

Gig Mill

PRIMARY SCHOOL



“Together We Care”

“Together We Succeed”

Progression in
Calculation
Reception—Year 6

Dear Parents/Carers

We are now able to provide an electronic copy of our calculation booklet. Each family can download their own copy to work from at home. A paper copy can be requested from the office. All four operations are included with examples of the methods used throughout the school. The booklet shows a progression throughout the whole school with a strong emphasis on mental and written methods. To support their learning at home, your child should develop the strategy that they use in their classroom. It is important that they feel happy and confident in the methods they use.

This booklet can be used to support maths homework or any additional learning you may choose to focus on.

If you would like example calculations, specific to your child's needs, their class teacher would be happy to help. We hope that these booklets give guidance and support to all ages!

Have fun using them.

Yours sincerely

The Maths Team

Revised March 2019

Mental Calculations— Addition

Question	Name of Strategy	Example
$46 + 53$	Partitioning	$40 + 50 = 90$ $6 + 3 = 9$ = 99
$7 + 16 + 3$	Looking for bonds	$7 + 3 = 10$ $10 + 16$ = 26
$65 + 67$	Near Doubles	Double 65 = 130 $130 + 2$ = 132
$59 + 25$	Adjusting	$59 + 25 = 60 + 24$ or $60 + 25 (-1)$ = 84

Subtraction

Question	Name of Strategy	Example
$72 - 47$	Counting On	How many do you count on from 47 to 72? = 25
$72 - 68$	Counting Back	How many do you count back from 72 to 68? = 4
$97 - 54$	Partitioning	$90 - 50 = 40$ $7 - 4 = 3$ = 43
$64 - 26$	Partition smaller number	$64 - 20 = 44$ $44 - 6$ = 38

Multiplication

Question	Name of Strategy	Example
15×12	Partitioning	$15 \times 10 = 150$ $15 \times 2 = 30$ = 180
24×6	Adjusting both parts	Halve 24 = 12 Double 6 = 12 12×12 = 144
49×6	Adjusting single part	$= 50 \times 6 = 300$ $= -6$ = 294
23×4	Double doubling ($\times 2, \times 2 = \times 4$)	$23 \times 2 = 46$ $46 \times 2 = 94$ = 94

Division

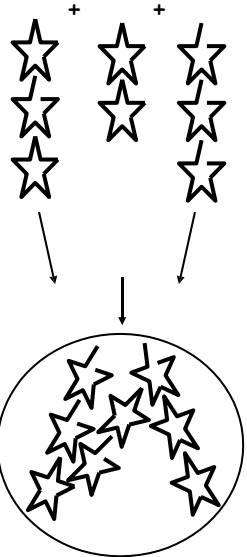

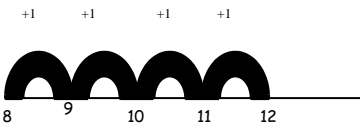

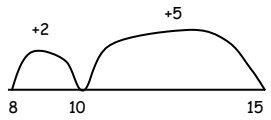

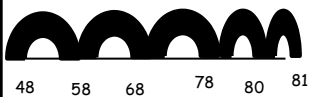

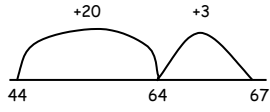
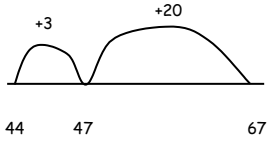
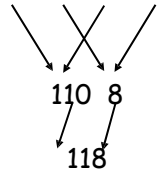
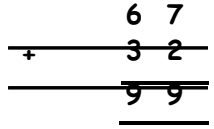
Question	Name of Strategy	Example
$85 \div 5$	Partitioning	How many 5's are in 80? 16 How many 5's are in 5? 1 = 17
$162 \div 6$	Grouping	$10 \times 6 = 60$, so, $20 \times 6 = 120$, so, $25 \times 6 = 150$, $2 \times 6 = 12$ so, $27 \times 6 = 162$ = 27
$88 \div 4$	Halve and halve again ($\div 2, \div 2 = \div 4$)	$88 \div 2 = 44$ $44 \div 2 = 22$ = 22



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Calculation Strategies - ADDITION



<p>Develop understanding through practical modelling, activities and discussions.</p>  <p>Use a blank number line to record single digit additions.</p> <p>Count up in steps of one. Without crossing the tens boundary.</p>	<p>$2 + 6 =$</p>  <p>Moving on to:</p> <p>Then count up in steps of one crossing the tens boundary.</p> <p>$8 + 4 =$</p>  <p>Counting up in steps of greater than one where appropriate.</p> <p>$5 + 7 =$</p>  <p>Counting up to a multiple of ten, the desired amount.</p>	<p>$8 + 7 =$</p>  <p>Move on to counting up from any 2 digit number .</p> <p>$48 + 33 =$</p>  <p>$48 + 33 =$</p>  <p>$48 + 33 =$</p> 	<p>Moving on to using a blank number line to add in the most efficient way. (TO+TO)</p> <p>$44 + 23$ Counting on in tens then units.</p>  <p>$44 + 23$ Counting on in units then tens.</p>  <p>Alongside the written calculation children should have an efficient mental method</p>	<p>Mental method - $75 + 43 =$ $(70 + 5) + (40 + 3)$</p>  <p>Written method - If confident: Teach how to only partition one number, for example: $75 + 43$ $70 + 40 = 110$ $5 + 3 = 8$ $110 + 8$ Extend to - $75 + 40 + 3$ $= 115 + 3 = 118$</p> <p>Then: Column addition — no carrying up to HTO</p> 
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Calculation Strategies - ADDITION



Using the column addition method with carrying

Use the words
'carry ten' and
'carry hundred',
not 'carry one'.

First

TO + TO

$$\begin{array}{r} 67 \\ + 85 \\ \hline 152 \\ 11 \end{array}$$

Then

HTO + TO

$$\begin{array}{r} 267 \\ + 85 \\ \hline 352 \\ 11 \end{array}$$

Then

HTO + HTO

$$\begin{array}{r} 267 \\ + 285 \\ \hline 552 \\ 11 \end{array}$$

$$\begin{array}{r} 2467 \\ + 785 \\ \hline 3252 \\ 111 \end{array}$$

Record the carry
digits below the
line.

Moving on to

ThHTO + ThHTO

$$\begin{array}{r} 6584 \\ + 5848 \\ \hline 12432 \\ 1111 \end{array}$$

Using column addition to add several numbers
together,

$$\begin{array}{r} 6584 \\ 2213 \\ 564 \\ + 48 \\ \hline 9409 \\ 121 \end{array}$$

Then

Add numbers with 1
decimal place.

$$\begin{array}{r} 46.7 \\ + 78.6 \\ \hline 125.3 \\ 111 \end{array}$$

Then onto 2 decimal
places.





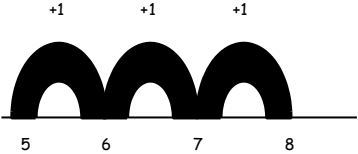
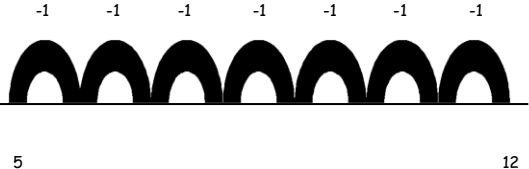
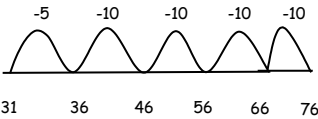
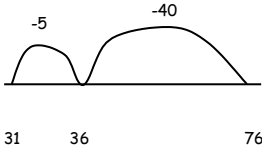
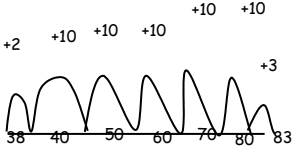
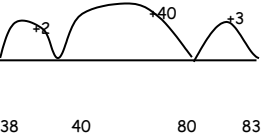
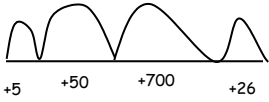
$$\begin{array}{r} 46.73 \\ + 78.60 \\ \hline 125.33 \\ 111 \end{array}$$



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Calculation Strategies - SUBTRACTION



<p>Develop understanding through practical modelling, activities and discussions.</p> <p>For example:</p>  <p>6 socks were on a washing line. 2 got blown away. How many were left?</p>  <p>A cat stole one sock. How many were left?</p>  	<p>Subtract by counting up on a blank number line.</p> <p>Count up in steps of one without crossing the tens barrier. Add up the jumps to give the answer.</p> <p>$8 - 5 =$</p>  <p>Then:</p> <p>Count back in steps of one crossing the tens boundary.</p> <p>$12 - 5 = 7$</p> 	<p>Use concrete apparatus including number lines and a range of pictorial representations—</p> <p>Move on to counting back from any 2 digit number. Then add up the jumps to give the answer.</p> <p>$76 - 45 = 31$</p>  <p>Extend the blank number line method by counting back in more efficient steps.</p> 	<p>Encourage children to subtract mentally using the following models.</p> <p>$83 - 38$</p>  <p>$83 - 38$</p>  <p>$826 - 45$</p> 	<p>Written method</p> <p>Column method—no exchange</p> $\begin{array}{r} 87 \\ - 32 \\ \hline 55 \end{array}$ <p>Introduce exchange using practical equipment such as diennes, Cuisenaire, multilink and counters.</p> <p>With standard notation:</p> $\begin{array}{r} 2 145 14 \\ - 1 8 6 \\ \hline 0 6 8 \end{array}$
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Calculation Strategies - SUBTRACTION



Start with 3 digits.

$$234 - 198$$

$$\begin{array}{r} \overset{1}{2} \overset{12}{3} \overset{14}{4} \\ - 198 \\ \hline 36 \end{array}$$

Then move on to 4 digits.

$$8146 - 4729$$

$$\begin{array}{r} \overset{7}{8} \overset{11}{1} \overset{14}{4} \overset{16}{6} \\ - 4729 \\ \hline 3417 \end{array}$$

Encourage children to spot questions that can be done mentally.

For example:

$$652 - 348 = ???$$

$$654 - 350 = 304$$

$$2008 - 1999 =$$

Include examples of decomposition with more than one zero.

$$\begin{array}{r} 4910 \\ - 362 \\ \hline 138 \end{array}$$

	2	9	
	2	9	10
-		5	7
	2	4	3

Moving on to
Subtraction with decimals to 1 d.p.

$$\begin{array}{r} \overset{7}{8} \overset{12}{3} . \overset{16}{6} \\ - 47 . 9 \\ \hline 35 . 7 \end{array}$$

Then
Subtraction with decimals to 2 d.p.

$$\begin{array}{r} \overset{2}{3} \overset{13}{4} \overset{16}{7} . \overset{11}{2} \overset{1}{6} \\ - 189 . 58 \\ \hline 157 . 68 \end{array}$$





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Calculation Strategies - MULTIPLICATION



Develop understanding through practical modelling, activities and discussions.

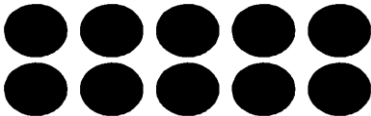
Activities might include:

- Counting pairs of objects.
- Counting in twos by physically jumping along a number line.
- Counting the wheels on the bikes in the playground (in twos/threes)
- Counting fingers (in fives/tens).

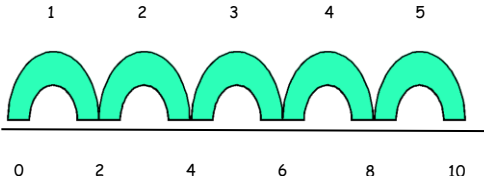


Understand multiplication using repeated addition in the 1, 2, and 5 times tables.

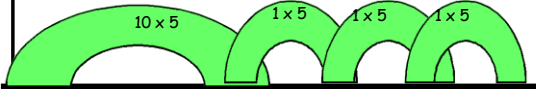
: Use arrays

$$5 \times 2 = 10$$
$$2 \times 5 = 10$$


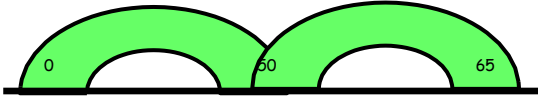
Use a number line to understand repeated addition.

$$5 \times 2 =$$


Consolidate and extend understanding of repeated addition— 13×5



Move on to changing the calculation around to be more efficient, where appropriate. Extend to partitioning on a number line for $TO \times O$

$$13 \times 5$$
$$10 \times 5$$
$$3 \times 5$$


Mental calculation to be introduced

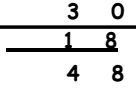
$$38 \times 7 = (30 \times 7) + (8 \times 7)$$
$$= 210 + 56$$
$$= 266$$

Extend to using number line methods with all tables to 12×12 . Move on to grid method— when children are confident introduce the short method alongside it so children can become familiar with it and then use it.

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Grid method— 16×3

x	10	6
3	30	18



Short Multiplication

$$\begin{array}{r} 67 \\ \times 4 \\ \hline 268 \end{array}$$

Record the carry digits below the line.

Extend use of the grid method to $TO \times TO$

x	50	6
20	1000	120
3	150	18

$$\begin{array}{r} 1000 \\ 150 \\ 120 \\ + 18 \\ \hline 1288 \end{array}$$

Moving on to the Standard (long) method for $TO \times TO$.

Long Multiplication

$$\begin{array}{r} 38 \\ \times 57 \\ \hline 266 \\ 1900 \\ \hline 2166 \end{array}$$

Extend to no partitioning down the side— 30×7 etc



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Calculation Strategies - DIVISION



Develop understanding of **Sharing/Grouping** through practical modelling, activities and discussions.

Activities might include:

Sharing of fruit at café time.



Sharing sweets on a child's birthday



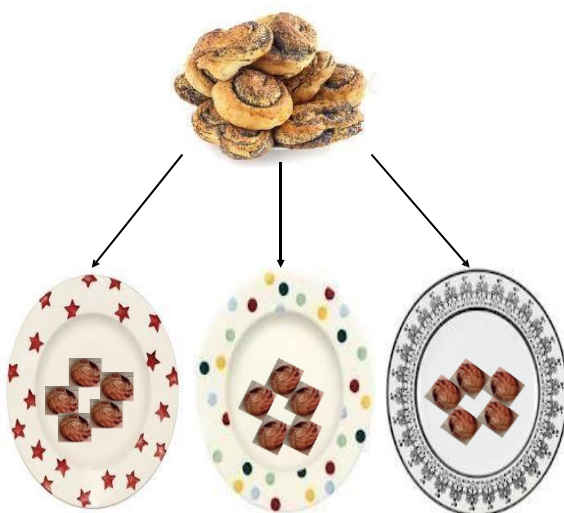
Sharing activities in the role play area or maths area.



Introduce sharing, use apparatus and arrays to model.

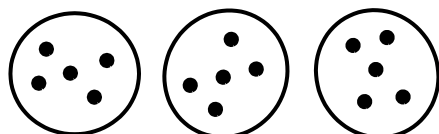
$$15 \div 3$$

For example:
Share 15 cakes out on to 3 plates.



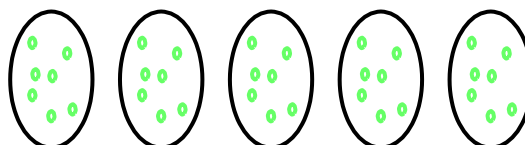
Share out 1 by 1. To get the answer, count how many cakes are on each plate.

Children may record with circles and dots.



Consolidate sharing using larger numbers. (Remainders with this method when ready).

$$35 \div 5$$

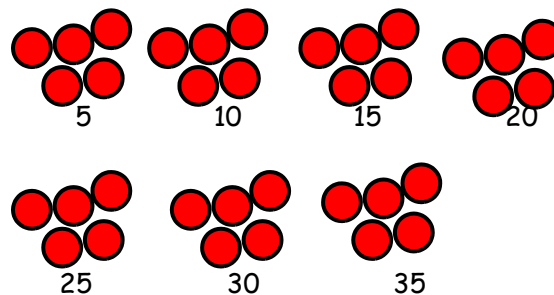


Sharing = How many dots in each circle?

Introduce the more efficient method of grouping as this leads to chunking in later year groups.

$$35 \div 5$$

How many groups of 5 make 35?
Make groups of 5. Till you get to 35.

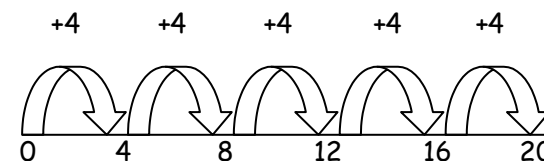


To get the answer, Count how many groups there are.

Then introduce the number line method for division. (Counting up)

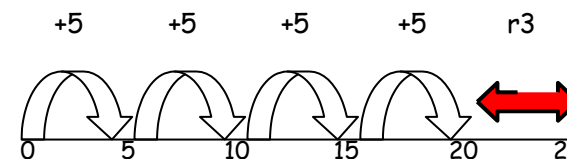
$$20 \div 4 =$$

How many jumps of four until you get to 20?



Continue until children are confident and then introduce remainders using this method.

$$23 \div 5 =$$





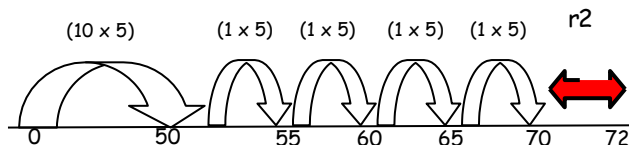
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Calculation Strategies - DIVISION

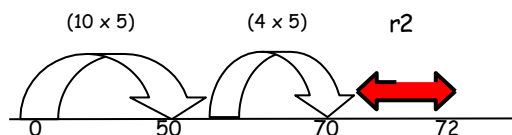


Introduce the concept of making more efficient jumps.

$$72 \div 5$$



To an even more efficient method



Introduce the chunking method when making efficient steps on a number line.

USE FACT BOXES—SEE EXAMPLE!

Start with simple examples that only require a single chunk of 10 lots of the divisor.

Progress to examples that require more than one chunk of 10.

$$87 \div 3 =$$

$$\begin{array}{r} 3 \overline{) 87} \\ - 30 \quad (10 \times 3) \\ \hline 57 \\ - 30 \quad (10 \times 3) \\ \hline 27 \\ - 27 \quad (9 \times 3) \\ \hline 0 \\ \hline = 29 \end{array}$$

Progress to remainders with TO ÷ O
 $75 \div 4 =$

$$\begin{array}{r} 4 \overline{) 75} \\ - 40 \quad (10 \times 4) \\ \hline 35 \\ - 32 \quad (8 \times 4) \\ \hline 3 \\ \hline = 18 \text{ r } 3 \end{array}$$

The remainder

Then quickly progress to HTO ÷ O.

Once the children are confident then make more efficient jumps, rather than 10 x

$$\begin{array}{r} 7 \overline{) 229} \\ - 210 \quad (30 \times 7) \\ \hline 19 \\ - 14 \quad (2 \times 7) \\ \hline 5 \\ \hline = 32 \text{ r } 5 \end{array}$$

Then move on to HTO ÷ TO using chunking.

$$\begin{array}{r} 26 \overline{) 967} \\ - 520 \quad (20 \times 26) \\ \hline 447 \\ - 260 \quad (10 \times 26) \\ \hline 187 \\ - 130 \quad (5 \times 26) \\ \hline 57 \\ - 52 \quad (2 \times 26) \\ \hline 5 \\ \hline = 37 \text{ r } 5 \end{array}$$

Introduce fact boxes alongside chunking -

A fact box for 13 will look like this -

$$1 \times 13 = 13$$

$$2 \times 13 = 26 \text{ (double } 1 \times 13)$$

$$10 \times 13 = 130$$

$$5 \times 13 = 65 \text{ (halve } 10 \times 13)$$

$$20 \times 13 = 260 \text{ (double } 10 \times 13)$$

Use the largest **CHUNK** possible.

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Once the children are confident with long division then move on to the short division or bus stop method.

Long Division

$$\begin{array}{r} 0175 \text{ r } 11 \\ 14 \overline{) 2461} \\ \underline{14} \\ 106 \\ \underline{98} \\ 81 \\ \underline{70} \\ 11 \end{array}$$

Short division (compact) method—Bus stop method

Ensure a clear explanation of how the method works.

$$87 \div 3 =$$

$$\begin{array}{r} 29 \\ 3 \overline{) 87} \end{array}$$

then

$$583 \div 4 =$$

$$\begin{array}{r} 145 \text{ r } 3 \\ 4 \overline{) 583} \end{array}$$

