IGNITE INNOVATE INSPIRE

Calculation Policy

September 2022

RATIONALE: The 2011 Ofsted published report into *Good Practice in Primary Mathematics* states that “A feature of strong practice in the maintained schools is their clear, coherent calculation policies and guidance, which are tailored to the particular school’s context. They ensure consistent approaches and use of visual images and models that secure progression in pupils’ skills and knowledge lesson by lesson and year by year.”

AIMS: At Monkhouse Primary School we aim for children to become fluent in all four operations. Through our policy we aim to provide consistent approaches and guidance to calculation methods across the school, ensuring that pupils develop efficient written methods which allow them to perform calculations accurately. We aim for them to become fluent in their calculation skills, allowing them over time to use their methods to solve increasingly complex problems with accuracy and efficiency. The progression in calculation skills and expectations match the expectations of the National Primary Curriculum for 2014.

Each operation is broken down into four stages. There are recommendations as to when each stage should be introduced, however at Monkhouse we recognise that not all children progress at the same pace. Therefore children will be taught a method that is consistent with their current level. Children should be taught the method at the stage appropriate to their current level of attainment and should move to the next stage as soon as is appropriate in their mathematical development.

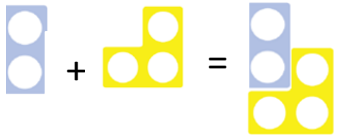
ADDITION

Stage 1

Children understand the concept of addition as the combining of two groups. They understand that when they add two numbers the answer will be larger. They understand the + and = symbols and use these correctly in number sentences. Calculations should be written on either side of the equals sign to that = is not just interpreted as the answer

6 + 2 = 8 **8 = 6+2**

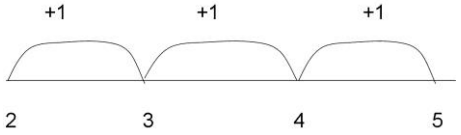
Children use Numicon and visual representations to add two numbers.



2 + 3 = 5

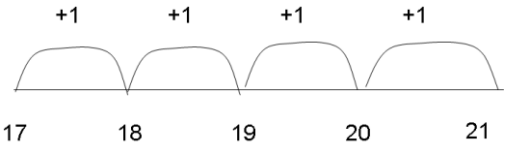
2 + 3 = 5

Extending to counting up in 1s on a number line.



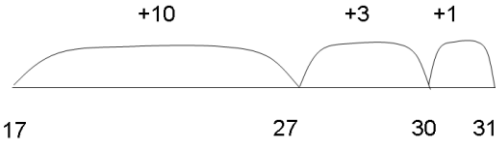
Stage 2

Children add 2 and 3 digit numbers using a number line.



17 + 4 = 21

The number line is extended to partitioning and adding tens then units when faced with larger numbers. Children use known number facts to help them bridge through multiples of 10.



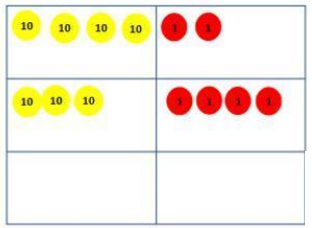
17 + 14 = 31

Children are supported in developing an understanding that addition and subtraction are inverse operations.

Recommended by the end of Year 1

Stage 3

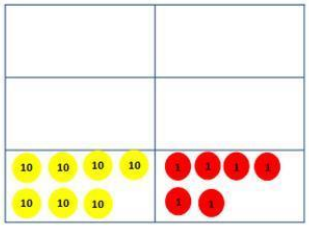
Children are introduced to the column method using **numbers appropriate to their current level of attainment.** Initially place value counters or deines are used, extending to the short formal method (without exchanging).



42 + 34 =

42

+ 34



42

+ 34

76

643

+ 226

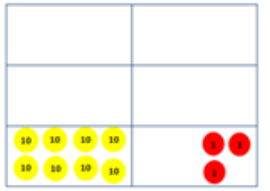
869

Children begin to use the inverse operation to check their addition calculations.

Recommended by the end of Year 2(with deines, place value counters Year 4 and beyond)

Stage 4

Children use the short written method using carrying **with numbers appropriate to their current level of attainment.** The digit exchanged goes underneath the answer. Initially place value counters or deines are used to secure an understanding of exchanging. Children estimate their answers first through rounding to an appropriate amount



56

+ 27

83

1

7893

+ 5385

13278

1 1

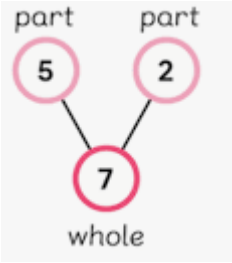
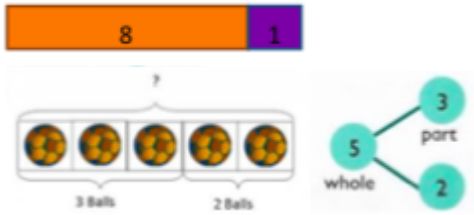
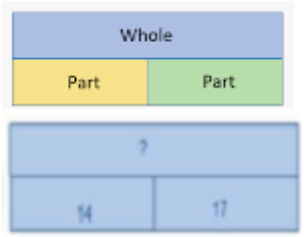
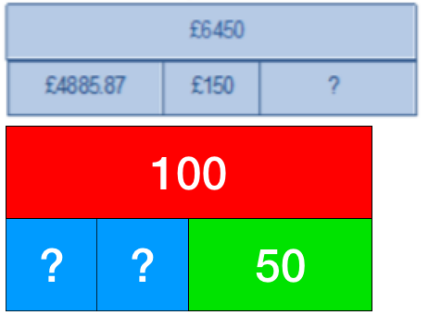
31.76

+ 18.07

49.83

1

Children routinely use the inverse operation to check their addition calculations.

			Recommended by the end of Year 3 (with deines, place value counters Year 4 and beyond)
Children are introduced to the language of first, next , now and use representations to show this 	Children are introduced to the part, part, whole model in a range of ways 	Children are introduced to the Singapore Bar model as a way of representing the question and linking this to part, part, whole 	By this point children should be confident in using the Singapore Bar to represent a problem and to assist with multi step problems or inverse operations (relevant to their year group) 

SUBTRACTION

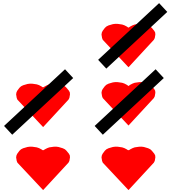
Stage 1	**Stage 2**	**Stage 3**	**Stage 4**

Children understand the concept of subtraction as taking a number away from another. They understand that subtraction causes numbers to become smaller. They understand the - and = symbols and use these correctly in number sentences. Calculations should be written on either side of the equals sign to that = is not just interpreted as the answer

6 - 2 = 4 4 = 6 - 2

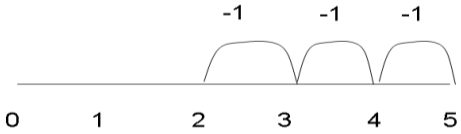
Children use Numicon and visual representations to subtract two numbers.

5 - 3 = 2

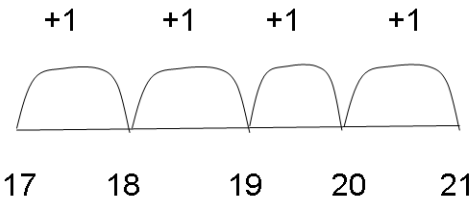


5 - 3 = 2

Extending to counting back in 1s on a number line.

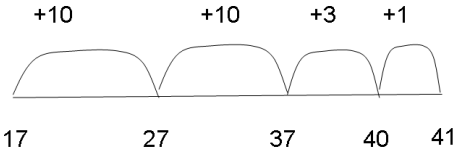


Children find the difference by counting on using a number line. Number lines should be a representation of a child's thought process and should lead to quick mental strategies.



20-17 = 4

The number line is extended to partitioning and counting on to find greater differences.



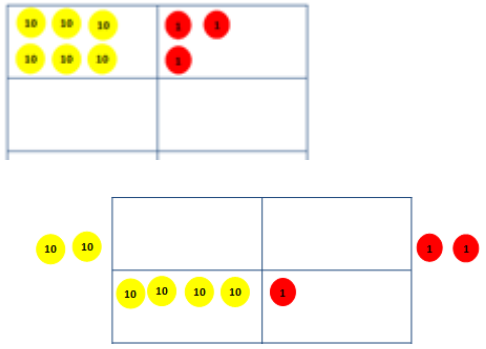
41 – 17 = 24

Children are supported in developing an understanding that subtraction and addition are inverse operations.

Recommended by the end of Year 1

Children are introduced to the column method using **numbers appropriate to their current level of attainment.**
Initially place value counters or deines are used, extending to the short formal method (without exchanging).

63 - 22 = 41

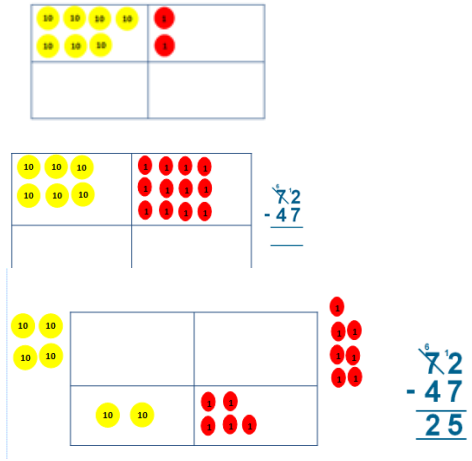


63
-22
42

Children begin to use the inverse operation to check their subtraction calculations.

Recommended by the end of Year 2(with deines, place value counters Year 4 and beyond)

Children use the short written method using exchanging **with numbers appropriate to their current level of attainment.**
The adjustments are recorded above the calculation
Children estimate their answers first through rounding to an appropriate amount

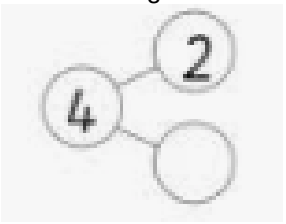
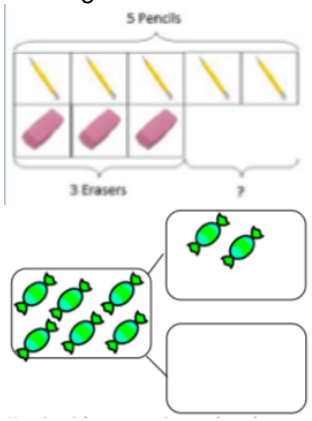
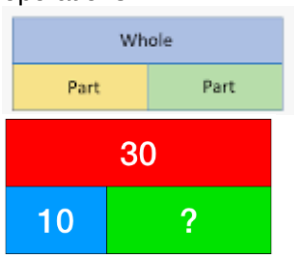
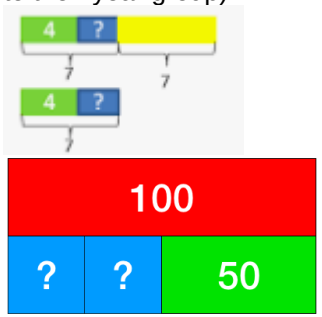


8 1
7893
-5385
2508

5 16 1
36.76
-13.87
22.89

Children routinely use the inverse operation to check their subtraction calculations.

Recommended by the end of Year 3(with deines, place value counters in Year 4 and beyond)

Children are introduced to the language of first, next , now and use representations to show missing values 	Children are introduced to the part, part, whole model in a range of ways to show missing values and subtraction 	Children are introduced to the Singapore Bar model as a way of representing the question and liking this to part, part, whole. They see that the bar can be used to show subtraction and inverse operations 	By this point children should be confident in using the Singapore Bar to represent a problem and to assist with multi step problems or inverse operations (relevant to their year group) 

MULTIPLICATION

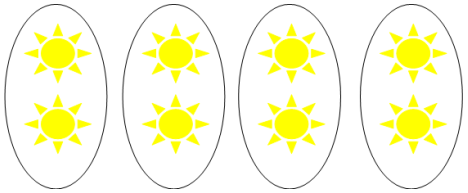
Stage 1	**Stage 2**	**Stage 3**	**Stage 4**

Children begin to understand the concept of multiplication as 'groups' or 'lots' of. They recognise the x sign and use Numicon and visual representations to show groupings of amounts.

They would learn that first they say the number in a group, followed by the number of groups. for example 2 x 5 would be two, 5 times

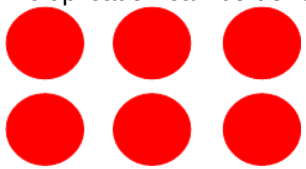
3 lots of 3 3 x 3 = 9

3 lots of 2 2 x 3 = 6



4 groups of 2 2 x 4 = 8

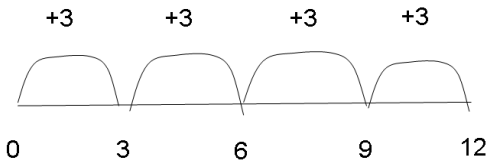
Children describe multiplication as an array and begin to recognise that multiplication can be done in any order.



3 x 2 = 6

2 x 3 = 6

This is extended to using a number line, showing multiplication as repeated addition.



3 + 3 + 3 + 3 = 12
OR
3 x 4 = 12 (Three, 4 times)

Children are supported in developing an understanding that multiplication and division are inverse operations.

Recommended by the end of Year 2

Children use the grid method as an informal method to carry out multiplication calculations. They use **numbers appropriate to their current level of attainment.**
Children estimate their answers first.

23 x 8 =

E = 20 x 10 = 200

x	20	8
8	160	24

160
+ 24
184

372 x 24 =

E = 400 x 20 = 8000

x	300	70	2
20	6000	1400	40
4	1200	280	8

7440
+ 1488
8928

Recommended by the end of Year 4

Children use the short written method using carrying **with numbers appropriate to their current level of attainment.**
The digit carried goes underneath the answer.
Children estimate their answers first.

E = 20 X 7

23
X 7
21 (3x7)
140 (20 x 7)

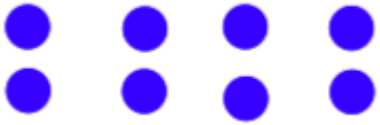
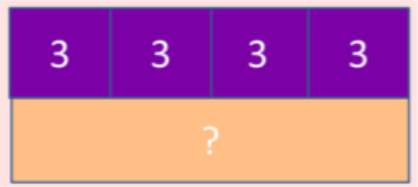
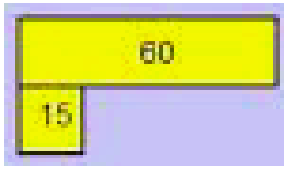
161

Progressing to 3 digit numbers and 4 digit numbers by 2 digit numbers

243
X 72
6 (3x2)
80 (40x2)
400 (200x2)
210 (70x3)
2,800 (70x40)
14,000 (70x200)
17,496
1

This is extended to long multiplication, where relevant in year 6

Recommended for Years 5 and 6

Multiplication is shown through the use of arrays to represent 	The children are introduced to a number of arrays to represent ways to show the problem 	Children are introduced to the singapore bar as a way of representing the problem and showing commutativity 	Children should represent their learning in different ways, where appropriate due to the size of numbers and showing a missing value when the number of groups are unknown 

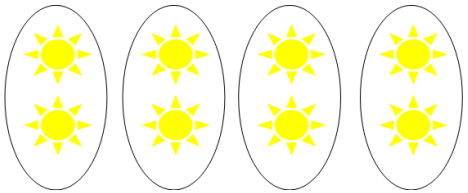
DIVISION

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**

Children begin to understand the concept of division as grouping and sharing and recognise the ÷ sign.

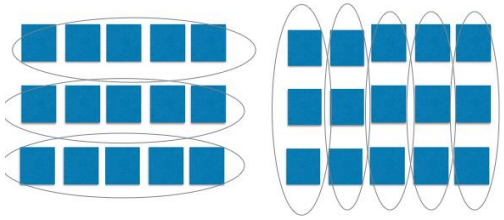
They use visual representations to show sharing amounts equally

6 shared equally by 3 6 ÷ 3 = 2



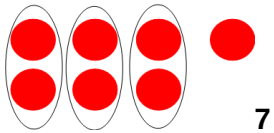
8 shared equally into 4 groups
8 ÷ 4 = 2

Children describe division as sharing into equal groups. They earn the difference between quotative and partitive division



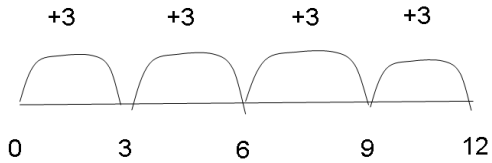
Quotative - 6 shared into groups of 3 (repeatedly subtract groups of 3)
Partitive - 6 shared into 3 equal groups (fair share into 3 groups)

They develop an understanding of remainders.



7 ÷ 3 = 2 r 1

This is extended to using a number line to show division as repeated addition and thus creating a link between multiplication and division.



SO
12 ÷ 3 = 4

Recommended by the end of Year 2

Children use the short written method to divide numbers, including decimals, by a single digit. They use **numbers appropriate to their current level of attainment.**

$$\begin{array}{r} 36 \\ 4\overline{)144} \end{array}$$

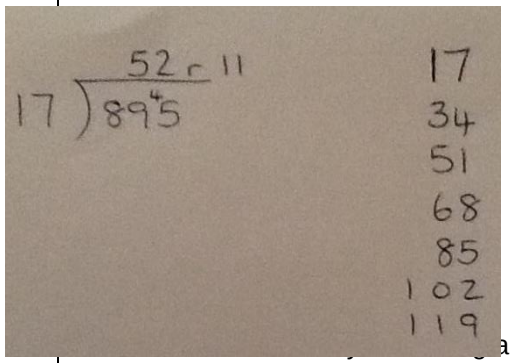
They show remainders and extend showing remainders as fractions.

$$\begin{array}{r} 26\ r\ 4 \\ 7\overline{)186} \end{array}$$

186 ÷ 7 = 26 r 4 OR 26 4/7

Recommended by the end of Year 3

Children use long written method to divide number, including decimals, by two and three digits. They use **numbers appropriate to their current level of attainment.**



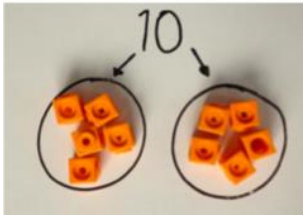
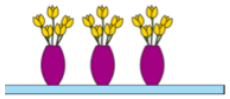
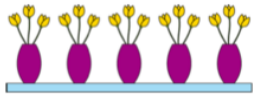
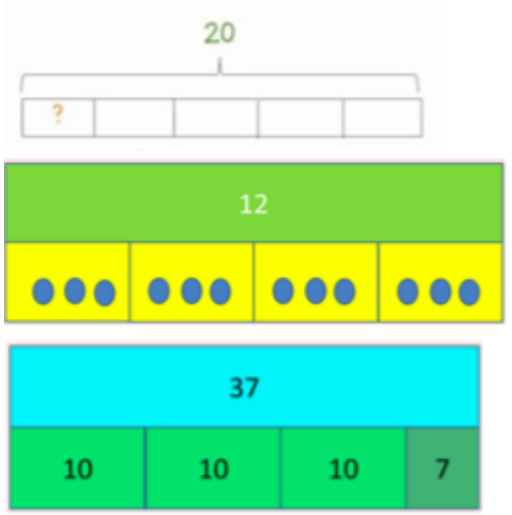
remainder. as remainder, as fraction and as a decimal (to 2DP) and when it is relevant to use each method.

$$\begin{array}{r} 104\ r\ 2 \\ 8\overline{)834} \end{array}$$

$$\begin{array}{r} 104\ \text{and}\ \frac{2}{8} \\ 8\overline{)834} \end{array}$$

$$\begin{array}{r} 104.25 \\ 8\overline{)834.00} \end{array}$$

Recommended for Years 5 and 6

Children are introduced to ways of representing equal groups 	Children use models to show quotative and partitive division and explicitly taught the difference between then both (sharing and grouping)  15 ÷ 5 = 3  15 ÷ 5 = 3	The Bar Model is introduced to show division and to show remainders 	

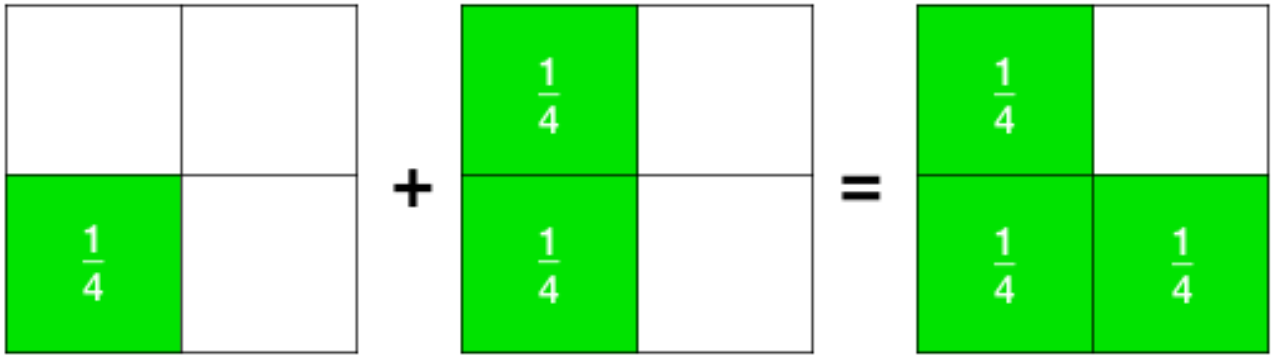
CALCULATING WITH FRACTIONS

Stage 1

Children begin to understand the concept of fractions by adding and subtracting fractions. They understand the roles of the numerator and denominator

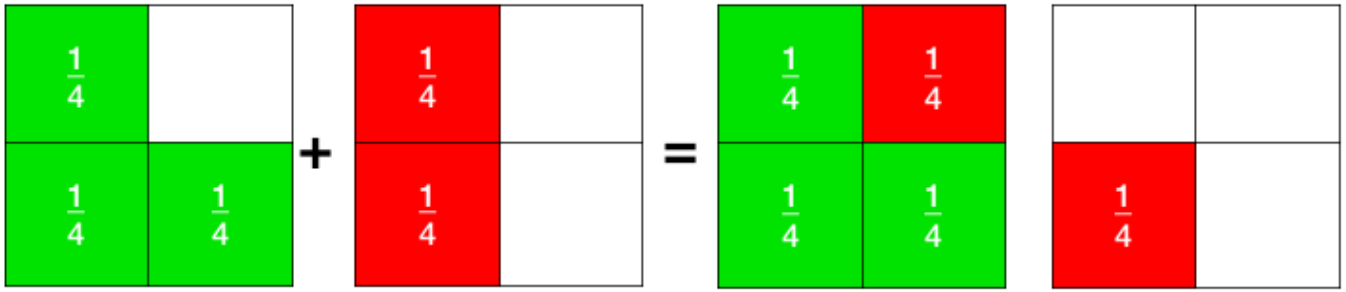
1/4 + 2/4 = 3/4

Children use models and manipulatives (post it notes) to represent the problem



Year 3

They move onto adding and subtracting through the whole



3/4 +2/4 = 5/4 or 1 and 1/4

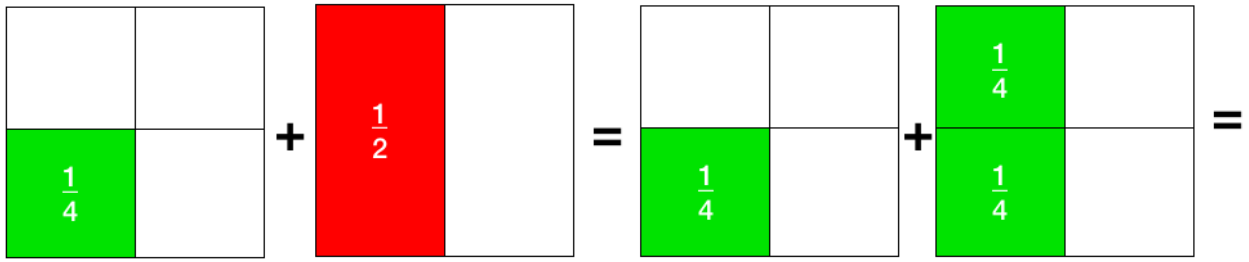
Year 4

Stage 2

Children use their knowledge of equivalence to add and subtract fractions with different denominators

Start with finding an equivalent fraction of one denominator

1/4 + 1/2 =

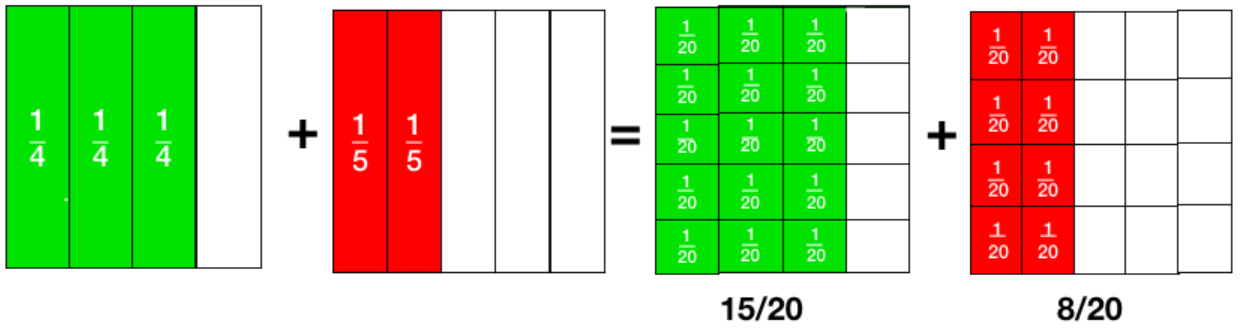


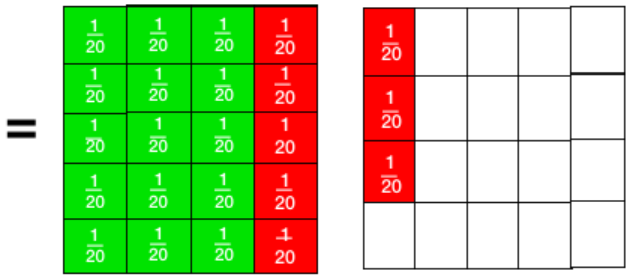
Explore this when the answer is a mixed number

3/4 + 1/2 =

Add and subtract with two different denominators ny converting to an equivalent denominator

3/4 + 2/5





23/20 or 1 and 3/20

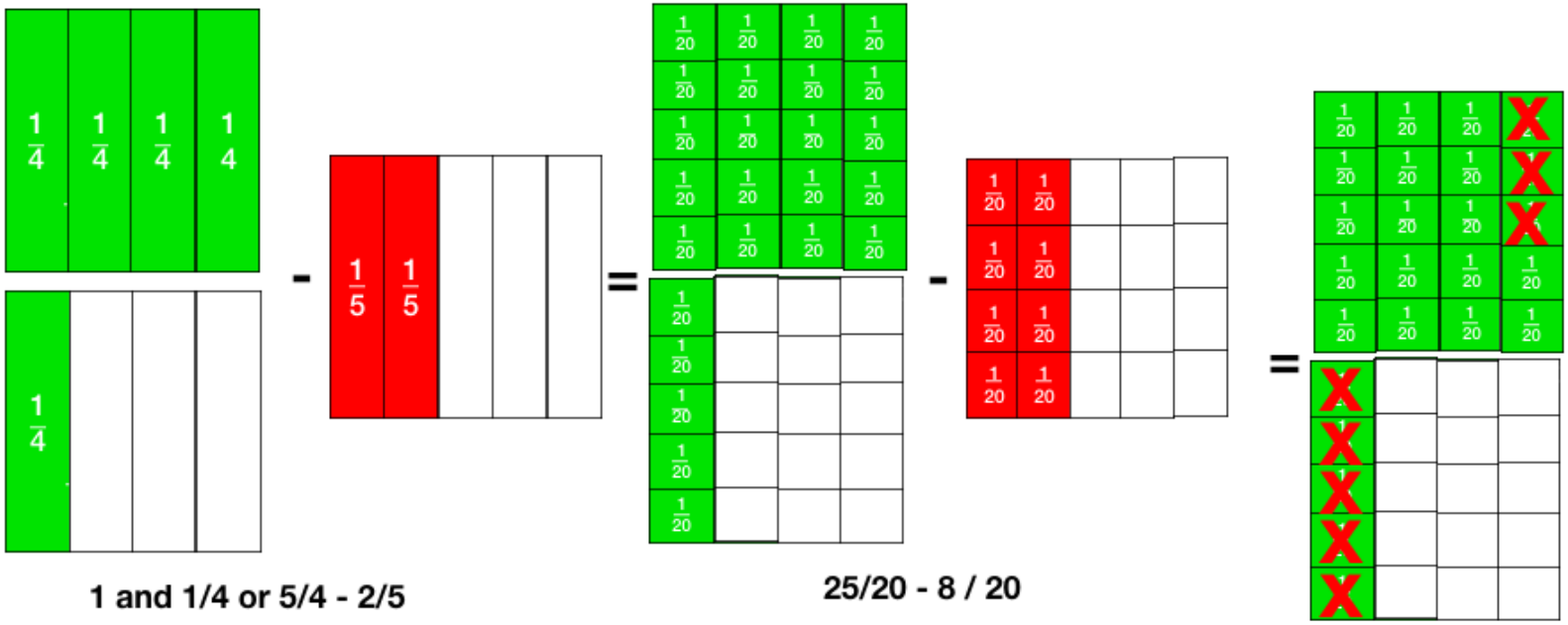
Stage 3

Children use different methods and models to add and subtract mixed numbers

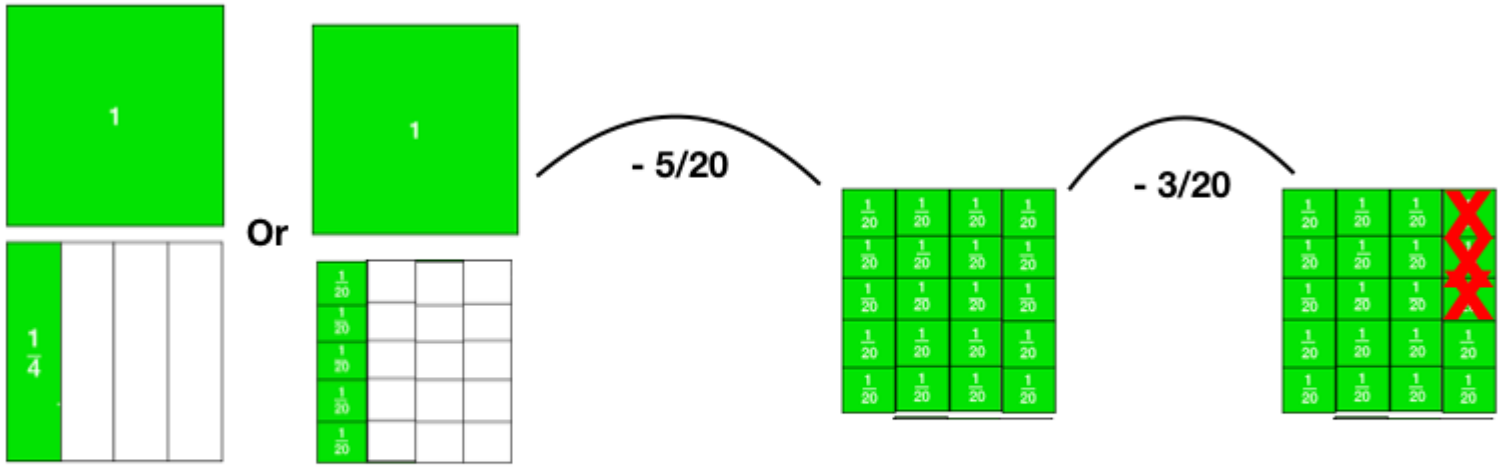
1 1/4 - 2/5 =

Children learn two methods for completing adding and subtracting mixed fractions

1 - Converting to **improper fractions**, find equivalent fractions and subtract



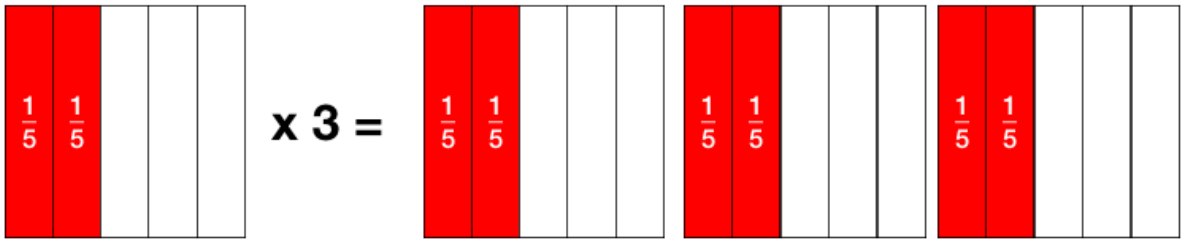
2 - Using number line to find equivalent fractions,subtract to the nearest whole number then subtract the remaining fractions

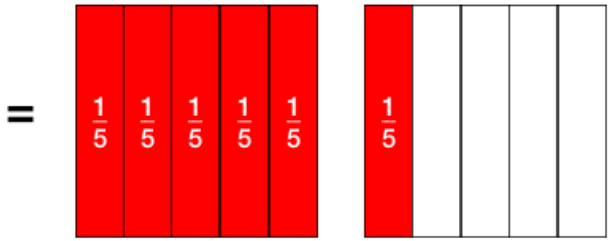


Stage 4 - Years 5 and 6

Children use their knowledge of fractions and different models to multiply and divide fractions

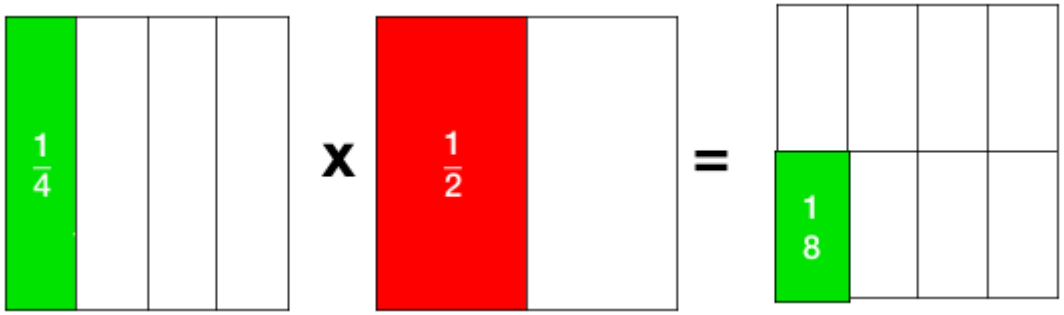
Multiply fractions by whole numbers (multiply the numerator by the integer - ⅖ x 3)



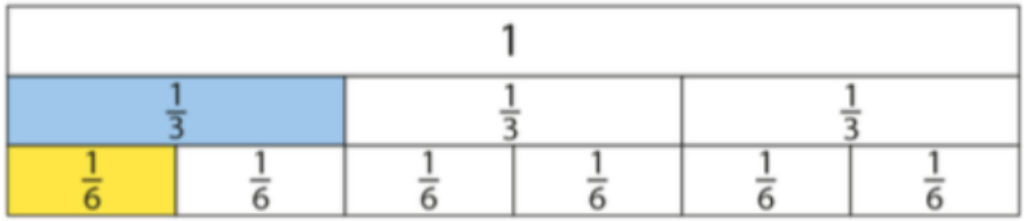


6 / 5 or 1 and 1/5

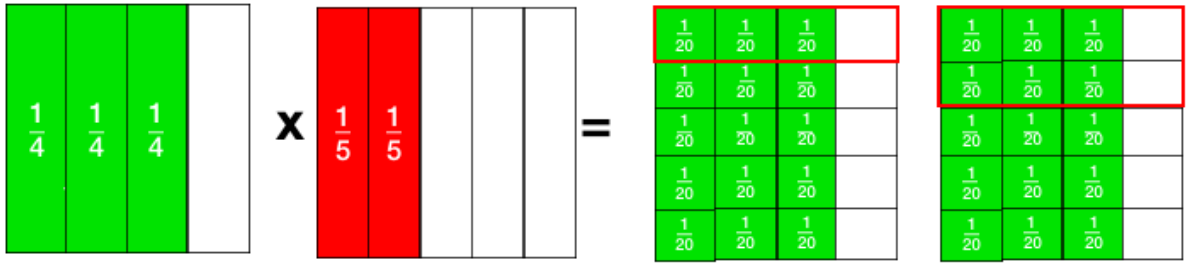
Multiply fraction by fraction. Children learn to find x amount of a fraction. 1/2 of 1/4, which is the same as 1/2 x ¼ (children multiply the numerators together. Then multiply the denominators together)



or 1/3 x 1/2



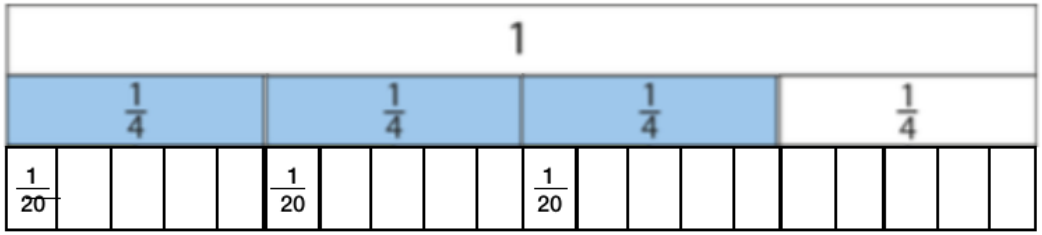
And then multiplying fractions by non unit fractions

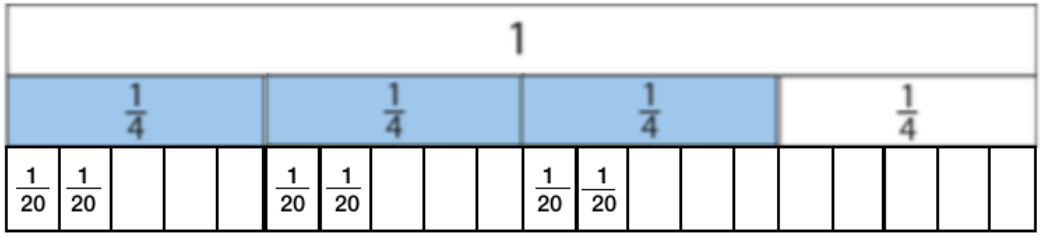


3/4 x 2 /5

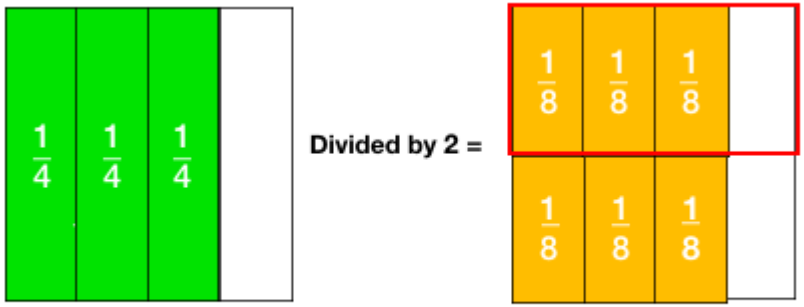
1/5 of 3/4 = 3/20

2/5 of 3/4 = 6/20





Divide fractions by whole numbers (children multiply the denominator by the integer)



3/4 divided by 2 = 3/8