



# The Federation of St Elphege's R.C Schools Calculation Policy

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
| 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
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| 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  |
| 91  | 92  | 93  | 94  | 95  | 96  | 97  | 98  | 99  | 100 |
|     |     |     |     |     |     |     |     |     |     |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 |
| 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
| 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 |
| 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 |
| 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 |
| 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 |
| 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 |
| 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 |
| 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 |
|     |     |     |     |     |     |     |     |     |     |
| 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 |
| 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 |
| 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 |
| 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 |
| 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 |
| 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 |
| 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 |
| 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 |
| 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 |
| 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 |

# **Counting:**

## **Reception Number and place value (statutory requirements)**

- Verbally count beyond 20, recognising the pattern of the counting system

## **Year 1 Number and place value (statutory requirements)**

- count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
- count, read and write numbers to 100 in numerals, count in different multiples including ones, twos, fives and tens

## **Year 2 Number and place value (statutory requirements)**

- count in steps of 2, 3, and 5 from 0, and count in tens from any number, forward or backward

## **Year 3 Number, place value and rounding (statutory requirements)**

- count from 0 in multiples of 4, 8, 50 and 100; finding 10 or 100 more or less than a given number
- count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10

## **Year 4 Number, place value and rounding (statutory requirements)**

- count in multiples of 6, 7, 9, 25 and 1000
- count backwards through zero to include negative numbers
- count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten

## **Year 5 Number, place value, approximation and estimation (statutory requirements)**

- count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000

# Addition

## Models and Images

Counting apparatus

Place value apparatus

Place value cards

Number tracks

Numbered number lines

Marked but unnumbered number lines

Empty number lines

Hundred square

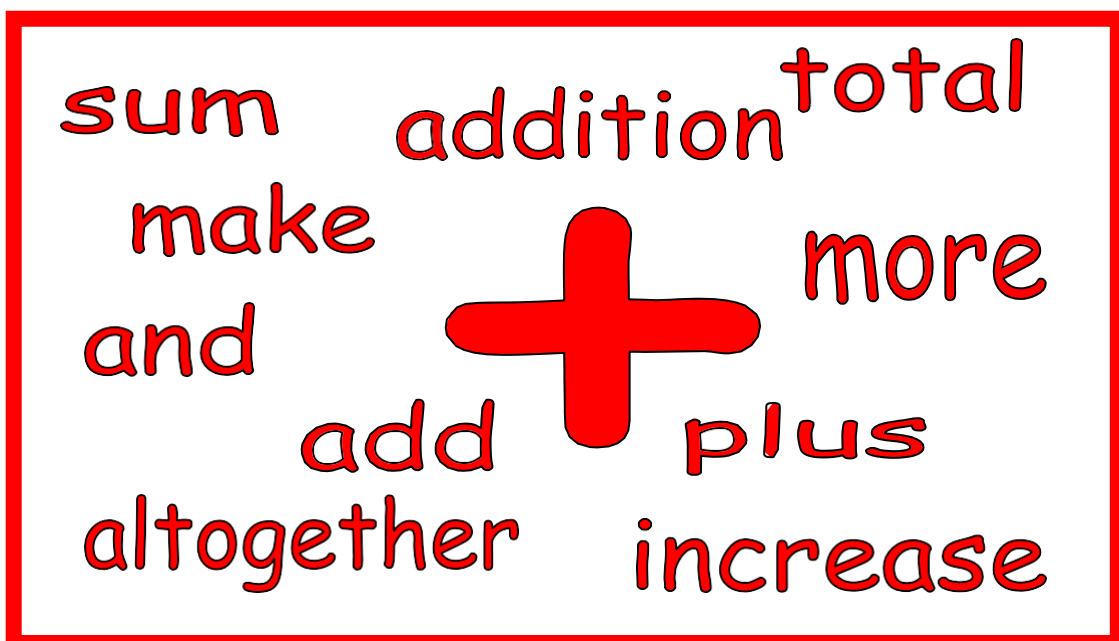
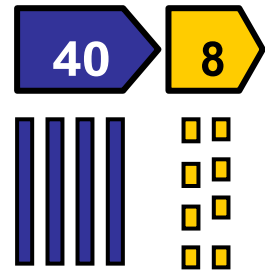
Counting stick

Bead string

Models and Images charts

ITPs – Number Facts, Ordering Numbers, Number Grid, Counting on and back in ones and tens

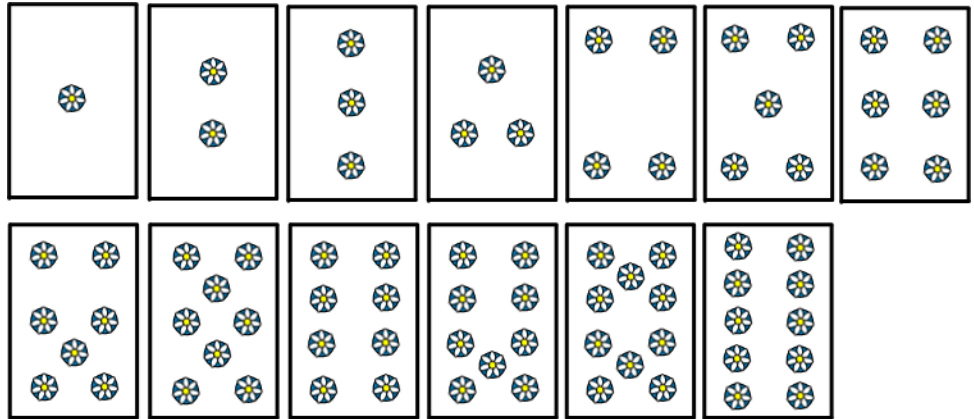
|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
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| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90  |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |



# Reception

0 1 2 3 4 5 6 7 8 9 10

Recognise numerals 0 to 10 and understand the meaning of each number by recognising and knowing their clusters

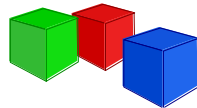


Count reliably up to 10 everyday objects.

1, 2, 3, 4, 5, 6 ... there are 6 teddies altogether



Find one more than a number



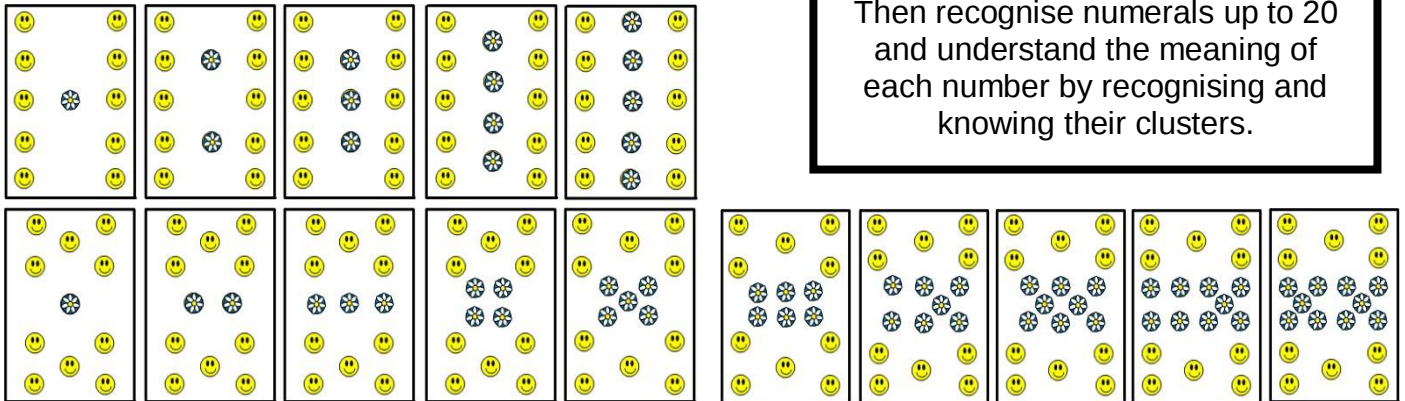
One more than three is four



The number after three is four.

What is the number after.....?

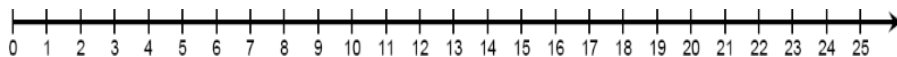
Then recognise numerals up to 20 and understand the meaning of each number by recognising and knowing their clusters.



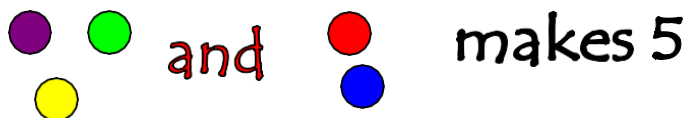
10 11 12 13 14 15 16 17 18 19 20

|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
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Count in ones as they become more familiar with using numbers on a number line and 100 square.



Begin to relate addition to combining two groups of objects.

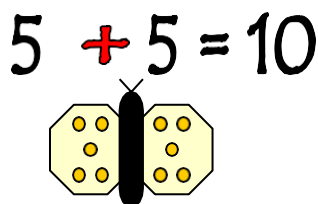


Begin to use the + and = signs to record mental calculations in a number sentence

$$6 + 4 = 10$$



Children begin to solve problems using doubling, halving, grouping and sharing.



Children show mental recall of number bonds to 10 and use these for problem solving. Some children show mental recall of number bonds to 20.

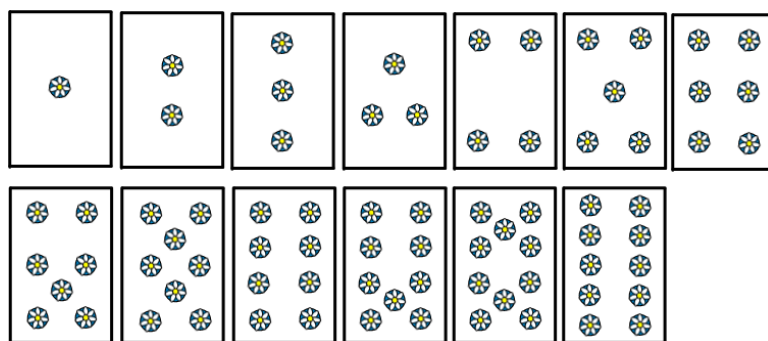
## Year 1

### Counting choir

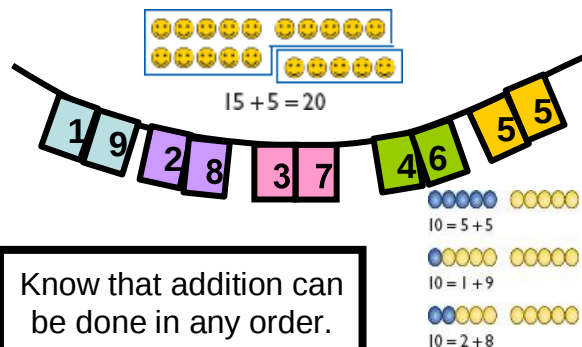
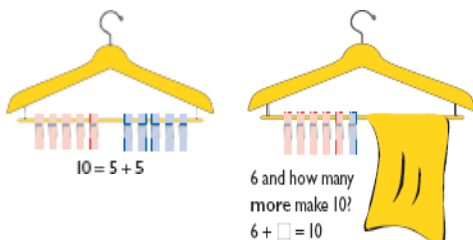
Count, read and write numbers to 100 in numerals, count in different multiples including ones, twos, fives and tens and recognise patterns with the help of a 100 square.

|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
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| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80  |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90  |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

Continue with the use of cluster cards in order for children to develop the skill of decomposing and recomposing numbers mentally.



Know by heart all pairs of numbers with a total of 10 and 20



$$1 + 2 = 3$$



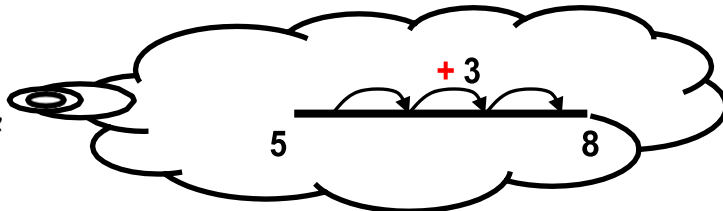
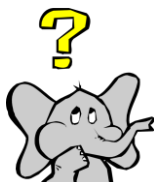
$$2 + 1 = 3$$



Know that addition can be done in any order.

When adding mentally put biggest number first and count on

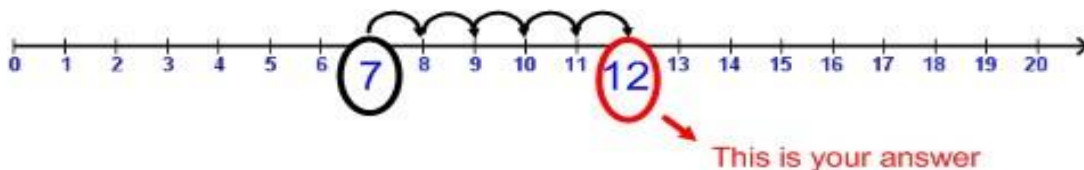
$$3 + 5$$



Progression in difficulty when adding on a number line

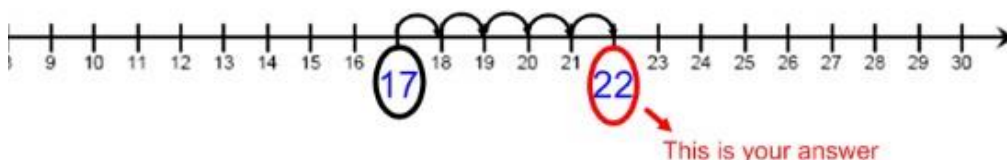
### 1. 1 digit + 1 digit

~~$$7 + 5 =$$~~



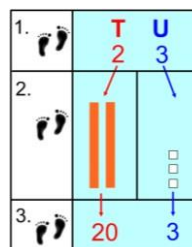
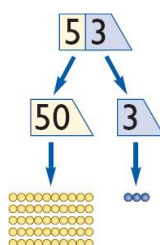
### 2. 2 digit + 1 digit

~~$$17 + 5 =$$~~



### 3. 2 digit + 2 digit

Begin to partition numbers in order to add two 2 digit numbers

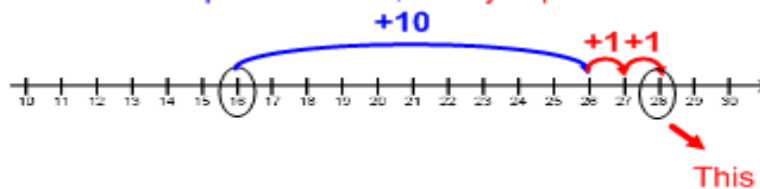


$$16 + 12 = 28$$

Partition your second number

$$16 + \begin{matrix} T & U \\ 10 & 2 \end{matrix} =$$

Jump of tens first, then jumps of units



**Please Note:** For this method to become successful and embedded, children must be able to add 10 and one from any given number using their knowledge of place value and having had plenty of experience with jumping in ones and tens on a 100 square.

## Counting choir

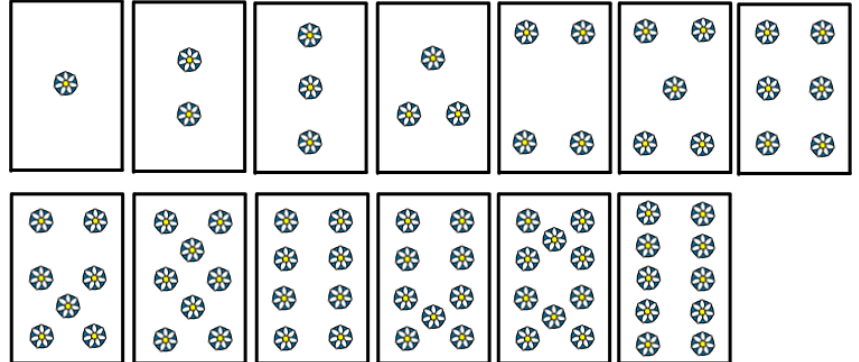
**C**ount in steps of 2, 3, and 5 from 0 and from any of its multiples.

Count in tens and ones from any number, forward or backward.

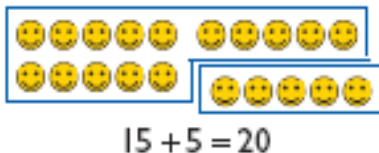
Alternate the above counting within one session to help with calculating on a number line.

|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
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Continue with the use of cluster cards in order for children to develop the skill of decomposing and recomposing numbers mentally and to help with calculating on a number line.



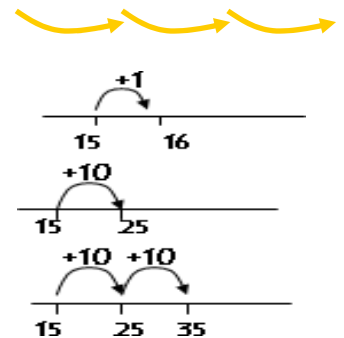
Continue to practice the mental recall of all pairs of number bonds with a total of 10 and 20



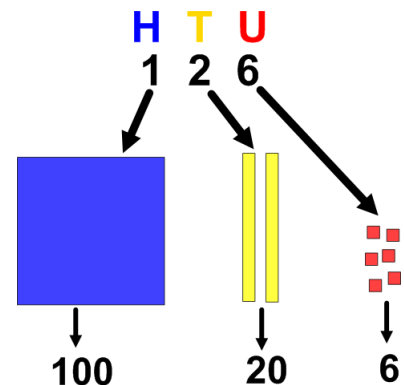
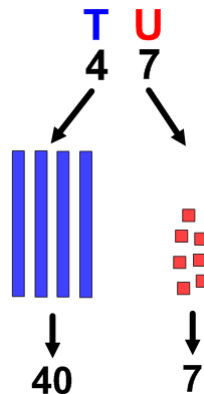
Know which digit changes when adding 1s or 10s to any number.

$$\underline{1}5 + 1 = \underline{1}6 \quad \underline{1}5 + 10 = \underline{2}5$$

|    |    |    |    |
|----|----|----|----|
| 15 | 16 | 17 | 18 |
| 25 | 26 | 27 | 28 |



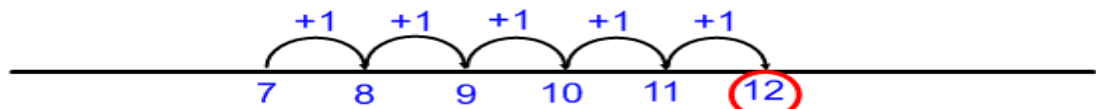
Continue with partition two digit numbers into their Tens and Units and extend to partitioning three digit numbers into their H, T, U.



In Year 2 children learn to add using a blank number line.  
Progression in difficulty when adding on a blank number line

1. 1 digit + 1 digit

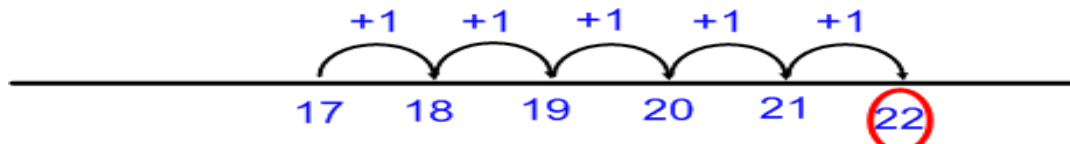
$$7 + 5 =$$



This is your answer

2. 2 digit + 1 digit

$$17 + 5 =$$



This is your answer

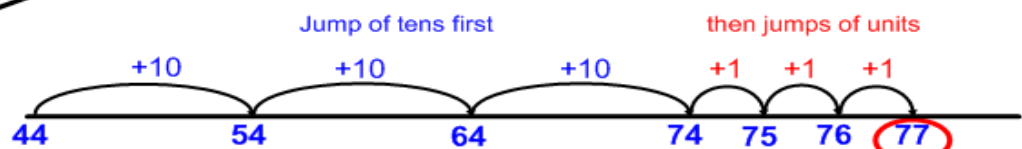
3. 2 digit + 2 digit

$$44 + 33 =$$

Partition your second number

$$44 + 33 =$$

TU  
30 3



This is your answer

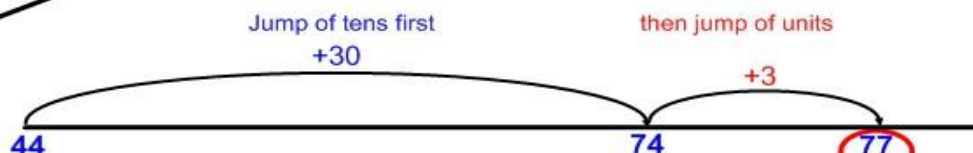
4. 2 digit + 2 digit: They begin to combine their jumps

$$44 + 33 =$$

Partition your second number

$$44 + 33 =$$

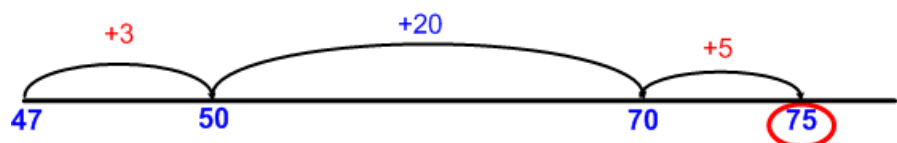
TU  
30 3



This is your answer

5. Begin bridging through 10 then teach the formal method of column addition.

$$47 + 28 =$$



This is your answer

For children to be confident with this method they must be able to quickly recompose numbers. Suggested mental maths activity is the use of cluster cards.

## Year 2 Summer term, Year 3, 4, 5 and 6:

### Column method of addition

Begin with teaching this method without carrying.

Carried digits are recorded below the line, using the words 'carry ten' or 'carry one hundred', not 'carry one'.

Later, extend to adding three-digit and two-digit numbers, two three-digit numbers and numbers with varied number of digits.

$$\begin{array}{r} 42 \\ + 31 \\ \hline 73 \end{array}$$

$$\begin{array}{r} 47 \\ + 36 \\ \hline 73 \\ 1 \end{array}$$

$$\begin{array}{r} 47 \\ + 76 \\ \hline 123 \\ 11 \end{array}$$

$$\begin{array}{r} 258 \\ + 87 \\ \hline 345 \\ 11 \end{array}$$

$$\begin{array}{r} 676 \\ + 558 \\ \hline 1234 \\ 11 \end{array}$$

**PLEASE NOTE THAT THE NUMBER LINE METHOD SHOULD STILL BE MODELLED AS PART OF A MENTAL MATHS STRATEGY!**

Column addition remains efficient when used with larger whole numbers and decimals. Once learned, the method is quick and reliable.

Children however need to be careful how they set out the numbers when calculating with decimals.

$$12.5 + 23.7$$

$$\begin{array}{r} 12.5 \\ + 23.7 \\ \hline 36.2 \\ 1 \end{array}$$

$$123.5 + 24.6$$

$$\begin{array}{r} 123.5 \\ + 24.6 \\ \hline 148.1 \\ 1 \end{array}$$

$$34.5 + 27.43$$

$$\begin{array}{r} 34.50 \\ + 27.43 \\ \hline 61.93 \\ 1 \end{array}$$

Use a zero as  
a place  
holder.

$$34.5 + 7.43$$

$$\begin{array}{r} 34.50 \\ + 7.43 \\ \hline 41.93 \\ 1 \end{array}$$

Use a zero as  
a place  
holder.

In these examples children need to understand that the decimal points are always written underneath each other when using column addition.

# Subtraction

## Mental Skills

Recognise the size and position of numbers

Count on or back in ones and tens

Know number facts for all numbers to 20

Subtract multiples of 10 from any number

Partition and recombine numbers (only partition the number to be subtracted)

Bridge through 10



## Models and Images

Counting apparatus

Place value apparatus

Place value cards

Number tracks

Numbered number lines

Marked but unnumbered lines

Hundred square

Empty number lines.

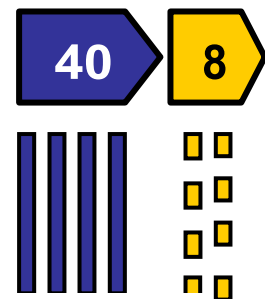
Counting stick

Bead strings

Models and Images Charts

ITPs – Number Facts, Counting on and back in ones and tens, Difference

|    |    |    |    |    |    |    |    |    |     |
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| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |



subtract

count on      count back

fewer      —      less

take away      minus

                 difference

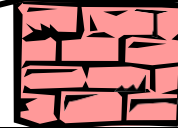
# Reception - Subtraction

Begin to count backwards in familiar contexts such as number rhymes or stories

Five fat sausages frying in a pan ...



Ten green bottles hanging on the wall ...



10, 9, 8, 7 ...

Continue the count back in ones from any given number

Begin to relate subtraction to 'taking away'



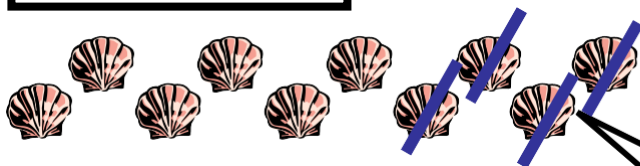
Three teddies **take away** two teddies leaves one teddy

Find one less than any number.

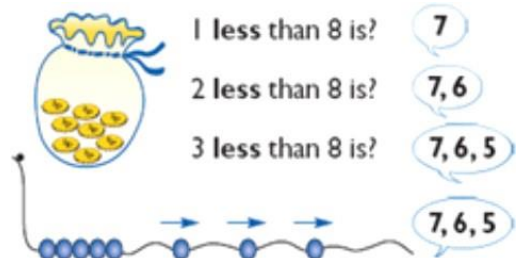
What is the number before 4?

|   |   |   |   |   |   |   |   |   |    |
|---|---|---|---|---|---|---|---|---|----|
|   |   |   |   |   |   |   |   |   |    |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Count back in ones

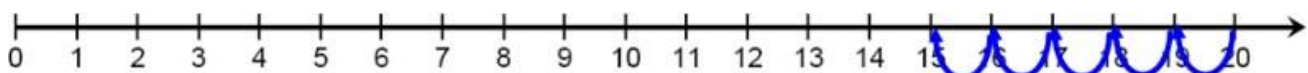
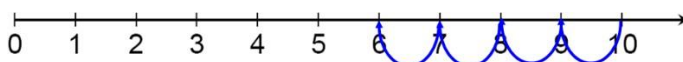


Count backwards along a number line to take away



If I **take away** four shells there are six

Some children show mental recall of number bonds to 10 and use these for problem solving.



## Year 1 - Subtraction

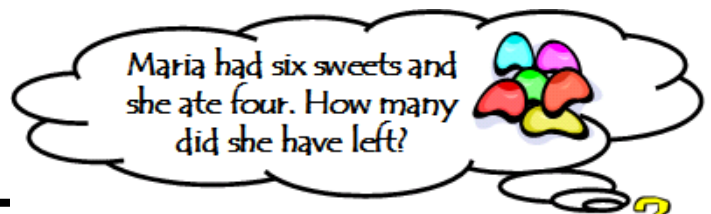
Begin to use the – and = signs to record mental calculations in a number sentence

Know by heart subtraction for numbers up to 10 and



$$6 + ? = 10 \quad ? + 6 = 10$$

$$10 - 6 = ? \quad 10 - 4 = 6$$

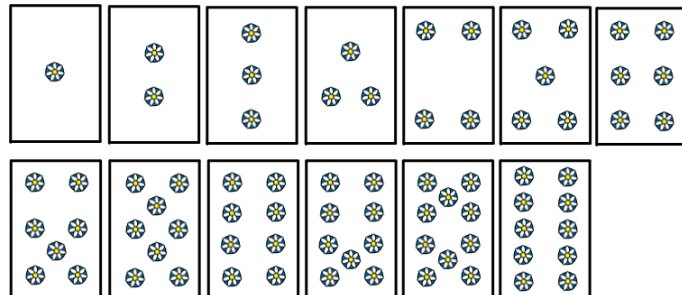


$$6 - 4 = 2$$

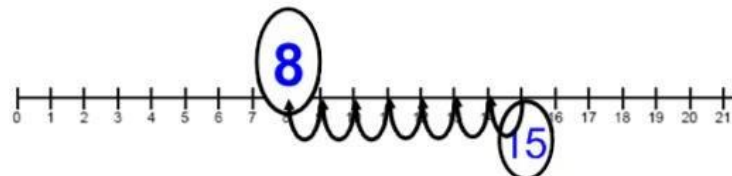


|  |  |               |               |
|--|--|---------------|---------------|
|  |  | $12 + 8 = 20$ | $8 + 12 = 20$ |
|  |  | $20 - 8 = 12$ | $20 - 12 = 8$ |

Continue with the use of cluster cards in order for children to develop the skill of decomposing and recomposing numbers mentally and to help with calculating on a number line.



Subtract single digits by counting back under the number line in ones.



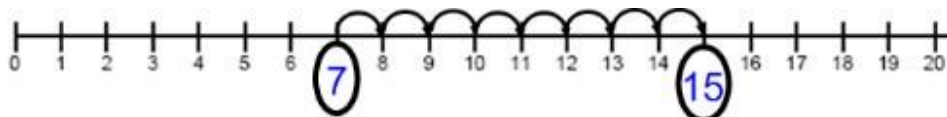
$$15 - 7 = 8$$

The answer is the number you land on  $15 - 7 = 8$



The difference is?

Begin to find the difference by counting on from the smallest number. **This is to be taught in the summer term.**



Circle both numbers then count on from the smaller to the larger number above the number

The answer is the number of steps made  
 $15 - 7 = 8$

Extend by counting on in 10s, then ones.

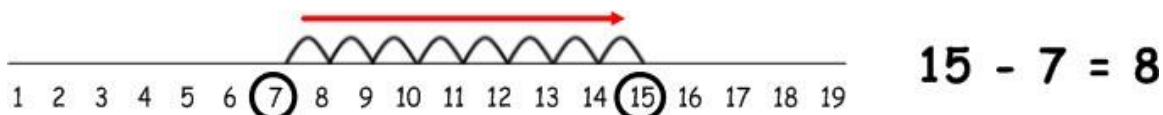
## Year 2: Subtracting using a number line

The vocabulary to be used is FINDING THE DIFFERENCE. In other words, children are finding how many numbers there are in between two chosen numerals.

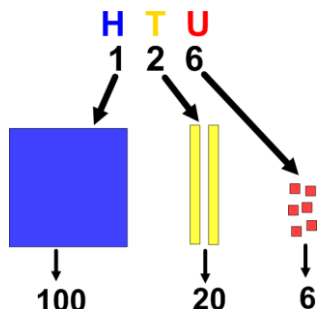
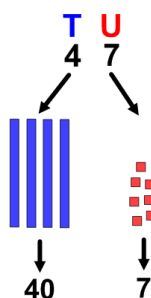
1) The steps are recorded by counting up from the smaller to the larger number to find the difference.

Children are taught to write the bigger number first when writing the number sentence. They then circle both numbers on the number line.

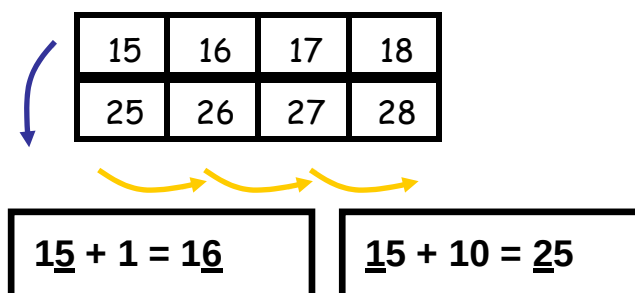
Starting with the smallest number children count on. They count the number of jumps.



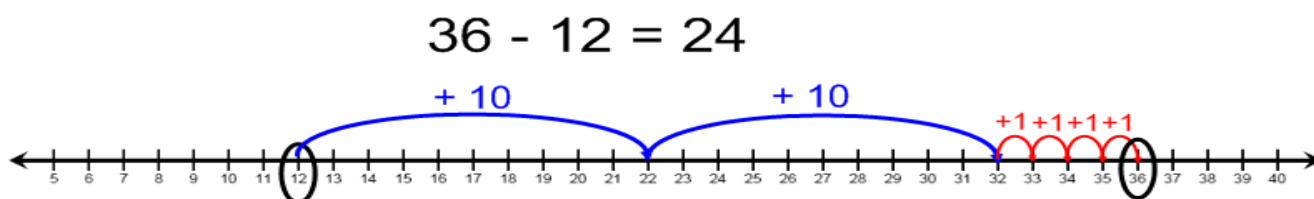
Partitioning two and three digit numbers.



Knowing which digit changes when adding 1s or 10s to any number.



2) Finding the difference between two 2 digit numbers by counting on in tens first, then counting on in 1s using a marked number line.



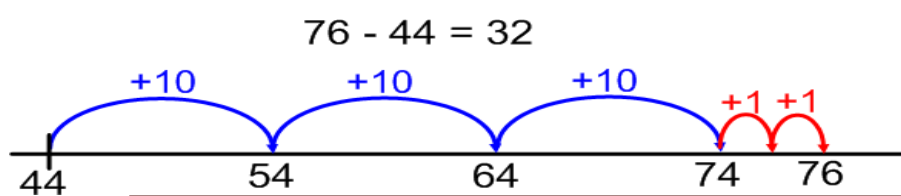
3) Finding the difference between two 2 digit numbers by counting on using an empty number line.

Children are taught to jump in tens and ones from the smaller number to get to the larger number. The jumps are added to get the answer.

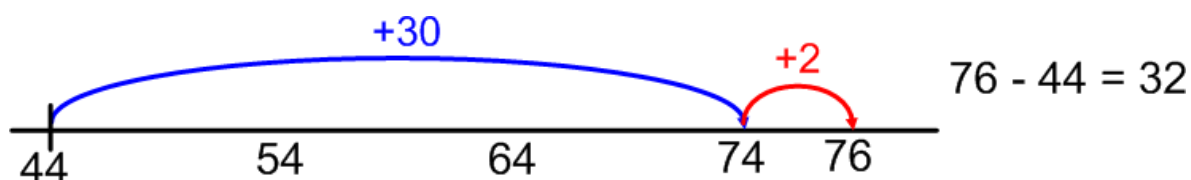
Mental maths

suggestion:

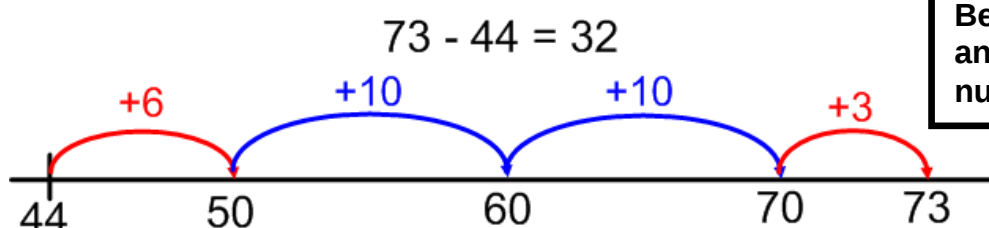
Counting choir and counting using meter stick.



4) They begin to combine their jumps.



5) Finding the difference using their knowledge of number bonds to the next multiple of 10.



**Essential knowledge:**  
Being able to decompose and recompose any number under 10.

## Years 3, 4, 5 and 6

### Compact column method of subtractions

$$67 - 32 =$$

$$\begin{array}{r} 67 \\ - 32 \\ \hline 35 \end{array}$$

$$74 - 27 =$$

$$\begin{array}{r} 74 \\ - 27 \\ \hline 47 \end{array}$$

$$741 - 367 =$$

$$\begin{array}{r} 741 \\ - 367 \\ \hline 374 \end{array}$$

$$501 - 278 =$$

$$\begin{array}{r} 501 \\ - 278 \\ \hline 223 \end{array}$$

Children should be encouraged to use inverse operations to check if their answer is correct. This gives them opportunity to practise both operations (addition and subtraction) at the same time. Explicit teaching needs to point out that if they add the bottom number to the answer they should end up with the top number.

**Calculation:**

$$\begin{array}{r} 501 \\ - 278 \\ \hline 223 \end{array}$$

**Checking using the inverse**

$$\begin{array}{r} 223 \\ + 278 \\ \hline 501 \end{array}$$

**Please note:**

This is purely the written method of subtraction. When calculating mentally using smaller numbers, teachers should model counting on using an empty number line.  
When calculating with time and finding time-differences, the number line method should be used EVERY TIME.

# Multiplication

## Mental Skills

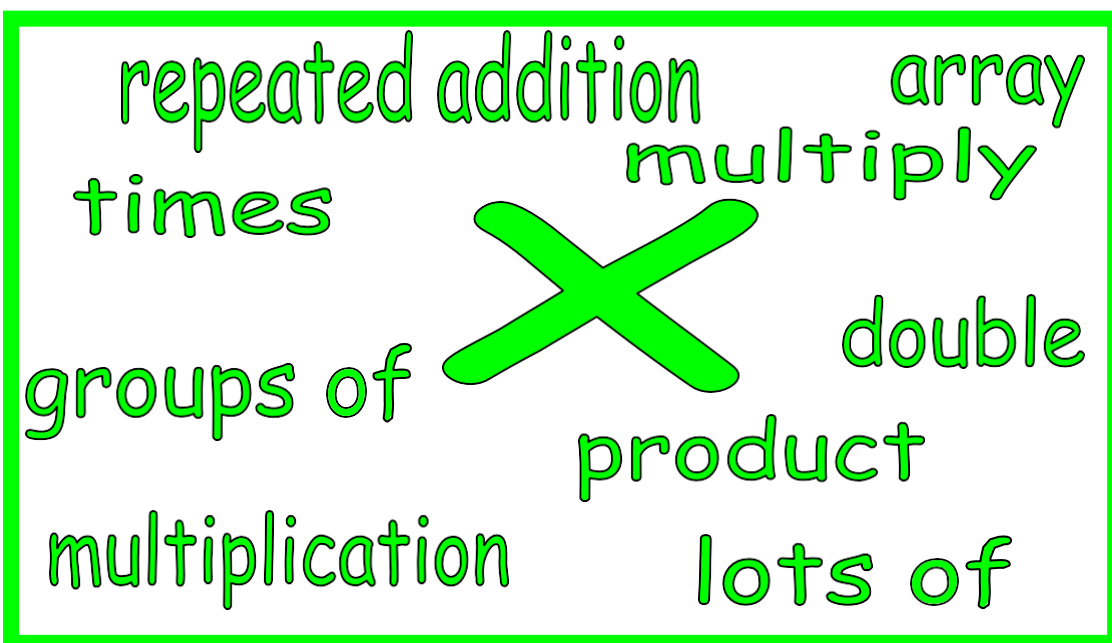
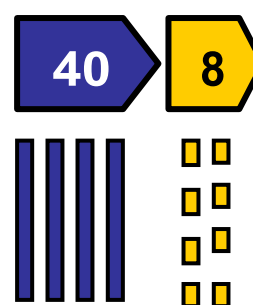
Recognise the size and position of numbers  
 Count on in different steps 2s, 5s, 10s  
 Double numbers up to 10  
 Recognise multiplication as repeated addition  
 Quick recall of multiplication facts  
 Use known facts to derive associated facts  
 Multiplying by 10, 100, 1000 and understanding the effect  
 Multiplying by multiples of 10

## Models and Images

Counting apparatus  
 Place value apparatus  
 Arrays  
 100 squares  
 Number tracks  
 Numbered number lines  
 Marked but unnumbered lines  
 Empty number lines.  
 Multiplication squares  
 Counting stick  
 Bead strings  
 Models and Images charts  
 ITPs – Multiplication grid, Number Dials, Multiplication Facts



|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20  |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30  |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40  |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50  |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60  |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70  |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80  |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90  |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |



# Year 1 - Multiplication

## Counting choir

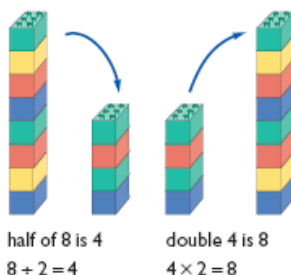
Count in steps of 2s, 5s and 10s forward and back from 0 and from any of its multiples using the 100 square and taking the opportunity to discuss patterns that are recognised.

|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20  |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30  |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40  |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50  |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60  |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70  |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80  |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90  |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

## Other resources that aid counting

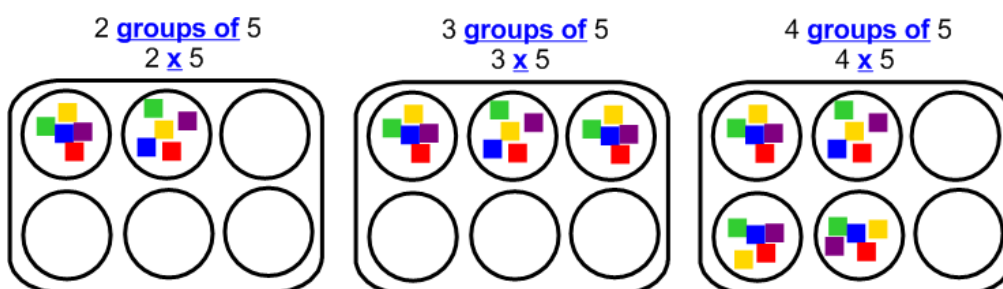


Know doubles and corresponding halves



Use fingers to work out doubles up to double 5.

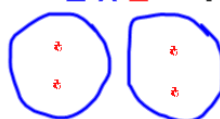
- Using laminated sheets with circles (groups) on them, children group objects using the correct mathematical vocabulary.



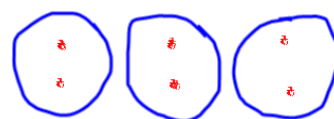
- Children begin using jottings of simple multiplication with the associated vocabulary.

They begin by drawing the number of groups, then draw the number of dots inside the circles. They count the number of dots they have altogether to get to the answer.

2 groups of 2  
 $2 \times 2 = 4$



3 groups of 2  
 $3 \times 2 = 6$



3. Children are exposed to the different ways in which multiplication can be expressed using concrete materials and linking it to real life situations. They begin to understand that repeated addition can also be expressed as multiplication using concrete materials.

Expressing multiplication as repeated addition

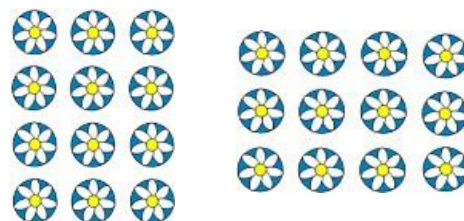
$$3 + 3 + 3 + 3 = 12$$



$$4 + 4 + 4 = 12$$



Expressing multiplication as arrays

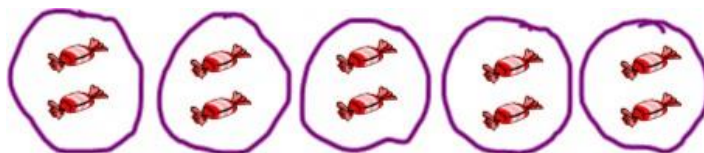


4. Children begin to commit multiples of 2, 5, 10 to memory and use these facts to solve problems.



There are 10 spiders... how many legs do they have altogether?  
 $8 \times 10 = 80$

When Peter behaves well in school he gets 2 sweets at the end of the day. If he behaves well for 5 days, how many sweets will he get altogether?

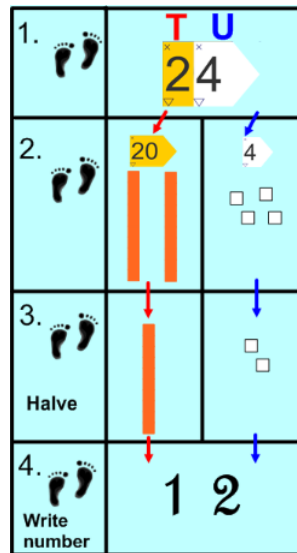
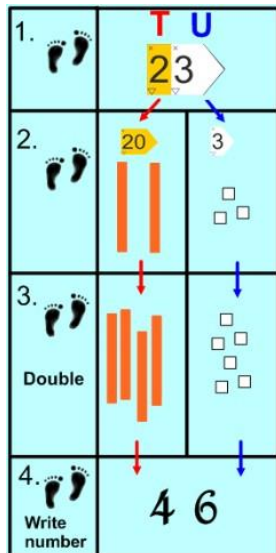


There are 4 flower beds in a garden. Each flower bed has 3 flowers. How many flowers are in the garden altogether?

# Year 2 - Multiplication

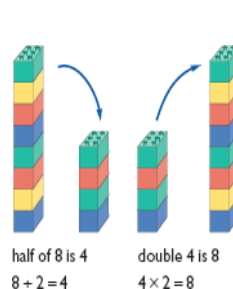
## Counting choir

Count in steps of 2s, 3s, 5s, 10s and 20s forward and back from 0 and from any of its multiples using the 100 / 200 square and taking the opportunity to discuss patterns that are recognised.



Know doubles and corresponding halves and extend to partitioning numbers then double / partitioning numbers then halve.

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
| 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
| 21  | 22  | 23  | 24  | 25  | 26  | 27  | 28  | 29  | 30  |
| 31  | 32  | 33  | 34  | 35  | 36  | 37  | 38  | 39  | 40  |
| 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  | 49  | 50  |
| 51  | 52  | 53  | 54  | 55  | 56  | 57  | 58  | 59  | 60  |
| 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | 69  | 70  |
| 71  | 72  | 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  |
| 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  |
| 91  | 92  | 93  | 94  | 95  | 96  | 97  | 98  | 99  | 100 |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 |
| 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 |
| 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 |
| 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 |
| 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 |
| 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 |
| 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 |
| 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 |
| 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 |

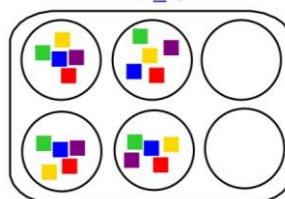


Use fingers to work out doubles up to double 5.

- Children continue using jottings of simple multiplication with the associated vocabulary and those who still find this difficult will use the laminated sheets with circles to group concrete objects.

They begin by drawing the number of groups, then draw the number of dots inside the circles. They count the number of dots they have altogether to get to the answer.

4 groups of 5  
 $4 \times 5$



3 groups of 2  
 $3 \times 2 = 6$



- Teach using jottings when multiplying multiples of ten by writing T in each of the groups.

They begin by drawing the number of groups, then write the number of T's inside the circles. They count the number of T's using their knowledge of counting in tens to obtain an answer.

3 groups of 10  
 $3 \times 10 = 30$



4 groups of 20  
 $4 \times 20 = 80$



### 3. Teach jumping on a marked number line in multiples of 2, 3, 5, 10.

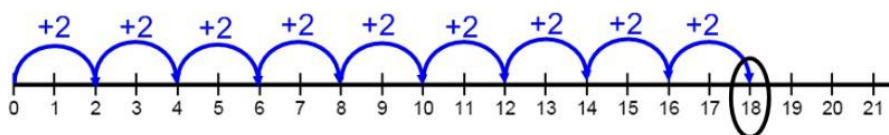
This method requires children to keep the jumps equal in size as they count the number of jumps. This is a challenging process, however it further embeds the understanding of repeated addition.

The constant re-enforcement of vocabulary 'groups of' is very important,

$$9 \text{ groups of } 2 = 18$$

$$9 \text{ jumps of } 2 = 18$$

$$9 \times 2 = 18$$



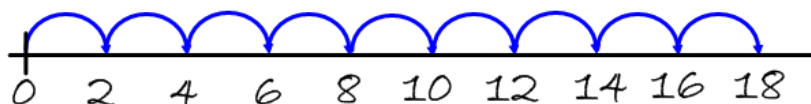
### 4. As children become confident with counting in multiples of 2, 3, 5, 10 they begin to use the empty number line to solve multiplication problems.

In this method there are strong links with the activity of counting choir using 100 / 200 squares and the recognition of patterns with each of the multiples. Children write their own number after each time they make a jump.

$$9 \text{ groups of } 2 = 18$$

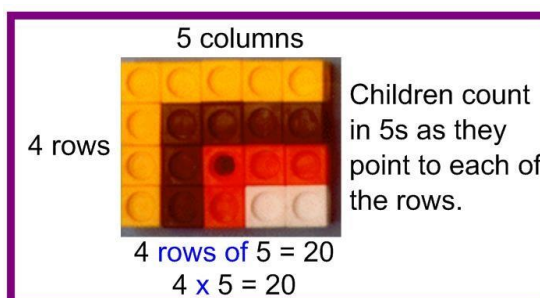
$$9 \text{ jumps of } 2 = 18$$

$$9 \times 2 = 18$$



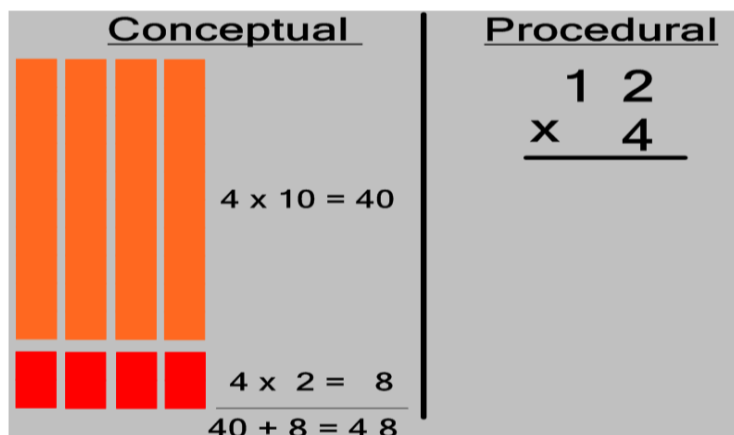
### 5. They further develop their skills of problem solving using multiplication and begin to relate it to the area of a rectangle / square.

Children investigate the number of multilink cubes needed to create a block with a given number of length and width.



## Year 3, 4, 5 and 6: Short and Long Multiplication

Because children have to get used to a new layout which does not necessarily provide understanding, it is important that the multiplication method is taught on split screen which shows the conceptual understanding alongside the procedural. Children must have secure times tables knowledge to 10 x 10 in order for them to see the benefits of this quick efficient method.



The carrying of digits further complicate the learning of this method, therefore the following progression in the teaching is recommended.

Begin with numbers where carrying is not involved.

Example:  
 $32 \times 3$

$$\begin{array}{r} 32 \\ \times 3 \\ \hline 96 \end{array}$$

Always start multiplying by the unit number. So 3 is multiplied by 2 first, then 3 is multiplied by 3.

Then move onto multiplying 3 digit numbers by a single digit without carrying.

Example:  
 $423 \times 3$

$$\begin{array}{r} 423 \\ \times 3 \\ \hline 1269 \end{array}$$

Again, begin by multiplying the units.

When knowledge is secure, higher numbers are used to introduce carrying.

Examples:  
 $643 \times 4$        $643 \times 8$

$$\begin{array}{r} 1 \quad 1 \\ 643 \\ \times 4 \\ \hline 2572 \end{array} \quad \begin{array}{r} 3 \quad 2 \\ 643 \\ \times 8 \\ \hline 5144 \end{array}$$

Carrying must be recorded as shown.

All children should be able to do this by the end of year 4.  
Year 4 should move onto 2D x 2D or 3D x 2D in the summer term but only those children who are secure with their multiplication facts up to 10 x 10.

Children will now be ready to move onto multiplying HTU x TU

Example:  
 $643 \times 24$

$$\begin{array}{r} 2 \quad 1 \\ 1 \quad 1 \\ 643 \\ \times 24 \\ \hline 2572 \\ + 32150 \\ \hline 34722 \\ 1 \end{array}$$

Begin by multiplying the unit with each of the digits. Children need to be taught that the 0 in the second row is written as a placeholder because we are now multiplying the tens with each digit.

## Multiplying with decimal numbers

Teach estimating the approximate answer to the multiplication using mental methods. In the below example children are encouraged to multiply the whole numbers of 6 and 5 to get the answer of 30. This will help them gauge whether the magnitude of the number they get as a result is right.

$$6.43 \times 5.4 = 34.722$$

$$\begin{array}{r} \cancel{2} \cancel{1} \\ \cancel{1} \cancel{1} \\ 643 \\ \times \quad \cancel{5}4 \\ \hline 2572 \\ + 32150 \\ \hline 34722 \\ \hline 1 \end{array}$$

Decimal points are taken out of both numbers and calculate multiplication just like whole numbers. Once an answer is obtained, the number of digits after the decimal point in both numbers are counted to indicate the number of digits after the decimal point in the answer.

## Mental method of multiplying 2 digit numbers by 1 digit.

Although written method is applied to calculate 2 digit numbers by 1 digit to teach the process of written multiplication, it is important that children are taught sufficient mental strategies to calculate this as well.

$$\begin{array}{l} 14 \times 3 = 42 \\ \swarrow \searrow \\ 10 \quad 4 \end{array} \quad \begin{array}{l} 10 \times 3 = 30 \\ 4 \times 3 = 12 \\ 30 + 12 = 42 \end{array}$$

$$\begin{array}{l} 14 \times 3 \\ \swarrow \searrow \swarrow \searrow \\ 30 + 12 = 42 \end{array}$$

# Year 3,4,5 and 6 Ratio

1. Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which  $n$  objects are connected to  $m$  objects.

If 1 child gets 3 sweets, how many sweets will 2 children get?

| Child                                                                             | Sweets                                                                            |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|  |  |
|  |  |
| 5                                                                                 | 15                                                                                |

Scaling factors:  $\times 2$  (vertical),  $\times 5$  (horizontal)

If 12 sweets are shared equally between 4 children, how many will each child get?

| Child | Sweets |
|-------|--------|
| 4     | 12     |
| 1     | 3      |

Scaling factors:  $\div 4$  (vertical),  $\div 4$  (horizontal)

Pre-requisite skill to scaling problems:

$$3 \times \square = 12$$

$$20 \div \square = 5$$

2. The comparison of measures includes simple scaling by integers (for example, a given quantity or measure is twice as long or five times as high) and this connects to multiplication.

Beatrice is baking a cake for 4 people. The ingredients are given for 2 people. How much flour will she need?

**Recipe**



2 eggs  
300g of flour  
150g of sugar

| People | Flour |
|--------|-------|
| 2      | 300g  |
| 4      | 600g  |

Scaling factors:  $\times 2$  (vertical),  $\times 2$  (horizontal)

3. Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts

Here are two cubes. The small one has a Volume of 8cm<sup>3</sup> and the large has a Volume of 64cm<sup>3</sup>. What is the ratio of small to large cube?

| Small | Large |
|-------|-------|
| 8     | 64    |
| 1     | 8     |

Scaling factors:  $\div 8$  (vertical),  $\div 8$  (horizontal)

**1 : 8**

Peter is making a smoothie for 7 people. The ingredients given are for 4 people. Calculate the amount of pineapple juice he will need.

**Smoothie for 4**



260ml pineapple juice  
12 raspberries  
14 grapes  
2 bananas

| People | Pineapple juice |
|--------|-----------------|
| 4      | 260ml           |
| 1      | 65ml            |
| 7      | 455ml           |

Scaling factors:  $\div 4$  (vertical),  $\times 7$  (horizontal)

# Division

## Mental Skills

Recognise the size and position of numbers

Count back in different steps 2s, 5s, 10s

Halve numbers to 20

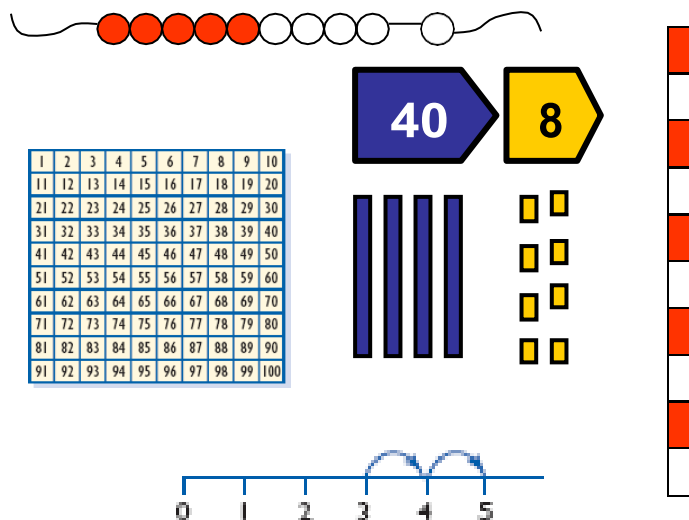
Recognise division as repeated subtraction

Quick recall of division facts

Use known facts to derive associated facts

Divide by 10, 100, 1000 and understanding the effect

Divide by multiples of 10



## Models and Images

Counting apparatus

Arrays

100 squares

Number tracks

Numbered number lines

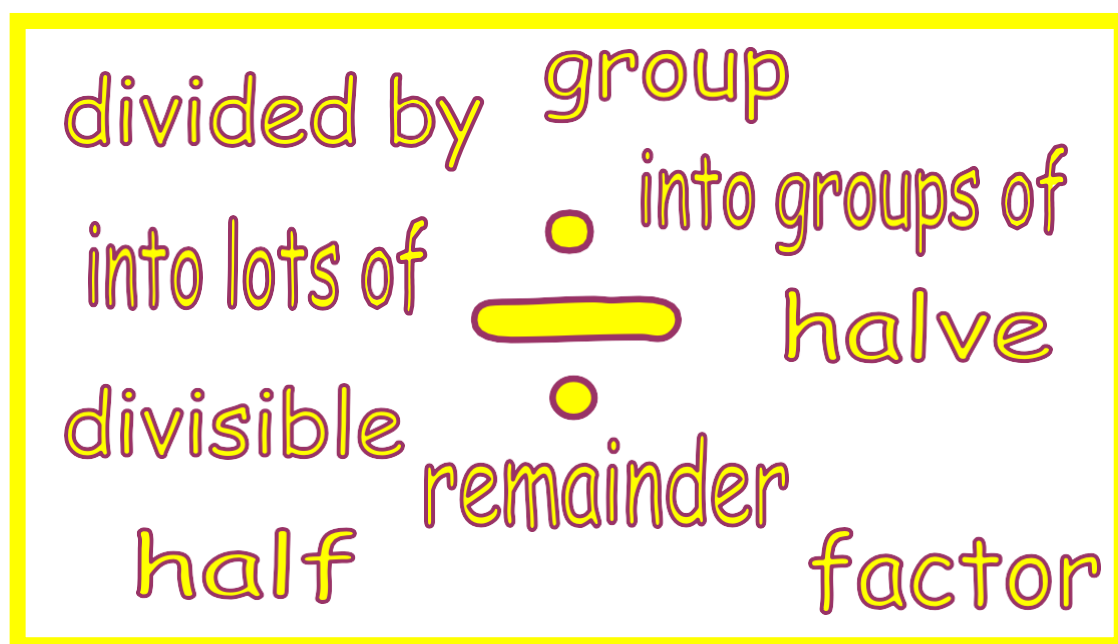
Marked but unnumbered lines

Empty number lines

Multiplication squares

Models and Images charts

ITPs – Multiplication remainders grid, Number Dials, Grouping

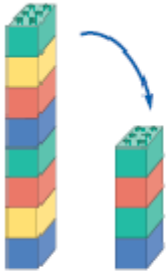


# Year 1 - Division

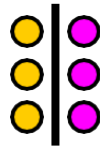
## Counting choir

Count in steps of 2s, 5s and 10s forward and back from 0 and from any of its multiples using the 100 square and taking the opportunity to discuss patterns that are recognised.

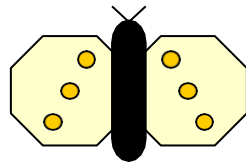
|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20  |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30  |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40  |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50  |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60  |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70  |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80  |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90  |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |



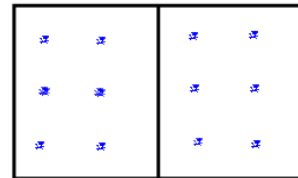
half of 8 is 4  
 $8 \div 2 = 4$



Half of 6 is 3  
 $\frac{1}{2}$  of 6 = 3



Half of 12. Share dots equally one by one.



1. Children learn to share objects practically.

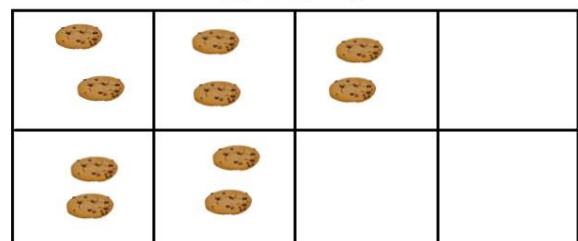


6 muffins shared between 3 people = 2 each  
 $6 \div 2 = 3$

2. Children use grouping to solve problems involving division. With the help of laminated sheets children place the given number of objects into groups using the correct mathematical vocabulary. **Please note: to distinguish between grouping using multiplication and division a different type of grouping sheet is used as shown below.**

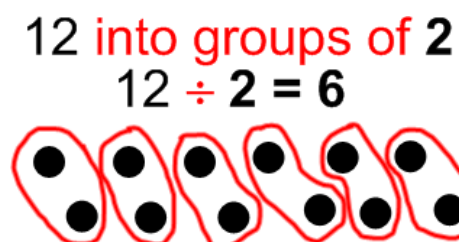
10 cookies into groups of 2  
How many groups?  
 $10 \div 2 = 5$

I have 10 cookies. Put them into groups of 2. How many groups have we got altogether?



3. Grouping with the use of jottings. Children first draw the total number of items using dots, then put circles around the given number of dots. They count the number of groups to obtain an answer.

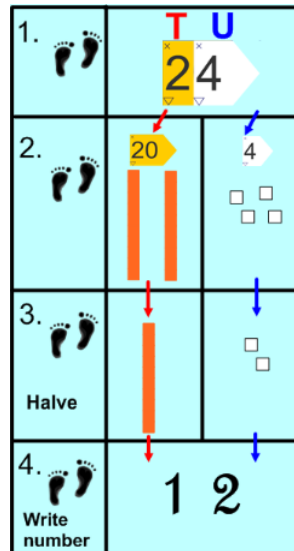
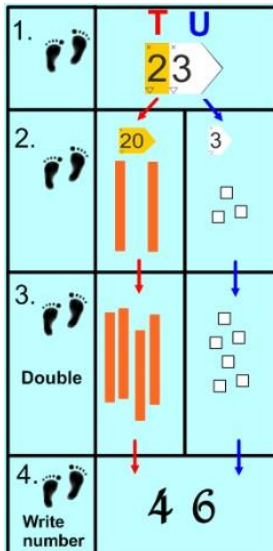
I have 12 multilink cubes. If I put them into groups of 2, how many groups have I got?



# Year 2 - Division

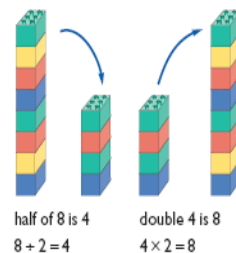
## Counting choir

Count in steps of 2s, 3s, 5s, 10s and 20s forward and back from 0 and from any of its multiples using the 100 / 200 square and taking the opportunity to discuss patterns that are recognised.

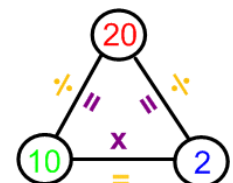


Know doubles and corresponding halves and extend to partitioning numbers then double / partitioning numbers then halve.

Use known multiplication facts to work out corresponding division facts



Use fingers to work out doubles up to double 5.



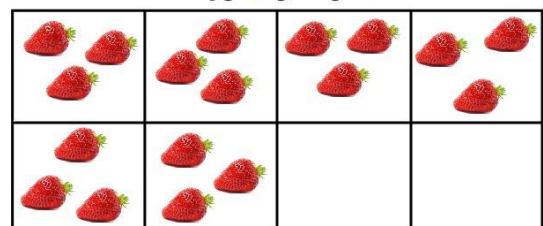
- Children continue to use concrete materials and physical resources to share objects equally with or without the help of the laminated grouping sheets.

12 muffins shared between 3 people = 4



I have 18 strawberries. Put them into groups of 3. How many groups have we got altogether?

18 strawberries into groups of 3  
How many groups?  
 $18 \div 3 = 6$

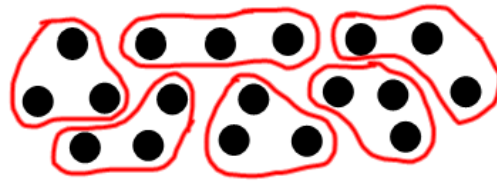


2. Grouping with the use of jottings. Children first draw the total number of items using dots, then put circles around the given number of dots. They count the number of groups to obtain an answer. In year 2 children are exposed to grouping in all multiples between 2-9.

I have 18 multilink cubes. If I put them into groups of 3, how many groups have I got?

18 into groups of 3

$$18 \div 3 = 6$$



3. Children begin to use a marked number line to solve division problems.

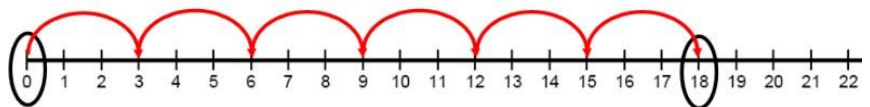
**Please note:** Although division is associated with repeated subtraction, we teach children to COUNT ON in jumps of the given number because when it comes to teaching division with remainders on a number line, this is the only way it will work. This eliminates confusion.

This method requires children to find out how many jumps of 3 can they make between 0 and 18. They circle 0 and 18 on the number line before they commence their equal jumps of 3. The constant re-enforcement of vocabulary 'into groups of' is very important.

18 into groups of 3 = 6 groups

18 into jumps of 3 = 6 jumps

$$18 \div 3 = 6$$



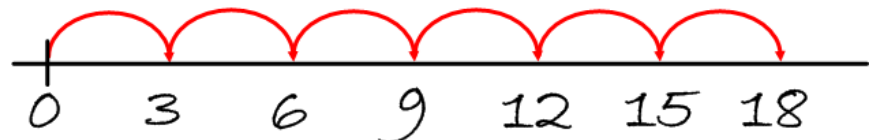
4. More confident children, who are able to reliably count in multiples of 2, 3, 5, 10 use an empty number line to make their jumps.

They write their own numbers underneath the number-line each time they complete a jump to keep track of where they are. The challenge in this process is to remember to stop once they got to the required number. In this case, 18.

18 into groups of 3 = 6 groups

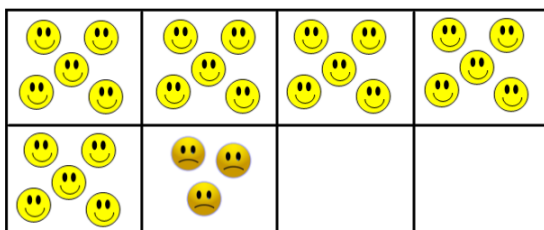
18 into jumps of 3 = 6 jumps

$$18 \div 3 = 6$$

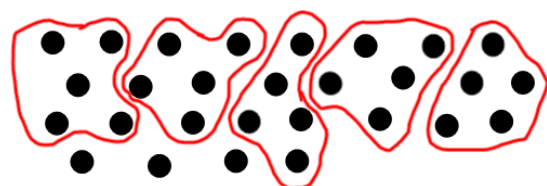


5. Reinforce division as grouping through arrays and jottings and introduce remainders.

28 children into groups of 5  
How many children left without a group?  
 $28 \div 5 = 5 \text{ r } 3$



28 children into groups of 5  
How many children left without a group?  
 $28 \div 5 = 5 \text{ r } 3$

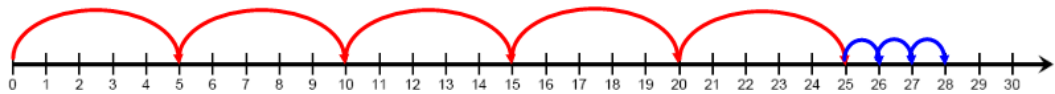


6. Children begin to use a marked number line to solve division problems involving remainders.

The challenge in this process is to remember to not to carry on jumping in multiples of 5s after number 25 and to realise that the remaining jumps need to be made in jumps of ones to work out the remainder. Children must be able to count in multiples of 2, 3, 5 and 10 securely in order to use this method successfully.

28 children into groups of 5  
How many children left without a group?

$$28 \div 5 = 5 \text{ r } 3$$



## Year 3, 4, 5 and 6: Short division HTU ÷ U

Children must have secure division facts knowledge to 10 x 10 in order for them to see the benefits of this quick efficient method. Teaching must however follow the order of difficulty to overcome possible misconceptions.

Those who are not yet ready for this method should carry on with grouping through the use of arrays as the models in previous pages show.

Because children have to get used to a new layout which does not necessarily provide understanding, it is important that the multiplication method is taught on split screen which shows the conceptual understanding alongside the procedural.

| Conceptual                                                                                         | Procedural                                                              |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|  $40 \div 2 = 20$ | $\begin{array}{r} 2 \overline{) 40} \\ \underline{40} \\ 0 \end{array}$ |
|  $8 \div 2 = 4$  |                                                                         |
| $20 + 4 = 24$                                                                                      |                                                                         |

We begin teaching with a number into which the divisor goes into exactly. Digit by digit we divide the dividend by the divisor.

We then teach a sum that has a remainder in the middle. The remainder is written in small in front of the next dividend digit. Then we divide 16 by 2.

The next level of difficulty is to write 0 above the digit into which the divisor doesn't go into.

Make a point of teaching the following: when the divisor doesn't go into the last digit of the dividend we write the 0 but we will also write that number as a remainder.

$$\begin{array}{r} 31 \\ 2 \overline{) 62} \\ \underline{62} \\ 0 \end{array}$$

$$\begin{array}{r} 482 \\ 2 \overline{) 964} \\ \underline{18} \\ 16 \\ \underline{16} \\ 4 \end{array}$$

$$\begin{array}{r} 098r2 \\ 4 \overline{) 394} \\ \underline{36} \\ 34 \\ \underline{32} \\ 2 \end{array}$$

$$\begin{array}{r} 108r3 \\ 4 \overline{) 435} \\ \underline{40} \\ 35 \\ \underline{32} \\ 3 \end{array}$$

$$\begin{array}{r} 130r3 \\ 4 \overline{) 5123} \\ \underline{40} \\ 11 \\ \underline{8} \\ 3 \end{array}$$

Suggested mental maths starter before teaching the division method with remainders is to find remainders when dividing numbers mentally. Example:  $27 \div 5 = 5r2$  or  $38 \div 6 = 6r2$  or  $82 \div 9 = 9r1$

**All children should be able to calculate using this method by the end of year 3.**

## Year 5 and 6: Long division HTU ÷ TU

This method is followed on from the short division however uses a different format to make finding the remainder easier to calculate.

When we first begin teaching this, provide children with an already prepared fact box. Once more confident, get children to create their own.

**Fact box:**

$2 \times 24 = 48$   
 $3 \times 24 = 72$   
 $4 \times 24 = 96$   
 $5 \times 24 = 120$   
 $6 \times 24 = 144$   
 $7 \times 24 = 168$   
 $8 \times 24 = 192$   
 $9 \times 24 = 216$   
 $10 \times 24 = 240$

$$\begin{array}{r}
 0 \text{ } 2 \text{ } 4 \text{ } r1 \text{ } 2 \\
 2 \ 4 \overline{) 5 \ 8 \ 8} \\
 \underline{- \text{ } 4 \text{ } 8 \text{ }} \\
 1 \ 0 \ 8 \\
 \underline{- \text{ } 9 \text{ } 6 \text{ }} \\
 1 \ 2
 \end{array}$$

Children must be taught to express long division as decimals as well as a mixed number fraction.

To express remainders as a decimal number, we must carry on with the division by bringing down a zero until we have remainders.

Children should use their knowledge of place value and conversions between fractions and decimals to express the answer as a decimal as well as a mixed number fraction.

$$\begin{array}{r}
 0 \text{ } 2 \text{ } 4 \text{ } . \text{ } 5 = 2 \text{ } 4 \text{ } \frac{1}{2} \\
 2 \ 4 \overline{) 5 \ 8 \ 8} \\
 \underline{- \text{ } 4 \text{ } 8 \text{ }} \\
 1 \ 0 \ 8 \\
 \underline{- \text{ } 9 \text{ } 6 \text{ }} \\
 1 \ 2 \ 0 \\
 \underline{- \text{ } 1 \text{ } 2 \text{ } 0 \text{ }} \\
 0 \ 0 \ 0
 \end{array}$$

In both of the above methods children should check if their answer is correct using inverse operations by multiplying their answer by the divisor and adding the remainder to their answer.

Using and applying: Once confident with this method, provide children with plenty of opportunity to be able to use and apply their newly gained skills to solve problems that involves getting answers with remainders and decimals.