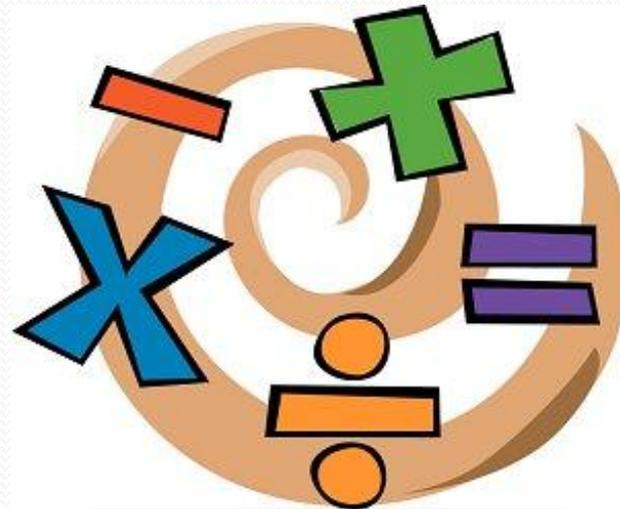
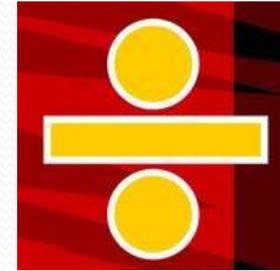


Coffee and Calculations



Workshop 4

Aims of session



To help you:

- Develop your knowledge of the methods children are taught and use in school for division
- Understand the progression in methods used as children move up through the school
- Support your child's learning at home

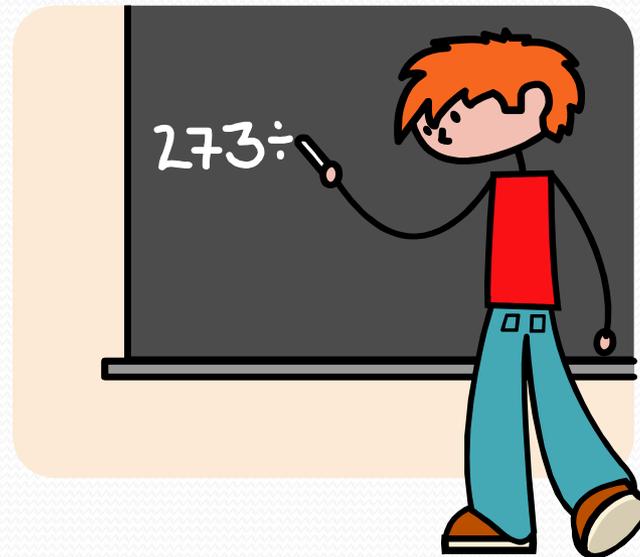


Now onto division

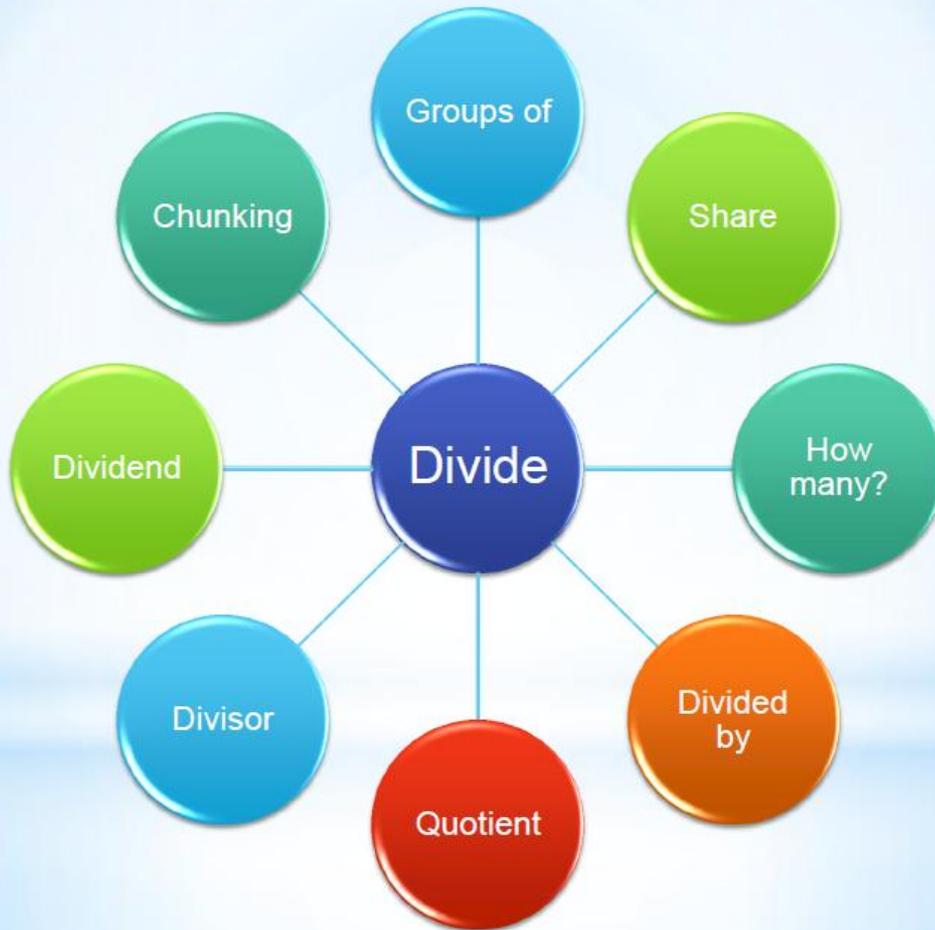
Of all of the four operations, children find division the trickiest to master.

They need to have a secure knowledge of lots of other mathematical concepts.

- Times tables
- Division facts
- Subtraction
- Addition
- Vocabulary



Vocabulary of division

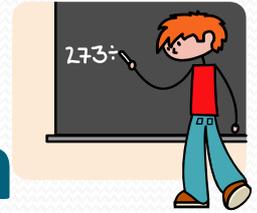


Tricky Vocabulary

$$12 \div 3 = 4$$

The **'dividend'** is the number being divided into (12). The **'divisor'** is the number it's being divided by (3).
The **'quotient'** is the answer (4).

Mental Strategies for Division



To divide successfully, children need to be able to:

- understand the relationship between multiplication and division
- understand and use multiplication and division as inverse operations.
- recall multiplication and division facts to 10×10 and recognise multiples of one-digit numbers
- know how to multiply single digits by multiples of 10 or 100
- know how to find a remainder working mentally - for example, find the remainder when 48 is divided by 5;

Written methods for Division



To carry out written methods of division successfully, children also need to be able to:

- **understand division as repeated subtraction;**
- **estimate how many times one number divides into another - for example, how many 6s there are in 47, or how many 23s there are in 92;**
- **multiply a two-digit number by a single-digit number mentally;**
- **subtract numbers using the column method.**

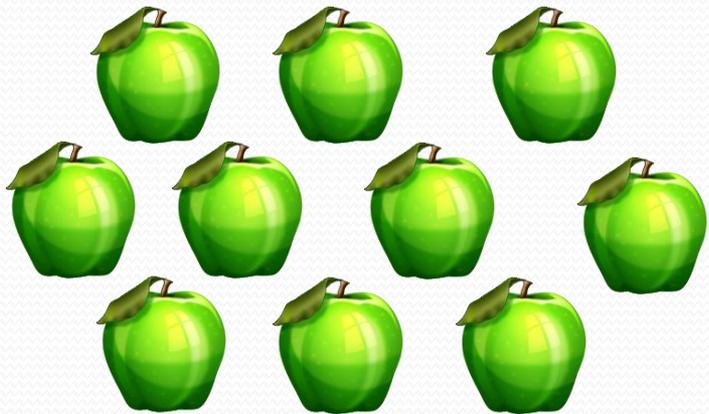


Foundation Stage

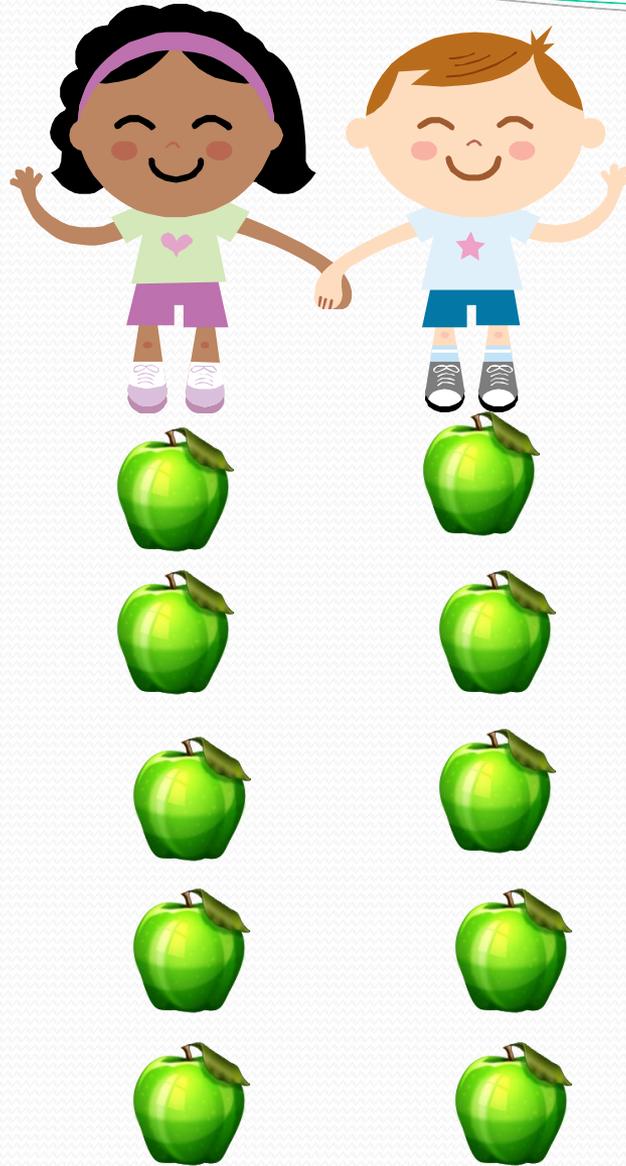
- **Practical activities involving grouping and sharing**
- How should we plant the daffodil bulbs in these 3 pots?
- Can we share these cakes out fairly? How shall we do it?
- I am going to divide this apple in half – how many pieces do I have?
- Lets sort these toys into 2s – how many groups have we made?

Written methods for Division

Initially division is introduced as 'sharing' using real objects or pictures.



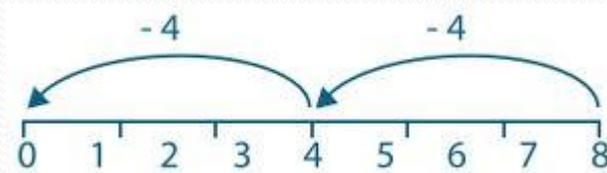
Share 10 apples equally between 2 children
which eventually becomes $10 \div 2 = 5$



$$10 \div 2 = 5$$

Key Stage 1

- Continue to practically group and share
- Record work using pictures and number lines
- Learn alongside multiplication



$$4 \times 2 = 8$$

$$8 \div 4 = 2$$

Children are taught to understand division as sharing and grouping

$$6 \div 2 =$$



6 colouring pencils are shared between 2 children.

How many pencils do they get each?

Sharing between 2



There are 6 colouring pencils.

How many children can have two each?



Grouping in twos

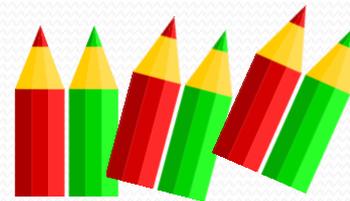
Understanding division as grouping

It is this aspect that links division facts to corresponding multiplication facts. Children need a solid understanding of multiplication as making 'groups of' or 'lots of' (repeated addition) in order to then carry out the inverse process of making groups or lots from a given total (repeated subtraction). Children should be encouraged to visually see the link between the two operations. Lots of practical work using objects to create these groups will help the initial understanding of this aspect of division.



$$2 + 2 + 2$$

$$3 \text{ groups of } 2 = 2 \times 3 = 6$$



$$\text{From } 6 - 2 - 2 - 2$$

$$6 \div 2 = 3$$

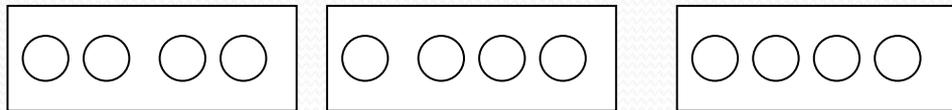
$$12 \div 4 =$$

4 apples are packed in a basket.
How many baskets can you fill
with 12 apples?



Grouping in fours

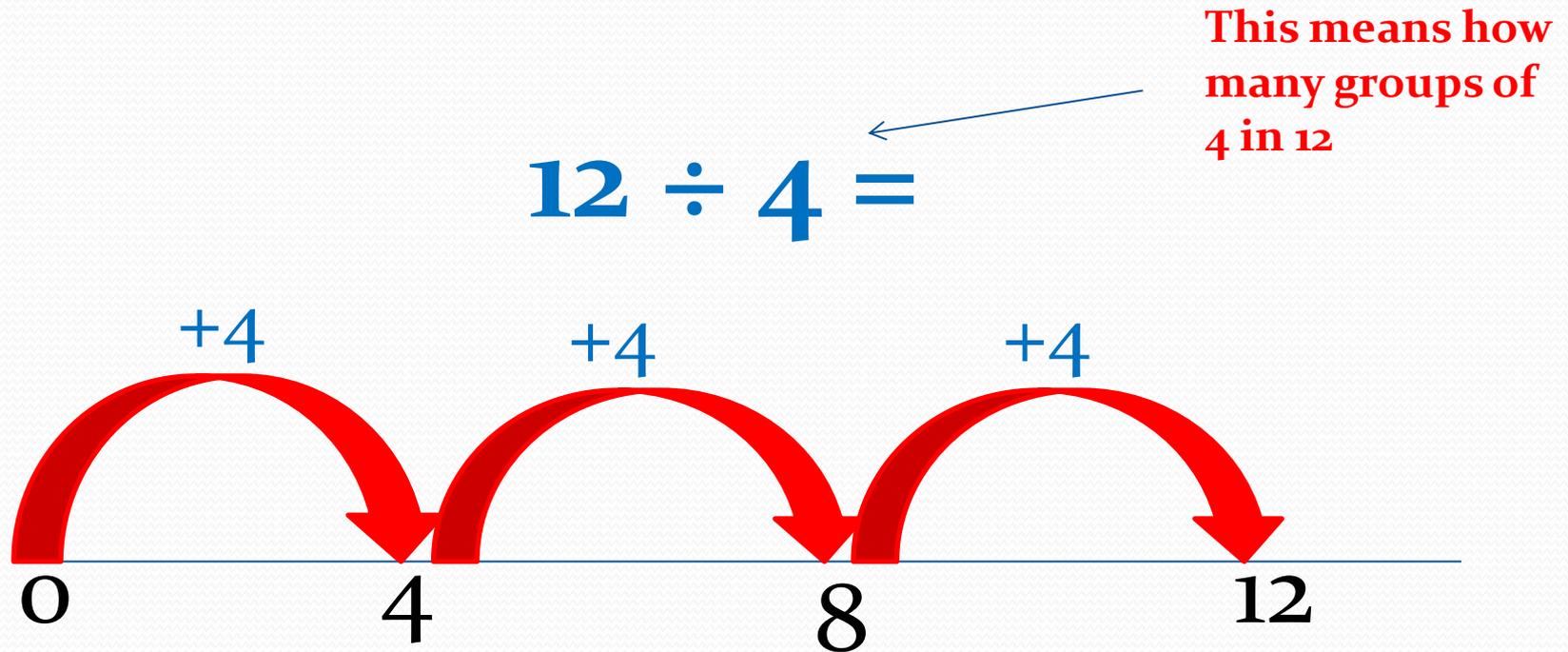
Here 12 dots can be split up into groups of 4



Division shown
as repeated
subtraction

Start with 12 apples/dots and takeaway a group of 4, then another group and then another. $12 - 4 - 4 - 4 = 3$ groups

Grouping can be shown easily on a number line



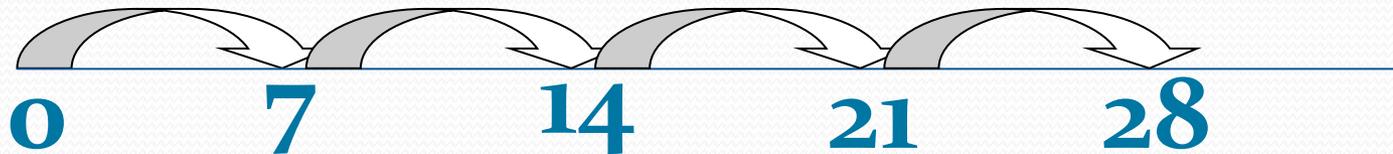
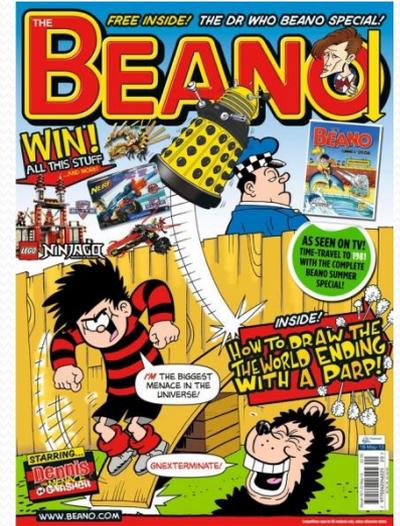
The hops or jumps along the number line show how many groups of 4 there are in 12. Start from zero and count in multiples of 4 up to 12.

$$12 \div 4 = 3$$

$$28 \div 7 =$$

A comic costs 7p.

How many can I buy with 28p?



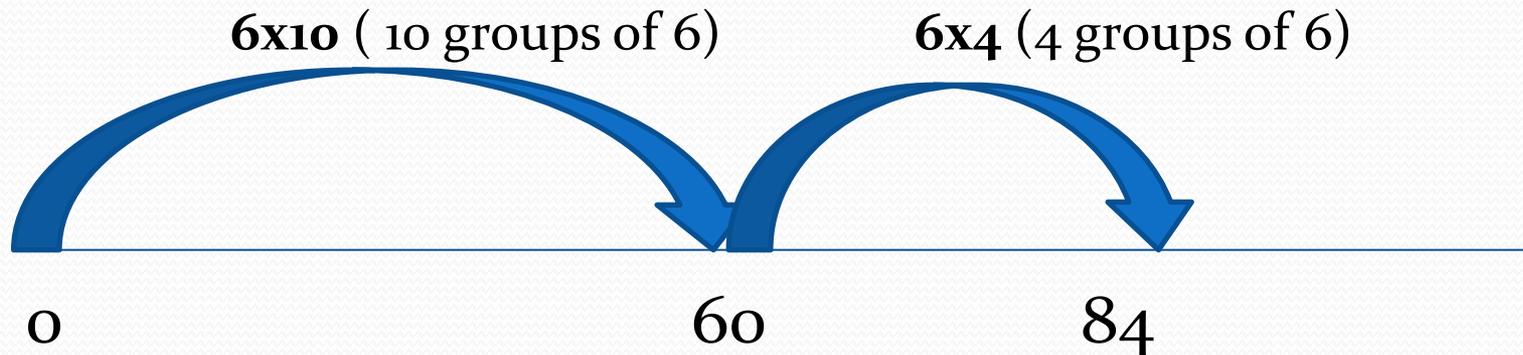
To work out how many 7's there are in 28, draw jumps of 7 along a number line. This shows you need 4 jumps of 7 to reach 28. So, I can buy 4 comics.



$$84 \div 6 =$$

With **larger numbers**, I can count in 6's up to 84 but it would take a long time - it's not efficient!
Instead, I jump in several groups of 6 at a time

I need 6 drawing pins to put up a picture.
How many pictures can I put up with 84 pins?



To be more efficient, jump on in bigger 'chunks'. A jump of 10 groups of 6 takes you to 60. Then you need another 4 groups of 6 to reach 84. Altogether, that is 14 groups of 6.

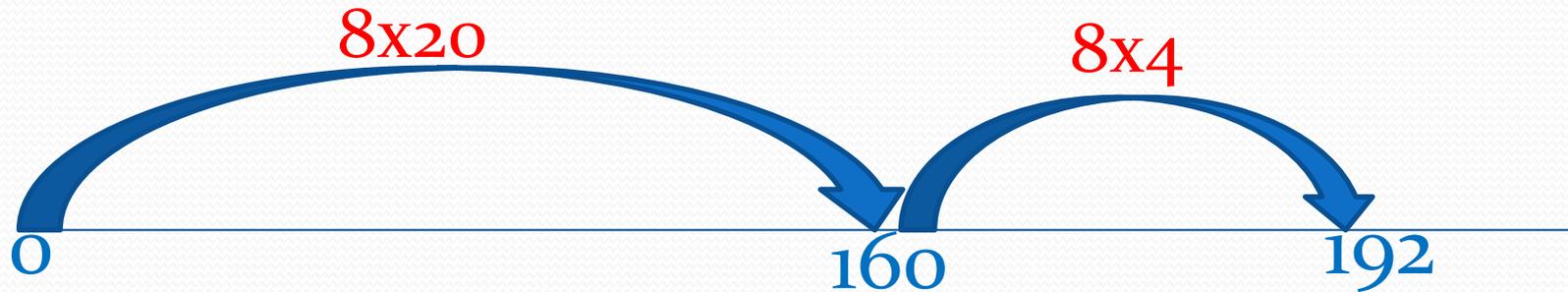
So, I can put up 14 pictures with my drawing pins.



$$192 \div 8 =$$

How many groups of 8 can we make from 192?

8 pencils fit into one packet. If you have 192 pencils, how many packets can be filled?



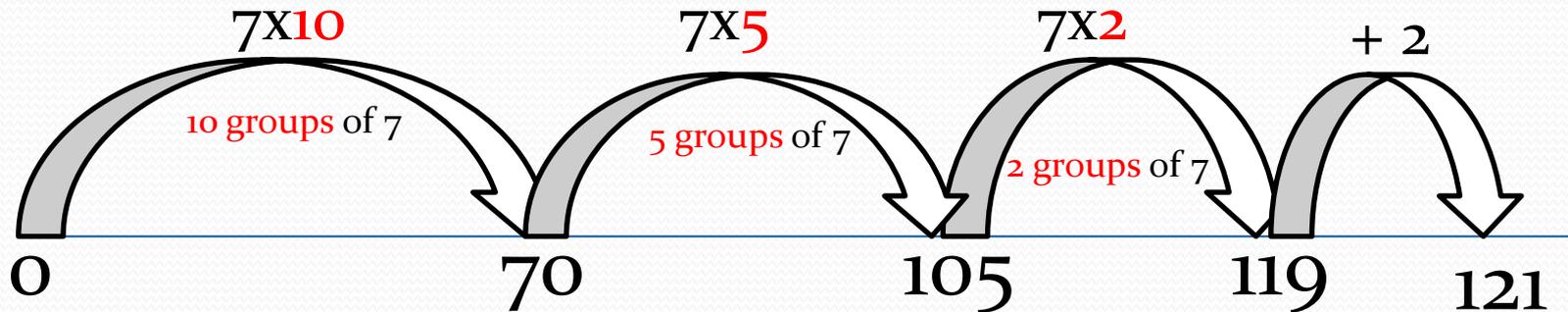
Using chunking on the number line

To be efficient you can jump in several groups of 8 i.e. Chunks/multiples of 8. The first jump is 20 groups of 8 which lands you on 160 and then you can choose another multiple of 8 to get to 192. In this case using times tables you can jump 4 groups of 8 which is a chunk of 32 to reach 192.

Division with remainders

$$121 \div 7$$

How many groups of 7
can we make from 121?



$$121 \div 7 = \underline{17} \text{ r } 2$$

Moving towards more formal methods

$$184 \div 7 =$$

I need 184 chairs for a concert. I arrange them in rows of 7.
How many rows do I need?

$$\begin{array}{r} 184 \\ - 140 \\ \hline 44 \\ - 42 \\ \hline 2 \\ = \underline{26 \text{ r}2} \end{array}$$

20 groups (7 x 20)
6 groups (7 x 6)



I would need 27 rows.

i.e. 26 complete rows and one more to accommodate the extra 2 chairs to make sure I have enough for the concert

This method is known as chunking

In this example, you are taking away chunks of 7. First subtract 140 (20 groups of 7) and you are left with 44. Then subtract 42 (6 groups of 7), to leave 2.

Altogether, that is 26 groups of 7 with a remainder of 2.

Formal Written Methods

Short Division

$$7 \overline{) 184} \begin{array}{l} 26 \\ \text{r } 2 \end{array}$$

Short division can also
be used for decimals

$$4 \overline{) 13.6} \begin{array}{l} 3.4 \end{array}$$

Long Division for HTU \div TU

The next step is to tackle HTU \div TU, which for most children will be in Year 6. Long division using chunking involves children subtracting multiples of the divisor (24) from the dividend (560). Children need to be confident in multiplying to keep this method efficient and reasonably compact. It is focused on repeated subtraction but is more difficult to use with decimals as the focus is on the whole of the starting number.



$$\begin{array}{r} 23 \\ 24 \overline{) 560} \\ \underline{-480} \quad 24 \times 20 \\ 80 \\ \underline{-72} \quad 24 \times 3 \\ 8 \end{array}$$

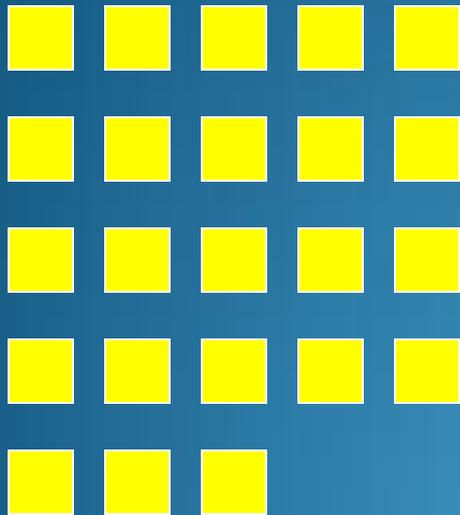
Answer: 23 R 8

$$\begin{array}{r} 23 \text{ r}8 \\ 24 \overline{) 560} \end{array}$$

Short division can be used for the same calculation and many children prefer it.

Division: Learning to show the remainder

$$23 \div 5$$



$$23 \div 5 = 4 \text{ r } 3$$

As a remainder

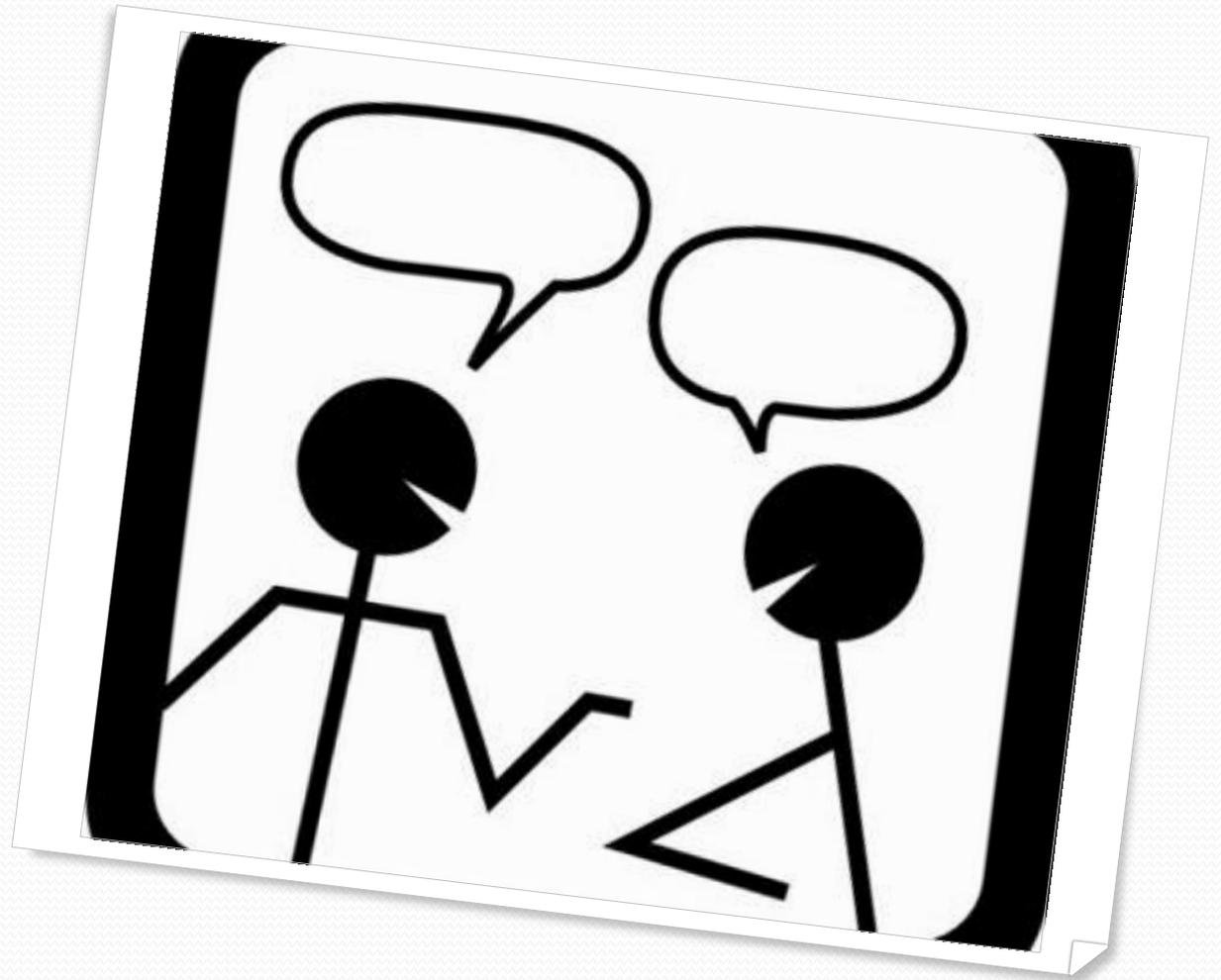
$$23 \div 5 = 4 \frac{3}{5}$$

As a fraction

$$23 \div 5 = 4.60$$

As a decimal
fraction

Over
to
you!





**Any
Questions?**