Maths in KS1

Calculations Policy for Parents

Wheatcroft Primary School

When teaching Mathematics as Wheatcroft, we intend to use a variety of teaching methods, strategies and resources that support all pupils and allow equal access to Mathematics.

This policy has been created to help you support your child at home with Maths. It shows the progression through different strategies for addition, subtraction, multiplication and division reflecting the Primary National Curriculum (2014). Recording in Mathematics is an important tool both for furthering the understanding of ideas and for communicating those ideas to others. A useful written method is one that helps children carry out a calculation and can be understood by others.

While this policy focuses on written calculation in mathematics, we recognise the importance of mental strategies and known facts that form the basis of all calculations. Pupils are provided with frequent opportunities to compare and evaluate different calculation strategies. This helps them develop an understanding that efficiency is personal and based on the numbers involved. Written methods are complementary to mental methods and should not be seen as separate from them. The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads, they use an efficient written method accurately and with confidence.

You can help your child's understanding by using practical methods and experimenting using toys, counters or objects like those illustrated. It is important for children to understand that Maths has a purpose and how it is used in everyday life. You can give them many of these opportunities at home.

Encourage your child to explain what they are doing. This will enhance their mathematical vocabulary as well as helping them to develop deeper understanding through enhancing their reasoning skills.
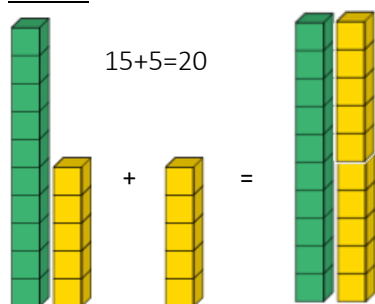
Addition

Year 1

NC Objectives

- To read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs.
- To represent and use number bonds and related subtraction facts within 20.
- To add and subtract one-digit and two-digit numbers to 20, including zero.
- To solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ - 9

Models and Examples

Dienes

$15+5=20$

Tens frame
$3+7=10$

Cherry Tree
$3+7=10$

Bead String
$2+8=10$

Numicon
$15+5=20$

Number Line
$4+6=10$

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
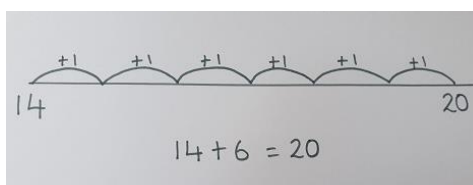
Blank Number Line

Sam has 14 coins and Jen has 6.

How many coins do they have altogether?

$14+6=20$

Misconceptions

Miscounting on a Number Line
$4+7=10$

1 2 3 4 5 6 7

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

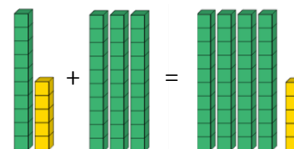The child has included their starting number when counting their jumps.

Miscalculation

$3+7=8$
The child has used the wrong Numicon piece to support their learning. They have selected a 5 piece instead of a 7.
$3+7=10$
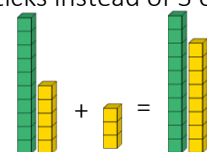
Place Value Knowledge
$15+3=45$

The child does not understand the place value of each diene and has added 3 tens sticks instead of 3 ones.

$15+3=18$

Notes

Key Vocabulary:

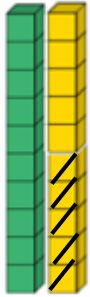addition   add   more   plus   total   equals

Subtraction

Year 1

NC Objectives
- ❖ To read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs.
- ❖ To represent and use number bonds and related subtraction facts within 20.
- ❖ To add and subtract one-digit and two-digit numbers to 20, including zero.
- ❖ To solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ - 9
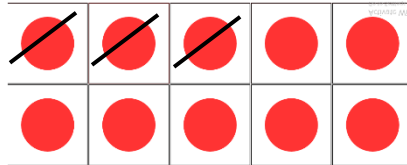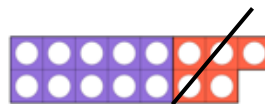
Models and Examples

Dienes

$20 - 5 = 15$

Tens Frame $10 - 3 = 7$

Bead String $10 - 2 = 8$
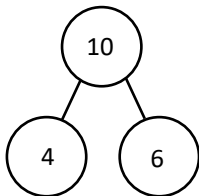
Numicon $15 - 5 = 10$

Number Line $18 - 6 = 12$

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
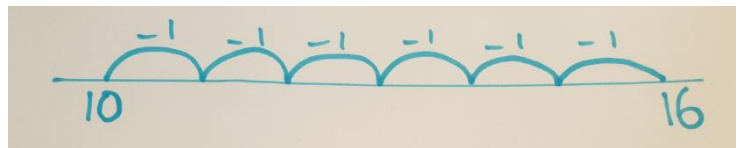
Cherry Trees $10 - 6 = 4$ and $10 - 4 = 6$

10
4   6

Using Objects $12 - 4 = 8$

Blank Number Line

Ella had 16 books. She gives 6 to her friend. How many does Ella have left?

-1 -1 -1 -1 -1 -1
10   16

Misconceptions

Miscounting Jumps on the Number Line

$10 - 6 = 5$

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

The child has missed a jump when counting backwards because they included their starting number when counting their jumps.

Understanding of Operations

$20 - 5 = 25$

The child does not understand that the '-' symbol means we need to take away, therefore they have added the two numbers together instead.

Notes

Key vocabulary

subtract   take away   subtraction   less   less than
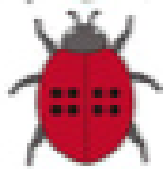
Multiplication

Year 1

NC Objectives

❖ To solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
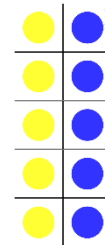
Models and Examples

Doubling
Children can use practical activities to show how to double a number.

Double 4 is 8.
The children can use objects or draw dots to show doubles of numbers or quantities.

Double 5 is 10.
Children can use tens frames to find doubles.
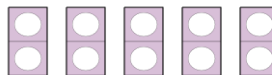
Counting in Multiples or Find Groups of Numbers.
Children can find multiples by using a bead string.
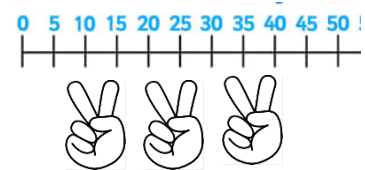2 groups of 5 make 10

Children can use multilink cubes or Numicon to show multiples of numbers.
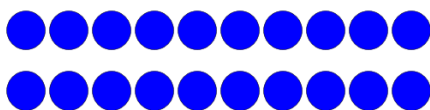5 groups of 2 make 10

Children can use a number line or pictures to support them counting in multiples of 2, 5 or 10.

Arrays
Children make arrays using counters and cubes or by drawing them to show multiplication number sentences. This array shows 2 x 10. This can also be written as 10 x 2 because multiplication is commutative. This means to have numbers that can be moved within the

Repeated Addition
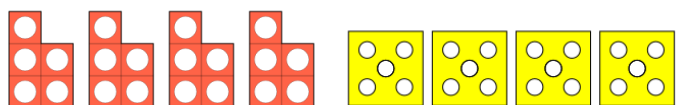Children can use different objects to add equal groups together.
5 x 4 =
5 + 5 + 5 + 5 = 20
This can also be written as: 4 groups of 5 makes 20.
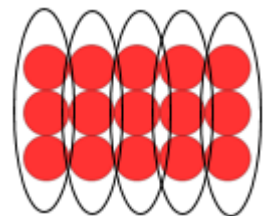
Misconceptions

Confusion between x and +
3 x 5 = 8
Children can become confused between symbols therefore they need to understand the difference of adding and multiplying.

Miscounting Arrays
3 x 5 = 75
The child has counted in 5's for each counter. The child has misunderstood the value of each counter in the array. In an array, each counter represents 1.

Notes

Key vocabulary
double   multiply   lots of   groups of   times   array   multiples
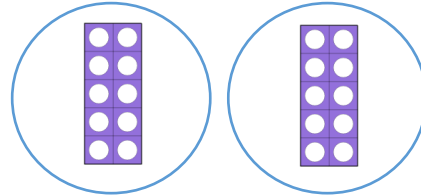
Division

Year 1

NC Objectives

❖ To solve one-step problems involving multiplication and division, by calculating the answer using concreate objects, pictorial representations and arrays with the support of the teacher.

Sharing
Children learn how to share objects or resources. They will learnt to use sharing circles. If we have 20 squares of chocolate and we share them between 2 people, each person will have 10 squares each.
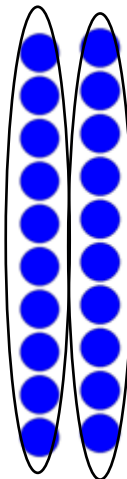
Division using arrays
The children will use arrays by drawing dots or using objects such as counters or cubes.

The children will begin to notice patterns such as 2 groups of 10 make 20 or 10 groups of 2 make 20.
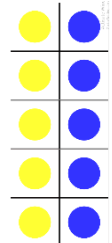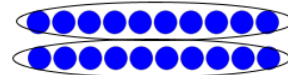
This is the same as 20 ÷ 10 = 2 or 20 ÷ 2=10

Halving
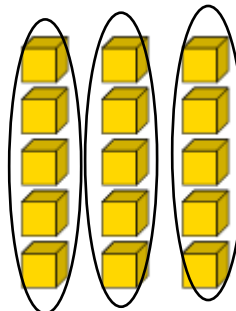If the children are sharing by 2 then this can also be shown as halving.

20 ÷ 2 = 10   is the same as saying ½ of 20 is 10

10 ÷ 2 = 5   is the same as saying ½ of 10 is 5

Dividing by grouping
Children will learn to divide quantities into groups. They can use counters, cubes, or Diennes to support their understanding. Children will begin to understand the inverse relationship with multiplication.
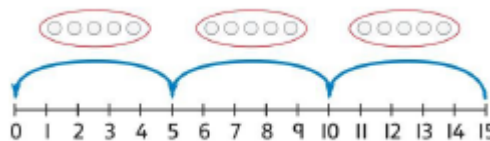
3 groups of 5 make 15

This can be written as:

15 ÷ 3 = 5 and 3 x 5 = 15

Multiples
Children will use their knowledge of counting in 2's, 5's and 10's.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Misconceptions

Unequal grouping or sharing
Children can become confused when using sharing circles and miscount the number that has been shared.

15 shared between 3 = 6

The counters have not been shared equally between the 3 sharing circles.

Notes

Key Vocabulary
halve share   share equally groups   equal groups of   divide   divided by
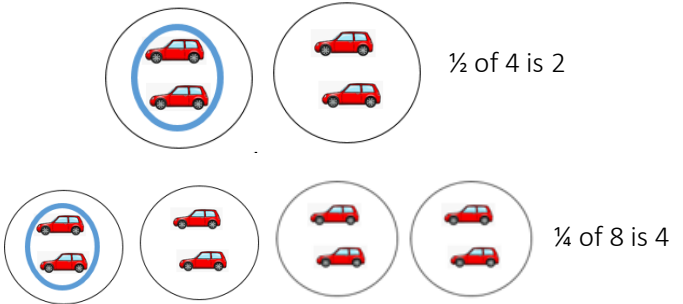
Fractions, Decimals Percentages

Year 1

NC Objectives

- ❖ To recognise, find and name a half as one of two equal parts of an object, shape or quantity.
- ❖ To recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.
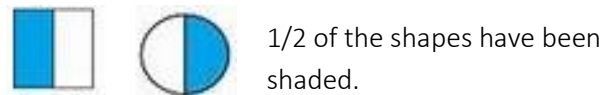
Models and Examples

Finding Half and a Quarter of Objects

Children will learn what the fraction ½ and ¼ means. They will share objects into two parts and count 1 of the parts to find half of the number of objects. To find a quarter, the children will share an amount between 4 parts then count one of the parts to find 1/4 .
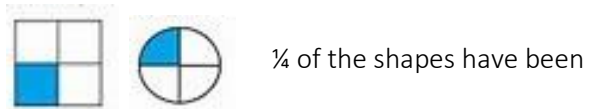
½ of 4 is 2

¼ of 8 is 4

Finding Half and a Quarter of Shapes

Children will learn how to find half and a quarter of a shape.

½ is finding two equal parts of the shape.

¼ is finding one of four equal parts of the shape.

1/2 of the shapes have been shaded.

¼ of the shapes have been

Finding Half and a Quarter of a Quantity

Children will explore finding half and a quarter of an amount. The children will identify the fraction using the amount given to them. To find half the children will learn how to split the quantity into two. To find a quarter, the children will learn how to split the quantity into four.

There are 6 apples.

Half of 6 is 3.

A rabbit ate a quarter of the carrots. How many did he eat?

The rabbit ate 3 carrots.

Misconceptions

Confusion of Parts of a Shape

Children may become confused about finding halves if the shape is divided into a number of different parts already. Circle all of the shapes that show half:

The red highlighted shape also shows half as two parts out of the 4 have been shaded. Half of 4 is 2.

Identifying the Incorrect Fraction

Colour ¼ of the square. The child has shaded in ½ of the shape and doesn't understand the parts of the shape that need to be shaded.

Notes

Key vocabulary
half   quarter   ½   ¼   part   equal parts

Addition
Year 2

NC Objectives

❖ To add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number, two two-digit numbers and adding three one-digit numbers.
❖ To recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100.
❖ To show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot.
❖ To recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems.
❖ To solve problems with addition and subtraction using concrete objects and pictorial representations, including those involving numbers, quantities and measures.
❖ To apply increasing knowledge of mental and written methods to solve addition and subtraction problems.

Models and Examples

Knowledge of Number Bonds
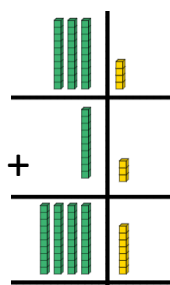Children can use their number bond knowledge to help make the calculation easier.

$26 + 8 = 34$

$4 \quad 4 \rightarrow 30 + 4 = 34$

$3 + 4 + 7 = 14$

$10 \rightarrow 10 + 4 = 14$
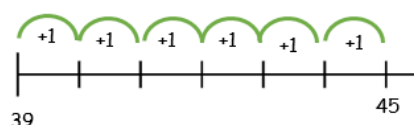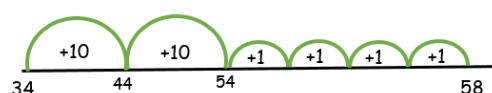
Use a Blank Number Line
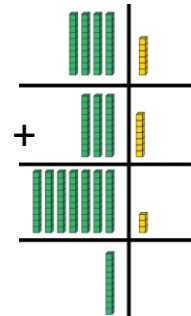Children can use a blank number line to jump 1s or in chunks of 10s and 1s.

$39 + 6 = 45$

+1 +1 +1 +1 +1 +1
39 45

$34 + 24 = 58$

+10 +10 +1 +1 +1 +1
34 ... 44 ... 54 58

Bar Model
Children can explore the idea that parts make up a whole using the bar model.

$8 + 7 = 15$

15	
8	7

$10 + 6 + 7 = 23$

23		
10	6	7

Column Addition – No Regrouping

	3	4
+	1	3
	4	7

Column Addition – Regrouping

	4	6
+	3	7
	8	3
	1	

Misconceptions

	4	6
+	3	7
	7	3
	1	

The child has forgotten to add the ten that he regrouped, it should = 83.

$34 + 24 = 68$

+10 +10 +1 +1 +1 +1
34 ... 54 ... 64 68

The child has miscounted in their 10s. They have missed the number 44. The answer should be 58.

$54 + 34 = 78$

+10 +10 +1 +1 +1 +1
54 ... 64 ... 74 78

The child is not secure in the knowledge of place value and has not added enough 10s for the number 34. The answer should be 88.

Notes

Key Vocabulary:
addition   add   more   plus   total   equals   altogether
In Year 2 we teach them the idea that addition can be done in any order and that it is ok to rearrange number sentences to make it easier to work out, for example, 9 + 34 = → 34 + 9 =
We also begin to explore the idea that addition is the **inverse** of subtraction, for example, 9 – 6 = 3 → 3 + 6 = 9

Subtraction

Year 2

NC Objectives

- To add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number, two two-digit numbers and adding three one-digit numbers.
- To recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100.
- To show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot.
- To recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems.
- To solve problems with addition and subtraction using concrete objects and pictorial representations, including those involving numbers, quantities and measures.
- To apply increasing knowledge of mental and written methods to solve addition and subtraction problems.

Models and Examples

100 Square

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

50-11=39
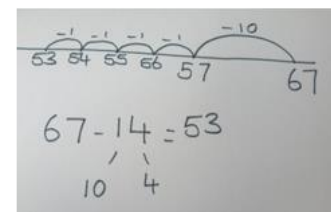Partition 11 into 1 ten and 1 one. Subtract the 1 ten first by moving UP 1 space
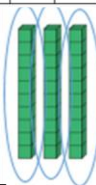Next, subtract the 1 one by moving LEFT 1 space.

Blank Number Line
67-14=53
Partition 14 into 1 ten (10) and 4 ones.

67-14 = 53

Dienes
38-6=32

I have 3 tens and 2 ones left. Together this makes 32.

Column Subtraction
34-13=21

1. Subtract the 3 ones from the 4 ones.
2. Subtract the 1 ten from the 3 tens.

Bead String
20-3=17

Start with 20 beads and take away 3. Count what is left.
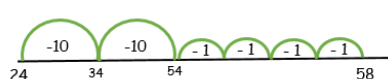
Column Subtraction (with regrouping)
46-37=9

You cannot take 7 ones away from 6 ones. You need to borrow a ten from the 40 and add this to the 6 ones. This is called regrouping (46=30+16)

Bar Model
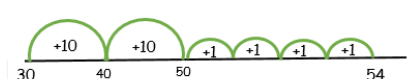15-8=7   23-7=16   16-6=10
15-7=8

Misconceptions

The child has forgotten regroup the tens to make the 16. The 4 tens should be changed to 3 tens.

58 – 24 = 34

The child has miscounted in their 10s. They have missed the number 44. The answer should be 34.

54 - 34 = 30

The child is not secure in the knowledge of place value and has not taken away enough 10s for the number 34. The answer should be 20.

Notes

In Year 2 children are taught that subtraction cannot be done in any order. They must always begin with the largest number so they have enough to subtract e.g. 30 – 10 not   10 – 30
Children also begin to explore the idea that subtraction is the **inverse** of addition, for example, 9 – 6 = 3 → 3 + 6 = 9
Key Vocabulary:
subtraction   subtract   less   less than   take away
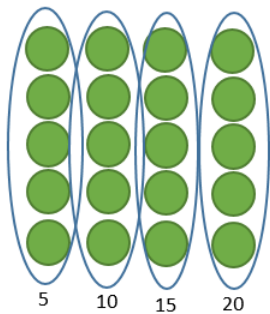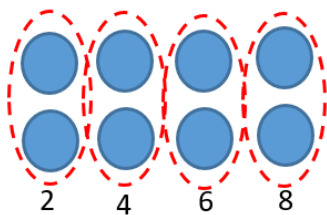
Multiplication

Year 2

NC Objectives

❖ To recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
❖ To calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.
❖ To show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.
❖ To solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in context.

Models and Examples

Arrays

Children can use arrays to help them count in groups.

2   4   6   8

5   10   15   20

Repeated Addition

Children can use arrays to understand that idea of multiplication is adding groups together.

$6 \times 2 = 12$

$2 + 2 + 2 + 2 + 2 + 2 = 12$

$+ \quad + \quad + \quad + \quad + \quad = 12$

Commutative

Children will explore the idea that multiplication is commutative and can be done in any order.

$7 \times 2 = 14$

$2 \times 7 = 14$

$7 \times 2 = 14$

$2 \times 7 = 14$

Multiplication and Division Relationship

Children will explore the idea that division and multiplication are the inverse.

$5 \times 2 = 10 \rightarrow 10 \div 2 = 5$
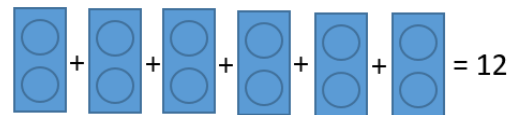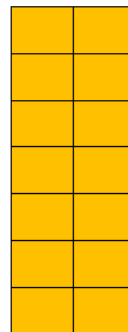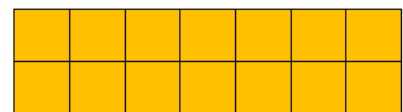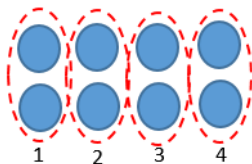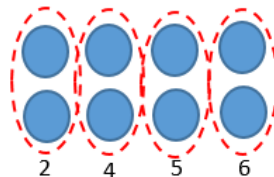
$7 \times 5 = 35 \rightarrow 35 \div 5 = 7$

$6 \times 10 = 60 \rightarrow 60 \div 10 = 6$

Misconceptions

1   2   3   4

The child has counted the groups and not realised their value.

2   4   5   6

The child has miscounted and started to count in 1s.

Notes

Key vocabulary

multiply   double   lots of   groups of   times   array   multiples   repeated addition
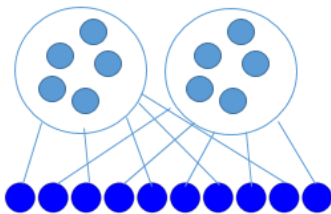
Division

Year 2

NC Objectives

- ❖ To recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- ❖ To calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.
- ❖ To show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.
- ❖ To solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in context.
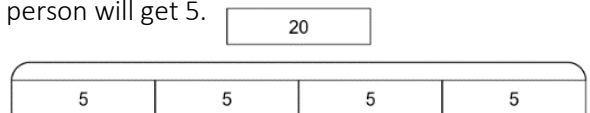
Models and Examples

Sharing Equally

Children are taught to start with the largest number (the whole) and share into equal parts, one at a time. 10 shared equally between 2 makes 5.

Grouping

Children begin to understand how sharing relates to grouping. The children learn how to take a number and share it equally between groups.

To share 20 equally between 4 people, take a group of 4 and give 1 to each person. Keep going until the objects have been shared. Each person will get 5.

20			
5	5	5	5

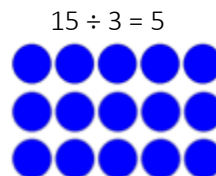### Inverse Relationship with Multiplication

Children will begin to understand the link between multiplication and division. They will use their knowledge of multiplication to support their understanding of division.
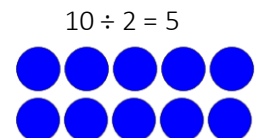
If I know that 4 x 5 is 20 then this can help me solve 20 ÷ 5 = 4 or 20 ÷ 4 = 5

Arrays

Children understand the relationship between grouping and division number sentences by using arrays. They can use counters, cubes or draw dots to support their understanding.
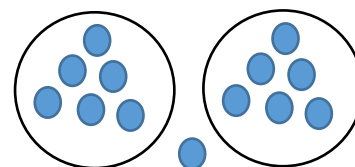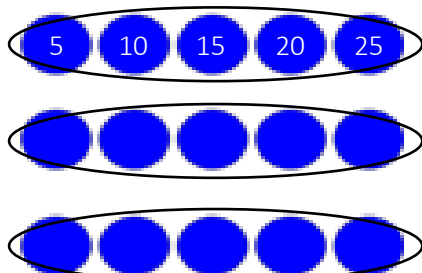
15 ÷ 3 = 5   10 ÷ 2 = 5

13 ÷ 2 = 6 r 1

Division with a Remainder

Children will begin to divide numbers that may have a remainder. This ideas explores what happens when you divide an odd number by 2.

Misconceptions

Miscounting Arrays

The child has become confused with the value of each counter. 15 shared between 3 = 25

The counters are worth 1 each. Yet the child has counted in 5's for each counter.

5   10   15   20   25

Notes

In Year 2, children are taught that multiplication is commutative.
We also explore the idea that division is the **inverse** of multiplication, for example, 45 ÷ 5 = 9➔ 9 x 5 = 45

Key Vocabulary

groups of   equal groups of   halve   share   share equally   divide divided by   inverse.

Fractions, Decimals Percentages

Year 2

NC Objectives

❖ To recognise, find, name and write fractions $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a length, shape, set of objects or quantity.

❖ To write simple fractions ($\frac{1}{2}$ of 6 = 3) and recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$.
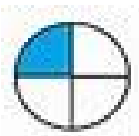
Models and Examples

Identifying Fractions of Shapes

Numerator = parts shaded

Denominator = total number of parts

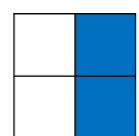 $= \frac{1}{2}$ $= \frac{1}{4}$ $= \frac{1}{3}$ $= \frac{2}{4}$

1 part shaded out of 2.   1 part shaded out of 4.   1 part shaded out of 3.   2 parts shaded out of 4.
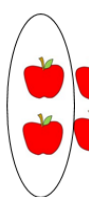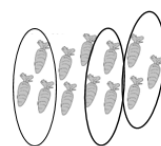
Finding Fractions of Amounts using Sharing and Grouping

There are 6 apples. I want to give 1/3 to my friend. How many apples will my friend get?

$\frac{1}{3}$ of 6 = 2

There are 12 carrots. I want to give my rabbit ¾ of the carrots. How many carrots will my rabbit get to eat?

$\frac{3}{4}$ of 12 = 9

Finding Fractions of Amounts

Finding $\frac{1}{2}$ ➞ Divide amount by 2 (denominator). $\frac{1}{2}$ of 8 = 4   (8÷2=4) $\frac{1}{2}$ of 24 = 12   (24÷2=12)

Finding $\frac{1}{4}$ ➞ Divide amount by 4 (denominator). $\frac{1}{4}$ of 12 = 3   (12÷4=3) $\frac{1}{4}$ of 28 = 7   (28÷4=7)

Finding $\frac{3}{4}$ ➞ Divide amount by 4 (denominator). Multiply by 3 (numerator). $\frac{3}{4}$ of 20 = 15   (20÷4=5   5x3=15)

Recognising Equivalent Fractions

$\frac{1}{2}$ of the square is shaded. $\frac{2}{4}$ of the square is shaded.

If the numerator is half of the denominator, the fraction is equal to $\frac{1}{2}$.

1/2					1/2				
1/4		1/4		1/4			1/4		
1/6		1/6		1/6		1/6		1/6	1/6
1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8		
1/10	1/10	1/10	1/10	1/10	1/10	1/10	1/10	1/10	1/10

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$$

Misconceptions

Misunderstanding the Meaning of a Fraction

3/5

The child has counted the shaded sections vs the unshaded sections rather than thinking about the shape as a whole.
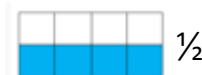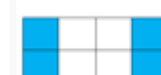
I have cut the pie into thirds.

The child has not split the pie into equal thirds, but instead cut it into 3 parts.

Finding Multiple Equivalent Fractions

The child has not understood that fractions can be shown in different ways but they still show the same fraction.

½   ¼

Confusion when drawing equal parts

The child has miscalculated equal parts when drawing fractions of a shape.

Notes

Key vocabulary

half   quarter   thirds   two quarters   three quarters   ½   ¼   1/3   2/4   ¾   part   equal parts   equivalent fraction