Division

About our calculation policy

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in Reception follows the 'Development Matters' EYFS document, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Age stage expectations

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, however it is vital that pupils are taught according to the stage that they are currently working at, being moved onto the next level when they are ready or working at a lower stage until they are secure enough to move on.

Providing a context for calculation

It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons.

Choosing a calculation method

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved...
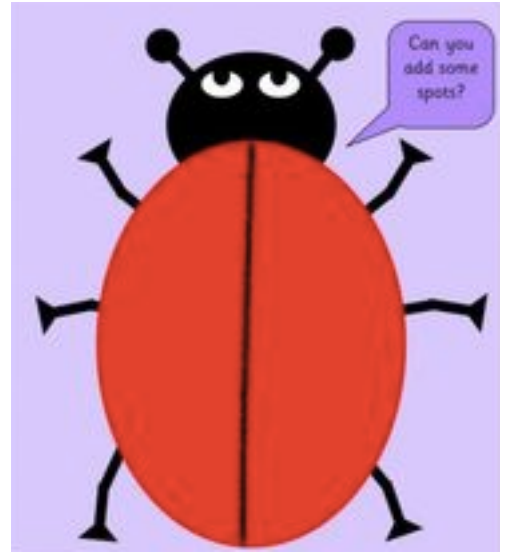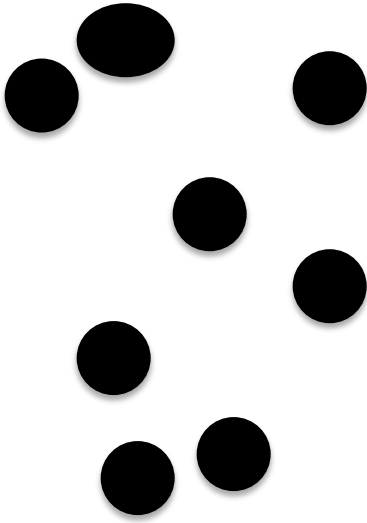
Can I do it in my head?

Could I use some jottings to help me?

Should I use a written method to work it out?

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Early Years Group and share small quantities

Key skills for division in Early Years:

- Recognise numerals 1 to 20 and place them in order.
- Count actions or objects which cannot be moved.
- Record using marks that they can interpret and explain.
- Estimate how many objects they can see and check by counting.
- Record, using marks and pictures that they can interpret and explain.
- Help children to recognise that when a group of objects is separated in different ways the total is the same.
- Provide a wide range of number resources and encourage children to be creative in identifying and devising problems and solutions in all areas of learning.
- Encourage children to extend problems, e.g. *"Suppose there were three people to share the bricks between instead of two"*.

Vocabulary: share, share equally, one each, two each..., group, groups of, lots of

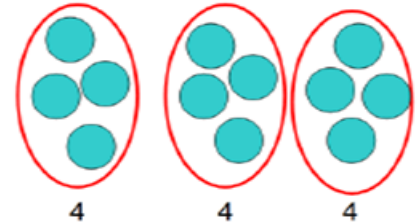# Division

Year 1 Group and share small quantities

Grouping

How many groups of 4 can be made with 12 stars?

Sharing

There are 3 children on this table and there are 12 pieces of fruit to share between us. If we share them equally, how many will we each get?

12 shared between 3 is 4

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, and ¼ of a group of objects by sharing into 4 equal groups.

Key skills for division at Y1:

- 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.

Vocabulary: share, share equally, one each, two each..., group, groups of, lots of

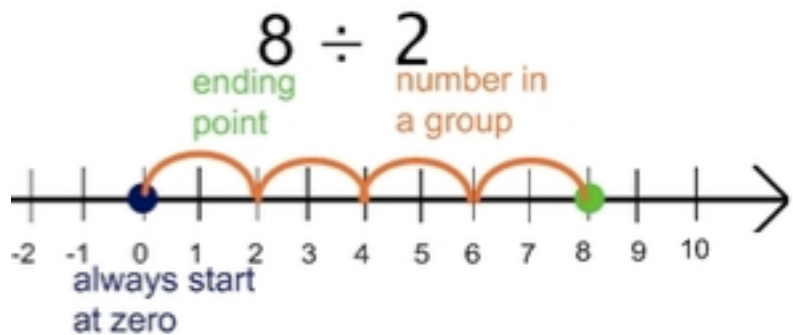# Division

year 2 Group and share, using the ÷ and = sign

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

Arrays 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.

12 ÷ 3 = 4
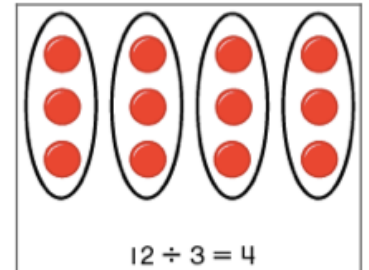
Grouping using a numberline

8 ÷ 2

ending point — number in a group

always start at zero

Key skills for division at Y2:

- Count in steps of 2, 3, and 5 from 0
- 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, including problems in contexts.

 Key vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of

Division

year 2 Advice for staff

Children should

- Be taught to recognise whether problems require sharing or grouping.
- Group from zero in equal jumps of the divisor to find out how many groups of ….. in ?
- Use practical apparatus

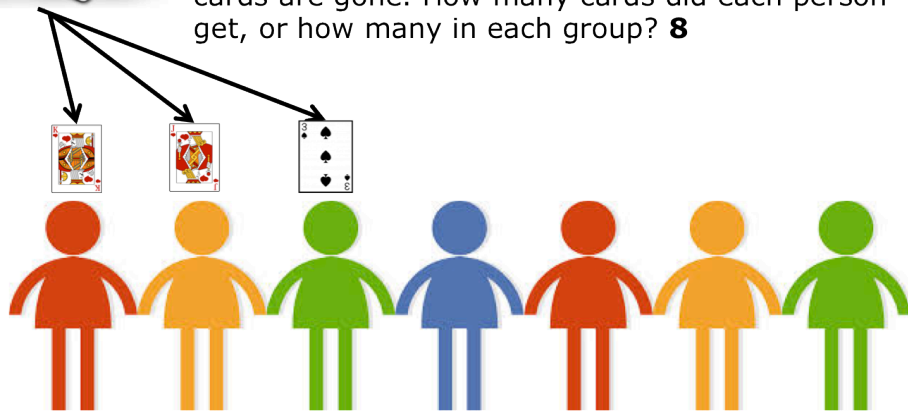Pupils could use a bead string to work out problems such as if 3 comics costs £9 How much would 1 comic cost?

Sharing Division

56 cards ÷ 7 people = ____ cards for each person
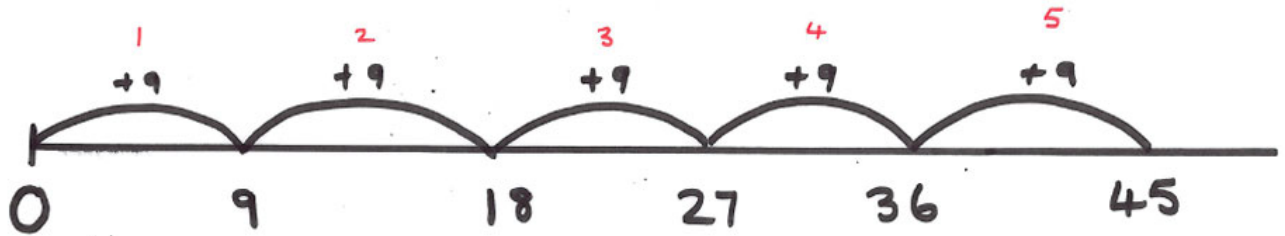
56 in all ÷ 7 groups = ____ in each group

Give each person, or group, a card until all the cards are gone. How many cards did each person get, or how many in each group? **8**

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year 3 Divide 2-digit numbers by a single digit (where there is no remainder in the final answer)

Grouping on a numberline 45÷9 = 5


Key skills 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).
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
- 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 $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts ($30 \times 2 = 60$, so $60 \div 3 = 20$ and $20 = 60 \div 3$).
- Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division.

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**
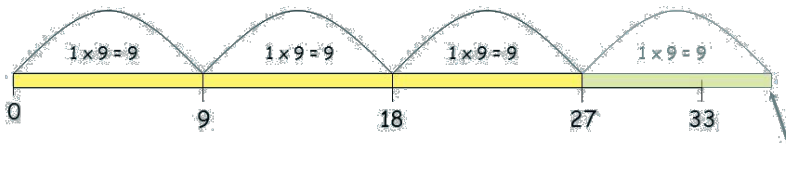
Division

Year 3 Advice for staff

STEP 1: Children continue to work out unknown division facts by grouping on a number line starting at zero.
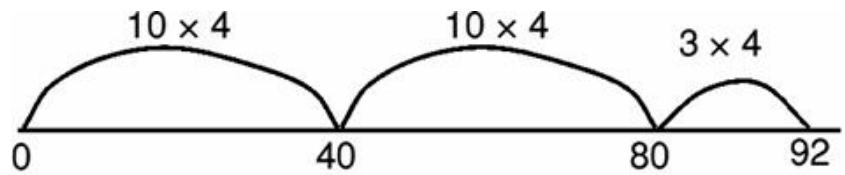
33 ÷ 9 = ?   How many lots of 9 are there in 33?

They are also now taught the concept of remainders, as in this 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 carrying remainders across within the short division method.

STEP 2: 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.

· How many 3s in 9tens? = 3tens, and record it above the 9 tens.
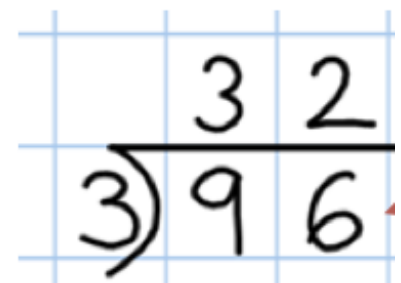
· How many 3s in 6units? = 2units, and record it above the 6 units.

STEP 3: 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. Children should use the number line to work out individual division facts that occur which they are not yet able to recall mentally.
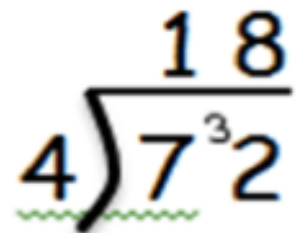
Division

year 4 Divide up to 3-digit numbers by a single digit (without remainders initially)

Continue to develop short division

$$2\ 1\ 8$$
$$4)\overline{8\ 7^{3}2}$$

Key skills for division at Y4:

- Recall multiplication and division facts for all numbers up to 12 x 12.
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.
- Pupils practice to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number
- Pupils practice mental methods and extend this to three-digit numbers to derive facts, for example $200 \times 3 = 600$ so $600 \div 3 = 200$
- 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.

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**

Division

year 4 Advice for staff

STEP 1: Pupils must be secure with the process of short division for diving 2-digit numbers by a single digit (those that do not result in a final remainder), but must understand how to calculate remainders, using this to carry remainders within the calculation process.

$$4\overline{)7\,^32}$$
$$18$$

STEP 2: Pupils move onto dividing numbers with up to 3-digits by a single digit. Problems and calculations should not result in a final remainder at this stage

$$4\overline{)8\,7\,^32}$$
$$2\,1\,8$$

When the answer for the first column is zero children could initially write a zero above to acknowledge its place, and must always "carry" the number over to the next digit as a remainder.

Real life contexts need to be used routinely to help pupils gain a full understanding, and the ability to recognise the place of division and how to apply it to problems.

Include money and measure contexts when confident.

Division

year 5 Divide up to 4 digits by a single digit, including those with remainders.

Short division, including remainder answers

```
   0 6 6 3 r 5
8) 5 ⁵3 ⁵0 ²9
```

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.

Key skills for division at Y5:

- Recall multiplication and division facts for all numbers up to 12 x 12
- 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.
- Use the vocabulary:prime numbers & factors and composite numbers
- Recall prime numbers to 19.
- Divide numbers up to 4 digits by a one-digit number using the formal written method of short division with remainders in context
- Use multiplication and division as inverses.
- 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 (98÷4 = 24r2 = 24.5 = 25).
- Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates.

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)**

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Year 5 Advice for staff

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.

$$\begin{array}{r} 1\ 3\ 7\ r\ 5 \\ 7\overline{)9\ ^2 6\ ^5 4} \end{array}$$

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
- Continue the short division to give a decimal answer for children who are confident, (See Y6).

Division

year 6 Divide at least 4 digits by both single-digit and 2-digit numbers (including decimal numbers and quantities)

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

$$\begin{array}{r} 0\ 8\ 1\ 2\cdot1\ 2\ 5 \\ 8\overline{)6\ ^{6}4\ 9\ ^{1}7\cdot^{0}0\ ^{2}0\ ^{4}0} \end{array}$$

a

```
400 ÷ 30
 300  | 10  (10 x 30 = 300)
 100  |     (10 pencils bought 100p left)
-  90 |  3  (3 x 30 = 90)
   10 |     (3 more pencils - 10p left)
      | 13  (10 + 3 = 13 pencils bought)
(10p Remaining)
```

Introduce long division by chunking for dividing by 2 digits

Key skills for division at Y6:

- Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as appropriate for the context.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Solve problems involving all 4 operations.
- Use estimation to check answers to calculations and determine accuracy, in the context of a problem.
- Use written division methods in cases where the answer has up to two decimal places.
- Solve problems, which require answers to be rounded to specified degrees of accuracy.

Key vocabulary: As previously, & common factor

Division

Year 6 Advice for staff
Short division with remainders

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). Keep dividing to an appropriate degree of accuracy for the problem being solved.
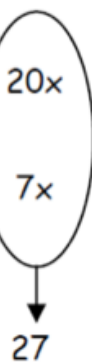
Long division by chunking

Find out how many 36's are in 972? By subtracting chunks of 36, until zero is reached (or there is a remainder).

Teach pupils to write a useful list at the side that will help them decide what chunks to use: **Useful list 1x = 36**

```
          27
36 ) 972
    - 720        20x
      252
    - 252        7x
        0

Answer :        27
```

10x = 360

100x = 3600

As children become more confident encourage more efficient chunks to get the answer more quickly, and expand on their useful list.

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