

# Progression in Calculation

## Multiplication and Division

## How to use this document

This document is designed to give ideas about how to use concrete apparatus and images to support children's conceptual understanding.

So often children are able to follow calculation processes and get the answer right in many cases without fully understanding how and why the method works. This document is designed to support teachers to do that so that children are able to reason effectively and apply maths that they have learnt to other methods and new concepts as they have that deep understanding required at mastery. Not all National Curriculum objectives are listed but just some to give a flavour of how the images and apparatus can be used to develop children's conceptual understanding of different mathematical ideas. Teachers should read previous year groups to ensure children have consolidated these ideas before moving on. For some year groups the same images and concrete resources will be used but maybe with larger numbers and with a greater level of reasoning so they have therefore not been repeated.

For more guidance use the Resource Tool <https://www.ncetm.org.uk/resources/41211> on the NCETM website where exemplification material and activity ideas can be found using the following tabs of EXEMPLIFICATION and ACTIVITIES. The SUBJECT KNOWLEDGE Audit tool will also help to give an insight to the expectations under each NC objective. There is also a tab for VIDEOS under each domain where you can see teacher using concrete resources to develop childrens' conceptual understanding and reasoning.

## The EYFS Framework

Mathematics involves providing children with opportunities to develop and improve their skills in **counting, understanding and using numbers**, calculating **simple addition and subtraction problems**; and to describe shapes, spaces, and measures

### **Early Learning Goals**

Mathematics Numbers: children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including **doubling, halving and sharing**.

Shape, space and measures: children use everyday language to talk about size, weight, capacity, position, distance, time and money to **compare quantities and objects and to solve problems**. They **recognise, create and describe patterns**. They explore characteristics of everyday objects and shapes and use **mathematical language** to describe them.

Additional Guidance can be found in Development Matters.

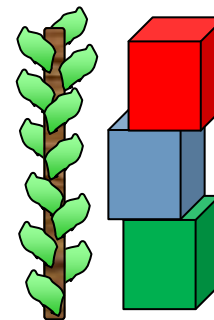
<https://www.early-education.org.uk/development-matters>

# Early Maths Foundation Stage to early KS1

ELG: Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Each day Jack's beanstalk doubled in height. It was twice as tall.

Today it is 3 bricks tall. How tall will it be tomorrow?



ELG

They solve problems, including doubling, halving and sharing.



Cut the food in half to share with a friend.



3 friends wanted to share the last 6 apples. To make it fair they need the same amount each.

## Key Stage 1

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils **develop confidence and mental fluency** with **whole numbers, counting and place value**. This should involve working with **numerals, words and the four operations**, including with **practical resources [for example, concrete objects and measuring tools]**.

At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to **describe and compare different quantities such as length, mass, capacity/volume, time and money**.

By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on **practice** at this early stage will aid **fluency**.

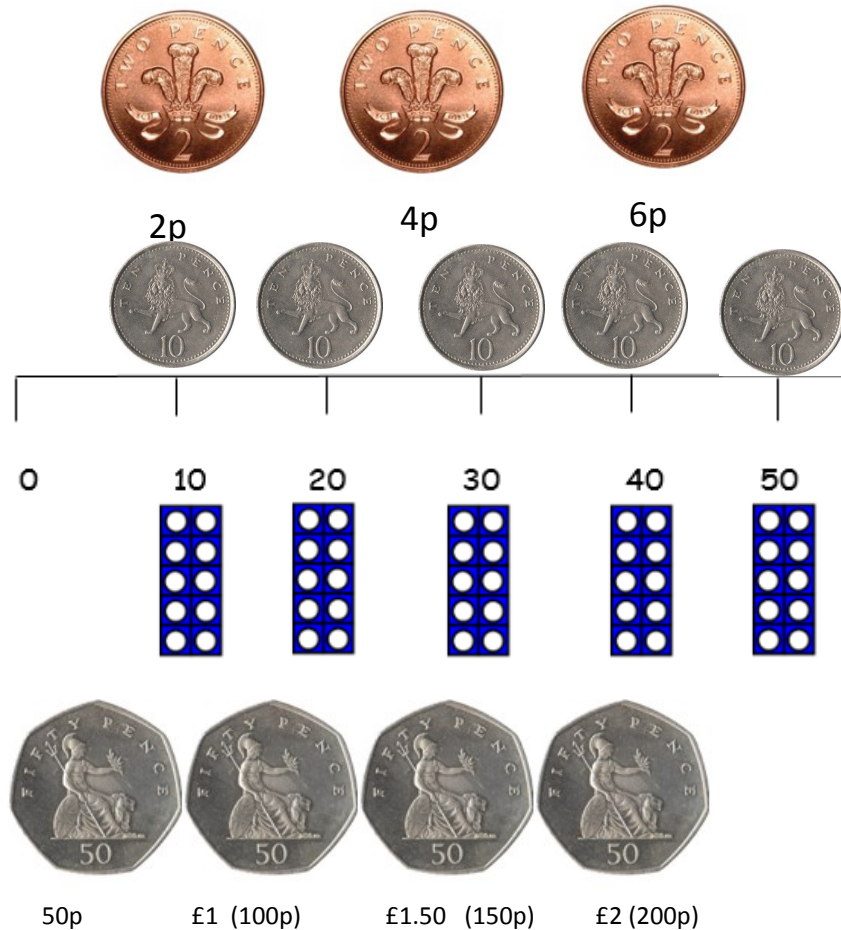
Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

**National Curriculum 2014**

## Counting and Place Value

Year 1

Count in multiples of two, five and ten.



Year 2

Count in steps of 2, 3, 5 from 0 and in tens from any number forwards and backwards

Year 2

Recall and use multiplication tables and division facts for the 2, 5 and 10 multiplication tables.

$$3 \times 5 = 15$$

How many 3s in 15?

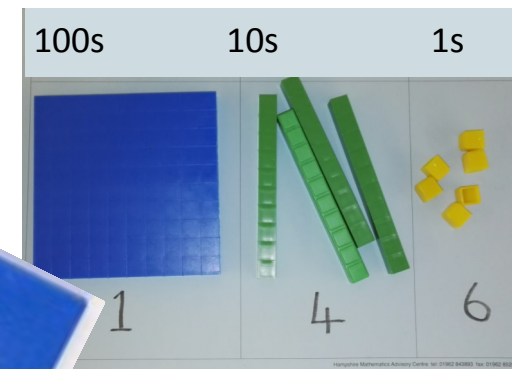
How many groups of 3 in 15?

$$3 \times \square = 15$$

Year 3

Count in zero from multiples of 4, 8, 50, 100 and find 100 more or less than a given num-

What will change/stay the same if I add/subtract another 100?

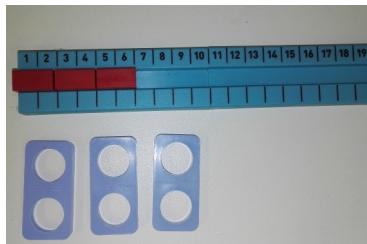


## Using objects and pictorial representations alongside concrete resources



If I have 6 socks. How many pairs will that make?

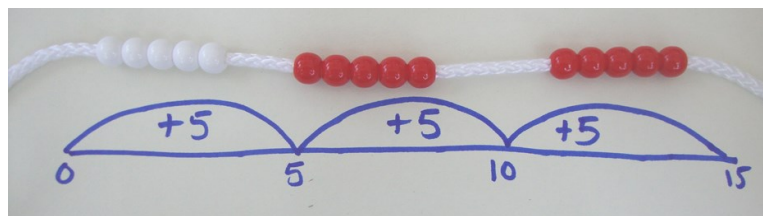
3 pairs



5 frogs on each lily pad

$$5 \times 3 = 15$$

Repeated Addition



Year 1

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.

Year 2

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

$$15 \text{ frogs} \div 3 \text{ lilly pads} = \boxed{\phantom{00}} \text{ Frogs on each}$$

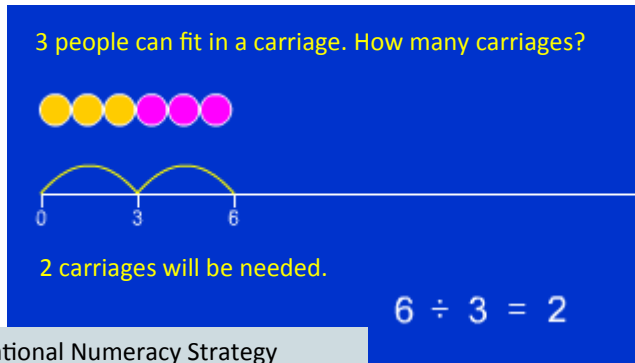
$$\boxed{\phantom{00}} \text{ frogs} \times 3 \text{ lilly pads} = 15$$

There are 15 frogs. There are the same amount on each Lilly pad. If there are 3 Lilly pads, how many are sat on each one?



## Division as grouping and sharing

3 people will fit in a carriage.  
How many carriages will I need  
to carry 6 people?



ITPs National Numeracy Strategy

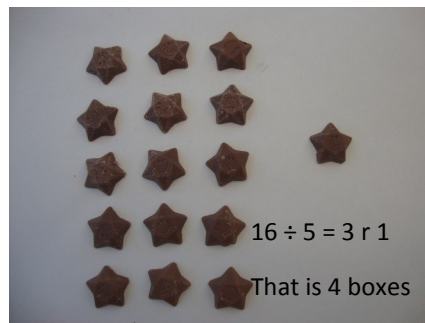


There are 6 fish. How many bowls will I  
need if I want 2 fish in each?

There are 3 bowls, each with 2 fish!

I will group in 2s or share my  
fish across the 3 bowls.

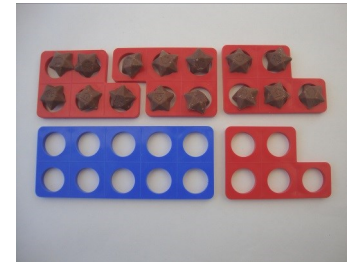
Which is more efficient?



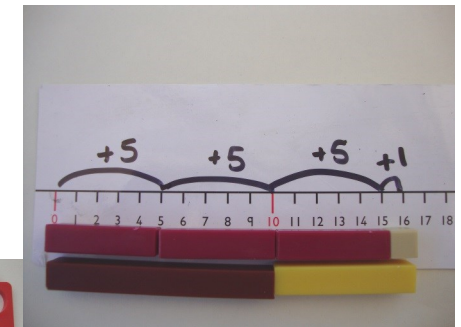
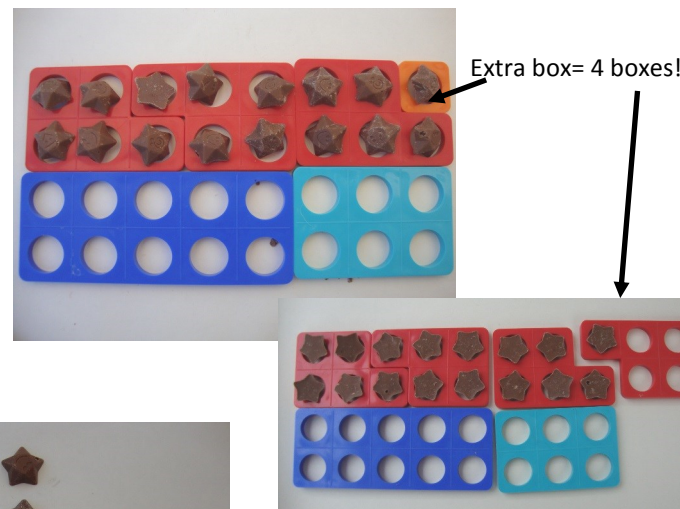
## Year 1

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.

5 chocolates will fit in a box. How many boxes will I need for 15  
chocolates?



What if I had 16 chocolates...how many boxes would I need then?



## Year 2

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



## Multiplication- Repeated addition, arrays and multiples



$$4 \times 1$$

$$4 \times 2$$

$$4 \times 3$$

$$4 \times 4$$

$$4 \times 5$$

4 Cheerios in one bowl, how many in 5 bowls?

$$4 + 4 + 4 + 4 + 4 = 20$$

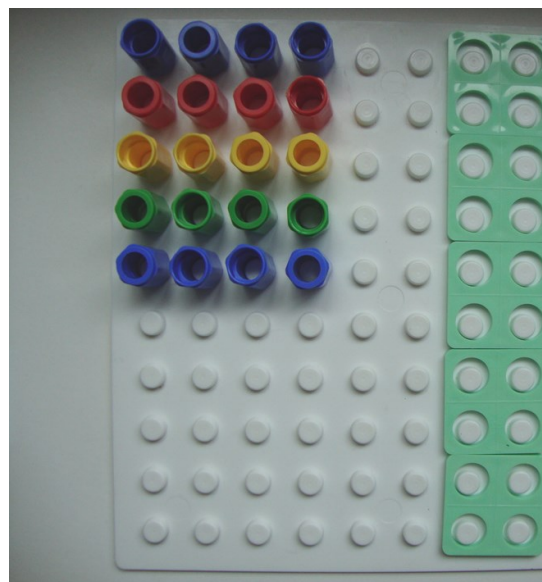
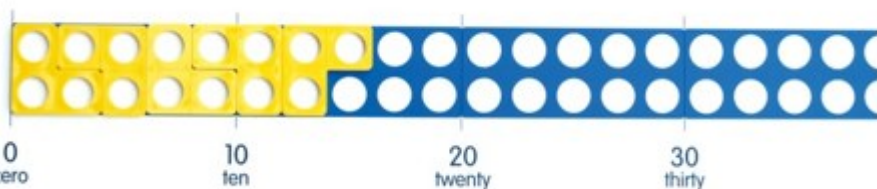
$$4 \times 5 = 20$$

If 5 friends wanted to share 20 Cheerios, how many would they each have?  $20 \text{ Cheerios} \div 5 \text{ people} = 4 \text{ Cheerios each}$



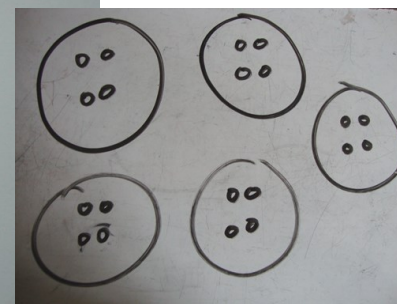
$$3 + 3 + 3 + 3 + 3$$

$$5 \times 3 = 15$$



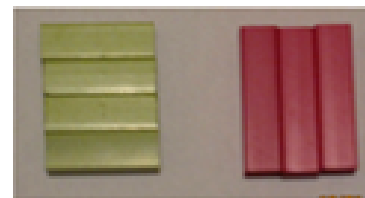
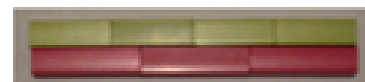
Year 1

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.



Year 2

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



$$4 \times 3 = 3 \times 4$$



How many pies?