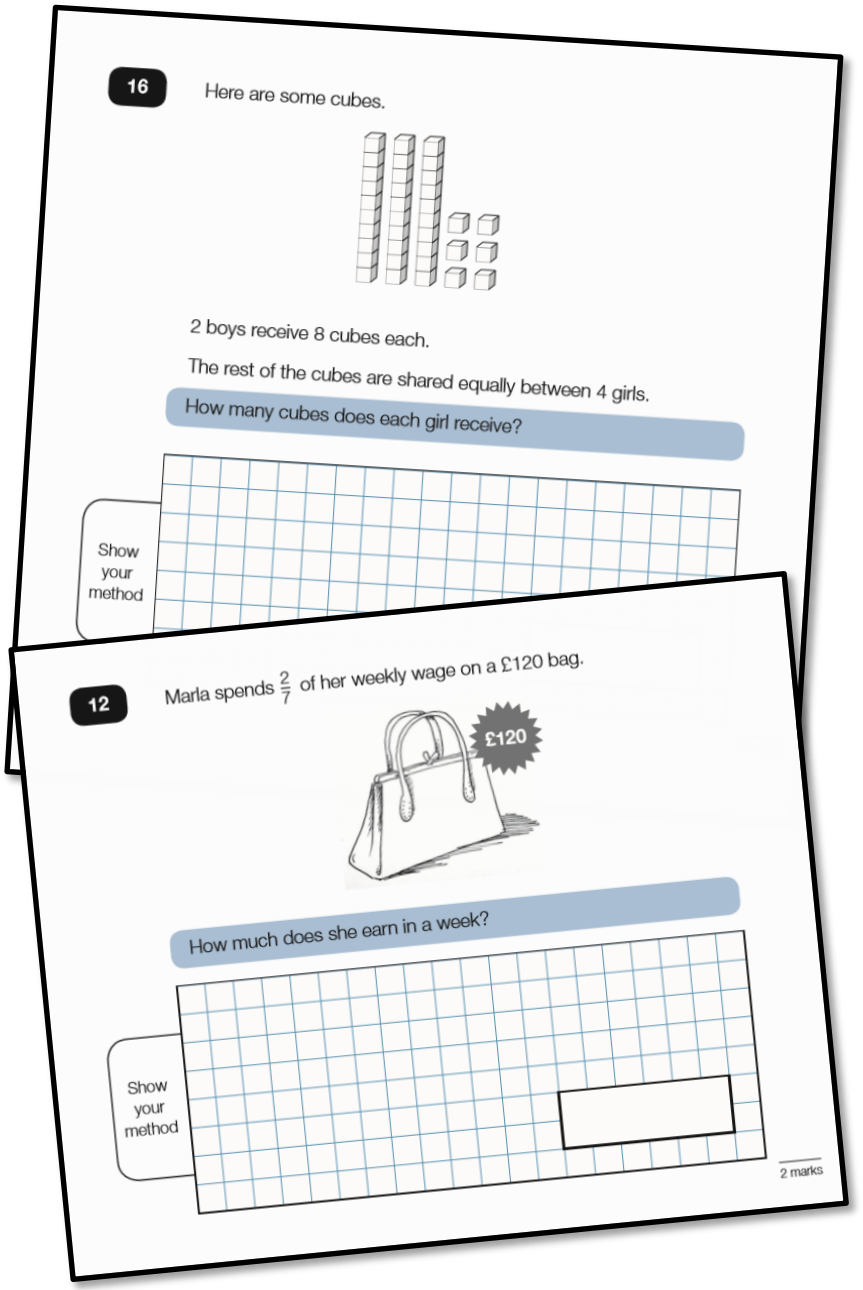
Part 1: Fluency based arithmetic practice

Part 2: Reasoning and problem solving based questions

Teachers can use these assessments to determine gaps in children's knowledge and use them to plan support and intervention strategies.

The assessments have been designed with new KS1 and KS2 SATs in mind.

For each assessment we provide a summary spread sheet so that schools can analyse their own data. We hope to develop a system to allow schools to make comparisons against other schools. Keep a look out for information next year.



Teaching for Mastery

These overviews are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the new National Curriculum.

The overviews:

- have number at their heart. A large proportion of time is spent reinforcing number to build competency
- ensure teachers stay in the required key stage and support the ideal of depth before breadth.
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of opportunities to build reasoning and problem solving elements into the curriculum.

For more guidance on teaching for mastery, visit the NCETM website:

https://www.ncetm.org.uk/resources/47230

Concrete - Pictorial - Abstract

We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking this approach.

Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

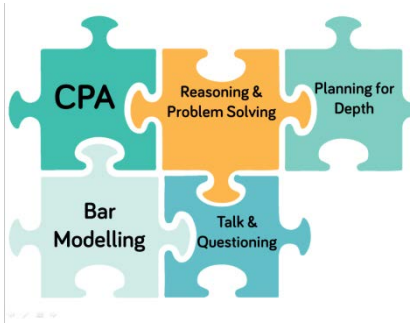
Need some CPD to develop this approach? Visit www.whiterosemaths.com for find a course right for you.

Training

White Rose Maths offer a plethora of training courses to help you embed teaching for mastery at your school.

Our popular JIGSAW package consists of five key elements:

- CPA
- Bar Modelling
- Mathematical Talk & Questioning
- Panning for Depth
- Reasoning & Problem Solving



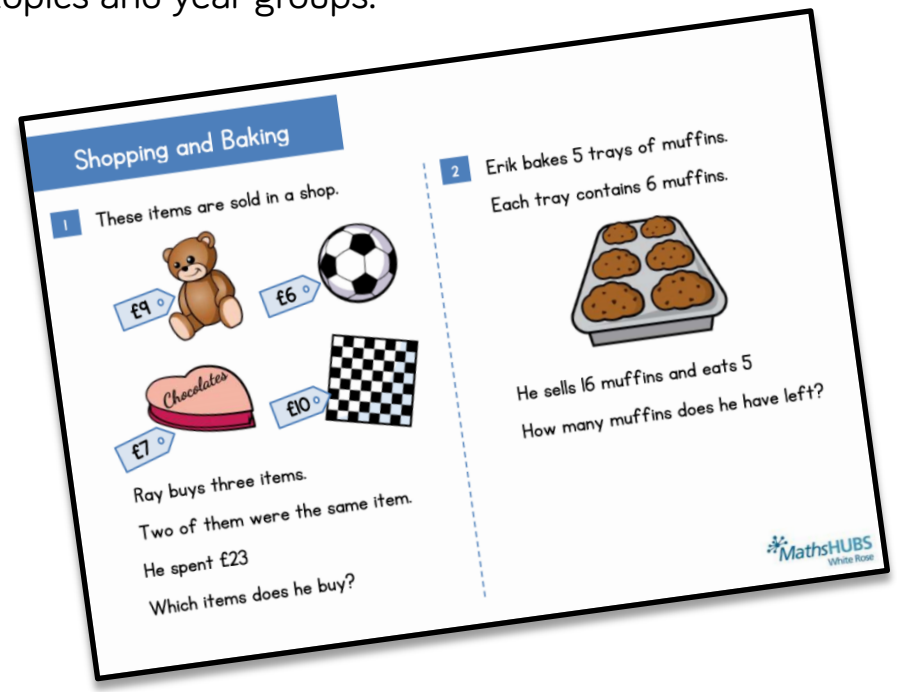
For more information and to book visit our website www.whiterosemaths.com or email us directly at support@whiterosemaths.com

Additional Materials

In addition to our schemes and assessments we have a range of other materials that you may find useful.

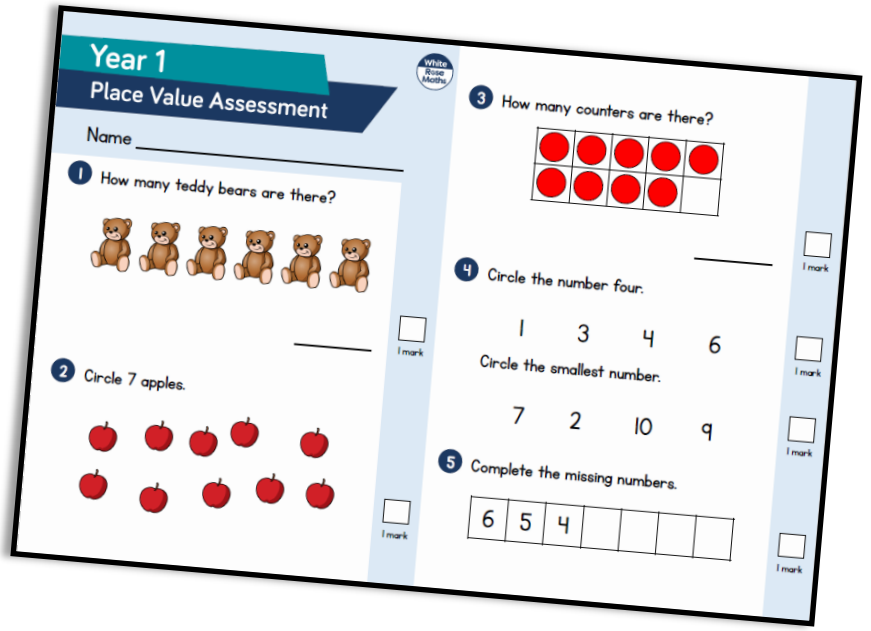
KS1 and KS2 Problem Solving Questions

For the last three years, we have provided a range of KS1 and KS2 problem solving questions in the run up to SATs. There are over 200 questions on a variety of different topics and year groups.



End of Block Assessments

New for 2018 we are providing short end of block assessments for each year group. The assessments help identify any gaps in learning earlier and check that children have grasped concepts at an appropriate level of depth.



FAQs

If we spend so much time on number work, how can we cover the rest of the curriculum?

Children who have an excellent grasp of number make better mathematicians. Spending longer on mastering key topics will build a child's confidence and help secure understanding. This should mean that less time will need to be spent on other topics.

In addition, schools that have been using these schemes already have used other subjects and topic time to teach and consolidate other areas of the mathematics curriculum.

Should I teach one small step per lesson?

Each small step should be seen as a separate concept that needs teaching. You may find that you need to spend more time on particular concepts. Flexibility has been built into the curriculum model to allow this to happen. This may involve spending more than one lesson on a small step, depending on your class' understanding.

How do I use the fluency, reasoning and problem solving questions?

The questions are designed to be used by the teacher to help them understand the key teaching points that need to be covered. They should be used as inspiration and ideas to help teachers plan carefully structured lessons.

How do I reinforce what children already know if I don't teach a concept again?

The scheme has been designed to give sufficient time for teachers to explore concepts in depth, however we also interleave prior content in new concepts. E.g. when children look at measurement we recommend that there are lots of questions that practice the four operations and fractions. This helps children make links between topics and understand them more deeply. We also recommend that schools look to reinforce number fluency through mental and oral starters or in additional maths time during the day.

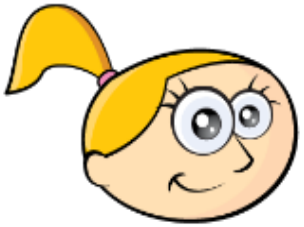
Meet the Characters

Children love to learn with characters and our team within the scheme will be sure to get them talking and reasoning about mathematical concepts and ideas. Who's your favourite?

Teddy

Rosie

Mo



Eva

Jack

Whitney

Amir

Dora

Alex

Tommy

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value			Number: Addition and Subtraction					Number: Multiplication and Division			Consolidation
Spring	Number: Multiplication and Division			Measurement: Money	Statistics		Measurement: Length and Perimeter			Number: Fractions		Consolidation
Summer	Number: Fractions			Measurement: Time			Geometry: Properties of Shape		Measurement: Mass and Capacity			Consolidation

White Rose Maths

Autumn - Block 1

Place Value

Overview

Small Steps

1. Hundreds
2. Represent numbers to 1,000
3. 100s, 10s and 1s (1)
4. 100s, 10s and 1s (2)
5. Number line to 1,000
6. Find 1, 10, 100 more or less than a given number
7. Compare objects to 1,000
8. Compare numbers to 1,000
9. Order numbers
10. Count in 50s

NC Objectives

Identify, represent and estimate numbers using different representations.

Find 10 or 100 more or less than a given number.

Recognise the place value of each digit in a three-digit number (hundreds, tens, ones).

Compare and order number up to 1,000.

Read and write numbers up to 1,000 in numerals and in words.

Solve number problems and practical problems involving these ideas.

Count from 0 in multiples of 4, 8, 50 and 100

Hundreds

Notes and Guidance

Children build on their understanding of tens and link this to 100. This is the first time they explore 100 explicitly.
It is crucial children understand that ten tens make 100 and a hundred ones make 100
They use a variety of concrete equipment to see this relationship.
Once children understand the concept of 100, they will count objects and numbers in multiples of 100 up to 1,000

Mathematical Talk

How many tens have you made? How else can we say this?
What do these digits mean/represent?
How many ones have you made? How else can you say this?
If we continue counting in tens, what do we say after 100?
What numbers wouldn't we say?

Varied Fluency

- Use bundles of straws in tens, bead strings and Base 10 to explore how many tens make a hundred. Children use the equipment to count up and down in tens to make 100

  There are 3 tens this is thirty.
  There are _____ this is _____ .
  There are _____ tens in one hundred.

- There are 100 sweets in each jar.

How many sweets are there altogether?
Write your answer in numerals and words.

- Complete the number tracks.

200	300		500			800	

	900	800			500		

Hundreds

Reasoning and Problem Solving

True or False?

If I count in 100s from zero, all of the numbers will be even.
Convince me.

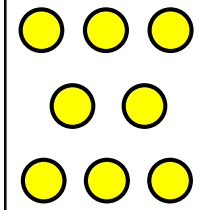
True, because if you start with zero and add 100 you get an even number, and you are adding another even so the number will always be even.

Sort these statements into always, sometimes or never.

- When counting in hundreds, the ones column changes.
- When counting in hundreds, the hundreds column changes.
- To count in hundreds we use 3-digit numbers.

- Never
- Always
- Sometimes

Whitney thinks the place value grid is showing the number eight.

Hundreds	Tens	Ones
		

Do you agree? Explain why.

Using all of the counters, what is the smallest number you can make?

What other numbers could you make?

Whitney is incorrect because the eight counters in the hundreds column so they represent eight hundreds. The number is 800

The smallest number that can be made is 8

Other possible numbers include:
80
170
350
Etc.

Numbers to 1,000

Notes and Guidance

In this small step, children will primarily use Base 10 to become familiar with any number up to 1,000
Using Base 10 will emphasise to children that hundreds are bigger than tens and tens are bigger than ones.
Children need to see numbers with zeros in different columns, and show them with concrete and pictorial representations.

Mathematical Talk

Does it matter which order you build the number in?

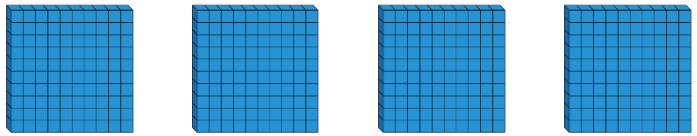
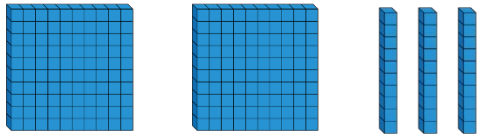
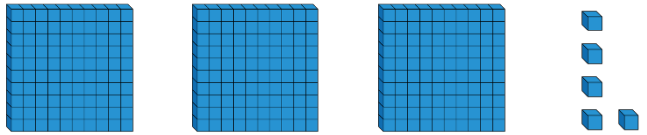
Can you have more than 9 of the same object? E.g. 11 tens.

Do you prefer using the Base 10 or drawing the Base 10? Why?

Can you create a part-whole model using or drawing Base 10 in each circle?

Varied Fluency

Write down the number represented with Base 10 in each case.

Representation	Number
	
	
	

Use Base 10 to represent the numbers.

700 120 407 999

Sanjay is drawing numbers. Can you complete them for him?

246 

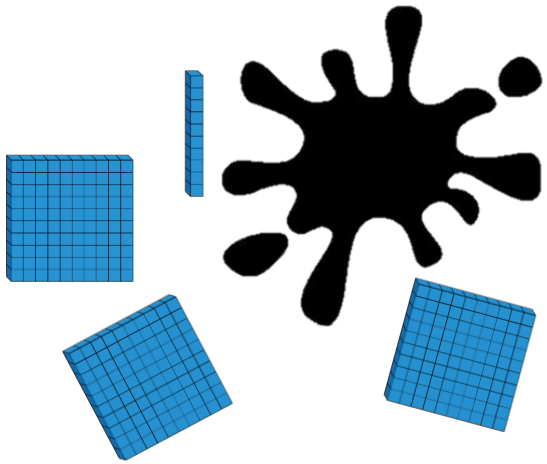
390 

706 

Numbers to 1,000

Reasoning and Problem Solving

Teddy has 420 in Base 10 but some are covered.



Work out the missing amount.

How many different ways can you make the missing amount using Base 10?

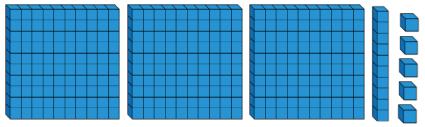
110 is the missing amount.

Possible ways:

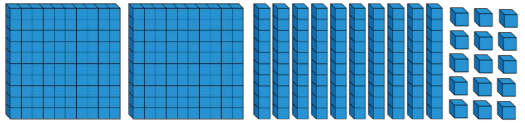
- 1 hundred and 1 ten
- 11 tens
- 110 ones
- 10 tens and 10 ones
- 50 ones and 6 tens etc.

Which child has made the number 315?

Dora



Mo



Explain how you know.

Dora and Amir have both made the number 315, but represented it differently.

3 hundreds, 1 ten and 5 ones is the same as 2 hundreds, 10 tens and 15 ones.

100s, 10s and 1s (1)

Notes and Guidance

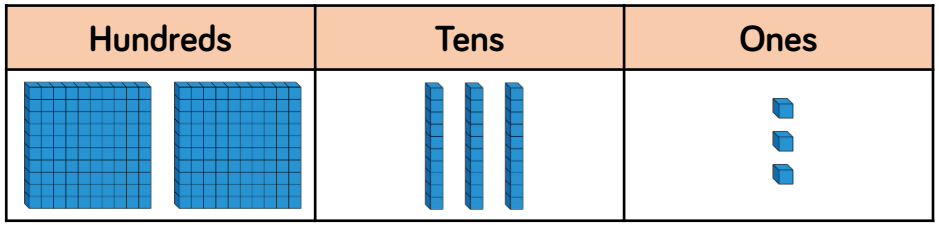
Children should understand that a 3-digit number is made up of 100s, 10s and 1s.
They read numbers shown in different representations on a place value grid, and write them in numerals. They should be able to represent different 3-digit numbers in various ways such as Base 10 or numerals.

Mathematical Talk

What is the value of the number shown on the place value chart?
Why is it important to put the values into the correct column on the place value chart?
How many more are needed to complete the place value chart?
Can you make your own numbers for a friend using Base 10?

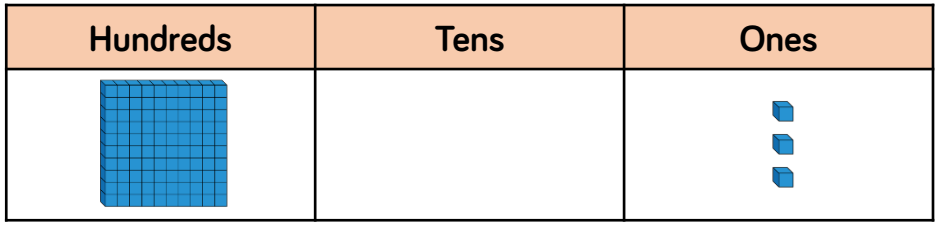
Varied Fluency

What is the value of the number represented in the place value chart?



Write your answer in numerals and in words.

Complete this place value chart so that it shows the number 354



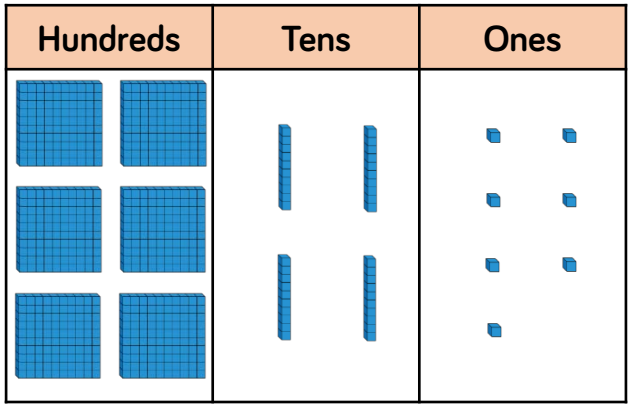
Represent the number using a part-whole model.

How many different ways can you make the number 452?
Can you write each way in expanded form? (E.g. 400 + 50 + 2)

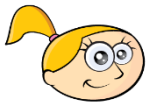
Compare your answer with a partner.

100s, 10s and 1s (1)

Reasoning and Problem Solving



Eva



The place value grid shows the number 467

Do you agree? Explain your reasoning.

What do you notice about the number shown?

Possible answers:

I disagree because there are six hundreds, four tens and seven ones so the number is 647.

I notice that 647 and 467 have the same digits but in a different order so the digits have different values.

Using each digit card, which numbers can you make?

Use the place value grid to help.

Hundreds	Tens	Ones

Compare your answers with a partner.

The numbers that can be made are:

- 503
- 530
- 305
- 350
- (0)35
- (0)53

100s, 10s and 1s (2)

Notes and Guidance

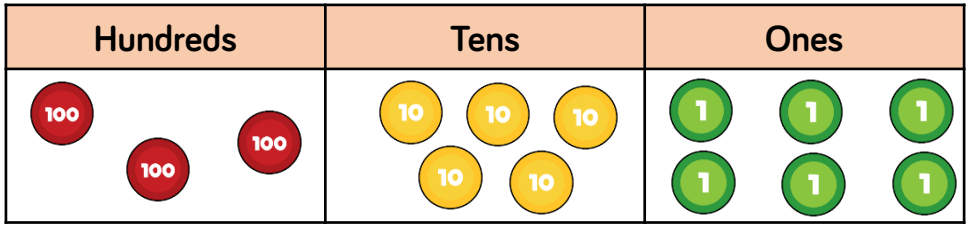
Children use place value counters to represent different numbers and understand how a number is made.
Their work with Base 10 should help them understand that the hundreds counter is worth more than the tens counter and the tens counter is worth more than the ones counter.

Mathematical Talk

What is the same and what is different about Base 10 and PV counters?
Why do we not call this number 300506?
What number would be shown if 1/10/100 was added?
Why is it important to put the values into the correct column on the place value grid?
What do we need to do if there is a zero in the number we are representing?

Varied Fluency

- What number is shown on the place value chart?



If one more 10 is added, what number would be shown?

- Use place value counters and a place value grid to represent the numbers:

615 208 37

- Use <, > or = to make the statement correct.

100s, 10s and 1s (2)

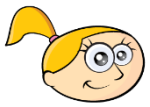
Reasoning and Problem Solving

Using place value counters, how many different ways can you make four hundred and fifty?

Show your solutions as a calculations.

E.g. four hundreds counters and 5 tens counters which as a calculation would be:
450 = 100 + 100 + 100 + 100 + 10 + 10 + 10 + 10 + 10

Eva



The number in the place value grid is the greatest number you can make with 8 counters.

100s	10s	1s
● ● ● ● ● ●	●	●

Do you agree? Explain your answer.

Eva is incorrect because you could make 800 which is greater than 611, she thinks you need to have at least one counter in each column.

100s	10s	1s
● ● ● ● ● ●		● ● ● ● ● ● ●

Dora

The place value chart shows 607

Jack

I think it shows 670

Who is correct? Explain your reasoning.

Dora is correct because there are six counters in the hundreds column, none in the tens column and seven in the ones column.

If it was 670 there would be seven counters in the tens column and none in the ones column.

Number Line to 1,000

Notes and Guidance

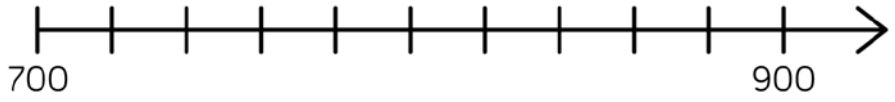
Children estimate, work out and write numbers on a number line.
Number lines should be shown with or without start and end numbers, and with numbers already placed on it.

Mathematical Talk

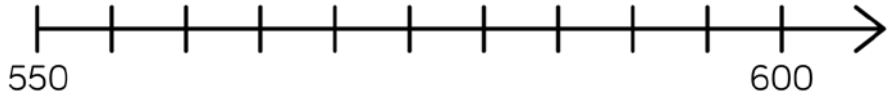
What intervals do the number lines go up in?
Which side of the number line did you start from? Why?
When estimating where a number should be placed, what facts can help you?
Can you draw a number line where 600 is the starting number, and 650 is half way along?
What value can A definitely not be? How do you know?

Varied Fluency

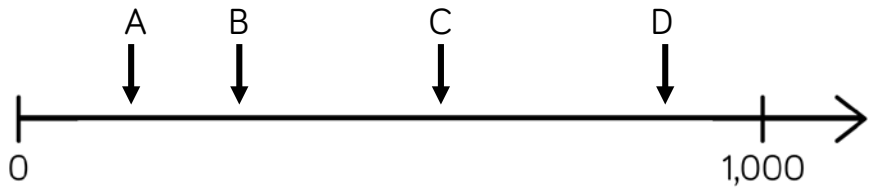
- Draw an arrow to show the number 800



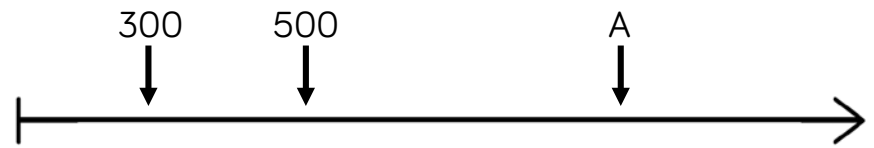
Draw an arrow to show the number 560



- Which letter is closest to 250?



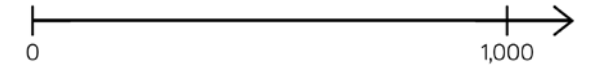
- Estimate the value of A.



Number Line to 1,000

Reasoning and Problem Solving

Estimate where seven hundred and twenty-five will go on each of the number lines.



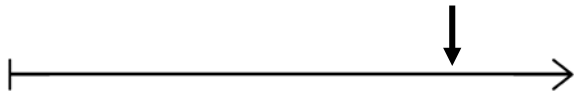
Explain why it is not in the same place on each number line.

725 is in different places because each line has different numbers at the start and end so the position of 725 changes.

All three of the number lines have different scales and therefore the difference between 725 and the starting and finishing number is different on all three number lines.

If the arrow is pointing to 780, what could the start and end numbers be?

Find three different ways and explain your reasoning.



Example answers:

Start 0 and end 1,000 because 500 would be in the middle and 780 would be further along than 500

Start 730 and end 790

Start 700 and end 800

Etc.

1, 10, 100 More or Less

Notes and Guidance

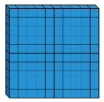
Building on children's learning in Year 2 where they explored finding one more/less, children now move onto finding 10 and 100 more or less than a given number.
Show children that they can represent their answer in a variety of different ways. For example, as numerals or words, or with concrete manipulatives.

Mathematical Talk

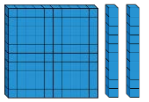
What is 10 more than/less than?
What is 100 more than/less than?
Which column changes?
What happens when I subtract 10 from 209

Varied Fluency

Put the correct number in each box.

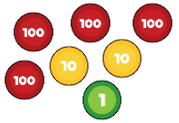

10 less


Number


10 more

100 less


Number

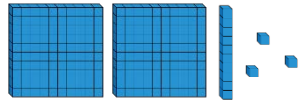


100 more

Show ten more and ten less than the following numbers using Base 10 and place value counters.

550 724 302

Complete the table.

100 less	Number	100 more
		
		

1, 10, 100 More or Less

Reasoning and Problem Solving

10 more than my number is the same as 100 less than 320

What is my number?

Explain how you know.

Write your own problem similar to describe the original number.

The number described is 210 because 100 less than 320 is 220, which means 220 is 10 more than the original number.

I think of a number, add ten, subtract one hundred and then add one.

My answer is 256

What number did I start with?

Explain how you know.

What can you do to check?

The start number was 345 because one less than 256 is 255, one hundred more than 255 is 355 and ten less than 355 is 345.
To check I can follow the steps back to get 256

A counter has dropped off the place value chart.

Hundreds	Tens	Ones
● ● ●		●

What number could it have been?

Possible answers:
401
311
302

Compare Objects

Notes and Guidance

Children use objects to represent numbers to 1,000
When given two numbers represented by objects, they use comparison language and symbols to determine which is greatest and which is smallest. Children can make the numbers using concrete manipulatives and draw them pictorially.
Use stem sentences to ensure the correct vocabulary is being used e.g. _____ is greater than _____.

Mathematical Talk

How do you know which number is greater?
Do you start counting hundreds, tens or ones first? Why?
What strategy did you use to compare the two numbers? Is this the same or different to your partner?
Are the Base 10 and place value counters showing the same amount? How do you know?
Is there only one answer?

Varied Fluency

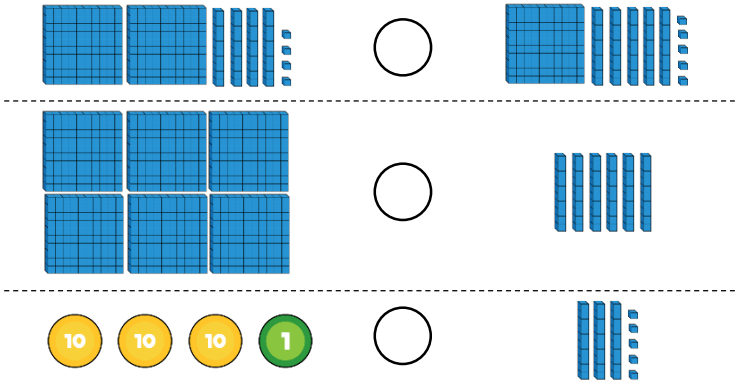
Represent and compare the numbers using place value counters.

100s	10s	1s

452 542

_____ is greater than _____.

Use <, > or = to make the statements correct.

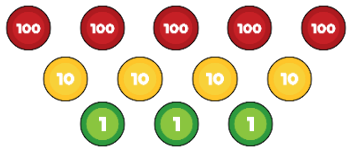


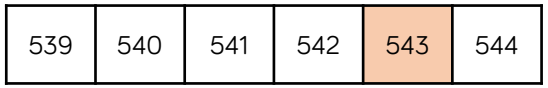
Draw objects to make the statement true.

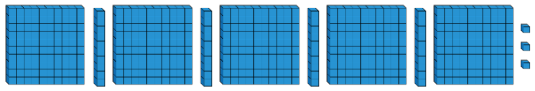
Compare Objects

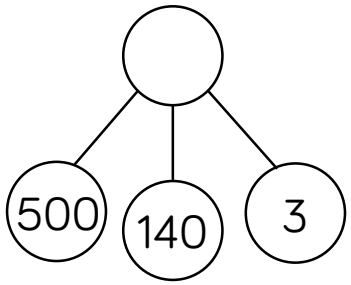
Reasoning and Problem Solving

Which image is the odd one out?







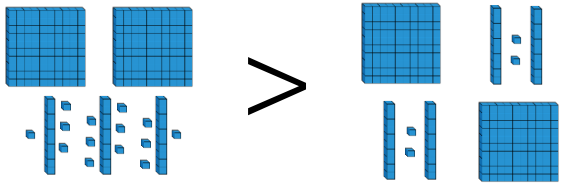


Explain why.
How else can you represent the number?

The part-whole model is the odd one out because it shows 643 whereas all the other images show 543

Children could show 543 in a part-whole model correctly, in Base 10 a different way or with place value counters in a different way.

True or False?



Explain your answer.
If it is false, how could you correct it?

The image is not correct because the number 244 is represented on both sides of the inequality symbol.

An equal sign should have been used.

To make it correct, I could add something to the number on the left or take something away from the number on the right.

Compare Numbers

Notes and Guidance

Children compare numbers as digits rather than objects. They need to be encouraged to use previous learning to choose an efficient method to compare the numbers. For example, children may choose to place the numbers on a number line, make them in concrete or draw them in a place value chart to compare.

Mathematical Talk

What strategy did you use to compare the numbers?
How do you know which number is the greatest?
Which column do you start comparing from? Why?
Can you find more than one way to complete the statements?

Varied Fluency

Circle the greatest number in each pair.

Nine hundred and two	920
500 and 63	568
7 hundreds and 6 ones	76 tens

Use <, > or = to make the statements correct.

399 ◯ 501

800 ◯ 80 tens

Complete the statements.

600 + 70 + 4 > 600 + _____ + 4

Two hundred and five < _____

Compare Numbers

Reasoning and Problem Solving

Amir has 3 jars of sweets.

A B C

Jar A contains 235 sweets.

Jar C contains 175 sweets.

Jar A has the most sweets in. Jar C has the least sweets in.

How many sweets could be in jar B? Explain how you know.

Jar B could contain any number of sweets between 176 and 234 inclusive.

Discussion point: Could B contain 175 or 235 sweets? Why?

I am thinking of a number.

It is between 300 and 500

The digits add up to 14

The difference between the greatest digit and the smallest digit is 2

What could my number be?

Is there only one option?

Explain each step of your working.

446 or 464

The only possibilities to go in the hundreds column are 3 and 4
If it was 3, the other two digits would have to total 11 and none of these pairs give the correct difference between the greatest and smallest digit, so the number has to have 4 in the hundreds column.

Order Numbers

Notes and Guidance

Children explore ordering a set of numbers from smallest to greatest and greatest to smallest. They need to be able to explain their reasoning throughout.
At this point, children are introduced to the words ascending and descending.

Mathematical Talk

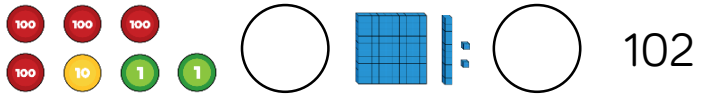
How do you know you have created the greatest/smallest number?
What number is being represented by the place value counters/Base 10?
What does the word ascending/descending mean?
Can you find more than one way to order your numbers?

Varied Fluency

Here are three digit cards.

What is the greatest number you can make?
What is the smallest number you can make?

Use the symbols <, > or = to make the statement correct.



Here is a list of numbers.

312, 321, 123, 132, 213, 231

Place the numbers in ascending order.
Now place them in descending order.
What do you notice?

Order Numbers

Reasoning and Problem Solving

Whitney has 6 different numbers.

She put them in ascending order then accidentally spilt some ink onto her page. Two of her numbers are now covered in ink.

214,  243, 256,  289

What could the hidden numbers be?
Explain how you know.

The first number could be anything between 215 and 242

The second hidden number could be anywhere between 257 and 288

True or False?

When ordering numbers you only need to look at the place value column with the highest value.

False.
For example, if you are ordering numbers in the hundreds you should start by looking at the hundreds column, but sometimes two numbers will have the same number of hundreds and so you will also need to look at other columns.

Count in 50s

Notes and Guidance

Children use their knowledge of the patterns in the 5 times table to count in steps of 50
They should start from any given multiple of 50 and be able to count both forwards and backwards.

Mathematical Talk

What is the same and what is different between counting in 5s and counting in 50s?

Hence, what is the connection between the 5 times table and the 50 times table?

Can you notice a pattern as the numbers increase/decrease?

Can you correct the mistakes in each?

Varied Fluency

Look at the number patterns.
What do you notice?

5	10	15	20	25	30
50	100	150	200	250	300

Complete the number tracks.

50		150	200			350		450	
	750	700	650			500			350

Circle and explain the mistake in each sequence.

50, 100, 105, 200, 250, 300 ...

990, 950, 900, 850, 800 ...

Count in 50s

Reasoning and Problem Solving

Odd One Out

100, 150, 200, 215, 300

Circle the odd one out. Explain how you know.

215 is the odd one out because it is not a multiple of 50
If we were counting up in 50s from 100, it should have been 250 not 215

Which is quicker: counting to 50 in 10s or counting to 150 in 50s?

Explain your answer.

It is quicker to count to 150 in 50s as it would only be 3 steps whereas counting to 50 in 10s would be 5 steps.

Always, sometimes, never.

Sort the statements into always, sometimes or never.

- When counting in 50s starting from 0, the numbers are all even.
- There are only two digits in a multiple of 50
- Only the hundreds and tens column changes when counting in 50s.

- Always
- Sometimes
- Sometimes

White Rose Maths

Autumn - Block 2

Addition & Subtraction

Overview

Small Steps

1. Add and subtract multiples of 100
2. Add and subtract 3-digit and 1-digit numbers – not crossing 10
3. Add 3-digit and 1-digit numbers – crossing 10
4. Subtract a 1-digit number from a 3-digit number – crossing 10
5. Add and subtract 3-digit and 2-digit numbers – not crossing 100
6. Add 3-digit and 2-digit numbers – crossing 100
7. Subtract a 2-digit number from a 3-digit number – crossing 100
8. Add and subtract 100s
9. Spot the pattern – making it explicit
10. Add and subtract a 2-digit and 3-digit numbers – not crossing 10 or 100
11. Add a 2-digit and 3-digit numbers – crossing 10 or 100
12. Subtract a 2-digit number from a 3-digit number – crossing 10 or 100
13. Add two 3-digit numbers – not crossing 10 or 100
14. Add two 3-digit numbers – crossing 10 or 100
15. Subtract a 3-digit number from a 3-digit number – no exchange

NC Objectives

Add and subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds.

Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.

Estimate the answer to a calculation and use inverse operations to check answers.

Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

Overview

Small Steps

- Subtract a 3-digit number from a 3-digit number – exchange
- Estimate answers to calculations
- Check

NC Objectives

Add and subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds.

Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.

Estimate the answer to a calculation and use inverse operations to check answers.

Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

Add & Subtract Multiples of 100

Notes and Guidance

Children are introduced to numbers greater than 100
They will apply their prior knowledge of adding and subtracting ones and tens to adding and subtracting multiples of 100
Using concrete manipulatives and pictorial representations throughout is important so the children can see the value of hundreds.

Mathematical Talk

What is the same and what is different about 2 ones and 3 ones, 2 tens and 3 tens and 2 hundreds and 3 hundreds?

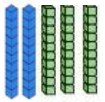
What is ____ hundreds and ____ hundreds equal to?

How many different ways can you represent 200 + 300?

Varied Fluency

Complete:

2 ones and 3 ones is equal to ____ ones.



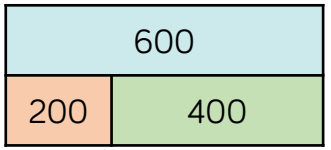
2 tens and 3 tens is equal to ____ tens.

2 hundreds and 3 hundreds is equal to ____ hundreds.

Complete each box for 400 + 500

Draw It	Write It	Part-Whole	Number Sentence

Use the bar model to complete the number sentences.



____ + ____ = 600
____ + ____ = 600
____ – ____ = 400
____ – ____ = 200

600 = ____ – ____
600 = ____ – ____
400 = ____ – ____
200 = ____ – ____

Add & Subtract Multiples of 100

Reasoning and Problem Solving

The answer is 800

How many ways can you get to the answer using multiples of 100?

Possible answers:
1,000 – 200
900 – 100
800 + 0
Etc.

Write a sensible story for the calculation:

$$500 + 400 = 900$$

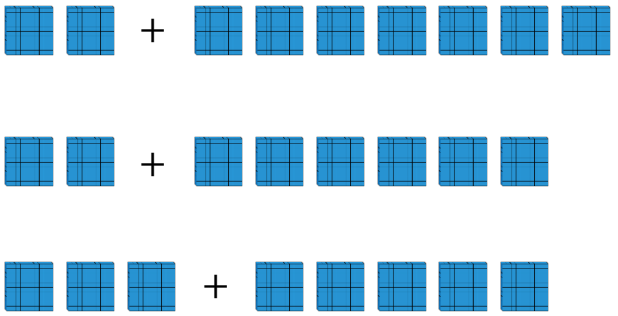
Open ended.
Example answer:

A school has 500 boys and 400 girls. How many children are there altogether?

Odd One Out

Which is the odd one out?

Explain why.



Possible answers:
The odd one out could be $300 + 500 = 800$ because it does not have the number 200 in the calculation.

The odd one out could also be $200 + 700 = 900$ because the answer is not 800

3-digit & 1-digit Numbers

Notes and Guidance

During this small step, children add and subtract ones from a 3-digit number. Children don't exchange or cross the ten, so they can build number sense. For example, if a child is completing 214 − 3 and 214 + 3 they should learn that they can ignore the hundreds and tens at this stage. Therefore, all they need to do is 4 + 3 and 4 − 3 respectively. The use of the column method can be used but mental arithmetic is the best strategy.

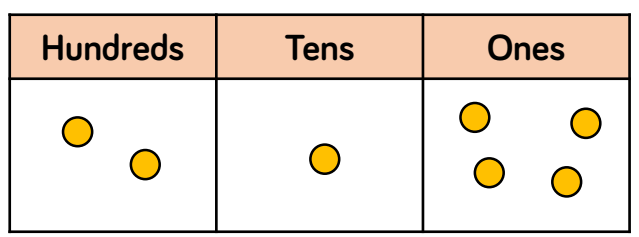
Mathematical Talk

Which column do I need to focus on? Do we need to make and use the whole number? Why?

How can you explain your method? Is there another way of checking?

What do we do when there are no ones left?
Can you use < and > to compare Sam and Tim's team points?

Varied Fluency



Use the place value grid to complete the calculations.

214 − 3 = ___ 214 + 3 = ___

Complete for the calculation 546 − 6

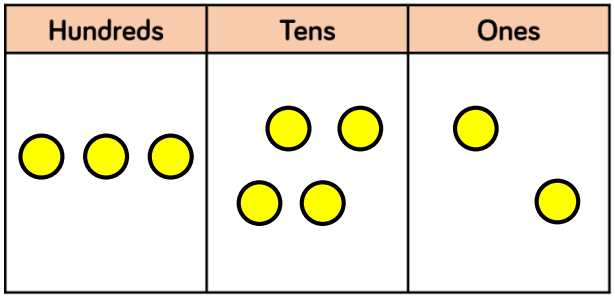
Draw It	Write It	Number Sentence	Explain It

Sam has 534 team points and gets four more.
Tim has 534 team points and loses four of his.
How many team points does each person have?
Who has the most?

3-digit & 1-digit Numbers

Reasoning and Problem Solving

Sally has added or subtracted ones to get this answer.



What could her calculation have been?

Her starting numbers are between and include 340 and 350

Did you use a strategy?

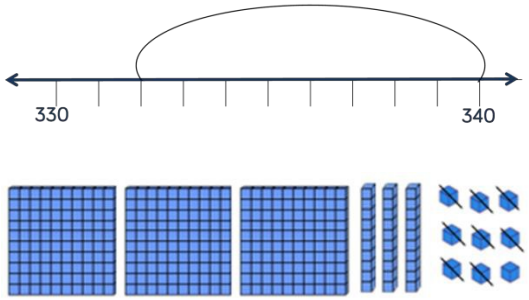
Do you see a pattern?

Possible answers

340 + 2
341 + 1
342 + 0
343 – 1
344 – 2
345 – 3
346 – 4
347 – 5
348 – 6
349 – 7
350 – 8

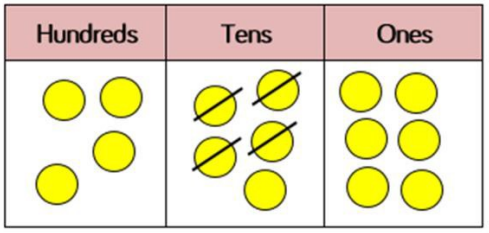
When the ones digit in the 3-digit number increases, the ones we subtract decreases.

Which image does not represent 339 – 8?



The number lines does not because it starts at 340 not 339

Sara thinks the chart shows 456 – 4
Do you agree?



Explain why.

No, I disagree. Sara has subtracted 4 tens not 4 ones.

Add 3-digit & 1-digit Numbers

Notes and Guidance

Children add ones to a 3-digit number, with an exchange. They must understand that when adding ones it can affect the ones column and the tens column.
Children must also know that we can only hold single digits in each column, anything over must be exchanged. The use of 0, e.g. 145 – 5 is important so they know to use zero as a place holder.

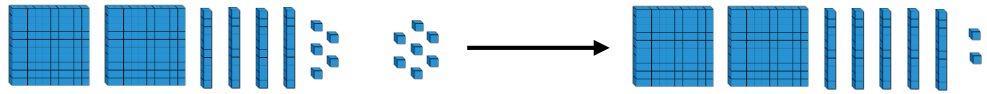
Mathematical Talk

When you add ones to a number does it always, sometimes or never affect the tens column?

What is the largest number you can have in each column? Why?

Varied Fluency

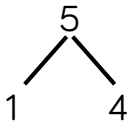
We can use Base 10 to solve 245 + 7



Use this method to calculate:

357 + 8 286 + 5 419 + 1

We can partition our 1-digit number to calculate 379 + 5

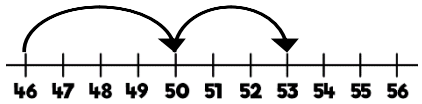


379 + 1 = 380 380 + 4 = 384

Use this method to calculate:

178 + 9 826 + 7 359 + 8

We can use a number line to calculate 346 + 7



46 + 7 = 53
so 346 + 7 = 353

Use this method to calculate:

564 + 8 716 + 9 327 + 5

Add 3-digit & 1-digit Numbers

Reasoning and Problem Solving

Always, sometimes, never.

When 7 and 5 are added together in the ones column, the digit in the ones column of the answer will always be 2

What other digits would always give a 2 in the ones column? Prove it.

Always

1 + 1

2 + 0

9 + 3

8 + 4

6 + 6

will also always give a 2 in the ones column.

Which questions are harder to calculate?

234 + 3 =
506 + 8 =
455 + 7 =
521 + 6 =

Explain your answer.

The second and third are harder as an exchange needs to be made.

Subtract 1-digit from 3-digits

Notes and Guidance

Children subtract a 1-digit number from a 3-digit number using an exchange.
Children need to be secure in the fact that 321 is 3 hundreds, 2 tens and 1 one but that it is also 3 hundreds, 1ten and 11 ones.
If children are not secure on regrouping, it is important to revisit this before subtracting.

Mathematical Talk

How can we partition the number 321?

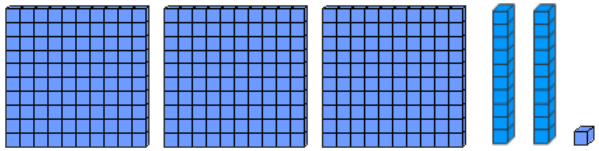
How else could we partition it to make it easier to subtract 4?

What calculation is the word problem representing?

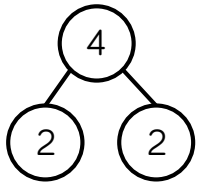
What does each number represent in the word problem?

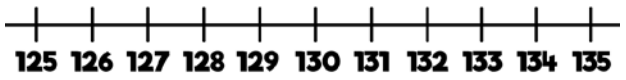
Varied Fluency

- Use Base 10 to solve 321 – 4



- How could this part-whole model help you solve 132 – 4?
Show me on a number line.





- Red team had 672 points this year and won the House Cup.

Blue team finished second with 7 less points than the red team.

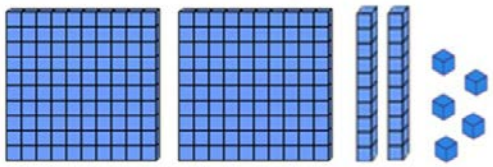
How many points did the Blue team finish with?

Subtract 1-digit from 3-digits

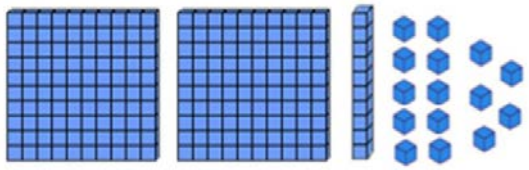
Reasoning and Problem Solving

Tom and Freddie use Base 10 to solve 225 – 8

Tom's method:



Freddie's method:



Explain which diagram you would use and why to solve the calculation.

Both methods can get the answer of 217 but I would choose Freddie's because he has already exchanged one of his tens for ten ones.

Write a sensible story for the calculation 852 – 8 = 844

Open ended.
Example answer:
852 people attend a football match. 8 people leave.
How many people are left?

Explain how you would solve these calculations:

564 – ___ = 558

___ – 8 = 725

352 = 361 – ___

For 564 - ? = 558, I would count from 58 to 64
For ? – 8 = 725, I would add 8 on to 725
For 352 = 361 - ?, I would count from 352 to 361

3-digit & 2-digit Numbers

Notes and Guidance

Children look at what happensto a 3-digit number when a multiple of 10 is added or subtracted.
Different representations such as Base 10, arrow cards, place value charts should be used. The use of the column method is exemplified in this example, but children should explore whether or not this is needed and explain why. Mental methods should be encouraged throughout.

Mathematical Talk

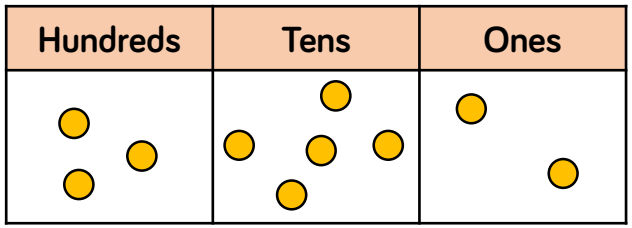
How else can you represent this calculation?

Do we need to make this number?

How is the similar and different to subtracting ones?
What do you notice about the columns that change?

Why don't we have to calculate for each? Give a reason.

Varied Fluency



Use place value counters to complete the number sentences.

352 + 4 tens = ____ 352 – 2 tens = ____

Complete for the calculation 793 subtract 70

Draw It	Write It	Number Sentence	Explain It

Complete using <, > or =

773 + 1 ◯ 773 + 10
653 + 10 ◯ 653 – 10
647 + 10 ◯ 657 – 10
721 + 10 ◯ 653 + 10

Do you need to calculate?

3-digit & 2-digit Numbers

Reasoning and Problem Solving

Spot the Mistake

Amir

589 – 70 is equal to 582

What should the answer be?

Amir has subtracted 7 ones instead of 7 tens. The answer should be 519

Choose **one** calculation that can complete **all** of the statements correct.

456 – 10 < ☐

466 + 1 > ☐

466 + 0 = ☐

Possible answers:
496 – 30
406 + 60
416 + 50

Any calculation with an answer of 466

Rosie

When I calculated 392 subtract 20 I used my known fact that 9 – 2 = 7

Explain Rosie's method.

Rosie was able to use this fact because 9 tens subtract 2 tens is like doing 9 ones subtract 2 ones. We do not need to subtract any ones or hundreds so those columns will stay the same.

Add 3-digit & 2-digit Numbers

Notes and Guidance

Children add multiples of 10, to a 3-digit number with an exchange.
They will recognise that when adding tens, it can change the tens and hundreds column. The column addition method has not been used within this small step because it is not the most efficient method. Children should be counting in tens.
Draw on knowledge of inverse to be able to work out missing number problems.

Mathematical Talk

How many tens do we have?

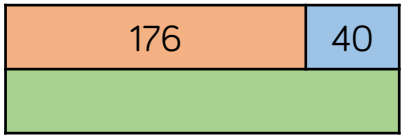
What can we do with the tens?

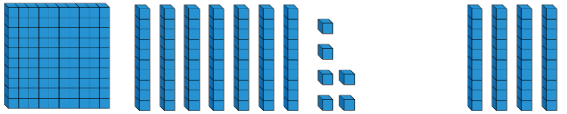
If we know how to count in tens, do we always need to use the column method or other methods?

Would it be easier for us to just count up in our heads?

Varied Fluency

- Use Base 10 to help complete the bar model.





- Miss Wilson has 237 marbles in a box.
She adds 6 more bags of 10 marbles.
How many marbles does she have now?
Write the calculation for this problem.

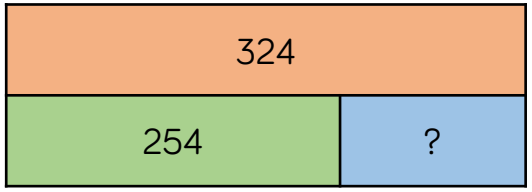
- Can you think of three different ways to work out 364 + 90

Column addition, count in tens mentally, add 100 then subtract 10

Add 3-digit & 2-digit Numbers

Reasoning and Problem Solving

Write a sensible number story to represent this bar model.



324 sandwiches are ordered for a school trip.
254 are eaten.
How many are left?
Etc.

Sort these calculations into two groups.
Justify your answer.

257 + 60
70 + 637
40 + 234
20 + 391

Compare your groups with a friend. Are they the same?

Possible ways to sort:
Odds and evens
Over and under 500
Exchanging and not exchanging

Which is the odd one out? Why?

336 + 80

453 + 60

347 + 70

285 + 80

285 + 80 is the odd one out because in all the others the tens columns add up to 11 tens.

Subtract 2-digits from 3-digits

Notes and Guidance

Children subtract multiples of 10 from a 3-digit number, with an exchange. The examples show different ways this concept could be taught using number lines and part-whole models. The column method could be used, however, it is not the most efficient method.
Counting backwards in tens or using 100 to help will support mental strategies.

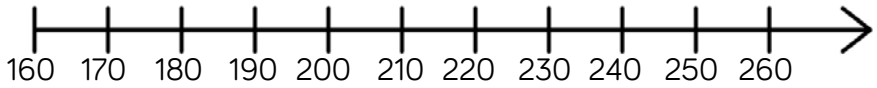
Mathematical Talk

How can we use the number line?

Why are the numbers 23 and 57 shown on the part-whole model? Is there another question we can use to test this strategy?

Varied Fluency

- Count back in tens to solve the calculation 240 – 70



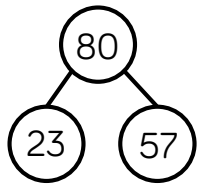
- You can solve 425 – 90 by subtracting 100 and then adding 10

$$425 - 100 = 325$$
$$325 + 10 = 335$$

Use this method to solve:

386 – 90 574 – 90 212 – 90

- How can the part-whole model help you solve five hundred and twenty-three subtract eighty?



Subtract 2-digits from 3-digits

Reasoning and Problem Solving

Find the missing numbers and explain how you found them.

13__ – 50 = 85

334 – ___ = 294

545 = ___ – 70

135
40
615

Ben thinks the rule for the function machine is subtract 60
Is he correct? Explain why.

Input	Rule	Output
567 →	? →	497

He is wrong because 567 subtract 60 is 507

The rule is subtract 70

How many different methods could you use to solve 837 – 90?

Share your methods with a partner.

Possible methods:
837 – 100 = 737
737 + 10 = 747

90 = 37 and 53 (could show in part-whole model)
837 – 37 = 800
800 – 53 = 747

Expanded or formal written methods.

Add & Subtract 100s

Notes and Guidance

Children build on their knowledge of adding 100s together, e.g. 300 + 500 by adding ones and tens to solve calculations such as 234 + 500
It is important to build 'number sense' and ask the children why the column method isn't the most effective method to solve questions like the ones modelled. We can 'bypass' the tens and ones column because of the zeros in 500

Mathematical Talk

What do you notice when we add and subtract 100s from a 3-digit number?

What is the calculation that matches the word problem? What does each number in your calculation represent?

Is there more than one way to complete the questions?

Varied Fluency

- Use the place value grid and Base 10 to help you calculate two hundred and thirty-four add three hundred.

Hundreds	Tens	Ones
		
		

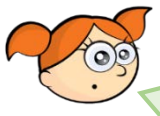
- Harriet has saved £675
She saved £200 more than Tom.
How much has Tom saved?

- Complete the missing boxes with a calculation that either adds or subtracts 100s.

401 + 300		961 – 200
Smallest →		Greatest
	105 + 100	393 – 200
Smallest →		Greatest

Add & Subtract 100s

Reasoning and Problem Solving



Alex

306 + 300 = 906 – 300

Is she correct?
Explain how you know.

She is correct because both give an answer of 606

Terry starts with the number 356
He adds a multiple of 100
His new number is greater than 500 but less than 800
Complete the table.

Numbers he couldn't have added	Numbers he could have added

He couldn't have added 100, 500 or 600 but he could have added 200, 300 or 400

Write a more than and less than word problem to describe the calculation
725 – 300

Example answers:

More than:

Tim has raised £725. He has raised £300 more than his target. What was his target?

Less than:

Amy spent £725 on a laptop. Tina spent £300 on a laptop. How much more did Amy spend?

Pattern Spotting

Notes and Guidance

Children consolidate adding ones, tens and hundreds to 3-digit numbers.
It is important in this step that children don't end up with the misconception that adding and subtracting ones only affects the ones column, because they need to identify it can affect the tens column too.

Mathematical Talk

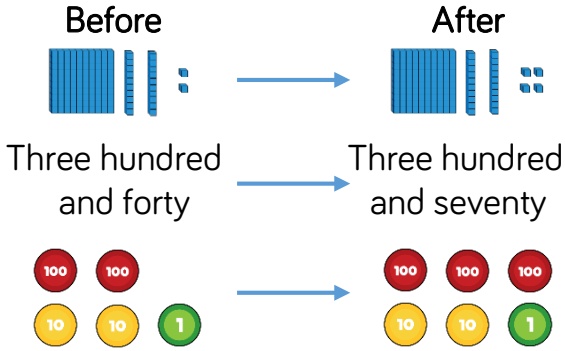
What do you notice? Which strategy can we use to add these numbers?

Do we need to write a zero in the hundreds column when there are no hundreds left?

Do we always need to work out each calculation or can we use what we already know?

Varied Fluency

- What has happened to each starting number? How do you know?



- Work out:

253 + 2	253 + 20	253 + 200
253 – 2	253 – 20	253 – 200

What is the same and what is different about each calculation?

- Fill in the missing numbers.

433 – ___ = 133

___ = 40 + 473

Pattern Spotting

Reasoning and Problem Solving

Steve uses column addition to solve 251 + 4

	2	5	1
+			4
	2	5	5

Is this the most efficient method?

Explain what Steve could have done.

Tell Steve how he can use your strategy to solve 241 + 40 and 241 + 400

The best strategy is to complete 1 + 4, which is 5 and the 2 hundreds and 5 tens stay the same.

When adding 40 it is the tens column which Steve needs to look at because 40 is 4 tens.

When adding 400, he needs to look at the hundreds column because 400 is 4 hundreds.

Investigate

Does adding and subtracting ones to a 3-digit number only affect the ones column?

Does adding and subtracting tens to a 3-digit number only affect the tens column?

No, the ones can change the ones column and any column to the left e.g. 123 + 9 and 402 – 4

The tens column can change itself and the hundreds column e.g. 456 + 50 and 456 – 60

When adding and subtracting from any column, it can only affect its own column and columns to the left.

2-digit & 3-digit Numbers

Notes and Guidance

Children focus on the position of numbers and place value to add and subtract 2-digit and 3-digit numbers.

The use of concrete equipment will support understanding at this stage.

Mathematical Talk

Where would these digits go on the place value chart? Why?

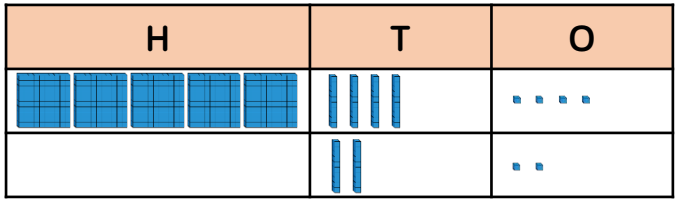
When we subtract, why do we not make both numbers?
Why do we make both numbers when we add?

Can you represent____using the equipment?

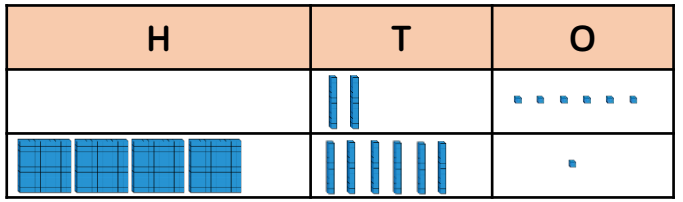
Varied Fluency

Match the calculation to the correct representation and solve.

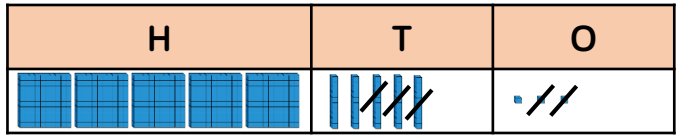
26 + 461



553 – 32



544 + 22



Represent the calculations using Base 10 and solve.

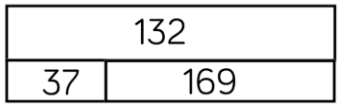
388 – 44 167 + 32 265 – 43

2-digit & 3-digit Numbers

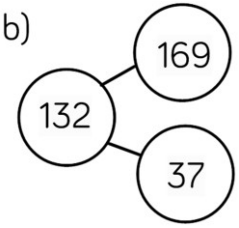
Reasoning and Problem Solving

Emma has 169 sweets in a jar.
She gives 37 sweets to Ben.
Which model represents this problem?

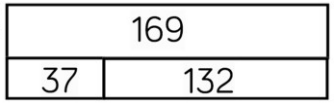
a)



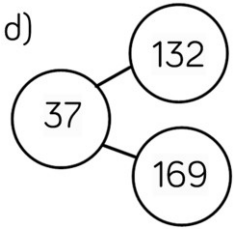
b)



c)



d)



C is correct because
37 + 132 = 169

37 is a part, 132 is a part and 169 is the whole.

Explain the mistake Joey has made.

H	T	O
2	3	1
+	6	3

Joey has put 63 in the wrong place value columns.

Monica and Rachel have some sweets.
Monica has 77 and Rachel has 121.
They want to know how many sweets there are in total, but they have written the calculation differently.

Monica	Rachel
1 2 1	7 7
+ 7 7	+ 1 2 1

Who is correct?

Both are correct because addition is commutative and can be added either way round.

Add 2-digit & 3-digit Numbers

Notes and Guidance

Children add 3 and 2 digit numbers that cross both the 10 and 100 barrier. They build upon the previous small steps and the concept of 'exchange' is explored.

They focus on the position of numbers and place value.

The placement of numbers is also key, i.e. 'Does it matter which number goes on top?'

The use of concrete equipment will support understanding at this stage.

Mathematical Talk

What happens when we have 10 ones? Can we exchange them for anything? Why?

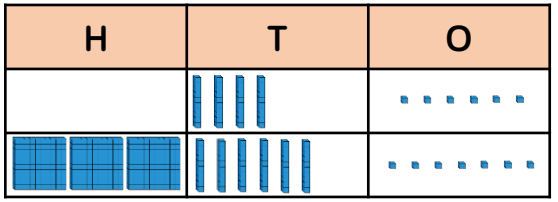
Where does this ten go? How does that help us?

What happens when we have 10 tens? Can we exchange them for anything? Why?

Where does this hundred go? How does that help us?

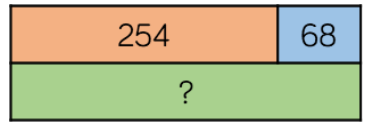
Varied Fluency

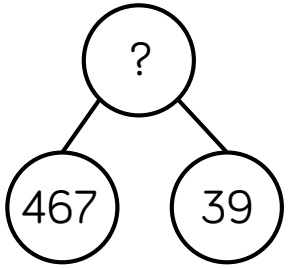
- Solve 46 + 367 using Base 10



		4	6
+	3	6	7

- Use column addition to calculate.



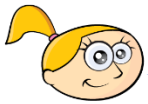


- Use column addition to solve.

248 + 37 476 + 59 556 + 77

Add 2-digit & 3-digit Numbers

Reasoning and Problem Solving



265 + 87 = 242

Eva

Here is her working out:

	2	6	5
+		8	7
	2	4	2

Is she correct? Explain why.

Eva is incorrect because she has not exchanged ten ones for one ten or ten tens for one hundred.

The answer should be 352.

Dora, Jack and Amir are working out 374 + 37

Dora

I started at 374 on a number line.

Jack

I used column method.

I added 40 and subtracted 3

Amir

Which method do you prefer?
Are there any other ways to work this out?

Children choose their preferred method and explain why.

Subtract 2-digits from 3-digits

Notes and Guidance

Children focus on the position of numbers and place value to subtract 2-digits from 3-digits using the column method. The term 'exchange' will be key and understanding of place value will help children to recognise when they should be exchanging.

Mathematical Talk

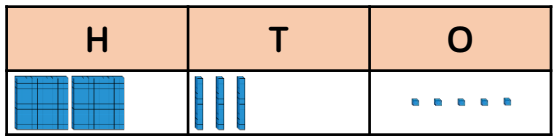
What happens when we are subtracting more ones than we have?

Can we exchange anything? (1 ten for 10 ones)
Where do the 10 ones go?
How does this help us solve the problem?

What happens if there are ones remaining after exchanging for 1 ten?

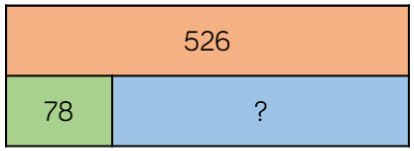
Varied Fluency

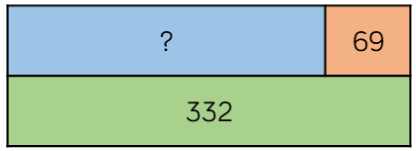
Represent 235 – 29 using Base 10 and solve.

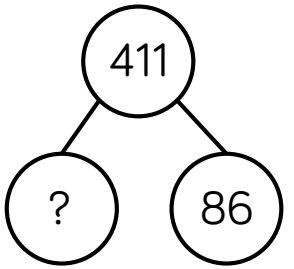


	2	3	5
–		2	9

Use column subtraction to calculate.







Use <, > or = to make the statements correct.

215 – 47 ◯ 234 – 57

452 – 84 ◯ 411 – 43

332 – 89 ◯ 406 – 28

Subtract 2-digits from 3-digits

Reasoning and Problem Solving

Maria thinks 352 – 89 = 337

	H	T	O
	3	5	2
–		8	9
	3	3	7

Is she correct?

Explain why.

Maria is incorrect because she has just found the difference between the ones rather than making an exchange. She has done the same with the tens.

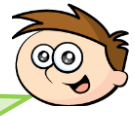
The answer should be 263

Alex, Teddy and Dora are trying to work out 300 – 57

Who has the most efficient way of working it out?
Explain how you know.

Alex: I know that take away means difference, so I can do 299 take away 56 and get the right answer.

Teddy: I can count on from 57 to 100, and then count on to 300



Dora: I can use the column method to work it out and exchange when I need to.

Accept different answers as long as they are justified. Children might even suggest subtracting 60 and then adding 3

Add Two 3-digit Numbers (1)

Notes and Guidance

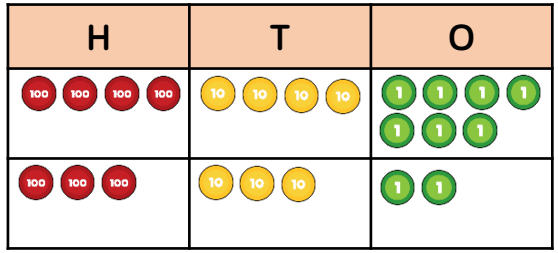
Children add two 3-digit numbers with no exchange. Use of place value counters builds on children's understanding of Base 10 equipment, as the individual units can no longer be seen.

Mathematical Talk

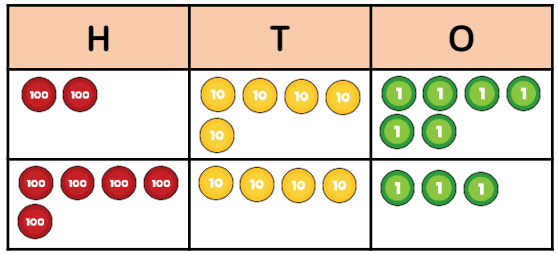
Where would these digits go on the place value chart? Why?
Why do we make both numbers when we add?
Can you represent ___ using the equipment?
Can you draw a picture to represent this?
Why is it important to put the digits in the correct column?

Varied Fluency

Complete the calculations.



___ + ___ = ___



___ + ___ = ___

Use the column method to calculate:

- Three hundred and forty-five add two hundred and thirty-six.
- Five hundred and sixteen plus three hundred and sixty-two.
- The total of two hundred and forty-seven and four hundred and two.

Add Two 3-digit Numbers (1)

Reasoning and Problem Solving

Josh is calculating 506 + 243

Here is his working out.

		5	6
+	2	4	3
	2	9	9

Can you spot Josh's mistake?
Work out the correct answer.

Josh hasn't used zero as a place holder in the tens column.
The correct answer should be 749

Here are three digit cards.

Alex and Teddy making 3-digit numbers using each card once.

Alex

I have made the greatest possible number.

I have made the smallest possible number.

Teddy

Work out the total of their two numbers.

Alex's number is 432
Teddy's number is 234

The total is 666

Add Two 3-digit Numbers (2)

Notes and Guidance

Children continue to add two 3-digit numbers, this time where an exchange is required.

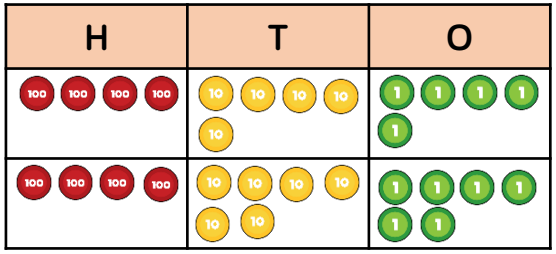
Use of place value counters builds on children's understanding of Base 10 equipment, as the individual units can no longer be seen.

Mathematical Talk

Where would these digits go on the place value chart? Why?
Why do we make both numbers when we add?
Can you represent ___ using the equipment?
Can you draw a picture to represent this?
Why is it important to put the digits in the correct column?

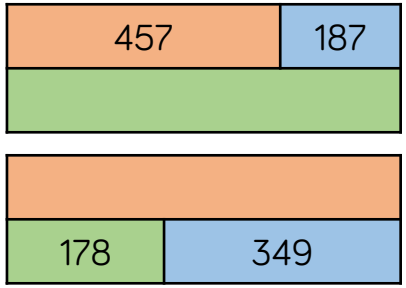
Varied Fluency

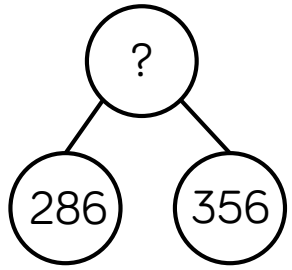
- Use place value counters to calculate 455 + 466



	4	5	5
+	4	6	6

- Use place value counters and column addition to calculate:





- Joan and Fred play a game. Fred scores 354 and Joan scores 478
  What is the total of their scores?

  Car A drives 248 miles, car B drives 40 miles more than car A.
  How many miles do they drive altogether?

Add Two 3-digit Numbers (2)

Reasoning and Problem Solving

Roll a 1 – 6 die.
Fill in a box each time you roll.

☐☐☐ + ☐☐☐ =

Can you make the total:

- An odd number
- An even number
- A multiple of 5
- The greatest possible number
- The smallest possible number

Discuss the rules with the children and what they would need to roll to get them e.g. to get an odd number. Only one of the ones should be odd because if both ones have an odd number, it will make an even.

Complete the statements to make them correct.

487 + 368 ◯ 487 + 468

326 + 258 ◯ 325 + 259

391 + 600 = 401 + ___

Explain why you do not have to work out the answers to compare them.

<
=
590

In the first one we start with the same number, so the one we add more to will be greater.
In the second 325 is one less than 326 and 259 is one more than 258, so the total will be the same.
In the last one 401 is 10 more than 391, so we need to add 10 less than 600.

Subtract 3-digits from 3-digits (1)

Notes and Guidance

It is important for the children to understand that there are different methods of subtraction. They need to explore efficient strategies for subtraction, including:

- counting on (number lines)
- near subtraction
- number bonds

They then move on to setting out formal column subtraction supported by practical equipment.

Mathematical Talk

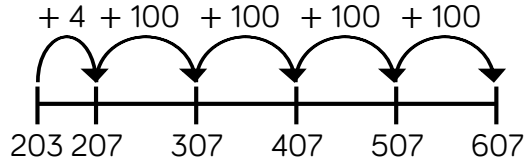
Which strategy would you use and why?

How could you check your answer is correct?

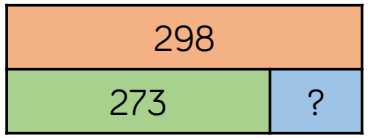
Does it matter which number is at the top of the calculation?

Varied Fluency

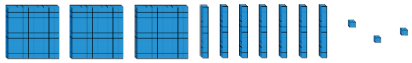
We can count on using a number line to find the missing value on the bar model. E.g.



Use this method to find the missing values.



There are 246 children on a school bus.
215 of them are girls. How many are boys?
Use a place value grid to help you work out the answer.

Start with 

Now subtract 142

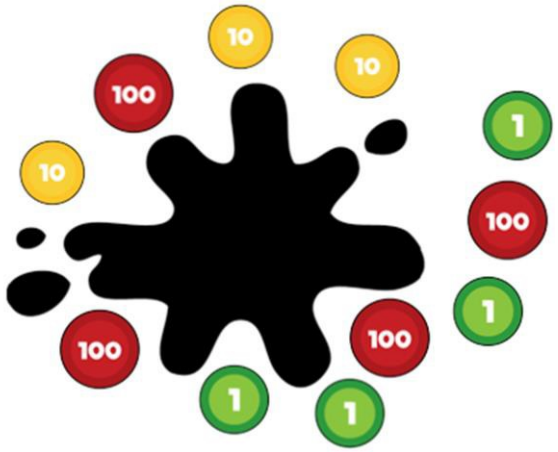
Copy and complete the column subtraction.

–	1	4	2

Subtract 3-digits from 3-digits (1)

Reasoning and Problem Solving

The value of the counters altogether is 566, but the splat is covering some.



How many different ways can you make the missing amount?

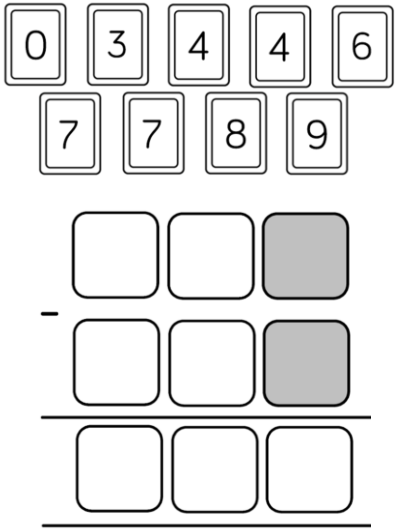
566 – 434 = 132

Possible answer: One 100, three 10s and two 1s.

Thirteen 10s and two 1s.

132 ones etc.

Use the digit cards to complete the calculation.



The digits in the shaded boxes are odd.

Is there more than one answer?

Possible answers:

987 – 647 = 340

879 – 473 = 406

Subtract 3-digits from 3-digits (2)

Notes and Guidance

Children explore column subtraction using concrete manipulatives. It is important to show the column method alongside so that children make the connection to the abstract and understand what is happening.

Mathematical Talk

Which method would you use for this calculation and why?

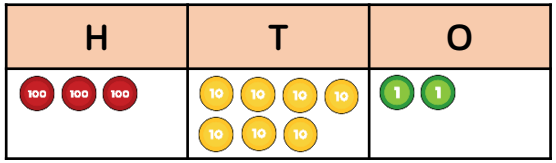
What happens when you can't subtract 9 from 7? 50 from 30 etc.

How would you teach somebody else to use column subtraction with exchange?
Why do we exchange? When do we exchange?

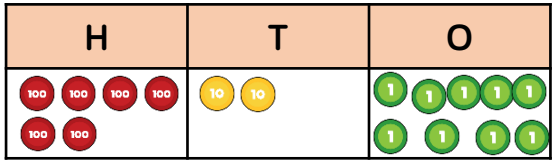
Varied Fluency

Complete the calculations using place value counters.

372 – 165



629 – 483



Complete the column subtractions showing any exchanges.

	H	T	O
	6	8	3
–	2	3	4

	H	T	O
	2	3	7
–	1	9	5

	H	T	O
	5	0	7
–	4	5	1

Subtract 3-digits from 3-digits (2)

Reasoning and Problem Solving

Work out the missing digits.

	H	T	O
	5	?	3
–	2	1	8
	3	1	5

	H	T	O
	?	0	?
–	2	?	8
	2	4	6

533 – 218 = 315

504 – 258 = 246

Kassie is working out 406 – 289

Here is her working out:

$$\begin{array}{r} \cancel{4}^{3}0^{1}\cancel{6} \\ -\,289 \\ \hline 7 \end{array} \qquad \begin{array}{r} 2\cancel{3}^{1}0^{1}\cancel{6} \\ -\,289 \\ \hline 027 \end{array}$$

Explain her mistake.

What should the answer be?

Kassie has exchanged from the hundred column to the ones so there are 106 ones in the ones column. She should have exchanged 1 hundred for 10 tens and then 1 ten for 10 ones.

406 – 289 = 117

Estimate Answers

Notes and Guidance

Children check how reasonable their answers are. While rounding is not formally introduced until Year 4, it is helpful that children can refer to 'near numbers' to see whether an estimate is sensible.

Mathematical Talk

What would you estimate this to be? Why did you choose this number?

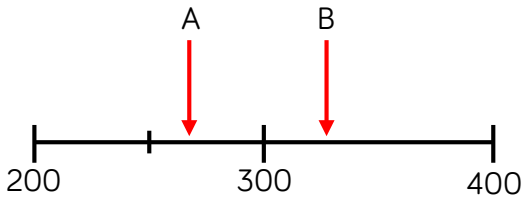
Why is/isn't this a sensible estimation to an answer?

How did they work out this answer?

Could you do it in a different/better way?

Varied Fluency

Estimate the position of arrows A and B on the number line.



Which is a sensible estimate of the number of sweets in the jar?

602 | 597 | 600

Match each number to it's 'near number'.

497	304	684	217
200	500	700	300

Estimate Answers

Reasoning and Problem Solving

Tommy

I estimate 143 – 95 will be 50 because I will subtract 100 from 150

Is this a good estimate? Why?

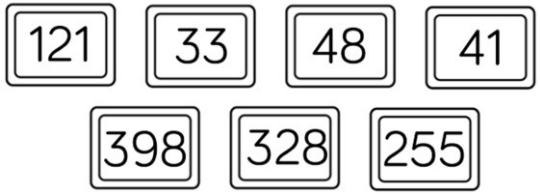
Are there any other ways he could have estimated?

Yes, because he found two numbers close to the original numbers.

He could have rounded to the nearest 10 and calculated.

140 – 100 (= 40)

Use the number cards to make different calculations with an estimated answer of 70



Possible answers:

121 – 48
(120 – 50)

41 + 33
(40 + 30)

398 – 328
(400 – 330)

Check Answers

Notes and Guidance

Children explore ways of checking to see if an answer is reasonable.

Checking using inverse is to be encouraged so that children are using a different method and not just potentially repeating an error, for example, if they add in a different order.

Mathematical Talk

How can you tell if your answer is sensible?

Does knowing if a number is close to a multiple of 100 help when adding and subtracting 3-digit numbers?
How does it help?

Does it help to check your answer if you spot which numbers are near to multiples of 10?
How does counting 10s, 50s and 100s help?

Varied Fluency

$34 + 45 = 79$

Use a subtraction to check the answer to the addition.

Hannah has baked 45 cakes for a bun sale.
She sells 18 cakes.
How many does she have left?

Show your answer using a bar model and check your answer using an addition.

Write all the calculations you could make using these cards.

660	120	540	+	−	=

Check Answers

Reasoning and Problem Solving

Mo

If I add two numbers together, I can check my answer by using a subtraction of the same numbers after e.g. to check 23 + 14, I can do 14 – 23

Do you agree? Explain why.

No, because you cannot have part subtract part.

You need to find the whole and this needs to be at the start of the subtraction then you subtract a part to check the remaining part.

I completed an addition and then used the inverse to check my calculation.

When I checked my calculation, the answer was 250.

One of the other numbers was 355.

What could the calculation be?

___ + ___ = ___

___ – ___ = 250

Possible answers:

355 – 105 = 250

605 – 355 = 250

So the calculation could have been:

250 + 105 = 355

250 + 355 = 605

White Rose Maths

Autumn - Block 3

Multiplication & Division

Overview

Small Steps

1. Multiplication – equal groups
2. Multiply by 3
3. Divide by 3
4. The 3 times table
5. Multiply by 4
6. Divide by 4
7. The 4 times table
8. Multiply by 8
9. Divide by 8
10. The 8 times table

NC Objectives

Count from 0 in multiples of 4, 8, 50 and 100.

Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.

Write and calculate mathematical statements for multiplication and division using the multiplication tables they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.

Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which *n* objects are connected to *m* objectives.

Multiplication – Equal Groups

Notes and Guidance

Children recap their understanding of recognising, making and adding equal groups. This will allow them to build on prior learning and prepare them for the next small steps.

Mathematical Talk

What is the same and what is different between each of the groups?

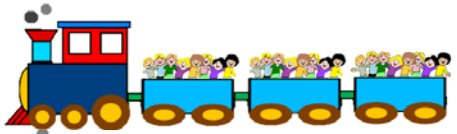
What does the 3 represent?

What does the 8 represent?

How can we represent the groups?

Varied Fluency

- Describe the equal groups.



____ equal groups of ____

____ equal groups of ____

- How many different ways can you represent 'six equal groups with 4 in each group'; 'six 4s'?

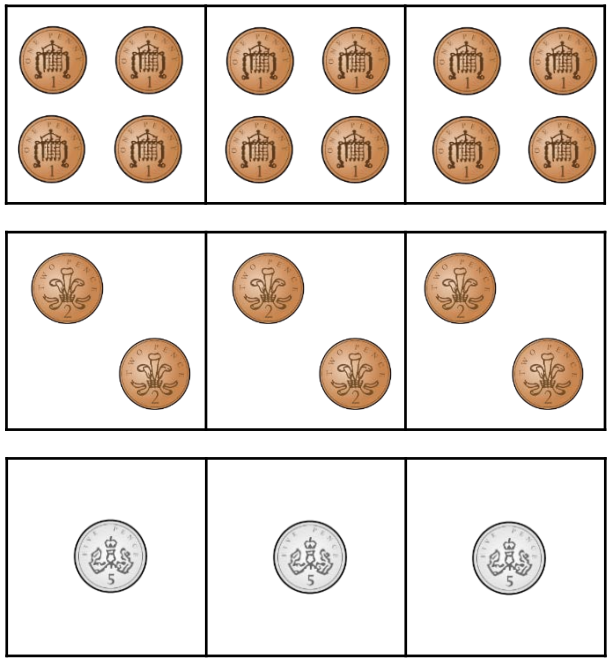
- Complete:

	Draw It
Say It There are ___ equal groups with ____ in each group. There are ____ altogether.	**Add It**

Multiplication – Equal Groups

Reasoning and Problem Solving

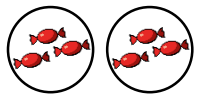
Which group of money is the odd one out?



Explain why.

The bags with 5p in each because the 2ps and 1ps have 4p in each group.

Match the equal groups together.



Three 5s

Two 10s

Two 3s

Sweets, squares, Two 3s

Dice, cubes, Three 5s

Coins, number pieces, Two 10s.

Multiply by 3

Notes and Guidance

Children draw on their knowledge of counting in threes in order to start to multiply by 3

They use their knowledge of equal groups to use concrete and pictorial methods to solve multiplication.

Mathematical Talk

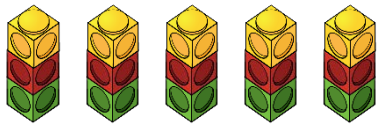
How many equal groups do we have?
How many are in each group?
How many do we have altogether?
Can you write a number sentence to show this?
Can you represent the problem in a picture?
Can you use concrete apparatus to solve the problem?
How many lots of 3 do we have?
How many groups of 3 do we have?

Varied Fluency

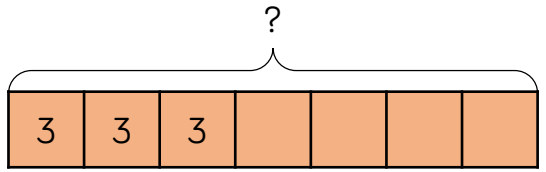
There are five towers with 3 cubes in each tower.
How many cubes are there altogether?

___ + ___ + ___ + ___ + ___ = ___

___ × ___ = ___



There are 7 tricycles in a playground.
How many wheels are there altogether?
Complete the bar model to find the answer.



There are 3 tables with 6 children on each table.
How many children are there altogether?

___ lots of ___ = ___

___ × ___ = ___

Multiply by 3

Reasoning and Problem Solving

There are 6 children.
Each child has 3 sweets.
How many sweets altogether?

Use concrete or pictorial representations to show this problem.

Write another repeated addition and multiplication problem and ask a friend to represent it.

There are 18 sweets altogether.

Children may use items such as counters or cube.

They could draw a bar model for a pictorial representation.

If $5 \times 3 = 15$, which number sentences would find the answer to 6×3?

- $5 \times 3 + 6$
- $5 \times 3 + 3$
- $15 + 3$
- $15 + 6$
- 3×6

Explain how you know.

$5 \times 3 + 3$ because one more lot of 3 will find the answer.

$15 + 3$ because adding one more lot of 3 to the answer to 5 lots will give me 6 lots.

3×6 because it is commutative.

Divide by 3

Notes and Guidance

Children explore dividing by 3 through sharing into three groups and grouping in threes.

They use concrete and pictorial representations and use their knowledge of the inverse to check their answers.

Mathematical Talk

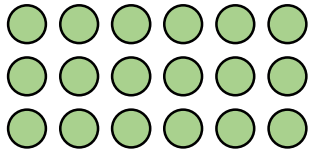
Can you group the numbers in threes?

Can you share the number into three groups?

What is the difference between sharing and grouping?

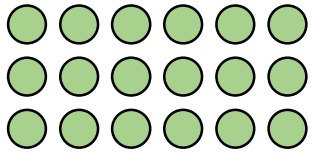
Varied Fluency

- Circle the counters in groups of 3 and complete the division.



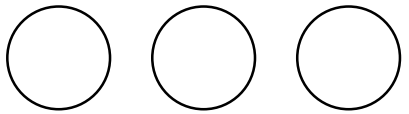
___ ÷ 3 = ___

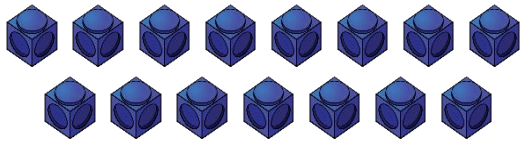
Circle the counters in 3 equal groups and complete the division.



___ ÷ 3 = ___

- There are 15 pieces of fruit. They are shared between 3 bowls equally. How many pieces of fruit are in each bowl?
Use cubes/counters to represent fruit and share between 3 circles.





- Bobbles come in packs of 3
If there are 21 bobbles altogether, how many packs are there?

Divide by 3

Reasoning and Problem Solving

Share 33 cubes between 3 parts.

Complete:
There are 3 parts with _____ cubes in each part.
33 ÷ 3 = _____

Put 33 cubes into groups of 3

Complete:
There are _____ parts with 3 cubes in each part.
33 ÷ 3 = _____

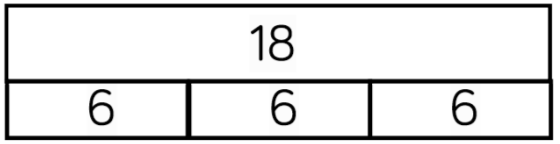
What is the same about these two divisions?
What is different?

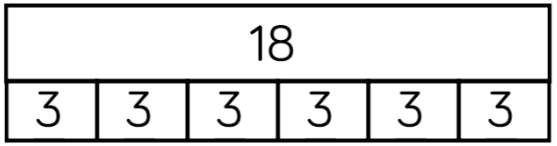
The divisors have the same numbers in.
The numbers in the divisions mean different things.
In the first question, the cubes are being shared. The 3 is the number of parts.
In the second question, the cubes are being grouped. The 3 is the amount in each part.

Jack has 18 seeds.

He plants 3 seeds in each pot.

Which bar model matches the problem?





Explain your choice.

The second bar model matches the problem because Jack plants 3 seeds in each pot therefore there will be 6 parts.

The 3 Times Table

Notes and Guidance

Children draw together their knowledge of multiplying and dividing by three in order to become more fluent in the three times table.

Children apply their knowledge to different contexts.

Mathematical Talk

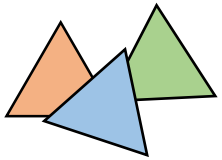
Can you use concrete or pictorial representations to help you?

What other facts can you link to this one?

What other times tables will help you with this times table?

Varied Fluency

Complete the number sentences.



1 triangle has 3 sides.	1 × 3 = 3
3 triangles have ___ sides.	___ × ___ = ___
___ triangles have 6 sides.	___ × ___ = 6
___ triangles have 3 sides.	___ × ___ = 15

Tick the number sentences that can be solved using the image.

12 ÷ 3 = 4	12 ÷ 4 = 3
4 × 3 = 12	3 × 12 = 4
3 ÷ 4 = 12.	3 × 4 = 12

Fill in the missing number facts.

1 × 3 = ___	___ × 3 = 30
2 × ___ = 6	8 × ___ = 24
___ = 3 × 3	6 × 3 = ___
9 × 3 = ___	21 = ___ × 3

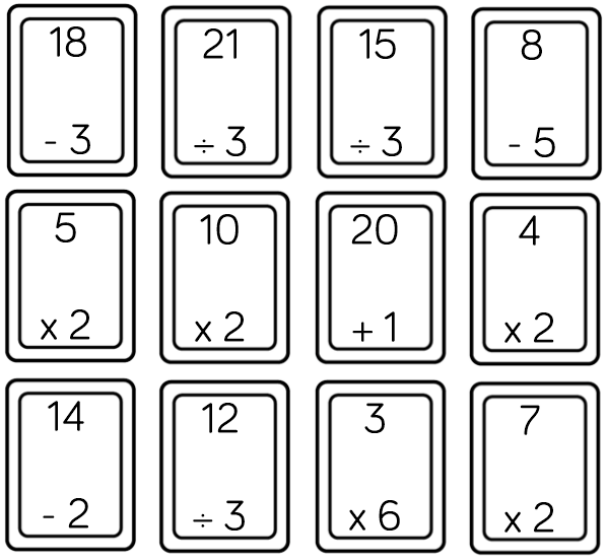
The 3 Times Table

Reasoning and Problem Solving

Sort the cards below so they follow round in a loop.

The number at the top is the answer. Then follow the instruction at the bottom to get the next answer.

Start at 18 – 3.



Order:

18 – 3
15 ÷ 3
5 × 2
10 × 2
20 + 1
21 ÷ 3
7 × 2
14 – 2
12 ÷ 3
4 × 2
8 – 5
3 × 6

Start this rhythm:

Clap, clap, click, clap, clap, click.

Carry on the rhythm, what will you be doing on the 15th beat?

How do you know?

What will you be doing on the 20th beat?

Explain your answer.

Clicks are multiples of three.

On the 15th beat, I will be clicking because it is a multiple of 3

On the 20th beat, I will be clapping because it is not a multiple of 3

Multiply by 4

Notes and Guidance

Building on their knowledge of the two times table, children start to multiply by four. They link to the idea of doubling the number and doubling again.
They link multiplying by four to repeated addition and counting in fours.
To show the multiplication of four, teachers may use Numicon, cubes, counters, bar models etc.

Mathematical Talk

How many equal groups do we have?
How many are in each group?
How many do we have altogether?
Can you write a number sentence to show this?
Can you represent the problem in a picture?
Can you use concrete apparatus to solve the problem?
How many lots of 4 do we have?
How many groups of 4 do we have?

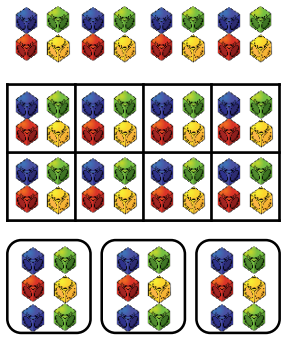
Varied Fluency

Match the multiplication to the representation.

8 × 4

4 × 4

4 × 6



How many dots are there altogether?

There are ____ dice with ____ dots on each.

There ____ fours.

____ × ____ = ____ dots.

There are 4 pens in a pack.
How many pens are there in 7 packs?

Multiply by 4

Reasoning and Problem Solving

Gavin has four bags with five sweets in each bag.

Stacey has six bags with four sweets in each bag.

Who has more sweets?

How many more sweets do they have?

Draw a picture to show this problem.

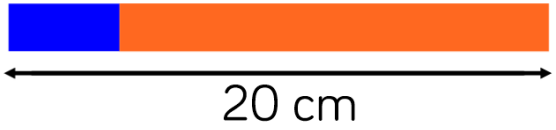
Stacey has more sweets.

She has four more sweets than Gavin.

Here is a blue strip of paper.

An orange strip is four times as long.

The strips are joined end to end.



How long is the blue strip?

How long is the orange strip?

Explain how you know.

The blue strip is 4cm long.

The orange strip is 16cm long.

I know this because the orange strip is 4 times as long so there are 5 equal parts.

$20 \div 5 = 4$

Divide by 4

Notes and Guidance

Children explore dividing by 4 through sharing into four groups and grouping in fours.

They use concrete and pictorial representations and their knowledge of the inverse to check their answers.

Mathematical Talk

Can you group the numbers in fours?

Can you share the number into four groups?

What is the difference between sharing and grouping?

Varied Fluency

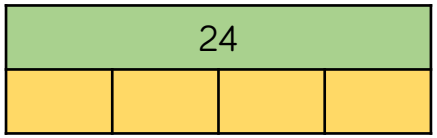
Circle the buttons in groups of 4.

Can you also split the buttons into 4 equal groups?
How is this the same? How is it different?

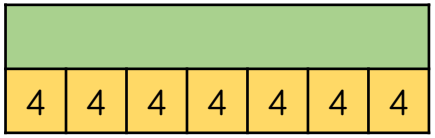
There are some cars in a car park.
Each car has 4 wheels.
In the car park there are 32 wheels altogether.
How many cars are there?

___ ÷ ___ = ___

Complete the bar models and the calculations.



24 ÷ 4 = ___



___ ÷ 4 = ___

Divide by 4

Reasoning and Problem Solving

Which of the word problems can be solved using 12 ÷ 4?

There are 12 bags of sweets with 4 sweets in each.
How many altogether?

A rollercoaster carriage holds 4 people.
How many carriages are needed for 12 people?

I have 12 crayons and share them out so people have 4 crayons each.
How many people did I share them between?

I have 12 buns and I give 4 to my brother.
How many do I have left?

Explain your reasoning for each.

The rollercoaster question can be solved because there are 12 people grouped into fours.

The crayons questions can be solved because there are 12 crayons shared between 4 people.

Five children are playing a game.

They score 4 points for every bucket they knock down.

Ben	16
James	28
Amrit	12
Kaci	32
Jenna	8

How many buckets did they knock down each?
How many buckets did they knock down altogether?
How many more buckets did James knock down than Ben?

Ben = 4 buckets.

James = 7 buckets.

Amrit = 3 buckets.

Kaci = 8 buckets.

Jenna = 2 buckets.

They knocked down 24 buckets altogether.

James knocked 3 more buckets down than Ben.

The 4 Times Table

Notes and Guidance

Children use knowledge of known multiplication tables (2, 3, 5 and 10 times tables) and understanding of key concepts of multiplication.

Children who have learnt $3 \times 4 = 12$ can use understanding of commutativity to know $4 \times 3 = 12$

Mathematical Talk

What do you notice about the pattern?

Can you use concrete or pictorial representations to help you?

What other facts can you link to this one?

What other times tables will help you with this times table?

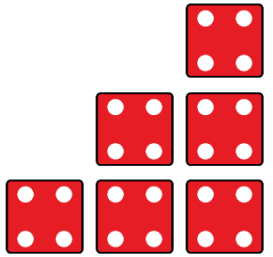
Varied Fluency

Use the pictorial representations to complete the calculations.

$4 = 1 \times 4 = \_\_\_$

$4 + 4 = 2 \times 4 = \_\_\_$

$4 + 4 + 4 = 3 \times 4 = \_\_\_$



Continue the pattern.

2 cars have eight wheels. How many wheels do four cars have?

$2 \times 4 = 8$ $4 \times 4 = \_\_\_$

Three cows have 12 legs. How many legs do six cows have?

$3 \times \_\_\_ = 12$ $6 \times \_\_\_ = \_\_\_$

Colour in the multiples of 4
What pattern do you notice?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

The 4 Times Table

Reasoning and Problem Solving

I have forgotten what 4×4 is.

Saffi says,
"The answer is more than 3×4"

Complete the calculation to prove this.
$4 \times 4 = \_\_ \times 4 + \_\_ = \_\_$

Izzy says,
"The answer is 4 less than 5×4"

Complete the calculation to prove this.
$4 \times 4 = \_\_ \times 4 - \_\_ = \_\_$

Jo says,
"The answer is double 2×4"

Complete the calculation to prove this.
$4 \times 4 = \_\_ \times 4 \times \_\_ = \_\_$

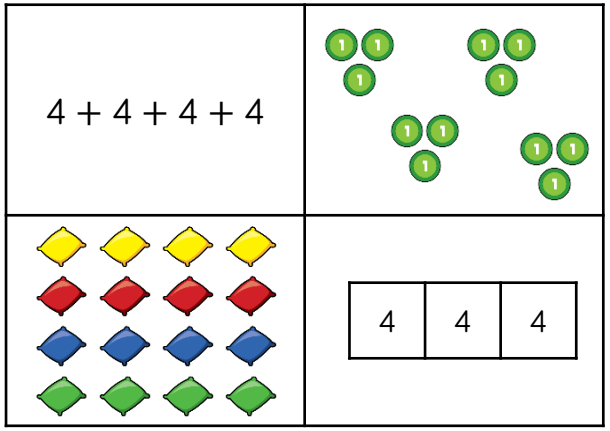
Whose idea do you prefer? Why?

4×4
$= 3 \times 4 + 4$
$= 12 + 4$
$= 16$

4×4
$= 5 \times 4 - 4$
$= 20 - 4$
$= 16$

4×4
$= 2 \times 4 \times 2$
$= 16$

Which part below does not show counting in fours?



Explain why.

The place value counters do not show counting in fours because each part has 3 in so it is counting in threes.

Multiply by 8

Notes and Guidance

Building on their knowledge of the four times table, children start to multiply by eight. They link to the idea of doubling the number twice and then doubling again.
They link multiplying by eight to previous knowledge of equal groups and repeated addition.
Children explore the concept of multiplying by 8 in different ways; when 8 is the multiplicand and where 8 is the multiplier.

Mathematical Talk

How many equal groups do we have?
How many are in each group?
How many do we have altogether?
Can you write a number sentence to show this?
Can you represent the problem in a picture?
Can you use concrete apparatus to solve the problem?
How many lots of 8 do we have?
How many groups of 8 do we have?
We have 8 groups, how many are in each group?

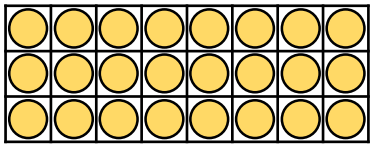
Varied Fluency

How many legs are there on four spiders?

___ + ___ + ___ + ___ = ___ × ___ = ___

There are ___ legs on each spider.

If there are ___ spiders, there will be ___ legs altogether.



Arrange 24 counters in an array as shown and complete the calculations.

___ + ___ + ___ = ___ × ___ = ___

___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ = ___ × ___ = ___

Fill in the table to show that multiplying by 8 is the same as double, double and double again.

6	6	6	6	6	6	6	6
6 × 2 = ___		6 × 2 = ___		6 × 2 = ___		6 × 2 = ___	
___ × 2 = ___				___ × 2 = ___			
___ × 2 = ___							

Multiply by 8

Reasoning and Problem Solving

$8 \times 3 = \_\_\_$
$2 \times 4 \times 3 = \_\_\_$
$2 \times 2 \times 2 \times 3 = \_\_\_$

What do you notice?
Why do you think this has happened?

All of the answers are equal.
Eight has been split into numbers that times together to make it.

Max calculates 8×6 by doing 5×6 and 3×6 and adding them.

$\_\_\_ + \_\_\_ = \_\_\_$

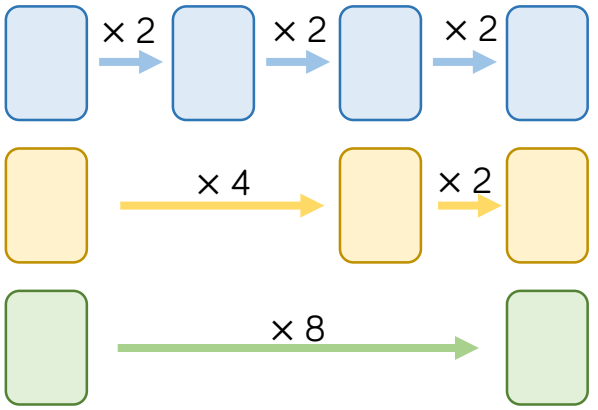
Paddy calculates 8×6 by doing $4 \times 6 \times 2$

$\_\_\_ \times 2 = \_\_\_$

Whose method do you prefer?
Explain why.

Possible answers:
I prefer Max's method because I know my 5 and 3 times tables.
I prefer Paddy's method because I know my 4 times table and can double numbers.

Start each function machine with the same number.



What do you notice about each final answer?

James knows the 4× table off by heart, but is still learning the 8× table. Which colour method should he use? Why?

Each time the final number is 8 times greater than the starting number.

Yellow – because he can double 4× to calculate 8×.
E.g. I know $4 \times 6 = 24$ so 8×6 is double that (48).

Divide by 8

Notes and Guidance

Children explore dividing by 8 through sharing into eight groups and grouping in eights.

They use concrete and pictorial representations and their knowledge of inverse operations to check their answers.

Mathematical Talk

What concrete/pictorial representations might help you?

Can you group the numbers in eights?

Can you share the number into eights groups?

Can you use any prior knowledge to check your answer?

Varied Fluency

- There are 32 children in a PE lesson.
  They are split into 8 equal teams for a relay race.
  How many children are in each team?
  Use counters or multi-link to represent each child.

  There are ____ teams and ____ children in each team.

- Pens are sold in packs of 8.
  Year 3 need 48 pens.
  How many packs should be ordered?

  They should order ____ packs of pens.

- Complete the missing numbers.

  $80 \div 8 = \_\_\_$ $\quad$ $24 \div \_\_\_ = 8$

  $64 \div 8 = \_\_\_$ $\quad$ $8 \times \_\_\_ = 40$

  $\_\_\_ \times 8 = 16$ $\quad$ $\_\_\_ \div 8 = 4$

Divide by 8

Reasoning and Problem Solving

$48 \div 2 = \_\_\_$

$48 \div 4 = \_\_\_$

$48 \div 8 = \_\_\_$

What do you notice about the answers to these questions?

The answers halve and the divisors double.

Can you predict what $48 \div 16$ would be?

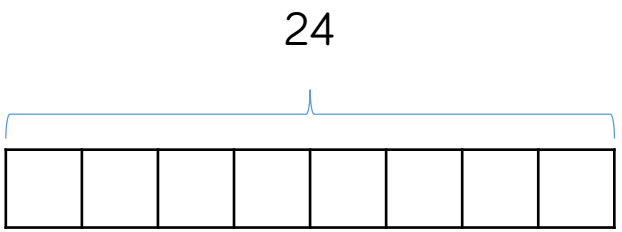
3

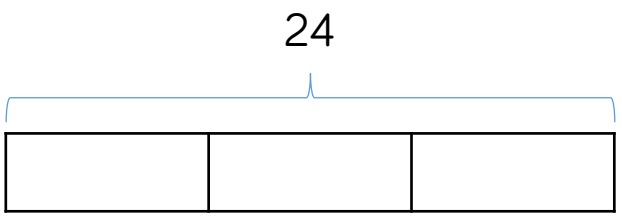
Which numbers can be divided by 8 without a remainder?

40	64	32
16	800	42

40, 32, 64, 16, 800

Rohan shares 24 sweets equally between 8 friends.
How many do they get each?
Which bar model would you use to represent this problem? Why?





Although both can represent $24 \div 8 = 3$, the first bar model fits this word problem best.

The 8 Times Table

Notes and Guidance

Children use prior knowledge of multiplication facts for 2, 3, 4 and 5 times tables (from prior learning), along with distributive law in order to calculate unknown multiplication facts.

Mathematical Talk

Why is it helpful to partition the number you are multiplying by?

Can you use concrete or pictorial representations to help you?

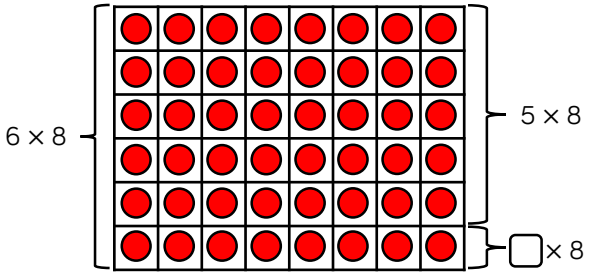
What other facts can you link to this one?

What other times tables will help you with this times table?

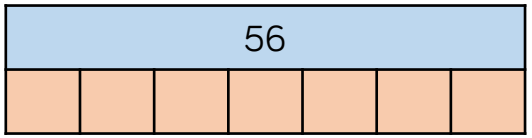
Varied Fluency

Complete the diagram using known facts.

6×8 < $5 \times 8 = \square$, $\square \times 8 = \square$; altogether $\square$



Complete the bar model.



Complete the table.

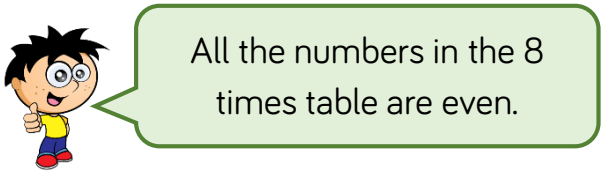
×	2	4	8
3	6		
	10	20	
			72

Can you spot a pattern between the numbers?

The 8 Times Table

Reasoning and Problem Solving

Explain why.



When you add an even number to an even number you always make an even number.
The 8 times table is repeated addition so keeps adding an even number each time.

On a blank hundred square, colour multiples of 8 red and multiples of 4 blue.

Always, sometimes, never.

- Multiples of 4 are also multiples of 8
- Multiples of 8 are also multiples of 4

1) Sometimes, every other multiple is also a multiple of 8
The ones in between aren't because the jumps are smaller than 8
2) Always – 8 is a multiple of 4 therefore all multiples of 8 will be multiples of 4

Megan has a box of pop that are in packs.

Some packs have 4 cans in them and some packs have 8 cans in them.

Megan's box contains 64 cans of pop.

How many packs of 4 cans and how many packs of 8 cans could there be?

Find all the possibilities.

Possible answers:

- 2 packs of 4, 7 packs of 8
- 4 packs of 4, 6 packs of 8
- 6 packs of 4, 5 packs of 8
- 8 packs of 4, 4 packs of 8
- 10 packs of 4, 3 packs of 8
- 12 packs of 4, 2 packs of 8
- 14 packs of 4, 1 pack of 8