

# Helping your child with Calculation

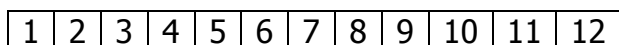
## Addition

### Year 1

Real objects and real-life situations should be used to support addition. For example: In the supermarket. I need 6 carrots, I already have 2, how many more do I need?

Bob has 5 Lego cards and his mum gives him 4 more? How many does he have now?

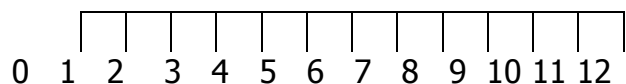
Number tracks



$$6 + 2 =$$

Place an object on the 6 and count on 2.

Number lines



$$5 + 4 =$$

Place an object on number 5 and count on 4.

The children also need to be able to recall number bonds to 10 and 20.

e.g.  $1 + 9 = 10$ ,  $2 + 8 = 10$ ,  $3 + 7 = 10$  and so on.

$1 + 19 = 20$ ,  $2 + 18 = 20$  and so on.

### Year 2

- **Starting with the biggest number and partition the second number**

e.g.  $15 + 16 =$        $16 + 15 = 16 + 10 + 5 =$

$$16 + 10 = 26$$

$$26 + 5 = 31$$

- **Add the 10s unit until there are no more and then add the units**

e.g.  $15 + 16 = (10 + 10 = 20 \text{ then } 5 + 6 = 11)$

$$20 + 11 = (20 + 10 = 30)$$

$$30 + 1 = 31$$

Knowing your number bonds is essential to this strategy.

- **Partitioning, adding the 10s and then the units**

e.g.  $15 + 26 =$

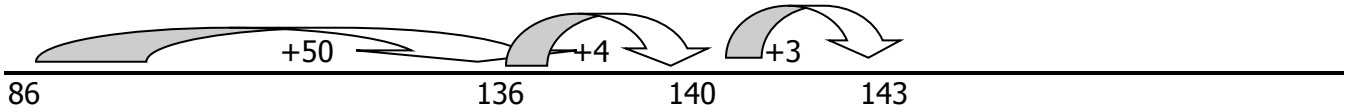
$$10 + 20 = 30$$

$$5 + 6 = 11$$

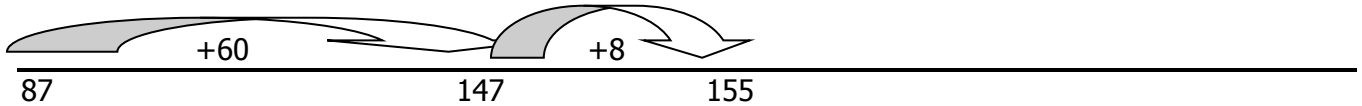
$$30 + 11 = 31$$

- **Using a blank number line**

$$86 + 57 = 86 + 50 + 7 = 136 + 7 = 143$$



$$87 + 68 = 87 + 60 = 147 + 8 = 155$$



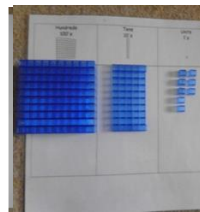
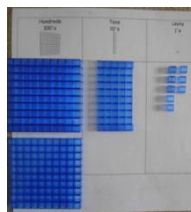
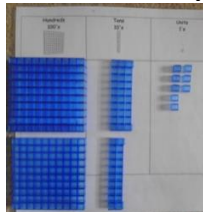
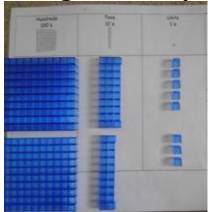
$$£1.46 + 83p = £1.46 + 80p = £2.26 + 3p = £2.29$$



**Year 3, 4, 5 and 6 – Written Calculation**

Written addition strategies are introduced in year 3, however the children will still be encouraged to use mental strategies when appropriate. The overall strategy will remain the same, however the values used will increase as the children progress through the school.

Using dienes (or Place Value counters)



Recording

$$\begin{array}{r} 235 \\ + 223 \\ \hline \end{array}$$

$$\begin{array}{r} 235 \\ + 223 \\ \hline 8 \end{array}$$

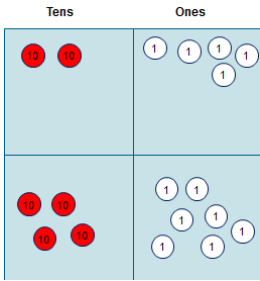
$$\begin{array}{r} 235 \\ + 223 \\ \hline 58 \end{array}$$

$$\begin{array}{r} 235 \\ + 223 \\ \hline 458 \end{array}$$

Script

1. "I have 2 hundred, 3 tens and 5 ones added to 2 hundreds, 2 tens and 3 ones."
2. "5 ones add 3 ones equals 7 ones."
3. "3 tens add 2 tens equals 5 tens."
4. "2 hundreds add 2 hundreds equals 4 hundreds."

## With exchanging



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

$$\begin{array}{r} 25 \\ + 47 \\ \hline 2 \\ 1 \end{array}$$

$$\begin{array}{r} 25 \\ + 47 \\ \hline 72 \\ 1 \end{array}$$

## Script

1. "I have two tens and five ones, which need adding to four tens and seven ones."
2. "I add five ones to seven ones, which gives me twelve ones."
3. "I exchange ten of my twelve ones for a ten counter."
4. "I add my three tens and four tens to make seven tens."  
"Altogether, I have seven tens and two ones."

## Addition with 3 digit numbers

$$\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \\ 1 \ 1 \end{array}$$

## Addition with Decimal numbers – usually in the context of money or measures

$$\begin{array}{r} 5.56 \\ + 2.49 \\ \hline 8.05 \\ 1 \ 1 \end{array}$$

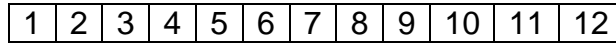
## Script

1. "I have 5 ones, 5 tenths and 6 hundredths which are to be added to 2 ones, 4 tenths and 9 hundredths."
2. "I have 6 hundredths add 9 hundredths equals 15 hundredths altogether. Exchange 10 hundredths for 1 tenth. This is 1 tenth and 5 hundredths." (record on the calculation)
3. "I have 5 tenths add 4 tenths add 1 tenths equals 10 tenths. Exchange the 10 tenths into 1 one. This is means I have 1 one and 0 tenths." (record on the calculation)
4. "I have 5 ones add 2 ones add 1 one which equals 8 ones."
5. I now have 8 ones, 0 tenths and 5 ones or 8.05

# Subtraction

As with addition real objects and real-life situations should be used to support addition. For example: Laura has 12 sweets and she gives her sister 4 sweets. How many has she got left?

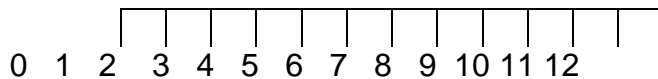
Number tracks



$12 - 4 =$

Place an object on the 12 and count back 4.

Number lines



$10 - 3 =$

Place an object on number 10 and count back 3.

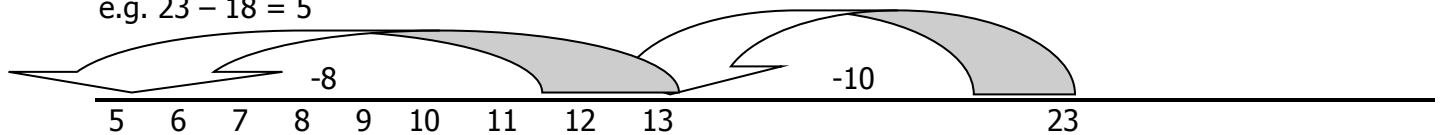
Children should also know subtraction fact to 10.

e.g.  $10 - 1 = 9$ ,  $10 - 2 = 8$  and so on.

## Year 2

### Counting back

e.g.  $23 - 18 = 5$



### Counting on

e.g.  $23 - 18 = 5$

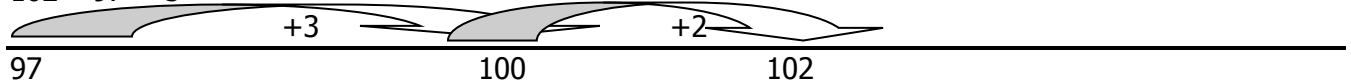
start at 18 and count up to 23 or to 20 and then 23

or  $102 - 97 = 5$

count from 97 to 102 or to 100 and then 102

Using a number line

$102 - 97 = 5$



## Using Inverse Operations

Inverse operations allow the children to complete calculations using know number facts.

$$34 + 27 = 61 \text{ therefore } 61 - 34 = 27 \text{ or } 61 - 27 = 34$$

This knowledge can them be used to solve problems e.g.

$$36 + ? = 92 \text{ so } 92 - 36 = ?$$

$$45 - ? = 25 \text{ so } 25 + ? = 45 \text{ therefore } 45 - 25 = 20$$

## Year 3, 4, 5 and 6 – Written calculation

As with addition, written strategies are introduced, however the children will still be encouraged to use mental strategies as appropriate. Initially the children will be using practical equipment as with addition. As the children progress through the school the use of equipment will lessen, and they will be using larger numbers.

$$\begin{array}{r} 98 \\ - 43 \\ \hline \end{array} \quad \begin{array}{r} 98 \\ - 43 \\ \hline 5 \end{array} \quad \begin{array}{r} 98 \\ - 43 \\ \hline 55 \end{array}$$

With exchanging

$$\begin{array}{r} 72 \\ - 47 \\ \hline \end{array} \quad \begin{array}{r} \overset{6}{\cancel{7}} \overset{1}{2} \\ - \underset{1}{4} \underset{7}{7} \\ \hline 5 \end{array} \quad \begin{array}{r} \overset{6}{\cancel{7}} \overset{1}{2} \\ - \underset{1}{4} \underset{7}{7} \\ \hline 25 \end{array}$$

Script

1. "I have seven tens and two ones. I need to subtract four tens and seven ones."
2. "At the moment, I cannot subtract seven ones from two ones, so I need to exchange one ten to become ten ones."
3. "Now I can take away seven ones from twelve ones, so that I have fives ones left."
4. "I can now subtract four tens from six tens, which leaves me with two tens."
5. "I recombine two tens and fives ones to understand that I am left with twenty-five."

## Subtraction with 3 digit numbers

$$\begin{array}{r} \overset{1}{3} \overset{6}{6} \overset{3}{3} \\ - \underset{1}{1} \underset{4}{4} \underset{7}{7} \\ \hline 6 \end{array} \quad \begin{array}{r} \overset{5}{3} \overset{1}{6} \overset{3}{3} \\ - \underset{1}{1} \underset{4}{4} \underset{7}{7} \\ \hline 16 \end{array} \quad \begin{array}{r} \overset{5}{3} \overset{1}{6} \overset{3}{3} \\ - \underset{1}{1} \underset{4}{4} \underset{7}{7} \\ \hline 216 \end{array}$$

This strategy can also be used with decimal numbers usually in the context of money and measures.

# Multiplication

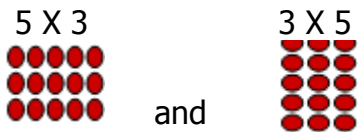
## Year 1

Use objects, pictorial representations and arrays to show the concept of multiplication:



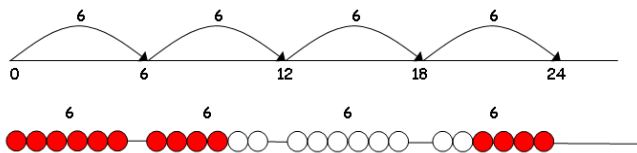
## Year 2

Arrays:



Number lines:

$$6 \times 4 = 24$$



So: 'Six taken four times'

## Year 3 and 4

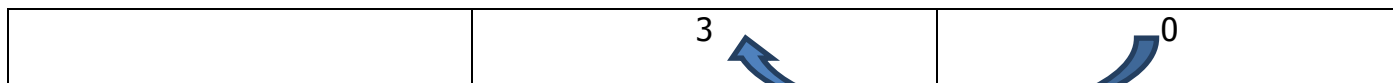
### Method to multiply by 10

Using dienes, place value counters, straw bundles



Using place value grid

H	T	1s
		3

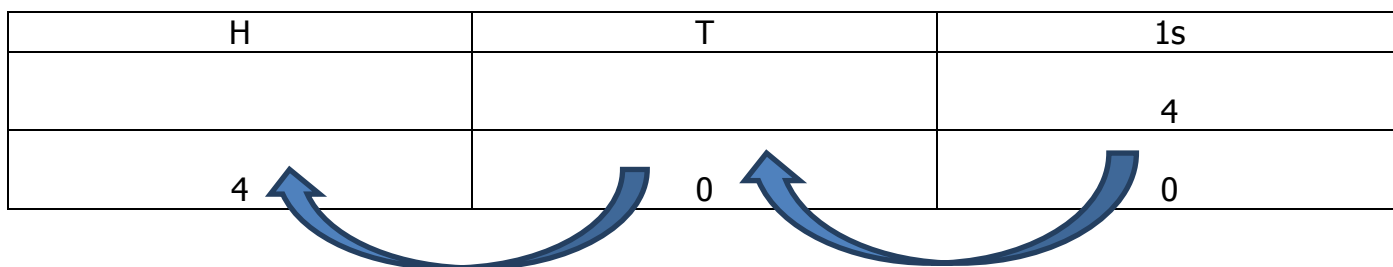


Move the digit one place to the left and use a place holder

Multiplying by 100



Using place value grid



Move the digit 2 places to the left and use 2 place holders.

### Year 3 – multiplication using place value

$$23 \times 7 = (7 \times 3) + (7 \times 20) = 161$$

$$21 + 140 = 161$$

Teacher Model

1. If we have  $23 \times 7$ .
2. I would partition the number 23 into 20 and 3.
3. There are then 2 calculations  $7 \times 3$  and  $7 \times 20$ .
4.  $7 \times 3 = 21$
5.  $7 \times 20$  can be made easier by using the related fact  $7 \times 2 = 14$ , so  $7 \times 20 = 140$
6. I now have the answers to each calculation and I need to add them together
7.  $140 + 21 = 161$
8. So  $23 \times 7 = 161$

## Written Methods

1. Year 3	2. Year 4	3. Year 5 and 6
$\begin{array}{r} 23 \\ \times 7 \\ \hline 21 \text{ (7 x 3)} \\ +140 \text{ (7 x 20)} \\ \hline 161 \end{array}$	$\begin{array}{r} 23 \\ \times 7 \\ \hline 161 \\ 2 \end{array}$	$\begin{array}{r} 18 \\ \times 13 \\ \hline 54 \\ 2 \\ \hline 180 \\ 234 \end{array}$

## Script

Example 2.

1. I have  $23 \times 7$
2. I always start with the ones so  $7 \text{ ones} \times 3 \text{ ones} = 21 \text{ ones}$ . I can exchange 20 ones in to 2 tens, so I can put the 1 one into the ones column and exchange the **2 tens** into the tens column.
3. I then have  $7 \times 2 \text{ tens} = 14 \text{ tens}$ . If I add the 2 tens I have already exchanged I will have 16 tens.
4.  $10 \text{ tens} = 100$  so I can put 1 hundred in the hundreds column and 6 tens in the tens column.
5. So  $23 \times 7 = 161$

Example 3.

1. "I have 18 multiplied by 13."
2. "I always start with the ones, so  $3 \text{ ones} \times 8 \text{ ones} = 24 \text{ ones}$ . I can exchange 20 ones into 2 tens, so I can put the 4 ones into the ones column and the exchanged 2 tens into the tens column.
3. " $3 \times 1 \text{ ten} = 3 \text{ tens}$  added to the exchanged 2 tens = 5 tens. Record the 5 tens in the tens column.
4. " $1 \text{ ten} \times 8 \text{ ones}$ . Because I am multiplying by a tens number I can make this simpler and use  $1 \times 8 = 8$  or 8 tens. I can then use a place holder in the ones column and add the 8 tens to the tens column."
5. "The final step is  $100 \times 100$ . Because I am multiplying by 100s I make this simpler and use  $1 \times 1 = 1$  or 1 hundred. I can then place the 1 hundred in the hundreds column."



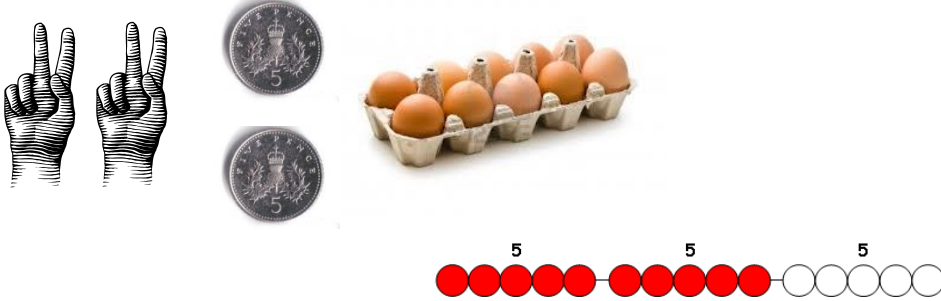
**Decimals** This would be in the context of money and measures

<p><b>1. Year 3</b> <math>£5.70 \times 4 =</math></p> <p>Covert £5.70 into pence = 570p</p> $\begin{array}{r} 570 \\ \times 4 \\ \hline 0 \text{ (4x 0)} \\ 280 \text{ (4x 70)} \\ \underline{2000} \text{ (4x 500)} \\ \underline{2280} \end{array}$ <p>2280 pence is £22.80</p>	<p><b>2. Year 4</b> <math>£5.70 \times 4 =</math></p> <p>Covert £5.70 into pence = 570p</p> $\begin{array}{r} 570 \\ \times 4 \\ \hline 2280 \\ 2 \end{array}$ <p>2280 pence is £22.80</p>	<p><b>3. Year 5 and 6</b> <math>£5.70 \times 24 =</math></p> <p>Covert £5.70 into pence = 570p</p> $\begin{array}{r} 570 \\ \times 24 \\ \hline 2280 \\ 2 \\ 11400 \\ \underline{\quad 1} \\ \underline{13680} \end{array}$ <p>13680 pence is £136.80</p>
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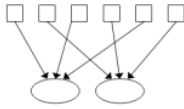
# Division

## Year 1

Use objects, pictorial representations and arrays to show the concept of division as grouping and sharing.



“Two children share six pencils between them”



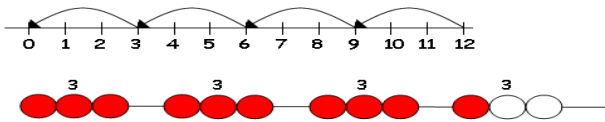
“Six children are asked to get into three equal groups”



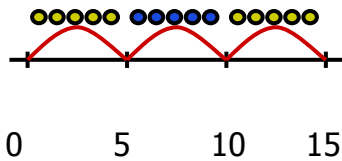
## Year 2

Number lines and arrays:

$$12 \div 3 = 4$$



$$15 \div 5 = 3$$



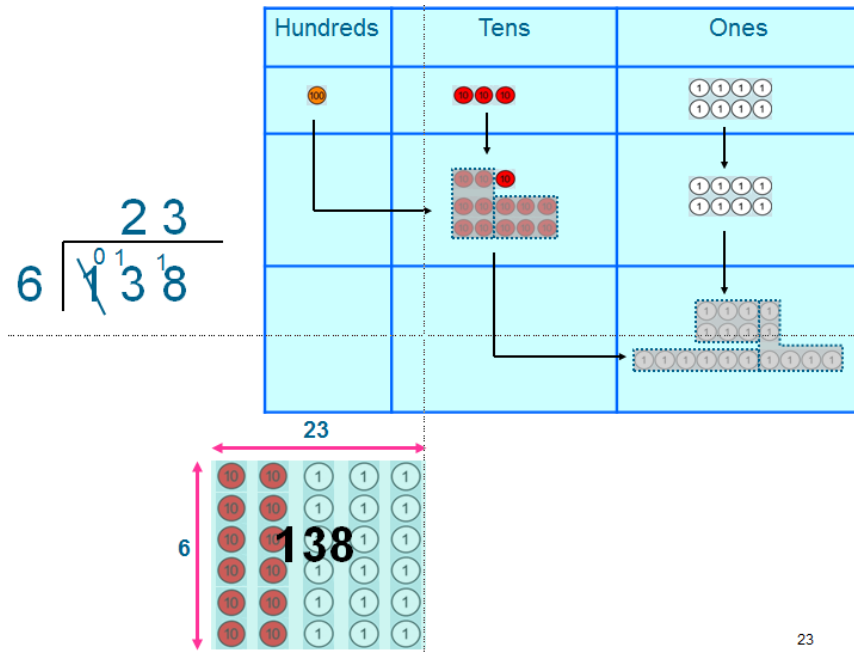
## Year 3

Children need to have a good understanding of division as the inverse of multiplication and should be able to recall related division facts, e.g.  $45 \div 5 = 9$  and  $45 \div 9 = 5$  because  $5 \times 9 = 45$

## Year 3, 4, 5 and 6

### Garage Method – short division

$$138 \div 6 = 23$$



23

### Teacher Model

1. "I have 138 divided by 6 or 1 hundred 3 tens and 8 ones divided by 6."
2. "I have 1 hundred (counter), can I share this between 6? No I need to exchange this into 10 tens." (record the exchange)
3. "Now I have 13 tens, which I can share between 6. Two tens each and one ten remaining" (record the 2 tens)
4. "The one remaining ten I can exchange into 10 ones." (record the exchange)
5. "I now have 18 ones which can be shared equally between 6. 3 ones each" (record the 3 ones)
6. "So 138 divided by 6 equals 23."

## Year 5 and 6 – Long Division

Long division:

Remainders should be interpreted in the following ways when long division is used:

- as whole numbers
- as fractions
- through rounding in an appropriate way to the context

$$432 \div 15 = 28 \frac{4}{5}$$

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{- 30} \phantom{0} \\ 132 \\ \underline{- 120} \\ 12 \end{array}$$

20 x 15

8 x 15

$$\frac{\cancel{12}}{\cancel{15}} = \frac{4}{5}$$

Answer:  $28 \frac{4}{5}$

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## Decimals

This will be in the context of money and measures and can be converted into an easier value, e.g £24.98 becomes 2498p, as with multiplication.