# St Cyprian’s Greek Orthodox Primary Academy

# Calculations Policy

Revised: September 2012

Reviewed and ratified by Full Academy Trust:

Date: 28 / 11 / 2012

## Mission Statement

The aim of St Cyprian's Greek Orthodox Primary Academyis to provide its children with primary education of the highest quality in a supportive learning environment through the national curriculum, enriched by the progressive teaching of the Greek language and Christian Orthodox religion.

The children will be equipped with the knowledge, skills and spirituality to enable them to achieve their full potential and prepare them for transition to secondary education and to contribute positively to the challenges of a diverse multicultural society.

## Calculations Policy

This policy contains the key pencil and paper procedures that are to be taught throughout the Academy. It has been written to ensure consistency and progression throughout the Academy.

Although the focus of the policy is on pencil and paper procedures it is important to recognise that the ability to calculate mentally lies at the heart of the Primary Framework for Mathematics. The mental methods in the Primary Framework for teaching mathematics will be taught systematically from Reception onwards and pupils will be given regular opportunities to develop the necessary skills. However mental calculation is not at the exclusion of written recording and should be seen as complementary to and not as separate from it. In every written method there is an element of mental processing. Sharing written methods with the teacher encourages children to think about the mental strategies that underpin them and to develop new ideas. Therefore written recording both helps children to clarify their thinking and supports and extends the development of more fluent and sophisticated mental strategies.

During their time at this Academy children will be encouraged to see mathematics as both a written and spoken language. Teachers will support and guide children through the following important stages:

- developing the use of pictures and a mixture of words and symbols to represent numerical activities;
- using standard symbols and conventions;
- use of jottings to aid a mental strategy;
- use of pencil and paper procedures;
- use of a calculator.

This policy concentrates on the introduction of standard symbols, the use of the empty number line as a jotting to aid mental calculation and on the introduction of pencil and paper procedures. It is important that children do not abandon jottings and mental methods once pencil and paper procedures are introduced. Therefore children will always be encouraged to look at a calculation/problem and then decide which is the best method to choose – pictures, mental calculation with or without jottings, structured recording or a calculator.

## Aims

We aim to ensure that by the end of year 6, as many children as possible will understand, and use successfully, compact written methods to carry out and record calculations they cannot do in their head.

**General Progression:**

- Establish mental methods, based on a good understanding of place value
- Use of informal jottings to aid mental calculations
- Develop use of empty number line to help mental imagery and aid recording
- Use partitioning and recombining to aid informal methods
- Introduce expanded written methods
- Develop expanded methods into compact standard written form.

To enable children to move towards compact written methods **with full understanding** a step-by-step approach is taken. For each of the four operations children are first introduced to expanded methods that lead to the compact form of calculation. It is important that children feel secure and comfortable with each stage towards compact methods before they move on to the next. **Children will progress through the stages of expanded calculation at different rates.** It is far better that they can operate efficiently at any stage and with understanding than to move them on too quickly. **Not all children will reach a compact method by the end of Year 6.**

**Before carrying out a calculation, children will be encouraged to consider:**

- Can I do it in my head? (using rounding, adjustment)
- The size of an approximate answer (estimation)
- Could I use jottings to keep track of the calculation?
- Do I need to use an expanded or compact written method?

**When are children ready for written calculations?**
**Addition and subtraction**

- Do they know addition and subtraction facts to 20?
- Do they understand place value and can they partition numbers?
- Can they add three single digit numbers mentally?
- Can they add and subtract any pair of two digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?
- Can they understand the commutative and associative laws of addition? (though not of these terms) * *see glossary*

**Multiplication and division**

- Do they know the 2, 3, 4, 5 and 10 time table
- Do they know the result of multiplying by 0 and 1?
- Do they understand 0 as a place holder?
- Can they multiply two and three digit numbers by 10 and 100?
- Can they double and halve two digit numbers mentally?
- Can they use multiplication facts they know to derive mentally other multiplication facts that they do not know?
- Can they explain their mental strategies orally and record them using informal jottings?
- Can they fully understand commutative, distributive and associative laws of multiplication? (though not of these terms) * *see glossary*

**The above lists are not exhaustive but are a guide for the teacher to judge when a child is ready to move from informal to formal methods of calculation.**

**Language**

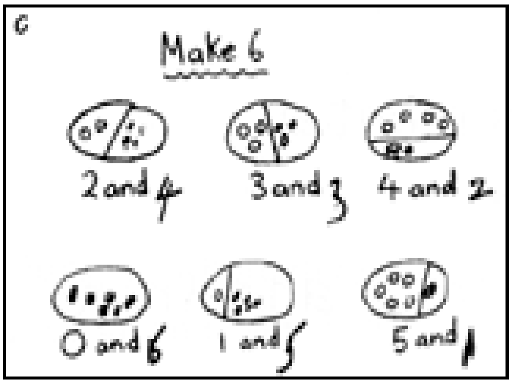
It is important that the language used when modelling calculations for children reflect the size of the numbers involved. In the following example where an addition calculation is completed using a compact written method you might say the following.

| | |
|---|---|
| 489 | Nine plus eight equals seventeen. Put down seven ones and carry ONE TEN |
| + 268 | Eighty plus sixty equals one hundred and forty. Add the extra ten which equals one hundred and fifty. Put down fifty and carry ONE HUNDRED. |
| 757 | Four hundred and two hundred equal six hundred. Add the extra one hundred which equals seven hundred. |
| 1 1 | Put down seven hundred. The answer is seven hundred and fifty seven. |

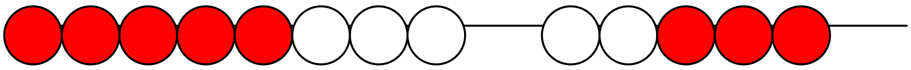
## Stages in Addition

### Informal methods

Informal methods reflect and support children's mental strategies for solving calculations. In the Early Years calculation will be represented using real objects and practical apparatus and children are encouraged to record their thinking in their own way for example, using pictures.




Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.

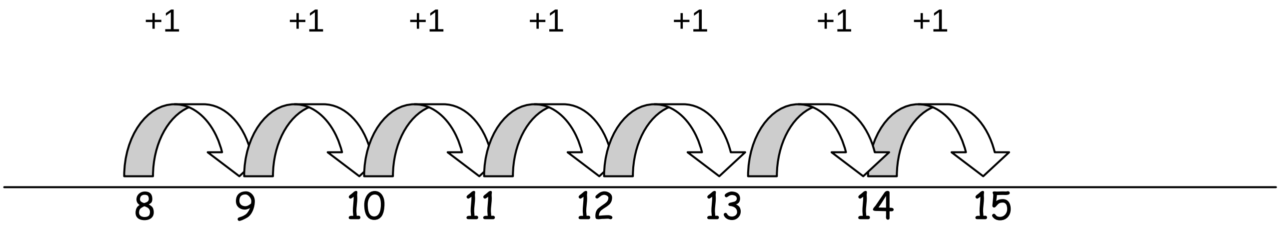


The following stages show a progression from informal methods for addition leading to a compact method.

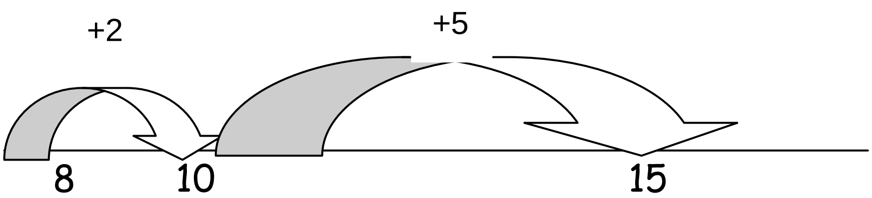
**Stage 1: The blank number lines**

- The mental methods that lead to column addition generally involve partitioning, e.g. adding the tens and ones separately, often starting with the tens. Children need to be able to partition numbers in ways other than into tens and ones to help them make multiples of ten by adding in steps.
- The empty number line helps to record the steps on the way to calculating the total.

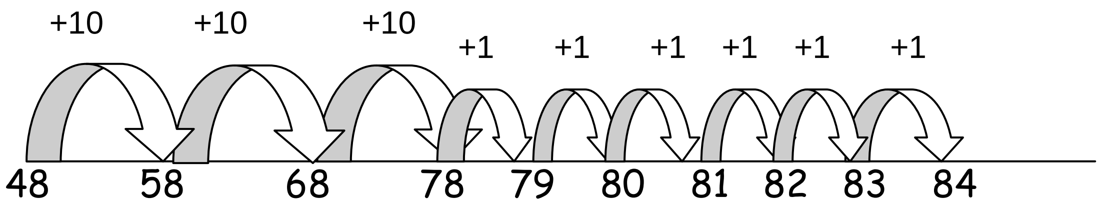
**8 + 7 = 15** **example 1**



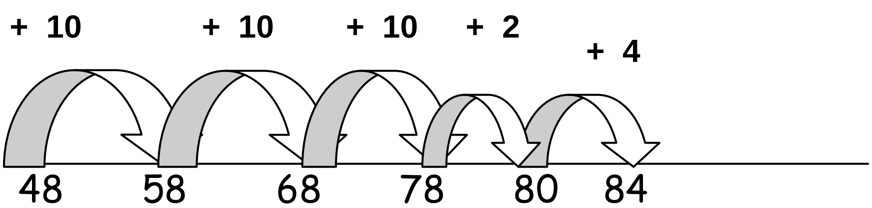

**8 + 7 = 15** **example 2**




**48 + 36 = 84** **example 3**



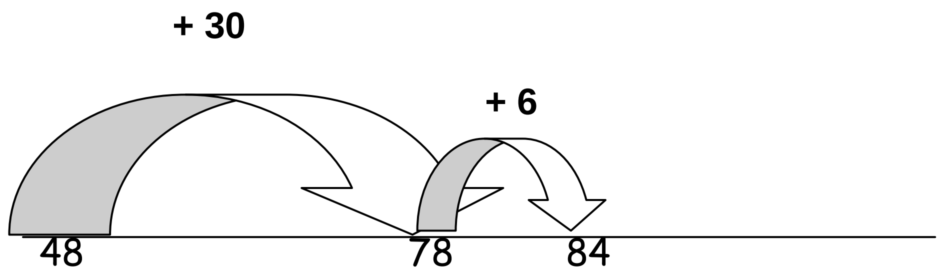

**48 + 36 = 84 example 4**



**Stage 2: Partitioning**

- The next stage is to record mental methods using partitioning. Add the tens and then the ones to form partial sums and then add these partial sums.

**48 + 36 = 84 example 5**




- Partitioning both numbers into tens and ones mirrors the column method where ones are placed under ones and tens under tens. This also links to mental methods.

**76 + 47 = 123 example 6**

70 + 40 + 6 + 7 =

110 + 13 = 123

**76 + 47 = 123 example 7**

|   |    |   |        |
|---|----|---|--------|
|   | 47 | → | 40 + 7 |
| + | 76 |   | 70 + 6 |
|   |    |   | 110 + 13 = 123 |

**Stage 3: Expanded methods in column**

- Move on to a layout showing the addition of the tens to the tens and the ones to the ones separately. To find the partial sums either the tens or the ones can be added first, and the total of the partial sums can be found by adding them in any order. As children gain confidence, ask them to start by adding the ones digits first always.
- The addition of the tens in the calculation 47 + 76 is described in the words 'forty plus seventy equals one hundred and ten', stressing the link to the related fact 'four plus seven equals eleven'.
- The expanded method leads children to the more compact method so that they understand its structure and efficiency. The amount of time that should be spent teaching and practising the expanded method will depend on how secure the children are in their recall of number facts and in their understanding of place value.

**76 + 47 = 123 example 8**

```
   76
+  47
 ______

   13   (7 + 6)
+ 110   (70 + 40)
 ______

  123
 ______
```

**Stage 4: Column method**

- In this method, recording is reduced further. Carry digits are recorded below the line, using the words 'carry ten' or 'carry one hundred', not 'carry one'.
- Later, extend to adding three two-digit numbers, two three-digit numbers and numbers with different numbers of digits.

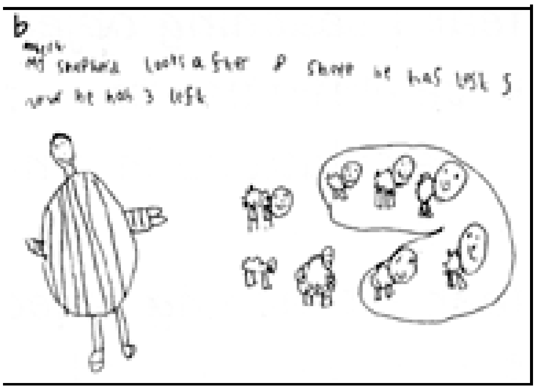
**76 + 47 = 123 example 9**

```
    47      258      366
 +  76    +  87     +458
   123      345      824
   11       11       11
```

## Stages in Subtraction

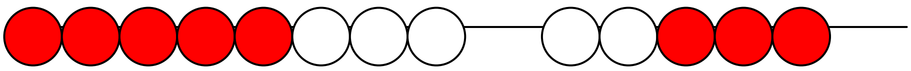
### Informal methods

Informal methods reflect and support children's mental strategies for solving calculations. In the Early Years calculation will be represented using real objects and practical apparatus and children are encouraged to record their thinking in their own way, for example, using pictures.



Bead strings or bead bars can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2.

13 – 5 = 8

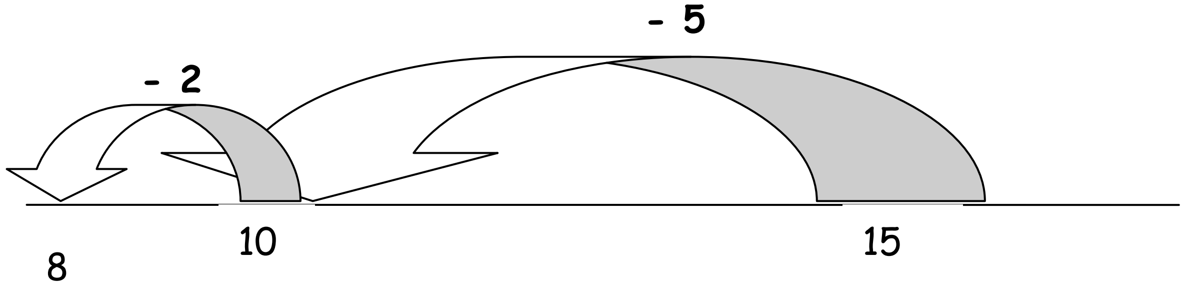


The following stages show a progression from informal methods for subtraction leading to a compact method.

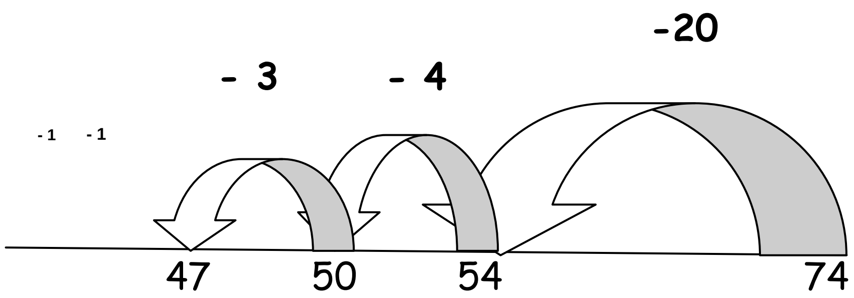
**Stage 1: Using the blank number line**

- The empty number line helps to record or explain the steps in mental subtraction. A calculation like 74 – 27 can be recorded by counting back 27 from 74 to reach 47. The empty number line is also a useful way of modelling processes such as bridging through a multiple of ten.
- The steps can also be recorded by counting up from the smaller to the larger number to find the difference, for example by counting up from 27 to 74 in steps totalling 47.
- With practice, children will need to record less information and decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations such as 57 – 12, 86 – 77 or 43 – 28.

**15 – 7 = 8 example 1**

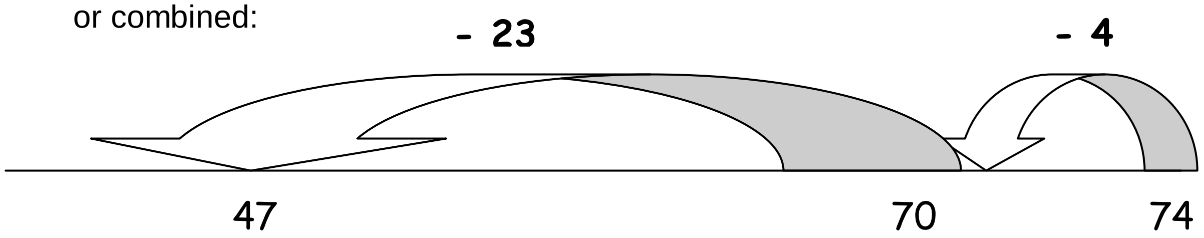



74 – 27 = 47 worked by counting back:



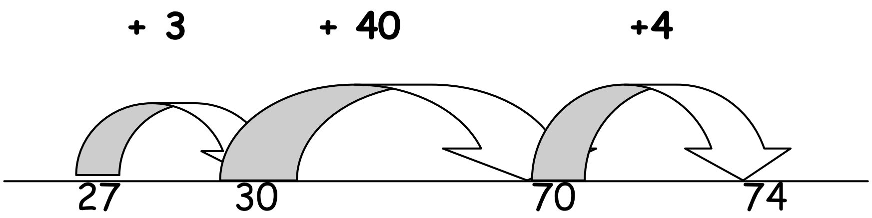

The steps may be recorded in a different order:

or combined:



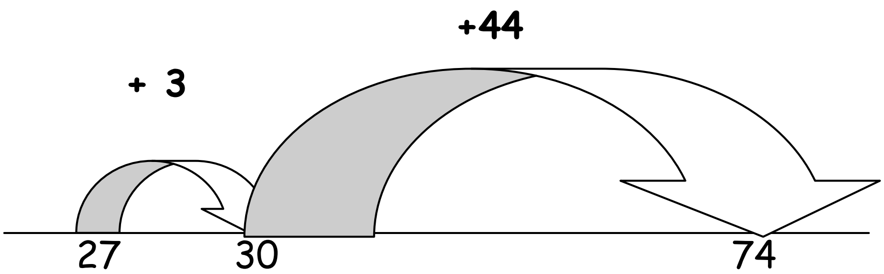
**Stage 2: The counting-up method**
The mental method of counting up from the smaller to the larger number can be recorded using either number lines or vertically in columns. The number of rows (or steps) can be reduced by combining steps. With two-digit numbers, this requires children to be able to work out the answer to a calculation such as 30 + ☐ = 74 mentally.

**74 - 27 = 47** **example 2**



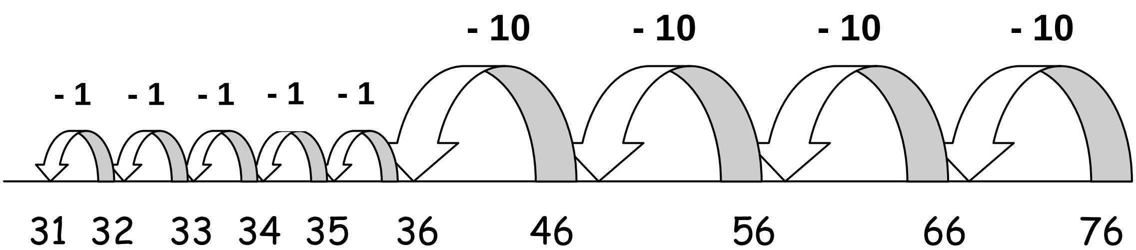

```
  74
– 27
   3   → 30
  40   → 70
   4   → 74
  47
```

Or




```
 74
- 27
   3 → 30
  44 → 74
 47
```

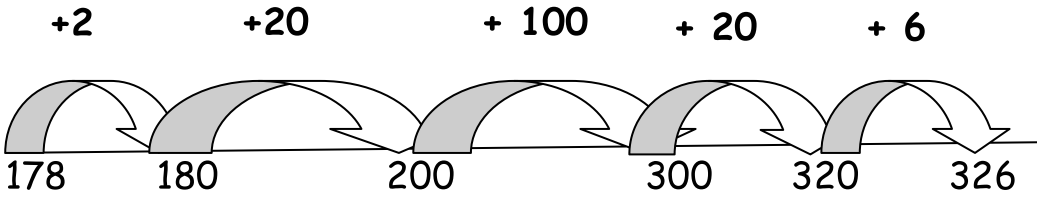
**76 – 45 = 31** **example 3**




With three-digit numbers the number of steps can again be reduced, provided that children are able to work out answers to calculations such as 178 + ☐ = 200 and 200 + ☐ = 326 mentally.

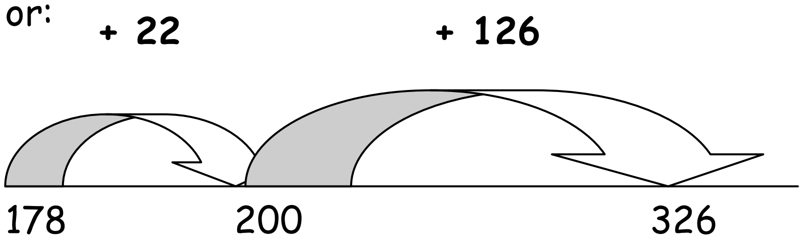
**The most compact form of recording remains reasonably efficient.**

**326 - 178 = 148** **example 3a**




326
-178
2 → 180
20 → 200
100 → 300
26 → 326
148

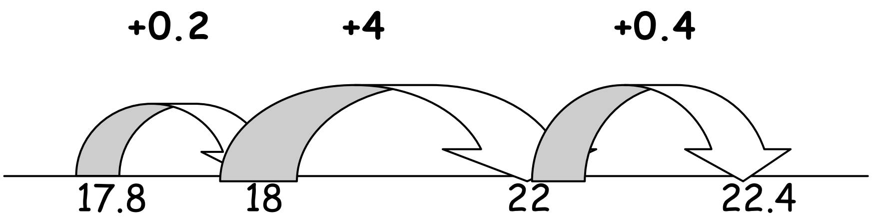
or:




326
-178
22 → 200
126 → 326
148

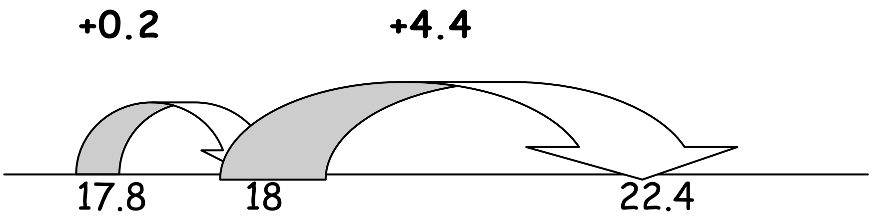
The method can be used with decimals where no more than three columns are required. However, it becomes less efficient when more than three columns are needed.

**22.4 - 17.8 = 4.6** **example 3b**




22.4
-17.8
0.2 → 18
4.0 → 22
0.4 → 22.4
4.6

Or:




22.4
-17.8
0.2 → 18
4.4 → 22.4
4.6

**Stage 3: Partitioning**

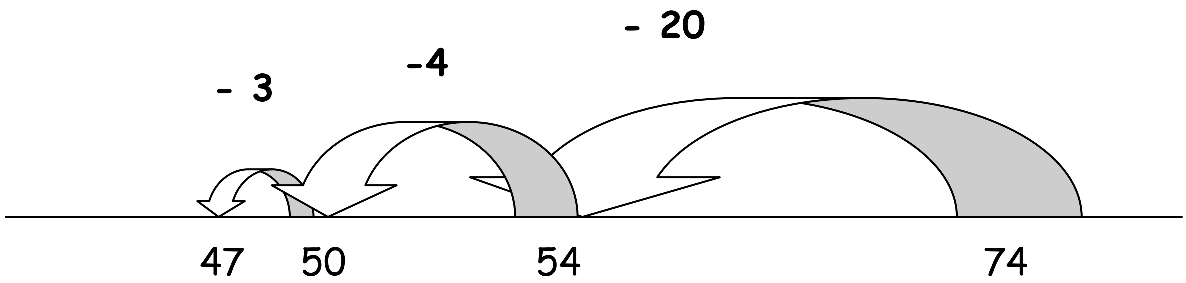
Subtraction can be recorded using partitioning to write equivalent calculations that can be carried out mentally. For 74 – 27 this involves partitioning the 27 into 20 and 7, and then subtracting from 74 the 20 and the 4 in turn. Some children may need to partition the 74 into 70 + 4 or 60 + 14 to help them carry out the subtraction.

Subtraction can be recorded using partitioning:

74 – 27 = 74 – 20 – 7
= 54 – 7
= 47

This requires children to subtract a single-digit number or a multiple of 10 from a two-digit number mentally. The method of recording links to counting back on the number line.

**74 – 27 = 47 example 4**



**Stage 4: Expanded layout, leading to column method**

Example: 563 − 241, no adjustment or decomposition needed

Expanded method leading to

$$\begin{array}{r} 500+60+3 \\ -\ 200+40+1 \\ \hline 300+20+2 \end{array} \qquad\qquad \begin{array}{r} 563 \\ -\ 241 \\ \hline 322 \end{array}$$

Start by subtracting the ones, then the tens, then the hundreds. Refer to subtracting the tens, for example, by saying ‘sixty take away forty’, not ‘six take away four’.

Example: 563 − 271, adjustment from the hundreds to the tens, or partitioning the hundreds

$$\begin{array}{r} 500+60+3 \\ -\ 200+70+1 \\ \hline \phantom{0} \end{array} \qquad \begin{array}{r} 400+160+3 \\ -\ 200+\ \ 70+1 \\ \hline 200+\ \ 90+2 \end{array} \qquad \begin{array}{r} \overset{400}{\cancel{500}}+\overset{160}{\cancel{60}}+3 \\ -\ 200+70+1 \\ \hline 200+90+2 \end{array} \qquad \begin{array}{r} \overset{4}{\cancel{5}}\ \overset{16}{\cancel{6}}\ 3 \\ -\ 2\ 7\ 1 \\ \hline 2\ 9\ 2 \end{array}$$

Begin by reading aloud the number from which we are subtracting: ‘five hundred and sixty-three’. Then discuss the hundreds, tens and ones components of the number, and how 500 + 60 can be partitioned into 400 + 160. The subtraction of the tens becomes ‘160 minus 70’, an application of subtraction of multiples of ten.

Example: 563 − 278, adjustment from the hundreds to the tens and the tens to the ones

$$\begin{array}{r} 500+60+3 \\ -\ 200+70+8 \\ \hline \phantom{0} \end{array} \qquad \begin{array}{r} 400+150+13 \\ -\ 200+\ \ 70+\ \ 8 \\ \hline 200+\ \ 80+\ \ 5 \end{array} \qquad \begin{array}{r} \overset{\overset{400}{\cancel{500}}}{\cancel{500}}+\overset{\overset{150}{\cancel{50}}}{\cancel{60}}+\overset{\overset{13}{13}}{\cancel{3}} \\ -\ 200+70+8 \\ \hline 200+80+5 \end{array} \qquad \begin{array}{r} \overset{4}{\cancel{5}}\ \overset{15}{\cancel{6}}\ \overset{13}{\cancel{3}} \\ -\ 2\ 7\ 8 \\ \hline 2\ 8\ 5 \end{array}$$

Here both the tens and the ones digits to be subtracted are bigger than both the tens and the ones digits you are subtracting from. Discuss how 60 + 3 is partitioned into 50 + 13, and then how 500 + 50 can be partitioned into 400 + 150, and how this helps when subtracting.

Example: 503 − 278, dealing with zeros when adjusting

$$\begin{array}{r} 500+\ \ 0+3 \\ -\ 200+70+8 \\ \hline \phantom{0} \end{array} \qquad \begin{array}{r} 400+90+13 \\ -\ 200+70+\ \ 8 \\ \hline 200+20+\ \ 5 \end{array} \qquad \begin{array}{r} \overset{\overset{400}{\cancel{400}}}{\cancel{500}}+\overset{\overset{90}{\cancel{100}}}{\cancel{0}}+\overset{\overset{13}{3}}{\cancel{3}} \\ -\ 200+70+8 \\ \hline 200+20+5 \end{array} \qquad \begin{array}{r} \overset{4}{\cancel{5}}\ \overset{9}{\cancel{0}}\ \overset{13}{\cancel{3}} \\ -\ 2\ 7\ 8 \\ \hline 2\ 2\ 5 \end{array}$$

Here 0 acts as a place holder for the tens. The adjustment has to be done in two stages. First the 500 + 0 is partitioned into 400 + 100 and then the 100 + 3 is partitioned into 90 + 13.

The expanded method leads children to the more compact method so that they understand its structure and efficiency. The amount of time that should be spent teaching and practising the expanded method will depend on how secure the children are in their recall of number facts and with partitioning.

## Stages in Multiplication

***Tables should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.***

Year 2 2, 5 and 10 times tables and related division facts.

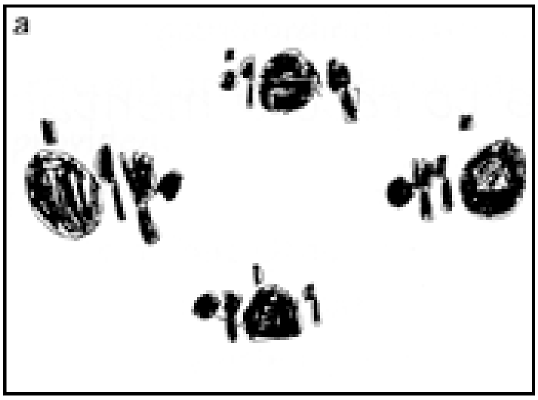
Year 3 2, 3, 4, 5, 6 and 10 times tables and related division facts.

Year 4 Derive and recall all multiplication facts up to 10 x 10 and related division facts.

Years 5 & 6 Derive and recall quickly all multiplication facts up to 10 x 10 and related division facts.

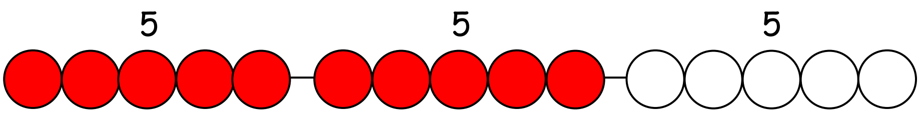
Informal methods

Begin with informal methods i.e. Practical work, pictorial representations, jumps along a number line (Make link to repeated addition) and arrays of numbers. * *See glossary*



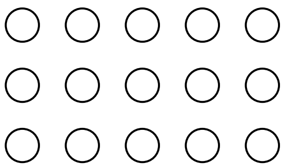
and on a bead bar:

5 x 3 = 5 + 5 + 5




**Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.

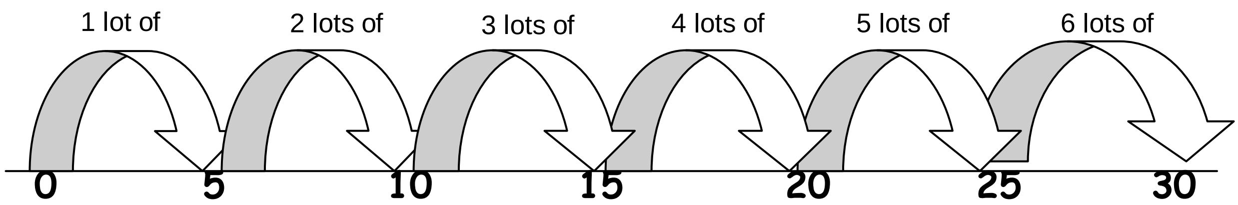


5 x 3 = 15

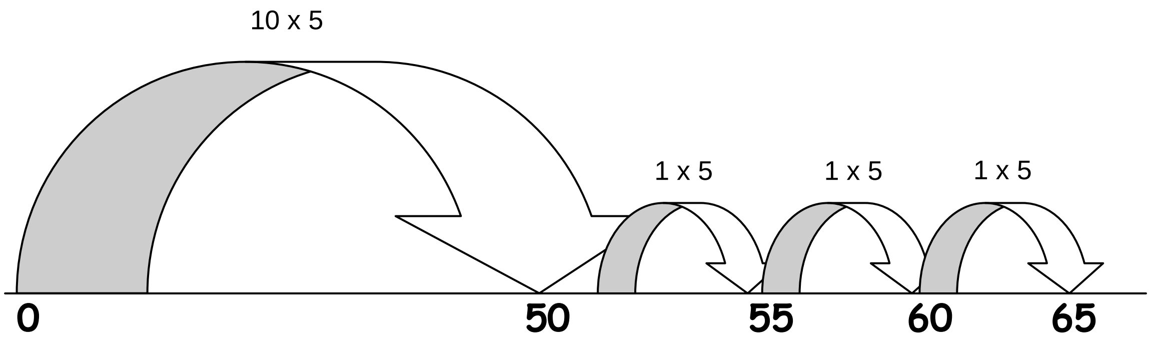
3 x 5 = 15

**Stage 1: The blank number lines**

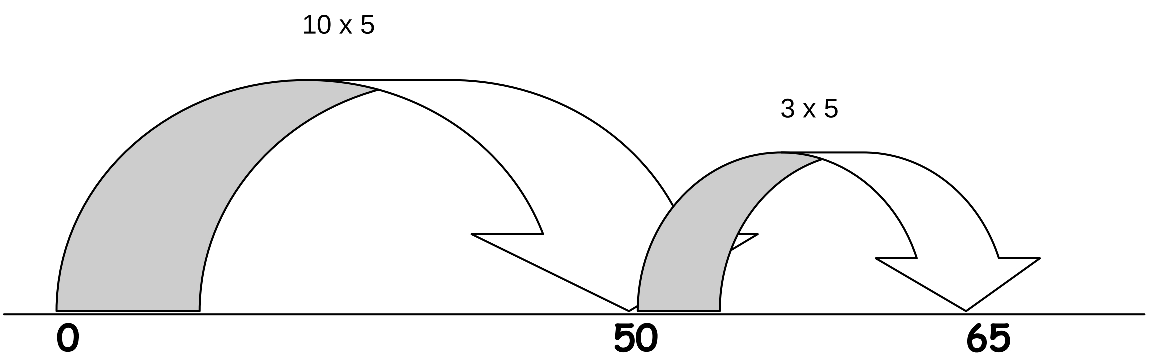
**6 x 5 = 30 example 1**




**13 x 5 = 65 example 2**




**13 x 5 = 65 example 3**




**Stage 2: Mental multiplication using partitioning**

16 x 3 = (10 x 3) + (6 x 3)
= 30 + 18
= 48

28 x 6 = (20 x 6) + (8 x 6)
= 120 + 48
= 168

**Stage 3: The grid method**
It is better to place the number with the most digits in the left-hand column of the grid so that it is easier to add the partial products.

**38 x 7 = 266 example 4**

$$38 \times 7 = (30 \times 7) + (8 \times 7) = 210 + 56 = 266$$

| X | 7 |
|---|---|
| 30 | 210 |
| 8 | 56 |
| | 266 |

- The next step is to move the number being multiplied (38 in the example shown) to an extra row at the top. Presenting the grid this way helps children to set out the addition of the partial products 210 and 56.
- The grid method may be the main method used by children whose progress is slow, whose mental and written calculation skills are weak and whose projected attainment at the end of Key Stage 2 is towards the lower end of level 4.

**Stage 4: Expanded short multiplication**

- The next step is to represent the method of recording in a column format, but showing the working. Draw attention to the links with the grid method above.
- Children should describe what they do by referring to the actual values of the digits in the columns. For example, the first step in 38 × 7 is ‘thirty multiplied by seven’,
- Most children should be able to use this expanded method for TU × U by the end of Year 4.

**38 x 7 = 266 example 5**

```
      30 + 8
   ×       7
+ ----------
         5 6    (7 x 8)
       2 1 0    (7 x 30)
  ----------
       2 6 6
  ----------
```

**Stage 5: Short multiplication – compact method**

- The recording is reduced further, with carry digits recorded below the line.

If, after practice, children cannot use the compact method without making errors, they should return to the expanded format of stage 4.

**38 x 7 = 266 example 6**

```
   3 8
   X 7
  -----
   266
  -----
   5
```

**Stage 6: Two – digit by two- digit products**

- Extend to TU × TU, asking children to estimate first.
- Start with the grid method. The partial products in each row are added, and then the two sums at the end of each row are added to find the total product.

**56 x 27 is approximately 60 x 30 = 1800** **example 7**

| X | 20 | 7 | |
|---|---|---|---|
| 50 | 1000 | 350 | 1350 |
| 6 | 120 | 42 | 162 |
| | | | 1512 |
| | | | 1 |

| | 50 | 6 | |
|---|---|---|---|
| X | 20 | 7 | |
| | 1000 | 350 | 1350 |
| | 120 | 42 | 162 |
| | | | 1512 |
| | | | 1 |

**Reduce the recording, showing the links to the grid method above.**

```
   56
X  27
 1000      50 x 20 = 1000
  120       6 x 20 = 120
  350       50 x 7 = 350
   42        6 x 7 = 42
 1512
  1
```

Reduce the recording further.
56 x 27 is approximately 60 x 30 = 1800

```
     56
X    27
   1120   56 x 20
    392   56 x 7
   1512
   1
```

**Stage 7: Three–digit by two-digit products**

- Extend to HTU × TU asking children to estimate first. Start with the grid method.
- It is better to place the number with the most digits in the left-hand column of the grid so that it is easier to add the partial products.

**286 x 29 is approximately 300 x 30 = 9000** example 8a

| X | 20 | 9 | |
|---|---|---|---|
| 200 | 4000 | 1800 | 5800 |
| 80 | 1600 | 720 | 2320 |
| 6 | 120 | 54 | 174 |
| | | | 8294 |
| | | | 1 |

```
  286
X  29
 4000   200 x 20 = 4000
 1600    80 x 20 = 1600
  120     6 x 20 =  120
 1800   200 x 9 = 1800
  720    80 x 9 = 720
   54     6 x 9 = 54
 8294
 1
```

**286 x 29 is approximately 300 x 30 = 9000** example 8b

| X | 10 | 2 | |
|---|---|---|---|
| 20 | 200 | 40 | 240 |
| 3 | 30 | 6 | 36 |
| 0.5 | 5 | 1 | 6 |
| | | | 282 |
| | | | 1 |

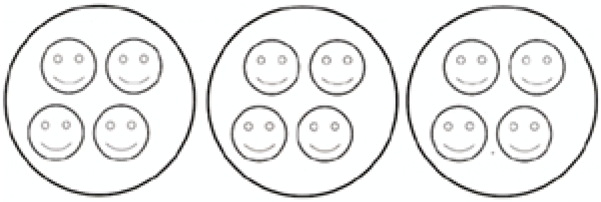
```
   23.5
X    12
    200   20 x 10
     30    3 x 10
      5   0.5 x 10
     40   20 x 2
      6    3 x 2
      1   0.5 x 2
    282
```

## Stages in Division

Division should be taught by starting with realistic problems and drawing out the maths. It is important for developing understanding that children are taught from the earliest stages that there are two aspects to division.

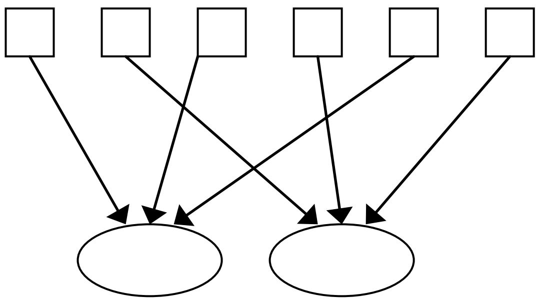
- Division as repeated subtraction
- Division as sharing

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.

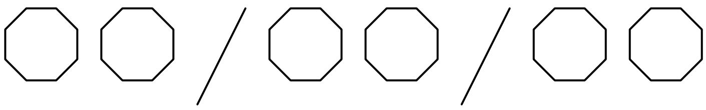


Children will develop their understanding of division and use jottings to support calculation

**Sharing equally**
6 sweets shared between 2 people, how many do they each get?

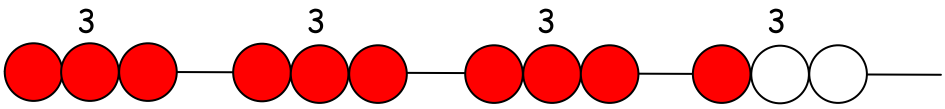


**Grouping or repeated subtraction**
There are 6 sweets, how many people can have 2 sweets each?



**Repeated subtraction using a bead bar**

12 ÷ 3 = 4




The bead bar will help children with interpreting division calculations such as 10 ÷ 5 as 'how many 5s make 10?'

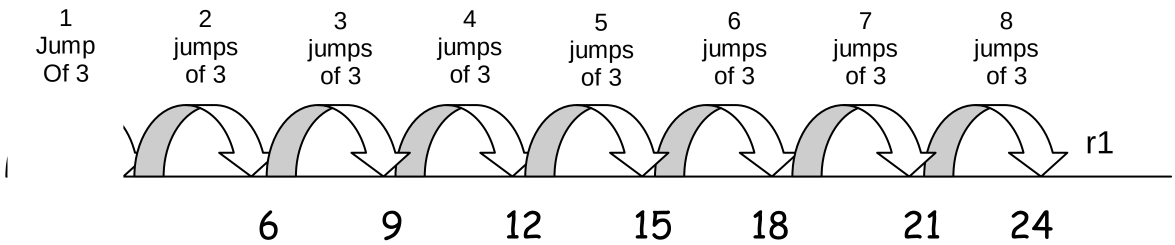
24 ÷ 6 can be thought of as 'How many 6's in 24?' or as 24 shared into 6 groups. Understanding both aspects of division will help children to solve division problems.

Until expanded methods are formally introduced division should be shown using ÷

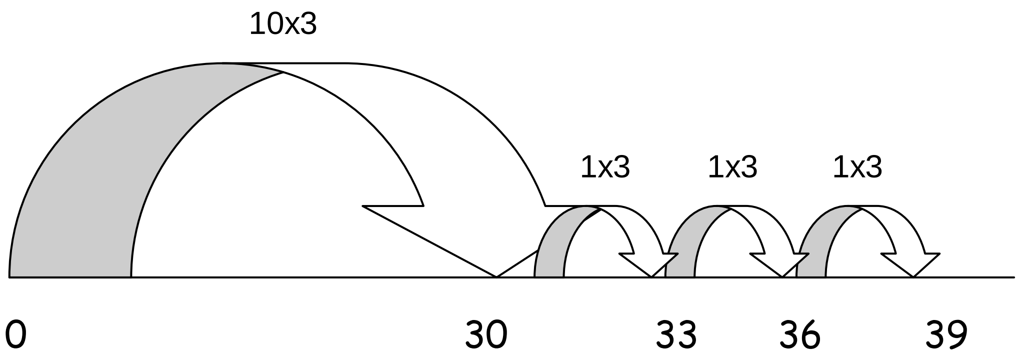
Recording should be done in a variety of ways to facilitate understanding.

**Stage 1: The blank number lines**

**25 ÷ 3 = 8 R1 example 1**




**13 example 2**



**Before beginning the chunking method use a blank number line to illustrate large chunks of the divisor.**

**Stage 2: Mental division using partitioning**
Also record mental division using partitioning:

**64 ÷ 4 = example 3**

$$
\begin{aligned}
64 \div 4 &= (40 + 24) \div 4 \\
&= (40 \div 4) + (24 \div 4) \\
&= 10 + 6 = 16
\end{aligned}
$$

$$
\begin{aligned}
87 \div 3 &= (60 + 27) \div 3 \\
&= (60 \div 3) + (27 \div 3) \\
&= 20 + 9 = 29
\end{aligned}
$$

Remainders after division can be recorded similarly.

$$
\begin{aligned}
96 \div 7 &= (70 + 26) \div 7 \\
&= (70 \div 7) + (26 \div 7) \\
&= 10 + 3 \text{ R } 5 = 13 \text{ R } 5
\end{aligned}
$$

**Stage 3: Short division of TU ÷ U**

- 'Short' division of TU ÷ U can be introduced as a more compact recording of the mental method of partitioning.
- Short division of a two-digit number can be introduced to children who are confident with multiplication and division facts and with subtracting multiples of 10 mentally, and whose understanding of partitioning and place value is sound.
- For most children this will be at the end of Year 4 or the beginning of Year 5.
- The accompanying patter is 'How many threes divide into 80 so that the answer is a multiple of 10?' This gives 20 threes or 60, with 20 remaining. We now ask: 'What is 21divided by three?' which gives the answer 7.

**81 ÷ 3 = 27** **example 4**

For 81 ÷ 3, the dividend of 81 is split into 60, the highest multiple of 3 that is also a multiple 10 and less than 81, to give 60 + 21. Each number is then divided by 3.

$$\begin{aligned} 81 \div 3 &= (60 + 21) \div 3 \\ &= (60 \div 3) + (21 \div 3) \\ &= 20 + 7 \\ &= 27 \end{aligned}$$

The short division method is recorded like this:

$$\begin{array}{r} 20 + \ 7 \\ 3\overline{)60 + 21} \end{array}$$

This is then shortened to:

$$\begin{array}{r} 2\ 7 \\ 3\overline{)8\ {}^{2}1} \end{array}$$

The carry digit '2' represents the 2 tens that have been exchanged for 20 ones. In the first recording above it is written in front of the 1 to show that 21 is to be divided by 3. In second it is written as a superscript.

The 27 written above the line represents the answer: 20 + 7, or 2 tens and 7 ones.

**Stage 4: 'Expanded' method for HTU ÷ U**

- This method, often referred to as 'chunking', is based on subtracting multiples of the divisor, or 'chunks'. Initially children subtract several chunks, but with practice they should look for the biggest multiples of the divisor that they can find to subtract.
- Chunking is useful for reminding children of the link between division and repeated subtraction.

**72 ÷ 5 = 14 R2 example 5**

```
 5 | 7 2
 -   5 0   (10 x 5)
     2 2
 -   2 0   (4 x 5)
       2
```

Answer: 10 + 4 = 14
14 remainder 2

Extend to larger numbers using this method

**256 ÷ 7 = 36 R4 example 6**

```
 7 | 2 5 6
 -     7 0   (10 x 7)
     1 8 6
 -   1 4 0   (20 x 7)
       4 6
 -     4 2   (6 x 7)
         4
```

Answer: 10 + 20 + 6 = 36    36 R4

The same method can be used for larger numbers and decimals. The chunking should reflect what the children can do mentally.

```
 24 | 1328
 -     960   (24 x 40)
       368
 -     240   (24 x 10)
       128
 -     120   (24 x 5)
         8        55 r 8
```

**764 ÷ 8 = 95.5 example 7**

8 | 764
- 640 (8 x 80)
124
- 80 (8 x 10)
44
- 40 (8 x 5)
4
- 4 (8 x 0.5)
0 95.5

**Short division method for able children**

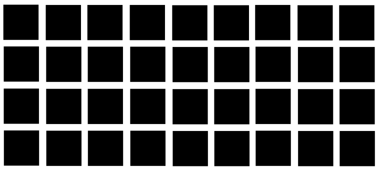
**81 ÷ 3 = 27 example 8**

**2 7**

**3 | 8 $_2$1**

## Glossary

**Array -** An ordered collection of counters, numbers etc. in rows and columns.



9 x 4 = 36

9 x 4 = 36

**Associative law –** Addition and subtraction are associative, that is if there are three numbers added, or multiplied together, it does not matter which pair of numbers is treated first, e.g. 2+ (3 + 4) = (2 + 3) + 4 and 2 x (3 x 4) = (2 x 3) x 4

**Chunking –** This is the name given to an expanded method used for division involving repeated subtraction or 'chunking'. This method works for all numbers and allows for different stages in the development in efficiency because it allows for variation in choosing the 'chunks' to be subtracted. This gives autonomy to the learner and allows a gradual progression to more efficiency without loss of understanding.

96 ÷ 6

```
     1 6
6 )  96
   - 60      10x6
     36
   - 36       6x6
      0
              ↓
Answer:      16
```

**Commutative law –** Addition and multiplication are commutative, that is the result does not depend on the order of the number, e.g. for addition 3 + 4 = 4 + 3 and for multiplication 3 x 4 = 4 x 3.
**Note subtraction and division are not commutative.**

**Decomposition –** Is a method of subtraction which breaks down (decomposes) the first line in the calculation, where necessary, to allow the subtraction to take place.

```
 614 1
  754
 -  86
  668
```

**Distributive law of multiplication –** Multiplication is distributive over addition (but addition is not distributive over multiplication).
E.g. 2 x (3 + 4) = (2 x 3) + (2 x 4)

Review date: September 2014