PROGRESSION THROUGH CALCULATIONS FOR DIVISION

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE BY THE END OF THE YEAR.

YR

Related objectives: count repeated groups of the same size; share objects into equal groups and count how many in each group, e.g.

Add trays with small compartments for sorting to the making area. Add collections of things: bottle tops, sequins, threads, tiny pieces of fabric, etc. Model sharing out the objects equally. For example: do you all want sequins? I'll put 5 each on your trays. Can you give everybody the same number of these? Have you got the same?

Hang up 3 bags outside for making collections. Put a number 2 on each bag. Encourage the children to collect 2 of any treasured object in each bag, for example fir cones or smooth pebbles. The collections could be used inside and outside in the learning environment for different purposes, for example as a gallery of natural objects or for adding to the making area.

Y1

Pupils should be taught 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.

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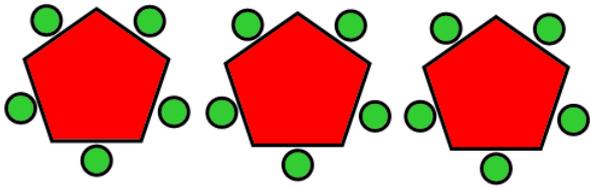
Eg children will experience equal groups of objects and will count in 2s, 5s and 10s. They will work on practical problem solving activities involving equal sets or groups,
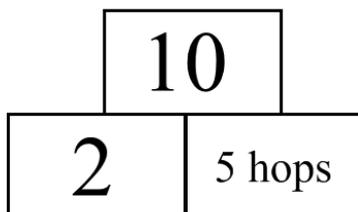
e.g. If the frog hops in 2s, how many hops will there be before he lands on 10?
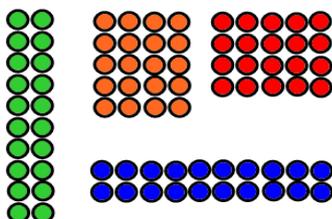
Here are 20 counters. Arrange them in equal rows. Is there a different way to arrange them in equal rows?

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?

Pupils should be taught to:
- 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 multiplication (×), division (÷) and equals (=) signs
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.
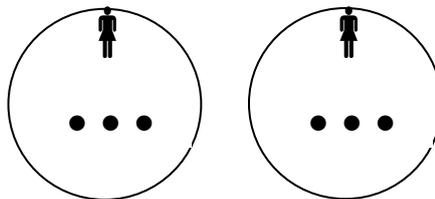

Through grouping and sharing small quantities, pupils begin to understand: multiplication and division; doubling numbers and quantities; and finding simple fractions of objects, numbers and quantities.

Y2

- They will represent division through repeated addition and arrays as multiplication, and sharing and repeated subtraction (grouping) as division; use practical and informal written methods and related vocabulary to support multiplication and division.

Use the symbols +, -, ×, ÷ and = to record and interpret number sentences involving all four operations; calculate the value of an unknown in a number sentence (e.g. □÷2 =6, 30 - □=24)

Children will develop their understanding of multiplication and use jottings to support calculation:
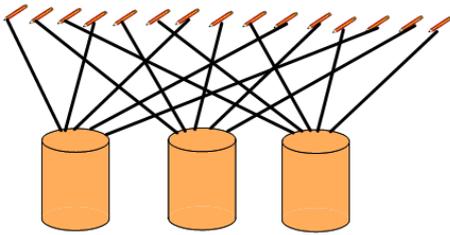
- **Sharing equally**

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**

Use practical equipment or objects to answer questions such as: *How many 2s make 12?* Relate this to the division 12 ÷2.
Use objects or a number line to support: record or explain this.
For example, starting from 12, jump back in steps of 2, or starting with 12 counters, keep on taking away 2 counters.

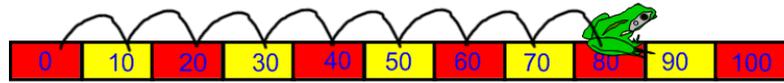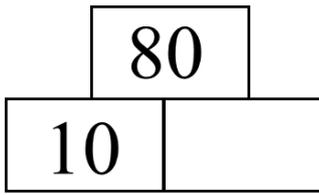Record this as **repeated subtraction** and as **division**:

12 - 2 - 2 - 2 - 2 - 2 - 2 =0
12 ÷2 =6
12 divided by 2 equals 6

Children explain how they use equipment, objects or a number line to carry out division.

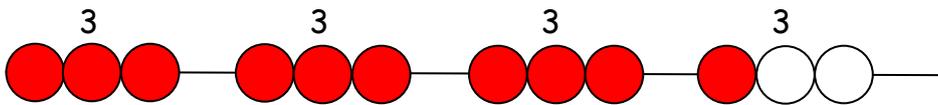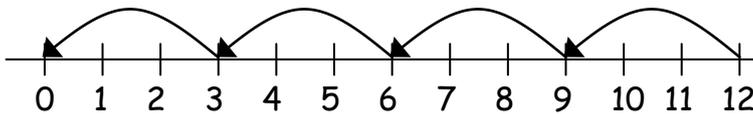Or count forward, e.g. How many tens make 80?

Use division facts for the x2, x5 and x10 tables

Recognise odd and even numbers as well as number patterns/ sequences

- **Repeated subtraction using a number line or bead bar**

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?

4 marbles	2 groups	

20p
4p each [ ]

[ ]
4 jumps
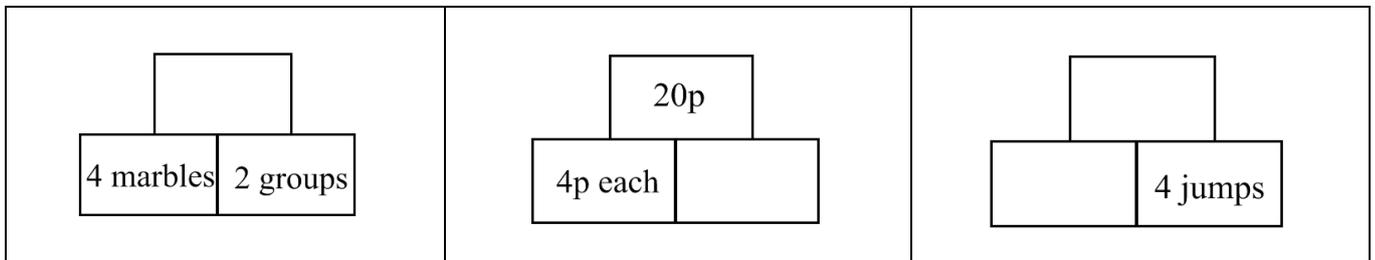
Y3

Pupils should be taught to:
- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- 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, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects.

Related objectives: Multiply one-digit and two-digit numbers by 10, 100 and 1000, and describe the effect;
Use practical and informal written methods to multiply and divide two-digit numbers (e.g. 13 ×3, 50 ÷4); round remainders up or down, depending on the context;
Understand that division is the inverse of multiplication and vice versa; use this to derive and record related multiplication and division number sentences;

Use division facts for the x3, x4, x8 (plus x2, x5 and x10 from Y2) tables

Recognise odd and even numbers as well as number patterns/ sequences

- **Sharing**

Children **understand division as sharing**. They solve problems such as:

➤ 42 crayons are divided equally between six pots. How many crayons are there in each pot?
➤ Three children want to buy their grandmother a present costing £1.50. They each give the same amount. How much does each child give?
➤ An 80 cm length of ribbon is cut into four equal pieces. How long is each piece?

- **Repeated subtraction**

Children review **multiplication as repeated addition** and **division as repeated subtraction** by counting hops on a number line. For example, they find how many fours make 24, either by counting on or back 6 hops of 4.
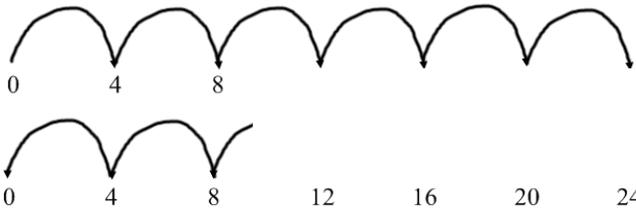
When multiplying use repeated addition to highlight numbers getting larger.

When dividing use repeated subtraction to highlight numbers getting smaller.

Children divide a number of objects by using grouping . They understand that one way to find 30÷6 is to find how many sixes there are in 30 . Through practical experience, they understand that some division calculations have a remainder, for example 13÷4=3 r 1:
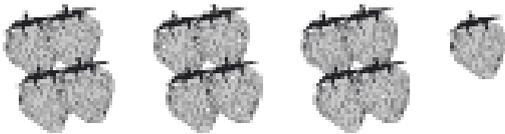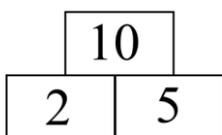

Grouping ITP may be a useful resource

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: multi-array ITP
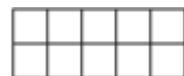
5×2=10, 2×5=10
10÷2=5, 10÷5=2

10	
2	5

They use the image of an array to explain why, for example, 2×5 gives the same answer as 5×2. They also use the image to show how many fives make 10 and how many twos make 10.
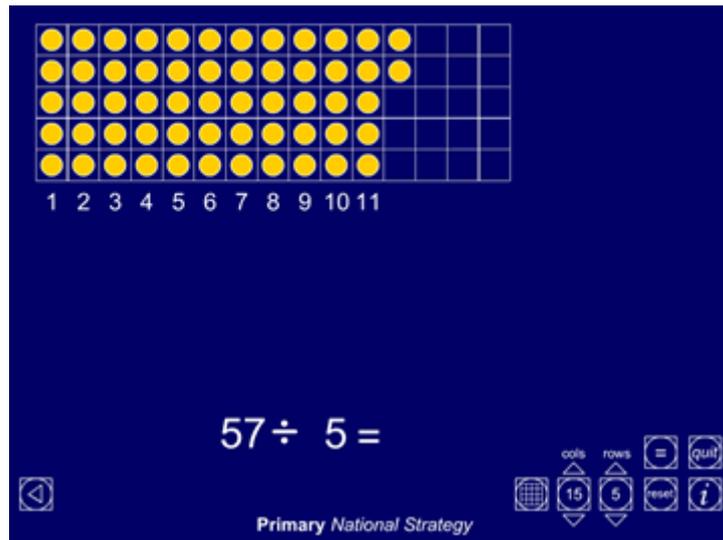
Children should use number lines or bead bars to support their understanding.

6   6   6   6

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0        6        12        18        24
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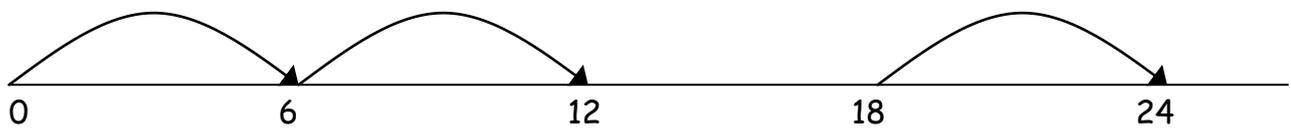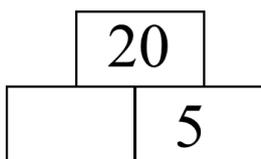

Remainders

Children work out calculations that divide exactly and those that give rise to **remainders**. They discuss the images in the ITP 'Remainders'.

$57 \div 5 =$

Primary National Strategy

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

| 20 |
| 5 |

□ x 5 = 20
20 ÷ 5 = □

| 18 |
| 3 | |

3 x △ = 18
18 ÷ 3 = △

| 32 |
| | |
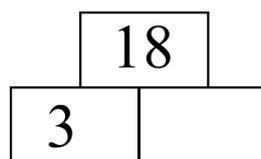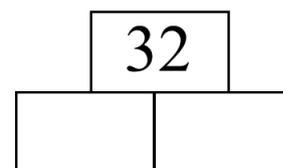
□ x O = 32
32 ÷ O = □
complete this division
in as may ways as you can.

Y4

Pupils should be taught to:
- recall multiplication and division facts for multiplication tables up to 12 × 12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1

- recognise and use factor pairs and commutativity in mental calculations

Related objectives: Multiply and divide numbers to 1000 by 10 and then 100 (whole-number answers), understanding the effect; relate to scaling up or down.
Children work out calculations that divide exactly and those that give rise to **remainders**.

Use division facts for the x7, x9, x11, x12 (plus all other) tables

Apply all know ÷ facts linking these to their times tables knowledge.

TU ÷ U and HTU ÷ U

Short division (e.g. 76 ÷ 4)
Pupils practise to become fluent in the formal written method of short division.

Set out the calculation like this

$$4 \overline{)76}$$

Get out 76 using base ten materials (i.e. 7 ten rods and 6 unit cubes)

Put the ten rods into groups of 4. How many groups of 4 can you make?
You can make one group.
Record this above the 7.

$$4 \overline{)76}^{\,1}$$

Now exchange the 3 ten rods you have left into unit cubes. This gives you 36 unit cubes.
Record it like this

$$4 \overline{)7^36}^{\,1}$$

Put the unit cubes into groups of 4. How many groups of 4 can you make?
You can make nine groups.
Record this above the 6.

$$4 \overline{)7^36}^{\,19}$$

Follow the same procedure when dealing with remainders. (e.g. 78 ÷ 4) and record the answer as 19 R 2.

```
    1 9 r2
4 | 7³6
```

NOT

```
    1 9 r2     = 19 r2
4 | 7³6
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Children need to be able to deal with remainders accurately, in context and in a variety of ways (as a remainder, as a fraction and as a decimal)

Therefore 19 R 2 should also be explained as 19 2/4 (a '2 out of 4' group) and as 19.5

Use the same procedure for HTU ÷ U, using base ten materials if required to show the exchanges.

Remember encouraging children to use their known multiplication and corresponding division facts is much more preferable to them having to rely on physically grouping objects.

Y5

Pupils should be taught to:
- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.
- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply and divide numbers mentally drawing upon known facts
- divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})
- solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

Divide numbers up to four digits by a one-digit number using formal written methods of short division and interpret remainders appropriately for the context.

Divide whole numbers and those involving decimals by 10, 100, 1000.

ITP 'Moving digits' to explore the effect of repeatedly multiplying/dividing numbers by 10.
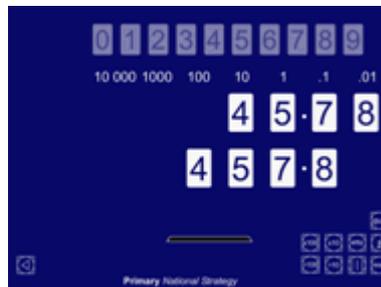
Answer questions such as:

➢ 32 500 ÷□=325
➢ *How many £10 notes would you need to make £12 000?*
➢ *Find the missing number in 0.42 × □=42.*
➢ *Play 'Stepping stones': Work out what operation to enter into a calculator to turn the number in one stepping stone into the number in the next stepping stone.*
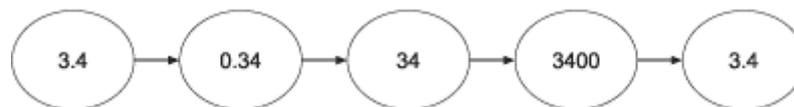
• Use short division methods to divide HTU ÷U (see Year 4)

Y6

Pupils should be taught to:
• divide numbers up to 4 digits by a two-digit whole number using the formal written method of **long division**, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
• divide numbers up to 4 digits by a 2 digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
• perform mental calculations, including with mixed operations and large numbers.
• solve problems involving division
• use estimation to check answers to calculations and determine, in the context of a problem an appropriate degree of accuracy.

Divide numbers up to four digits by a two-digit number using formal written methods of short division and interpret remainders, as appropriate for the context.

Divide numbers up to four digits by a two-digit number using formal written methods of long division and interpret remainders, fractions, decimals or by rounding as appropriate for the context.

Long division Year 6

e.g. 432 ÷ 15

```
        28 r12
    15 | 4 3 2
        3 0
        1 3 2
        1 2 0
          1 2
```

As this method is very abstract, it should not be introduced until children are ready i.e. year 6.

- "How many 15s are there in 4?" There are none so now ask "how many 15s are there in 43?"
- There are 2. Write 2 on the answer line above the 3 and write 30 (15x2) beneath the 43.
- Subtract 30 from 43 and write the answer (13) beneath the 30.
- Check that your intermediate answer is smaller than the divisor. If the answer is larger than the divisor (e.g. more than 15) then go back and start again as the first division is incorrect.
- Now bring down the next figure (2) and place this digit on the end of the intermediate answer. (e.g. 132)
- "How many 15s are there in 132?" There are 8 (15x8 = 120) Write the 8 on the answer line and write 120 (15x8) beneath 132.
- Subtract 120 from 132 and write the answer (12) beneath the 120.
- As this answer is smaller than the divisor of 15 then this is the remainder. (28 R 12)

Divide numbers with up to three decimal places by 10, 100, 1000.

Divide proper fractions by whole numbers e.g. 1/3 divided by 2 = 1/6

A ribbon is 87.6m long. It is cut into 6 equal pieces. How long is each piece?	How many packs of 24 can we make from 560 biscuits?

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

Children should always be encouraged to approximate their answers before calculating. Children should always be encouraged to consider if a mental calculation would be appropriate before using written methods.