Spire Junior School

Parent Information Guide to helping your child in Maths

Foreword

Have you ever found yourself wanting to help your child with their mathematics work and realising that "*it is all different from when I was at school*"?

The aim of this booklet is to help parents and carers to have a better understanding of how our school approaches mathematics and therefore to be more able to get involved in their child's mathematical learning. It will explain the strategies that children will be exploring for the four operations of addition, subtraction, multiplication and division.

An essential part of any child's learning is to apply their understanding to many different aspects of real life as this is, after all, why they are learning mathematics in the first place.

Overview

Our Calculations Policy builds on the interconnectedness of mathematics and outlines the progression for addition, subtraction, multiplication and division. The links between the operations (+ - x and ÷) and the inverse (reversible) nature of them should be made explicit from the beginning of their mathematical education.

Children should **secure mental strategies**. They are taught the strategy of counting forwards and backwards in ones and tens first and then 'Special Strategies' are introduced. Children are taught to look carefully at the calculation and decide which strategy they should use. Children should explain and reason as to why they have chosen a strategy and whether it is the most efficient.

The **formal written methods** should be introduced with caution and only when the children have depth of understanding. Calculations that require a written method should be presented to the children and models and images, such as dienes apparatus, place value counters, etc. should be used to ensure children have a conceptual understanding of the written method and that it is not a process that the children use for every type of calculation regardless of whether it can be completed mentally or mentally with jotting i.e. the number line.

By being taught a variety of methods children realise that there are better, more efficient methods depending on the numbers in the calculation. They think more carefully about the questions set, and unless a particular method is being practiced, they will never be told that they have to do a calculation in a certain way. They learn to choose the method that is most suitable or that they are most comfortable with.

The way that mathematics is taught at Spire Junior School is relatively flexible, but a typical mathematics lesson may be split into 3 parts. Most lessons begin with a **mental warm up,** which is to get the children thinking mathematically and dealing with numbers. The warm up is followed by the **main activity,** where the teacher explains the objective of the lesson to the class and work is then completed in groups or independently. The final part of the lesson is the **plenary,** where the lesson's work is discussed or extended. This may not always occur at the end of the lesson as it may be more appropriate to stop and discuss the work at an earlier point.

As the strategies have been given in order of progression from Year 3 to Year 6 you should be able to find the method most relevant to your child, but if you have any doubts your class teacher will be more than happy to help you.

This will hopefully help you to gain a better understanding of the work covered in class, and also help you support your child in the most constructive way possible.

The content of the lessons from Year 3-6 can be split into areas which are taught. They are:

- Number
  - Number and place value
  - Addition and subtraction
  - Multiplication and division
  - Fractions (including decimals from Year 4 and percentages from Year 5)
- Ratio and Proportion (from Year 6)
- Algebra (from Year 6 formally but introduced in simple terms from Year 1)
- Measurement
- Geometry
  - Properties of shape
  - Position and direction
- Statistics (from Year 2)

The following pages are a guide to the four operations that permeate all areas of mathematics and confidence: addition, subtraction, multiplication and division.

Enjoy finding out how *marvellous* mathematics can be!

Number

Number and Place value

Children are initially taught about numbers which are of relevance to them. They learn to count forwards and backwards and the concept of none. They learn that a set of 6 remains 6 however the objects are arranged. They recognise numerals.

The children are taught not only to recognise and say numbers but, more importantly, they are taught the value of a number e.g. what 2 actually looks like, what it feels like and where it fits into the number system. This is an essential step and children vary enormously with the time they need to embed this knowledge.

Addition

Adding on – Relate addition to combining two groups in practical situations and begin to use the correct mathematical vocabulary.
The children add one more number onto a unit. E.g. 2 add 1 = 3
This starts as single digits in Reception.

Counting on – The children hold one number in their head or use a visual stimulus such as a number line using their fingers and counting on.

Using a known fact – The children give a rapid response to a known fact by heart.

Number Bonds – This starts with number bonds in Reception and continues throughout school. The children are expected to learn number bonds (pairs of numbers) that make firstly 10 and 20 then later to 100, and recall them immediately – e.g. 7 and 3. The level of difficulty progresses so that in KS2 children can use number bonds with decimals.

Using a derived fact – The children use a known fact to work out a new one. For example, 16 + 4 = 20, so 17 + 4 must be 21 or 6 + 4 = 10 so 60 + 40 = 100. They will also be taught that the = sign does not always appear at the end of a calculation and that 10 = 6+4 is valid as is 7+3=14 - 4. Children will also learn to add in 10's from any number.

Hundred squares – A child will respond to questions like 40 + 50 or 52+ 30 by using their knowledge of multiples of 10, and some children will do this by using a number square.

Adding several numbers – The children should look for pairs of numbers that make 10 and use these first. They are also taught to start with the largest number and are also aware that they can find pairs that make 9 or 11 and add these by adding 10 and then adjusting by 1.

Partitioning and recombining – This starts in Year 1 and is when children break 6, 7, 8 and 9 into '5 and a bit'
e.g. 7 = 5 + 2.

Years 2 & 3 move onto 2 and 3 digit numbers when the children are ready. For example, the children will work out mentally that: 55 + 16 = 55 + 15 + 1 = 70 +1 = 71

Partitioning in tens and ones – Partitioning is splitting numbers up. The children would add the tens together first, then add the ones and then add the two results.

For example: 36 + 53 = (30 + 50) + (6 + 3) = 80 + 9 = 89

Some children will only partition the numbers they are adding on.

For example: 36 + 53 = 36 + 50 + 3 = 86 + 3 = 89

Bridging 10- Once the children are confident with adding up to 10 they are taught to bridge 10.

7 + 5 aiming for 10 first becomes 7 + 3 + 2

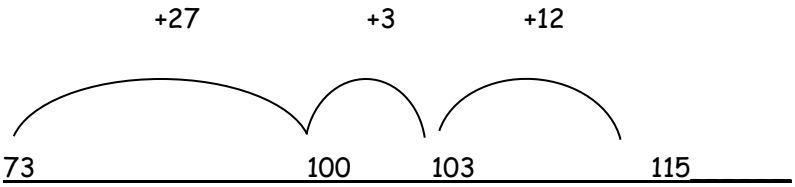
Bridging 100 - Once the children are confident with adding up to 100 they are taught how to bridge significant digits 10's 50 and 100 etc.

70 + 39 aiming for 100 first

70 + 30 = 100 100 + 9 = 109

73 + 42 = aiming for 100

Start with 73



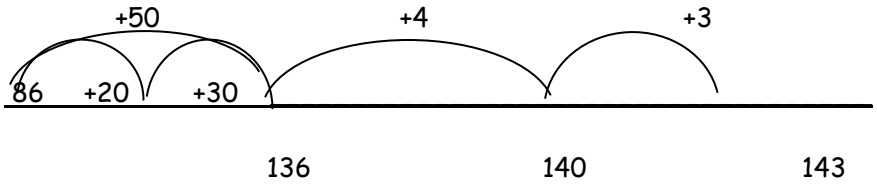
They will also be taught to use a place value grid which may look like this:

Hundred thousands HTh	Ten thousands TTh	Thousands Th	Hundreds H	Tens T	Ones O	Tenths 1/10	Hundredths 1/100	Thousandths 1/1000

Counting on in multiples of 100, 10 or 1 – This method is best demonstrated using a number line. The children start with the lowest number and count on by partitioning the second number and adding the tens and then the ones, which can be split to make the calculation easier. For example:

86 + 57 = 86 + 50 + 7

= 86 + 20 + 30 + 4 + 3



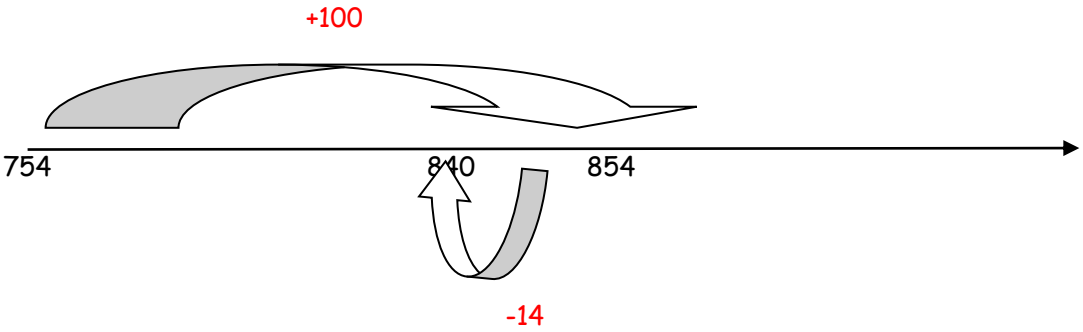
Adding smaller digits first – This is an extension of partitioning, where the children add ones then tens, hundreds and so on. Although it is set out in columns, the children are expected to develop the mental strategies to do the calculation in their head with a few jotted notes as an aid if required. For example

625	783
+ 48	+ 42
13	5
60	120
600	700
673	825

Compensation – This method requires the children to add too much and then subtract the difference. It can be useful in turning a calculation into adding a multiple of 10 and then subtracting a smaller number. For example:

754 + 86 = (754 + 100) – 14 = 854 – 14 = 840

367 + 92 = (367 + 100) – 8 = 467 – 8 = 459



Adding near multiples of 10 – This works on the basis that to add 9 is the same as to add 10 and then subtract 1. It is a mental strategy that the children should be able to operate in their heads. For example:

43 + 9 = (43 + 10) – 1 = 53 – 1 = 52

86 + 39 = (86 + 40) – 1 = 126 – 1 = 125

328 + 199 = (328 + 200) – 1 = 528 – 1 = 527

Standard written method – This will be taught higher in Key Stage 2. The children should develop an efficient standard method that can be applied generally. They add from the least significant digit (starting on the right) and extend to exchange below the line.

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  358          37.49
+  73        + 2.60
  431         40.09
  1 1          1 1
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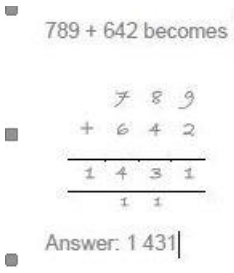


Subtraction

Relate subtraction to taking away in practical situations, physically taking objects away and begin to use the correct mathematical vocabulary.

Taking away (when only a small difference is involved) – A child finding 9 – 3 holds up nine fingers and folds down three.

Number Bonds – The children are expected to learn number bonds to 10 and 20 and can use these for subtraction. For example, if 6 + 4 = 10 then 10 – 4 = 6.

Using derived facts – If the children know that 20 – 7 = 13, then 21 – 7 must be 14.

Partitioning into tens and ones – Partitioning is splitting numbers up. For example, 57 could be partitioned into 50 and 7. The children partition numbers to make separate subtraction calculations, and then add the results together.

47 – 24 = (40 and 7) – (20 and 4) 40 – 20 = 20

7 – 4 = 3 20 + 3 = 23

Some children will only partition the number that they are subtracting: 47 – 24 = 47 – 20 – 4 = 27 – 4 = 23

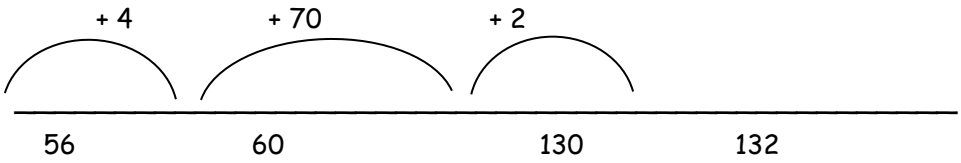
Partitioning can be extended to thousands and also decimals as the children progress through the school.

Counting on – If you imagine a number line when asking a child to do subtraction and visualise both numbers on it (e.g. 56 – 23) your first reaction will be to start on 56 and count backwards 23 places. Now imagine chopping the 23 off the number line – you are left with the rest of the numbers to count (from 23 up to 56) this is actually what we teach them to do. Start on 23 and add up the digits that are left (up to 56). We can all add up quicker than take away.

A classic example is 1002 – 999 is much easier to count on 3 than counting back. Children need to learn to look at the calculation and think about the most appropriate method to use.

This is subtraction by addition! The children start with the lowest of the two numbers and count up to the highest. It is easier to count up to the next multiple of 10, then the multiple of 10 immediately before the highest number and then finally to the highest number itself. For example:

132 – 56



The children are then left with a simple addition calculation to complete the question:

70 + 4 + 2 = 76 and therefore 132 – 56 = 76

This method is continued with larger numbers and decimals throughout the school.

Counting back – The children may decide later on that the numbers are close enough or easy enough to simply count back. E.g. 872 – 50 this is much easier to count back than add up.

Subtraction compensation– This is a mental strategy that works on the basis that to subtract 9 is the same as subtracting 10 and adding 1. For example:

54 – 9 = (54 – 10) + 1 = 44 + 1 = 45

76 – 39 = (76 – 40) + 1 = 36 + 1 = 37

438 – 199 = (438 – 200) + 1 = 238 + 1 = 239

If the children don't like the numbers that they are working with then they can change them by adding or subtracting an amount to make one of the numbers more manageable (as long as they remember to take the number away again at the end.)

For example: 83 – 47: it is easier to subtract 50, so add 3 to 47.

83 – 50 = 33 remember we have taken away 3 too many so we need to add 3 back on 33 + 3 =36

632 – 84: it is easier to subtract 100 so add 16 to 84.

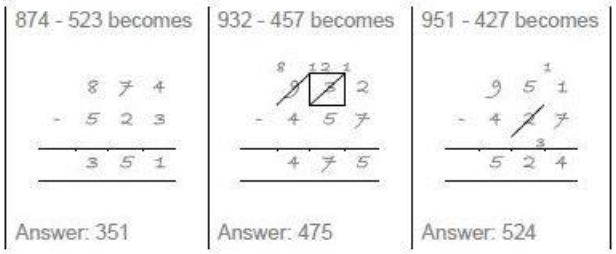
632 – 100 = 532 add 16 back on so 532 + 16 = 548

Subtracting decimals – children learn to subtract decimals with either 1 or 2 decimal places (d.p.) – that is numbers after the decimal point.

Missing numbers – Children are taught how to solve missing number calculations such as 15.40 + ____ = 12.54 by using their knowledge of inverse operations.

15.40 – 12.54 = _____

Standard written method – This will be taught higher in Key Stage 2. The children should develop an efficient standard method that can be applied generally. Decomposition will only be taught when children are ready and have a deep understanding.



Multiplication

Count groups of the same number of objects and add them together.

Repeated addition – This method shows that 4 x 2 is 2 + 2 + 2 + 2 using 2, 5 and 10 to start with.

Doubling – To double numbers the children would partition them and double the tens and then the ones, adding the two answers together. For example:

47 x 2 = (40 x 2) + (7 x 2) = 80 + 14 = 94 Using the vocabulary: double, times, multiply, multiply by, lots of

Multiplying by multiples of 10 The rule is not simply to add a 0! The children are taught the importance of place value and that the **digits move** one place to the left for each multiple of 10, but the **decimal point remains fixed**. For example:

9 x 10 = 90 9 x 100 = 900 9 x 1000 = 9000

0.3 x 10 = 3 0.3 x 100 = 30 0.3 x 1000 = 300

6 x 30 = 6 x 3 x 10 = 18 x 10 = 180

In Key Stage 2 the children are expected to be able to multiply by 10, 100 and 1000 in their head and explain the rule.

To multiply by 2, 4, 5, 8, 20 and 25

To multiply by 2, double.

To multiply by 4, double and then double again.

To multiply by 5, multiply by 10 and then halve.

To multiply by 20, multiply by 10 and then double (or vice versa)

To multiply by 8, multiply by 4 and double.

To multiply by 25, multiply by 100, halve and then halve again.

Multiplying by near multiples of 10 – This works on the basis that to multiply by 9 is to multiply by 10 and then subtract the number that you multiplied. For example:

15 x 9 = (15 x 10) – 15 = 150 – 15 = 135

13 x 29 = (13 x 30) – 13 = 390 – 13 = 377

47 x 99 = (47 x 100) – 47 = 4700 – 47 = 4653

Multiplying by doubling and halving – In a multiplication problem it is possible to achieve the same answer by doubling one of the numbers in the calculation and halving the other. This means the children are looking for a calculation that is easier to solve mentally. For example:

24 x 25 = 12 x 50 = 6 x 100 = 600

Written methods Given a problem such as 48 x 7 or 43 x 36, the children could use the following methods:

Grid method – this involves partitioning both numbers.

40 x 7 = 280

8 x 7 = 56 therefore 48 x 7 = 336

x	**7**
40	280
8	56

40 x 30 = 1200
40 x 6 = 240
3 x 30 = 90
3 x 6 = 18
1548

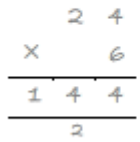
Some children find it easier to set this out in a grid or box format.

x	**30**	**6**
40	1200	240
3	90	18

Short multiplication will be introduced to compare methods and to help children find the most effective method. This can prove challenging if a child is not fluent with their tables knowledge.

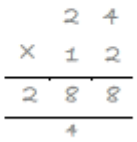
Short multiplication

24 × 6 becomes



Answer: 144

24 × 12 becomes



Answer: 288

Children are expected to learn their tables and be fluent in their knowledge. This means not only be able to recite them quickly and accurately, but also being able to answer quick fire questions using their knowledge when the questions do not come in the correct order. (This learning starts in Key Stage 1 with repeated addition)

They need to learn them in the following order.

Firstly 2, 5 and 10 times tables.

Next they should move onto their 3 and 4 times tables.

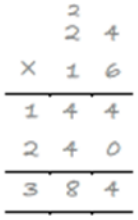
Lastly they should learn their 6, 7, 8 and 9 times tables.

Children should know these by the time they leave year 4, leaving years 5 and 6 for consolidating their methods of applying this knowledge.

At this point, with fluent tables knowledge, long multiplication can be introduced:

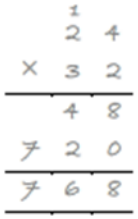
Long multiplication

24 × 16 becomes



Answer: 384

24 × 32 becomes



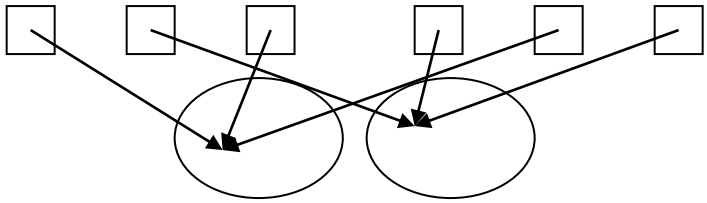
Answer: 768

Division

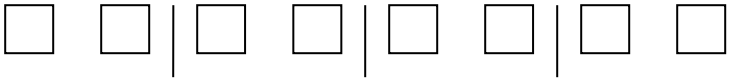
Share objects equally by counting how many in each group.

Sharing - If you have 6 sweets and you are sharing them with a friend, how many do you get each? The children will use a simple diagram or resources such as multilink

(or sweets!) to share the number evenly.

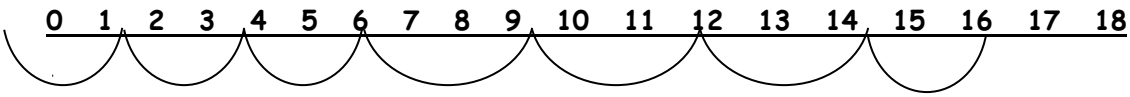


Grouping – This is reading the calculation 8 ÷ 2 as "how many 2's make 8?" The children would draw or have 8 objects and then put them into groups of 2 and see how many groups there were.



A number line could also be used. For example:

18 ÷ 2 can be read as "How many groups of 2 are needed to reach 18?"



The children should recognise that dividing by 2 is the same as halving.

Halving multiples of 10 – The children focus on the tens digit while remembering that the 0 is a very significant digit.

Dividing by multiples of 10 – The rule is *not simply to take off a 0!* The children are taught the importance of place value and that the **digits move one place to the right** for each multiple of 10 that is divided by, but the **decimal place remains fixed.** For example:

90 ÷ 10 = 9 90 ÷ 100 = 0.9 90 ÷ 1000 = 0.09

In KS2 children are expected to be able to divide numbers with decimals by 10, 100 and 1000 in their head and explain the rule.

Finding simple remainders after dividing

Thinking about the question they are being asked about – for instance if I have £46 how much money will I have left if I buy 5 tickets costing £9 each?

Using division where there is a remainder works through very recognized stages too:

1) 33 ÷ 10 = 3 r 3 is the first step children are taught to record. This moves onto
2) 33 ÷ 10 = 33 and 3/10 (the tenths comes from the size of the divisions being shared thus if you were dividing by 5 the remainder would be in fifths)
3) 33 ÷ 10 = 33.3 (converting the fraction to a decimal where possible)

Using known facts of halving to help

Children are taught to understand that dividing by 4 is the same as halving and halving again. E.g. 48 ÷ 4 is the same as dividing by 2 (halving) and dividing by 2 again (halving again.)

Finding quarters – The children divide by 4 by halving and halving again.

Finding fractions of amounts – Fractions are related to division and the children understand that to find a fraction of an amount is to perform a division calculation. For example:

$\frac{1}{4}$ of 32 = 32 ÷ 4 = 8

To find fractions of amounts the method is to divide by the denominator (bottom number) and multiply by the numerator (top number). For example:

3/8 of 72 = (72 ÷ 8) x 3 = 9 x 3 = 27

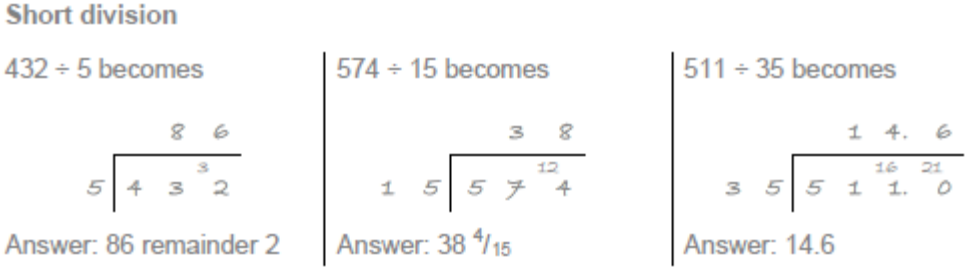
Written methods

Short division

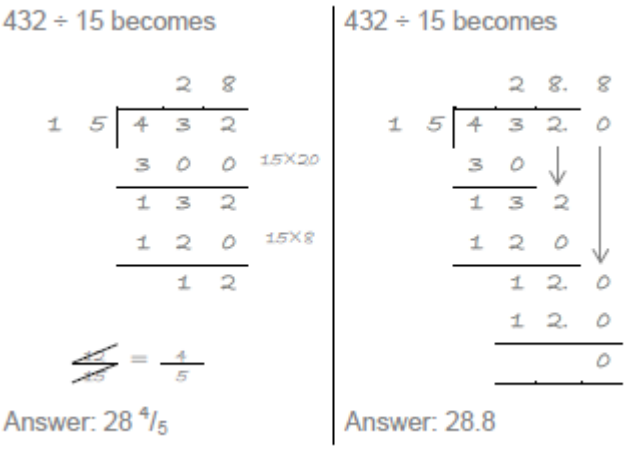
430 ÷ 4 = 107 remainder 2

Answer = 107 remainder 2 or 107 2/4 or 107 $\frac{1}{2}$ or 107.5

Year 5 and 6 children should attempt to display the remainder as a fraction or decimal where possible.



Long division will also be introduced when a child has developed secure understanding of multiplication tables and division. This demonstrates how the move from chunking to long division is taught.



List of Maths Websites for Parents and Carers

- National Numeracy Parent Toolkit has a wealth of tips and advice for parents. http://www.nnparenttoolkit.org.uk/
- Oxford Owl includes a range of activities, top tips and eBooks to help your child with their maths at home. http://www.oxfordowl.co.uk/maths-owl/maths
- Maths 4 Mums and Dads explains some of the milestones children make between the ages of 3-and-11-years-old. http://www.maths4mumsanddads.co.uk/index.php
- Nrich. A range of maths games, problems and articles on all areas of maths. Parents of Key Stage 1 children should select 'stage 1' and parents of Key Stage 2 children should select 'stage 2'. http://nrich.maths.org/frontpage

List of Maths Websites for Children

http://amathsdictionaryforkids.com/
http://www.bbc.co.uk/bitesize/ks1/maths/
http://www.bbc.co.uk/bitesize/ks2/maths/
http://www.ictgames.com/resources.html
http://www.ilovemathsgames.com/
http://www.mathsisfun.com/index.htm
http://www.mathszone.co.uk/
http://www.multiplication.com/
http://www.primarygames.co.uk/
http://resources.woodlands-junior.kent.sch.uk/maths
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