÷ Division ÷

Year 1 ÷

Key Vocabulary: share, share equally, one each, two each…, group, groups of, lots of, array

Key number skills needed for division at Y1:

*Begin to count in 2s, 5s and 10s

*Find half of an even numbers to 12 and know it is hard to halve an odd number Find half of even numbers by sharing

*Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations arrays with the support of the teacher

* Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities.

* They make connections between arrays, number patterns, and counting in twos, fives and tens.

Pupils should :

 use lots of practical apparatus, arrays and picture representations

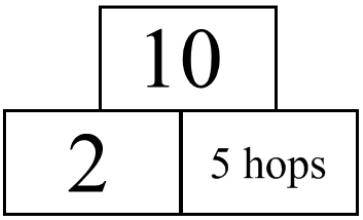
 Be taught to understand the difference between „grouping" objects (How many groups of 2 can you make?) and „sharing" (Share these sweets between 2 people)

 Be able to count in multiples of 2s, 5s and 10s.

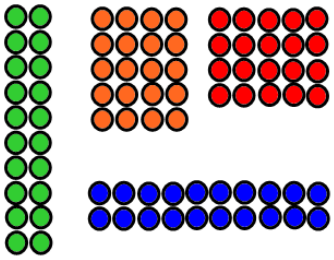
 Find **half** of a group of objects by sharing into 2 equal groups.

Group and share small quantities:

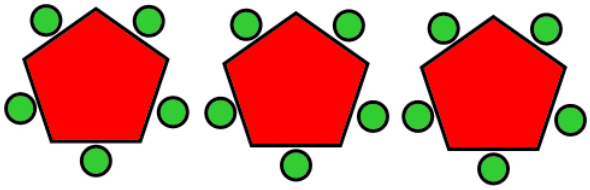
Children will experience equal groups of objects and will count in 2s, 5s and 10s. They will work on practical problem solving activities involving equal sets or groups,



e.g. If the frog hops in 2s, how many hops will there be before he lands on 10?

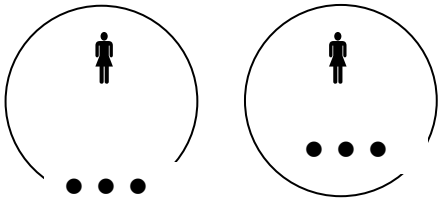


Here are 20 counters. Arrange them in equal rows. Is there a different way to arrange them in equal rows?



15 children sit at 3 tables. There is the same number of children at each table. How many children sit at each table?

Millie had 6 toffees; she gave half to her friend. How many toffees do they each get?



Example division problem in a familiar context:
There are 6 pupils on this table and there are 18 pieces of fruit to share between us.
If we share them equally, how many will we each get?
Can they work it out and give a division statement… ?
"18 shared between 6 people gives you 3 each."

Year 2

Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over

Key number skills needed for division at Y2:

*Count in steps of 2, 3, and 5 from 0

*Using fingers, say where a number is in the 2s,5s or 10s. (E.g> 8 is the fourth number when I count)

*Relate division to grouping,

* Recall and use multiplication and division facts for the **2, 5 and 10** multiplication tables, including recognising odd and even numbers.

* Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the x, ÷ and = signs.

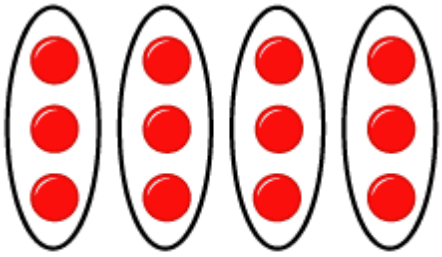
* Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.

* Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, include problems in contexts.

Group and share, using the ÷and = sign.

Use objects, arrays, diagrams and pictorial representations, and grouping on a number line.

Arrays:



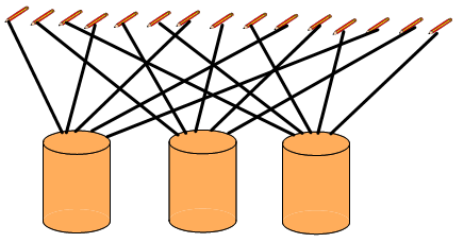
12 ÷ 3 = 4

This represents **12 ÷ 3, posed as** how many groups of 3 are in 12?

Pupils should also show that the same array can represent **12 ÷ 4 = 3** if grouped horizontally.

Sharing equally

Use **sharing** to answer division questions; Suppose 15 pencils were to be shared out between three children. How many pencils would each child get? Explain to me how you could work it out.



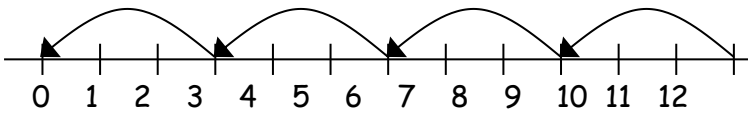
Experience divisions that give rise to remainders, such as:

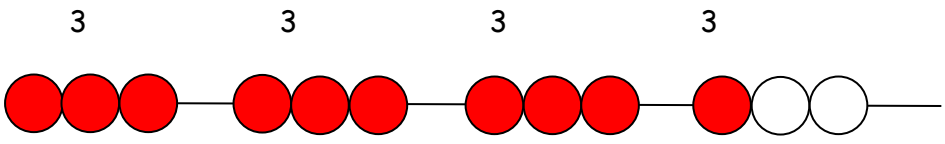
Three friends share 16 marbles equally. How many marbles does each friend get? How many marbles are left over?

- **Grouping or repeated subtraction using a number line or bead bar.:**

Group from zero in equal jumps of the divisor to find out "how many groups of _ in _ ?". Pupils could and using a bead string or practical apparatus to work out problems like „A CD costs £3. How many CDs can I buy with £12?" **This is an important method to develop understanding of division as grouping.**

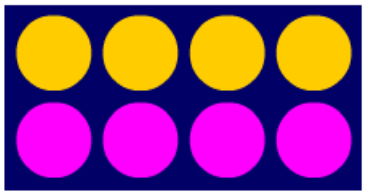
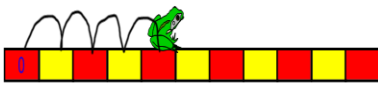
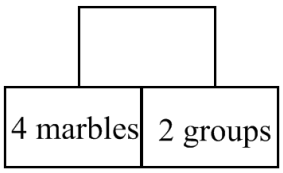
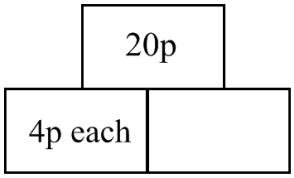
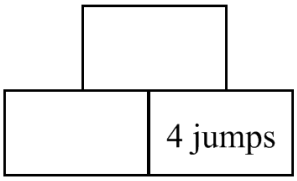
Show me on a number line how you could do: 12 ÷ 3 = 4





The bead bar will help children with interpreting division calculations such as 12 ÷ 3 as 'how many 3s make 12?'

- **Using symbols to stand for unknown numbers to complete equations using inverse operations**

□ ÷ 2 = 4	20 ÷ △ = 4	□ ÷ △ = 4
A number of marbles divided between 2 groups gives each group 4 each	20p is divided between some children. Each child gets 4p. How many children are there?	On a number line, I do four equal jumps. What numbers could I land on?
		
		

Year 3

Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, **inverse, short division, _carry', remainder, multiple**

Key number skills needed for division at Y3:

*Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through doubling, connect the 2, 4 and 8s).

*Divide whole numbers by 10 or 100 to give whole number answers

*Recognise that division is not commutative.

*Use place value and number facts in mental division. (E.g. 84 ÷ 4 is half of 42)

*Divide larger numbers mentally by subtracting the tenth multiple, including those with remainders. (E.g. 57 ÷ 3 is 10 + 9 as 10x3=30 and 9x3=27)

*Halve even numbers to 100, halve odd numbers to 20

*Solve problems, in contexts, and including missing number problems, involving multiplication and division.

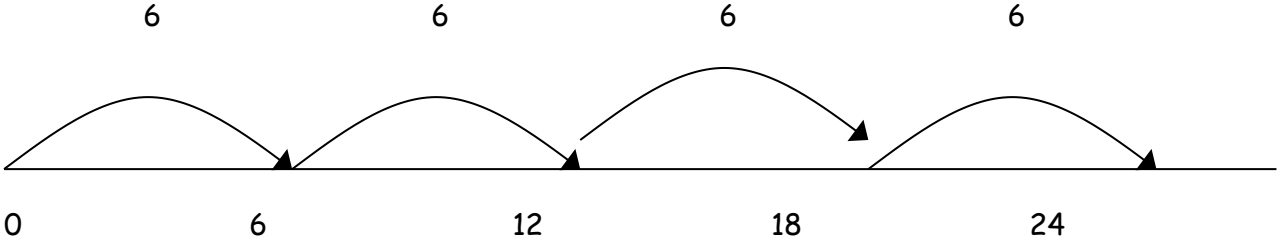
*Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3).

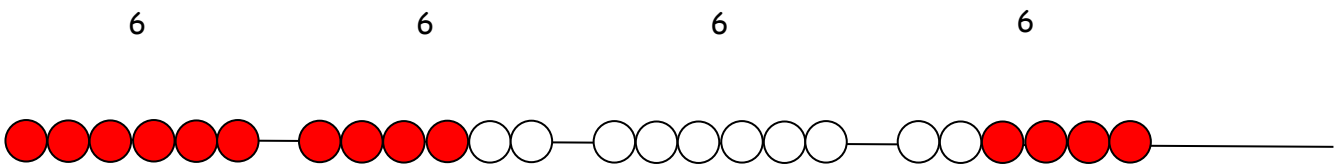
*Perform divisions just above the 10th multiple using the written layout and understanding how to give a remainder as a whole number.

*Find unit fractions of quantities and begin to find non-unit fractions of quantities

Divide 2-digit numbers by a single digit.

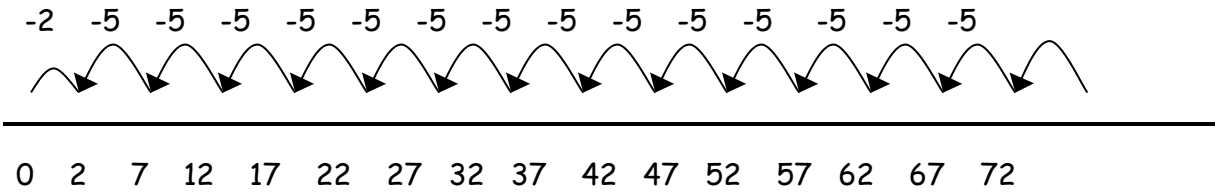
Children should continue to use number lines or bead bars to support their understanding.



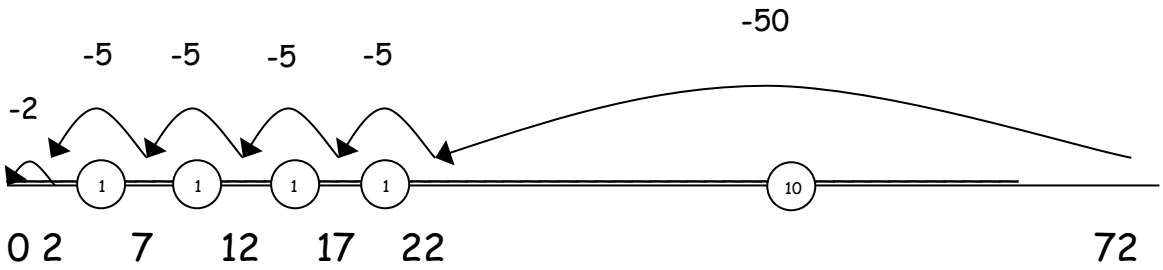


Grouping / repeated subtraction on a number line: STEP 1: Children continue to work out unknown division facts by grouping on a number line from zero. They are also now taught the concept of **remainders,** as in the example. This should be introduced practically and with arrays, as well as being translated to a number line. Children should work towards calculating some basic division facts with remainders mentally for the 2s, 3s, 4s, 5s, 8s and 10s, ready for remainders within vertical chunking methods.

72 ÷ 5

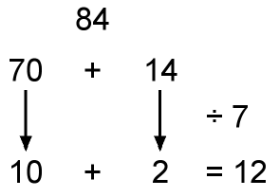


Moving on to



Step 2 - The above method of CHUNKING on a number line leads itself to its representation vertically (see Y4).

Mental - Informal recording in Year 3 for 84 ÷ 7 might be:



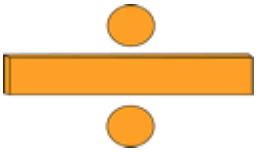
In this example, using knowledge of multiples, the 84 is partitioned into 70 (the highest multiple of 7 that is also a multiple of 10 and less than 84) plus 14 and then each part is divided separately using the distributive law.

Children **understand the relationship between multiplication and division** . For example, they state two multiplication sentences and two division sentences that relate to a particular array, for example:  $5 \times 2 = 10$, $2 \times 5 = 10$

$10 \div 2 = 5$, $10 \div 5 = 2$

Children who are secure with division as grouping and demonstrate this using number lines, arrays etc. may be extended to **short division** (see Y4).

Year 4



Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry", remainder, multiple, **divisible by, factor**

Key number skills needed for division at Y4:

*Know by heart all the division facts up to 144 ÷ 12.

*Divide whole numbers by 10, 100 to give whole number answers or answers with one decimal place

*Divide multiples of 100 by 1-digit numbers using division facts. (E.g. 3200 ÷ 8 = 400)

*Use place value and number facts in mental division. (E.g. 245 ÷ 20 is double 245 ÷ 10)

*Divide larger numbers mentally by subtracting the 10^{th} or 20^{th} multiple as appropriate. (E.g. 156 ÷ 6 is 20 + 6 as 20x6=120 and 6x6=36)

*Find halves of even numbers to 200 and beyond using partitioning

*Begin to halve amounts of money. (E.g. Half of £52.40 = £26.20)

*Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

*Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number (2 or 3-digit by a single digit)

*Give remainders as whole numbers.

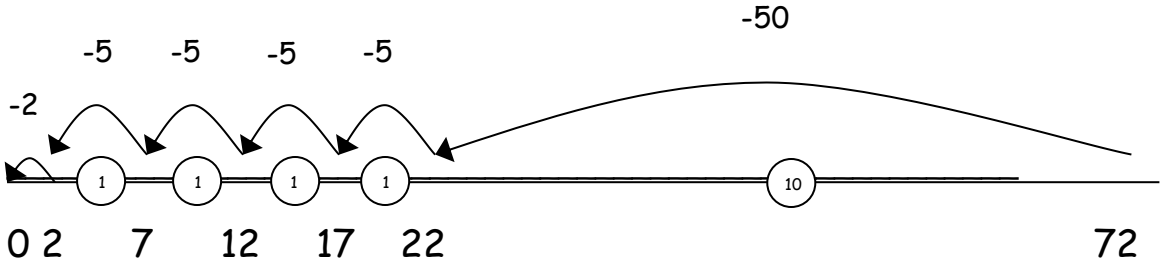
*Begin to reduce fractions to their simplest forms.

*Find unit and non-unit fractions of larger amounts.

Divide up to 3-digit numbers by a 1- digit (without remainders initially)

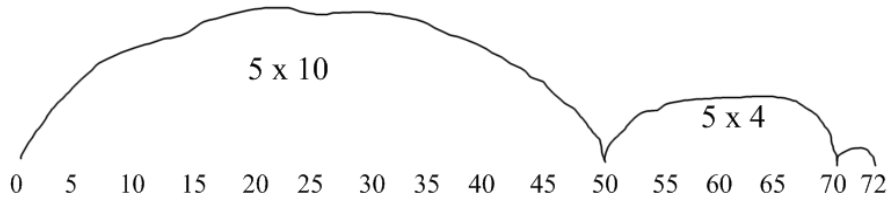
They will continue to develop their use of repeated subtraction to be able to subtract multiples of the divisor (chunking) (see Y3).

72 ÷ 5



or counting forward(linked to multiplication)

or

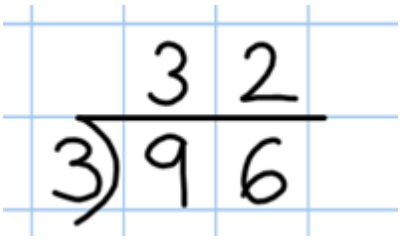


Step 2 - The above method of CHUNKING on a number line leads itself to its representation vertically. Once children are secure with division as grouping and demonstrate this using number lines, arrays etc they can also represent this as an informal vertical method of recording.

		10	+	5	=	1	5r2
	5	7	2				
	-	5	0				
		2	2				
	-	2	0				
		r	2				

Include teaching in context using measure and money.

Formal written methods:



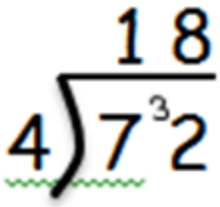
Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., **short division** for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all. Start by introducing the layout of short division by comparing it to an array.

Remind children of correct place value, that 96 is equal to 90 and 6, but in short division, pose:

 How many 3"s in 9? = 3, and record it above the **9 tens**.

 How many 3"s in 6? = 2, and record it above the **6 units**

Limit numbers to **NO** remainders in the final answer, but with remainders occurring within the calculation



Once children demonstrate a full understanding of remainders, and also the short division method taught, they can be taught how to use the method when remainders occur within the calculation (e.g. 96†4), and be taught to „carry" the remainder onto the next digit. **If needed, children should use the number line to work out individual division facts that occur which they are not yet able to recall mentally.**

Pupils move onto dividing numbers with up to **3-digits** by a single digit, however problems and calculations provided should **not result in a final answer with remainder** at this stage.

Year 5 ÷

Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry", remainder, multiple, divisible by, factor, inverse, **quotient, prime number, prime factors, composite number (non-prime)**

Key number skills needed for division at Y5:

*Recall multiplication and division facts for all numbers up to 12 x 12 (as in Y4).

* Multiply and divide numbers mentally, drawing upon known facts.

* Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number.

* Solve problems involving multiplication and division where larger numbers are decomposed into their factors.

* Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 and 10,000 to give whole number answers or answers to to 1,2 or 3 decimal places.

* Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.

* Work out whether a number up to 100 is prime, and recall prime numbers to 19.

* Use multiplication and division as inverses.

*Halve amounts of money by partitioning. (E.g. Half of £75.40 = half of £75 (37.50) plus half of 40p (20p) which is £37.70)

*Divide larger numbers mentally by subtracting the 10^{th} or 100^{th} multiple as appropriate. (E.g. 96 ÷ 6 is 10 + 6, as 10 × 6 = 60 and 6 × 6 = 36; 312 ÷ 3 is 100 + 4 as 100 x 3 = 300 and 4 x 3 = 12)

*Reduce fractions to their simplest form.

* 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 (e.g. 98 ÷ 4 = 24 r 2 = 241/2 = 24.5 ≈ 25).

Written

*Use short division to divide a number with up to 4 digits by a number ≤12.

*Give remainders as whole numbers, fractions or appropriate context.

*Find non-unit fractions of large amounts.

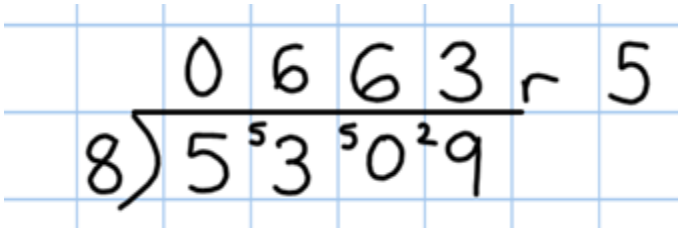
*Turn improper fractions into mixed numbers and vice versa.

*Choose the most efficient method in any given situation

Divide up to 4 digits by a single digit, including those with remainders.

Children should continue to use the vertical method of chunking (see Y4).

Those who are not secure should use previous methods (Y4).



.**Short division with remainders:** Now that pupils are introduced to examples that give rise to remainder answers, division needs to have a real life problem solving context, where **pupils consider the meaning of the remainder and how to express it,** ie. as a fraction, a decimal, or as a rounded number or value , depending upon the context of the problem.

The answer to 5309 ÷ 8 could be expressed as 663 and five eighths, 663 r 5, as a decimal, or rounded as appropriate to the problem involved.

See Y6 for how to continue the short division to give a decimal answer for children who are confident.

Include money and measure contexts.

If children are confident and accurate:

 Introduce **long division** for pupils who are ready to divide any number by a 2-digit number (e.g. 2678 ÷ 19). This is a Year 6 expectation.

Year 6 ÷

Key Vocabulary: As previously, & common factor
Key number skills needed for division at Y6:
*Know by heart all the division facts up to 144 ÷ 12.

*Divide whole numbers by powers of 10 to give whole number answers or answers with up to three decimal places.

*Identify common factors, common multiples and prime numbers and use factors in mental division. (E.g. 438 ÷ 6 is 219 ÷ 3 which is 73)

*Use tests for divisibility to aid mental calculation.

*Use doubling and halving as mental division strategies, e.g. to divide by 2, 4, 8, 5, 20 and 25. (E.g. 628 ÷ 8 is halved three times: 314, 157, 78.5)

*Divide one and two place decimals by numbers up to and including 10 using place value. (E.g. 2.4 ÷ 6 = 0.4 or 0.65 ÷ 5 = 0.13, £6.33 ÷ 3 = £2.11)

*Halve decimal numbers with up to 2 places using partitioning

e.g. Half of 36·86 is half of 36 (18) plus half of 0·86 (0·43)

*Know and use equivalence between simple fractions, decimals and percentages, including in different contexts.

*Recognise a given ratio and reduce a given ratio to its lowest terms.

Written

*Use short division to divide a number with up to 4 digits by a 1-digit or a 2-digit number

*Use long division to divide 3-digit and 4-digit numbers by 'friendly' 2-digit numbers.

*Give remainders as whole numbers or as fractions, decimals or the appropriate context

*Divide a one-place or a two-place decimal number by a number ≤ 12 using multiples of the divisors.

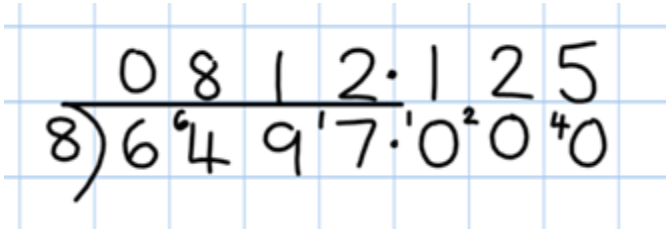
*Divide proper fractions by whole numbers.

Divide at least 4 digits by both single-digit and 2-digit numbers

(including decimal numbers and quantities)

Only move to this method when they are secure.

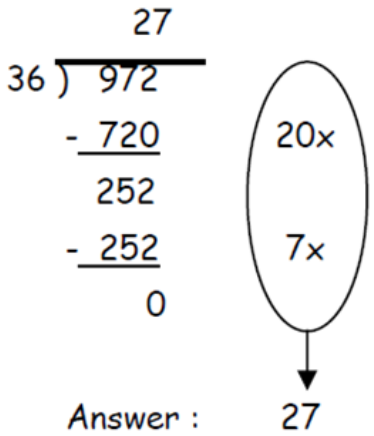
Short division, for dividing by a single digit: e.g. 6497 ÷ 8



Short division with remainders: (see Y5) Pupils should continue to use this method, but with numbers to at least 4 digits, and understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers. Real life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder.

Calculating a decimal remainder: In this example, rather than expressing the remainder as **r 1**, a decimal point is added after the units because there is still a remainder, and the one remainder is carried onto zeros after the decimal point (to show there was no decimal value in the original number).

Introduce long division by chunking **for dividing by 2 digits.**



Find out „How many 36s are in 972?" by subtracting „chunks" of 36, until zero is reached (or until there is a remainder).

Where **remainders** occur, pupils should express them as fractions, decimals or use rounding, depending upon the problem.

Teach pupils to write a „**useful list**' first at the side that will help them decide what chunks to use, e.g.:

Useful' list: 1x = 36
10x = 360
100x = 3600
 Introduce the method in a simple way by limiting the choice of chunks to „Can we use 10 lots? Can use 100 lots? As children become confident with the process, encourage more efficient chunks to get to the answer more quickly (e.g. 20x, 5x), and expand on their „useful" lists.

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.