

Calculation Guidelines for Foundation Stage

ADDITION

SUBTRACTION

MULTIPLICATION

DIVISION

Children begin to record in the context of play or practical activities and problems.

Begin to relate addition to combining two groups of objects

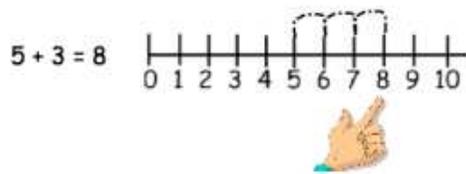
- Make a record in pictures, words or symbols of addition activities already carried out.
 - Construct number sentences to go with practical activities
 - Use of games, songs and practical activities to begin using vocabulary
- Solve simple word problems using their fingers



$$5 + 1 = 6$$

Can find one more to ten.

Higher Ability/ Gifted and Talented children progress to using a number line. They jump forwards along the number line using finger.



Begin to relate subtraction to 'taking away'

- Make a record in pictures, words or symbols of subtraction activities already carried out
- Use of games, songs and practical activities to begin using vocabulary
- Construct number sentences to go with practical activities
- Relate subtraction to taking away and counting how many objects are left.



$$5 - 1$$



$$= 4$$



$$5 - 1 = 4$$

Can find one less to ten.

Higher Ability/ Gifted and Talented Progression:

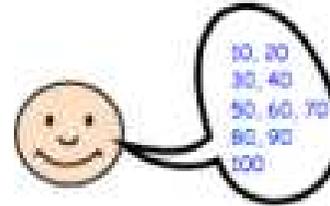


Counting backwards along a number line using finger.

Real life contexts and use of practical equipment to count in repeated groups of the same size:

- Count in twos; fives; tens

Also chanting in 2s, 5s and 10s.



Share objects into equal groups

Use related vocabulary

Activities might include:

- Sharing of milk at break time
- Sharing sweets on a child's birthday
- Sharing activities in the home corner
- Count in tens/twos
- Separate a given number of objects into two groups (addition and subtraction objective in reception being preliminary to multiplication and division)

Count in twos, tens
How many times?
How many are left/left over?
Group
Answer
Right, wrong
What could we try next?
How did you work it out?
Share out
Half, halve

ADDITION GUIDELINES

Year One

+ = signs and missing numbers

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

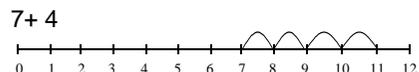
$$\begin{aligned} 2 &= 1 + 1 \\ 2 + 3 &= 4 + 1 \\ 3 &= 3 \\ 2 + 2 + 2 &= 4 + 2 \end{aligned}$$

Missing numbers need to be placed in all possible places.

$$\begin{array}{ll} 3 + 4 = & = 3 + 4 \\ 3 + = 7 & 7 = + 4 \\ + 4 = 7 & 7 = 3 + \\ + \nabla = 7 & 7 = + \nabla \end{array}$$

The Number Line

Children use a numbered line to count on in ones. Children use number lines and practical resources to support calculation and teachers *demonstrate* the use of the number line.



Year Two

+ = signs and missing numbers

Continue using a range of equations as in Year 1 but with appropriate, larger numbers.

Extend to

$$14 + 5 = 10 +$$

and

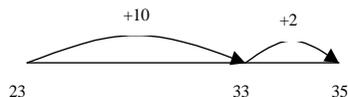
$$32 + \quad + \quad = 100 \quad 35 = 1 + \quad + 5$$

Partition into tens and ones and recombine

$$\begin{aligned} 12 + 23 &= 10 + 2 + 20 + 3 \\ &= 30 + 5 \\ &= 35 \end{aligned}$$

Count on in tens and ones

$$\begin{aligned} 23 + 12 &= 23 + 10 + 2 \\ &= 33 + 2 \\ &= 35 \end{aligned}$$



The Empty Number Line:

Partitioning and bridging through 10.

The steps in addition often bridge through a multiple of 10

e.g.

Children should be able to partition the 7 to relate adding the 2 and then the 5.

$$8 + 7 = 15$$

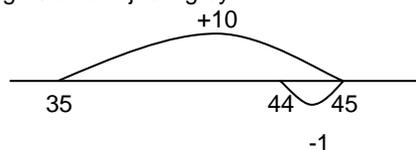


Add 9 or 11 by adding 10 and adjusting by 1

e.g.

Add 9 by adding 10 and adjusting by 1

$$35 + 9 = 44$$



Year Three

+ = signs and missing numbers

Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.

Partition into tens and ones

- Partition both numbers and recombine.
- Count on by partitioning the second number only

$$\begin{aligned} 36 + 53 &= 53 + 30 + 6 \\ &= 83 + 6 \\ &= 89 \end{aligned}$$



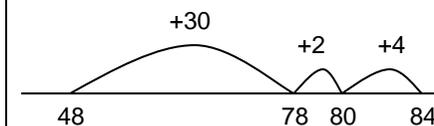
Add a near multiple of 10 to a two-digit number

Secure mental methods by using a number line to model the method. Continue as in Year 2 but with appropriate numbers

e.g. $35 + 19$ is the same as $35 + 20 - 1$.

Children need to be secure adding multiples of 10 to any two-digit number including those that are not multiples of 10.

$$48 + 36 = 84$$



pencil and paper procedures

$$83 + 42 = 125$$

either

1. Vertical expansion

$$\begin{array}{r} 83 \\ + 42 \\ \hline 5 \\ \hline 120 \\ \hline 125 \end{array}$$

or

2. Horizontal expansion

$$\begin{aligned} 80 + 3 \\ + 40 + 2 \\ \hline 120 + 5 = 125 \end{aligned}$$

SUBTRACTION GUIDELINES

Year One

- = signs and missing numbers

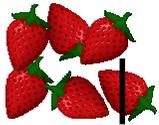
$$7 - 3 = \quad = 7 - 3$$

$$7 - \quad = 4 \quad 4 = \quad - 3$$

$$- 3 = 4 \quad 4 = 7 - \quad$$

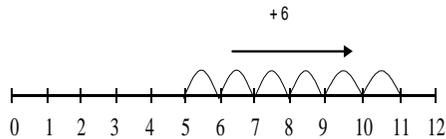
$$- \nabla = 4 \quad 4 = \quad - \nabla$$

- Understand subtraction as 'take away'



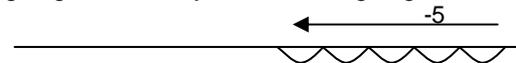
- Find a 'difference' by counting up;

I have saved 5p. The socks that I want to buy cost 11p. How much more do I need in order to buy the socks?



- Use practical and informal written methods to support the subtraction of a one-digit number from a one digit or two-digit number and a multiple of 10 from a two-digit number.

I have 11 toy cars. There are 5 cars too many to fit in the garage. How many cars fit in the garage?



Use the vocabulary related to addition and subtraction and symbols to describe and record addition and subtraction number sentences

Recording by

- drawing jumps on prepared lines
- constructing own lines

Year Two

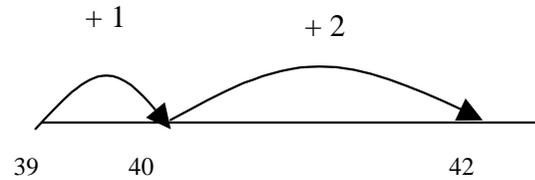
- = signs and missing numbers

Continue using a range of equations as in Year 1 but with appropriate numbers.

Extend to $14 + 5 = 20 -$

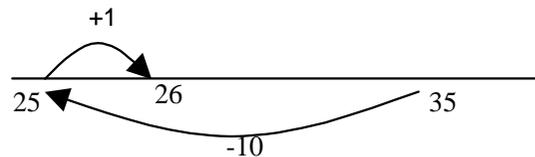
Find a small difference by counting up

$$42 - 39 = 3$$



Subtract 9 or 11. Begin to add/subtract 19 or 21

$$35 - 9 = 26$$



Use known number facts and place value to subtract

(partition second number only)

$$37 - 12 = 37 - 10 - 2$$

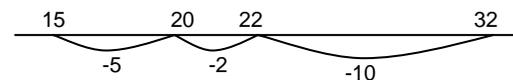
$$= 27 - 2$$

$$= 25$$



Bridge through 10 where necessary

$$- 17$$



32

Year Three

- = signs and missing numbers

Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Find a small difference by counting up

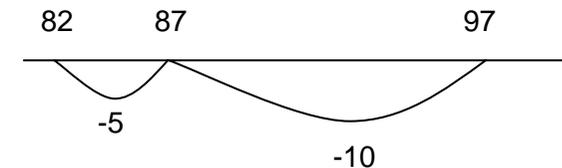
Continue as in Year 2 but with appropriate numbers e.g. $102 - 97 = 5$

Subtract mentally a 'near multiple of 10' to or from a two-digit number

Continue as in Year 2 but with appropriate numbers e.g. $78 - 49$ is the same as $78 - 50 + 1$

Use known number facts and place value to subtract

Continue as in Year 2 but with appropriate numbers e.g. $97 - 15 = 72$

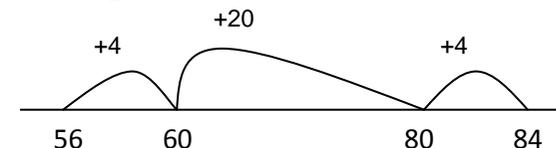


With practice, children will need to record less information and decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations such as $57 - 12$, $86 - 77$ or $43 - 28$.

Pencil and paper procedures

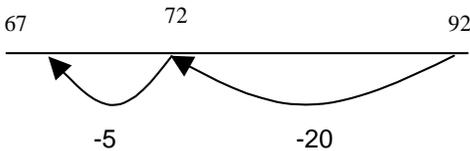
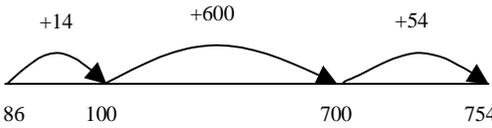
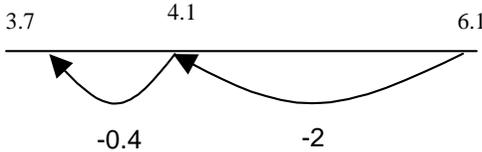
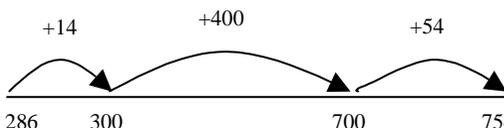
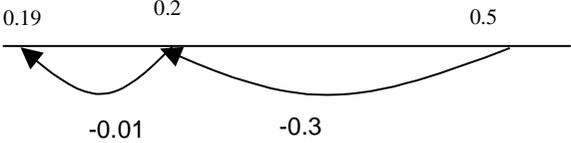
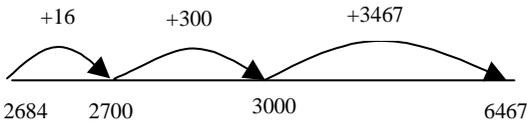
Complementary addition

$$84 - 56 = 28$$

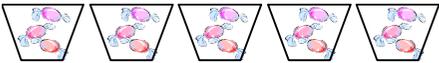
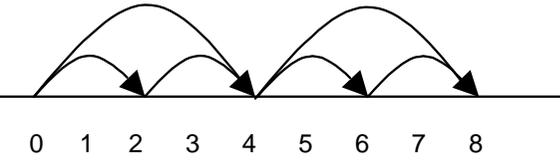
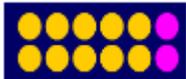


SUBTRACTION GUIDELINES

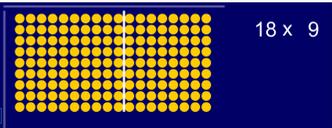
(- = signs and missing numbers: Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.)

Year Four	Year Five	Year Six
<p><u>Find a small difference by counting up</u> e.g. $5003 - 4996 = 7$ This can be modelled on an empty number line (see complementary addition below). Children should be encouraged to use known number facts to reduce the number of steps.</p> <p><u>Subtract the nearest multiple of 10, then adjust.</u> Continue as in Year 2 and 3 but with appropriate numbers.</p> <p><u>Use known number facts and place value to subtract</u> $92 - 25 = 67$</p> <div style="text-align: center;">  </div> <p style="text-align: right;">Pencil</p> <p><u>and paper procedures</u> Complementary addition $754 - 86 = 668$</p> <div style="text-align: center;">  </div> <p>For those children with a secure mental image of the number line they could record the jumps only:</p> $754 - 86 = 668$ $\begin{array}{r} 14 \text{ (100)} \\ 600 \text{ (700)} \\ \underline{54 \text{ (754)}} \\ 668 \end{array}$	<p><u>Find a difference by counting up</u> e.g. $8006 - 2993 = 5013$ This can be modelled on an empty number line (see complementary addition below).</p> <p><u>Subtract the nearest multiple of 10 or 100, then adjust.</u> Continue as in Year 2, 3 and 4 but with appropriate numbers.</p> <p><u>Use known number facts and place value to subtract</u> $6.1 - 2.4 = 3.7$</p> <div style="text-align: center;">  </div> <p style="text-align: right;">Pencil</p> <p><u>and paper procedures</u> Complementary addition $754 - 286 = 468$</p> <div style="text-align: center;">  </div> <p>OR $754 - 286 = 468$</p> $\begin{array}{r} 14 \text{ (300)} \\ 400 \text{ (700)} \\ \underline{54 \text{ (754)}} \\ 468 \end{array} \quad \text{can be refined to} \quad \begin{array}{r} 14 \text{ (300)} \\ \underline{454 \text{ (754)}} \\ 468 \end{array}$ <p>Reduce the number of steps to make the calculation more efficient. <i>Extend to 2 places of decimals</i></p>	<p><u>Find a difference by counting up</u> e.g. $8000 - 2785 = 5215$ To make this method more efficient, the number of steps should be reduced to a minimum through children knowing:</p> <ul style="list-style-type: none"> ▪ Complements to 1, involving decimals to two decimal places ($0.16 + 0.84$) ▪ Complements to 10, 100 and 100 <p><u>Subtract the nearest multiple of 10, 100 or 1000, then adjust</u> Continue as in Year 2, 3, 4 and 5 but with appropriate numbers.</p> <p><u>Use known number facts and place value to subtract</u> $0.5 - 0.31 = 0.19$</p> <div style="text-align: center;">  </div> <p style="text-align: right;">Pencil</p> <p><u>and paper procedures</u> Complementary addition $6467 - 2684 = 3783$</p> <div style="text-align: center;">  </div> <p>OR</p> $6467 - 2684 = 3783$ $\begin{array}{r} 16 \text{ (2700)} \\ 300 \text{ (3000)} \\ \underline{3467 \text{ (6467)}} \\ 3783 \end{array} \quad \text{can be refined to} \quad \begin{array}{r} 316 \text{ (3000)} \\ \underline{3467 \text{ (6467)}} \\ 3783 \end{array}$ <p>Reduce the number of steps to make the calculation more efficient. <i>Extend to 2 places of decimals</i></p>

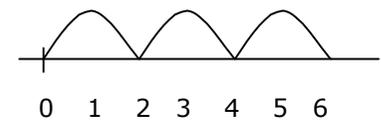
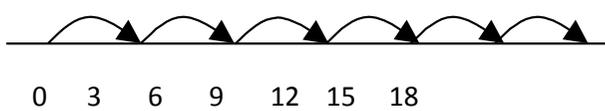
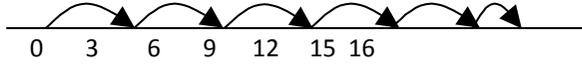
MULTIPLICATION GUIDELINES

Year One	Year Two	Year Three																
<p>Multiplication is related to doubling and counting groups of the same size.</p>  <p>Looking at columns $2 + 2 + 2$ 3 groups of 2</p> <p>Looking at rows $3 + 3$ 2 groups of 3</p> <p><u>Counting using a variety of practical resources</u> Counting in 2s e.g. counting socks, shoes, animal's legs... Counting in 5s e.g. counting fingers, fingers in gloves, toes... Counting in 10s e.g. fingers, toes...</p> <p>Pictures / marks</p> <p>There are 3 sweets in one bag. How many sweets are there in 5 bags?</p> 	<p><u>x = signs and missing numbers</u> $7 \times 2 = \quad = 2 \times 7$ $7 \times \quad = 14$ $14 = \quad \times 7$ $\quad \times 2 = 14$ $14 = 2 \times \quad$ $\quad \times \nabla = 14$ $14 = \quad \times \nabla$</p> <p><u>Arrays and repeated addition</u></p> <p>  4×2 or $4 + 4$  2×4 or $2 + 2 + 2 + 2$ </p>  <p><u>Doubling multiples of 5 up to 50</u> $15 \times 2 = 30$</p> <p>Partition Children need to be secure with partitioning numbers into 10s and 1s and partitioning in different ways: $6 = 5 + 1$ so e.g. Double 6 is the same as double five add double one.</p> <p>  </p> <p>AND double 15</p> $\begin{array}{r} 10 + 5 \\ \downarrow \quad \downarrow \\ 20 + 10 = 30 \end{array}$ <p>OR</p> $\begin{array}{r l} X & 10 \quad 5 \\ \hline 2 & 20 \quad 10 \end{array} = 30$	<p><u>x = signs and missing numbers</u> Continue using a range of equations as in Year 2 but with appropriate numbers.</p> <p><u>Arrays and repeated addition</u> Continue to understand multiplication as repeated addition and continue to use arrays (as in Year 2).</p> <p><u>Doubling multiples of 5 up to 50</u> $35 \times 2 = 70$</p> <p>Partition</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px;">X</td> <td style="border-bottom: 1px solid black; padding: 5px;">30</td> <td style="border-bottom: 1px solid black; padding: 5px;">5</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">2</td> <td style="padding: 5px;">60</td> <td style="padding: 5px;">10</td> <td style="padding: 5px;">=70</td> </tr> </table> <p>Use known facts and place value to carry out simple multiplications</p> <p>Use the same method as above (partitioning), e.g.</p> <p>$32 \times 3 = 96$</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px;">x</td> <td style="border-bottom: 1px solid black; padding: 5px;">30</td> <td style="border-bottom: 1px solid black; padding: 5px;">2</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">3</td> <td style="padding: 5px;">90</td> <td style="padding: 5px;">6</td> <td style="padding: 5px;">= 96</td> </tr> </table>	X	30	5		2	60	10	=70	x	30	2		3	90	6	= 96
X	30	5																
2	60	10	=70															
x	30	2																
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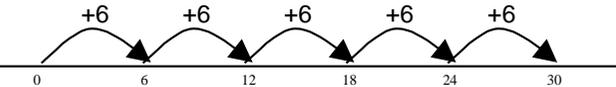
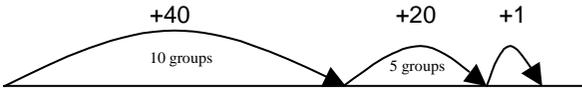
MULTIPLICATION GUIDELINES

Year Four	Year Five	Year Six																																																		
<p><u>x = signs and missing numbers</u></p> <p>Continue using a range of equations as in Year 2 but with appropriate numbers</p> <p><u>Partition</u></p> <p>Continue to use arrays:</p>  <p>$18 \times 9 = 162$</p> <p>$18 \times 9 = (10 \times 9) + (8 \times 9) = 162$</p> <p>OR</p> <p>Use the grid method of multiplication (as below)</p> <p><u>Pencil and paper procedures</u></p> <p>Grid method</p> <p>23×7 is approximately $20 \times 10 = 200$</p> <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">x</td> <td style="border-right: 1px solid black; padding: 5px;">20</td> <td style="padding: 5px;">3</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">7</td> <td style="border-right: 1px solid black; padding: 5px;">140</td> <td style="padding: 5px;">21</td> <td style="padding: 5px;">= 161</td> </tr> </table>	x	20	3		7	140	21	= 161	<p>Partition</p> <p>$47 \times 6 = 282$</p> <p>$47 \times 6 = (40 \times 6) + (7 \times 6) = 282$</p> <p>OR</p> <p>Use the grid method of multiplication (as below)</p> <p><u>Pencil and paper procedures</u></p> <p>Grid method</p> <p>72×38 is approximately $70 \times 40 = 2800$</p> <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">x</td> <td style="border-right: 1px solid black; padding: 5px;">70</td> <td style="padding: 5px;">2</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">30</td> <td style="border-right: 1px solid black; padding: 5px;">2100</td> <td style="padding: 5px;">60</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">8</td> <td style="border-right: 1px solid black; padding: 5px;">560</td> <td style="padding: 5px;">16</td> <td></td> </tr> </table> <p style="margin-left: 40px;">$2100 + 60 = 2160$</p> <p style="margin-left: 40px;">$560 + 16 = 576$</p> <p style="margin-left: 40px;">2160</p> <p style="margin-left: 40px;">$560 +$</p> <p style="margin-left: 40px;"><u>2736</u></p> <p><u>Expanded Column Multiplication</u></p> <p>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', not 'three times seven', although the relationship 3×7 should be stressed.</p> <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 5px;">$30 + 8$</td> <td style="padding: 5px;">38</td> </tr> <tr> <td style="padding: 5px;">$x \underline{7}$</td> <td style="padding: 5px;">$x \underline{7}$</td> </tr> <tr> <td style="padding: 5px;">56 (8 x 7 = 56)</td> <td style="padding: 5px;">56</td> </tr> <tr> <td style="padding: 5px;"><u>210</u> (30 x 7 = 210)</td> <td style="padding: 5px;"><u>210</u></td> </tr> <tr> <td style="padding: 5px;"><u>266</u></td> <td style="padding: 5px;"><u>266</u></td> </tr> </table>	x	70	2		30	2100	60		8	560	16		$30 + 8$	38	$x \underline{7}$	$x \underline{7}$	56 (8 x 7 = 56)	56	<u>210</u> (30 x 7 = 210)	<u>210</u>	<u>266</u>	<u>266</u>	<p>Partition</p> <p>$87 \times 6 = 522$</p> <p>$87 \times 6 = (80 \times 6) + (7 \times 6) = 522$</p> <p>OR</p> <p>Use the grid method of multiplication (as below)</p> <p><u>Pencil and paper procedures</u></p> <p>Grid method</p> <p>372×24 is approximately $400 \times 20 = 8000$</p> <p>Extend to decimals with up to two decimal places.</p> <p><u>Short Column Multiplication</u></p> <p>The recording is reduced further, with carry digits recorded below the line.</p> <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 5px;">38</td> <td></td> </tr> <tr> <td style="padding: 5px;">x 7</td> <td></td> </tr> <tr> <td style="padding: 5px;"><u>266</u></td> <td></td> </tr> <tr> <td style="padding: 5px;">5</td> <td></td> </tr> </table> <p>Children who are already secure with multiplication for TU \times U and TU \times TU should have little difficulty in using the same method for HTU \times TU or applying decimals.</p> <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 5px;">286</td> <td></td> </tr> <tr> <td style="padding: 5px;">x 29</td> <td></td> </tr> <tr> <td style="padding: 5px;">2574</td> <td style="padding: 5px;">(9 x 286 = 2574)</td> </tr> <tr> <td style="padding: 5px;"><u>5720</u></td> <td style="padding: 5px;">(20 x 286 = 5720)</td> </tr> <tr> <td style="padding: 5px;">8294</td> <td></td> </tr> <tr> <td style="padding: 5px;">1</td> <td></td> </tr> </table>	38		x 7		<u>266</u>		5		286		x 29		2574	(9 x 286 = 2574)	<u>5720</u>	(20 x 286 = 5720)	8294		1	
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DIVISION GUIDELINES

Year One	Year Two	Year Three
<p>Sharing</p> <p>Requires secure counting skills -see counting and understanding number strand</p> <p>Develops importance of one-to-one correspondence</p> <p>See appendix for additional information on x and ÷ and aspects of number</p> <p>Sharing – 6 sweets are shared between 2 people. How many do they have each?</p> <div style="text-align: center;">  </div> <p>Practical activities involving sharing, distributing cards when playing a game, putting objects onto plates, into cups, hoops etc.</p> <p>Grouping</p> <p>Sorting objects into 2s / 3s/ 4s etc How many pairs of socks are there?</p> <div style="text-align: center;">  </div> <p>There are 12 crocus bulbs. Plant 3 in each pot. How many pots are there?</p> <p>Jo has 12 Lego wheels. How many cars can she make?</p>	<p><u>÷ = signs and missing numbers</u></p> $6 \div 2 = \quad \quad = 6 \div 2$ $6 \div \quad = 3 \quad \quad 3 = 6 \div \quad$ $\quad \div 2 = 3 \quad \quad 3 = \quad \div 2$ $\quad \div \nabla = 3 \quad \quad 3 = \quad \div \nabla$ <p>Grouping</p> <p>Link to counting and understanding number strand Count up to 100 objects by grouping them and counting in tens, fives or twos;...</p> <p>Find one half, one quarter and three quarters of shapes and sets of objects</p> <p>6 ÷ 2 can be modelled as: There are 6 strawberries. How many people can have 2 each? How many 2s make 6?</p> <p>6 ÷ 2 can be modelled as:</p> <div style="text-align: center;">  </div> <p>In the context of money count forwards and backwards using 2p, 5p and 10p coins Practical grouping e.g. in PE 12 children get into teams of 4 to play a game. How many teams are there?</p> <div style="text-align: center;">  </div>	<p><u>÷ = signs and missing numbers</u></p> <p>Continue using a range of equations as in Year 2 but with appropriate numbers.</p> <p>Understand division as sharing and grouping 18 ÷ 3 can be modelled as: Sharing – 18 shared between 3 (see Year 1 diagram)</p> <p>OR</p> <p>Grouping - How many 3's make 18?</p> <div style="text-align: center;">  </div> <p>Remainders 16 ÷ 3 = 5 r1</p> <p>Sharing - 16 shared between 3, how many left over?</p> <p>Grouping – How many 3's make 16, how many left over?</p> <p>e.g.</p> <div style="text-align: center;">  </div>

DIVISION GUIDELINES

Year Four	Year Five	Year Six
<p><u>÷ = signs and missing numbers</u></p> <p>Continue using a range of equations as in Year 2 but with appropriate numbers.</p> <p><u>Sharing and grouping</u></p> <p>$30 \div 6$ can be modelled as:</p> <p>grouping – groups of 6 placed on no. line and the number of groups counted e.g.</p>  <p>sharing – sharing among 6, the number given to each person</p> <p><u>Remainders</u></p> <p>$41 \div 4 = 10 \text{ r}1$</p>  <p>$41 = (10 \times 4) + 1$</p> <p><u>Pencil and paper procedures- Chunking.</u></p>	<p><u>Sharing and grouping</u></p> <p>Continue to understand division as both sharing and grouping (repeated subtraction).</p> <p><u>Remainders</u></p> <p>Quotients expressed as fractions or decimal fractions $61 \div 4 = 15 \frac{1}{4}$ or 15.25</p>  <p><u>Pencil and paper procedures- Chunking</u></p> <p>$256 \div 7$ lies between $210 \div 7 = 30$ and $280 \div 7 = 40$</p> <p>* Partition the dividend into multiples of the divisor:</p> <p>e.g. $256 = 210 + 46$ $210 \div 7 = 30$ $46 \div 7 = 6\text{r}4 \rightarrow 30 + 6\text{r}4 = 36\text{r}4$</p> <p style="text-align: center;">OR</p> $\begin{array}{r} 256 \\ - 210 \quad (30 \text{ groups}) \\ \hline 46 \\ - 42 \quad (6 \text{ groups}) \\ \hline 4 \end{array}$ <p>Answer: 36 remainder 4</p>	<p><u>Sharing, grouping and remainders as Year Five</u></p> <p><u>Pencil and paper procedures- Chunking</u></p> <p>$977 \div 36$ is approximately $1000 \div 40 = 25$</p> <p>* Partition the dividend into multiples of the divisor:</p> <p>e.g. $977 = 720 + 180 + 77$ $720 \div 36 = 20$ $180 \div 36 = 5$ $77 \div 36 = 2\text{r}5 \rightarrow 20 + 5 + 2\text{r}5 = 27\text{r}5$</p> <p style="text-align: center;">OR</p> $\begin{array}{r} 977 \\ - 720 \quad (20 \text{ groups}) \\ \hline 257 \\ - 180 \quad (5 \text{ groups}) \\ \hline 77 \\ - 72 \quad (2 \text{ groups}) \\ \hline 5 \end{array}$ <p>Answer: $27 \frac{5}{36}$</p> <p><u>Pencil and Paper procedures- Short Division Method</u></p> <div style="text-align: center; margin: 10px 0;"> $\begin{array}{r} \text{quotient} \\ \text{divisor } 5 \overline{) 847} \text{ dividend} \end{array}$ </div> <p>Write down how many times your divisor goes into the first number of the dividend. If there is a remainder, that's</p>

$72 \div 5$ lies between $50 \div 5 = 10$ and $100 \div 5 = 20$

* Partition the dividend into multiples of the divisor:

e.g $72 = 50 + 22$

$$50 \div 5 = 10$$

$$22 \div 5 = 4r2 \rightarrow 10 + 4r2 = 14 r 2$$

OR

72

- 50 (10 groups)

22

- 20 (4 groups)

2

Answer : 14 remainder 2

Also, Short Division for More Able Children

$$\begin{array}{r} 16 \\ 5 \overline{)847} \end{array}$$

Considering each column starting from the left. See Year Six for full explanation.

okay.

Write down your remainder to the left of the next digit in the dividend.

Continue. Repeat steps 1-3 until you are done.

$$\begin{array}{r} 169r2 \\ 5 \overline{)847} \end{array}$$

Both methods above are necessary at this stage, to deal with the wide range of problems experienced at Year Six.

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

ADDITION

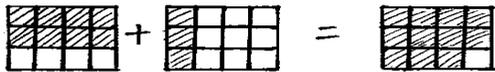
Extend to decimals with up to 2 decimal places, including:

- sums with different numbers of digits;
- totals of more than two numbers.

e.g. $76.56 + 312.2 + 5.07 = 398.83$

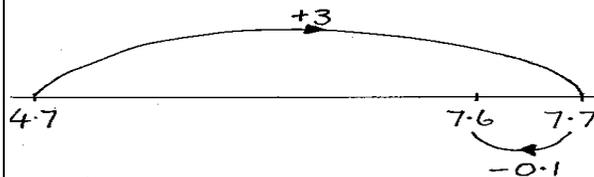
Use diagrams to illustrate
adding fractions

$$\frac{2}{3} + \frac{1}{4} = \frac{11}{12}$$



Use compensation by adding too much, and then compensating

$$\begin{aligned} 4.7 + 2.9 &= 4.7 + 3 - 0.1 \\ &= 7.7 - 0.1 \\ &= 7.6 \end{aligned}$$



Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

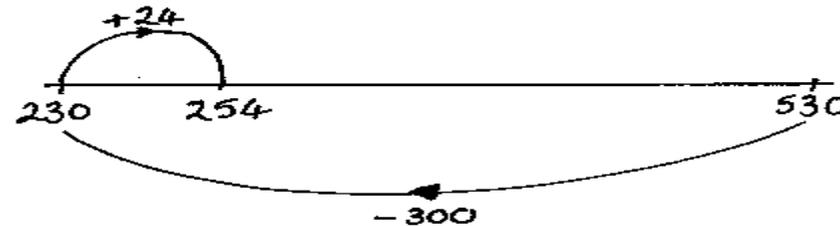
SUBTRACTION

Mental methods

Use compensation by subtracting too much, and then compensating

Use jottings such as an empty number line to support or explain methods for adding mentally.

$$\begin{aligned} 530 - 276 &= 530 - 300 + 24 \\ &= 230 + 24 \\ &= 254 \end{aligned}$$



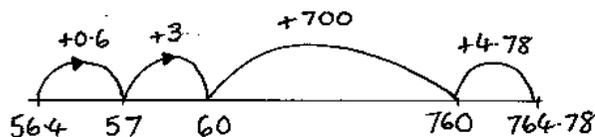
Pencil and paper procedures (Written methods)

Extend to decimals with up to 2 decimal places, including:

- differences with different numbers of digits
- totals of more than two numbers.

Complementary addition

$$764.78 - 56.4 = 708.38$$



Subtract more complicated fractions

For Example:

Know that fractions can be added/subtracted if they have the same denominator.

$$\frac{5}{6} - \frac{3}{4}$$

$$\frac{10}{12} - \frac{9}{12} = \frac{1}{12}$$

MULTIPLICATION

Mental methods

Use partitioning

Partition either part of the product e.g. $7.3 \times 11 = (7.3 \times 10) + 7.3 = 80.3$

OR

Use the grid method of multiplication (as below).

Pencil and paper procedures (Written methods)

Use written methods to support, record or explain multiplication of:

- a three-digit number by a two-digit number
- a decimal with one or two decimal places by a single digit

Grid method

6.24×8 is approximately $6 \times 8 = 48$

x	6	0.2	0.04
8	48	1.6	0.32

= 49.92

Grid lines can become optional

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

DIVISION

Pencil and paper procedures (Written methods)

Use written methods to support, record or explain division of:

- a three-digit number by a two-digit number
- a decimal with one or two decimal places by a single digit.

Refine methods to improve efficiency while maintaining accuracy and understanding.

$109.6 \div 8$ is approximately $110 \div 10 = 11$.

$$\begin{array}{r}
 109.6 \\
 - \underline{80} \quad (10 \text{ groups of } 8) \\
 29.6 \\
 - \underline{24} \quad (3) \\
 5.6 \\
 - \underline{5.6} \quad (0.7) \\
 0.0
 \end{array}$$

Answer: 13.7

Pencil and paper procedures (Written methods)

Continue to use the same method as in Year 7 and Year 8. Adjust the dividend and divisor by a common factor before the division so that no further adjustment is needed after the calculation

e.g. $361.6 \div 0.8$ is equivalent to $3616 \div 8$

Use the inverse rule to divide fractions, first converting mixed numbers to improper fractions.

Look at one half of a shape.

How many sixths of the shape can you see? (six)

So, how many sixths in one half? (three)

$$\begin{aligned}
 \text{So } \frac{1}{2} \div \frac{1}{6} &= \frac{1}{2} \times \frac{6}{1} \\
 &= \frac{6}{2} \\
 &= 3
 \end{aligned}$$

