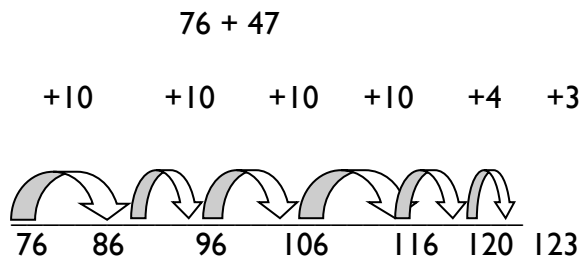
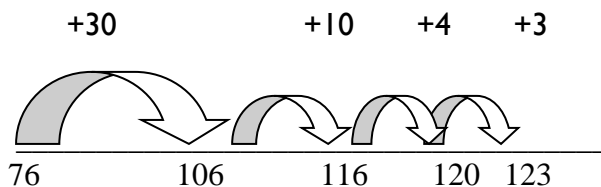


# ADDITION ROUTE

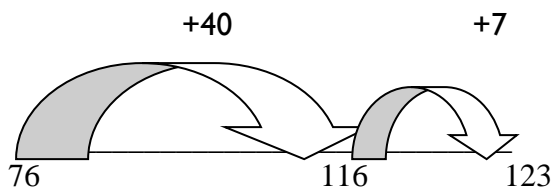
- Use of number line to support counting on for **Mental Calculations**



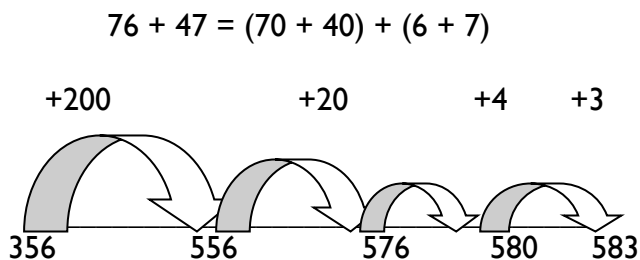
- Encourage children to start with the largest number.
- Use knowledge of bonds to 100 to make larger jumps.



- Leading onto:

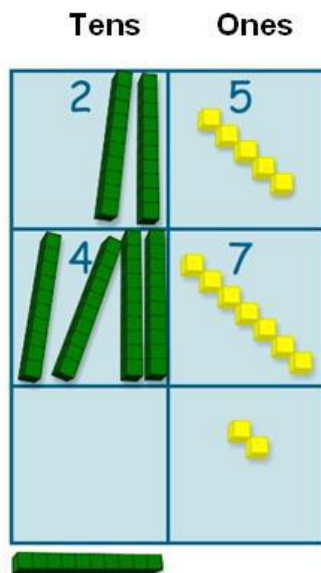


- Make links with number sentences where both numbers are partitioned instead of just the one.
- Support using place value arrow cards.



$$\begin{aligned}
 356 + 227 &= 356 + (200 + 20 + 7) \\
 &= 556 + 20 + 7 \\
 &= 576 + 7 \\
 &= 583
 \end{aligned}$$

*\*By the end of KS1 children will have used hundred squares, number lines and early baseboard work.*



**Practical work with equipment:**

*It is essential that children have experience of 'concrete' examples to understand carrying.*

- Packets containing items of 10.

*Placing these on the place value / base boards*

- Straws in bundles of ten

*Placing these on the place value / base boards*

- Dienes apparatus

*Placing these on the place value / base boards*

- Place value counters

*Placing these on the place value*

**Progression**

1. Baseboard with equipment.
2. Baseboard with equipment and numbers.
3. Baseboard with drawings and numbers.
4. Baseboard numbers only.
5. Compact method

**YEAR 3**

- Compact method, first with TU + TU then with HTU + HTU, where only 'one carry' is required.

$$\begin{array}{r} 25 \\ +47 \\ \hline 72 \\ | \end{array}$$

$$\begin{array}{r} 368 \\ +423 \\ \hline 791 \\ | \end{array}$$

- Extend to H T U and H T U + T U with 'two carries'

$$\begin{array}{r} 47 \\ +76 \\ \hline 123 \\ || \end{array} \quad \rightarrow \quad \begin{array}{r} 368 \\ +493 \\ \hline 861 \\ || \end{array}$$

- Using similar methods, add several numbers with different numbers of digits. For example, find the total of:

83, 256, 4, 57

Extend to decimals. Using methods similar to those above, begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds. Know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts such as £3.59 ± 78p. For example:

$$\begin{aligned} &£4.21 + £3.87 \\ &£2.24 + £5.23 + £1.36 \end{aligned}$$

#### **YEAR 4**

- Extend the compact method to include Th H T U + Th H T U and ‘three carries’

$$\begin{array}{r} 7648 \\ +1486 \\ \hline 9134 \\ \text{III} \end{array} \qquad \begin{array}{r} 6584 \\ +5848 \\ \hline 12432 \\ \text{III} \end{array}$$

- Using similar methods add several numbers with different numbers of digits. For example, find the total of:

$$58, 671, 9, 468, 2187$$

- Extend to decimals. Using the chosen method, add two or more decimal fractions with up to three digits and the same number of decimal places. Know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts such as 3.2 m ± 350 cm. For example:

$$\begin{aligned} &£6.72 + £8.56 + £2.30 \\ &298.67\text{km} + 54.6 \text{ km} \end{aligned}$$

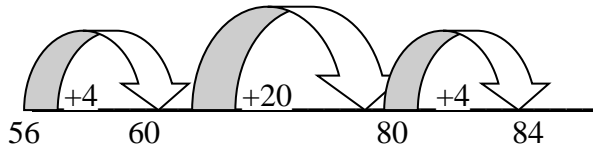
- Extend method to numbers with any number of digits.
- Extend to decimals  
Using the chosen method, add two or more decimal fractions with up to four digits and either one or two decimal places. Know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts such as 14.5 kg ± 750 g. For example:

$$\begin{aligned} &124.9 + 7.25 \\ &401.2 + 26.85 + 0.71 \end{aligned}$$

# SUBTRACTION ROUTE

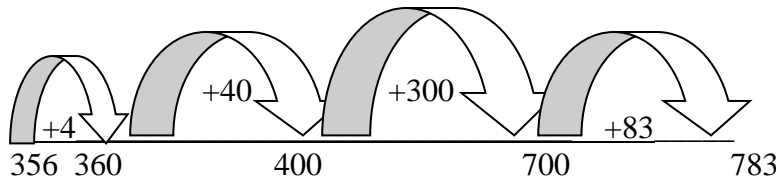
- Use a number line to count on (or back) to find a difference. **Mental calculations**

$$84 - 56 \quad 56 + 4 + 20 + 4 = 84$$



- When numbers are close e.g.  $23 - 21$  **count on**
- When numbers are far apart e.g.  $728 - 3$  or  $725 - 8$  **count back**

$$783 - 356$$



- Ensure children are confident with partitioning eg.  $562 \Rightarrow 500 \ 60 \ 2$  (Support process with place value arrow cards).

Practical activities using:

- Packs of balloons or similar (anything that comes in a pack of 10).
- Cocktail straws
- Dienes apparatus
- Counters (10s and 1s)
- All of these activities to be completed using the 'Baseboards'

Tens	Ones
7	7
4	5
3	2

- Initially complete where **no** exchange is needed.
- Progress to exchange using all of the practical resources listed above



- Subtract numbers with different numbers of digits. For example, find the difference between:

671 and 58

46 and 518

#### **YEAR 4**

Extend to decimals.

£8.95 - £4.38

£7.50 - £2.84

- Extend compact method to Th H T U.
- Subtract numbers with different numbers of digits. For example, find the difference between:

764 and 5821

4567 and 893

- Extend to decimals  
Using the compact method, find the difference between two decimal fractions with up to three digits and the same number of decimal places. Know that decimal points should line up under each other. For example:

£9.42 - £6.78

72.5 km – 4.6 km

- Continue to use this compact method for subtractions involving Th H T U – Th H T U, larger numbers and decimals.

$$\begin{array}{r}
 \phantom{6} \phantom{4} \phantom{6} \phantom{7} \\
 \phantom{6} \cancel{4} \cancel{6} \phantom{7} \\
 - \phantom{2} \phantom{6} \phantom{8} \phantom{4} \\
 \hline
 \phantom{3} \phantom{7} \phantom{8} \phantom{3}
 \end{array}$$

- **Ensure explicit teaching of 4 digit numbers that include at least one zero e.g. 4506 – 2627 =**

$$\begin{array}{r}
 \phantom{4} \phantom{5} \phantom{0} \phantom{6} \\
 \phantom{4} \cancel{5} \cancel{0} \phantom{6} \\
 - \phantom{2} \phantom{6} \phantom{2} \phantom{7} \\
 \hline
 \phantom{1} \phantom{8} \phantom{7} \phantom{9}
 \end{array}$$

- Subtract numbers with different numbers of digits. For example, find the difference between:

782 and 4387

#### **YEAR 5**

- Extend to decimals  
Using the compact method, subtract two or more decimal fractions with up to three digits and either one or two decimal places. Know that decimal points should line up under each other. For example:

324.9 – 7.25

14.24 – 8.7

#### **YEAR 5** – Subtraction with more than 4 digits

# MULTIPLICATION ROUTE

- Describing an array. For example:

$$\begin{array}{ccc} \square\square\square & 4 \times 2 = 8 & 2 \times 4 = 8 \\ \square\square\square & & \end{array}$$

- Recognise from arranging arrays that multiplication can be done in any order. For example:

$$\begin{array}{l} 4 \text{ lots of } 2 ) \\ 2 \text{ lots of } 4 ) \end{array} \text{ are the same.}$$

- Recognise the use of symbols such as  $\square$   
For example:

$$\begin{array}{l} 3 \times \square = 12 \\ \square \times 4 = 12 \end{array}$$

- Multiply single digit numbers by single digit – instant recall of some multiplication fact, derivation of others.
- To begin to understand that digits shift one/two place/s to the left when multiplying by 10/100

$$\begin{array}{r} 3 \\ 30 \\ 300 \end{array}$$

- **Year 2:** 2, 5, 10 times tables (**up to x12**)
- **Year 3:** Counting in 2, 4, 5, 8, 50 and 100
- **Later in Year 3:** Times Tables 2, 3, 4, 5, 8, and 10 (**up to x 12**)
- **Year 4: All tables up to 12 x 12**
- **Year 4:** Counting in 6, 7, 9, 25 and 100
- Multiply 2 3 4 5 10 by multiples of 10 up to 50.

- Partition numbers, using place value cards to support this.
- Partitioning – using distributive law. For example:

$$12 \times 4 \rightarrow (10 \times 4) + (2 \times 4) = 40 + 8 = 48$$

$$43 \times 5 \rightarrow 200 + 15 = 215$$

- Introduce children to the grid layout for TU x U

X	10	5	
4	40	20	60

 $15 \times 4 = 60$

- Extend to numbers where answer bridges 100

$38 \times 6 \rightarrow$ 

x	30	8
6	180	48 = 228

add mentally

- **Show the link** between the grid layout and the vertical expanded method.

x	30	8
6	180	48 = 228

add mentally

$\rightarrow$ 

38
x 6
48 (6 x 8)
180 (6 x 30)
<u>228</u>

$\rightarrow$ 

38
x 6
<u>228</u>
4

#### YEAR 4

- Extend short multiplication to HTU x U

346
x 9
<u>3114</u>
5

#### YEAR 5

- $72 \times 38$  is approximately  $70 \times 40 = 2800$

72	
x 38	
576	$72 \times 8$
<u>2160</u>	$72 \times 30$
<u>2736</u>	
1	

- Extend to simple decimals with one decimal place. Multiply by a single digit, approximating first. Know that decimal points should line up under each other.

$4.9 \times 3$  is approximately  $5 \times 3 = 15$

$4.9 \times 3$	$4.0 \times 3 = 12.0$
	$0.9 \times 3 = \underline{2.7}$
	14.7

- Extend short multiplication to a 4-digit number by a 1-digit number.
- Short multiplication: ThHTU x U



$4346 \times 8$  is approximately  $4500 \times 10 = 45\ 000$

$$\begin{array}{r} 4346 \\ \times \quad 8 \\ \hline 34768 \\ \phantom{34}234 \end{array}$$

- Multiply 3-digit numbers by 2-digit numbers.
- Long multiplication: HTU  $\times$  TU

$352 \times 27$  is approximately  $350 \times 30 = 10500$

- Extend to decimals with up to two decimal places. Multiply by a single digit, approximating first. Know that decimal points should line up under each other.  
 $4.92 \times 3$  is about  $5 \times 3 = 15$

$$\begin{array}{r} 4.92 \times 3 \\ 4.00 \times 3 = 12.00 \\ 0.90 \times 3 = 2.70 \\ 0.02 \times 3 = \underline{0.06} \\ \hline 14.76 \end{array}$$

Begin to extend to multiplying by two-digit numbers. For example:

$4.92 \times 73$  is about  $5 \times 70 = 350$

## **YEAR 6**

- $356.7$   
 $\times \quad 6$   
 $\hline 2140.2$   
3 4 4

- $356.7$   
 $\times \quad 0.7$   
 $\hline 249.69$   
3 4 4

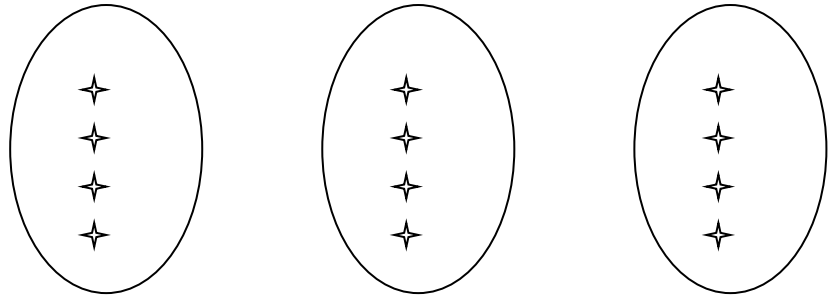
**OR Multiply by 7 and then divide by 10**

# **DIVISION ROUTE**

## **YEAR 3 – Mental calculations**

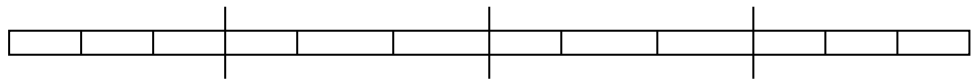
- Continue to give children experience sharing using practical apparatus

$$12 \div 3 =$$



- Teach how to find answers to divisions using grouping, e.g. counting up in multiples of the divisor.

$$12 \div 3 = \text{how many 3s make 12?}$$



$20 \div 4$  read as ‘how many 4s in 20?’ and calculated by counting up 4, 8, 12, 16, 20 to find the answer of 5.

- Reinforce times tables
- Recognise that division is the inverse of multiplication  
e.g.  $5 \times 7 = 35$ , so  $35 \div 7 = 5$ .
- Continue to practice simple multiplication facts and understand how these can be used to solve divisions.
- Begin to find remainders after simple division  $16 \div 3 = 5 \text{ r}1$  Mental Calculations
- Start with numbers that give no remainder. Lead onto numbers with remainders.

*Children to use practical resources to complete these calculations.*

e.g.  $73 \div 5$  How many 5’s make 73?

$$\begin{array}{r}
 73 \\
 -60 \quad 12 \times 5 \\
 \hline
 13 \\
 -10 \quad 2 \times 5 \quad 73 \div 5 = 14 \text{ r}3
 \end{array}$$

14 groups of 5 and 3 remainder.

Children to record as  $73 \div 5 = 14 \text{ r}3$

- Encourage children to estimate answers first.
- Begin to familiarise children with the notation used for division.

### **YEAR 4**

Recap from previous Year but introducing the division sign in written algorithm form. Children to use their known number facts to answer e.g.

$$12 \times 3 = 36$$

6 left over

$$2 \times 3 = 6$$

So the answer is 14 (record as shown below)

- $$\begin{array}{r} \underline{14} \\ 3) 42 \end{array}$$

- Progress to **short division** with appropriate annotations shown.

How many 3's are there in 40? Record the 10 above the line and carry the additional 10 to the units / ones column so that it says 12. How many 3's are there in 12? There are 4 so record on the line above.

$$\begin{array}{r} \underline{14} \\ 3) 42 \end{array}$$

- Extend to HTU  $\div$  U

$$\begin{array}{r} \underline{137} \\ 3) 411 \end{array}$$

### **End of Year 4**

- Extend to division involving decimals e.g. money

$$\begin{array}{r} \underline{\pounds 25.50} \\ 3) \pounds 76.50 \end{array}$$

### **YEAR 5**

- Extend to HTU  $\div$  TU (introduce **long division**)

e.g. 
$$\begin{array}{r} \overline{36)972} \\ \underline{720} \quad \underline{20} \times 36 \\ 252 \\ \underline{180} \quad \underline{5} \times 36 \\ 72 \\ \underline{72} \quad \underline{2} \times 36 \end{array}$$

Answer 27

- $432 \div 15 = 28.8$

e.g. 
$$\begin{array}{r} \underline{28.8} \\ 15 \overline{)432.0} \\ \underline{30} \downarrow \\ 132 \\ \underline{120} \downarrow \\ 12.0 \\ \underline{12.0} \\ \underline{0} \end{array}$$