Junior Maths

@ HPS

Mar 22-20:05

We follow the national curriculum (NC).
Key aims of the NC are:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop **conceptual understanding** and the **ability to recall and apply knowledge rapidly and accurately**
- **reason mathematically** by following a line of enquiry, **conjecturing relationships** and generalisations, and d**eveloping an argument, justification or proof using mathematical language**
- can **solve problems** by a**pplying their mathematics to a variety of routine and non-routine problems with increasing sophistication**, including breaking down problems into a series of **simpler steps and persevering** in seeking solutions

Nov 7-14:29

End of KS2 (Year 6) expectations

• demonstrate an understanding of place value, including large numbers and decimals (e.g. what is the value of the '7' in 276,541?; find the difference between the largest and smallest whole numbers that can be made from using three digits; 8.09 = 8 + 9 /?; 28.13 = 28 + ? + 0.03)

• calculate mentally, using efficient strategies such as manipulating expressions using commutative and distributive properties to simplify the calculation (e.g. 53 – 82 + 47 = 53 + 47 – 82 = 100 – 82 = 18; 20 × 7 × 5 = 20 × 5 × 7 = 100 × 7 = 700; 53 ÷ 7 + 3 ÷ 7 = (53 + 3) ÷ 7 = 56 ÷ 7 = 8)

• use formal methods to solve multi-step problems (e.g. find the change from £20 for three items that cost £1.24, £7.92 and £2.55; a roll of material is 6m long: how much is left when 5 pieces of 1.15m are cut from the roll?; a bottle of drink is 1.5 litres, how many cups of 175ml can be filled from the bottle, and how much drink is left?)

• recognise the relationship between fractions, decimals and percentages and can express them as equivalent quantities (e.g. one piece of cake that has been cut into 5 equal slices can be expressed as 1 /5 or 0.2 or 20% of the whole cake)

• calculate using fractions, decimals or percentages (e.g. knowing that 7 divided by 21 is the same as 7/21 and that this is equal to 1/3; 15% of 60; $1\ 1/2 + 3/4$; 7/9 of 108; 0.8 x 70)

• substitute values into a simple formula to solve problems (e.g. perimeter of a rectangle or area of a triangle)

• calculate with measures (e.g. calculate length of a bus journey given start and end times; convert 0.05km into m and then into cm)

• use mathematical reasoning to find missing angles (e.g. the missing angle in an isosceles triangle when one of the angles is given; the missing angle in a more complex diagram using knowledge about angles at a point and vertically opposite angles).

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A Mastery Approach

We adopted a mastery approach throughout the school starting last year (2016-17) and continuing this year (2017-18).

What our approach means:

- developing understanding is key and we usually spend longer on a topic
- using concrete apparatus and pictorial representations before moving on to abstract calculations
- removing a ceiling for children
- developing mathematical language and reasoning
- providing opportunities to go deeper

We are constantly reviewing and modifying how and what we teach.

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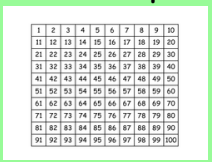
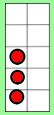
Some of the resources we use

Number squares



Base 10

10 frames

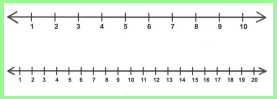


Counters

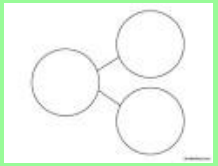
Everyday objects

Interlocking cubes

Number lines



Part-part-whole diagrams



Place value counters

Rulers

Bead strings

Numicon

Nov 6-10:00

Addition

6 + 2
Quick recall of number facts

7 + 4 - Using number bonds and adjusting

15 + 16
Near double

45 + 5
Use number bonds

52 + 10
Count on one ten

How would you solve these?

38 + 6
Use number bonds and adjust -> 38 + 2 = 40, then 40 + 4

42 + 30
Count on 3 tens

66 + 9
Add 10 and subtract 1

23 + 34
Add tens and ones

143.43 + 23826
Use column method

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Addition

Mentally add on one digit number and multiples of 10, 100, 1000, etc.

135 + 4 143 + 40 128 + 400
135 + 6 143 + 70 244 + 500

2304 + 1000
2304 + 3000

Revise methods from Y2: Partition and recombine

222 + 247 = 200 + 200 + 20 + 40 + 2 + 7
= 400 + 60 + 9
= 469

Children need to have grasp of addition facts.

Number bonds (pairs of numbers that equal a total) - to 10.
Number facts - all addition (and related subtraction) facts up to 20 then to 100. These can be used to solve problems with much larger numbers.

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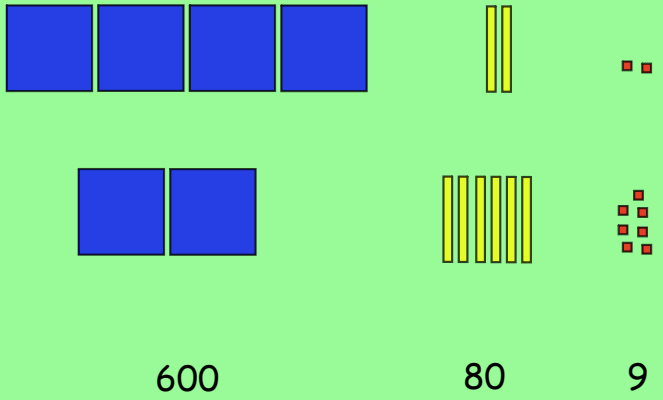
Addition

Setting out partitioning method in columns
- brief to support transition between methods



$$\begin{array}{r} 422 \\ +\ 267 \\ \hline 9 \\ 80 \\ 600 \\ \hline 689 \\ \hline \end{array}$$

.....▸

$$\begin{array}{r} 422 \\ +\ 267 \\ \hline 689 \\ \hline \end{array}$$

Number facts like number bonds to 10 and 20 will be revised. Children will look at multiple of 5 number facts to 100 - e.g. 35 + ? = 100
Strategies for adding 9 and 11 as well as 19 and 21.

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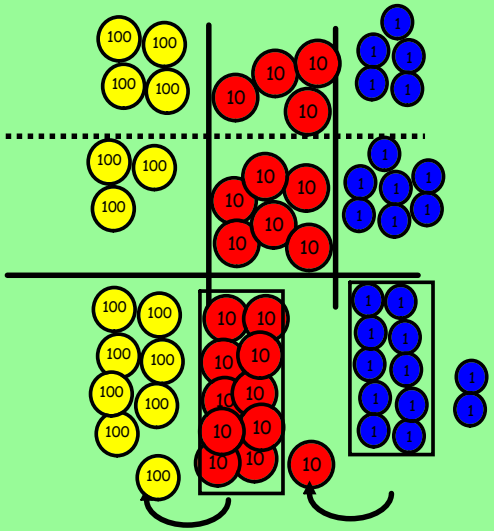
Addition

Children then refine this method and move on to column method with carrying. Children will be exposed to larger numbers and decimal numbers in context e.g. length, weight, capacity, money. This will continue to be modelled with apparatus before and during the process of learning how to use a written method.




```
  4 4 5
+ 3 6 7
  8 1 2
  1 1
```

```
  £41.85
+ £3.09
  £44.94
     1
```

```
  5392.3
+  53.356
  5445.656
     1
```

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Subtraction

1009 - 20 = 989
Count back 2 tens -
cross over 1000 barrier

52 - 10 = 42
Understand that subtracting 10
doesn't change the units

64 - 28 = 36
Several methods:
count on from 28 to 64;
subtract 8 then subtract 20 from 64;
from 64 subtract 4 then 20 then 4 (4 + 20 + 4 = 28)

How would you solve these?

95 - 30 = 65
Subtract 3 tens

4007 - 3994 = 13
Count on from 3994 to 4007 -
these are very close!

35 - 9 = 26
Subtract 10 and give back 1

65- 19 = 46
Subtract 20 and give back 1

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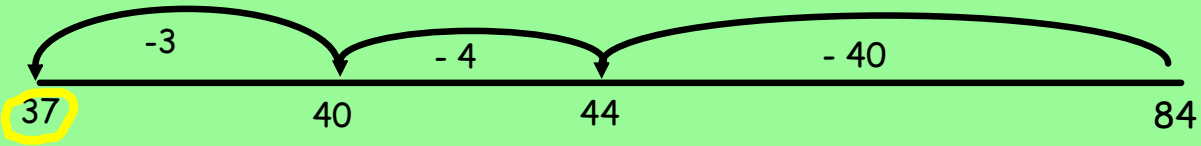
Subtraction

Children will revise subtracting using a number line and/or counting back.

84 - 47 =



Mentally subtract one digit numbers, multiples of 10 and multiples of 100 and so on

135 - 4 143 - 40 528 - 400
135 - 6 143 - 50 644 - 500

4359 - 1000
4359 - 3000

To complement this children will be taught strategies to subtract mentally.
Counting back in regular steps (e.g. of 2, 3, 4, 5, 10, 20, 25)
Subtracting 9 by subtracting 10 and adding 1.
Subtracting other near multiples
in similar ways: 19, 29, 49, 99

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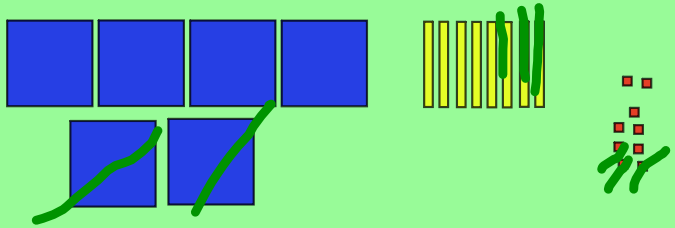
Subtraction

Setting out partitioned method in columns
- brief to support transition between methods.



600	80	9
- 200	30	3
400	50	6

⋯⋯▸

6	8	9
- 2	3	3
4	5	6

Number facts like number bonds to 10 and 20 will be revised. Children will look at multiple of 5 number facts to 100 - e.g. 35 + ? = 100
Strategies for adding 9 and 11 as well as 19 and 21.

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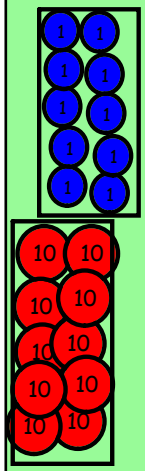
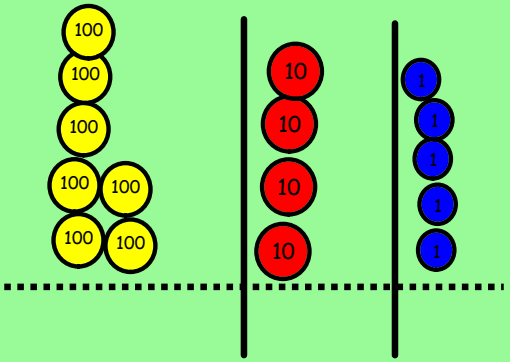
Subtraction

Children in will be taught how to steal and exchange.
Understanding of order of subtraction is vital here. We use part-part-whole and bar modelling to break into problems.

745 - 567





600	130	15	
~~700~~	~~40~~	15	
- 500	60	7	⋯→
100	70	8	

6	13		
~~7~~	~~4~~	15	
- 5	6	7	
1	7	8	

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Subtraction

This method can then be used for larger numbers and decimal numbers too.

$$\begin{array}{r} {}^{3}\not{4}\,{}^{1}7\,{}^{3}\not{4}\,{}^{1}5\;2 \\ -\quad 8\;2\;7\;0 \\ \hline 3\;9\;1\;8\;2 \end{array}$$

$$\begin{array}{r} 8\;3\;4\;7.4 \\ -\quad\;\; 8\;2.7\;4\;6 \\ \hline \end{array}$$

$$\begin{array}{r} 8\;{}^{2}\not{3}\,{}^{1}4\;{}^{6}\not{7}\,{}^{1}.\,{}^{3}\not{4}\,{}^{9}\not{0}\,{}^{1}0 \\ -\quad\;\; 8\;2.7\;4\;6 \\ \hline 8\;2\;6\;4.6\;5\;4 \end{array}$$

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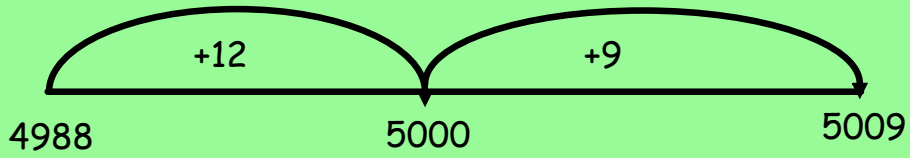
Subtraction

Look at finding the difference by counting on.

5009 - 4988 =

5009	
4988	Difference



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Multiplication

How would you solve:

5 x 8 = 40? - Know these by **LEARNING** times tables by heart

28 x 10 = 280? - know that x 10 moves digits to the left - 28 becomes 280

28 x 7? - break into small pieces - see grid method

4.2 x 100 = 420? - know that x 100 moves digits two places left 4.2 becomes 420

0.5 x 0.8? know that 5 x 8 =40 and that each number was divided by 10 once, so the answer will be divided by 10 twice

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Multiplication

Year 3

Multiplying is portrayed as repeated addition and arrays are used too. Children write number sentence

2 x 4 = 8 - Repeated addition - 4 + 4 = 8 or 2 + 2 + 2 + 2 = 8

Arrays

4 x 2 or 4 + 4

2 x 4 or 2+2+2+2

Times tables are taught and this should be supported at home.
Times table order - 10, 2, 5, 3, 4, 8s - children should know these (preferably off by heart) by the end of Y3.

Year 4

6, 7, 9, 11 and 12 times tables need to be learnt off by heart. Keep revising other tables.

A new national test in 2019 for the current Y3 will be introduced. This will solely test times table knowledge.

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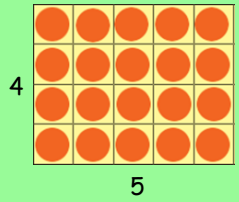
Multiplication

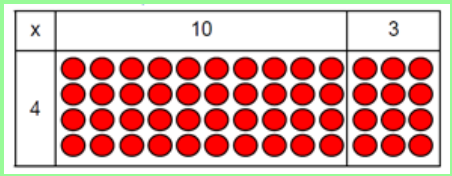
Arrays demonstrate times tables and commutativity:

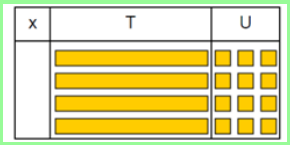
4 x 5 = 20
5 x 4 = 20



Show the link with arrays to introduce grid method.

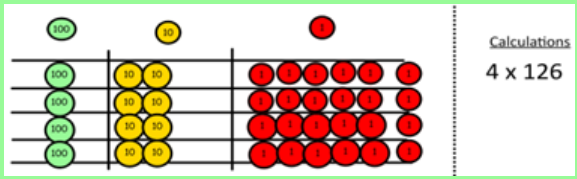
13 x 4 or 4 x 13





4 rows of 13

Move on to place value counters



400 80 24 Total = 504

x	100	20	6
4	400	80	24

Total = 504

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Multiplication

386 x 7

x	300	80	6
7	2100	560	42

2100
560
42
2702
1

Progression in grid method

34 x 83

x	30	4
80	2400	320
3	90	12

2400
320
90
12
2822
1

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Multiplication

Short multiplication

x	40	7
3	120	21

→

```
  4 7
x   3
  2 1   (3 x 7)
1 2 0   (3 x 40)
1 4 1
```

→

```
  4 7
x   3
1 4 1
1 2
```

x	100	20	6
4	400	80	24

→

```
  1 2 6
x     4
  2 4   (4 x 6)
  8 0   (4 x 20)
4 0 0   (4 x 100)
5 0 4
1
```

→

```
  1 2 6
x     4
5 0 4
1 2
```

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Multiplication

Long multiplication

```
    4 7
x   2 3
    2 1   (3 x 7)
  1 2 0   (3 x 40)
  1 4 0   (20 x 7)
  8 0 0   (20 x 40)
1 0 8 1
1
```



```
    4 7
x   2 3
  1 4 1
  1 2
  9 4 0
  1
1 0 8 1
```

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Division

How would you solve:

24 ÷ 6? - know 6 x 4 = 24

182 ÷ 2? - halve (partition first)

66 ÷ 10? - divide by 10 moves digits one place to the right

360 ÷ 6? - divide 36 by 6 and then adjust by x10

244 ÷ 4? - halve and halve again

320 ÷ 200? - halve then divide by 100

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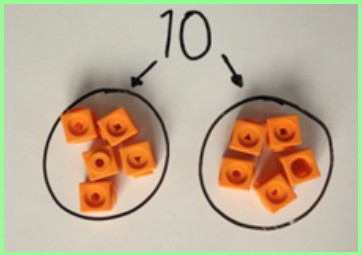
Division

Division is the most complex of the four operations.

Division can be portrayed:

as sharing.



10 divided between two people.

as grouping.

Grouping - There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)

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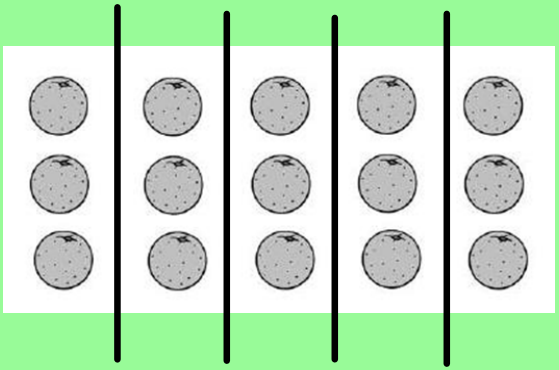
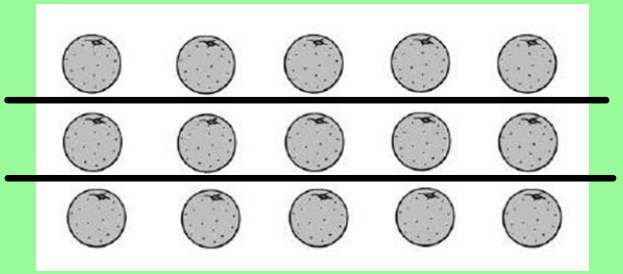
Division

Children need to recognise division as the opposite of multiplication - knowledge of tables is key.

Children will use arrays to find division facts:



15 ÷ 5 = 3



15 ÷ 3 = 5

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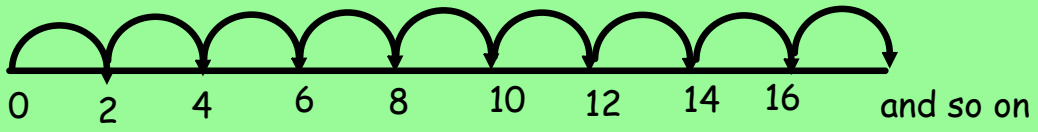
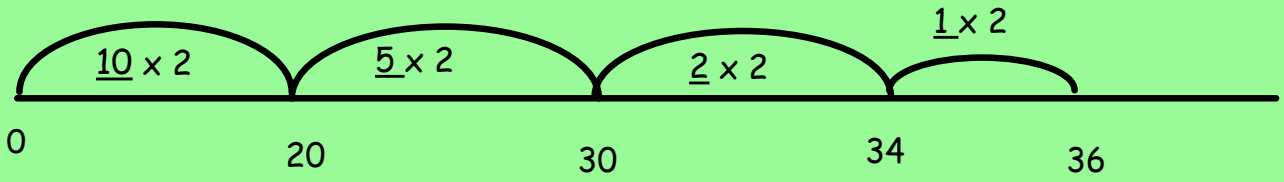
Division

Key Facts
1 x 2 = 2
2 x 2 = 4
5 x 2 = 10
10 x 2 = 20

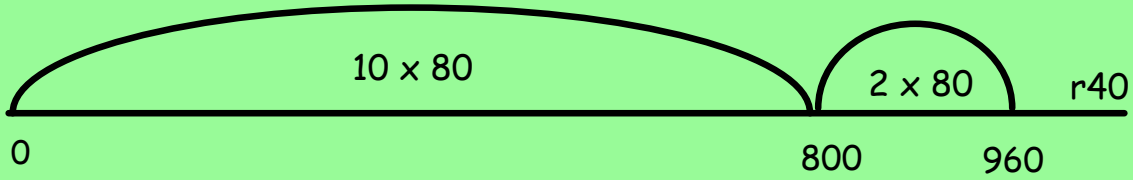
Division on a numberline using keyfacts:





10 + 5 + 2 + 1 = 18 so 36 ÷ 2 = 18

How many 80p apples can you buy for £10?



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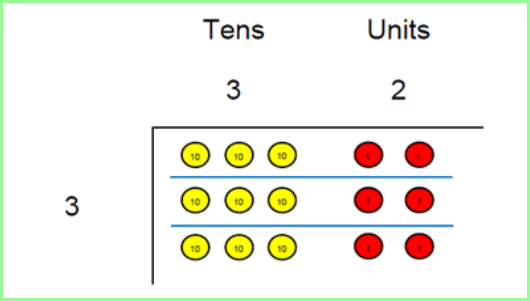
Division

Short division

96 ÷ 3 = 32



$$\begin{array}{r} 3\ 2 \\ \hline 3\,\big|\,9\ 6 \end{array}$$

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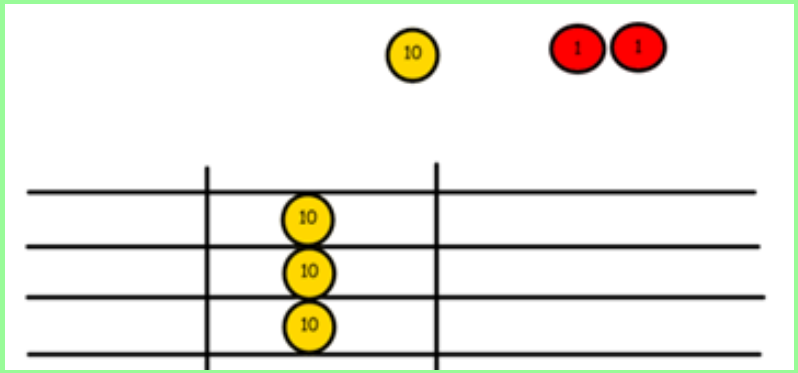
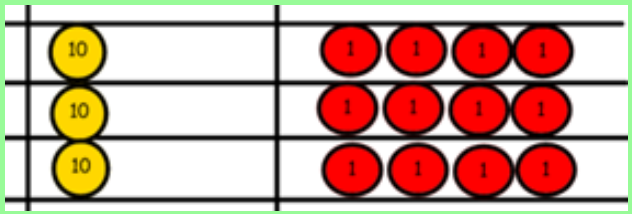
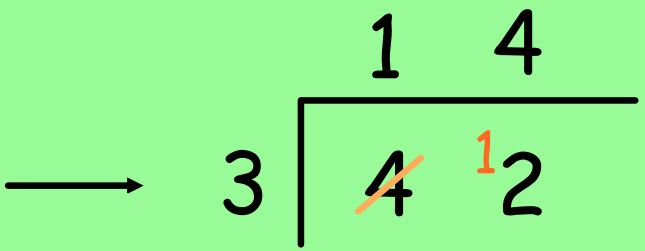
Division

Short division

42 ÷ 3 =







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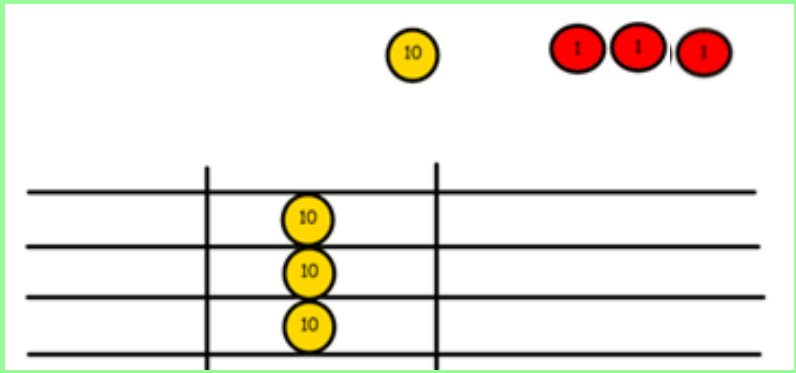
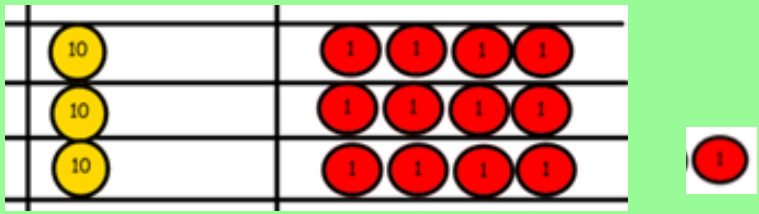
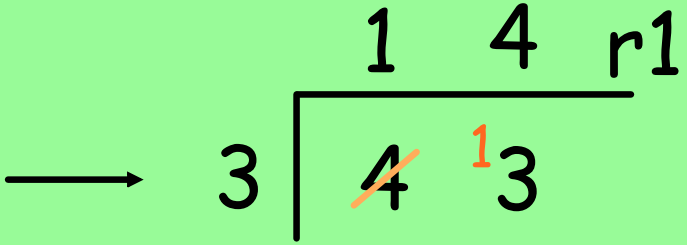
Division

Short division

42 ÷ 3 =







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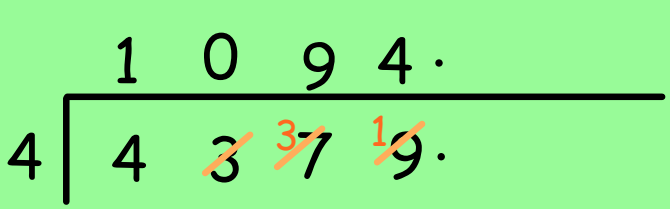
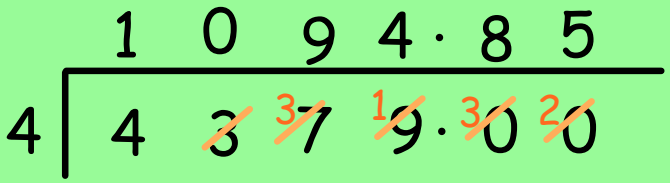
Division

Short division





Move on to dividing to find decimal answers.

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Division

Long division - for divisions with large divisors - children are shown how to use long division but many prefer short division as it is more compact.

```
      0 1 8 2
   ┌──────────
24 │ 4 3 6 8
     2 4
   ──────
     1 9 6
     1 9 2
   ──────
         4 8
         4 8
       ─────
           0
```

Work out 24x table

24
48
72
96
120
144
168
192
216
240

```
      0 1 8 2
   ┌──────────
24 │ 4 3 6 8
```

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Nov 9-16:44