

Addition

Introduction

It is important that children understand that addition can be done in any order ($2+3=3+2$). We want children to be able to partition numbers and then add them together using the methods described below. It is important that children understand that addition equations are 'sums', but equations using other operations are not.

Vocabulary:

add, addition, total, plus, more than, and, altogether, increase, equals, make, sum

The use of maths equipment and a practical approach to teaching maths is encouraged throughout all year groups.

Progression through calculations for Addition

Mental Calculations – ongoing

Mental recall of number bonds (asked for in a variety of ways)

$$6 + 4 = 10$$

$$\underline{\quad} + 3 = 10$$

$$25 + 75 = 100$$

$$20 = \underline{\quad} + 17$$

Mental recall of doubles

Use near doubles

$$6 + 7 = \text{double } 6 + 1 = 13$$

Addition using partitioning and recombining

$$34 + 45 = (30 + 40) + (4 + 5) = 79$$

Counting on or back in repeated steps of 1,10,100,1000

$$86 + 57 = 143 \text{ (by counting on in tens then in ones)}$$

$$460 + 300 = 760 \text{ (by counting on in hundreds)}$$

Add the nearest multiple of 10,100 and 1000 and adjust

$$24 + 19 = 24 + 20 - 1 = 43$$

$$458 + 71 = 458 + 70 + 1 = 529$$

Use the relationship between addition and subtraction

$$36 + 19 = 55 \quad 19 + 36 = 55$$

$$55 - 19 = 36 \quad 55 - 36 = 19$$



Many mental calculation strategies will continue to be used. They are not replaced by written methods.

Written Methods

KS1

(Using quantities and objects, they **add** two single-digit numbers and count on to find the answer.

Taken from the New Draft curriculum)

	7
	1

8

Recording the answer next to the objects.

When recording in their books ensure the calculation is put into a column.

(Add numbers using concrete objects, pictorial representations, a two-digit number and ones show that addition of two numbers can be done in any order. Taken from the New Draft curriculum)

Column Addition 1

(a)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 3 \quad 2 \\ + \quad 4 \\ \hline \end{array} \quad (2 + 4 = 6)$$

(b)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 3 \quad 2 \\ + \quad 4 \\ \hline 6 \end{array} \quad (3 + 0 = 3)$$

(c)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 3 \quad 2 \\ + \quad 4 \\ \hline 3 \quad 6 \end{array}$$

At KS1 unless the child is secure with mental methods and the above written methods do not move them onto crossing the tens barrier.

If they are ready, start with adding the numbers mentally, by putting the larger number in their head and counting on in ones. $7 + 5 = 12$

They must be secure with place value to move on.

When crossing the tens barrier, start with the expanded column method

Column Addition - expanded column method.

(a)

	T	U		
	4	8	<i>(8 + 5 = 13)</i>	
+		5		
	1	3		
	4	0		
	5	3		

Then teach contracted column

Column Addition - contracted column method.

(a)

	T	U	
	4	8	<i>(8 + 5 = 13)</i>
+		5	

(b)

	T	U	
	4	8	<i>(4 + 0 = 4)</i>
+		5	<i>(4 + 1 = 5)</i>
		3	
	1		

(c)

	T	U	
	4	8	
+		5	
	5	3	
	1		

TU + TU then TU + TU

Column Addition - expanded method

(a)

	T	U		
	4	8	<i>(8 + 5 = 13)</i>	
+		5		
	1	3		
	6	0		
	7	3		

Column Addition - contracted column method.

(a)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 8 \\ + 2 \quad 5 \\ \hline \hline \end{array} \quad (8 + 5 = 13)$$

(b)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 8 \\ + 2 \quad 5 \\ \hline \quad 3 \\ \hline 1 \end{array} \quad \begin{array}{l} (4 + 2 = 6) \\ (6 + 1 = 7) \end{array}$$

(c)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 8 \\ + 2 \quad 5 \\ \hline 7 \quad 3 \\ \hline 1 \end{array}$$

Subtraction

Introduction

It is important that children understand that subtraction is the inverse (the opposite, or in reverse) of addition, and begin to make connections between these two operations. It is vital that children understand that subtraction isn't just 'minus' or 'take away' but also means 'find the difference', as this will help them apply their knowledge to a range of contexts. The number line is a key device for demonstrating this.

Vocabulary:

subtract, subtraction, take away, minus, less than, find the difference, decrease, leave, how many left

The use of maths equipment and a practical approach to teaching maths is encouraged throughout all year groups.

Progression through calculations for Subtraction

Mental Calculations – ongoing

Mental recall of subtraction facts

$$10 - 6 = 4 \quad 17 - _? = 11$$

$$20 - 17 = 3 \quad 10 - _? = 2$$

Find a small difference by counting up

$$82 - 79 = 3$$

Counting back in repeated steps of 1,10,100 and 1000

$$86 - 52 = 34 \text{ (by counting back in tens and then in ones)}$$

$$460 - 300 = 160 \text{ (by counting back in hundreds)}$$

Subtract the nearest multiple of 10,100,1000 and adjust

$$24 - 19 = 24 - 20 + 1 = 5$$

$$458 - 71 = 458 - 70 - 1 = 387$$

Use the relationship between addition and subtraction

$$36 + 19 = 55 \quad 19 + 36 = 55$$

$$55 - 19 = 36 \quad 55 - 36 = 19$$

Many mental calculation strategies will continue to be used. They are not replaced by written methods.

Written Methods

KS1

(Using quantities and objects, they **subtract** two single-digit numbers and count on or back to find the answer. Taken from New Draft Curriculum)

	12
	6
	6

Recording the answer next to the objects.

(Solve simple one-step problems that involve subtraction, using concrete objects and pictorial representation, and missing number problems. Taken from New Draft Curriculum)

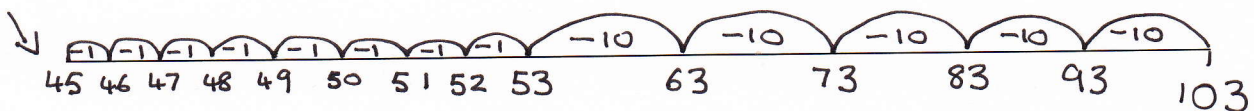
Subtraction using a number line

$$103 - 58 =$$

Place 103 at the end of the line, and count back in tens and then ones. (A mental method strategy previously taught)

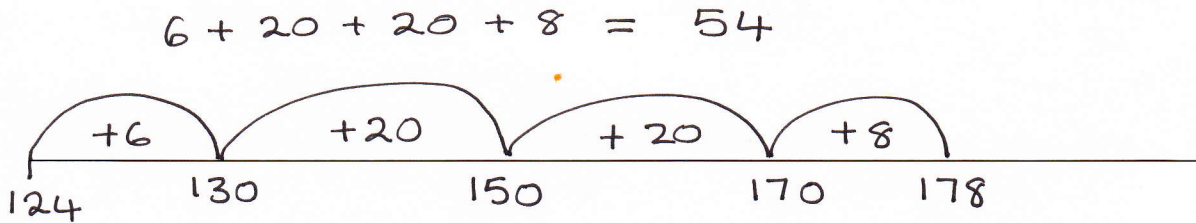
This method is consolidating mental methods, is reinforcing that subtraction is removing, taking away of an amount.

Answer



When finding the difference between two numbers e.g. Sharon bought 124 pencils and Rafa bought 178, how many more did Rafa buy?

Use a number line and addition; place the smaller number at the beginning and count up to the larger number at the end.



KS2

When the child is secure with subtraction on a number line and mental methods then introduce column subtraction.

(Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers. Taken from New Draft Curriculum.)

Subtraction 1

(a)

	T	U	
	6	7	$(7 - 4 = 3)$
-	2	4	
	4	3	

(b)

	T	U	
	6	7	
-	2	4	$(6 - 2 = 4)$
	4	3	

(c)

	T	U	
	6	7	
-	2	4	
	4	3	

Subtraction 2 (decomposition)

(a)

	T	U	
	8	2	$(2 - 6 = ?)$
-	5	6	<i>move over a 10</i>
	3	6	

(b)

	T	U	
	7	12	
-	5	6	$(12 - 6 = 6)$
	2	6	

(c)

	T	U	
	7	12	
-	5	6	$(7 - 5 = 2)$
	2	6	

Multiplication

Introduction

Children will begin to understand multiplication as repeated addition ($3 \times 4 = 3 + 3 + 3 + 3$ or $4 + 4 + 4$) and also that multiplication, like addition, is commutative (you can do it either way: $3 \times 4 = 4 \times 3$).

Vocabulary:

multiply, lots of, product, groups of, times

The use of maths equipment and a practical approach to teaching maths is encouraged throughout all year groups.

Progression through calculations for Multiplication

Mental Calculations – ongoing

Doubling and halving

Applying the knowledge of doubles and halves to known facts.

e.g. 8×4 is double 4×4

Using multiplication facts

Tables should be taught regularly from Y2 onwards. All children should know these by heart by;

Year 2 – recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables.

Year 3 – recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.

Year 4 - recall multiplication and division facts for multiplication tables up to 12×12

Year 5 - multiply and divide numbers mentally drawing upon known facts

Year 6 - perform mental calculations, including with mixed operations and large numbers.

Using and applying multiplication facts

Children should be able to utilize their tables knowledge to derive other facts.

e.g. If I know $3 \times 7 = 21$, what else do I know?

$30 \times 7 = 210$, $300 \times 7 = 2100$, $3000 \times 7 = 21000$, $0.3 \times 7 = 2.1$

Use closely related facts already known

$$\begin{aligned} 13 \times 11 &= (13 \times 10) + (13 \times 1) \\ &= 130 + 13 = 143 \end{aligned}$$

Multiplying by 10, 100, 1000

Knowing the effect of multiplying by 10 is a shift in the digits one place to the left.

Knowing that the effect of multiplying by 100 is a shift in the digits two places to the left.

Partitioning

$$23 \times 4 = (20 \times 4) + (3 \times 4)$$

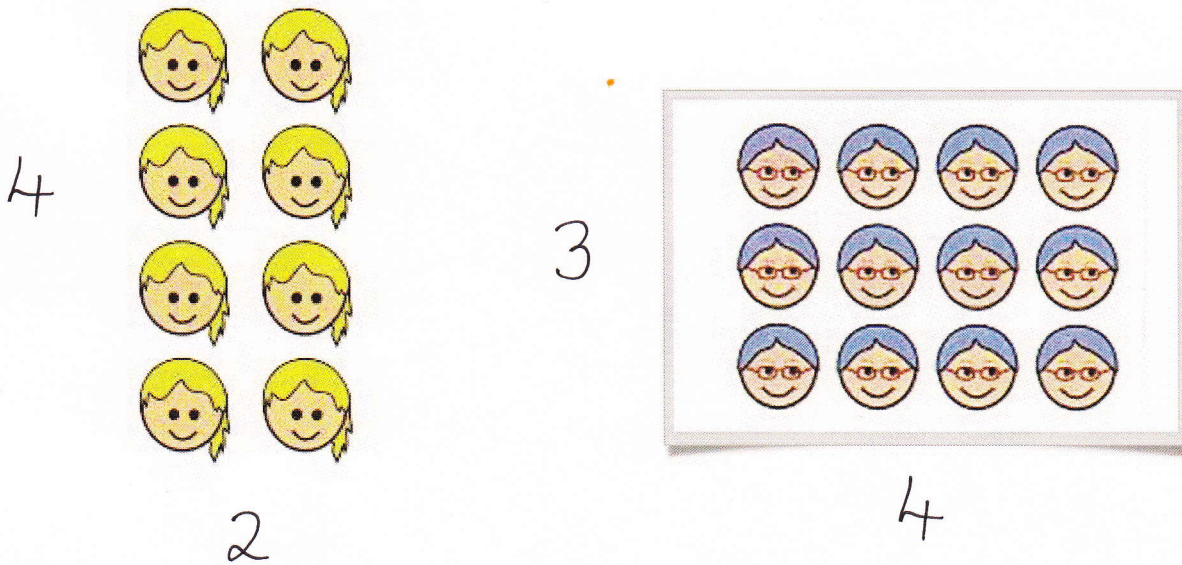
$$= 80 + 12 = 102$$

Many mental calculation strategies will continue to be used. They are not replaced by written methods.

Written Methods

KS1

(Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. Taken from the New draft curriculum)



Show that multiplication of two numbers can be done in any order (commutative)

Solve one-step problems involving multiplication using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

KS2

(Pupils develop efficient mental methods, for example, using commutativity (e.g. $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and multiplication and division facts (e.g. using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts ($30 \times 2 = 60$, $60 \div 3 = 20$ and $20 = 60 \div 3$).

Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division. Taken from the New Draft curriculum)

Partitioning and informal recording

$$32 \times 7 =$$

$$(10 \times 7) + (10 \times 7) + (10 \times 7) + (2 \times 7) \text{ or}$$

$$(30 \times 7) + (2 \times 7)$$

Using arrays and then the grid method

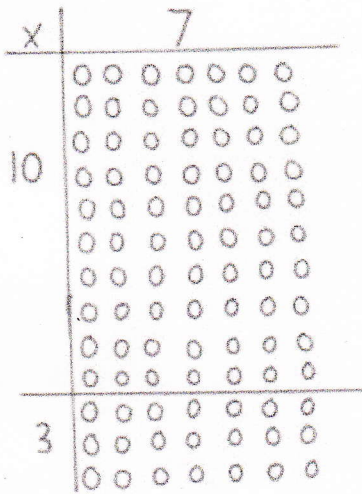
Try and always link arrays to real life situations.

See examples below:



Arrays help children visualise a multiplication question, and see how the grid method follows on from this. Once children are familiar with how arrays work, they can move onto the grid method.

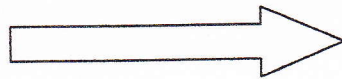
13x7=



$$7 \times 10 = 70$$

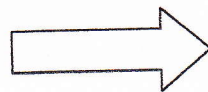
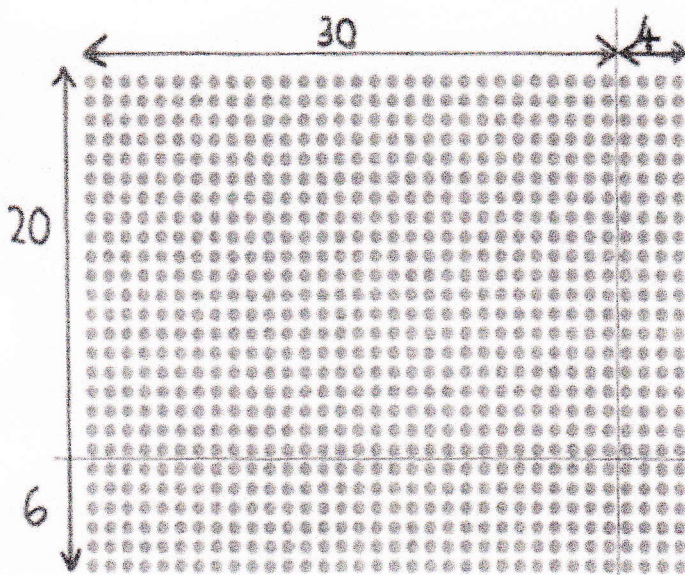
$$7 \times 3 = 21$$

$$7 \times 13 = 91$$



x	7
10	70
3	21

34x26=



x	30	4
20	600	80
6	180	24

$$780 + 104 = 884$$

When secure with the grid method, short multiplication can be taught.

Short Multiplication 1

(a)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 2 \quad 6 \quad (6 \times 3 = 18) \\ \times \quad \quad 3 \\ \hline \end{array}$$

(b)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 2 \quad 6 \quad (20 \times 3 = 60) \\ \times \quad \quad 3 \quad (60 + 10 = 70) \\ \hline 8 \\ \hline 1 \end{array}$$

(c)

$$\begin{array}{r} \text{T} \quad \text{U} \\ 2 \quad 6 \\ \times \quad \quad 3 \\ \hline 7 \quad 8 \\ \hline 1 \end{array}$$

Short Multiplication 2

(a)

$$\begin{array}{r} \text{H} \quad \text{T} \quad \text{U} \\ 3 \quad 4 \quad 6 \\ \times \quad \quad \quad 9 \\ \hline 5 \quad 4 \quad (6 \times 9) \end{array}$$

(b)

$$\begin{array}{r} \text{H} \quad \text{T} \quad \text{U} \\ 3 \quad 4 \quad 6 \\ \times \quad \quad \quad 9 \\ \hline 5 \quad 4 \\ 3 \quad 6 \quad 0 \quad (40 \times 9) \end{array}$$

(c)

$$\begin{array}{r} \text{H} \quad \text{T} \quad \text{U} \\ 3 \quad 4 \quad 6 \\ \times \quad \quad \quad 9 \\ \hline 5 \quad 4 \\ 3 \quad 6 \quad 0 \\ + 2 \quad 7 \quad 0 \quad 0 \quad (300 \times 9) \\ \hline 3 \quad 1 \quad 1 \quad 4 \\ \hline 1 \quad 1 \end{array}$$

Division

Introduction

As so many children can find division difficult, we will focus on ensuring they understand what division is. Making the connection with multiplication, and understanding that division is the inverse of multiplication is important. It is vital that children understand that division is about sharing (ie, $20 \div 4$ as sharing 20 into 4 groups) but also about grouping (how many groups of 4 are there in 20?).

Vocabulary

divide, division, divided by, share, sharing, equal, equally, how many, remainder, quotient, divisor, dividend

The use of maths equipment and a practical approach to teaching maths is encouraged throughout all year groups.

Progression through calculations for Multiplication

Mental Calculations – ongoing

Doubling and halving

Knowing that halving is dividing by 2

Deriving and recalling division facts

Tables should be taught regularly from Y2 onwards. All children should know these by heart by;

Year 2 – recall division facts for the 2, 5 and 10 multiplication tables.

Year 3 – recall division facts for the 3, 4 and 8 multiplication tables.

Year 4 - recall division facts for multiplication tables up to 12×12

Year 5 - divide numbers mentally drawing upon known facts

Year 6 - perform mental calculations, including with mixed operations and large numbers.

Using and applying division facts

Children should be able to utilise their tables knowledge to derive other facts

e.g. If I know $3 \times 7 = 21$, what else do I know?

$21 \div 7 = 3$ so $210 \div 7 = 30$, $210 \div 3 = 70$, $210 \div 70 = 3$

Dividing by 10, 100, 1000

Knowing the effect of dividing by 10 is a shift in the digits one place to the right.

Knowing that the effect of dividing by 100 is a shift in the digits two places to the right.

Use of factors

$378 \div 21 = ??$, $378 \div 3 = 126$, $126 \div 7 = 18$, $378 \div 21 = 18$

Many mental calculation strategies will continue to be used. They are not replaced by written methods.

Written Methods

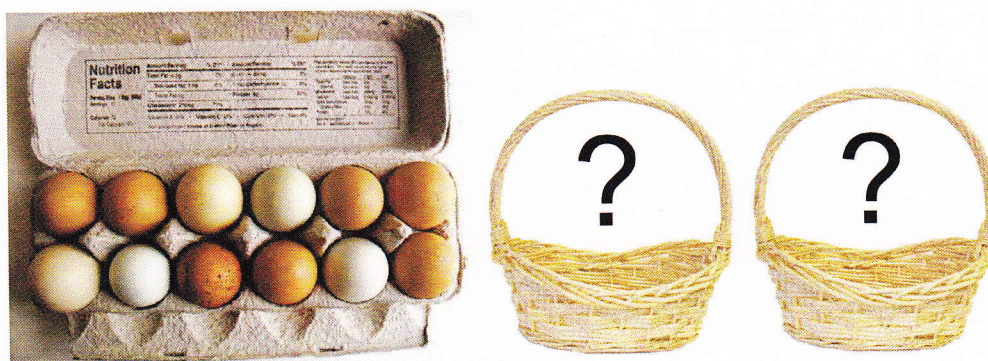
KS1

(Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. Taken from the New draft curriculum)

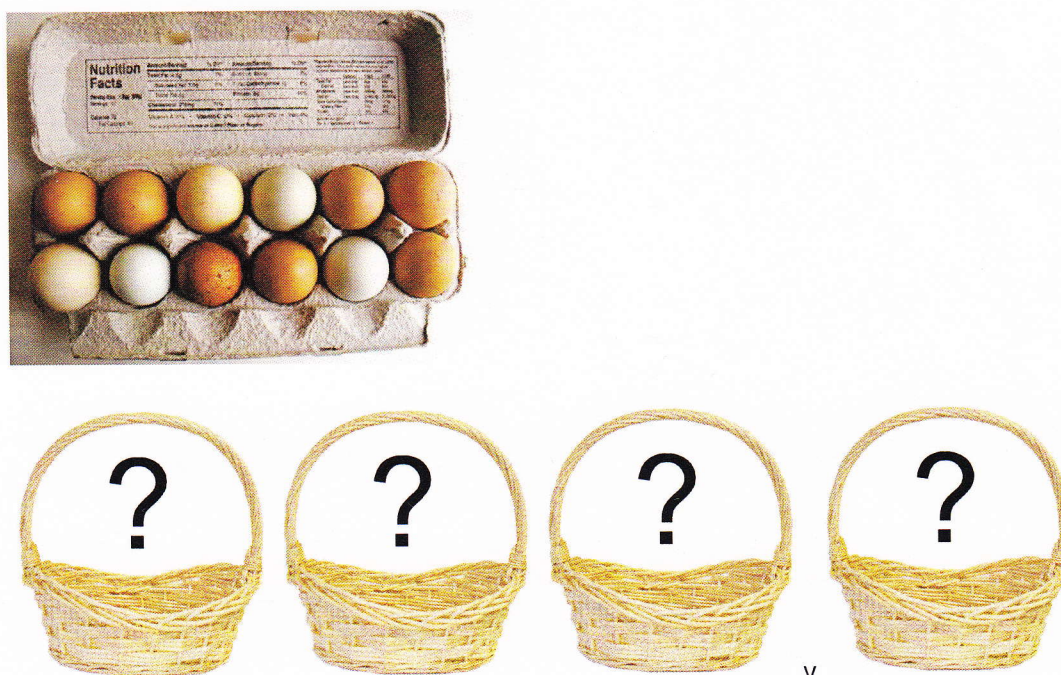
Division at KS1 should be based around sharing objects and linking to simple fractions. ($\frac{1}{2}$ and $\frac{1}{4}$)

Children should solve contextual problems and record their findings using pictures, arrays and numbers.

Share the eggs into 2 baskets, $\frac{1}{2}$ in each basket.



Share the eggs into 4 baskets, $\frac{1}{4}$ in each basket.



KS2

Division along a number line.

$$228 \div 12 =$$

Using known multiplication facts the children list 1,2,5, and 10 x table facts

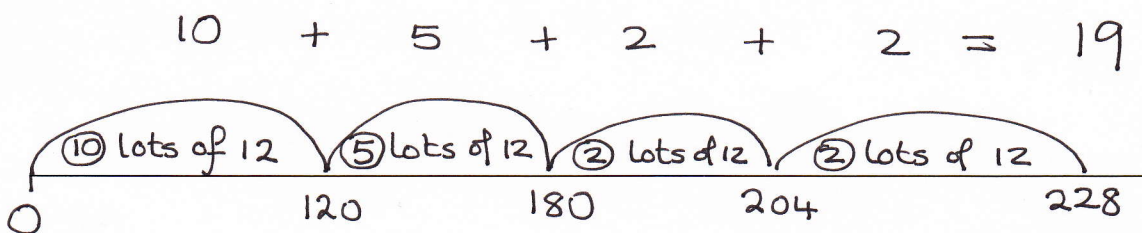
$$1 \times 12 = 12$$

$$2 \times 12 = 24$$

$$5 \times 12 = 60$$

$$10 \times 12 = 120$$

Then placing 228 at the end of the number line, jump in multiples of 12 till they reach 228.



When secure with division on a number line, move onto short division.

Short Division

(a)

	H	T	U
	1		
3	3	7	5

3 into 3 goes 1

(b)

	H	T	U
	1	2	
3	3	7	15

3 into 7 goes 2 r1

(c)

	H	T	U
	1	2	5
3	3	7	15

3 into 15 goes 5