Progression In Calculations at Homefield Primary School and SSC

Multiplication and Division

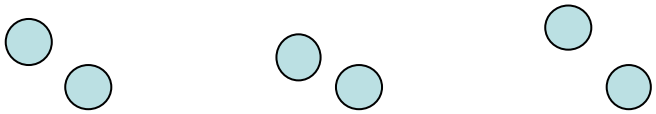
Mathematical Calculations in School Today.

This document is designed to help you to understand the calculation methods your child will be taught in school. When supporting your child at home with Maths work it would be helpful if you could reinforce these methods rather than teach them the way that you were taught. Please speak to you child's teacher to find out which methods would currently be the most appropriate for your child to practice at home.

Remember each child will progress at their own pace.

Understand Counting in Different Size Steps

Children could count out small sets of repeated groups of the same size using sweets, pencils, counters etc.



3 lots of 2 makes 6

Count from 0 up to 20 and back.
Count in 2's and 10's from 0.
Begin to know doubles up to double 5.

Counting in different sized steps can be done in a range of contexts to make children familiar with the patterns in the numbers… count in 10's as you go up the stairs…. Count in 2's as you sort out the shoes/socks…. How many fingers are in the room? Count the hands of the people in the room in 5's.. Etc.

Key Question/Vocabulary

Double, add, add on, lots of, groups of

Once, twice, three times…..

How many groups are there?

How many items are in each group?

Explanation.

Children need to make the link between counting in different sized steps and the concrete experience of what that looks like. They need to experience physically counting repeated groups of the same size. This is best done in a 'real-life' context, eg counting piles of sweets, buttons or toys.

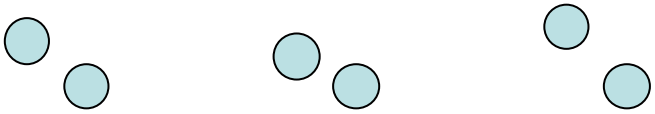
Progression

- Explore counting in 10's up to 100 and link to sets of objects
- Move on to counting in 2's, initially to 10 then on to 20 and link to sets of objects
- Progress to counting in 5's up to 50, linked to sets of objects

Understand Multiplication as Repeated Addition

Children could count out repeated groups of the same size as before, using sweets, pencils, counters etc. This time relate the vocabulary of addition to the vocabulary of multiplication.

Using Numicon to show 2 x 3 for eg, get out three 2 shapes and then use them to cover the 6 shape to show it is the same.



2 add 2 add 2 makes 6

2 + 2 + 2 = 6

3 lots of 2 makes 6

2 x 3 = 6 (read as '2 three times')

Count from 0 up to 20 and back.
Count in 2's, 5's and 10's from 0.
Begin to know doubles up to double 5 and link counting in 2's to doubling.

Continue counting in steps of 2's, 5's and 10's regularly. Then ask your child questions such as 'What is 2 x 6?', helping them to understand that if they count 6 times in 2's they will reach the answer.

Key Question/Vocabulary

Add, addition, repeated addition,

Times, multiply, multiplied by, lots of, groups of

How many equal groups are there?

How many items are in each group?

Explanation.

Children need to experience physically counting repeated groups of the same size. This is best done in a 'real-life' context, eg counting piles of sweets, buttons or toys

Progression

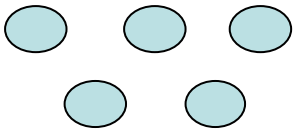
- Explore counting in 10's up to 100 and link to sets of objects
- Move on to counting in 2's, initially to 10 then on to 20 and link to sets of objects
- Progress to counting in 5's up to 50, linked to sets of objects

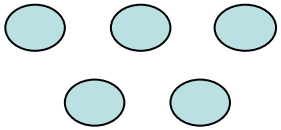
Understanding Division as Sharing

Share 10 sweets between 2 friends.

One for you, one for me, one for you….

Until all shared out equally. Count both piles to ensure that they are equal.





Use Numicon to explore how many shapes cover another larger one. Eg, how many 2 shapes cover an 8 plate?

Count in 2's, 5's and 10's from 0. Begin to know doubles up to double 5 and link to halving. Know the multiplication and division facts for the 10 times table.

Key Questions/Vocabulary

Share, share equally, share between

Share fairly, halve

How many each?

How many in each group?

Explanation

Children need to experience sharing a set of objects **equally** between people or teddies, initially between 2. It is important that they realise that things must be shared equally so ensure that they have a multiple of 2 to begin sharing with.

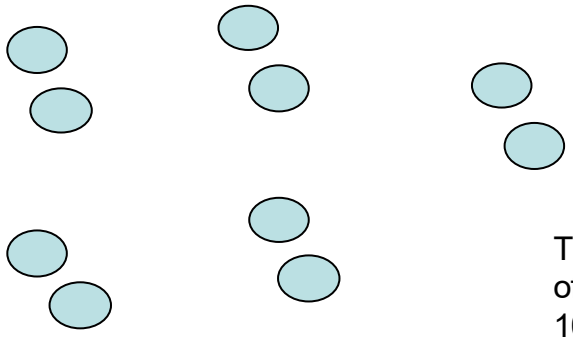
Progression

- Begin by sharing even numbers up to 10, then 20, equally between 2 and linking to the vocabulary of half
- Progress to sharing multiples of 10 between 10
- Progress to sharing multiples of 5 between 5

Understanding Division as Grouping

10 ÷ 2 = ? How many 2's are in 10?

Repeatedly take away groups of 2 from a set of 10 and counting how many equal piles of 2 there are.



There are 5 equal groups of 2 in 10
10 ÷ 2 = 5

Encourage children to read divisions as 'How many in?' (EG. 10 ÷ 2 is How many 2's in 10?) In this way children are able to begin to apply their times table knowledge by seeing how many times they count in 2's to reach 10.

Count in 2's, 5's and 10's from 0.
Know doubles up to double 5 and link to halving
Know the multiplication and division facts for the 10 times table.

Key Questions/Vocabulary

Share, share equally, share between, groups of

Divide

How many each?

How many groups?

Explanation

Children need to experience dividing a set of objects by grouping them equally or repeatedly taking away groups of equal size.

Progression

- Begin by dividing even numbers up to 10, then 20, by taking away equal groups of 2
- Progress to dividing multiples of 10 between 10 by taking away equal groups of 10
- Progress to dividing multiples of 5 between 5 by taking away equal groups of 5

Recognising Patterns in Numbers

By counting on in twos and colouring in the numbers it is clear to see the pattern created. This helps children to understand odd and even numbers and recognise what multiples of 2 end with.

This activity can be done with any times table and allows children to see patterns in the times tables which may help them to learn them. (Eg, recognising that multiples of 10 end in 0, that multiples of 5 end in 0 or 5 etc)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Count in 2's, 5's and 10's from 0.
Count in 10's from any number forwards and backwards

Key Questions/Vocabulary

Count on in twos, fives, tens…
Add, plus, more than, count on
Digits, pattern, sequence
Multiples of…
What is the same about the numbers coloured?
If we continue the pattern, will….. be coloured in? How do you know?

Explanation

Working with a hundred square helps develop a child's understanding of the number system. Looking at the patterns in numbers created by colouring in steps of the same size can help a child to predict which number will or won't be a multiple of a number.

Progression

- Begin by looking at the patterns created by the 2 and 10 times tables and use to make predictions
- Count on and back in tens from any given number, noting the patterns in the sequence created
- Progress to looking at the 5 times table and use to make predictions

Multiplication by Counting

Remember that x2 is the same as doubling!

2 x 4

Count in 2's four times

2, 4, 6, 8

5 x 6

Count in 5's six times

5, 10, 15, 20, 25, 30

8 x 5 (I can't count in 8's, so..)
Count in 5's eight times
5, 10, 15, 20, 25, 30, 35, 40

Encourage children to look at multiplication as 'What have I got and how many times have I got it?' So the first number relates to what you have and the second number indicates how many times you have it (2 x 6 would be you've got 2 six times)

Count in 2's, 5's and 10's from 0.
Know x and related ÷ facts for the 2, 5 and 10 times tables

Key Questions/Vocabulary

Lots of, groups of, times, multiplied by, repeated addition
Eg 2 x 4... What have you got? (2)
How many times have you got it? (4)
Divide, shared by, share equally
Eg, 15 ÷ 5….. How many 5's are in 15?

Explanation

Solving multiplication calculations by counting is a quick and efficient method to use before children learn all the times table facts. Children need to understand multiplication and ensure they count in the table most familiar to them. Remember the multiplication is COMMUTATIVE, 5 x 4 is the same as 4 x 5

Progression

- In KS1, children learn the 2, 5 and 10 times tables
- In Year 3, they learn the 3, 4 and 8 times tables
- In Year 4 and after children should be using all tables up to 12 x 12
- Progress to applying known facts to solve x calculations

Division by Counting

Remember that ÷2 is the same as halving!

18 ÷ 2

How many 2's are in 18?

Count in 2's and keep track on fingers… 2, 4, 6, 8, 10, 12, 14, 16, 18

The answer is 9

35 ÷ 5

How many 5's are in 35?

Count in 5's keeping track on fingers…. 5, 10, 15, 20, 25, 30, 35

The answer is 7

The connection can also be made between fractions and division.

$\frac{1}{3}$ of 30 is the same as asking How many 3's are in 30?

$\frac{1}{4}$ of 20 is the same as asking How many 4's are in 20?

Count in 2's, 5's and 10's from 0. Know x and related ÷ facts for the 2, 5 and 10 times tables

Key Questions/Vocabulary

Division, divide, shared by, share equally

Eg, 15 ÷ 5….. How many 5's are in 15?

70 ÷ 10… How many 10's are in 70?

Explanation

Solving division calculations by counting is a quick and efficient method to use before children learn related times table facts. Children need to begin to see the connection between times table facts and division Eg, 25 ÷ 5 is How many 5's are in 25? I know 5 x 5 is 25 so the answer is 5

Progression

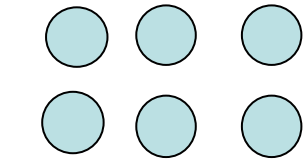
- In KS1, children learn the 2, 5 and 10 times tables
- In Year 3, they learn the 3, 4 and 8 times tables
- In Year 4 and after children should be using all tables up to 12 x 12
- Progress to applying known facts to solve ÷ calculations

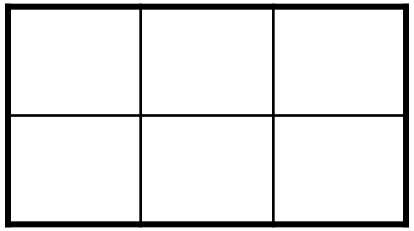
Multiplication as an Array

2 three times = 6

2 + 2 + 2 = 6

2 x 3 = 6

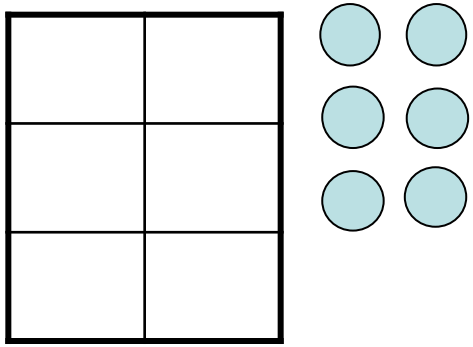




3 two times = 6

3 + 3 = 6

3 x 2 = 6



Children need to understand that these arrays shown are the same. Multiplication is COMMUTATIVE (2 x 3 = 3 x 2)

Look for arrays in the environment. ... Egg boxes, window panes, some trays of apples or bars of chocolate. Try creating arrays with sweets or other items

Know x and related ÷ facts for the 2 and 10 times tables and begin to know the 5 times table

Key Questions/Vocabulary

Lots of, groups of, times, multiplied by, multiplication, Equals, commutative
Array, grid, representation
What have you got?
How many times have you got it?

Explanation

The arrangement of images clearly represents the number sentence and can aid visual learners to understand multiplication. So long as the rows and columns represent the numbers being multiplied, the orientation doesn't matter

Progression

- Begin with arrays that represent the 2 times table
- Progress to arrays that represent the 10 times and 5 times table
- In Year 3, progress to the 3, 4 and 8 times tables
- In Year 4 and after children should be using all tables up to 12 x 12

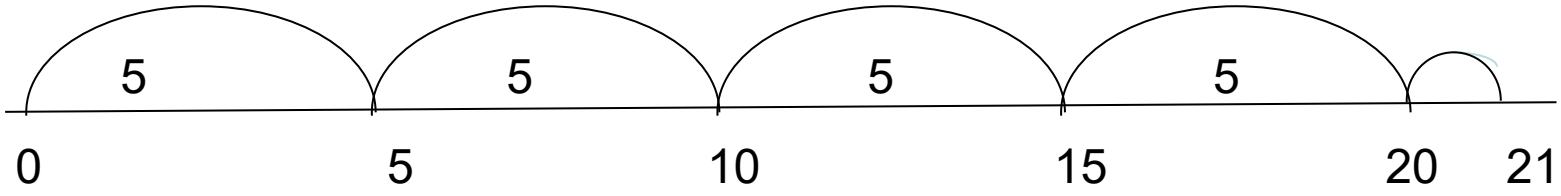
Division with Remainders

It is important to remember that the answer will be found by counting how many times the dividing number will go into the first number until it is impossible to do any more even jumps. The left over amount is the remainder and cannot be greater than or equal to the dividing number.

$21 \div 5 = 4 \text{ r } 1$

How many 5's are in 21? There were 4 jumps of 5 with 1 left over.

Know x and related ÷ facts for the 2, 5 and 10 times tables. Count in 3's from 0.



Key Questions/Vocabulary

Share, share equally, share between
Divide, division, grouping
Remainder, left over
How many ... in...?
How many are left over?

Explanation

When children understand division and are able to accurately solve TU ÷ U with no remainders, then they are ready to solve more complex problems that do involve remainders.

Progression

- Begin with TU ÷ U where there is a remainder of 1
- Progress to TU ÷ U where there is a greater remainder

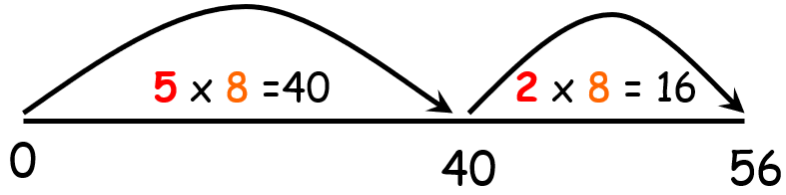
Division on a Number Line in chunks

Use a key facts box of known multiplication facts to support - 1 x, 2 x, 5 x and 10 x.

Key Facts
1 x 8 = 8
2 x 8 = 16
5 x 8 = 40
10 x 8 = 80

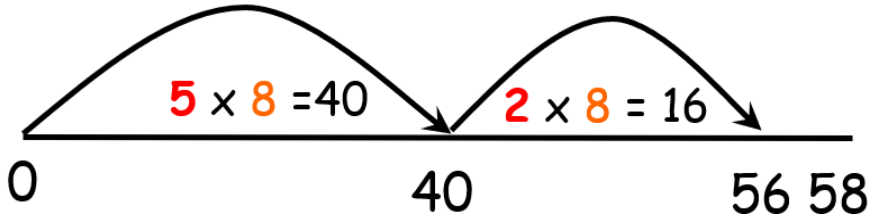
What jumps of 8 can you make on the number line towards 56?
5 x 8 = 40 would be good!

Now a jump of 2 x 8 = 16 would take you to 56.



Add 5 and 2 = 7.

56 ÷ 8 = 7



58 ÷ 8 = 7 r2

Key Questions/Vocabulary
Share, share equally, share between
Divide, division, grouping
Remainder, left over
How many ... in...?
How many are left over?

Explanation

When children understand division and are able to accurately solve TU ÷ U with no remainders, then they are ready to solve more complex problems that do involve remainders.

Know x and related ÷ facts for the 2, 5, 10, 3, 4 and 8 times tables. Count in 3s from 0.

Progression
- Begin with TO ÷ O where there is a remainder of 1
- Progress to TO ÷ O where there is a greater remainder
- Then progress onto HTO ÷ O.

Compact Method for Short Division

Always start dividing from the largest value digit (8 = 800)

$$7 \overline{)\,8^{1}7^{3}5} \quad 1\,2\,5$$

8 ÷ 7 = 1 r1
17 ÷ 7 = 2 r3
36 ÷ 7 = 5

(Write the remainder next to the digit in the place value column to the right.)

875 ÷ 7 = 125

$$7 \overline{)\,8^{1}7^{3}6} \quad 1\,2\,5\ r1$$

8 ÷ 7 = 1 r1
17 ÷ 7 = 2 r3
36 ÷ 7 = 5 r1

876 ÷ 7 = 125 r1

Know x and related ÷ facts for all times tables up to 12 x 12.

Key Questions/Vocabulary

Share, share equally, share between
Divide, division, grouping
Remainder, left over
How many ... in...?
How many are left over?
Decimal fraction
Multiples
Divisor
"8 tens divided by 4 is equal to 2 tens: write 2 in the tens column."
"4 ones divided by 4 is equal to 1 one: write 1 in the ones column."

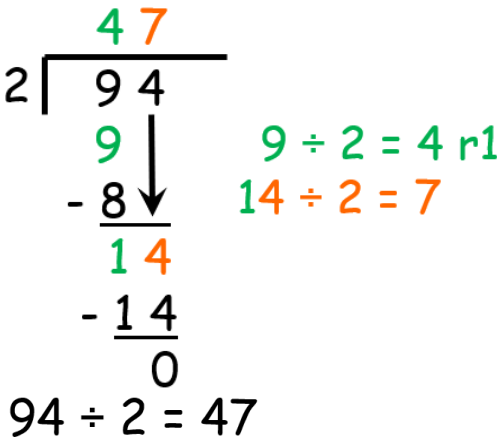
Explanation

Children then progress onto using a compact method – typically beginning with HTO ÷ O. They start by dividing one column at the time, beginning with the largest value digit. Any remainders are carried to the next column.

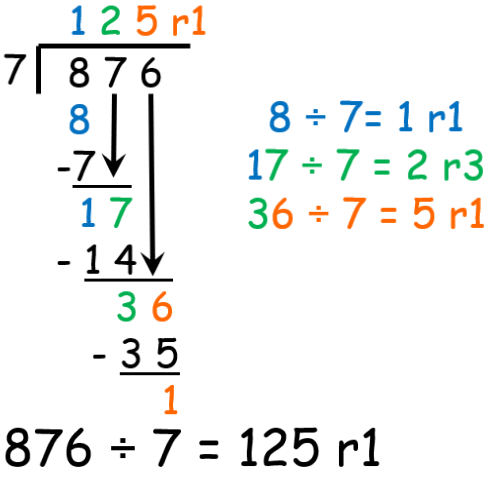
Progression

- Begin using this method without remainders.
- Move onto calculating with remainders.
- Calculate HTO ÷ O then move onto ThHTO ÷ O.

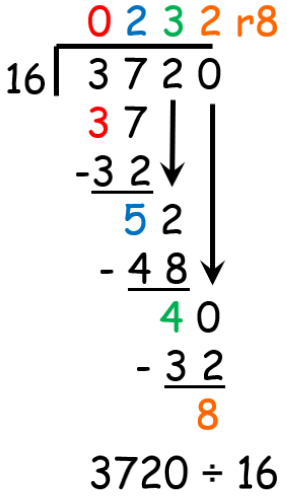
Compact Method for Long Division



9 ÷ 2 = 4 r1
14 ÷ 2 = 7



8 ÷ 7= 1 r1
17 ÷ 7 = 2 r3
36 ÷ 7 = 5 r1



3 ÷ 16 = 0 r3
37 ÷ 16 = 2 r5
52 ÷ 16 = 3 r4
40 ÷ 16 = 2 r8

Key Questions/Vocabulary

Share, share equally, share between
Divide, division, grouping
Remainder, left over
How many ... in...?
How many are left over?
Decimal fraction
Multiples
Divisor

Explanation

Once children are fluent with short division, they then use long division to solve more complex calculations. This involves dividing the first digit by the divisor, or first two digits if a 2-digit divisor and subtracting to find the difference until either 0 is reached or there is a remainder.

Know x and related ÷ facts for all times tables up to 12 x 12.

Progression

- Begin with TO ÷ O where there is a remainder of 1
- Progress to TO ÷ O where there is a greater remainder
- Move onto dividing HTO or ThHTO by O or TO.

Grid Multiplication – Short and Long

56 x 7… partition 56 to 50 + 6

50 x 7 = 350

6 x 7 = 42

	50	6	
7	350	42	= 392

Now add 350 and 42

56 x 7 = 392

56 x 27 ….. partition 56 to 50 + 6
and …… 27 to 20 + 7

	50	6	
20	1000	120	= 1120
7	350	42	= 392

1120 + 392 = 1512

56 x 27 = 1512

Know x and related ÷ facts for all times tables up to 12 x 12. Scale up known facts by multiples of 10.

Key Questions/Vocabulary

Share, share equally, share between
Divide, division, grouping
Remainder, left over
How many … in…?
How many are left over?

Explanation

Children use this method to breakdown multiplication into simpler calculations. They partition 2-digit numbers into tens and ones and then add together the products. Multiplying the tens number will typically require scaling up known facts e.g. 7 x 5 = 35 so 7 x 50 = 350.

Progression

• Begin by multiplying TO by O before moving onto TO by TO.

Expanded Column Multiplication – Short and Long

$$\begin{array}{r} 56 \\ \times\ \ 7 \\ \hline 42 \quad (6 \times 7) \\ +\ 350 \quad (50 \times 7) \\ \hline 392 \\ \hline \end{array}$$

56 x 7 = 392

$$\begin{array}{r} 56 \\ \times\ 27 \\ \hline 42 \quad (6 \times 7) \\ 350 \quad (50 \times 7) \\ 120 \quad (6 \times 20) \\ +\ 1000 \quad (50 \times 20) \\ \hline 1512 \\ \hline 1 \end{array}$$

56 x 27 = 1512

Know x and related ÷ facts for all times tables up to 12 x 12. Scale up known facts by multiples of 10.

Key Questions/Vocabulary

Lots of, groups of, times, multiplied by, multiplication, Equals, commutative
Array, grid, representation
What have you got?
How many times have you got it?
Distributive law

Explanation

When confident with the grid method, children then move onto using columns. Children partition 2-digit numbers again, writing the calculation on a separate row before totalling each column.

Progression

• Begin by multiplying TO by O before moving onto TO by TO.

Compact Column Multiplication – Short and Long

$$\begin{array}{r} 56 \\ \times \quad 7 \\ \hline 392 \\ \hline {\scriptstyle 4} \end{array}$$

(6 x 7 = 42)
(50 x 7 = 350)

56 x 7 = 392

$$\begin{array}{rl} & 56 \\ \times & 27 \\ \hline & 392 \quad (56 \times 7) \\ & {\scriptstyle 4} \\ + & 1120 \quad (56 \times 20) \\ & {\scriptstyle 1} \\ \hline & 1512 \end{array}$$

56 x 27 = 1512

Know x and related ÷ facts for all times tables up to 12 x 12.

Key Questions/Vocabulary

Lots of, groups of, times,
multiplied by, multiplication,
Equals, commutative
Array, grid, representation
What have you got?
How many times have you got it?
Distributive law
Regroup
"2 times 4 ones is equal to 8 ones: write 8 in the ones column."
"2 times 3 tens = 6 tens: write 6 in the tens column."

Explanation

When children understand division and are able to accurately solve TU ÷ U with no remainders, then they are ready to solve more complex problems that do involve remainders.

Progression

• By Year 6, children should multiply ThHTO by TO using the formal written method of long multiplication.