



Beecroft Academy

**Calculation Policy
December 2014**



Addition



- Practical counting of objects in a group
- Say the number that is one more
- Recognition of numerals
- Match numerals to groups of objects

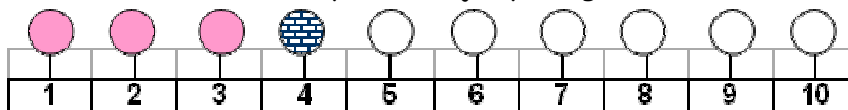
- Counting two groups of objects to find a total
- Record these groups in preferred way

- Read and understand a number sentence using standard symbols
- Write a number sentence to match two groups of objects
- Begin to understand that addition can be done in any order

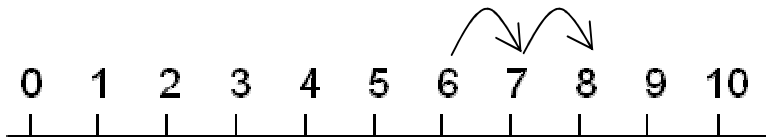
$$3 + 2 = 2 + 3$$

$$a + b = b + a$$

- Use numbered number line to do practical jumps (e.g. three and one more)



- Record addition jumps on a simple number line (e.g. 6+2)

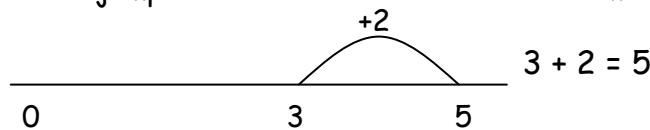


- Visual aid of a 100 square for adding tens and ones

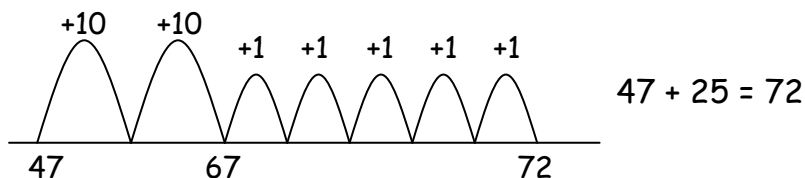
- Use the same method but increase numbers beyond 10.

(The above steps may need to be repeated as larger numbers are introduced)

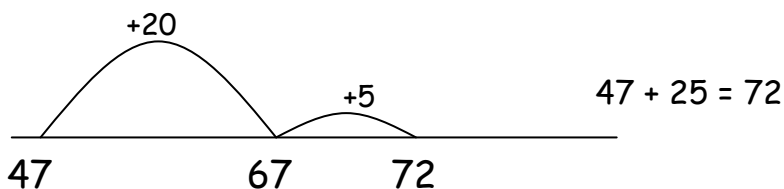
- Use empty number line to jump on and record the horizontal number sentence to go with it.



- Increase to two two-digit numbers or three-digit numbers, using partitioning skills. Extend to adding three numbers together in this way.



$$47 + 25 = 72$$



$$47 + 25 = 72$$

Vocabulary

+
add
addition
plus
and
more
altogether
total
equals
balance
sum
much
increase
same as
make
equals
inverse
near double

Regular number bond practice and recall of facts
↓
Make estimates for calculations

- When the previous methods are secure children may wish to record in one of the ways below as opposed to the number line.

Partitioning (both numbers)

$$36 + 45 = 30 + 40 + 6 + 5$$

$$= 70 + 11$$

$$= 81$$

Partition (one number)

$$36 + 45 = 36 + 40 + 5$$

$$= 76 + 5$$

$$= 81$$

Rounding and adjusting:

$$36 + 45 = 36 + 50 - 5$$

$$= 86 - 5$$

$$= 81$$

- Vertical column addition - adding the most significant digits first.

$$\begin{array}{r}
 427 \\
 + 328 \\
 \hline
 700 \\
 40 \\
 \underline{15} \\
 755
 \end{array}$$

Understanding that addition is commutative means that the hundreds do not have to be added first, any order of adding will give the same total. It is possible to add with the least significant digits first.

$$\begin{array}{r}
 427 \\
 + 328 \\
 \hline
 15 \\
 40 \\
 \underline{700} \\
 755
 \end{array}$$

- This makes it possible to record the vertical method more quickly by making a note of multiples of 10 or 100 rather than writing it all out.

$$\begin{array}{r}
 68 \\
 + 26 \\
 \hline
 14 \\
 \underline{80} \\
 94
 \end{array}$$

becomes

$$\begin{array}{r}
 68 \\
 + 26 \\
 \hline
 \underline{94} \\
 1
 \end{array}$$

(This method would **not normally be used before Year 5**, and even then there is **no hurry** to move to this.)

- Carrying can now be introduced.

$$\begin{array}{r}
 789 \\
 + 642 \\
 \hline
 1431 \\
 \hline
 11
 \end{array}$$

Answer: 1431

Other examples for addition :

Money

$$\begin{array}{r}
 \pounds 12.74 \\
 + \pounds 13.35 \\
 \hline
 \pounds 26.09 \\
 \hline
 1
 \end{array}$$

Answer : £26.09

Make estimates for calculations

Regular number bond practice and recall of facts

Decimals

Pupils can then use either the expanded or compact method with larger numbers or decimals.

$$\begin{array}{r} 53.2 \\ + 4.9 \\ \hline 58.1 \\ 1 \end{array}$$

$$\begin{array}{r} 28.53 \\ + 9.7 \\ + 5.32 \\ \hline 43.55 \\ 21 \end{array}$$

Fractions

Adding fractions where the denominator is the same

$$\frac{2}{7} + \frac{3}{7} = \frac{5}{7}$$

Please note:

- Use of any method is appropriate depending on the type of calculation.
- Practise choosing the most appropriate method for a variety of calculations.
- Apply methods learnt and use confidently in a range of situations





Subtraction



- Practical situations and discussion some recording of numbers
- Practical counting of objects in a group
- Say the number that is one less than another
- Recognition of numerals and match numerals to groups of objects
- Count a group of objects, take some away and count again
- Record this process in preferred way
- Read and understand a number sentence using standard symbols
- Write a number sentence to match a group of objects with some removed
- Create own number sentence
- Reinforce that subtracting means you are trying to find the difference between the numbers
- Use a hundred square/number line to find the difference between two numbers.
- Write related horizontal number sentence

Vocabulary

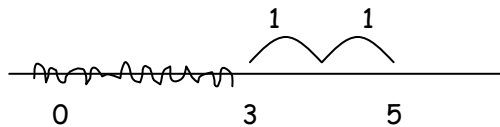
-
- subtract
- less than
- minus
- difference
- decrease
- between
- take away
- count on
- leave
- left over
- gone
- fewer
- half
- halve
- equals
- inverse

- Use a numbered number line to do practical jumps.

'Count on' to 'find the difference' between simple numbers.

$$5 - 3 = ?$$

We count on from 3 up to 5 to find the difference

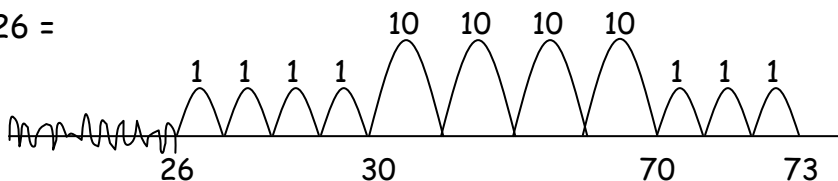


$$\text{So } 5 - 3 = 2$$

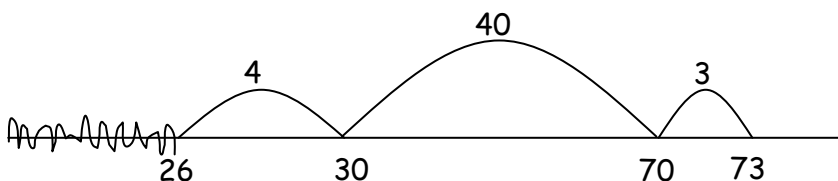
- Reinforce inverse operations and checking of calculations
- Move on to using higher numbers and partitioning.

Write related horizontal number sentence.

$$73 - 26 =$$



Or,



$$\text{So } 73 - 26 = 47$$

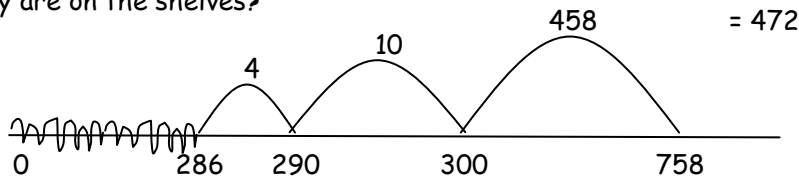
Either counting forwards or backwards

Regular number bond practice and recall
(with associated facts)
↓
Make estimates for calculations

- This method is extended to larger numbers

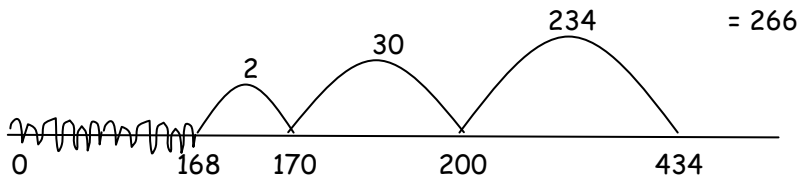
$$758 - 286 =$$

The library owns 758 books. 286 of them are out on loan.
How many are on the shelves?



$$\text{So } 758 - 286 = 472$$

The number line method may be developed into a vertical method by finding what to add to make the next multiple of 1, 10, 100 etc.



$$\text{So } 434 - 168 = 266$$

Initially the number line and the vertical method will be recorded side by side.

$$\begin{array}{r} 434 \\ - 168 \\ \hline 2 \text{ (170)} \\ 30 \text{ (200)} \\ \hline 234 \text{ (434)} \\ \hline 266 \end{array}$$

Regular number bond practice and recall (with associated facts)

Make estimates for calculations

874 - 523 becomes

$$\begin{array}{r} 874 \\ - 523 \\ \hline 351 \end{array}$$

Answer: 351

932 - 457 becomes

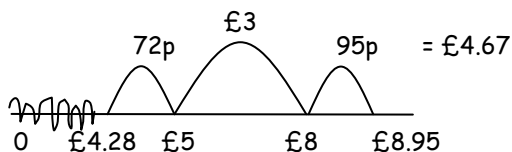
$$\begin{array}{r} 8 \ 12 \ 1 \\ \cancel{9} \ \cancel{3} \ 2 \\ - 4 \ 5 \ 7 \\ \hline 4 \ 7 \ 5 \end{array}$$

Answer: 475

Other examples

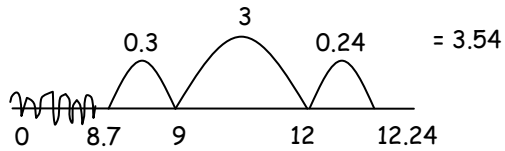
Money

Toby wants to buy a CD costing £8.95, he has already saved up £4.28 towards the cost. How much more money does he need to buy the CD?



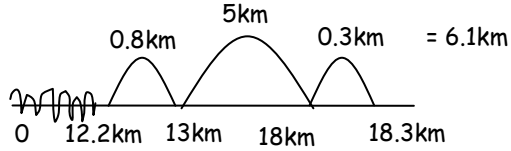
Decimals

At sports day one year, Helen completed her race in 12.24 seconds. Her older brother ran the race 8.7 seconds faster than she did. What was his time?



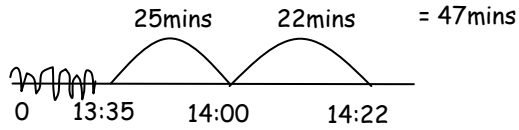
Distance

The distance from Riseley to Bedford is 12.2km and Riseley to Ampthill is 18.3km. How far is it from Bedford to Ampthill?



Time

James arrived at the train station at 13:35 and his train left at 14:22. How long did he wait at the station for?



Fractions

Subtracting fractions where the denominator is the same

$$\frac{5}{7} - \frac{3}{7} = \frac{2}{7}$$

Please note:

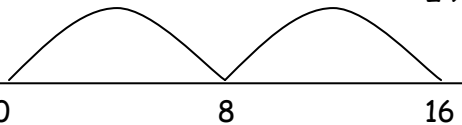
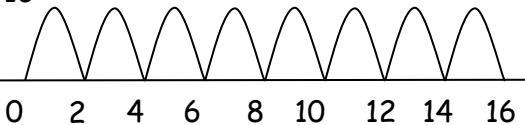
- Use of any method is appropriate depending on the type of calculation.
- Practise choosing the most appropriate method for a variety of calculations.
- Apply methods learnt and use confidently in a range of situations





Multiplication



<ul style="list-style-type: none"> • Making equal groups of objects - How many altogether? 		Vocabulary
<ul style="list-style-type: none"> • Repeated Addition - three groups of 2 • Lots of 2's 5's 10's • Add another group 		times
<ul style="list-style-type: none"> • Drawing objects in groups. 		groups of
<ul style="list-style-type: none"> • Match numerals to groups of objects. 		multiply
<ul style="list-style-type: none"> • Record numbers, possibly in a horizontal sentence along with drawings 		product
<ul style="list-style-type: none"> • Use x sign to indicate groups of 		lots of
<ul style="list-style-type: none"> • Draw arrays (arrangements of dots/marks) • Write related horizontal calculations. <div style="text-align: center;"> $\begin{array}{ccccccc} * & * & * & * & * & * & * \\ * & * & * & * & * & * & * \end{array} \quad 8 \times 2 = 16$ $2 \times 8 = 16$ </div> <div style="text-align: right; margin-right: 50px;"> $\left(\begin{array}{l} 16 \div 2 = 8 \\ 16 \div 8 = 2 \end{array} \right)$ </div>		multiplied by sets of multiple of once twice repeated- addition array row column
<ul style="list-style-type: none"> • Regular times table practice begins. 		
<ul style="list-style-type: none"> • Make the connection with the inverse and matching division facts 		
<ul style="list-style-type: none"> • Use a number line or hundred square to count on in groups of a number. • Record the horizontal number sentence to go with it. • Use a number line to jump forward in groups and record the horizontal number sentence to go with it. <div style="text-align: center;"> $8 \times 2 = 16$ $2 \times 8 = 16$ </div> <div style="display: flex; justify-content: space-around;">   </div> <p>(I count on in groups of 8/lots of 8) (I count on in groups of 2/lots of 2)</p>		Regular number times table practice and recall (with associated facts)
<ul style="list-style-type: none"> • Write horizontal number sentences and use partitioning <div style="text-align: center;"> $\begin{aligned} 8 \times 23 &= 8 \times 10 + 8 \times 10 + 8 \times 3 \\ &= 80 + 80 + 24 \\ &= 184 \end{aligned}$ </div>		

- This develops into the grid method

X	10	10	3	
8	80	80	24	=184

leading to

X	20	3	
8	160	24	= 184

The grid method can then be used for 2-digit by 2-digit multiplication.

$66 \times 34 =$

X	60	6	
30	1800	180	
4	240	24	
	= 2040	= 204	= 2244

Or

X	60	6	
30	1800	180	= 1980
4	240	24	= 264
			= 2244

This is extended to larger numbers

2035×17

X	2000	30	5	
10	20000	300	50	
7	14000	210	35	
	= 34000	= 510	= 85	= 34595

Short multiplication

24×6 becomes:

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ \hline \end{array}$$

Answer: 144

342×7 becomes:

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ \hline \end{array}$$

Answer: 2394

Make estimates for calculations

Regular times table practice (with associated division facts)

Decimals

For multiplication with decimals equivalent calculations can be used

$$3.4 \times 0.68 \text{ (consider } 34 \times 68 \text{ as a similar calculation)}$$

Adjust numbers involved by multiples of 10 or 100 to create an integer sum

$$3.4 \times 0.68 = 2.312$$

$$\begin{array}{l} \downarrow \times 10 \\ 34 \end{array} \times \begin{array}{l} \downarrow \times 100 \\ 68 \end{array} = \begin{array}{l} \uparrow \div 1000 \\ 2.312 \end{array}$$

$$34 \times 68 = 2312$$

X	60	8	
30	1800	240	
4	240	32	
	= 2040	= 272	= 2312

Please note:

- Use of any method is appropriate depending on the type and context of calculation.
- In problem solving situations practise choosing the most appropriate method for a variety of calculations.
- Apply methods learnt and use confidently in a range of situations
- Ongoing consolidation of times tables and related division facts
- Instant recall of 2, 5, 10, 3, 4, 6, 7, 8, 9 times tables (usually in that order)

Age appropriate timetables:

Year 1 : N/A (As a school we encourage children to learn the 2, 5 and 10 timetables)

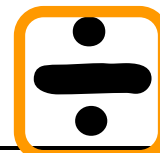
Year 2: recall the 2, 5 and 10 times tables.

Year 3: recall multiplication facts 2, 3, 4, 5, 8 and 10

Year 4 : All timetables up to 12 x12



Division



<ul style="list-style-type: none"> • Sharing objects into equal groups 	<p><u>Vocabulary</u></p> <p>divide</p> <p>divided by</p> <p>divided into</p> <p>how many</p> <p>each</p> <p>share</p> <p>left</p> <p>left over</p> <p>group</p> <p>equally</p> <p>goes into</p> <p>remainder</p> <p>divisible</p> <p>factor</p> <p>quotient</p> <p>inverse</p>				
<ul style="list-style-type: none"> • Repeated subtraction/addition 					
<ul style="list-style-type: none"> • Discussion and practical activities 					
<ul style="list-style-type: none"> • Drawing objects and splitting into groups 					
<ul style="list-style-type: none"> • Match numerals to groups 					
<ul style="list-style-type: none"> • Write a horizontal sentence along with drawings of groups of objects 	<p>Regular times table practice and recall (with associated facts)</p> <p>Make estimates for calculations</p>				
<ul style="list-style-type: none"> • Use ÷ sign to indicate sharing/grouping 					
<ul style="list-style-type: none"> • Draw arrays (arrangements of dots/marks) • Write related horizontal calculations. <div style="text-align: center; margin-top: 10px;"> $16 \div 8 = 2$ $16 \div 2 = 8$ </div>					
<ul style="list-style-type: none"> • Regular times table practice begins. 					
<ul style="list-style-type: none"> • Make the connection with the inverse and matching multiplication facts. 					
<ul style="list-style-type: none"> • Use a number line to jump forward in groups from 0 to the number being divided into and record the horizontal number sentence to go with it (without remainders) <div style="text-align: center; margin-top: 10px;"> <table style="border: none;"> <tr> <td style="padding: 0 20px;">* * * * *</td> <td style="border-left: 1px solid black; padding: 0 10px; vertical-align: middle;"> $2 \times 8 = 16$ $8 \times 2 = 16$ </td> </tr> <tr> <td style="padding: 0 20px;">* * * * *</td> <td></td> </tr> </table> </div> <p style="font-size: small; margin-top: 10px;">(I start at zero and count in 8s until I get to 16) (I start at zero and count in 2's until I get to 16)</p>		* * * * *	$2 \times 8 = 16$ $8 \times 2 = 16$	* * * * *	
* * * * *		$2 \times 8 = 16$ $8 \times 2 = 16$			
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<p>This method can also be used with larger numbers</p>					

Place value understanding is needed to count **on** in multiples of the divisor.

For many pupils, the addition of an 'I Know' box can be very beneficial

<p>I Know</p> <p>$6 \times 10 = 60$</p> <p>$6 \times 20 = 120$</p> <p>$6 \times 30 = 180$</p> <p>$6 \times 40 = 240$</p> <p>$6 \times 50 = 300$</p> <p style="color: red;">(too many)</p> <p style="color: red;">so I will use</p> <p style="color: red;">6×40</p>	<p>$259 \div 6 =$</p> <p>$6 \times 40 = 240$ $6 \times 3 = 18$</p> <p style="text-align: right;">so $259 \div 6 = 43 \text{ r } 1$</p>
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A tabular way of recording multiples of the divisor can be used

$874 \div 7$

$7 \times$	Running Total
$\times 100 = 700$	700
$\times 20 = 140$	840
$\times 4 = 28$	868
$\times 124$	$+ 6 = 874$

I Know	
$7 \times 1 = 7$	so $7 \times 10 = 70$
$7 \times 2 = 14$	so $7 \times 20 = 140$
$7 \times 3 = 21$	so $7 \times 30 = 210$
$7 \times 4 = 28$	so $7 \times 40 = 280$

So $874 \div 7 = 124 \text{ r } 4$

Short division

98 divided 7 becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

432 divided by 5

$$\begin{array}{r} 86 \text{ r} 2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer : 86 remainder 2

Make estimates for calculations

Regular times table practice (with associated division facts)

The remainder can be written as a fraction (simplifying fractions where possible and then using equivalent decimals)

$$674 \div 6 = 112 \text{ r } 2 = 112 \frac{2}{6} = 112 \frac{1}{3}$$

$$3786 \div 4 = 946 \text{ r } 2 = 946 \frac{2}{4} = 946 \frac{1}{2} = 946.5$$

$$\frac{2}{6} \quad \frac{1}{3}$$

$$\frac{2}{4} \quad \frac{1}{2}$$

Please note:

- Use of any method is appropriate depending on the type of calculation.
- Practise choosing the most appropriate method for a variety of calculations.
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- Instant recall of 2, 5, 10, 3, 4, 6, 7, 8, 9 times tables (usually in that order)

