Bollin Primary School

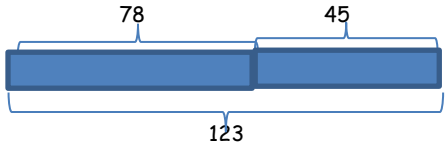
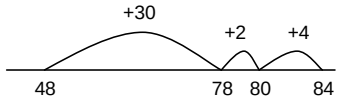
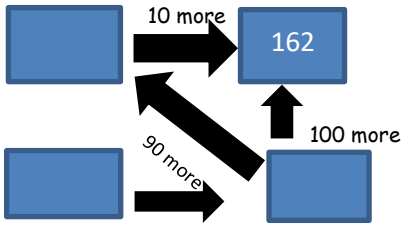
Calculation Policy

Year 3

Bollin Primary School

Growing hearts and minds together

Addition Guidelines

	Calculation Strategy	Questioning (adapt to use real life contexts where possible)	Vocabulary
Year 3	**+ = signs and missing numbers** Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers. Use of bar model to understand structure of addition.  **Mental Methods** Regroup to nearest multiple of 10 before adding (when ones cross tens boundary) Ensure use of equipment e.g. Cuisenaire, Numicon, Base Ten to aid e.g. 47+ 58 = 45 + 60 (by moving 2 from the 47 and giving it the 58, it makes this a much easier sum) (2) Or 77 + 46 = 80 + 43 (by moving 3 from the 46 and giving it to the 77) Children need to be secure adding multiples of 10 to any two-digit number including those that are not multiples of 10. 48 + 36 = 84  Missing numbers & balancing equations ☐ + 78 = 27 + 80 ☐ - 56 = 87 ☐ + ☐ + ☐ = 126 **Pencil and paper procedures (These should only be used where mental methods are inappropriate)** Partition the number into hundreds, tens and ones and begin to calculate using vertical column method. 183 + 242 = 425 **Stage 1** 100 + 80 + 3 200 + 40 + 2 300+120 + 5 = 425 Expanded (stage 1) and Ladder method (stage 2) are brief stepping stones on the journey to understanding standard written method. Children should only use these to gain understanding - it should not become a method they rely on.	• How many ways can you use 4, 7, and 11 in a number sentence? • What is 127 + 11, 136 – 9, 57 – 39, 103 + 69? • Continue the pattern 16 + 3 = 19, 16 + 13 = 29 etc. What is 16 + 83? • Work out 3 + 8 + 17. What number facts did you use? • What numbers go in the box 7 + 7 = ■, 17 + 17 = ■, 27 + 27 • 36 + 10, 36 +100 and 36 + 20, 36 + 200 • 512 + 1, 512 + 10, 512 + 100, an 512 + 6, 512 + 60, 512 + 600 • Jani says 198 + 214 s best to be done using written method. Elise says she thinks she can manipulate the numbers to be 200 + 212. Which method do you think is the most efficient and why? • Which is closest to 1000, 364 + 643 Or 364 + 634? How do you know without calculation? • If183+242=425, then how you can use this information to quickly solve 283 + 242, or 186 + 242, or 183 + 262? • Stephen states that he used three odd numbers to add up to 136. Explain why he cannot be correct? • Jason adds 3 different even numbers between 20 and 50 to make a total of 102. Which numbers could he have used? Would it have been possible to solve this using numbers between 20 and 40? • Solve missing number questions such as:  	+, add, more, addition plus make, sum, total altogether, double, near double, one more…, two more… ten more…, 100 more…greater, more, units, ones, tens, count, count (up) to count on (from, to) how many…? Hundreds boundary.

Stage 2

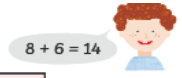
367
+185
12
140
400
552

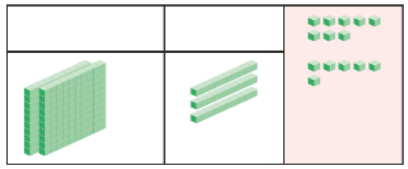
Stage 3

367
+ 185
552
11

Method 2

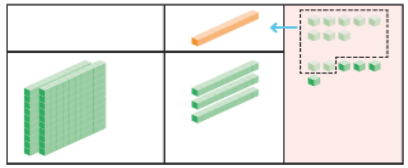
Step 1 Add the ones.
8 ones + 6 ones = 14 ones





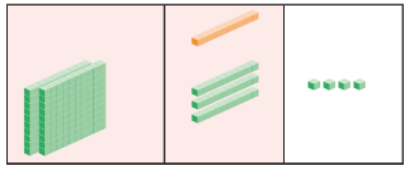
	h	t	o
			8
+	2	3	6
			4

Step 2 Regroup the ones.
14 ones = 1 ten + 4 ones



	h	t	o
			8
+	2	$\frac{1}{3}$	6
			4

Step 3 Add the tens.
1 ten + 3 tens = 4 tens
Add the hundreds.



	h	t	o
			8
+	2	$\frac{1}{3}$	6
	2	4	4

8 + 236 = 244
There are 244 children altogether.

Ladder method – PV grids could be used to start and as an aid throughout.

200 less

Other questions that could be posed around this model include, what would happen to the relationship between the numbers if the top arrow was 10 less? 20 more? Etc. The position of the numbers and the language in this are really important.

Step 1 Add the ones.

8 + 6 = 14

	h	t	o
			8
+	2	3	6
		1	4

Step 2 Add the tens.

0 + 30 = 30

	h	t	o
			8
+	2	3	6
		1	4
+		3	0

Step 3 Add the hundreds.

0 + 200 = 200

	h	t	o
			8
+	2	3	6
		1	4
		3	0

Step 4 Add 14, 30 and 200

8 + 236 = 244

	h	t	o
+	2	0	0
	2	4	4

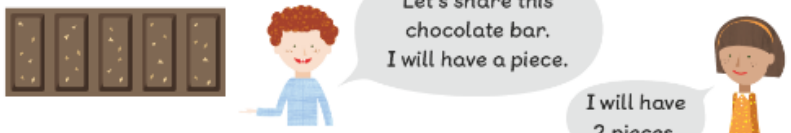
Compact method – PV grids could be used to start and as an aid throughout. Some chn may need to use the concrete to support their understanding, such as counters or Dienes.

Fractions

Add fractions of the same denominator within one whole – using equipment and real life situations to aid understanding

e.g $\frac{1}{7} + \frac{4}{7}$

In Focus



How much of the chocolate bar did the two children eat?

Let's Learn

1 Each piece is 1 fifth of the bar.

$\frac{1}{5}$

eats 1 fifth of the bar.

$\frac{2}{5}$

eats 2 fifths of the bar.

Together,  eat 3 fifths of the chocolate bar.

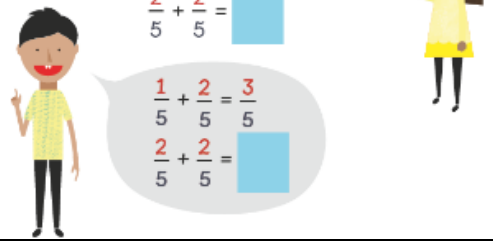
1 fifth + 2 fifths = 3 fifths

$\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$

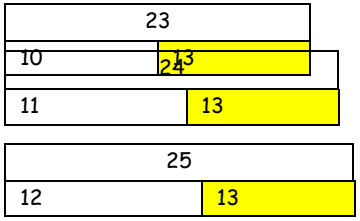
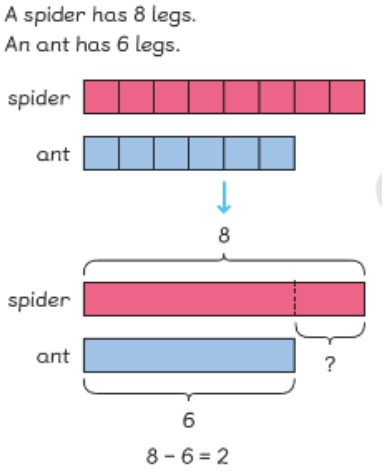
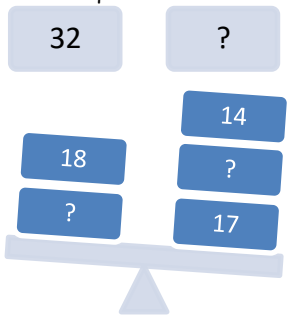
2 Add $\frac{2}{5}$ and $\frac{2}{5}$.

2 fifths 2 fifths

$\frac{2}{5}$ $\frac{2}{5}$



Subtraction Guidelines

	Calculation Strategy	Progression	Vocabulary
Year 3	Subtract numbers using concrete objects, pictorial representations, and mentally, including: two-digit and three digit numbers **Mental Methods- consolidate use of number line taught in Key Stage 1** Find a small difference by counting up Continue as in Year 2 but with appropriate numbers e.g. 102 – 97 = 5 Subtract mentally a 'near multiple of 10' to or from a two-digit number Continue as in Year 2 but with appropriate numbers e.g. 78 – 49 is the same as 78 – 50 + 1 **Adjusting numbers** Understand that : 23-10 =13 63 - 25 = 38 574 - 156 24-11 = 13 62 – 24 =38 584 - 166 25-12 = 13 61 – 23 =38 1574 - 1156 26-13 = 13 60 – 22 =38 27-14 = 13 59 – 21 =38 806 – 454 816 – 464 Use of part, part, whole Bar model and comparative bar model:   Once children understand this – how can this help to make 94 – 68 …becomes 96 – 70 = 26 (much easier) 212 – 194…becomes 218 – 200 = 18 (much easier) 497 – 302 = 495 – 300 (slightly easier)	• What is 15 – 8? How does this help you to find 150 – 80, 65 – 58? Give reasons • ■ + ▲ – ◆ = 20. What could the three missing numbers be? Is it possible to solve this using digits which are all smaller than 10, or all larger than 10? Can it be solved with only even numbers, only odd numbers, a mixture of odd and even? • Derive quickly all number pairs that total 100. 62 + ■ = 100; 100 = 75 + ■; what needs to be added to 37 to make 100? • Offer solutions to questions such as: 	-, subtract, take (away), minus leave, how many are left/left over? one less, two less… ten less… one hundred less how many fewer is… than …? how much less is…? difference between half, halve =, equals, sign, is the same as tens boundary, *hundreds boundary*

Balancing equations:

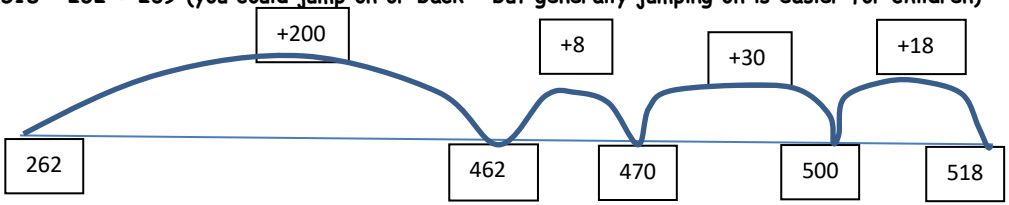
◊ - 26 = 38 – 27

57 - ◊ = 77 – 38

35 – 26 = ◊ - 30

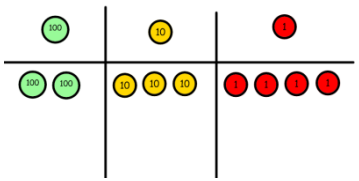
<u>Use of number line for jumping on to subtract (if adjusting is not appropriate)</u>

518 – 262 = 239 (you could jump on or back – but generally jumping on is easier for children)



<u>Pencil and Paper Procedures</u> Continuation of prior knowledge and methods in Year 2, including exchanging and renaming with up to three digit numbers. Begin to exchange ones once secure move to tens:
Use <u>Base ten</u> first to explain this BEFORE moving on to using place value counter/cubes.

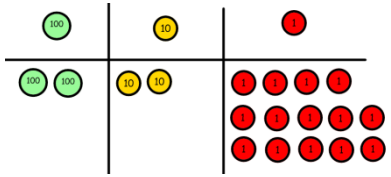
Make the larger number with the place value counters.



<u>Calculations</u>

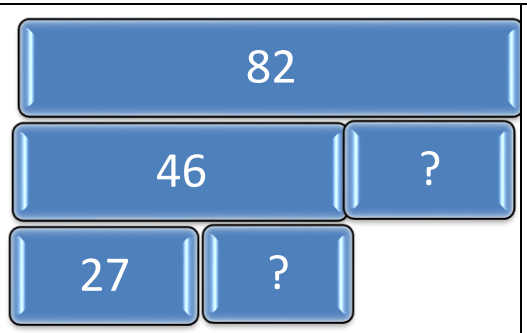
234
- 88

Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones

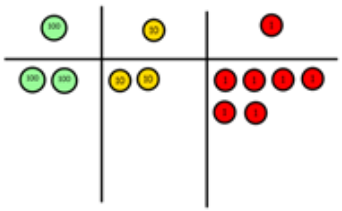


<u>Calculations</u>

234
- 88



Now I can subtract my ones.

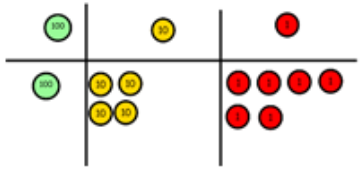


Calculations

234
- 88

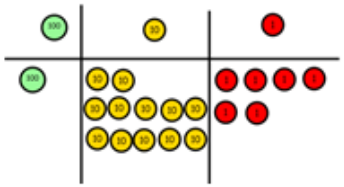
Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.

Now I can take away eight tens and complete my subtraction



Calculations

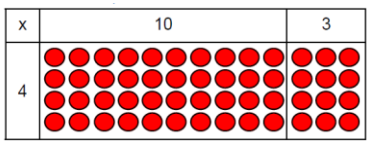
~~2~~ 1 ~~3~~ 4
- 88
146



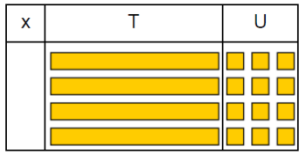
Calculations

234
- 88

Multiplication Guidelines

	Calculation Strategy	Progression	Vocabulary
Year 3	Multiply whole numbers by 10 and 100 ensuring that children understand that numbers move along the place value chart **(WE DON'T ADD ZEROS)** Develop efficient mental methods, for example, using commutativity and associativity e.g. 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) Partition tens and ones to complete T0 x 0. e.g. Show the link with arrays to first introduce the partitioning/grid method. 13 x 4  4 rows of 10 4 rows of 3	Is 35 a multiple of 5? How do you know? Jason says that all multiples of 4 are also multiples of 8. True or false? Give examples to prove you are correct. • Arrange the following digits to solve the product calculation below:	lots of, groups of x, times, *multiplication*, multiply, multiplied by multiple of, *product* once, twice, three times, four times, five times… ten times… times as (big, long, wide and so on) repeated addition array row, column

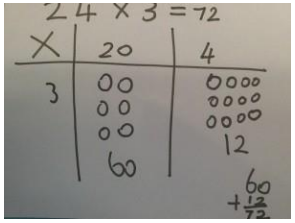
Move on to using Base 10/Dienes/PV counters to move towards a more compact method. They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.



13 x 4
10 x 4 = 30
3 x 4 = 12

30 + 12 = 42

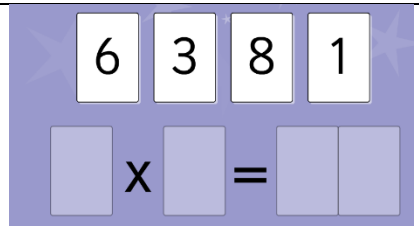
4 rows of 13



Grid method can be used as a stepping stone to build upon before moving to ladder method.

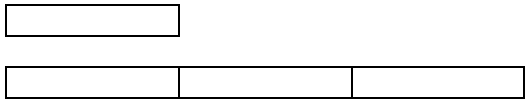
×	30	5
7	210	35

210 + 35 = 245

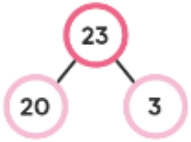


If you add 6 × 5 and 8 × 5, what multiple of 5 do you have?
If you add 6 × 5 and 8 × 5, what multiple of 10 do you have? (greater depth)

Henry has 15 toy cars. John has 3 times as many toy cars as Henry. How many toy cars has John got?
OR
How many toy cars do they have altogether. (These would still be represented on a comparative bar model):



Depth (once they've drawn the 3 comparative bar models they should then see that they only need to do 15 x 4 to solve this question):



Step 1 Multiply the ones by 2.

3 ones × 2 = 6 ones

	t	o
	2	3
×		2
		6

Step 2 Multiply the tens by 2.

2 tens × 2 = 4 tens

	t	o
	2	3
×		2
		6
	4	0

Step 3 Add the products.

6 + 40 = 46

	t	o
	2	3
×		2
		6
+	4	0
	4	6

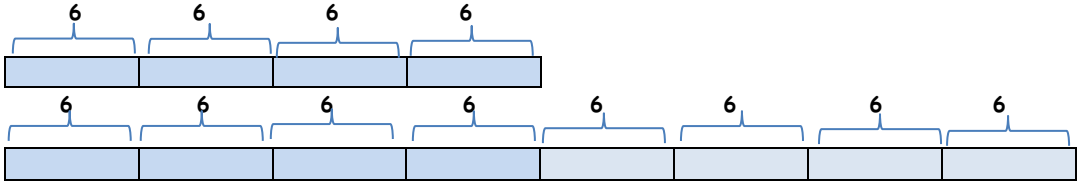
23 × 2 = 46

There are 46 children in the 2 classes.

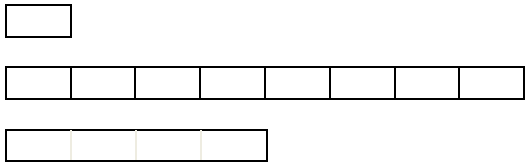
Chant 3, 4, 6 and 8 x tables to ensure rapid recall and know associated division facts.

Know that the 8 x table is double the 4s, and the 6s are double the 3s.
Use arrays and bar models to make this explicit

e.g 4 x 6 doubles to 8 x 6:



Hattie has 15 toy cars. John has 8 times as many toy cars as Hattie. Zak has half the amount of toy cars that John has. How many toy cars has Zak got?



True or false?

All the numbers in the two times table are even.

There are no numbers in the three times table that are also in the two times table.

Solve questions such as:

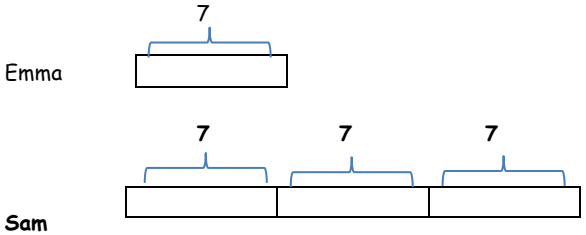
☐ x 6 = 42 ☐ x ☐ = 4 x 7

4 x ☐ = 8 x 12 (master understanding of doubling rule)

3 x ☐ = ☐ x 6 6 x ☐ + 7 = 6 x 8 + 1 (depth)

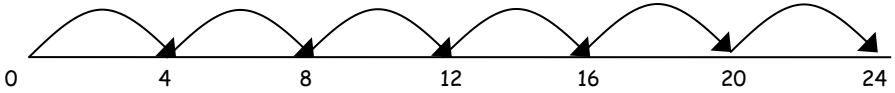
☐ x 4 + 2 = 3 x 8 + 6 (mastery with greater depth)

Use bar models to represent/solve real life questions such as:
Sam has 3 times as many marbles as Emma. Emma has 7 marbles. How many has Sam?



3 x 7 = 21

Division Guidelines

	Calculation Strategy	Progression	Vocabulary
Year 3	Ensure that the emphasis in Y3 is on both **grouping** and **sharing**. Keep division in context: e.g. Cards come in packs of 4. How many packs do I need to buy to get 32 cards? Children will continue to use: **Additive division using a number line** Children will use an empty number line to support their calculation. 24 ÷ 4 = 6  Use a Bar model to show division as breaking into groups:	Use Bar models to solve and represent word problems: •How many lengths of 10 cm can you cut from 81 cm of tape? How many will be left? • If you put 25 eggs in boxes of 6, how many boxes would you fill? How many eggs would be left over? How many boxes would be needed for all of the eggs. •Scalextric cars use 3 AA batteries, I buy 2 packs of 8 batteries, how many cars can I power? • Count a handful of pasta pieces by grouping them	double, halve share, share equally one each, two each, three each… group in pairs, threes… tens equal groups of ÷, divide, *division*, divided by, divided into left, left over, *remainder*

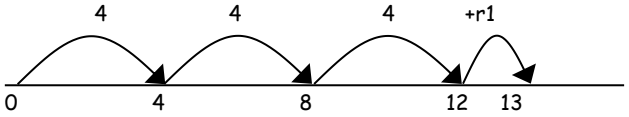
48 ÷ 6 = □ 48

□ x 6 = 48

?					

Children should also move onto calculations involving remainders.

13 ÷ 4 = 3 r 1



Using symbols to stand for unknown numbers to complete equations using inverse operations

26 ÷ 2 = □ 24 ÷ △ = 12 □ ÷ 10 = 8

Continue to relate division facts to known multiplication facts.
Know that 4 x 6 = 24 therefore 24÷6=4 and 24÷4=6,

Manipulation to make division easier:
24 ÷ 6 = 12 ÷ 3

Extend to: 112 ÷ 4 = 56 ÷ 2

in 5s.How many groups do you think I will get? How many 5s were there? How many left over?
How many pasta pieces altogether? What division sentence could you write?

- How many will be left over if I divide 27 by 5?
- How many 5s make 35?
- If I know 4 x 6 = 24 link this to knowing therefore that 25÷6=4r1 or 25÷4=6r1, what would 26÷4 be?

Prove it (link to multiplication)

What goes in the missing box?		
x	?	?
4	80	12

Use the inverse to check if these calculations are correct:

23 x 4 = 82

117 ÷ 9 = 14

□ ÷ 6 = 124 ÷ 12

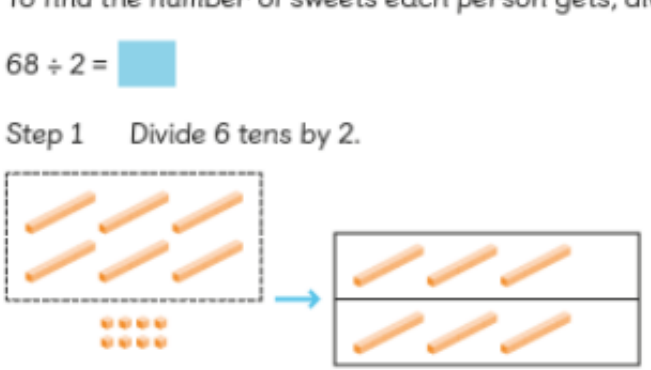
USE PARTITIONG (INFORMAL METHOD) TO INTRODUCE WRITTEN DIVISION BEFORE BUS STOP METHOD.

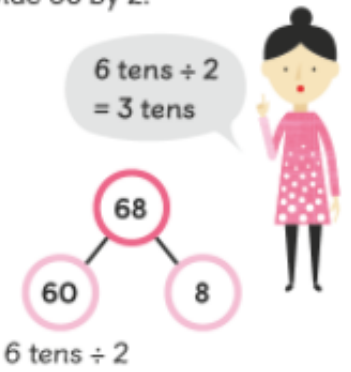
Simple dividing:

To find the number of sweets each person gets, divide 68 by 2.

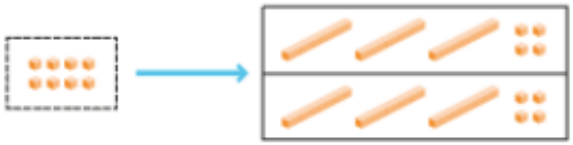
68 ÷ 2 = ☐

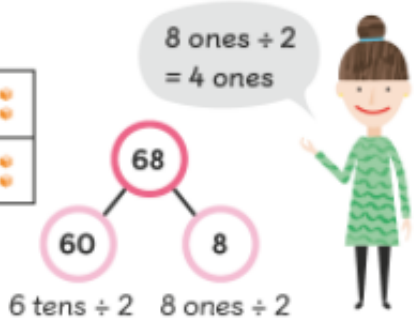
Step 1 Divide 6 tens by 2.





Step 2 Divide 8 ones by 2.





Step 3 Add the results.

68 ÷ 2 = 30 + 4 = 34

Each person gets 34 sweets.

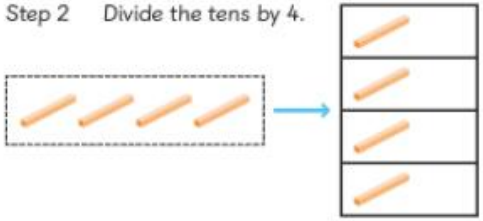
Dividing with regrouping:

To find the number of ice creams in each box, divide 52 by 4.

$52 \div 4 =$ ☐

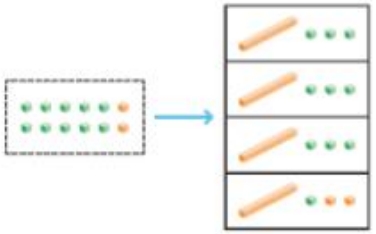
Step 1 Split 52 into 40 and 12.

Step 2 Divide the tens by 4.



Step 3 Regroup 1 ten into 10 ones.

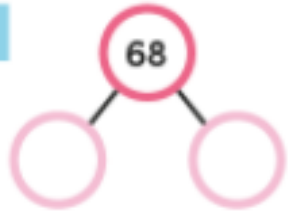
Step 4 Divide the ones by 4.



Step 5 Add the results.

$52 \div 4 = 10 + 3 = 13$

There are 13 ice creams in each box.

	$54 \div 3 =$  $68 \div 4 =$ 	$96 \div 80 =$