Maths Mastery

Maths teaching in school

- Power maths scheme.
- Mastering number – a new National initiative started this term, to ensure a firm foundation in number – from Reception to Year 2.
- Key Instant Recall Facts – starting from year 1.

Power Maths

- Scheme of work for teaching maths mastery.
- Throughout the school, from reception classes to year 6.
- Emphasis is on understanding.
- Based on three phases of understanding – concrete, pictorial and abstract.

Early Years – Nursery and Reception

‘Developing a strong grounding in number is essential so that all children develop the necessary building blocks to excel mathematically.’ *Statutory framework for the early years foundation stage 2021*

‘It is important that children develop positive attitudes and interests in mathematics, look for patterns and relationships, spot connections, ‘have a go’, talk to adults and peers and not be afraid to make mistakes.’ *Statutory framework for the early years foundation stage 2021*

- Emphasis is on understanding.
- Learning from practical work is key.

Early Years –Reception

Early learning goals:

- Have a deep understanding of number to 10;
- Subitise (recognise quantities without counting) up to 5;
- Automatically recall number bonds to 5 and some number bonds to 10;
- Verbally count beyond 20;
- Compare quantities to 10 in different contexts, recognising greater than, less than and the same as the other quantity;
- Explore and represent patterns within numbers to 10, including even and odd, double facts and how quantities can be distributed equally.

At the heart of
Power Maths
is the belief that all children can achieve.
It's built on an exciting growth mindset and problem-solving approach.

Key aims of *Power Maths*

Keeping the whole class progressing together

Providing rich problem solving to challenge and engage every child

Practical assessment to reveal misconceptions and inform speedy interventions

Nurturing a growth mindset and building children's confidence in maths

What is mastery?

"Mastering maths means acquiring a deep, long-term, secure and adaptable understanding of the subject" – NCETM

We achieve this by …

- Carefully sequenced, small step learning
- Representation that expose mathematical structures
- Developing mathematical thinking
- Building fluency
- Using mathematical language

Growth mindset

Fixed mindset	Growth mindset
"I'm not good at maths – I've never been good at maths"	"I'm finding maths hard now, but I can improve with time and effort"
"I give up – I can't make this any better"	"I can improve if I keep trying"
"If I fail I am a failure"	"Most successful people fail along the way"
"I can't do this – I keep making mistakes"	"Mistakes help me learn"

Growth Mindset

- Everyone can!
- It’s okay to get it wrong.
- Praise hard work.
- Mind your language.
- Build in opportunities for success.

Meet the growth-mindset characters!

Flo

Flo is flexible and creative. She often with new methods to solve problems.

Can we do it differently?

Dexter

Dexter is determined. When he makes a mistake he learns from it and tries again.

Let’s try again!

Meet the growth-mindset characters!

Astrid

Astrid is brave and confident. She is not afraid to make mistakes.

I will share my ideas!

Is there a pattern?

Ash

Ash is curious and inquisitive. He loves to explore new concepts

See the lesson structure

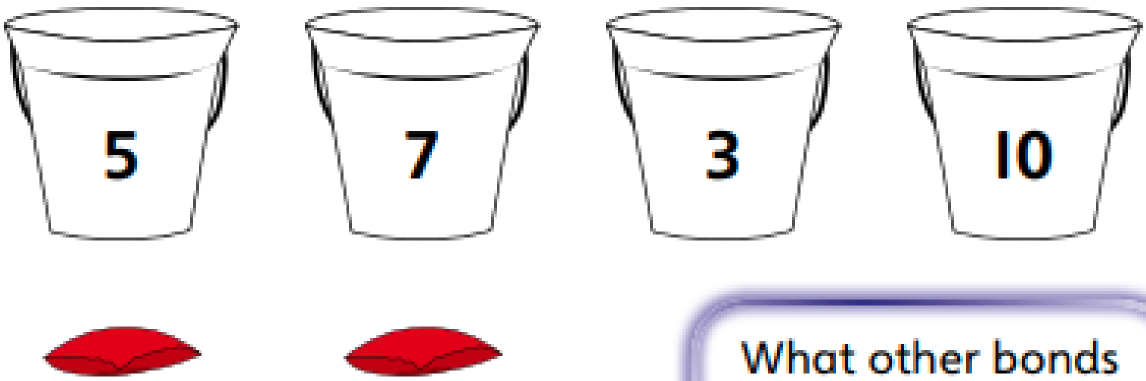
POWER UP! ▶ DISCOVER & SHARE ▶ THINK TOGETHER ▶ PRACTICE ▶ REFLECT

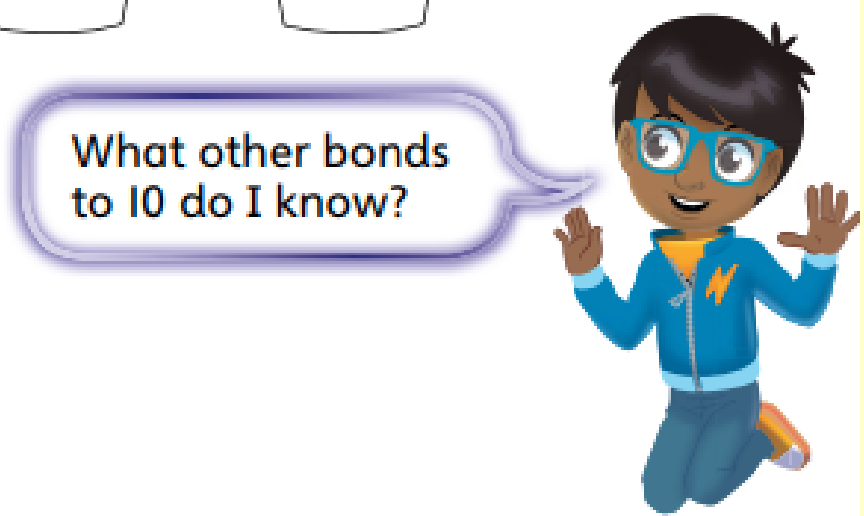
Pearson

Power up

Power Up

Work out all the ways to get a score of 10.



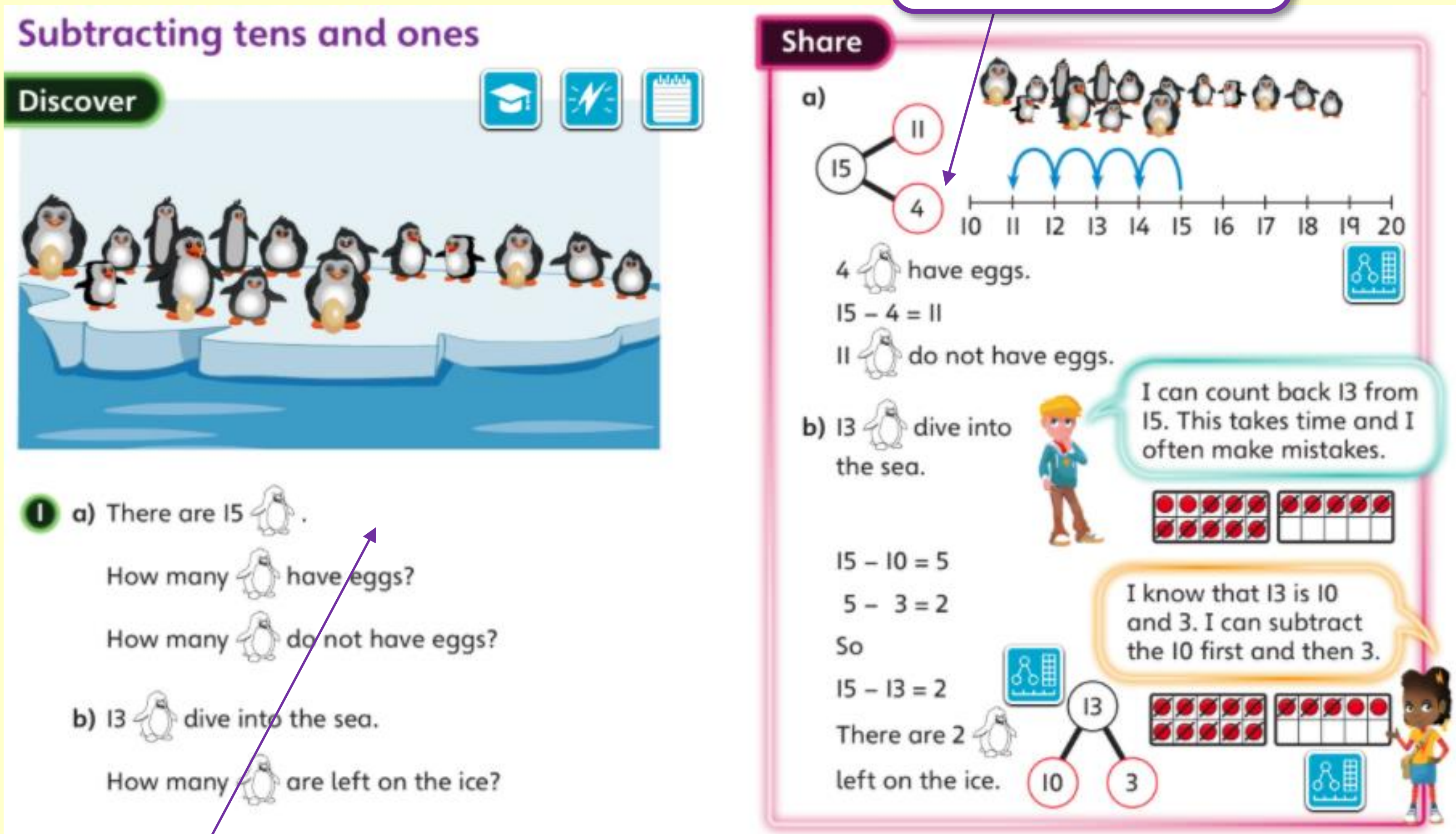


$5 + \boxed{} = 3 + 7$

$7 + 3 = 10 + \boxed{}$

Discover and Share

Concrete-Pictorial-Abstract approach



Engaging scenarios

Pearson

Think together

Unit 8: Subtraction within 20, Lesson 2

Think together

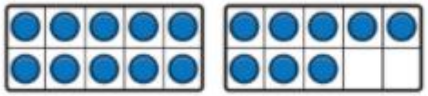
1

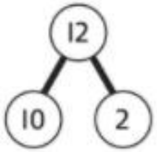
There are 18 fish.

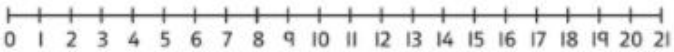
A penguin eats 12 fish.

How many fish are left?

Use 1 counter for each fish.







18 – 10 = ☐

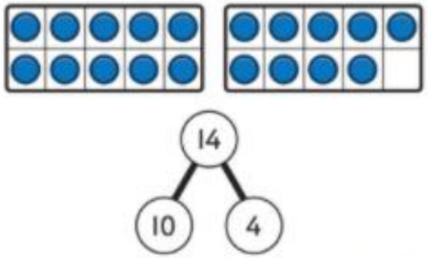
☐ – 2 = ☐

So

18 – 12 = ☐

There are ☐ fish left.

2 Work out 19 – 14.



19 – ☐ = ☐

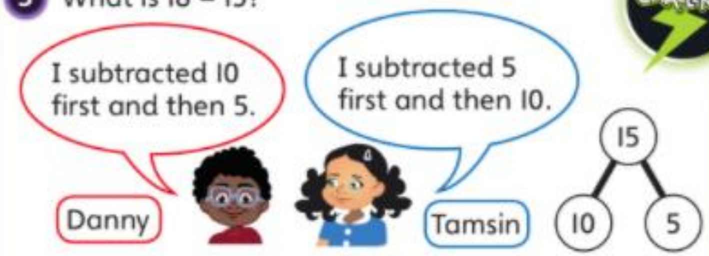
☐ – ☐ = ☐

So

19 – 14 = ☐

3 What is 18 – 15?

CHALLENGE

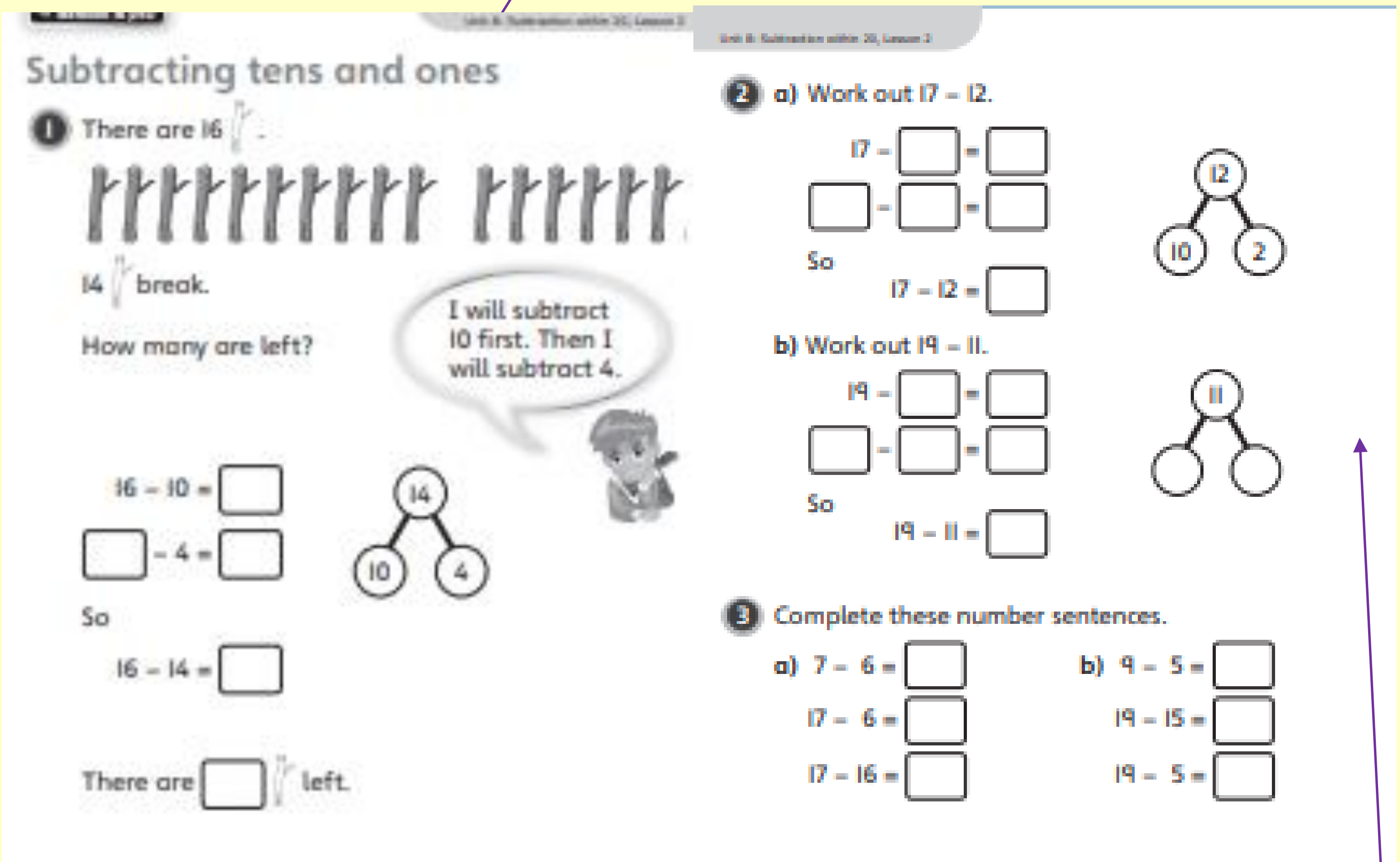


Do Danny and Tamsin get the same answer?

Danny	Tamsin
18 – 10 = ☐	18 – 5 = ☐
☐ – ☐ = ☐	☐ – ☐ = ☐
So	So
18 – 15 = ☐	18 – 15 = ☐

Practice

Questions are presented in a logical sequence.


Subtracting tens and ones

1. There are 16 .

14 break.

How many are left?

I will subtract 10 first. Then I will subtract 4.

16 − 10 = ☐

☐ − 4 = ☐

So

16 − 14 = ☐

There are ☐ left.

2. a) Work out 17 − 12.

17 − ☐ = ☐

☐ − ☐ = ☐

So

17 − 12 = ☐

b) Work out 19 − 11.

19 − ☐ = ☐

☐ − ☐ = ☐

So

19 − 11 = ☐

3. Complete these number sentences.

a)		b)	
7 − 6 =	☐	9 − 5 =	☐
17 − 6 =	☐	19 − 15 =	☐
17 − 16 =	☐	19 − 5 =	☐

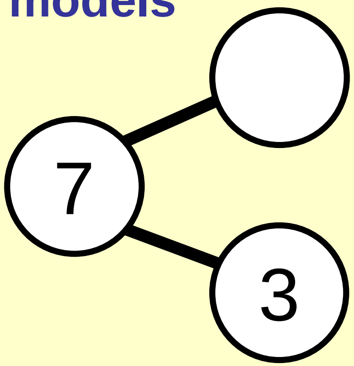
Calculations are connected so that children think about the underlying concepts.

Pearson

POWER MATHS

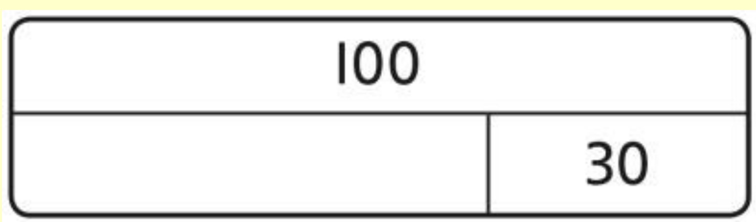
Models and representations

Part-whole models



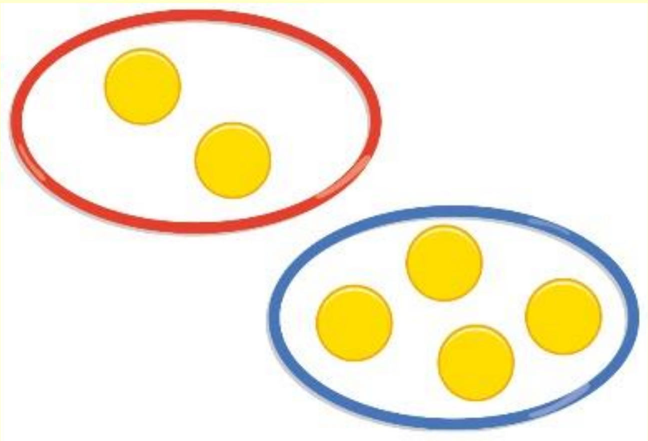
Shows how numbers can be split into parts. Helps show the connection between addition and subtraction.

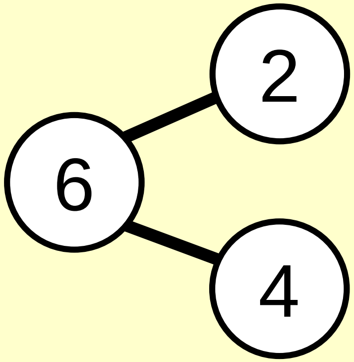
Bar models



Helps show the maths problem as a picture.

Models and representations



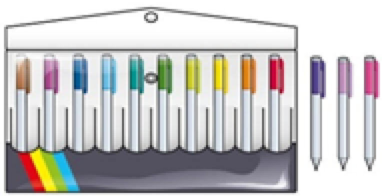
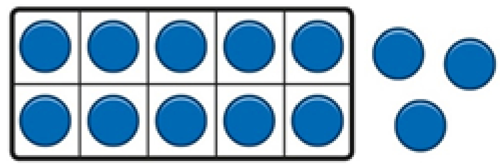
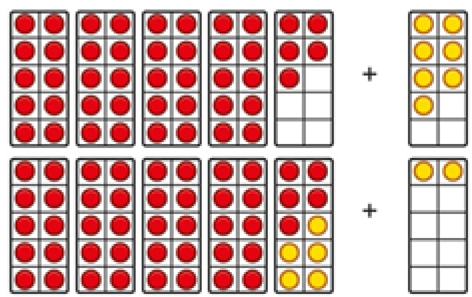
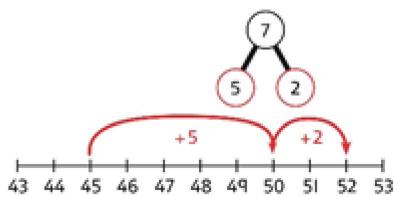


2 + 4 = 6

Calculations

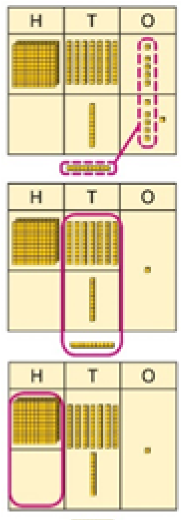
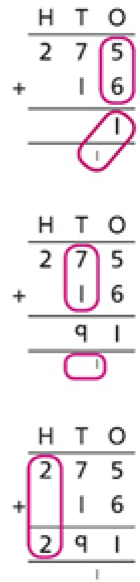
- Addition
- Subtraction
- Multiplication
- Division

Addition

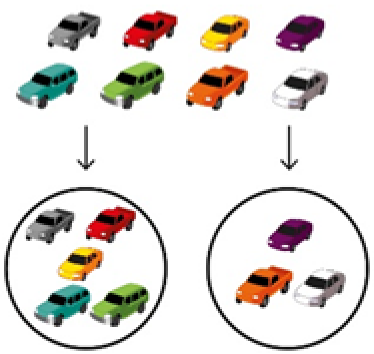
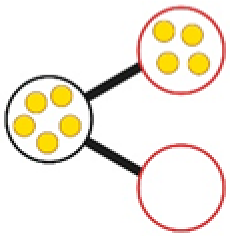
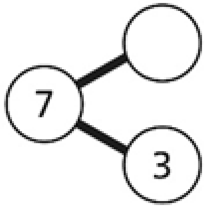
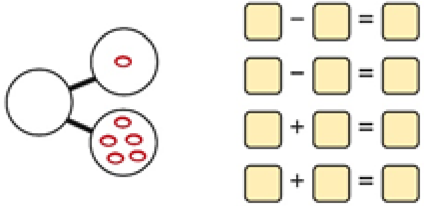
	Concrete	Pictorial	Abstract
Y1	**Understanding teen numbers as a complete 10 and some more** Complete a group of 10 objects and count more.  *13 is 10 and 3 more.*	**Understanding teen numbers as a complete 10 and some more** Use a ten frame to support understanding of a complete 10 for teen numbers.  *13 is 10 and 3 more.*	**Understanding teen numbers as a complete 10 and some more.** *1 ten and 3 ones equal 13.* *10 + 3 = 13*
Y2	Complete a 10 using number bonds.  *There are 4 tens and 5 ones.* *I need to add 7. I will use 5 to complete a 10, then add 2 more.*	Complete a 10 using number bonds.  	Complete a 10 using number bonds.  *7 = 5 + 2* *45 + 5 + 2 = 52*

Addition

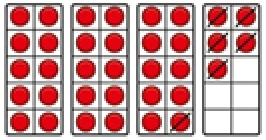
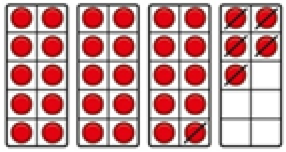
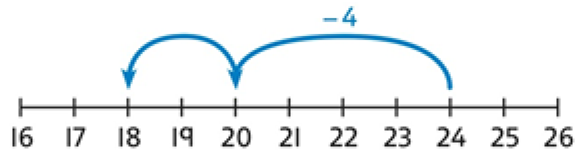
Y3

Concrete	Pictorial	Abstract
Use place value equipment to model addition and understand where exchange is required. *Use place value counters to represent 154 + 72.* *Use this to decide if any exchange is required.* *There are 5 tens and 7 tens. That is 12 tens so I will exchange.*	Represent the required exchange on a place value grid using equipment. *275 + 16 = ?*  *275 + 16 = 291* Note: In this example, a mental method may be more efficient. The numbers for the example calculation have been chosen to allow children to visualise the concept and see how the method relates to place value. Children should be encouraged at every stage to select methods that are accurate and efficient.	Use a column method with exchange. Children must understand how the method relates to place value at each stage of the calculation.  *275 + 16 = 291*

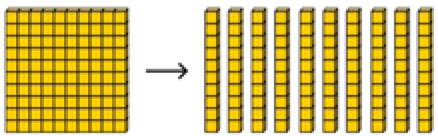
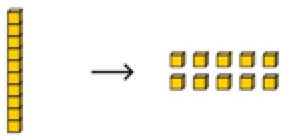
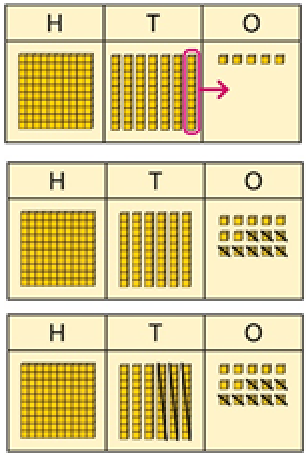
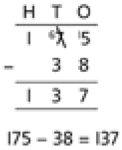
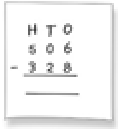
Subtraction – Y1

Concrete	Pictorial	Abstract
Finding a missing part, given a whole and a part Children separate a whole into parts and understand how one part can be found by subtraction.  *8 − 5 = ?*	**Finding a missing part, given a whole and a part** Children represent a whole and a part and understand how to find the missing part by subtraction.  $\boxed{5} - \boxed{4} = \boxed{}$	**Finding a missing part, given a whole and a part** Children use a part-whole model to support the subtraction to find a missing part.  *7 − 3 = ?* Children develop an understanding of the relationship between addition and subtraction facts in a part-whole model. 

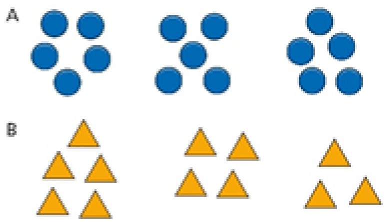
Subtraction – Y2

Concrete	Pictorial	Abstract
Bridge 10 by using known bonds.  *35 − 6* *I took away 5 counters, then 1 more.*	Bridge 10 by using known bonds.  *35 − 6* *First, I will subtract 5, then 1.*	Bridge 10 by using known bonds.  *24 − 6 = ?* *24 − 4 − 2 = ?*

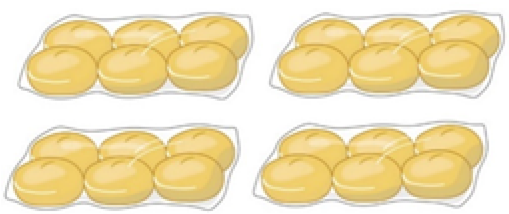
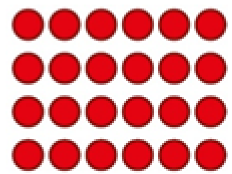
Subtraction – Y3

Concrete	Pictorial	Abstract
Use equipment to enact the exchange of 1 hundred for 10 tens, and 1 ten for 10 ones.  	*Model the required exchange on a place value grid.* *175 − 38 = ?* *I need to subtract 8 ones, so I will exchange a ten for 10 ones.*  	Use column subtraction to work accurately and efficiently.  If the subtraction is a 3-digit number subtract a 2-digit number, children should understand how the recording relates to the place value, and so how to line up the digits correctly. Children should also understand how to exchange in calculations where there is a zero in the 10s column. 

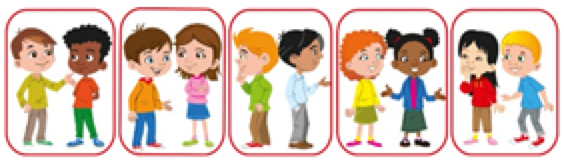
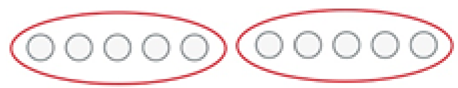
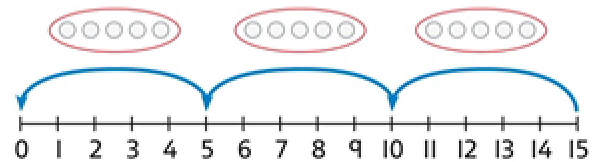
Multiplication – Y1

Concrete	Pictorial	Abstract
Recognising and making equal groups Children arrange objects in equal and unequal groups and understand how to recognise whether they are equal. 	**Recognising and making equal groups** Children draw and represent equal and unequal groups. 	**Describe equal groups using words** *Three equal groups of 4.* *Four equal groups of 3.*

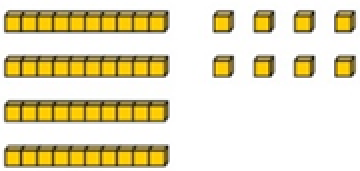
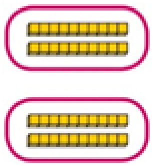
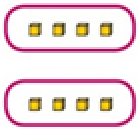
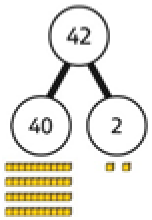
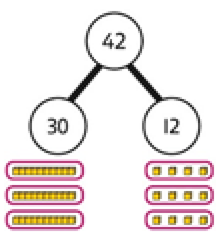
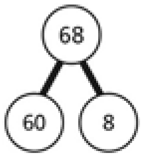
Multiplication – Y3

Concrete	Pictorial	Abstract
Understand how to use times-tables facts flexibly.   *There are 6 groups of 4 pens.* *There are 4 groups of 6 bread rolls.* *I can use 6 × 4 = 24 to work out both totals.*	Understand how times-table facts relate to commutativity.  *6 × 4 = 24* *4 × 6 = 24*	Understand how times-table facts relate to commutativity. *I need to work out 4 groups of 7.* *I know that 7 × 4 = 28* *so, I know that* *4 groups of 7 = 28* *and* *7 groups of 4 = 28.*

Division - Y1

Concrete	Pictorial	Abstract
Grouping Learn to make equal groups from a whole and find how many equal groups of a certain size can be made. Sort a whole set people and objects into equal groups.  *There are 10 children altogether.* *There are 2 in each group.* *There are 5 groups.*	**Grouping** Represent a whole and work out how many equal groups.  *There are 10 in total.* *There are 5 in each group.* *There are 2 groups.*	**Grouping** Children may relate this to counting back in steps of 2, 5 or 10. 

Division – Y3

Concrete	Pictorial	Abstract
Children explore dividing 2-digit numbers by using place value equipment.  *48 ÷ 2 = ?* *First divide the 10s.*  *Then divide the 1s.* 	Children explore which partitions support particular divisions.  *I need to partition 42 differently to divide by 3.*  *42 = 30 + 12* *42 ÷ 3 = 14*	Children partition a number into 10s and 1s to divide where appropriate.  *60 ÷ 2 = 30* *8 ÷ 2 = 4* *30 + 4 = 34* *68 ÷ 2 = 34* Children partition flexibly to divide where appropriate. *42 ÷ 3 = ?* *42 = 40 + 2* *I need to partition 42 differently to divide by 3.* *42 = 30 + 12* *30 ÷ 3 = 10* *12 ÷ 3 = 4* *10 + 4 = 14* *42 ÷ 3 = 14*

Number facts

By the end of Year 2 children should know:

- All addition and subtraction facts for each number to 20 fluently.
- Facts for the 2, 5 and 10 multiplication tables and related division facts.

Number facts

By the end of Year 3 children should know:

- Multiplication facts for 2, 3, 4, 5, 8, and 10 and corresponding division facts.

Key Instant Recall Facts

Year 1 – Autumn 2

I know number bonds for each number to 6.

By the end of this half term, children should know the following facts. The aim is for them to recall these facts **instantly**.

0 + 1 = 1	0 + 4 = 4	0 + 6 = 6
1 + 0 = 1	1 + 3 = 4	1 + 5 = 6
	2 + 2 = 4	2 + 4 = 6
0 + 2 = 2	3 + 1 = 4	3 + 3 = 6
1 + 1 = 2	4 + 0 = 4	4 + 2 = 6
2 + 0 = 2		5 + 1 = 6
	0 + 5 = 5	6 + 0 = 6
0 + 3 = 3	1 + 4 = 5	
1 + 2 = 3	2 + 3 = 5	
2 + 1 = 3	3 + 2 = 5	
3 + 0 = 3	4 + 1 = 5	
	5 + 0 = 5	

Key Vocabulary

What is 3 **add** 2?

What is 2 **plus** 2?

What is 5 **take away** 2?

What is 1 **less than** 4?

They should be able to answer these questions in any order, including missing number questions e.g. 3 + ◯ = 5 or 4 – ◯ = 2.

Top Tips

The secret to success is practising **little** and **often**. Use time wisely. Can you practise these KIRFs while walking to school or during a car journey? You don't need to practise them all at once: perhaps you could have a fact of the day. If you would like more ideas, please speak to your child's teacher.

Use practical resources – Your child has one potato on their plate and you give them three more. Can they predict how many they will have now?

Make a poster – We use Numicon at school. You can find pictures of the Numicon shapes here: bit.ly/NumiconPictures – your child could make a poster showing the different ways of making 5.

Play games – You can play number bond pairs online at www.conkermaths.com and then see how many questions you can answer in just one minute.

Key Instant Recall Facts

Year 2 – Autumn 2

I know doubles and halves of numbers to 20.

By the end of this half term, children should know the following facts. The aim is for them to recall these facts **instantly**.

0 + 0 = 0	½ of 0 = 0	
1 + 1 = 1	½ of 2 = 1	11 + 11 = 22
2 + 2 = 4	½ of 4 = 2	12 + 12 = 24
3 + 3 = 6	½ of 6 = 3	13 + 13 = 26
4 + 4 = 8	½ of 8 = 4	14 + 14 = 28
5 + 5 = 10	½ of 10 = 5	15 + 15 = 30
6 + 6 = 12	½ of 12 = 6	16 + 16 = 32
7 + 7 = 14	½ of 14 = 7	17 + 17 = 34
8 + 8 = 16	½ of 16 = 8	18 + 18 = 36
9 + 9 = 18	½ of 18 = 9	19 + 19 = 38
10 + 10 = 20	½ of 20 = 10	20 + 20 = 40

Key Vocabulary

What is **double** 9?

What is **half** of 14?

Top Tips

The secret to success is practising **little** and **often**. Use time wisely. Can you practise these KIRFs while walking to school or during a car journey? You don't need to practise them all at once: perhaps you could have a fact of the day. If you would like more ideas, please speak to your child's teacher.

Use what you already know – Encourage your child to find the connection between the 2 times table and double facts.

Ping Pong – In this game, the parent says, "Ping," and the child replies, "Pong." Then the parent says a number and the child doubles it. For a harder version, the adult can say, "Pong." The child replies, "Ping," and then halves the next number given.

Practise online – Go to Purple Mash Maths and see how many questions you can answer in just 90 seconds.

www.princessfrederica.brent.sch.uk/

Curriculum Overview

(*scroll down to the bottom*)

Maths

Calculation policy

KIRFS: Key Instant Recall Facts

Please write any questions or comments on the chat function.

Thank you for your continuing interest in maths.