Federation of Winklebury Infant and Junior Schools

Helping Your Child With Their Maths

Why Has It All Changed?

The 2014 curriculum places greater emphasis on the use of formal methods of calculation for addition, subtraction, multiplication and division.

Children are expected to be able to use:

- Columnar addition
- Columnar subtraction
- Short and long multiplication
- Short and long division

However it is important that children understand how and why these method work.

To Start With…

When faced with a calculation problem, encourage your child to ask:

- can I do this in my head?
- could I do this in my head using drawings or jottings to help me?
- do I need to use a written method?
- should I use a calculator?

Also help your child to estimate and then check the answer. Encourage them to ask:

- is the answer sensible?

Mental Strategies

Secure mental calculation requires the ability to:

- **recall key number facts instantly**
  *all addition and subtraction facts for each number to at least 20
  *sums and differences of multiples of 10
  *times tables and division facts up to 12 x 12 (now expected to be secure by the end of Year 4)

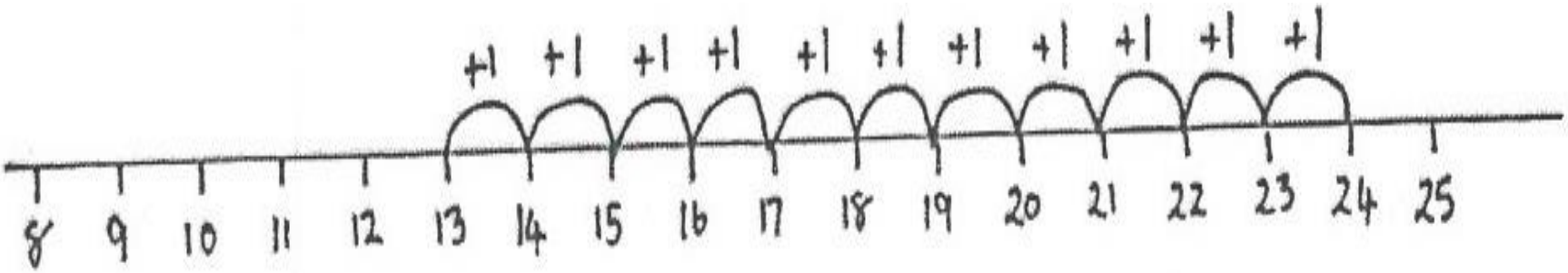
- **use knowledge of place value to extend known number facts**
  *using the fact that 7 x 6 = 42 to calculate 70 x 6 = 420

- **use strategies such as realising that addition can be done in any order or partitioning (splitting) numbers into tens and units**

Progression in Addition

- Use practical objects
- Structured number line
- Unstructured number line
    - *TU+U, TU+TU without bridging
    - *TU+U, TU+TU with bridging
- Partitioning
- Expanded columnar addition
- Formal columnar addition

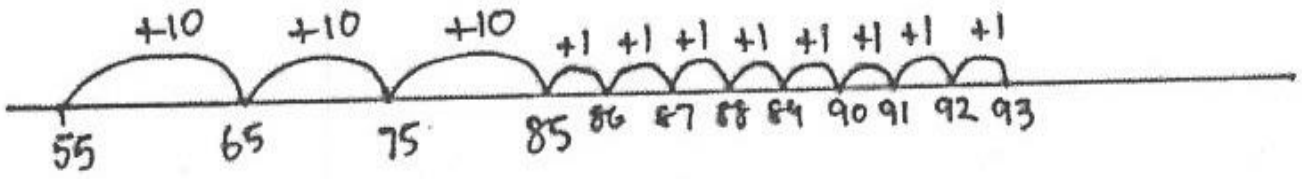
A Structured Number Line



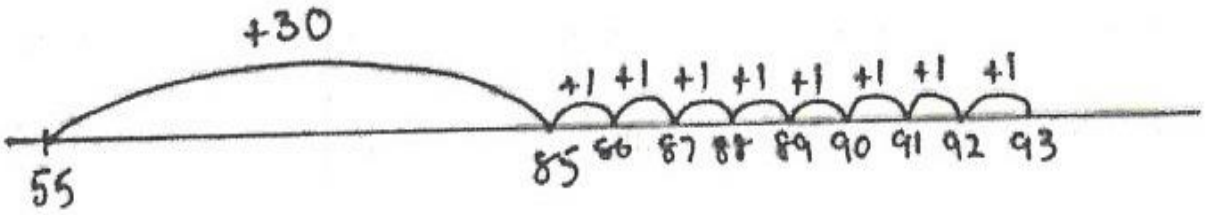
13 apples and 11 apples equals 24 apples.

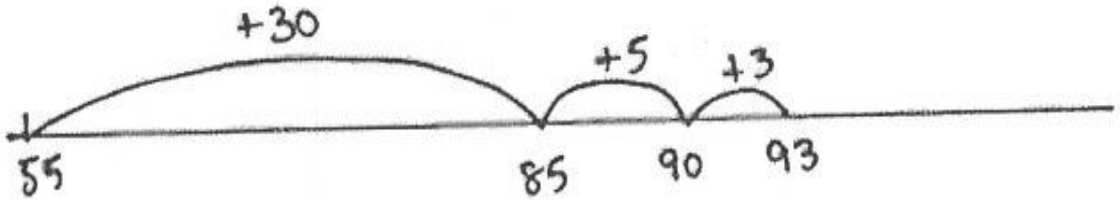
13 + 11 = 24

An Unstructured Number Line



55+38 = 93





Partitioning

47 + 76

40 + 70 = 70 + 30 + 10 = 110

7 + 6 = 7 + 3 + 3 = 13

110 + 13 = 100 + 10 + 10 + 3 = 123

Expanded Columnar

47 + 76 =

40 + 7

70 + 6

110 + 13 = 123

258 + 87 =

200 + 50 + 8

80 + 7

200 + 130 + 15 = 345

Formal Columnar Addition

47 + 76 123 11	258 + 87 345 11	366 +458 824 11

4.7 + 7.6 12.3 11	25.8 + 8.76 34.56 11

Note how the decimal points must be lined up when adding decimals.

Year 3

3 digit numbers

Year 4

4 digit numbers

Year 5

More than 4 digit numbers

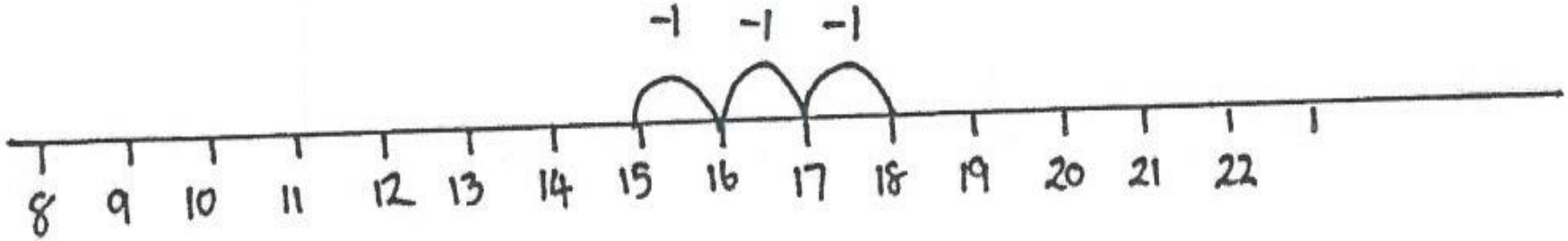
Progression in Subtraction

- Use practical objects
- Structured number line
- Unstructured number line
    - *TU-U, TU-TU without bridging
    - *TU-U, TU-TU with bridging
- Partitioning
- Expanded columnar subtraction
- Formal columnar subtraction

Inverse of addition

A Structured Number Line

If a farmer has 18 apples on a tree and he picks 3. How many apples will be left?



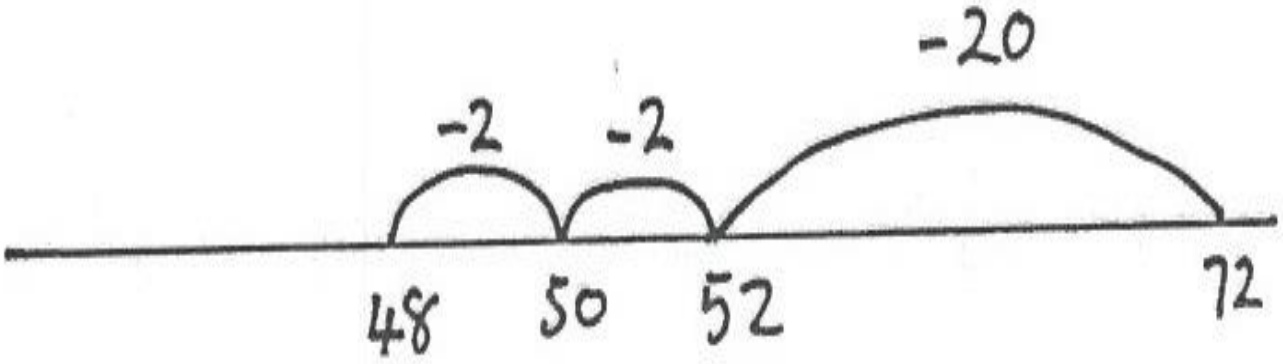
18 - 3 = 15

18 apples, take away 3 apples,

equals 15 apples.

An Unstructured Number Line

There were 72 books in the library. Children borrowed 24 of them. How many books were left in the library?



NB - 24 is partitioned into 20 + 2 + 2 not 20 + 4

Partitioning

264 – 182

What can go wrong?

200 – 100 = 100

80 – 60 = 20

4 – 2 = 2

100 + 20 + 2 = 122

What should it be?

264 – 100 = 164

164 – 80 = 84

84 – 2 = 82

Expanded Columnar

362 - 48

300 + 60 + 2

\- 40 + 8

300 + 50 + 12

\- 40 + 8

300 + 10 + 4 = 314

362 - 48

50 12

300 + ~~60~~ + ~~2~~

\- 40 + 8

300 + 10 + 4 =

Formal Columnar Subtraction

362 - 48

$3\ ^{5}\cancel{6}^{1}2$

$-\ \ 4\ 8$

$3\ 1\ 4$

Year 3

3 digit numbers

Year 4

4 digit numbers

Year 5

More than 4 digit numbers

Progression in Multiplication

- Arrays
  *Concrete objects
  *Pictorial representation
- Number lines (repeated addition)
  *U x U
  *TU x U
- Partitioning
  *TU x U
  *HTU x U
- Grid method
- Short multiplication
- Long multiplication

Arrays

6 X 4

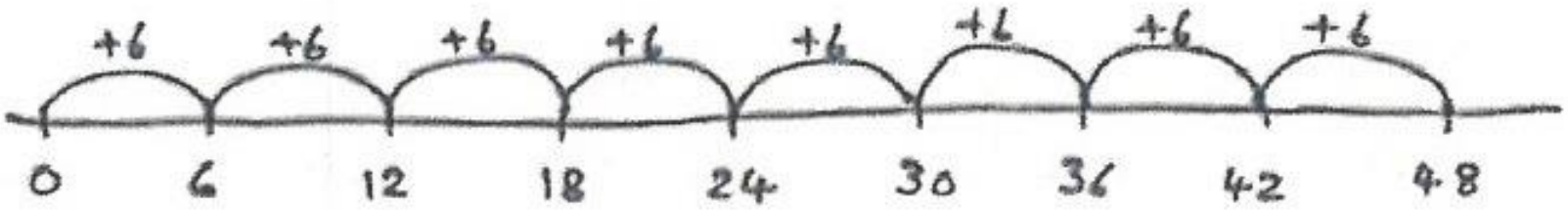
X X X X X X
X X X X X X
X X X X X X
X X X X X X

24

An Unstructured Number Line

There are six carrots in a bag.

How many carrots are there in eight bags?



6 x 8 = 48

There are 48 carrots altogether.

Partitioning

438 x 6

400 x 6 = 2400

30 x 6 = 180

8 x 6 = 48

2400 + 180 + 48 = 2628

Partitioning

Why not partitioning for TU x TU?

45 x 38

40 x 30 = 1200

5 x 8 = 40

1200 + 40 = 1240

Oops!

Grid Method

45 x 38

	40	5
30	1200	150
8	320	40

Then add the four 'answers'

Expanded Multiplication

- This makes clear the link between grid and columnar methods of multiplication.

45
38
40
320
150
1200
1710

Long Multiplication

24 × 16 becomes

$$\begin{array}{rrr} & {\scriptstyle 2} & \\ & \mathbf{2} & \mathbf{4} \\ \times & \mathbf{1} & \mathbf{6} \\ \hline \mathbf{2} & \mathbf{4} & \mathbf{0} \\ \mathbf{1} & \mathbf{4} & \mathbf{4} \\ \hline \mathbf{3} & \mathbf{8} & \mathbf{4} \\ \hline \end{array}$$

Answer: 384

124 × 26 becomes

$$\begin{array}{rrrr} & & {\scriptstyle 1} & {\scriptstyle 2} \\ & & \mathbf{1} & \mathbf{2} & \mathbf{4} \\ \times & & \mathbf{2} & \mathbf{6} \\ \hline \mathbf{2} & \mathbf{4} & \mathbf{8} & \mathbf{0} \\ & \mathbf{7} & \mathbf{4} & \mathbf{4} \\ \hline \mathbf{3} & \mathbf{2} & \mathbf{2} & \mathbf{4} \\ \hline {\scriptstyle 1} & {\scriptstyle 1} & & \end{array}$$

Answer: 3224

124 × 26 becomes

$$\begin{array}{rrrr} & & {\scriptstyle 1} & {\scriptstyle 2} \\ & & \mathbf{1} & \mathbf{2} & \mathbf{4} \\ \times & & \mathbf{2} & \mathbf{6} \\ \hline & \mathbf{7} & \mathbf{4} & \mathbf{4} \\ \mathbf{2} & \mathbf{4} & \mathbf{8} & \mathbf{0} \\ \hline \mathbf{3} & \mathbf{2} & \mathbf{2} & \mathbf{4} \\ \hline {\scriptstyle 1} & {\scriptstyle 1} & & \end{array}$$

Answer: 3224

Year 5 and 6

2 digit x 2 digit

2 digit x 3 digit

4 digit x 2 digit

Short Multiplication

24 × 6 becomes

	2	**4**
×		**6**
1	**4**	**4**
	2	

Answer: 144

342 × 7 becomes

	3	**4**	**2**
×			**7**
2	**3**	**9**	**4**
	2	1	

Answer: 2394

2741 × 6 becomes

	2	**7**	**4**	**1**
×				**6**
1	**6**	**4**	**4**	**6**
	4	2		

Answer: 16 446

Year 3

2 digit x 1 digit

Year 4

3 digit x 1 digit

Year 5

4 digit x 1 digit

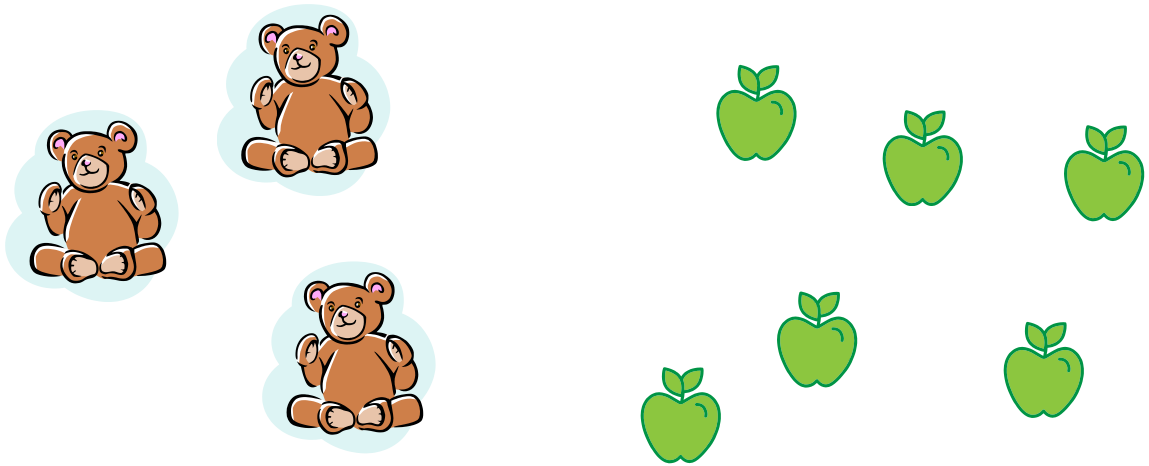
Progression in Division

- Using pictures
- Number line (repeated subtraction)
- Chunking
- Short division
- Long division

Inverse of multiplication

Using Pictures

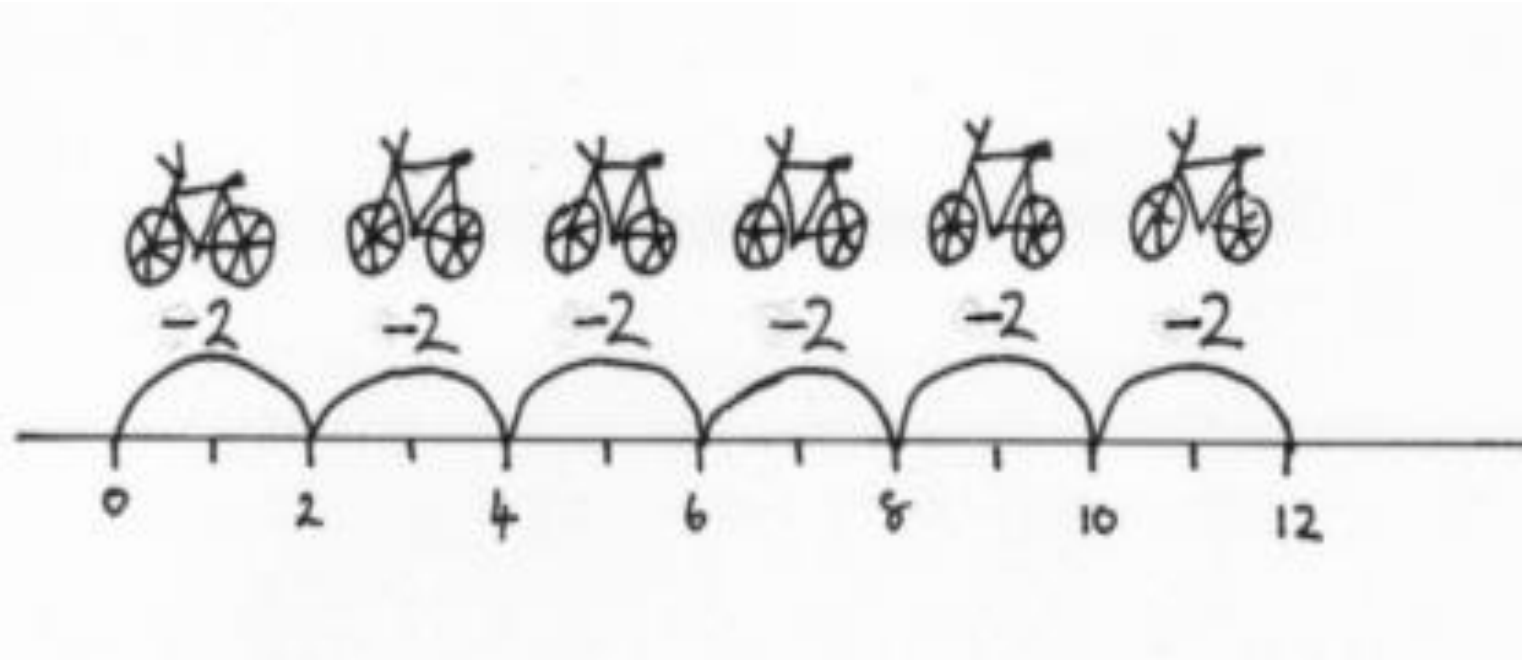
Share the apples between the teddies.



An Unstructured Number Line

There are 12 bicycles wheels. How many bikes are there?

$12 \div 2 = 6$



Chunking

Eighty one stickers are divided equally between three friends.
How many stickers do they each get?

81 ÷ 3 =

81
- 30 (10 x 3)
51
- 30 (10 x 3)
21
- 21 (7 x 3)
0

Long Division

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8\ \text{r } 12 \\ 15\overline{)\,4\ 3\ 2} \\ -\ 3\ 0\ 0 \\ \hline 1\ 3\ 2 \\ -\ 1\ 2\ 0 \\ \hline 1\ 2 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8 \\ 15\overline{)\,4\ 3\ 2} \\ -\ 3\ 0\ 0 \quad (15\times 20) \\ \hline 1\ 3\ 2 \\ -\ 1\ 2\ 0 \quad (15\times 8) \\ \hline 1\ 2 \end{array}$$

$\frac{\cancel{12}}{\cancel{15}} = \frac{4}{5}$

Answer: $28\ \frac{4}{5}$

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8\cdot 8 \\ 15\overline{)\,4\ 3\ 2\cdot 0} \\ -\ 3\ 0 \\ \hline 1\ 3\ 2 \\ -\ 1\ 2\ 0 \\ \hline 1\ 2\ 0 \\ -\ 1\ 2\ 0 \\ \hline 0 \end{array}$$

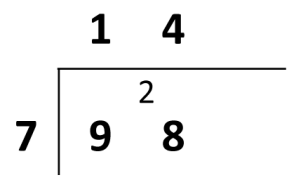
Answer: 28·8

Year 6

4 digit ÷ 2 digit

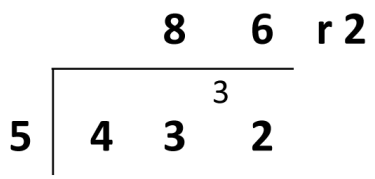
Short Division

98 ÷ 7 becomes



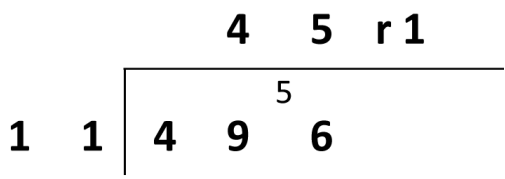
Answer: 14

432 ÷ 5 becomes



Answer: 86 remainder 2

496 ÷ 11 becomes



Answer: $45\frac{1}{11}$

Year 3

2 digit ÷ 1 digit

Year 4

3 digit ÷ 1 digit

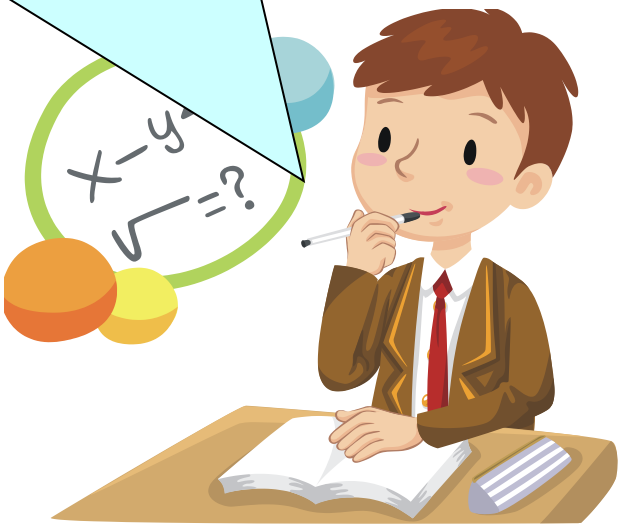
Year 5

4 digit ÷ 1 digit

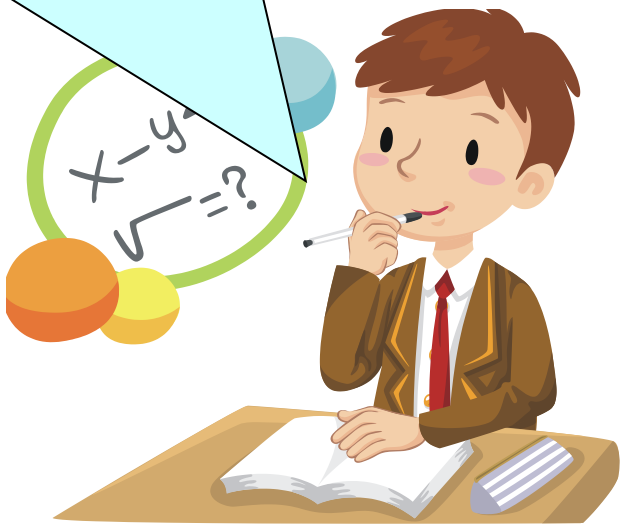
Year 6

4 digit ÷ 2 digit

Discuss with your child how things work and ask them to explain how they know.



Any questions?



NOW IT'S
YOUR TURN!