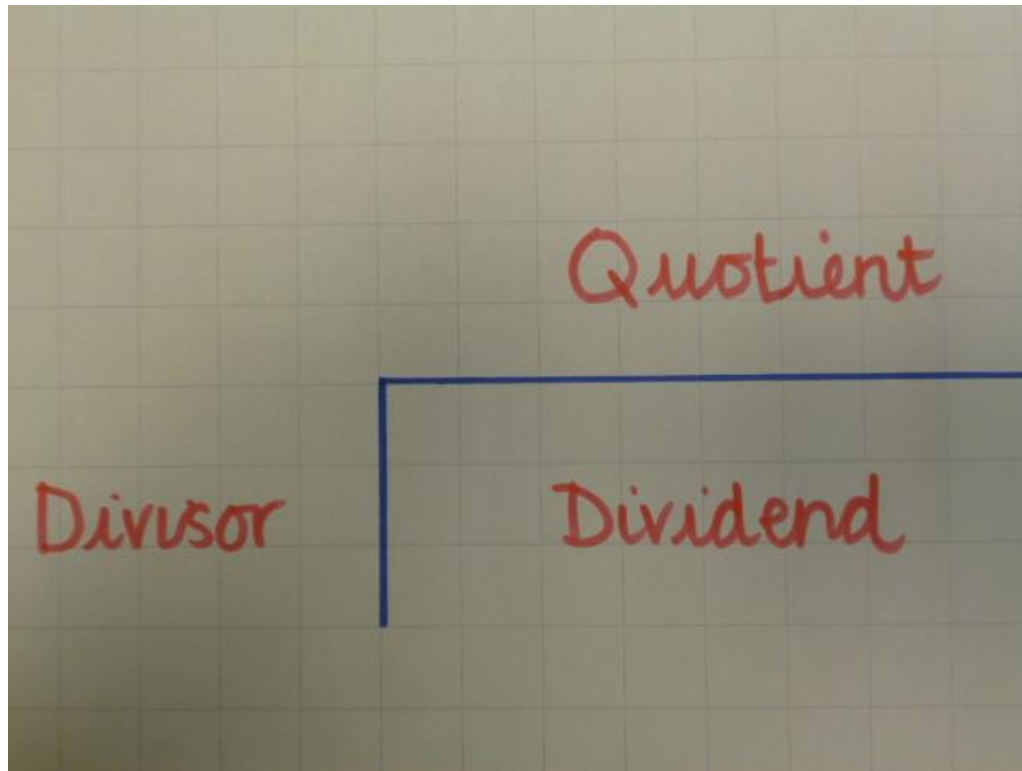# Progression in Division Calculations

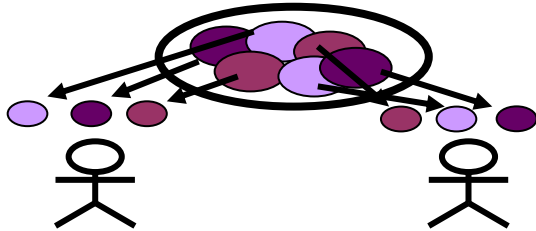# Structures for Division (Haylock and Cockburn 2008)

Children should experience problems with the different division structures in a range of practical and relevant contexts e.g. money and measurement

Equal-sharing

Sharing equally between
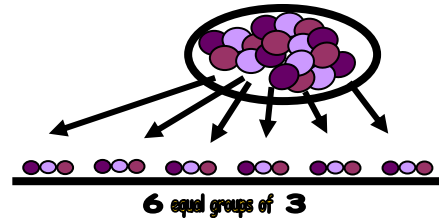*How many (much) each?*

6 shared equally by **2**

6 ÷ 2

Inverse of multiplication (Grouping)

So many lots (sets/groups) of so many
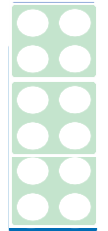*Share equally in to groups of ...*

18 ÷ 3

18 divided into equal groups of **3s**

6 equal groups of 3

Divide twelve into equal groups of four

= 3

Make 12

Overlay groups of four

Ratio structure
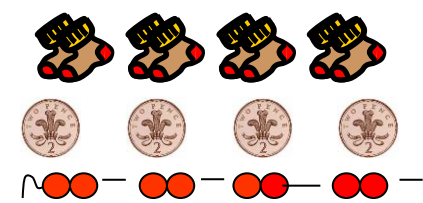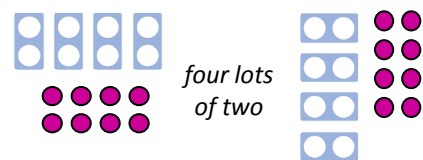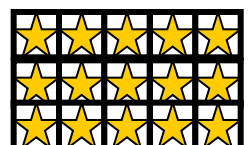
comparison
inverse of scaling structure of multiplication
scale factor (decrease)

Barney earns three times more than Fred. If Barney earns £900 how much does Fred earn?

Jo's journey to school is three times as long as Ella's. If Jo walks to school in 30 minutes how long does it take Ella?

Division

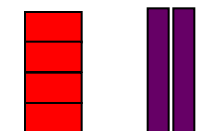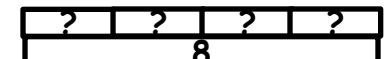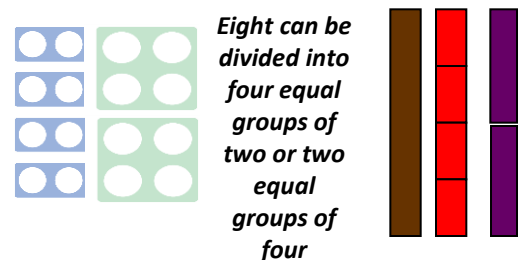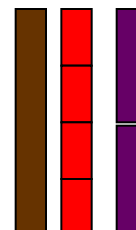| End of Year Expectations	Possible concrete and visual representation	Teacher Modelling/Children's Recording	Fluency
Year 1 Solve single step practical problems involving division Use concrete objects, pictorial representations Understand division as grouping and sharing Use the language of 'sharing equally between'	*counting in groups of twos* *straw bundles* *four lots of two* *Numicon and counter arrays*	Practical only e.g. link to small world Using concrete objects, pictorial representations and arrays with the support of an adult – take photographs/draw pictures – if using Numicon small icons could be stuck in ***Eight can be divided into four equal groups of two or two equal groups of four***	Count in twos, fives and tens from different multiples e.g. 6, 8, 10, 12 etc Emphasise patterns Find simple fractions eg half and quarter, of objects, numbers and quantities
Year 2 Solve single step practical problems involving division Use concrete objects, pictorial representations Understand division as grouping Find halves and then quarters Work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete quantities and to arrays	*Cuisenaire* *four lots of two* *two lots of four* *doubling* *flexible array* bar models	Record as number sentences using ÷ and = $8 ÷ 4$ Eight divided into four equal groups = two in each group $8 ÷ 4 = 2$ ***Eight can be divided into four equal groups of two or two equal groups of four***	Count back in twos, threes, fives from zero and tens from any number e.g. 12, 10, 8, 6 etc Emphasise patterns Connect ten times table to place value and five times table to divisions on a clock face Introduction to multiplication tables. Practise to become fluent in division facts for 2, 5 and 10 Solve division problems involving grouping and sharing

bar models
?	?	?	?
8			

Division - multiplication and division should be taught together– refer to structures of division

End of Year Expectations	Possible concrete and visual representation	Teacher Modelling/Children's Recording	Fluency

Year 3

Develop a reliable written method for division

Solve problems involving missing numbers

Solve problems including those that involve scaling

Recognise, find and name ½ and ¼ of an object, shape or quantity

Understand the link between unit fractions and division

Connect 1/10 to division by 10

Count in tenths

Year 4

Become fluent in the formal written method of short division with exact answers when dividing by a one-digit number

Divide one- or two-digit numbers by 10 or 100, identifying value of digits as tenths or hundredths

Solve two-step problems in different contexts, choosing the appropriate operation, working with increasingly harder numbers including correspondence questions e.g. three cakes shared equally between 10 children

Cuisenaire to represent scaling

Statue is 3 metres

I am 3 times smaller

arrays

$88 \div 4$

$\div$ 2 2

4

10 10 | 1 1
10 10 | 1 1
10 10 | 1 1
10 10 | 1 1

? ? ? ?

? ? ? ?

80

bar models

Children should use manipulatives alongside algorithms

0 3 6 9 12 15 18
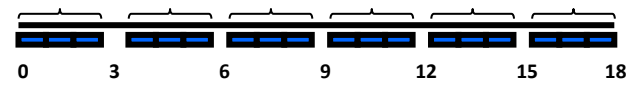
Repeated subtraction - chunking

Ensure children see/understand the link between grouping on a number line and vertical recording for chunking
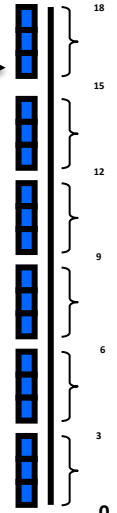
$95 \div 5 = \underline{19}$

95

$-\ 50$ ($\underline{10}$ x 5)

45

$-\ 25$ ($\underline{5}$ x 5)

20

$-\ 20$ ($\underline{4}$ x 5)

0

Fact Box

2 x 5 = 10

5 x 5 = 25

10 x 5 = 50

18
15
12
9
6
3
0

$\div$ | 1 2 1
3 | 3 6 3

$321 \div 3$

Short division- no remainders

$560 \div 4$

$\div$ | 1 4 0
4 | 5 ^{1}6 0

Fluency
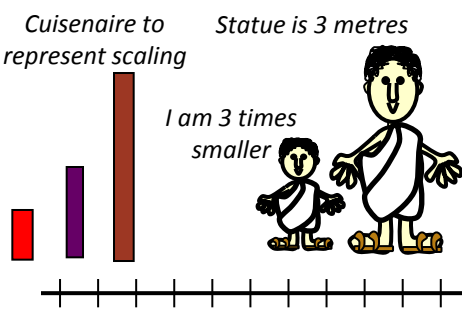
Recall and use related division facts for the 3, 4 and 8x tables (Continue to practise other tables)
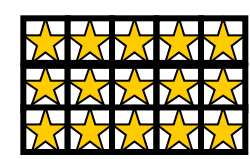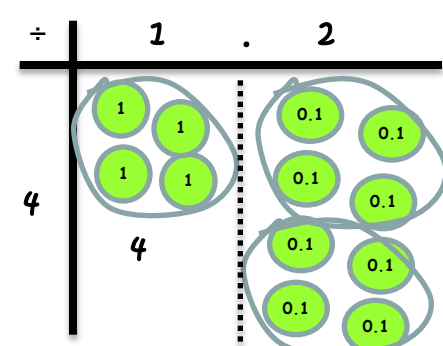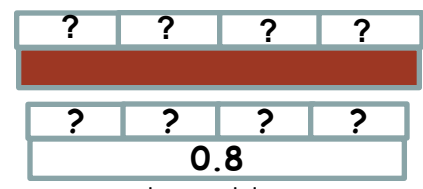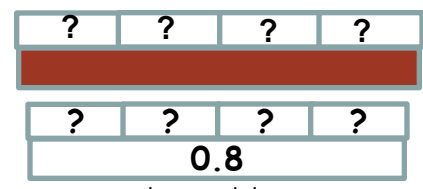
Write and calculate mathematical statements for division using what is known

Use division facts to derive related division facts e.g. using 6 ÷ 3 = 2 to work out 60 ÷ 3 = 20

Continue to practise recalling division facts for multiplication tables up to 12 x 12

Practise mental methods and extend this to three-digit numbers for example 200 x 3 = 600 into 600 ÷ 3 = 200

Use place value, known and derived facts to divide mentally, including dividing by 1

Recognise and use factor pairs and commutativity in mental calculations

Division - multiplication and division should be taught together– refer to structures of division

End of Year Expectations	Possible concrete and visual representation	Teacher Modelling/Children's Recording	Fluency

Year 5

End of Year Expectations:

- Identify factors, including finding all factor pairs of a number, and common factors of two numbers
- Practise and extend the formal written method of short division: numbers up to four-digits by a one-digit number
- Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding as appropriate for the context
- Use multiplication and division as inverses
- Solve problems involving division including scaling down
- Divide whole numbers and those involving decimals by 10, 100 & 1000

Possible concrete and visual representation:

Cuisenaire to represent scaling

Statue is 3 metres

I am 3 times smaller

flexible arrays

$4.8 \div 4$

$\div$ | 1 . 2

4

4

0.8

? ? ? ?

? ? ? ?

0.8

bar models

Teacher Modelling/Children's Recording:

Children might use manipulatives alongside algorithms

short division

without remainder

$560 \div 4$

remainder as a decimal

$564 \div 5$

remainder as a fraction

$560 \div 24$

long division

remainder as a whole number

remainder as a fraction in its lowest form

remainder as a decimal

Year 6

End of Year Expectations:

- Divide numbers up to 4-digits by a 2-digit whole number using formal written methods of long division, interpret remainders as whole numbers, fractions or by rounding, as appropriate for the context
- Divide numbers with up to 2 decimal places by 1-digit and 2-digit whole numbers, initially in practical contexts involving money and measures
- Understand the relationship between unit fractions and division
- Recognise division calculations as the inverse of multiplication
- Solve problems involving division

Fluency (Year 5):

- Count backwards in steps of powers of 10 for any given number up to 1 000 000
- Count backwards with positive/negative whole numbers through zero
- Practise mental calculation with increasingly large numbers
- Apply all multiplication tables and related division facts frequently, commit them to memory and use them to confidently to make larger calculations

Fluency (Year 6):

- Practise division for larger numbers, using the formal written methods of short and long division
- Continue to use all multiplication tables and division facts to maintain fluency
- Perform mental calculations, including with mixed operations and larger numbers