In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them. Encourage children to choose and use the most efficient and appropriate method for the numbers and the situation. Teach operations together to emphasise the importance of the inverse.

	Addition should be taught alongside Subtraction		Multiplication should be taught alongside Division	

Y3	Children will continue to use empty number lines with increasingly complex numbers, where appropriate. and will begin to use informal methods (jottings) to support, record and explain partial mental methods, building on existing mental strategies.
	
	Counting on
	Count on from the largest number irrespective of the order of the calculation. Bridge through tens and begin to bridge through 100's. Encourage to partition only the second number, building on counting in 10s and 1s.
	
	Compensation (for near multiples of 10)
	
	Expanded informal method using place Encourage children to use when the calculation can't be done mentally. Model with simpler numbers where they can solve mentally initially)
	
	  67 = 60 + 7
	+<u>24</u> 20 + 4
	        80 + 11 = 91
	
	Model expanded horizontal partitioning with Base 10 leading to compact vertical method working from left to right...... then from right to left. (end of summer term/ higher atainers?)
	
	 67 67 67
	+<u>24</u> + <u>24</u> +<u>24</u>
	 80 11 91
	 <u>11</u> <u>80</u> 1
	 91 91
	
	 243 = 200 + 40 + 3
	+<u>435</u> 400 + 30 + 5
	 678 = 600 + 70 + 8
		Children will continue to use empty number lines with increasingly large numbers. and will begin to use informal methods (jottings) to support, record and explain partial mental methods, building on existing mental strategies .
		Counting back
		Encourage to partition only the second number, building on counting in 10s and 1s Subtracting the tens in one jump and the units in one jump (focus on efficiency… e.g. challenge children to solve subtraction calculation in two steps)
		
		47 – 23 = 24
		
		47 – 20 = 27 27 -3 = 24
		Bridging through ten can help children become more efficient.
		
		Counting on
		Finding the difference between two numbers by counting on. Use NNS ITP image. Relate to every day contexts such as age, height, length etc.
		
		Where the numbers involved in the calculation **are close together or near to multiples of 10, 100 etc co**unting on using a number line should be used.
		
		Compensation (for near multiples of 10) 63-8 =63-10 +2 =55
		
		Expanded informal method using place value
		 67 = 60 + 7
		-<u>24</u> - 20 + 4
		 43 = 40 + 3
		
		Develop into 3 digit – 2 digit numbers modelling with Base 10. Partition 3 digit numbers into ways that are helpful for the subtraction. E.g. 325 – 58 = 325 – 25 - 25 – 5 – 3 = 267
		
			Or 325 – 58 = 267 so 325 becomes 200 + 110 + 15

- 50 - 8

200 + 60 + 7		Children will continue to use: **Repeated addition**
		6 multiplied by 4 = 6 x 4 = 6 'four times'
		4 times 6 is 6 + 6 + 6 + 6 = 24 or 4 lots of 6
		Children should use number lines or bead bars to support.
		
		Arrays Increasingly use arrays to make links between x and ÷.
		
		Children should model a multiplication calculation using an array. This knowledge will support the development of the grid method.
		
		   9 x 4 = 36
		
		    4 x 9 = 36 **36÷ 9 = 4 36 ÷ 4 = 9**
		Important for teachers to be consistent. Either seen as a row of 9, 4 times (9 x 4)... or a column of 4, 9 times (4 x 9). Both are right.
		Moving towards 2 digit x 1 digit using place value.
		90 x 4 = 40 x 9 = 360 360 ÷ 9 = 40 360 ÷ 4 = 90
		
		Derive facts from unknown facts
		Use number line to show known multiplication facts and then derive unknown facts. E.g. if you know 5 x 10 = 50. Count back 5 to derive 5 x 9 etc. 5 x 5 will be half of 5 x 10 etc... Relate to other 'tables'.
		
		0 5 10 25 30 45 50
		
		Also partition an array to show how to derive an unknown fact from a known fact e.g. 5 x 7 = 5 x (5 + 2)
		
		Scaling
		
		Use Base 10 equipment to show 10 times bigger / smaller. Model the enlargement. E.g to show why 6 x 3 helps in solving the calculation 60 x3.
		Find a ribbon that is 4 times as long as the blue ribbon
		
		Using symbols to stand for unknown numbers to complete equations using inverse operations
		□ x 5 = 20 3 x △ = 18 □ x O = 32
		
		Partitioning
		38 x 5 = (30 x 5) + (8 x 5) = 150 + 40 = 190
			Ensure that the emphasis in Y3 is on **grouping** rather than sharing except when finding fractions as this is sharing.
			Children will continue to use:
			Number lines and known multiplication facts to solve division
			
			Use number lines and known multiplications to solve divisions incl. with remainders.
			Move into chunking using these steps. Encourage children to be as efficient as possible.
			
			23 ÷ 5=4 r3
			
			Moving towards more efficient approaches, using known facts
			
			Using symbols to stand for unknown numbers to complete equations using inverse operations
			
			26 ÷ 2 = □ 24 ÷ △ = 12 □ ÷ 10 = 8
			
			Find unit fractions of numbers and quantities, including continuous measures and relate to division in context
			e.g. There are 12 cakes in this cake tray. What fraction is in one row? 2 rows? ¼ x12 = 12 ÷ 4 =3
			
				4 x 3=12 |
				
					3 x 4 =12 |
					
						12 ÷ 4=3 |
						
							12 ÷ 3 =4 |
							
								¼ x 12=3 |
								
									1/3 x 12=4 |
									
									e.g. a cake recipe for 8 people uses 500g of flour. How much flour would I need to make a cake for 4 people? 2 people?
									
									What is ½ of 5m, 1/3 of 12 litres or ¼ of 20 kg ?

Encourage children to check results by using the inverse, using a different method e.g. equivalent calculation and by estimation where appropriate.

In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them. Encourage children to choose and use the most efficient and appropriate method for the numbers and the situation. Teach operations together to emphasise the importance of the inverse.

Y4

Expanded informal method leading to compact method

```
 67  = 60 + 7
+24    20 + 4
       80 + 11  =  91
```

Model expanded horizontal partitioning using Base 10 (see above)… leading to compact vertical method working from left to right, then from right to left.

```
 67        67
+24       +24
 80        11
 11        80
 91        91
```

Moving quickly into 3 and 4 digit numbers for calculations that are hard to solve mentally.

625	625	2327	2327
+ 324	+ 324	+ 542	+ 542
900	9	2000	9
40	40	800	60
9	900	60	800
949	949	9	2000
		2869	2869

Model how solving an addition on an empty number line increasingly becomes less efficient as the complexity and size of numbers increases.
Moving into compact method

Using similar methods, children will:
✓ *add several numbers with different numbers of digits;*
✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;*
✓ *know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.*

Compensation

Continue to teach compensation method where children round and adjust to the nearest 10 / 100, especially in the context of money.

E.g. £4.99 + £6.99 = £5 – 1p + £7 – 1p = £11.98

Difference by counting on (See Y3) For numbers close together:

```
102 – 89 = 13
```


Including a range of contexts e.g. 714cm – 687cm   750ml –698 ml., £12.00-£10.98
Children should solve with increasing efficiency using only two steps

Counting back and Compensation When appropriate (using number lines) bridging through 10, 100 and 1000 and rounding and adjusting (compensating) e.g. 42p – 5p *or* 193 litres – 18 litres *or* £823 – £32 *or* 706mins – 28mins *or* 307cm – 111cm *or* 1006km - 9km
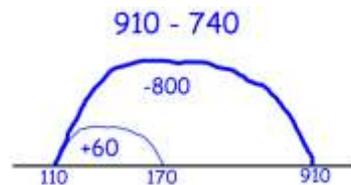
Expanded horizontal (including 4 digit numbers) using base 10

```
Step 1    754  =    700  + 50 + 4
          -286       - 200 + 80 + 6

Step 2             700  + 40 + 14    (adjust from T to U)
                  - 200 + 80 + 6

Step 3             600  + 140 + 14   (adjust from H to T)
                  + 200 + 80 + 6
                   400 + 60 + 8  = 468
```



```
754 = 700 + 50 + 4    =    700 + 40 + 14   =  600 + 140 + 14
                                            - 200   80   6
                                              400   60   8
```

Children should:
✓ *be able to subtract numbers with different numbers of digits;*
✓ *begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;*
✓ *solve with increasing efficiency using only two steps*

---

2 and 3 digit x 1 digit numbers. Include X 0 and X 1
(Continue setting calculations in a range of contexts-see above)

Partitioning using place value and the distributive law
(continuing from Y3)
```
38 x 5 = (30 x 5) + (8 x 5)
       = 150 + 40
       = 190
```
Children will continue to use arrays where appropriate leading into the grid method of multiplication.


```
(10 x 6) + (4 x 6)

60  +  24

    84
```
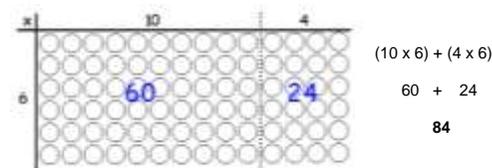
Grid method
(Short multiplication – multiplication by a single digit)
23 x 8
Children will approximate first
23 x 8 is approximately 25 x 8 = 200, encouraging to use known facts to 100 e.g. 25 x 4 =100

```
  23
X  8
  24   (3 x 8)  (record in expanded format first)
+ 160  (20 x 8)
  184
```

Recognise and use factor pairs.

21 x 8 = 7 x 3 x 2 x 4 = 168

Encourage children to multiply 3 single digits together
e.g. 3 x 4 x 5 and link to contexts such as volume.
e.g. using 3 dice is it always, sometimes, never true that if you multiply all 3 dice numbers together you get the biggest total?

2 and 3 digit ÷ 1 digit numbers. Include ÷ 0 and ÷ 1
(Continue setting calculations in a range of contexts)
Number lines and known multiplication facts to solve division
Children will continue to develop their use of number lines and known multiplication facts to solve division (using known multiples of the divisor). Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

Short division (2 digit ÷ 1 digit numbers)
Illustrate using horizontal and vertical bead bar and number line to make link between vertical column method and chunking using knowledge of multiples of the divisor. (if a child struggles subtracting, just encourage to count forwards from zero in multiples of the divisor to reach the dividend)

72÷3

96 – 6
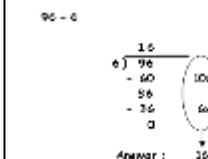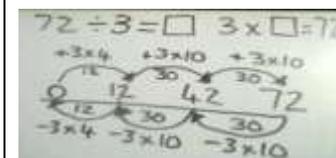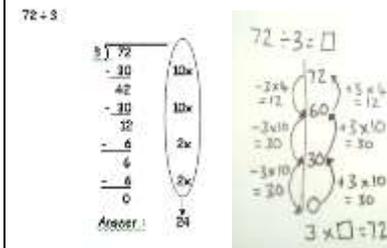
Continue relating division to fractions and scaling
A pair of jeans originally cost £60. In a sale they were reduced by a quarter. How much do they cost now?

£60
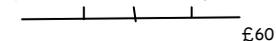
Begin to model divisions as fractions and use knowledge of factors to simplify divisions by representing as equivalent ratios
E.G. £360 lottery win shared between 6 friends. Each gets a sixth. This is the same as £120 being shared between 2.
£360÷ 6= £120÷2

NB Children need to make sensible decisions about rounding up or down after division accordingly. Any remainders should be shown as integers, e.g. 44 ÷ 3 = 14 remainder 2 or 14 r 2.

Encourage children to check results by using the inverse, using a different method e.g. equivalent calculation and by estimation where appropriate.

In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them. Encourage children to choose and use the most efficient and appropriate method for the numbers and the situation. Teach operations together to emphasise the importance of the inverse.

Encourage children to check results by using the inverse, using a different method e.g. equivalent calculation and by estimation where appropriate.