

# VHPS CALCULATION POLICY



## ADDITION AND SUBTRACTION

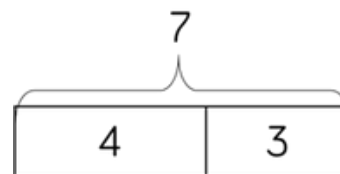
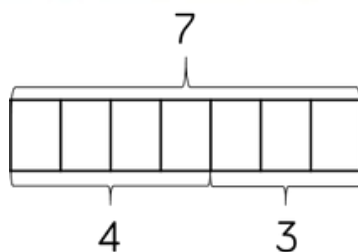
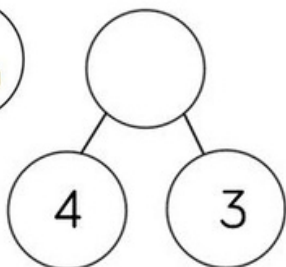
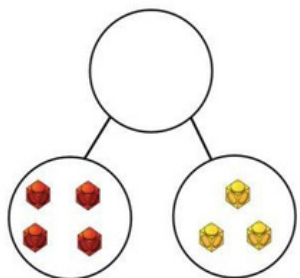
<b>DATE OF REVIEW</b>	<b>SEPTEMBER 2023</b>
<b>DATE OF NEXT REVIEW</b>	<b>AUGUST 2024</b>

**THIS POLICY IS REVIEWED ANNUALLY AND IS IN LINE  
WITH WHITE ROSE HUB**

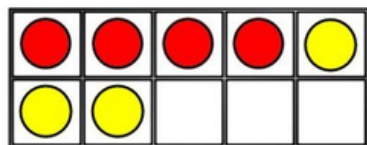
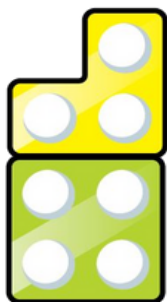
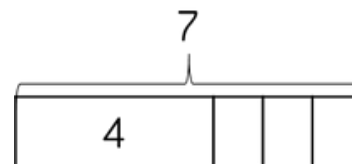
**Addition**

## Skill: Add 1-digit numbers within 10

EYFS/Year: 1



$$4 + 3 = 7$$



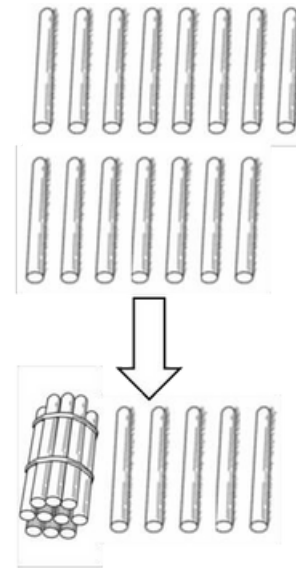
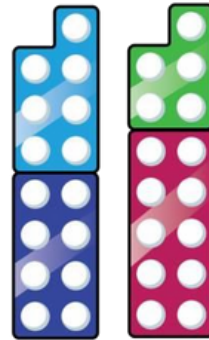
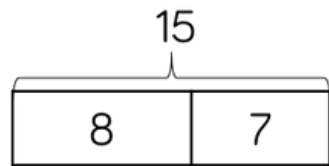
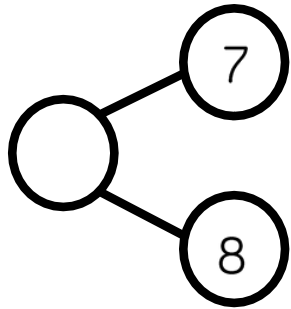
When adding numbers to 10, children can explore both aggregation and augmentation.

The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation.

The combination bar model, ten frame, bead string and number track all support augmentation.

## Skill: Add 1 and 2-digit numbers to 20

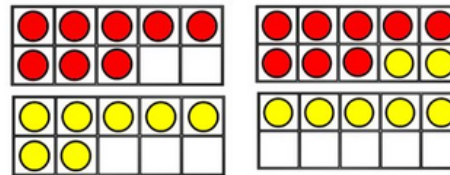
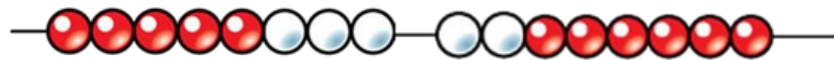
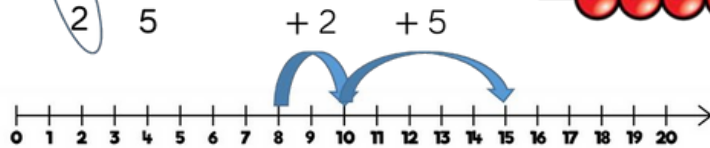
Year: 1/2



$$8 + 7 = 15$$

$$8 + 7 = 15$$

2 5



$$8 + 7 = 15$$

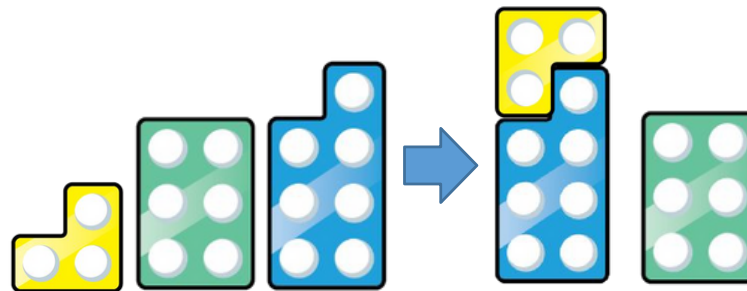
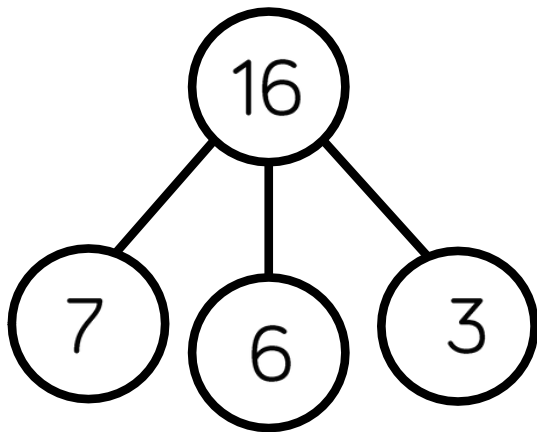
2 5

When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

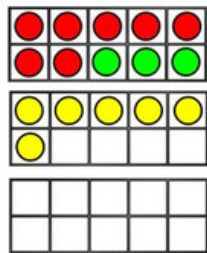
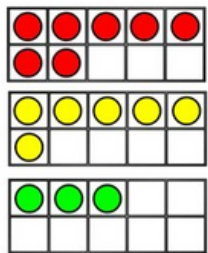
Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.

### Skill: Add three 1-digit numbers

Year: 2

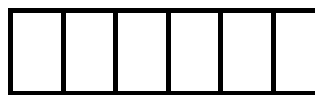


$$7 + 6 + 3 = 16$$



$$7 + 6 + 3 = 16$$

10



16

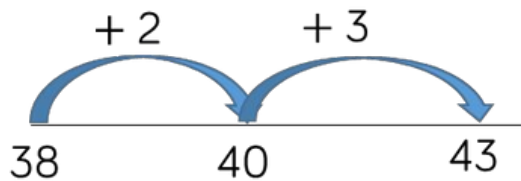
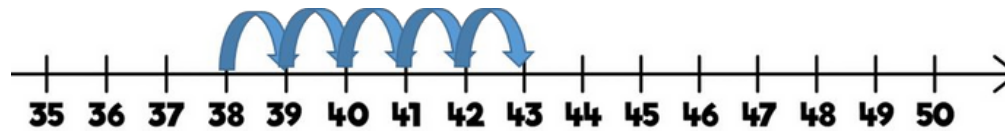
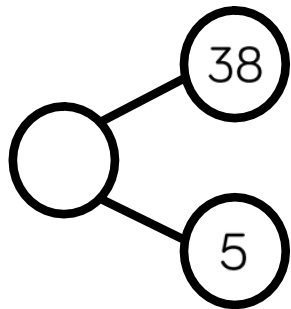
When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently.

This supports children in their understanding of commutativity.

Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

## Skill: Add 1-digit and 2-digit numbers to 100

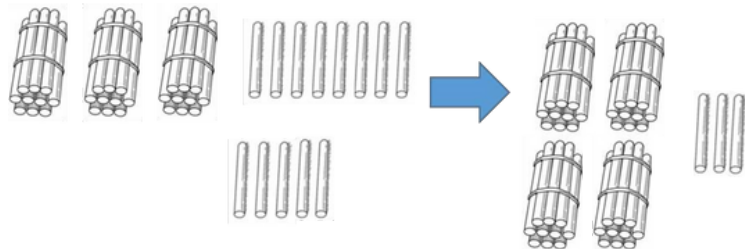
Year: 2/3



?



$$38 + 5 = 43$$



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

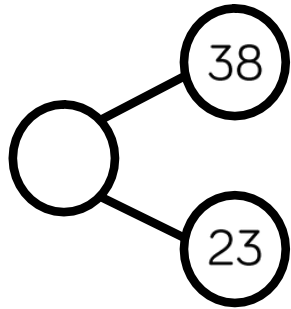
When adding single digits to a two-digit number, children should be encouraged to count on from the larger number.

They should also apply their knowledge of number bonds to add more efficiently e.g.  $8 + 5 = 13$  so  $38 + 5 = 43$ .

Hundred squares and straws can support children to find the number bond to 10.

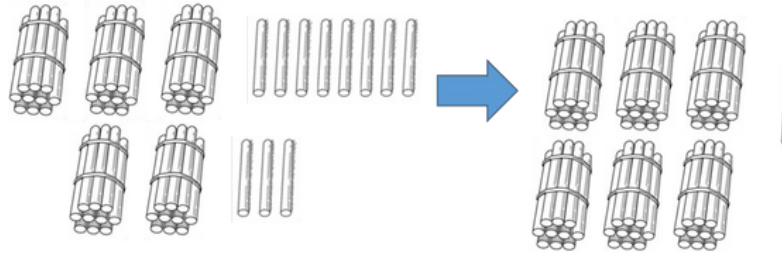
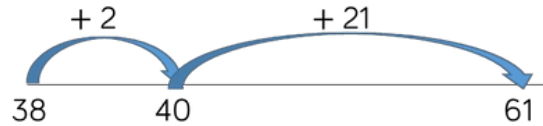
## Skill: Add two 2-digit numbers to 100

Year: 2/3



?

38	23
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$$38 + 23 = 61$$

Tens	Ones
	■ ■ ■ ■ ■ ■ ■ ■
	■ ■ ■ ■ ■ ■ ■ ■

$$\begin{array}{r} 38 \\ + 23 \\ \hline 61 \\ 1 \end{array}$$

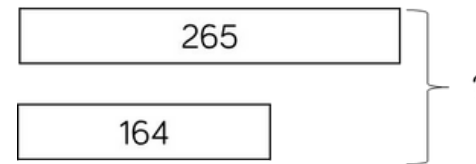
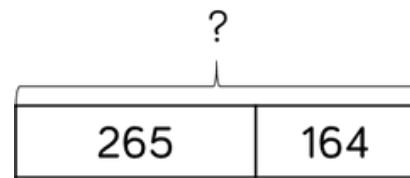
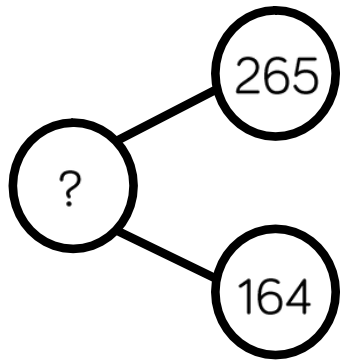
Tens	Ones
10 10 10	1 1 1 1 1 1 1 1
10 10	1 1 1

At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

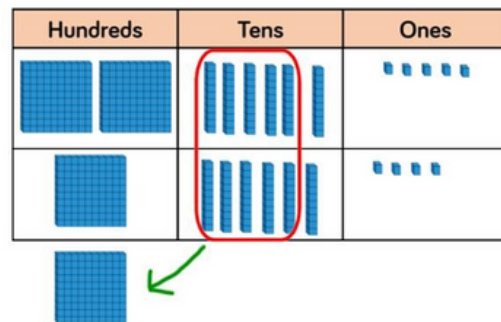
Children can also use a blank number line to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient.

## Skill: Add numbers with up to 3 digits

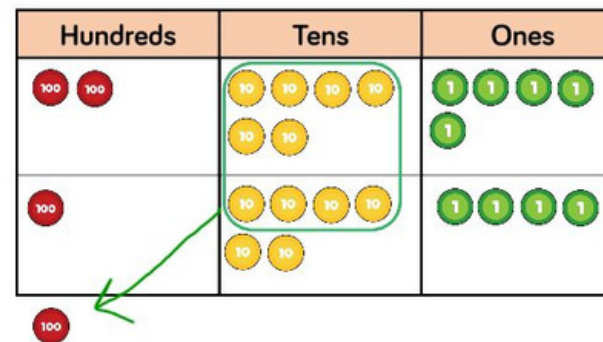
Year: 3



$$265 + 164 = 429$$



$$\begin{array}{r} 265 \\ + 164 \\ \hline 429 \\ \hline 1 \end{array}$$



Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits.

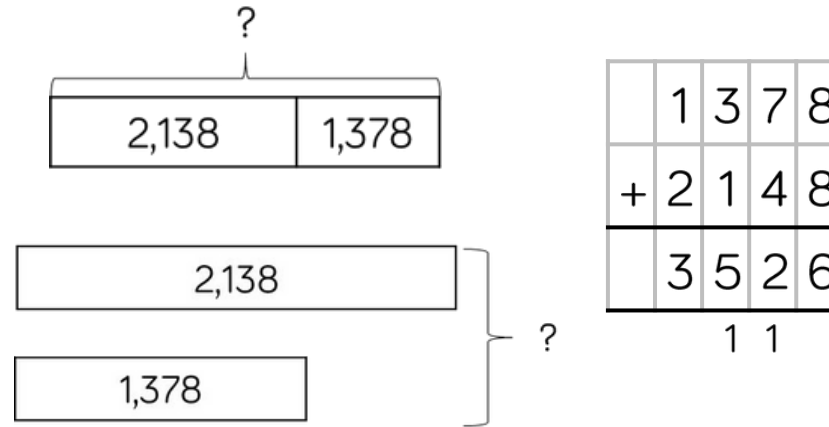
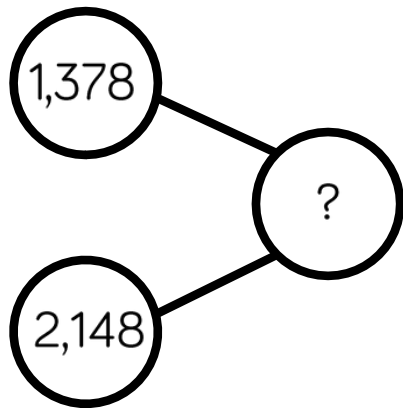
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

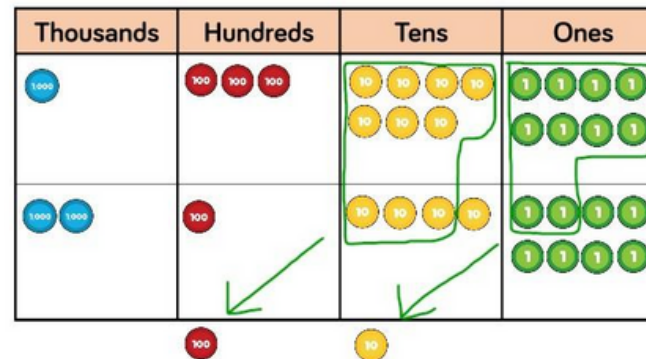
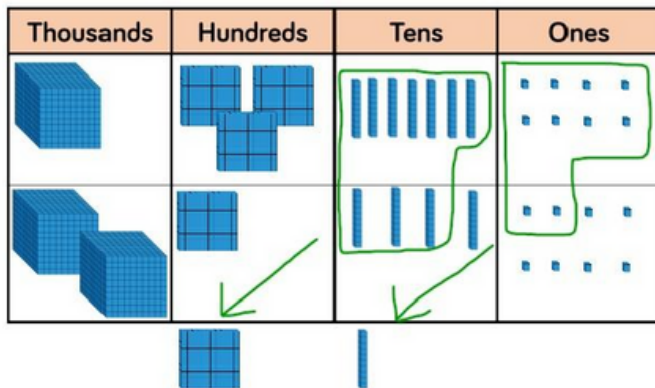


## Skill: Add numbers with up to 4 digits

Year: 4



$$1,378 + 2,148 = 3,526$$



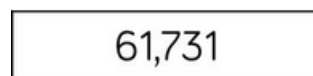
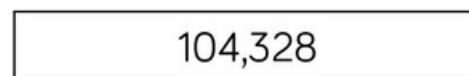
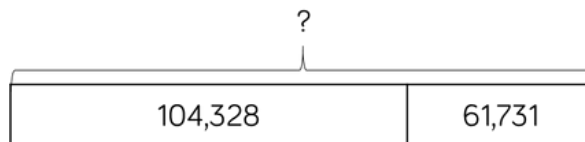
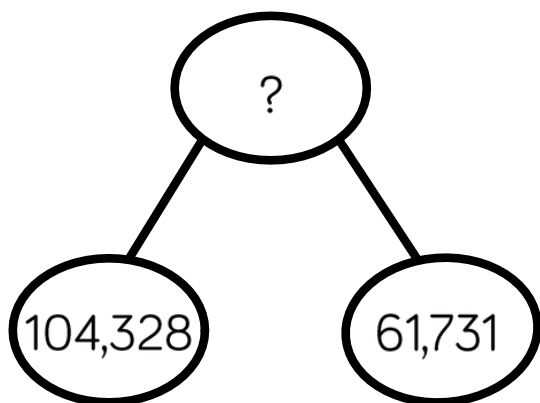
Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

## Skill: Add numbers with more than 4 digits

Year: 5/6



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$$104,328 + 61,731 = 166,059$$

HTh	TTh	Th	H	T	O
10000		1000 1000 1000 1000	100 100 100	10 10	1 1 1 1 1 1 1 1
	10000 10000 10000 10000 10000 10000	1000	100 100 100 100 100 100 100	10 10 10	1

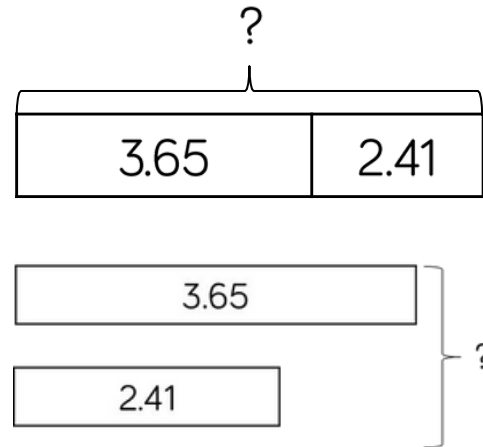
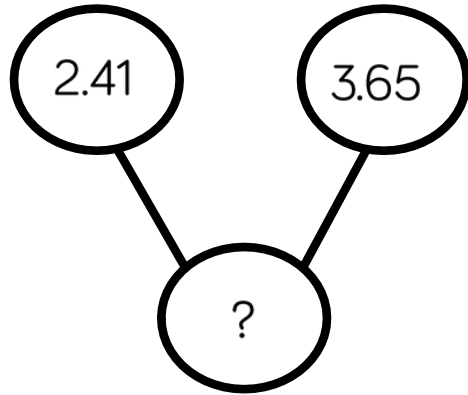
1	0	4	3	2	8
+	6	1	7	3	1
1	6	6	0	5	9
			1		

Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

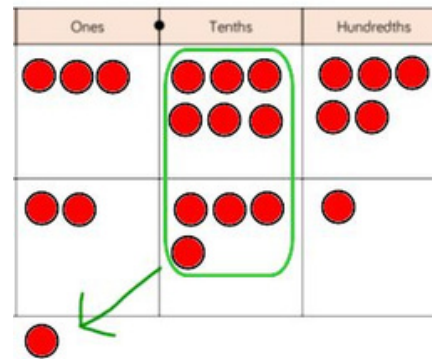
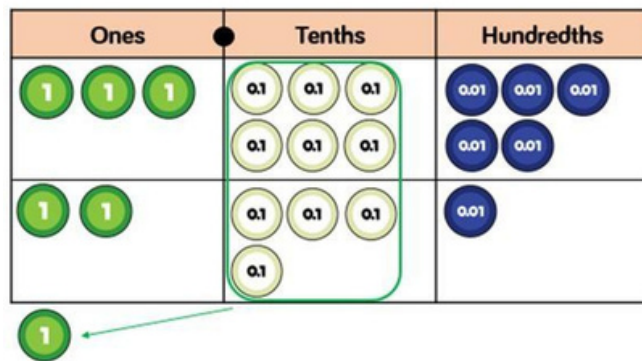
## Skill: Add with up to 3 decimal places

Year: 5



$$\begin{array}{r} 3.65 \\ + 2.41 \\ \hline 6.06 \\ 1 \end{array}$$

$$3.65 + 2.41 = 6.06$$



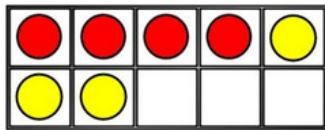
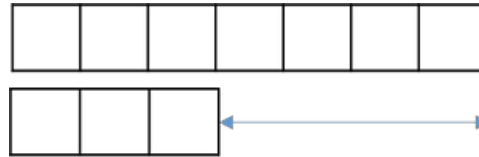
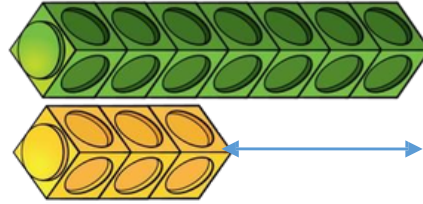
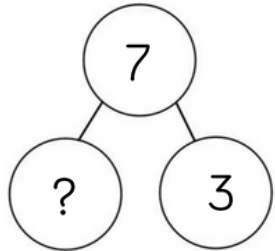
Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

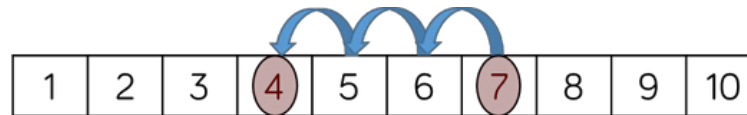
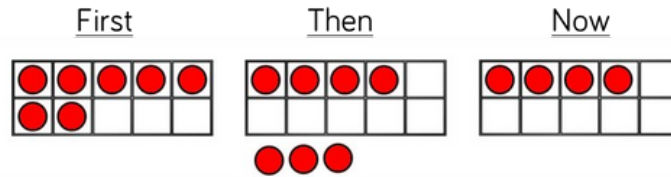
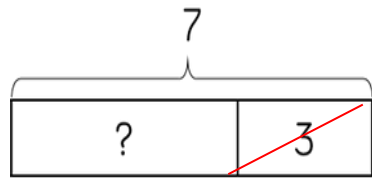
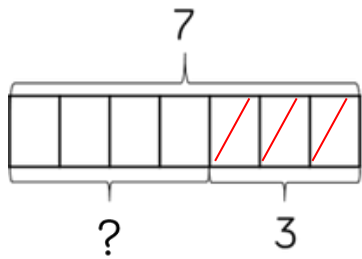
# Subtraction

## Skill: Subtract 1-digit numbers within 10

EYFS/Year: 1



$$7 - 3 = 4$$



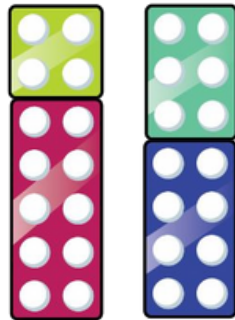
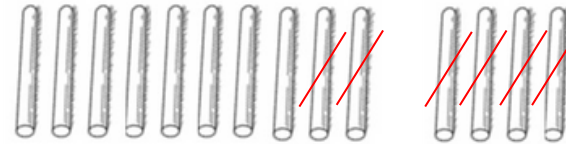
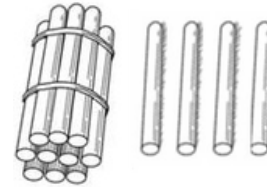
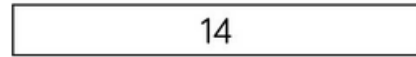
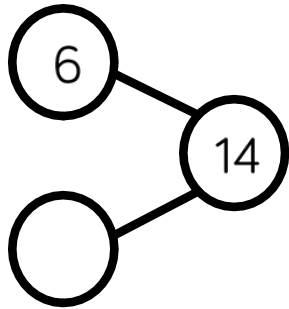
Part-whole models, bar models, ten frames and number shapes support partitioning.

Ten frames, number tracks, single bar models and bead strings support reduction.

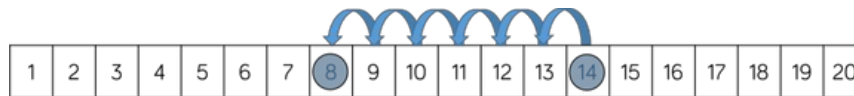
Cubes and bar models with two bars can support finding the difference.

## Skill: Subtract 1 and 2-digit numbers to 20

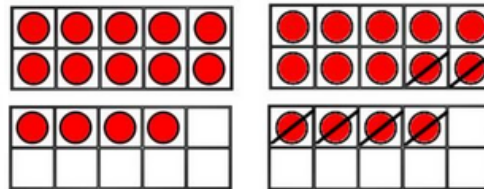
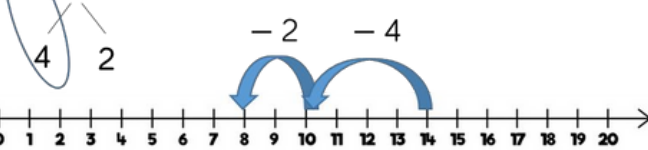
Year: 1/2



$$14 - 6 = 8$$



$$14 - 6 = 8$$



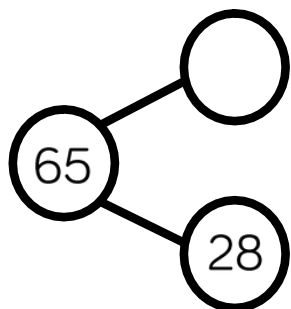
$$14 - 6 = 8$$

When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

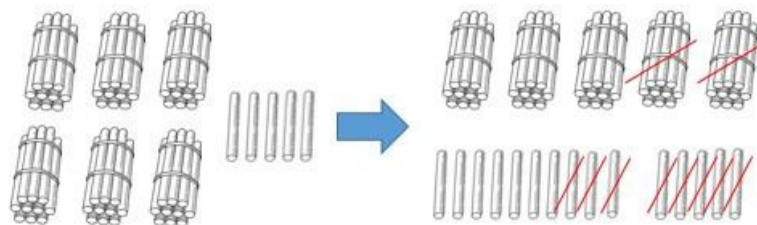
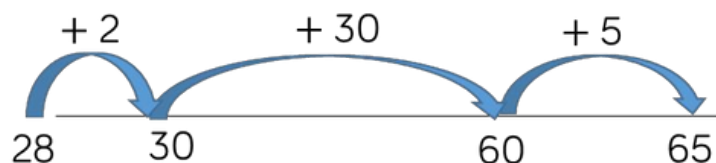
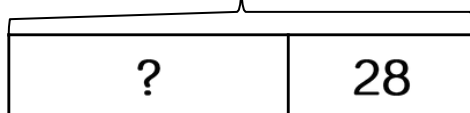
Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.

## Skill: Subtract 1 and 2-digit numbers to 100

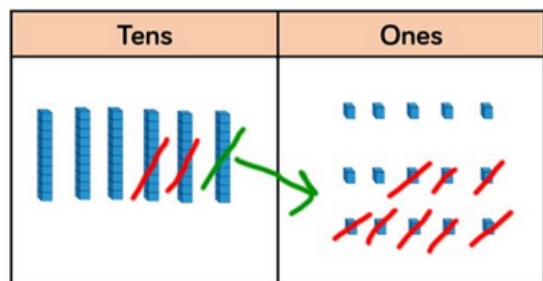
Year: 2



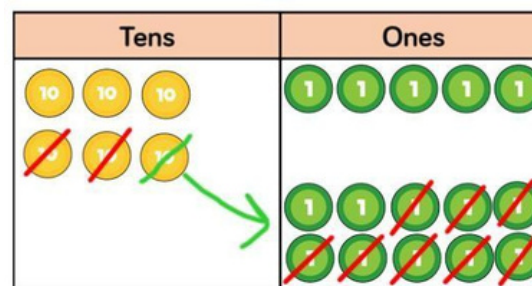
65



$$65 - 28 = 37$$



$$\begin{array}{r} 5 \ 1 \\ 65 \\ - 28 \\ \hline 37 \end{array}$$

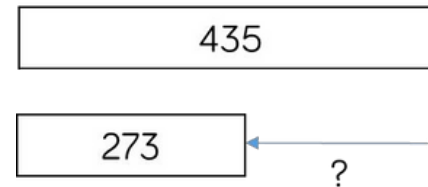
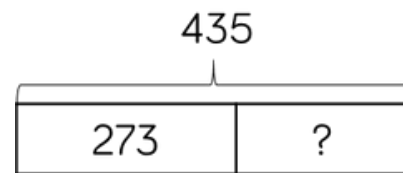
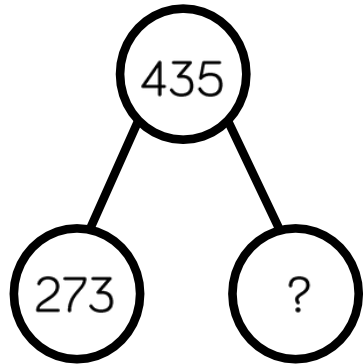


At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

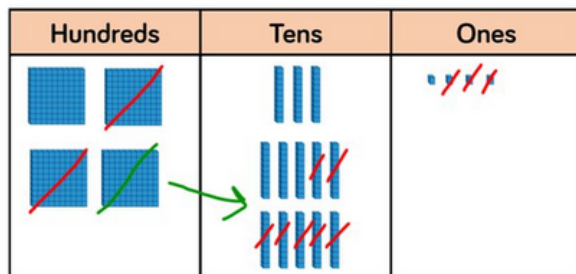
Children can also use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.

## Skill: Subtract numbers with up to 3 digits

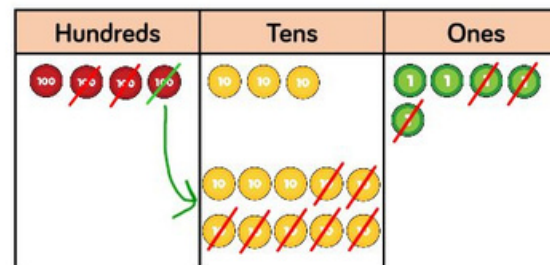
Year: 3



$$435 - 273 = 262$$



$$\begin{array}{r} 3 \phantom{0} \phantom{0} \phantom{0} \\ 435 \\ - 273 \\ \hline 262 \end{array}$$



Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits.

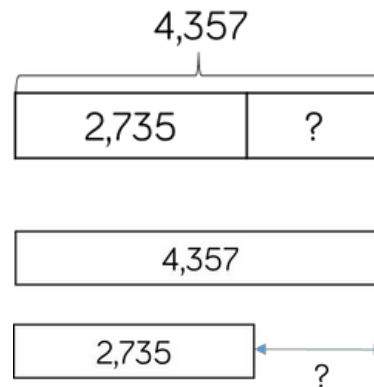
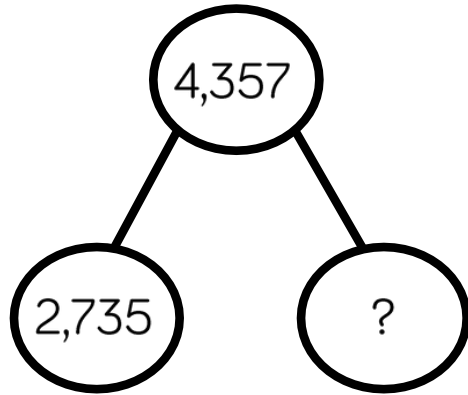
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.



## Skill: Subtract numbers with up to 4 digits

Year: 4



$$\begin{array}{r} 3 \ 1 \\ \cancel{4}357 \\ - 2735 \\ \hline 1622 \end{array}$$

$$4,357 - 2,735 = 1,622$$

Thousands	Hundreds	Tens	Ones

Thousands	Hundreds	Tens	Ones

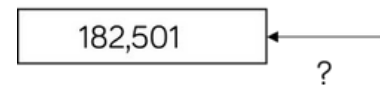
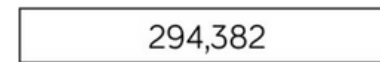
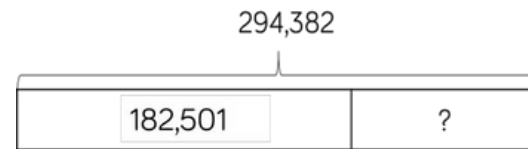
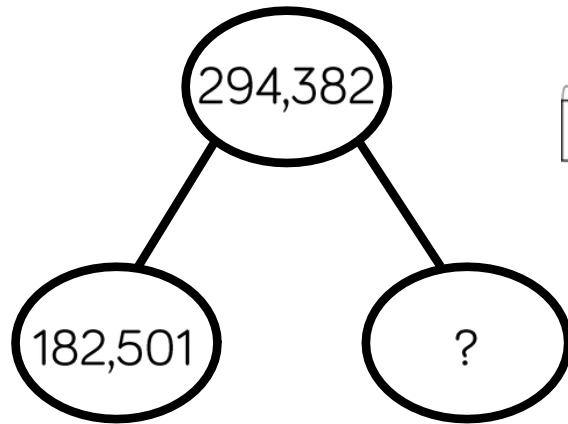
Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

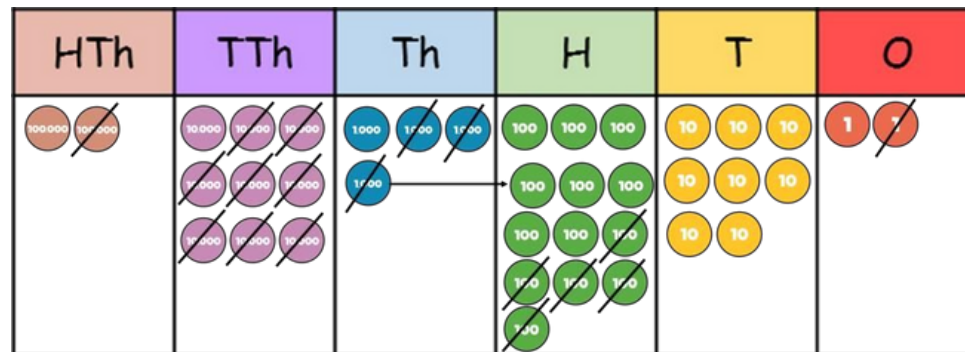
Plain counters on a place value grid can also be used to support learning.

## Skill: Subtract numbers with more than 4 digits

Year: 5/6



$$294,382 - 182,501 = 111,881$$



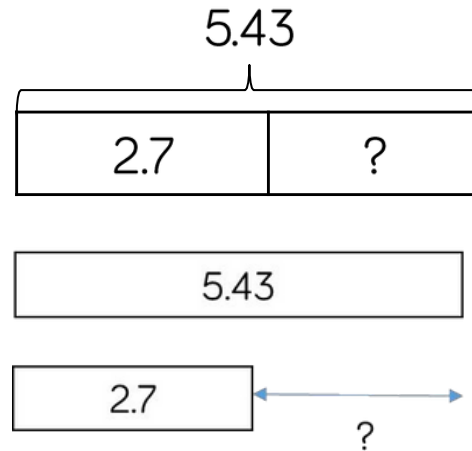
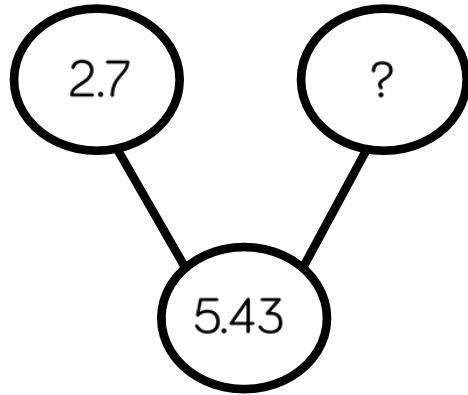
	2	9	<del>3</del>	13	8	2
-	1	8	2	5	0	1
	1	1	1	8	8	1

Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

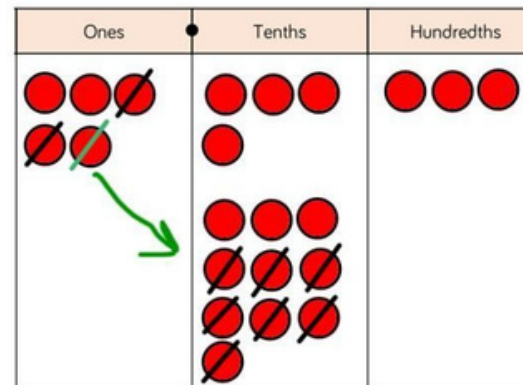
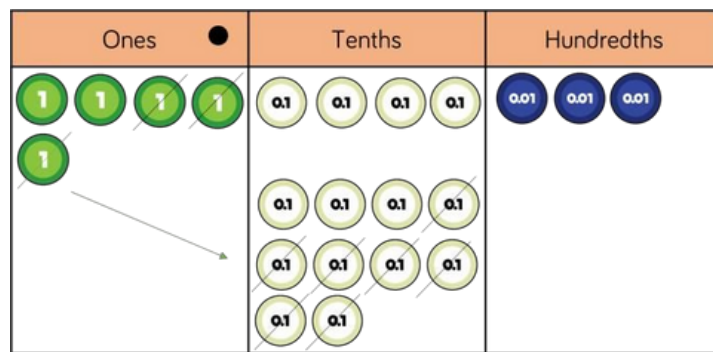
## Skill: Subtract with up to 3 decimal places

Year: 5



$$\begin{array}{r} 4 \quad 1 \\ 5.43 \\ + 2.7 \\ \hline 2.73 \end{array}$$

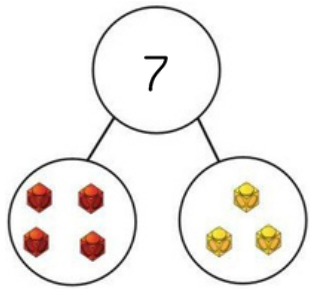
$$5.43 - 2.7 = 2.73$$



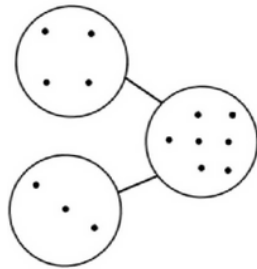
Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

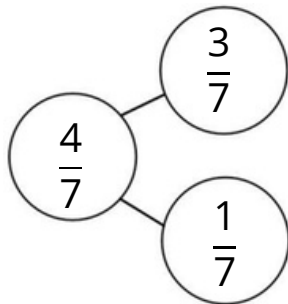
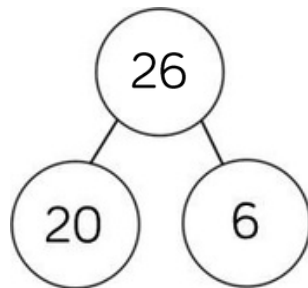
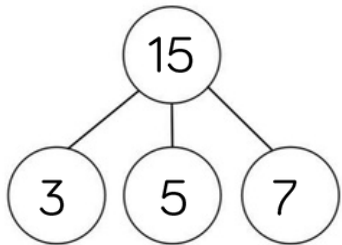
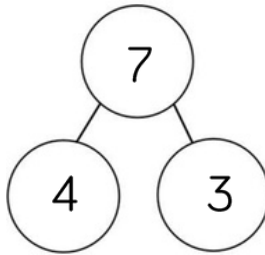
# Part-Whole Model



$$7 = 4 + 3$$
$$7 = 3 + 4$$



$$7 - 3 = 4$$
$$7 - 4 = 3$$



## Benefits

This part-whole model supports children in their understanding of aggregation and partitioning. Due to its shape, it can be referred to as a cherry part-whole model.

When the parts are complete and the whole is empty, children use aggregation to add the parts together to find the total.

When the whole is complete and at least one of the parts is empty, children use partitioning (a form of subtraction) to find the missing part.

Part-whole models can be used to partition a number into two or more parts, or to help children to partition a number into tens and ones or other place value columns.

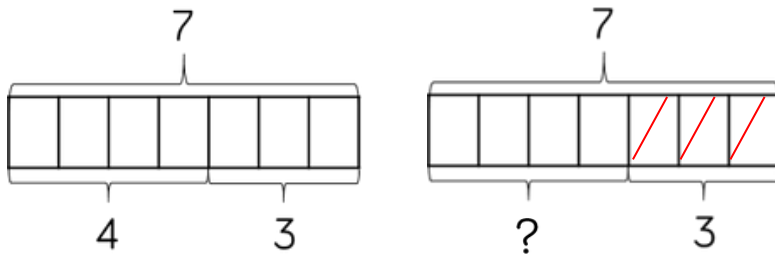
In KS2, children can apply their understanding of the part-whole model to add and subtract fractions, decimals and percentages.

# Bar Model (single)

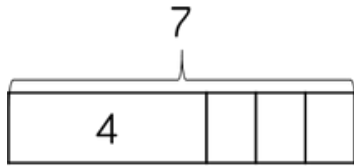
Concrete



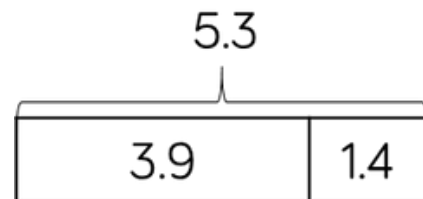
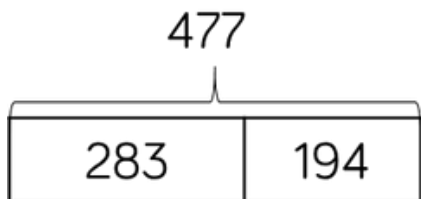
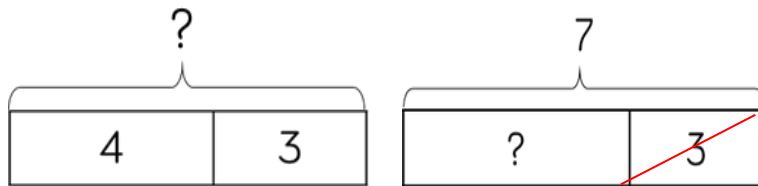
Discrete



Combination



Continuous



## Benefits

The single bar model is another type of a part-whole model that can support children in representing calculations to help them unpick the structure.

Cubes and counters can be used in a line as a concrete representation of the bar model.

Discrete bar models are a good starting point with smaller numbers. Each box represents one whole.

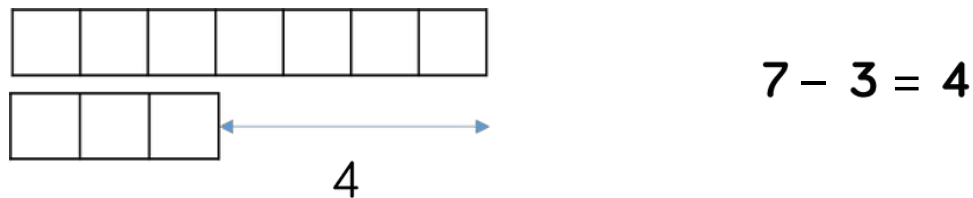
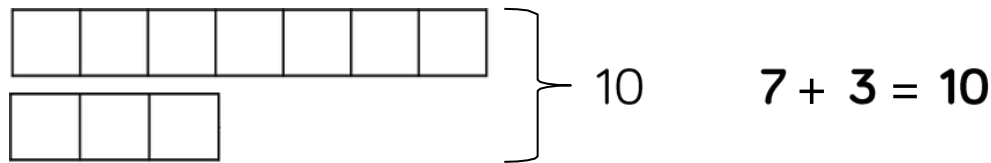
The combination bar model can support children to calculate by counting on from the larger number. It is a good stepping stone towards the continuous bar model.

Continuous bar models are useful for a range of values. Each rectangle represents a number. The question mark indicates the value to be found.

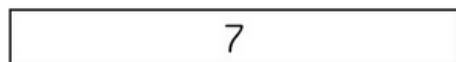
In KS2, children can use bar models to represent larger numbers, decimals and fractions.

# Bar Model (multiple)

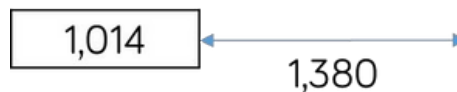
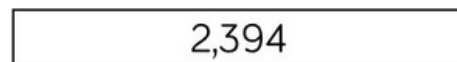
## Discrete



## Continuous



$$7 - 3 = 4$$



$$2,394 - 1,014 = 1,380$$

## Benefits

The multiple bar model is a good way to compare quantities whilst still unpicking the structure.

Two or more bars can be drawn, with a bracket labelling the whole positioned on the right hand side of the bars. Smaller numbers can be represented with a discrete bar model whilst continuous bar models are more effective for larger numbers.

Multiple bar models can also be used to represent the difference in subtraction. An arrow can be used to model the difference.

When working with smaller numbers, children can use cubes and a discrete model to find the difference. This supports children to see how counting on can help when finding the difference.

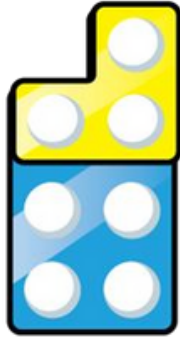
# Number Shapes



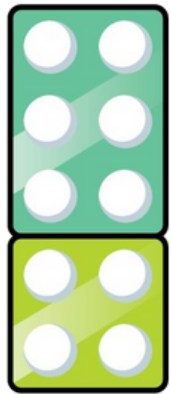
$$7 = 4 + 3$$



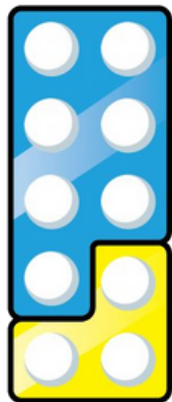
$$7 = 3 + 4$$



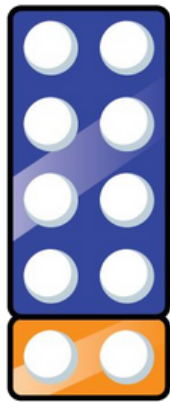
$$7 - 3 = 4$$



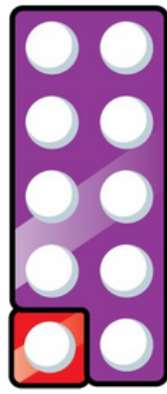
$$6 + 4$$



$$7 + 3$$



$$8 + 2$$



$$9 + 1$$

## Benefits

Number shapes can be useful to support children to subitise numbers as well as explore aggregation, partitioning and number bonds.

When adding numbers, children can see how the parts come together making a whole. As children use number shapes more often, they can start to subitise the total due to their familiarity with the shape of each number.

When subtracting numbers, children can start with the whole and then place one of the parts on top of the whole to see what part is missing. Again, children will start to be able to subitise the part that is missing due to their familiarity with the shapes.

Children can also work systematically to find number bonds. As they increase one number by 1, they can see that the other number decreases by 1 to find all the possible number bonds for a number.