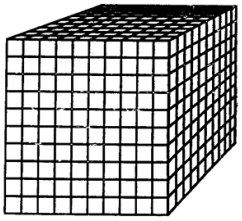
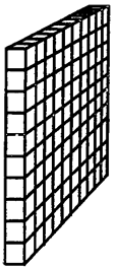
# Written Methods Calculation Policy

| Thousands | Hundreds | Tens | Ones | . | Tenths | Hundredths | Thousandths |
|---|---|---|---|---|---|---|---|
| 1000s | 100s | 10s | 1s | . | 1/10s | 1/100s | 1/1000s |
|  |  |  |  | . | | | |

**Number Lines:** regardless of which operation is being used, smallest & largest numbers must be at the 'correct' end (place value needed so children know which is the smallest & largest number).

Smallest Number

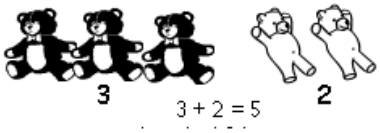
Largest Number

## Formal Written Methods Must:

- show operation symbol
- carry **underneath**
- exchange by crossing through and rewriting **above**

**Year 1:**

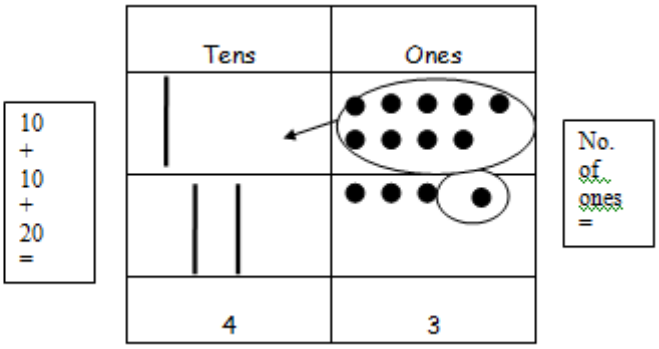
Objects (concrete), number tracks (visual), written equations (abstract).
Maths Mastery big picture. Show addition can be done in any order.



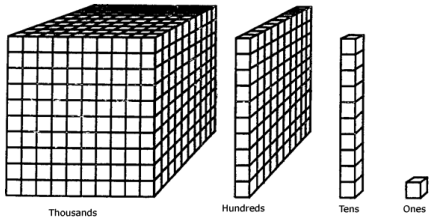

3 + 2 = 5

Jane had 3 bears. She was given 2 more. How many does she have now?

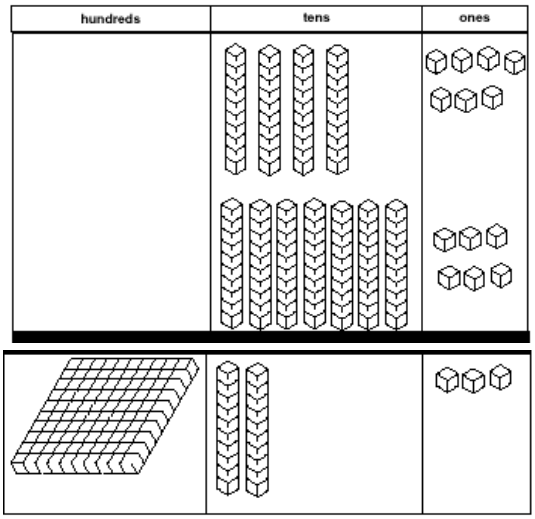
19 + 24 = 43




Exchange Game (to prepare for formal written addition):
e.g. using dienes blocks or other objects:
roll a dice & take 1-6 'ones'.
When have ten, 'swap' for a 'ten'.
When have ten 'tens', swap for a 'hundreds'.
When have ten 'hundreds', swap for a 'thousand'.



## Year 2:




Partitioning & recombining when exchanging - using concrete objects to support.

47 + 76 =

Use dienes blocks to represent the numbers in correct columns.

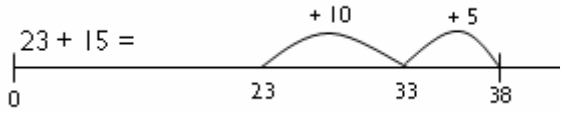
Add together, starting from the ones and exchange where necessary – carry over into the new column. Then recombine.

Partitioning and recombining.

42 → 40 + 2
+36 → 30 + 6
70 + 8 → 78

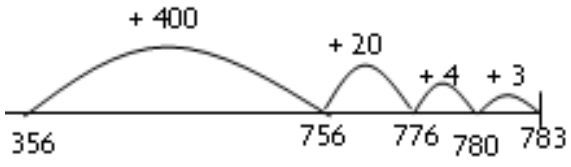
37 → 30 + 7
+85 → 80 + 5
110 + 12 → 122

Number line – adding multiples of ten, using numbers bonds to 10.




## Year 3:

Number line addition – partitioning one number.




Column Addition – adding ones first, then tens and recombining.

```
  4 3
+ 5 4
    7
  9 0
  9 7
```

## Year 4:

Column Addition – adding ones first, then tens, then 100s and recombining.

```
  4 3        3 5 8
+ 5 4      + 3  3
    7        1 1
  9 0        8 0
  9 7      3 0 0
             3 9 1
```

Compact Column Method – adding from ones and carrying **underneath**.

```
  3 5 8
+ 3 3
3 9 1
  1
```

8 + 3 = 11. So place the one and carry ten.
50 _ 30 + 10 = 90
300 + no hundreds is 300

## Year 5 & 6:

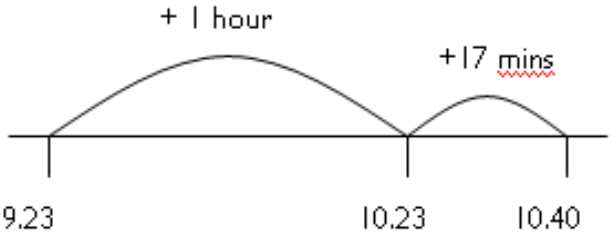
Compact Column Method, extending to 4 digit numbers; 2 decimal places; different number of decimal places and adding more than 2 numbers.

```
  72.5
+54.6
------
 127.1
  1
```

```
 3481.9
   26.85
+   0.71
--------
 3509.46
  1 2
```

```
  £ 73.42
+ £ 84.73
---------
 £158.15
  1
```

Number line method to add time, in minutes and hours (as time is measured in 60 minutes, not hundreds).



## Subtraction:

### Year 1

Objects (concrete), number tracks/drawings (visual), written equations (abstract).

Subtract/take away:

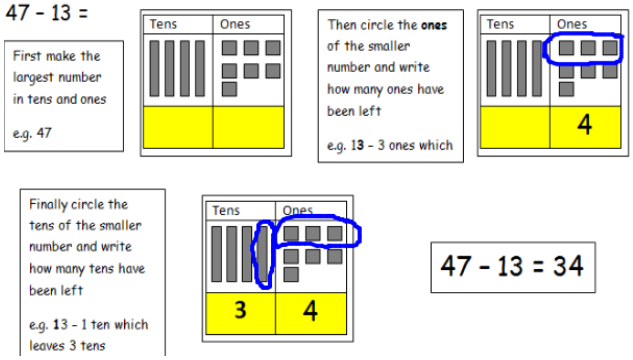
Using moveable objects to physically take away and pictures.

Write equations using symbols

e.g. 5 – 2 = 3

6 in a bag. Take away 2 and there are 4 left in the bag → 6 – 2 = 4

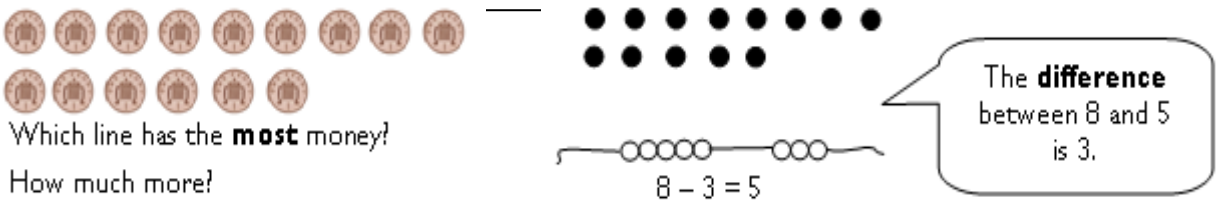

As with addition, concrete objects to shows tens and ones. Taking away objects and then starting to circle drawings for the pictorial representation.




Find the difference:

Using moveable objects and drawings e.g. bead string, coins, cubes

Maths meetings

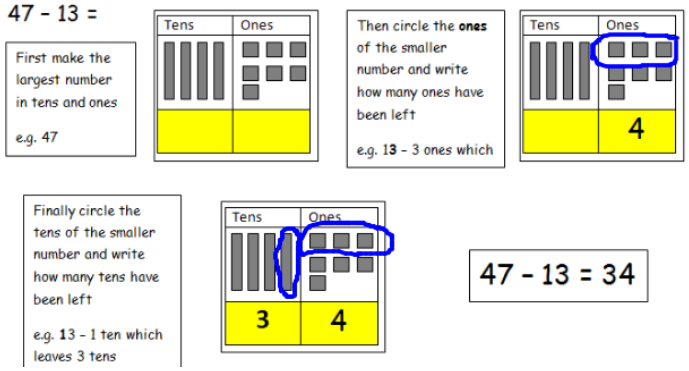


## Year 2

Use of concrete to consolidate but moving towards number lines and column methods.

### Subtract/Take away:

47 – 13 =




Use partitioning and column method (supported with **dienes blocks**) when not crossing the tens boundary.

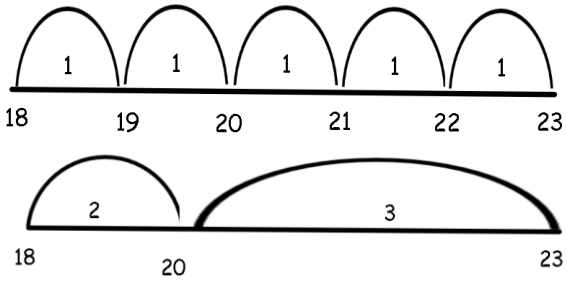
67 → 60 + 7
-35 → 30 + 5
30 + 2 → 32

82 → 80 + 2
- 21 → 60 + 1
20 + 1 → 21

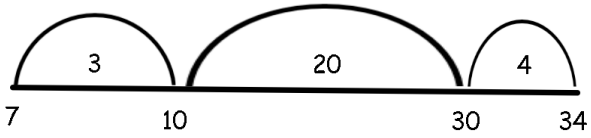
### Find the difference:

Use place value knowledge to add to the nearest ten, add in tens and then ones.

e.g. What is the difference between 23 and 18? (Counting on)




e.g. what is the difference between 7 and 34?




Add the ones, then add the tens

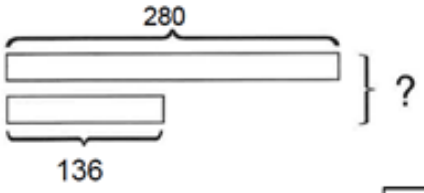
3 + 4 = 7

20 + 7 = 27

Bar modelling:

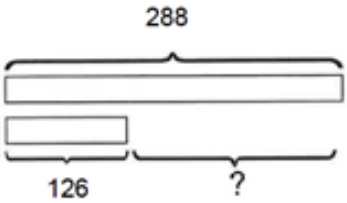
Use pictorial bars to represent numbers to find missing numbers.

. What is the sum of 280 and 136?




The sum of 280 and 136 is ☐

. Find the difference between 288 and 126?



**Year 3**

Continue pictorial methods (see above) moving onto the abstract formal written column methods, including HT1s – HT1s, with concrete objects to support (e.g. dienes blocks)

3 digit subtract 3 digits
(using dienes blocks to consolidate from Yr 2)

874 → 800 + 70 + 4
- 523 → 500 + 20 + 3
300 + 50 + 1 → 351

Including **exchanging**:

200 120
326 → ~~300~~ + ~~20~~ + 6
- 152 → 100 + 50 + 2
100 + 70 + 4 = 174

**Year 4**

Consolidate column method with partitioning, then move to compact method.

Always beginning with the 'ones' column,

```
  874        3 6 7
- 523      -   2 5
  351        3 4 2
```

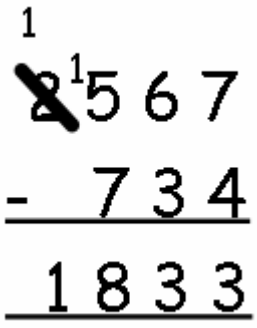
Including **single exchange**:
(children must be confident in the value of each digit e.g. 2 = 20 – two tens)

```
 2  12
 ~~3~~ ~~2~~6
-1 5 2
 1 7 4
```

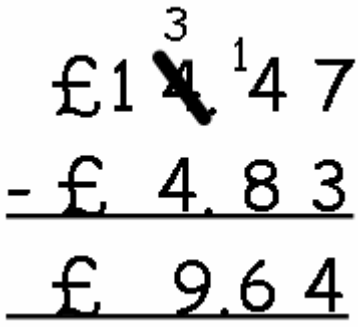
**Year 5 & 6:**

Use column compact method for a wider range of applications.

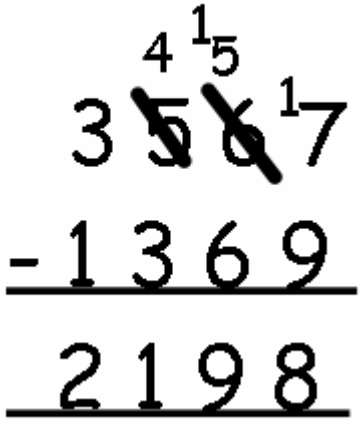
Different numbers of digits:




Decimals, including money & measures:

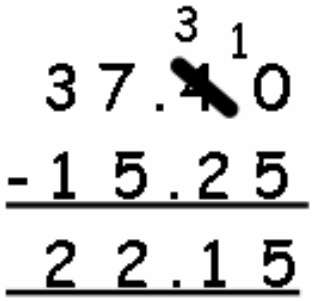



Double exchanging:




Numbers with different numbers of decimal places – use of a place holder.

37.4 - 15.25

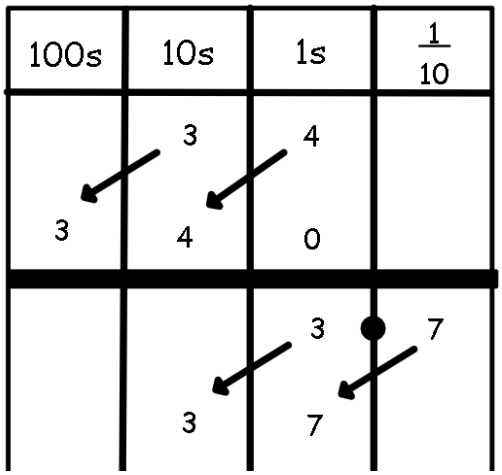


## Multiplication:

### X10 and x100

Years 2 and 3: move digits written method

Years 4 – 6: mental calculations (including decimals)




### Year 1

Use of concrete objects and pictorial representation.

Find patterns on 100s squares for x2, x5, x10:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |

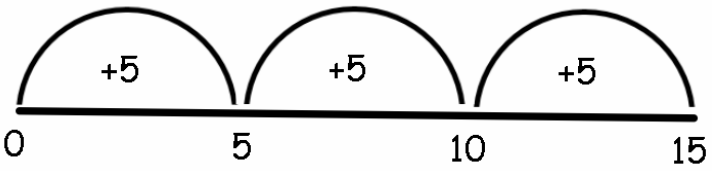
Counting in 5s and 10s using money:

"10, 20, 30, 40, 50 ....."

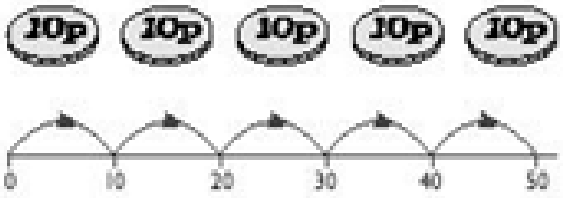
Counting in twos with pairs of objects:

**Year 2:** (times tables- x2, x5, x10)
Building on skills of counting in 2s, 5s and 10s.

Repeated addition:
3 x 5 (3 lots of 5)




5 x 10 (5 lots of 10)




10p + 10p + 10p + 10p + 10p = 50p
10p x 5 = 50p
5 hops of 10

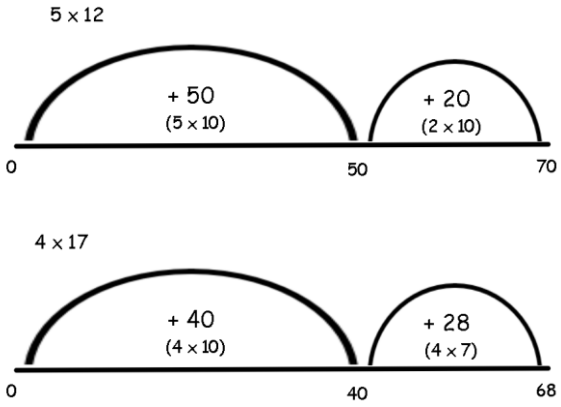
Arrays:
Support understanding that the multiplication of 2 numbers can be done in any order.

3 x 4 (3 rows of 4)

4 x 3 (4 rows of 3)

## Year 3

Consolidate repeated addition, including larger jumps




Introduce multiplying with formal vertical method.
Begin by multiplying with the 'ones' digits. Introduce carrying underneath.

$$\begin{array}{r} 24 \\ \times\ 6 \\ \hline 24 \\ 120 \\ \hline 144 \end{array} \quad (6 \times 4) \quad (6 \times 20)$$

$$\begin{array}{r} 24 \\ \times\ 6 \\ \hline 144 \\ \hline 2 \end{array}$$

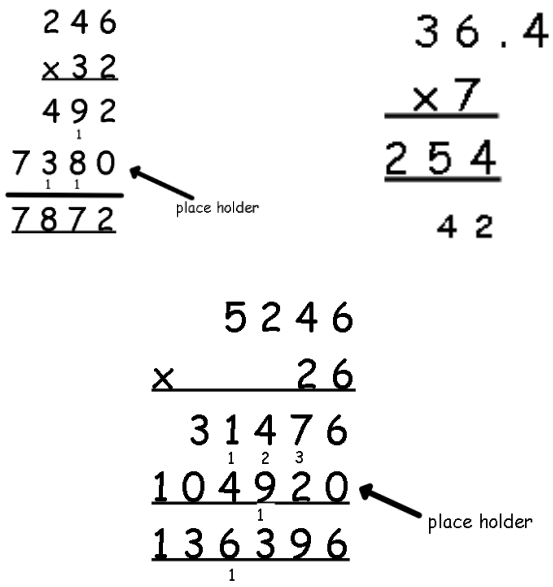
## Year 4

Consolidate column method from Yr 3 including carrying underneath (as in addition).

$$\begin{array}{r} 24 \\ \times\ 6 \\ \hline 144 \\ \hline 2 \end{array} \qquad \begin{array}{r} 354 \\ \times\ 4 \\ \hline 1416 \\ \hline 21 \end{array}$$

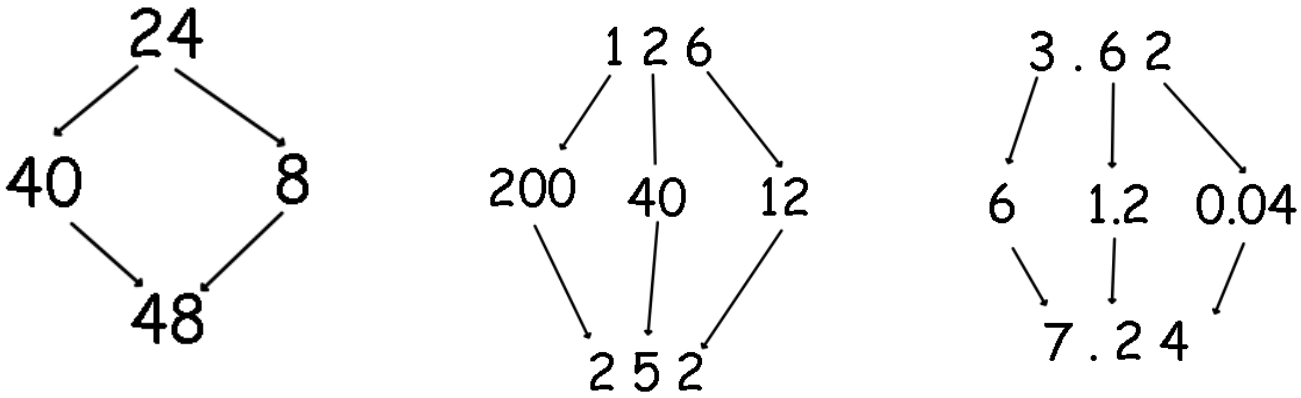
## Year 5 & 6

Vertical Multiplication, including 4 digits x 2 digit numbers and decimals.

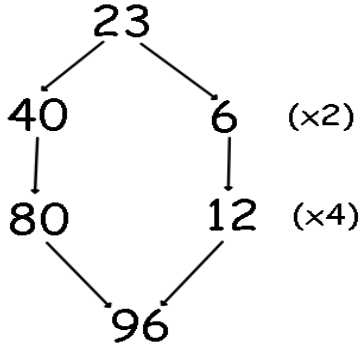



## Doubling and x 4

Partition, x2 and then recombine:




## X4 → double and double again



## Division:

### Year 1

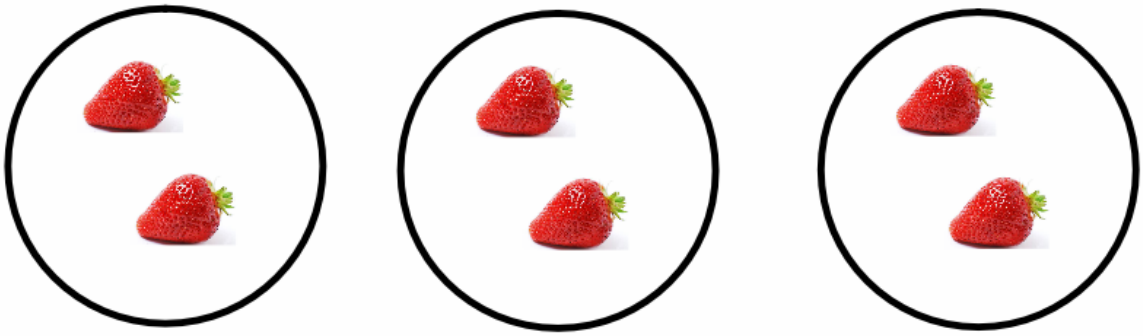
Consolidate counting to prepare for formal division.
Using concrete objects (bead string, cubes, numicon) and pictorial representations.

Halving – sharing concrete objects into two groups.

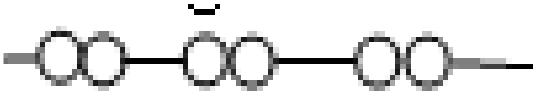
### Year 2

Introduce the language 'division' and the symbol '÷'

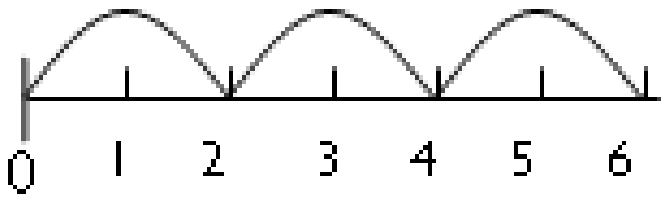
**Sharing** equally – into 2s, 5s and 10s → moving objects
e.g. 6 ÷ 3 = 2



**Grouping** – into 2s, 5s and 10s →Cubes, bead strings, pictorially
e.g. 6 ÷ 2 = 3

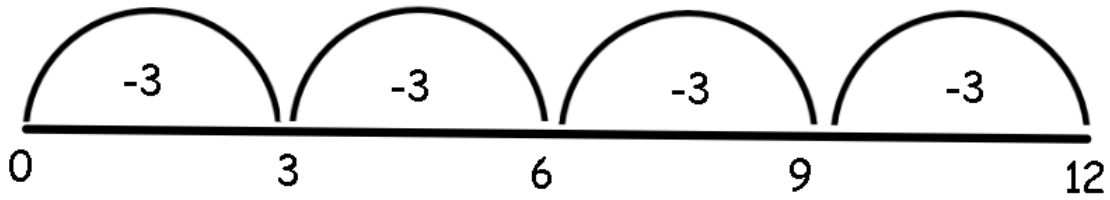


Represent using equal jumps on a number line:
3 jumps of 2. So 6 divided by 2 = 3



## Year 3

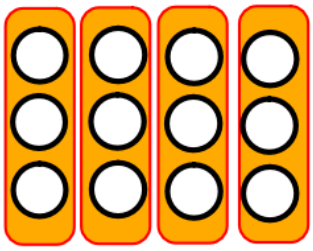
Repeated Subtraction:
e.g. 4 groups of 3. So 12 ÷ 3 = 4




Arrays to show inverse:

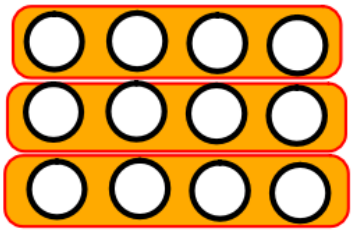
12 ÷ 4 = 3

How many groups of 4 are there?



12 ÷ 3 = 4

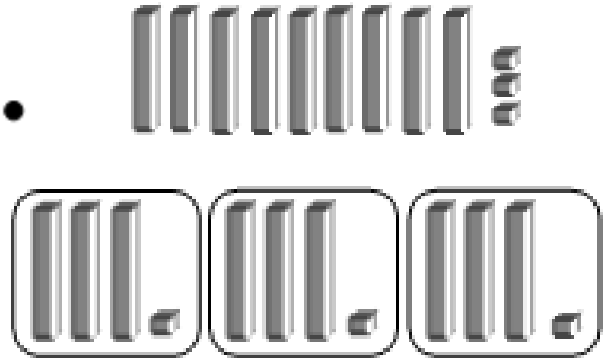
How many groups of 3 are there?



Sharing using concrete objects, introduce remainder:

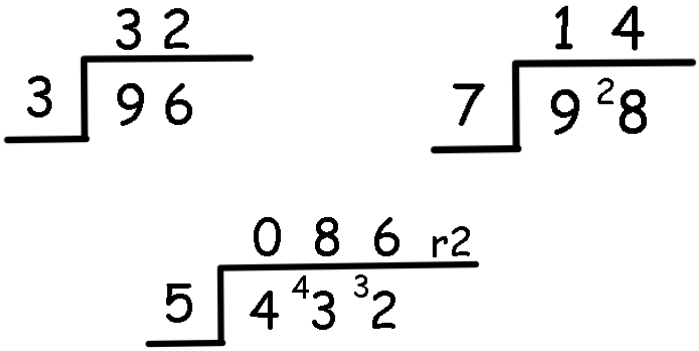
11 ÷ 2 = 5 r 1

93 ÷ 3 = 31



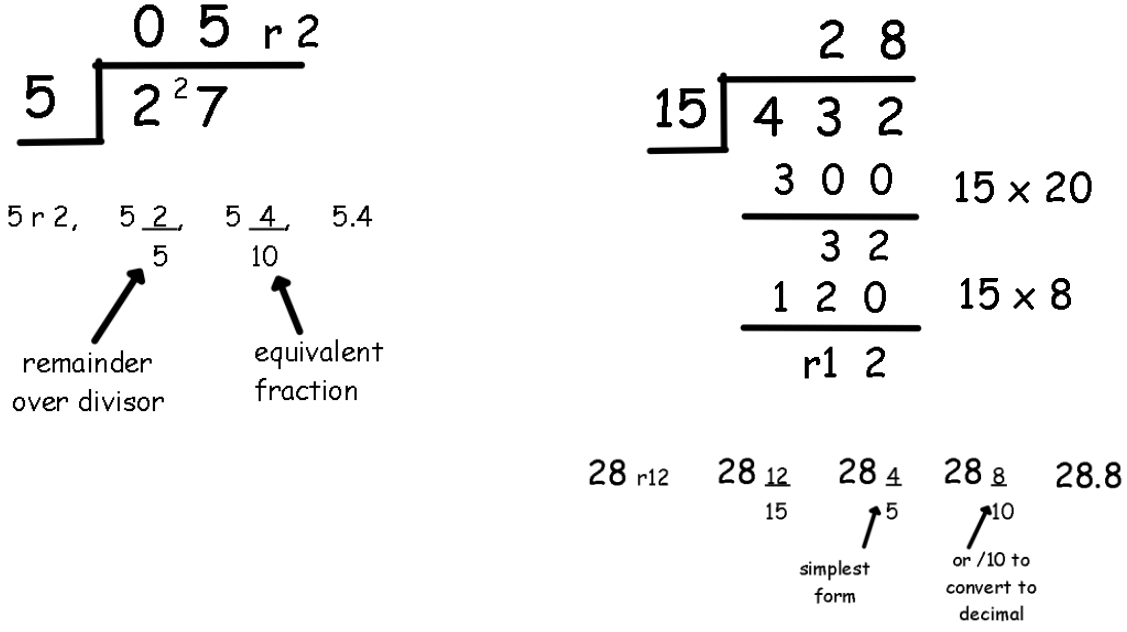
## Year 4

Short division using times tables and remainder:



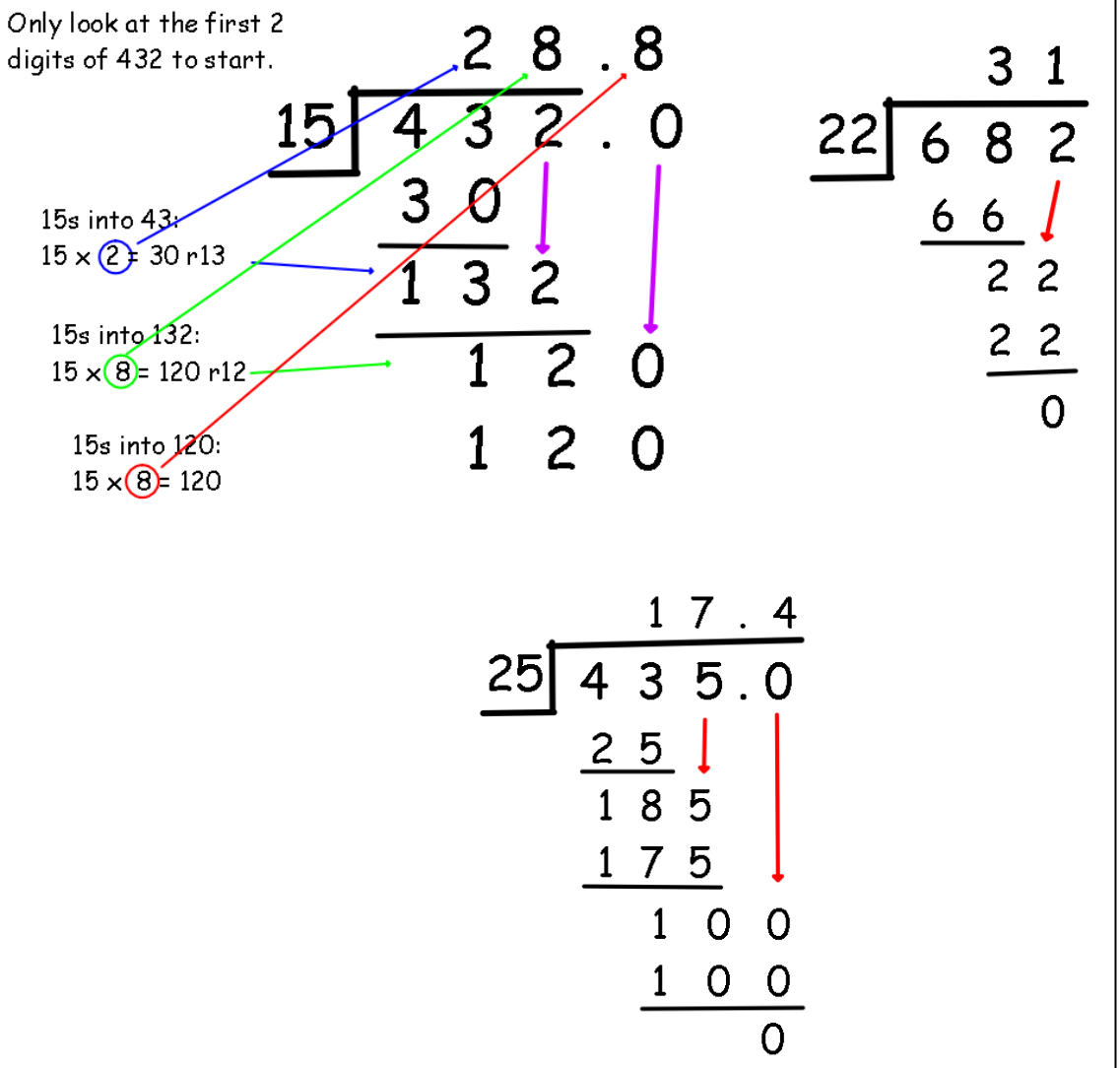

## Year 5

Short division, including remainder as fractions and decimals:



## Year 6

Long division to give remainder as decimals.




## Halving