Crown Meadow First School Calculations Exemplification 2025/26

We plan from Oak Academy, linked to the NCETM Curriculum Prioritisation Materials and the NCETM PD spine. We also use Mastering Number in EYFS/Ks1 and Ks2.

This document summarises information from the NCETM PD Spines linked to Addition and Subtraction, and Multiplication and Division. It is designed to be used to supplement our Calculations Policy.

As we transition our curriculum to be led more by the NCETM, this document supports teachers in building connections, reinforcing stem sentences and following the principles of the NCETM materials. We will currently retain our previous calculations policy (linked to White Rose) and develop a new policy to amalgamate this with NCETM materials as the year progresses.

All of our teaching in Mathematics links to the 3 aims of the National Curriculum - fluency, reasoning and problem solving. In order to be proficient in Mathematics, children will need a good grasp of a range of methods and a deep conceptual understanding. A CPA (concrete, pictorial, abstract) approach can support this.

Children should on the whole see concrete, pictorial and abstract representations alongside each other, CPA is not a linear structure.

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The representations and concepts shared in this document closely link to our planning.

Addition and Subtraction

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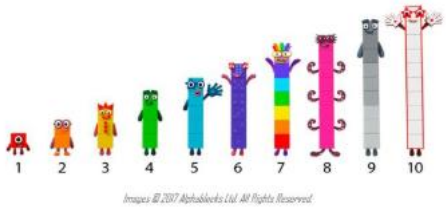
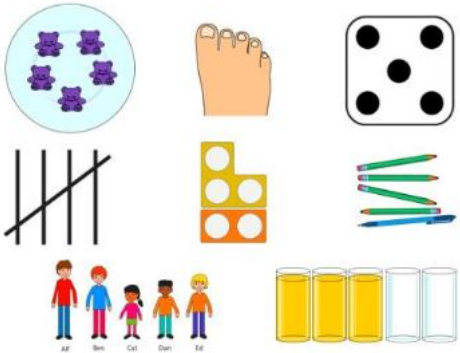
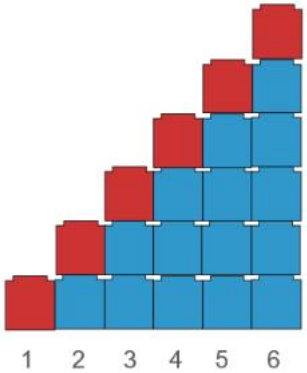
Year 1 Addition and Subtraction - Compose and partition numbers to 10 (slide 1)



Understand that numbers to 10 can be represented in many different ways.

Numbers to 5 can be identified without counting (subitising).





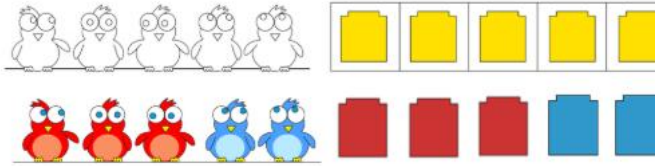
Each number is composed of the previous number and one more.

A number can be partitioned in different ways.

There are 5 ___. 3 are ____. 2 are ____.

There are 2 glasses. 3 glasses are full and 2 glasses are empty.
There are 5 cubes. 3 are red and 2 are blue.
There are 5 cakes. 2 have cherries and 3 do not.

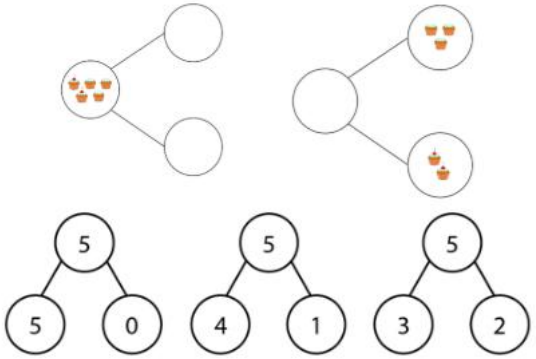
5 is the whole. 3 is a part. 2 is a part.



Each number can be partitioned into two smaller numbers

There are 5 ____. 3 are ____. 2 are ____.

5 is the whole. 3 is a part. 2 is a part.



Remember to show PW models in different

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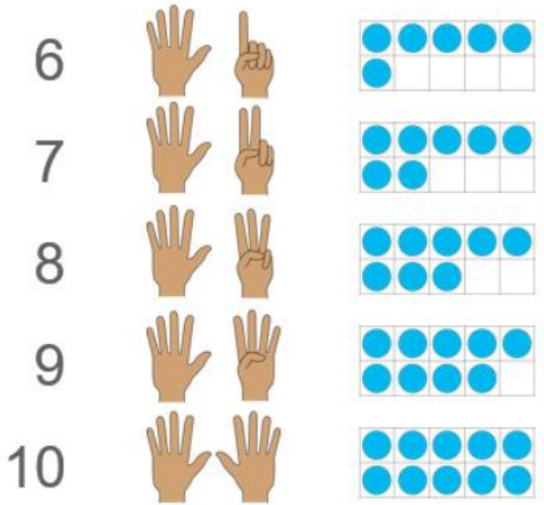
Year 1 Addition and Subtraction - Compose and partition numbers to 10 (slide 2)

There are two types of subitising

1. Perceptual – Just 'seeing' the group and knowing how many (up to 5 in non-standard arrangements). Supports cardinality.
2. Conceptual – Seeing groups within groups. Supports composition and enables us to subitise larger amounts.

	Blue	Red
	0	5
	1	4
	2	3
	3	2
	4	1
	5	0

A number can be partitioned in different ways systematically.



Numbers from 6 – 10 are composed of the '5 and a bit' structure.

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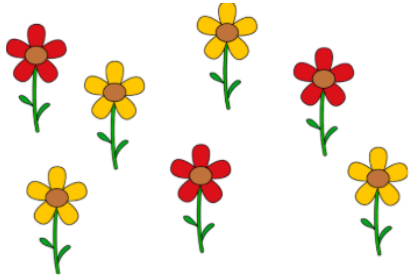
Year 1 Addition and Subtraction - Read, Write and Interpret Additive Equations (slide 1)

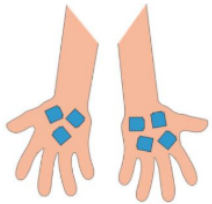


Identify what each number represents using real life contexts.

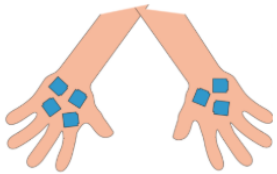
The 4 represents the 4 yellow flowers.

The 3 represents the 3 red flowers.

Start with lots of talk, before introducing the abstract symbols/equations alongside the actions/ images.



3 + 4

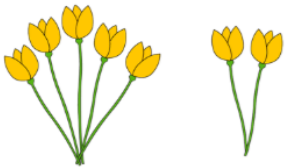


4 + 3

Note the progression in the use of resources/ images, starting with identical objects, where the groups are distinguished by position or colour.

We can write the addends in any order.
(Commutative Law)
3 plus 4 is equal to 3 plus 4

An expression does not have '=' : 3 + 4
An equation includes '=' : 3 + 4 = 7, 7 = 4 + 3

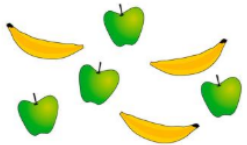


5 + 2 = 7

Identify what each number represents in an equation.

We can write 5 plus 2 is equal to 7.

The 5 represents ____.
The 2 represents___.
The 7 represents the total number of ___.
The 7 represents how many ___there are in all.



USE the NOUNS
5 flowers plus 2 flowers is equal to 7 flowers.
4 apples plus 3 bananas is equal to 7 pieces of fruit.

4 + 3 = 7
7 = 4 + 3

Vary the position of the = symbol

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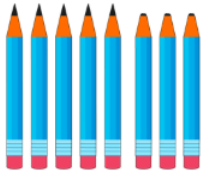
Year 1 Addition and Subtraction - Read, Write and Interpret Additive Equations (slide 2)



8 – 5 = 3

Subtraction can take the form of partitioning.

There are 8 ____ altogether.

5 ___ are ____.

3 ___ are ____.

We can write this as 8 minus 5 is equal to 3.

4 + 3 = 7

Addition can tell us about combining objects. (Aggregation structure)

Subtraction can tell us about splitting objects into two or more groups. (Partitioning structure)

The partitioning structure is sometimes referred to as the 'not structure'. Eg, There are 5 teddies. 3 are in the tent and 2 are not.

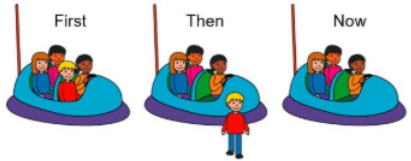
Make connections between addition and subtraction.

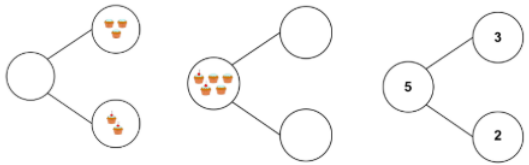
This can be shown using the part-part-whole model. Ensure children have lots of practice in combining and partitioning objects before using abstract numerals.

Understand the 'First, Then, Now' structure of addition and subtraction.

Addition can tell us about a quantity increasing. (Augmentation)

Subtraction can tell us about a quantity decreasing. (Reduction)





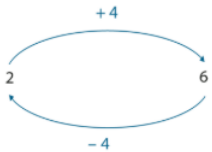
2 + 3 = 5

3 + 2 = 5

5 – 3 = 2

5 – 2 = 3

4 – 1 = 3



Addition and subtraction undo each other.

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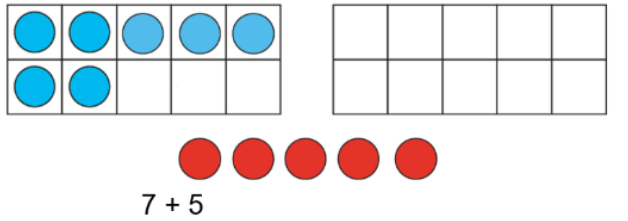
Year 1 Addition and Subtraction - Add and subtract across 10 (slide 1)

Use knowledge of known facts to bridge through 10 using a 'make 10' strategy. We can partition one of the addends to help us add.

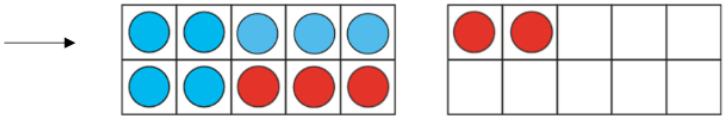
First, I partition the __ into ___ and ___.

Then, I add ___ and ___ to make 10.

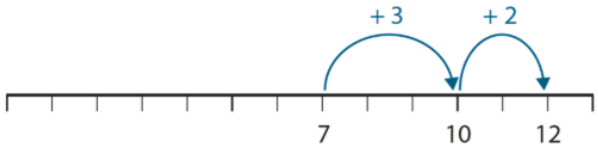
Then, I add the remaining ___ to make ___.

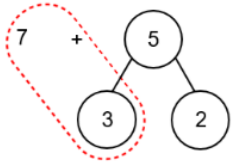


7 + 5



7 + 5 = 7 + 3 + 2 = 10 + 2





7 + 3 = 10

10 + 2 = 12

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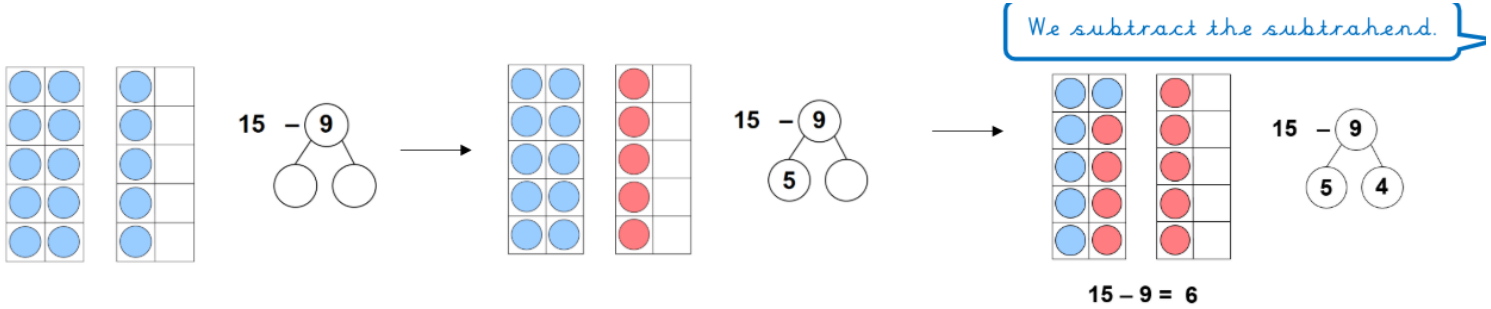
Year 1 Addition and Subtraction - Add and subtract across 10 (slide 2)

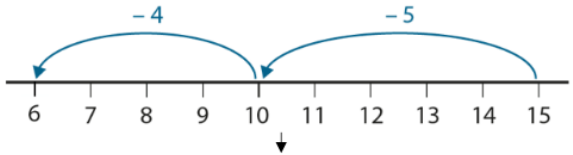


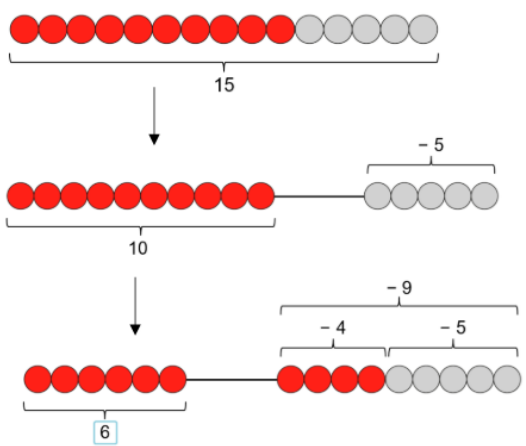
Use knowledge of known facts to subtract *through 10*. We can partition the subtrahend to help us subtract.

First, I partition the __ into ___ and ___.

Then, I subtract ___ to get to 10.

Then, I subtract the remaining ___ to make ___.





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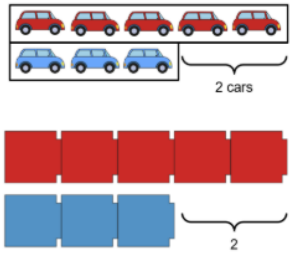
Year 2 Addition and Subtraction - Solve Comparative Addition and Difference Problems

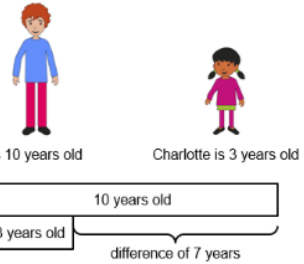


Line up sets of objects in a bar model structure to support comparison.

There are 2 fewer blue cars than red cars.

There are 2 more red cars that blue cars.

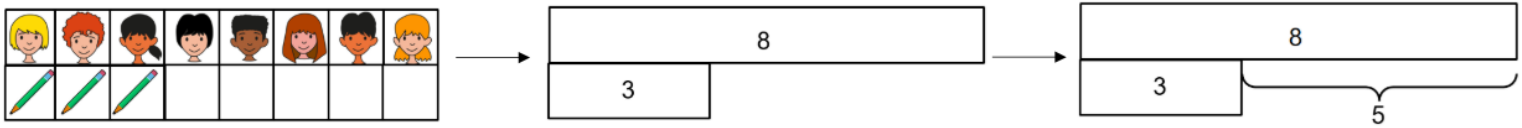
The difference is 2 cars.



Represent a range of comparison contexts.

Ben is 7 years older than Charlotte.

Charlotte is 7 years younger than Ben.

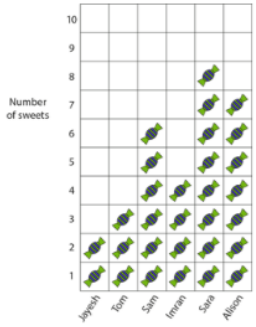


We can use subtraction to help solve difference problems / missing addend problems about 'how many more?' and 'how many fewer?'

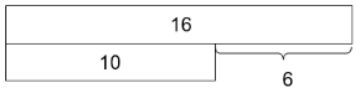
3 + __ = 8

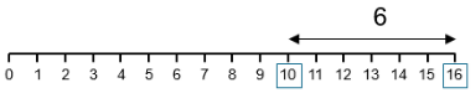
8 – 3 = 5

Create contexts for recognising the difference/comparative addition structure with all representations below.



10 + ☐ = 16 **16 – 10 = ☐**





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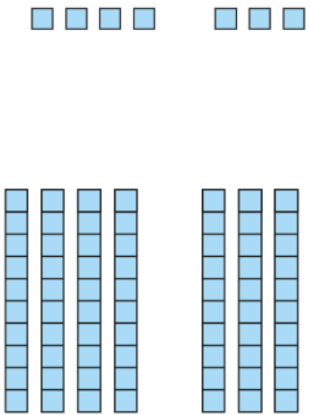
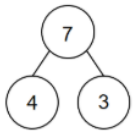
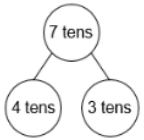
Year 2 Addition and Subtraction - Add and subtract within 100 (slide 1)







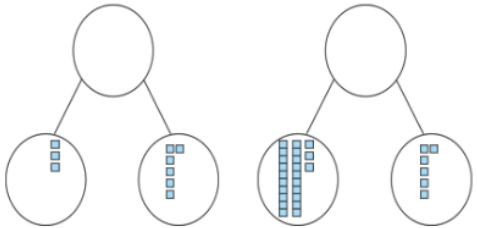
Use known facts within 10 to add/subtract multiples of 10.

I know that 4 plus 3 is equal to 7.

So, 4 tens plus 3 tens is equal to 7 tens.

40 + 30 = 70.

70 – 40 = 30

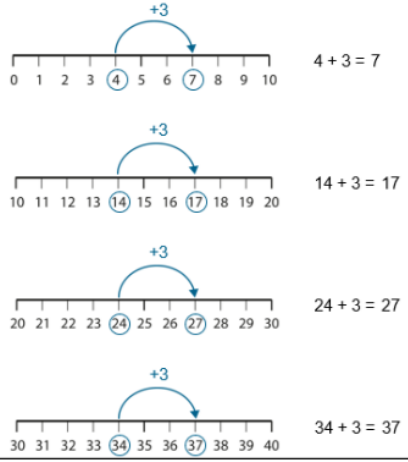


Use known facts within 10 to add/subtract ones to/from a 2 digit number.

I know that 3 plus 6 is equal to 9.

So, 2 tens and 3 ones plus 6 ones is equal to 2 tens and 9 ones.

23 + 6 = 29.



Generalise that adding/subtracting within 10 can be applied to adding a 2 digit number with a 1 digit number – not crossing the tens boundary.

I know that 4 plus 3 is equal to 7.

So, 1 ten and 4 ones plus 3 ones is equal to 1 ten and 7 ones.

4 + 3 = 7

So 14 + 3 = 17.

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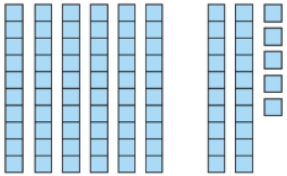
Year 2 Addition and Subtraction - Add and subtract within 100 (slide 2)

6 + 2 = 8

60 + 25 = ?



Use known facts within 10 to add/subtract multiples of 10 to a 2-digit number.

I know that 6 plus 2 is equal to 8.

So, 6 tens plus 2 tens is equal to 8 tens. Then add the additional 5 ones.

60 + 20 = 80.

80 + 5 = 85

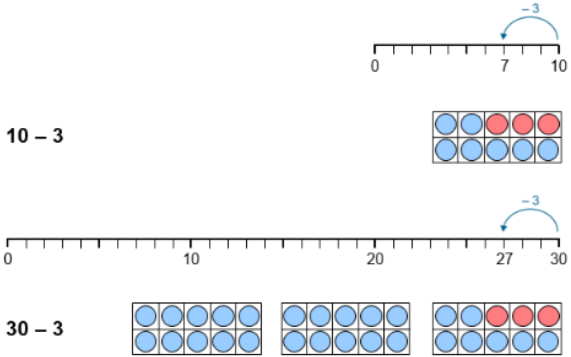
Or 60 + 25 = 60 + 20 + 5

Use knowledge of subtracting from 10 to subtract a single-digit number from a multiple of 10.

I know that 10 minus 3 is equal to 7.

So, 3 tens minus 3 ones is equal to 2 tens and 7 ones.

30 - 3 = 27.



Provide lots of opportunities for children to subtract a single digit number from a multiple of 10, starting with 1 less.

Display sections of number lines and use procedural variation for practice.

Eg 10-3, 20-3, 30-3

Draw attention to the tens and ones digits.

What changes?
What stays the same?

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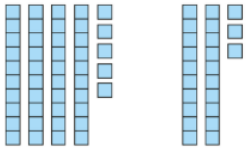
Year 2 Addition and Subtraction - Add and subtract within 100 (slide 3)

Addition Method A: Partition both addends

45 + 23

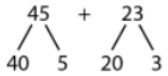


Partition both addends to add efficiently without crossing the tens boundary. (No regrouping)

40 + 20 = 60

5 + 3 = 8

60 + 8 = 68



Following lots of practice with concrete and pictorial support, move to the use of abstract equations only, with jottings to record the three steps.

First, I partition the 45 into 40 and 5, and the 23 into 20 and 3.

40 + 20 = 60

'Forty plus twenty is equal to sixty…'

5 + 3 = 8

'…five plus three is equal to eight…'

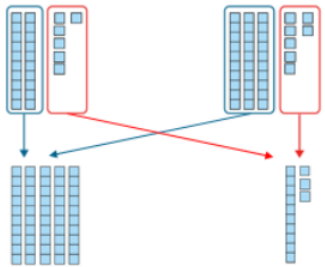
60 + 8 = 68

'…and sixty plus eight is equal to sixty-eight.'

45 + 23 = 68

Partition both addends to add efficiently when we need to regroup the ones into one ten and some ones.

26 + 37 = 63



20 + 30 = 50

6 + 7 = 13

50 + 13 = 63

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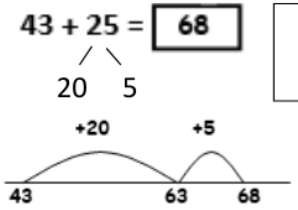
Year 2 Addition and Subtraction - Add and subtract within 100 (slide 4)

Addition Method B: Partition one addend

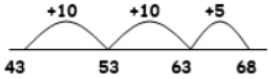


Partition one addend into tens and ones.
Add the tens and then the ones.
No need to bridge through a multiple of 10.

43 = 20 = 63
63 + 5 = 68

OR 43 + 20 + 5
= 63 + 5
= 68

Interim step if needed



When adding 2-digit numbers, it is really important that children do not use counting strategies (counting on ones or counting manipulatives), but use know facts to add decomposed parts.

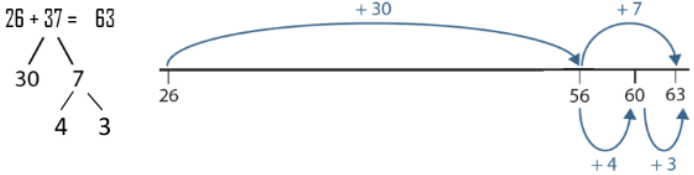
If this is the case, provide additional fluency practice, ensuring children know and can apply addition facts to 10 and can add a 1-digit number to a multiple of 10.

To enable successful bridging, children need to be secure in pairs equal to 10 and know why this is important. Intelligent practice in identifying how an addend should be partitioned is very helpful.

Eg I'm adding to 35, how should I partition 6? 7? 8? to bridge through a the next multiple of 10?

I'm adding 8. How should I partition this if I'm adding to 35?, 37?, 32? (It's useful to include examples when partitioning is not necessary. Can they identify when to partition and when not to?)

Partition one addend into tens and ones.
Add the tens and then the ones.
Bridge through a multiple of 10.



Crown Meadow First School Calculations Exemplification 2025/26

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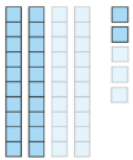
Year 2 Addition and Subtraction - Add and subtract within 100 (slide 5)

When subtracting, only partition the subtrahend. (If children learn to partition both the minuend and the subtrahend for calculations when the ones digit in the subtrahend is smaller than the ones digit in the minuend, eg 37-14, they often swap the digits around to try to make it work in calculations such as 34 – 17). This can be a real point of difficulty when children have added by partitioning both addends.

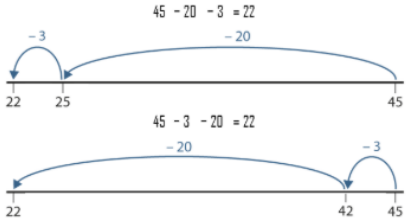
Subtract from any two-digit number by partitioning the subtrahend into tens and ones.

Subtract the tens and then the ones. No bridging through a multiple of 10 initially.

45 - 20 - 3

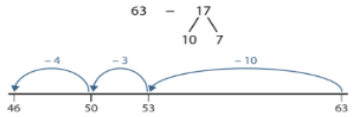


45 – 23 = 22

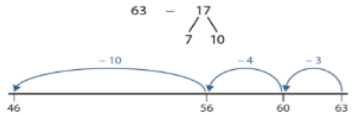


Subtract two-digit number by partitioning the subtrahend into tens and ones where bridging through a multiple of 10 is required.

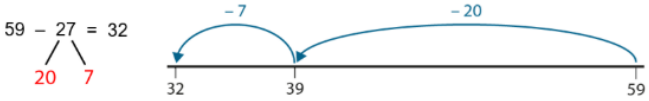
Bridging a multiple of ten – subtracting the tens first:



Bridging a multiple of ten – subtracting the ones first:



Provide examples of subtracting the tens first and then the ones first so children understand that this doesn't change the result. Subtracting the tens first can become the preferred strategy, linking in with addition, when adding the tens first is often easier.



When subtracting 2-digit numbers, it is really important that children do not use counting strategies (counting on ones or counting manipulatives), but use know facts to add decomposed parts.

If this is the case, provide additional fluency practice, ensuring children know and can apply subtraction facts to 10 and can subtract a 1-digit number from a multiple of 10.

To enable successful bridging, children need to be secure in pairs equal to 10 and know why this is important. See ideas for adding and adapt for subtraction

Crown Meadow First School Calculations Exemplification 2025/26

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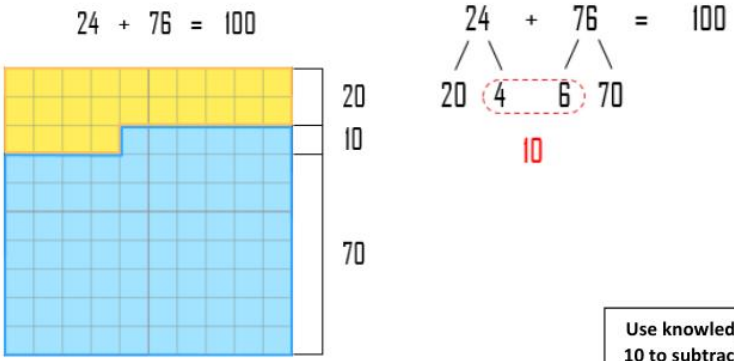
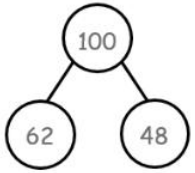
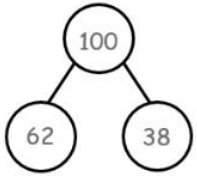
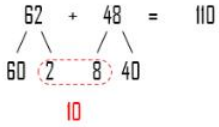
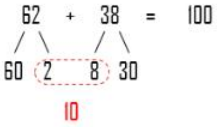
Year 3 Addition and Subtraction - Calculate complements to 100.









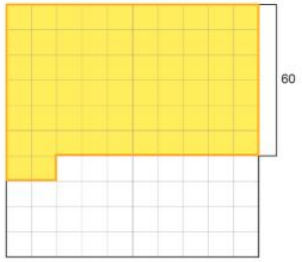


Use knowledge of subtracting from 10 to subtract a single-digit number from a multiple of 10.

First we make 10 ones. The ones digits add up to make 1 ten, so we need 9 more tens to make a total of 100.

Compare equations which do and do not sum to 100.

Solve missing number problems that sum to 100.



62 + ☐ = 100

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Year 3 Addition and Subtraction - Columnar Addition (slide 1)

Use Dienes to represent columnar addition *without regrouping* before moving to abstract algorithm.

We add the ones.

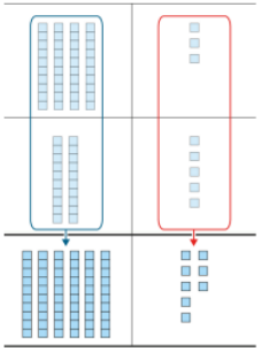
3 ones plus 5 ones is equal to 8 ones.

We add the tens.

4 tens plus 2 tens is equal to 6 tens.

Ensure children understand how the addends and sum are represented in column addition. Draw attention to the 'large equals symbol' that frames the sum.

In preparation for column addition with regrouping, give practice on regrouping teen numbers of ones into one ten and some ones.



	10s	1s
	4	3
+	2	5
	6	8

Model moving all the pieces in a particular column down into the answer space to form the sum for that column.

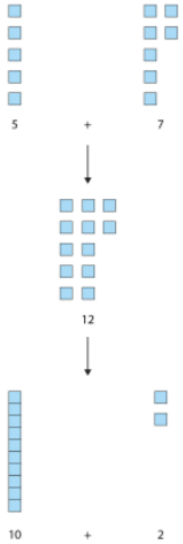
Ensure that the manipulatives are used to highlight the structure, rather than to do the calculating; children should use known facts to find the sum of each column. They should not be counting the cubes to find the answer.

As children become familiar with how the algorithm works, remove the concrete apparatus.

Provide varied practice to include:

- + of three 2-digit numbers
- + of 3-digit numbers
- Cases where some of the digits are zero
- + of two number with different numbers of digits. Ensure the children can set these out correctly and align the digits.
- Calculations involving empty boxes in different positions

Ensure children can talk about what the digits represent within the algorithm.



Encourage children to describe the regrouping process in full using the language if unitizing:

5 ones plus 7 ones is equal to 12 ones.

12 ones is equal to 1 ten and 2 ones.

Also model the language of regroup:

We can regroup 12 ones into 1 ten and 2 ones.

Crown Meadow First School Calculations Exemplification 2025/26

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Year 3 Addition and Subtraction - Columnar Addition (slide 2)

Use Dienes to represent columnar addition *with regrouping* before moving to abstract algorithm.

5 ones plus 7 ones is equal to 12 ones. I can regroup 12 ones. 12 ones is equal to 1 ten and 2 ones.

2 tens plus 4 tens is equal to 6 tens. We also need to add 1 ten from the regrouping. There are 7 tens altogether.

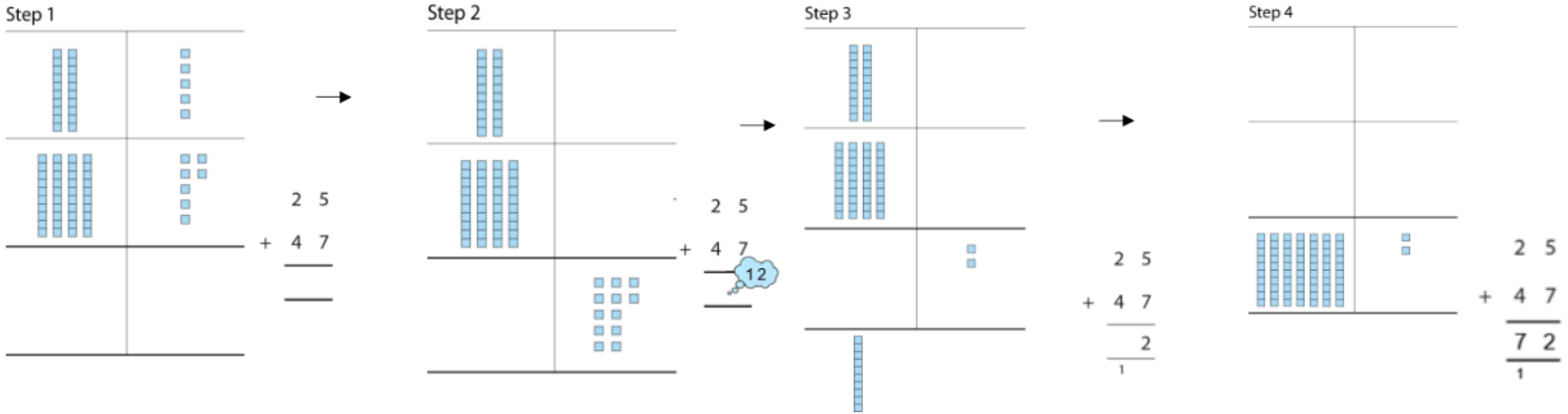
If a column group is equal to 10 or more we must regroup. 10 ones is equal to 1 ten. 10 tens is equal to 1 hundred.

When starting to regroup, start with a calculation where the ones digits sum to 10.

In Step 2, stress that we cannot record 12 in the ones column and reinforce the stem sentence: If the column sum is ten or more, we must regroup.

In Step 3, model how we record the regrouped digit underneath the answer space in the tens column, ready to add with the other tens.

Some children find it really helpful to cross out the regrouped digit as it's added to the other tens in the final step. It is good to model this.



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Year 3 Addition and Subtraction - Columnar Addition (slide 3)

Use Dienes to represent columnar addition *with regrouping* before moving to abstract algorithm.

5 ones plus 7 ones is equal to 12 ones. I can regroup 12 ones. 12 ones is equal to 1 ten and 2 ones.

2 tens plus 4 tens is equal to 6 tens. We also need to add 1 ten from the regrouping. There are 7 tens altogether.

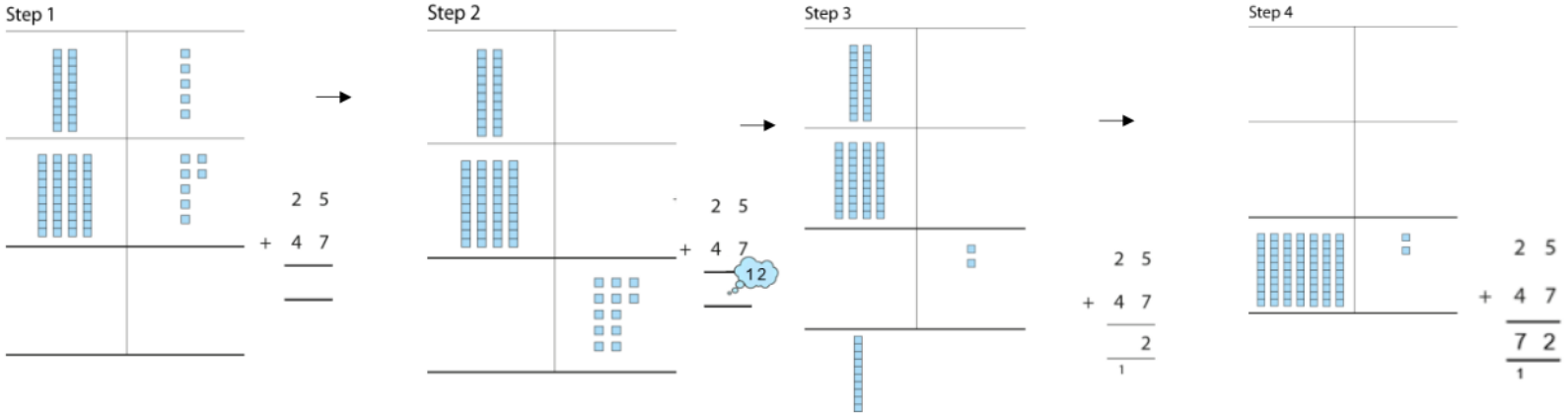
If a column group is equal to 10 or more we must regroup. 10 ones is equal to 1 ten. 10 tens is equal to 1 hundred.

When starting to regroup, start with a calculation where the ones digits sum to 10.

In Step 2, stress that we cannot record 12 in the ones column and reinforce the stem sentence: If the column sum is ten or more, we must regroup.

In Step 3, model how we record the regrouped digit underneath the answer space in the tens column, ready to add with the other tens.

Some children find it really helpful to cross out the regrouped digit as it's added to the other tens in the final step. It is good to model this.



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Year 3 Addition and Subtraction - Columnar Addition (slide 4)

Provide varied practice using the method above to add two 2-digit and 3-digit numbers where regrouping is needed in some or all columns. Also include:

- + of several addends which add to a number greater than 20 in column (eg 18 + 36 + 29) so children don't begin to believe that the regrouped digit is only ever 1.
- + of 2-digit number that sum to more than 100.
- Calculations involving empty boxes. Discuss: What could the missing number be? What can't it be?

It is essential that, once column methods are introduced, these do not become the default strategies and that children continue to engage their number sense and reasoning, making considered decisions about when mental methods are more appropriate.

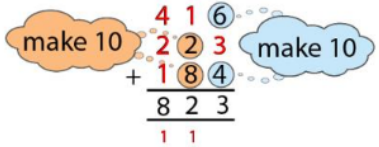
Compare expressions which can be calculated using mental or written strategies.

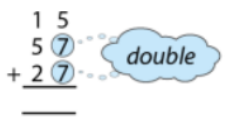
475 + 25 237 + 156

349 + 84 120 + 130

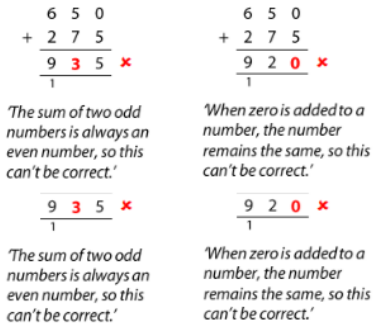
Use column addition	Use mental strategies

Add 3 addends using columnar addition, using a make 10 strategy to support. Children should be able to choose the most efficient order to add digits within a column and use known facts, explaining their reasoning.





Use rules to check for errors quickly, justifying responses. Eg:



Use other methods to encourage children to engage their number sense and to reason about the methods they are choosing/ using. Encourage estimation. See Year 3 Spine 1.20, p 18 & 19.

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Year 3 Addition and Subtraction - Columnar Subtraction (slide 1)

10s	1s
6	5
− 2	3
4	2

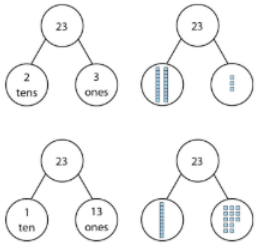
Use Dienes to represent columnar subtraction *without regrouping* initially.

We subtract the ones. 5 ones minus 3 ones is equal to 2 ones.

We subtract the tens. 6 tens minus 2 tens is equal to 4 tens.

Ensure children understand how the minuend, subtrahend and difference are represented in the algorithm. Draw attention to the 'large equals symbol' that frames the difference.

Introduce regrouping practically using Dienes so children become familiar with different representations of a number and are able to work flexibly in preparation for column subtraction.



23 is equal to 2 tens and 3 ones.

23 = 20 + 3 = 10 + 13

23 is also equal to 1 ten and 13 ones.

Move to introducing regrouping to solve a calculation when the ones digit in the minuend is smaller than the ones digit in the subtrahend. Eg 94 – 6

Solve first using Dienes and then record alongside each step.

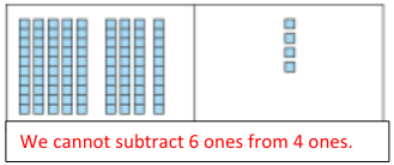
When recording the regrouping, show as here, crossing out the original number of tens and ones and recording the quantity of each after regrouping.

N.B. This is different to the NCETM, but has worked better for our children as it reinforces the new quantity of ones and reduces the chance of confusion with the small one written above the ones digit.

N.B. It should be stressed to the children that calculations like this should usually be done mentally. We are only doing this now as a step in learning the column method, which will be helpful for making tricky calculations with larger numbers.

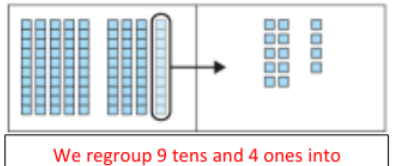
NB. We have decided to use 'regroup' rather than exchange, as used by the NCETM, as this links to +.

94 – 6



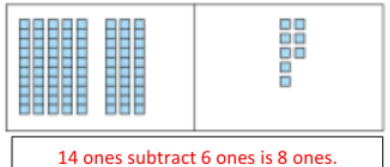
We cannot subtract 6 ones from 4 ones.

10s	1s
9	4
−	6



We regroup 9 tens and 4 ones into 8 tens and 24 ones.

10s	1s
9 (8)	14 (4)
−	6



14 ones subtract 6 ones is 8 ones.
8 tens subtract 0 tens is 8 tens.

10s	1s
9 (8)	14 (4)
−	6
8	8

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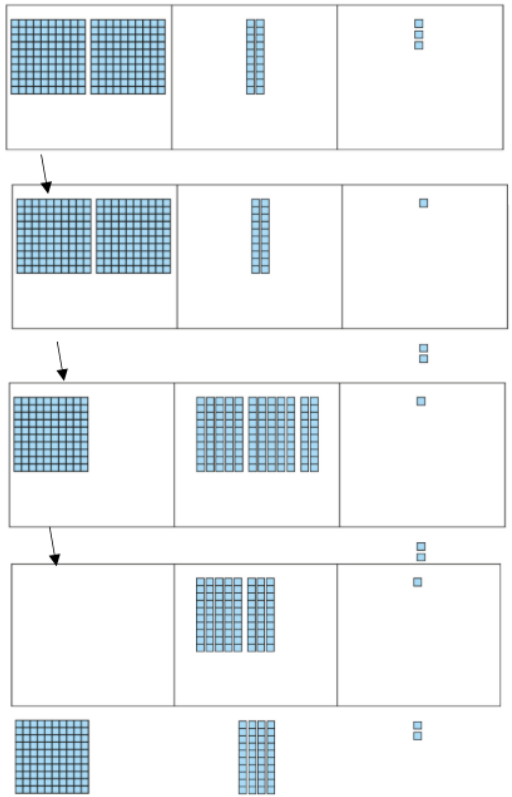
Year 3 Addition and Subtraction - Columnar Subtraction (slide 2)

With subtraction we only make the minuend with blocks and we subtract the subtrahend from this.

Move the subtracted blocks underneath as they are subtracted. They should remain visible so that we can make a clear link with the inverse operation to check the answer.

As with addition, include varied practice at all stages including examples where regrouping of the digits in different columns is needed and calculations with empty boxes.



The minuend has 2 hundreds, 2 tens and 3 ones.

	2	2	3
−	1	4	2

3 ones subtract 2 ones is equal to 1 one.

	2	2	3
−	1	4	2
			1

We cannot subtract 4 tens from 2 tens.

We must regroup.

We regroup 2 hundreds and 2 tens into 1 hundred and 12 tens.

	1 2	12 2	3
−	1	4	2
			1

12 tens subtract 4 tens is equal to 8 tens.

1 hundred subtract 1 hundred is zero hundreds.

223 subtract 142 is 81

	1 2	12 2	3
	1	4	2
	0	8	1

Compare expressions which can be calculated using mental or written strategies.

The best mathematicians do the easiest maths!

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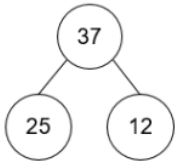
Year 3 Addition and Subtraction - Manipulating the additive relationship



37	
25	12

25 + 12 = 37
12 + 25 = 37

37 = 25 + 12
37 = 12 + 25

37 – 12 = 25
37 – 25 = 12

25 = 37 – 12
12 = 37 – 25

Recognise the different equations that can be recorded based on the part-whole structure.

Addend + addend = sum

Minuend – subtrahend = difference

Part Part Whole

329 + 414 = 743

743	
329	414

743 – 329 = 414

Whole Part Part

447 – 162 = 285

447	
285	162

447 – 285 = 162

Use the part-whole structure to support finding a missing part.

There is a missing part. To find the missing part, we subtract the other part from the whole.

sum

addend → 37 ← addend	
25	12

25 + 12 = 37
12 + 25 = 37

minuend

subtrahend (or difference) → 37 ← subtrahend (or difference)	
25	12

37 – 25 = 12
37 – 12 = 25

Whole Part Part

614 – 527 = 87

614	
527	87

527 + 87 = 614

Use the part-whole structure to support finding a missing whole.

There is a missing whole. To find the missing whole, we add the two parts.

Crown Meadow First School Calculations Exemplification 2025/26

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Year 4 Addition and Subtraction - Manipulating the additive relationship

In Year 4, children build on their use of columnar methods to add and subtract a wide range of numbers. Refer to the steps, vocabulary and stem sentences for Year 3. Ensure work conti to reinforce mental strateges and promote number sense.
Manipulatives should be used to support children's understanding of structure. Childrne should not be using manipulatives to do the calculations.

Year 4:

- Composition of 1000
- Addition and subtraction of 4-digit numbers
- Addition and subtraction of numbers involving tenths, hundredths and thousandths.
- Addition and of money.

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Multiplication and Division

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Year 2 Multiplication and Division - multiplication as repeated addition

Understand the difference between equal and unequal groups.

The ___ have been grouped into equal/ unequal groups.

We can represent equal groups as repeated addition.

There are 3 groups of 5.

5 + 5 + 5

3 × 5

5 + 5 + 5 = 3 × 5

We can represent repeated addition using a multiplication expression.

The 3 represents the number of groups.

The 5 represents the number of eggs in each group.

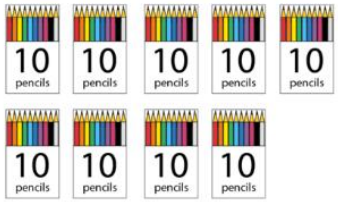
15 represents the total number of eggs.

Ensure children understand what the numbers represent in expressions and equations and can relate these to real contexts.

The ___ represents the number of groups.

The __ represents the number of ___ in each group.

___ represents the total number of ___.



9 × 10

Notice how the representations allow the children to see each of the numbers/ quantities (i.e. 10 pencils and 9 packets).

We can skip count in multiples of __ to work out the total amount.

10, 20, 30, 40 … there are 90 pencils altogether.

7 × 2

Crown Meadow First School Calculations Exemplification 2025/26

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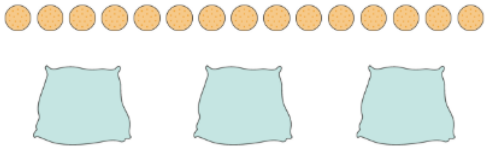
Year 2 Multiplication and Division - missing factors and division

Explore putting quantities of objects into equal groups as a lead in to division.

Discuss different ways of grouping, eg 15 is equal to 3 groups of 5.

Express as an equation: 15 = 3 x 5



$\boxed{3} \times 5 = 15$

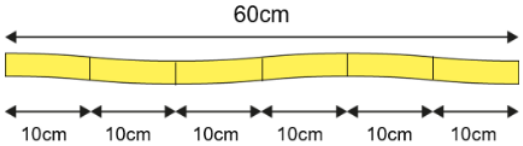
$15 \div 5 = \boxed{3}$

The 15 represents the number of biscuits.

The 5 represents the number of biscuits in each bag (group).

The 3 represents the number of bags (groups).

We can solve division problems by finding missing factors.



$\boxed{6} \times 10 = 60$

$60 \div 10 = \boxed{6}$

The 60cm represents the length of the ribbon.

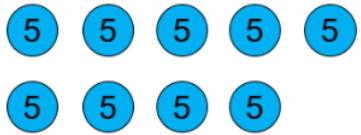
The 10 represents the size of each piece.

The 6 represents the number of pieces we can make.

We can use ÷ to mean 'divided by'

We can use our knowledge of times tables to help solve division problems.

$45 \div 5 = \boxed{9}$



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Year 3 Multiplication and Division - Multiplication and Division Structures. Manipulating the Multiplicative Relationship

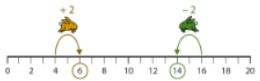
Introduction to the distributive property of multiplication: adjacent multiples of 2 have a difference of 2. This applies to all multiples patterns.

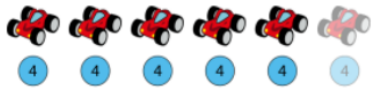
Adjacent multiples of two have a difference of two:

	×2
0	0
1	2
2	4
3	
4	8
5	10
6	12
7	
8	16
9	18
10	20
11	22
12	24

↓+2 $3\times2=2\times2+2$

↑−2 $7\times2=8\times2-2$





$0\times4=0$	$4\times0=0$
$1\times4=4$	$4\times1=4$
$2\times4=8$	$4\times2=8$
$3\times4=12$	$4\times3=12$
$4\times4=16$	$4\times4=16$
$5\times4=20$	$4\times5=20$
$6\times4=24$	**$4\times6=24$**

Ratio Table

Number of cars	Total number of wheels
0	0
1	4
2	8
3	12
4	16
5	20
6	**24**

Introduction to ratio tables

Pose questions such as:

How many wheels do 4 cars have?

How many cars are there if there are 24 wheels?

What are the factors of 8?

Deepen understanding of distributive law and multiplicative structure using empty boxes

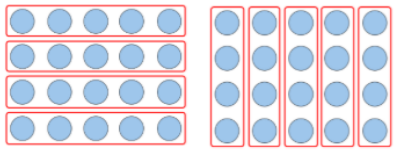
$3\times4=2\times4+\square$

$3\times4-\square=2\times4$

'Fill in the missing symbols (<, > or =).'

$9\times4 \bigcirc 8\times4$

$9\times4 \bigcirc 8\times4+4$



Reinforce that multiplication is commutative.

4 x 5 = 5 x 4

Factor times factor is equal to product.

The order of the factors does not affect the product.

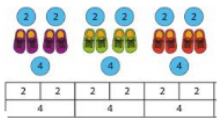
Explore the relationship between multiplication tables, eg

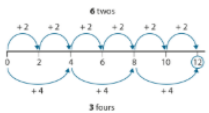
The products in the 4 times table are double the products in the 2 times table.

Represent using a range of models.

Explore the inverse: Products in the 2 times table are half of those in the 4 times table.

This extends to the 8x table and links between other times tables are made later using the same ideas.





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Year 3 Multiplication and Division - Multiplication and Division Structures. Manipulating the Multiplicative Relationship

Explore arranging quantities of objects into equal groups as a lead in to division.

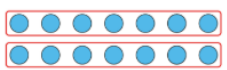
Do all numbers make equal groups?

Discuss different ways of grouping, eg 15 is equal to 3 groups of 5.
Express as an equation: 15 = 3 x 5. What does each number represent?

NB. This is not covered in NCETM materials, but is helpful to deepen children's understanding and make connections between x and ÷ and supports learning in Y4 re. remainders, bridging the work done in Y2.
Explore empty boxes, eg 15 = ☐ x 5
"15 is equal to * groups of 5."

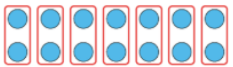
The same equation can be represented in both grouping and sharing contexts.

Explore how the bar model looks different.



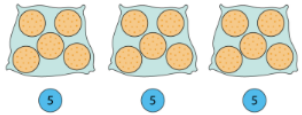
14 ÷ 2 = 7

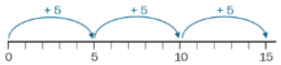
14	
7	7

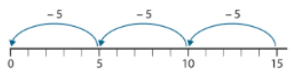


14 ÷ 2 = 7

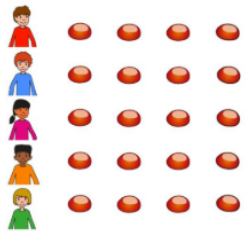
14						
2	2	2	2	2	2	2







Making groups of



Focus on repeated addition when dividing. This will ensure that children use their knowledge of skip counting in multiple groups.

Counting back becomes problematic when a remainder is involved. (Y4)

Division equations can be used to represent 'grouping' problems.

We can use multiplication facts to find the number of groups.

(Quotitive division)

15 divided into groups of 5 is equal to 3 in each group.
5 + 5 + 5 = 15
15 – 5 - 5 – 5 = 0
15 ÷ 5 = 3

Division equations can be used to represent 'sharing' problems.

We can use multiplication facts to find the size of groups.

(Partitive division)

Four fives are four each.
20 divided between 5 is equal to 4 each.
20 ÷ 5 = 4

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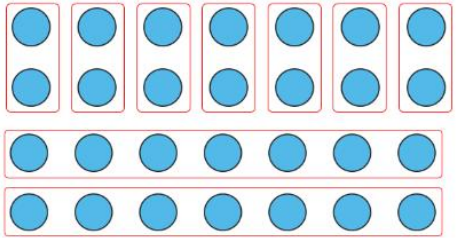
Year 4 Multiplication and Division - Multiplication and Division Structures, Manipulating the Multiplicative Relationship



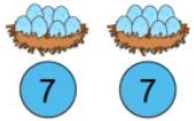
$2 \times 7 = 7 \times 2$

Understand that multiplication is commutative and the factors can be

2 groups of 7 is equal to 14.

2, 7 times is equal to 14.

2 groups of 7 is equal to 7, two times.



$2 \times 7 = 14$

$7 \times 2 = 14$

The 2 represents ___.

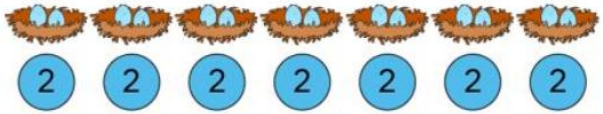
The 7 represents ___.

The 14 represents ___.

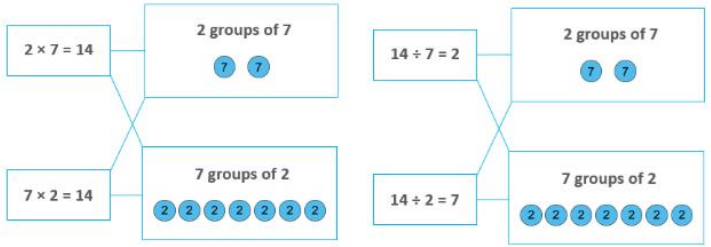
Multiplicand & Multiplier

If there is a context for the multiplication, we can use these terms to identify the role of each number.

The multiplicand is the size of each group. The multiplier is the number of groups. These words, although not featured in the NCETM materials, can help us to explain and explore multiplication. For example, exploring the effect on the product of increasing the multiplicand by one and how this is different to increasing the multiplier by one, will deepen children's understanding of multiplication and can support with later learning.



Match equations to representations and contexts.



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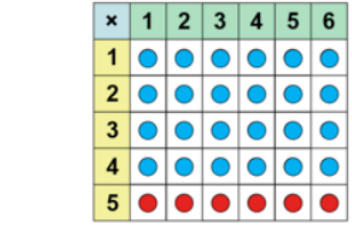
Year4 Multiplication and Division - Distributive law

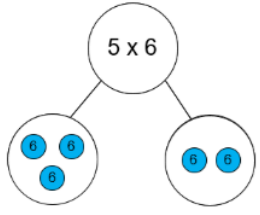
0 × 6 = 0	6 × 0 = 0
1 × 6 = 6 (+6)	6 × 1 = 6 (+6)
2 × 6 = 12 (+6)	6 × 2 = 12 (+6)
3 × 6 = 18 (+6)	6 × 3 = 18 (+6)
4 × 6 = 24 (+6)	6 × 4 = 24 (+6)
5 × 6 = 30 (+6)	6 × 5 = 30 (+6)
6 × 6 = 36	6 × 6 = 36
7 × 6 = 42	6 × 7 = 42
8 × 6 = 48	6 × 8 = 48
9 × 6 = 54	6 × 9 = 54
10 × 6 = 60	6 × 10 = 60
11 × 6 = 66	6 × 11 = 66
12 × 6 = 72	6 × 12 = 72

Adjacent multiples of ___ have a difference of ___.



4 × 6 + 6

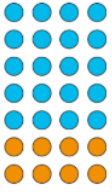
Five sixes is one more six than four sixes.



3 x 6 + 2 x 6 = 5 x 6

5 is equal to 3 plus 2, so 5 sixes is equal to 3 sixes plus 2 sixes.

We can partition one of the factors to make calculations easier.

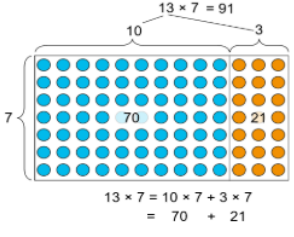


7 = 5 + 2

7 × 4 = 5 × 4 + 2 × 4

= 20 + 8

= 28



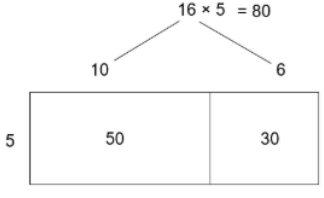
9 = 10 − 1

9 × 4 = 10 × 4 − 1 × 4

= 40 − 4

= 36

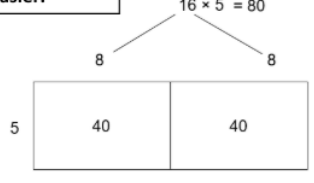
We can partition the factors in different ways to make calculations easier.



16 × 5 = 10 × 5 + 6 × 5

= 50 + 30

= 80



16 × 5 = 8 × 5 + 8 × 5

= 40 + 40

= 80

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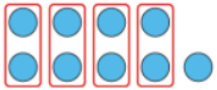
Year4 Multiplication and Division - Division and remainders

Explore arranging quantities into equal groups and express using a multiplication equation, eg 8 = 4 x 2 *('8 is equal to 4 groups of 2.')*

Explore what the numbers represent.
The 8 represents the total number of counters.
The 4 represents the 4 groups. The 2 represents the number of counters in each group,

Explore a quantity that cannot be partitioned into equal groups, eg 9. Express as an equation:



$9 = 4 \times 2 + 1$

Nine is divided into groups of 2. There are four groups of 2 and a remainder of 1.

Explore what the numbers represent.
The 9 represents the total number of counters.
The 4 represents the 4 groups. The 2 represents the number of counters in each group,
The 1 represents the remaining one counter.

Provide lots of practice of grouping counters and expressing in this way.

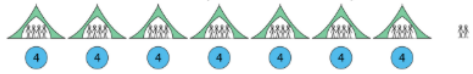
Build on from Y3 work on quotitive and partitive division – real contexts, with and without remainders.
.) NB: The NCETM models division by adding and subtracting groups on a number line. When there is a remainder, subtracting can becomes error prone as it does not utilise children's knowledge of multiple patterns. It is helpful to show this strategy to explore how the remainder is represented, but children should not spend time practising this.

Through intelligent practice, children will explore when division will result in a remainder and when it won't, and how the divisor will affect the size of the remainder.
Stem sentences:
'__ is a multiple of __ , so when it is divided into equal groups of __ there are none left over; there is no remainder.'
'__ is not a multiple of __, so when it is divided into equal groups of __ there are some left over; there is a remainder.'

Generalisations
If the dividend is a multiple of the divisor, there is no remainder.
If the dividend is not a multiple of the divisor, there is a remainder.
The remainder is always less than the divisor.

Introduce children to a variety of contexts where they need to make sense of the remainder to find the solution to a problem, either by 'rounding' the quotient up or down.

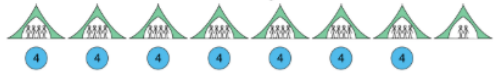
'Four scouts can fit in each tent. How many tents will be needed for thirty scouts?'



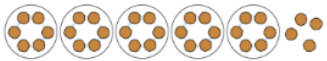
$30 \div 4 = 7 \text{ r } 2$

- *'The "30" represents the total number of scouts.'*
- *'The "4" represents the number of scouts in each tent.'*
- *'The "7" represents the number of full tents.'*
- *'The "2" represents the number of scouts left over.'*

- *'We need another tent for the two left-over scouts. Eight tents are needed.'*



'Stephanie is having a party. She has thirty-four biscuits and wants to put them onto plates of six. How many full plates of six can she make?'



$34 \div 6 = 5 \text{ r } 4$

- *'The "34" represents the total number of biscuits.'*
- *'The "6" represents the number of biscuits on each plate.'*
- *'The "5" represents the number of plates of biscuits.'*
- *'The "4" represents the number of biscuits left over.'*

- *'So, five full plates of biscuits can be made.'*

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Year4 Multiplication and Division - Multiplying and dividing by 10 and 100

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

8 made ___ times the size is ___.

Develop language in order to multiply and divide by 10 or 100.

80 is ten times bigger than 8.
8 is ten times smaller than 80.
80 is ten times the size of 8
8 is one-tenth the size of 80.

800 is one hundred times bigger than 8.
8 is one hundred times smaller than 800.
800 is on hundred times the size of 8
8 is one-hundredth the size of 80.

8 x 1 = 8
8 x 1 ten – 8 tens
8 x 1 hundred = 8 hundreds

Generalisations

All multiples of 10 have a ones digit of zero.

All multiples of 100 have both a tens and ones digits of zero.

To find the inverse of ___times as many, you divide by ____.

If one factor if made ___ times bigger/smaller then the product will be ten times bigger/smaller

ten times the size
x10

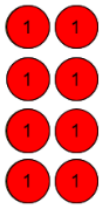
1,000s	100s	10s	1s
			8
		8	0

÷10
one-tenth of the size

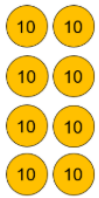
one hundred times the size
x100

1,000s	100s	10s	1s
			8
	8	0	0

÷100
one-hundredth of the size



8 × 1 = 8



8 × 10 = 80

8 × 100 = 800

8 groups of ___ is ___.