

KS2 Calculation

Four Operations

Outline of the session

- ▶ Lower KS2 calculations (Miss Ostler)
 - Addition and subtraction
 - Times tables
 - Multiplication and division
- ▶ Upper KS2 calculations (Mrs Mockridge)
 - Addition and subtraction
 - Multiplication and division
 - F.D.P (fractions, decimals and percentages)
 - SATs questions
- ▶ Key links

Addition – column method

- ▶ Year 3 – adding numbers up to 3 digits.
- ▶ Year 4 – adding numbers up to 4 digits.

Both including adding without carrying and adding with carrying.

Adding without carrying

Year 3

$$\begin{array}{r} 562 \\ + 337 \\ \hline 899 \\ \hline \end{array}$$

Year 4

$$\begin{array}{r} 4,873 \\ + 2,126 \\ \hline 6,999 \\ \hline \end{array}$$

★ $375 + 524 =$

Adding with carrying

Year 3

$$\begin{array}{r} 753 \\ + 428 \\ \hline 1,181 \\ \hline \end{array}$$

Year 4

$$\begin{array}{r} 8,376 \\ + 1,345 \\ \hline 9,721 \\ \hline \end{array}$$

Children are required to include a comma when the numbers are one thousand or more.

Misconceptions when adding

- ▶ Starting with hundreds or thousands column rather than the ones.
- ▶ Forgetting to add the carried numbers.
- ▶ Not lining up the digits in the correct place value.

Subtraction – column method

- ▶ Year 3 – subtracting numbers up to 3 digits.
- ▶ Year 4 – subtracting numbers up to 4 digits.

Both including subtracting without borrowing and subtracting with borrowing.

Subtracting without borrowing

Year 3

$$\begin{array}{r} 672 \\ - 341 \\ \hline 331 \\ \hline \end{array}$$

Year 4

$$\begin{array}{r} 5,684 \\ - 2,451 \\ \hline 3,233 \\ \hline \end{array}$$

Subtracting with borrowing

Year 3

$$\begin{array}{r} \overset{3}{\cancel{4}} \overset{12}{\cancel{3}} 12 \\ - 247 \\ \hline 185 \\ \hline \end{array}$$

Year 4

$$\begin{array}{r} \overset{3}{\cancel{4}}, 13 \overset{6}{\cancel{7}} 12 \\ - 2, 856 \\ \hline 1, 516 \\ \hline \end{array}$$

Star Challenge

- ▶ How would you use column method to solve this subtraction question?

$$9,000 - 5,842 =$$

Misconceptions when subtracting

- ▶ Writing the calculation with the smaller number on top.
- ▶ Not lining up the digits in the correct place value.

Have a go..

1. $567 - 249 =$

2. $641 - 392 =$

3. $6,263 - 4,832 =$

4. $7,345 - 5,592 =$

Times tables

- ▶ Year 3 children are expected to know their

x 2 x 3 x 4 x 5 x 8 x 10

- ▶ Year 4 children should know all their times tables (including x 11 and x 12).

- ▶ Not just knowing them as times tables but also knowing them as division facts.

Multiplication Year 3

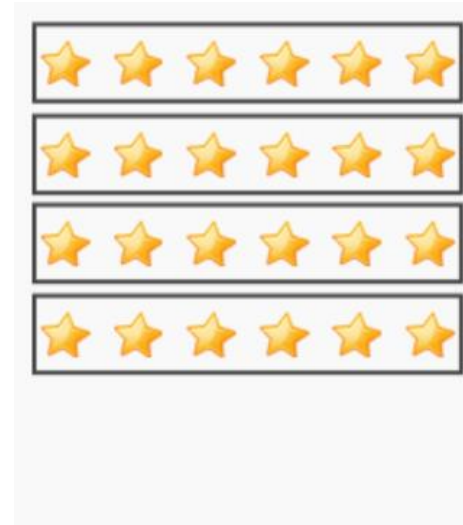
- ▶ In Year 2, children will learn how to use repeated addition and arrays to multiply.

- ▶ In Year 3, children learn to use the grid method to work out multiplication questions.

$$15 \times 3$$

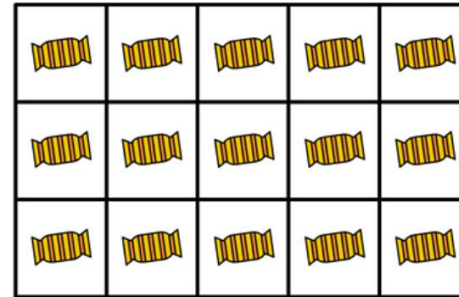
A handwritten grid method for the multiplication 15×3 . The grid is set up with 10 and 5 in the left column, and 30 and 15 in the right column. A vertical line separates the columns, and a horizontal line separates the rows. The final product, 45, is written at the bottom.

$$\begin{array}{r|l} & 3 \\ \hline 10 & 30 \\ 5 & 15 \\ \hline & 45 \end{array}$$



$$6 + 6 + 6 + 6 = 24$$

$$4 \times 6 = 24$$



- There are **3** rows of sweets and **5** sweets in each **row**.
- There are **5** columns of sweets and **3** sweets in each **column**.

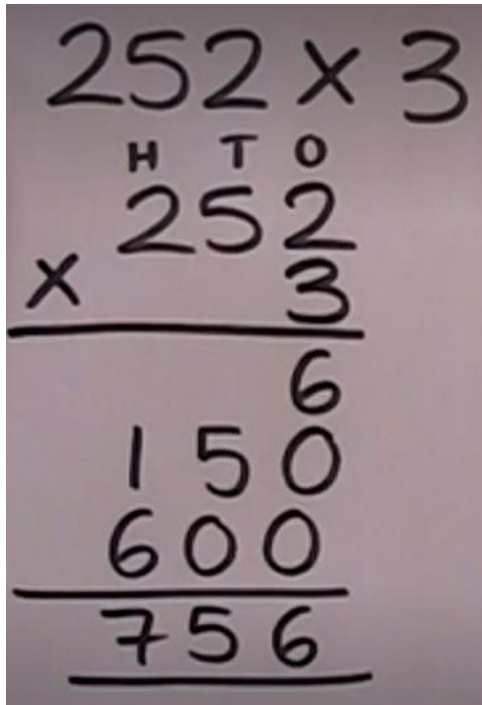
This array shows the multiplication statements **3×5** and **5×3** .

The array has **15** apples in total. This tells us that **3×5** and **5×3** are both equal to **15**.

$3 \times 5 = 15$ and **$5 \times 3 = 15$**

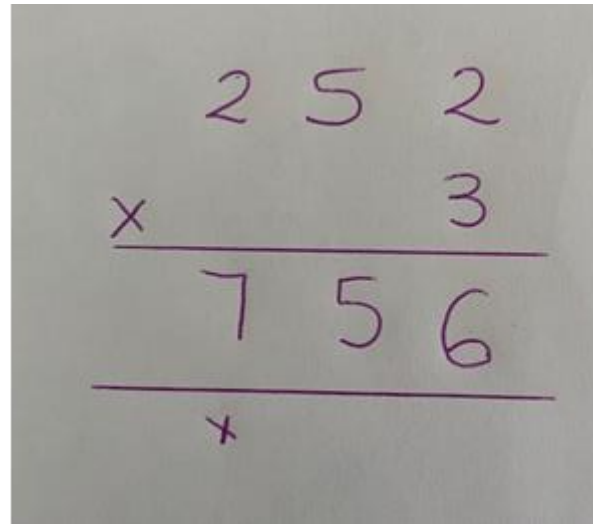
Multiplication Year 4

- ▶ In Year 4, the children learn how to column method to work out multiplication questions.



Handwritten column multiplication of 252 by 3. The numbers are aligned by place value: 252 is written above 3. Above the 252, the letters H, T, and O are written above the 2, 5, and 2 respectively. A horizontal line is drawn under the 252. To the left of the 252 is an 'x' symbol. Below the line, the product 756 is written. The calculation shows 252 multiplied by 3, resulting in 756.

$$\begin{array}{r} 252 \times 3 \\ \hline 756 \end{array}$$



Handwritten column multiplication of 252 by 3. The numbers are aligned by place value: 252 is written above 3. A horizontal line is drawn under the 252. To the left of the 252 is an 'x' symbol. Below the line, the product 756 is written. The calculation shows 252 multiplied by 3, resulting in 756.

$$\begin{array}{r} 252 \times 3 \\ \hline 756 \end{array}$$

Have a go...

▶ 20×5

▶ 19×3

▶ 17×5

▶ 673×4

▶ 478×6

▶ 205×9

Division Year 3

- ▶ In Year 3, the main thing is children will be thinking about division as multiplication facts.
- ▶ Repeated subtraction (for children who aren't quite there with their division facts)

Handwritten work for $18 \div 3$ using repeated subtraction. On the left, $18 \div 3 = 6$ is written. To the right, a vertical line is drawn with a bracket on the left side. To the left of the line, the numbers 15, 12, 9, 6, 3, and 0 are listed from top to bottom. To the right of the line, there are six instances of -3 , each with a circled 3 next to it, indicating that 3 is subtracted six times from 18 to reach 0.

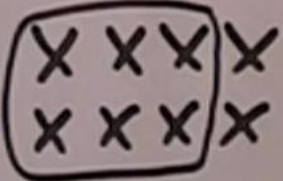
Repeated subtraction

Handwritten work for $84 \div 6$ using chunking. On the left, $84 \div 6 = 14$ is written. To the right, a long division setup is shown: $6 \overline{)84}$. The first step shows 60 being subtracted from 84 , leaving a remainder of 24 . The second step shows 24 being subtracted from 24 , leaving a remainder of 0 . To the right of the division, two equations are written: $60 \div 6 = 10$ and $24 \div 6 = 4$, both with the results circled. Brackets connect these equations to the corresponding steps in the long division.

Chunking

Division Year 4

- ▶ Bus stop method

$$\begin{array}{r} 864 \div 6 \\ 144 \\ \hline 6 \overline{) 864} \end{array}$$


$$\begin{array}{r} 483 \div 7 \\ 069 \\ \hline 7 \overline{) 483} \end{array}$$

UPPER KS2

Year 5 & 6 – Overview

- ▶ Numbers to 10,000,000
- ▶ Rounding to the nearest 10, 100 and 1,000 (Y5)
- ▶ Round any number (Y6)
- ▶ Compare and order numbers within 1,000,000 (Y5)
- ▶ Compare and order any number (Y6)
- ▶ Negative numbers
- ▶ Add & subtract whole numbers with more than 4-digits (including exchange)
- ▶ Multiply and divide by 10,100 and 1,000
- ▶ Multiply up to 4-digit numbers by 2-digit numbers
- ▶ Divide up to 4-digit numbers by 1-digit numbers (including remainders) Y5
- ▶ Divide numbers by 2-digit numbers (including remainders as decimals) Y6
- ▶ Multiples, factors, prime numbers, square numbers and cubed numbers
- ▶ Inverse operations

Four Operations (addition & subtraction)

- ▶ Same method for adding and subtracting
- ▶ Children will use bigger numbers

$$\begin{array}{rcccc} \text{TH} & \text{T} & \text{H} & \text{T} & \text{O} \\ 34,567 \\ + 48,272 \\ \hline 82,839 \\ \times & & \times & & \end{array}$$

$$\begin{array}{rcccc} \text{TH} & \text{T} & \text{H} & \text{T} & \text{O} \\ 4 \cancel{5} \overset{3}{4}, \cancel{1} \overset{6}{1} \cancel{1} \cancel{2} \\ - 36,958 \\ \hline 17,214 \end{array}$$

Four Operations (multiplication)

- ▶ Move from long multiplication towards short multiplication method (including \times by 2-digits)
- ▶ Move from area (grid) method when multiplying by a 2 or 3-digit number

\times	40	2
40		
6		

$$\begin{array}{r}
 5,249 \\
 \times 32 \\
 \hline
 10,498 \\
 157,470 \\
 \hline
 167,968
 \end{array}$$

$$\begin{array}{r}
 2,865 \\
 \times 3 \\
 \hline
 8,595
 \end{array}$$

$$\begin{array}{r}
 2,865 \\
 \times 3 \\
 \hline
 15 \\
 180 \\
 2,400 \\
 6,000 \\
 \hline
 8,595
 \end{array}$$

Four Operations (division)

- ▶ Continue to use 'bus stop' method to divide up to 4-digit numbers by 1-digit numbers (including where there are remainders).
- ▶ Importance of times tables to 12 (If you know 1, you know 10 method)
- ▶ Move onto long division in Y6 (Model)

Handwritten long division of 1,025 by 7:

$$\begin{array}{r}
 1,025 \div 7 \\
 \underline{0146} \quad r3 \\
 7 \overline{) 1,025}
 \end{array}$$

Vertical multiplication table for 7:

$$\begin{array}{l}
 7 \\
 14 \\
 21 \\
 28 \\
 35 \\
 42 \\
 49 \\
 56 \\
 63 \\
 70
 \end{array}$$

			1	0	9	r	9
1	3	1	4	2	6		
	-	1	3	0	0		
			1	2	6		
	-		1	1	7		
					9		

Common misconceptions & errors

- ▶ Reversing numbers when subtracting
- ▶ Forgetting to add numbers together when multiplying by a 2-digit number
- ▶ Forgetting to add the 'sneaky' 0 when multiplying by a 2-digit number
- ▶ Times table knowledge errors

Order of operations

B.O.D.M.A.S./B.I.D.M.A.S.

Brackets

Orders (indices)

Division

Multiplication

Addition

Subtraction

$$34 - 12 \times 9$$

Y5 & Y6 - OVERVIEW F.D.P. (fractions, decimals & percentages)

- ▶ Add & subtract fractions (including mixed/improper fractions)
- ▶ Multiply unit/non-unit fractions by integers & other fractions (including mixed/improper fractions)
- ▶ Divide unit/non-unit fractions by integers & other fractions (including mixed/improper fractions)
- ▶ Calculate fractions of a quantity and an amount
- ▶ Find equivalent fractions, simplify fractions, compare and order fractions
- ▶ Add & subtract decimals (3dp)
- ▶ Multiply and divide numbers by 10, 100 and 1,000 (including decimals)
- ▶ Multiply and divide decimals by integers
- ▶ Find percentage of an amount
- ▶ Missing values
- ▶ Increasing and decreasing percentages
- ▶ Convert between F.D.P.

SATs Practice: F.D.P.

- ▶ *Example Y6 arithmetic paper*
- ▶ *Common misconceptions*
- ▶ *We're going to go through some of the F.D.P questions together (walkthrough)*
- ▶ *I have a completed version of this test (with all written methods) for you to take away with you.*

Adding & subtracting decimals

- PLACE VALUE FIRST

$$\begin{array}{r} 23.361 + 9.08 + 1.3 \\ \text{To t h th} \\ 23.361 \\ 9.080 \\ + 1.300 \\ \hline 33.741 \\ \times \quad \times \end{array}$$

$$\begin{array}{r} 23.069 - 6.41 \\ \begin{array}{r} 12 \\ \cancel{23} \end{array} .069 \\ - 6.410 \\ \hline 16.659 \end{array}$$

Multiply and divide by 10, 100 and 1,000

- ▶ Resources to support (slide to the left, slide to the right!)

Th H T O . 10th 100th 1,000th
1, 9 4 6 .

Multiply decimals $2.34 \times 5 =$

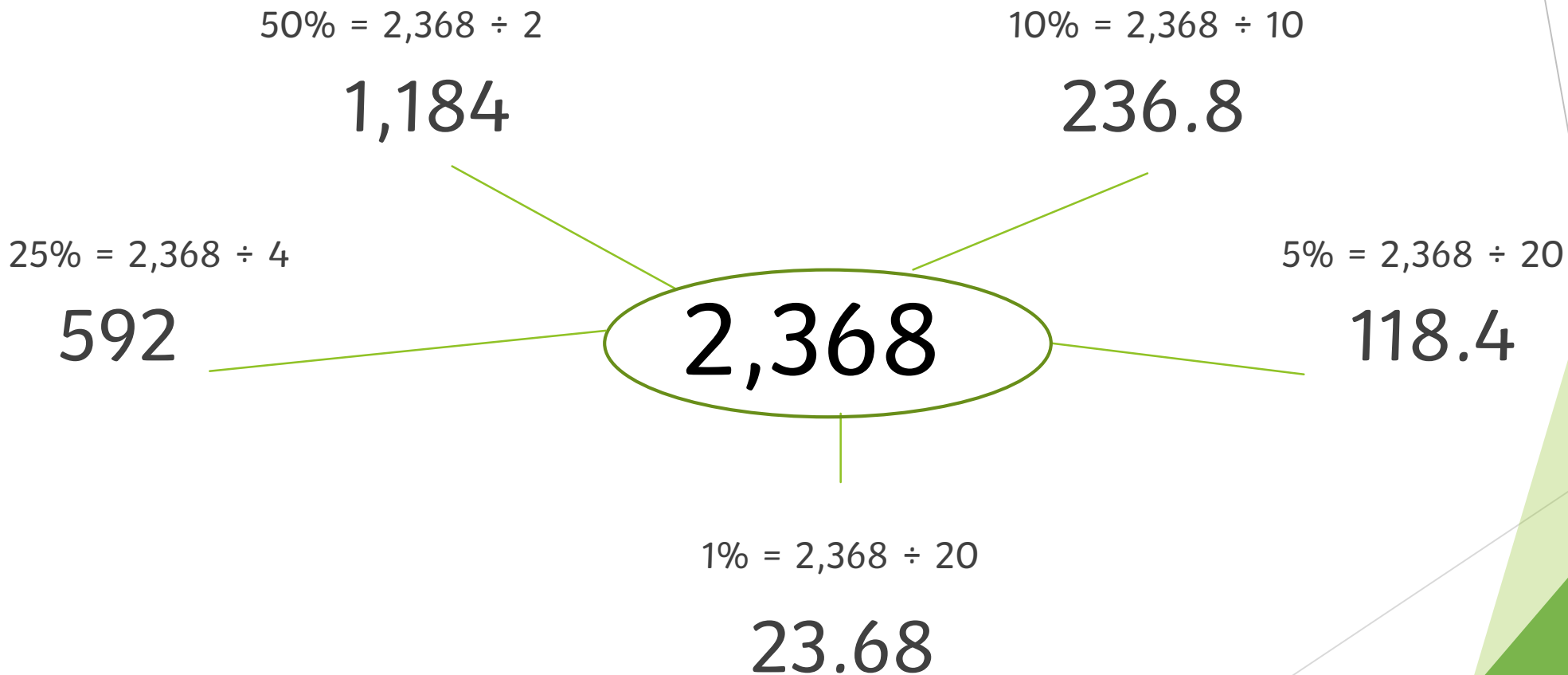
- ▶ Take out the decimal place(s)
- ▶ Multiply as normal
- ▶ Add the decimal place(s) back in

Divide decimals $51.23 \div 5 =$

- ▶ Bus stop method (into decimals)
- ▶ Round if needed (1, 2 or 3 decimal places)

Percentages

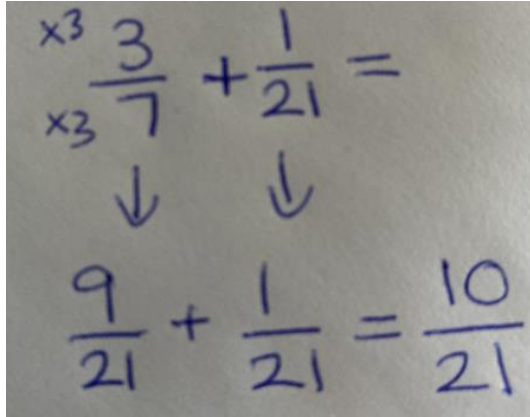
- ▶ Teach whole divided by 100 then multiply by percentage
- ▶ Teach associated facts

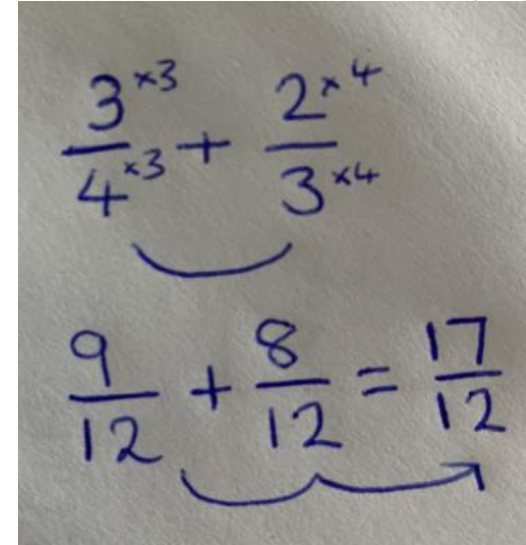


Fractions (add and subtract)

- ▶ The denominators MUST be the same to do this!
- ▶ If they are not, use multiplication to make them the same:

$$\frac{3}{7} + \frac{5}{7} = \frac{8}{7}$$


$$\begin{array}{l} \times 3 \quad \frac{3}{7} + \frac{1}{21} = \\ \downarrow \quad \downarrow \\ \frac{9}{21} + \frac{1}{21} = \frac{10}{21} \end{array}$$


$$\begin{array}{l} \frac{3 \times 3}{4 \times 3} + \frac{2 \times 4}{3 \times 4} \\ \frac{9}{12} + \frac{8}{12} = \frac{17}{12} \end{array}$$

- ▶ Multiply the denominators together.
- ▶ Whatever you do to the bottom, you have to do to the top!
- ▶ Then add together.

Fractions (multiply)

- ▶ Just multiply the denominators together and the numerators together.
- ▶ Simplify if possible.

$$\frac{3}{7} \times \frac{5}{7} = \frac{15}{49}$$

Fractions (divide) K.F.C.

- ▶ Keep first fraction
- ▶ Flip second fraction
- ▶ Change calculation
- ▶ Multiply as above
- ▶ Simplify if possible.

Keep
Flip
Change

K F C

↓ ↓ ↓

$$\frac{5}{3} \div \frac{2}{4} = \frac{12}{10} \left(\frac{6}{5} \right)$$

Helpful links:

- [White Rose](#)
- [Oak Academy](#)
- [Calculation Policy: Addition and subtraction \(EYFS - Y6\)](#)
- [Calculation Policy: Multiplication and division \(EYFS - Y6\)](#)
- [BBC BITESIZE \(KS2 Calculation\)](#)
- [Times Tables Rock Stars](#)

Any questions:

Thank you for coming!