YEAR 3/4 MATHS WORKSHOP

Aims of the session

- To share exactly what your child should know by the end of their current academic year
- To learn how the 4 operations are taught at BPSP
- To explore common misconceptions encountered when teaching children of this age
- To see an example of what the government's push for 'greater depth' means in real terms
- To unravel the post-level assessment system

Before getting onto formal algorithms, it is essential to start from

concrete then move on to

pictorial and only then to

abstract

Pictorial

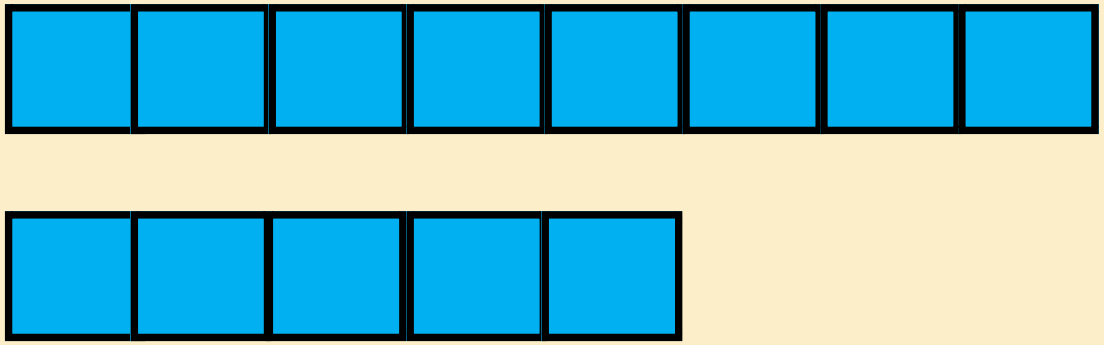
Association between the two operations is key for algebra purposes e.g. b – 270 = 130 as children will often put 140 for this

$5 + 2 = 7$ $\qquad$ $2 + 5 = 7$

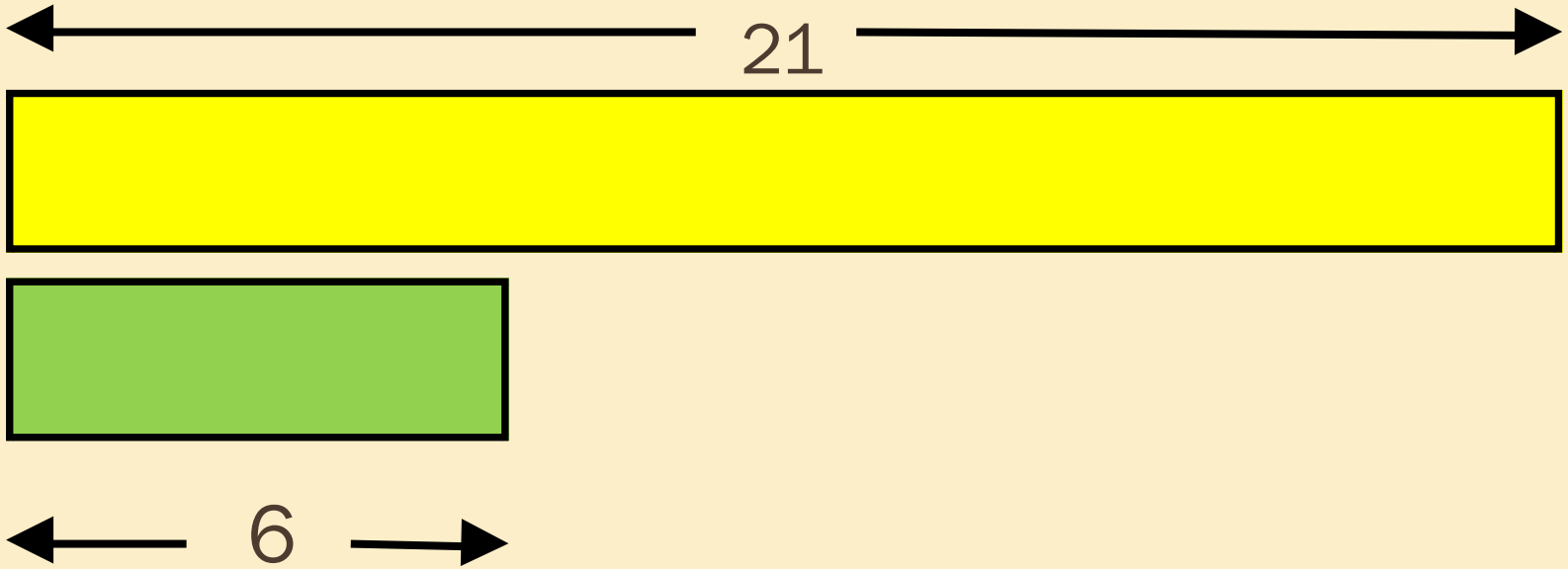
$7 - 2 = 5$ $\qquad$ $7 - 5 = 2$

Moving closer to abstract with a discrete (one square for every one counted) bar model

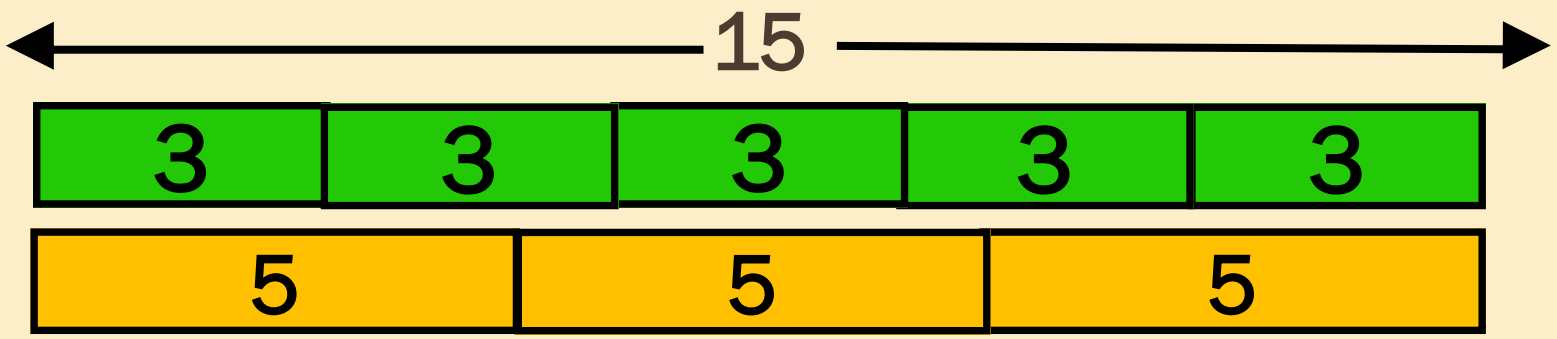
Good visual way to illustrate 8 + 5 or 8 – 5 (the difference between 8 and 5)



Last step before moving to completely abstract: a continuous bar model where bar lengths are just approximate. This helps children visualise what operation they might use for, ‘What is 6 more than 21?’ ‘What is the difference between 21 and 6 etc



A bar model way of looking at multiplication and division



5 x 3 = 15 3 x 5 = 15

15 ÷ 5 = 3 15 ÷ 3 = 5

As well as helping children see the link between the two operations, they can also start to see how calculating fifths and dividing by 5 are one and the same.

It is also key that the children's mental skills are sharp and accurate

- Tables: essential for multiplication, division, fractions, pictograms, area and so much more
- Number bonds, particularly tens
- Doubles
- Near doubles e.g. knowing 6 + 7 is just one more than two sixes or 8 + 9 is three less than 20
- Compensation e.g. adding 56 + 19 is same as adding 20 and taking one away; or stealing one from 56 to make the numbers 55 and 20

Formal methods - subtraction
(year 4 example; Y3 only have to go up to 3 digits)

$$\begin{array}{r} 4027 \\ -\ 2808 \\ \hline \end{array}$$

Formal methods: subtraction (use term *steal* rather than *borrow*)

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

Formal method: addition

$$
\begin{array}{r}
7\,8\,3\,9 \\
+\,1\,7\,4\,9 \\
\hline
=\quad\quad\quad\quad
\end{array}
$$

Formal method: addition

$$
\begin{array}{rr}
 & 7\,8\,3\,9 \\
+ & 1\,7\,4\,9 \\
\hline
= & 9\,5\,8\,8 \\
 & 1\quad\ 1
\end{array}
$$

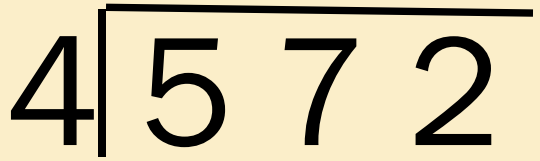
Formal method: multiplication (year 4 example; Y3 only have to go up to 2 digits multiplied by 1)

$$\begin{array}{r} 267 \\ \times \quad 8 \\ \hline = \quad\quad \end{array}$$

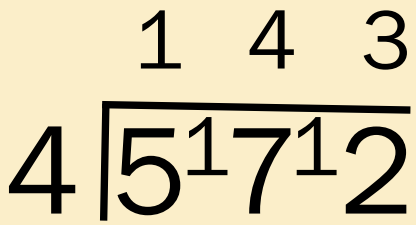
Formal method: multiplication (year 4 example; Y3 only have to go up to 2 digits multiplied by 1)

$$
\begin{array}{r}
267 \\
\times \quad 8 \\
\hline
= 2136 \\
\hline
\ 5\ 5
\end{array}
$$

Formal method: division (year 4 example; Y3 work at division within their tables knowledge)



Formal method: division
(the only operation where we start with the column of greatest value)



Where we are heading by Year 6

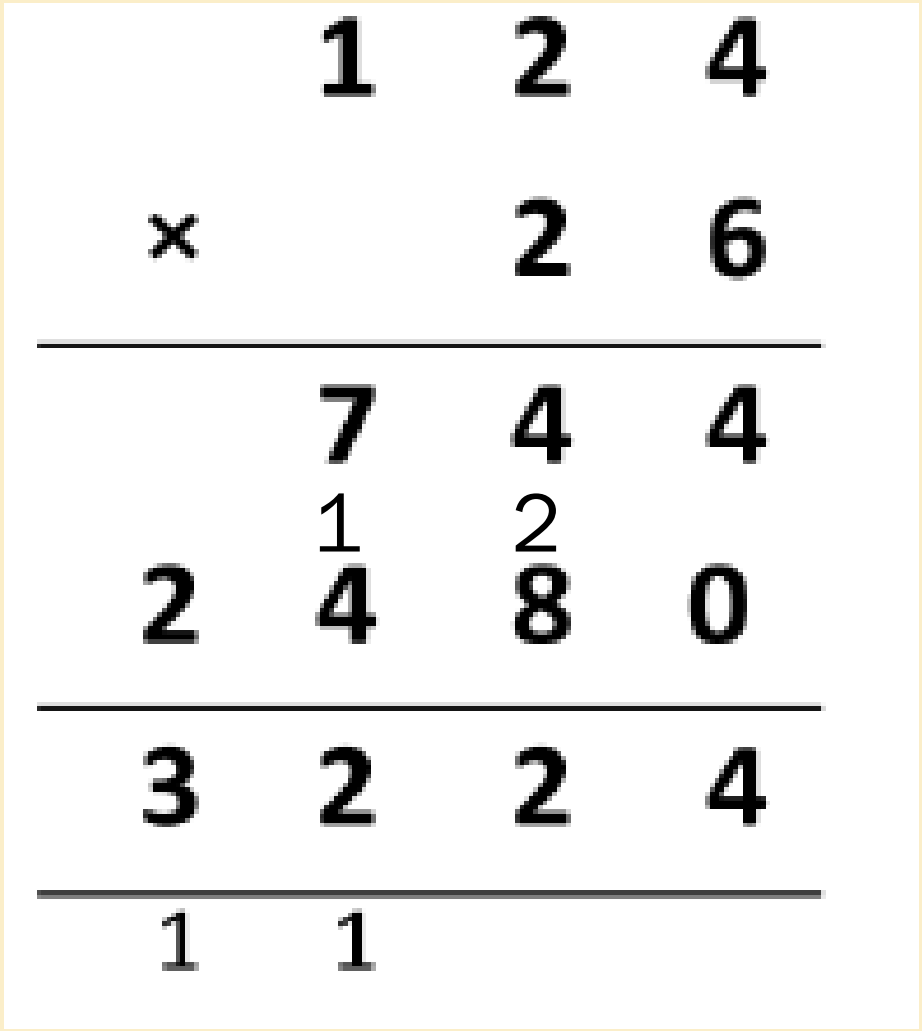
Addition and Subtraction – as you were, just with more digits and with decimal points to line up.

Probably the hardest they will encounter is something like…..

- 237,804 + 9.89 + 46 + 0.7
- 89.7 – 3.78
- 37 – 2.076

long multiplication

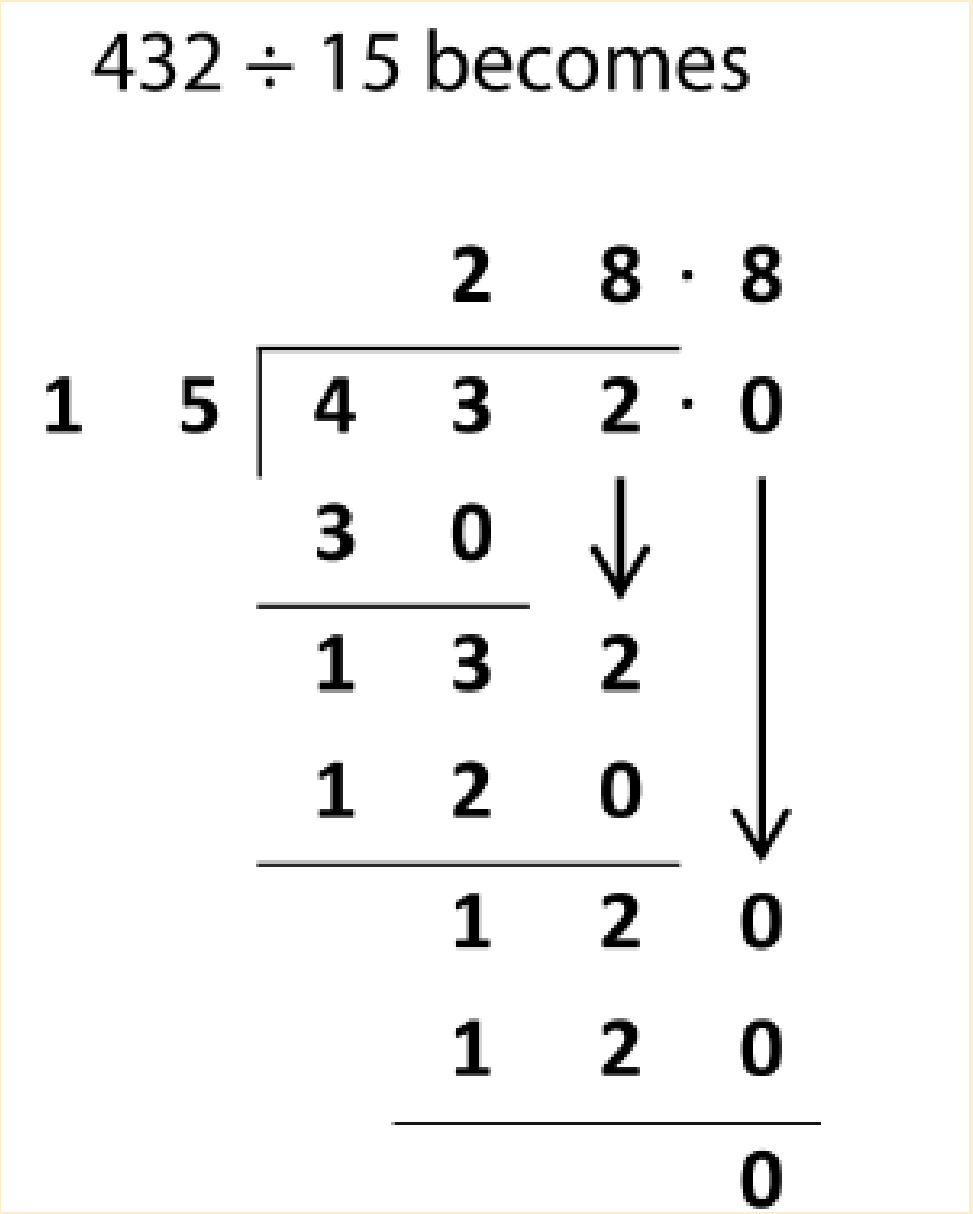
124 x 26


1 2 4
x 2 6
7 4 4
1 2
2 4 8 0
3 2 2 4
1 1

Long division

$$432 \div 15$$

432 ÷ 15 becomes



Creating an unfamiliar times table for long division

Fill in the easy ones; start with 1 x 10 x and (half way) 5 x. Don't waste time filling all of them in as you may not need them all; 2 x 3 x 6 x and 9 x are usually easy once you have this scaffold in place. Just add 23 or take 23 away mentally to pop them in quickly. You can always fill in the rest should you need them.

23

46

69

115

138

207

230

Top ten misconceptions

Keep an eye out for errors connected to these misunderstandings:

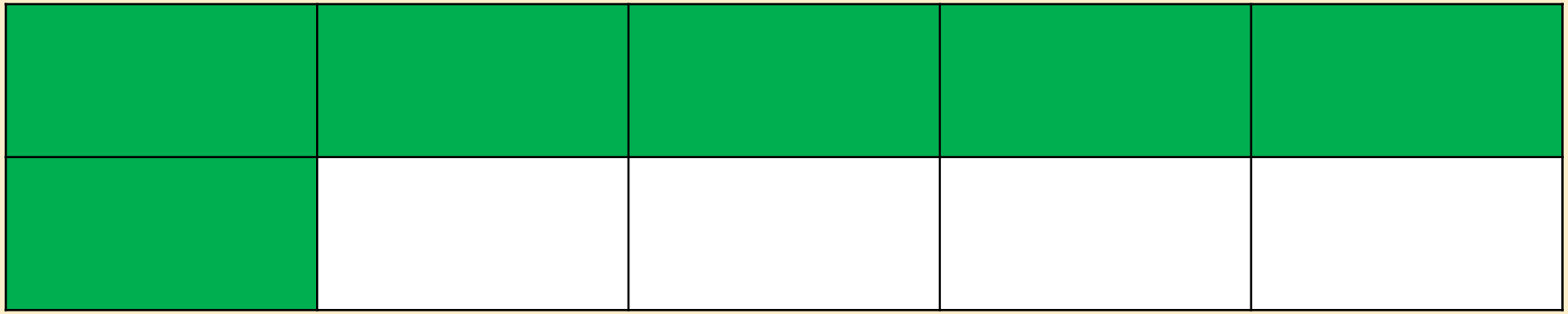
10 Nasty noughts

$$\begin{array}{rr} & 309 \\ - & 182 \\ \hline = & 187 \\ \hline \end{array}$$

And another thing: don’t call it oh!

You’d be surprised how often 4 x 0 4 + 0 0 – 4 cause issues

9 A fraction confused



What fraction is shaded in?

Typical answer: 6/4

Referring to the line between numerator and denominator as ‘out of’ helps the children cement this

8 counting on confusion

e.g. John had 27 pencils; Jenny had 34. How many more pencils did Jenny have?

Asked which operation is needed to solve this, children often suppose that it is addition because they are used to using terms like ‘counting on’ or ‘adding on’. It is, of course, subtraction which is used. Something they will need to understand when it gets to larger numbers.

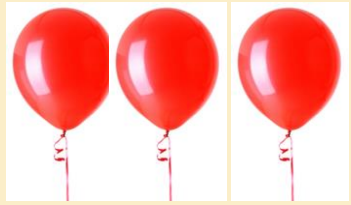
7 Flipping annoying

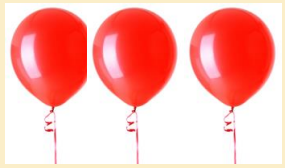
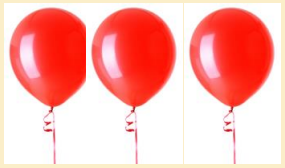
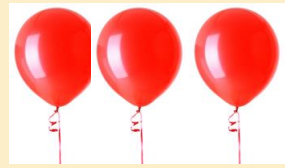
$$
\begin{array}{r}
627 \\
\times \quad 3 \\
\hline
= \quad 1872 \\
\hline
1
\end{array}
$$

6 Not with the times

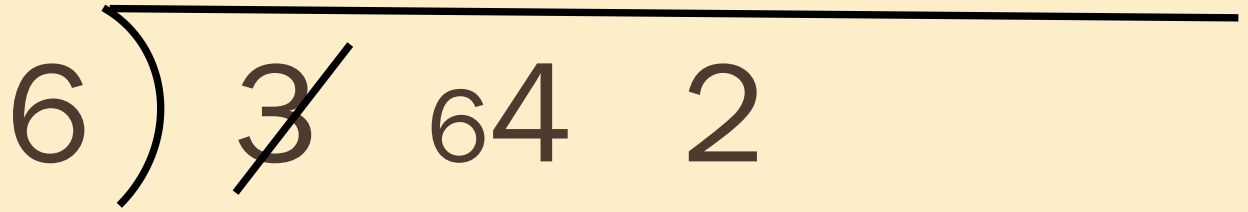
Children sometimes get to year 6 still not truly understanding what times tables actually are:

Remind the children that for the word ‘times’, read ‘lots of’/ ‘sets of’/ ‘groups of’. It is basically just a short-cut for repeated addition of the same number.

5 + 3 =  + 

5 x 3 =  +  +  +  + 

5 division dilemma



The 6 (the divisor) is mistakenly brought under the ‘bus stop’ rather than the 3 from the hundreds column, which was not able to be shared out fairly.

4 Elementary error

Children, when asked to add on a small number or to subtract a small number, often count the start number as the first one added or subtracted.

e.g. 23 – 4, children count 23,22,21,20 and answer 20 rather than 19.

3 Wasted time

Moving one from 672 to 999, to make it effectively 1000 + 671, is much more efficiently done mentally

999+672

```
  999
+ 672
-----
 1671
-----
  1 1 1
```

2 when equals doesn't add up

$9 + 4 = 20 - \square$

Common answer is 13; remind children that **the answer** to both sides have to balance out or those two lines will become < or > rather than =

1 Most worrying of all

Poor understanding of place value

e.g.

- add 30 700 6 = 700306
- write three thousand and twenty three = 3,23
- Or, as they get older, write 3/100 as a decimal = 0.003
- Or 3674 + 678 3674
  +678

Greater depth

In 2014, a new curriculum was launched and teachers were told to deepen children's understanding rather than steam through to the next year's objectives.

They also made the curriculum more challenging: in came division of fractions, cubed numbers, more complex algebra and BODMAS, amongst others

13 (there are more) ways to extend, enrich, deepen understanding of a simple concept

Objective:

I can add two numbers together

#1

Find all of the ways of making 20

#2

Add more than two numbers

27 + 83 + 66

#3

‘Two odd numbers added together give an even total.’

Always, sometimes, never?

Prove it!

#4

John said he added two 2-digit numbers. He said his answer was 40 and that he only used odd digits. Was he telling the truth?

#5

What is the sum of the first 10 odd numbers?

#6

73 + 24 = 97

Write 3 related number sentences, using these three amounts.

Write a word problem for these sentences.

#7

If you add a double-digit number to another double-digit number, it always makes a double-digit answer.

e.g. 33 + 11 = 44 or 22 + 33 = 55

True or false? Prove it!

#8

Olivia was thinking of a number.

She added 26 to it and got 50.

What was her number?

#9 calculate the values of the two different coloured star

#10

When you add three consecutive numbers, the answer is never/always/sometimes even.

Prove it!

#11

What is the highest and lowest total you can make by adding two 2-digit numbers?

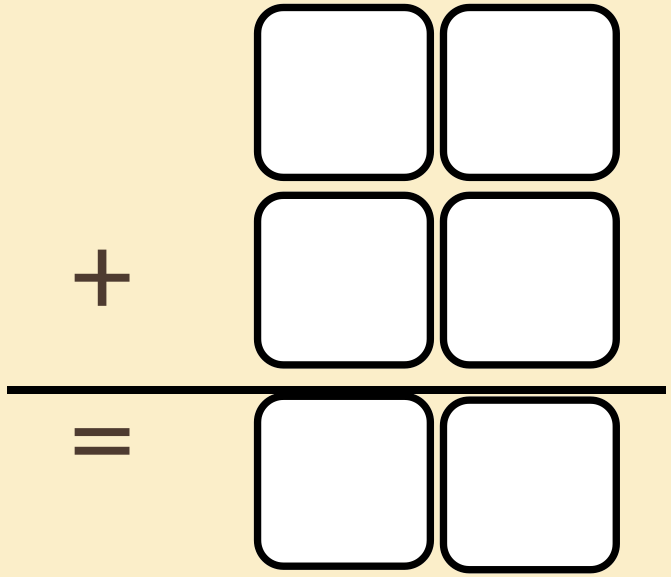
#12

$$\begin{array}{r} \square 8 \\ +\ 3\square \\ \hline 85 \end{array}$$

#13

Use these digits to make the sum work

4 0 5 6 2 8



Assessment round-up

- At the end of year 6, the children will be teacher-assessed in Writing, Reading and Maths; this year looks like being the last time that teacher assessment will be required for all but Writing (where there is no test)
- For writing there is a GDS award (greater depth); an EXS award (expected standard) also known as ARE (Age-Related Expectation), and a WTS award (working towards expected standard)
- There are also P awards where a child is still working at Key stage 1 objectives
- In Reading and Maths, the children are assessed as at ARE or not at ARE only.

Assessment continued

- The Key Stage 2 tests are sat in May and cover:

- Spelling Punctuation and Grammar (commonly known as SPaG or GPS)
- Reading
- Maths

For these tests, the children are awarded a scaled score. If they achieve 100, they are considered at ARE (age-related expectations) and if they achieve 110, they are considered to be at Greater Depth or ‘working at a higher standard’

- It seems likely that an online times table test will be introduced in Year 4 from 2019