**Muxton Primary School**

# PROGRESSION THROUGH CALCULATIONS FOR DIVISION

## Foundation stage

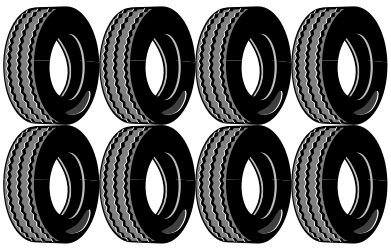
Counting on and back in steps of 1, 2 and 10.

**Sharing** objects equally, practical contexts. 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?

Pictorial recording.

**Grouping**, in practical contexts.

How many cars can you make if you have 8 wheels?



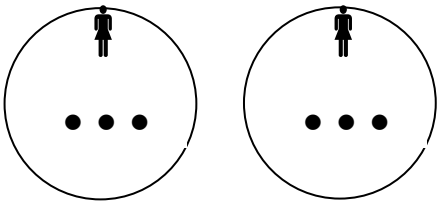
## Y1

Children will count in 2s, 5s and 10s.

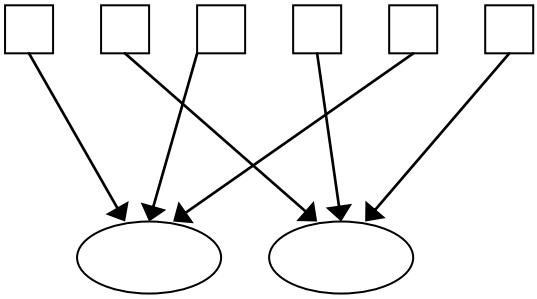
They will experience equal groups of objects and share items out in play and problem solving.

**Sharing equally:** Record by using pictorial notation.

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



6 sweets shared between 2 people, how many do they each get?



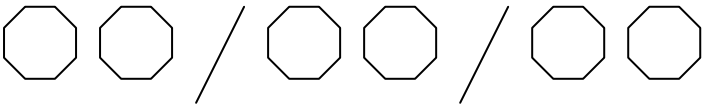
There are 20 sweets in a bag. How many children can share them if they each have 5?

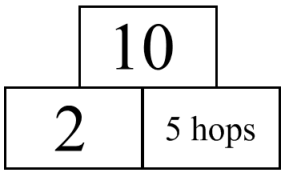
+5 +5 +5 +5

0 5 10 15 20

**Grouping as repeated addition**

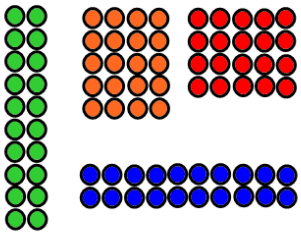
There are 6 sweets, how many people can have 2 sweets each?



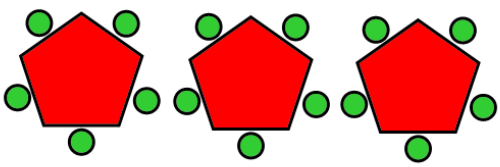




If the frog hops in 2s, how many hops will there be before he lands on 10?



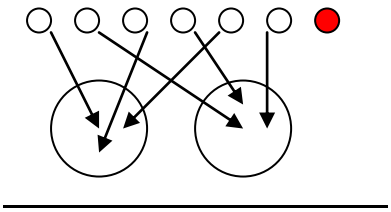
Here are 20 counters. Arrange them in equal rows /groups. Is there a different way to arrange them in equal rows / groups?



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

'Left overs' may be introduced in practical contexts

There are 7 cakes and 2 children. How many cakes will they each get?



Introduce the ÷ symbol once repeated addition (grouping) is understood.

20 ÷ 5 = 4: How many groups of 5 are there in 20?

Solve practical problems that involve combining groups of 2, 5 or 10, or sharing into equal groups

## Y2

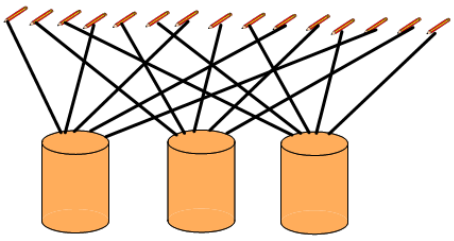
Continue to use practical apparatus and informal written methods and related vocabulary to support division, including calculations with remainders.

Learn division facts corresponding to the 2, 10 and 5 times tables

Use x and ÷ signs

Record using the correct division symbol

**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**

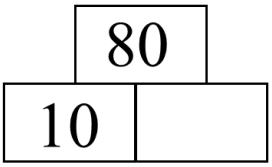
Repeated addition or subtraction using a number line or bead bar

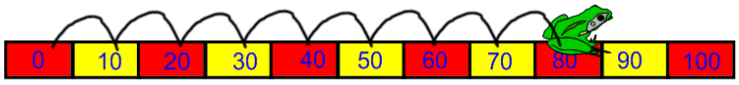
Use practical equipment or objects to answer questions such as: *How many 2s make 12?* Relate this to the division 12 ÷2.

Use objects or a number line to support, record or explain this.

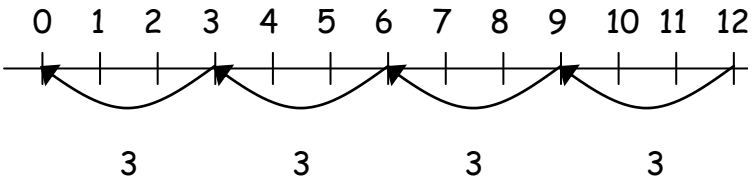
For example, starting from 12, jump back in steps of 2, or starting with 12 counters, keep on taking away 2 counters.

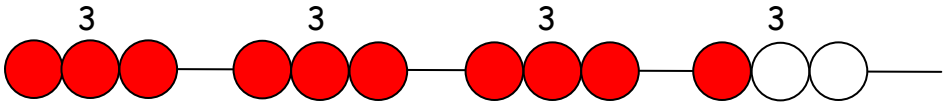
Or count forward, e.g. How many tens make 80?



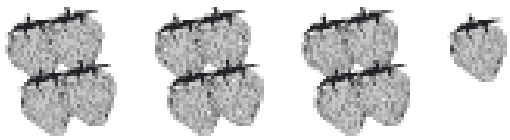

12 ÷ 3 = 4

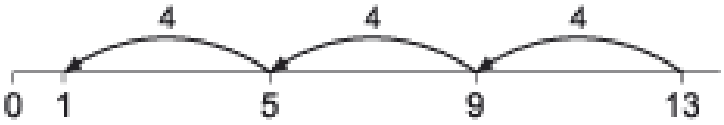



The bead bar will help children with interpreting division calculations such as 12 ÷ 3 as 'how many 3s make 12?'

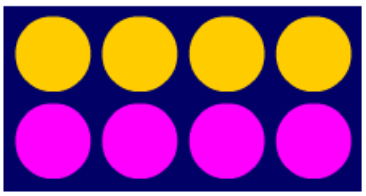
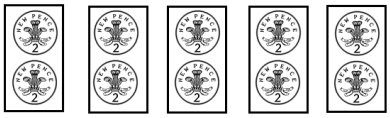
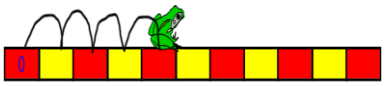
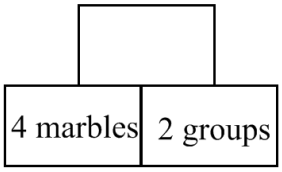
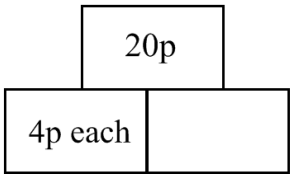
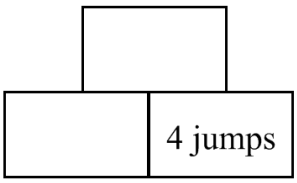
Through practical experience, they understand that some division calculations have a remainder, for example 13÷4=3 R 1:






Grouping ITP may be a useful resource

Beginnings of algebra - 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? |
|  |  |  |
|  |  |  |

## Y3

Multiply one-digit and two-digit numbers by 10 or 100, and describe the effect;

Know multiplication facts for 2, 5 and 10 and begin to know 3 and 4. Derive related division facts mentally

Use practical and informal written methods to multiply and divide two-digit numbers (e.g. 13 × 3, 50 ÷ 4);

Understand that division is the inverse of multiplication and vice versa; use this to derive and record related multiplication and division number sentences;

**Sharing**

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?

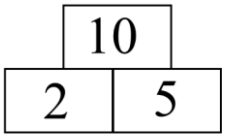
**Grouping**

Children understand as repeated addition and 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. They understand that one way to find 30÷6 is to find how many sixes there are in 30 .

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: Multiarray ITP

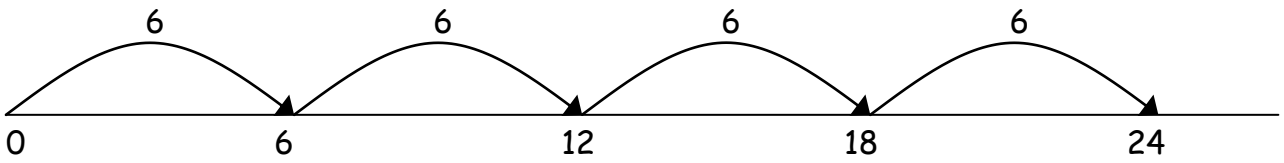
5×2=10, 2×5=10

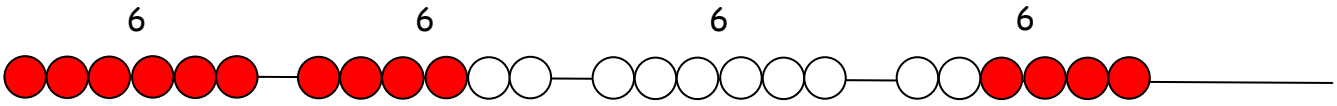
10÷2=5, 10÷5=2




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 still use number lines or bead bars to support their understanding.




Begin to use the number line to add or subtract multiples of the divisor, eg ten lots of 2 in one step.

Begin to use knowledge of known multiplication facts to solve division calculations using informal jottings e.g. I know 10 x 4 are 40 so 9 x 4 are 36
Begin to use partitioning/re-arranging to find multiples (chunks) of the divisor.

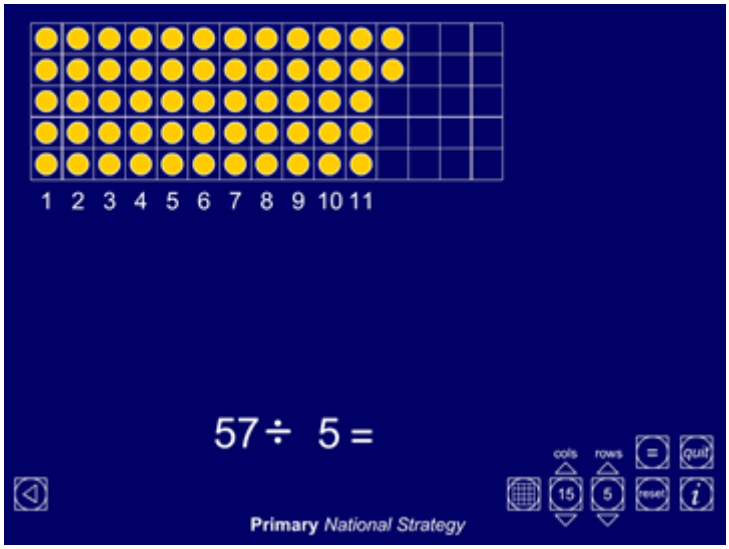
36 ÷ 4 = 9

| | | |
|---|---|---|
| | 36 | |
| - | 20 | 5 X 4 |
| | 16 | |
| - | 16 | 4 x 4 |
| | 0 | |

**Remainders**

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

21 ÷ 5 = 4 r 1



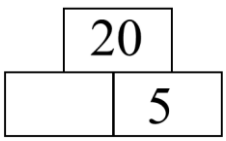

Children decide whether to **round remainders up or down** to answer word problems such as: We have 21 building block wheels. How many four-wheeled cars can we make?

Peaches come in packs of six. I want 20 peaches. How many packs do I need to buy?

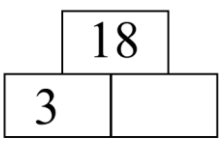
How many 30 cm lengths of ribbon can I cut from a ribbon measuring 2 metres?

Children model such problems with objects or draw a sketch to help them. They discuss their answers and give reasons why they decided to round up or down.

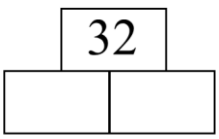
Using symbols to stand for unknown numbers to complete equations using inverse operations




□ x 5 = 20
20 ÷ 5 = □




3 x △ = 18
18 ÷ 3 = △




□ x O = 32
32 ÷ O = □

## Y4

Know by heart multiplication facts for 2, 3, 4, 5 and 10; begin to know 6, 7, 8 and 9

Multiply and divide numbers to 1000 by 10 and then 100 (whole-number answers), understanding the effect; relate to scaling up or down

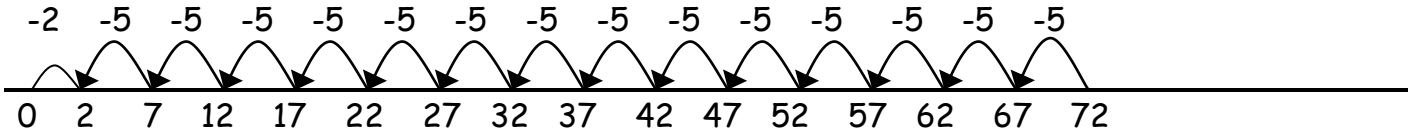
Know that fractions relate to division - $\frac{1}{2}$ of 10 is the same as 10 ÷ 2

Develop and use written methods to record, support and explain multiplication and division of two-digit numbers by a one-digit number, including division with remainders (e.g. 98 ÷6)

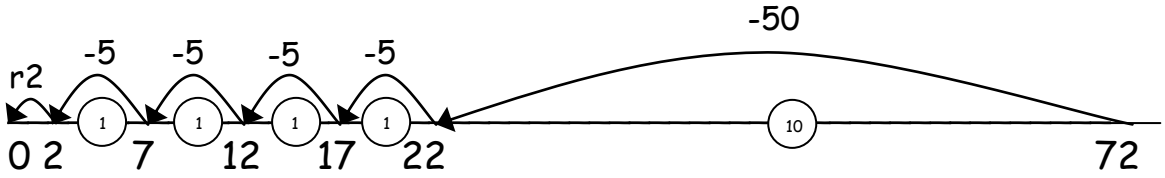
Use knowledge of multiplication facts eg I know that 21 is not a multiple of 5, so there will be a remainder.

Children will develop their use of **repeated subtraction** to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

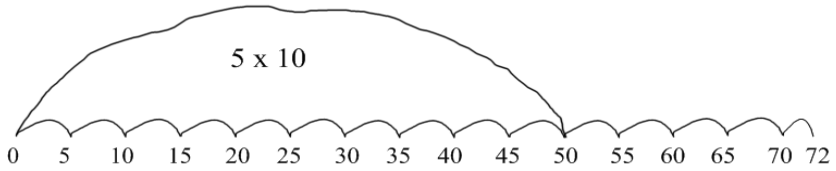
72 ÷ 5



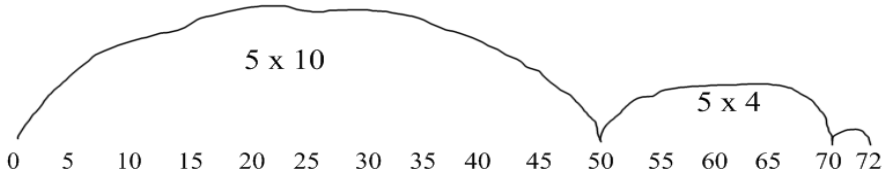

Moving onto:




Or **repeated addition** – counting forward




Or:




Leading to **partitioning / chunking** for TU by U division

When dividing 64 by 4, children approximate first. They recognise that the answer must lie between 40 ÷4 =10 and 80 ÷4 =20.
Using knowledge of multiples, the 64 is partitioned into 40 (the highest multiple of 4 that is also a multiple of 10) plus 24, and then each part is divided separately using the distributive law:

64 ÷ 4 = 16
40 (4 x 10)
24 (4 x 6)

Similarly for remainders:

89 ÷ 6 =
89
- 60 (10 x 6)
29
- 24 (4 x 60
5

89÷ 6 = 14 r 5

Leading to:

89 ÷ 6 =
89
- 60 (10)
29
- 24 (4)
5

89÷ 6 = 14 r 5

Begin to record remainders in fraction or decimal notation when appropriate

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example 62 ÷ 8 is 7 remainder 6, but whether the answer should be rounded up to 8 or rounded down to 7 depends on the context.

e.g. I have 62p. Sweets are 8p each. How many can I buy?
Answer: 7 (the remaining 6p is not enough to buy another sweet)

Apples are packed into boxes of 8. There are 62 apples. How many boxes are needed?
Answer: 8 (the remaining 6 apples still need to be placed into a box)

## Y5

Recall quickly multiplication facts up to 10 ×10 and use them to derive quickly corresponding division facts.

Use and discuss mental strategies for division

| e.g. 90 ÷6 | 360 ÷ 5 | £2.48 ÷4 |
|---|---|---|
| 90 ÷ 3 ÷ 2 | 360 ÷ 10 x 2 | £2.48 ÷2 ÷2 |
| (90 ÷ 3) ÷ 2 | (360 ÷10) x 2 | (£2.48 ÷2) ÷2 |
| 30 ÷ 2 | 36 x 2 | £1.24 ÷2 |
| Ans: 15 | Ans: 72 | Ans: 62p |

Use understanding of place value to divide whole numbers and decimals by 10, 100 or 1000.

Understand the terms factor and multiple.

Understand prime numbers and prime factors. Recall prime numbers to 19 and how to find the prime numbers up to 100

Recognise and use square numbers and cube numbers, and use correct notation.

**Continue to use models and images for support where needed.**

Refine and use efficient written methods to divide HTU÷U, TU÷TU, U.t÷U and HTU÷U.

96 ÷ 6

```
    1 6
  ------
6 ) 96
  - 60      10x
    36
  - 36       6x
     0
```

Answer: 16

Move on to subtraction of larger multiples of the divisor.

196 ÷ 6

```
     32 r 4
   ---------
6 ) 196
  - 180     30x
     16
  -  12      2x
     4
```

Answer: 32 remainder 4 or 32 r 4

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division.

For example 240 ÷ 52 is 4 remainder 32, but whether the answer should be rounded up to 5 or rounded down to 4 depends on the context.

They should be able to show remainders as fractions or decimals depending on context:
Share 12 by 10 = 1 r2 = 1 2/10 = 1.2:
*Share 12 pizzas between 10 people = $3\ ^{2}/_{10}$ or $3\ ^{1}/_{5}$ in its lowest term.*
*Share £12 between 10 people = £1.20*

**Standard written division**

For 81 ÷ 3, the dividend of 81 is split into 60 + 21. Each number is then divided by 3.
81 ÷ 3
60 (3x20)
21 (3x7)

This can be recorded as:

$$3\overline{)60+21}\quad 20+7$$

Then shortened to:

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

## Y6

Continue to use mental strategies where appropriate.

Continue to use models and images for support where appropriate.

Use efficient written methods to divide integers and decimals up to 4 digits by a 1 or 2 digit whole number.

Interpret remainders as whole numbers, fractions or decimals, or by rounding up or down as appropriate to the context.

Identify common factors, common multiple and prime numbers

**Written division HTU ÷ TU**

972 ÷ 36

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

Answer : 27

Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other.

87.5 ÷ 7

```
      12.5
7 )  87.5
   -  70.0     10x
      17.5
   -  14.0      2x
       3.5
   -   3.5     0.5x
       0
```

Answer : 12.5

**Standard written division**

For 291 ÷ 3

Could be recorded as:

$$3\overline{)290+1} = 3\overline{)\begin{array}{r}90+7\\ 270+21\end{array}}$$

Then shortened to:

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

The carry digit '2' represents the 2 tens that have been exchanged for 20 ones. In the first recording above it is written in front of the 1 to show that a total of 21 ones are to be divided by 3.

As above when to divide by 2 digits

They should solve problems such as:

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 not be made to go onto the next stage if:**

1) **they are not ready.**
2) **they are not confident.**

**Children should be encouraged to approximate their answers before calculating.**
**Children should be encouraged to check their answers after calculation using an appropriate strategy.**
**Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.**